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HEXAGON PROGRAM
PRELIMINARY POST FLIGHT REPORT
FOR FLIGHT NO. 9

31 MARCH 1975

This document is prepared to support the Program HEXAGON analysis and reporting requirement established by the System Program Director.

This report represents the coordinated inputs from Program HEXAGON Technical Advisor Staff at Sunnyvale, California. The Technical Advisor Staff is composed of the Aerospace Program HEXAGON Sunnyvale Field Office and the Satellite Contractors who provided technical support during the mission. The data contained in this report were collected and analyzed during mission operations and were assembled in sections keyed to injection, each RV recovery and SOLO as major mission segments.

The sections of this report pertaining to the Satellite Control Facility performance were prepared by the 6595th ATW Field Test Force Director.

FOREWORD

This document presents preliminary evaluation results of vehicle and ground system performances during the ninth Program HEXAGON flight. The evaluation is based upon data gathered during operations at the Satellite Test Center (STC), Sunnyvale, California.

The report was prepared in sections, keyed to major segments, during mission operations and were assembled at the end of the operation.

Preliminary evaluation began as data were gathered at the STC during operations. The Aerospace Corporation and the Associate Contractors submitted formal inputs to the Aerospace Corporation ten calendar days after injection, after each RV recovery event and after completion of the SOLO phase and deboost. The Aerospace Corporation compiled the inputs for each section as they were received and published the report. Throughout the preparation of this report, editorial considerations were minimized in order to provide timely publication of technically useful information.

SECURITY

This HEXAGON Program Preliminary Post Flight Report for Flight No. 9 has been prepared covertly in accordance with the requirements set forth in the BYEMAN Industrial Facility Security Manual, which established procedures and assigns responsibilities for the preparation of security plans for all program operation. Personnel should refer all security problems not covered therein to one of the following:

> The SAFSP Deputy Director has overall responsibility for Program security.
>
> The 6595th ATW is responsible for all security procedures applicable to prelaunch and launch operations at VAFB.
>
> Det No. 1, Hq. AFSCF is responsible for all security procedures applicable to the SCF and retrieval operations.

It is emphasized that security requirements take precedence over all other Program requirements.

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FLIGHT SUMMARY

SV-9 was shipped to VAFB on the 8th of October for a scheduled launch on 22 October. Replacement of contaminated Titan IIID components delayed the launch until 29 October. Liftoff occurred at 11:30 PST at the opening of the launch window Solar arrays were deployed at Rev 1 INDI and positioned at Rev 1 KODI. Panoramic camera tests were completed by Rev 4 and the system started operational photography with the Rev 6 command message. The mapping camera health test was successful on Rev 2 with the system ready to start photography on Rev 5 also. The Doppler Beacon System antenna was deployed and verified normal. Subsatellite No. 1 (-Y) was separated on Rev 13 and Subsatellite No. 2 (+Y) was separated on Rev 15.

Panoramic and mapping camera photography continued without incident throughout the segment. The image quality of both cameras ranged from very good to poor. The poor imagery was for the most part attributed to hazy or inclement weather. The majority of the imagery ranged from fair to good, with the good quality being comparable to previous missions. The RV-1 payload was 100.65% of the maximum I.C.D. weight and unbalanced 0.0%. The RV-1 recovery took place on Nov 17, 1974 on Rev 310, Flight Day 20. Aerial recovery was accomplished on the second pass at 7600 feet altitude, 20.0 nautical miles from the predicted impact point.

The Sensor Subsystem exhibited nominal characteristics throughout RV-2, with no anomalies or malfunctions experienced. The overall quality of the acquired photogrpahy ranged from very good to poor with the majority rated as good. The quality of the Color photography (SO-255) compared to previous color acquisitions ranged from good to fair with most rated good. The SO-255 material had an apparent underexposure of 1/3 to 1/2. The RV-2 payload was 99.72% of the maximum I.C.D.

weight and unbalanced 0.02%. Recovery occurred on Rev 894, December 23, 1974, operations day 56. All events were normal and executed as planned. Aerial recovery was accomplished on the first pass at 13,350 feet altitude, 11.88 nautical miles from the predicted impact point.

The Mapping Camera Subsystem completed mapping requirements successfully. All operations over BAR XC and special engineering ops made with QX8G1 type film were completed successfully. Total film in the RV-5 at recovery, including ground test was 68.51 pounds. RV-5 recovery events were nominal. Recovery occurred on Rev 958, December 27, 1974, operations day 60. Aerial recovery occurred on the first pass at 14,600 feet altitude, approximately 7 nautical miles from the predicted impact point.

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-3 with no anomalies or malfunctions experienced. The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the best of RV-3 was comparable with the best of RV-2.

On Rev 1118 vehicle control was switched to ACS-2 because of a H/S Inhibit in the roll channel. On Rev 1311, control was transferred to the RCS-2 thrusters because of low thrust levels on RCS-1. The RV-3 payload was 99.30% of the maximum I.C.D. weight and unbalanced 4.34%. The recovery took place on January 21, 1975, Flight Day 85, Rev 1364.

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced. The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the

best of RV-4 indicated a slight decrease from the best of RV-3. The RV-4 payload was 96.28% of the maximum I.C.D. weight and unbalanced 5.08%. The recovery took place on March 7, 1975 on Rev 2094, Flight Day 129. Aerial recovery was accomplished on the 1st pass at 12,700 feet altitude, 14.2 nautical miles from the predicted impact point.

PROGRAM SUMMARY
ORBIT ADJUST PROPELLANT USAGE

TABLE 1

Year	SV	# Days	# OAs	OA Cycle	H. Perigee NM Mean	Argument of Perigee	OA Prop Use Lbs/Day
1972	2	39	17	2 Day (Avg)	85.0	115-140°	33
1972	3	19 39	12	4 Day 5 Day	96.5 98.0	140-165° 125-160°	12 13
1972	4	65	18	4 Day	90.2	120-150°	19
1973	5	49 15	49	2 Day 3 Day	86.5	120-140°	26 21
1973	6	24 51	34	2 Day 3 Day	88.0	120-140° 120-150°	29 21
1973-74	7	18 84	43	3 Day	88.5 90.5	120-150°	25 21
1974	8	87	43	3 Day	85.4	120-150° 115-150°	28
1974	9	141	51	3 Day	87.1	120-150°	23

MISSION	CONFIGURATION	DURATION	RECOVERIES	COMMENTS
1201 Launched 15 June 1971 Deboost 6 August 1971	FIRST HEXAGON MISSION Normal ACS/RCS config. Restricted rewind-Pan. Cam. Beta Angle -20° to +10° RV unbalance 60%	Primary 31 days Solo 21 days	RV-1 5 Days 6/20/71 Water-Parachute damage RV-2 6 days 6/26/71 RV-3 14 days 7/10/71 Lost-Parachute failure RV-4 6 days 7/16/71 Restricted to 45% capacity	1. Thermal contamination High temperatures reduce batt. capacity-limited payload operations. 2. Main parachute damage RV's 1, 2, 3. 3. Camera ESD's - resumed operation each time. 4. Degraded RCS thruster pulse shapes-Control OK
1202 Launched 20 January 1972 Deboost 28 February 1972	Beta angle +18° to +30° Subsatellite Rev 13 Parachutes modified Rewind limited to 35 ips	Primary 40 days Solo 0 days	RV-1 6 days 1/26/72 RV-2 13 days 2/8/72 RV-3 9 days 2/17/72 RV-4 11 days 2/28/72	1. Film path break Camera. RV 3 & 4 Monoscopic operation. 2. RCS thruster degradation SV tumbled 2 times. 3. Deboost used Lifeboat. 4. Thermal contamination verified.
1203 Launched 7 July 1972 Deboost 13 Sept. 1972	Laboratory quality Hydrazine. Higher perigee, min manuevers and OA's Redundant RCS tanks empty-filled from OAS when needed Beta angle +34° to +26° Subsatellite-Rev 13.	Primary 48 days Solo 11 days	RV-1 8 days 7/15/72 RV-2 14 days 7/29/72 RV-3 14 days 8/12/72 RV-4 21 days 9/2/72	1. Film edge folds - both cameras. 2. Film path disturbance at high rewinds. 3. High RCS thruster leaks primary and redundant.
1204 Launched 10 October 1972 Deboost 8 January 1973	10,000 color-Camera A RCS tanks 3 & 4 capped. Beta angle +30° to +24° Minimum SV maneuvers Subsatellite - Rev 2 RACS control RCS 1 at L.O.	Primary 68 days Solo 22 days	RV-1 11 days 10/21/72 RV-2 16 days 11/5/72 RV-3 18 days 11/23/72 RV-4 24 days 12/17/72	1. Improper OB stow degraded early photography 2. Yaw bias RACS Day 35 3. Yaw bias PACS Day 68 4. Pyro battery leaks RV-2 and RV-4

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MISSION	CONFIGURATION	DURATION	RECOVERIES	COMMENTS
1205 Launched 9 March 1973 Deboost 18 May 1973	First mapping mission 2000' color-Camera A RCS operated from OAS No subsatellites Beta angle +2° to -8°	Primary 61 days Mapping 43 days Solo 9 days	RV-1 12 days 3/22/73 RV-2 14 days 4/5/73 RV-3 14 days 4/19/73 RV-4 22 days 5/9/73 RV-5 43 days 4/21/73	1. Primary ACS pitch error. 2. Redundant ACS yaw bias (degraded photography) 3. ST terrain thermal door (restricted ST operations) (No ST calibration) 4. SGLS 2 (Cubic) failure 5. ST quality excellent
1206 Launched 13 July 1973 VASP Deboost 12 October 1973	21,000' color-Camera B in 5 segments RCS 1 & 2 operate from OAS Propellant in RCS Tank 2 only. (Emergency use) Beta angle +2° to -8° 50 hour batteries in RV's Modified ST terrain therm.	Primary 74 days Mapping 42 days Solo 17 days	RV-1 19 days 8/1/73 RV-2 12 days 8/13/73 RV-3 26 days 9/8/73 RV-4 17 days 9/25/73 RV-5 42 days 8/24/73	1. Primary ACS yaw bias on day 3-Transferred to RAC 2. Thrust level decay REA #4 & 8 - No effect. 3. ST calibration successfu 4. VASP Deboost/impact successful.
1207 Launched 10 November 1973 Deboost 13 March 1974	Soft seat REM values RCS 1 supplied from RCS tanks 1 & 2 PACS and RACS torquers isolated SGLS 1 & 2 Cubic. + Y and -Y subsatellites Pan Camera commandable filter. 5000' color & 500' IR Special ST terrain film for test.	Primary 101 days Mapping 57 days Solo 21 days	RV-1 14 days 11/24/73 RV-2 24 days 12/17/73 RV-3 27 days 1/13/74 RV-4 37 days 2/20/74 RV-5 57 days 1/8/74	1. RCS 1 used until Day 90 2. All mission objectives satisfied. 3. 58 OA's executed during mission and Solo. 4. All expendables used 5. SSP successful
1208 Launched 10 April 1974 Deboost 28 July 1974	RCS Tanks 1-4 filled SGLS 1 G.D. unit. TR 1 & 2 stored cmds via MCS. B/U ECS/VHF command receiver. +Y and -Y subsatellites 2600' color and 3400' of IR film for Pan.	Primary 106 days Mapping 61 days Solo 5 days	RV-1 15 days 4/23/74 RV-2 28 days 5/21/74 RV-3 27 days 6/26/74 RV-4 36 days 7/24/74 RV-5 61 days 6/9/74	1. RCS-1 used until day 62 2. All mission objectives satisfied. 3. 43 OA's executed. 4. All expendables used.

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SECTION 1

1.0 READINESS, LAUNCH AND ASCENT

1.1 Readiness Activity

SV-9 was shipped to VAFB on the 8th of October for a scheduled launch on 22 October. Replacement of contaminated Titan IIID components delayed the launch until 29th October. The first countdown went to completion although upper winds exceeded control margin constraints during the early countdown period.

1.2 SV-~~8~~9 Operational Configuration

1.2.1 SV-~~8~~9 Changes

1.2.1.1 Satellite Vehicle

	Description	Comment
	Both link 1 & 2 are cubic Mfr.	Block II configuration
	Shroud Temp Transducers relocated and extra shroud pressure transducer	To assist analysis of why shroud separates faster than estimates.
	Ascent vibration and quantic instrumentation removed	Not required

1.2.1.2 Panoramic Camera Subsystem — No change

1.2.1.3 Main Re-entry Vehicle — No change

1.2.1.4 Mapping Camera Subsystem

	Description	Comment
	Wratten 12 filter and exposure times of 6, 12, 24 m sec.	Change film type from 3400 to 3414

1.2.1.5 RV-5 - No change

1.2.1.6 Command Subsystem - No change

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1.2.1.7 Operational

a. The on-orbit Beta range is constrained to remain within -8° and $+30^{\circ}$ during the mission.

b. A nominal 3 day orbit adjust cycle with dual OA's as required to control argument.

c. The primary mission duration is planned for 120 days which will be extended as propellant margins allow.

d. Mapping camera mission planned for 60 days.

e. Orbit Parameters (Nominal) Case 902 D

(1)	Inclination	96.8 degrees
(2)	Period	88:53.3 minutes
(3)	Perigee Altitude	87.1 n-miles
(4)	Argument of Perigee	160.2 degrees

f. Panoramic Camera Restrictions

(1) Rewind fixed at 5 ips.

g. General Constraints

(1) Doppler beacon ON/OF commanding to be managed by 'TDERBY.

(2) RV-5 not to be released until after RV-1 recovery.

(3) PACS and RACS gyros are both on at lift-off and will remain ON unless a failure or thermal considerations requires a turnoff.

1.2.1.8 'TUNITY

1) Separate load order for Pan & ST systems
2) New 'TSOLAR for sunrise and sunset times
3) New 'TSPEC for special target planning aid
4) ST system Data Base defined wastage parameter .
5) Command count since last VBE in CMG
6) Separate command for Slit Width for Camera A and Camera B
7) Rewrite of sequence building Table 'TDEFINE

1.2.2 Documentation and Software

1.2.2.1 Documentation

1) Test Operations Order (TOO) 72-12, with RCN #06, OCN #2.
2) Test Operating Instructions (TOI), dated 16 September 1974.
3) Flight Profile Addendum (FPA), revision dated 15 March 1974.
4) Field Test Force (FTF) Profile Nom Flt, dated 23 October 1974.
5) Computer Usage Schedule (CUS) Flt 9-1E
6) Test Group Operations Plan 1-75
7) Test Group Operations Order #12 dated 18 October 1974.
8) Orbital Requirements Document (ORD), dated 31 August 1972, Revision No. 2.
9) CDPTO Requirements Letter, dated 6 March 1974.
10) Systems Test Objectives (STO), dated October 1973, (Rev B).
11) Orbital Support Plan (OSP), dated 15 December 1969.
12) Sequence Definition Specification (SDS), dated 25 September 1974.
13) Command Definition Specification (CDS), dated 25 September 1974.
14) Hardware/Software Limitations Specification (HSLS), dated 25 September 1974.
15) MADCOMX, MS-IV, dated 28 September 1973, (Rev C).
16) MOD-IVA ECS/MCS Handbook, dated December 1972, (Revised).
17) Orbital Operations Policies (OOPS), dated 11 March 1974.
18) SV-8 Contingency Plan, dated 15 February 1974.

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1.2.2.2 Software:

1) 'TUNITY

a) Auxiliary Master Tape AMT 3.224
b) Auxiliary COMPOOL COMOCPFQ
c) SAFARI Tape 911

2) System II

a) System Support Tape (SST) 15.0A
b) SST Corrector Tape CT150A13
c) Data Base F1t 9DBM
d) System COMPOOL COMSYSXF

3) Bird Buffer Master 13.1 BR

4) RTS Master Disk 13.1 RG with Corrector Set 1

1.2.3 Telemetry

All telemetry modes required for support of SV-8 were generated and validated prior to start of Dress Rehearsal, using prepass F.

1.2.4 Pad Load and Emergency Messages

1. The flight pad load was generated to support a planned launch date of 22 October and was used for the 29 October launch with a time offset to accomodate the revised launch window. The pad load was generated using one message 100, covering station contacts to rev 19 and events to rev 2. The first on-orbit message for rev 2 Pogo contained normal events forward. The pad load contents are summarized as:

a) Selected station contacts to Rev 19 and operational activities thru Rev. 4.
b) Rev 0
SV/BV Separation enable
Uncage SS System
ST System out of Ascent Mode
Inhibited SA deploy at INDI
Doppler beacon activation
c) Rev 1
ECS Telltale
SA Deploy (inhibited)
d) Rev 2
SA deploy

A set of emergency messages were generated for use as required.

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2. Msg 098 SGLS2/PCM2 Emergency contacts - Rev 1 use.

3. Msg 068 VBE to Solar Array Deploy - Rev 1 use.

4. Msg 990 Emergency PCCN - Available throughout the mission. This message obtains PCM Side 2B, PCM Format B, telemetry and tape recorder readout through SGLS 2 in the event of negative acquisition due to malfunction of the primary transponder, PCM 1A telemetry, and/or ECS command system.

5. Msg 992 Recovery Emergency PCON - Available throughout the mission. This message is used in the event of no acquisition at POGO on a recovery pass. It will accomplish a complete switch to SGLS 2, PCM 2 to gain visibility of the vehicle.

6. Msg 084 MCS Rev 1 Emergency Contacts - Rev 1 use.

7. Msg 080 Emergency Orbit Adjust - Rev 1 use.

8. Msg 074 Emergency ACS Message - Rev 1 use.

9. Msg 096 Command Exercise - Early rev use.

1.2.5 Expendables (Liftoff Status)

OA Tank	3300 Pounds Propellant	
RCS Tanks 1, 2, 3, 4	520 Pounds Propellant	
Panoramic Camera	Camera A	Camera B*
Film on RV-1 ft.	1500	1500
Film on Supply ft.	116,930	100,400
Pneumatics lbs.	17.61	17.78

*Includes 8150 feet color and 3400 feet IR.

Mapping Camera	Terrain	Stellar
Mapping (frames) 3414	2064	2064
Engineering (frames)	14	14
Calibration (frames)	26	26
Excess (frames)	---	233
Total footage	3377.5 ft.	2103.5 ft.

1.3 Launch and Ascent

1.3.1 Launch

The ninth HEXAGON vehicle was launched on the first count-down attempt. Lift-off occurred at 11:30 PST at the opening of the launch window (system time 70200.7) on 29 October 1974.

1.3.2 Injection Accuracy

Rev 1 tracking showed that a near nominal orbit had been achieved except perigee was 7.1 degrees South of the planned location and perigee was 1.8 NM lower than planned. Table 1-1 shows the comparison between the actual and planned injection conditions and the Rev 0 orbit comparison.

MATCH POINT AND INJECTION ACCURACY

ITEM	PREDICTED	ACTUAL	(A-P)	UNITS
Match Point Geod Lat.	20.2809	20.3499	0.0690	Deg.
Radius	3529.3517	3529.3577	.0060	N.M.
Velocity	25,748.15	25,748.07	-.08	Fps
Gamma	.0793	.0799	.0006	Deg.
Long	123.7373	123.7239	.0134	Deg.
Rev 0 Orbit Comparisons				
Apogee	151.8	155.6	+3.8	N.M.
Perigee	87.1	85.3	-1.8	N.M.
Arg Per	160.2°	163.3°	+7.1° ?	Deg.
Period	88:53.3	88:56.6	+3.3	Min
Eccentricity	.0091	.0099	.0008	nd
Inclination	96.799	96.695	-.104	Deg.

SECTION 2

2.0 ORBIT PHASE - REV 1 THROUGH RV-1 RECOVERY

2.1 Summary

Solar arrays were deployed at Rev 1 INDI and positioned at Rev 1 KODI. Panoramic camera tests were completed by Rev 4 and the system started operational photography with the Rev 6 command message. The mapping camera health test was successful on Rev 2 with the system ready to start photography on Rev 5 also.

The Doppler Beacon System antenna was deployed and the system activated by stored commands on Rev 0 prior to Antartica. Evaluation of the vehicle telemetry data indicated that the antenna properly deployed and locked in position as verified by the correct and stable readings in S750, DBS Antenna Position monitor.

The sensor system was successfully uncaged and the optical bars stowed just after BV/SV separation. The constant velocity run and health checks were performed on orbital revolutions (Revs) 2 and 4 respectively, both indicating normal operation. Operational photography began on Rev 6, and the regular realtime engineering functioned normally on Rev 8 COOK.

Subsatellite No. 1 (-Y) was separated from the satellite at -15.0° Lat Descending on Rev 13. The satellite executed a yaw left (-) maneuver of 26.9 degrees. The vehicle normal fly forward attitude occurred immediately after separation. Subsatellite No. 2 (+Y) was separated from the vehicle on Rev 15 at $+56.84^{\circ}$ Lat Descending. The satellite vehicle was pitched down an angle of 18.3 degrees. The return to fly normal attitude occurred immediately after separation.

RCS propellant consumption was 77.6 pounds which equates to 3.9 pounds per day. The OAS functioned nominally for the 7 orbit adjusts performed during Segment 1. The total propellant usage for the OAs was 500.0 pounds.

Panoramic and mapping camera photography continued without incident throughout the segment. The image quality of both cameras ranged from very good to poor. The poor imagery was for the most part attributed to hazy or inclement weather. The majority of the imagery ranged from fair to good, with the good quality being comparable to previous missions. There was a definite preference for the aft camera imagery when compared to the forward.

The RV payload was 100.65% of the maximum I.C.D. weight and unbalanced 0.0%. The PREP2 event took place on Rev 309 over POGO and separation occurred on Rev 310. Preparation, de-orbit and entry events, and drogue and main parachute conditions were normal and executed as planned. Aerial recovery was accomplished on the second pass at 7600 feet altitude, 20.0 nautical miles from the predicted impact point. On the first attempted recovery pass, the parachute cone collapsed and the chute moved to the right. The cone then erected itself and the chute moved back to the left.

2.1.2 Problem Summary

2.1.2.1 RCS Thrusters

An anomaly appeared during BV/SV separation when the temperature transducer on thruster five indicated an anomalous reading. On Rev 13 yaw both thrusters 5 and 8 indicated

anomalous readings. During all subsequent maneuvers and some quiescent periods these temperature discrepancies re-appeared. Analyses of the problem attributed the anomalous temperature readings to a variable resistance resulting from a break in the thermocouple wire.

2.1.2.2 DBS Reflective Power

The Doppler Beacon had nominal performance of all components with the exception of point S702, Reflective Power Output, which was over high tolerance. The over tolerance reflects an increase in the C41, Main Bus Voltage. The increased readings are acceptable to the Doppler Beacon users.

2.2 COMMAND SUBSYSTEMS PERFORMANCE (Prepared by CSC)

2.2.1 Health

The health of the Command Systems remained excellent throughout Segment 1 (Revs 0-310). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures or voltages. There were no power dropouts, relay driver overloads, or clock status errors experienced.

2.2.1.1 EXTENDED COMMAND SUBSYSTEM

2.2.1.1.1 Command Modes

The ECS responded properly in all modes into which it was commanded. There were a total of 180 messages loaded in the ECS for this segment. This resulted in 50,054 SPC's being stored for readout from the PMU's.

Of the 50,054 SPC's loaded, 22,054 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 50,054 SPC's there were no rejects except at 28 Guam, where there was a reject due to bad main frame synchronization.

The ECS/UHF commanding system has continued to function as expected.

2.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 2.31 parts in 10^7. This corresponds to an average frequency offset of 0.2368 HZ above the nominal frequency of 1.024×10^6 HZ. The frequency of the clock oscillators changed 0.381 HZ in 310 revs. This results in a stability of 6.37 parts in 10^8 over 310 revs, or 8.34 parts in 10^{10} for an average six hour period. All of these values are well within system specifications.

2.2.1.1.3 ECS Anomalies

There were no ECS anomalies experienced during this segment.

2.2.1.2 MINIMAL COMMAND SUBSYSTEM

2.2.1.2.1 Command Modes

The MCS was commanded on to the Operate mode at 18 Pogo and the memory was addressed and filled. The MCS remained in the Operate mode for three revs, and responded properly to all stored and real-time commands.

2.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

2.2.1.3 REMOTE DECODER/BUD

2.2.1.3.1 Command Modes

The remote decoder was used for the recovery of RV-1 which ended this segment of the flight. The performance of both channels was verified from telemetry to be proper for all commands.

No commands were issued from the BUD during this segment.

2.2.1.3.2 Remote Decoder/BUD Anomalies

There were no remote decoder or back-up decoder anomalies.

2.2.1.4 SUMMARY

2.2.1.4.1 Expendables and Environmental Data

Total Command Readouts	PMU-A 10,853 PMU-B 11,201
ECS Clock Drift Rate	2.31 parts in 10^7
ECS Clock Stability	6.37 parts in 10^8 for a 310 rev period
Total Hours On	ECS 460 MCS 4.5 RD 1.6 BUD .05
Secure Words Expended at end of Segment 1:	PMU-A 28 PMU-B 20
Environmental Data:	All temperatures within specifications.

2.3 SENSOR SYSTEMS OPERATIONS THROUGH RV-1

2.3.1 MISSION OPERATIONS PERFORMANCE

The sensor system was successfully uncaged and the optical bars stowed just after BV/SV separation. The constant velocity run and health checks were performed on orbital revolutions (Revs) 2 and 4 respectively, both indicating normal operation. Operational photography began on Rev 6, and the regular realtime engineering functioned normally on Rev 8 COOK.

All operations through the first mission segment were achieved with no sensor system malfunctions. This segment consisted of 140 sensor systems operations, cnnsumming 17,299 seconds of camera power on time, 7.0 pounds of nitrogen gas, and approximately 29,500 feet of film usage per camera. (This includes pre-launch footage on the takeup at lift-off.) Consumption profiles are shown in Figure 6.3-1.

The image quality of both cameras ranged from very good to poor. The poor imagery was for the most part attributed to hazy or inclement weather. The majority of the imagery ranged from fair to good, with the good quality being comparable to previous missions. There was a definite preference for the aft camera imagery when compared to the forward.

Subjective analysis of the smear slit imagery of the aft camera revealed a consistent skew angle error, assessed as an In-Track velocity error of approximately 0.04 ips. In order to improve the image quality, a minus 4 command step change to the aft camera OOAA In-Track direction was implemented for RV-2 effective on mission Op 156.

The Sensor System Configuration at Liftoff was as follows:

	FORWARD-LOOKING CAMERA	AFT-LOOKING CAMERA
Filter Type	W-12	W-12
Focal Length (inches)	60.0041	59.9906
Focus Setting (microns)	31	70
Film Type	1414	1414/255/3916
Total Film Length (feet)	116,930	111,958
Supply Spool Number	5052	5058
Pneumatics Loaded (pounds)	34.8	

2.3.2 ENGINEERING TESTS

The standard uncage/OB stow, constant velocity, and SS health checks sequence were routinely executed on Revs 0, 2, and 4 respectively. The regular nighttime engineering run was performed in realtime at Rev 8 Cook. In addition, the following PFA engineering tests were performed:

Rev 65	Through focus - San Francisco
Rev 177	Through focus - Milwaukee/Chicago
Rev 178	Through focus - Phoenix
Rev 226	Through focus - Dallas/Ft. Worth
Rev 248	Through focus - Kobe/Osaka, Japan
Rev 259	Tucson Acquisition
Rev 264	Through focus - Tokyo/Yokohama, Japan
Rev 276	Through focus - Vancover
Rev 290	Through focus - Washington/Baltimore
Rev 306	Through focus - New York
Rev 307	Through focus and protective wrap- Dallas

2.4 RV-1 (S/N 37) Performance

This report presents an analysis of the RV-1 performance based on evaluation of recovery studies, command message, RV and SV telemetry, voice reports, and the recovery test report TWX. Tables 2.4-1 thru 2.4-3 list all relevant data. RV heater performance graphs are also included.

2.4.1 Summary

The RV payload was 100.65% of the maximum I.C.D. weight and unbalanced 0.0%. The PREP2 event took place on Rev 309 over POGO and separation occurred on Rev 310. Preparation, deorbit and entry events, and drogue and main parachute deployment conditions were normal and executed as planned. Aerial recovery was accomplished on the 2nd pass at 7600 feet altitude, 20.0 nautical miles from the predicted impact point. On the first attempted recovery pass, the parachute cone collapsed and the chute moved to the right. The cone then erected itself and the chute moved back to the left.

IDENTIFICATION DATA

SV 9	IRON NO 7122			RECOVERY REV 310	
RV 1	RV S/N 37	RETRO MOTOR S/N Q61		RECOVERY DATE 17 Nov 74	

EVENT TIMES (IN SYSTEMS TIME - SECONDS)

EVENT	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVAL	COMMAND MESSAGE	SV TLM	VOICE REPORTS	RV TLM MODE 51	DIFF NOTE 1
RV OUT T/S	REV/STA			74792.4	74793			0
RV IN T/S	309P			74796.4	74797			0
DT START	78901.2	78901.6	78901.71	78901.2	78901.4			0
POGO TRAN	79948.2			79948.4	79936			-12.4
PITCH START	79978.2			79978.4	79979			0
PITCH STOP				80026.6	80027			0
PYRO ARM BATT				80148.4	80148			0
POGO FADE	80276.5			80276.8	80280			3.2
KODI TRAN	80392.7			80393.0	80463	Confirm		70.0
ORB PWR OFF				80484.8	80485			0
RV SEP (0)	80494.8	80494.8	80494.8	80494.8	80495	Confirm	N/A NOTE 2	0
SPIN UP (+2.4)				80497.2		80498	N/A	N/A
RETRO START	80620.2	80620.2	80620.2	80620.2		80620	80620.8	0
DESPIN (+160.4)				80655.2		80657	80656.3	0
PROP JETT (+175.4)				80670.2		Confirm	N/A	N/A
KODI FD (RV)	80752.4					80768	80758.8	6.4
RV ENTRY (400K	80797.1	80797.4	80797.59		RECOV TLM			
△ 1-2 ACQ					80862	N/A		
ION ENTR	80893.8	80894.1	80894.27		80890	N/A		-4.27
ION EXIT	81082.5	81082.9	81083.04		81075	N/A		-7.04
DROGUE DEPLOY	81128.1	81128.5	81128.67	TONE STOP	81138	N/A	81130.9	9.33
IMPACT (50K)	81146.2	81146.6	81146.71					
MAIN CHUTE DPL	81149.1	81149.6	81149.71		N/A	N/A	81152.8	3.09
H/SHLD JETT	81153.1	81153.6	81153.71	TONE START	81153	N/A	81157.8	4.09
STEADY STATE	81164.1	81164.6	81164.71					
ETPD(RAINDROP)	81194.4	81194.1	81194.3					
RV @ 13.5K	82099.3	82099.0	82099.2	IN TRAIL	82320 *	82320*	82329.6	220.8
WATER IMPACT	82650.3	82649.9	82650.1		N/A	N/A	N/A	N/A
HULA TRAN (RV)	N/A					N/A	N/A	N/A
HULA FADE (RV)	N/A					N/A	N/A	N/A
DT RUNOUT	81616.2	81616.6	81616.71		N/A	N/A	N/A	

*To nearest Minute.

NOTES: 1. DIFF = Actual - Predicted times, TLM differences of less than 1.0 sec are ignored. [ ] = PREDICTED TIME, [ ] = ACTUAL TIME.

2. Assume RV SEP Sequencing starts 0.4 seconds after RV SEP Command msg. time.

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	25.498	25.498	25.483	25.167	25.333	25.167
LONGITUDE	165.45	165.45	165.46	165.57	165.383	165.567

RECOV. A/C DEPLOYMENT FORMATION No. 1, RECOVERING A/C No. 1

RECOV ALT 7600 ft, PASS No. 2, TIME 2252 Z

AIRSPEED 145 KTAS, 126 KIAS; TIME IN TOW 13 min.

RAINDROP ETPD 81194 sec 4600 ft; RATE/DESCENT, 15K 29.1 FPS, 10K 26.9 FPS

CONTACT LOCATION Rig & Parachute #3 Hook

PRESET TENSION LEVEL 3600 lb, PAYOUT Normal

MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)

OVERSHOOT 18.96 nm, CROSS TRACK -6.42 nm EAST

RC CONDITION Normal

CHUTE/CONE CONDITION Normal

CHUTE/CONE BEHAVIOR Cone collasped and chute moved to the right on first pass then erected itself.

WIND DATA

ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT	ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT
SCF	080	40	15	25	25	010	350	65	15
2	035	-	30	-	30	360	350	65	20
4	030	-	30	-	35	360	300	50	35
6	040	50	30	15	40	350	320	60	40
8	030	-	35	-	45	350	330	55	35
10	035	50	40	20	50	350	340	50	25
15	360	30	45	15	55				
20	360	20	40	15	60				

RV BATTERY TIME HISTORY

TIME	ACT 80151	152	153	155	156	157	158	159	161	163	165	171
MAIN	22.7	24.9	23.7								25.5	
PYRO #1	15.8	24.2		24.5		25.1	24.5	25.1	25.6			
PYRO #2	24.4		25.1		25.6					26.2		25.6
TIME	174	182	202	475	485	493	559					
MAIN	26.0		26.0	25.6	25.1		22.9					
PYRO #1		25.1	25.2	25.3		24.8	25.6					
PYRO #2			25.5	25.6		25.1	25.9					

SV RATES BEFORE & AFTER SEP (SV TLM)

	TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
	493	-.069	0	0
SEP	495	-.07	.04	.01
	496	+1.33	-.18	.01

MISC DATA

Payload Temp before SEP,	Rn06 70	°F
Payload Temp, Max REENTRY,	TB02 ~~70~~	°F
Chute Press before PREP 2,	P711 .68	PSI
Supply Press before PREP 2,	P113 .63	PSI
BETA ANGLE of Recovery Rev.	9	°

PITCH ANGLE

BASIC STUDY		Ω_y 1.41 °/sec		PITCH (CMD MSG)	-33.981 °
Θ_{rvs}	-126.03°	$\Delta\Theta_2$ .107 °		Θ_{sv} (PDNN-SV TLM)	-33.2 °
$\Delta\Theta_1$	-2.00 °	Θ_{sv} -33.92 °		Θ_{rvs} ON UPDATED TEAPOT	-126.091°

RV-1 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION		ACTUAL POST FLT	
TU-A	230.72	lb	231.5	lb	231.5	lb	230.6	lb
TU-B	230.72	lb	231.5	lb	231.5	lb	230.9	lb
TOTAL	461.44	lb	463	lb	463	lb	461.5	lb
SEP WGT	1542.27	lb	1543.83	lb	1543.83	lb	UPDATED TEAPOT	
RETRO WGT	1540.58	lb	1542.14	lb	1542.14	lb	% UNBAL 0	
ENTRY WGT	1349.77	lb	1351.33	lb	1351.33	lb	% FULL 100.65	
AIR RECOV WGT	1138.06	lb	1139.62	lb	1139.62	lb	(100% = 460 lb)	

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	19889.2	lb	PITCH INERTIA (Iy)	145867.2	SLUG-FT^2
CG FROM STA 2220.2(X)	219.4	in	ROLL INERTIA (Ix)	5871.2	SLUG-FT^2
CG FROM LONG AXIS(Y)	1.36	in	YAW INERTIA(Iz)	146817.2	SLUG-FT^2

'DORBEL EPHEMERIS

REV OF SEP 310	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION	
PREDICTED FROM REV	.01093570		.01092743		.01089355	
APOGEE	164.921	nm	164.861	nm	164.629	nm
PERIGEE	87.932	nm	87.931	nm	87.945	nm
ARG OF PERIGEE	136.452	°	136.532	°	136.581	°
INCLINATION	96.677	°	96.677	°	96.677	°
TRUE ANOMALY AT RETRO	347.43	°	347.32	°	347.27	°
HEATSHIELD JETT ALT	49638.08	FT	49593.93	FT	49599.79	FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	80494.8	80620.2	80797.59	81128.67
ALTITUDE (FT)	574610.33	555009.24	400000.05	63537.2
LATITUDE (°N)	64.064	55.659	43.935	25.525
LONGITUDE (°W)	152.32	156.90	161.08	165.45
INERTIAL AZIMUTH (°)	195.43	191.91		
INERT FLT PATH ANGLE (°)	-.2361	-.1446		
INERT VELOCITY (FT/SEC)	25727.56	25745.35	25562.34	
LOCAL AZIMUTH (°)			191.73	190.52
LOCAL FLT PATH ANGLE (°)			-2.1679	-31.2804
LOCAL VELOCITY (FT/SEC)				1426.51
ANGLE OF ATTACK (°)			103.37	
MACH NUMBER				1.47
DYN PRESS (PSF)				194.239

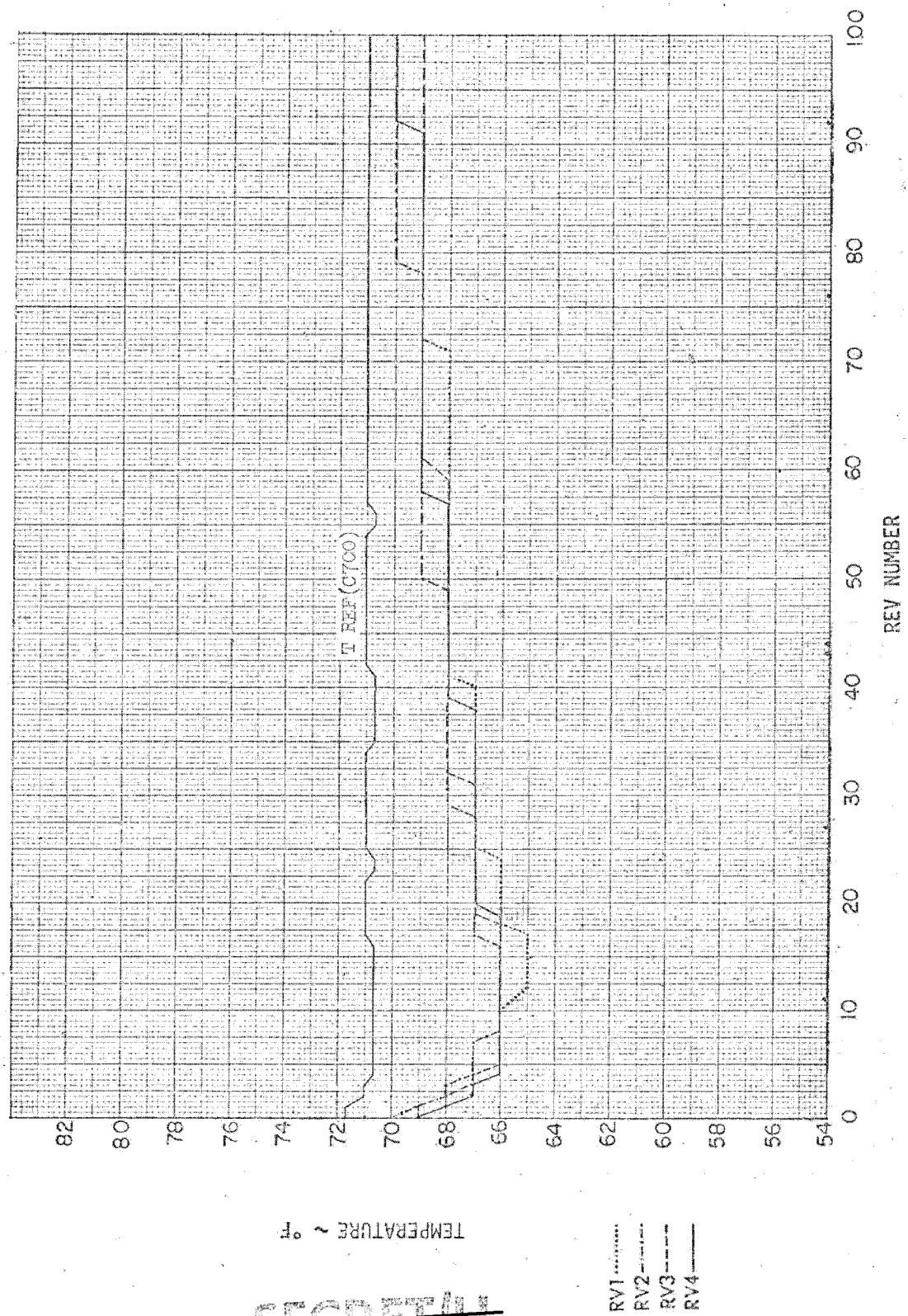
CORE PINS SHEARED (FROM REBOUND TWX) A: YES ____ NO X , B: YES ____ NO X

BFE VECTOR, Parameters from a SYS Time near the ascending node of the Recovery Rev.

SYS TIME	78791.067 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	-.0007 °
LONGITUDE	20.8374E °	INERTIAL GEOCENTRIC FLT PATH ANGLE	.4122 °
ALTITUDE	151.7067 nm	INERTIAL GEOCENTRIC AZIMUTH	353.3228 °
		INERTIAL VELOCITY	25284.96 FT/SEC
SV C_D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.47089 FT^2/SLUG

SECRET/N

ACTIVE THERMAL CONTROL SYSTEM
RV PAYLOAD CONTAINER & REFERENCE TEMPERATURES

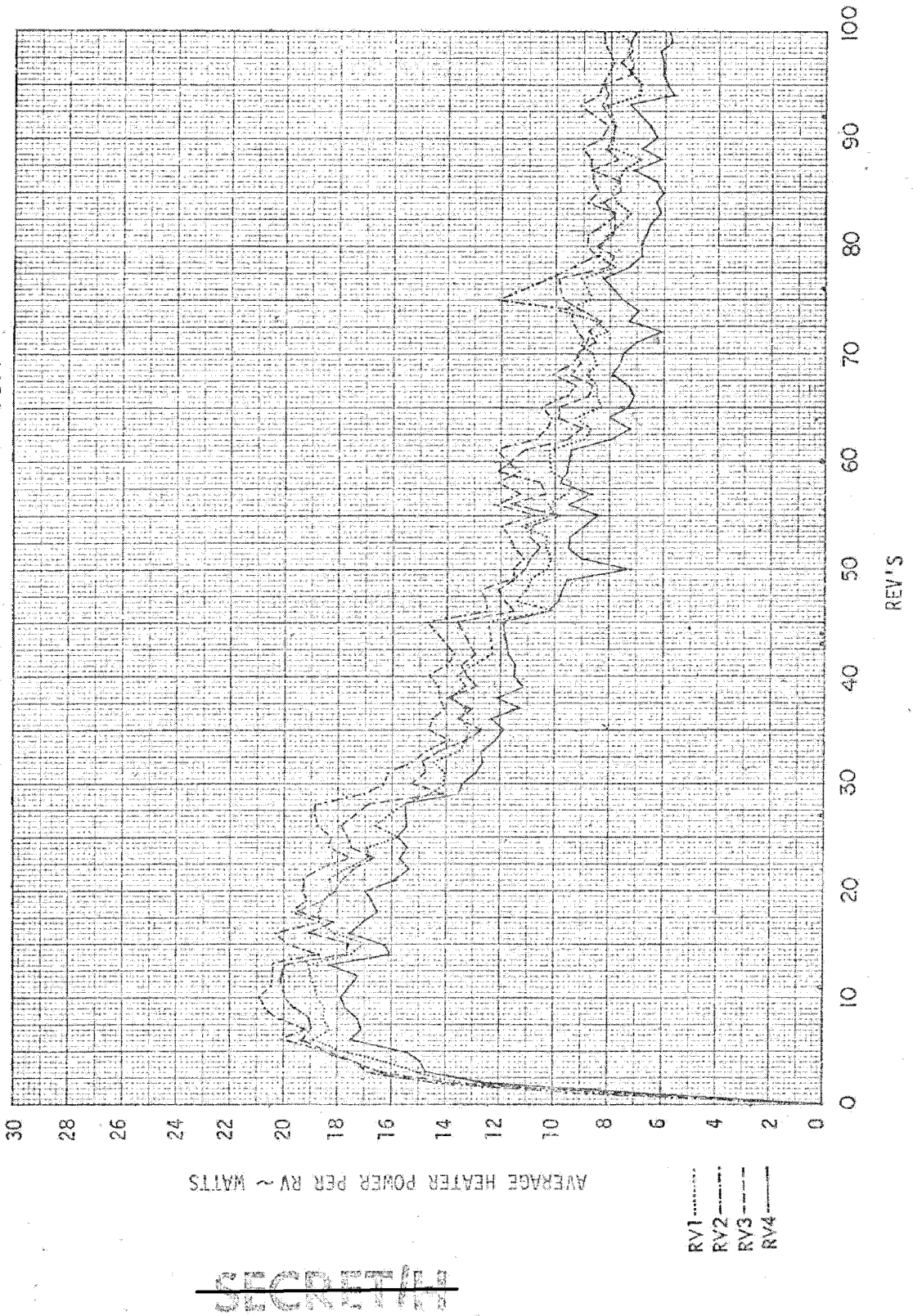


SECRET/N

SECRET/US

ACTIVE THERMAL CONTROL SYSTEM

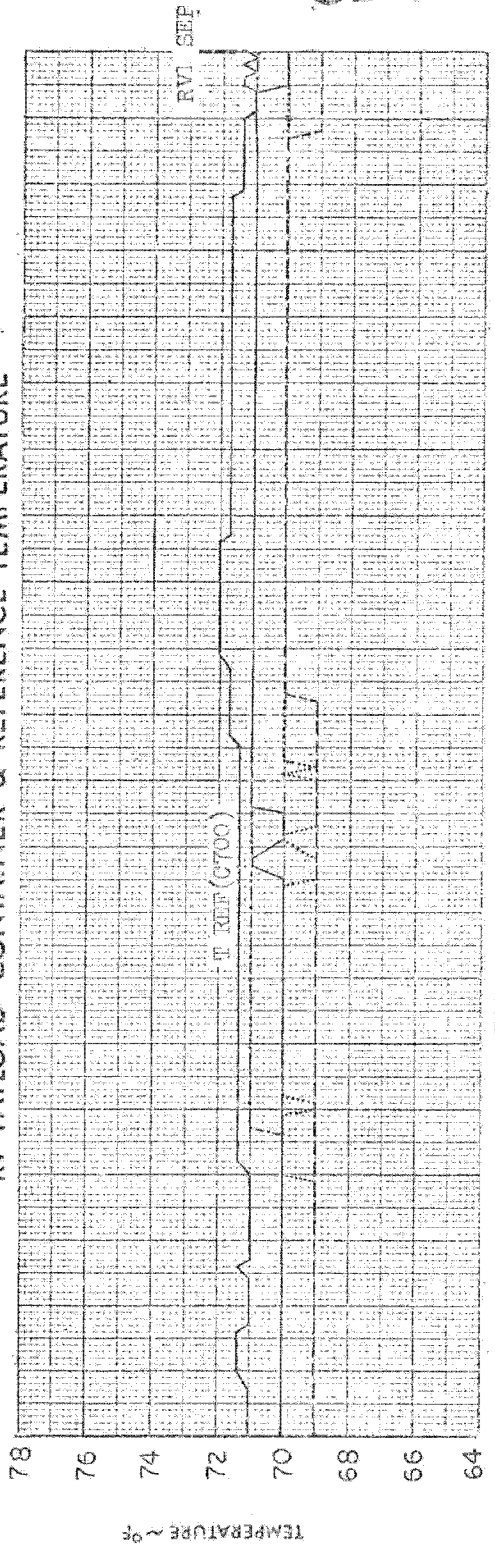
RV HEATER POWER CONSUMPTION



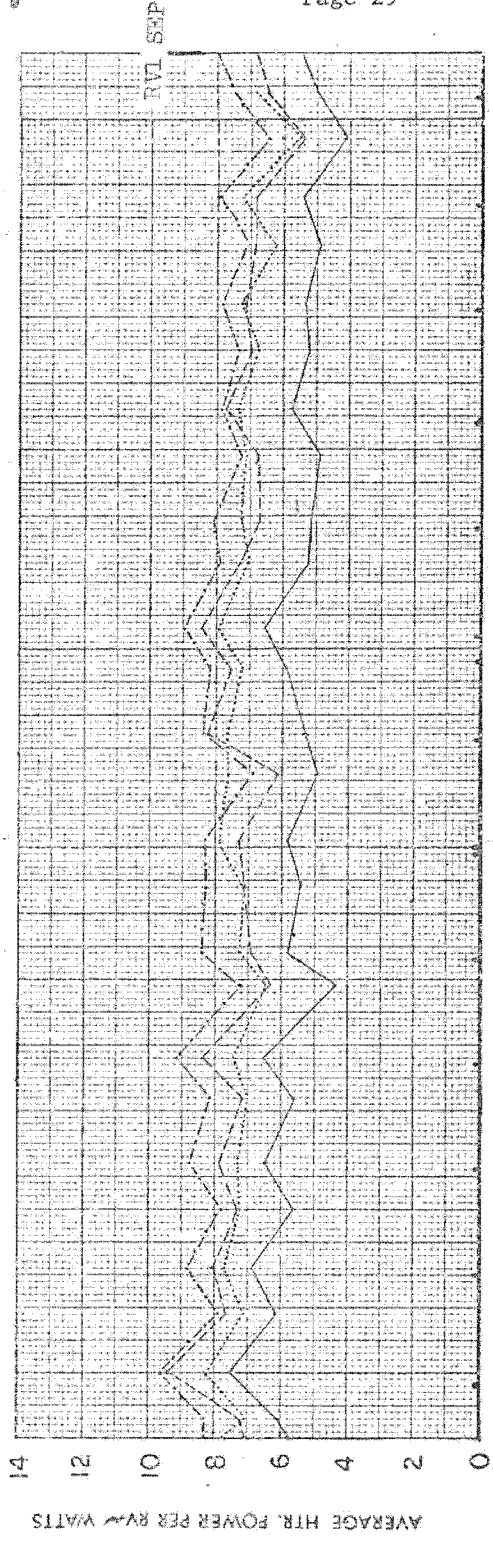
SECRET/US

ACTIVE THERMAL CONTROL SYSTEM

RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



RV HEATER POWER CONSUMPTION



Sec. 2.5.0 Satellite Vehicle Support

2.5.1 Satellite Control Facility Support

2.5.1.1 Readiness

The following Exercises/Rehearsals were conducted satisfactorily:

(a) 21-23 Aug 74 Development Rehearsal (32 Revs)
(b) 23-27 Sep 74 Mod 3.2 Command Exercise
(c) 15-18 Oct 74 Dress Rehearsal (48 Rev)
(d) 7-8 Nov 74 SSP Exercise (On Flight)
(e) 13-14 Aug 74 Back-Up STC Exercise

2.5.1.2 Orbit Operations - (Thru Rev 310 - 17 Nov 74)

Orbital support from the SCF was very satisfactory except for the following significant impact problems encountered - (No loss of support):

(a) Computers:

160A: Rev 131K - Bad tape drive on Sys 46. Lost 106 secs. Switched to Sys 42.

3800: Sys 24 failed due to OPE, IPE, APE on the following dates:
6 Nov - 30 min lost and reload twice
7-8 Nov - 4 hrs lost
15 Nov - 1½ hrs lost

DTV: Rev 168 - Failed for 200 secs. Used printers
Rev 240 - Lost Prior to Acq. Back 60 sec prior to fade.
Rev 267 - No DTV thru out pass. Software alarm

(b) RTS Problems Causing Impact

(1) Xmtr Failures

a. 231P - Unable to switch from dummy load. SGLS active 80 secs after ETA. Commanding completed; lost 45 secs range and range-rate.

b. 208P - SGLS Xmtr unreliable - cmd with UHF using command Xmtr - SGLS provided range and range-rate. No impact.

c. 256G - SGLS Xmtr unable to go active. Commanded with CT (UHF). No range data.

(2) MWL Problems

a. Rev 227 & 235 COOK
BIT SYNC inadvertently misconfigures during PMI. Necessitated P/B after problem was identified and corrected.

THRU REV 310 TABLE 2.5.1

	POCO	KODI	BOSS	COOK	HULA	GUAM	I	STC
CT PWR AMP				1				
SGLS XMTR	3		2			1		
SGLS PWR AMP			1					
COMPUTER PWR				1				
DISK ERRORS				2				
DECOM	2							
BASEBAND ASSY UNIT	1							
MOTOR GEN	1							
TDP PATCHBOARD				1				
NOISY 1.7 (High E1)	5	1	1			1		
NOISY 1.7 (Other)	3		1					
D/VOICE LINES	6		1					
MICROWAVE LINES				2				
SYSTEMTIME				1				
160A								7
3800								
PERSONNEL ERROR								2

Sec. 2.5.2 Telemetry & Mode Processing

The following TLM Mode activity occurred during the RV-1 segment of Ops 7122.

1. All modes were retransmitted to INDI because the incorrect prepass ID was in use. This problem was discovered during the Rev 81 INDI pass when RACS rather than PACS data was being processed.
2. Mode 128 was modified to correct the wavetrain location of Vehicle Time in Format A.
3. DVOS & Mode generation completed one following MCRs:
   a. MCR 9-1: Pan Camera Shutter Open/Close Processing
   b. MCR 9-25: High Rate Signal Strength Processing in Real Time Modes

   Validation of the affected modes was in process during this segment.
4. MSTAC Model 14 versions of Format B modes were provided for validation.
5. MCR 9-50 & MCR 9-51 were submitted for incorporation of processing improvements in modes 123 & 51 respectively.

None of the above items were considered flight critical.

Sec. 2.5.3 Orbit Events

Case 902D orbit parameters were selected to provide less variation in altitude over a wider span of northern latitudes over the Sino Soviet land mass. Just prior to RV-1 modification of the orbit provided better Mid-east track coverage.

Sec. 2.5.3 continued

The range bias delay for the SGLS transponder was 805 ft. as determined from the first 15 days of BFE data.

[redacted]

Our primary weather satellite failed on 11/29. A secondary satellite which covers our area 2.5 hours before us has a smaller recorder capability. Impact, however, is minimal as weather this time of year offers more open good weather.

As scheduled as of Dec 3 the recovery ship and H-3 helicopters have been phased out and replaced with the larger land based airborne refuelable helicopters.

[redacted]

Sec. 2.5.4 Orbit Parameters

Table 2.5.2 shows a summary of orbital conditions from each tracking reduction. Significant events affecting the orbit, after the initial southern argument of perigee was an orbit adjust every three days.

The daily average K factor (ground magnetometer readings from Alaska and Colorado) are indicative of possible radiation damage to the stellar film.

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 29	73348	004	0.450		85.3	6.83	156.0	88 57.3	0.219	
S 30	5596	005	0.413		85.0	7.38	155.6	88 56.4	0.205	2.6
S 30	9628	006	0.438		85.0	7.47	155.4	88 56.2	0.217	
S 30	15004	008	0.441		85.1	7.65	155.2	88 56.1	0.218	
P 30	24596	010	0.449		85.1	8.06	154.8	88 55.8	0.223	
S 30	36172	012	0.421		85.1	8.33	154.6	88 55.2	0.209	
S 30	46252	013	0.410		84.9	8.56	154.5	88 54.8	0.208	
S 30	52870	015	0.478		84.8	8.71	154.3	88 54.4	0.244	
D 30	62345	015	0.693		84.8	8.98	153.9	88 54.1	0.256	
P 30	63604	017	0.472		84.8	8.94	153.8	88 53.9	0.241	
S 30	73937	019	0.456		84.7	9.31	153.5	88 53.4	0.235	
S 30	84689	021	0.454		84.6	9.70	153.3	88 52.8	0.238	
P 31	8892	024	0.452		84.5	9.95	153.0	88 52.4	0.239	1.4
P 31	24620	028	0.450		84.6	10.54	152.4	88 51.7	0.237	
P 31	45200	032	0.431		84.4	11.01	151.9	88 50.8	0.232	
P 31	68472	035	0.443		84.3	11.63	151.3	88 49.7	0.241	
S 31	83969	037	0.452		84.1	12.22	150.9	88 48.9	0.251	
P 1	12185	040	0.446		84.1	12.62	150.4	88 48.4	0.250	1.8
P 1	23148	045	0.443		84.1	13.06	150.0	88 47.9	0.248	
P 1	49460	049	0.438		83.8	13.70	149.4	88 46.6	0.253	
P 1	72604	052	0.452		83.9	14.35	148.6	88 45.4	0.265	
S 2	1217	054	0.443		83.6	14.95	148.3	88 44.7	0.262	1.4
P 2	16841	057	0.438		83.6	15.34	147.7	88 44.0	0.261	
P 2	27628	061	0.436		83.7	15.75	147.3	88 43.4	0.259	
P 2	48268	065	0.458		83.4	16.40	146.6	88 42.3	0.281	
I #1	59722	065	0.458	14.0	83.4	16.40	146.6	88 42.0	0.281	
I #1	59764	065	0.458	14.0	86.4	21.20	152.7	88 50.6	0.217	
P 2	71444	068	0.465		86.4	21.46	152.5	88 50.0	0.223	
S 3	76	070	0.452		86.2	22.06	152.2	88 49.4	0.220	1.25
P 3	15028	073	0.458		86.2	22.46	151.8	88 48.9	0.224	
P 3	26440	077	0.451		86.3	22.93	151.5	88 48.3	0.220	
P 3	47112	081	0.467		86.1	23.32	151.1	88 47.4	0.233	
P 3	70316	084	0.472		86.1	23.77	150.5	88 46.4	0.238	
S 3	85084	086	0.458		85.9	24.54	150.3	88 45.7	0.234	
P 4	9568	089	0.465		85.9	24.77	150.0	88 45.2	0.240	0.88

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 4	25260	093	0.469		86.0	25.44	149.5	88 44.5	0.242	
S 4	45724	097	0.462		86.0	25.87	148.9	88 43.6	0.241	
P 4	69100	100	0.476		85.9	24.45	148.4	88 42.5	0.253	
S 4	84028	102	0.478		85.7	27.07	148.1	88 41.7	0.257	
P 5	12580	105	0.458		85.8	27.18	147.6	88 41.2	0.248	1.6
P 5	23704	110	0.461		85.8	27.98	147.3	88 40.6	0.250	
P 5	49964	114	0.463		85.7	28.96	146.5	88 39.3	0.258	
I #2	62824	114	0.463	23.9	85.7	28.96	146.5	88 39.1	0.258	
I #2	62892	114	0.463	23.9	66.4	25.14	157.1	88 53.8	0.218	
P 5	72472	117	0.487		86.4	25.35	156.8	88 53.3	0.231	
S 6	1860	119	0.478		86.2	25.93	156.5	88 52.6	0.232	1.6
P 6	17484	122	0.493		86.2	26.37	156.1	88 52.0	0.239	
P 6	28212	126	0.494		86.3	26.85	155.7	88 51.4	0.239	
P 6	48384	130	0.516		86.1	27.33	155.3	88 50.5	0.256	
P 6	72060	133	0.521		86.1	28.26	154.6	88 49.3	0.262	
S 7	510	135	0.494		85.9	28.64	154.4	88 48.6	0.252	2.1
P 7	11348	138	0.493		85.9	28.86	154.0	88 48.1	0.253	
P 7	27072	142	0.472		86.0	29.61	153.6	88 47.4	0.242	
P 7	47740	146	0.487		85.9	30.04	153.0	88 46.5	0.255	
P 8	51454	162	0.465		85.7	32.90	150.7	88 42.1	0.256	2.3
I #3	53987	162	0.465	19.4	85.7	32.90	150.7	88 42.1	0.256	
I #3	54043	162	0.465	19.4	86.3	29.91	159.3	88 54.2	0.224	
P 8	69744	165	0.502		86.3	30.41	158.8	88 53.4	0.244	
S 8	84787	167	0.524		86.2	30.80	158.5	88 52.6	0.258	
P 9	13339	170	0.538		86.2	31.23	157.9	88 52.0	0.267	2.1
P 9	24744	174	0.560		86.2	31.73	157.6	88 51.4	0.278	
P 9	45348	178	0.547		86.1	32.27	156.9	88 50.3	0.277	
S 9	83731	183	0.589		86.0	33.54	155.8	88 48.1	0.306	
P 10	12283	186	0.564		85.0	33.98	155.2	88 47.4	0.296	4.2
P 10	23288	191	0.523		86.0	34.57	155.0	88 46.8	0.276	
P 10	49600	195	0.486		85.9	35.27	154.2	88 43.4	0.263	
P 10	72740	198	0.493		85.8	36.27	153.6	88 44.2	0.269	
S 11	1316	200	0.465		85.7	35.67	153.3	88 43.5	0.257	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 11	16940	203	0.474		85.8	37.15	152.8	88 42.8	0.263	2.5
P 11	27740	207	0.469		85.9	37.76	152.4	88 42.2	0.260	
P 11	48388	211	0.531		85.7	38.20	151.8	88 41.1	0.303	
P 11	71544	214	0.556		85.7	39.20	151.0	88 39.8	0.323	
S 11	86324	216	0.571		85.5	39.57	150.6	88 38.8	0.337	
P 12	15212	219	0.579		85.6	40.02	149.9	88 37.9	0.345	3.7
P 12	26436	223	0.576		85.5	40.65	149.5	88 37.1	0.346	
P 12	47076	227	0.590		85.3	41.19	148.5	88 35.7	0.364	
I #4	54375	227	0.590	35.9	85.3	41.19	148.5	88 35.6	0.357	
I #4	54482	227	0.590	35.9	86.2	35.42	164.6	88 58.0	0.285	
P 12	70308	230	0.592		86.2	35.99	164.0	88 57.0	0.291	
S 12	85226	232	0.564		86.1	36.35	163.6	88 56.2	0.279	
P 13	9608	235	0.548		86.1	36.63	163.3	88 55.6	0.274	
P 13	30242	239	0.527		86.2	37.64	162.6	88 54.7	0.263	4.9
P 13	46004	243	0.507		86.2	37.99	162.2	88 53.9	0.256	
P 13	62260	248	0.535		86.2	38.96	161.5	88 52.8	0.275	
S 13	84170	248	0.542		86.0	39.35	161.2	88 51.9	0.280	
P 14	8556	251	0.522		86.0	36.69	160.8	88 51.4	0.273	
P 14	12722	256	0.522		86.1	39.81	190.6	88 51.3	0.272	3.4
P 14	50168	260	0.533		86.0	41.42	159.4	88 49.2	0.285	
I #5	58628	260	0.533	24.9	86.0	41.42	159.4	88 49.2	0.284	
I #5	58703	260	0.533	24.9	93.2	31.65	162.3	89 4.6	0.154	
I #6	66635	260	0.533	-21.5	93.2	31.65	162.3	89 4.4	0.154	
I #6	66700	260	0.533	-21.5	86.3	24.05	154.0	88 50.6	0.257	
P 14	72804	263	0.535		86.3	24.26	153.8	88 50.3	0.259	
S 15	1972	265	0.479		86.1	24.88	153.6	88 49.5	0.237	
P 15	17596	268	0.476		86.1	25.30	153.1	88 48.9	0.236	3.4
P 15	28516	272	0.455		86.2	25.77	152.8	88 48.4	0.226	
P 15	49172	276	0.449		86.0	26.27	152.4	88 47.5	0.228	
P 15	72336	281	0.421		86.0	26.51	151.9	88 46.5	0.217	
P 16	11612	284	0.426		85.9	27.77	151.4	88 45.4	0.222	
P 16	37036	288	0.413		86.0	28.77	150.8	88 44.8	0.215	1.8
I #7	39445	288	0.413	34.9	86.0	28.77	150.8	88 44.5	0.220	
I #7	39555	288	0.413	34.9	86.6	24.58	167.5	89 6.3	0.173	
S 16	47788	292	0.460		86.6	24.62	167.3	89 6.2	0.201	

SECRET/ET

SECTION 2.6

PROGRAM COMMAND SOFTWARE PERFORMANCE

(Prepared by HTC)

2.6.1 Command Message Summary

This section summarizes pertinent command message data from Mission 1209, IRON 7122. The command messages discussed cover the period of RV1 initiation (Rev 5 load) to the RV1 recovery message (Rev 307 load).

Two hundred and twelve command messages were received by the Technical Advisor (TA) staff. One hundred and eighty-four were accepted and twenty-eight were rejected. Nine of the rejected messages were subsequently altered and loaded into the vehicle. The remaining nineteen were not required due to lack of payload activity or no change in payload activity. The reasons for rejection of the nine messages are summarized below:

Rev No. and Load Station	Reason for Rejection
22 BOSS	This message was regenerated to include slit width and predicted weather cards in the execution deck.
40 COOK	This message was altered to add a transponder off command for an SS operation which would be required in case of an ST VBE.
70 POGO	This message was altered to correct a PCM blink in violation of hardware constraints.
97 POGO	This message was altered to include telemetry format B for the 97 COOK station contact.
113 POGO	This message was altered to add a redundant transponder on command for a manual station contact.
167 POGO	This message was regenerated in order to modify payload operations.

SECRET/ET

Rev No. and Load Station	Reason for Rejection
204 KODI	This message was altered to resolve a payload hardware constraint violation.
246 POGO	This message was regenerated to include a SUB 94 card.
248 POGO	This message was regenerated in order to modify payload operations.

One hundred and eighty messages were loaded and thirty-two were not for the reasons stated below:

1. The nine rejected messages were not loaded.
2. The contingency orbit adjust message (Rev 176 POGO) was not required.
3. The RV1 contingency recovery abort message was not required.
4. Twenty-one messages were received but cancelled due to no payload requirement.

A one-rev load cycle was employed while the vehicle was over the area of interest. The "add-on" message generation and loading philosophy was in effect. This resulted in the generation of one hundred and seventy-four "add-on" messages.

Summary

Total RV1 Messages	-	212
Messages rejected	-	9
Total messages accepted	-	203
Messages not required	-	23
Total messages accepted and loaded	-	180

2.6.2 'TUNITY Software Problems

The Flight 9 'TUNITY software problems itemized below pertain only to the period from launch through RV1. They have been grouped into the

following categories to demonstrate their impact on the flight. The disposition of these software problems will be specified by the Configuration Control Board.

Category	No. of SPRs	Comments
Flight Critical	2 (8107,8117)	Software corrections were made and incorporated during this flight period.
Non-Flight Critical (Requiring Work-Around)	8	Work-around procedures were developed and implemented.
Non-Flight Critical (Minor)	8	Work-around procedures were not required.
Product Improvement or New Requirements	2	To be considered during future development.
Documentation Error	2	MS-4 or MS-7 affected.

Itemized Software Problems

SPR MD3-8107 ('TIDY) -- FLIGHT CRITICAL --

- Problem Description: Message 400 the 38 BOSS load, a 12EV60060 (XDR-) for sequence 120 was deleted because it was redundant to a 12EV60060 for sequence 150. Sequence 120 had a serial number of 500, an event load order of 5 and a start time of 202684.8. Sequence 150 had a serial number of 541, an event load order of 8 and a start time of 202521.0. 'TIDY failed to save the serial number and event load order for sequence 120 and replace them for sequence 150 along with the time tag of sequence 150.

- Solution or Work-Around: The problem was determined to be Flight Critical because without an alter the message generated was not useable. A change was made to 'TIDY correcting this problem and was incorporated on the Flight Aux Master.

- Operational Impact: The messages had to be altered which cause a delay in an already tight message checking cycle. With the implementation of the new mod of 'TIDY, the problem has been solved.

SPR MD3-8108 ('TSTAGEN)

- Problem Description: The 'TSTAGEN billboard in the SP message for 45 GUAM (SP Rev span 45-73) showed the deleted portion of the 42 HULA split pass between 45 GUAM and 45 POGO.

- Solution or Work-Around: None.

- Operational Impact: There was no operational impact because this problem is an output problem only.

- Comment: It is a software problem, the solution is known and it should be fixed and implemented in the SV-9 software configuration.

SPR MD3-8109 (E&CG)

- Problem Description: Rev 42 HULA was a split pass in which the first portion did not meet minimum command duration constraints and, hence, was deleted in the SP message. In the add-on message generated for Rev 42 HULA, the XPRs for initializing the command system occurred prior to Decoder AB+ for 42 HULA.

- Solution or Work-Around: None.

- Operational Impact: There is no operational impact, the message can be loaded as is with no alter required.

- Comment: It is a software problem, the solution is known and it should be fixed and implemented in the SV-9 software configuration at the earliest convenience.

SPR MD3-8112 ('TINTERN)

- Problem Description: A problem exists in 'TINTERN which can cause improper deweighting of MCATs. If an MCAT change card is input the fields for altitude deweighting factor, minimum altitude deweighting and max altitude deweighting will be set erroneously to a maximum value, even though those fields were not filled. This may cause altitude deweighting to be turned on when it is not desired.

- Solution or Work-Around: This problem can be avoided completely by always filling the 3 fields described above (Cols. 36-38, cols. 40-42 and cols. 44-46) with the parameter "DB" for any MCAT change cards that are submitted.

- Operational Impact: Using the above mentioned work-around procedure there will be no operational impact.

- Comment: It is a software problem, the solution is known and it should be fixed at the earliest convenience not involving a flight.

SPR MD3-8113 ('TIDY/'TRIAL)

[redacted]

SPR MD3-8114 ('TDEFINE)

- Problem Description: A 'TDEFINE test run was made which attempted to reset the PMU assignment from E (either) to D (both); however, a 'TDEFINE list showed that no change was made.

- Solution or Work-Around: The "SEQ" card must be followed by a "MOD" card to an existing load order so that the "SEQ" card will take effect.

- Operational Impact: Using the above mentioned work-around procedure there will be no operational impact.

- Comment: It is a software problem, the solution is known and it should be fixed at the earliest convenience not involving a flight.

SPR MD3-8115 ('TIDY/'TRIAL)

- Problem Description: In message 660 for Rev 70 POGO 'TRIAL failed to de-conflict meshed sequences to avoid duty cycle violations and/or loss of status of PCM.

- Solution or Work-Around: An alter of the message is required to resolve the duty cycle violations.

- Operational Impact: The message must be altered causing a delay in the message checking time.

- Comment: In order to resolve all duty cycle violations 'TRIAL would have to make two to three passes through the command list. 'TRIAL was only designed to make one pass through the command list. With the future delivery of the tape recorder scheduler this problem will no longer exist.

SPR MD3-8116 (CDS)

- Problem Description: On page 156, first paragraph, the last sentence reads "Commands for a sequence within an odd rev are assembled for PMU B and commands for a sequence within an even rev are assembled for PMU A". This statement is not correct.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The above mentioned discrepancy should be corrected with the next publication of the CDS.

SPR MD3-8117 (CMG) -- FLIGHT CRITICAL --

- Problem Description: A format change command (12EV6/7) from sequence 445 was deleted from the command message without the associated error message being output.

- Solution or Work-Around: The problem was determined to be Flight Critical because commands were being deleted for no apparent reason. A DBCR was input to change the PMU assignment of sequence 445's parent sequence (86) to E (either) from D (both). This corrected the problem and the DBCR was input to the Flight Data Base.

- Operational Impact: The message had to be altered to add the deleted command. With the implementation of the DBCR the problem has been solved.

- Comment: 'TBLOCK is not designed to properly assemble a redundant sequence whose parent sequence is already redundant to itself by having a PMU assignment of both PMUs.

SPR MD3-8118 ('TUPCAT)

- Problem Description: The following card was input to 'TUPCAT thru 'TMOD:

```
     ACAT      20      A                C
```

'TUPCAT error message 4-3 was output followed by the following card listing

```
     ACATO     20  DB A   DB------DB------DB   127   C
```

The 127 listed for item 'TACC2N is erroneous.

- Solution or Work-Around: None.

- Operational Impact: There is no operational impact because this is a display problem only.

- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-10.

SPR MD3-8119 ('TSTAGEN)

- Problem Description: In the SP message for 133 POGO the station contacts for revs 135-137 were duplicated on the billboard listing. Also, contacts for revs 138 thru 139 were missing on the billboard and also missing in the chrono listing.

- Solution or Work-Around: When the problem occurs the VE ID on the 'TLOAD function card must be changed and the message rerun.

- Operational Impact: The message checking time is impacted because the message must be regenerated.

- Comment: It is a software problem, the solution is known and it should be fixed and implemented in the SV-9 software configuration at the earliest convenience.

SPR MD3-8120 ('TINCO)

- Problem Description: While processing MPR for a two frame ST operation many 'TEPH errors were encountered. MPR is unable to process operations that are less than the required overlap.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-10.

SPR MD3-8121 ('TSTAGEN)

- Problem Description: In message 600 for rev 158 GUAM, 'TSTAGEN deleted the first portion of a split pass for rev 161 POGO. 'TSTAGEN deleted a 188 second portion of the pass and kept the 131 second part of the pass. 'TSTAGEN erroneously output a duration of 86,397 seconds for the first portion of the pass.

- Solution or Work-Around: If a station is to have a capability of any kind in the message then that station must not be given a capability of zero via the "STA" card and then later in the card deck be given different capability via another "STA" card.

- Operational Impact: Using the above mentioned work-around procedure there will be no operational impact.

- Comment: It is a software problem, the solution is known and it should be fixed and implemented in the SV-9 software configuration at the earliest convenience.

SPR MD3-8122 ('TSPEC MS-7)

- Problem Description: The Milestone-7 write up for 'TSPEC ACAT changes is not correct.
  (1) An "R" in column 14 only changes the THB flag to false and
  (2) when columns 55-56 are blank the stored values are not changed.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The above mentioned discrepancies should be corrected in the next publication of the MS-7.

SPR MD3-8123 ('TOREP/'TOUT)

- Problem Description: Request a modification to the header data on any transmission tape. At present the classification is in the first record and the message header data is in the second record. The order should be reversed such that the message header data is in the first record and the classification is in the second record.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8124 ('THISUM)

- Problem Description: 'THISUM aborted with error message number 15-4 because the V.E. was not long enough. The MS-7 and the MS-4 state that corrective action is to extend the V.E. data and rerun. This was done and incorrect times were output for many of the RTCs in the span.

- Solution or Work-Around: The data base must be reloaded prior to extending the V.E. data and rerunning 'THISUM.

- Operational Impact: 'THISUM had to be rerun on a secondary machine in order to obtain a proper selective retrieval of the RTC and ephemeris data.

- Comment: The error message should be changed to inform the user that the data base must be reloaded prior to rerunning.

SPR MD3-8125 (DATA BASE)

- Problem Description: In message 200 for rev 204 KODI ST and SS operations overlapped such that the ST MODE RESET command was bumped earlier in time than the ST - command. The message was disapproved and an alter done.

- Solution or Work-Around: The message must be altered to move the command that is in error.

- Operational Impact: The message had to be altered causing a delay in the message checking time.

- Comment: A new check message should be input to the 'TCT to flag this error condition.

SPR MD3-8126 ('TCATCHM)

- Problem Description: (1) MOPS (ST) with inhibit overrides programmed over mixed ground, which is inhibited, will not be assembled if more than MGAP (2 for triple overlap) DEAs are bounded by the MOP. The inhibit flags ('TJMMFG) are both set for the same DEAs. Inhibits override mandatories in the selection process. (2) In the very special case where two MOPs are input, one spanning from active ground into a gap and the second spanning from a gap (same gap) into active area, erroneous MOPs may occur because the bounded DEAs of both MOPs may appear to conflict. In actuality they don't. This will happen only if MGAP DEAs are spanned by the first MOP.

- Solution or Work-Around: The item 'CAMMGP must be set to 100, to minimize the number of GAPs in the 'TJMTAB thus avoiding the above mentioned problems.

- Operational Impact: These problems were discovered in SOST test cases and had no impact on flight operations.

- Comment: These problems are software problems and they should be fixed prior to the support of SV-10.

SPR MD3-8127 ('TCATCHM)

- Problem Description: The following limitations currently exist in 'TCATCHM and are not noted in the MS-4 or MS-7.
  (1) A MOP programmed to start in active ground, span a gap, and end in active ground will not be assembled correctly. Two operations of insufficient length or no operations may be assembled.
  (2) Active DEA printout in 'TREPLAY will be erroneous in the following situations.

(A) When the number of active DEAs within a MOP is not > MGAP(2) DEAs, no DEAs will be printed.
(B) When an ST MOP is modded (trimmed or extended) in a subsequent run, the DEAs printed out will reflect only those in the original operation.

- Solution or Work-Around: A MOP must not be input spanning a gap. If an operation is desired to span the gap then a MOP must be input completely within the gap and then extended on both ends in a SELUP run.
- Operational Impact: None.
- Comment: SOST is currently investigating the possibility of making a software modification to correct part two of this SPR.

SPR MD3-8128 ('TAMASS)

- Problem Description: An error exists in the K-weight option in 'TAMASS. Item 'TAPIMC is not being set correctly when 'TACNGT is equal to zero. Without a fix to this problem the new MOD of 'THAYER (N B T) does not report properly.
- Solution or Work-Around: None.
- Operational Impact: There is no operational impact because the K-weight option of 'TAMASS is not being used during this flight.
- Comment: If the new mod of 'THAYER is implemented during this flight then 'TAMASS must be fixed and implemented at the same time.

SPR MD3-8131 ('THISUM)

- Problem Description:
- Solution or Work-Around: None.
- Operational Impact: MCC2 is unable to process the data for rev 0 only.
- Comment: It is a software problem and it should be fixed prior to the support of SV-10.

SPR MD3-8134 ('TUNITY and SST)

- Problem Description: The current disc usage of our current SAFARI is coming close to pushing the capacity of the STC hardware. With the incorporation of the new software requirements and improvements this problem may soon become catastrophic. It is requested that both CPAC ('TUNITY) and CPIC (SST) identify items on our SAFARI that are not necessary and can be deleted and therefore decrease disc usage.

- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: SOST is currently investigating this problem to determine the impact on 'TUNITY.

It should be noted that the following SPRs are not included in this report: MD3-8110, MD3-8111, MD3-8129, MD3-8130, MD3-8132 and MD3-8133. These SPRs were written against non-'TUNITY routines.

2.6.3 Hardware/Software Interface Changes

For IRON 7122, fourteen change requests were processed from RV1 initiation through the RV1 recovery message (as shown in Table 2.6.3.1).

These requests were implemented via requests SV9-1 through SV9-18 and have been incorporated into the flight data base and hardware/software interface documentation. (NOTE: Requests SV9-5, SV9-7, SV9-8 and SV9-9 were disapproved and are not reflected here.)

Table 2.6.3-1. Summary of Hardware/Software Interface Changes

Request No.	Identification	Effectivity
SV9-1	Adds constraint to Sequence 441: "MR31, MCS TR1 Select, must be sent prior to and remain in effect during this sequence."	SV-9 and nominal data base
SV9-2	Adds constraint to Sequence 442: "MR32, MCS TR2 Select, must be sent prior to and remain in effect during this sequence."	SV-9 and nominal data base
SV9-3	Deletes Sequence 293	SV-9 and nominal data base
SV9-4	Changes 'CCORSB, entry no. 6 to 1, causing 'TWORT redundant commands to be loaded immediately after primary 'TWORT commands.	SV-9 and nominal data base
SV9-6	Changes Sequence 86 memory assignment to "Both" PMU's.	SV-9 and nominal data base
SV9-10	Replaces Sequence 100 with Sequence 89 in MACRO 222 in order to obtain proper sequence deconflicting.	SV-9 and nominal data base
SV9-11	Adds a new Sequence 89 for use in MACRO 222.	SV-9 and nominal data base
SV9-12	Deletes redundant sequence 445 from Sequence 86.	SV-9 and nominal data base
SV9-13	Replaces Sequence 100 with Sequence 89 in MACRO 111.	SV-9 and nominal data base
SV9-14	Adds tape recorder commands to solar array deploy Sequence 252.	Nominal data base only
SV9-15	Adds new Sequence 460 to turn on and off transponders in format A.	SV-9 only
SV9-16, -17 & -18	Adds system macros MAT1414, MATS0255 and MATS0130 which permit pre-checking and storage of data base changes required at time of material changes.	SV-9 only

2.7 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE
(Prepared by Satellite Basic Assembly Contractor)

2.7.1 EDAP Performance

Solar Arrays were deployed at Rev 0 INDI. Deployment and erection were moninal. (Reference Figures 2.7-1 and 2.7-2). With a Beta Angle of 9 degrees, the arrays were left at the +18 degrees position. Solar Array output stabilized on Rev 7 at 25.37 A-H/Rev.

The main battery/Solar Array power system performed satisfactorily during Segment 1. On the first day, Charge Current Controller K-2 Relay openings occurred on Revs 5, 6, 12, 13, 15 and 16. On Rev 112, K-2 Relay openings occurred on all four CCC Relays.

The Main Battery Voltages at sun entrance and the predicted power usage were nominal during the segment. The average main bus voltage, at sun entrance, during the segment was 27.4 volts. The average actual power consumption was 22.00 A-H/Rev.

The Main Battery Discharge load sharing at sun entrance were nominal during the segment. Batteries 3 and 4 were carrying about 25% of the load with battery 1 carrying about 24% and battery 2 about 26%.

The Main Battery Temperatures as observed in realtime were nominal during the segment.

2.7.2 T&T Performance

The SGLS, PCM Telemetry Systems and Tape Recorders have demonstrated satisfactory performance throughout the Segment 1. The primary systems have been utilized during this segment with the exception of redundant systems used for health checks or evaluation.

The Back-up Timer was checked on Rev 25. The timer period was 535 seconds. The specification is 540 seconds $\pm$ 54 seconds.

The SGLS2 Transponder has been utilized for 3 HULA station contacts during Segment 1. Results to-date are insufficient to evaluate the system. Tests are planned weekly throughout the flight.

2.7.3 ACS/RCS Performance

The primary attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout segment one. The redundant Attitude Control System was also "on", however, it provided no control. Comparative data indicated good correlation between primary and redundant ACS. The primary system pitch and roll gyro temperatures were between 156^{O}F and 161^{O}F, with the yaw gyro temperature between 161^{O}F and 167^{O}F. Gyro temperatures of the non controlling redundant system were between 146^{O} and157^{O}F.

The Reaction Control System performance was nominal throughout the segment. The thruster performance is tabulated in Table 2.7-1.

An anomaly appeared during BV/SV Separation when the temperature transducer on thruster five indicated an anomalous reading. On Rev 13 yaw both thrusters 5 and 8 indicated anomalous readings. During all subsequent maneuvers and some quiescent periods these temperature discrepancies reappeared. Analyses of the problem attributed the an anomalous temperature readings to a variable resistance resulting from a break in the thermocouple wire.

RCS propellant consumption was 77.6 pounds which equates to 3.9 pounds per day.

2.7.4 Orbit Adjust System (OAS) Performance

The OAS functioned nominally for the 7 orbit adjusts performed during Segment 1. The total propellant usage for the OAs was 500.0 pounds.

The orbit adjust summary for the segment appears in Table 2.7-2.

2.7.5 Lifeboat II (LBII) Performance

The LBII system electronics were activated on Rev 18 for early rev health check. No activation of the pneumatics was performed. Analysis of the magnetometer data indicated the systems performance was nominal.

The LBII propellant tank heaters were commanded on following orbit injection and remained on until Rev 6 at which time they were commanded off. The tank temperature decreased from 178.5°F on Rev 6 to 95°F on Rev 310.

2.7.6 Doppler Beacon Performance

The Doppler Beacon System antenna was deployed and the system activated by stored commands on Rev 0 prior to Antartica. Evaluation of the vehicle telemetry data indicated that the antenna properly deployed and locked in position as verified by the correct and stable readings in S750, DBS Antenna Position monitor.

Throughout Segment 1, telemetry has verified nominal performance of the system's transmitters, heaters, oscillators and power supply components with the exception of point S702, Reflective Power Output, which was over high tolerance. The over tolerance reflects an increase in the C41, Main Bus Voltage. The increased readings are acceptable to the Doppler Beacon users.

Utilization of the software program 'TDERBY was initiated following the Doppler Beacon activation on Rev 0 and throughout the remainder of Segment 1 operational period. The program performed satisfactorily during the segment.

2.7.7 Thermal

2.7.7.1 Ascent Heating

The special shroud temperature instrumentation configuration flown on SV-7 (to measure z-ring to skin temperature differences) was repeated on SV-9. Ring-skin temperature differences observed at shroud separation were similar to those observed on SV-7.

The pressure transducers flown on the SV-9 shroud were thermally isolated to minimize their temperature rise during ascent. A temperature sensor located on one of these transducers recorded temperatures in the range 68/72°F during ascent (well below the 100°F thermal constraint).

2.7.7.2 Mid Section, Forward Section and APSA Lift-off Conditioning

Prior to the launch of SV-9,it was determined that the optimum lift-off temperature for the Mid Section would be 73°F. The choice of this temperature is based on an attempt to minimize thermal settling in the primary payload during the first few days of flight. SSC indicated that the most desirable lift-off temperature is 1°F higher than the predicted orbit temperature. The desired prelaunch temperature was obtained with the air conditioning system and subsequent flight data showed that the prelaunch temperature was determined correctly.

2.7.7.3 Orbit Temperatures

The temperatures in the Mid Section, Forward Section and APSA are all within the required limits. A summary of the average temperature for each section is shown in Table 2.7-3. In comparing the temperatures achieved on this flight with all temperatures on previous flights, some variation can be seen. This variation is due to the time of year of the flights and the orbital beta angle. Table 2.7-4 shows temperature differentials within the Mid Section in terms of the average temperature at various locations on the SBA. Differences between this flight and previous flights are due to the differences in orbital beta angle.

2.7.7.4 Subsatellite Effects

A study of SBA temperatures before and after the SSU and S3 subsatellite launches show no temperature changes. These subsatellites had no apparent thermal effects on the SBA.

2.7.7.5 Aft Section Temperature Control

From a thermal standpoint, SV-9 aft section design is identical to SV-8. Likewise, the thermal performance of SV-9 has been been similar to SV-8. As Table 2.7-5 demonstrates, all aft section critical components are operating well within design limits and, as with SV-8, near to predicted values.

Although during the SV-8 flight the orbit Beta angle changed continuously (from Beta ≈-3.0 degrees to B ≈26.0 degrees), during the SV-9 mission it will remain fairly constant at Beta ≈9.0 degrees. Figure 2.7-3 compares preflight predictions (for B=9.0 deg) with the orbit average temperatures of the equipment section doors. The predictions indicate a temperature band bounded by a low level of launch contamination on the skins and another level representative of the maximum contamination observed in previous flights. The flight data indicates a level of contamination similar to earlier vehicles.

Other than some anomalous behaviour of the REM thermocouples, B055 and B058, there appears to be no thermal problems associated with this flight. All temperatures are expected to remain well within design limits.

2.7.7.6 REM Thermocouple Anomaly

Erratic readings were experienced on thrust temperature monitors B055 and B058 (thrusters No. 5 and 8). The anomalous readings, which occurred during periods of high thruster activity and high temperature, can be attributed to a variable resistance resulting from a break in the thermocouple wire. Such a break could have occurred anywhere in the electrical circuit, including the REA leads, connectors, connecting wiring and wiring and reference junction within the PCM. However, the apparent triggering of erroneous data at the higher temperatures during thruster activity, coupled with a previous history of thermocouple lot failures, suggests that the most probable location of the break is the REA lead/junction area where thermal expansions due to changing temperature levels would produce a change in electrical resistance at a wire break. All other thermocouple failure modes are ruled out as not resulting in the temperature response observed.

2.7.8 Subsatellite

2.7.8.1 Subsatellite No. 2 (+Y)

Subsatellite No. 2 (+Y) was separated from the vehicle at system time 63765.8 sec. on Rev 15 at +56.84° Lat Descending. The satellite vehicle was pitched down an angle of 18.3 degrees. The return to fly normal attitude occurred immediately after separation.

2.7.8.2 Subsatellite No. 1 (-Y)

Subsatellite No. 1 (-Y) was separated from the satellite at -15.0° Lat Descending at system time 54148.6 sec. On Rev 13 the satellite executed a yaw left (-) maneuver of 26.9 degrees. The vehicle normal fly forward attitude occurred immediately after separation.

2.7.9

Table 2.7-1

RCS 1 Thruster Evaluation

Early Segment 1

Thrust in Lbs

REA	Rev	Actual	Qual
1	13	5.23	5.35
2	14	5.06	5.28
3	14	5.23	5.28
4	13	5.39	5.39
5	13	5.12	5.39
6	14	5.06	5.26
7	14	5.23	5.30
8	13	5.61	5.35

Late Segment 1

1	258	4.2	4.4
2	310	4.1	4.2
3	310	4.1	4.2
4	258	4.4	4.4
5	258	4.2	4.4
6	310	4.0	4.2
7	310	4.1	4.2
8	258	4.5	4.4

Table 2.7-2

Orbit Adjust Summary

Segment 1 Rev 0-310

OA/No/Type	1/POS	2/POS	3/POS	4/POS	5/POS	6/NEG	7/POS
Ops Day	4	7	10	14	16	16	18
Rev. No.	63	112	159	224	257	259	286
Delta V (Predict)-fps	13.9	23.887	19.264	35.93	24.889	21.453	35.0687
Delta V (Tracking)-fps	14.0126	24.002	19.35	35.94	25.234	21.333	34.894
Burn Duration - Sec.	39.6	68.4	56.4	106.0	75.8	66.8	110.0
Propellant Used-Lbs.	40.8	69.0	55.8	102.4	71.3	61.6	99.1
Avg OA Tank Temp - ^{o}F	75.1	76.9	78.0	79.8	80.6	81.2	81.5
Avg OA Tank Press-psia	288.1	276.6	266.3	253.6	240.5	231.4	220.6

TABLE 2.7-3

AVERAGE SECTION TEMPERATURES (^{o}F)

SECTION*	ICD LIMITS	SV-9 PREDICTION	SV-7 ACTUAL	SV-8 ACTUAL	SV-9 FIRST SEGMENT
Mid Section					
TREF	-	72	70	67	72
TTCA	49/91	72	70	68	72
TSU	47/93	74	72	70	74
Fwd Section					
TFWD	47/93	75	71/78	68/74	72/80
APSA					
TENC	32/69	50	52	52	55
TTP	30/85	52	50	53	53
TDBS	32/90	55	59	60	63

*The temperature designators TREF, TTCA, etc., represent orbit average temperatures for the various vehicle sections. Where the designated temperatures are calculated using data from several temperature sensors, the method of calculation is equivalent to the method described in the Interface Control Documentation.

TABLE 2.7-4

MID SECTION TEMPERATURE DIFFERENTIALS (^{o}F)*

DESIGNATION	ICD LIMITS	SV-7 ACTUAL	SV-8 ACTUAL	SV-9 FIRST SEGMENT
TCA COMPARTMENT				
I to IV	9	0	1	2
III to II	6	0	1	1
I to II	4	3	3	2
III to IV	4	3	3	3
SU COMPARTMENT				
I to IV	57	1	3	15
III to II	30	1	1	9
I to II	16	4	4	1
III to IV	16	2	0	3
II to V	16	1	0	2
III to V	16	1	1	6

*The Mid Section Interface Control Document provides limits for the difference in average temperature between various structural zones of the Mid Section. These zones are defined in detail in the Interface Control Document.

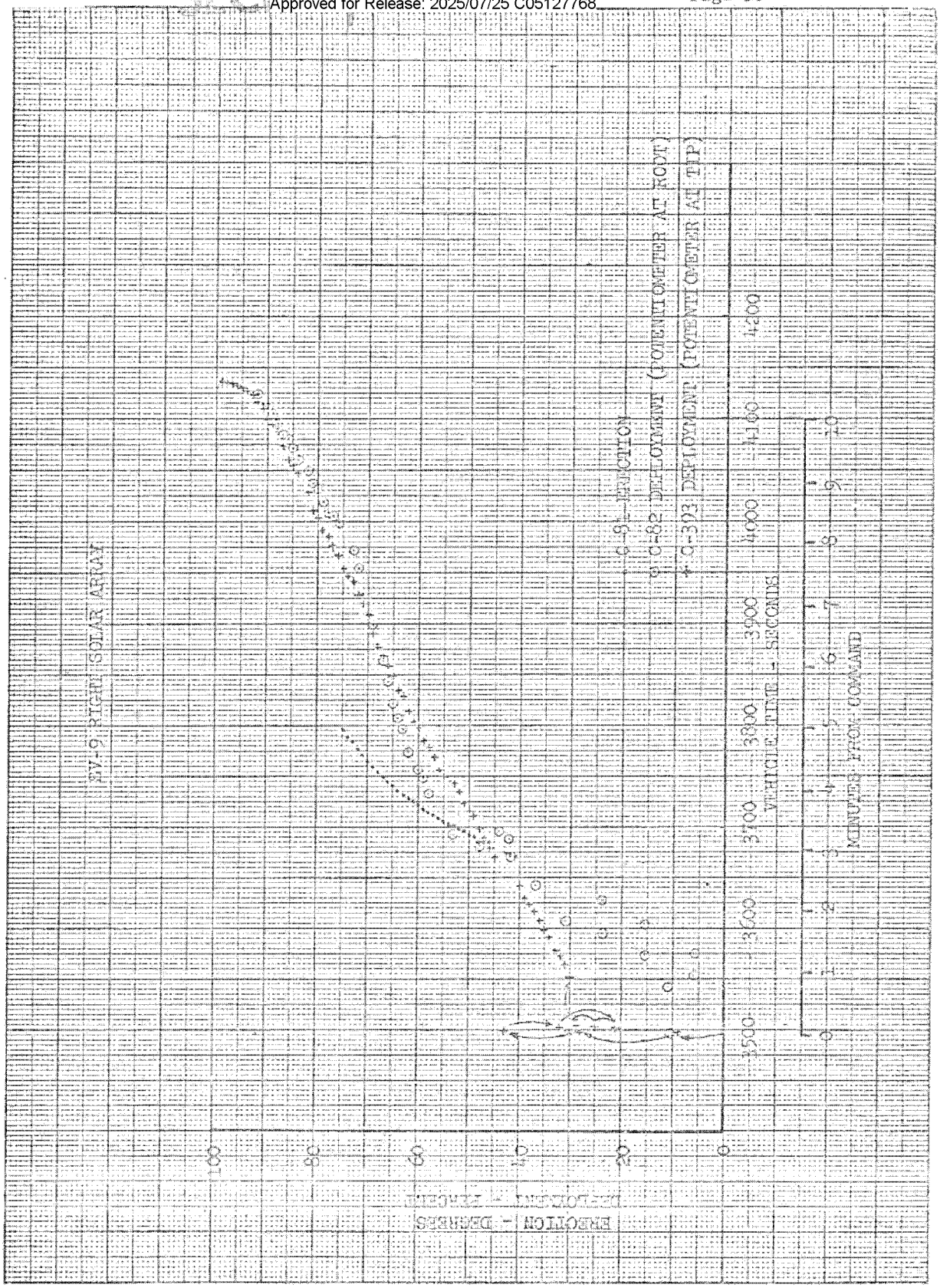
TABLE 2.7-5

SV-9 AFT SECTION CRITICAL COMPONENT TEMPERATURES (^{o}F)

SEGMENT 1

CRITICAL COMPONENT	DESIGN LIMITS	SV-9 ACTUALS*
PDJB	-30/165	81/88
CCC #2	-30/170	95/102
TYPE 29 BATTERIES BAY 3	35/70	43/49
TYPE 30 BATTERY	30/90	47/55
TYPE 31 BATTERIES	40/90	48/54
TYPE 29 BATTERIES BAY 4	35/70	43/51
HSA HEADS	0/130	77/83
IRAs	50/130	105/112
PCM MASTER	-30/170	80/110
TAPE RECORDERS	20/120	78/92
TRANSMITTERS	-30/170	80/110
ECS CLOCKS	40/153	96/103
ECS PMUA	-40/145	80/89
ECS PMUB	-40/145	96/99
IRA GYRO	50/200	139/165
RCS TANKS	40/140	70/85
PLUMBING BAY 6	35/140	77/85
PLUMBING BAY 12	35/140	76/96
OA TANK	70/100	73/83
PDAs	-30/160	55/94
SOLAR ARRAYS	-125/225	-83/147
QUAD VALVE	40/200	110/117

* Temperature ranges after launch transients.



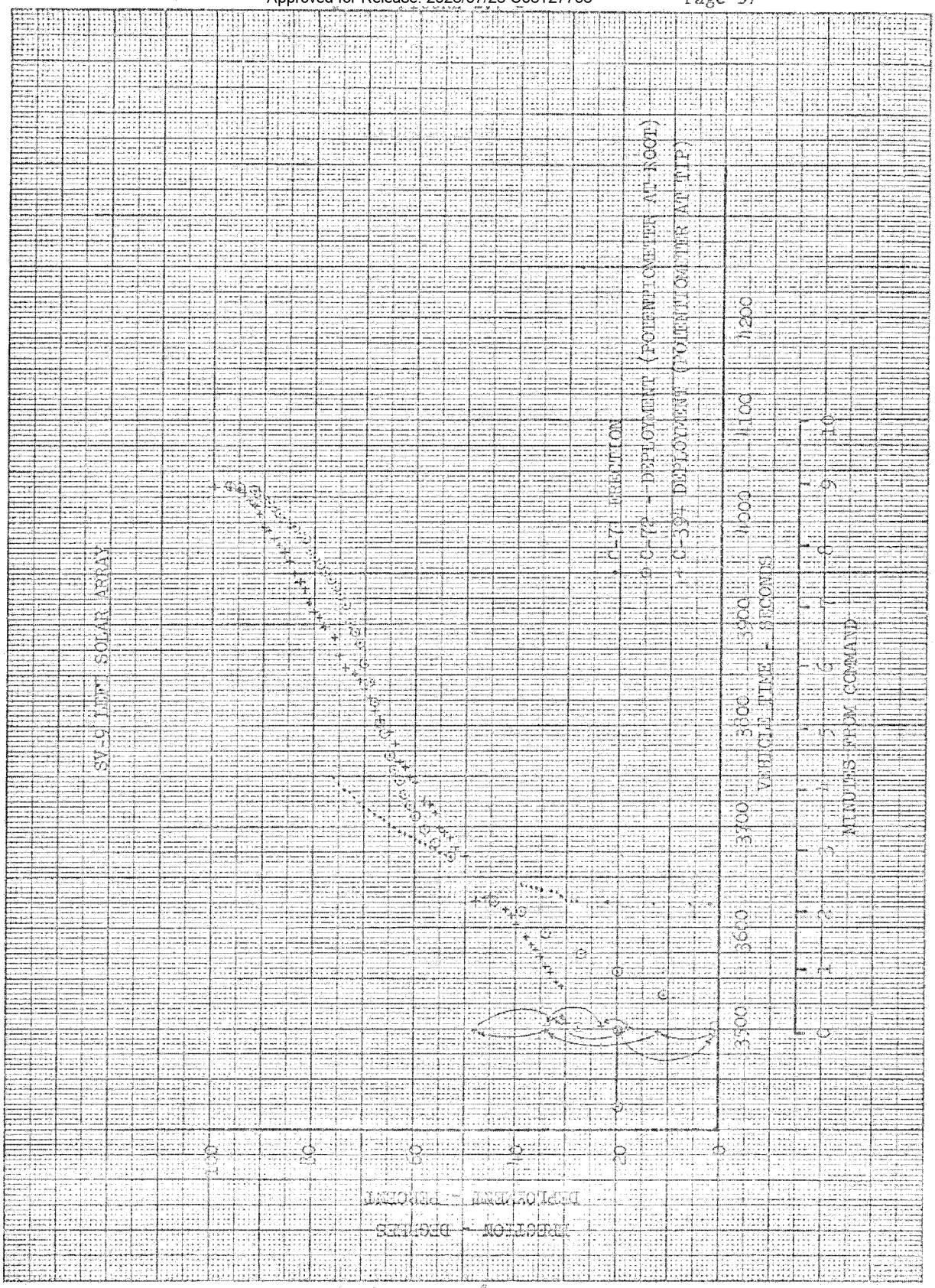
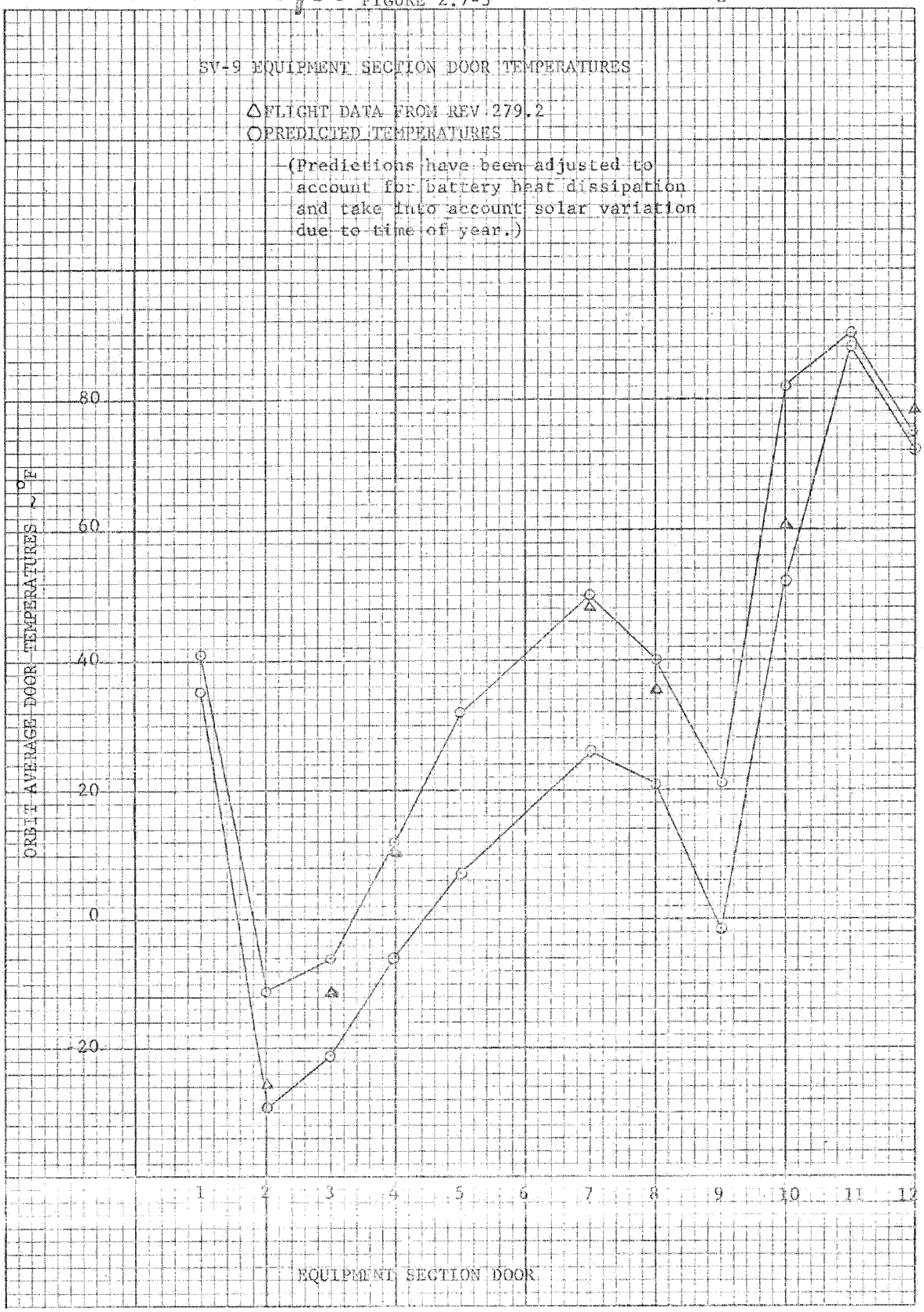


FIGURE 2.7-5



SECTION 3

3.0 ORBIT PHASE - REV 310 THROUCH RV-2 AND RV-5 RECOVERIES

3.1 Summary

The Sensor Subsystem exhibited nominal characteristics throughout RV-2, with no anomalies or malfunctions experienced. The Aft camera OOAA adjustment recommended by PFA, after evaluation of RV-1 imagery, was implemented on Rev 350. The overall quality of the acquired photography ranged from very good to poor with the majority rated as good. The poor imagery for the most part was attributed to haze or inclement weather. The Aft camera imagery continued to be better than that of the Fwd camera. The quality of the Color photography (SO-255) compared to previous color acquisitions ranged from good to fair with most rated good. The SO-255 material had an apparent underexposure of 1/3 to 1/2.

The RV-2 payload was 99.72% of the maximum I.C.D. weight and unbalanced 0.02%. Recovery occurred on Rev 894, operations day 56. All events were normal and executed as planned. Aerial recovery was accomplished on the first pass at 13,350 feet altitude, 11.88 nautical miles from the predicted impact point. The RV and parachute condition were reported as normal. The heatshield was also recovered.

The Primary Attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout segment two. The primary RCS thrusters were used for control during this period. RCS propellant consumption was 125.9 pounds which equates to an average of 3.5 pounds per day. The Orbit Adjust System (OAS) performance was

nominal for the 15 orbit adjusts performed. The total propellant usage for the orbit adjusts was 943.5 pounds.

[redacted]

The Mapping Camera Subsystem was successfully removed from the Ascent Mode (powered) shortly after BV/SV separation. On Rev 3, a two (2) cycle health check operate was completed with the data indicating normal ST operation. The ST was released thereafter and completed mapping requirements successfully. All operations over BAR XC and special engineering ops made with QX801 type film were completed successfully. Total film in the RV-5 at recovery, including ground test was 68.51 pounds.

RV-5 recovery events were nominal. Recovery occurred on Rev 958, operations day 60. Aerial recovery occurred on the first pass at 14,600 feet altitude, approximately 7 nautical miles from the predicted impact point.

3.1.2 Problem Summary

3.1.2.1 ST Platen Press

On Rev 154, the stellar platen press telemetry monitor indicated abnormal press. Possible causes for abnormal press condition are low press motor torque or mechanical bind.

3.1.2.2 ECS Command

On Rev 759 Guam Dec A indicated an off 20 seconds before fade. At the same time there was a bad main frame sync, weak signal, multipathing and loss of range information.

Detailed analysis of playback data showed that this RF noise at the receiver threshold caused each Decoder to see the bit structure of a real time command and accept it while the station was only sending S-pulses. Decoder B accepted and executed an RTC. New procedures now call for sending the "Decoders OFF" block prior to fade, before signals become marginal, to preclude accepting and executing anomalous commands.

3.1.2.3 ECS Command

On Rev 868 Kodi a message was VBE'd out of the ECS because of an "Upper Bound Error" after repeated attempts to load. Problem was attributed to PS 18 and PS 19 alarms at the station.

3.2 COMMAND SUBSYSTEMS PERFORMANCE
(Prepared by CSC)

3.2.1 Health

The health of the Command Systems remained excellent throughout Segment 2 (Revs 311-894). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures or voltages. There were no power dropouts, relay driver overloads, or clock status errors experienced.

3.2.1.1 EXTENDED COMMAND SUBSYSTEM

3.2.1.1.1 Command Modes

The ECS responded properly in all modes into which it was commanded. There were a total of 324 messages loaded in the ECS for this segment. This resulted in 81,385 SPC's being stored for readout from the PMU's.

Of the 81,385 SPC's loaded, 33,412 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 81,385 SPC's there were no command rejects.

On rev 868 KODI message 190 was VBE'ed out of ECS because of "Upper Bound Error" after repeated attempts to load. Problem was attributed to PS 18 and PS 19 alarms at station. Telemetry playback of ECS Memory Image indicated proper load including seven repeated commands sent from station which caused the UBE.

The UHF/ECS commanding system has continued to function as expected.

3.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 2.98 parts in 10^7. This corresponds to an average frequency offset of 0.30474 HZ above the nominal frequency of the 1.024×10^6 HZ. The frequency of the clock oscillators changed 0.926 HZ in 584 revs. This results in a stability of 4.55 parts in 10^8 over 584 revs, 3.16 parts in 10^{10} for an average six hour period. All of these values are well within system specifications.

3.2.1.1.3 ECS Anomalies

On rev 759 GUAM at ST 52151 Dec A indicated AOFF 20 seconds before fade. At the same time there was a bad main frame sync (MFSB), weak signal (up to 117 dbm), multipathing and loss of range information. Detailed analysis of playback data showed that this RF noise at the

3.2.1.1.3 ECS Anomalies, continued

receiver threshold caused each Decoder to see the bit structure of a real time command and accept it while the station was only sending S-pulses. Decoder B accepted and executed ER 57 (Left Array Stop) then Decoder A accepted an internal RTC which placed it into a non-RT state which telemetry interpreted as AOFF. Decoder B did not go to idle because it was busy executing the RTC.

New procedures now call for sending the "Decoders OFF" block prior to fade, before signals become marginal, to preclude accepting and executing anomalous commands.

3.2.1.2 MINIMAL COMMAND SUBSYSTEM

3.2.1.2.1 Command Modes

The MCS was not used during Segment 2.

3.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

3.2.1.3 REMOTE DECODER/BUD

3.2.1.3.1 Command Modes

The remote decoder was used for the recovery of RV-2 which ended this segment of the flight. The performance of both channels was verified from telemetry to be proper for all commands.

No commands were issued from the BUD during this segment.

3.2.1.3.2 Remote Decoder/Bud Anomalies

There were no remote decoder or back-up decoder anomalies.

3.2.1.4 SUMMARY

3.2.1.4.1 Expendables and Environmental Data

Command Readouts for Segment	PMU-A 16,314 PMU-B 17,098
ECS Clock Drift Rate	2.98 parts in 10^7
ECS Clock Stability	4.55 parts in 10^8 for a 584 rev period
Total Hours On	ECS 1341 MCS 4.5 RD 6.2 BUD .05
Total Secure Words Expended	PMU-A 60 PMU-B 60
Environmental Data	All temperatures within specifications.

3.3 Sensor System Operations Through RV-2

3.3.1 Mission Operations Performance

The Sensor Subsystem exhibited nominal characteristics throughout RV-2, with no anomalies or malfunctions experienced.

The Aft camera OOAA adjustment recommended by PFA, after evaluation of RV-1 imagery, was implemented on Rev 350, OP 156. The OOAA was retreated minus 4 command steps from minus 3 steps to a new nominal of minus 7 steps.

The RV-2 mission segment consisted of 226 sensor system operations, consuming 23,926 seconds of camera power on time, 9.3 pounds of nitrogen gas, and a film usage of approximately 29,500 feet on the Fwd camera and approximately 26,900 feet on the Aft camera. The consumption profiles through RV-2 are graphically depicted in Figure 1.

The overall quality of the acquired photography ranged from very good to poor with the majority rated as good. The poor imagery for the most part was attributed to haze or inclement weather. The Aft camera imagery continued to be better than that of the Fwd camera.

The quality of the Color photography (SO-255) compared to previous color acquisitions ranged from good to fair with most rated good. The SO-255 material had an apparent underexposure of 1/3 to 1/2 stop based on the analysis of several acquisitions. A three count (.10 log E) exposure increase will be made in RV-3 for the remaining SO-255 material.

3.3.2 Engineering Tests

Several engineering tests were performed during this segment of the mission in support of PFA imagery evaluation.

REV 340 TUCSON, DA TARGETS, TEST TYPES 7/9/15

REV 405 PROCESSING STUDIES, TEST TYPE 4C

REV 421 PROCESSING STUDIES, TEST TYPE 4C

REV 438 SMEAR VS. SCAN, TEST TYPE 10

REV 486 TUCSON, SPECIAL TGTS, TEST TYPES 7/9/12/14

REV 519 SMEAR SLITS, TEST TYPE 3A

REV 534 SMEAR SLITS, TEST TYPE 3A

REV 566 SMEAR SLITS, TEST TYPE 3A

REV 582 SMEAR SLITS, TEST TYPE 3A

REV 616 SMEAR SLITS, TEST TYPE 3A

REV 681 SMEAR SLITS, TEST TYPE 3A

REV 777 TONE REPRODUCTION, TEST TYPE 4B

REV 778 RADIOMETRIC CAL., TEST TYPE 4A

REV 794 TONE REPRODUCTION, TEST TYPE 4B

3.4 RV 2 (S/N 38) Performance

This report presents an analysis of the RV 2 performance based on evaluation of recovery studies, command message, RV and SV telemetry, voice reports, and the recovery test report TWX. Tables 3.4-1 thru 3.4-3 list all relevant data.

3.4.1 Summary

The RV payload was 99.72% of the maximum I.C.D. weight and unbalanced 0.02%. The PREP2 event took place on Rev 891 over BOSS and separation occurred on Rev 894. Preparation, deorbit, and entry events, and drogue and main parachute deployment conditions were normal and executed as planned. Aerial recovery was accomplished on the first pass at 13,350 feet altitude, 11.88 nautical miles from the predicted impact point.

The RV and Parachute condition were reported as normal. The heatshield was also recovered.

IDENTIFICATION DATA

SV 9 IRON NO 7122 RECOVERY REV 894.
RV 2 RV S/N 38 RETRO MOTOR S/N Q64 RECOVERY DATE 23 Dec 74

EVENT TIMES (IN SYSTEMS TIME - SECONDS)

EVENT	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVAL	COMMAND MESSAGE	SV TLM	VOICE REPORTS	RV TLM MODE 51	DIFF NOTE 1
RV 3 OUT T/S	REV/STA			65366.1	65367			0
RV 2 IN T/S	891 BOSS			65370.1	65371			0
DT START	80065.5	80065.5	80065.5	80065.3	80065			0
POGO TRAN	81075.78			81076.9	81065			-11.9
PITCH START	81105.70			81106.5	81107			0
PITCH STOP				81160.5	81161			0
PYRO ARM BATT				81276.5	81277			0
POGO FADE	81387.68			81388.1	81402			+13.9
KODI TRAN	81522.66			81523.9	81581	Confirm		+57.1
ORB PWR OFF				81650.5	81651			0
RV SEP (0)	81660.70	81660.7	81660.7	81660.5	81661	Confirm	NA NOTE 2	0
SPIN UP (+2.4)				81662.9		Confirm	NA	NA
RETRO START	81786.10	81786.1	81786.1	81785.9		81786	81786.6	0
DESPIN (+160.4)				81820.9		81824	81822.3	1.4
PROP JETT (+175.4)				81835.9		81838	81837.6	1.7
KODI FD (RV)	81844.86					81851	81851	+6.14
RV ENTRY (400K	81949.70	81949.8	81949.8		RECOV TM			
△ 1-2 ACQ					NA	NA		
ION ENTR	82051.91	82051.3	82052.0		NA	NA		NA
ION EXIT	82246.83	82246.8	82246.9		82250	82250		+3.1
DROGUE DEPLOY	82292.35	82292.4	82292.4	TONE STOP	82302	82299	NA	+9.6
IMPACT (50K)	82310.45	82310.5	82310.5					
MAIN CHUTE DPL	82313.31	82313.3	82313.5		NA	NA	NA	NA
H/SHLD JETT	82317.31	82317.3	82317.5	TONE START	82317	82319	NA	0
STEADY STATE	82328.31	82328.3	82328.5					
ETPD(RAINDROP)	82359.7	82359.8	82359.0					
RV @ 13.5K	83287.4	83287.4	83286.6	IN TRAIL	83220	83280	NA	-66.6
WATER IMPACT	83852.1	83852.1	83851.3		NA	NA	NA	NA
HULA TRAN (RV)	NA					NA	NA	NA
HULA FADE (RV)	NA					NA	NA	NA
DT RUNOUT	82780.5	82780.5	82780.5		NA	NA	NA	

*To nearest Minute.

NOTES: 1. DIFF = Actual - Predicted times, TLM differences of less than 1.0 sec are ignored. [ ] = PREDICTED TIME, [ ] = ACTUAL TIME.
2. Assume RV SEP Sequencing starts 0.4 seconds after RV SEP Command msg. time.

~~SECRET/H~~

RV 2 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	23.000	23.056	23.048	22.850	22.967	22.850
LONGITUDE	169.10	169.09	169.10	169.10	169.13	169.10

RECOV. A/C DEPLOYMENT FORMATION No. 1, RECOVERING A/C No. 1

RECOV ALT 13350 ft, PASS No. 1, TIME 2307 Z

AIRSPEED 159 KTAS, 125 KIAS; TIME IN TOW 19 min.

RAINDROP ETPD 82359.7 sec 46000 ft; RATE/DESCENT, 15K 29.1 FPS, 10K 26.9 FPS

CONTACT LOCATION No. 3 Hook On One Heavy Load Line

PRESET TENSION LEVEL 3600 lb, PAYOUT Normal

MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)

OVERSHOOT 11.88 nm, CROSS TRACK 0 nm EAST

RC CONDITION Normal

CHUTE/CONE CONDITION Normal

CHUTE/CONE BEHAVIOR Normal

WIND DATA

ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT	ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT
SCF	100	-	15	-	25	270	360	30	20
2	080	020	20	10	30	310	360	35	30
4	070	020	15	20	35	330	350	25	20
6	070	360	10	20	40	350	340	30	20
8	070	350	20	20	45	330	340	10	30
10	070	350	15	15	50	360	360	10	30
15	030	040	20	15	55	-	-	-	-
20	010	360	30	30	60	-	-	-	-

RV BATTERY TIME HISTORY

TIME	ACT 81277	279	280	282	284	285	288	294	295	298	331	581
MAIN		23.4	24.6									24.8
PYRO #1		22.1	23.1		23.9	24.6	25.3	26.0	26.6	27.2		27.6
PYRO #2		22.8	22.1	23.0	23.5	24.1	24.6	25.3			25.9	25.9
TIME	607	651	SEP									
MAIN	24.8	24.1										
PYRO #1	27.6	26.7										
PYRO #2	26.0											

SV RATES BEFORE & AFTER SEP (SV TLM)

TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YCR °/sec
81659	-0.069	0.001	0.0
SEP81660	-0.07	+0.02	+0.01
81661	+0.19	-0.03	+0.01

MISC DATA

Payload Temp before SEP,	Rn06 71	°F
Payload Temp, Max REENTRY,	TB02 70	°F
Chute Press before PREP 2,	P711 .54	PS
Supply Press before PREP 2,	P113 .61	PS
BETA ANGLE of Recovery Rev.	10.9	°

PITCH ANGLE

BASIC STUDY

Θ rvs -125.85 °

$\Delta\Theta 1$ 2.18 °

Ωy 1.38 °/sec

$\Delta\Theta 2$ .007 °

Θ sv -38.023 °

PITCH (CMD MSG) -38.07 °

Θ sv (PDWN-SV TLM) -37.4 °

Θ rvs ON UPDATED TEAPOT -125.9 °

RV 2 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	ACTUAL POST FLT
TU-A	231.58 lb	231.58 lb	231.58 lb	230.8 lb
TU-B	227.13 lb	227.13 lb	227.13 lb	226.7 lb
TOTAL	458.71 lb	458.71 lb	458.71 lb	457.5 lb
SEP WGT	1538.79 lb	1538.79 lb	1538.79 lb	UPDATED TEAPOT
RETRO WGT	1537.10 lb	1537.10 lb	1537.10 lb	% UNBAL .02
ENERY WGT	1346.29 lb	1346.29 lb	1346.29 lb	% FULL 99.72
AIR RECOV WGT	1138.24 lb	1138.24 lb	1138.24 lb	(100% = 460 lb)

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	17273.0 lb	PITCH INERTIA (Iy)	122239.98 SLUG-FT^2
CG FROM STA 2220.2(X)	216.47 in	ROLL INERTIA (Ix)	5607.68 SLUG-FT^2
CG FROM LONG AXIS(Y)	1.57 in	YAW INERTIA(Iz)	123336.76 SLUG-FT^2

DOPPEL EPHEMERIS

REV OF SEP 894	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION
PREDICTED FROM REV	884	891	N/A
APOGEE	153.455 nm	153.438 nm	153.288 nm
PERIGEE	87.741 nm	87.741 nm	87.744 nm
ARG OF PERIGEE	126.578 °	126.585 °	126.554 °
INCLINATION	96.643 °	96.642 °	96.642 °
TRUE ANOMALY AT RETRO	359.90 °	359.84 °	359.87 °
STEADY STATE ALT.	47586.3 FT	47587.1 FT	47538.71 FT
HEATSHIELD JETT ALT.	49656.16 FT	49657.0 FT	49601.80 FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	81660.70	81786.10	81949.79	82292.39
ALTITUDE (FT)	545084.37	533017.88	400000.0	63591.67
LATITUDE (°N)	61.501	53.069	42.246	23.089
LONGITUDE (°W)	157.15	161.15	164.72	169.09
INERTIAL AZIMUTH (°)	194.04	191.11		
INERT FLT PATH ANGLE (°)	-0.0898	-0.0072		
INERT VELOCITY (FT/SEC)	25734.84	25743.39	25534.49	
LOCAL AZIMUTH (°)			191.50	190.37
LOCAL FLT PATH ANGLE (°)			-2.0431	-31.3338
LOCAL VELOCITY (FT/SEC)				1425.74
ANGLE OF ATTACK (°)			104.22	
MACH NUMBER				1.47
DYN PRESS (PSF)				193.525

CORE PINS SHEARED (FROM REBOUND TWX) A: YES X NO , B: YES X NO

BFE VECTOR, Parameters from a SYS Time near the ascending node of the Recovery Rev.

SYS TIME	79927.660 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	.0001 °
LONGITUDE	17.6639 °	INERTIAL GEOCENTRIC FLT PATH ANGLE	-.4187 °
ALTITUDE	136.1333 nm	INERTIAL GEOCENTRIC AZIMUTH	353.3583 °
		INERTIAL VELOCITY	25369.24 FT/SEC
SV C_D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.49177 FT^2/SLUG

SEC 3.5.0 SATELLITE VEHICLE SUPPORT

SEC 3.5.1 SATELLITE CONTROL FACILITY SUPPORT
(Prepared by the FTFD)

3.5.1.1 RTS Equipment Failures Affecting Operations

Rev 573 POGO - SGLS 14 KMTR Failure - Lost 5 sec range and 2 sec realtime TLM.

Rev 722 KODI - Intermittent NFFK XMIT capability caused delayed cmd; No data lost.

Rev 750, 1, 2 POGO - SGLS 14 XMTR Motor Generator No output; CMD w/CT.

Rev 832 POGO - Bad Disk Drive (Computer) Lost 154 sec TLM Data.

Rev 868 KODI - Unable to load CMD MSG due to PS19 and DLS2 Alarms caused by Processor 2 being powered down, due to an outage. Equipment powered up, PS19 & DLS2 Alarms terminated.

3.5.1.2 RTS Personnel Errors

Rev 673 COOK - Lost 5 sec Tape Recorder R/O due to writing two operations on the same FR 1600.

Rev 681 COOK - Microwave misconfigured lost 59 secs of data.

Rev 792 POGO - Lost Partial Tape Recorder R/O due to misconfigured patch.

3.5.1.3 Miscellaneous RTS Problems

Rev 560 KODI - Lost Frontline ETA - 3 mins. Switched Front/Back Lines.

Rev 570 KODI - Both lines very noisy ETA - 30 sec Ran Pass On Marginal Backline.

Rev 842 POGO - Lost Frontline at ETA - 2 min Ran Pass On Backline.

3.5.1.4 STC Computer Problems

a) Bird Buffers

3.5.1.4 STC Computer Problems, continued

Rev 541 POGO - BB 48 No Contact - Switched to BB 46 at ETA - 30

Rev 571 POGO - Lost 12 sec data with BB 48. No action taken.

Rev 756 KODI - BB No Contact - Switched prior to acquisition.

b) 3800 Problems and Impacts

System 25 - Primary

2, 22, 29 Dec - Printer Failure - Lost 15 min on timeline.

13, 22, 24, 25, 29 Dec - Error conditions halted processing - Greatest impact 10 min.

c) Similar Minor Impacts on Sys 23 and 24 (Secondarys)

d) DTV Lost (Top) or Impacted Ops on Revs: 541, 581, 622, 631, 655, 702, 863, 881, 883, 900, 908, 912, 1006 and 1022.

SEC 3.5.2 TELEMETRY DISPLAY MODES

The following TLM Display Mode Activity occurred during the RV-2 segment of OPS 7122:

a) The following MCRs were submitted to Mode Gen.

1) MCR 9-52: Processing change in Modes 121 & 143 for SSC.

[redacted]

3) MCR 9-54: Addition of OA Pressure Monitors.

4) MCR 9-55: Reformatting of R/T Modes

5) MCR 9-56: High Rate Signal Strength Processing in R/T Modes.

6) MCR 9-57: Addition of VTCW to Mode 148 Evt Field.

All of the above MCRs except MCR 9-56 were implemented during this segment.

SEC 3.5.2 TELEMETRY DISPLAY MODES, continued

b) MSTAC Model 14 Format B modes were not validated by TAS. Numerous problems remain. Mode Generation & DVOS are attempting to resolve the problems.

c) Validation of MCR 9-56 is continuing. DVOS & Mode Generation are investigating the problem areas.

None of the above items were considered flight critical.

SEC 3.5.3 ORBIT PARAMETERS

Table 3.5.2 shows a summary of orbital conditions from each tracking reduction. Significant events affecting the orbit, after the initial southern argument of perigee was an orbit adjust every three days.

The daily average K factor (ground magnetometer readings from Alaska and Colorado) are indicative of possible radiation damage to the stellar film.

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 16	71307	295	0.461		86.6	25.56	166.9	89 5.2	0.202	
S 17	27	297	0.449		86.5	25.94	166.7	89 4.6	0.199	3.1
S 17	10443	300	0.473		86.5	26.18	166.4	89 4.2	0.211	
P 17	26084	304	0.461		86.6	26.90	166.0	89 3.7	0.205	
P 17	47148	308	0.461		86.5	27.39	165.6	89 2.9	0.208	
P 17	70408	311	0.519		86.5	28.26	164.9	89 1.7	0.236	
S 17	85346	313	0.498		86.3	28.65	164.6	89 0.9	0.230	
P 18	9740	316	0.504		86.3	28.95	164.3	89 0.4	0.234	3.1
P 18	25452	320	0.496		86.4	29.67	163.9	88 59.8	0.229	
P 18	46172	324	0.480		86.3	30.33	163.2	88 58.8	0.225	
I #8	58350	320	0.480	11.3	86.3	30.33	163.2	88 58.6	0.218	
I #8	58384	320	0.480	11.3	86.1	29.14	156.6	88 51.3	0.240	
P 18	69428	327	0.490		86.2	29.62	156.2	88 50.6	0.244	
P 19	34144	337	0.468		86.2	31.34	154.8	88 48.3	0.239	1.9
S 19	50145	341	0.462		86.0	31.67	154.5	88 47.6	0.240	
P 19	72884	344	0.506		86.1	32.45	153.9	88 46.5	0.262	
S 20	2008	346	0.501		85.9	33.08	153.6	88 45.7	0.266	1.8
S 20	12760	349	0.519		86.0	33.26	153.2	88 45.1	0.276	
P 20	11920	349	0.519		86.0	33.26	153.2	88 45.2	0.276	
P 20	28580	353	0.498		86.0	34.07	152.7	88 44.3	0.266	
P 20	49224	359	0.501		85.8	34.52	152.2	88 43.3	0.274	
P 20	72372	360	0.527		85.8	35.47	151.5	88 42.0	0.292	
S 21	952	362	0.504		85.7	35.87	151.1	88 41.2	0.284	
P 21	16576	365	0.505		85.7	36.32	150.6	88 40.5	0.286	
P 21	27324	369	0.490		85.8	36.93	150.3	88 39.8	0.280	
P 21	47968	373	0.512		85.6	37.51	149.6	88 38.7	0.298	
I #9	55278	370	0.512	25.6	85.6	37.51	149.6	88 38.7	0.303	
I #9	55355	370	0.512	25.6	86.1	33.98	161.2	88 54.5	0.252	
S 21	70979	376	0.541		86.1	37.50	160.7	88 53.6	0.271	
S 21	86099	378	0.531		85.9	34.73	160.4	88 52.8	0.270	
P 22	14651	381	0.533		86.0	35.28	159.8	88 52.3	0.272	2.9
P 22	26168	385	0.519		86.0	35.87	159.5	88 51.5	0.265	
P 22	46864	389	0.519		86.0	36.39	158.8	88 50.5	0.270	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 23	13595	397	0.508		85.9	38.23	157.3	88 47.9	0.273	3.2
P 23	24736	401	0.504		85.9	38.83	157.0	88 47.2	0.272	
P 23	45648	405	0.488		85.9	39.43	156.3	88 46.1	0.267	
P 23	68908	408	0.504		85.9	40.38	155.7	88 45.0	0.279	
S 23	83987	410	0.512		85.7	40.77	155.3	88 44.1	0.288	
P 24	12539	413	0.500		85.8	41.29	154.7	88 43.4	0.284	2.9
P 24	23528	418	0.503		83.8	41.92	154.5	88 42.8	0.287	
P 24	49820	422	0.509		85.7	43.09	153.4	88.41.3	0.298	
I#10	62403	420	0.509	21.3	85.7	43.09	153.4	88 41.1	0.297	
I#10	62467	420	0.509	21:3	86.2	39.79	163.1	88 54.2	0.258	
P 24	72316	425	0.555		86.1	39.99	162.7	88 53.5	0.283	
S 25	1435	427	0.531		85.9	40.67	162.3	88 52.7	0.277	2.4
P 25	17395	430	0.530		86.1	41.22	161.8	88 51.9	0.276	
P 25	28052	434	0.503		86.1	41.90	161.5	88 51.4	0.263	
P 25	48736	438	0.517		86.0	42.48	160.8	88 50.3	0.276	
P 25	71920	441	0.523		86.0	43.58	160.2	88 49.1	0.284	
S 26	379	443	0.509		85.9	43.98	159.8	88 48.3	0.279	3.3
P 26	15667	446	0.517		85.9	44.54	159.2	88 47.6	0.285	
P 26	26900	450	0.492		85.9	45.24	158.9	88 46.9	0.272	
P 26	47580	454	0.509		85.9	45.79	158.2	88 45.9	0.288	
P 26	70776	457	0.520		85.9	46.89	157.5	88 44.6	0.297	
S 26	85723	459	0.520		85.7	47.29	157.0	88 43.7	0.303	
P 27	14275	462	0.515		85.8	47.87	156.4	88 43.0	0.302	2.8
P 27	25708	466	0.490		85.7	48.61	156.1	88 42.3	0.290	
P 27	46316	470	0.491		85.7	49.31	155.2	88 41.1	0.294	
I#11	54408	468	0.491	43.0	85.7	49.31	155.2	88 41.1	0.295	
I#11	54539	468	0.491	43.0	95.0	31.07	163.2	89 7.8	0.125	
I#12	62431	469	0.491	-21.1	95.0	31.07	163.2	89 7.7	0.125	
I#12	62495	469	0.491	-21.1	86.4	24.55	157.2	88 54.3	0.231	
S 27	69383	473	0.501		86.5	24.58	156.9	88 53.9	0.236	
P 28	13055	478	0.482		86.3	25.65	156.2	88 52.7	0.231	2.5
P 28	24292	482	0.484		86.4	26.15	155.9	88 52.1	0.232	
P 28	45236	486	0.477		86.3	26.69	155.4	88 51.2	0.232	
P 28	68480	489	0.480		86.3	26.22	154.9	88 50.1	0.237	

Approved for Release: 2025/07/25 C05127768

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 28	83447	491	0.483		86.1	27.92	154.6	88 49.4	0.241	
P 29	7800	494	0.465		86.1	28.24	154.4	88 49.0	0.233	2.3
P 29	23160	499	0.458		86.2	28.88	154.0	88 48.4	0.230	
P 29	49492	503	0.457		86.1	29.58	153.4	88 47.2	0.235	
P 29	72648	506	0.470		86.1	30.52	152.8	88 46.1	0.244	
S 30	1031	508	0.457		85.9	30.92	152.6	88 45.4	0.241	2.0
P 30	16991	511	0.453		86.0	31.37	152.1	88 44.8	0.239	
P 30	27652	515	0.430		86.1	31.94	151.8	88 44.3	0.227	
P 30	48308	519	0.451		86.0	32.86	151.2	88 43.4	0.242	
I#13	60910	517	0.451	15.3	86.0	32.86	151.2	88 43.1	0.244	
I#13	60959	517	0.451	15.3	86.2	31.47	158.5	88 52.6	0.218	
S 30	71207	522	0.457		86.1	31.49	158.3	88 52.0	0.229	
S 30	86327	524	0.439		85.9	32.16	158.0	88 51.3	0.223	
P 1	15215	527	0.448		86.0	32.68	157.6	88 50.8	0.228	1.4
P 1	26492	531	0.437		86.1	33.26	157.4	88 50.2	0.223	
P 1	47180	535	0.442		86.0	33.73	156.8	88 49.3	0.229	
P 1	70392	538	0.468		86.0	34.68	156.3	88 48.3	0.246	
S 1	85271	540	0.497		85.9	35.07	156.0	88 47.5	0.263	
P 2	9652	543	0.517		85.9	35.37	155.6	88 47.0	0.275	0.6
P 2	30287	547	0.532		86.0	36.30	154.9	88 45.9	0.285	
P 2	45964	551	0.521		85.9	36.65	154.4	88 45.1	0.283	
P 2	69200	554	0.525		85.9	37.55	153.7	88 43.8	0.289	
S 2	84215	556	0.537		85.7	37.95	153.3	88 42.9	0.301	
P 3	12767	559	0.534		85.7	38.42	152.7	88 42.2	0.302	1.3
P 3	23812	564	0.504		85.7	39.04	152.4	88 41.6	0.287	
P 3	50088	568	0.503		85.6	39.96	151.6	88 40.1	0.293	
I#14	57393	567	0.503	23.4	85.6	39.96	151.6	88 40.0	0.294	
I#14	57467	567	0.503	23.4	86.2	36.57	162.2	88 54.5	0.249	
S 3	72419	571	0.549		86.2	36.76	161.6	88 53.6	0.276	
S 4	1811	573	0.527		86.0	37.45	161.2	88 52.8	0.270	2.5
P 4	17435	576	0.525		86.1	37.97	160.7	88 52.1	0.269	
P 4	28340	580	0.488		86.2	38.61	160.4	88 51.5	0.250	
P 4	49020	584	0.484		86.0	39.21	159.9	88 50.6	0.254	
P 4	72204	587	0.480		86.0	40.27	159.3	88 49.4	0.254	
S 5	755	589	0.456		85.9	40.68	159.0	88 48.7	0.245	2.7

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 5	16379	592	0.455		86.0	41.21	158.5	88 48.1	0.245	
S 5	26963	594	0.443		86.0	41.87	158.3	88 47.6	0.239	
P 5	37280	600	0.442		86.1	42.18	157.9	88 47.1	0.240	
P 5	71072	603	0.457		86.0	43.45	157.1	88 45.5	0.252	
S 5	86100	605	0.456		85.9	43.84	156.7	88 44.8	0.256	
P 6	10312	608	0.459		85.9	44.21	156.4	88 44.2	0.259	2.5
P 6	26004	612	0.448		86.0	45.15	156.0	88 43.5	0.254	
P 6	46644	616	0.455		86.0	46.11	155.1	88 42.5	0.261	
I#15	60080	615	0.455	37.6	86.0	46.11	155.1	88 42.4	0.263	
I#15	60200	615	0.455	37.6	94.2	30.51	161.9	89 5.7	0.122	
I#16	68089	616	0.455	-18.9	94.2	30.51	161.9	89 5.6	0.123	
I#16	68150	616	0.455	-18.9	86.6	24.53	156.3	88 53.5	0.213	
P 6	69896	619	0.463		86.5	24.64	156.1	88 53.1	0.220	
S 6	84782	621	0.458		86.3	25.00	155.9	88 52.4	0.219	
P 7	9192	624	0.442		86.3	25.28	155.6	88 52.0	0.213	1.8
P 7	24896	628	0.441		86.4	25.95	155.2	88 51.4	0.212	
P 7	45476	632	0.444		86.4	26.46	154.7	88 50.6	0.216	
P 7	68772	635	0.450		86.4	25.84	154.3	88 49.6	0.222	
S 7	83726	637	0.485		86.2	27.69	154.0	88 48.9	0.241	
P 8	8084	640	0.460		86.2	28.01	153.8	88 48.4	0.231	1.4
P 8	23448	645	0.448		86.3	28.66	153.4	88 47.9	0.225	
P 8	49768	649	0.473		86.1	29.37	152.8	88 46.7	0.243	
P 8	72916	652	0.496		86.1	30.30	152.2	88 45.5	0.257	
S 9	1310	654	0.494		86.0	30.70	151.9	88 44.8	0.260	1.9
P 9	12204	657	0.495		86.0	30.90	151.5	88 44.3	0.262	
P 9	27552	661	0.492		86.1	31.69	151.0	88 43.6	0.260	
P 9	48576	665	0.515		85.9	32.33	150.4	88 42.4	0.279	
I#17	55862	662	0.515	16.0	85.9	32.33	150.4	88 42.3	0.276	
I#17	55915	662	0.515	16.0	86.1	30.97	158.1	88 52.3	0.256	
P 9	71768	668	0.572		86.1	31.50	157.6	88 51.3	0.289	
S 10	260	670	0.562		86.0	31.87	157.2	88 50.5	0.287	2.3
P 10	11048	673	0.555		85.9	32.09	156.8	88 49.9	0.285	
P 10	26764	677	0.515		86.0	32.86	156.4	88 49.2	0.265	
P 10	47444	681	0.512		85.9	33.32	155.7	88 48.1	0.268	
P 10	70652	684	0.518		85.9	34.25	155.1	88 46.9	0.275	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 10	85604	686	0.501		85.8	34.62	154.7	88 46.1	0.270	
P 11	9904	689	0.496		85.7	34.91	154.4	88 45.6	0.268	3.9
P 11	25524	693	0.495		85.8	35.63	153.9	88 44.8	0.269	
P 11	46216	697	0.487		85.8	36.15	153.2	88 43.8	0.269	
P 11	69440	700	0.504		85.8	37.06	152.6	88 42.6	0.282	
S 11	84548	702	0.499		85.6	37.43	152.2	88 41.7	0.284	
P 12	8688	705	0.479		85.6	37.78	151.9	88 41.2	0.275	3.4
P 12	24040	710	0.479		85.7	38.52	151.4	88 40.5	0.276	
P 12	50304	714	0.480		85.6	39.40	150.6	88 39.1	0.283	
I#18	57620	711	0.480	26.4	85.6	39.40	150.6	88 39.0	0.272	
I#18	57706	711	0.480	26.4	86.2	35.59	162.6	88 55.4	0.237	
P 12	72832	717	0.491		86.2	35.96	162.1	88 54.6	0.246	
S 13	2050	719	0.461		86.0	36.57	161.8	88 53.9	0.234	
P 13	12820	722	0.464		86.1	36.83	161.5	88 53.4	0.235	3.2
P 13	28576	726	0.453		86.2	37.68	161.1	88 52.7	0.230	
P 13	49256	730	0.470		86.0	38.23	160.6	88 51.9	0.244	
P 13	72440	733	0.484		86.1	39.29	160.0	88 50.7	0.253	
S 14	995	735	0.482		85.9	39.69	159.7	88 50.0	0.255	3.2
P 14	11732	738	0.485		86.0	39.99	159.3	88 49.5	0.257	
P 14	27456	742	0.458		86.0	40.86	159.0	88 48.8	0.244	
P 14	48140	746	0.461		86.0	41.44	158.3	88 47.8	0.249	
P 14	71332	749	0.456		86.0	42.49	157.7	88 46.7	0.249	
S 14	86339	751	0.452		85.9	42.90	157.5	88 46.0	0.251	
P 15	10464	754	0.456		85.9	43.21	157.1	88 45.5	0.255	2.9
P 15	28252	758	0.448		86.0	44.14	156.7	88 44.8	0.251	
S 15	46679	762	0.452		85.9	44.83	155.9	88 43.7	0.257	
I#19	54184	759	0.452	14.4	85.9	44.83	155.9	88 43.6	0.254	
I#19	54232	759	0.452	14.4	86.3	42.60	162.5	88 52.6	0.233	
P 15	70164	765	0.460		86.3	43.23	162.0	88 51.8	0.239	
S 15	84976	767	0.473		86.2	43.65	161.7	88 51.0	0.248	
P 16	9440	770	0.451		86.2	44.03	161.4	88 50.5	0.239	
P 16	24832	774	0.449		86.3	44.87	161.0	88 49.9	0.238	1.5
P 16	45732	778	0.442		86.3	45.55	160.3	88 48.9	0.237	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 16	69024	781	0.455		86.4	46.61	159.8	88 47.9	0.247	
S 16	83920	783	0.460		86.2	47.05	159.5	88 47.2	0.252	
P 17	8308	786	0.443		86.2	47.53	159.2	88 46.7	0.245	2.0
P 17	23668	791	0.441		86.3	48.35	158.8	88 46.0	0.244	
P 17	72460	798	0.508		86.3	50.23	157.3	88 43.6	0.289	
S 18	1840	800	0.513		86.1	50.97	156.8	88 42.7	0.299	2.6
P 18	12396	803	0.522		86.1	51.34	156.4	88 42.1	0.306	
S 18	28006	807	0.510		86.3	52.62	155.6	88 41.2	0.298	
P 18	48756	811	0.531		86.1	53.50	154.9	88 39.9	0.318	
I#20	56783	808	0.531	46.3	86.1	53.50	154.9	88 39.9	0.320	
I#20	56938	808	0.531	46.3	96.6	32.21	163.0	89 8.8	0.124	
I#21	64797	810	0.531	-24.6	96.6	32.21	163.0	89 8.7	0.124	
I#21	64879	810	0.531	-24.6	86.4	24.40	156.0	88 52.9	0.252	
P 18	71980	814	0.540		86.3	24.96	155.8	88 52.5	0.260	
S 19	487	816	0.542		86.2	25.21	155.5	88 51.7	0.263	3.4
P 19	11272	819	0.547		86.1	25.39	155.1	88 51.2	0.268	
P 19	26996	823	0.534		86.2	26.07	154.7	88 50.4	0.262	
P 19	47680	827	0.523		86.1	26.51	154.1	88 49.4	0.263	
P 19	70884	830	0.541		86.0	27.39	153.4	88 48.3	0.276	
S 19	85831	832	0.556		85.9	27.77	153.1	88 47.4	0.287	
S 20	10148	835	0.562		85.8	27.97	152.7	88 46.8	0.293	3.5
S 20	25597	839	0.544		85.8	28.65	152.2	88 46.1	0.285	
P 20	46476	843	0.512		85.8	29.09	151.5	88 44.9	0.273	
P 20	69696	846	0.515		85.7	29.95	150.8	88 43.7	0.277	
S 20	84775	848	0.514		85.6	30.32	150.5	88 42.9	0.282	
P 21	8948	851	0.502		85.5	30.60	150.2	88 42.3	0.278	3.0
S 21	24205	856	0.502		85.6	31.27	149.7	88 41.6	0.278	
P 21	50368	860	0.505		85.5	32.12	148.8	88 40.2	0.288	
I#22	58102	857	0.505	23.1	85.5	32.12	148.8	88 40.1	0.290	
I#22	58181	857	0.505	23.1	86.3	28.10	158.7	88 54.5	0.241	
P 21	73100	863	0.521		86.3	28.39	158.3	88 53.6	0.251	
S 22	2189	865	0.499		86.1	29.02	158.0	88 52.9	0.245	2.9
P 22	13084	868	0.501		86.2	29.24	157.6	88 52.4	0.247	
P 22	28840	872	0.494		86.3	29.98	157.1	88 51.7	0.243	
P 22	49512	876	0.501		86.1	30.51	156.7	88 50.8	0.252	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 22	72000	879	0.514		86.2	31.23	156.1	88 49.6	0.259	
S 23	1133	881	0.507		86.0	31.88	155.8	88 48.8	0.261	3.0
P 23	11976	884	0.505		86.0	32.10	155.4	88 48.3	0.261	
P 23	27704	888	0.476		86.1	32.90	155.0	88 47.6	0.247	
P 23	48376	891	0.482		86.0	33.38	154.4	88 46.7	0.255	
P 23	65564	896	0.500		85.9	33.86	153.8	88 45.5	0.266	
S 24	5482	898	0.550		85.7	34.89	153.1	88 44.0	0.303	2.4
S 24	15898	900	0.546		85.8	35.14	152.7	88 43.5	0.300	
P 24	26484	904	0.509		85.8	35.76	152.4	88 42.9	0.283	
P 24	47144	908	0.505		85.7	36.60	151.6	88 41.8	0.284	
I#23	59823	906	0.505	20.5	85.7	36.60	151.6	88 41.6	0.286	
I#23	59887	906	0.505	20.5	86.2	33.68	160.8	88 54.3	0.249	
P 24	70364	911	0.532		86.2	34.04	160.4	88 53.6	0.267	
S 24	85255	913	0.532		86.0	34.42	160.1	88 52.8	0.269	
P 25	9652	916	0.523		86.0	34.73	159.8	88 52.2	0.267	2.3
P 25	25364	920	0.515		86.1	35.49	159.3	88 51.5	0.263	
P 25	45984	924	0.491		86.1	36.05	158.6	88 50.5	0.254	
P 25	69252	927	0.520		86.1	36.98	158.0	88 49.4	0.272	
S 25	84200	929	0.537		85.9	37.38	157.6	88 48.5	0.285	
P 26	8544	032	0.535		85.9	37.75	157.3	88 47.9	0.286	1.6
P 26	23912	937	0.517		86.0	38.48	156.8	88 47.2	0.278	
P 26	50220	941	0.494		85.9	39.23	156.0	88 45.8	0.271	
P 26	73360	944	0.495		85.7	40.29	155.2	88 44.4	0.278	
S 27	2067	946	0.498		85.6	40.66	154.9	88 43.5	0.284	
P 27	17691	949	0.528		85.7	41.17	154.3	88 42.7	0.302	2.4
P 27	28368	953	0.527		85.8	41.86	153.8	88 42.1	0.303	
P 27	49016	956	0.541		85.6	42.36	153.1	88 40.9	0.318	
P 27	66192	960	0.546		85.7	42.77	152.2	88 39.6	0.323	
S 28	724	962	0.512		85.3	43.77	151.6	88 38.3	0.313	2.4
I#24	7161	961	0.512	26.6	85.3	43.77	151.6	88 38.2	0.318	
I#24	7243	961	0.512	26.6	86.2	38.63	163.1	88 54.8	0.257	
P 28	15643	965	0.514		86.3	38.86	162.8	88 54.4	0.259	
P 28	27140	969	0.502		86.3	39.49	162.5	88 53.7	0.253	
S 28	47731	973	0.512		86.3	40.10	161.8	88 52.7	0.261	

Approved for Release: 2025/07/25 C05127768

SECTION 3.6

PROGRAM COMMAND SOFTWARE PERFORMANCE

(Prepared by HTC)

3.6.1 Command Message Summary

This section summarizes pertinent command message data from Mission 1209, IRON 7122. The command messages discussed cover the period of RV-2 initiation (Rev 311 load) to the RV-2 recovery message (Rev 892 load). Four hundred and eighty-nine command messages were planned by the flight profile of which one hundred and seventy were cancelled. The remaining three hundred and nineteen command messages were received and reviewed by the Technical Advisor (TA) staff. Three hundred and twelve were accepted and seven were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the seven messages are summarized below:

Rev No. and Load Station	Reason for Rejection
362 BOSS	This message was regenerated to add a MOP.
408 POGO	This message was regenerated to add an omitted SUB card to the execution deck.
410 POGO	This message was altered to modify payload operations.
427 BOSS	This message was altered to modify payload operations.
438 POGO	This message was altered to modify payload operations.
671 BOSS	This message was regenerated to reject a payload operation.
752 POGO	This message was regenerated to modify a MOP.

In addition to the messages cancelled and rejected above, 1 message was not loaded for the reason stated below:

Rev No. and Load Station	Reason for not Loading
893 POGO	The RV-2 recovery abort contingency message was not required.

A one-rev load cycle was employed while the vehicle was over the area of interest. The "add-on" message generation and loading philosophy was in effect. This resulted in the generation of two hundred and thirty-nine add-on messages.

Summary

Total Planned Messages:		489
Messages Cancelled:	(-)	170
Total RV2 Messages:		319
Messages Rejected:	(-)	7
Messages Altered:	(+)	7
Total Messages Accepted:		319
Messages not Required:	(-)	1
Total Messages Accepted and Loaded:		318

3.6.2 'TUNITY Software Problems

The Flight 9 'TUNITY software problems itemized below pertain only to the period from RV1 recovery through RV2 recovery. They have been grouped into the following categories to demonstrate their impact on the flight. The disposition of these software problems will be specified by the Configuration Control Board.

Category	No. of SPRs	Comments
Flight Critical	2 (8145,8146)	Software corrections were made and incorporated during this flight period.
Non-Flight Critical (Requiring Work-Around)	4	Work-around procedures were developed and implemented.
Non-Flight Critical (Minor)	10	Work-around procedures were not required.
Product Improvements or New Requirements	13	To be considered during future development.
Documentation Error	1	MS-4 or MS-7 affected.

Itemized Software Problems

SPR MD3-8135 ('TPITCH)

- Problem Description: A PUL card was input to rev 292 to subtract 8 feet from the footage total. The SE span for the run was 292-294. The PUL worked correctly for rev 292 but rev 293 showed an additional loss of 8 feet. The problem was that there were no SS acquisitions for rev 293 in 'TBAT and the 'TLITAB entry for that rev was, therefore, not being zeroed out.

- Solution or Work-Around: The user must ensure that PUL cards are not input on revs prior to a rev with no acquisitions.

- Operational Impact: None

- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-10.

SPR MD3-8136 ('TBALLA)

- Problem Description: The malfunction list was output on Rev 183 for operation 9 Rev 183. A malfunction list was output on Rev 184 for operation 9 Rev 183. There were only 8 operations on Rev 184. The malfunction for operation 9 appears to really be for operation 9 Rev 183 even though it was displayed on Rev 184.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: SOST is currently investigating the problem to see if it can be reproduced.

SPR MD3-8137 ('TPLATE)

- Problem Description: A problem with automatic focus update commanding occurred in message 360 on rev 316. The rev contained a mono "A" operation followed by a stereo operation. The mono operation included a focus advance for "A" only (achieved through the use of a SUB card) but the return to the null position did not occur until the set-up for the following operation and the SUB did not extend that far, therefore, the nominal focus sequence was used and it does a RET for both "A" and "B" even though only "A" was previously commanded. The result is that "A" is now at the null position but "B" is at +2.

- Solution or Work-Around: The message must be altered and the proper commands added for the "B" side.

- Operational Impact: With the use of the above mentioned work-around procedure, there is no operational impact.

- Comment: The software cannot handle this situation because the SUB card was used. The "SUB" card takes affect after the event generator has assembled the proper sequences.

SPR MD3-8138 ('THISUM)

- Problem Description: 'THISUM failed to update the 'TFS with the Inhibit Release RTC sent at rev 309 POGO. This caused the TRIM and SEAL fid not to be updated and therefore 'THISUM was still passing RV-1 to MPR and MPE instead of RV-2.

- Solution or Work-Around: The INHIBIT RELEASE RTC must be input to the CMU run that contains the INHIBIT ON command.

- Operational Impact: PCUMs were being accumulated for the wrong RV.

- Comment: 'THISUM was not designed to update each and every 'TFS after stripping RTCs from the 'SUPPORT files.

SPR MD3-8140 ('TBALLA)

- Problem Description: 'TBALLA aborted with an illegal instruction at location 116060. Using SAFARI 914, and Data Base C292230 message 420 was generated for rev 512. A 'TSEL run with an SS MOP was generated showing not only the SS operation but an automatic ST operation. A 'TLOAD "SELUP" run was attempted with a MOD card for the ST operation. 'TBALLA aborted at location 116060 on both system 25 and system 24.

- Solution or Work-Around: None

- Operational Impact: Unable to modify operations as needed.

- Comment: It is a software problem, the solution is known and it should be fixed as soon as possible during SV-9.

SPR MD3-8141 ('TSPEC)

- Problem Description: The MS-4 should be updated to include a statement explaining that 'TSTATUS must be run after 'TSPEC in order to correctly update and display population data.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: The above mentioned discrepancy should be corrected with the next publication of the 'TSPEC MS-4.

SPR MD3-8142 ('TREPLAY)

- Problem Description: Updates for the ST "R" value print under the EXP-TIME column. It appears that an encode uses the wrong column. This occurs in SELUP runs where an ST operation is being modified. Also, EXP values, which print out for each DEA in an ST operation, disappear in SELUP MOD runs.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: It is a software problem, the solution is known and it should be fixed prior to the start of support of SV-10.

SPR MD3-8144 ('TREPLAY)

- Problem Description: Add the following data to the 'TBALL output:
  1. The sun angle integer of the first frame, i.e., the initial sun angle.
  2. All sun angle changes following the initial sun angle, in 1^{0} increments.
  3. The system time for the above.
  4. The sun angle data should be displayed when the 1^{0} change occurs, not necessarily with the "R" value data.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8145 ('THAYER) - FLIGHT CRITICAL -

- Problem Description: Within 'THAYER, the weather applied to mapping operations is incorrect. The start row (for weather determination purposes) being passed to WITHPRE is incorrect.

- Solution or Work-Around: The problem was determined to be Flight Critical because the 'THAYER output is used for selection planning and the output was in error. A change was made to 'THAYER correcting this problem and was incorporated on the Flight Aux Master.

- Operational Impact: With the erroneous output from 'THAYER, selection planning could not be accomplished properly. With the implementation of the new Mod of 'THAYER the problem has been solved.

SPR MD3-8146 ('THAYER) - FLIGHT CRITICAL -

- Problem Description: ST MOPS which encompass several DEAs containing zero WAC cells will show erroneous average predicted weather. The pointer for the start of the weather band is not being updated for DEAs which have no WAC cells in them. Active DEAs following these zero cell DEAs will receive weather (usually "0") which is erroneous.

- Solution or Work-Around: The problem was determined to be Flight Critical because the 'THAYER output is used for selection planning and the output was in error. A change was made to 'THAYER correcting this problem and was incorporated on the Flight Aux Master.

- Operational Impact: With the erroneous output from 'THAYER, selection planning could not be accomplished properly. With the implementation of the new Mod of 'THAYER the problem has been solved.

SPR MD3-8147 ('THAYER)

- Problem Description: 'THAYER output the following message:
  1 NO ACTIVE WACS IN OP
  The preceding 1 is extraneous.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: It is a software problem, the solution is known and it should be fixed prior to the start of support of SV-10.

SPR MD3-8148 ('TSTAGEN)

- Problem Description: A split pass that occurs during the rev number change, i.e., 48.9I (with 49.0I the short pass) can be updated to change its capability and R/S, T/F times (widening).

- Solution or Work-Around: None

- Operational Impact: None

- Comment: This is not a software problem because the stations occur on different revs and are treated separately.

SPR MD3-8149 ('TBALLA)

- Problem Description: One ST OVR MOP was input each rev for three revs. Each MOP was in the middle of an inhibit band. The 'TBALLA summary output showed the first and last operations as being MOPs. But the middle operation was not designated a MOP.

- Solution or Work-Around: None
- Operational Impact: None
- Comment: This SPR is not a software problem but rather a misunderstanding of the way 'TBALLA operates.

SPR MD3-8150 ('TBALLA)

- Problem Description: The 'TBALLA summary output had two sets of headers at the top of the page.
- Solution or Work-Around: None
- Operational Impact: None
- Comment: The two headers at the top of the page are due to the fact that the ST output and a page eject occurred at the same time, thus one header for the start of the ST output and one header for the page eject.

SPR MD3-8151 ('TBALL)

- Problem Description: Request that 'TBALL be modified to assemble MONO OPS and STEREO OPS on the same rev. This should be done by specifying bands for MONO OPS, i.e.,

  MOP _____ MONO A
  or INH _____ CAM B

- Solution or Work-Around: None
- Operational Impact: None
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8152 ('TREPLAY)

- Problem Description: The VER weather request output by 'TBALL for rev 658 (msg 820) was erroneous. VER 658 80.5 S 23.9 W D 83.0 S 88.6 W D 060 should have been 83.0 S 88.6 W A. This caused missed Wx for rev 658 for the ST system.
- Solution or Work-Around: MPE must be re-run to cover the area of missed weather.
- Operational Impact: None
- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-10.

SPR MD3-8169 ('TUNITY)

- Problem Description: All RTC's and XPR's stripped from the 'SUPPORT files are printed in CHG as informational messages, however, some RTC's and XPR's should affect the 'TMI block, particularly SPC inhibit releases and VBE commands. This would facilitate configuring the software correctly without human error.

- Solution or Work-Around: The RTC's or XPR's in question can be put directly into the CMU run of the message that was affected.

- Operational Impact: None

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8170 ('TMECO)

- Problem Description: A 'TMECO run of message number 190 for 869 KODI did not show any miscompares between locations 334 and 499.

- Solution or Work-Around: None

- Operational Impact: None

- Comment: The reason 'TMECO did not show any miscompares above location 333 was because SUB was set to 333 and 'TMECO only does a comparison from location 192 to SUB.

SPR MD3-8171 ('TPROPS)

- Problem Description: Today's CHG run contained numerous 'TPROPS errors (see msg #1) - 'TFSTAB ENTRY TIME GREATER THAN TABLE UPDATE TIME FID XXX OF 'TFSTAB. Starting with message 220 all records of the 'TFS have some incorrect times associated with fids. Although no problems have been found to date, it is felt that the potential for propagating incorrect status could exist.

- Solution or Work-Around: The 'TFSTAB could be 'SDBG'd with valid time tags if status is being propagated incorrectly.

- Operational Impact: None

- Comment: SOST is currently investigating the problem to determine the cause of the bad times.

It should be noted that the following SPRs are not included in this report: MD3-8139, MD3-8143, MD3-8154, MD3-8155, MD3-8157, MD3-8158 and MD3-8159. These SPRs were written against non-'TUNITY routines but were given MOD3 numbers because they reside on the 'TUNITY Aux Master.

3.6.3 Hardware/Software Interface Changes

For IRON 7122, six change requests were processed from RV2 initiation through the RV2 recovery message (as shown in Table 3.6.3-1).

These requests were implemented via requests SV9-19 through SV9-24 and have been incorporated into the flight data base and hardware/software interface documentation.

Table 3.6.3-1. Summary of Hardware/Software Interface Changes

Request No.	Identification	Effectivity
SV9-19	Modifies Sequence 144 to reflect new nominal value of PSI.	SV-9 only
SV0-20	Modifies Sequence 144 to reflect new nominal value of PSI.	SV-9 only
SV9-21	Changes Sequence 149 ST off time to minimize effects of time bumping.	SV-9 and nominal
SV9-22	Changes Sequence 150 ST off time to minimize the effects of time bumping.	SV-9 and nominal
SV9-23	Adds hardware constraint "ST mode reset command must not occur prior to the ST off command".	SV-9 and nominal
SV9-24	Increases duration of Sequence 90 in Macro 32 to permit evaluation of thruster data following an orbit adjust.	SV-9 and nominal

3.7 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE
(Prepared by Satellite Basic Assembly Contractor)

3.7.1 EDAP Performance

The main battery/Solar Array power system performed satisfactorily during Segment 2. Due to the moderate power consumption of this vehicle, there were consistent Charge Current Controller K-2 Relay openings during every orbit throughout this segment.

The Main Battery Voltages at sun entrance and the predicted power usage were nominal during the segment. The average main bus voltage, at sun entrance, during the segment was 27.3 volts. The average actual power consumption was 20.9 A-H/Rev.

The main Battery Discharge load sharing condition at sun entrance was nominal. Approximate load sharing percentages were as follows:

Battery 1	24%
Battery 2	26.2%
Battery 3	25%
Battery 4	24.8%

The Main Battery Temperatures, as observed in realtime, were nominal during the segment.

3.7.2 T&T Performance

The SCLS, PCM Telemetry Systems and Tape Recorders have demonstrated satisfactory performance throughout the Segment 2. The primary systems have been utilized during this segment with the exception of redundant systems used for health checks or evaluation.

3.7.3 ACS/RCS PERFORMANCE

The Primary Attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout segment two. The Redundant Attitude Control System remained "on", however, it provided no attitude control. Comparative data indicated good correlation between the primary and redundant ACS. The primary system gyro temperatures were between 156° and 167°F.

The Reaction Control System (RCS) performance was nominal throughout this segment. The primary thrusters were used for control during this period. RCS propellant consumption was 125.9 pounds which equates to an average of 3.5 pounds per day. Thruster performance is tabulated in Table 3.7-1.

3.7.4 ORBIT ADJUST SYSTEM (OAS) PERFORMANCE

The Orbit Adjust System (OAS) performance was nominal for the 15 orbit adjusts performed. The total propellant usage for the orbit adjusts was 943.5 pounds.

The orbit adjust summary is shown in Table 3.7-2.

3.7.5 LIFEBOAT II (LBII) PERFORMANCE

The LBII system electronics were activated on Rev 310 and Rev 894 during RV-1 and RV-2 recoveries. No activation of the pneumatics was performed. Data indicated system performance was nominal.

The LBII propellant tank heaters remained off during this segment with the tank temperature decreasing from 95°F to 75.5°F.

3.7.6

TABLE 3.7-1

RCS 1 THRUSTER EVALUATION

EARLY SEGMENT 2

REV	REA	ACTUAL THRUST LB_f	QUAL THRUST LB_f
468	1	3.54	3.69
469	2	3.65	3.69
469	3	3.59	3.69
469	4	3.70	3.71
469	5	3.54	3.71
468	6	3.49	3.71
468	7	3.59	3.71
468	8	3.76	3.69
		LATE SEGMENT 2	
809	1	2.94	3.09
809	2	2.94	3.09
809	3	3.27	3.09
809	4	3.10	3.11
809	5	2.78	3.11
809	6	2.94	3.09
809	7	3.16	3.11
809	8	2.67	3.11

TABLE 3.7-2

ORBIT ADJUST SUMMARY

SEGMENT 2 REV 311-894

OA NO/TYPE	8/NEG	9/POS	10/POS	11/POS	12/NEG	13/POS	14/POS	15/POS	16/POS	17/POS	18/POS	19/POS	20/POS	21/NEG	22/POS
OPS DAY	20	23	26	29	29	32	35	38	38	41	44	47	50	50	53
REV NO.	322	370	420	467	469	517	565	614	616	662	711	759	808	810	857
DELTA V (PREDICT) fps	-11.26	25.60	21.25	42.95	-21.00	15.21	23.23	37.41	-19.15	16.03	26.25	14.37	46.14	-24.50	22.92
DELTA V (TRACKING) fps	-11.35	25.78	21.44	42.26	-20.83	15.47	23.49	37.64	-19.25	16.29	26.48	14.44	46.56	-24.52	23.15
BURN DURATION	34.0	76.6	64.6	131.0	66.0	48.4	73.8	119.6	62.8	52.8	86.4	48.0	153.2	83.2	78.2
PROPELLANT USED - Lbs.	30.2	67.2	55.8	111.0	54.8	39.9	60.1	95.6	49.5	41.3	66.7	36.8	115.4	61.7	57.5
ARG OA TANK TEMP - ^{o}F	83.1	83.7	84.8	85.5	86.15	86.9	87.5	88.3	88.5	88.9	89.5	90.0	90.6	91.1	91.1
ARG TANK PRESS - PSIA	214.6	209.1	203.1	195.2	187.6	184.4	180.1	173.7	168.6	166.2	162.2	159.8	154.2	149.5	146.7

3.8 Mapping Camera Operations
(Prepared by Mapping Camera Contractor - NEC)

3.8.1 Mission Performance

The Mapping Camera Subsystem was successfully removed from the Ascent Mode (powered) shortly after BV/SV separation. On Rev 3, a two (2) cycle health check operate was completed with the data indicating normal ST operation. The ST was released for operational requirements for the first operational load.

The following is a summary of the Mapping Camera operations.

	Operates	Frames
Health Check	1	2
Mapping Requirements	164	1955
BAR XC	4	42
QX 801 Engineering	2	14
Inflight Calibration	4	26
Totals	175	2039

Total film in the RV-5 at recovery, including ground test was:

	Frames	Footage	Weight
Terrain	2103	3375.3	57.62
Stellar	2337	2103.3	10.89
Total			68.51

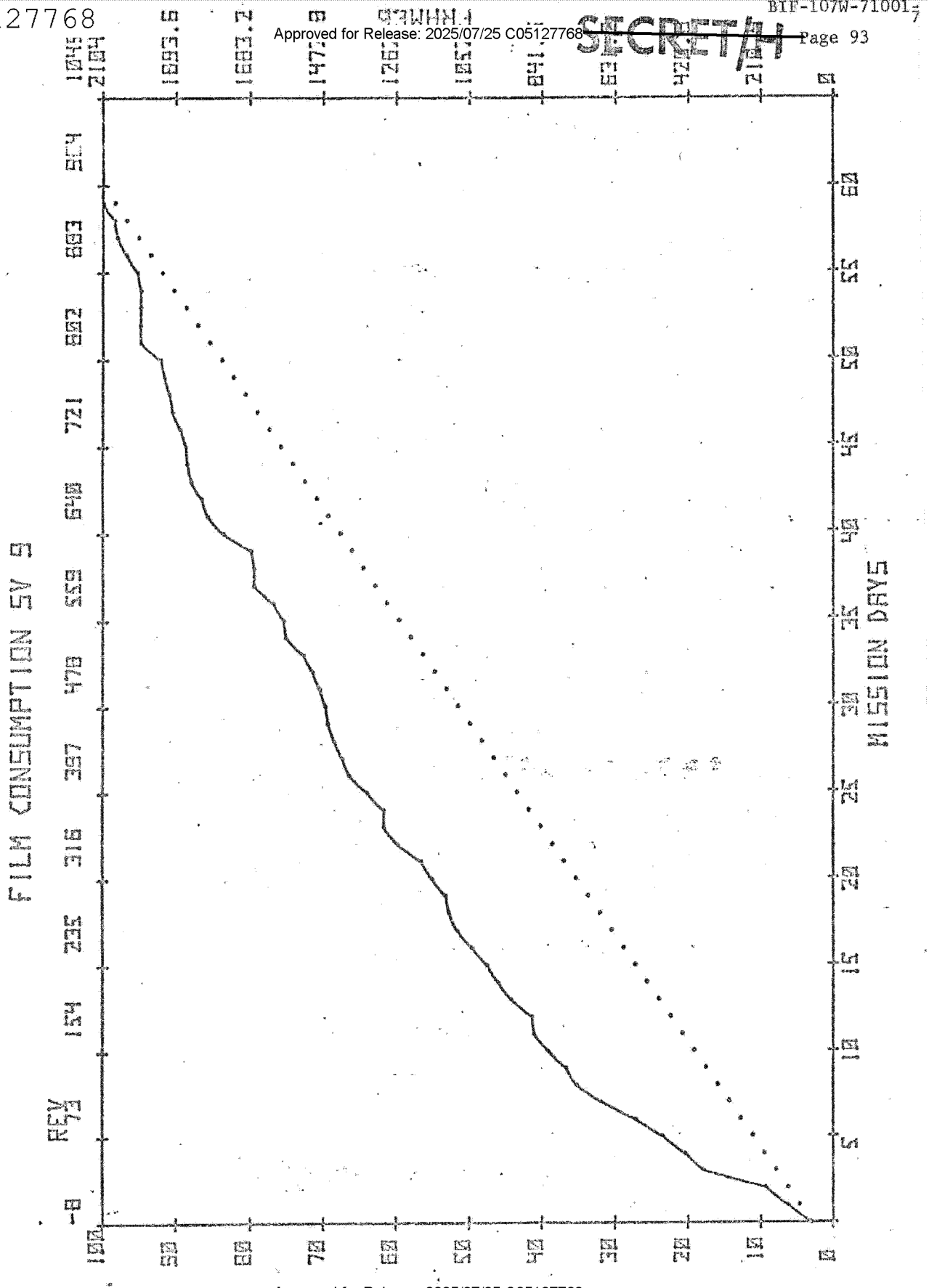
Operations over BAR XC were taken on revs 32, 259, 340 & 632.

Special engineering ops were made with QX801 type film on revs 930 & 939.

Figure 3.- is the mapping mission activity daily summary.

3.8.2 System Anomaly

On rev 154, Op #1, the stellar platen press telemetry monitor (S211) indicated no press on frame 4 & abnormal press on frames 2, 5, 6 & 7. Possible causes for abnormal press condition are: 1) low press motor torque; 2) mechanical bind.



3.9 RV-5 Performance (Prepared by OPC)

The telemetry measurements indicated that the RV-5 system status (temperatures and discrete monitors) remained within specification limits during the third phase of the mission (through successful recovery on Rev 958, 27 December 1974). The following information is reported after evaluating DROP recovery studies, commanded messages, RV-5 telemetry, PCM telemetry, voice reports, and the recovery test report TWX.

3.9.1 Weight

SRV weight separated from SV	394.92 lbs
SRV-5 weight at retro	393.92 lbs
100% payload predicted weight (57.03+10.79)	67.82 lbs
RV-5 weight at top of atmosphere (410K ft)	298.62 lbs
RV-5 capsule suspended weight	181.88 lbs
RV-5 air snatch weight	205.84 lbs

The flight performance analysis TWX reported the total payload weight as 68 pounds.

3.9.2 PREPS

Recovery Battery Heater Power On occurred on Rev 955B. The temperature monitor indicated 54°F before turnon, 67°F on Rev 956 and 60°F at the time of battery activation (arm command) on Rev 958.

Run Out of the excess stellar film was accomplished on Rev 950.

RV-5 Closure was accomplished on Rev 956P.

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3.9.3 Recovery Conditions (Evaluation TPOT Data)

Orbit

Rev No.	958
Apogee	151.959 N.M.
Perigee	87.263 N.M.
Argument	116.642 Degrees
Inclination	96.637 Degrees
Eccentricity	0.00921978
Period (Keplerian)	88:43.767 Minutes:Seconds

Retro

True Anomaly	11.60 Degrees
Altitude	521865.17 Ft
Latitude	51.279 Degrees North
Longitude	142.04 Degrees West
Velocity (Inertial) (Start of Retro)	25746.80 Ft/Sec
Velocity (Inertial) (Burn Out)	25382.48 Ft/Sec
Pitchdown Angle	-64.717 Degrees (After YAW Reverse)

Entry (410K ft)

Velocity (Inertial)	25507.09 Ft/Sec
Gamma (Geod. Inertial)	-2.0704 Degrees
Alpha	104.51 Degrees
Latitude	42.713 Degrees North
Longitude	144.80 Degrees West

Drogue

Velocity (Local)	957.39 Ft/Sec
Mach. No.	0.99
Altitude	59934.43 Ft
Dymanic Pressure	103.900 PSF

Impact

Altitude	55000.17 Ft
Latitude	23.995 Degrees North
Longitude	149.12 Degrees West

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3.9.4 Miss Distance

Figure 4.3.1 shows the predicted impact point (PIP), the actual impact point (EPPD) and the air snatch point. The miss distance between the distance between PIP (Eval TPOT) and EPPD was calculated to be 1.14 N.M. (0.49 N.M. short and 1.03 N.M. east of the ground track).

3.9.5 Aerial Recovery (Recovery Group TWX Info)

Altitude	14600 Ft
Pass Number	1
Airspeed	160 KTAS 125 KIAS
Chute Condition	Chute Appeared to Have an Abnormal Contour - Pictures Should Verify
RV	Normal
Winch PTL Setting	1000 lbs.
Payout	Normal
Contact Location (Rig & Parachute)	Down the Center Slightly Tight. Number 7 and 8 Hooks Engaged 4 Laterals.
Recovery Aircraft	No. 1

Comments (Unusual Conditions or Events)

1. Backup timer was still on when capsule was boarded (in excess of 34 minutes).

2. During reel-in, capsule rotated clockwise. Spin rate increased as capsule was reeled in.

3.9.6 Recovery Events

Table 4.3-1 presents the predicted and actual times of RV-5 deorbit/recovery events.

3.9.7 SV Maneuvers Information

The following information is related to the SV maneuvers required for RV-5 recovery and post recovery operations:

Sequence Item	System Time
Yaw Reverse Start	70265.0
Pitch Down Start	76496.0
Pitch Down Stop	76587.8
RV-5 Separation	77090.6
RV-5 Retro	77100.97
Pitch Up Start	77121.0
Yaw Forward Start	78451.0

NOTE: RV-5 Retro is not an SV command function. The actual predicted time is 77100.85. KODI magnetic tape reduction data indicated retro occurred at 77100.94

ACS

Pitch Attitude at Separation	-64.7	Degrees
Roll Rate at Separation	-0.001	Degrees/Second
Pitch Rate at Separation	0.068	Degrees/Second
Yaw Rate at Separation	0.0	Degrees/Second
Max Roll Rate after Separation	-0.027	Degrees/Second
Max Pitch Rate after Separation	1.45	Degrees/Second
Max Yaw Rate after Separation	-0.019	Degrees/Second

3.9.8 MK V Re-Entry Comments

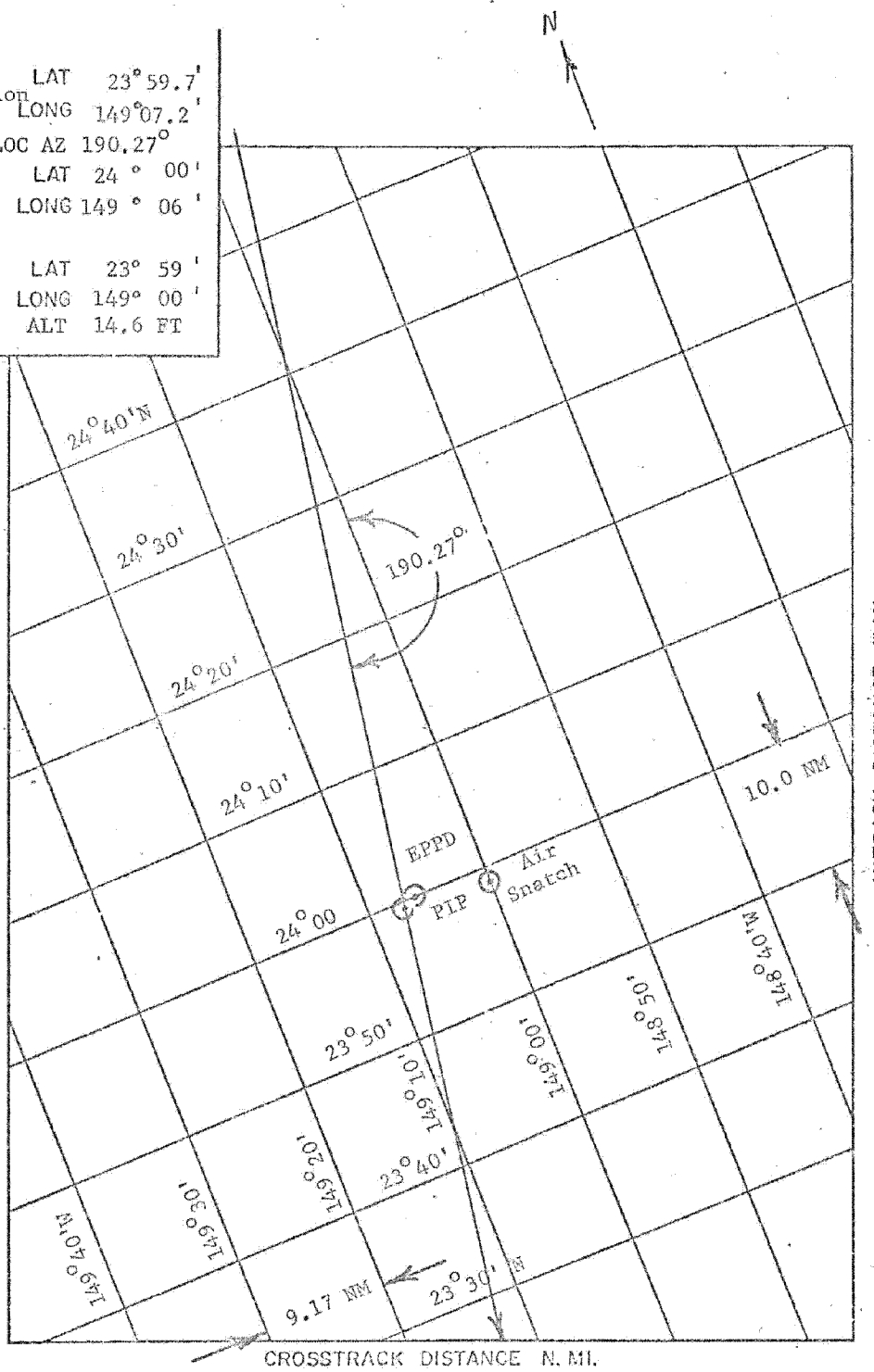
All re-entry events appeared nominal.

The abnormal chute contour reported in recovery test report was not evidenced in the recovery films. The 16mm nose, overhead, boom and two hand held films show a normal chute. The operational chute could appear as having a slight cusp look, compared to the training chutes. This is because the operational chute top laterial is slightly shorter than for the training chute.

The back-up timer on when boarded (in excess of 34 minutes) was confirmed to be nominal. Beacon 2 nominally turns off 34.27 minutes after ARM.

The capsule spinning while "on the hook" has been seen on some previous Mark 5 recoveries and is not considered to be a problem.

PIP (Evaluation TPOT)	LAT	23° 59.7'
	LONG	149° 07.2'
55K FT	LOC AZ	190.27°
EPPD	LAT	24 ° 00'
	LONG	149 ° 06 '
AIR SNATCH	LAT	23° 59 '
	LONG	149° 00 '
	ALT	14.6 FT



Predicted / Actual Impact Locations

Figure 3.9-1

FORM DB-28-C4

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RECOVERY DATE 27 Dec 74 SRV RV-5 SERIAL NO. 1805 SHIELD SERIAL NO. 466

RECOVERY REV 958 MANUFACTURING DATE Dec 72

STRESS LEVEL 2550 PSI

	PLANNED	ACTUAL
IMPACT LOCATION	Lat 23°59'42"N	Lat 24°00'
	Long 149°07'12"	Long 149°06'

Events	Predicted Time System Time (sec)	Execution Time System Time (sec)	Beacon Rep. Rate (PPS	Source of Data
Arm	76972.97	76973.0	NA	A(M 32.3)
Beacon 1 On	76997.97	76998.5	4.0 / ---	KTS Mag
Beacon 2 On	76997.97	76998.5	--- / 4.0	KTS Mag
Recovery Battery 1 On	76996.97	77003.0	No Change	A
Recovery Battery 2 On	76996.97	77003.0	No Change	A
Transfer	77089.12	77089.0	No Change	A
IFD Disconnect	77090.02	77089.97	No Change	KTS Mag
SEPARATION	77090.72	77090.6	No Change	KTS Mag
Spin Time/RPM (57 Nominal)	77093.42/50-57	77093.39/57.2	No Change	KTS Mag
Retro	77100.97	77100.94	1.98 / 1.97	KTS Mag
Despin Time/RPM	77111.72/10-16	77111.53/12.9	No Change	KTS Mag
T/C Separation	77113.22	77113.08	1.05 / 1.08	KTS Mag
G Switch Close	77451.14	NA - Blackout	8.5 / 8.4	RS2
G. Switch Open	77559.40	77555.17	0.998 / 1.0	RS2
Piston Fire	77585.40	77582.04	0.52 / 0.49	RS2
Drogue Shock Time/Duration (sec)	77586.20	77583.75/2.35	7.5 / 8.0	RS2/Mag
Main Shock Time/Duration (sec)	77596.20	NONE	NONE	RS/Mag
Air Snatch Time/Duration	78620.20	78611.45/0.6	7.69 / 8.0	RS1/Mag
R/U G Switch Close	79039.0	79035.6	7.33 / off	RS1/Mag
R/U G Switch Open	79099.0	79095.5	0.52 / off	RS2 Mag

Mag-Mag Tape Reduction RS-Recovery Strip
NA - Not Available

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SECTION 4

4.0 ORBIT PHASE - REV 894 THROUGH RV-3 RECOVERY

4.1 Summary

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-3 with no anomalies or malfunctions experienced. The Forward Camera OOAA Adjustment recommended by PFA, after evaluation of RV-2 imagery, was implemented on Rev 979, Op 390. The OOAA was advanced plus one command step from minus 3 steps to a new nominal of minus 2 steps. The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the best of RV-3 was comparable with the best of RV-2.

On Rev 1118 vehicle control was switched to ACS-2 because of a H/S Inhibit in the roll channel. On Rev 1311 control was transferred to the RCS-2 thrusters because of low thrust levels on RCS 1.

The propellant used for attitude control during segment 3 was 105 lbs or an average of 3.6 lbs/day. Propellant consumption was 665.2 lbs for the 12 adjust burns for an average per day rate of approximately 23 lbs/day.

The RV payload was 99.30% of the maximum I.C.D. weight and unbalanced 4.34%. The PREP2 event took place on Rev 1361 over POGO and separation occurred on Rev 1364. Preparation, deorbit, and entry events, and drogue and main parachute deployment conditions were normal and executed as planned.

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Aerial recovery was accomplished on the 1st pass at 13900 feet altitude, 19.9 nautical miles from the predicted impact point. The Recovery Forces reported the parachute was excessively torn after recovery. The Recovery Capsule condition was reported as normal.

4.1.2 Problem Summary

4.1.2.1 SV Roll Rates

During a MIX 1 operation on Rev 950, on startup and shutdown, pitch rates were significantly higher than normally seen for such an operation. Pitch rates were up to $-.105^{\circ}$/sec decreasing to $-.072^{\circ}$/sec within two seconds. Pitch rate maximums on previous MIX 1 operations were $-.075^{\circ}$/sec. No data was lost, however, and ACS 1 continued to provide satisfactory attitude control.

4.1.2.2 H/S Inhibit Channel

On Rev 1113, from P/B data, it was noted that the H/S had inhibited for 100 sec during a P/L Op and also during a P/L Op on Rev 1114. On Rev 1115, the H/S was inhibited during the pass. On Rev 1116, stored commands were erased and on Rev 1118, the M_1V_1 - M_2V_1 tumbling capture was loaded and executed. Following resumption of normal operations on Rev 1119, the ACS 1 H/S remained inhibited almost continuously until Rev 1129 which showed inhibit cycling. Following this, the inhibit has remained "off" throughout the rest of this segment.

4.1.2.3 RCS Thruster Leak

In addition to the normal thruster degradation, on Rev 1267, REA No. 7 exhibited leaking, however, with normal control pulsing, the leakage was stopped. This was the only leakage that was encountered.

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4.2 COMMAND SUBSYSTEMS PERFORMANCE
(Prepared by CSC)

4.2.1 Health

The health of the Command Systems remained excellent throughout Segment 4 (Revs 894-1364). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures or voltages. There were no power dropouts, relay driver overloads, or clock status errors experienced.

4.2.1.1 EXTENDED COMMAND SUBSYSTEM

4.2.1.1.1 Command Modes

The ECS responded properly in all modes into which it was commanded. There were a total of 259 messages loaded in the ECS for this segment. This resulted in 65,163 SPC's being stored for readout from the PMU's.

Of the 65,163 SPC's loaded, 27,304 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 65,163 SPC's there were no command rejects.

On Rev 1116 the PMU's were VBE'ed to locations 334 by Block 9433 due to vehicle instabilities caused by the Horizon Sensor System.

The UHF/ECS commanding system has continued to function as expected.

4.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 3.46 parts in 10^7. This corresponds to an average frequency offset of .3544 HZ above the nominal frequency of the 1.024 X 10^6 HZ. The frequency of the clock oscillators changed .867 HZ in 470 revs. This results in a stability of 2.69 parts in 10^8 over 470 revs, 2.32 parts in 10^{10} for an average six hour period. All of these values are well within system specifications.

4.2.1.1.3 ECS Anomalies

There were no ECS anomalies during this segment.

4.2.1.2 MINIMAL COMMAND SUBSYSTEM

4.2.1.2.1 Command Modes

The MCS was not used during Segment 4.

4.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

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4.2.1.3 REMOTE DECODER/BUD

4.2.1.3.1 Command Modes

The remote decoder was used for the recovery of RV-3 which ended this segment of the flight. The performance of both channels was verified from telemetry to be proper for all commands.

No commands were issued from the BUD during this segment.

4.2.1.3.2 Remote Decoder/Bud Anomalies

There were no remote decoder or back-up decoder anomalies.

4.2.1.4 SUMMARY

4.2.1.4.1 Expendables and Environmental Data

Command Readouts for Segment	PMU-A 13,546 PMU-B 13,758
ECS Clock Drift Rate	3.46 parts in 10^7
ECS Clock Stability	2.69 parts in 10^8 for a 470 rev period
Total Hours On	ECS 2046 MCS 4.5 RD 10.77 BUD .05
Total Secure Words Expended	PMU-A 96 PMU-B 96
Environmental Data	All temperatures within specifications.

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4.3 SENSOR SYSTEM OPERATIONS

4.3.1 MISSION OPERATIONS PERFORMANCE

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-3 with no anomalies or malfunctions experienced.

The Forward Camera OOAA Adjustment recommended by FPA, after evaluation of RV-2 imagery, was implemented on Rev 979, Op 390. The OOAA was advanced plus one command step from minus 3 steps to a new nominal of minus 2 steps.

The RV-3 mission segment consisted of 184 sensor system operations, consuming 20,438 seconds of camera power on time, 7.9 pounds of nitrogen gas, and a film usage of approximately 28,510 feet on the Fwd camera and approximately 27,500 feet on the Aft camera. The consumption profiles through RV-3 are graphically depicted in Figure 1.

The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the best of RV-3 was comparable with the best of RV-2.

4.3.2 ENGINEERING TESTS

Several engineering tests were performed during this segment of the mission in support of PFA imagery evaluation.

Rev 1054 Quality Variability, Test Type 12
Rev 1247 Smear vs Scan, Test Type 10
Rev 1265 Smear vs Scan, Test Type 10
Rev 1297 FE3916 Radiometric Cal, Test Type 5
Rev 1313 FE3916 Radiometric Cal, Test Type 5
Rev 1345 Quality Variability, Test Type 12

4.4 RV3 (S/N 39) Performance

This report presents an analysis of the RV 3 performance based on evaluation of recovery studies, command message, RV and SV telemetry, voice reports, and the recovery test report TWX. Tables 4.4-1 thru 4.4-3 list all relevant data.

4.4.1 Summary

The RV payload was 99.30% of the maximum I.C.D. weight and unbalanced 4.34%. The PREP2 event took place on Rev 1361 over POGO and separation occurred on Rev 1364. Preparation, deorbit, and entry events, and drogue and main parachute deployment conditions were normal and executed as planned. Aerial recovery was accomplished on the 1st pass at 13900 feet altitude, 19.9 nautical miles from the predicted impact point.

The Recovery Forces reported the parachute was excessively torn after recovery. The Recovery Capsule condition was reported as normal.

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TABLE 4.4-1

RV 3 RECOVERY DATA

IDENTIFICATION DATA

SV 9	IRON NO 7122			RECOVERY REV 1364	
RV 3	RV S/N 39	RETRO MOTOR S/N Q 67		RECOVERY DATE 21 Jan 75	

EVENT TIMES (IN SYSTEMS TIME - SECONDS)

EVENT	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVAL	COMMAND MESSAGE	SV TLM	VOICE REPORTS	RV TLM MODE 51	DIFF NOTE 1
RV 4 OUT T/S	REV/STA			63836.0	63837			0
RV 3 IN T/S	1361P			63840.0	63841			0
DT START	78609.10	78610.14	78610.81	78609.0	78609.2			0
POGO TRAN	79577.974			79577.8	79566			-11.8
PITCH START	79608			79608.0	79609			0
PITCH STOP				79662.6	79664			1.4
PYRO ARM BATT				79777.8	78778			0
POGO FADE	79878.298			79877.6	79901			23.4
KODI TRAN	80004.070			80004.4	80141	80214		136.6
ORB PWR OFF				80181.2	80182			0
RV SEP (0)	80191.22	80191.20	80191.20	80191.2	80192	CONF	NOTE 2	0
SPIN UP (+2.4)				80193.6		-	N/A	N/A
RETRO START	80316.62	80316.60	80316.6	80316.6		80317	80317.6	0
DESPIN (+160.4)				80351.6		80353	80353.6	2
PROP JETT (+175.4)				80366.6		80368	80367.6	0
KODI FD (RV)	80369.539					80382	80372	2.5
RV ENTRY (400K)	80480.06	80480.52	80481.20		SHADOW TM			
△ 1-2 ACQ					-	80565		
ION ENTR	80588.07	80588.79	80589.46		-	80600		-
ION EXIT	80790.54	80791.61	80792.28		80790	80800		-2.3
DROGUE DEPLOY	80835.90	80837.04	80837.71	TONE STOP	80849	80850	80842.2	11.3
IMPACT (50K)	80854.10	80855.14	80855.81					
MAIN CHUTE DPL	80857.13	80858.09	80858.75		-	-	80863.5	4.7
H/SHLD JETT	80861.13	80862.09	80862.75	TONE START	80863	-	80867.7	0
STEADY STATE	80872.13	80873.09	80873.75					
ETPD(RAINDROP)	80903.20	80904.80	80905.60					
RV @ 13.5K	81830.80	81832.50	81833.30	IN TRATL	81780*	81780*	81800	-53.3
WATER IMPACT	82395.50	82397.20	82398.00		-	-	-	-
HULA TRAN (RV)	80579.412					80565	-	-
HULA FADE (RV)	80806.488					80600	-	-
DT RUNOUT	81324.10	81325.14	81325.81		-	-	-	

*To nearest Minute.

NOTES: 1. DIFF = Actual - Predicted times, TLM differences of less than 1.0 sec are ignored. [ ] = PREDICTED TIME, [ ] = ACTUAL TIME.

2. Assume RV SEP Sequencing starts 0.4 seconds after RV SEP Command msg. time.

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TABLE 4.4-2

RV 3 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	18.0	17.94	17.896	17.567	17.567	17.567
LONGITUDE	162.59	162.6	162.61	162.65	162.617	162.650

RECOV. A/C DEPLOYMENT FORMATION No. 1, RECOVERING A/C No. 1

RECOV ALT 13900 ft, PASS No. 1, TIME 2243 Z

AIRSPEED 123 KTAS, 151 KIAS; TIME IN TOW 13 min.

RAINDROP ETPD 80903 sec 46000 ft; RATE/DESCENT, 15K 29.1 FPS, 10K 26.8 FPS

CONTACT LOCATION Center, Number 5 hook engaged.

PRESET TENSION LEVEL 3600 lb, PAYOUT Normal

MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)

OVERSHOOT 19.74 nm, CROSS TRACK -2.4 nm EAST

RC CONDITION Normal

CHUTE/CONE CONDITION Main Chute excessively torn after recovery.

CHUTE/CONE BEHAVIOR Normal

WIND DATA

ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT	ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT
SCF	240	010	15	25	25	350	020	35	45
2	250		10		30	360	010	60	65
4	230		10		35	350	010	75	60
6	260	060	10	10	40	350	020	45	45
8	290		10		45	350	360	45	50
10	350	040	35	15	50	020	020	45	30
15	360	030	35	20	55	040		30	
20	020	020	30	25	60				

RV BATTERY TIME HISTORY

TIME	ACT 79780	781	782	783	786	787	790	801	802	804	811	815
MAIN	0	22.1				21.6		22.7	23.5	24.4		24.9
PYRO #1	0	22.3	24.1			25.3	25.9				25.3	
PYRO #2	0	24.4	23.5	24.2	24.8	25.5						
TIME	80182											
MAIN	24.2											
PYRO #1												
PYRO #2	24.9											

SV RATES BEFORE & AFTER SEP (SV TLM)

	TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
	80190	-.069	.001	0.0
SEP	80192	-.06	0.03	0.0
	80193	+1.41	-.10	0.0

MISC DATA

Payload Temp before SEP, Rn06 71 °F

Payload Temp, Max REENTRY, TE02 71 °F

Chute Press before PREP 2, P711 .63 PSI

Supply Press before PREP 2, P113 .68 PSI

BETA ANGLE of Recovery Rev. 12.6 °

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PITCH ANGLE

BASIC STUDY

Θ_{rvs} 126.04 °

$\Delta O1$ 2.34 °

Ω_y 1.45 °/sec

$\Delta O2$ -0.07 °

Θ_{sv} 38.45 °

PITCH (CMD MSG) 38.493 °

Θ_{sv} (PDMN-SV TLM) 37.8 °

Θ_{rvs} ON UPDATED TEAPOT 126.08 °

RV 3 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	ACTUAL POST FLT
TU-A	221.0 lb	223.40 lb	223.40 lb	222.6 lb
TU-B	230.9 lb	233.40 lb	233.40 lb	233.4 lb
TOTAL	451.9 lb	456.80 lb	456.80 lb	456.0 lb
SEP WGT	1532.13 lb	1537.03 lb	1537.03 lb	UPDATED TEAPOT
RETRO WGT	1530.44 lb	1535.34 lb	1535.34 lb	% UNBAL 4.34
ENTRY WGT	1339.63 lb	1344.53 lb	1344.53 lb	% FULL 99.30
AIR RECOV WGT	1133.92 lb	1138.82 lb	1138.82 lb	(100% = 460 lb)

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	14571.0 lb	PITCH INERTIA (Iy)	93735.68 SLUG-FT^2
CG FROM STA 2220.2(X)	203.06 in	ROLL INERTIA (Ix)	5262.35 SLUG-FT^2
CG FROM LONG AXIS(Y)	1.86 in	YAW INERTIA(Iz)	95072.k4 SLUG-FT^2

DORBEL EPHEMERIS

REV OF SEP 1364	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION
PREDICTED FROM REV	1354	1361	N/A
APOGEE	160.433 nm	160.161 nm	160.026 nm
PERIGEE	87.789 nm	87.799 nm	87.893 nm
ARG OF PERIGEE	120.546 °	120.637 °	120.546 °
INCLINATION	96.612 °	96.612 °	96.612 °
TRUE ANOMALY AT RETRO	10.03 °	9.92 °	10.01 °
STEADY STATE ALT.	47587.17 FT	47602.5 FT	47609.80 FT
HEATSHIELD JETT ALT.	49631.84 FT	49673.8 FT	49681.52 FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	80191.20	80316.60	80481.20	80837.71
ALTITUDE (FT)	532600.50	525810.26	400002.04	63596.83
LATITUDE (°N)	57.421	48.940	38.025	17.937
LONGITUDE (°W)	151.86	155.19	158.36	162.60
INERTIAL AZIMUTH (°)	192.36	190.10		
INERT FLT PATH ANGLE (°)	.0104	.0999		
INERT VELOCITY (FT/SEC)	25755.59	25757.48	25535.38	
LOCAL AZIMUTH (°)			191.09	190.17
LOCAL FLT PATH ANGLE (°)			-1.9277	-31.4064
LOCAL VELOCITY (FT/SEC)				1425.04
ANGLE OF ATTACK (°)			104.44	
MACH NUMBER				1.47
DYN PRESS (PSF)				193.287

CORE PINS SHEARED (FROM REBOUND TMX) A: YES ___ NO X , B: YES ___ NO X

BFE VECTOR, Parameters from a SYS Time near the ascending node of the Recovery Rev.

SYS TIME	78399.490 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	.0013 °
LONGITUDE	25.1415 °E	INERTIAL GEOCENTRIC FLT PATH ANGLE	-.4981 °
ALTITUDE	137.1926 nm	INERTIAL GEOCENTRIC AZIMUTH	353.3878 °
		INERTIAL VELOCITY	25370.52 FT/SEC
SV C_D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.49730 FT^2/SLUG

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SEC 4.5 SATELLITE VEHICLE SUPPORT

SEC 4.5.1 SCF PERFORMANCE (Prepared by the FTFD)

4.5.1.1 RTS Equipment Failures Affecting Operations

Rev 1092.2 POGO - Unable to support due to a sprinkler system failure. Tech power removed from the Antenna Control Console.

Rev 1141.1 BOSS - Unable to R/O Tape Recorder due to a Sinewave on Station 1.7CH.

Rev 1226.1 KODI - Cmd Xmsn delayed due to intermittent NFFK failure.

Rev 1377.2 POGO - Power failure delayed playbacks 75 mins. Frontline Comm lost for the last 109 sec of the pass. Track & record only.

4.5.1.2 RTS Miscellaneous Problems

Rev 1225.0 COOK - Antenna locked onto a sidelode throughout the pass. S/S weak but tape recorder R/O good.

Rev 1384.1 BOSS - Carrier 4 S/S not recorded throughout the pass due to an open patch.

4.5.1.3 STC Computer Failures Affecting Operations

160A Computer Problems

Rev 1213 GUAM - BB45 lost 25 sec realtime data to printers and DTV. Reason unknown.

Rev 1451 COOK - BB43 offline for 50 sec due to an error halt.

4.5.1.4 3800 Computer Problems (Sys 25 Primary)

8 Jan - Typewriter failed,lost 45 min.

11 Jan - Tape drive had parity errors, lost 45 min.

13 Jan - Had to reload from Safari, lost 30 min.

17 Jan - Card punch failure, moved to Sys 23.

26 Jan - Circuit board burned out, lost 30 min.

4.5.1.5 DTV Failures Occurred on the Following Revs:

1025, 1027, 1038, 1041, 1043, 1044, 1058, 1071, 1095, 1111, 1118, 1128, 1160, 1174, 1238, 1304, 1310, 1330, 1336, 1364, 1372, 1375, 1378.

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SEC 4.5.2 TELEMETRY DISPLAY MODES

During the RV-3 segment, MCR 9-56 was implemented and validated. The revised real time modes were transmitted to all stations. Use of these modes began with the RV-4 segment.

Also, during the RV-3 segment, work began on MCR 9-58. This MCR defines a diagnostic mode for processing and display of high rate signal strength data.

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 28	71064	976	0.520		86.3	41.11	161.1	88 51.6	0.267	
P 28	86152	978	0.515		86.2	41.50	160.8	88 50.8	0.270	
P 29	14587	981	0.504		86.3	42.03	160.3	88 50.2	0.265	2.2
P 29	26000	985	0.493		86.3	42.70	160.0	88 49.5	0.260	
P 29	46700	989	0.503		86.3	43.28	159.3	88 48.5	0.269	
P 29	69936	992	0.532		86.3	44.31	158.6	88 47.3	0.287	
S 29	84979	994	0.529		86.1	44.70	158.2	88 46.4	0.290	
P 30	9192	997	0.498		86.1	45.12	157.8	88 45.9	0.275	2.0
P 30	34514	1002	0.478		86.2	46.47	157.0	88 44.7	0.267	
P 30	50840	1006	0.485		86.2	47.00	156.5	88 43.8	0.275	
I#25	59017	1003	0.485	36.3	86.2	47.00	156.5	88 43.8	0.275	
I#25	59129	1003	0.485	36.4	94.8	31.61	162.3	89 6.4	0.126	
I#26	67026	1005	0.485	-21.7	94.8	31.61	162.3	89 6.3	0.127	
I#26	67093	1005	0.485	-21.7	86.5	24.40	155.4	88 52.4	0.231	
P 30	74004	1009	0.495		86.4	24.62	155.3	88 51.9	0.238	
S 31	2701	1011	0.465		86.2	25.22	155.1	88 51.3	0.227	2.0
P 31	18325	1014	0.488		86.3	25.66	154.6	88 50.7	0.238	
P 31	29132	1018	0.489		86.3	26.11	154.3	88 50.1	0.239	
P 31	49792	1022	0.494		86.1	26.59	153.8	88 49.2	0.247	
P 31	72956	1025	0.514		86.1	26.96	153.2	88 48.0	0.260	
S 1	1644	1027	0.504		86.0	27.91	152.9	88 47.3	0.259	
P 1	17268	1030	0.505		86.0	28.35	152.4	88 46.6	0.260	
P 1	27972	1034	0.481		86.1	28.87	152.1	88 46.0	0.248	
P 1	48636	1038	0.479		86.0	29.34	151.5	88 45.1	0.252	
P 1	71808	1041	0.498		86.0	30.25	150.9	88 43.9	0.266	
S 2	252	1043	0.485		85.8	30.62	150.6	88 43.2	0.262	
P 2	15204	1046	0.476		85.8	31.02	150.1	88 42.6	0.259	
P 2	26732	1050	0.465		85.9	31.59	149.9	88 41.9	0.254	
P 2	47388	1054	0.460		85.8	32.40	149.1	88 40.9	0.255	
I#27	60118	1052	0.460	22.8	85.8	32.40	149.1	88 40.6	0.257	
I#27	60190	1052	0.460	22.8	86.3	29.24	159.5	88 54.8	0.221	
P 2	70600	1057	0.460		86.3	29.62	159.2	88 54.2	0.223	
S 2	85558	1059	0.466		86.2	30.00	158.9	88 53.6	0.229	
P 3	14110	1062	0.461		86.2	30.42	158.5	88 53.1	0.228	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 3	25620	1066	0.457		86.2	30.95	158.3	88 52.5	0.226	
P 3	46252	1070	0.442		86.2	31.46	157.7	88 51.6	0.221	
P 3	69512	1073	0.478		86.2	32.35	157.2	88 50.6	0.241	
S 3	84502	1075	0.498		86.1	32.73	156.9	88 49.8	0.255	
P 4	13054	1078	0.497		86.1	33.20	156.4	88 49.2	0.256	
P 4	24180	1083	0.516		86.1	33.72	156.1	88 48.7	0.266	
P 4	50488	1087	0.545		86.0	34.39	155.3	88 47.3	0.288	
P 4	72992	1090	0.594		86.1	35.14	154.6	88 46.0	0.315	
S 5	2086	1092	0.533		85.8	35.81	154.2	88 45.0	0.291	
P 5	12476	1095	0.539		85.9	36.03	153.7	88 44.5	0.294	
P 5	28660	1099	0.535		86.0	36.89	153.2	88 43.6	0.293	
P 5	49308	1103	0.557		85.8	37.47	152.4	88 42.3	0.313	
I#28	56639	1100	0.557	18.2	85.8	37.47	152.4	88 42.3	0.312	
I#28	56696	1100	0.557	18.2	86.2	34.93	160.7	88 53.6	0.278	
P 5	72496	1106	0.551		86.2	35.50	160.1	88 52.6	0.279	
S 6	1040	1108	0.539		86.0	35.89	159.8	88 51.8	0.277	
P 6	16664	1111	0.536		86.1	36.39	159.2	88 51.1	0.276	
P 6	27520	1115	0.509		86.1	36.98	158.9	88 50.5	0.262	
P 6	48208	1119	0.573		86.1	37.44	158.2	88 49.4	0.302	
P 6	71412	1122	0.572		86.0	38.43	157.5	88 48.1	0.305	
S 6	86384	1124	0.575		85.9	38.82	157.1	88 47.2	0.312	
P 7	14936	1127	0.613		85.9	39.26	156.4	88 46.4	0.335	
P 7	26336	1131	0.627		85.9	39.87	156.0	88 45.5	0.346	
P 7	47012	1135	0.572		85.8	40.43	155.1	88 44.2	0.321	
P 7	70224	1138	0.568		85.8	41.39	154.3	88 42.8	0.324	
S 7	84992	1140	0.538		85.6	41.75	153.8	88 41.9	0.312	
P 8	9456	1143	0.532		85.6	42.08	153.4	88 41.3	0.313	
P 8	24816	1147	0.552		85.7	42.85	152.8	88 40.4	0.326	
P 8	45700	1151	0.551		85.6	43.75	151.7	88 39.0	0.331	
I#29	58379	1149	0.551	26.9	85.6	43.75	151.7	88 38.7	0.322	
I#29	58464	1149	0.551	26.9	86.3	39.07	163.7	88 55.4	0.274	
P 8	68956	1154	0.602		86.3	39.41	163.2	88 54.7	0.304	
S 8	83832	1156	0.619		86.2	39.77	162.7	88 53.8	0.316	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 9	12720	1159	0.582		86.2	40.28	162.2	88 53.0	0.299	
P 9	23668	1164	0.538		86.2	40.90	161.9	88 52.5	0.278	
P 9	50016	1168	0.517		86.1	41.73	161.1	88 51.1	0.273	
P 9	73184	1171	0.541		86.1	42.85	160.4	88 49.8	0.288	
S 10	1794	1173	0.515		86.0	43.25	160.0	88 49.0	0.279	
P 10	12484	1176	0.508		86.1	43.55	159.6	88 48.4	0.274	
P 10	28216	1180	0.492		86.2	44.52	159.1	88 47.7	0.267	
P 10	48888	1184	0.504		86.1	45.11	158.5	88 46.6	0.279	
P 10	72072	1187	0.497		86.0	46.23	157.8	88 45.4	0.279	
S 11	738	1189	0.474		85.9	46.61	157.4	88 44.6	0.271	
P 11	11316	1192	0.490		85.9	46.96	157.0	88 44.0	0.282	
P 11	27000	1196	0.492		86.0	47.90	156.5	88 43.2	0.285	
P 11	47668	1201	0.508		86.1	48.76	155.5	88 42.1	0.296	
I#30	61059	1198	0.508	41.4	86.1	48.76	155.5	88 41.9	0.297	
I#30	61189	1198	0.508	41.4	95.1	31.11	162.9	89 7.5	0.130	
I#31	69070	1200	0.508	-21.5	95.1	31.11	162.9	89 7.4	0.131	
I#31	69138	1200	0.508	-21.5	86.3	24.44	156.7	88 53.7	0.243	
S 11	75690	1203	0.503		86.2	24.68	156.6	88 53.3	0.243	
S 11	85770	1205	0.457		86.1	25.03	156.5	88 52.9	0.222	
P 12	10196	1208	0.468		86.1	25.30	156.2	88 52.4	0.230	
P 12	25928	1212	0.485		86.2	25.96	155.7	88 51.7	0.237	
P 12	46564	1216	0.467		86.2	26.46	155.2	88 50.8	0.232	
P 12	69808	1219	0.485		86.1	27.35	154.6	88 49.8	0.244	
S 12	84714	1221	0.489		86.0	27.73	154.3	88 49.0	0.249	
P 13	9096	1224	0.489		85.9	28.01	154.1	88 48.5	0.251	
P 13	24472	1229	0.526		86.1	28.65	153.5	88 47.9	0.269	
P 13	50764	1233	0.555		85.9	29.24	152.8	88 46.5	0.292	
P 13	73272	1236	0.608		85.9	29.93	152.0	88 45.1	0.323	
S 14	2634	1238	0.591		85.7	30.56	151.6	88 44.1	0.321	
P 14	13208	1241	0.603		85.7	30.74	151.1	88 43.5	0.329	
P 14	28936	1245	0.591		85.8	31.50	150.5	88 42.5	0.324	
P 14	49576	1249	0.594		85.5	32.18	149.7	88 41.2	0.336	
I#32	57086	1246	0.594	18.8	85.5	32.18	149.7	88 41.1	0.336	
I#32	57147	1246	0.594	18.8	86.3	28.91	157.7	88 52.8	0.291	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 14	72752	1252	0.606		86.2	29.42	157.0	88 51.7	0.301	
S 15	1155	1254	0.611		86.0	29.81	156.6	88 50.8	0.309	
P 15	12052	1257	0.610		86.0	30.03	156.2	88 50.2	0.310	
P 15	27784	1261	0.559		86.1	30.78	155.7	88 49.4	0.286	
P 15	48460	1265	0.554		86.0	31.23	155.0	88 48.3	0.288	
P 15	71652	1268	0.572		86.0	32.16	154.2	88 47.0	0.302	
S 16	99	1270	0.564		85.8	32.52	153.8	88 46.1	0.302	
P 16	10908	1273	0.565		85.7	32.70	153.5	88 45.5	0.306	
P 16	26588	1277	0.539		85.8	33.45	152.9	88 44.6	0.293	
P 16	47252	1281	0.546		85.7	33.87	152.2	88 43.5	0.302	
P 16	70456	1284	0.591		85.7	34.74	151.4	88 42.1	0.331	
S 16	85443	1286	0.605		85.5	35.09	150.9	88 41.1	0.346	
P 17	9684	1289	0.577		85.5	35.36	150.5	88 40.4	0.332	
P 17	25044	1293	0.572		85.5	36.09	149.9	88 39.5	0.333	
P 17	45948	1297	0.568		85.4	36.89	148.8	88 38.2	0.337	
I#33	58709	1295	0.568	28.0	85.4	36.89	148.8	88 37.8	0.329	
I#33	58798	1295	0.568	28.0	86.2	32.25	161.1	88 55.2	0.278	
P 17	69180	1300	0.569		86.2	32.59	160.6	88 54.5	0.281	
S 17	84166	1302	0.573		86.1	32.96	160.2	88 53.6	0.287	
P 18	8512	1305	0.552		86.0	33.29	159.9	88 53.0	0.279	
P 18	23688	1310	0.539		86.1	33.95	159.4	88 52.3	0.273	
P 18	50232	1314	0.538		86.0	34.68	158.6	88 51.0	0.278	
P 18	73396	1317	0.546		86.0	35.68	157.9	88 49.7	0.286	
S 19	2087	1319	0.520		85.9	36.07	157.5	88 48.9	0.276	
P 19	12704	1322	0.530		85.9	36.31	157.1	88 48.3	0.281	
P 19	28436	1326	0.518		86.0	37.18	156.6	88 47.5	0.276	
P 19	49108	1330	0.508		85.9	37.72	155.9	88 46.4	0.276	
P 19	72280	1333	0.548		85.9	38.72	155.2	88 45.2	0.303	
S 20	695	1335	0.513		85.8	39.8	154.8	88 44.3	0.287	
P 20	11528	1338	0.509		85.8	39.34	154.4	88 43.7	0.287	
P 20	27220	1342	0.491		85.8	40.21	154.0	88 43.0	0.278	
P 20	47884	1346	0.496		85.8	41.10	153.1	88 41.8	0.285	
I#34	60485	1344	0.496	22.7	85.8	41.10	153.1	88 41.5	0.287	
I#34	60558	1344	0.496	22.7	86.4	37.72	163.4	88 55.6	0.246	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 20	71096	1349	0.494		86.3	38.14	163.0	88 55.0	0.248	
S 20	85926	1351	0.484		86.2	38.52	162.7	88 54.2	0.245	
P 21	10388	1354	0.497		86.2	38.82	162.4	88 53.7	0.255	
P 21	26056	1358	0.499		86.2	39.60	161.9	88 53.0	0.255	
P 21	46768	1361	0.487		86.3	40.18	161.2	88 52.0	0.252	
P 21	64036	1366	0.533		86.3	40.70	160.6	88 51.0	0.278	
S 22	3726	1367	0.545		86.1	41.79	159.9	88 49.5	0.292	
S 22	9102	1370	0.518		86.2	42.07	159.6	88 49.2	0.276	
P 22	24684	1375	0.522		86.2	42.87	159.2	88 48.5	0.280	
P 22	50976	1379	0.518		86.2	43.65	158.3	88 47.1	0.283	
P 22	73472	1382	0.540		86.3	44.57	157.5	88 45.8	0.297	
S 23	2670	1384	0.545		86.1	45.25	157.1	88 44.9	0.307	
P 23	13428	1387	0.559		86.1	45.55	156.6	88 44.2	0.315	
P 23	29156	1391	0.542		86.2	46.53	156.1	88 43.3	0.307	
P 23	49804	1295	0.549		86.1	47.58	155.1	88 42.1	0.320	
I#35	62290	1393	0.549	18.3	86.1	47.58	155.1	88 41.8	0.317	
I#35	62343	1393	0.549	18.3	86.4	44.77	163.5	88 53.1	0.283	
P 23	72972	1398	0.566		86.4	45.27	163.1	88 52.3	0.297	
S 24	1647	1400	0.568		86.2	45.67	162.6	88 51.4	0.302	
P 24	17271	1403	0.576		86.3	46.27	162.0	88 50.6	0.387	
P 24	28000	1407	0.558		86.3	46.97	161.7	88 49.9	0.300	
P 24	48688	1411	0.555		86.3	47.60	160.9	88 48.8	0.303	
P 24	71884	1414	0.560		86.2	48.75	160.1	88 47.4	0.311	
S 25	256	1416	0.538		86.1	49.14	159.6	88 46.6	0.303	
P 25	11132	1419	0.539		86.1	49.52	159.2	88 45.9	0.307	
P 25	26812	1423	0.530		86.2	50.48	158.7	88 45.1	0.303	
P 25	15544	1419	0.539		86.2	49.73	159.0	88 45.8	0.306	
P 25	26812	1423	0.530		86.2	50.48	158.7	88 45.1	0.303	
P 25	47492	1427	0.520		86.2	51.19	157.8	88 43.9	0.302	
P 25	70700	1430	0.526		86.2	52.38	157.0	88 42.6	0.312	
S 25	85600	1432	0.518		86.0	52.77	156.5	88 41.6	0.311	
P 26	14152	1435	0.511		86.1	53.43	155.8	88 40.9	0.309	
P 26	25284	1438	0.517		86.0	54.21	155.5	88 40.2	0.315	
P 26	46200	1444	0.534		86.2	55.03	154.4	88 39.2	0.324	

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SECTION 4.6

PROGRAM COMMAND SOFTWARE PERFORMANCE

(Prepared by HTC)

4.6.1 Command Message Summary

This section summarizes pertinent command message data from Mission 1209, IRON 7122. The command messages discussed cover the period of RV3 initiation (Rev 895 load) to the RV3 recovery message (Rev 1364 load).

Three hundred and ninety-eight command messages were planned by the flight profile, of which one hundred and thirty-five were cancelled. The remaining two hundred and sixty-three command messages were received and reviewed by the Technical Advisor (TA) staff. Two hundred and sixty were accepted and three (3) were rejected. Three of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the three messages are summarized below:

Rev No. and Load Station	Reason for Rejection
992 POGO	This message was rejected because an [redacted] had been omitted.
1090 POGO	This message added 1095 COOK to the SP message.
1011 BOSS	This message was rejected because OL-AI did not approve the automatic target selection.

In addition to the messages cancelled and rejected above, five messages were not loaded for the reasons stated below:

Rev No. and Load Station	Reason for Not Loading
954 POGO	The RV-5 PIP update was not required.
958 POGO	The RV-5 recovery abort message was not required.

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Section 4.6
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Rev No. and Load Station	Reason for Not Loading
1312 POGO	The contingency tumbling capture following the switch to RCS-2 was not required.
1362 POGO	The RV-3 PIP update was not required.
1364 POGO	The RV-3 recovery abort message was not required.

A one-rev load cycle was employed while the vehicle was over the area of interest. The "add-on" message generation and loading philosophy was in effect. This resulted in the generation of two hundred add-on messages.

Summary

Total Planned Messages	398
Messages Cancelled	-135
Total RV-3 Messages	263
Messages Rejected	- 3
Messages Altered	+ 3
Total Messages Accepted	263
Messages Not Required	- 5
Total Messages Accepted and Loaded	258

4.6.2 'TUNITY Software Problems

The Flight 9 'TUNITY software problems itemized below pertain only to the period from RV-2 Recovery through RV-3 Recovery. They have been grouped into the following categories to demonstrate their impact on the flight. The disposition of these software problems will be specified by the Configuration Control Board.

Category	No. of SPR's	Comments
Flight Critical	1 (8172)	Software corrections were made incorporated during this flight period.

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Section 4.6
"Program Command
Software Performance"

Category	No. of SPR's	Comments
Non-Flight Critical (Requiring Work-around)	1	Work-around procedures were developed and implemented.
Non-Flight Critical (Minor)	0	Work-around procedures were not required.
Product Improvements or New Requirements	3	To be considered during future development.
Documentation Error	1	MS-4 or MS-7 affected.

Itemized Software Problems

SPR MD3-8172 ('TCATCH) -- FLIGHT CRITICAL --

- Problem Description: In message 442, 'TBALL had 'TEPH errors and the ON-OFF latitude and longitude could not be calculated. Although the 'TBALL run was for Rev 899, the 'TEPH errors were for times from Rev 885. It was discovered that the first SS operation on Rev 899 was actually the second operation from Rev 885. It turns out that the 'TLI is not being correctly zeroed out and in message 442, "leftover" data was merged in with the current selection.

- Solution or Work-Around: The problem was determined to be flight critical because SS operations could not be selected or processed properly. A change was made to 'TCATCH correcting this problem and was incoporated on the Flight Aux Master.

- Operational Impact: Because of the non-zeroing of the 'TLITAB selection could not be processed properly. With the implementation of the new mod of 'TCATCH, the problem has been solved.

SPR MD3-8173 ('TMECO)

- Problem Description: Memo-Gram 9-1320, dated 22 December 1974, requested that 'TMECO be run on the first RMT of PMU B obtained at Rev 869 KODI. 'TMECO will currently only process the last RMT pair from a BBRT.

~~SECRET/H~~

~~SECRET/H~~

Section 4.6
"Program Command
Software Performance"

MD3-8173 (Continued)

- Solution or Work Around: A playback must be obtained containing only the RMT that is required.
- Operational Impact: None.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8174 ('THISUM)

- Problem Description: 'THISUM does not pay any attention to RTC's stripped from the 'SUPPORT files with respect to updating status. The commands were sent; there is no reason why they souldn't affect status. This shortcoming has affected the flight twice thus far.
- Solution or Work-Around: The RTC's or XPR's in question can be put directly into the CMU run of the message that was affected.
- Operational Impact: None.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8175 ('TREPLAY)

- Problem Description: In a 'TSEL - 'TDUGOUT run for rev 1193, an operation contained rows that appeared to make the operation inefficient. The operation in question was a combination of a MOP and a selected operation. Investigation has shown that the operation was efficient, but that the selection plot was shifted down by one DE row. The commanding of the operation was correct but the DE row pointers in the 'TLI are incorrectly set. The result is that the selection plot and 'THAYER do not correctly reflect the actual operation.
- Solution or Work-Around: None.
- Operational Impact: All operations cannot be evaluated properly.
- Comment: It is a software problem. The solution is known and it should be fixed as soon as possible during SV-9.

~~SECRET/H~~

~~SECRET/II~~

Section 4.6
"Program Command
Software Performance"

SPR MD3-8176 ('TDUGOUT)

- Problem Description: The selection plot from 'TDUGOUT for the operation on Rev 1193 is inaccurate. There is a one row shift of the operation in the plot. It shows the operation as including DE rows 72-75 when, in fact, the operation consisted of rows 71-74. The reason is that there was an ephemeris shift of .68 seconds between the ephemeris used by 'TBAT and the one used by 'TBALL. 'TDUGOUT uses the 'TIJTAB record built by 'TBAT rather than the 'TIJTAB plus one record built by 'TBALL during selection. The 'TIJTAB record built by 'TBALL accounts for any ephemeris shift that may have occurred between the running of 'TBAT and 'TBALL.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8177 (COMPOOL)

- Problem Description: 'COPTER description references camera "B" instead of camera "A".

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The above mentioned discrepancy should be corrected with the next compool update.

~~SECRET/II~~

~~SECRET/H~~

4.6.3 Hardware/Software Interface Changes

For IRON 7122, seven change requests were processed from RV-3 initiation through RV-3 recovery message (as shown in Table 4.6.3-1).

These requests were implemented via requests SV9-25 through SV9-31, and have been incorporated into the flight data base and hardware/software interface documentation. (Note: Request SV9-31 was voided and is not reflected here.)

Table 4.6.3-1 Summary of Hardware/Software Interface Changes

Request No.	Identification	Data Base Effectivity
SV9-25	New Sequence 381 provides a redundant OFF for the Sequence 380 ST CAL.	SV-9 and nominal.
SV9-26	Modifies Sequence 380 redundancy flag to reflect Sequence 381 redundancy.	SV-9 and nominal
SV9-27	Modifies Sequence 144 to reflect new nominal value of PS1 for the "A" side.	SV-9 only
SV9-28	Modifies Sequence 147 to reflect new nominal value of PS1 for the "B" side.	SV-9 only
SV9-29	Changes MACRO MATS0255 to reflect new nominal slit values.	SV-9 only
SV9-30	Changes MACRO MATSO 130 to reflect new WRATTEN filter requirement.	SV-9 only

4.7 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE

4.7.1 EDAP Performance

The main battery/solar array power system performed satisfactorily during Segment 3. Opening of Charge Current Controller K-2 Relay was observed on all but three (3) revs. The solar array output exceeded demand by an average of approx 68 amp-hours per day.

The average main bus voltage at sun entrance was 27.0 volts. Main battery discharge load sharing remained nominal. Main battery temperatures remained nominal from 42 to 50°F.

No significant degradation of solar array was noted in Segment 3.

4.7.2 T&T Performance

The primary SGLS, PCM Telemetry and Tape Recorder performed satisfactorily throughout Segment 3. SGLS-2 and PCM-2 systems were health checked five times.

4.7.3 ACS/RCS Performance

The SV was controlled by the primary ACS and RCS (M_1V_1) through the start of Segment 3, Rev 895 until Rev 1118. On Rev 1118, control was transferred to ACS 2. An M_2V_1, Tumbling Capture sequence was used to effect this transfer. The transfer was prompted by an H/S inhibit in the roll channel that occurred on Rev 1113. Prior to the inhibit, the ACS 1 operation was normal with one exception. During a MIX 1 operation on Rev 950, on startup and shutdown, pitch rates were significantly higher than normally seen for such an operation. Pitch rates were up to -.105 °/sec decreasing to -.072°/sec within two seconds. Pitch rate maximums on previous MIX 1 operations were -.075 °/sec. No data was lost however and ACS 1 continued to provide satisfactory attitude control. On Rev 1113, from P/B data, it was noted that the H/S had inhibited for 100 sec during a P/L Op and also during a P/L Op on Rev 1114. On Rev 1115, the H/S was inhibited during the pass. On Rev 1116, stored commands were erased and on Rev 1118, the M_1V_1 - M_2V_1 tumbling capture was loaded and executed.

Following resumption of normal operations on Rev 1119, the ACS 1 H/S remained inhibited almost continuously until Rev 1129 which showed inhibit cycling. Following this, the inhibit has remained "off" throughout the rest of this segment. Operation with ACS 2 has been nominal since the transfer.

The primary reaction control thrusters were used until Rev 1311 when, due to low thrust levels, an orderly transfer to RCS 2 was made (M_2V_2). A pitch down test was performed to obtain RCS 2

4.7.3 ACS/RCS Performance (continued)

thrust levels on Rev 1330, prior to event 3 occurrence on Rev 1364. Thrust levels for RCS 1 for early revs and the degraded levels on Rev 1200 are presented as figure . The thrust levels for the redundant thrusters, from the R/D test data, are shown on figure .

In addition to the normal thruster degradation, on Rev 1267, REA No. 7 exhibited leaking, however with normal control pulsing, the leakage was stopped. This was the only leakage that was encountered.

The propellant used for attitude control during segment 3 was 105 lbs or an average of 3.6 lbs/day. Up to Rev 989 RCS propellant was used from tanks 1/2 only. Propellant remaining in tanks 1/2 was 24.7 lbs. During Rev 989, isolation valves 2 and 3 were opened which then provided propellant from both tanks 1/2 and tanks 3/4. Following the opening of IV 2 and 3, the propellant in tanks 1/2 was 148.7 lbs and in tanks 3/4, 143.0 lbs.

Figure shows ACS/RCS/OAS events in Segment 3.

4.7.4 Orbit Adjust System

There were 12 orbit adjusts performed OA's 23 through 34. Two were negative burns. The adjusts were all successful. Figure presents a summary of the orbit adjusts for Segment 3. Propellant consumption was 665.2 lbs for the 12 adjust burns for an average per day rate of approximately 23 lbs/day, comparing favorably with pre-flight predictions.

4.7.5 Lifeboat II System

No special L/B system tests were performed during segment 3. The L/B tank temperatures stabilized at 75°F by Rev 1178 with a related impulse of 2130 lb-sec immediately available.

RCS 1 - REA THRUST LEVEL - (PRIMARY)

REV NO.	REA NO.	REA FORCE LBS	FEED PRESS. PSIA	QUAL. FORCE LBS	DELTA LBS
258	1	4.2	171	4.4	-0.2
310	2	4.1	163	4.2	-0.1
310	3	4.1	163	4.2	-0.1
258	4	4.4	173	4.4	0
258	5	4.2	174	4.4	-0.2
310	6	4.0	162	4.2	-0.2
310	7	4.1	162	4.2	-0.1
258	8	4.5	171	4.4	+0.1

RCS-1 REA THRUST LEVEL - (PRIMARY)

REV NO.	REA NO.	REA FORCE LBS	FEED PRESS PSIA	QUAL. FORCE LBS	DELTA LBS
1200	1	3.38	135	3.58	-0.20
1200	2	1.96	135	3.58	-1.62
1200	3	3.49	135	3.58	-0.09
1200	4	3.43	134	3.55	-0.12
1200	5	1.96	135	3.58	-1.62
1198	6	3.16	137	3.62	-0.46
1200	7	1.20	135	3.58	-2.38
1200	8	2.12	134	3.55	-1.43

RCS-2 REA THRUST LEVEL - (REDUNDANT)

REV NO.	REA NO.	REA FORCE - LBS
1330	2	2.9
1330	3	3.8
1330	6	3.9
1330	7	3.1

ACS/RCS/OAS EVENTS IN SEGMENT 3

REV	EVENT	REV	EVENT
906	OA 23	1118	M_1V_1- M_2V_1 Tumbling Capture
942	ST CAC	1149	OA 29
957	Yaw Rev	1197	OA 30
958	Event 5	1198	Yaw Rev
961	OA 24	1199	OA 31 - Yaw Fwd
989	Open IV 2&3	1246	OA 32
1003	OA 25	1267	REA 7 Leaking
1004	Yaw Rev	1295	OA 33
1005	OA 26 - Yaw Fwd	1311	M_2V_1 - M_2V_2 Orderly Transfer
1053	OA 27	1330	P/D Test
1100	OA 28	1344	OA 34
1114	Roll H/S Inhibit	1364	Event 3

FIGURE

ORBIT ADJUST SUMMARY

SEGMENT 3 REV 895 - 1364

OA NO/TYPE	23/POS	24/POS	25/POS	26/NEG	27/POS	28/POS	29/POS	30/POS	31/NEG	32/POS	33/POS	34/POS
OPS DAY	56	59	62	62	65	68	71	74	74	77	80	83
REV NO.	906	961	1003	1005	1052	1100	1149	1198	1200	1247	1295	1344
DELTA V (PREDICT) FPS	20.47	26.48	36.18	-21.72	22.70	18.05	26.92	41.29	-21.50	18.77	27.89	21.59
DELTA V (TRACKING) FPS	20.54	26.60	36.39	-21.77	22.91	18.29	27.67	41.33	-21.54	19.05	28.04	21.49
BURN DURATION	64.6	81.6	111.8	68.2	71.4	57.2	84.8	130.2	69.0	60.4	89.4	70.0
PROPELLANT USED - LBS	47.1	58.9	79.6	48.1	49.9	39.7	58.4	88.7	46.6	40.5	59.5	42.2
AVG OA TANK TEMP - ^{o}F	91.8	92.6	92.9	93.2	92.9	93.6	93.7	93.7	94.0	93.9	94.1	93.9
AVG TANK PRESS - PSIA	144.3	141.5	137.9	135.2	132.8	130.8	128.8	126.0	123.7	122.0	120.0	118.0

SECRET/XT

SECRET/XT

SECTION 5

5.0 ORBIT PHASE REV 1364 THROUGH RV-4 RECOVERY

5.1 SUMMARY

The Sensor Subsystems exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced. The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the best of RV-4 indicated a slight decrease from the best of RV-3.

The Redundant Attitude Control System (RACS) and the Redundant Reaction Control System (RCS-2) performance was nominal throughout the segment. Propellant consumption was 114.4 pounds which equates to an average of 2.5 pounds per day. The Orbit Adjust System (OAS) performance was nominal for the 17 orbit adjusts performed during the segment (15 positive, 2 negative). Total propellant usage for these orbit adjusts was 859.5 pounds.

The RV payload was 96.28% of the maximum I.C.D. weight and unbalanced 5.08%. The PREP2 event took place on Rev 2092 over POGO and separation occurred on Rev 2094, Day 129. Preparation, deorbit, and entry events, and drouge and main parachute deployment conditions were normal and executed as planned. Aerial recovery was accomplished on the 1st pass at 12,700 feet altitude, 14.2 nautical miles from the predicted impact point. The heatshield was recovered and returned for engineering evaluation.

5.1.2 PROBLEM SUMMARY

This segment experienced no system anomalies.

5.2 COMMAND SUBSYSTEMS PERFORMANCE (Prepared by CSC)

5.2.1 Health

The health of the Command Systems remained excellent throughout Segment 5 (Revs 1364-2094). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures or voltages. There were no power dropouts, relay driver overloads, or clock status errors experienced.

5.2.1.1 EXTENDED COMMAND SUBSYSTEM

5.2.1.1.1 Command Modes

The ECS responded properly in all modes into which it was commanded. There were a total of 336 messages loaded in the ECS for this segment. This resulted in 86,899 SPC's being stored for readout from the PMU's.

Of the 86,899 SPC's loaded, 36,563 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 86,899 SPC's, there were no command rejects.

On Rev 2023 GUAM, message 190 was only partially loaded because of Decomm 1 problems at GUAM.

The UHF/ECS commanding system has continued to function as expected.

5.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 3.88 parts in 10^7. This corresponds to an average frequency offset of .398 HZ above the nominal frequency of the 1.024×10^6 HZ. The frequency of the clock oscillators changed .0412 HZ in 730 revs. This results in a stability of 4.03 parts in 10^8 over 730 revs, 2.24 parts in 10^{10} for an average six hour period. All of these values are well within system specifications. See Figures 1 and 2 for clock calculations and plot.

5.2.1.1.3 ECS Anomalies

There were no ECS anomalies during this segment.

5.2.1.2 MINIMAL COMMAND SUBSYSTEM

5.2.1.2.1 Command Modes

The MCS was not used during Segment 4.

5.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

5.2.1.3 REMOTE DECODER/BUD

5.2.1.3.1 Command Modes

The remote decoder was used for the recovery of RV-4 which ended this segment of the flight. The performance of both channels was verified from telemetry to be proper for all commands.

No commands were issued from the BUD during this segment.

5.2.1.3.2 Remote Decoder/Bud Anomalies

There were no remote decoder or back-up decoder anomalies.

5.2.1.4 SUMMARY

5.2.1.4.1 Expendables and Environmental Data

Command Readouts for Segment	PMU-A 18,032 PMU-B 18,531
ECS Clock Drift Rate	3.88 parts in 10^7
ECS Clock Stability	4.03 parts in 10^8 for a 730 rev period
Total Hours On	ECS 3126 MCS 4.5 RD 13.77 BUD .05
Total Secure Words Expended	PMU-A 132 PMU-B 140
Environmental Data	All temperatures within specifications

	(1)	(2)
VEH. TIME SPAN	7268143.2 TO 11156879.4 SECS.	

AVERAGE CLOCK ACCURACY =BIAS CHANGE/TIME CHANGE

=(1.8083- 0.2988)/(1.1E+07- 7268143.2)

= 3.88172E-07

= 3.88172 PARTS IN 10 TO THE 7TH

AVERAGE CLOCK FREQUENCY =(3.88172E-07*1,024,000.0)+1,024,000.0

= 1024000.39748 HZ

FREQUENCY 1 (F1) =-(SLOPE AT 1)*1.024MHZ+1.024MHZ

=(3.64580E-07)*1.024MHZ+1.024MHZ

= 1024000.37332 HZ

FREQUENCY 2 (F2) =-(SLOPE AT 2)*1.024MHZ+1.024MHZ

=(4.04800E-07)*1.024MHZ+1.024MHZ

= 1024000.41459 HZ

CLOCK STABILITY =(F2-F1)/AVERAGE CLOCK FREQ.

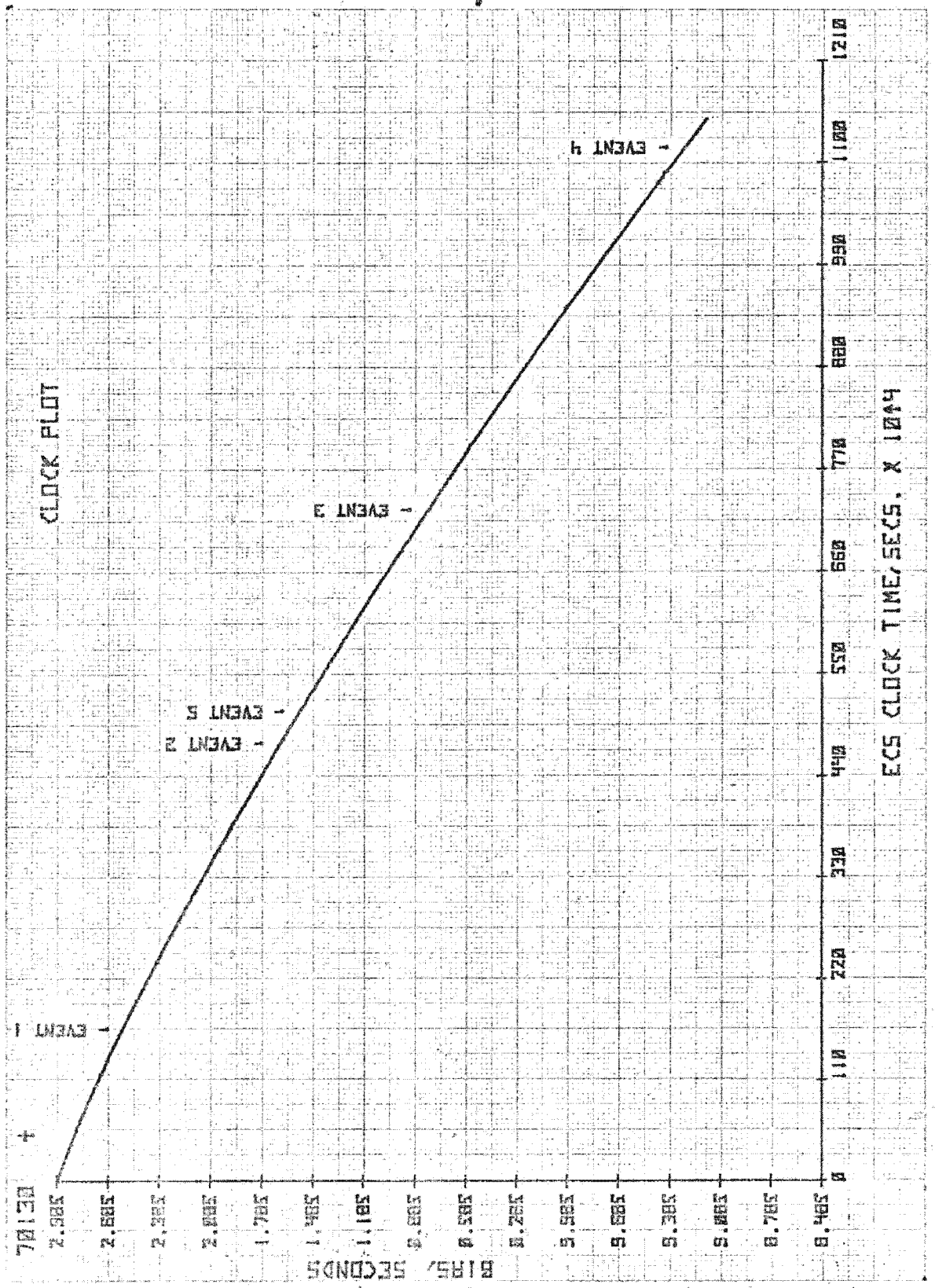
=(1024000.41459- 1024000.37332)/1.024E+06

= 4.03027E-08

= 4.03027 PARTS IN 10 TO THE 8TH
FOR THIS 730 REV. PERIOD

= 2.23862 PARTS IN 10 TO THE 10TH
FOR AN AVERAGE 6 HOUR PERIOD

Figure 1


CLOCK PLOT
EVENT 1
EVENT 2
EVENT 5
EVENT 3
EVENT 4
ECS CLOCK TIME, SECS. X 1044
0
110
220
330
440
550
660
770
880
990
1100
1210
BIAS, SECONDS
8.465
8.785
9.105
9.385
9.685
9.985
10.285
10.585
10.885
11.185
11.485
11.785
12.085
12.385
TOTAL

5.3 SENSOR SYSTEM OPERATIONS

5.3.1 Mission Operations Performance

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced.

Forward camera film depletion occurred on OP 757, as planned. Aft camera depletion occurred on OP 759, the last planned operation of the mission.

The RV-3 mission segment consisted of 209 sensor system operations, consuming 21,775 seconds of camera power on time, 9.2 pounds of nitrogen gas, and a film usage of approximately 29,240 feet on the Fwd camera and approximately 27,750 feet on the Aft camera. The consumption profiles through RV-4 are graphically depicted in Figure 1.

The overall image quality of both cameras ranged from very good to poor, with the majority rated as fair. The quality was comparable to previous winter missions and the best of RV-4 indicated a slight decrease from the best of RV-3.

5.3.2 Engineering Tests

Several engineering tests were performed during this segment of the mission in support of PFA imagery evaluation.

REV 1378 Special target, test type 14
Tucson W/DA, test type 7, 9

REV 1411 Quality variability, test type 12

REV 1426 Smear vs scan, test type 10

REV 1426 Special target, test type 14
DA targets, test type 15

REV 1476 Smear vs scan, test type 10

REV 1555 Special target, test type 14
DA targets, test type 15

REV 1571 Smear vs scan, test type 10

REV 1637 Smear vs scan, test type 10

5.3.2 Engineering Tests - Cont'd.

REV 1769 Stellar photography, test type 13

REV 1836 Smear vs scan, test type 10

REV 2010 Smear vs scan, test type 10

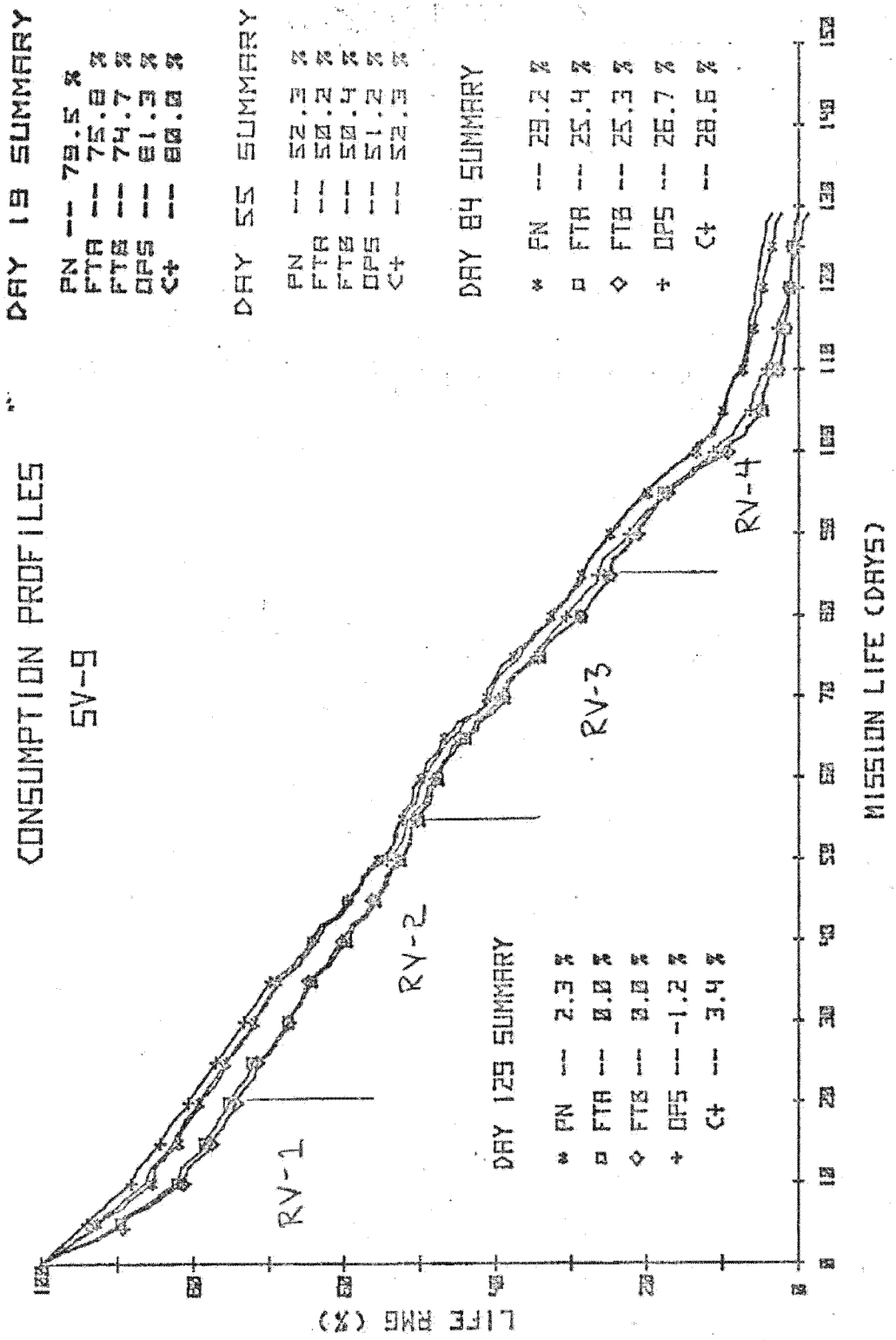


Figure I-1 Consumption Profiles

5.4 RV 4 (S/N40) Performance

This report presents an analysis of the RV 4 performance based on evaluation of recovery studies, command message, RV and SV telemetry, voice reports, and the recovery test report TWX. Tables 5.4-1 thru 5.4-3 list all relevant data. RV heater performance graphs are also included.

5.4.1 Summary

The RV payload was 96.28% of the maximum I.C.D. weight and unbalanced 5.08%. The PREP2 event took place on Rev 2092 over POGO and separation occurred on Rev 2094. Preparation, deorbit, and entry events, and drouge and main parachute deployment conditions were normal and executed as planned. Aerial recovery was accomplished on the 1st pass at 12700 ft. altitude, 14.2 nautical miles from the predicted impact point. The heatshield was recovered and returned for engineering evaluation.

TABLE 6.4-1

RV RECOVERY DATA

IDENTIFICATION DATA

SV 9	IRON NO 7122			RECOVERY REV 2094	
RV 4	RV S/N 40	RETRO MOTOR S/N Q68		RECOVERY DATE 7 Mar 75	

EVENT TIMES (IN SYSTEMS TIME - SECONDS)

EVENT	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVAL	COMMAND MESSAGE	SV TLM	VOICE REPORTS	RV TLM MODE 51	DIFF NOTE 1
RV OUT T/S	REV/STA			N/A	N/A			
RV 4 IN T/S	2092P			70432.3	70433			0
DT START	79799.6	79799.42	79800.04	79799.3	79801			1.7
POGO TRAN	80766.2			80767.7	80752			-15.7
PITCH START	80796.2			80797.5	80798			0
PITCH STOP				80859.9	80856			1.1
PYRO ARM BATT				80967.3	80968			0
POGO FADE	81050.6			81051.3	81054			12.7
KODI TRAN	81190.4			81191.9	81310			118.1
ORB PWR OFF				81336.1	81337			0
RV SEP (0)	81346.3	81346.3	81346.3	81346.1	81347	Conf	NOTE 2	0
SPIN UP (+2.4)				81348.5		Conf	81349	0
RETRO START	81471.7	81471.7	81471.7	81471.5		81472	81471	0
DESPIN (+160.4)				81506.5		81508	81507	0
PROP JETT (+175.4)				81521.5		81523	81522	-0
KODI FD (RV)	81548.9					81571	81553	4.1
RV ENTRY (400K	81661	81660.8	81661.6		RECOV TM			
△ 1-2 ACQ					81752	81987		
ION ENTR	81774.5	81774.31	81775		81775	- -		0
ION EXIT	81981	81980.84	81981.45		81975	81987		6.5
DROGUE DEPLOY	82026.2	82025.95	82026.56	TONE STOP	82036	- -	- -	9.4
IMPACT (50K)	82044.6	82044.42	82045.04					
MAIN CHUTE DPL	82047.7	82047.36	82048.04		N/A	N/A	- -	- -
H/SHLD JETT	82051.7	82051.36	82052.04	TONE START	82052	82053	- -	0
STEADY STATE	82062.7	82062.36	82063.04					
ETPD(RAINDROP)	82095	82095.9	82096.3					
RV @ 13.5K	83022.7	83023.6	83023.9	IN TRAIL	83400	83040	- -	376.1
WATER IMPACT	83587.4	83588.3	83588.6		N/A	N/A	N/A	- -
HULA TRAN (RV)	81794.3					N/A	N/A	- -
HULA FADE (RV)	81933.7					N/A	N/A	- -
DT RUNOUT	82514.6	82514.42	82515.04		N/A	N/A	N/A	

*To nearest Minute.

NOTES: 1. DIFF = Actual - Predicted times, TLM differences of less than 1.0 sec are ignored. [ ] = PREDICTED TIME, [ ] = ACTUAL TIME.

2. Assume RV SEP Sequencing starts 0.4 seconds after RV SEP Command msg. time.

TABLE 6.4-2

RV 4 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	18.0	18.112	18.129	18.02	18.00	18.02
LONGITUDE	166.1	166.08	166.08	165.87	166.067	165.87

RECOV. A/C DEPLOYMENT FORMATION No. 1, RECOVERING A/C No. 1

RECOV ALT 12700 ft, PASS No. 1, TIME 2310 Z.

AIRSPEED 163 KTAS, 130 KIAS; TIME IN TOW 17 min.

RAINDROP ETPD 82095 sec 46000 ft; RATE/DESCENT, 15K 28.8 FPS, 10K 26.6 FPS

CONTACT LOCATION Left Pole with Hooks 8,2, and 6 in Load Line

PRESET TENSION LEVEL 3500 lb, PAYOUT Normal

MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)

OVERSHOOT 6.54 nm, CROSS TRACK 12.6 nm EAST

RC CONDITION Normal

CHUTE/CONE CONDITION Minor damage starting from top of cone skirt extending into main parachute.

CHUTE/CONE BEHAVIOR Erratic chute oscillations of 20 degrees. Oscillations, more than usual while in trail, were observed.

WIND DATA

ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT	ALT (K)	DIRECTION PRED	DIRECTION ACT	VELOCITY PRED	VELOCITY ACT
SCF	120	080	15	10	25	330	310	15	25
2	090	100	20	20	30	330	290	20	25
4	070	080	15	20	35	300	320	30	45
6	060	080	15	10	40	290	330	30	80
8	060	080	15	10	45	320	300	55	60
10	050	120	10	05	50	280	290	30	60
15	070	030	10	05	55	280	310	20	30
20	340	320	20	15	60				

RV BATTERY TIME HISTORY

TIME	ACT 80970	971	975	977	979	989	991	991	012	034		
MAIN	23.4	23.9				24.6	25.6	26.3	26.9	26.9		
PYRO #1	18.3	24.4	25.1	25.6	26.2	25.6				25.3		
PYRO #2	23.8	24.4	24.9		25.5					25.2		
TIME	327	337										
MAIN	27.0	26.2										
PYRO #1	25.3											
PYRO #2	25.3											

SV RATES BEFORE & AFTER SEP (SV TLM)

	TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
	346	-.059	-.001	.0
SEP	347	1.24	.009	.0
	348	1.15	.051	.0

MISC DATA

Payload Temp before SEP, Rn06 67 °F

Payload Temp, Max REENTRY, TB02 67 °F

Chute Press before PREP 2, P711 .82 PSI

Supply Press before PREP 2, P113 .51 PSI

BETA ANGLE of Recovery Rev. 10.1 °

PITCH ANGLE

EASIC STUDY

Θ_{rvs} 128.5 °

$\Delta\theta_1$ 1.86 °

Ω_y 1.14 °/sec

$\Delta\theta_2$ -.154 °

Θ_{sv} 40.504 °

PITCH (CMD MSG) 40.467 °

Θ_{sv} (PDWN-SV TLM) 39.6 °

Θ_{rvs} ON UPDATED TEAPOT 128.47 °

RV 4 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	ACTUAL POST FLT
TU-A	228.53 lb	228.53 lb	228.53 lb	228.3 lb
TU-B	216.84 lb	216.84 lb	216.84 lb	217.0 lb
TOTAL	445.37 lb	445.37 lb	445.37 lb	445.3 lb
SEP WGT	1517.79 lb	1517.79 lb	1517.79 lb	UPDATED TEAPOT
RETRO WGT	1516.1 lb	1516.1 lb	1516.1 lb	% UNBAL 5.08
ENTRY WGT	1325.29 lb	1325.29 lb	1325.29 lb	% FULL 96.82
AIR RECOV WGT	1120.1 lb	1120.1 lb	1120.1 lb	(100% = 460 lb)

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	12063.4 lb	PITCH INERTIA (Iy)	82812.86 SLUG-FT^2
CG FROM STA 2220.2(X)	205.62 in	ROLL INERTIA (Ix)	5048.43 SLUG-FT^2
CG FROM LONG AXIS(Y)	2.26 in	YAW INERTIA(Iz)	84281.16 SLUG-FT^2

'DORBEL EPHEMERIS

REV OF SEP	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION
PREDICTED FROM REV	2084	2088	N/A
APOGEE	161.545 nm	161.77 nm	161.736 nm
PERIGEE	88.033 nm	88.047 nm	88.188 nm
ARG OF PERIGEE	103.206 °	103.286 °	103.324 °
INCLINATION	96.564 °	96.564 °	96.565 °
TRUE ANOMALY AT RETRO	24.97 °	24.79 °	24.69 °
STEADY STATE ALT.	47631.77 FT	47696.34 FT	47678.93 FT
HEATSHIELD JETT ALT.	49680.82 FT	49748.04 FT	49730.03 FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

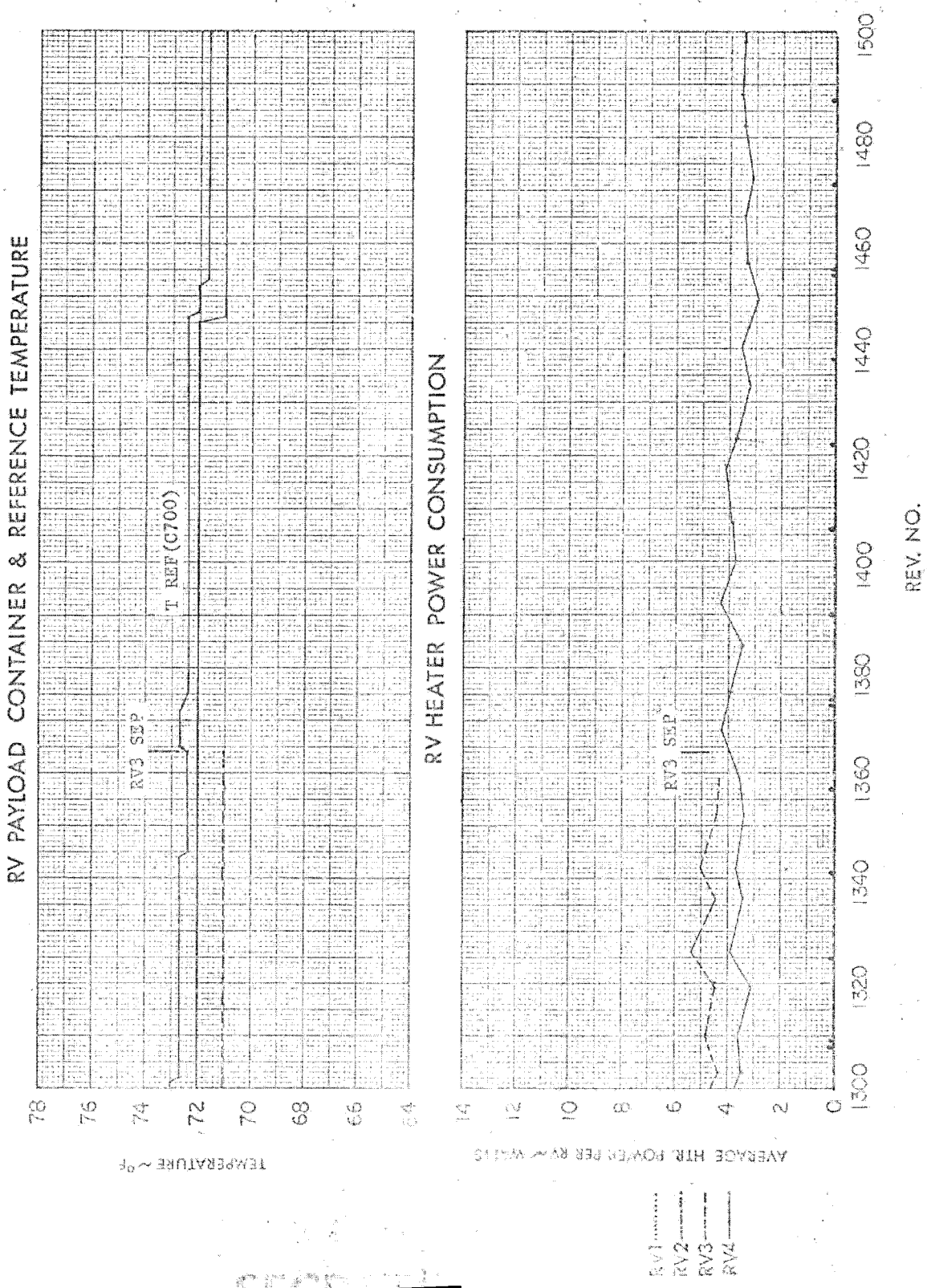
	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	81346.3	81471.7	81661.63	82026.56
ALTITUDE (FT)	532203.48	534773.32	399999.86	63890.6
LATITUDE (°N)	59.833	51.374	38.785	18.171
LONGITUDE (°W)	154.23	157.90	161.70	166.08
INERTIAL AZIMUTH (°)	193.17	190.59		
INERT FLT PATH ANGLE (°)	.1723	.2587		
INERT VELOCITY (FT/SEC)	25753.15	25743.96	25493.2	
LOCAL AZIMUTH (°)			191.09	190.17
LOCAL FLT PATH ANGLE (°)			-1.8270	-31.4025
LOCAL VELOCITY (FT/SEC)				1424.66
ANGLE OF ATTACK (°)			105.23	
MACH NUMBER				1.47
DYN PRESS (PSF)				190.490

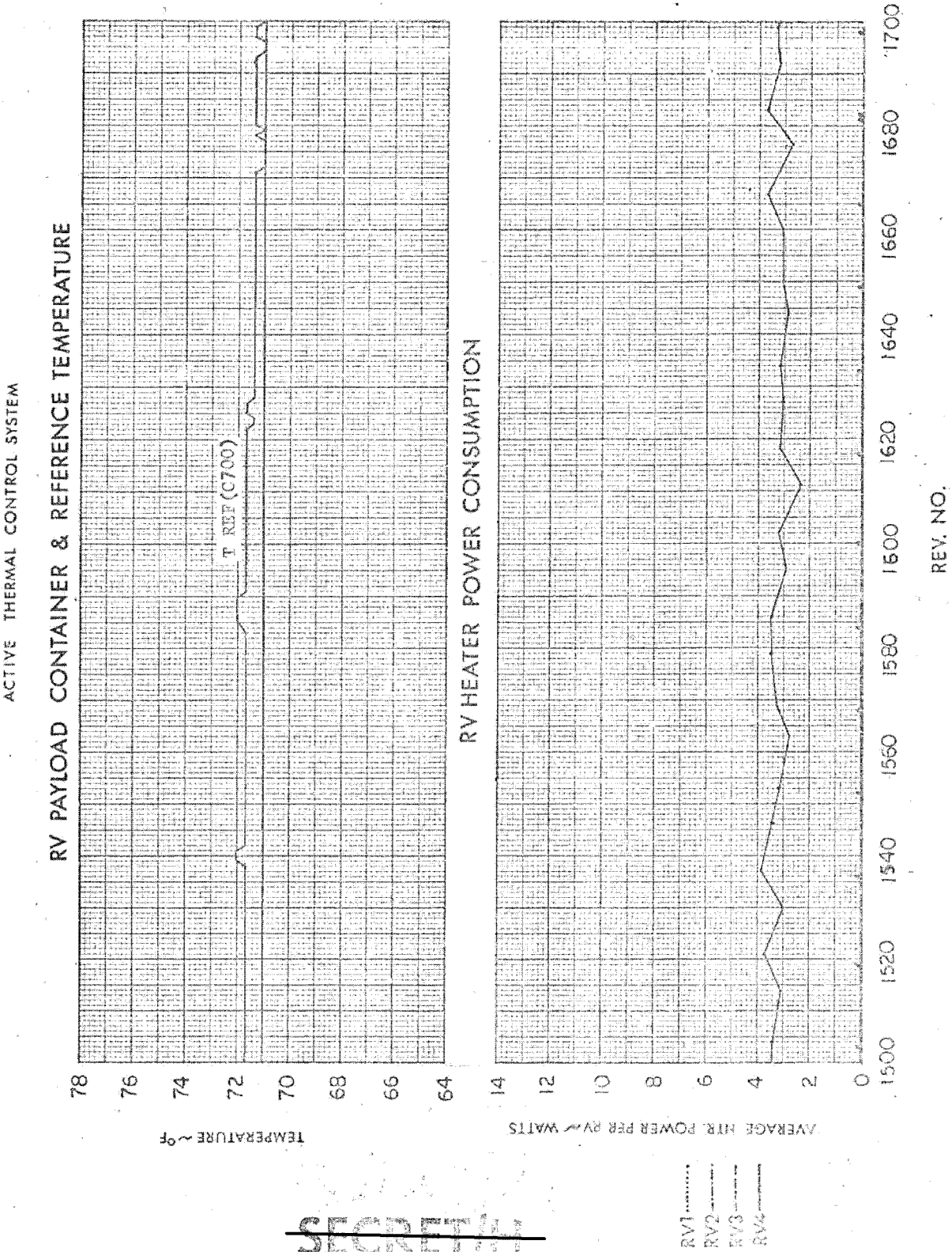
CORE PINS SHEARED (FROM REBOUND TWX) A: YES ____ NO X , B: YES ____ NO X

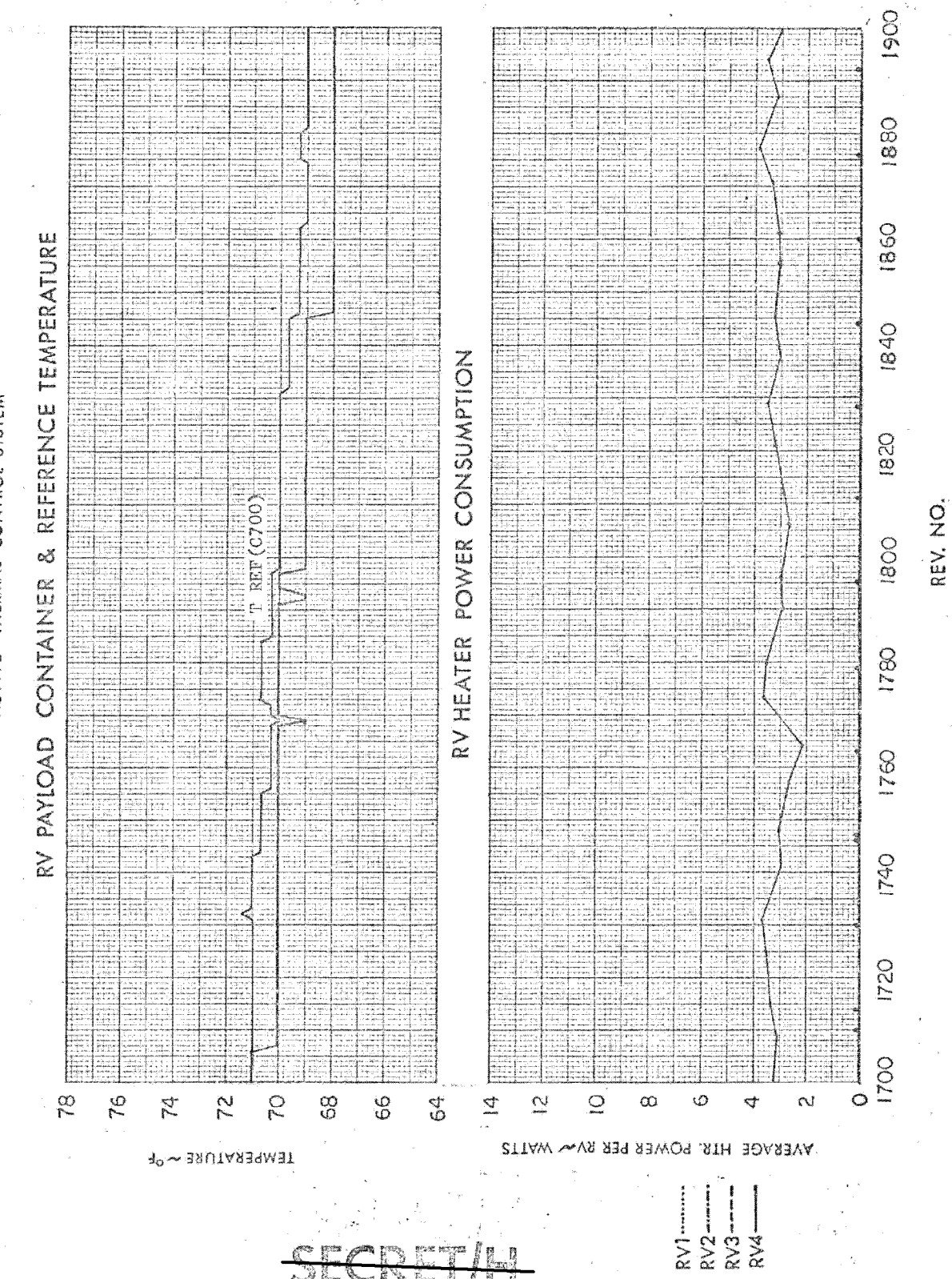
BFE VECTOR, Parameters from a SYS Time near the ascending node of the Recovery Rev.

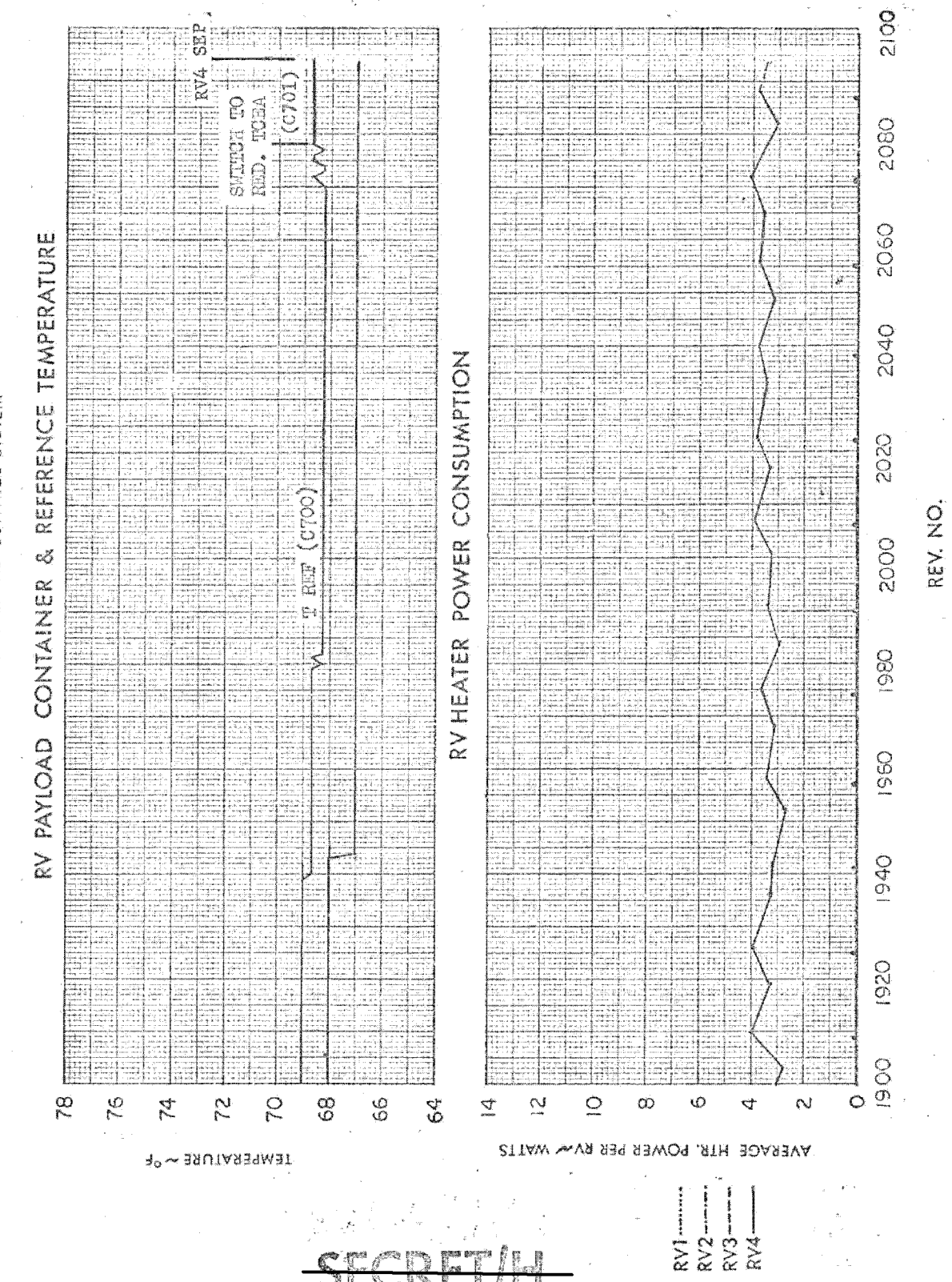
SYS TIME	79599.282 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	.0030 °
LONGITUDE	21.6079 °	INERTIAL GEOCENTRIC FLT PATH ANGLE	-.5785 °
ALTITUDE	125.0831 nm	INERTIAL GEOCENTRIC AZIMUTH	353.4355 °
		INERTIAL VELOCITY	25452.2 FT/SEC
SV C_D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.6456 FT^2/SLUG

SECRET/RD









SEC 5.5 SATELLITE VEHICLE SUPPORT

POST FLIGHT PERFORMANCE REPORT - PART IV

5.5.1 SCF Performance (Prepared by the FTFD)

5.5.1.1 RTS Equipment Failures Affecting Ops

Rev 1500 KODI - Lost 100 sec realtime data due to 3-CH10 I/O Parity Errors - suspect comm buffer.

Revs 1754 & 1769 KODI - Disc drive 3 stopped during support. Lost some history.

Revs 1767,68, 69,71 POGO - No S-Tones output from BAU. Delayed commanding utilized CT for commanding on Revs 1769 and 1771.

Rev 2023 GUAM - Unable to complete command plan due to PCM Decom 1 outputting invalid VTCW; causing VBE, load no good.

Rev 2033 BOSS - Planned read-out not accomplished due to noisy 1.7MHZ baseline from data transceiver B.

Rev 2041 BOSS - Antenna delayed going active due to a faulty switch. No data lost.

5.5.1.2 RTS Miscellaneous Problems

Rev 1476 COOK - MWC data on CH.2 was noisy, reconfigured MWC line near mid-pass.

5.5.1.3 STC Computer Problems

160A Computer Problems:

Rev 1610 POGO - Negative contact with BB48 for the first 91 sec of support due to mode tape problem. BB reint.

Rev 1629 POGO - Lost 129 sec data to BB48 due to an error halt. BB reint.

Rev 1642 POGO - Lost last 42 sec of data to BB42 due to an error halt. Computer faded.

Rev 1713 HULA - Lost 130 sec TCM when mode 13 was selected. BB47 indicated a primary error and had to be recovered.

Rev 1781 POGO - BB48 transmission errors throughout pass. Attempted recovery experienced error halt. BB reint provided contact at ETT 55 sec. RTS provided voice reports as required.

Rev 1934 POGO - Lost 97 sec TRK and 159 sec TLM due to BB48 dropping off line. Mode tape problem. BB recovered.

Rev 1935 POGO - Lost 100 sec TLM to BB46 during Mode 13/ Mode 11 cycle. Recovery of RTS and BB46 did not clear the problem.

5.5.1.4 Dataline/Comm Problems

Rev 1668 POGO - Excessive dataline transmission errors during first 84 sec of support. Problem cleared.

Rev 1782 POGO - Lost BB48 contact twice during support - Total 49 sec lost.

Rev 1932 KODI - Lost all data lines during support. Problem unknown/cleared.

Rev 1954 COOK - Lost 85 sec of data transmission. Switched to backup dataline.

No DTV Failure Data Available

5.5.2 Telemetry Display Modes

During the RV-4 segment of OP 7122, the following telemetry display mode activity occurred:

1. MCR 9-59 was submitted to recind the high rate signal strength processing which was implemented in all R/T modes per MCR 9-56. The reason for recinding MCR 9-56 was due to the erroneous data output for source zero events. This problem was not evident during validation of the R/T modes with the MCR 9-56 changes.

2. Due to the problems stated in item 1, implementation of MCR 9-58 (Signal Strength Diagnostic Mode) was deferred until SV-10.

3.

No Changes Were Made to the Modes Following MCR-60.

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
I#36	59527	1441	0.534	52.0	86.2	55.03	154.4	88 39.0	0.327	
I#36	59680	1441	0.534	52.0	96.8	31.47	164.7	89 11.3	0.123	
I#37	67544	1443	0.534	-23.2	96.8	31.47	164.7	89 11.2	0.123	
I#37	67612	1443	0.534	-23.2	86.7	24.78	158.9	88 56.5	0.246	
S 26	73828	1446	0.534		86.7	24.99	158.7	88 56.0	0.246	
S 26	84580	1448	0.543		86.5	25.36	158.5	88 55.5	0.254	
P 27	13132	1451	0.521		86.6	25.80	158.0	88 54.9	0.246	
P 27	24188	1456	0.529		86.6	26.29	157.7	88 54.4	0.249	
P 27	50532	1460	0.571		86.4	26.94	157.0	88 53.1	0.275	
P 27	73048	1463	0.617		86.5	27.65	156.3	88 51.8	0.298	
S 28	2164	1465	0.586		86.5	28.36	155.7	88 50.9	0.286	
P 28	17788	1468	0.601		86.5	28.80	155.1	88 50.2	0.295	
P 28	28772	1472	0.598		86.6	29.28	154.7	88 49.5	0.294	
P 28	49440	1476	0.598		86.3	29.79	154.1	88 48.3	0.303	
P 28	72716	1479	0.589		86.3	30.72	153.4	88 47.0	0.304	
S 28	1108	1481	0.562		86.1	31.09	153.0	88 46.1	0.293	
P 29	16060	1484	0.569		86.2	31.52	152.4	88 45.5	0.299	
P 29	27588	1488	0.550		86.2	32.09	152.1	88 44.7	0.289	
P 29	48252	1492	0.555		86.0	31.61	151.2	88 43.5	0.299	
I#38	60677	1490	0.555	16.1	86.0	31.61	151.2	88 43.2	0.293	
I#38	60725	1490	0.555	16.1	86.2	32.72	159.6	88 53.1	0.280	
P 29	71456	1495	0.551		86.1	33.12	159.2	88 52.4	0.280	
S 30	29	1497	0.532		85.9	33.49	158.8	88 51.6	0.274	
P 30	10736	1500	0.541		85.9	33.74	158.4	88 51.1	0.280	
P 30	26420	1504	0.547		86.0	34.48	157.9	88 50.3	0.284	
P 30	14931	1500	0.541		86.0	33.93	158.3	88 51.0	0.281	
P 30	26420	1504	0.547		86.0	34.48	157.9	88 50.3	0.284	
P 30	47112	1508	0.526		86.0	35.00	157.2	88 49.2	0.278	
P 30	70340	1511	0.537		86.0	35.92	156.5	88 47.9	0.286	
S 30	35289	1513	0.535		85.8	36.31	156.1	88 47.1	0.289	
P 31	9604	1516	0.524		85.8	36.63	155.8	88 46.5	0.286	
P 31	24980	1520	0.538		85.9	37.36	155.2	88 45.7	0.294	
P 31	45826	1524	0.542		85.9	37.92	154.4	88 44.5	0.301	
P 31	69124	1527	0.576		85.8	38.80	153.7	88 43.2	0.325	

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Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 31	84233	1529	0.600		85.7	39.19	153.1	88 42.1	0.345	
P 1	8400	1532	0.591		85.6	39.56	152.7	88 41.5	0.345	
P 1	23736	1537	0.598		85.7	40.26	152.1	88 40.6	0.350	
P 1	50032	1541	0.613		85.5	41.19	150.9	88 38.7	0.370	
I#39	57368	1538	0.613	26.3	85.5	41.19	150.9	88 38.7	0.373	
I#39	57446	1538	0.613	26.3	86.3	36.63	162.4	88 54.9	0.305	
P 1	73212	1544	0.634		86.2	37.20	161.7	88 53.8	0.321	
S 2	1791	1546	0.633		86.1	37.49	161.2	88 52.8	0.325	
P 2	12524	1549	0.629		86.2	37.82	160.7	88 52.2	0.323	
P 2	28268	1553	0.617		86.3	38.68	160.1	88 51.3	0.318	
P 2	48956	1557	0.633		86.1	39.18	159.3	88 50.0	0.334	
P 2	72148	1560	0.623		86.1	40.20	158.5	88 48.6	0.334	
S 3	735	1562	0.607		85.9	40.59	158.0	88 47.6	0.331	
P 3	11408	1565	0.611		85.9	40.89	157.5	88 46.9	0.335	
P 3	17104	1569	0.600		86.0	41.76	156.9	88 46.0	0.333	
P 3	47780	1573	0.593		85.9	42.30	156.0	88 44.7	0.335	
P 3	70980	1576	0.589		85.9	43.30	155.2	88 43.2	0.338	
P 3	86040	1578	0.580		85.7	43.67	154.7	88 42.2	0.339	
P 4	10208	1581	0.571		85.7	44.02	154.2	88 41.5	0.338	
P 4	25572	1585	0.570		85.7	44.87	153.6	88 40.6	0.340	
P 4	14631	1581	0.571		85.8	44.20	154.0	88 41.4	0.338	
P 4	25572	1585	0.570		85.7	44.87	153.6	88 40.6	0.340	
P 4	46460	1589	0.565		85.7	45.82	152.4	88 39.2	0.342	
I#40	59100	1589	0.565	27.3	85.7	45.82	152.4	88 38.9	0.348	
I#40	59181	1589	0.565	27.3	86.4	41.06	164.6	88 55.8	0.283	
P 4	69732	1592	0.582		86.4	41.43	164.1	88 55.0	0.296	
P 4	85260	1594	0.587		86.3	41.80	163.7	88 54.1	0.303	
P 5	9044	1597	0.572		86.2	42.21	163.3	88 53.5	0.297	
P 5	24432	1602	0.578		86.3	42.97	162.8	88 52.8	0.300	
P 5	50764	1606	0.590		86.2	43.76	161.8	88 51.2	0.313	
P 5	73280	1609	0.622		86.3	44.63	161.0	88 49.8	0.333	
P 6	2660	1611	0.589		86.1	45.29	160.5	88 48.8	0.323	
P 6	13240	1614	0.593		86.1	45.61	160.0	88 48.2	0.326	
P 6	28980	1618	0.576		86.2	46.64	159.4	88 47.3	0.318	
P 6	49644	1622	0.581		86.1	47.27	158.6	88 46.0	0.329	

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 6	72812	1625	0.588		86.0	48.44	157.7	88 44.6	0.338	
P 7	1488	1627	0.559		85.9	48.81	157.2	88 43.6	0.329	
P 7	17037	1630	0.575		85.9	49.43	156.5	88 42.7	0.341	
P 7	27756	1634	0.577		85.9	50.21	156.1	88 41.9	0.346	
P 7	48416	1638	0.596		85.9	51.28	154.9	88 40.5	0.362	
I#41	61127	1638	0.596	23.8	85.9	51.28	154.9	88 40.2	0.366	
I#41	61198	1638	0.596	23;8	87.4	44.40	164.1	88 54.9	0.286	
P 7	71624	1641	0.612		87.3	44.85	163.6	88 54.1	0.297	
P 8	316	1643	0.616		87.2	45.24	163.1	88 53.1	0.305	
P 8	10904	1646	0.651		87.1	45.54	162.7	88 52.5	0.323	
P 8	26588	1650	0.636		87.2	46.41	162.1	88 51.6	0.318	
P 8	47296	1654	0.617		87.2	47.05	161.2	88 50.4	0.314	
P 8	70532	1657	0.617		87.2	48.15	160.4	88 49.0	0.318	
S 8	85511	1659	0.604		87.0	48.55	159.9	88 48.1	0.317	
P 9	14063	1662	0.598		87.1	49.14	159.3	88 47.3	0.317	
P 9	25172	1666	0.610		87.0	49.88	158.9	88 46.6	0.325	
P 9	46096	1670	0.590		87.0	50.64	158.0	88 45.2	0.320	
P 9	69336	1673	0.597		87.0	51.74	157.2	88 43.9	0.330	
S 9	84455	1675	0.621		86.8	52.18	156.6	88 42.8	0.350	
P 10	13007	1678	0.626		86.8	52.82	155.9	88 41.9	0.358	
P 10	23940	1683	0.672		86.8	53.45	155.4	88 41.1	0.387	
P 10	50236	1687	0.686		86.6	54.61	154.0	88 39.1	0.409	
I#42	57447	1684	0.686	26.6	86.6	54.61	154.0	88 39.0	0.412	
I#42	57527	1684	0.686	26.6	87.6	48.14	165.5	88 55.5	0.328	
P 10	73420	1690	0.710		87.5	48.88	164.8	88 54.3	0.347	
S 11	1871	1692	0.709		87.4	49.29	164.2	88 53.2	0.351	
P 11	17831	1695	0.711		87.5	49.92	163.5	88 52.3	0.354	
P 11	28476	1699	0.683		87.4	50.67	163.0	88 51.5	0.343	
P 11	49168	1703	0.680		87.3	51.33	162.1	88 50.2	0.349	
P 11	72364	1706	0.706		87.3	52.56	161.2	88 48.7	0.371	
S 12	815	1708	0.700		87.1	52.94	160.6	88 47.6	0.374	
P 12	16103	1711	0.704		87.2	53.57	159.8	88 46.6	0.380	
P 12	27312	1715	0.689		87.1	54.38	159.3	88 45.7	0.374	
P 12	47992	1719	0.718		87.0	55.00	158.2	88 44.2	0.401	

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Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 12	71196	1722	0.716		86.9	56.22	157.1	88 42.5	0.408	
S 12	86159	1724	0.693		86.7	56.60	156.4	88 41.3	0.405	
P 13	10408	1727	0.685		86.7	57.12	155.8	88 40.5	0.403	
P 13	25772	1731	0.669		86.7	58.12	155.0	88 39.4	0.403	
P 13	25772	1731	0.669		86.7	58.12	155.0	88 39.4	0.403	
P 13	46664	1736	0.694		86.6	59.26	153.4	88 37.7	0.425	
I#43	59996	1733	0.694	55.8	86.6	59.26	153.4	88 37.3	0.430	
I#43	60162	1733	0.694	55.8	98.2	31.84	164.0	89 12.0	0.149	
I#44	68014	1735	0.694	-24.3	98.2	31.84	164.0	89 11.8	0.150	
I#44	68087	1735	0.694	-24.3	87.5	24.67	157.8	88 56.2	0.304	
S 13	74303	1738	0.708		87.5	24.87	157.7	88 55.8	0.311	
S 13	85055	1740	0.685		87.3	25.23	157.4	88 55.1	0.306	
P 14	9280	1743	0.662		87.3	25.51	157.0	88 54.5	0.298	
P 14	24676	1748	0.638		87.3	26.16	156.5	88 53.8	0.289	
P 14	51000	1752	0.646		87.2	26.80	155.6	88 52.3	0.299	
P 14	73528	1755	0.671		87.2	27.50	154.8	88 51.0	0.312	
S 15	2639	1757	0.636		87.0	28.11	154.4	88 50.0	0.304	
S 15	13391	1759	0.642		87.0	28.29	153.9	88 49.4	0.307	
P 15	23556	1764	0.621		87.0	28.81	153.6	88 48.9	0.299	
P 15	49900	1768	0.645		86.9	29.47	152.7	88 47.4	0.318	
P 15	73068	1771	0.648		86.8	30.39	151.9	88 45.9	0.326	
S 16	1583	1773	0.623		86.6	30.76	151.5	88 45.0	0.318	
P 16	12336	1776	0.626		86.6	30.95	151.0	88 44.4	0.322	
P 16	29840	1780	0.636		86.7	31.87	150.4	88 43.4	0.330	
P 16	48704	1784	0.649		86.6	32.59	149.2	88 41.9	0.342	
I#45	51634	1782	0.649	19.1	86.6	32.59	149.2	88 41.6	0.343	
I#45	61591	1782	0.649	19.1	87.3	29.06	157.2	88 53.3	0.297	
P 16	71900	1787	0.671		87.2	29.43	156.8	88 52.5	0.312	
S 17	559	1789	0.647		87.1	29.80	156.4	88 51.6	0.305	
P 17	11180	1792	0.651		87.1	29.97	155.9	88 51.0	0.308	
P 17	28736	1796	0.639		87.2	30.85	155.3	88 50.1	0.306	
P 17	47568	1800	0.639		87.1	31.14	154.5	88 48.9	0.310	
P 17	70788	1803	0.615		87.0	32.01	153.8	88 47.6	0.304	

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Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 17	85693	1805	0.618		86.8	32.39	153.4	88 46.7	0.310	
P 18	10048	1808	0.623		86.8	32.66	153.0	88 46.0	0.315	
P 18	25420	1812	0.622		86.9	33.38	152.4	88 45.2	0.317	
P 18	46308	1816	0.612		86.8	33.87	151.5	88 43.9	0.317	
P 18	69572	1819	0.620		86.7	34.71	150.8	88 42.5	0.328	
S 18	84679	1821	0.622		86.5	35.08	150.3	88 41.5	0.335	
P 19	8832	1824	0.608		86.5	35.41	149.9	88 40.9	0.331	
P 19	24172	1829	0.598		86.5	36.10	149.4	88 40.0	0.328	
P 19	50452	1833	0.593		86.4	36.94	148.3	88 38.3	0.334	
I#46	57879	1830	0.593	27.0	86.4	36.94	148.3	88 38.2	0.337	
I#46	57960	1830	0.593	27.0	87.3	32.11	159.8	88 55.0	0.273	
P 19	73624	1836	0.612		87.2	32.68	159.3	88 54.0	0.286	
S 20	2304	1838	0.600		87.1	33.04	158.9	88 53.1	0.284	
P 20	12956	1841	0.610		87.1	33.26	158.5	88 52.6	0.289	
P 20	28700	1845	0.568		87.2	34.08	158.0	88 51.8	0.270	
P 20	49384	1849	0.588		87.1	34.58	157.3	88 50.7	0.285	
P 20	72576	1852	0.580		87.1	35.55	156.6	88 49.4	0.285	
S 21	1248	1854	0.543		87.0	35.93	156.3	88 48.6	0.271	
P 21	11848	1857	0.559		87.0	36.17	155.9	88 48.1	0.280	
P 21	27556	1861	0.566		87.0	36.98	155.4	88 47.3	0.285	
P 21	48236	1865	0.585		87.0	37.44	154.6	88 46.1	0.299	
P 21	71432	1868	0.593		87.0	38.39	153.9	88 44.8	0.309	
S 21	86256	1870	0.581		86.8	38.75	153.4	88 43.9	0.306	
P 22	10668	1873	0.578		86.8	39.08	153.0	88 43.3	0.308	
P 22	26040	1877	0.559		86.8	39.88	152.5	88 42.5	0.300	
P 22	46972	1881	0.550		86.8	40.76	151.5	88 41.2	0.299	
I#47	59608	1879	0.550	22.6	86.8	40.76	151.5	88 40.9	0.301	
I#47	59676	1879	0.550	22.6	87.3	37.42	161.8	88 54.9	0.259	
P 22	70216	1884	0.564		87.3	37.82	161.3	88 54.2	0.268	
S 22	85044	1886	0.582		87.2	38.21	160.9	88 53.4	0.280	
P 23	9520	1889	0.572		87.1	38.51	160.6	88 52.8	0.278	
P 23	24908	1894	0.572		87.2	39.26	160.1	88 52.1	0.278	
P 23	51220	1898	0.626		87.1	39.91	159.2	88 50.6	0.312	

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Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
I 23	73732	1901	0.700		87.2	40.73	158.3	88 49.2	0.353	
S 24	2965	1903	0.664		87.0	41.39	157.8	88 48.2	0.341	
P 24	13704	1906	0.661		87.0	41.65	157.3	88 47.5	0.340	
P 24	29444	1910	0.624		87.1	42.54	156.7	88 46.5	0.323	
P 24	50096	1914	0.608		86.9	43.09	155.9	88 45.3	0.324	
P 24	73256	1917	0.623		86.9	44.20	155.1	88 43.9	0.337	
S 25	1909	1919	0.600		86.7	44.56	154.6	88 42.9	0.330	
P 25	12512	1922	0.610		86.7	44.86	154.1	88 42.2	0.338	
P 25	28216	1926	0.601		86.8	45.84	153.5	88 41.2	0.337	
P 25	49368	1930	0.628		86.8	46.77	152.2	88 39.7	0.358	
M#48	61417	1928	0.628	25.0	86.8	46.77	152.2	88 39.4	0.360	
M#48	61425	1928	0.628	25.0	87.4	42.11	163.3	88 54.9	0.300	
I 25	72064	1933	0.623		87.3	42.55	162.9	88 54.1	0.302	
S 26	462	1935	0.599		87.2	42.92	162.5	88 53.3	0.294	
P 26	11348	1938	0.618		87.2	43.21	162.0	88 52.6	0.307	
P 26	27040	1942	0.599		87.2	44.10	161.5	88 51.8	0.299	
P 26	47752	1946	0.580		87.2	44.68	160.7	88 50.6	0.293	
P 26	70934	1949	0.604		87.2	45.74	159.9	88 49.3	0.310	
S 26	85806	1951	0.583		87.1	46.13	159.4	88 48.4	0.303	
P 27	10240	1954	0.568		87.1	46.53	159.0	88 47.8	0.298	
P 27	25624	1958	0.566		87.1	47.40	158.5	88 47.0	0.298	
P 27	46538	1962	0.546		87.1	48.11	157.7	88 45.8	0.292	
P 27	69340	1965	0.562		87.1	49.17	156.9	88 44.6	0.303	
S 27	84750	1967	0.566		87.0	49.57	156.5	88 43.6	0.312	
P 28	9056	1970	0.547		86.9	50.07	156.1	88 43.0	0.304	
P 28	24408	1975	0.545		87.0	50.94	155.5	88 42.2	0.306	
P 28	50696	1979	0.546		86.9	52.05	154.4	88 40.6	0.314	
M#49	57846	1976	0.546	25.4	86.9	52.05	154.4	88 40.6	0.316	
M#49	57923	1976	0.546	25.4	87.5	47.41	166.1	88 56.4	0.262	
P 28	73216	1982	0.579		87.6	47.91	165.5	88 55.4	0.280	
P 1	2616	1984	0.587		87.4	48.53	165.1	88 54.5	0.289	
P 1	13208	1987	0.617		87.5	48.89	164.6	88 53.9	0.305	
P 1	28960	1991	0.606		87.5	49.95	164.1	88 53.0	0.301	
P 1	49652	1995	0.630		87.4	50.58	163.2	88 51.8	0.319	
P 1	72848	1998	0.651		87.4	51.83	162.4	88 50.4	0.335	

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Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
S 2	1547	2000	0.629		87.3	52.23	161.8	88 49.4	0.329	
P 2	12120	2003	0.646		87.3	52.61	161.3	88 48.8	0.341	
P 2	27832	2007	0.624		87.3	53.64	160.8	88 47.8	0.333	
P 2	48516	2023	0.600		87.2	54.21	159.7	88 46.4	0.325	
P 3	47260	2027	0.584		87.0	58.85	155.8	88 41.0	0.341	
I#50	59775	2025	0.584	23.0	87.0	58.85	155.8	88 40.7	0.343	
I#50	59846	2025	0.584	23.0	88.0	52.70	165.9	88 54.9	0.281	
P 3	70508	2030	0.596		88.0	53.22	165.4	88 54.1	0.290	
S 3	85550	2032	0.615		87.8	53.66	164.9	88 53.2	0.304	
P 4	9796	2035	0.616		87.8	54.06	164.5	88 52.6	0.306	
P 4	25188	2039	0.621		87.8	54.98	163.9	88 51.7	0.312	
P 4	46120	2043	0.609		87.8	55.88	163.0	88 50.5	0.310	
P 4	69392	2046	0.607		87.8	57.11	162.1	88 49.2	0.314	
S 4	84494	2048	0.612		87.7	57.55	161.6	88 48.2	0.322	
P 5	8638	2051	0.614		87.6	58.12	161.2	88 47.6	0.327	
P 5	24040	2056	0.650		87.7	59.07	160.5	88 46.6	0.348	
P 5	50368	2060	0.704		87.6	60.21	159.2	88 44.8	0.387	
P 5	73528	2063	0.727		87.4	61.71	158.1	88 43.1	0.410	
P 5	3078	2065	0.703		87.3	62.16	157.4	88 41.9	0.406	
P 6	12776	2068	0.706		87.3	62.71	156.7	88 41.1	0.410	
P 6	28476	2072	0.681		87.2	64.09	155.9	88 39.9	0.404	
P 6	49124	2076	0.695		87.0	65.45	154.5	88 38.3	0.424	
I# 51	61475	2074	0.695	27.2	87.0	65.45	154.5	88 37.9	0.431	
I# 51	61559	2074	0.695	27.2	88.0	57.64	166.8	88 54.7	0.341	
P 6	72324	2079	0.716		87.9	58.21	166.2	88 53.8	0.357	
S 7	863	2081	0.713		87.8	58.62	165.6	88 52.7	0.362	
P 7	13815	2084	0.737		87.8	59.28	164.8	88 51.8	0.378	
P 7	27296	2088	0.699		87.7	60.06	164.4	88 50.9	0.362	
S 7	47903	2092	0.665		87.7	60.89	163.2	88 49.5	0.349	
P 7	71232	2097	0.590		87.7	62.18	162.0	88 47.8	0.317	
P 8	10472	2100	0.667		87.5	63.30	160.9	88 46.1	0.368	
P 8	25648	2104	0.680		87.5	64.49	160.1	88 45.0	0.380	

SECTION 5.6

PROGRAM COMMAND SOFTWARE PERFORMANCE

(Prepared by HTC)

5.6.1 Command Message Summary

This section summarizes pertinent command message data from Mission 1209, IRON 7122. The command messages discussed cover the period of RV4 initiation (Rev 1365 load) to the RV4 recovery message (Rev 2092 load). Six hundred and four command messages were planned by the flight profile of which two hundred and sixty-five were cancelled. The remaining three hundred and thirty-nine command messages were received and reviewed by the Technical Advisor (TA) staff. Three hundred and thirty-two were accepted and seven were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the seven messages are summarized below:

Rev No. and Load Station	Reason for Rejection
1634 G	Regenerated to add a sensor manual operation.
1728 K	No "SL" cards in deck for Rev 1728.
1748 G	Regenerated to add a forward assembly engineering MOP.
1820 P	Regenerated to delete 1825 C station contact per profile change notice.
1907 K	Regenerated to prevent a hardware constraint violation.
1942 G	Regenerated to supply manual FID entry.
2086 H	No "SL" cards in initial run deck.

In addition to the messages cancelled and rejected above, four messages were not loaded for the reasons stated below:

Rev No. and Load Station	Reason For Not Loading
1770 P	Contingency tumbling capture message was not required.
1962 P	Contingency 1964 H station contact was not required.
2092 C	RV4 alternate PIP message was not required.
2094 P	RV4 recovery abort contingency message was not required.

A one-rev load cycle was employed while the vehicle was over the area of interest. The "add-on" message generation and loading philosophy was in effect. This resulted in the generation of two hundred and thirty-six add-on messages.

Summary

Total Planned Messages:	604
Messages cancelled:	- 265
Total RV4 Messages:	339
Messages Rejected:	- 7
Messages Altered:	+ 7
Total Messages Accepted:	339
Messages Not Required:	- 4
Total Messages Accepted and Loaded:	335

5.6.2 'TUNITY Software Problems

The Flight 9 'TUNITY software problems itemized below pertain only to the period from RV3 recovery through RV4 recovery. They have been grouped into the following categories to demonstrate their impact on the flight. The disposition of these software problems will be specified by the Configuration Control Board.

Category	No. of SPR's	Comments
Flight Critical	0	Software corrections were made and incorporated during this flight period.
Non-Flight Critical (Requiring Work-Around)	0	Work-around procedures were developed and implemented.
Non-Flight Critical (Minor)	5	Work-around procedures were not required.
Product Improvement or New Requirements	6	To be considered during future development.
Documentation Error	2	MS-4 or MS-7 affected.

Itemized Software Problems

SPR MD3-8178 ('TOUT)

- Problem Description: When listing the SO tape by categories, blank pages are output. When a 'TUNITY program that writes on the SO tape terminates, it makes a call to 'TOUTF. 'TOUTF then writes a page reject on the SO tape as part of its termination processing. The page eject has the same category assigned to it as the terminating 'TUNITY program. Between 'TUNITY programs there are system messages written on the SO tape with system categories assigned to them. The next 'TUNITY program that outputs on the SO tape begins its output with a page eject to begin its output at the top of the page. This page eject is assigned the category of the 'TUNITY program that is about to write on the SO tape.

  The result of this sequence of events is system messages bracketed by 'TUNITY page ejects on the SO tape.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8179 ('TELPRO)

- Problem Description: 'TUNITY is not designed to process type 53 massage from BBRT tapes. This capability is desired for SV-10.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8180 ('TAPSTAT)

- Problem Description: 'TAPSTAT outputs a message describing each pseudo update due to a load card in a CMG run. This message only goes to the SO tape. This message should also go to the printer.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8181 ('THAYER)

- Problem Description: In message 520 for Rev 1481 POGO, 'THAYER put out the following operation and span total for Expected Due Cells:

  Normal = 20, Bonus = 26, Total = 47.

  The sub-totals for Bonus cells for the operation were 10, 17 and 0, but the total was 26. This appears to be a rounding problem.

- Solution or Work-Around: None.

- Operational Impact: There is no operational impact, just confusion to the user.

- Comment: SOST is currently investigating the problem to determine if it is a software problem or if 'THAYER is working per design.

SPR MD3-8182 ('TBALL)

- Problem Description: Duplicate commands and duplicate 'TOSTAB records will occur when the following SE cards are input:

  SE 1060 1062 ST
  SE 1060 1060 SE.

  That is, for a given message generation, if an ST subspan is specified which is longer than the SS subspan, redundant 'TOSTAB records will be written.

- Solution or Work-Around: None.

- Operational Impact: This problem has no effect on SV9 since no SE XXX XXX ST cards are being submitted.

- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-10.

SPR MD3-8183 ('TELPRO)

- Problem Description: Type 13 messages from BBRT tapes will undergo a minor format change upon implementation of Model 14.1 Realtim RTS-BB software. At transition to that software (currently planned for SV-11), 'TUNITY must be capable of processing the new format Type 13 message.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8184 ('TELPRO)

- Problem Description: Please note the following changes in the BB recording tape format in Model 14.1:

  (1) A 12-bit word consisting of two 6-bit BCD characters representing the mode run ID now follows the 12-bit word representing the mode and block number. All following words remain unchanged, aside from appearing one word later in the message.

  (2) Mode changes will be effected through Type 21 messages in lieu of 5 word Type 13 messages.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-8185 ('THISTLE)

- Problem Description: Presently we have the capability to strip history tapes of RTC data using a BBRT card with the R option under 'TUNITY. Unfortunately, these RTC's do not affect status at all. Suggest that the CMU Subsystem routines be modified to provide the capability for 'THISTLE to strip RTC's and place them in status properly.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR is not a software problem. If the BBRT is stripped at the same time that the message affected--or the next message--is being updated, the RTC's will be put in the 'TMI and they will affect status.

SPR MD3-8186 ('TWIT)

- Problem Description: MPE had a rev span from 1769 to 1781. By design, no VER WX cards were input on Rev 1769. 'TWIT error message number six came out with a response of "NO" (processing will continue), however, the processing terminated because it happened on the first rev of the span.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The above mentioned error message should be expanded to state that processing will terminate if there are no WX cards for the first rev of the span.

SPR MD3-8187 (MS-4/MS-7)

- Problem Description: The unit of values that appear in "VEHTIME" and "MVTIME", in MPR, are ambiguously defined in both the MS-4 and MS-7 documents. VEHTIME is printed out in octal clock steps, not in octal vehicle time as stated in the MS-4 and MS-7.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The Milestone 4 and the Milestone 7 should both be updated to correct the above mentioned discrepancy.

SPR MD3-8188 ('TBLOCK)

- Problem Description: When station cones occur close enough together to "combine" their load order fails to adhere to the "offs-before-ons" policy. The decoder plus will be loaded prior to the TTC minus. This problem only occurs for passes which are "combined" so that two decoder sequences are generated.

- Solution or Work-Around: The message must be altered to get the off's loaded before the on's.

- Operational Impact: If the message must be altered, then the message checking time is cut down.

- Comment: This SPR is written against the wrong program. After investigating the problem, SOST has come to the conclusion that the problem is in 'TSTAGEN and not 'TBLOCK.

SPR MD3-8189 (TUNITY MS-7)

- Problem Description: There is no description of the 'TDUGOUT run option billboard in the MS-7. This billboard appears at the beginning of 'TDUGOUT execution and should be described in the 'TUNITY MS-7 documentation.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: The above mentioned discrepancy should be corrected in the next publication of the MS-7.

SPR MD3-8190 ('TMOD)

- Problem Description: Request the capability to make rev peculiar ACAT/MCAT/WACM changes. Subsequent and prior changes should not be affected by this type of change, nor should it be necessary to make more than a single input to accomplish the entire change and subsequent release.

- Solution or Work-Around: None.

- Operational Impact: None.

- Comment: This SPR should be considered as a product improvement item for a future software delivery.

5.6.3 Hardware/Software Interface Changes

For IRON 7122, 15 change requests were processed from RV4 initiation through the RV4 recovery message (as shown in Table 5.6.3-1).

These requests were implemented via requests SV9-35 through SV9-55 and have been incorporated into the flight data base and hardware/software interface documentation. (NOTE: Requests SV9-40 through SV9-45 were disapproved and are not reflected here.)

Table 5.6.3-1. Summary of Hardware Software Interface Changes

Request No.	Identification	Data Base Effectivity
SV9-35	Adds new sequence 450 for solo test.	SV-9 only.
SV9-36	Adds redundant sequence 172 to sequence 219.	SV-9 and nominal.
SV9-37	Modifies sequence 212.	SV-9 and nominal.
SV9-38 thru SV9-39	Add new sequences 456 and 458 for solo test.	SV-9 only.
SV9-46 thru SV9-49	Add new sequences 501 thru 504 for solo test.	SV-9 only.
SV9-50 thru SV9-55	Modify sequences 92, 93, 95, 432, 433 and 434.	SV-9 and nominal.

5.7 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE (Prepared by Satellite Basic Assembly Contractor)

5.7.1 EDAP Performance

The Main Battery/Solar Array power system performed satisfactorily throughout Segment 4. Opening of Charge Current Controller K-2 Relay occurred during 723 of the 730 Rev period.

The average power usage was 20.3 amp-hours per Rev. The minimum Main Bus voltage at sun entrance was 26.6 volts during Segment 4, with an average EMF greater than 27.0 volts. The minimum Main Bus voltage during Primary Payload operations was 26.3 volts at a current drain of 60.0 amperes.

The Main Battery load sharing performance was nominal, and Main Battery temperatures were also within nominal range during Segment 4.

5.7.2 T&T Performance

The VCTS', PCM Telemetry systems, and Tape Recorders performed satisfactorily during Segment 4. The Primary systems received the majority of usage with periodic selection of Redundant systems for purposes of health checks and/or evaluation.

The weekly SGLS-2 health checks terminated on Rev 2029. Those data points collected indicated no apparent degradation in performance. The average signal strength during the flight, at 5° Rise, was approximately 88 DBM with a maximum signal strength of 82 DBM and a minimum signal strength of 94 DBM. The average signal strength at 5° Fade was approximately 84 DBM with a maximum signal strength of 80 DBM and a minimum signal strength of 89 DBM.

5.7.3 ACS/RCS Performance

The Redundant Attitude Control System (RACS) and Redundant Reaction Control System (RCS-2) maintained nominal control throughout Segment 4. The Primary Attitude Control System (PACS) remained enabled with the gyros running, however, the system provided no attitude control. There were no indications noted of PACS horizon sensor inhibit during the entire segment. Comparative data indicated good correlation between the primary and redundant attitude control systems. Gyro temperatures ranged between 167°F and 156°F for the primary system and 159°F to 149°F for the redundant system.

The Redundant Reaction Control System (RCS-2) performance was nominal throughout the segment. Propellant consumption was 114.4 pounds which equates to an average of 2.5 pounds per day.

5.7.4 Orbit Adjust System (OAS) Performance

The Orbit Adjust System (OAS) performance was nominal for the 17 orbit adjusts performed during the segment (15 positive, 2 negative). Total propellant usage for these orbit adjusts was 859.5 pounds.

An orbit adjust summary of the Segment 4 Orbit Adjusts appears in Table 5.7-1 .

5.7.5 LifeBoat II (LBII) Performance

The Lifeboat II System electronics were activated on Revs 1364 and 2094 during RV-3 and RV-4 recovery maneuvers. The data indicated nominal system performance in both cases.

The LBII propellant tank heaters remained "off" until Rev 2076. On this rev the tank heaters were activated and remained "on" for the remainder of the segment. During the "off" time the tank temperature average was between 75.5°F and 73.5°F.

TABLE 5.7-1

ORBIT ADJUST SUMMARY

SEGMENT 4, REV 1364 - 2094

~~SECRET~~

OA NO./TYPE	35 POS	36 POS	37 NEG	38 POS	39 POS	40 POS	41 POS	42 POS	43 POS	44 NEG	45 POS	46 POS	47 POS	48 POS	49 POS	50 POS	51 POS
OPS DAY	86	89	89	92	95	98	101	104	107	107	110	113	116	119	122	125	128
REV. NO.	1393	1441	1443	1490	1538	1587	1636	1684	1733	1735	1782	1830	1879	1928	1976	2025	207
DELTA VEL, fps (PREDICT)	18.31	51.96	23.16	16.10	26.44	27.18	23.87	26.70	55.58	24.55	19.05	27.08	22.63	25.02	25.51	23.10	2.39
DELTA VEL, fps (TRACKING)	18.38	52.36	22.99	16.29	26.39	27.22	23.87	26.76	55.74	24.28	18.94	27.24	22.58	25.17	25.50	23.07	2.26
BURN DURATION, SECONDS	53.8	152.2	68.4	48.2	78.2	80.8	71.2	79.6	164.8	73.8	56.6	81.4	68.6	75.8	77.4	70.2	3.2
PROPELLANT USED, LBS	35.3	98.7	44.0	30.9	49.8	51.2	44.7	49.7	101.9	45.2	35.1	49.4	41.4	45.4	46.1	41.7	9.1
AVERAGE TANK TEMP, °F	94.1	94.4	94.5	94.1	93.9	93.7	93.7	93.8	93.9	93.9	93.7	93.3	92.5	92.5	92.3	91.9	91.8
AVERAGE TANK PRESS.PSIA	116.9	114.1	112.2	111.4	109.7	108.2	106.6	105.4	103.4	101.5	100.7	99.5	98.3	97.1	95.9	95.1	93.9

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Approved for Release: 2025/07/25 C05127768

SECTION 6

6.0 Orbit Phase - Solo and Deboost

6.1 Summary

Limited Solo Testing started after RV-5 recovery with the Doppler Beacon Subsystem redundant equipment testing and turn off on Rev 1023.

Stellar Terrain Testing also started during the RV-4 segment and was basically complete prior to the normal solo segment with the exception of additional diagnostic tests.

Also prior to RV-4 recovery was a panoramic camera stellar calibrate. An 11 frame 120° scan star field exposure during a 360° pitch through maneuver was conducted on Rev 1769.

Actual solo occurred from Rev 2094 to Rev 2274, operations day 141. Because of very limited propellant allocated for both maneuvers and orbit maintenance, solo started with an OA burn raising the orbit to 105x154 N Miles. Further high drags required an additional small burn on day 135 to maintain an adequate tumble life to the deboost rev.

Most of the solo events that were scheduled were executed as planned.

On Rev 2266, the ACS-2 Power Supply failed and the vehicle was unstable a few revs prior to the planned deboost. The short tumble life and the requirement for a Lifeboat Deboost resulted in intensive planning and execution of the final events. Deboost occurred successfully on Rev 2274, operations day 141, March 18, 1975. The updated impact coordinates were 30.5°N and 174.78°E. longitude.

6.1.1 Secondary Flight Objective Accomplishments

The requirement and definition of the Secondary Flight Objectives (SFO) identified prior to the launch of 1209 are provided in Annex H to the System Test Objectives (STO). The SFO accomplishment for SV-9 is as follows:

A. SV Shroud Separation Dynamics: Conducted During Ascent

B. Reaction Control Subsystem Evaluation: SV was switched from RCS 1 to RCS 2 on operations day 82.

C. Orbit Adjust System Evaluation: System performance was monitored and reported on during the mission. A burn to depletion for deboost was planned prior to the required use of Lifeboat deboost.

D. Electrical System Degradation Determination: Conducted after each RV recovery.

E. T&T Redundant Equipment Evaluation: SGLS 2, PCM 2, TPS 2, and the UHF/ECS receiver were tested weekly.

F. Lifeboat Health Check: Conducted during early rev activity on Rev 18.

G. Weekly RE&T Performance Check: Test was performed weekly.

H. Electrical System Rev Status (ES Record): Performed twice each rev.

I. SGLS Signal Strength: Conducted weekly as planned.

J. Panoramic Camera Photographic Operations: All pan camera engineering operations were completed for each RV and for black and white, color and IR film as planned.

K. Panoramic Camera Thermal Evaluation: A thermal survey record was conducted daily.

L. Stellar Terrain Bar XC MOPs: MOPs were executed as planned.

M. Stellar Terrain Calibrations: The ST star field calibration was successfully executed on Rev 941.

N. Stellar Terrain Type 3414 Test: Three ground target accesses were successfully accomplished with the Type 3414 film.

O. K-Value Monitoring: K-value monitoring and daily reporting continued until the completion of the Stellar Terrain mission.

P. INDI Commanding: INDI RTS was used weekly for test commanding to maintain station proficiency.

Q.

R. [redacted]

S. RV-5 Thermal Protection: Data was collected to evaluate RV-5 thermal response over the range of beta angles experienced by SV-9.

T. Yaw Maneuvers: Data was collected during the mission required yaw maneuvers for negative OAs.

6.1.2 Solo Event Chronology

A summary of the Solo Event chronology is as follows:

RV-5 Recovery - Rev 958

Rev	Solo ID	Event
990-1023	DBS Test	DBS Redundant System Checks
1069,1265	FA-1	ST Emergency Shutter Open
1045	FA-2	ST Terrain Thermal Shutter Reset
1056,1137	CAR 4 TEST	Carrier 4 Signal Testing
1135	FA-4	Stellar Capping Shutters
1151,1168	OPS 1 (CDEFG)	ST Redundant Systems
1298	FA-3	ST Operation with Emergency Shutter
1588-1929	FA-6+7	ST Thermal + Rotary Shutter Motor
1670	- - -	Pallet Recording Test
1769	SFO 4.12	SS Cal Maneuver

RV-4 Recovery - Rev 2094

Rev	Solo ID	Event
2098-2143	OPS-5	Model 14 Software Compatibility
2112,2140	SS-1	SS Supply Seal Door Impedance Test
2115	ACS-3	Horizon Sensor Inhibit Diagnostic
2123	SS-2	SS Focus Adjust Range of Travel
2126-2130	EDAP-3	Solar Array Output Tumble Mode
2125-2192	EDAP-5	Solar Array Position Switches
2134	BUT CK	TT&C Back-up Timer Check

Rev	Solo ID	Event
2136-2138	RCS-1	RCS Thermal Profile
2146-2147	OPS-2 (EFGH)	SBA Heater Checks
2149	RCS-2	RCS Evaluation
2158-2166	EDAP-1	Solar Array Albedo Output-Inertial
2158	VVSA-2	Gyro Drift Calibrate
2174-2186	EDAP-2	Solar Array Albedo Output - Geocentric
2186	SS-3	TCA Thermal Test
2188-2190	EDAP-4	Solar Array Output - Maximum Baseline
2195-2214	ACS-2	Ferrotic Gyro Start Capability
2221	ACS-1	Solar Array Dynamics
2223-2238	TT&C-1	PCM Operation on Internal Clock
2040	VVSA-1	Simulate Calibrate Maneuver
2243-2248	ACS-4	Pitch Attitude Determination via S/A Output
2255	OPS-7	MCS Fuse Blow Verification
2257-2268	ACS-5/6	Vehicle Attitude Determination
2261-2268	ACS-7	Vehicle Attitude Determination
2274	- - -	Deboost

6.2 COMMAND SUBSYSTEMS PERFORMANCE
(Prepared by CSC)

6.2.1 Health

The health of the Command Systems remained excellent throughout Segment 5 (Revs 2095-2274). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures or voltages. There were no power dropouts, relay driver overlaods, or clock status errors experienced.

6.2.1.1 EXTENDED COMMAND SUBSYSTEM

.2.1.1.1 Command Modes

The ECS responded properly in all modes into which it was commanded. There were a total of 62 messages loaded in the ECS for this segment. This resulted in 17,928 SPC's being stored for readout from the PMU's.

Of the 17,928 SPC's loaded, 10,497 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 17,928 SPC's there were no command rejects.

The PCM 1 out-of sync test during revs 2223 through 2236 was completed. Most of the data was usable with the exception of VHIST offset. RMT's had to be sent three times usually to get a complete one, and the 16-Bit TLM was bad occasionally. All of these conditions are normal when the PCM is out-of-sync with the ECS.

The UHF/ECS commanding system has continued to function as expected.

6.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 4.19 parts in 10^7. This corresponds to an average frequency of .430 HZ above the nominal frequency of the 1.024×10^6 HZ. The frequency of the clock oscillators changed .00423 HZ in 179 revs. This results in a stability of 2.25 parts in 10^{10} over the 179 revs, 5.08 parts in 10^{12} for an average six hour period. All of these values are well within system specifications. See Figure 1 for clock temperature during the flight.

6.2.1.1.3 ECS Anomalies

There were no ECS anomalies during this segment.

6.2.1.2 MINIMAL COMMAND SUBSYSTEM

6.2.1.2.1 Command Modes

The MCS responded properly in all modes into which it was commanded. There were no command rejects.

The MCS was used during Rev 2143 Pogo for Model 14 commanding verification and Rev 2223 Pogo for enabling the PCM Master 1 out-of-sync solo test.

6.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

6.2.1.3 REMOTE DECODER/BUD

6.2.1.3.1 Command Modes

The Remote Decoder and BUD were not used during Segment 6.

6.2.1.3.2 Remote Decoder/Bud Anomalies

There were no remote decoder or back-up decoder anomalies.

6.2.1.4 SUMMARY

6.2.1.4.1 Expendables and Environmental Data

Command Readouts for Segment	PMU-A 5,755 PMU-B 4,742
ECS Clock Drift Rate	4.19 parts in 10^7
ECS Clock Stability	2.25 parts in 10^{10} for a 179 rev period
Total Hours On	ECS 3,365 MCS 4.6 RD 13.77 BUD .05
Total Secure Words Expended	PMU-A 148 PMU-B 140
Environmental Data	All temperatures within specifications.

6.2.2 Serial Numbers

ECS SN-113
MCS SN-111
R/D SN-109
BUD SN-113

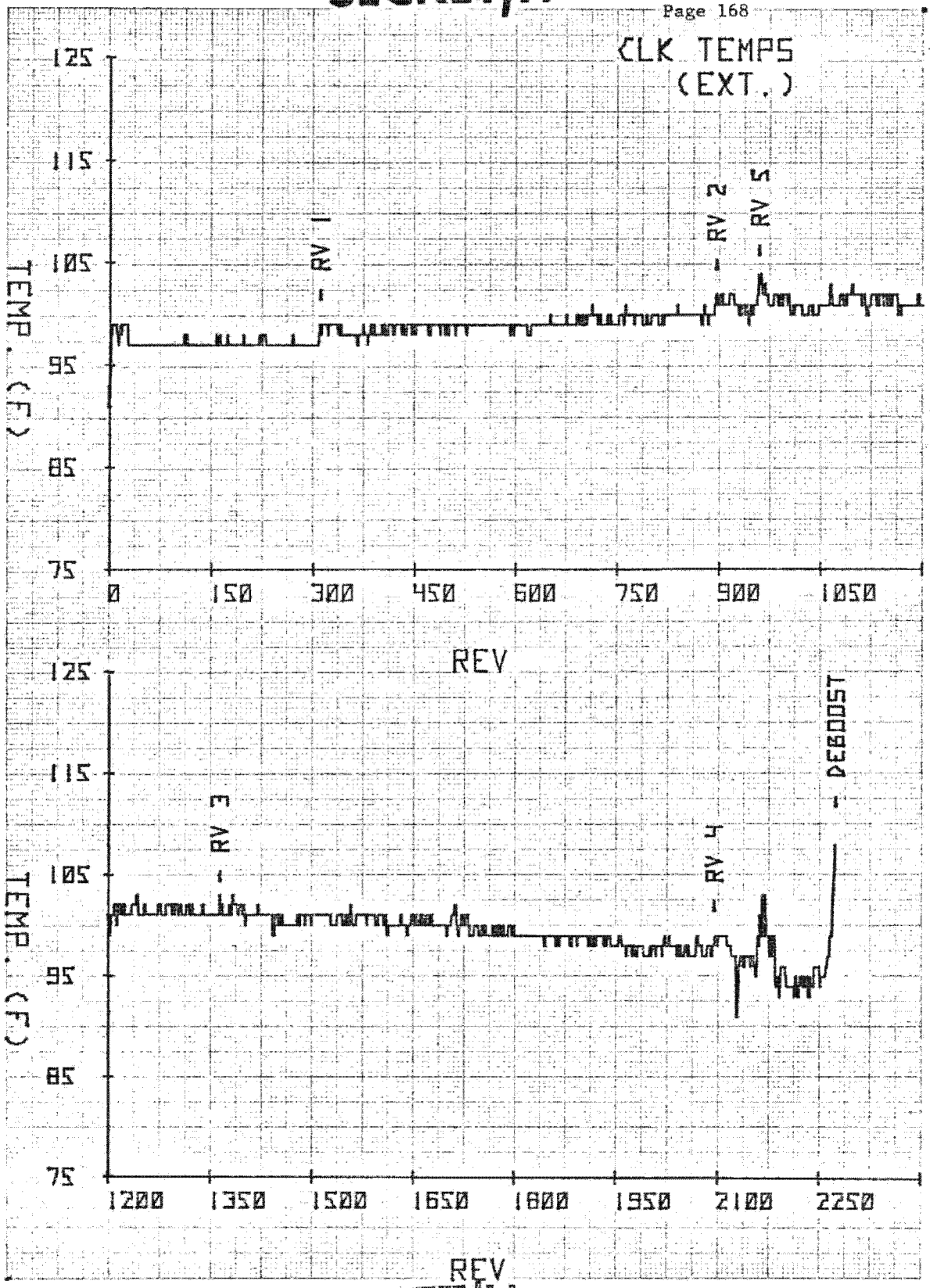

Figure 6.1

6.3 Sensor System Solo Summary

6.3.1 Test SS-1 was designed to provide data which would determine the gas flow impedence of the Film Exit Vestibule (FEV) when a pressurized supply was exhausting to a TCA in Vacuum. Data was obtained with the supply exhausting via Deal Door A (SLDA), Seal Door B (SLDB) and both SDLA and SLDB. The data for the three parts of this test were played back on station tapes 2113P, 2141C, and 2175H, respectively.

6.3.2 Test SS-2 was designed to confirm previosuly established focal plane position constraints. Data obtained on the 2124C station playback established functional maximum FP positions for sides A and B; a similar maximum position in the minus direction could not be precisely determined from the data obtained.

6.3.3 Test SS-3 was performed to provide temperature data which would allow estimation of TCA frame and midsection bending during a simulated stellar camera calibration. The test was performed on Rev 2186 and the data was played back at 2189P.

6.4 Satellite Vehicle Support

6.4.1 Solo Orbit

The orbit for solo was raised to 105x154 N Miles based on a minimum of 10 revs of tumble life on Day 141. Higher drags resulted in a need for another OA on Day 135. See Table 6.4.1

6.4.2 B Factor Sensitivity to Yaw Error

See section 6.8.10 for B Factor and Magnetic Index data supporting Solo Experiment ACS-5.

6.4.3 OPS-5 AOES Model 14 Compatibility

The demonstration of Model 14 software was accomplished at extra atation passes brought up for the purpose. The following discrepancies were noted and SPRs written:

1. Signal strength invalid
2. Improper VHIST values
3. OL error alarms during PST modes
4. Lack of SOC display of a RT source swap
5. Station time code word not displayed until sync

6.5 RV Solo Summary - No Experiments

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 8	46760	2108	0.648		87.4	65.63	159.0	88 43.5	0.371	
P 8	70024	2111	0.653		87.3	67.13	158.0	88 42.0	0.384	
S 8	84934	2113	0.664		87.1	67.64	157.2	88 40.8	0.398	
P 9	9252	2116	0.651		87.0	68.39	156.7	88 40.0	0.395	
P 9	24596	2121	0.648		87.0	69.64	155.9	88 38.9	0.401	
P 9	50864	2125	0.673		86.7	71.31	154.3	88 36.8	0.432	
I#52	59919	2122	0.673	33.3	86.7	71.31	154.3	88 36.7	0.431	
I#52	60008	2122	0.673	33.3	105.1	66.52	154.0	88 57.1	0.140	
S 9	73952	2128	0.532		105.0	69.35	154.0	88 56.5	0.226	
D 9	78230	2128	1.995		105.0	69.35	153.8	88 56.2	0.417	
S 10	2750	2131	2.431		104.5	67.16	153.2	88 55.1	0.526	
P 10	23026	2134	0.894		104.2	73.45	151.7	88 52.8	0.203	
S 10	34282	2137	1.016		104.3	74.67	151.1	88 52.2	0.230	
P 10	49808	2141	1.123		104.2	74.81	150.6	88 51.5	0.259	
P 10	73032	2146	1.290		104.0	79.27	149.8	88 50.2	0.304	
P 11	17266	2149	1.255		103.6	82.91	148.7	88 48.5	0.306	
P 11	28000	2153	1.222		103.4	83.23	148.3	88 47.9	0.303	
P 11	48672	2157	1.027		103.1	79.97	147.5	88 46.7	0.261	
P 11	71984	2160	1.025		102.6	74.65	146.3	88 44.9	0.271	
S 12	303	2162	0.987		102.3	72.49	145.9	88 44.2	0.265	
P 12	5832	2165	0.971		102.1	72.10	145.3	88 43.2	0.265	
P 12	26760	2169	0.876		101.6	66.50	144.1	88 41.5	0.249	
P 12	47416	2173	0.846		101.3	63.25	142.6	88 39.7	0.249	
P 12	70660	2177	0.845		100.7	60.08	141.2	88 37.6	0.260	
P 13	4572	2181	0.846		100.0	58.49	140.0	88 35.6	0.273	
P 13	25176	2186	0.845		100.5	47.19	139.0	88 35.7	0.263	
P 13	51388	2190	0.854		98.9	54.78	137.5	88 31.9	0.434	
D 13	55291	2190	2.945		98.9	54.81	137.0	88 31.5	0.751	
D 13	58023	2190	0.854		98.7	53.73	137.0	88 31.2	0.304	
P 13	74508	2196	0.821		98.4	52.11	135.4	88 29.2	0.305	
P 14	18968	2202	0.848		97.7	50.15	134.2	88 27.4	0.328	
P 14	49964	2206	0.876		97.1	48.08	132.8	88 25.3	0.357	
P 14	73088	2211	0.886		96.4	45.91	131.8	88 23.8	0.378	

Figure 6.4.1

Ephemeris Orbital Parameters Data

Event Code M-Maneuver, I-OAJ, P-Vector Discont, S-Splice, D-Drag

Day Event	System Time	Epoch Rev	B Factor	OA DEL-V	Min Altitude	Lat Min Alt	Max Altitude	Period	Period Decay	K Factor
P 14	73088	2211	0.886		96.4	45.91	131.8	88 23.8	0.378	
P 15	11716	2214	0.869		95.8	44.51	130.5	88 21.9	0.387	
P 15	27496	2218	0.855		95.2	43.27	129.8	88 20.8	0.394	
P 16	14832	2230	0.852		93.5	39.28	125.4	88 14.7	0.461	
P 16	25876	2234	0.838		92.8	38.10	124.8	88 13.7	0.466	
P 16	46668	2238	0.862		92.4	37.08	123.4	88 11.7	0.506	
P 16	69808	2242	0.863		91.6	35.05	121.6	88 9.3	0.541	
I#53	4742	2242	0.794	8.9	90.9	34.61	120.6	88 7.5	0.522	
I#53	4766	2242	0.794	8.9	94.8	41.74	123.8	88 12.6	0.438	
P 17	13672	2247	0.852		94.5	40.48	123.1	88 11.7	0.477	
P 17	29768	2251	0.841		93.7	39.17	122.3	88 10.3	0.494	
P 17	50264	2255	0.815		93.2	38.14	121.0	88 8.3	0.507	
P 17	73312	2260	0.832		92.2	36.40	119.6	88 6.1	0.556	
P 18	12360	2263	0.823		91.2	34.87	117.8	88 3.2	0.596	
P 18	27584	2267	0.899		90.3	33.25	116.5	88 1.4	0.692	

ORBIT ADJUST SUMMARY

SEGMENT No. SOLO & DEBOOST

OA No./ Type	Ops Day	Rev. No.	Delta Vel (Predict) fps	Delta Vel (Tracking) fps	Burn Dur sec.	Prop Used lbs	Avg OA Tank Temp deg F	Avg OA Tank Press psia
52/Pos	131	2122	33.3724	33.4690	89.6	52.6	92.03	93.05
53/Pos	135	2242	9.00	9.04	25.0	14.6	88.6	91.45
54/Neg (Deboost)	141	2274	x174.6	(Deboost)	463.2	265.4	90.3	88.3

Figure 6.4.1

SECTION 6.6

PROGRAM COMMAND SOFTWARE PERFORMANCE

(Prepared by HTC)

6.6.1 Command Message Summary

This section summarizes pertinent command message data from Mission 1209, IRON 7122. A total of one thousand eight hundred and nine command messages were planned by the flight profile throughout the flight of which six hundred and forty-nine were cancelled. The remaining one thousand one hundred and sixty were reviewed by the Technical Advisor (TA) staff. One thousand one hundred and twenty-seven of these messages were loaded into the vehicle. Additional information regarding these messages may be found in Sections 2 through 5 of this report.

During the solo phase of the flight, sixty-eight command messages were planned by the flight profile of which one was cancelled. The remaining sixty-seven command messages were received and reviewed by the Technical Advisor (TA) staff. Sixty-one were accepted and six were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the six messages are summarized below:

Rev No. and Load Station	Reason for Rejection
2132 COOK	This message was regenerated to add manual sequences which had been omitted from the execution deck.
2140 POGO	This message was altered to add an MFA-command deleted from the load station by an ephemeris shift between messages.
2183 HULA	This message was regenerated to delete a telemetry blink hardware constraint violation.
2212 POGO	This message was regenerated to add a FDU 1+2+ command omitted from the manual input.

Rev No. and Load Station	Reason for Rejection
2260 BOSS	This message was altered to add an MFA- and an I-command deleted from the load station due to an ephemeris shift between messages.
2272 POGO	This message was regenerated to change the load station from 2272 POGO to 2271 COOK.

In addition to the messages cancelled and rejected above, one message was not loaded for the reasons stated below:

Rev No. and Load Station	Reason for not Loading
2268 POGO	Vehicle was tumbling, load was attempted but not successful.

Summary

Total Planned Messages:	68
Messages Cancelled:	- 1
Total SOLO Messages:	67
Messages Rejected:	- 6
Messages Altered:	+ 6
Total Messages Accepted:	67
Messages Not Required:	- 1
Total messages accepted and loaded:	66

6.6.2 'TUNITY Software Problems

There were no software problem reports written during the solo portion of SV-10.

6.6.3 Hardware/Software Interface Changes

For IRON 7122, eleven change requests were processed from RV4 recovery through the deboost message (as shown in Table 6.6.3-1).

These requests were implemented via requests SV9-56 through SV9-66 and have been incorporated into the flight data base and hardware/software interface documentation.

Table 6.6.3-1. Summary of Hardware/Software Interface Changes

Request No.	Identification	Effectivity
SV9-56 & SV9-57	New Sequences 505 and 506 for Solo Tests.	SV-9 only
SV9-53 thru SV9-61	New Sequence MACROS 184, 185, 192 and 193 for Solo Tests.	SV-9 only
SV9-62 thru SV9-66	New Sequences 500, 507, 508, 509 and 510 for Solo Tests.	SV-9 only

6.7 FA Solo Activity Summary

Prepared by NEC

6.7.1 FA-1 Evaluate Terrain Thermal Shutter Emergency Open Characteristics

Purpose

The purpose of FA-1 was to verify the emergency open contingency capability and to obtain FA thermal response data with the thermal shutter open.

Results

The thermal shutter failed to open via the emergency open commands on the first attempt, rev 1006. A second attempt, which was successful, was made on rev 1069 during the warmest sector of the orbit. Third and fourth successful attempts were made on revs 1120 and 1165 during colder orbit sectors.

The terrain lens temperatures reached stabilization by the third rev following the initial emergency open on rev 1069.

ST operation during the rev 1006 emergency open attempt did verify proper commanding had been executed. The system had been commanded ON for forty (40) seconds with no observed thermal shutter operation, i.e., the thermal shutter remained closed.

6.7.2 FA-2 Verify Thermal Shutter Emergency Open Reset Capability

Purpose

The purpose of FA-2 was to verify the emergency open circuit could be reset and return the terrain thermal shutter operation to normal.

Results

On revs 1054, 1119, 1135 and 1166 the terrain thermal shutter was successfully electrically reset from the emergency open condition.

6.7.3 FA-3 FA Operation With Emergency Shutter Open and Reset Contingencies

Purpose

The purpose of FA-3 was to verify the FA system could be operated between thermal shutter emergency open and reset command executions.

Results

On rev 1298 a 240 second operate was executed with the thermal shutter emergency opened at operate ON and reset closed with the last frame.

6.7.4 FA-4 Verify Operation of the +/- Stellar Safety Shutters

Purpose

The purpose of FA-4 was to verify operation of the stellar safety capping shutter contingency capabilities.

Results

On rev 1135 both stellar safety capping shutters were successfully executed "closed" as verified via telemetry points S246 and S247, "Stellar Shutter Close Monitors".

6.7.5 FA-5 Operation With One Voltage Converter Off

Purpose

The purpose of FA-5 was to verify the FA system operation with either the primary or redundant voltage converter commanded OFF in both normal and backup modes.

Results

On rev 1168 two (2) normal mode operates were executed with each of the power converters separately turned OFF. Operation was normal with either converter turned OFF.

On rev 1184 three (3) operates were executed in the backup mode with each of the power converters separately turned OFF. Operation was normal with either converter turned OFF.

6.7.5 (continued)

Operate 1 - Backup Mode Baseline
Operate 2 - Backup Mode, Converter 1 OFF
Operate 3 - Backup Mode, Converter 2 OFF

6.7.6 FA-6 Emergency Thermal Shutter Motor Cumulative Cycles

Purpose

The purpose of FA-6 was to verify normal thermal shutter operation was not degraded when the emergency open motor was mechanically coupled to the normal drive train.

Results

The thermal shutter operation appeared normal until it temporarily failed on rev 2206 ops day 136. The shutter resumed operation on the third subsequent 5 frame operate. The timing of the shutter event was not typical, giving the appearance of sluggish operation. After a few cycles the shutter operation was normal. This anomaly is still being investigated.

6.7.7 FA-7 Rotary Shutter Motor Brush Test

Purpose

The purpose of FA-7 was to determine effects on rotary shutter motor brushes from extended high speed shutter operation.

Results

On rev 1621, ops day 100, during an extended operate, the rotary shutter stalled between frames 238-267 of a 269 frame operate. This failure mode repeated on long, 6 msec exposure operates and stalled permanently on rev 1864, ops day 115.

This failure occurred at approximately 30 minutes into a 35 minute operate. (The FA operational operating time limit is less than 25 minutes at maximum speed).

It has not yet been determined whether this failure mode can be attributed to the motor brushes. This failure is still being investigated.

6.7.8 FA-8 Thermal Shutter Emergency Open Operation, Forced Cold

Purpose

The purpose of FA-8 was to determine thermal shutter emergency open operation at lower than-flight-normal-temperatures.

Results

FA-8 was not accomplished due to termination of extended solo operations due to the rotary shutter failure.

6.7.9 Ops-1, c Through g, Redundant FA Electronic Systems

Purpose

The purpose of OPS-1 was to verify the FA system operation utilizing the redundant servo electronics.

Results

Transfer to the redundant electronics was completed on rev 1151. No change in operation was noted upon transfer to the redundants.

6.8 SBA Solo Test Summary

Prepared by SBAC

6.8.1 OPS-1(a) and OPS-1(b) DBS Redundant Heater/Oscillator

At Rev 990 POGO, the Doppler Beacon Systems (DBS) operating configuration was commanded to switch from the primary oscillator to the redundant oscillator. This configuration was maintained until Rev 1006 when the redundant heater was turned on and primary turned off. At Rev 1023 KODI, the DBS configuration was returned to the primary oscillator and heater operation and at Rev 1039 KODI, the DBS was totally deactivated as planned. The software program TDERBY that supports DBS commanding was also operationally terminated as of Rev 1039.

At Rev 2116 COOK, the DBS was reactivated in the primary configuration at the request of APL to check out the ground receiving equipment at Station 111. 'TDERBY was utilized for DBS command generation for Station 111 commencing with the Rev 2132 COOK load. The system re mained operational until Rev 2220 POGO when the system was again turned off. 'TDERBY support terminated with the Rev 2218 GUAM load.

Throughout the test period of redundant system check and during the additional operational period for support of Station 111, the DBS operated within specification limits. 'TDERBY performed satisfactorily throughout both specified periods.

6.8.2 OPS-2(a) Backup Timer Health Check

The objective of OPS-2(a) was to verify the Backup Timer (BUT) duration and to ensure that when the BUT docked out, the transponder would by switched off.

A non-scheduled ZI tracking station was scheduled specifically for this test, during which the transponder was programmed to be ON for a duration of 30 seconds longer than the perviously measured BUT clockout time.

The test was conducted over the HULA tracking station during Rev 2134. The transponder OFF SPC was programmed for 565.8 and 566.0 seconds (Decoder A and Decoder B) after the transponder ON SPC. The transponder was actually switched OFF 534 seconds after transponder ON,

indicating successful clockout and operation of the BUT.

Specification tolerance for the BUT duration is 540 ± 54 seconds.

6.8.3 OPS-2(c) Lifeboat II Execute

The objective of the Lifeboat II Execute was to verify that the subsystem was functionally operational. The test was performed in conjunction with EDAP-3 test "Solar Array Output, Tumble Mode". At the conclusion of the EDAP-3 test on Rev 2131, capture was initiated with Lifeboat II. Capture was acheived and the SV stabilized with magnetometer attitude control. After the initial capture, a series of eleven cycles of Lifeboat II controlled maneuvers were performed. These maneuvers consisted of RV mode (which is a pitched down orientation) to the deboost mode (which orients the SV horizontal to the magnetic flight path). The data shows that the system performed as required.

6.8.4 OPS 2 Verification of Redundant Systems Performance

OPS-2(e)	TCS Injector Manifold Heaters
OPS-2(f)	TCS Propellant Valve Heaters
OPS-2(g)	OAS Tank Heaters
OPS-2(h)	RCS Tank Heaters
OPS-2(i)	LB II Tank Heaters

The objective of OPS-2(e) through OPS-2(i), (redundant heater operation) was to verify that each heater was functionally operational. In all cases, the heaters performed as required. OPS-2(e), 2(f), 2(g), and 2(h) were ON between Rev 2146 (POGO) and 2147 (POGO). OPS 2(i) was initiated on Rev 2076 and remained ON during the remainder of the flight.

6.8.5 OPS-3 OAS Propellant Mass Status

The objective of this test was to obtain engineering data on the accuracy of the propellant mass status calculations. On the deboost Rev, 2274, the O.A. burn was segmented into two burns. The first was for 120 seconds, followed by a five (5) second shutdown. The second burn was for 348.2 seconds. Post burn data showed that there was a burn to fuel depletion and was within approximately eight (8) pounds of predicted propellant available based on the venture flow calculations.

6.8.6 ACS-1 Solar Array Dynamics

The objective of this test was to obtain additional structural damping and frequency characteristic data associated with the solar arrays for use in defining control gas usage rates. On Rev 2221, a 5 second positive roll held for 10 seconds and a 5 second negative roll was executed. Twenty five seconds later, the redundant ACS was deactivated for 150 seconds. Tape recorder data was obtained for the duration of this test plus 300 seconds. At POGO acquisition after this test the horizon sensor was inhibited in roll. The M2V2-M2V2 tumbling capture contingency was loaded and capture was initialized 65 seconds subsequent to POGO fade.

6.8.7 ACS-2 Ferrotic Gyro Start Capability

The objective of this test was to obtain start-up data on the ferrotic gyro after prolonged operation. The test was conducted on Revs 2195 through 2213 at which time the test was terminated. The IRA was disabled on Rev 2095 and remained off until Rev 2205 (approximately 15 hours) at which time it was to be enabled once per rev for ten revs.

On Rev 2205, the TLM instructions were that a gyro in the IRA failed to start during the enable cycle. The once per rev enable cycle for 120 seconds continued until test termination on Rev 2212. Diagnostic tests were performed on Rev 2215 and Rev 2214 (roll test) and Rev 2222 (mini-yaw maneuvers) which verified the yaw gyro had failed to start. Further testing of the ferrotic gyro start capability was performed during ACS-7 Solo test.

6.8.8 ACS-3 Horizon Sensor Inhibit Anomaly

The objective of this test was to produce horizon sensor single and double head inhibits to assist in the engineering evaluation of anomalous horizon sensor operation observed during the primary mission. This test was performed on Rev 2115 by rolling the vehicle to right and left to angle of 42° causing an inhibit on both horizon sensors. Vehicle performance during the test was nominal.

6.8.9 ACS-4 Pitch Attitude Determination via S/A Output

The object of this test was to obtain data to determine if a pitch bias angle could be detected by solar array output comparison at sunrise. In addition, the L/B electronics were energized to obtain magnetometer output comparisons

with ACS data. This test was conducted on revs 2244 through rev 2247. Pitch angles of $+1^{\circ}$, $+2^{\circ}$, $+4^{\circ}$ and 2° were recorded with baseline data taken on revs 2243 and 2248.

6.8.10 ACS 5 Vehicle Attitude Determination Via B-Factor

The objective of the Vehicle Attitude Determination via B-Factor Test was to determine if pitch/yaw attitude errors of ten degrees (10°) or less are detectable as bias levels on observed B-factor variations. The SV was yawed to the right ten degrees (10°) on Rev 2257. The test was terminated on Rev 2266 due to an anomalous condition in the attitude flight control electronics module.

Figure 6.8.1 shows both B-factor and magnetic index over the test period. The figure implies little correlation to the B-factor, also that there is a stronger correlation in Mag Index for the previous 6 hours than the yaw maneuver itself.

6.8.11 ACS 6 Vehicle Attitude Determination Via RCS Pulse Count

The objective of the Vehicle Attitude Determination via RCS Pulse Count Test was to determine if pitch/yaw errors of ten degrees (10°) or less are detectable as an observable increase in reaction control thruster activity. The SV was yawed to the right ten degrees (10°) on Rev 2257. Test termination occurred on Rev 2266 due to an anomalous condition in the attitude flight control electronics module. Data was obtained for pulse count analysis prior to the test termination.

6.8.12 ACS-7 PAC Yaw Gyro Evaluation

The objective of this test was to perform PACS yaw gyro tests to obtain data for evaluation of the yaw gyro's failure to start following ACS-1 turn-off on Rev 2195 and attempted restart on Rev 2205.

This test was performed in three separate sub-tests. The first test was an unsuccessful attempt to restart the PACS yaw gyro on Rev 2251, at maximum main bus voltage. The main bus voltage was 29.5 vdc, with the battery voltage at 30.6 vdc. This compares with respective voltages of 28.8 and 29.6 vdc on Rev 2205.

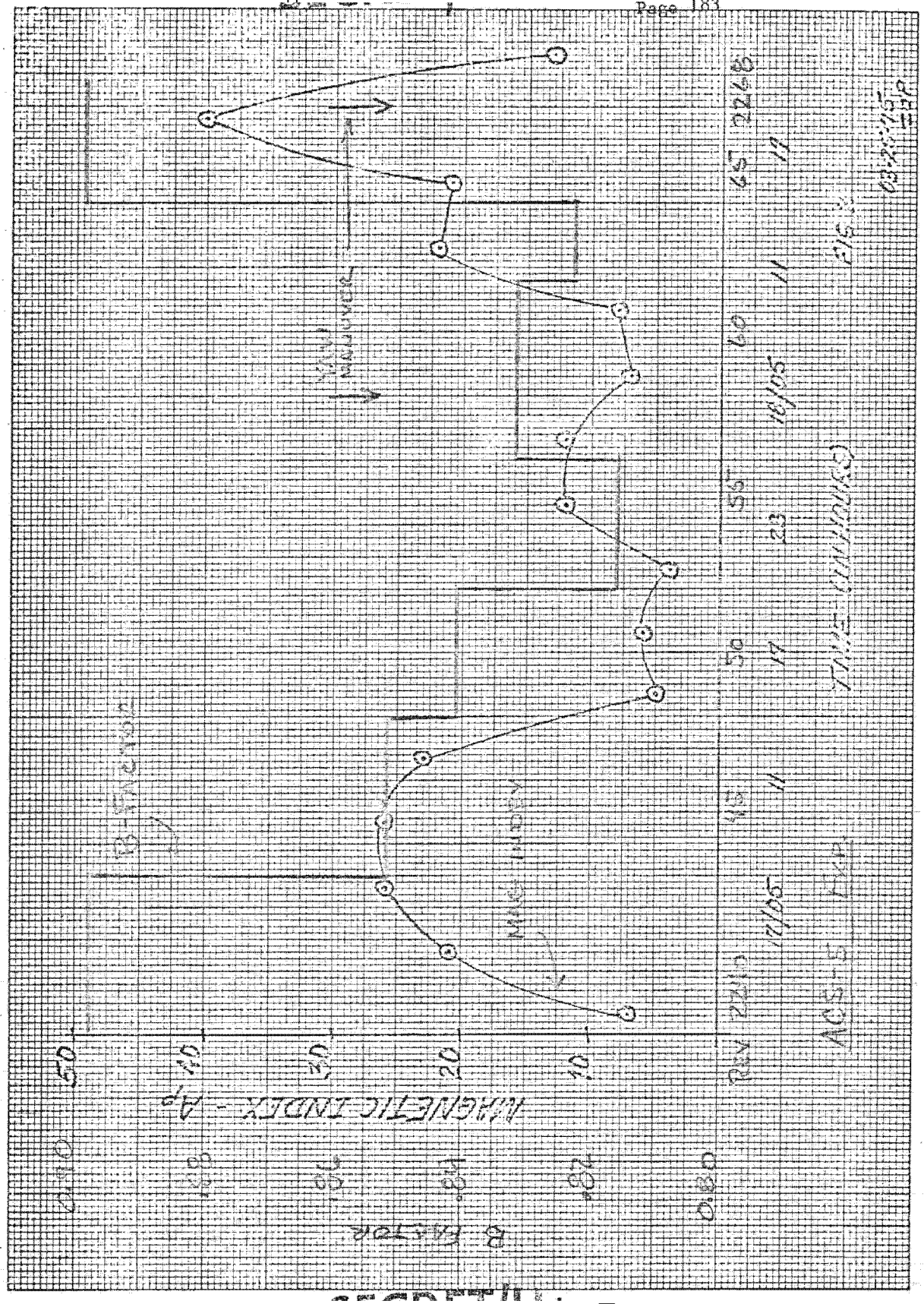

Fig. 6.8.1

The second test was a repeat of turn-on, turn-off cycles with a duration of one (1) minute on and one (1) minute off. This test consisted of twenty-four (24) unsuccessful attempts, starting on Rev 2252 to restart the yaw gyro.

The third sub-test procedure was to turn on the PACS for a period of ten (10) minutes and turn off for a period of ten (10) minutes, repeating this cycle for two hours (6 cycles). At the completion of the 6th cycle, the system was left "off" to thermally stabilize for thirty (30) minutes, then turned on for the remainder of the flight. This test was to evaluate the possibility of moisture contamination in the gyro gimbal, hence the longer on/off cycle times. The test was initiated on Rev 2260. PACS was turned "on" for the continuous on period on Rev 2261, however on Rev 2265, PACS was commanded off due to the base plate temperature exceeding 130°F. Primary pitch and roll gyro temperatures were in excess of 250°F and the yaw gyro at 328°F.

6.8.13 ACS-8 RACS FCEA Diagnostic

On Rev 2267, real time data showed no response from the FCEA. There was no RACS rate or attitude data or RCS pulsing. The objective of this test was to operate the PACS and RACS in a specific sequence which would provide discrete telemetry data to verify that the RACS FCEA failure was due to a loss of the five (5) volt regulated power supply in the FCEA. This test was performed in real time over KTS on Rev 2273. The SV was not under attitude control, however the vehicle attitude was such that data was obtained. Data dropouts were experienced throughout the pass.

6.8.14 RCS 1 RCS Thermal Profile

The objective of this test was to establish an on-orbit thermal baseline for a non-firing thruster system that included sun shadow and heater effects. This test was performed on Revs 2136 through 2138. Data was obtained during the experiment for analysis of thermal profile.

6.8.15 RCS-2 Reaction Control Subsystem Evaluation

The objective of this test was to evaluate the effect of a long storage period on the primary reaction control system.

The tests for this experiment were performed on Revs 2141, 2142 and 2149 with mini yaw maneuvers and pitchdown/pitchup maneuvers being performed to acquire the required data. One pitchdown/pitchup maneuver data was lost due to station problem on Rev 2149. Vehicle performance during these maneuvers was as expected. Data indicated thruster pulse shapes to be same as when last observed prior to transfer to RCS-2. Thruster force data indicated thrusters which had shown the greatest degradation prior to tansfer showed continued degradation.

Those thrusters which showed little degradation prior to transfer remained at approximately the same thrust level as at the beginning of the storage period.

6.8.16 LB-1 Lifeboat II Impulse/Thermal Evaluation

The objective of the Lifeboat II Impulse/Thermal Evaluation was to obtain flight data to assist in determining the total impulse capability of the system resulting from heating the propellant tanks. LB II had been used to capture the SV during the EDAP 3 Test and subsequent OPS-2(c) Tests. The system was again used to provide attitude control during the deboost burn of the orbit adjust engine. Data was obtained during the propellant tank heating for analysis of impulse availability.

6.8.17 TTC-1 PCM Operation on Internal Clock

The TTC-1 Solo Test objective was to determine and evaluate the impact on STC/RTS operations when the vehicle Master Unit is allowed to operate on its Internal Clock.

On Rev 2223 POGO, the 5 PPS signals from the ECS to the operating Master Unit were disabled, requiring the multiplexers to operate an internal clock. The vehicle remained in this configuration for thirteen revs before returning the system to ECS control.

Normal realtime data was used to assess system performance and the following preliminary results were observed:

a) The VTCW was intermittently valid at random cyclic rates. When out of sync conditions existed, trigger 2 evented continuously, causing data clutter until an in-sync condition was restored. However, this problem was circumvented by disabling the software controlled event timing by turning off various ID's.

b) The ECS time word was also intermittently valid, with an observed cyclic rate of approximately 180 seconds of valid time and 60 seconds of invalid time.

c) PMU memory totals were unable to ve verified from telemetry.

d) VHIST was invalid throughout the test.

e) DIU counts could not be adequately assessed due to no primary payload operations were performed during the test revs. However, observed counts were not affected.

With the exception of the above mentioned trigger 2 that was compensated for early in the test, realtime and playback data were not affected.

6.8.18 EDAP-1 Solar Array Albedo Output-Inertial Flight

The objective of this test was to determine the solar array output resulting from albedo radiation during the illuminated portion of the orbit. A comparison of this data and data obtained from SV-8 will be made to detect any seasonal variations that might exist. The vehicle was commanded to fly interial at mid-dark with return to geocentric control on the following rev. This test was performed four times: Revs 2158-2159, 2162-2163, 2166-2167, 2170-2171.

Data was recorded for 3100 seconds starting at sunrise; 200 seconds during the fly inertial sequence, and 212 seconds during the return to geocentric control. The 200 seconds records were to obtain pitch and roll gyro drift data.

6.8.19 EDAP-2 A Solar Array Albedo Output - Geocentric Flight

The objective of this test was to obtain data to assist in predicting the amount of solar array output resulting when the vehicle is passing, inverted over a portion of the earth that is illuminated by the sun.

Solar arrays were positioned to 0° for this test. Fly inertial was initiated on Rev 2173 at exit penumbra minus 180°. At sunrise of Rev 2174 with the vehicle inverted and flying reverse, the geocentric rate "ON" command was initiated. The vehicle then orbited through the full illuminated portion

of Rev 2174. Fly inertial was initiated at Rev 2174 Sunset. Return to normal flight forward attitude with geocentric control was performed at the correct orbit location on Rev 2175. The test was repeated twice, starting on Rev 2177 and Rev 2181 respectively.

Data was obtained during all maneuvers and continuously from sunrise minus 300 seconds to sunset plus 300 seconds.

6.8.20 EDAP 2B/SS3 Solar Array Albedo Output - Geocentric Flight/ TCA Thermal

The objective of this test was to obtain data to assist in predicting the amount of solar array output resulting when the vehicle is passing inverted over a portion of the earth that is illuminated by the sun. Concurrent with the EDAP test was a TCA thermal test, SS-3. The purpose of the SS-3 test was to obtain temperature data to estimate TCA frame and midsection bending during a simulated stellar camera calibration.

Solar arrays were positioned to 0^{o} for this test. Fly inertial was initiated on Rev 2185 sunset minus 180^{o}. At sunset on Rev 2185, the geocentric "ON" command was initiated. The vehicle was inverted and flying reverse for this portion of the test. On Rev 2186 at Sunset plus 200 seconds, the vehicle returned to inertial flight. The vehicle returned to normal geocentric flight at the correct orbit location on Rev 2187.

Data was obtained from 300 seconds prior to sunrise on Rev 2186, through the illuminated period, through sunset plus 300 seconds. Data was also obtained during the maneuvers.

6.8.21 EDAP-3 Solar Array Output, Tumble Mode

The objective of this test was to obtain data depicting typical solar array power output during the tumble mode. Test data is to be used in predicting the capability to accomplish required Lifeboat tasks in accordance with Block III EDAP design requirements. (Minimum solar array output during Lifeboat operation).

The solar arrays remained positioned at an Alpha angle of 0 from earlier EDAP-5 (Solar Array Position Switch Operation) testing.

The vehicle's Attitude Control System was disabled prior to Rev 2126 sunrise, preventing normal corrective action provided by the thrusters. The test began at Rev 2126 sunrise and was terminated on Rev 2131 sunset. Data samples were recorded for a 16 second duration at 110 second intervals from 100 seconds prior to Rev 2126 sunrise too 100 seconds after Rev 2130 sunset, and recorded continuously from 100 seconds prior to Rev 2131 sunrise to 100 seconds after Rev 2131 sunset.

The Lifeboat system provided the capture and attitude control capability at the conclusion of the test on Rev 2131. Capture was achieved in approximately 132 seconds

6.8.22 EDAP-4 A Solar Array Output, Maximum Baseline

The EDAP-4 A solo test objective was to determine a baseline solar array power output in preparation for earth albedo tests EDAP-1 and EDAP-2.

The solar arrays were positioned at an Alpha angle of 0 and the vehicle maneuvered such that at Rev 2191 sunrise, the vehicle's attitude was inertial, with the arrays directly facing the sun.

The vehicle remained in inertial flight during the complete illuminated portion of Rev 2191. The primary payload power was programmed on during the sun portion of Rev 2191 so as to hinder K2 relay closure during the test Rev.

Also, in preparation for the EDAP-4 A test, additional loading of the main battery/solar array power system was performed during Revs 2188 through 2190 (EDAP-4) in order to minimize the probability of a K2 relay closure during the test Rev.

Test data was recorded continuously from 300 seconds prior to Rev 2191 sunrise to 300 seconds following Rev 2191 sunset.

6.8.23 EDAP-5 Verification of Solar Array Positioning Switches

The objective of this test, since the solar arrays had remained in the $+18^{\circ}$ position throughout the mission, was to verify operation of the positioning drive motors

and position switches.

On Rev 2125 COOK the arrays were positioned from +18° to 0° for the EDAP-3 test remaining at 0° through the EDAP-1 test. On Rev 2187 POGO, the arrays were positioned to -18° for the EDAP-4 test which was designed to provide minimum array output. On Rev 2190 COOK, the arrays were positioned to 0° for the EDAP-4 A test. On Rev 2192 POGO, the arrays were positioned to their original +18° where they remained for the mission duration.

The time for positioning ranged from 48 to 56 seconds. This was well within the nominal range. All functional aspects of the system performed satisfactorily.

6.8.24 EDAP-6 Solar Array Degradation Evaluation

The objective of this test was to determine the solar cell degradation experienced during the mission. It was necessary, for an accurate evaluation, to obtain a full solar array output (no K2 relays open).

Revs 1702 and 1703 were selected, due to heavier than normal power usage because of the FA 6 and 7 solo tests. RET record sequences were scheduled and very good output data was recorded on both revs.

The data was plotted and the output integrated for comparison with the data obtained on Rev 7.

6.8.25 Simulate Calibrate Maneuver

Test objective was to demonstrate the maneuver technique to be used for the calibration of VVSA which is to be installed on a future vehicle. The maneuver to demonstrate the calibrate technique was performed on rev 2240. The sequence involved a pitch-down, roll right, roll left and a pitch down during inertial flight. Vehicle performance during this test was nominal and demonstrated the vehicle capability to perform the required VVSA calibrate manuever.

6.8.26 Gyro Drift Calibrate

The objective of this test was to calibrate the gyro drift and demonstrate the compatibility of the command sequence with the vehicle for flying inertial. This test was performed in conjunction with EDAP-1 solo test while the vehicle was flying inertial on revs 2158, 2162, 2166 and 2170. Vehicle performance during this test was considered to be nominal.