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R. Anderson

5.10.2

PRELIMINARY POST FLIGHT
REPORT (PPFR)

SV-10

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HEXAGON PROGRAM
PRELIMINARY FLIGHT EVALUATION
REPORT FOR FLIGHT NO.10

31 OCTOBER 1975



R. L. MEREDITH
Technical Advisor
Hexagon Program

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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 the 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.

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FOREWORD

This document presents preliminary evaluation results of vehicle and ground system performances during the tenth 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. 10 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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~~SECRET/H~~1.1 Flight Summary

SV-10 was shipped to Vandenberg Air Force Base on the 14th of May for a scheduled launch of 3 June. Investigation of mounting bolt torques on a vector motor of the Titan IIID delayed the launch until 7 June. A countdown conducted on 7 June was delayed ten minutes into the launch window due to a train in the range and finally aborted at T-31 sec due to a low battery voltage on the SRM unit. The vehicle was launched successfully on 8 June at 1130:01.0 PDT.

Solar Arrays were deployed at Rev 0 INDI. No change of positioning was required. The Doppler Beacon System (DBS) antenna was deployed and the system activated on Rev 0. Subsatellite No. 2 (+Y) was enabled, erected and separated on Rev 2. [REDACTED]

All Panoramic Camera operations through the first mission segment were achieved with no sensor system malfunctions. The overall image quality of both cameras ranged from good to poor with the majority being rated fair. The poor imagery was for the most part attributed to atmospheric and weather conditions.

The RV-1 payload was 98.9 percent of the maximum weight and unbalanced 1.36 percent. RV-1 Recovery occurred on Rev 261, June 24, 1975, Flight Day 17. Aerial recovery was accomplished on the first pass at 12,300 feet altitude, 15.24 nautical miles from the predicted impact point.

The Sensor Subsystem exhibited nominal characteristics until Rev 433, when an Aft Camera ESD shut down both cameras. Data indicated that a relay contact in the Power Distribution System failed to properly apply power to the Aft Camera when commanded. Normal camera operations were resumed on Rev 461. The remainder of RV-2 operations were nominal. The over-all quality of the acquired photography ranged from good to poor with the majority rated as fair. Prevailing atmospheric haze and poor weather continued to significantly affect image quality. The forward camera imagery continued to be judged sharper than that of the aft.

The RV-2 payload was 97.62 percent of the maximum weight and unbalanced 0.08 percent. RV-2 Recovery occurred on Rev 829, July 29, 1975, Flight Day 52. Aerial recovery was accomplished on the first pass at 12,200 feet altitude, 3.7 nautical miles from the predicted impact point. With aircraft contact payout was excessive to the point the winch had to be manually stopped. Once on board the Recovery Aircraft, inspection revealed only three of the eight heavy load lines remained intact.

The performance of the Stellar Terrain camera was affected by two major camera relay failures. ST camera relays K2 and K3 failed in the closed configuration, applying power to the takeup and supplies (K2) and applying power to the terrain and stellar film transport clutches (K3). The relay failures were unrelated.

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1.1 Contd.

The Sensor Subsystem exhibited nominal operation until Rev 852, when the aft camera take-up integrator reset signal ceased functioning. The problem occurred twice through the remainder of RV-3 and had some impact on efficiency. The overall image quality of RV-3 ranged from poor to very good. As in previous segments of this mission the poor and fair imagery is attributable to adverse atmospheric and acquisition conditions. Forward camera imagery also continued to show superiority compared to the Aft, and the overall quality of RV-3 was slightly improved over that of RV-2.

The Primary Attitude Control System was nominal throughout this segment. The Primary Reaction Control System Thrusters were used until Rev 1299 when, due to low thrust levels, an orderly transfer to RCS-2 was performed.

The RV-3 payload was 97.97 percent of the maximum weight and unbalanced 1.80 percent. RV-3 Recovery occurred on Rev 1429, September 4, 1975, Flight Day 89. All reentry events were normal and executed as planned. Aerial recovery was accomplished on the second pass at 7500 feet altitude, 8.4 nautical miles from the predicted impact point.

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced. The nested operation constraint, instituted in RV-3 was eliminated. The overall image quality of both cameras ranged from poor to good with the majority rated fair to good. The poor and fair photography was attributed to adverse atmospheric and acquisition conditions.

The RV-4 payload was 88.68 percent of the maximum weight and unbalanced 0.68 percent. RV-4 Recovery occurred on Rev 1948, 6 October 1975, Flight Day 121. All events were normal and executed as planned. Aerial recovery was accomplished on the first pass at 12,200 feet altitude, 6.6 nautical miles from the predicted impact point. The heat shield was not recovered.

Actual solo occurred from Rev 1949 to Rev 2436, Operation Day 151. With sufficient propellant, solo started with an orbit adjust to an orbit of 91 x 160 nautical miles. Orbit adjusts were scheduled every two days to maximize the number of restarts until Day 143. Thereafter, a new orbit at 100 x 158 was allowed to decay without maneuvers to permit evaluation of drag effects on orbit determination. Most of the solo events that were scheduled were executed as planned.

On the last day and the final Solo test demonstrating a new recovery procedure, the vehicle did not complete a pitch-up maneuver and tumbled on Rev 2433, three revs before the planned Deboost. After tumbling the planned Burn to Depletion Test and ACS controlled Deboost was cancelled and quickly modified to the Lifeboat Deboost for the planned rev. Deboost occurred on Rev 2436, Flight Day 151, November 5, 1975. The updated impact coordinates were 52.8° N Latitude and 177.8 E Longitude.

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1.1.1 Anomaly Summary

<u>REV.</u>	<u>DESCRIPTION</u>	<u>ACTION TAKEN</u>
61	K2 Pwr Relay (NEC) failed in "closed" position. Continued to fail & heal alternately until final freeze up on Rev 153.	a. K2 cycled to release on Rev 63. b. Withheld further FA ops until greater conf. Continued FA ops "as is" watching temp.
112	REA #55 Chamber Temp Sensor inoperative at high temps.	No impact on mission.
146	REA #6 Pressure Transducer inoperative.	No impact on mission.
308	REA #8 Chamber Temp Sensor erratic.	No impact on mission.
434G	ESD "B" side.	Suspended P/L ops--ops resumed with return of CB power.
545	FA System lost phase lock.	FA engine Rev 552 COOK--suspended FA ops.
561	K-3 (FA) failed in "I" state (closed).	K-3 fixed itself.
853	TU-3B Integrator failed to reset.	Inhibited nested ops.
1299	RCS-1 Thruster Levels low.	Switched to RCS-2.
1573	Time Word improper in TM	Switched to TPS2.
2287	HSA #1 Pwr Supply failure.	Switched to ACS-2

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<u>REV.</u>	<u>EVENT</u>
0	Liftoff and early orbit was nominal.
7	First payload operations.
21	Missed payload due to rejected message.
32	Transitions from 1414 to S0-130 and back (B&W to IR and back) occurred.
78	FA K-2 relay was stuck. FA ops were suspended until Rev 105 when K-2 relay operation was again satisfactory.
112	First yaw around and negative burn this operation. Thruster evaluation in process.
153	FA K-2 relay remained closed after the operate. Subsequent operates failed to free the relay.
173	
196	Cycling ST+ and ST- with K-1 as a contingency action
267	Successful recovery of RV-1. Commenced operations on RV-2.
314	Changed nominal $0^{22}A$.
433	An ESD experienced on Camera B. Payload ops suspended.
446	Health test showed "A" side OK, "B" shut down by failure. "Blink" tests on "B" side profiled. Mono A operation.
461	Malfunction corrected itself. Normal stereo ops resumed.
498	The ST operations cycle now 9 revs on, 7 revs off, to limit rise of T/U temp.
553	FA on, deleted due to phase lock problem observed on Rev 545 and subsequent engineering test required at 552C. Test was successful.
557	FA released for ops on Rev 557.
559	On Rev 559 a 0.1 volt signature variation on FA terrain transport metering tach was observed for duration of the 10 frame operation. Phase lock was maintained throughout the operation. All other ops were normal.
561	K-3 relay failed closed after op. OA 15 and 16 were nominal. Thruster evaluation made. Remote TM Unit 1B used to evaluate Pressure Transducer #6.
611	Mono A.
640	K-3 relay opened after the FA op.
744	Remote Unit 1B is to be used for OA #15.
750	S/C FA ON moved to S/C 7 to reduce take-up heating.
754	FA Material Change Detector turned on.

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<u>REV.</u>	<u>EVENT</u>
778	Stellar Metering Clutch operated abnormally.
806	FA Cal & Runout performed.
829	RV-2 recovered.
835	Twenty-five frames of Mono A.
845	RV-5 recovery successful.
869	Data indicated that Aft Camera Take-up Integrator failed to reset at Film Transport ON. Under investigation with restriction on nested ops.
881	O ² A ² change.
894	Tape Recorder 2 is being used to accomplish the survey.
910	Doppler Beacon turned off.
914	Mono A ops on 914 and 916.
924	Take-up "B" Integrator reset correctly.
928	Mono A op, 21 frames.
932	Take-up "B" Integrator reset correctly.
1006	RCS Valves 2 & 3 scheduled to be opened to increase feed pressure to increase thrust.
1053	
1233	
1250	
1298	RCS2 Heater on.
1299	MLV1 MLV2 on.
1310	Primary REM Heaters off.
1318	Transfer to Type 1414 film.
1429	RV-3 recovered successfully.
1480	Forty frames of Mono A.
1569	Initiated on SP message per day procedure.
1580	Mono A.
1709	Twenty-eight frames Mono A.
1725	Entered SO-255 material.
1789	Changed from SO-255 to SO-124.
1883H	Switched to redundant temp control elec assembly for OPS-1(L) SFO.
1894	Switched to Time Word Power Supply 2. No erroneous VTCWs observed since switching to TPS-2.

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1908 Path pressurization, no ops taken.

1918 No ops, path pressurization.

1940 ESD on Side A as anticipated for the final operation.

2110 TR-2 used in support of NEGR-3.

2135 OB's failed to stow properly after DEMO-2A. Special add-on with OB stow sequence loaded at 2135 COOK. OB stow was confirmed.

2142 Simultaneous use of RCS 1 and 2 started.

2161 RCS 1 and 2 joint operation terminated. Back to M1V2 configuration.

2284 Solar Arrays moved from -18° to 0° .

2287 ACS 1 failed, switched to ACS 2 on Rev 2289.

2409 Magnetic storm resulted in very high drags. Now diminishing and expected to reach Rev 2436 with 16 revs Tumble Life.

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1.2 PROGRAM SUMMARY

MISSION	CONFIGURATION	DURATION	RECOVERIES	COMMENTS
1201 <u>Launched</u> 15 June 1971 <u>Deboost</u> 6 August 1971	FIRST HEXAGON MISSION. Normal ACS/RCS config. Restricted rewind-Pan Cam. Beta Angle -20° to $+10^{\circ}$ RV unbalance 60%	<u>Primary</u> 31 days <u>Solo</u> 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	- Thermal contamination High temperatures reduced batt. capacity--limited payload operations. - Main parachute damage RV's 1, 2, 3. - Camera ESD's--resumed operation each time. - Degraded RCS thruster pulse shapes--Control OK
1202 <u>Launched</u> 20 January 72 <u>Deboost</u> 28 February 72	Beta angle $+18^{\circ}$ to $+30^{\circ}$ Subsatellite Rev 13 Parachutes modified Rewind limited to 35 ips	<u>Primary</u> 40 days <u>Solo</u> 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	- Film path break Camera B RV 3 & 4 Monoscopic operation. - RCS thruster degradation SV tumbled 2 times. - Deboost used Lifeboat. - Thermal contamination verified.
1203 <u>Launched</u> 7 July 1972 <u>Deboost</u> 13 Sept 1972	Laboratory quality Hydrazine. Higher perigee, minimum maneuvers and OA's Redundant RCS tanks empty-- filled from OAS when needed Beta angle $+34^{\circ}$ to $+26^{\circ}$ Subsatellite-Rev 13.	<u>Primary</u> 48 days <u>Solo</u> 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	- Film edge folds--both cameras. - Film path disturbance at high rewinds. - High RCS thruster leaks, primary and redundant.

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MISSION	CONFIGURATION	DURATION	RECOVERIES	COMMENTS
1204	10,000' color-Camera A	<u>Primary</u>	RV-1 11 days 10/21/72	. Improper OB stow degraded
<u>Launched</u>	RCS tanks 3 & 4 capped	68 days	RV-2 16 days 11/5/72	early photography
10 October 72	Beta angle +30° to +24°		RV-3 18 days 11/23/72	. Yaw bias RACS Day 35
	Minimum SV maneuvers	<u>Solo</u>	RV-4 24 days 12/17/72	. Yaw bias PACS Day 68
	Subsatellite - Rev 2	22 days		. Pyro battery leaks
<u>Deboost</u>	RACS control RCS 1 at L.O.			RV-2 and RV-4
8 January 73				
1205	First mapping mission	<u>Primary</u>	RV-1 12 days 3/22/73	. Primary ACS pitch error.
<u>Launched</u>	2000' color-Camera A	61 days	RV-2 14 days 4/5/73	. Redundant ACS yaw bias
9 March 1973	RCS operated from OAS		RV-3 14 days 4/19/73	(degraded photography)
	No subsatellites	<u>Mapping</u>	RV-4 22 days 5/9/73	. ST terrain thermal door
	Beta angle +2° to -8°	43 days		(restricted ST operations)
<u>Deboost</u>			RV-5 43 days 4/21/73	(No ST calibration)
18 May 1973		<u>Solo</u>		. ST quality excellent
		9 days		. SGLS 2 (Cubic) failure
1206	21,000' color-Camera B	<u>Primary</u>	RV-1 19 days 8/1/73	. Primary ACS yaw bias on
<u>Launched</u>	in 5 segments	74 days	RV-2 12 days 8/13/73	Day 3-Transferred to
13 July 1973	RCS 1 & 2 operate from		RV-3 26 days 9/8/73	RACS
	OAS	<u>Mapping</u>	RV-4 17 days 9/25/73	. Thrust level decay REA
	Propellant in RCS Tank 2	42 days	RV-5 42 days 8/24/73	#4 & 8 - No effect.
<u>VASP Deboost</u>	only. (Emergency use)			. ST calibration successful
12 October 73	Beta angle +2° to -8°	<u>Solo</u>		. VASP Deboost/impact
	50 hour batteries in RV's	17 days		successful.
	Modified ST terrain therm.			. RV-1 recovery one day after
				trimmed seal.

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MISSION	CONFIGURATION	DURATION	RECOVERIES	COMMENTS
1207	Soft seat REM valves	<u>Primary</u>	RV-1 14 days 11/24/73	. RCS 1 used until Day 90
<u>Launched</u>	RCS 1 supplied from RCS tanks 1 & 2	101 days	RV-2 24 days 12/17/73	. All mission objectives satisfied.
10 November 73	PACS and RACS torquers isolated	<u>Mapping</u>	RV-3 27 days 1/13/74	. 58 OA's executed during mission and Solo.
<u>Deboost</u>	SGLS 1 & 2 Cubic. +Y and -Y subsatellites	57 days	RV-4 37 days 2/20/74	. All expendables used
13 March 1974	Pan Camera commandable filter. 5000' color & 500' IR Special ST terrain film for test.	<u>Solo</u>	RV-5 57 days 1/8/74	. SSP successful
		21 days		
1208	RCS Tank 1-4 filled	<u>Primary</u>	RV-1 15 days 4/23/74	. RCS-1 used until Day 62
<u>Launched</u>	SGLS 1 G.D. unit.	106 days	RV-2 28 days 5/21/74	. All mission objectives satisfied.
10 April 1974	TR 1 & 2 stored cmds via MCS. B/U ECS/UHF command receiver.	<u>Mapping</u>	RV-3 27 days 6/26/74	. 43 OA's executed.
<u>Deboost</u>	+Y and -Y subsatellites	61 days	RV-4 36 days 7/24/74	. All expendables used.
28 July 1974	2600' color and 3400' of IR film for Pan.	<u>Solo</u>	RV-5 61 days 6/9/74	
		5 days		
1209	RCS Tanks 1-4 filled	<u>Primary</u>	RV-1 20 days 11/17/74	. RCS-1 used until Day 70.
<u>Launched</u>	SGLS 1 & 2 Cubic Mfg.	129 days	RV-2 36 days 12/23/74	. All mission objectives satisfied.
29 October 74	+Y and -Y subsatellites	<u>Mapping</u>	RV-3 29 days 1/21/75	. 54 OA's executed
<u>Deboost</u>	8150' color and 3400' IR film for Pan camera.	60 days	RV-4 44 days 3/7/75	. All expendables used.
18 March 1975		<u>Solo</u>	RV-5 60 days 12/27/74	. LB Deboost Rev 2274 after ACS 2 Power Supply Failure
		12 days		. H/S Inhibit Failure on ACS 1 on Rev 1118

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1.3 Readiness, Launch, Ascent

1.3.1 Readiness Activity

SV-10 was shipped to Vandenberg Air Force Base on the 14th of May for a scheduled launch of 3 June. Investigation of mounting bolt torques on a vector motor of the Titan IIID delayed the launch until 7 June. A countdown conducted on 7 June was delayed ten minutes into the launch window due to a train in the range and finally aborted at T-31 sec due to a low battery voltage on the SRM unit. The vehicle was launched successfully on 8 June at 1130:01.0 PDT.

1.3.2 SV-10 Configuration Update

1.3.2.1 ACS/RCS Subsystem

- RCS propellant tank load (520#) has been effectively increased by increasing the tank pressure to the maximum allowable (2:1 ratio, burst pressure/load pressure).
- OAS propellant tanks are "stuffed" with 3416# (approximately 100# over nominal) of usable propellant.

1.3.2.2 EDAP Subsystem

- A "Current Sensor Integrator" (CSI) has been added to each of the main (type 29) battery circuits. This device will provide an amp-hour count of battery charge and discharge currents to provide a better view of battery efficiency and "state-of-charge".
- Concurrently, the amp/hour meter range has been increased to 0-100 amp/hrs, stepping at one amp/hour increments, greatly improving the granularity.
- Lifeboat tank heaters have been moved from the Lifeboat Buss to the Switched Buss for greater flexibility in contingencies involving the Lifeboat system.

1.3.2.3 ECS/MCS Subsystem

- Command either TR from either ECS decoder
- Select SGLS 1 or SGLS 2 with PCON

1.3.2.4 TT&C Subsystem

- Improved (late) checking procedures should improve reliability of antenna cavities to hold pressure.

1.3.2.5 SSC Subsystem

- None

1.3.2.6 RV-1 thru 4

- RV-2, 3 & 4 will contain 476# of product when registering "100% FULL". RV-1 will contain 460# at "100% FULL".
- A Builder Roller modification should minimize, if not prevent, the film fold-over problem experienced in the past.
- RV-2 has Paradyamics parachute.

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1.3.2.7 APSA Subsystem

- . The Terrain Camera Shutter has been modified to function at a lower (18V) voltage.
- . Increased shielding around the Thermal Shutter will insure a minimal impact when operating in a high radiation environment.

1.3.2.8 Subsatellites

- . SV-10 will carry a on the +Y side to be ejected at apogee on Rev 2.9.
- . The SSU Subsat, previously scheduled for the -Y side, will not fly on SV-10.

1.3.3 Operational Ground Rules

- 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 130 days. Planned recovery days are 25, 55, 90, and 130.
- d. Mapping camera mission planned for 60 days.
- e. Orbit Parameters (Nominal) Case 1001.

Inclination	96.4 degrees
Period	88:52.25 minutes
Perigee Altitude	88.6 nautical miles
Apogee Altitude	153.02 nautical miles
Argument of Perigee	145.2 degrees

f. Panoramic Camera Restrictions

- 1 (1) Rewind fixed at 5 ips.

g. General Constraints

- (1) Doppler beacon ON/OFF 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 require a turnoff.

1.3.4 'TUNITY Modifications Summary

- 1) Slit Servo Model to allow commanding time.
- 2) WAC Data Card adjustment for Number of Looks
- 3) Front Lighting Weight Penalty in Acquisition
- 4) Mapper Camera Category increase from 15 to 50
- 5) An expanded Single Cell base weighting
- 6) Rise/Tran and Fade/Set Separate Widening
- 7) Improved Manual Station Capability
- 8) Uniform System and Vehicle Time Printout.

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1.3.5 Documentation Configuration

- 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 19 May 1975.
- 4) Field Test Force (FTF) Profile Nom Flt, dated 23 October 1974.
- 5) Computer Usage Schedule (CUS) Flt 10-1B
- 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 12 May 1975.
- 10) Systems Test Objectives (STO), dated October 1973, (Rev B).
- 11) Orbital Support Plan (OSP), dated 27 November 1974.
- 12) Sequence Definition Specification (SDS), dated 14 May 1975.
- 13) Command Definition Specification (CDS), dated 14 May 1975.
- 14) Hardware/Software Limitations Specification (HSLS), dated 5/14/75
- 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 5 May 1975.
- 18) SV-10 Contingency Plan, dated 12 May 1975.

1.3.6 Software Configuration

- 1) 'TUNITY
 - a. Auxiliary Master Tape AMT 3.318
 - b. Auxiliary COMPOOL COMOCPGP
 - c. SAFARI Tape 1003
- 2) System II
 - a. System Support Tape (SST) 15.0A
 - b. SST Corrector Tape CT150A18
 - c. Data Base Fit FLT10DB5
 - d. System COMPOOL COMSYSXF
- 3) Bird Buffer Master 14.0CD
- 4) RTS Master Disk 14.0CB with Corrector Set 2

1.3.7 Telemetry

All telemetry modes required for support of SV-10 were generated and validated prior to start of Dress Rehearsal, using prepass D.

1.3.8 Pad Load and Emergency Messages

- 1) The flight pad load was generated to support a planned launch date of 3 June and was used for the 8 June launch with a time offset to accommodate 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:

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- 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
 - BU Timer Enabled
- d. Rev 2
 - SA deploy

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

- 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 PCON - 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.

1.3.9

Expendables (Liftoff Status)

OA Tank	3417 Pounds Propellant	
RCS Tanks 1, 2, 3, 4	543 Pounds Propellant	
Panoramic Camera	Camera A	Camera B*
Film on RV-1 ft.	1884	1866
Film on Supply ft.	113,576	108,880
Pneumatics lbs	17.5	17.5

*Includes 9150 feet color, 3150 feet IR and 3750 feet of Hi Resolution

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Mapping Camera	Terrain	Stellar
Mapping (frames) 3414	2029	2029
Engineering (frames)	62	78
Excess (frames)	----	228
Total footage	3398	2125

1.3.10

Injection Accuracy

Day 1 Best Flt Ephemeris showed that a near nominal orbit had been achieved except perigee was 9.8 degrees North of the planned location and perigee was 1.1 n.mi. higher 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

<u>ITEM</u>	<u>PREDICTED</u>	<u>ACTUAL</u>	<u>(A-P)</u>	<u>UNITS</u>
Match Point Geod Lat.	20.0352	19.9444	.0908	Deg.
Radius	3530.2374	3530.2590	-.0216	N.M.
Velocity	25,735.79	25,735.67	.12	Fps
Gamma (Flt path)	.2205	.2212	-.07	Deg.
Long	123.6914	123.7083	.0169	Deg.
<u>Rev 0 Orbit Comparisons</u>				
Apogee	149.38	157.12	+7.74	N.M.
Perigee	87.84	88.96	+1.12	N.M.
Arg Per	145.3	135.5	-9.8	Deg.
Period	88:47.3	53.7	+6.4	Sec
Eccentricity	.0091	.0099	.0008	nd
Inclination	96.4	96.36	-.04	Deg.

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SECTION 2

2.0 ORBIT PHASE - REV 1 THROUGH RV-1 RECOVERY

2.1 Summary

Solar Arrays were deployed at Rev 0 INDI. No change of positioning was required. The Doppler Beacon System (DBS) antenna was deployed and the system activated by Rev 0 over Antarctica.

Subsatellite No. 2 (+Y) was enabled, erected and spearated on Rev 2, at 31.5 degrees south latitude with no additional maneuvers required. No subsatellite was carried on the -Y side on SV-10.

The sensor system was successfully uncaged and the optical bars were stowed just after BV/SV separation. The constant velocity run and health checks were performed on revs 3 and 6 respectively, both indicating normal operation. Operational photography began on rev 7, and the regular realtime engineering functioned normally on rev 13.

The Primary Attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout Segment 1.

Two minor RCS anomalies were noted during this segment, involving a thermocouple wire break and a pressure transducer reading. Analysis of the transducer failure is pending. No operation impact resulted due to these transducer failures. RCS propellant consumption was 54.2 pounds which equates to an average of 3.4 pounds per day.

The Orbit Adjust System performance was nominal for the 5 orbit adjusts performed. The total propellant usage for the orbit adjusts was 287.9 pounds.

All Panoramic Camera operations through the first mission segment were achieved with no sensor system malfunctions. The overall image quality of both cameras ranged from good to poor with the majority being rated fair. The poor imagery was for the most part attributed to atmospheric and weather conditions. The image quality of the fwd camera appeared to be sharper than that of the aft. In order to improve the image, PFA analysis recommended a plus 2 command step change to the fwd camera OAAA In-Track direction and was implemented for RV-2.

The RV payload was 98.9% of the maximum weight and unbalanced 1.36%. The PREP2 event took place on Rev 260 over POGO and separation occurred on Rev 261, June 24, 1975, Flight Day 17. All reentry events and main parachute deployment were normal and executed as planned. Aerial recovery was accomplished on the first pass at 12,300 feet altitude, 15.24 nautical miles from the predicted impact point. The uprange TIM aircraft was 235 nautical miles short of the required position due to an aircraft malfunction prior to takeoff.

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2.2 COMMAND SYBSYSTEMS PERFORMANCE (Prepared by CSC)

2.2.1 Health

The health of the Command Systems remained excellent throughout Segment 1 (Revs 0-261). 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 169 messages loaded in the ECS for this segment. This resulted in 44,954 SPC's being stored for readout from the PMU's.

Of the 44,954 SPC's loaded, 18,690 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 44,954 SPC's there were no rejects.

An "ERROR" alarm, on RTC Block 9017 at 77 Guam, was found to be caused by an improper "quad H" word assigned to a new TR Fast Fwd command in the block. This has since been corrected.

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 1.50 parts in 10^8 . This corresponds to an average frequency offset of 0.015 HZ below the nominal frequency of 1.024×10^6 HZ. The frequency of the clock oscillators changed 0.055 HZ in 261 revs. This results in a stability of 5.41 parts in 10^8 over 261 revs, or 8.41 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.

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2.2.1.2 MINIMAL COMMAND SUBSYSTEM

2.2.1.2.1 Command Modes

The MCS was commanded in 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 Commands Readouts	PMU-A <u>9,395</u> PMU-B <u>9,295</u>
ECS Clock Drift Rate	1.50 parts in 10^8
ECS Clock Stability	5.41 parts in 10^8 for a 261 rev period
Total Hours On	ECS <u>386</u> MCS <u>4.5</u> RD <u>1.6</u> BUD <u>.05</u>
Secure Words Expended at end of Segment 1	PMU-A <u>20</u> PMU-B <u>20</u>
Environmental Data	All temperatures within specifications

2.2.2 COMMAND SYSTEMS SERIAL NUMBERS

ECS SN-112

MCS SN-112

R/D SN-111

BUD SN-111

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2.3 SENSOR SYSTEMS OPERATIONS THROUGH RV-1

2.3.1 MISSION OPERATIONS PERFORMANCE

The sensor system was successfully uncaged and the optical bars were stowed just after BV/SV separation. The constant velocity run and health checks were performed on orbital revolutions (revs) 3 and 6 respectively, both indicating normal operation. Operational photography began on Rev 7, and the regular realtime engineering functioned normally on Rev 13G.

All operations through the first mission segment were achieved with no sensor system malfunctions. This segment consisted of 140 sensor system operations, consuming 16,848 seconds of camera power ON time, 6.6 pounds of nitrogen gas, and approximately 28,700 feet of film usage per camera. (This includes pre-launch footage on the take-up at lift-off.) Consumption profiles are shown in Figure 1.

The overall image quality of both cameras ranged from good to poor with the majority being rated fair. The poor imagery was for the most part attributed to atmospheric and weather conditions. The image quality of the fwd camera appeared to be sharper than that of the aft.

Subjective analysis of the smear slit imagery on the fwd camera revealed a skew angle error, estimated to be an in-track velocity error of approximately 0.02 in/sec. In order to improve the image quality, a plus 2 command step change to the fwd camera OAAA In-Track direction was implemented for RV-2 effective on mission op 171.

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The Sensor System Configuration at Lift-Off was as follows:

	<u>Fwd-Looking Camera</u>	<u>Aft-Looking Camera</u>
Filter Type	W-12	W-12
Focal Length (inches)	59.9724	59.9844
Focus Setting (microns)	31	31
Film Type	1414	1414/130/255/124
Total Film Length (feet)	115,460	110,746
Supply Spool Number	5044	5073
Pneumatics Loaded (pounds)		35.0

2.3.2 ENGINEERING TESTS

The standard uncage/OB stow, constant velocity, and SS Health Checks sequence were routinely executed on Revs 0, 3, and 6 respectively. The regular engineering run was performed in realtime at Rev 13 Guam. In addition, the following PFA engineering tests were performed:

Rev 32	Through focus - Phoenix
Rev 80	Through focus - Dallas/Ft. Worth
Rev 144	Through focus - Phila/Baltimore/Wash.
Rev 146	Through focus - Sacramento/Stockton
Rev 177	Through focus - Milwaukee/Chicago
Rev 178	Through focus - Phoenix
Rev 194	Tuscon Acquisition/Quality Monitor
Rev 211	Through focus - San Francisco

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2.4 RV1 (S/N 44) Performance

This report presents an analysis of the RV1 performance based on evaluation of recovery studies, command message, RV and TV 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 98.9% of the maximum weight and unbalanced 1.36%. The PREP2 event took place on Rev 260 over POGO and separation occurred on Rev 261. 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 12,300 feet altitude, 15.24 nautical miles from the predicted impact point. The uprange TLM aircraft was at position 44.03 N, 152.567 W at time of separation. This was 235 nautical miles short of required position due to aircraft malfunction prior to takeoff.

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IDENTIFICATION DATA

SV 10	IRON NO 6381	RECOVERY REV 261
RV 1	RV S/N 44	RECOVERY DATE 24 June 75
RETRO MOTOR S/N Q69		

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 2 OUT T/S	REV/STA			68730.2	68731			0
RV 1 IN T/S	260P			68734.2	68735			0
DT START	72945.3	72944.36	72944.51	72945.4	72945.7			0
POGO TRAN	73897.07			73897.0	73889			-8
PITCH START	73927.0			73927.0	73928			0
PITCH STOP				73977.0	73978			0
PYRO ARM BATT				74097.0	74098			0
POGO FADE	74183.06			74182.2	74183			0
TLM A/C TRAN	74506.4					74510	74604	98
ORB PWR OFF				74496.4	74496.3			0
RV SEP (0)	74506.39	74506.40	74506.4	74506.4	74506.3			0
SPIN UP (+2.4)				74508.8			NOTE 2 CONFIRM	0
RETRO START	74631.79	74631.80	74631.8	74631.8			CONFIRM	0
DESPIN (+16.4)				74666.8			74666.9	0
PROP JETT (+173.4)				74681.8			74681.7	0
TLM A/C FADE	74795.52					74880	74843	48
RV ENTRY (400K)	74808.94	74808.48	74808.81		RECOV TW			
△ 1-2 ACQ					74901	75124		
ION ENTR	74920.90	74920.22	74920.47		74911	N/A		-9
ION EXIT	75126.82	75125.84	75125.99		75122	75124		-3
DROGUE DEPLOY	75172.21	75171.19	75171.34	TONE STOP	75180	75180	N/A	9
IMPACT (50K)	75190.32	75189.36	75189.51					
MAIN CHUTE DPL	75195.27	75194.29	75194.46		N/A	N/A	N/A	N/A
H/SHLD JETT	75199.27	75198.29	75198.46	TONE START	75200	75201	N/A	2
STEADY STATE	75210.27	75209.29	75209.46					
ETPD(RAINDROP)	75221.6	75221.0	75221.3					
RV @ 13.5K	76126.5	76125.9	76126.3	IN TRAIL	76140	76200	N/A	14
WATER IMPACT	76677.4	76676.8	76677.2		N/A	N/A	N/A	N/A
HULA TRAN (RV)	74869.87					74860	N/A	N/A
HULA FADE (RV)	75120.73					75228	N/A	N/A
DT RUNOUT	75660.3	75659.36	75659.51		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	15.009	15.082	15.071	14.817	14.967	14.817
LONGITUDE	157.78	157.77	157.77	157.77	157.867	157.77

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

RECOV ALT 12,300 ft, PASS No. 1, TIME 2109 Z

AIRSPEED 128 KTAS, 155 KIAS; TIME IN TOW 24 min.

RAINDROP ETPD 75221 sec 46000 ft; RATE/DESCENT, 15K 29.1 FPS, 10K 26.9 FPS

CONTACT LOCATION #5 HOOK ENGAGED ONE HEAVY LOAD LINE

PRESET TENSION LEVEL 3600 lb, PAYOUT NORMAL

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

OVERSHOOT 15.24 nm, CROSS TRACK 0 nm EAST

RC CONDITION NORMAL

CHUTE/CONE CONDITION 3 FT DIAMETER TEAR IN CONE SKIRT

CHUTE/CONE BEHAVIOR 20 DEGREE OSCILLATIONS OF ENTIRE SYSTEM AT HIGHER ALTITUDES
CONE LEANING & COLLAPSING NEAR RECOVERY ALTITUDE.

WIND DATA

ALT (K)	DIRECTION		VELOCITY		ALT (K)	DIRECTION		VELOCITY	
	PRED	ACT	PRED	ACT		PRED	ACT	PRED	ACT
SCF	080	80	15	15	25	170	170	15	15
2	080	--	15	--	30	240	240	25	25
4	070	--	5	--	35	260	260	30	30
6	070	70	15	15	40	290	290	40	40
8	070	--	25	--	45	290	290	70	70
10	080	80	20	20	50	250	230	20	20
15	100	100	20	20	55	--	--	--	--
20	090	90	12	12	60	--	--	--	--

RV BATTERY TIME HISTORY

TIME	ACT 74100	74101	74102	74103	74106	74108	74109	74122	74124	74125	74127	74128
MAIN	21.1	23.1		22.5				23.2	24.1		24.6	
PYRO #1	24.1		25.1			25.6						25.1
PYRO #2	23.8		24.6		25.2		25.9			25.3		
TIME	74151		74496									
MAIN	24.9		23.9									
PYRO #1	25.2		25.1									
PYRO #2	25.2		24.6									

SV RATES BEFORE & AFTER SEP (SV TLM)

TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
74506	-.07	.002	0.0
SEP 74507	-.07	.002	0.0
74508	+1.34	-.012	0.0

MISC DATA

Payload Temp before SEP,	Rn06	65 °F
Payload Temp, Max REENTRY,	TB02	65 °F
Chute Press before PREP 2,	P711	.67 PSI
Supply Press before PREP 2,	P113	.65 PSI
BETA ANGLE of Recovery Rev.		21.8 °

PITCH ANGLE

BASIC STUDY		Ω_y 1.39 °/sec	PITCH (CMD MSG)	-35.25 °
Θ_{rvs} -127.22°	$\Delta\theta_2$ -112°		Θ_{sv} (PDWN-SV TLM)	-34.8 °
$\Delta\theta_1$ -2.08 °	Θ_{sv} -35.25°		Θ_{rvs} ON UPDATED TEAPOT	-127.22°

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RV 1 RECOVERY DATA

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RV MASS PROPERTIES

	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION		ACTUAL POST FLT
TU-A	228.70	1b	225.91	1b	225.91	1b	226.7 1b
TU-B	229.20	1b	229.04	1b	229.04	1b	228.8 1b
TOTAL	457.90	1b	454.95	1b	454.95	1b	455.5 1b
SEP WGT	1535.92	1b	1532.97	1b	1532.97	1b	UPDATED TEAPOT
RETRO WGT	1534.23	1b	1531.28	1b	1531.28	1b	% UNBAL 1.36
ENTRY WGT	1343.42	1b	1340.47	1b	1340.47	1b	% FULL 98.90
AIR RECOV WGT	1135.89	1b	1132.94	1b	1132.94	1b	(100% = 460 1b)

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	20339.2	1b	PITCH INERTIA (I _y)	148651.76	SLUG-FT ²
CG FROM STA 2220.2(X)	216.75	in	ROLL INERTIA (I _x)	5896.52	SLUG-FT ²
CG FROM LONG AXIS(Y)	1.51	in	YAW INERTIA(I _z)	149542.83	SLUG-FT ²

'DORBEL EPHEMERIS

REV OF SEP 261	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION
PREDICTED FROM REV	251		N/A		N/A
APOGEE	155.405	nm	N/A	nm	155.05 nm
PERIGEE	88.432	nm	N/A	nm	88.472 nm
ARG OF PERIGEE	111.562	°	N/A	°	111.564 °
INCLINATION	96.361	°	N/A	°	96.361 °
TRUE ANOMALY AT RETRO	20.63	°	20.60	°	20.62 °
STEADY STATE ALT.	46577.15	FT	46596.52	FT	46607.38 FT
HEATSHIELD JETT ALT.	48589.54	FT	48607.19	FT	48619.23 - FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

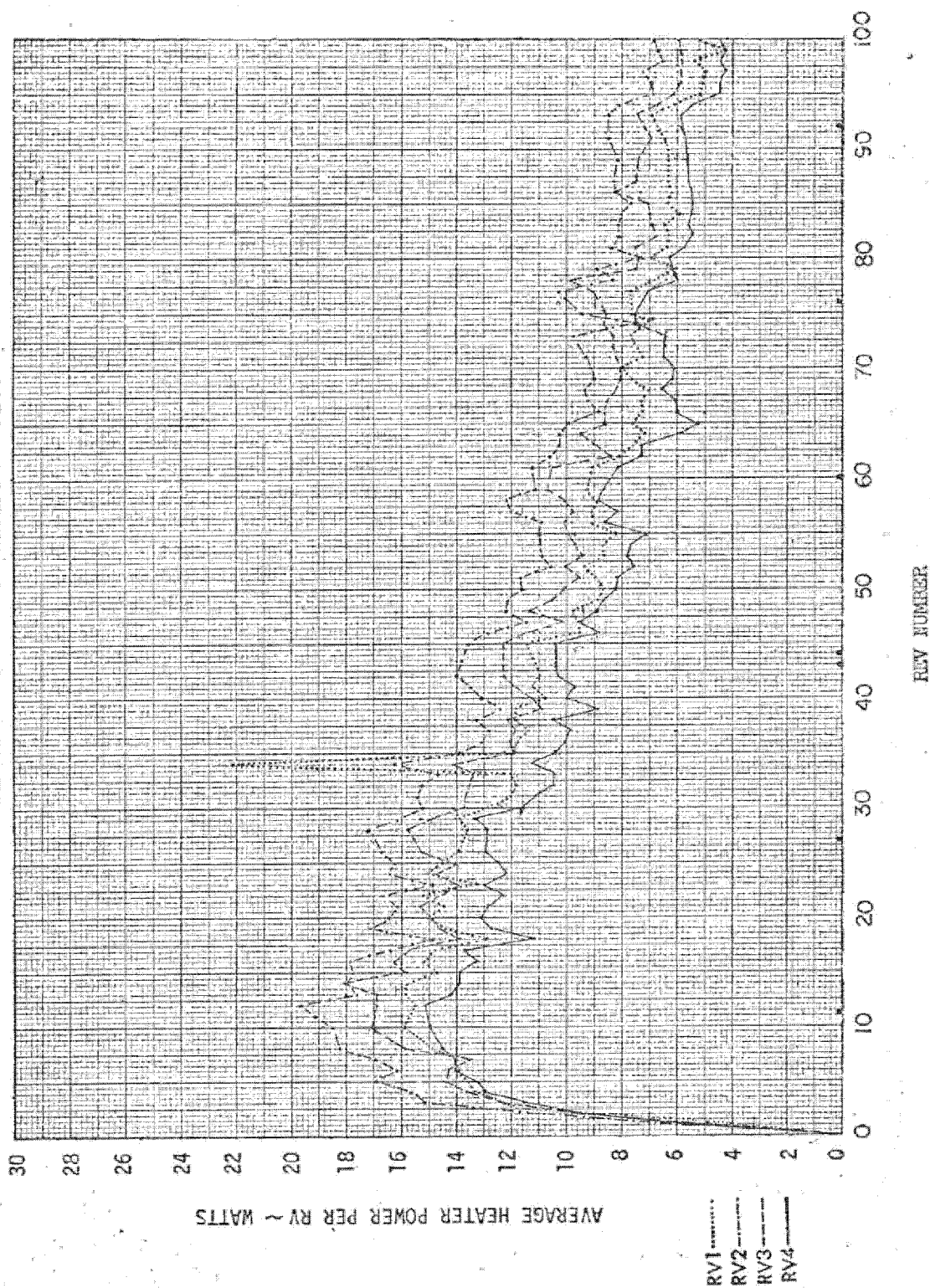
	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	74506.4	74631.8	74808.81	75171.34
ALTITUDE (FT)	530479.58	529150.64	400000	63648.95
LATITUDE (°N)	55.862	47.364	35.605	15.113
LONGITUDE (°W)	147.50	150.54	153.69	157.77
INERTIAL AZIMUTH (°)	191.40	189.42		
INERT FLT PATH ANGLE (°)	.1150	.1947		
INERT VELOCITY (FT/SEC)	25744.35	25739.56	25503.87	
LOCAL AZIMUTH (°)			190.62	189.84
LOCAL FLT PATH ANGLE (°)			-1.8612	-31.4344
LOCAL VELOCITY (FT/SEC)				1424.56
ANGLE OF ATTACK (°)			104.81	
MACH NUMBER				1.47
DYN PRESS (PSF)				192.703
CORE PINS SHEARED (FROM REBOUND TWX) A: YES ☒ NO ☐ , B: YES ☒ NO ☐				

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

SYS TIME	72696.292 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	.0001 °
LONGITUDE	30.5545 ° E	INERTIAL GEOCENTRIC FLT PATH ANGLE	-.5004 °
ALTITUDE	127.2189 nm	INERTIAL GEOCENTRIC AZIMUTH	353.6393 °
		INERTIAL VELOCITY	25429.03 FT/SEC
SV C _D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.3226 FT ² /SLUG

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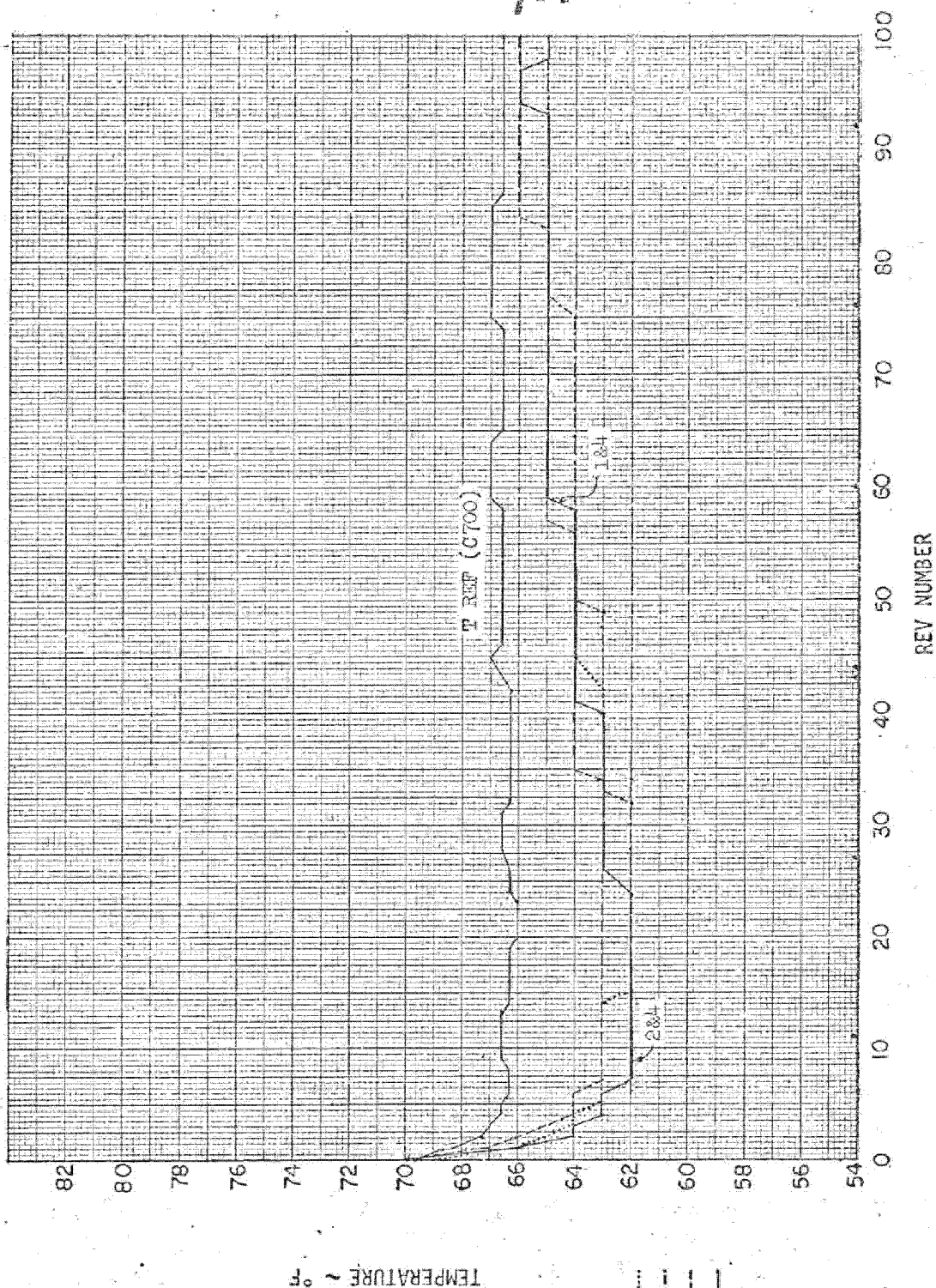
ACTIVE THERMAL CONTROL SYSTEM
RV HEATER POWER CONSUMPTION



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ACTIVE THERMAL CONTROL SYSTEM
RV PAYLOAD CONTAINER & REFERENCE TEMPERATURES



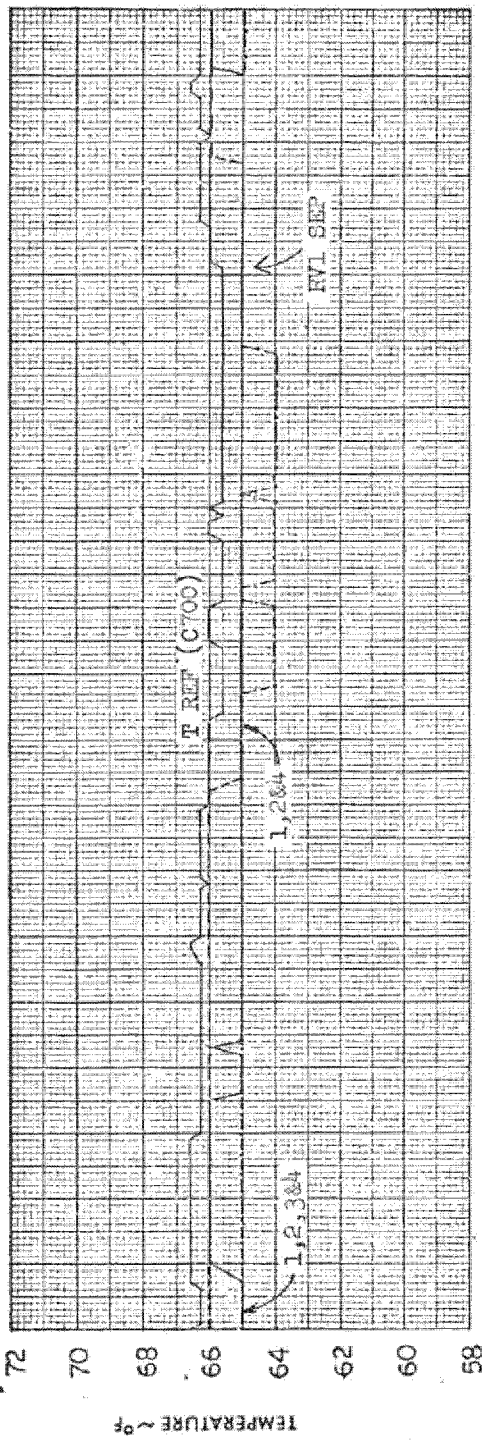
TEMPERATURE - °F

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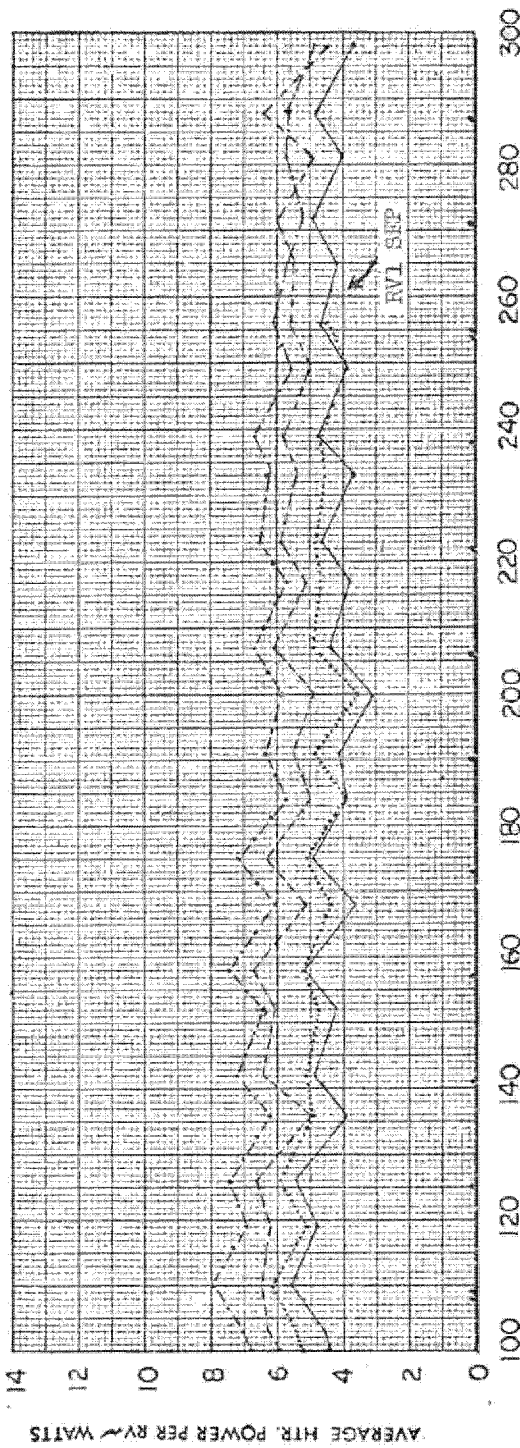
RV1
RV2 - - - -
RV3 - - - -
RV4 _____

~~SECRET~~

ACTIVE THERMAL CONTROL SYSTEM
RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



RV HEATER POWER CONSUMPTION



RV1
RV2
RV3
RV4

REV. NO.

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2.5 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE

2.5.1 EDAP Performance

Solar Arrays were deployed at Rev 0 INDI. Deployment and erection were nominal. (Reference Figures 2.5-1 and 2.5-2). With an initial Beta Angle of 21.2 degrees, the arrays were left at the +18 degrees position. Solar array output stabilized at 25.2 Ampere-Hours as determined by the Ampere-Hour Meter output.

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 4, 5, 14 and 16. During Segment 1, K-2 Relay openings occurred approximately 50% as frequently as was observed on SV-9, indicating a significantly higher power usage rate.

The Main Battery voltages at sun entrance and the predicted power demand were nominal during Segment 1. The average main bus voltage at sun entrance was 27.5 volts. The average power consumption was 24.1 Ampere-Hours per rev.

The Main Battery discharge load sharing was nominal. Batteries 1 and 2 each carried approximately 24% of the load; Batteries 3 and 4 each carried approximately 26%.

Main Battery temperatures observed during station passes were consistently between 44° and 51°F.

Both Ampere-Hour Meters functioned nominally throughout Segment 1. The increased resolution (one (1) ampere-hour) of these meters allowed an acceptably accurate measure of Solar Array output derived from a minimum of recorded data.

Current Signal Integrators (CSI) provided telemetered outputs of charge, discharge and Charge Current Controller K-2 Relay Status. These outputs have been logged and compared with Ampere-Hour Meter monitors and K-2 relay discrete monitors. A good correlation was observed between these data sources.

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2.5.2 T&T

The SGLS, PCM Telemeter and Tape Recorders demonstrated satisfactory performance during Segment 1. The primary equipment has been used throughout this segment with the exception of redundant equipment usage for health or evaluation checks.

The Back-up Timer was checked on Rev 15. The timer period was 541 seconds (the same as was observed on R-1). The specification is 540 ± 54 seconds.

The SGLS-2 Transponder has been used on Revs 99 and 245 at HULA for signal strength evaluations. It was also used on Rev 18 thru 21 for the Lifeboat, MCS health tests.

The UHF/ECS receiver was used only once on Rev 68. Performance was nominal.

2.5.3 ACS/RCS Performance

The Primary Attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout Segment 1. 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 120°F and 151°F and the non-controlling redundant system gyro temperatures between 121°F and 157°F .

The Reaction Control System (RCS) performance was nominal throughout the segment. Thruster performance is tabulated in Table 2.5-1.

Two RCS anomalies were noted during this segment. During the yaw maneuver for the negative OA on Rev 112, the temperature transducer on Thruster 5 indicated an anomalous reading. During the yaw maneuver on Rev 113 the temperature transducer on Thruster 1 showed an erratic output for a period of approximately 65 seconds. Analysis of the problem attributed the anomalous temperature readings to a variable resistance resulting from a break in the thermocouple wire. On Rev 146 the chamber pressure transducer for Thruster 6 was noted to be

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inoperative. Analysis of the transducer failure is pending. No operation impact resulted due to these transducer failures. RCS propellant consumption was 54.2 pounds which equates to an average of 3.4 pounds per day.

2.5.4 Orbit Adjust System (OAS) Performance

The Orbit Adjust System (OAS) performance was nominal for the 5 orbit adjusts performed. The total propellant usage for the orbit adjusts was 287.9 pounds.

The orbit adjust summary for this segment appears in Table 2.5-2.

2.5.5 Lifeboat II (LB II) Performance

The LB II system electronics were activated on Rev 18 for a LB II system health check and on Rev 261 during RV-1 recovery.

The pneumatics were not activated. Analysis of the magnetometer data indicated system performance was nominal.

The LB II tank heaters were commanded on during Rev 24 and remained on until Rev 47 at which time they were commanded off. Tank temperature decreased from 178°F to 104°F on Rev 261; impulse was 6540 lb-sec and 4060 lb-sec respectively for the noted tank temperatures.

2.5.6 Doppler Beacon Performance

The Doppler Beacon System (DBS) antenna was deployed and the system activated by stored program commands on Rev 0 at System Time 68620.4 over Antarctica. Evaluation of the vehicle telemetry data indicated that the antenna properly deployed and locked into position as verified by the correct and stable readings of S750, DBS Antenna Position Monitor.

Throughout Segment 1, telemetry data has verified nominal performance of the system's transmitters, heaters, oscillators and power supply components.

Utilization of the software program 'TDERBY to support DBS operations was initiated following the activation of the beacon on Rev 0 and throughout the remainder of Segment 1. The program performed the required function satisfactorily during the entire segment period.

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2.5.7 Thermal

2.5.7.1 Aft Section Thermodynamic Performance

The thermal design of the SV-10 aft section was similar to that of SV-8 and SV-9. Likewise, the resulting flight temperatures are similar to those experienced by SV-8 and SV-9. There have been no thermal anomalies associated with the SV-10 aft section.

Figure 2.5-3 compares orbit average flight temperatures from SV-10 with preflight predictions. Predictions were made for two cases: (1) uncontaminated surface properties, and (2) contaminated properties representative of the maximum levels of contamination observed in previous flights. All of the data on the equipment section doors falls close to the worst case contamination levels.

Table 2.5-3 describes the temperature ranges experienced by typical aft section equipment. All equipment is operating well within design limits and near predicted values.

2.5.7.2 Mid Section, Fwd Section and APSA Lift-off Conditioning

During the prelaunch operations, the ground air conditioning temperatures were set to provide a mid-section average temperature of 69°F and a vehicle inlet air temperature of 69°F. These temperature levels were selected to meet the primary payload thermal settling restrictions when on-orbit thermal equilibrium had been achieved.

2.5.7.3 Orbit Temperatures

Tables 2.5-4 and 2.5-5 present the orbit-average temperature data for critical vehicle parameters. The data was derived from vehicle temperature monitors by methods described in detail in the respective interface control documents. Included in Table 2.5-4 is a summary of post flight data for SV-7 and up and the allowable limits. The first column of SV-10 temperature data applies to the period preceding, the APSA K2 relay

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hangup anomaly. This data indicates slightly cooler vehicle temperatures than the previous flights which is attributed to the expected solar heating reduction corresponding to the summer launch. The vehicle temperatures were within allowable limits. The second column of SV-10 data in Table 2.5-4 was monitored during Rev 277 subsequent to the APSA anomaly and shows the temperature rise in the APSA section. This rise is the result of continuous power being dissipated in the APSA SU's. The APSA and SRX component temperatures were maintained within allowable limits by hand controlling the APSA K1 relay on a duty cycle compromise of thermal and mission requirements. The ICS upper limits for both T_{ENC} and T_{TP} were exceeded periodically for short periods during the thermal management duty cycling with the concurrence of the responsible payload engineers. There has been no indication of high temperature-related problems occurring as the result of exceeding the ICD limits.

Table 2.5-5 shows the vehicle mid-section temperature differentials between structural zones and their respective limits. Significant differences from the previous flight data were noted and are the result of the higher Beta angle of SV-10. SV-7 and SV-8 data was monitored at near Beta zero environments and SV-9 data applies to Beta angles of approximately $+9^{\circ}$. The mid-section temperature differentials for SV-10 at a Beta angle of approximately $+21^{\circ}$ were less than Beta equal 30° data monitored during the SV-2, 3 and 4 flights and were not an indication of anomalous thermal performance.

2.5.8 Subsatellite

Subsatellite No. 2 (+Y) was enabled, erected and separated on Rev 2. Separation occurred at system time 80250.4 at 31.5 deg. south latitude and 3.0 deg. east longitude, ascending. No satellite vehicle maneuvers were required for separation. No subsatellite was carried on the -Y side on SV-10.

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TABLE 2.5-1

RCS THRUSTER EVALUATION

SEGMENT 1

Rev No.	REA#1 Actual Thrust	REA#2 Actual Thrust	REA#3 Actual Thrust	REA#4 Actual Thrust	REA#5 Actual Thrust	REA#6 Actual Thrust	REA#7 Actual Thrust	REA#8 Actual Thrust	QUAL Thrust
53		5.3	4.8			5.2	5.3		5.2
113	4.9	4.9	4.5	4.8	5.0	5.0	4.9	4.9	4.9
261		4.4	4.1			4.5	4.4		4.4

ORBIT ADJUST SUMMARY

SEGMENT No. 1

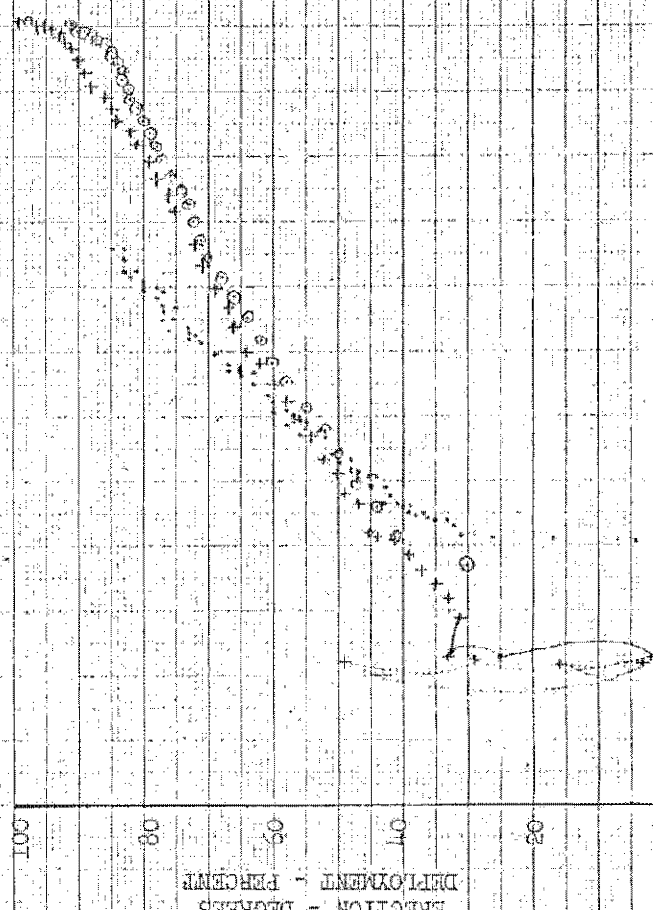
TABLE 2.5-2

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
1/Pos	4	63	7.688	7.8146	22.4	23.2	71.9	290.7
2/Pos	7	111	43.9784	44.33	126.2	126.6	73.3	272.3
3/Neg	7	113	-19.2474	-19.39	58.0	56.4	73.9	255.6
4/Pos	10	159	10.8644	10.845	33.4	32.0	75.2	249.3
5/Pos	13	209	17.0431	17.34	52.6	49.7	76.2	242.1

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SV-10 LEFT SOLAR ARRAY



SV-10 EJECTION

SV-10 DEPLOYMENT (POTENTIOMETER AT FOOT)

SV-10 DEPLOYMENT (POTENTIOMETER AT TIP)

Figure 2.5-1

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SV-10 RIGHT SOLAR ARRAY

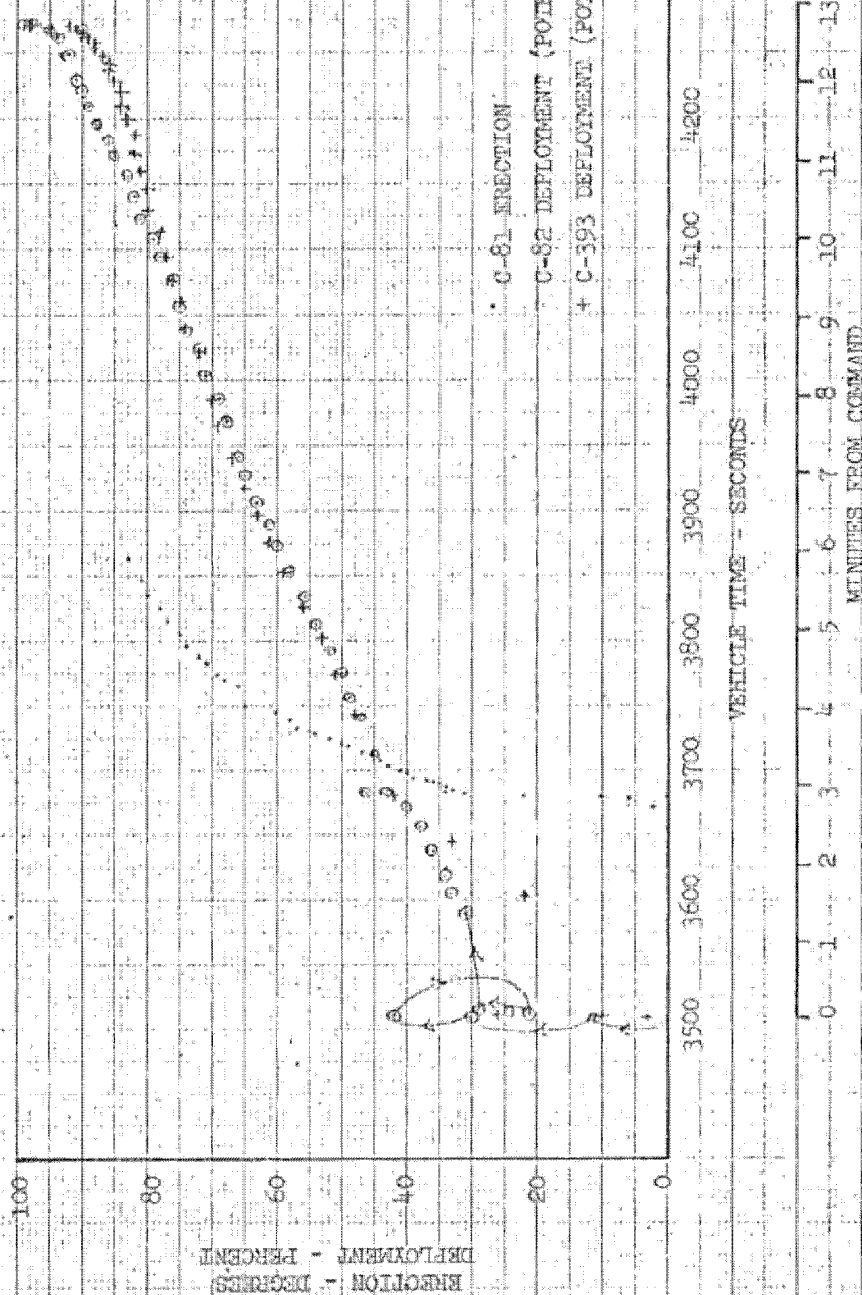


Figure 2-5-2

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10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN USA

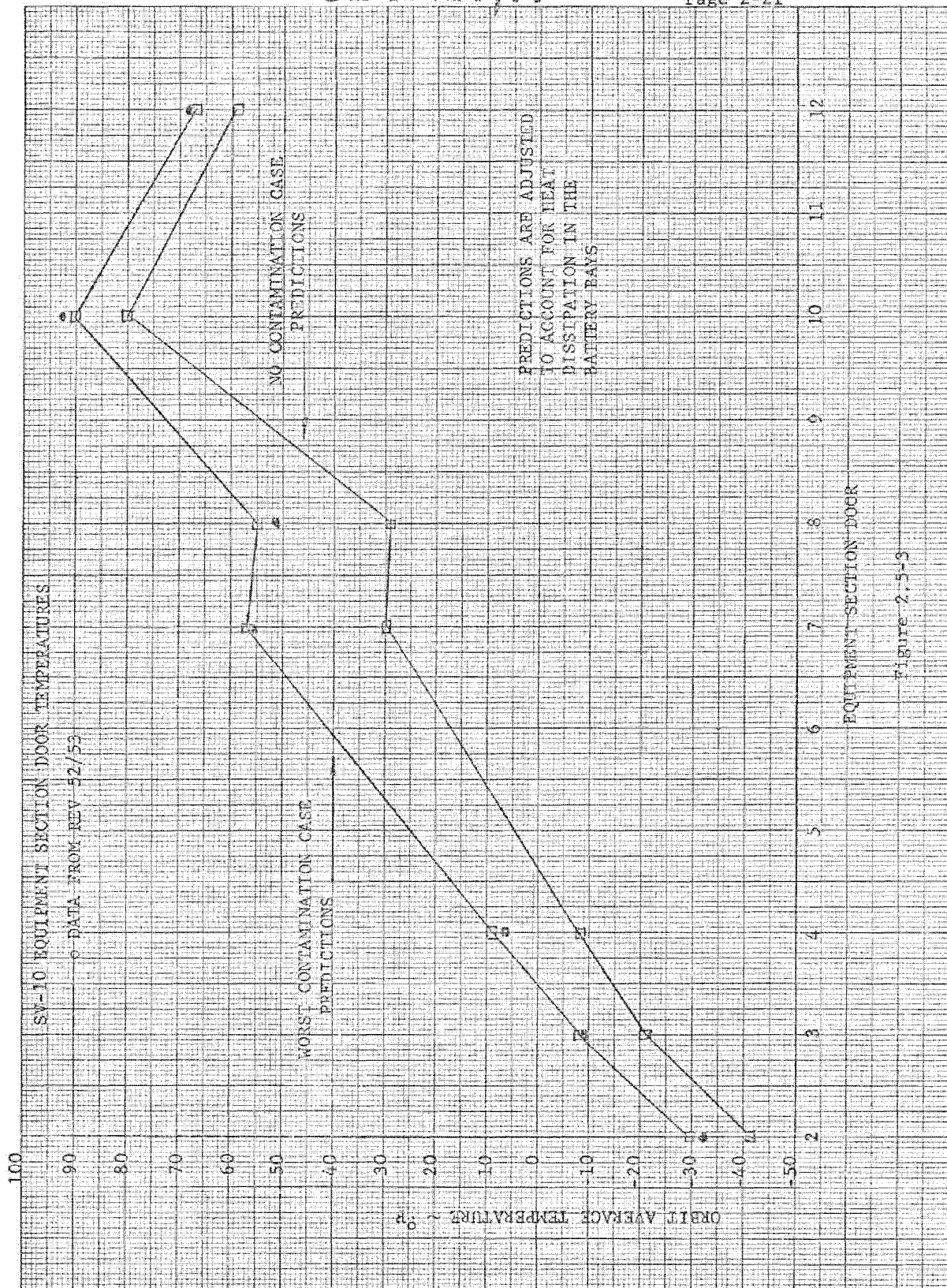


Figure 2.5-3

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TABLE 2.5-3

SV-10 AFT SECTION CRITICAL COMPONENT TEMPERATURES ~ °F

CRITICAL COMPONENT	DESIGN LIMITS	SV-10 PREDICTIONS (1)	SV-10 ACTUALS (2)
PDJB	-30/165	76	76/79
CCC#2	-30/170	87	92/98
Type 29 Batteries Bay 3	35/70	48 ⁽³⁾	45/49
Type 30 Battery	30/90	48 ⁽³⁾	52/53
Type 31 Batteries	40/90	48 ⁽³⁾	48/49
Type 29 Batteries Bay 4	35/70	48 ⁽³⁾	47
HSA Heads	0/130	68/77 ⁽⁴⁾	78/83
IRA	50/130	101/106 ⁽⁴⁾	103/110
PCM Master	-30/170	90	76/94
Tape Recorders	20/120	77/80	79/88
Transmitters	-30/170	78/88	80/90
ECS Clocks	40/153	105/111	103/108
ECS PMUA	-40/145	92	90/91
ECS PMUB	-40/145	103	101/104
IRA Gyros	50/200	- -	140/158
MCS	-40/149	83	81/83
RCS Tanks	40/140	71/103	69/84
Plumbing Bay 6	35/140	81	79/86
Plumbing Bay 12	35/140	89/94	79/91
OA Tank	70/100	87	70/79
PDA (+Y)	-30/160	47	58/89
Solar Arrays	125/225	38	-67/140
Quad Valve	40/200	- -	107/117

- (1) Predicted temperature is for the orbit average, multiple temperatures indicate multiple points.
- (2) Stabilized temperature ranges, not including launch transients.
- (3) Temperature controlled by heater.
- (4) Prediction assumes dual IRA operation (Primary ACS and redundant IRA only).

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TABLE 2.5-4
AVERAGE SECTION TEMPERATURES (°F)

SECTION (1)	ICD LIMITS	SV-10 PREDICTION	SV-7 ACTUAL	SV-8 ACTUAL	SV-9 ACTUAL	SV-10 (2) ACTUAL	SV-10 (3) ANOMALY
<u>MID SECTION</u>							
T _{REF}	- -	68	70	67	72	66.5	66.3
T _{TCA}	49/91	68	70	68	72	64	64
T _{SU}	47/93	70	72	70	74	68	67
<u>FWD SECTION</u>							
T _{FWD}	47/93	72	71/78	68/74	72/80	68/72	70/72
<u>APSA</u>							
T _{ENC}	32/69	52	52	52	55	52	68
T _{TP}	30/85	45	50	53	53	42	133
T _{DBS}	32/90	57	59	60	63	60	74

- NOTES: (1) The temperature designators, T_{REF}, T_{TCA}, - - - etc., represent orbit-average temperatures for the various vehicle sections. The designated temperatures are calculated by methods described in the applicable interface control documentation.
- (2) The temperature data applies to the first segment flight phase during normal SV operations prior to Rev 59.
- (3) This temperature data was recorded subsequent to the APSA K2 Relay anomaly during Rev 277.

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TABLE 2.5-5
MID-SECTION TEMPERATURE DIFFERENTIALS ($^{\circ}\text{F}$)*

DESIGNATION	ICD LIMITS	SV-7 ACTUAL	SV-8 ACTUAL	SV-9 ACTUAL	SV-10 FIRST SEGMENT
<u>TCA COMPARTMENT</u>					
ZONE I to IV	9	0	1	2	4
ZONE III to II	6	0	1	1	3
ZONE I to II	4	3	3	2	2
ZONE III to IV	4	3	3	3	2
<u>SV COMPARTMENT</u>					
ZONE I to IV	57	1	3	15	35
ZONE III to II	30	1	1	9	19
ZONE I to II	16	4	4	1	8
ZONE III to IV	16	2	0	3	7
ZONE II to V	16	1	0	2	7
ZONE III to V	16	1	1	6	12

* The structural zones, allowable limits, and methods of calculation are described in detail in the Mid-Section Interface Control Document.

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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 1210, IRON 6381. The command messages discussed cover the period of RV1 initiation (Rev 5 load) to the RV1 recovery message (Rev 261 load).

Two hundred and thirty-five command messages were planned by the flight profile of which seventy were cancelled. The remaining one hundred and sixty-five command messages were received and reviewed by the Technical Advisor (TA) staff. One hundred and forty-nine were accepted and sixteen were rejected. All (except 21P) of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the sixteen messages are summarized below:

<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
5 BOSS	Because post-pass data was late arriving from 3 POGO, Msg. 120 (SP) required an alter to change the format of 6 BOSS to Mode "B" so that the SSC health check and inhibit release could be performed at 6 BOSS vice 4 GUAM.
21 POGO	Message 270 was rejected because of a missing DIU counter "ON" command resulting from an incorrect status update after the Rev 18 MCS message. Msg. 270 was never altered due to time limitations.
22 BOSS	Message 280 was regenerated to add a missing DIU counter "ON" command.
54 BOSS	Message 570 was altered to add an ES record for Rev 55.
61 GUAM	Message 640 was altered to delete a payload operation in an OA message.

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<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
62 POGO	Message 640 was altered and loaded per FPA 8-11 to reduce the Stellar Terrain Camera temperature.
77 GUAM	Message 770 was altered and loaded. This message was in accord with FPA 8-11 to reduce ST temperature.
99 POGO	Message 150 altered to provide a missing PCM2.
105 COOK	Message 220 altered to remove a redundant ST ON command to minimize pulsing of the K2 relay.
106 COOK	Message 230 altered, as above, to minimize pulsing of the K2 relay.
107 HULA	Message 240 altered, as above, for K2 relay problem.
161 POGO	Message 710 altered, K2 relay problem.
162 POGO	Message 720 altered, K2 relay problem.
178 POGO	Message 870 was altered to delete a Format C TR + occurring over a station and to add an ST- for 179 POGO; then an ST+, ST- at 181 POGO to allow an ST temperature reading.
183 POGO	Message 120 altered in order to modify payload operations.
239 GUAM	Message 640 altered to bring up a manual station in the SP message.

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

<u>Rev No. and Load Station</u>	<u>Reason for not Loading</u>
63 POGO	Contingency message per FPA 8-11 K2 relay and temperature problem was not required.
78 POGO	Contingency message per FPA 8-11 K2 relay and temperature problem was not required.
260 COOK	The RV-1 PIP update was not required.
261 POGO	The RV-1 recovery abort message was not required.

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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 twenty add-on messages.

Summary

Total Planned Messages	-	235
Messages Cancelled	-	70
Total RV1 Messages	-	165
Messages Rejected	-	16
Messages Altered	+	15
Total Messages Accepted	-	164
Messages not Required	-	4
Total Messages Accepted and Loaded	-	160

2.6.2 'TUNITY Software Problems

The Flight 10 '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.

<u>Category</u>	<u>No. of SPRs</u>	<u>Comments</u>
Flight Critical	1 (9039)	Software corrections were made and incorporated during this flight period.
Non-Flight Critical (Requiring Work-Around)	1	Work-around procedures were developed and implemented.
Non-Flight Critical (Minor)	6	Work-around procedures were not required.
Product Improvements or New Requirements	1	To be considered during future development.
Documentation Error	5	MS-4 or MS-7 affected.

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Itemized Software Problems

SPR MD3-9032 ('TLOAD)

- Problem Description: 'TRIAL deleted a DIU + command from message 270 rev 21 POGO causing a loss of payload.
- Solution or Work-Around: The message has to be altered to add the missing command.
- Operational Impact: In this particular case the message was not loaded because the missing command was not detected until it was too late to alter the message thus causing a loss of payload.
- Comment: This SPR was caused by a procedural error. An MCS message was updated prior to the starting of the MCS clock. This causes an erroneous load time and thus status cannot be propagated properly.

SPR MD3-9033 ('TEMPER)

- Problem Description: MPR mission day is printing out incorrectly.
- Solution or Work-Around: A DBCR was input changing the item 'TGAHRS from 1800 to 18 thus allowing 'TOREP to compute mission day properly.
- Operational Impact: With the implementation of the DBCR to the 'TGA data block the problem was solved.

SPR MD3-9034 ('TUNITY/'TLOAD)

- Problem Description: There is a need for a new card (FPA) in place of/in addition to the MAC data card. The purpose of this card would be to permit a one-card input for any FPA ID. On this card one could specify the FPA ID and as many time and DT fields as necessary. It would also be necessary to restructure the 'CWO data block to allow both SPC's and SEQ's, to specify which time field and DT to use, and what bias to apply to each.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9037 (Milestone 7)

- Problem Description: The description of the MOD data card slit modification fields (SLA & SLB), describes the fields as slit exposure settings. The values are actually slit exposure bias values.
- Solution or Work-Around: None
- Operational Impact: None
- Comment: The MS-7 should be updated to correct the above mentioned discrepancy prior to the support of SV-11.

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SPR MD3-9039 ('TINCO) - FLIGHT CRITICAL -

- Problem Description: MPR processed the ascending operation improperly on Rev 46. Frame times for Frame 1 (A and B side) reported with times from Frame 13. Other parameters were also duplicated. The problem appears to be related to the inverse processing of ascending operations frames.
- Solution or Work-Around: The problem was determined to be Flight Critical because the MPR output for ascending operations could not be processed by the user. A change was made to 'TINCO correcting this problem and was incorporated on the Flight Aux Master.
- Operational Impact: The MPR output for ascending operations could not be processed properly by the user. With the implementation of the new mod of 'TINCO, the problem has been solved.

SPR MD3-9042 ('TFENCE)

- Problem Description: In 'TSEL2 for rev 205 the REJ ALL option was used. 'TSEL1 had 1 ST operation and no SS operations. The 'TBALL output from 'TSEL2 showed 1 SS operation rejected from rev 205. This operation was the first operation from rev 204.
- Solution or Work-Around: None
- Operational Impact: There is no operational impact, just confusion for the user because of the erroneous output in 'TBALL.
- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-11.

SPR MD3-9043 ('TREEL)

- Problem Description: Two overlapping SE cards were input on one message for the same subsystem with different selection options (SELECT & UPDATE). Since both options can't be satisfied an information message should be displayed.
- Solution or Work-Around: Care must be taken when running 'TBALL to make sure that overlapping SE cards are not input to the 'TBALL run.
- Operational Impact: None
- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-11.

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2.6.3 Hardware/Software Interface Changes

For IRON 6381, nineteen change requests were processed from RVI initiation through the RVI recovery message (as shown in Table 2.6.3-1).

These requests were implemented via requests SV10-74 through SV10-95 and have been incorporated into the flight data base and hardware/software interface documentation. (Note: Requests SV10-77, SV10-78 and SV10-84 were disapproved and are not reflected here.)

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

<u>Request No.</u>	<u>Identification</u>	<u>Effectivity</u>
SV10-74	Adds status fill FID 179 to Sequence 323 to accommodate shortened POGO passes on S/C 14 & 15.	SV-10 and nominal
SV10-75	Adds a title to Sequence 175.	SV-10 and nominal
SV10-76	Adds a title to Sequence 203.	SV-10 and nominal
SV10-79	Modifies sequence order in MACRO 222 to preserve load order integrity.	SV-10 and nominal
SV10-80	Provides new Sequence 310 to allow for segmented O/A engine burns.	SV-10 and nominal
SV10-81,-82	Deletes a redundant ST+ from Sequence 148 and 150, respectively, to minimize K2 pulsing.	SV-10 only
SV10-83	Adds new Sequence 154 to provide a contingency for K2 failure.	SV-10 only
SV10-85	Adds new MACRO 323 to provide for short POGO passes on S/C 14 & 15.	SV-10 and nominal
SV10-86,-87,-88,-89	Deletes redundant ST+ from Sequences 152, 381, 380 and 153 respectively to minimize K2 pulsing.	SV-10 only
SV10-90	Changes command times of Sequence 154 to provide more time to record the last command of FPA 8-11 (Main Buss ON).	SV-10 only
SV10-91	Deletes redundant ST+ from Sequence 149 to minimize K2 pulsing.	SV-10 only
SV10-92	Changes ST ON/OFF times to provide for more rapid pulsing of K2 relay.	SV-10 only
SV10-93,-94	Adds new Sequences 382 and 383 to effect ST power ON/OFF cycling.	SV-10 only

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2.7 Satellite Vehicle Support

2.7.1 Satellite Control Facility
(Prepared by the FTFD)

2.7.1.1 Support Changes for SV-10

a. Tracking Station Support

Due to deactivation of Kodiak Tracking Station on 1 April 1975, SV-10 was supported using nine tracking stations at six geographic locations. In addition to the SCF network, the USAF Space Defense Tracking System was utilized for early orbit determination and during reentry.

b. Recovery Group Support

With the addition of the HH-53 refuelable helicopters for surface support, the recovery area ballpark has been increased to 650 nautical miles from the three extended takeoff points; Hickam AFB, Oahu, Boaham, Kauai, and Hilo Airport Hawaii.

c. Documentation Support

A completely rewritten Test Operations Order was issued on 1 May 1975. The new T00 75-7 reorganized all the recovery related information exclusively into Annex R. The new T00 also deleted detailed command system operations from the old T00 72-12. This information was replaced by issuing each of the tracking station vehicle directors a copy of the command system training manual.

2.7.1.2 Operational Impacts Prior to RV-1

Rev 1 Pogo - The Grare Receiver was left in the wrong mode resulting in a loss of 2 sec realtime and tape recorded data, and 83 sec of signal strength data.

Rev 200 Boss - The computer halted at ETA-83 sec and could not be reinitialized nor quick recovered resulting in loss of command capability, tracking data and realtime telemetry.

Rev 326 Hula - Erroneous Carrier 4 signal was observed. The cause was isolated to be crosstalk between the 10 mHz input from the BBSU and the receiver input.

Rev 345 Pogo - Lost the dataline and the backline due to wet communication cables on Thule Air Base, the result was no command capability.

Rev 379 Boss - The antenna drive system on the Command Transmitter (CT) failed. The impact was no UHF support available.

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2.7.2 Telemetry and Mode Processing

The following telemetry mode problems were identified and corrected during the RV-1 segment of SV-10.

1. The mode 121 processing of P/L camera monitors P421, Slit Position Side A and P422, Slit Position Side B was incorrect. Operational impact was minimal.
2. Time correlator IDs were added to mode 122 DP display to aid in mapping camera analysis.
3. Trigger 1 and 3 output in mode 11 and 41 was modified to eliminate excessive eventing.
4. ECS Command System TLM diagnostic modes 145 and 155 were regenerated to correct errors in the definition of 16 and 48 bit TLM IDs.
5. The vehicle time sample rate was changed from 16 sps to 8 sps in all R/T modes. This change improved analysis of ECS clock status.

The following TLM software, MSTAC modes 14, problems were identified and are currently under investigation.

1. In the PST configuration, data processing begins approximately 15 sec after Beginning Vehicle Time requested. The workaround is to pad all BV times by 15 sec.
2. PS XX and DLPX alarms indicate that RTS timing and tracking processing is in error. Since these alarms have been very infrequent, the present status is to monitor.
3. The signal strength and carrier 4 plotting mode, Mode 60, is in the processing of final checkout by DVOS.

2.7.3 Orbital Events

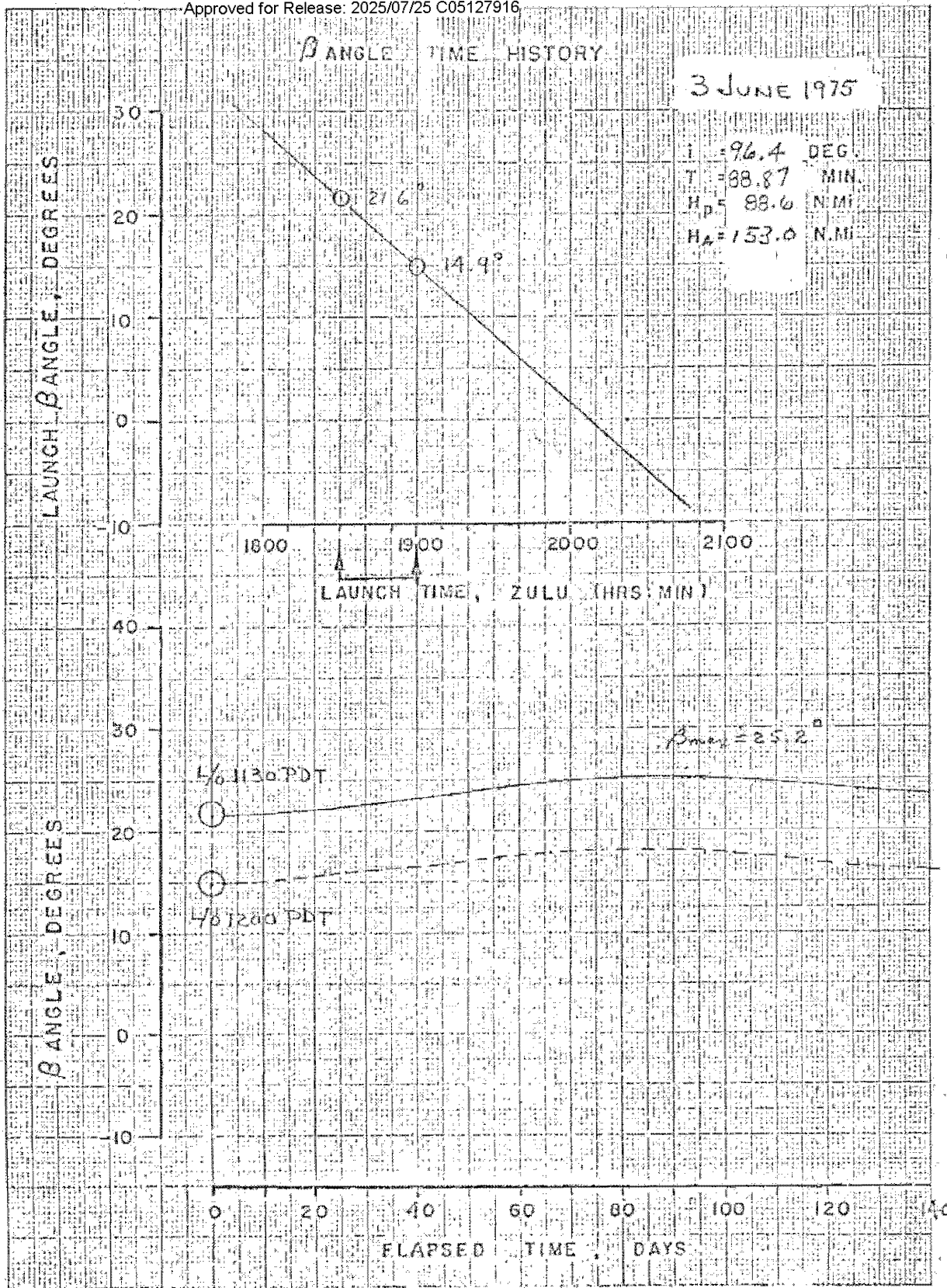
Early Rev orbit determination procedures were exercised and modified to assure a proper determination without the aid of Kodi Tracking Station. The operation ran smoothly.

Lack of Kodi did effect the time line of playback data and evaluation of the sensor subsystem in sufficient time for the planned start up. Higher priority for the playbacks and a review of the timeline for SV-10 will be required.

The Range Bias delay for the SGLS transponder was 751.9 ft as determined from the first 15 days BFE data.

Tumbling lifetime in the AOES was modified to reflect a more accurate modeling. The tracking reductions now compute the tumble life on Stable Life divided by 4.7.

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SECTION 3

3.0 ORBIT PHASE - REV 261 TO RV-2 AND RV-5 RECOVERY

3.1 Summary

The Sensor Subsystem exhibited nominal characteristics until Rev 433, when an Aft Camera ESD shut down both cameras. Data indicated that a relay contact in the Power Distribution System failed to properly apply power to the Aft Camera when commanded. After a series of health check operations, normal camera operations were resumed on Rev 461. The remainder of RV-2 operations were nominal. The overall quality of the acquired photography ranged from good to poor with the majority rated as fair. Prevailing atmospheric haze and poor weather continued to significantly affect image quality. The forward camera imagery continued to be judged sharper than that of the aft.

The RV payload was 97.62% of the maximum weight and unbalanced 0.08%. The PREP2 event took place on Rev 827 over POGO and separation occurred on Rev 829, July 29, 1975, Flight Day 52. All reentry events were normal and executed as planned. Aerial recovery was accomplished on the first pass at 12,200 feet altitude, 3.7 nautical miles from the predicted impact point.

This RV contained the first PDI parachute to be recovered from actual flight. The recovery was normal up to and including contact. After contact, payout was excessive to the point the winch had to be manually stopped. Once on board the Recovery Aircraft, inspection revealed only three of the eight heavy load lines remained intact. Investigation into the situation continues. The RV condition was nominal. The heat shield was also recovered.

The Reaction Control System performance was nominal throughout this segment. RCS propellant consumption was 117.8 which equates to an average of 3.27 pounds per day. The Orbit Adjust System performance was nominal for the 16 orbit adjusts performed. The propellant usage for the orbit adjusts was 1006.8 pounds.

The main Battery/Solar Array Power System performed satisfactorily during Segment 2. However, a Mapping Camera Module relay anomaly did necessitate close management of the Main Battery system. During this period, a continuous current drain of approximately 3.1 Amps was added to the normal system power usage, and a minimum system state-of-charge of 65% was observed. The maximum period required for system recovery to 90% state-of-charge was 43 revs.

The performance of the Stellar Terrain camera was affected by two major camera relay failures. ST camera relays K2 and K3 failed in the closed configuration, applying power to the takeup and supplies (K2) and applying power to the terrain and stellar film transport clutches (K3). The relay failures were unrelated.

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Page 3-2

The K2 failure required considerable system operational management procedures. The ST temperature control was greatly altered due to the constant thermal sources resulting from power being applied to the takup and supplies. Thermal control was effected by cycling the ST main power ON and OFF throughout the flight. Temperature control was required to maintain the following:

1. To keep the ST temperatures above the minimum required for calibration.
2. To keep the takeup temperatures below the level predicted to produce degrading base plus fog levels.

The operational management procedures utilized to work the temperature problem, including the increased power drain on the system, were successful in maintaining the ST within the required calibration temperature range. Preliminary recovered film analysis showed no degradation due to the elevated temperatures.

RV-5 recovery events were nominal. Recovery occurred on Rev 845, July 30, 1975, Flight Day 53. Aerial recovery occurred on the first pass at 11,800 feet altitude approximately three miles from the predicted impact point.

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3.2 COMMAND SUBSYSTEMS PERFORMANCE (Prepared by CSC)

3.2.1 Health

The health of the Command Systems remained excellent throughout Segment 2 (Revs 262-829). 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 322 messages loaded in the ECS for this segment. This resulted in 86,082 SPC's being stored for readout from the PMU's.

Of the 86,082 SPC's loaded, 36,036 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 86,082 SPC's there were five rejects - all at 518 POGO - caused by main-frame sync dropouts during the load.

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

3.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 5.24 parts in 10^8 . This corresponds to an average frequency offset of 0.054 Hz above the nominal frequency of 1.024×10^6 Hz. The frequency of the clock oscillators changed 0.078 Hz in 569 revs. This results in a stability of 7.59 parts in 10^8 over 569 revs, or 5.41 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

There were no ECS anomalies experienced during this segment.

3.2.1.2 Minimal Command Subsystem

3.2.1.2.1 Command Modes

The MCS was not commanded during this segment.

3.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

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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

Total Commands Readouts	PMU-A 17,706	PMU-B 18,330
ECS Clock Drift Rate	5.24 parts in 10^8	
ECS Clock Stability	7.59 parts in 10^8	for a 569 rev period
Total Hours On	ECS 1226.8 MCS 4.5	RD 4.7 BUD .05
Secure Words Expended at end of Segment 2	PMU-A 60	PMU-B 56
Environmental Data	All temperatures within specifications	

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3.3 SENSOR SYSTEM OPERATIONS THROUGH RV-2

3.3.1 Mission Operations Performance

The Sensor Subsystem exhibited nominal characteristics until Rev 433, when an Aft camera ESD shut down both cameras. Data indicated that a relay contact in the Power Distribution System failed to properly apply power to the Aft camera when commanded. The following Health operations were conducted in an effort to turn on Aft camera power.

Rev 440	Creep -B, ESO	(unsuccessful)
Rev 442	CB+ Verify	(unsuccessful)
Rev 449	CB+ BLINK TEST	(successful)
Rev 454	Creep -B, ESO	(successful)
Rev 456	CV-B, OB STOW	(successful)
Rev 458	Mono -B Health Check	(nominal)

As a result of the successful health operations, normal camera operations were resumed on Rev 461. The remainder of RV-2 operations were nominal.

The forward camera OAAA in-track adjustment recommended by PFA, after evaluation of RV-1 imagery, was implemented for RV-2 on Rev 314 effective for mission op 171. The in-track OAAA was advanced 2 command steps from minus 1 command step to a new nominal of plus 1 command step.

The RV-2 mission segment consisted of 216 sensor system operations, consuming 23,167 seconds of camera power ON time, 9.1 pounds of nitrogen gas, and a film usage of approximately 29,800 feet and 28,000 feet respectively on the forward and aft cameras. The consumption profiles through RV-2 are graphically depicted in Figure 1.

The overall quality of the acquired photography ranged from good to poor with the majority rated as fair. Prevailing atmospheric haze and poor weather continued to significantly affect image quality. The forward camera imagery continued to be judged sharper than that of the aft.

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Analysis of smear slit imagery from the OAAA engineering indicated the need for skew and velocity adjustments to both cameras. The forward camera skew was adjusted plus one command step and the velocity was adjusted minus one command step. The aft camera skew was adjusted plus one command step and the velocity was adjusted minus two command steps. These changes were implemented per PFA direction effective Rev 881, mission op 380.

3.3.2 Engineering Tests

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

Rev 292	Smear Slits, Test Type 3A
Rev 308	Smear Slits, Test Type 3A
Rev 324	Through Focus, Test Types 1, 12
Rev 340	Through Focus, Test Type 1
Rev 355	Through Focus, Test Type 1
Rev 355	Through Focus, Test Type 1
Rev 357	Smear Slits, Test Type 3A
Rev 371	Smear Slits, Test Type 3A
Rev 469	Through Focus, Test Type 1
Rev 485	Through Focus, Test Type 1
Rev 567	Through Focus, Test Type 1
Rev 584	Smear Slits, Test Type 3A
Rev 599	Radiometric Cal., Test Type 4A
Rev 681	WHEAT, Test Type 18A
Rev 762	Quality, Test Type 9
Rev 777	Through Focus, Test Type 1
Rev 778	Tucson, Test Types 7, 9, 12
Rev 811	Through Focus, Test Type 1

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3.4 RV-2 (S/N 45) 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 through 3.4-3 list all relevant data. RV heater performance graphs are also included.

3.4.1 Summary

The RV payload was 97.62% of the maximum I.C.D. weight and unbalanced 0.08%. The PREP2 event took place on Rev 827 over Pogo and separation occurred on Rev 829. 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 12,200 feet altitude, 3.7 nautical miles from the predicted impact point.

This RV contained the first PDI parachute to be recovered from actual flight. The recovery was normal up to and including contact. After contact, payout was excessive to the point the winch had to be manually stopped. Once on board the Recovery Aircraft, inspection revealed only 3 of the 8 heavy load lines remained intact. Investigation into the situation continues.

The RV condition was nominal. The heatshield was also recovered.

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IDENTIFICATION DATA

SV 10	IRON NO 6381	RECOVERY REV 829
RV 2	RV S/N 45	RECOVERY DATE 29 Jul 75
	RETRO MOTOR S/N Q60	

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			65276.9	65278			1.1
RV 2 IN T/S	827P			65280.9	65282			1.1
DT START	74725.9	74725.9	74726.7	74725.9	74726			0
POGO TRAN	75713.9			75713.9	75700			-13.9
PITCH START	75743			75743.9	75744			0
PITCH STOP				75799.3	75800			0
PYRO ARM BATT				75913.9	75915			1.1
POGO FADE	76017.7			76017.7	76025			7.3
TLM A/C TRAN	76250.7					76311	76305	54.3
ORB PWR OFF				76295.3	76296			0
RV SEP (0)	76305.2	76305.2	76305.2	76305.3	76306		N/A NOTE 2	0
SPIN UP (+2.4)				76307.7			N/A	N/A
RETRO START	76430.6	76430.6	76430.6	76430.7			N/A	N/A
DESPIN (+160.4)				76465.7			N/A	N/A
PROP JETT (+175.4)				76480.7			N/A	N/A
TLM A/C FADE	76591.7					76652	76708	116.3
RV ENTRY (400K)	76602.7	76602.7	76603.75		RECOV TW			
Δ 1-2 ACQ					76692	76908		
ION ENTR	76708.3	76708.3	76709.2		76708	N/A		-1.2
ION EXIT	76907.6	76907.5	76908.29		76908	76908		-
DROGUE DEPLOY	76953.7	76953.6	76954.36	TONE STOP	76963	N/A	76955.2	-8.7
IMPACT (50K)	76970.9	76970.9	76971.68					
MAIN CHUTE DPL	76975.7	76975.5	76976.36		N/A	N/A	76974.8	-
H/SHLD JETT	76979.7	76979.6	76980.36	TONE START	76976	76975	76978.8	-5.4
STEADY STATE	76990.7	76990.6	76991.36					
ETPD(RAINDROP)	77007.2	77008.2	77008.7					
RV @ 13.5K	77974.3	77975.3	77975.8	IN TRAIL	78060*	N/A	78027.0	84.2
WATER IMPACT	78563.1	78564.1	78564.6		N/A	N/A	N/A	-
HULA TRAN (RV)	76750.9					N/A	N/A	-
HULA FADE (RV)	76898.2					N/A	N/A	-
DT RUNOUT	77440.9	77440.9	77441.7		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.

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RV 2 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	20.001	20.033	19.977	19.917	20.200	19.917
LONGITUDE	164.74	164.74	164.75	164.767	164.80	164.767
RECOV. A/C DEPLOYMENT FORMATION No. <u>1A</u> , RECOVERING A/C No. <u>1</u>						UPRANGE TIM A/C
RECOV ALT <u>12,200</u> ft, PASS No. <u>1</u> , TIME <u>2141</u> Z						51.083
AIRSPEED <u>154</u> KTAS, <u>124</u> KIAS; TIME IN TOW <u>21</u> min.						155.70
RAINDROP ETPD <u>76977.7</u> sec <u>46000</u> ft; RATE/DESCENT, 15K <u>26.3</u> FPS, 10K <u>24.3</u> FPS						
CONTACT LOCATION <u>Down the center, No. 3 hook engaged one heavy load line</u>						
PRESET TENSION LEVEL <u>3700</u> lb, PAYOUT <u>excessive</u>						
MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)						
OVERSHOOT <u>3.60</u> nm, CROSS TRACK <u>-1.02</u> nm EAST						
RC CONDITION <u>Normal</u>						
CHUTE/CONE CONDITION <u>Excessive payout of cable, after contact, required winch to be manually stopped. 3 of 8 heavy load lines remained intact.</u>						
CHUTE/CONE BEHAVIOR <u>Cone collapsed causing 20° oscillations at 24000 ft, which damped out to 10° at recovery.</u>						

WIND DATA

ALT (K)	DIRECTION		VELOCITY		ALT (K)	DIRECTION		VELOCITY	
	PRED	ACT	PRED	ACT		PRED	ACT	PRED	ACT
SCF	070	080	15	15	25	290	210	15	15
2	090	080	20	15	30	240	270	10	25
4	090	070	20	05	35	270	300	20	50
6	090	070	15	15	40	280	290	20	60
8	110	070	15	25	45	290	290	30	70
10	100	080	15	20	50	290	250	20	20
15	080	090	10	25	55	050	-	15	-
20	050	070	10	10	60	-	-	-	-

RV BATTERY TIME HISTORY

TIME	ACT											
	75915	75917	75918	75920	75921	75924	75939	75940	75943	75947	76012	76296
MAIN		21.8		21.4	21.3		22.0	22.7	24.1	24.6	24.5	24.1
PYRO #1		24.1		24.6		25.3					25.2	25.3
PYRO #2		21.8	24.2	24.8		25.8					25.3	25.2
TIME												
MAIN												
PYRO #1												
PYRO #2												

SV RATES BEFORE & AFTER SEP (SV TLM)

TIME	PITCH RATE PCR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
305	-0.069	+0.001	+0.003
SEP 306	-0.070	+0.001	+0.003
307	+1.40	0.00	-0.020

MISC DATA

Payload Temp before SEP, Rn06 65 °F
 Payload Temp, Max REENTRY, TB02 65.6 °F
 Chute Press before PREP 2, P711 .67 PSI
 Supply Press before PREP 2, P113 .54 PSI
 BETA ANGLE of Recovery Rev. 24.2 °

PITCH ANGLE

BASIC STUDY	Ω_y <u>1.39</u> °/sec	PITCH (CMD MSG)	<u>39.057</u> °
Θ_{rvs} <u>126.87</u> °	$\Delta\theta_2$ <u>0.01</u> °	Θ_{sv} (PDWN-SV TLM)	<u>38.1</u> °
$\Delta\theta_1$ <u>2.17</u> °	Θ_{sv} <u>39.03</u> °	Θ_{rvs} ON UPDATED TEAPOT	<u>126.9</u> °

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RV 2 RECOVERY DATA

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RV MASS PROPERTIES

	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION		ACTUAL POST FLT	
TU-A	233.4	1b	233.4	1b	233.4	1b	236.6	1b
TU-B	233.2	1b	233.2	1b	233.2	1b	232.4	1b
TOTAL	466.6	1b	466.6	1b	466.6	1b	469.0	1b
SEP WGT	1579.58	1b	1579.58	1b	1579.58	1b	UPDATED TEAPOT	
RETRO WGT	1577.89	1b	1577.89	1b	1577.89	1b	% UNBAL	0.08
ENTRY WGT	1387.08	1b	1387.08	1b	1387.08	1b	% FULL	97.62
AIR RECOV WGT	1165.24	1b	1165.24	1b	1165.24	1b	(100% = 478 1b)	

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	17628.2	1b	PITCH INERTIA (I _y)	123925.9	SLUG-FT ²
CG FROM STA 2220.2(X)	213.53	in	ROLL INERTIA (I _x)	5612.7	SLUG-FT ²
CG FROM LONG AXIS (Y)	1.74	in	YAW INERTIA (I _z)	124982.9	SLUG-FT ²

'DORBEL EPHEMERIS

REV OF SEP 829	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION	
PREDICTED FROM REV	819		827		N/A	
APOGEE	152.974	nm	152.895	nm	152.650	nm
PERIGEE	88.492	nm	88.496	nm	88.633	nm
ARG OF PERIGEE	126.389	°	126.428	°	126.456	°
INCLINATION	96.336	°	96.336	°	96.336	°
TRUE ANOMALY AT RETRO	2.00	°	1.93	°	1.91	°
STEADY STATE ALT.	46790.3	FT	46847.04	FT	46832.85	FT
HEATSHIELD JETT ALT.	48543.74	FT	48602.89	FT	48588.25	FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

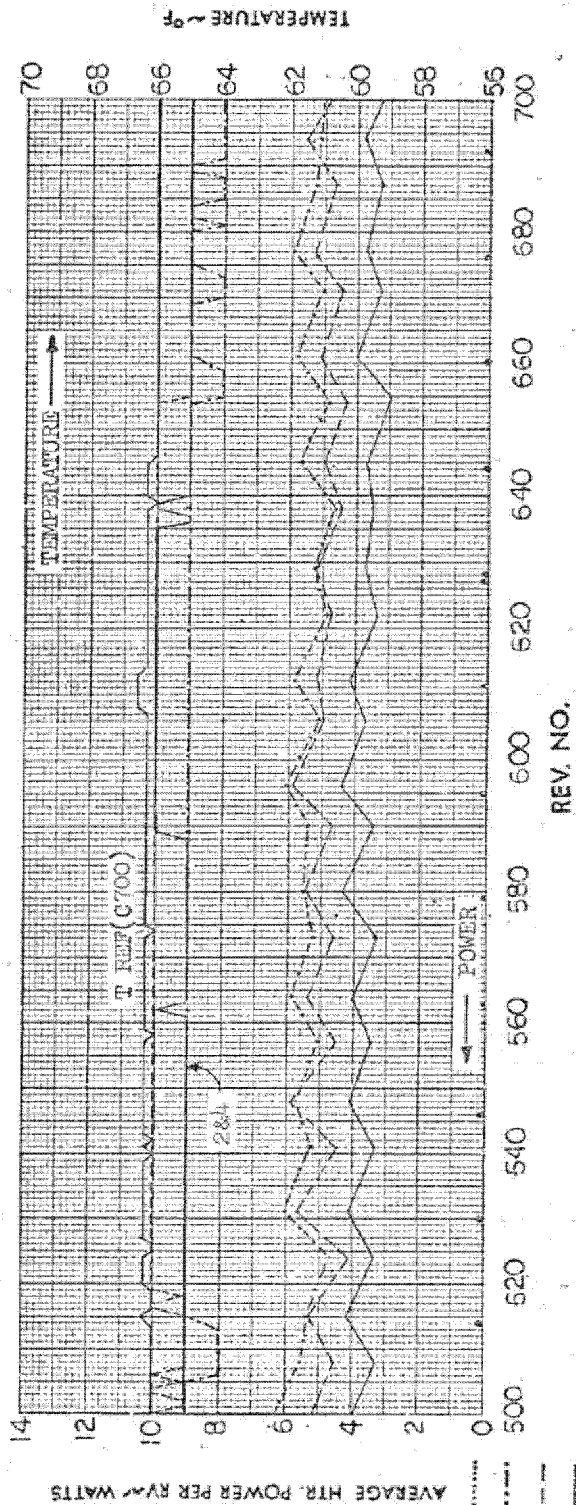
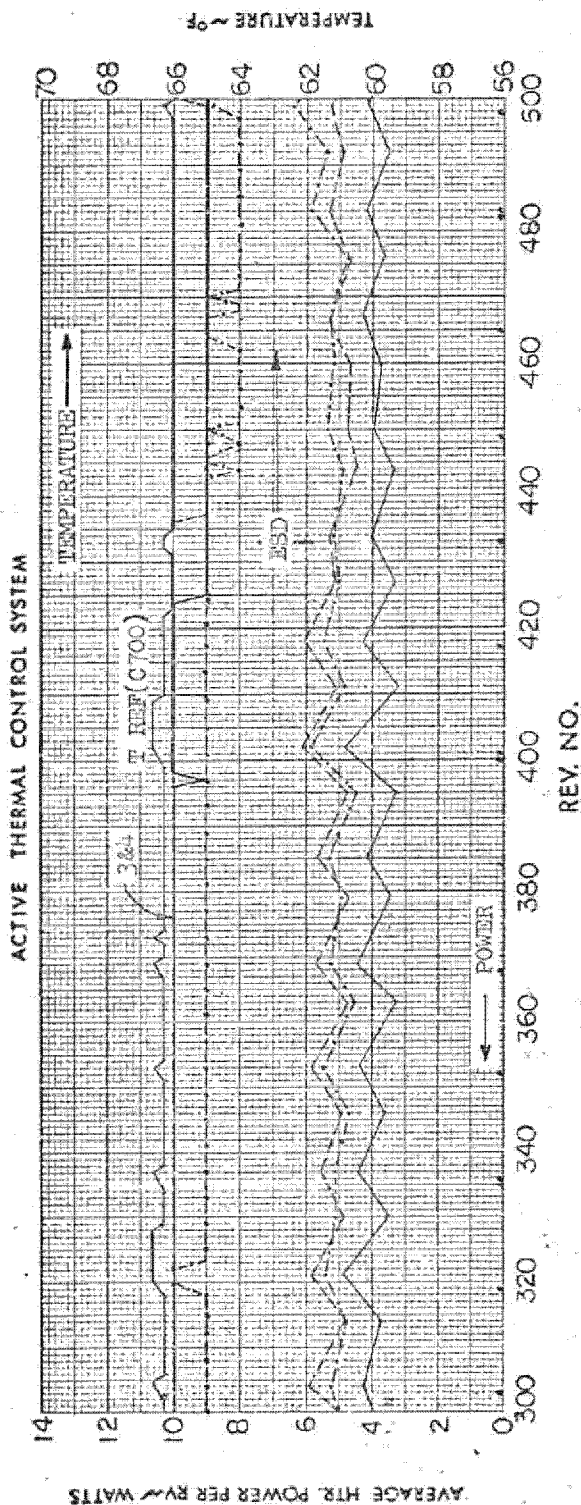
	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	76305.2	76430.6	76603.75	76954.36
ALTITUDE (FT)	547396.12	536172.72	400000	62978.22
LATITUDE (°N)	59.682	51.216	39.733	20.017
LONGITUDE (°W)	153.64	157.18	160.59	164.74
INERTIAL AZIMUTH (°)	192.65	190.16		
INERT FLT PATH ANGLE (°)	- 0.0686	0.0119		
INERT VELOCITY (FT/SEC)	25731.12	25738.41	25529.11	
LOCAL AZIMUTH (°)			190.88	189.97
LOCAL FLT PATH ANGLE (°)			- 1.9784	-31.3467
LOCAL VELOCITY (FT/SEC)				1425.66
ANGLE OF ATTACK (°)			104.65	
MACH NUMBER				1.47
DYN PRESS (PSF)				199.26
CORE PINS SHEARED (FROM REBOUND TWX) A: YES ☒ NO ☐ , B: YES ☒ NO ☐				

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

SYS TIME	74544.213 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	0.0260	°
LONGITUDE	22.7209	INERTIAL GEOCENTRIC FLT PATH ANGLE	-0.4086	°
ALTITUDE	135.6669 nm	INERTIAL GEOCENTRIC AZIMUTH	353.6637	°
		INERTIAL VELOCITY	25372.78	FT/SEC
SV C _D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			0.39515	FT ² /SLUG

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RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



RV HEATER POWER CONSUMPTION

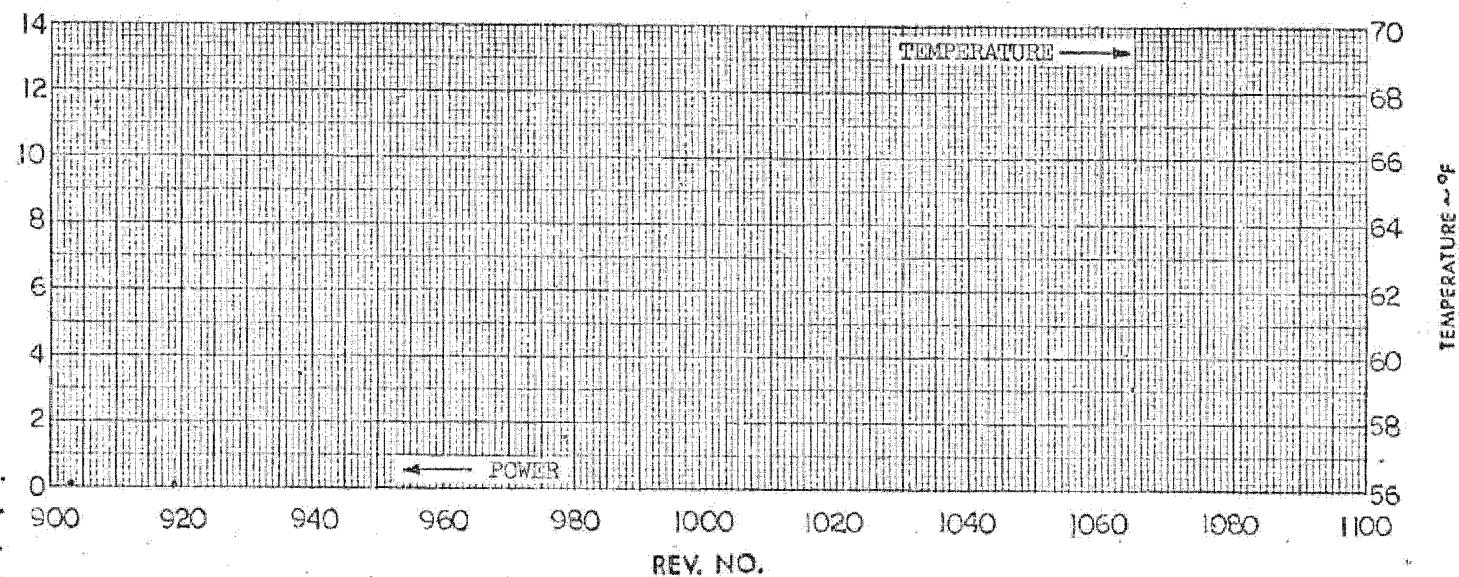
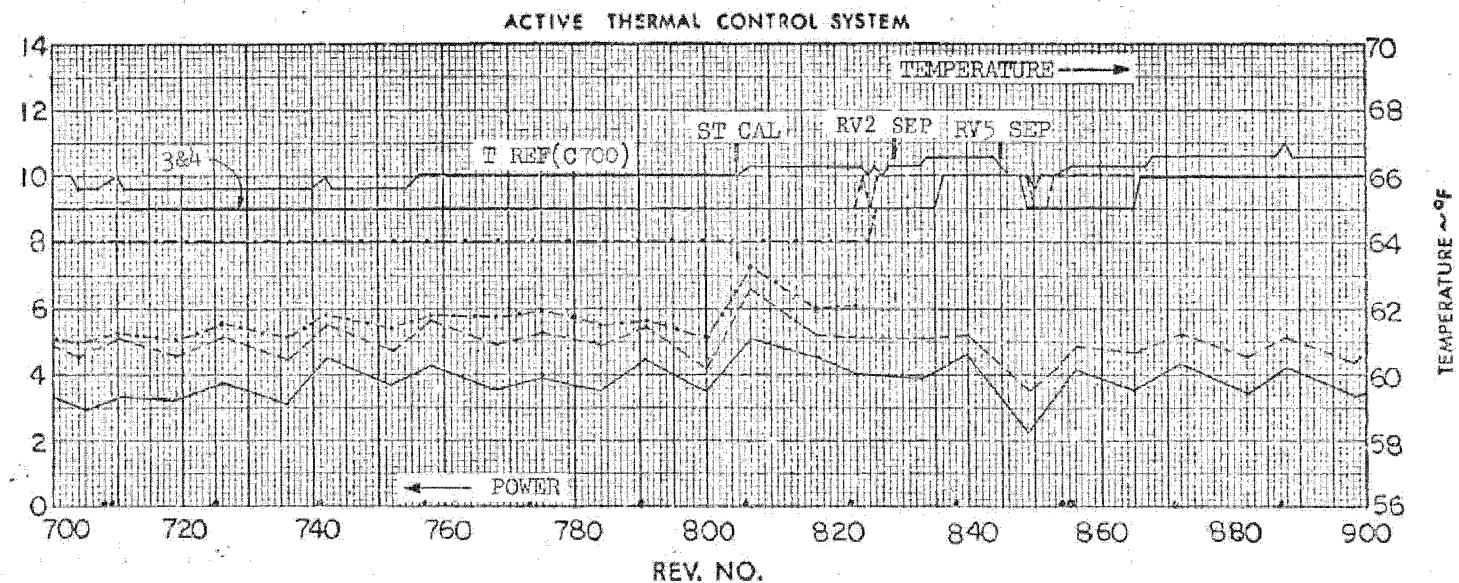
AVERAGE HTR. POWER PER RV ~ WATTS

AVERAGE HTR. POWER PER RV ~ WATTS

RV1
RV2
RV3
RV4

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RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



RV HEATER POWER CONSUMPTION

AVERAGE HTR. POWER PER RV ~ WATTS

AVERAGE HTR. POWER PER RV ~ WATTS

- RV1 - - - - -
- RV2 - - - - -
- RV3 - - - - -
- RV4 - - - - -

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3.5 Satellite Vehicle and Auxiliary Payload Performance

3.5.1 EDAP PERFORMANCE

The main Battery/Solar Array Power System performed satisfactorily during Segment 2. However, a Mapping Camera Module (MCM) relay anomaly did necessitate close management of the Main Battery system. During this period, a continuous current drain of approximately 3.1 AMPS was added to the normal system power usage, and a minimum system state-of-charge of 65% was observed. The maximum period required for system recovery to 90% state-of-charge was 43 revs.

In order to reduce the impact of additional loading, the MCM power was cycled off and on, which permitted the Main Battery System to recover to 90% capacity within 16 revs.

The average power usage during Segment 2 was 23.56 amps-hours/rev and the average Solar Array Output was 24.74 amp-hours/rev. No significant degradation of Solar Arrays was observed.

The average Main Bus voltage at sun entrance was 27.2V and the minimum Main Bus voltage during Primary Payload operations was 26.7V with a maximum current of 65.5A.

Main Battery temperatures were within limits except for Battery #3 which was an average of approximately 3° cooler than the other three. The Main Battery heater duty cycle was observed to be as follows:

Battery #1 @ 40%

Battery #2 @ 14%

Battery #3 @ 55%

Battery #4 @ 47%

Primary Battery temperatures remained within limits during this segment thereby supporting an orbital life expectancy of 139 days for the Pyro Batteries and 136 days for L/B.

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The flight Beta Angle range during this segment was 21.7° to 25.2° and the S/A position will remain at $+18^{\circ}$ throughout nominal flight.

3.5.2 T&T PERFORMANCE

The VCTS's, PCM Telemetry Systems and Tape Recorders performed satisfactorily during Segment 2. Primary Systems were utilized with periodic selection of redundant units for purposes of health checks and/or evaluation. The following tabulation shows the accumulated hours and cycles for the T&T equipments during Segment 2.

	<u>XDR 1</u>	<u>TR 1</u>	<u>PCM 1</u>	<u>XDR 2</u>	<u>TR 2</u>	<u>PCM 2</u>
<u>CYC</u>	908	3979	4199	17	12	14
<u>HOURS</u>	86.72	205.06	259.35	.56	.97	.94

3.5.3 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 140° and 153° F.

The Reaction Control System (RCS) performance was nominal throughout this segment. RCS propellant consumption was 117.8 lbs. which equates to an average of 3.27 pounds per day. Thruster performance is tabulated in Table 3.5-1.

One RCS anomaly was noted during this segment. During the yaw maneuver on Rev 308 the temperature transducer on thruster 8 showed erratic output. Analysis of the problem attributed the anomalous temperature readings to a variable resistance resulting from a break in the thermocouple wire. No operational impact resulted due to this transducer failure.

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3.5.4 ORBIT ADJUST SYSTEM (OAS) PERFORMANCE

The Orbit Adjust System (OAS) performance was nominal for the 16 orbit adjusts performed. The propellant usage for the orbit adjusts was 1006.8 pounds.

The orbit adjust summary is shown in Table 3.5-2.

3.5.5 LIFEBOAT II (LBII) PERFORMANCE

The LBII system electronics were activated on Rev 829 for RV-2 recovery and on Rev 845 for RV-5 recovery. The pneumatics were not activated. Analysis of the magnetometer data indicated system performance was nominal. Lifeboat tank heaters were not turned on for this segment. Tank temperature continued to decrease from 104°F. on Rev 261 to 72.0°F. on Rev 845. Impulse was 4060 lb.sec. and 1900 lb.sec. respectively for the noted tank temperatures.

3.5.7 DOPPLER BEACON PERFORMANCE

Normal DBS operation was in effect through Rev 861. Following normal operations, check of the redundant systems was performed as follows: Test A, on Rev 862, activated Oscillator 2; Test B, on Rev 878, activated Heater 2; Test C, on Rev 894, returned the system to Oscillator 1 and Heater 1; Test D, on Rev 910, took power off the entire system. Telemetry data throughout the tests verified nominal performance of the redundant systems.

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RCS THRUSTER PERFORMANCE SUMMARY

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SEGMENT NO. 2

Table 3.5-1

REV NO.	REA #1 ACTUAL THRUST	REA #2 ACTUAL THRUST	REA #3 ACTUAL THRUST	REA #4 ACTUAL THRUST	REA #5 ACTUAL THRUST	REA #6 ACTUAL THRUST	REA #7 ACTUAL THRUST	REA #8 ACTUAL THRUST	QUAL THRUST
307	4.3	4.3	3.8	4.2	4.1		4.2	4.1	4.2
454	3.8	3.2	3.4	3.8	3.9		3.9	3.7	3.8
600	3.5	2.5	3.3	3.5	3.5		3.5	3.4	3.5
746	3.2	2.1	3.0	3.2	2.8		3.1	3.1	3.2
805	3.0	2.2	2.8	3.1	2.3	2.8	3.1	3.0	3.1
829		2.1	2.8			2.7	3.1		3.1

ORBIT ADJUST SUMMARY

SEGMENT NO. 2

Table 3.5-2

OA No./ Type	Ops Day	Rev No.	Delta Vel (Predict)	Delta Vel (Tracking)	Burn Dur.	Prop. Used	Avg OA Tank Temp	Avg OA Tank Press
			Fps	Fps	Sec.	Lbs.	deg F.	psia
6/POS	17	263	14.2348	14.3772	41.6	38.8	78.0	235.4
7/POS	19	306	46.4787	46.624	135.4	123.1	78.7	233.8
8/NEG	19	308	31.180	31.418	94.2	82.9	79.1	209.8
9/POS	22	354	14.000	14.1728	43.6	37.8	80.0	203.9
10/POS	25	403	19.6133	19.976	61.2	52.4	80.7	198.8
11/POS	28	452	35.4699	35.77	111.0	93.4	81.6	191.6
12/NEG	28	454	22.0256	22.26	70.8	58.4	82.0	184.4
13/POS	31	500	20.1422	20.58	65.5	53.4	82.5	179.3
14/POS	34	549	16.7724	16.97	55.2	44.4	83.3	175.3
15/POS	37	599	34.4176	34.599	113.0	89.5	84.1	169.7
16/NEG	38	601	18.900	19.166	63.6	49.5	84.5	164.1
17/POS	40	646	18.4728	18.817	62.8	48.4	84.4	160.9
18/POS	43	695	16.7387	16.9682	57.4	43.9	84.9	157.7
19/POS	46	744	34.2796	34.6314	117.2	88.1	85.3	152.9
20/NEG	46	746	19.9084	20.2345	69.6	51.7	85.5	149.0
21/POS	49	792	19.7567	20.1713	69.6	51.1	85.4	145.8

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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 1210, IRON 6381. The command messages discussed cover the period of RV-2 initiation (Rev 262P load) to the RV-2 recovery message (Rev 827C load). Five hundred and twenty-five command messages were planned by the flight profile, of which two hundred and five were cancelled. The remaining three hundred and twenty command messages were received and reviewed by the Technical Advisor (TA) staff. Three hundred and four were accepted and sixteen were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the sixteen messages are summarized below:

<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
362 POGO	SP message altered because PMU A was not filled to a minimum SUB of 334, the location to which auto VBE commands 9333 and 9433 erase.
349 COOK	Altered because CG omitted a load card.
357 POGO	Altered to eliminate a TT/C hardware constraint violation.
366 HULA	DOX rejected third of 3 ops requiring an alteration.
371 POGO	Message altered because SPC inhibits were not VBE'd out for the long POGO pass due to an incorrect VBE address.



454 POGO This planned alter added CB+ to Seq. 171.

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<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
456 POGO	This planned alter added CB+ to Seq. 171.
458 POGO	This message was altered twice; once to add CB+ to Seq. 171 and once to add a load card which had been omitted.
544 COOK	Altered to eliminate a TT/C hardware constraint violation.
638 BOSS	Altered to turn OFF STI+ before ST power removal sequence to ensure removal of excessive load from the K1 relay.
645 GUAM	Altered to include the OA Macro 32 which had been inadvertently omitted.
688 POGO	DOX deleted an IMOP.
746 POGO	Altered to eliminate a TT/C hardware constraint violation.
778 POGO	Altered to provide proper recording of an NEC ops using Sequence 149 vice the wrong sequence called out initially.

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

<u>Rev No. and Load Station</u>	<u>Reason For Not Loading</u>
438 POGO	This message contained nothing different from the previously loaded message.
804 HULA	This altered message was not loaded due to an insufficient number of copies and thus insufficient time for checking. With SPO approval, the original message was accepted for one rev only.
827 COOK	The secure alternate PIP message for RV-2 recovery was not required.
829 POGO	The RV-2 recovery abort contingency message was not required.

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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 fifty-one add-on messages.

Summary

Total Planned Messages:	525
Messages Cancelled:	(-) 205
Total RV-2 Messages:	320
Messages Rejected:	(-) 16
Messages Altered:	(+) 16
Total Messages Accepted:	320
Messages Not Required:	(-) 4
Total Messages Accepted and loaded:	316

3.6.2 'TUNITY Software Problems

The Flight 10 'TUNITY software problems itemized below pertain only to the period from RV-1 recovery through RV-2 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.

<u>Category</u>	<u>No. of SPRs</u>	<u>Comments</u>
Flight Critical	0	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)	5	Work-around procedures were not required.
Product Improvements or New Requirements	3	To be considered during future development.
Documentation Error	3	MS-4 or MS-7 affected.

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SPR MD3-9045 ('TLMP)

- Problem Description: MPR: If the last frame of an ST operation is not encompassed in time by an SS operation, then the attitude data is "NOMINAL" for that frame instead of "LIVE DATA". This situation occurs because 'TLMP stops reading the attitude data when the telemetered operation flag changes state. MPR needs one more attitude data point for interpolation. Since it does not exist, "NOMINAL" data is used.
- 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-11.

SPR MD3-9046 ('TDUGOUT)

- Problem Description: 'TDUGOUT for Rev 324 indicated that two rows were taken when actually they were not. The operation in question was a two row operation which 'TPUTOUT displayed as three rows. The first row had weight but no cells were reported by 'THAYER. Row two was OK. Row three was zero weighted and not selected, but 'TPUTOUT included it. This is a limitation which is not documented and it could result in missing targets.
- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: A detailed description of how the bias is applied in 'TDUGOUT between the 'TIJ and 'TIJ+1 should be documented in the MS-4.

SPR MD3-9047 ('TINGE)

- Problem Description: Message 142 contained a LOAD card for messages 130 and 140. Message 130 "load time" was 665593.8 (Veh) based on the ephemeris Rev 434. Message 140 "load time" was 665593.6 (Veh). Therefore, the add-on message (140) was "loaded" before the SP message. This caused a 'TINGE abort. If message 140 had been run against VE REV434 instead of REV438, there would have been no problem. 'TUNITY should be modified so that the load option allows separate load times or load time biases for each message when multiple messages appear on the "LOAD" card.
- Solution or Work-Around: The SP message and the add-on message should be generated on the same vehicle ephemeris.

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- Operational Impact: The generation of the message must be started over again after CMU has been run on one of the previous messages. This causes a delay in the verification of the message in an already tight time-line.
- Comment: It is a software problem, the solution is known, and it should be fixed prior to the support of SV-11.

SPR MD3-9048 ('TSTAGEN)

- Problem Description: In the 531 GUAM SP message, message 160, 534 POGO was profiled as a short station (150 seconds duration). However, it was also a broken pass (it had 1 SET and 2 FADES). The commanding was broken up. When the station was shortened, the 'TSTAGEN listing showed a FADE time before a TRAN time for the second part of the broken pass (it was also before the fade time of the first part of the broken pass). This resulted in a pass duration of 150 seconds which was correct, but two command durations of 179 seconds for the first part of the pass and 86, 363 seconds for the second part. The station is the correct length in the chrono listing, but the 'TSATGEN listing of stations for that station was incorrect.
- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: SOST is currently investigating this problem to determine if it is a software problem or if the software is working per design.

SPR MD3-9040 ('TWIT)

- Problem Description: 'TWIT provides only an informational message for missed weather for the MPE run. There is a possibility of passing over this 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 MD3-9050 ('TLMP/'TFRTFIX)

- Problem Description: The FRT time for frame 22 Rev 557 had a vernier of 776 which is a "NO REPORT". The software splits the potential error by passing a default value of .1 (the maximum of the vernier is .2 seconds). An improvement would be to drop the entire FRT time, if the vernier is a "NO REPORT". This would cause the software to interpolate across this point, which is much more accurate than the above method.

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- Solution or Work-Around: When the above mentioned error is noticed in 'TFRTFIX then the error should be corrected with a manual 'TFRTFIX run prior to running MPR.
- Operational Impact: With the implementation of the above mentioned work-around procedure, there is no operational impact.
- Comment: It is a software problem and it should be fixed prior to the support of SV-11.

SPR MD3-9051 ('TRANFUN)

- Problem Description: System time for SPC's is not printing out correctly in the 'TRANFUN sequence summary listing. 'TRANFUN is also failing to recognize correctly the system time turnover.
- 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-11.

SPR MD3-9052 ('TSTAGEN)

- Problem Description: If the first station of an SP span is made a capability 14, 'TSTAGEN displays this station as a capability 0.
- 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-11.

SPR MD3-9053 (E&CG OVERVIEW)

- Problem Description: A summary of how 'TBALL interprets the time fields on IMOP, MOP and INH cards should be included in the data card descriptions in the MS-4 and MS-7.
- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: The MS-4 and MS-7 should be updated to correct the above mentioned discrepancy prior to the support of SV-11.

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SPR MD3-9054 ('TSEL)

- Problem Description: 'TSEL has no capability to construct less than a complete rev of sensor events at a time. This can cause problems if an ascending operation is selected by the previous message on its second rev. In order to keep this operation in the 'TLITAB, it is necessary to either INHIBIT the ascending portion of the rev and re-input the operation if it was a MOP, or use the 'TLOAD entrance with a PACC card for SP-10A's 'TSEL runs.
- Solution or Work-Around: Use the 'TLOAD entrance for the 'TSEL runs in order to take advantage of the automatic partial accept.
- Operational Impact: None.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9055 ('TCATCHM MS-4)

- Problem Description: In the 'TCATCHM MS-4, paragraph 6.4.4 (Page 79), it states that the mandatory flag is set for the first DEA of a MOP. The flag is actually not set until the first properly overlapped DEA.
- Solution or Work-Around: The MOP must be started two rows prior to the DEA that triple overlap is desired.
- Operational Impact: None.
- Comment: A complete description of how the MOP card works should be documented in the 'TCATCHM MS-4 prior to the support of SV-11.

SPR MD3-9056 ('TFENCE)

- Problem Description: In the preliminary runs of message 410, a "real-time" MOP was rejected and a new MOP, without the "RTM", was specified. However, 'TBALL still assembled a "real-time" MOP.
- Solution or Work-Around: Once a "real-time MOP" (RTM) has been assembled for a given rev, the rev must be reconstructed (not SELUP) if the RTM option is to be eliminated.
- Operational Impact: None.
- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-11.

SPR MD3-9057 ('TRIAL)

- Problem Description: It appears that 'TRIAL is non deconflicting held functions at the Load station.

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- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: SOST is currently investigating this problem to determine the software modification necessary to fix it prior to the support of SV-11.

SPR MD3-9058 ('TBALL)

- Problem Description: The message generated for Rev 778 had both an ascending and a descending operation. When the commands for the second operation were assembled erroneous focus update commands were also assembled. The focus should have been in the nominal state but instead it was commanded out of the nominal position.
- Solution or Work-Around: The message must be altered to delete the erroneous focus commands.
- Operational Impact: The amount of time allowed to check the message is shortened because the message must be altered.
- Comment: It is a software problem, the solution is known and it should be fixed prior to the support of SV-11.

SPR MD3-9059 ('TPURR)

- Problem Description: 'TPURR currently outputs the 'CPUTAB and the 'TJDTAB prior to the data base purge. A more useful procedure would be to additionally output these tables after the purge is completed. Also, I recommend the addition of a new item in the 'CPUTAB or 'TJDTAB which is the result of dividing the slope ('CPUSLP) into the last record saved ('CPULST) and then adding the pad ('TJDPAD). This would be done for each 'CPUNAM in the purge table. This output could be added directly to the right of the 'CPUFIL column in the 'CPUTAB and the 'TJDTAB. These improved output capabilities would greatly simplify the checking of 'TPURR and eliminate the possibility of checker error.
- Solution or Work-Around: None.
- Operational Impact: None.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

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3.6.3 Hardware/Software Interface Changes

For IRON 6381, twenty-four change requests were processed from RV-2 initiation through the RV-2 recovery message (as shown in Table 3.6.3-1).

These requests were implemented via requests SV10-96 through SV10-119 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

<u>Request No.</u>	<u>Identification</u>	<u>Data Base Effectivity</u>
SV10-96	Adds ST PWR+ to Sequence 149 to provide power for ops if system was OFF.	SV-10 only
SV10-97	Adds ST PWR+ to Sequence 150 to provide power for ops if system was OFF.	SV-10 only
SV10-98	Modifies Sequence 144 to reflect new nominal value of PSI.	SV-10 only
SV10-99	Modifies Sequence 147 to reflect new nominal value of PSI.	SV-10 only
SV10-100	Provides new Sequence 188 to verify SSC CB+ capability.	SV-10 only
SV10-101	Modifies Sequence 183 to provide multiple CB+ commands.	SV-10 only
SV10-102	Modifies Sequence 171 to provide extra CB+ command.	SV-10 only
SV10-103	Modifies Sequence 181 to provide extra CB+ command.	SV-10 only
SV10-104	Modifies Sequence 213 to provide extra CB+ command.	SV-10 only
SV10-105	Modifies Sequence 120 to provide extra CB+ command.	SV-10 only

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<u>Request No.</u>	<u>Identification</u>	<u>Data Base Effectivity</u>
SV-106	Modifies Sequence 213 to provide extra CB+ command	SV-10 only
SV-107	Restores Sequence 120 to normal configuration	SV-10 only
SV-108	Modifies Sequence 148 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-109	Modifies Sequence 149 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-110	Modifies Sequence 150 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-111	Modifies Sequence 152 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-112	Modifies Sequence 153 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-113	Modifies Sequence 380 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-114	Modifies Sequence 381 by adding ST+ to re-establish the emergency shutdown command.	SV-10 only
SV-115	Adds new Sequence 155 to pulse the K1 relay attempting to clear a failure.	SV-10 only
SV-116	Adds new Sequence 156 to provide an extended FA operate without tape recorder.	SV-10 only
SV-117	Modifies Sequence 71, ST CAL roll maneuver, to comply with operational philosophy.	SV-10 and Nominal

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3.7 Satellite Vehicle Support

3.7.1 Satellite Control Facility (Prepared by the FTFD)

3.7.1.1 Field Test Force Support

1. A study has been completed on the effects of loading One SP Message per Day. This proposal would optimize computer usage by eliminating the requirement for a daytime secondary and by better utilizing the scheduled computer during the night-time dead rev. This proposal would also eliminate add-on messages which contain no payload operations. This procedure could be implemented by the end of SV-10.
2. A 3800 Computer Usage Study was completed and as a result of this study two additional disk packs will be installed on each of the computers beginning in December 1975. This will eliminate disk overflow errors and will add credibility to the extremely short command generation timeline.
3. The Mission Control Complex for Program 467 will begin modifications in November 1975. Test Control Area expansion, new display installation, and major reconstruction in all areas will increase program effectiveness. SV-11 operations may temporarily be supported from MCC-1.

3.7.1.2 RTS Outages Affecting Operations

1. Communications

Satellite Voice and Dataline Communications with the Thule Tracking Station (POGO) failed seven times. The impacts due to these outages ranged from re-established communications prior to acquisition to loading the secure pitchdown and separation message for RV-5 using only the backline (cable) for voice reports from the station operations controller. There were no missed loads due to these communications outages.

Interim Wideband data supports from Guam and Hula were not successfully transmitted to the STC on 5 Revs (434G, 456H, 497G, 515H, and 742G) due to decom failures at the STC ground Station and antenna failure at Hula (Rev 515).

2. Equipment

Antenna tracking failures were observed on four passes at POGO. Those errors were attributed to multipathing at acquisition and fade. The impact of these outages was limited taperecorder readout.

Rev 885 Hula was supported successfully with the command transmitter antenna since the SGLS46 10KW transmitter faulted at ETA 2 minutes.

The 1230 computer at POGO failed to initialize on Revs 666, 67, 68 and 69. Tracking and telemetry support was provided. Three loads were missed.

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3.7.1.3 STC Outages Affecting Operations Equipment

Seven 160A computer failures imparted operations. The impacts varied from limited prepass support to total loss of the computer for an entire pass. All program requirements were met using playbacks and an alternate 160A computer.

3.7.2 Telemetry and Display Modes Processing

The following telemetry mode activity occurred during the RV-2 portion of SV-10:

1. Octal correctors were provided by DVOS to correct the BV-EV processing errors in Fmt C PST modes.
2. Mode 60, Signal Strength & Carrier 4 Data Plotting Mode, was generated and tested. The TAS evaluated the test runs and suggested improvement in mode design.
3. New Honeywell Oscillograph recorders were being installed in the STC Oral Station. The TAS revised the set-up-sheets for microwave data to be compatible with the capabilities of these recorders.
4. Errors in the definition of the wavetrain location of some CMD System Monitors was corrected in the CMD System Diagnostic Modes.

3.7.3 Orbital Events

3.7.3.1

3.7.3.2

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

3.8.1 Mission Performance

The performance of the ST camera was affected by two major camera relay failures. ST camera relays K2 and K3 failed in the closed configuration, applying power to the takeup and supplies (K2) and applying power to the terrain and stellar film transport clutches (K3). The relay failures were unrelated.

The K2 failure required considerable system operational management procedures. The ST temperature control was greatly altered due to the constant thermal sources resulting from power being applied to the takeup and supplies. Thermal control was effected by cycling the ST main power ON and OFF throughout the flight. Temperature control was required to maintain the following:

1. To keep the ST temperatures above the minimum required for calibration.
2. To keep the takeup temperatures below the level predicted to produce degrading base plus fog levels.

The operational management procedures utilized to work the temperature problem, including the increased power drain on the system, were successful in maintaining the ST within the required calibration temperature range.

An additional problem, believed to be associated with the higher takeup temperatures, was erratic terrain film transport phase lock on several operates.

On rev 755 the stellar film output idler roller stopped for the last 2 frames. Subsequent operation was normal.

Both the terrain and stellar film tag ends were successfully passed by the film transports at the completion of each film load.

The problems experienced in flight are still under investigation. SV-11 and subsequent do have modification to relays such as K2 and K3 to reduce the drop out time

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that is believed to have been responsible for the relay failures on SV-10. These modifications were incorporated before the SV-10 flight problems.

Preliminary recovered film analysis showed no degradation due to the elevated temperatures.

3.8.2 Milestone Events

	<u>Rev</u>	<u>Ops Day</u>	
Lift Off	0	1	8 June 1975
Engineering Health Check	4	1	
First Mapping Operation	7	1	
K2 Relay - Intermittent Failure	59	4	
K2 Relay - Permanent Failure	155	10	
K3 Relay - Failure	561	35	
K3 Relay - Failure Cleared	640	40	
MCD Shutdown	804	50	
Calibrate Completed	805/806	50	
Film Depletion Run Out	806	50	
RV-5 Recovery	845	53	30 July 1975

	<u>Terrain</u>	<u>Stellar</u>
<u>Frames</u>		
Total Expected	2117	2361
Total Actual	2114	2359
Difference	3	2
Ground Test Preload and Health Check	64	80
Special Engineering	5	5
Inflight Calibration	24	26
Stellar Run Out	--	227
Mapping Operation	2021	2021
Total Weight	57.20	10.99
Total Footage	3398	2125

3.8.3 Bar XC Coverage

The mapping camera was operated over the Bar XC range in Arizona during the following revs:

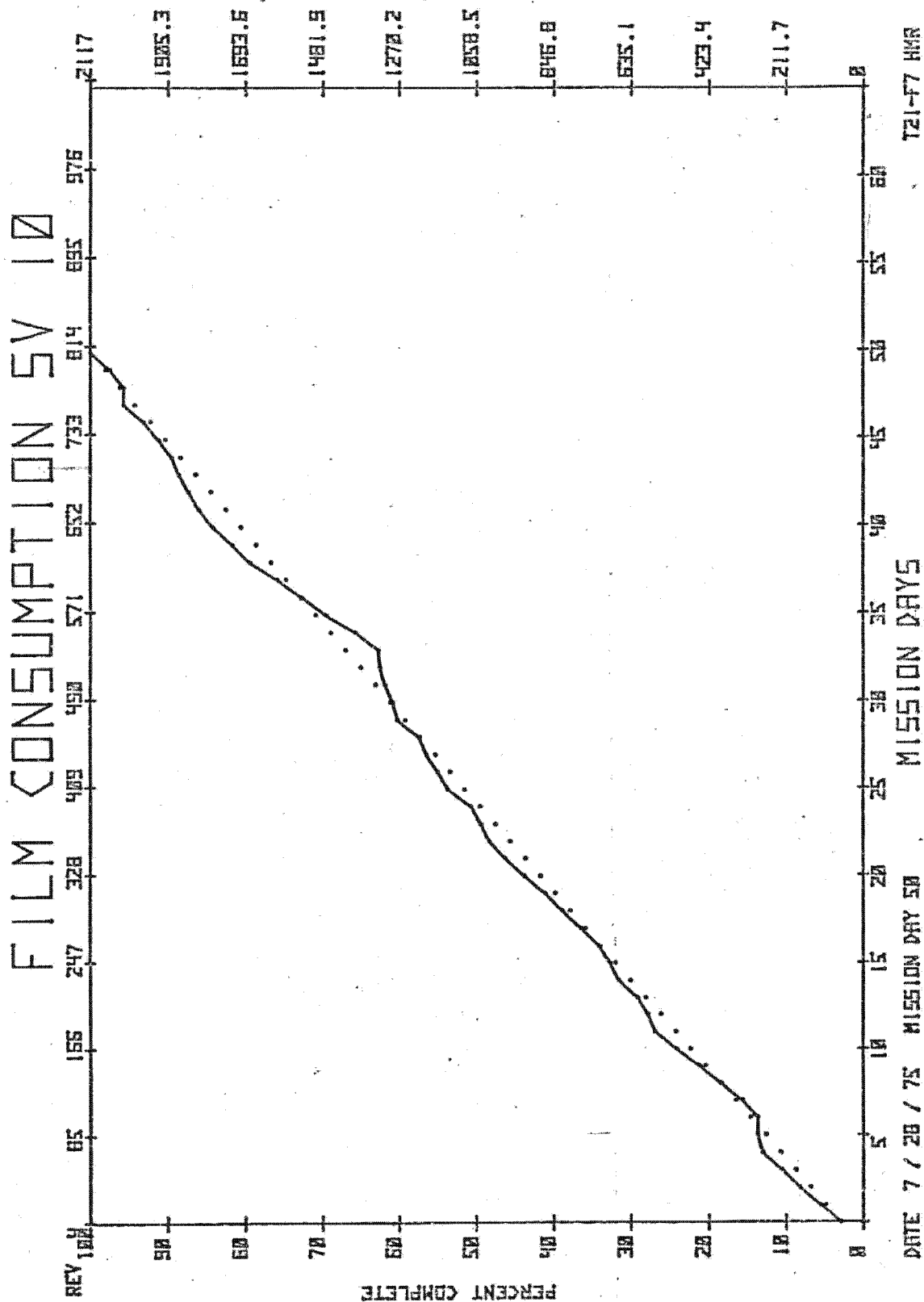
<u>Rev</u>	<u>Frames Taken</u>
32	8
178	8
778	7

3.8.4 Figure 1 is the film consumption record of the SV-10 mapping operations.

3.8.5 ST solo activities have been postponed until after the RV-4 recovery.

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FIGURE 1

3.9 RV-5 Performance (Prepared by OPC)

Telemetry measurements indicated that the following RV-5 temperature and discrete monitors remained within specification limits during the mission: stagnation point, -45° skirt liner, $+45^{\circ}$ skirt liner, thrust cone-retro and recovery battery temperatures; XD1, XD2 and XD3 discrete monitors.

The payload temperature sensor exceeded its 30°F to 85°F specification limits. The temperature sensor indicated 87°F on Rev 77, 87°F on Rev 156 and a maximum of 164°F on Rev 741.

The upper specification limit was exceeded because of a malfunctioning NEC K2 relay which allowed power to remain on the stellar and terrain takeup motors. The NEC K2 relay hung up for short period on Revs 59 and 74 and for the duration of the mission on Rev 153.

The temperature of the SRV and the stellar-terrain camera system were "controlled" in a cyclic manner by using the NEC K1 relay(s) starting on Rev 179. The maximum SRV temperature indicated was 104°F on Rev 337 by the recovery battery temperature sensor.

The following information is reported after evaluating drop recovery studies, command messages, RV-5 telemetry, PCM telemetry, voice reports, and the recovery test report TWX:

3.9.1 Weight

SRV weight separated from SV	394.30 lb
SRV-5 weight at retro	393.30 lb
100% payload predicted weight (57.20 + 10.99)	68.19 lb
RV-5 weight at top of atmosphere (410 K ft)	299.23 lb
RV-5 capsule suspended weight	181.19 lb
RV-5 air snatch weight	206.25 lb

The flight performance analysis TWX reported the total payload weight as 67 pounds.

3.9.2 Preps

Run out of the excess stellar film was accomplished on Rev 807.

Recovery Battery Heater Power On command occurred on Rev 841B. The temperature monitor indicated 54°F before turn-on, 66°F on Rev 842 and approximately 66°F at the time of battery activation (ARM command) on Rev 845.

RV-5 Closure was accomplished on Rev 842P.

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3.9.3 Recovery Conditions (Evaluation TPOT Data)

Orbit

Rev No.	845
Apogee	150.450 NM
Perigee	88.637 NM
Argument	122.638 Degrees
Inclination	96.335 Degrees
Eccentricity	0.00885007
Period (Keplerian)	88:45.631 Minutes:Seconds

Retro

True Anomaly	11.25 Degrees
Altitude	529173.78 Ft
Latitude	45.767 Degrees North
Longitude	153.79 Degrees West
Velocity (Inertial)	25736.90 Ft/Sec
(Start of Retro)	
Velocity (Inertial)	25363.78 Ft/Sec
(Burn Out)	
Pitchdown Angle	-64.116 Degrees (After Yaw Reverse)

Entry (410 K Ft)

Velocity (Inertial)	25496.75 Ft/Sec
Gamma (Geod. Inertial)	-2.0818 Degrees
Alpha	104.57 Degrees
Latitude	36.650 Degrees North
Longitude	156.21 Degrees West

Drogue

Velocity (Local)	938.80 Ft/Sec
Mach. No.	0.97
Altitude	59910.96 Ft
Dynamic Pressure	100.018 PSF

Impact

Altitude	55000.05 Ft
Latitude	17.930 Degrees North
Longitude	160.01 Degrees West

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 PIP (Eval TPOT) and EPPD was calculated to be 13.43 NM (13.43 NM short and 0.20 NM east of the ground track).

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3.9.5 Aerial Recovery (Recovery Group TWX Info)

Altitude	11,800 Ft
Pass Number	1
Airspeed	158 KTAS 128 KIAS
Chute Condition	Normal
RV	Normal
Winch PTL Setting	1000 lb
Payout	Normal
Contact Location (Rig & Parachute)	Number 7 and 8 Hooks engaged 3 Laterals. The reference point was scored at 1 ft right 13 ft elevation
Recovery Aircraft	No. 1 (#750)

Comments (Unusual Conditions or Events)

1. Three Recovery Aircraft had TLM operators (Nos. 1, 2 & 4)
2. No. 1 crew reported system swinging 8 to 10 degrees from 17,000 ft. RAC reported that the swing did not affect his recovery.
3. No. 1 aircraft failed to receive Delta 4 signals because of a faulty crystal in the EDF position switch.
4. The uprange TLM aircraft (No. 8) acquired the beacon at 2052:59Z, position 39°41'N 154°50'W. Beacon fade was at 2058:44, position 39°44'N 155°26'W. The track was 278 degrees; IAS: 165 KTS; TAS: 264 KTS; altitude: 28,000 ft.

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:

ACS

Pitch Attitude at Separation	-63.4 Degrees
Roll Rate at Separation	-0.003 Degrees/Second
Pitch Rate at Separation	0.069 Degrees/Second
Yaw Rate at Separation	0.0 Degrees/Second
Max Roll Rate after Separation	-0.027 Degrees/Second
Max Pitch Rate after Separation	1.27 Degrees/Second
Max Yaw Rate after Separation	-0.016 Degrees/Second

3.9.8 MK V Re-Entry Comments

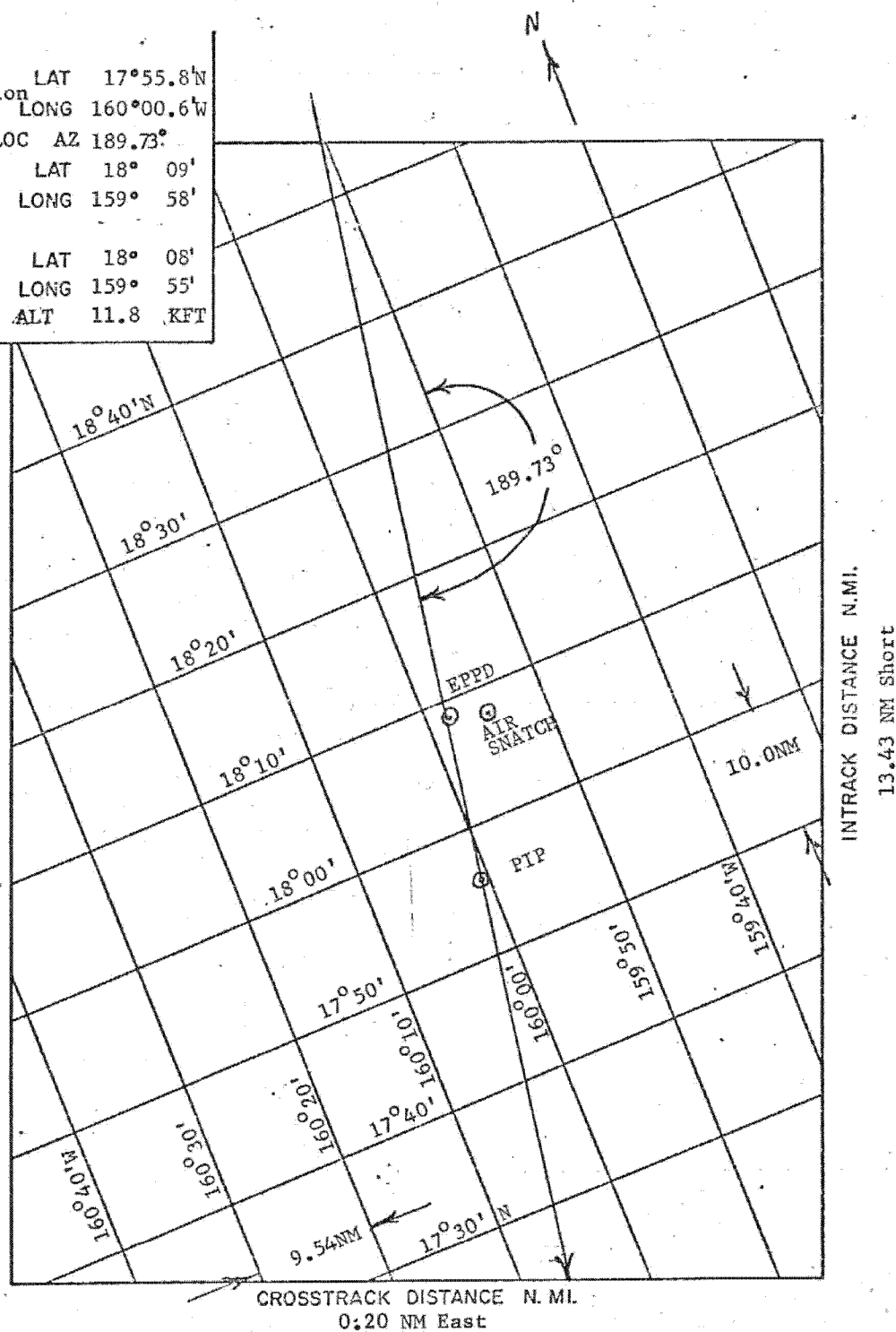
All re-entry events appeared nominal.

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PIP (Evaluation TPOT) LAT 17°55.8'N
 LONG 160°00.6'W
 55K FT. LOC AZ 189.73°

EPPD LAT 18° 09'
 LONG 159° 58'

AIR SNATCH LAT 18° 08'
 LONG 159° 55'
 ALT 11.8 KFT



Predicted / Actual Impact Locations
 Figure 4.3.1

FORM DB-28-C4

Rev A

~~SECRET HEXAGON~~

Approved for Release: 2025/07/25 C05127916

Recovery Events Table 4.3-1

RECOVERY DATE 30Jul75 SRV RV-5 SERIAL NO. 1806 SHIELD SERIAL NO. 480RECOVERY REV 845MANUFACTURING DATE Oct 73STRESS LEVEL 2800 PSI

PLANNED ACTUAL
 IMPACT LOCATION Lat 17°55'48"N Lat 18°09'N
 Long 160°00'36"W Long 159°58'W

Events	Predicted Time System Time (sec)	Execution Time System Time (sec)	Beacon Rep. Rate CPS	Source of Data
Arm	75154.31	75154.30	NA	A (M126.3)
Beacon 1 On	75179.31	75179.30	4.2	RS8
Beacon 2 On	75179.31	75241.2	3.9	RS8
Recovery Battery 1 On	75178.31	75196.30	No Change	A (M32.3)
Recovery Battery 2 On	75178.31	75196.30	No Change	A (M32.3)
Transfer	75270.31	75270.30	No Change	A (M126.1)
TFD Disconnect	75271.21	75271.30	No Change	A (M32.3)
Separation	75271.91	75271.90	No Change	A (M126.1)
Spin Time/RPM (57 NOMINAL)	75274.61/50-57	NA /55.0	No Change	RS8
Retro	75282.15	75282.1	2.0 1.96	RS8
Despin Time/RPM (13 NOMINAL)	75292.9/10-16	NA /13.5	No Change	RS8
T/C Separation	75294.4	75295.05	1.00 1.00	RS8
G-Switch Close	75639.36	NA - Blackout	8.4 8.1	RS2
G-Switch Open	75747.55	75740.5	1.0 1.0	RS2
Piston Fire	75773.55	75766.45	0.51 0.52	RS2
Drogue Shock Time/Duration (sec)	75774.35	75767.52/3.2	7.83 7.5	RS2
Main Shock Time/Duration (sec)	75784.35	75784.2/0.4	8.0 8.0	RS2
Air Snatch Time/Duration	76806.30	76904.48/1.7	7.8 8.0	RS2
B/U G-Switch Close	77210.0	77221.94	6.67 OFF	RS2
B/U G-Switch Open	77270.0	77274.60	0.51 OFF	RS2

A - Augie

 Mag-Mag Tape Reduction A/C Recovery
 NA - NOT AVAILABLE Strip Chart

 DB- 30-C3
 REV A
~~SECRET HEXAGON~~

SECTION 4

4.0 ORBIT PHASE - REV 829 TO RV-3 RECOVERY

4.1 Summary

The Sensor Subsystem exhibited nominal operation characteristics until Rev 852, when the aft camera take-up integrator reset signal ceased functioning. The problem occurred twice through the remainder of RV-3.

While the failure of this signal did not casue a shutdown, as did an indential failure on 1208-4B, it did impact operation efficiency inasmuch as nested operations were constrained from REV 867..

The RV-3 mission segment consisted of 199 sensor system operations. The overall image quality of RV-3 ranged from poor to very good. As in previous segments of this mission the poor and fair imagery is attributable to adverse atmospheric and acquisition conditions. Fwd camera imagery also continued to show superiority compared to the Aft, and the overall quality of RV-3 was slightly improved over that of RV-2.

The Primary Attitude Control System was nominal throughout this segment. The Primary Reaction Control System Thrusters were used until REV 1299 when, due to low thrust levels, an orderly transfer to RCS-2 was performed.

The propellant used for attitude control during Segment 3 was 113.3 lbs or 3.1 lbs per day. RCS propellant tanks 1 and 2 were used for propellant supply until Rev 1006, Day 63. During Rev 1006, isolation valaves 2 and 3 were opened providing propellant from tanks 1/2 and 3/4.

The Orbit Adjust System performance was nominal for the 15 orbit adjusts performed. The propellant usage for the orbit adjusts was 818.8 pounds.



The RV payload was 97.97% of the maximum weight and unbalanced 1.80%. The PREP2 event took place on Rev 1411 over COOK and separation occurred on Rev 1429, September 4, 1975, Flight Day 89. All reentry events were normal and executed as poanned. Aerial recovery was accomplished on the 2nd pass at 7500 feet altitude, 8.4 nautical miles from the predicted impact point. The heat shield was not recovered.

~~SECRET/H~~

4.2 COMMAND SUBSYSTEMS PERFORMANCE (Prepared by CSC)

4.2.1 Health

The health of the Command Systems remained excellent throughout Segment 3 (Revs 830-1429). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures of voltages. There were no power dropouts, relay driver overloads, or clock status errors.

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 302 messages loaded in the ECS for this segment. This resulted in 84,463 SPC's being stored for readout from the PMU's.

Of the 84,463 SPC's loaded, 33,527 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches. In loading the 84,463 SPC's the only problem was on rev 1261 Guam due to antenna problems.

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

4.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 1.24 parts in 10^7 . This corresponds to an average frequency offset of 0.128 HZ above the nominal frequency of 1.024×10^6 HZ. The frequency of the clock oscillators changed to 0.074 HZ in 408 revs. This results in a stability of 6.04 parts in 10^8 over 600 revs, or 4.08 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 experienced during this segment.

4.2.1.2 Minimal Command Subsystem

4.2.1.2.1 Command Modes

The MCS was not commanded during this segment.

4.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

4.2.1.3 REMOTE DECODER/BUD

4.2.1.3.1 Command Modes

The remote decoder was used for the recovery of RV-5 on rev 845 and 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

Total Commands Readouts	PMU-A <u>16,664</u>	PMU-B <u>16,863</u>
ECS Clock Drift Rate	1.25 parts in 10^7	
ECS Clock Stability	6.04 parts in 10^8 for a 569 rev period	
Total Hours On	ECS <u>2113.75</u>	MCS <u>4.5</u> RD <u>11.2</u> BUD <u>.05</u>
Secure Words Expended at end of Segment 3	PMU-A <u>104</u>	PMU-B <u>104</u>
Environmental Data	All temperatures within specifications. Clock calculation and plot figures 4.1 and 4.2.	

4.3 SENSOR SYSTEM OPERATIONS THROUGH RV-3

4.3.1 Mission Operations Performance

The Sensor Subsystem exhibited nominal operational characteristics until Rev 852, Mission Op 367, when the aft camera take-up integrator reset signal ceased functioning. On Rev 917, Mission Op 390, the reset signal self-restored and continued functioning until Rev 1206, Mission Op 490, where it again disappeared. On Rev 1302, Mission Op 615, it self-restored once more and continued functioning through the remainder of RV-3.

While the failure of this signal did not cause a shutdown, as did an identical failure on 1208-4B, it did impact operational efficiency inasmuch as nested operations were constrained from Rev 867, Mission Op 375, through the remainder of RV-3.

Adjustments to the OAAA nominals recommended by PFA after evaluation of RV-2 imagery were implemented for RV-3 on Rev 881 effective for Mission Op 380. The adjustments implemented were as follows:

Fwd Cam In-Track increased one step to a new orbital nominal of +1;

Fwd Cam Cross-Track decreased one step to a new orbital nominal of -1;

Aft Cam In-Track increased one step to a new orbital nominal of -3;

Aft Cam Cross-Track decreased two steps to a new orbital nominal of -2.

The RV-3 mission segment consisted of 199 sensor system operations consuming 21352 seconds of camera power ON time, 8.3 pounds of nitrogen gas, and a film usage of approximately 29,600 feet and 27,750 feet on the Fwd and Aft cameras respectively. The expendables consumption profiles through RV-3 are shown in Figure 1.

The overall image quality of RV-3 ranged from poor to very good. As in previous segments of this mission the poor and fair imagery is attributable to adverse atmospheric and acquisition conditions. Fwd camera imagery also continued to show superiority compared to the Aft, and the overall quality of RV-3 was slightly improved over that of RV-2.

4.3.2 Engineering Tests

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

Rev 924	Tucson, Test Types 7A, 9, and 12
Rev 957	Quality Monitor, Test Type 12
Rev 1182	GOB Detection, Test Type 16B
Rev 1184	Radiometric Cal, Test Type 5
Rev 1184	Wheat, Test Type 18A
Rev 1200	Wheat, Test Type 18C

4.4 RV-3 (S/N 42) Performance

This report presents an analysis of the RV-3 performance based on² 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. RV heater performance graphs are also included.

4.4.1 Summary

The RV payload was 97.97% of the maximum I.C.D. weight and unbalanced 1.80%. The PREP2 event took place on Rev 1411 over COOK and separation occurred on Rev 1429. 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 7500 feet altitude, 8.4 nautical miles from the predicted impact point. The heat shield was not recovered.

IDENTIFICATION DATA

SV 10	IRON NO 6381	RECOVERY REV 1429
RV 3	RV S/N 42	RECOVERY DATE 4 Sept 75
	RETRO MOTOR S/N Q57	

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			66554.3	66555			0
RV 3 IN T/S	1411C			66558.3	66559			0
DT START	73985.2	73985.2	73985.6	73985.1	73985.3			0
POGO TRAN	75058.6			75058.7	75197			138.3
PITCH START	75088.6			75088.6	75088.4			0
PITCH STOP				75144.3	75144.5			0
PYRO ARM BATT				75258.6	75259			0
POGO FADE	75355.9			75356.0	75360			4.0
TLM A/C TRAN	75515.3					N/A	75573	57.7
ORB PWR OFF				75560.1	75560.5			0
RV SEP (0)	75570.2	75570.1	75570.1	75570.1	75570.5		NOTE 2	0
SPIN UP (+2.4)				75572.5			N/A	N/A
RETRO START	75695.6	75695.5	75695.5	75695.5			75695.35	0
DESPIN (+160.4)				75730.5			N/A	N/A
PROP JETT (+175.4)				75745.5			N/A	N/A
TLM A/C FADE	75856.9					N/A	75916	59.1
RV ENTRY (400K)	75866.4	75866.6	75867.1		RECOV TWX			
△ 1-2 ACQ					75910	N/A		
ION ENTR	75970.3	75970.4	75970.9		75970	N/A		0
ION EXIT	76166.8	76166.8	76167.2		76163	N/A		- 4.2
DROGUE DEPLOY	76212.8	76212.8	76213.3	TONE STOP	76222	N/A	76214.6	1.8
IMPACT (50K)	76230.2	76230.2	76230.6					
MAIN CHUTE DPL	76234.9	76235.0	76235.4		N/A	N/A	76236.2	1.2
H/SHLD JETT	76238.9	76239.0	76239.4	TONE START	76237	N/A	76240.2	1.2
STEADY STATE	76249.9	76250.0	76250.4					
ETPD(RAINDROP)	76259.2	76258.6	76259.1					
RV @ 13.5K	77164.1	77163.5	77164.0	IN TRAIL	77310	N/A	N/A	146.0
WATER IMPACT	77715.0	77714.4	77714.9		N/A	N/A	N/A	N/A
HULA TRAN (RV)	76097.0					N/A	76165	68
HULA FADE (RV)	76209.7					N/A	76748	538.3
DT RUNOUT	76700.2	76700.2	76700.6		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.

RV 3 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	24.997	25.007	24.979	24.950	25.033	24.950
LONGITUDE	161.31	161.31	161.32	161.183	161.283	161.183
RECOV. A/C DEPLOYMENT FORMATION No. <u>1</u> , RECOVERING A/C No. <u>1</u>						UPRANGE
RECOV ALT <u>7500</u> ft, PASS No. <u>2</u> , TIME <u>2128:30</u> Z						TLM A/C
AIRSPEED <u>144</u> KTAS, <u>126</u> KIAS; TIME IN TOW <u>16</u> min.						56.017
RAINDROP ETPD <u>76259</u> sec <u>46000</u> ft; RATE/DESCENT, 15K <u>26.4</u> FPS, 10K <u>24.4</u> FPS						155.867
CONTACT LOCATION <u>#7 Hook Engaged One Load Line</u>						
PRESET TENSION LEVEL <u>4200</u> lb, PAYOUT <u>255</u> , Normal						
MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)						
OVERSHOOT <u>1.74</u> nm, CROSS TRACK <u>8.22</u> nm EAST						
RC CONDITION <u>Normal</u>						
CHUTE/CONE CONDITION <u>4 Light Risers serially broken upon reel in.</u>						
CHUTE/CONE BEHAVIOR <u>Cone deflated and 10-20 degree oscilation on first pass.</u>						

WIND DATA

ALT (K)	DIRECTION		VELOCITY		ALT (K)	DIRECTION		VELOCITY	
	PRED	ACT	PRED	ACT		PRED	ACT	PRED	ACT
SCF	060	080	12	05	25		290		10
2	080		15		30	290	280	20	25
4	090		15		35	290	280	40	30
6	040	150	05	10	40	300	290	60	50
8	130		05		45	280	260	40	25
10	200	140	05	05	50	270	240	25	20
15	080	290	10	05	55				
20	320	230	10	10	60				

RV BATTERY TIME HISTORY

TIME	ACT	75261	262	263	264	266	267	279	345	SEP	75570	76165		
MAIN	19.9	23.9						24.5	24.8		23.5			
PYRO #1	14.1	24.4	24.9	25.6					25.2		25.4			
PYRO #2	9.5	22.8	23.5	24.4	24.9	25.6			25.2		25.7			
TIME														
MAIN														
PYRO #1														
PYRO #2														

SV RATES BEFORE & AFTER SEP (SV TLM)

TIME	PITCH RATE PGR °/sec	ROLL RATE RGR °/sec	YAW RATE YGR °/sec
75569.5	-0.07	0.00	0.01
SEP 75570.5	+1.33	0.03	0.01
75571.5	+1.46	0.06	0.01

MISC DATA

Payload Temp before SEP,	Rn06 67 °F
Payload Temp, Max REENTRY,	TB02 64.8 °F
Chute Press before PREP 2,	P711 0.65 PSI
Supply Press before PREP 2,	P113 0.57 PSI
BETA ANGLE of Recovery Rev.	25.4 °

PITCH ANGLE

BASIC STUDY	Ω_y 1.47 °/sec	PITCH (CMD MSG)	-39.198 °
Θ_{rvs} -126.89°	$\Delta\theta_2$ -0.005°	Θ_{sv} (PDWN-SV TLM)	-39.4 °
$\Delta\theta_1$ + 2.34°	Θ_{sv} -39.235°	Θ_{rvs} ON UPDATED TEAPOT	-126.85 °

RV 3 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION		ACTUAL POST FLT	
TU-A	232.00	1b	232.00	1b	232.00	1b	232.3	1b
TU-B	236.30	1b	236.30	1b	236.30	1b	234.7	1b
TOTAL	468.30	1b	468.30	1b	468.30	1b	467	1b
SEP WGT	1576.80	1b	1576.80	1b	1576.80	1b	UPDATED TEAPOT	
RETRO WGT	1575.11	1b	1575.11	1b	1575.11	1b	% UNBAL 1.80	
ENTRY WGT	1384.30	1b	1384.30	1b	1384.30	1b	% FULL 97.97	
AIR RECOV WGT	1171.19	1b	1171.19	1b	1171.19	1b	(100% = 478 1b)	

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	1576.80	1b	PITCH INERTIA (I _y)	94178.9	SLUG-FT ²
CG FROM STA 2220.2(X)	201.38	in	ROLL INERTIA (I _x)	5254.7	SLUG-FT ²
CG FROM LONG AXIS(Y)	2.08	in	YAW INERTIA (I _z)	95474.1	SLUG-FT ²

'DORBEL EPHEMERIS

REV OF SEP 1429	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION	
PREDICTED FROM REV	1419		1427		N/A	
APOGEE	149.207	nm	148.967	nm	148.755	nm
PERIGEE	88.194	nm	88.225	nm	88.297	nm
ARG OF PERIGEE	123.805	°	123.906	°	123.919	°
INCLINATION	96.305	°	96.305	°	96.306	°
TRUE ANOMALY AT RETRO	0.03	°	359.91	°	359.90	°
STEADY STATE ALT.	46471.79	FT	46437.51	FT	46446.61	FT
HEATSHIELD JETT ALT.	48516.58	FT	48482.19	FT	48490.89	FT

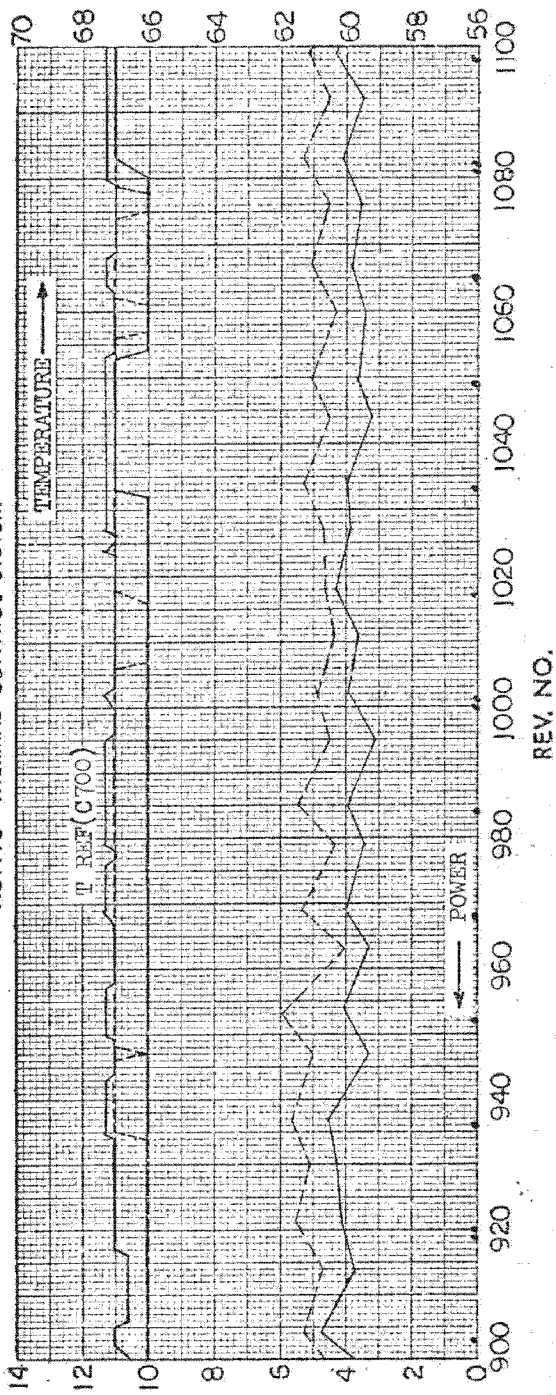
ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	75570.10	75695.50	75867.09	76213.25
ALTITUDE (FT)	547926.45	536444.95	400000.0	63021.60
LATITUDE (°N)	64.182	55.764	44.416	25.020
LONGITUDE (°W)	148.61	153.00	156.89	161.31
INERTIAL AZIMUTH (°)	194.63	191.27		
INERT FLT PATH ANGLE (°)	-0.085	-0.0076		
INERT VELOCITY (FT/SEC)	25724.67	25732.81	25524.18	
LOCAL AZIMUTH (°)			191.28	190.10
LOCAL FLT PATH ANGLE (°)			-2.0068	-31.3138
LOCAL VELOCITY (FT/SEC)				1426.40
ANGLE OF ATTACK (°)			104.68	
MACH NUMBER				1.47
DYN PRESS (PSF)				199.054
CORE PINS SHEARED (FROM REBOUND TWX) A: YES ☒ NO ☐ , B: YES ☒ NO ☐				

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

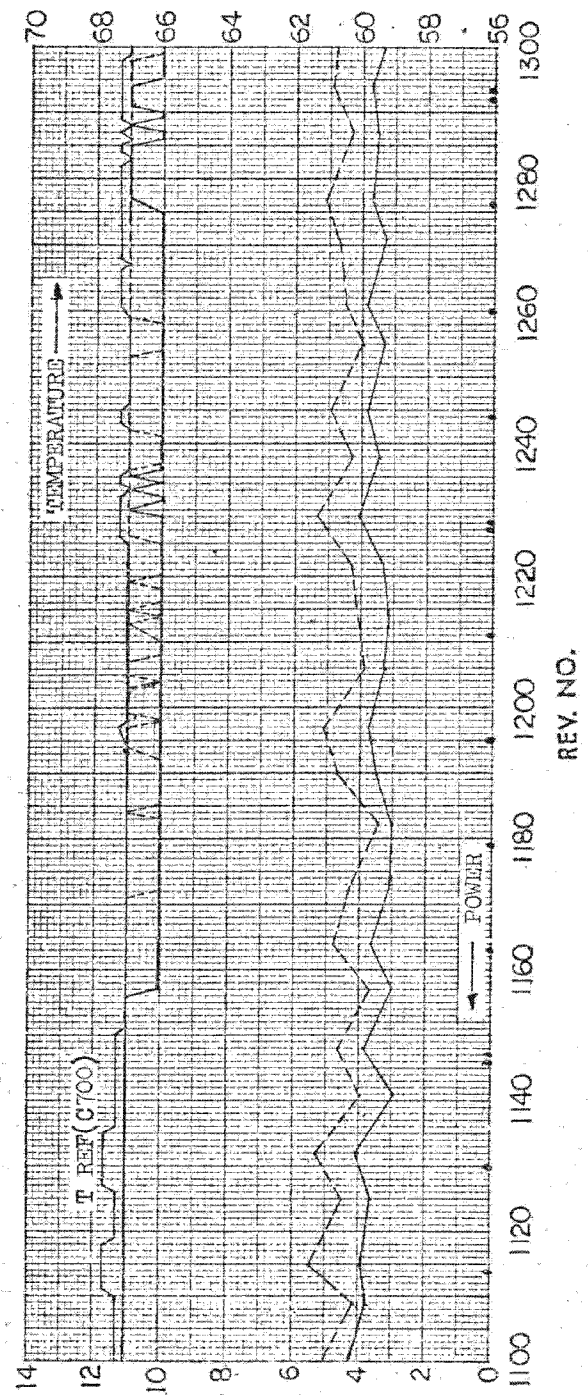
SYS TIME	73879.224	sec	DECLINATION (MDAC = GEOCENTRIC LAT)	- .0016	°
LONGITUDE	25.2081	° E	INERTIAL GEOCENTRIC FLT-PATH ANGLE	- .4009	°
ALTITUDE	131.1131	nm	INERTIAL GEOCENTRIC AZIMUTH	353.6939	°
			INERTIAL VELOCITY	25396.51	FT/SEC
SV C _D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)				.49810	FT ² /SLUG

ACTIVE THERMAL CONTROL SYSTEM



AVERAGE HTR. POWER PER RV ~ WATTS

RV HEATER POWER CONSUMPTION

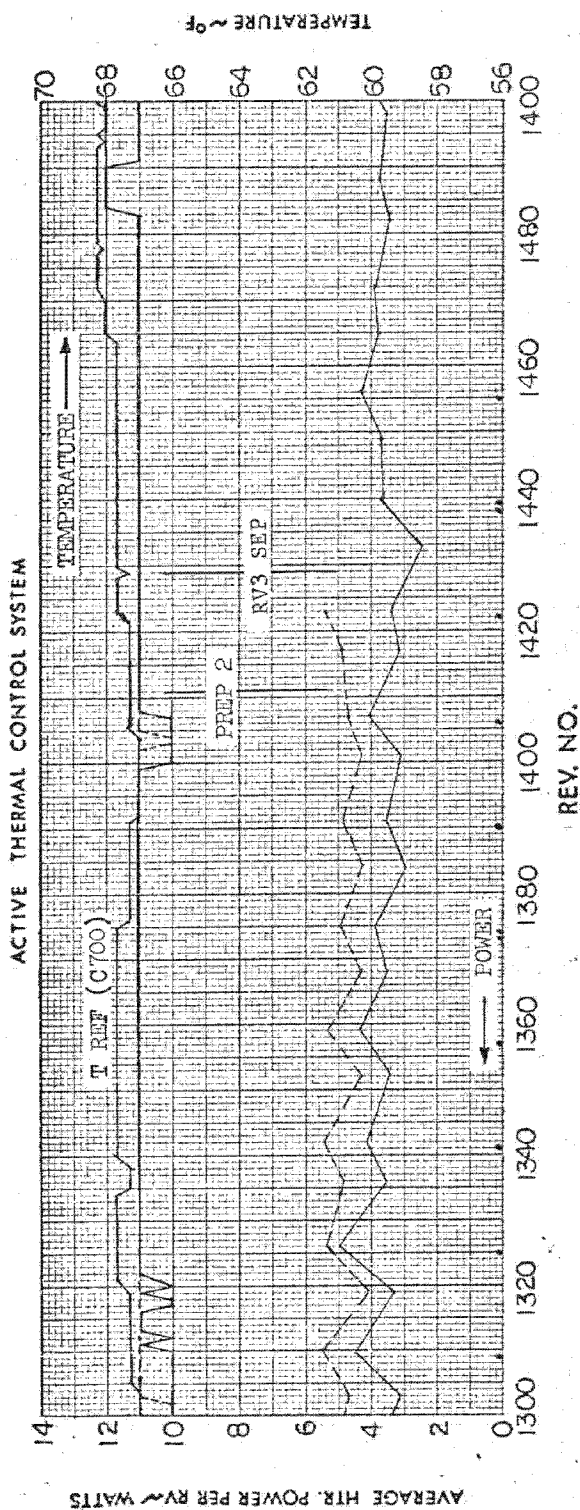


AVERAGE HTR. POWER PER RV ~ WATTS

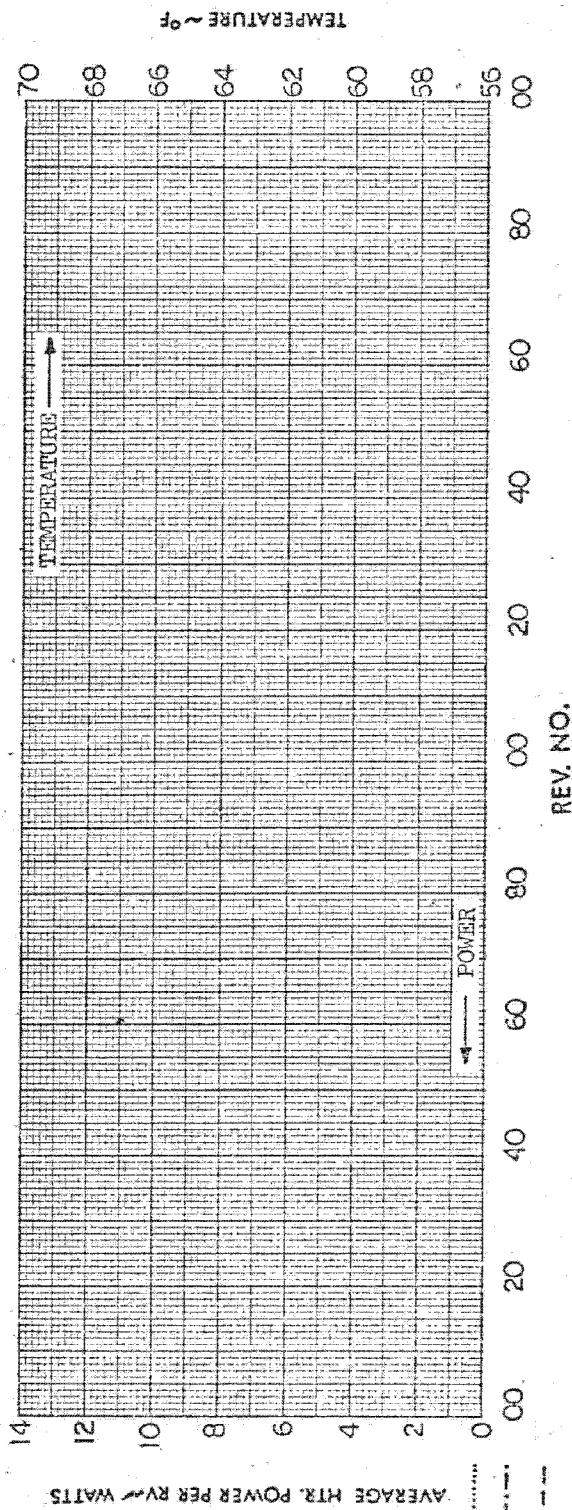
- RV1
- RV2
- RV3
- RV4

RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE

RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



RV HEATER POWER CONSUMPTION



RV1
RV2 - - - - -
RV3 - - - - -
RV4 - - - - -

4.5 SATELLITE VEHICLE AND AUXILIARY PAYLOAD PERFORMANCE

4.5.1 EDAP Performance

The main Battery/Solar Array Power System performed satisfactorily during Segment 3.

The average power usage during Segment 3 was 19.86 amp-hours/rev and the average Solar Array Output was 24.74 amp-hours/rev. No significant degradation of Solar Arrays was observed.

Primary Battery temperatures remained within limits during this segment thereby supporting an orbital life expectancy of 139 days for the Pyro Batteries and 136 days for L/B.

The Main Battery #3 temperature continues to vary in an abnormal manner. The battery temperature, although often several degrees lower than normal, is within specification. The signature produced when the Battery #3 temperature is charted gives reason to believe the thermostat is operating somewhat erratically. This battery is taking a slightly greater share of the bus load indicating no performance impairment even though the lower average temperature has meant that Battery #3 has seldom had a K-2 (90% charge).

The flight Beta Angle range during this segment was $+24.2^{\circ}$ to 25.5° and the S/A position will remain at $+18^{\circ}$ throughout nominal flight.

4.5.2 T&T Performance

The VCTS, PCM Telemetry Systems and Tape Recorders performed satisfactorily during Segment 3. Primary Systems were utilized with periodic selection of redundant units for purposes of health checks and/or evaluation. The following tabulation shows the accumulated hours and cycles for the T&T equipments during Segment 3.

	<u>XDR 1</u>	<u>TR 1</u>	<u>PCM 1</u>	<u>XDR 2</u>	<u>TR 2</u>	<u>PCM 2</u>
<u>CYC</u>	1572	6677	7092	25	141	18
<u>HOURS</u>	150.37	373.50	476.67	.78	18.79	1.37

4.5.3 ACS/RCS Performance

The Primary Attitude Control System (ACS) and Reaction Control System (RCS) maintained nominal control throughout Segment 3. 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 140° F and 154° F.

The Reaction Control System (RCS) performance was nominal throughout this segment. The primary reaction control thrusters were used until Rev 1299 when, due to low thrust levels, an orderly transfer to RCS-2 was performed. Thrust levels for the primary and redundant thrusters are shown in Table 4.5.

The propellant used for attitude control during Segment 3 was 113.3 lbs or 3.1 lbs per day. RCS propellant tanks 1 and 2 were used for propellant supply until Rev 1006, Day 63. During Rev 1006, isolation valves 2 and 3 were opened providing propellant from tanks 1/2 and 3/4.

4.5.4 Orbit Adjust System (OAS) Performance

The Orbit Adjust System (OAS) performance was nominal for the 15 orbit adjusts performed. The propellant usage for the orbit adjusts was 818.8 pounds.

The orbit adjust summary is shown in Table 4.5.

4.5.5 Lifeboat II (LB II) Performance

The LBII system electronics were activated on Rev 1429 for the recovery of RV-3. System pneumatics were not activated. Magnetometer data indicated the system performance was nominal. Lifeboat tank heaters remained off during this segment and the tank temperatures stabilized at a temperature of 72.0° F. Total impulse for the noted temperature was 1900 lb-sec.

4.5.6 Pyro Batteries Performance

On Operations Day 62 both pyro battery voltages stabilized, indicating monoxide levels reached; stabilized voltage for both batteries is the same at 28.30 volts. Stabilization of the Lifeboat Battery will occur early during Segment IV.

4.5.7 Current Sensor Integration Operation

The newly installed Current Sensor Integrator (CSI) system seems to be performing as planned. Computer printout of the Main Battery system status, as measured by the CSI instrumentation, is provided on a daily basis by the FST.

SEGMENT NO. 3

PRIMARY THRUSTERS

REV NO.	REA #1 ACTUAL THRUST	REA #2 ACTUAL THRUST	REA #3 ACTUAL THRUST	REA #4 ACTUAL THRUST	REA #5 ACTUAL THRUST	REA #6 ACTUAL THRUST	REA #7 ACTUAL THRUST	REA #8 ACTUAL THRUST	QUAL THRUST
846	3.0	2.2	2.6	2.9	2.3	2.9	2.9	2.9	3.0
940	3.0	1.9	1.1	2.8	2.6		2.9	2.7	2.8
1134	3.8	1.7	0.8	3.5	2.7		3.8	3.1	3.7

REDUNDANT THRUSTERS

REV NO.	REA #1 THRUST	REA #2 THRUST	REA #3 THRUST	REA #4 THRUST	REA #5 THRUST	REA #6 THRUST	REA #7 THRUST	REA #8 THRUST	QUAL THRUST
1330	3.0			2.4	3.0			3.0	3.5
1429		2.5	3.4			3.6	2.6		3.4

ORBIT ADJUST SUMMARY

SEGMENT NO. 3

OA No./ Type	Ops Day	Rev No.	Delta Vel (Predict)	Delta Vel (Tracking)	Burn Dur.	Prop Used	Avg OA Tank Temp	Avg OA Tank Press
			Fps	Fps	Sec.	Lbs.	deg F.	psia
22/POS	53	847	18.8211	19.0360	60.0	43.6	85.9	142.6
23/POS	55	890	13.8400	14.2200	44.6	32.3	86.5	141.4
24/POS	58	938	46.8504	47.4670	148.4	105.6	86.9	136.8
25/NEG	58	940	23.5636	23.7120	76.4	53.6	86.9	133.0
26/POS	61	986	17.4735	17.7830	57.4	39.9	87.1	130.7
27/POS	64	1036	25.2418	25.7170	82.8	57.1	87.3	128.2
28/POS	67	1084	16.3304	16.6833	54.2	37.1	87.7	126.6
29/POS	70	1133	44.6350	45.0894	146.0	98.7	87.7	123.5
30/NEG	70	1135	16.7921	16.7478	56.4	37.8	88.1	121.1
31/POS	73	1182	13.1252	13.3484	44.6	29.7	87.8	119.5
32/POS	76	1230	23.4613	23.8938	78.6	52.1	87.9	118.3
33/POS	79	1278	17.7747	17.9614	60.2	39.5	88.2	116.3
34/POS	82	1328	44.7301	45.3894	149.8	97.2	88.3	113.5
35/NEG	82	1330	20.4242	20.4745	69.8	44.9	88.5	111.5
36/POS	85	1376	22.7510	23.2733	77.8	49.7	88.3	109.9

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 1210, IRON 6381. The command messages discussed cover the period of RV-3 initiation (Rev 830P load) to the RV-3 recovery message (Rev 1429 load). Five hundred and ten command messages were planned by the flight profile of which two hundred and nineteen were cancelled. The remaining two hundred and ninety one command messages were received and reviewed by the Technical Advisor (TA) staff. Two hundred and eighty-seven were accepted and four were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the four messages are summarized below:

<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
879 POGO	Station contact requirements changed after generation of original SP.
927 POGO	A sequence 251 was omitted from the original deck listing.
1166 POGO	The MOP required by both OL-AI and SSC did not satisfy the requirements of SSC and the message was altered accordingly.
1182 POGO	This message was altered to correct a MOP card input error.

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

<u>Rev No. and Load Station</u>	<u>Reason for not Loading</u>
1429 POGO	The emergency VBE 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 fifteen add-on messages.

Summary

Total Planned Messages:	510
Messages Cancelled:	-219
Total RV-3 Messages:	291
Messages Rejected:	- 4
Messages Altered:	+ 4
Total Messages Accepted:	291
Messages not Required:	- 1
Total Messages Accepted and Loaded:	290

4.6.2 'TUNITY Software Problems

The Flight 10 'TUNITY software problems itemized below pertain only to the period from RV-2 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.

<u>Category</u>	<u>No. of SPRs</u>	<u>Comments</u>
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)	2	Work-around procedures were not required.
Product Improvements or New Requirements	6	To be considered during future development.
Documentation Error	2	MS-4 or MS-7 affected.

Itemized Software Problems

SPR MD3-9060 ('TIDY)

- Problem Description: If two commands are identical and command all current vehicle functions 'TIDY stores the lowest class load order command in the location of the command with the earliest execution time, in effect, switching two commands. The command with the latest execution time is redundantly deleted however, resulting in a deleted command appearing in the command listing. Thus, 'TIDY keeps the earliest OFF command associated with the ON command of the sequence insuring that ON commands have OFF commands with the same sequence number. The logic is correct but 'TIDY fails to inform the analyst of these command changes.
- 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 MD3-9061 ('TPLAY)

- Problem Description: 'TPLAY lists the 'TUNITY sequence macros found in the 'CWO block. In doing so, a macro 0 appears, also some macros appear on a different page than their comments. Macro 0 has no use whatsoever and it takes up space. It is easier to understand a macro if its comments appear with it and not on the next page. Leaving macro 0 out will enhance the printout and eliminate useless information.
- Solution or Work-Around: None
- Operational Impact: None
- Comment: This SPR should be considered as a product improvement for a future software delivery.

SPR MD3-9062 ('TDERBY)

- Problem Description: The 'TDERBY internal table used to hold Doppler Beacon circle conflicts can only handle fifty (50) conflicts. With the present number and size of Doppler Beacon circles we have defined, 'TDERBY is able to process only eight (8) or nine (9) revs before this table overflows.
- Software or Work-Around: None
- Operational Impact: None
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9063 ('TBALL)

- Problem Description: The IMOP card does not have the RTM option. Since OLAI occasionally has point targets over active stations, this would be a useful capability.
- 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 MD3-9064 ('TPLATE)

- Problem Description: A 'TLOAD selection on rev 916 obtained an operation with a footage of 270 feet. The same operation when run in the SELUP mode got a footage of 269 feet.
- 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-11.

SPR MD3-9065 ('TCOPS)

- Problem Description: Because of the vehicle anomaly due to the tension reset not being set, the SS system has a requirement of no nested operations. To avoid iterations of runs to find an acceptable setting of 'CAMBIS and 'CAMNNO a new item should be added to the compool to flag the 'TBALL routines that nesting is not allowable.
- Solution or Work-Around: The data base items 'CAMBIS and 'CAMNNO must be set to the appropriate values (currently 70. and 4) to avoid nesting.
- Operational Impact: None
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9066 ('TPITCH)

- Problem Description: For IMOPs, cells within those DEs flagged as mandatory and which are above LATBAR will have a "0" contribution to the operation score. For cells in the DEs flagged as mandatory which are below LATBAR, a normal score contribution will appear.
- Solution or Work-Around: None
- Operational Impact: There is no operational impact, just confusion to the user.
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9068 (Data Base Handbook, Compool)

- Problem Description: The described source/review agency assignments for 'VEBKI should be changed in the DBHBK and Compool.
- Solution or Work-Around: None
- Operational Impact: None
- Comment: These changes should be incorporated in the documentation for SV-11.

SPR MD3-9069 (Data Base Handbook, Compool)

- Problem Description: The described source agency assignments for 'TUNITY blocks should be changed in the DBHBK and Compool.
- Solution or Work-Around: None
- Operational Impact: None
- Comment: These changes should be incorporated in the documentation for SV-11.

4.6.3 Hardware/Software Interface Changes

For IRON 6381, eleven change requests were processed from RV-3 initiation through the RV-3 recovery message (as shown in Table 4.6.3-1).

These requests were implemented via requests SV-10-120 through SV-10-130 and have been incorporated into the flight data base and hardware/software interface documentation.

Table 4.6.3-1. Summary of Hardware/Software Interface Changes

<u>Request No.</u>	<u>Identification</u>	<u>Date Base Effectivity</u>
SV10-121	Modifies sequence 147 to reflect new nominal value of PSI for the "B" side	SV-10 only
SV10-122	Modifies sequence 144 to reflect new nominal value of PSI for the "A" side	SV-10 only
SV10-123	Changes MACRO MATSO 130 to reflect new WRATTEN filter requirement	SV-10 only
SV10-129	Modifies sequence 34 to provide fine deadband to evaluate RCS2 thrust level from vehicle rates	SV-10 only
SV10-130	Modifies sequence 35 to evaluate RCS2 thrust level from rates	SV-10 only

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4.7 SATELLITE VEHICLE SUPPORT

4.7.1 Telemetry and Mode Processing

During the RV-3 segment of SV-10, the following Telemetry Processing activity occurred:

- A. Octal Corrections were supplied to all stations to correct processing of noisy data in M124 and incomplete processing of data in M127. The mode 127 problem was attributed to Faulty Logic in the BV-EV Algorithm, ALG 56.
- B. The new SUS Formats for the STC Ground Station were reviewed by the TAS.
- C. Octal Correctors were sent to all stations to restore output of the ACQ Block at a mode change.
- D. M6Z, which processes and plot Camera 4 Data, was validated by the TAS.

4.7.2 Orbital Events4.7.3 Operational Impacts Prior to RV-3

- A. All tracking stations experienced problems with their antenna systems during this period. The minimum impact problems occurred at BOSS (No B/U CT Rev 1157) and at HULA (no SGLS support; used CT - Rev 885). COOK acquired the vehicle on sidelobes twice--revs 1127 and 1321 causing a delay in planned tape recorder readout. The major antenna failure occurred at GUAM. The TT&C 60 was inoperative due to a burned-out azimuth drive motor for revs 1180, 1196, 1212, 1213. The loss of the passes lengthened the subcycle 11 dead revs and also delayed loading of the station contacts message. GUAM's antenna also failed on revs 1294 and 1310 but the CT was used to complete the passes as planned.
- B. Communications failed between the 160A computers and the sites. This occurred most frequently at POGO (five times) and once at each of the other tracking stations (including IWBC from HULA). The impacts varied from loss of front lines and data lines and running the pass via the backline to delayed playback due to noisy IWBC.
- C. A significant personnel error occurred at POGO on Rev 1429. The 1230 MTC computer was initialized with the wrong prepass ID (1429.2 ID-F88 vice 1429.3 ID-F89). The offset difference was 57 sec. This caused a delay in acquisition (acquired manually) for the recovery sequence rev.

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SECTION 5

5.0 ORBIT PHASE - Rev 1429 to RV-4 Recovery

5.1 Summary

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced. The nested operation constraint, instituted in RV-3, was eliminated.

The overall image quality of both cameras ranged from poor to good with the majority rated fair to good. The poor and fair photography was attributed to adverse atmospheric and acquisition conditions.

The Vehicle Tracking and Telemetry Systems performed satisfactorily throughout Segment 4 with the exception of Time Word Power Supply No. 1. Improper shifting of the first bit of the eight-bit shift register with the Type 1 J-Box resulted in invalid samples of the VTCW. Invalid samples were first observed on Rev 1573, and with increasing frequency until switching to TWPS No. 2 on Rev 1894.

Both the Redundant Attitude Control System and the Redundant Reaction Control System performance was nominal throughout this segment.

The propellant used for Attitude Control during Segment 4 was 73.6 lb or 2.4 lb per day. RCS propellant tanks 1, 2, 3, and 4 were used for propellant supply during this segment. The Orbit Adjust System performance was nominal for the 12 orbit adjusts performed. The propellant usage for the orbit adjusts was 561.6 pounds.

The RV payload was 88.68 percent of the maximum weight and unbalanced 0.68 percent. The PREP2 event took place on Rev 1944 over BOSS and separation occurred on Rev 1948, 6 October 1975, Flight Day 121. All events were normal and executed as planned. Aerial recovery was accomplished on the first pass at 12,200 feet altitude, 6.6 nautical miles from the predicted impact point. The heatshield was not recovered. The RV and parachute condition were reported normal except for a small tear reported in the cone.

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5.2 COMMAND SUBSYSTEMS PERFORMANCE
(Prepared by CSC)

5.2.1 Health

The health of the Command Systems remained excellent throughout Segment 4 (Revs 1430-1948). There were no equipment malfunctions. None of the Command Systems were subjected to out of specification temperatures of voltages. There were no power dropouts, relay driver overloads, or clock status errors.

5.2.1.1 Extended Command Subsystem

The ECS responded properly in all modes into which it was commanded. There were a total of 246 messages loaded in the ECS for this segment. This resulted in 64,303 SPC's being stored for readout from the PMU's.

Of the 64,303 SPC's loaded, 30,192 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches.

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

5.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 1.93 parts in 10^7 . This corresponds to an average frequency offset of 0.198 HZ above the nominal frequency of 1.024×10^6 HZ. The frequency of the clock oscillators changed to .062 HZ in 519 revs. This results in a stability of 6.44 parts in 10^8 over 519 revs, or 5.02 parts in 10^{10} for an average six hour period. All of these values are well within system specifications.

5.2.1.1.3 ECS Anomalies

There were no ECS anomalies experienced during this segment.

5.2.1.1.4 Special Studies

Anomalous VTCW's (primary) were observed on Rev 1573 Cook. These continued to occur, on an intermittent basis, until switching from TPS #1 (primary VTCW) to TPS #2 (redundant VTCW) on rev 1894

The anomalous VTCW's were only for a 0.2 second sample, with previous and next 0.2 second sample valid. These anomalous VTCW's presented no problems to playback or real time modes or other systems on the vehicle.

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5.2.1.1.4 Special Studied cont'd

Evaluation of the anomalous VTCW values by CSC and SBAC, indicated the cause is most likely an improper data transfer between the 25th and 24th flip-flops in the vehicle type 1 J-box time word register. This register is associated with TPS#1. A similar but separate register is associated with TPS#2.

Evaluation of the problem is continuing and some solo testing is planned.

5.2.1.2 Minimal Command Subsystem

5.2.1.2.1 Command Modes

The MCS was not commanded during this segment.

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 on rev 1948 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.

5.2.1.4 SUMMARY

5.2.1.4.1 Expendables and Environmental Data

Total Commands Readouts	PMU-A <u>14,511</u>	PMU-B <u>15,681</u>
ECS Clock Drift Rate	1.93 parts in 10^7	
ECS Clock Stability	6.44 parts in 10^8	for a 519 rev period
Total Hours On	ECS <u>2880.85</u>	MCS <u>4.5</u> RD <u>17.1</u> BUD <u>.05</u>
Secure Words Expended at End of Segment $\frac{1}{4}$	PMU-A <u>132</u>	PMU-B <u>140</u>
Environmental Data	All temperatures within specifications. Clock calculations and plot figures 5.1 and 5.2.	

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5.3 SENSOR SYSTEM OPERATIONS THROUGH RV-4

5.3.1 Mission Operations Performance

The Sensor Subsystem exhibited nominal performance characteristics throughout RV-4 with no anomalies or malfunctions experienced. The nested operation constraint, instituted in RV-3, was eliminated.

The RV-4 mission segment consisted of 228 sensor system operations, consuming 22,569 seconds of camera power ON time, 9.6 pounds of nitrogen gas, and a film usage of approximately 27,250 feet and 26,150 feet respectively on the forward and aft cameras. The consumption profiles through RV-4 are graphically depicted in Figure 1.

Forward camera film depletion occurred on OP 789, as planned. Aft camera depletion occurred during the up-ramp of the last planned operation of the mission.

The overall image quality of both cameras ranged from poor to good with the majority rated fair to good. The poor and fair photography was attributed to adverse atmospheric and acquisition conditions.

5.3.2 Engineering Tests

The following engineering tests were performed during this segment of the mission in support of PFA evaluation.

Rev 1622	1414 Quality Monitor, Test Type 12
Rev 1637	1414 Quality Monitor, Test Type 9 and 12
Rev 1751	SO 255 Radiometric Cal., Test Type 4A
Rev 1816	SO 124 Quality Standard, Test Type 7B
Rev 1849	SO 124 Thru Exposure, Test Type 17
Rev 1863	SO 124 Thru Exposure, Test Type 17

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CONSUMPTION PROFILES

SV-10

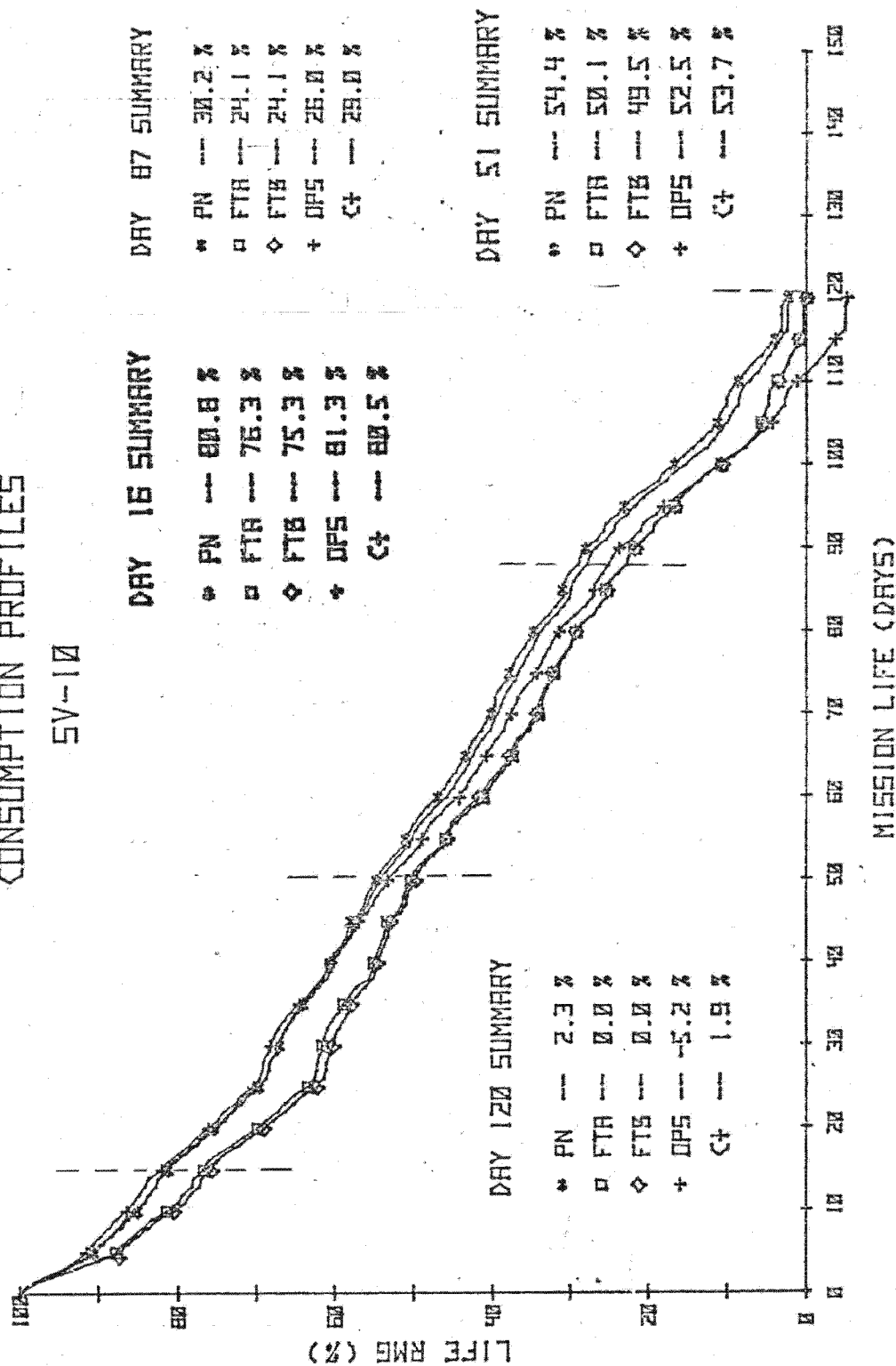


FIGURE 1

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5.4 RV4 (S/N 41) Performance

This report presents an analysis of the RV4 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 88.68% of the maximum I.C.D. weight and unbalanced 0.68%. The PREP2 event took place on Rev 1944 over BOSS and separation occurred on Rev 1948. 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 12,200 feet altitude, 6.6 nautical miles from the predicted impact point. The heatshield was not recovered.

The RV and parachute condition were reported normal except for a small tear reported in the cone.

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RV 4 RECOVERY DATA

IDENTIFICATION DATA

SV 10	IRON NO 6381	RECOVERY REV 1948
RV 4	RV S/N 41	RECOVERY DATE 6 Oct. 75
	RETRO MOTOR S/N Q66	

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
RV OUT T/S	REV/STA			N/A	N/A			N/A
RV 4 IN T/S	1944B			54382.3	54383			0
DT START	73660.2	73659.4	73659.9	73659.8	73660			0
POGO TRAN	74750.5			74749.1	74744			-5.1
PITCH START	74780.6			74779.0	74781			1.0
PITCH STOP				74834.1	74835			0
PYRO ARM BATT				74949.0	74950			0
POGO FADE	75024.5			75022.7	75028			+5.3
TLM A/C TRAN	75194.3					75244	N/A	+49.7
ORB PWR OFF				75231.3	N/A			N/A
RV SEP (0)	75241.3	75241.3	75241.3	75241.3	N/A		N/A NOTE 2	N/A
SPIN UP (+2.4)				75243.7			N/A	N/A
RETRO START	75366.7	75366.7	75366.7	75366.7			N/A	N/A
DESPIN (+160.4)				75401.7			N/A	N/A
PROP JETT (+175.4)				75416.7			N/A	N/A
TLM A/C FADE	75527.1					75580	N/A	+52.9
RV ENTRY (400K)	75528.7	75528.4	75628.9		RECOV TLM			
△ 1-2 ACQ					N/A	N/A		
ION ENTR	75638.8	75638.4	75638.9		N/A	N/A		N/A
ION EXIT	75841.6	75840.9	75841.3		75838	75812		-3.3
DROGUE DEPLOY	75886.9	75886.2	75886.6	TONE STOP	75896	75897	75889	0
IMPACT (50K)	75905.2	75904.4	75904.9					
MAIN CHUTE DPI	75910.0	75909.3	75909.9		N/A	N/A	75912	+2.1
H/SHLD JETT	75914.0	75913.3	75913.9	TONE START	75913	75914	75916	0
STEADY STATE	75925.0	75924.3	75924.9					
ETPD(RAINDROP)	75938.5	75937.3	75937.0					
RV @ 13.5K	76866.1	76865.0	76864.6	IN TRAIL	76860*	76860*	76832	-4.6
WATER IMPACT	77430.8	77429.7	77429.0			N/A	N/A	N/A
HULA TRAN (RV)	75765					75812	75839	+74.0
HULA FADE (RV)	75908					N/A	77004	+1096.0
DT RUNOUT	76375.2	76374.4	76374.9		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.

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RV 4 RECOVERY DATA

RECOVERY DATA

	BASIC STUDY	UPDATED TEAPOT	TEAPOT EVALUATION	QUICK LOOK RPT	EPPD (TWX)	AERIAL RECOVERY
LATITUDE	25.000	24.924	24.885	24.783	24.833	24.783
LONGITUDE	160.370	160.38	160.39	160.433	160.50	160.433
RECOV. A/C DEPLOYMENT FORMATION No. <u>1</u> , RECOVERING A/C No. <u>1</u>						UPRANGE TLM A/C
RECOV ALT <u>12200</u> ft, PASS No. <u>1</u> , TIME <u>21:21</u> Z						55.450
AIRSPEED <u>124</u> KTAS, <u>151</u> KIAS; TIME IN TOW <u>12</u> min.						153.75
RAINDROP ETPD <u>75938</u> sec <u>46000</u> ft; RATE/DESCENT, 15K <u>28.9</u> FPS, 10K <u>26.7</u> FPS						
CONTACT LOCATION <u>RIGHT POLE, NO. 7 HOOK, 2 HEAVY LINES ENGAGED</u>						
PRESET TENSION LEVEL <u>4200</u> lb, PAYOUT <u>NORMAL</u> Peak line load 10800 lb						
MISS DISTANCE (TEAPOT EVAL VS AERIAL RECOV) (Uncorrected for Wind)						
OVERSHOOT <u>6.12</u> nm, CROSS TRACK <u>2.58</u> nm EAST						
RC CONDITION <u>Normal</u>						
CHUTE/CONE CONDITION <u>Normal, small tear in cone, near base of cone skirt reported</u>						
CHUTE/CONE BEHAVIOR <u>Oscillations up to 30° & lateral chute movement reported.</u>						

WIND DATA

ALT (K)	DIRECTION		VELOCITY		ALT (K)	DIRECTION		VELOCITY	
	PRED	ACT	PRED	ACT		PRED	ACT	PRED	ACT
SCF	090		15		25	350	230	05	05
2	080	070	15	20	30	340	270	15	15
4	070	080	25	25	35	320	290	20	40
6	070	080	25	25	40	310	290	35	45
8	080	080	20	20	45	310	280	15	10
10	090	080	20	25	50		230		05
15	100	090	15	25	55		170		05
20	080	060	05	05	60				

RV BATTERY TIME HISTORY

	ACT											
TIME	74950	74952	74954	74955	74957	74958	74959	74961	74965	74967	74972	74973
MAIN		22.1									22.8	23.7
PYRO #1		22.3	22.8	23.7	24.8	23.9		24.9		25.5		
PYRO #2		24.5					25.5		26.0		25.5	
TIME	74975	74976										
MAIN	25.2	25.8										
PYRO #1												
PYRO #2												

SV RATES BEFORE & AFTER SEP (SV TLM)

	PITCH RATE	ROLL RATE	YAW RATE
TIME	PGR °/sec	RGR °/sec	YGR °/sec
75241	-0.069	+0.002	+0.001
SEP 75242	-0.069	+0.002	+0.001
75243	+1.23	+0.024	+0.001

MISC DATA

Payload Temp before SEP, Rn06 68 °F
 Payload Temp, Max REENTRY, TB02 68 °F
 Chute Press before PREP 2, P711 .68 PS
 Supply Press before PREP 2, P113 .53 PS
 BETA ANGLE of Recovery Rev. 24.8 °

PITCH ANGLE

BASIC STUDY	Ω_y <u>1.16</u> °/sec	PITCH (CMD MSG)	<u>-38.9</u> °
Θ_{rvs} <u>-126.88</u> °	$\Delta\Theta_2$ <u>-.131</u> °	Θ_{sv} (PDWN-SV TLM)	<u>-38.5</u> °
$\Delta\Theta_1$ <u>1.84</u> °	Θ_{sv} <u>-38.851</u> °	Θ_{rvs} ON UPDATED TEAPOT	<u>-126.95</u> °

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RV 4 RECOVERY DATA

RV MASS PROPERTIES

	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION		ACTUAL POST FLT
TU-A	213.1	1b	213.1	1b	213.1	1b	213.8 1b
TU-B	210.8	1b	210.8	1b	210.8	1b	211.2 1b
TOTAL	423.9	1b	423.9	1b	423.9	1b	425.0 1b
SEP WGT	1529.43	1b	1529.43	1b	1529.43	1b	UPDATED TEAPOT
RETRO WGT	1527.74	1b	1527.74	1b	1527.74	1b	% UNBAL 0.96
ENTRY WGT	1336.93	1b	1336.93	1b	1336.93	1b	% FULL 88.68
AIR RECOV WGT	1124.45	1b	1124.45	1b	1124.45	1b	(100% = 478 1b)

SV MASS PROPERTIES - AFTER SEP (FROM BASIC STUDY)

SV WEIGHT	12491.3	1b	PITCH INERTIA (I _y)	84719.7	SLUG-FT ²
CG FROM STA 2220.2(X)	199.36	in	ROLL INERTIA (I _x)	5043.0	SLUG-FT ²
CG FROM LONG AXIS(Y)	2.45	in	YAW INERTIA (I _z)	86124.7	SLUG-FT ²

'DORBEL EPHEMERIS

REV OF SEP 1948	BASIC STUDY		UPDATED TEAPOT		TEAPOT EVALUATION	
PREDICTED FROM REV	1938		1942		N/A	
APOGEE	153.14	nm	152.345	nm	152.392	nm
PERIGEE	86.356	nm	86.388	nm	86.444	nm
ARG OF PERIGEE	106.007	°	106.137	°	106.152	°
INCLINATION	96.272	°	96.273	°	96.272	°
TRUE ANOMALY AT RETRO	17.71	°	17.70	°	17.70	°
STEADY STATE ALT.	46670	FT	46648	FT	46605.4	FT
HEATSHIELD JETT ALT.	48682	FT	48660	FT	48615.9	FT

ENTRY PARAMETERS FROM TEAPOT EVALUATION RUN

	SEPARATION	RETRO	REENTRY	DROGUE DEPLOY
SYSTEMS TIME (sec)	75241.35	75366.75	75528.87	75886.65
ALTITUDE (FT)	520802.29	519023.50	400000.02	63701.43
LATITUDE (°N)	64.206	55.770	45.058	24.926
LONGITUDE (°W)	147.71	152.09	155.78	160.38
INERTIAL AZIMUTH (°)	194.56	191.21		
INERT FLT PATH ANGLE (°)	0.0847	0.1670		
INERT VELOCITY (FT/SEC)	25750.86	25747.41	25503.66	
LOCAL AZIMUTH (°)			191.30	190.11
LOCAL FLT PATH ANGLE (°)			-1.8835	-31.3767
LOCAL VELOCITY (FT/SEC)				1421.04
ANGLE OF ATTACK (°)			105.53	
MACH NUMBER				1.47
DYN PRESS (PSF)				191.245
CORE PINS SHEARED (FROM REBOUND TWX) A: YES X NO , B: YES X NO				

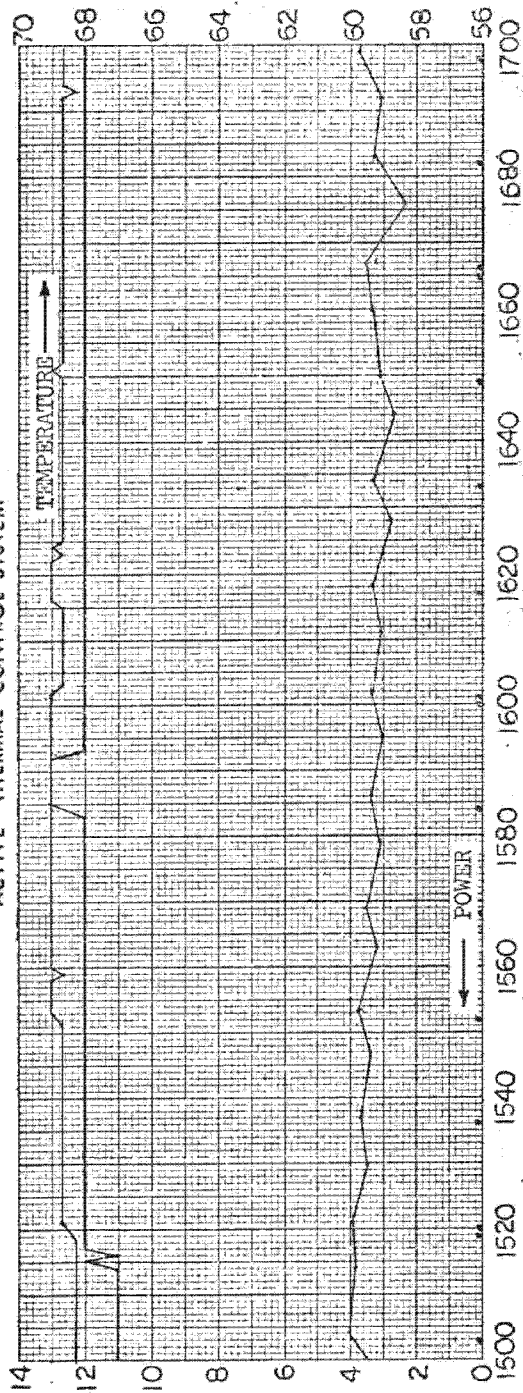
BFE VECTOR, Parameters from a SYS Time near the ascending node of the Recovery Rev.

SYS TIME	73561.388 sec	DECLINATION (MDAC = GEOCENTRIC LAT)	0.1394 °
LONGITUDE	26.1068 °	INERTIAL GEOCENTRIC FLT PATH ANGLE	-0.5147 °
ALTITUDE	120.8017 nm	INERTIAL GEOCENTRIC AZIMUTH	353.7276 °
		INERTIAL VELOCITY	25464.28 FT/SEC
SV C _D A/M (DRAG VALUE AT ASCENDING NODE OF RECOVERY REV)			.71619 FT ² /SLUG

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ACTIVE THERMAL CONTROL SYSTEM



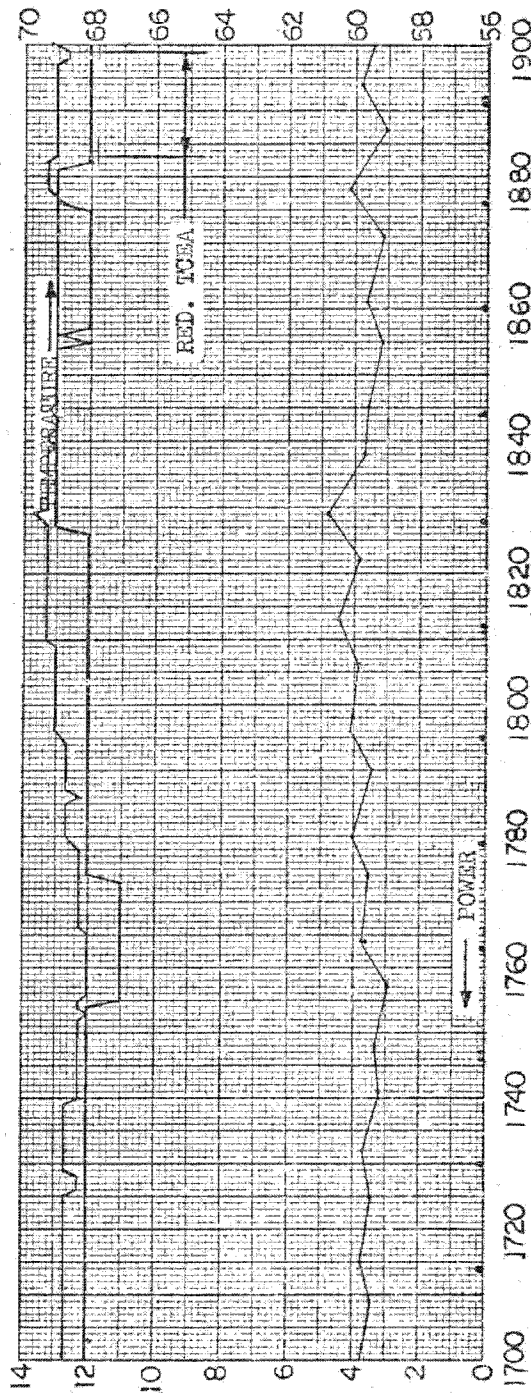
AVERAGE HTR. POWER PER RV ~ WATTS

RV HEATER POWER CONSUMPTION

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REV. NO.

TEMPERATURE ~ °F



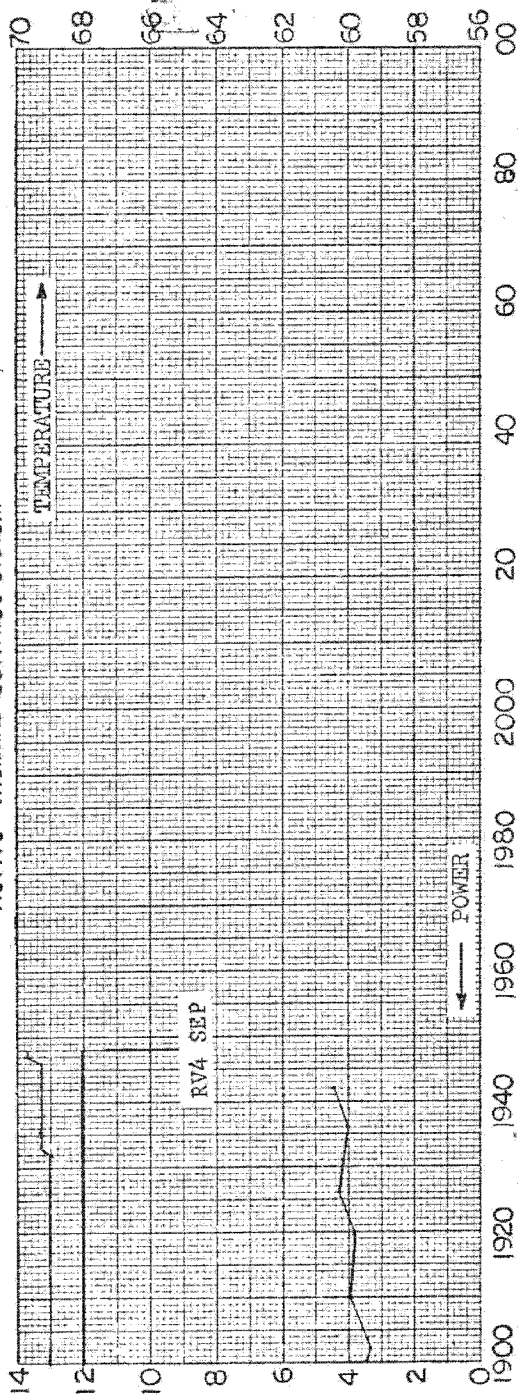
AVERAGE HTR. POWER PER RV ~ WATTS

- RV1
- RV2 - - - - -
- RV3 - - - - -
- RV4 - - - - -

REV. NO.

RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE

ACTIVE THERMAL CONTROL SYSTEM

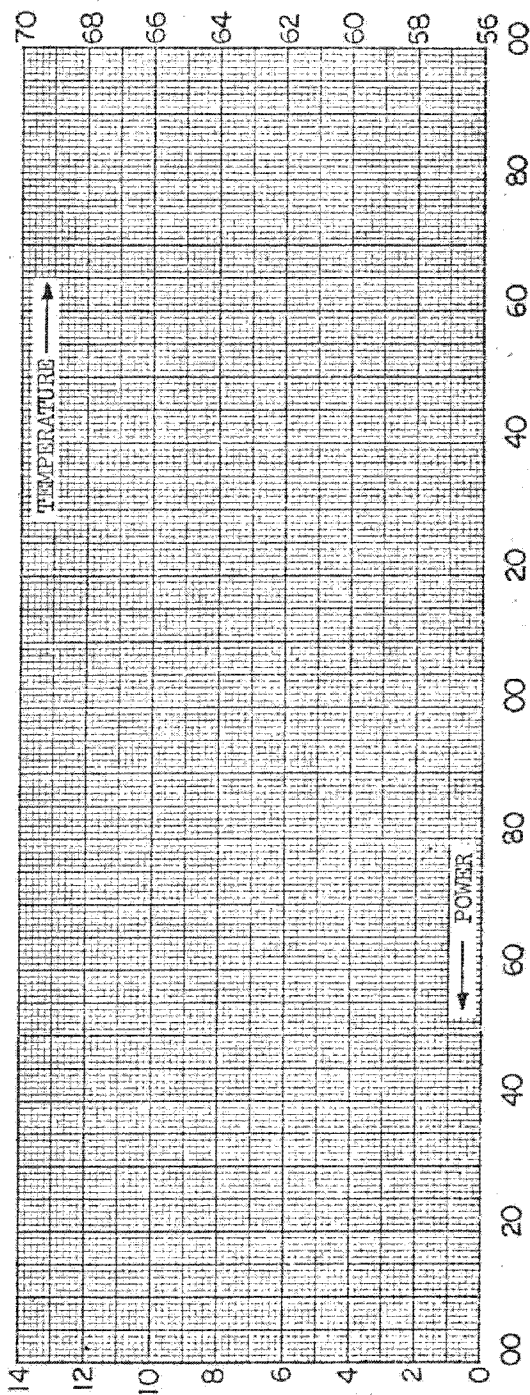


AVERAGE HTR. POWER PER RV ~ WATTS

RV HEATER POWER CONSUMPTION

RV1
RV2
RV3
RV4

RV PAYLOAD CONTAINER & REFERENCE TEMPERATURE



AVERAGE HTR. POWER PER RV ~ WATTS

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5.5 Satellite Vehicle and Auxiliary Payload Performance

5.5.1 EDAP Performance

The Main Battery/Solar Array Power System performed satisfactorily throughout Segment 4. Battery temperatures remained within nominal limits; however, the primary heater for Battery No. 3 continued to cycle excessively. This irregularity was believed to be the result of "drifting" of operating bandwidth within the primary thermostat associated with Battery Heater No. 3. Consequently, due to slightly lower temperatures, fewer K2 relay openings were observed in comparison with the other three batteries.

The average Main Buss loading was 20.93 A-H/Rev with an average Solar Array output of 24.70 A-H/Rev. The Solar Arrays remained positioned at +18 throughout a Beta Angle range of 25.5° to 24.7°.

The average Main Buss Voltage observed at sunrise on the vehicle was greater than 27 volts and no significant degradation of Solar Arrays was observed.

5.5.2 T&T Performance

The Vehicle Tracking and Telemetry Systems performed satisfactorily throughout Segment 4 with the exception of Time Word Power Supply No. 1. Improper shifting of the first bit of the eight-bit shift register (A7Z6) within the Type 1 J-Box resulted in invalid samples of the VTCW. Invalid samples were first observed on Rev 1573, and with increasing frequency during Revs 1597, 1805, 1841, 1845, 1864, 1871, 1872, and 1874.

In order to preclude invalid time tagging of telemetry data, a decision was made to switch to the redundant unit. After switching to TWPS No. 2 on Rev 1894, no invalid VTCW's were observed during the remainder of this segment.

The following tabulation shows the number of cycles and hours of T&T equipment usage compiled during Segment 4:

Equipment	XDR#1	XDR#2	TR#1	TR#2	PCM#1	PCM#2
Cycles	640	10	2414	0	2601	5
Hours	54.85	0.24	148.22	0	179.58	0.53

5.5.3 Current Signal Integrator Performance

The CSI's performed satisfactorily throughout Segment 4.

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5.5.4 Primary Battery Performance

On operations day 87, the Lifeboat Battery stabilized at a monoxide level of 28.51 volts. Primary battery temperatures remained within nominal limits throughout Segment 4.

The life-to-cell-failure expectancy for the Primary Batteries remained at 139 days for Pyros and 136 days for Lifeboat.

5.5.5 ACS/RCS Performance

The Primary Attitude Control System (ACS) and Redundant Reaction Control System (RCS) maintained nominal control throughout Segment 4. 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 140° F and 152° F.

The Redundant Reaction Control System (RCS) performance was nominal throughout this segment. Thrust levels for the redundant thrusters are shown in Table 5.7.

The propellant used for attitude control during Segment 4 was 73.6 lb or 2.4 lb per day. RCS propellant tanks 1, 2, 3, and 4 were used for propellant supply during this segment.

5.5.6 Orbit Adjust System (OAS) Performance

The Orbit Adjust System (OAS) performance was nominal for the twelve orbit adjusts performed. The propellant usage for the orbit adjusts was 561.6 pounds.

The orbit adjust summary is shown in Table 5.5.

5.5.7 Lifeboat II (LB II) Performance

The LB II system electronics were activated on Rev 1948 for the recovery of RV 4. System pneumatics were not activated. Magnetometer data indicated the system performance was nominal. Lifeboat tank heaters remained off during this segment and the tank temperatures stabilized at a temperature of 74.0° F. Total impulse for the noted temperature was 2040 lb-sec.

5.5.8

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ORBIT ADJUST SUMMARY

SEGMENT NO. 4

TABLE 5.7

OA No./ Type	Ops Day	Rev No.	Delta Vel (Predict)	Delta Vel (Tracking)	Burn Dur.	Prop Used	Avg OA Tank Temp	Avg OA Tank Press
			Fps	Fps	Sec.	Lbs.	deg F.	psia
37/POS	89	1431	23.6007	23.7689	72.8	46.2	88.4	108.4
38/POS	91	1474	22.9998	23.2677	71.2	44.8	88.6	106.8
39/POS	94	1522	29.4162	29.8056	90.8	56.7	88.2	105.2
40/POS	97	1570	31.5778	31.8637	97.4	60.3	89.1	103.2
41/POS	100	1620	42.7361	43.1198	131.8	80.8	89.4	101.2
42/NEG	100	1622	20.7618	20.6890	65.2	39.7	89.8	100.0
43/POS	103	1668	19.4873	19.8600	61.4	37.2	89.5	98.8
44/POS	106	1717	25.0000	25.3791	78.2	47.0	89.6	97.2
45/POS	107	1737	15.2200	15.1100	48.0	28.8	89.7	96.8
46/POS	110	1782	15.1019	15.0864	48.0	28.7	90.1	96.0
47/POS	113	1830	42.6021	42.9722	132.6	78.7	90.2	94.8
48/POS	116	1879	15.4007	15.5939	49.2	29.0	90.9	93.6
49/POS	120	1936	16.0000	16.1109	51.0	29.9	90.9	92.8

RCS THRUSTER PERFORMANCE SUMMARY

SEGMENT NO. 4

TABLE 5.7

REDUNDANT THRUSTERS

REV NO.	REA #1 THRUST	REA #2 THRUST	REA #3 THRUST	REA #4 THRUST	REA#5 THRUST	REA#6 THRUST	REA#7 THRUST	REA#8 THRUST	QUAL THRUST
1330	3.0			2.4	3.0			3.0	3.5
1429		2.5	3.4			3.6	2.6		3.4
1622	3.3			2.8	3.2			3.2	
1948		2.2	3.5			3.3	2.3		

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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 1210, IRON 6381. The command messages discussed cover the period of RV-4 initiation (Rev 1414 load) to the RV-4 recovery message (Rev 1948 load). Four hundred thirty-two command messages were planned by the flight profile of which one hundred eighty-one were cancelled. The remaining two hundred fifty-one command messages were received and reviewed by the Technical Advisor (TA) staff. Two hundred forty-seven were accepted and four were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the four messages are summarized below:

<u>Rev No. and Load Station</u>	<u>Reason for Rejection</u>
1544 POGO	The SP message did not exceed PMU location 334, a requirement for an emergency VBE utility block.
1622 POGO	An incorrect scan center was input on a MOP card.
1863 POGO	The software extended a MOP, causing an erroneous slit selection that was unacceptable to SSC.
1894 GUAM	Altered out Sequence 322 which would have switched vehicle back to TPS 1 after 1899 HULA. SPC's were inserted to perform the SGLS 2 test and maintain desired configuration.

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

<u>Rev No. and Load Station</u>	<u>Reason for not Loading</u>
1946 POGO	The alternate PIP message was not required.
1948 POGO	The emergency VBE message was not required.

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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 forty-five add-on messages.

Summary

Total Planned Messages:	432
Messages Cancelled:	-181
Total RV-4 Messages:	351
Messages Rejected:	- 4
Messages Altered:	+ 4
Total Messages Accepted:	351
Messages not Required:	- 2
Total Messages Accepted and Loaded:	349

5.6.2 'TUNITY Software Problems

The Flight 10 'TUNITY software problems itemized below pertain only to the period from RV-3 recovery through RV-4 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.

<u>Category</u>	<u>No. of SPRs</u>	<u>Comments</u>
Flight Critical	0	Software corrections were made and incorporated during this flight period.
Non-Flight Critical (requiring work-around)	1	Work-around procedures were developed and implemented.
Non-Flight Critical (minor)	1	Work-around procedures were not required.
Product Improvements or New Requirements	1	To be considered during future development.
Documentation Error	0	MS-4 or MS-7 affected.

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SPR MD3-9070 ('TBLOCK)

- Problem Description: Ref: Msg. 610 for 1479 POGO. 'TBLOCK presently allows SP messages to have EUB's less than the emergency VBE locations in blocks 9333 and 9433.
- Solution or Work-Around: The SP message must be altered to add the extra commands (TALE) in order to fill the message to the necessary locations.
- Operational Impact: None
- Comment: This SPR should be considered as a product improvement item for a future software delivery.

SPR MD3-9071 ('TSPEC)

- Problem Description: 'TSPEC showed on Rev 1601 for ACAT 270 under "Percent Accessed": 16290.
- 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-11.

SPR MD3-9072 ('TUPITT)

- Problem Description: RPT update number eight was attempted and it aborted out of 'TUPITT with error message number four because of a data parity on the input tape. The message did not say that the data base had to be reloaded. The run was restarted later with a good tape. It aborted and 'TFCARD output error message number twelve stating that the data base should have been reloaded.
- Solution or Work-Around: The data base must be reloaded after the 'TUPITT abort.
- Operational Impact: None
- Comment: The data base should be changed to state that the data base must be reloaded for 'TUPITT error message number four. This should be done prior to the support of SV-11.

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5.6.3 Hardware/Software Interface Changes

For IRON 6381, two change requests were processed from RV-4 initiation through the RV-4 recovery message (as shown in Table 5.6.3-1).

These requests were implemented via requests SV-10-131 and SV-10-148 and have been incorporated into the flight data base and hardware/software interface documentation.

Table 5.6.3-1. Summary of Hardware/Software Interface Changes

<u>Request No.</u>	<u>Identification</u>	<u>Data Base Effectivity</u>
SV10-131	Provides second station deletion capability to delete backup load station when not required	SV-10 and nominal
SV10-148	Modified Sequence 322 to TPS 2 configuration	SV-10 only

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PPFR INPUTS #4

5.7 Satellite Vehicle Support

5.7.1 Operational Impacts During RV-4 Segment

- a. Communication failures between the tracking stations and the STC continue to cause delays in playbacks and realtime data availability. COOK experienced constant dataline resync indications on Rev 1752 and switched datalines. The microwave data from COOK on Rev 1857 was unusable due to a bad paper tape for the simulator.

POGO and INDI continue to have unreliable communications with two failures occurring at each station.
- b. Computer malfunctions impacted operations at POGO. The 1230 mtc computer had a disk controller problem and a mass storage adaptor failure both of which prevented the station recording tracking and command history data. Playbacks during revs 1457-1499 were delayed for up to two hours.
- c. Antenna systems supported operations successfully except for two instances at POGO. The SGLS 14 auto-track capability was inoperative for Rev 1903. During Rev 1918, the SGLS Transmitter faulted and the last 91 sec were passive track and record. Sidelobe acquisitions occurred three times at HULA (revs 1461, 1575 and 1802) delaying pass objectives.
- d. Single instances of noisy downlink occurred at the following stations: GUAM (rev 1602), BOSS (rev 1774) and a RFI at acquisition at POGO (rev 1512). COOK experienced noise (.5 to 1.0v.) on the 1.7 mhz carrier due to a malfunctioning Dynair Amplifier. This occurred on revs (1443, 1460, 1467, 1468, 1476 and 1484).
- e. Personnel errors occurred at BOSS and HULA. BOSS supported Rev 1903 with the Command Transmitter antenna due to an outage on the SGLS 46 10kw Transmitter. During the pass, the maintenance people activated the SGLS transmitter causing telemetry dropouts and incomplete tape recorder readout. HULA supported Rev 1899 (SGLS 2 Test) with the command modulation on for 30 sec at acquisition.

5.7.2 Telemetry and Mode Processing

No problems were reported.

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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. 894.

Stellar Terrain Testing normally planned during the RV-4 segment was postponed until regular solo because of the K-2 switching problem.

Actual solo occurred from Rev 1949 to Rev 2436, Operation Day 151. With sufficient propellant, solo started with an orbit adjust to an orbit of 91 x 160 N miles. Orbit adjusts were scheduled every two days to maximize the number of restarts until day 143. Thereafter, a new orbit at 100 x 158 was allowed to decay without maneuvers to permit evaluation of drag effects on orbit determination.

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

On day 149, Vehicle Tumble life became quite short because of an extreme magnetic storm almost requiring a corrective response. On the last day and the final Solo test demonstrating a new recovery procedure, the vehicle did not complete a pitch-up maneuver and tumbled on Rev 2433, three revs before the planned Deboost.

After tumbling the planned Burn to Depletion Test and ACS controlled Deboost was cancelled and quickly modified to the Lifeboat Deboost for the planned rev. Deboost occurred on Rev 2436, Flight Day 151, Nov. 5 1975. The updated impact coordinates were 52.8°N latitude and 177.8E longitude.

6.1.1 Secondary Flight Objective Accomplishments

The requirement and definition of the Secondary Flight Objectives (SFO) identified prior to the launch of 1210 are provided in Annex H to the System Test Objectives (STO). The SFO accomplishment for SV-10 is as follows:

1. Early Rev Activity: All Primary and Redundant System tests were complete by Rev 21 as planned.
2. Attitude Control System Evaluation: Evaluated Primary and Redundant ACS Subsystems performance during flight. Transferred to ACS-2 on Rev 2287.
3. Reaction Control Subsystem Evaluation: Evaluated Primary and Redundant RCS thrust levels as a function of feed pressure, to assess thruster degradation. Transferred to RCS-2 on Rev 1299 and Lifeboat Deboost Rev 2436.

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4. Orbit Adjust System Evaluation: Evaluated OAS Engine performance and propellant margin. A total of 61 Engine restarts were used. Deboost Burn was segmented but not burn to depletion.
5. Electrical System Degradation Determination: Determined after each RV event, whether any contamination was encountered which degrade the Solar Array cells or affect battery performance.
6. T and T Redundant Equipment Evaluation: Determined operational status and characteristics of the redundant tracking and telemetry equipment on a weekly basis.
7. Lifeboat Health Check: Verified Lifeboat performance for ability to perform required on-orbit functions, including Lifeboat Deboost.
8. RCS, Electrical and Thermal Systems Performance Check (RET Record): Determined the pulse rate of the RCS System for a normal quiescent rev, determined the electrical system performance, and determined the thermal environment of the vehicle, on a weekly basis.
9. Electrical System Rev Status Determination: Determined the minimum bus and battery voltages and battery load sharing at sunrise +150 secs on each rev, and determined the K-2 Relay status 700 seconds before sunset each rev.
10. ECS/UHF Test: Verified ECS loading capability through the ECS/UHF Receiver on a weekly basis.
11. Panoramic Camera Photographic Operations: Verified optimum focus, in and cross track OAAA bias settings, determined lens MTF, collected standard scene photography and radiometrically calibrated the separate film types as planned.
12. Panoramic Camera Thermal Evaluation: Provided a continuing thermal survey of the Panoramic Camera subsystem on a daily basis.
13. Stellar Terrain Bar XC MOPs: Determined the metric calibration of the ST subsystem periodically during the ST mission as planned.
14. Stellar Terrain Calibration: Determined the metric calibration of the ST subsystem by photographing star fields with the terrain camera and the stellar cameras on Rev 805.
15. FA Subsystem On Orbit Life Test: Limited Testing because of K-2 problems.
16. K-Value Monitoring and Reporting: Monitored, as planned, magnetic effects that could cause stellar film radiation damage to permit possible contingency stellar terrain activity to minimize damage.
17. INDI Commanding: Maintained proficiency of INDI RTS with program commanding procedures on a weekly basis.

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19.

20. RV-5 Thermal Protection: The evaluation of the adequacy of RV-5 thermal protection for SI takeup and film during orbital operations for higher solar (Beta) angles was limited because of the K-2 thermal problem.

21. Stellar Terrain 24 msec Exposure Test: Evaluated the exposure latitude and smear factors associated with operating the terrain camera as planned.

22.

23. Solar Array Output Evaluation: Determined the feasibility of utilizing the solar array output current at the mid-point of solar panel illumination period as planned.

24.

25. MCS Link Margin: Determined the MCS Link Margin with the vehicle in the normal attitude.

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6.1.2 Solo Event History

A summary of the Solo Event history is as follows:

Post RV-5: Starting Rev 845
Post RV-4: Starting Rev 1949.

<u>REV OR SPAN</u>	<u>ID</u>	<u>EVENT - OPERATIONS TESTS</u>
	OPS-1	Verification of Redundant Systems
878-894	a	DBS Red Heaters
862-894	b	DBS Red Oscillator
2109-2429	c	ST Red Power Converter (NEC)
2060	d	ST Red Terrain Therm Shutter (NEC)
2060	e	ST Red Terrain Cap Shutter (NEC)
2060	f	ST Red Stellar Transport (NEC)
2060	g	ST Red Stellar Platen (NEC)
2094	h	ST Emerg Shutter Open (NEC)
2094	i	ST Terrain Shutter Reset (NEC)
2094	j	ST Stellar Capping Shutter (NEC)
2076-2189	k	ST Converter ON/OFF (NEC)
1883-1894	l	Redundant TCEA (MWC/SBAC)
2092	m	Backup Timer (SBAC)
1984-1985	n	Aft SW Bus to LB Batt (SBAC)
1984-1985	o	MCS/SGLS2 (SBAC)
1984-1985	p	LB Check (SBAC)
1966-1967	q	OA Man Htr 2 + (SBAC)
1966-1967	r	OA TCV Htr 2 + (SBAC)
1966-1967	s	OA TNK Htr 2 + (SBAC)
1966-1967	t	RCS TNK Htr 2 + (SBAC)
2002-2003	u	Lifeboat Tank Htrs (SBAC)
2235-2305	v	Solar Array Position Sw (SBAC)
2431	OPS-1-w	Stellar Inhibit Test (NEC)
N/A	OPS-2	OAS Propellant Mass Status (SBAC)
N/A	OPS-3	SV Life Capability (SBAC/CSC)
N/A		

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<u>REV OR SPAN</u>	<u>ID</u>	<u>SYSTEMS CAPABILITY DEMONSTRATION TESTS</u>
1952	DEMO-1	Model 14.1 Test and Transition (FTFD)
1968-2410	DEMO-2	Extended RCS Lifetime Evaluation (SBAC)
1963-1964	DEMO-3	Magnetometer Measurement Evaluation (SBAC)
2092	DEMO-4	375 Receiver Test (SBAC)
2142-2161	DEMO-5	RCS No. 1 Status (SBAC)
N/A	DEMO-6	OA System Evaluation (SBAC)
Cancelled	DEMO-7	ECS/MCS Redun. Operation Test (OPC/CSC)
Cancelled	DEMO-8	Rev 1 PCON Procedure (SBAC/CSC)
Cancelled	DEMO-9	Pitchdown Maneuver with RCS1 only (SBAC)
2125-2337	DEMO-10	Extended FA Operations (NEC)
2202	DEMO-11	Switch to TWPS 1 (SBAC)
2137	DEMO-12	Execute Utility Blocks 9160 & 9260 (CSC)
2336-2417	DEMO-13	OB Life Test (SSC)
2205-2207	DEMO-14	Demonstrate VBE of Remote Dec OFF (SBAC/MWC)
Cancelled	DEMO-15	RV-5 VBE Enable.
<u>REV OR SPAN</u>	<u>ID</u>	<u>ENGINEERING AND DEVELOPMENT TESTS</u>
2142-2174	ENGR-1	Simultaneous Thruster Operation (SBAC)
1996-1997	ENGR-2	Gyro Drift Calibrate (SBAC)
2110-2111	ENGR-3	Horizon Sensor Mapping (SBAC)
Cancelled	ENGR-4	Solar Array Dynamics (SBAC)
2223-2289	ENGR-5	Battery Module Temp. Test (SBAC)
1955-1959	ENGR-6	Molecular Shield Evaluation (SBAC)
2300-2436	ENGR-7	Drag Coefficient Evaluation (SBAC)
1962-2320	ENGR-8	OB Modeling Information (SSC)
1979	ENGR-9	ST Camera Thermal Rise Data (NEC)
2351-2407	ENGR-10	ST Camera Thermal Decay Data (NEC)
Cancelled	ENGR-11	ACS Restart Capability (SBAC)
2352	ENGR-13	NCVU Test

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6.2 COMMAND SUBSYSTEMS PERFORMANCE (Prepared by CSC)

6.2.1 Health

The health of the Command Systems remained excellent throughout Segment 5 (Revs 1949-2436). 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.

6.2.1.1 Extended Command Subsystem

The ECS responded properly in all modes into which it was commanded. There were a total of 122 messages loaded in the ECS for this segment. This resulted in 42,544 SPC's being stored for readout from the PMU's.

Of the 42,544 SPC's loaded, 26,839 were output from the PMU's for processing by the decoders. The remaining were erased out prior to time label matches.

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

6.2.1.1.2 ECS Clock Operation

The accuracy of the ECS clock was 2.50 parts in 10^7 . This corresponds to an average frequency offset of .256 HZ above the nominal frequency of 1.024×10^6 HZ. The frequency of the clock oscillators changed to .039 HZ in 488 revs. This results in a stability of 4.71 parts in 10^8 over 488 revs, or 3.92 parts in 10^{10} for an average six hour period. All of these values are well within system specifications.

6.2.1.1.3 ECS Anomalies

There were no ECS anomalies experienced during this segment.

6.2.1.1.4 Special Studies

No anomalous VTCW's (redundant) were observed while on TPS #2 during revs 1894 to 2202.

Switched back to TPS #1 on rev 2202, primary VTCW, to see if anomalous VTCW's would come back. No anomalous VTCW's were observed during the period of revs 2202 to 2436 (deboost).

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The MCS was commanded into the operate mode at rev 1984 Boss and the memory was addressed and filled. The MCS remained in the operate mode for one rev, and responded properly to all stored and real time commands.

6.2.1.2.2 MCS Anomalies

There were no MCS anomalies.

6.2.1.3 REMOTE DECODER/BUD6.2.1.3.1 Command Modes

The remote decoder was used for evaluation of new recovery plans on rev 2206 for RV-4 and rev 2433 for RV-5. The performance of both channels were verified from telemetry to be proper for all commands.

One command was executed by the BUD during this segment and was verified from telemetry to be proper.

6.2.1.4 SUMMARY6.2.1.4.1 Expendables and Environmental Data

Total Command Readouts	PMU-A <u>13,417</u>	PMU-B <u>13,422</u>
ECS Clock Drift Rate	2.50 parts in 10^7	
ECS Clock Stability	4.71 parts in 10^8 for a 488 rev period	
Total Hours On	ECS <u>3604.2</u>	MCS <u>6.15</u> RD <u>20.14</u> BUD <u>.10</u>
Secure Words Expended at End of Segment 5	PMU-A <u>184</u>	PMU-B <u>176</u>
Environmental Data	All temperatures within specification.	

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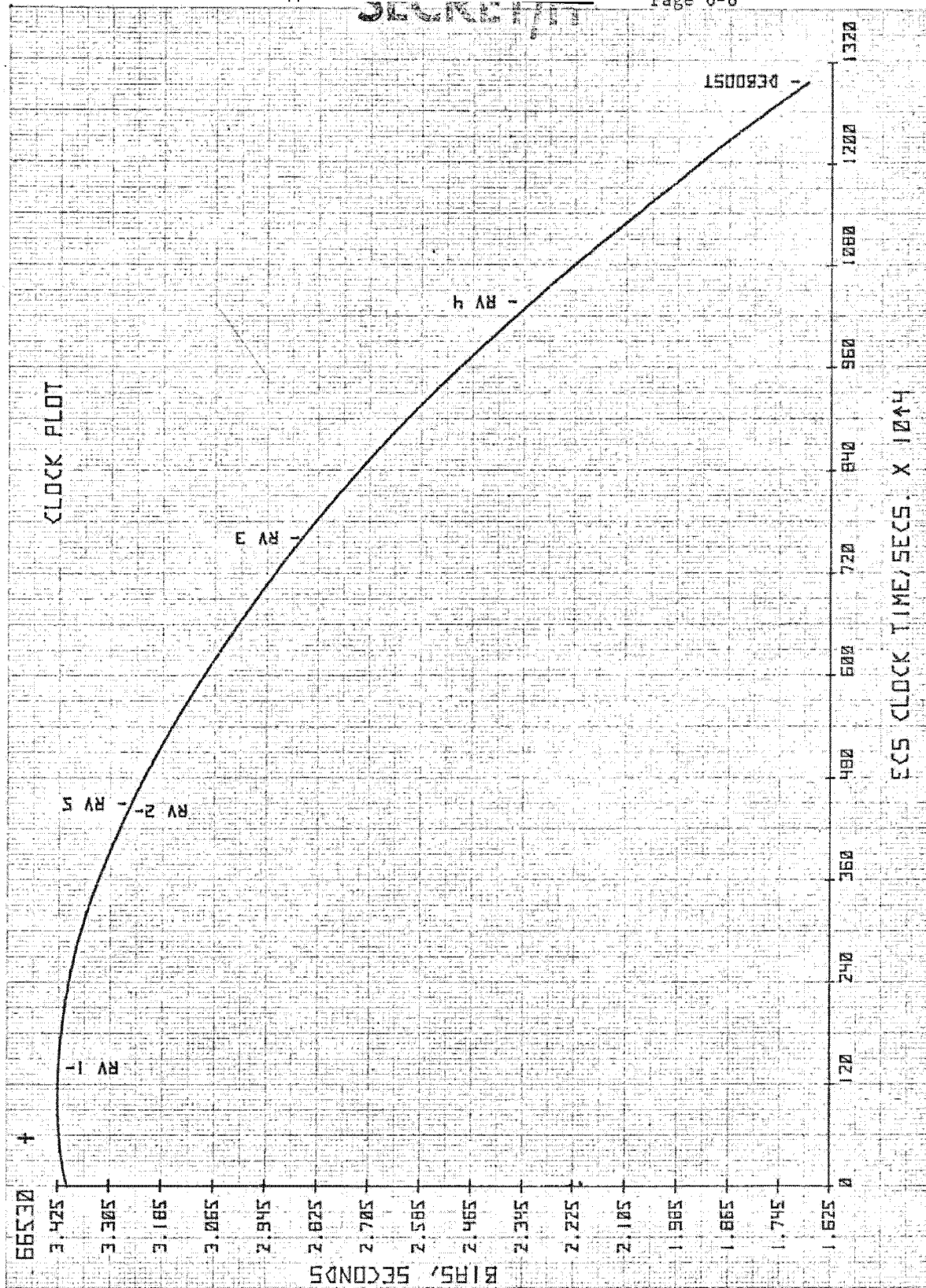
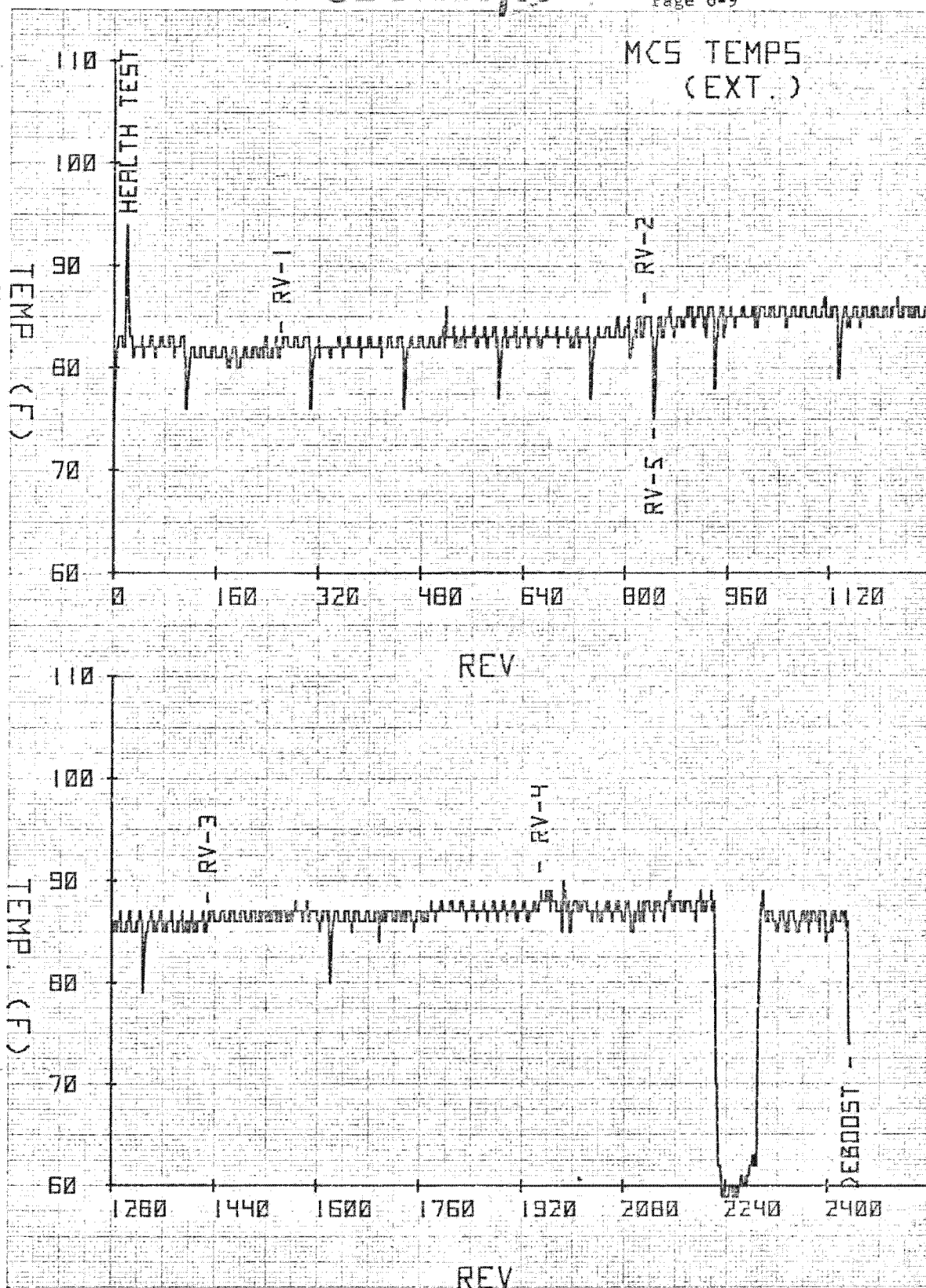


Figure 6.1



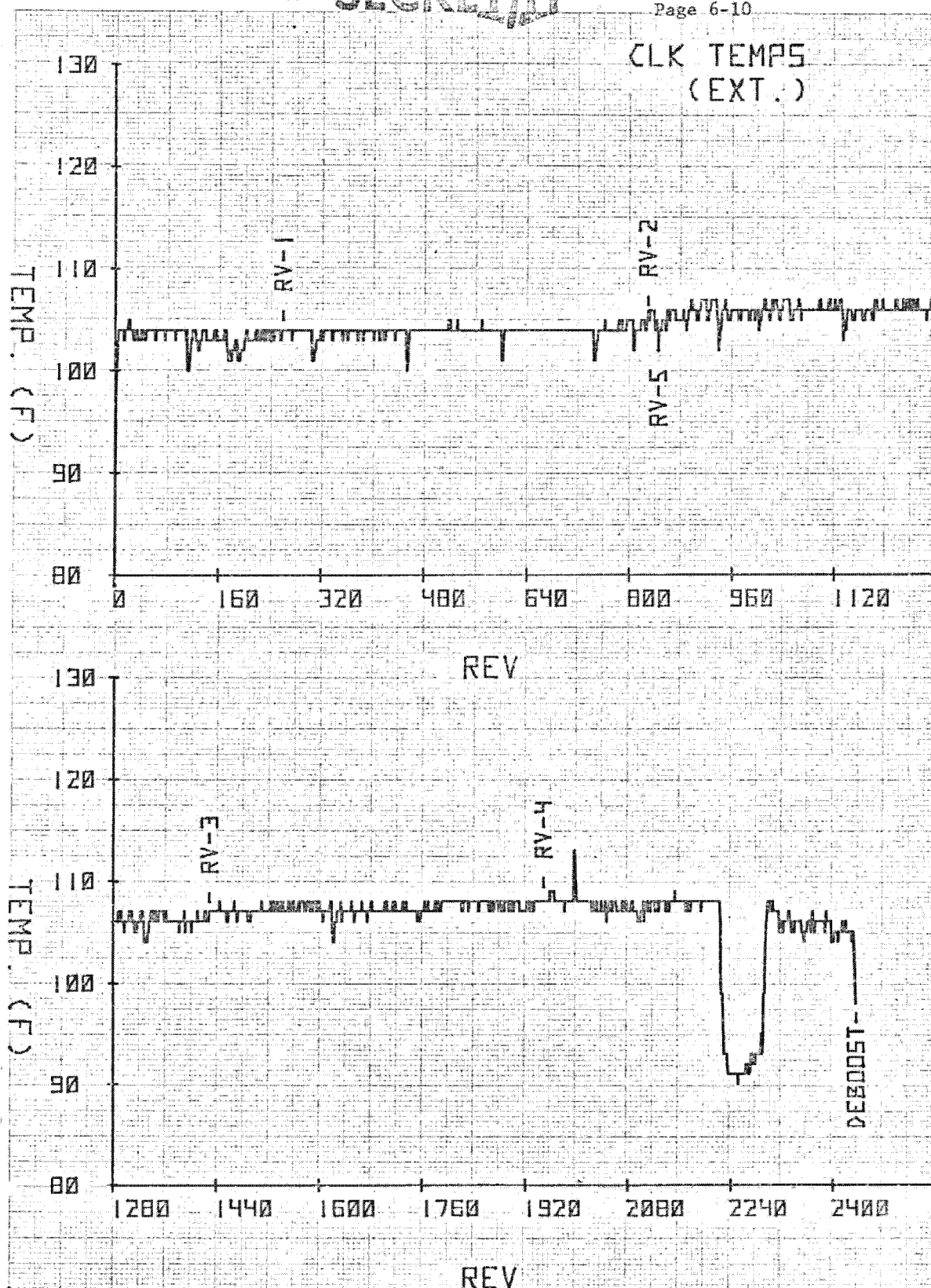
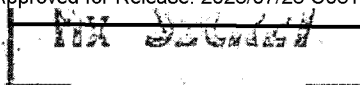


Figure 6.3



6.3 SENSOR SYSTEM OPERATIONS THROUGHOUT SOLO

6.3.1 TEST OBJECTIVES

Solo testing on SV-10 was designed to meet the following objectives:

1. Test D2

Provide vehicle dynamics for SBAC evaluation of their RCS thruster lifetime by simulating daily mission operations.

2. Test E8

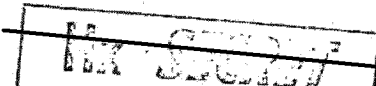
Provide optical bar performance data throughout the V_x/h operational range. Provide mono operation data and SCC comparison data.

3. Test E13

Investigated the feasibility of using the NCVU box to operate the optical bars and platens in the photo mode without transporting material, for in house evaluation.

6.3.2 TEST DESCRIPTIONS

Test D2 consisted of OB sequences of 40 seconds to 317 seconds duration, performed at approximately the normal mission average operating frequency, covering the areas of interest, utilizing primarily stereo mode, but with occasional mono runs. This test was planned to continue throughout the solo phase, terminating the day before de-boost.



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6.3.2 TEST DESCRIPTIONS - CONT'd.

Test E8 consisted of optical bar sequences providing Vx/h operations from step 40 thru step 120 with a minimum of 20 cycles at each 10th step, and at least 2 cycles between each intermediate step, and a similar sequence with Vx/h decreasing from step 100 to step 80, and a mono A sequence with Vx/h steps 80 thru 100. A nested sequence was used to provide data on when intermediate Vx/h updates take effect, and was repeated on a weekly basis to provide engineering data on bearing lubricant lifetime. All E8 tests were performed in both SCC's.

Test E13 was a stereo sequence with TU only and SU only commanded after C+ but before commanding OB+ and FT+.

6.3.3 SOLO EVENTS

GN2 depletion to the point where insufficient gas remained to open the sealed doors occurred at the 8th solo operation, in Rev 1981, providing 2819 seconds of pneumatics operation in the solo phase.

An OB phase discrepancy was noted on Rev 2115, resulting from a timing problem in the nested sequence performed in Rev 2109. OB stow sequences were run on Rev 2125 and after all subsequent runs of the nested sequence.

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6.4 MAPPING CAMERA SOLO OPERATIONS

Because of the K2/K3 relay failures incurred in flight, the ST solo activities were postponed until after RV-4 recovery. The system was operated for 63 operates (1967 cycles) in the normal mode and 7 operates (696 cycles) in the backup mode, a total of 70 operates and 2393 equivalent frames. The following is a description of the SV-10 solo activity that was accomplished post RV-4 recovery.

6.4.1 Main Power On Thermal Response Time ENGR - 9

Main bus power was turned ON on rev 1979 after 1173 revs (73 days) without heater power. Stabilization at normal operating temperatures was attained in 20 revs. Heater activity began cycling within 150 seconds after main bus ON. C640 indicated 10.9 amps for 140 seconds and then dropped to 4.9 amps. Typical C640 station pass cycling was reached by rev 1787, 8 revs after the main bus was turned ON. (Note that the K2 relay was still failed closed, resulting in slightly higher C640 levels from the power being supplied to both stellar and terrain supply units).

6.4.2 Base Line Test

To establish baseline test data for subsequent solo testing, the ST system was operated on rev 2060 for 7 frames in the normal mode. The system had not been operated since rev 806. The thermal shutter did not open on the first 5 frames. It began to open on frame 6 and was fully operational by frame 7. Since the main bus had been turned off for 73 days, the resultant lack of heater power combined with the extended sit period caused sluggish operation of the shutter. The most likely cause of this initial operating anomaly was congealing of grease in the gear mechanism. Subsequent operations of the thermal shutter during solo activity were normal.

6.4.3 Redundant Electronics OPS 1-c

Transfer to the redundant electronics was completed on rev 2060. All subsequent solo activity was completed with the redundant electronics selected. No redundant servo electronic related problems were observed.

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To verify independent operation of the primary and secondary power converters, the ST was operated in both modes with each converter off. On rev 2076 four operates were programmed. Normal operating sequences were utilized with the converter OFF commands executing 0.6 seconds after the operate ON (ST+) commands. The normal sequence for this command is to execute converter off command prior to ST+. A system failure was observed during the first secondary converter OFF operation. The -5VDC (H) operate voltage, telemetry monitor S172, went to a -0.2 volts. S172 should have indicated approximately -4.5 to -4.7. The loss of the -5.0 VDC (H) voltage caused the system to run away (frame time decreased to approximately 2.5 seconds/frames, tach levels saturated, loss of press and shutter events, etc.). This failure did not occur in the other three sequences of paragraph b.

A rerun of the procedure in paragraph b with the converter OFF commands executing 0.6 seconds before the operate ON (ST+) command was completed on rev 2109. System operation was normal for all four operate conditions. However, during the secondary converter OFF, normal mode operate, the S172 -5 VDC (H) monitor indicated -5.1 and -5.2 volts. Historically this monitor on other systems has never indicated above -4.8 volts. Throughout the SV-10 operational mission this monitor was indicating -4.6 to -4.7 volts.

Subsequent diagnostic power converter testing was programmed to determine the status of the -5 VDC (H) voltage. A series of short operate ON's and OFF's with converter OFF commands executing at various times was attempted. Reference table 2 for sequence of events. The first operate of this test series resulted in a system failure.

The -5 VDC (H) dropped to zero and the terrain transport backed up during its inhibit period to the approximate position where the framing roller normally stops rotating. At the end of the transport inhibit period, approximately $7\frac{1}{2}$ seconds after operate ON, the transport ran in the forward direction through approximately 90 percent of the framing roller dwell and then stalled. The antibackup spring was either broken or slipping during this period. Normally the antibackup in the takeup would have prevented the transport from backing up, however, it was ineffective due to the lack of film in the system during solo. This stalled condition continued for the remainder of this test series. The system freed itself from the stalled condition on a subsequent operate. A two operate

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CONVERTER TEST SUMMARY

REV	OPERATE	TEST CONFIGURATION	CONVERTER OFF TIME FROM OPERATE ON	-5 VDC (H)	COMMENTS
2076	1	NORMAL MODE, #2 OFF	+0.6	-0.2	RO AND IC SYSTEM RUNAWAY, D XPT BACKUP AND STALLED
	2	BACKUP MODE, #2 OFF	+0.6	-0.5*	
	3	NORMAL MODE, #1 OFF	+0.6	-4.8	
	4	BACKUP MODE, #1 OFF	+0.6	-6.0*	
2109	1	NORMAL MODE, #2 OFF	-0.6	-5.2	-5V (H) UNUSUALLY HIGH
	2	BACKUP MODE, #2 OFF	-0.6	-0.4*	
	3	NORMAL MODE, #1 OFF	-0.6	-4.9	
	4	BACKUP MODE, #1 OFF	-0.6	-5.9*	
2125	1	EXTENDED OP NORMAL	----	-4.7 to -5.2	FLUCTUATING
2127	1	EXTENDED OP NORMAL	----	-4.5	STABLE
2188/9	1	NORMAL MODE, #2 OFF	+0.6	-0.1	SYSTEM ENTERED A STALLED CONDITION
	2	NORMAL MODE	----	-4.4	SYSTEM STALLED
	3	NORMAL MODE, #1 OFF	+0.6	-4.8	SYSTEM STALLED
	4	NORMAL MODE	----	-4.5	SYSTEM STALLED
	5	NORMAL MODE, #2 OFF	+1.2	-0.2	SYSTEM STALLED
	6	NORMAL MODE	----	-4.5	SYSTEM STALLED
	7	NORMAL MODE, #1 OFF	+1.2	-4.8	SYSTEM STALLED
	8	NORMAL MODE	----	-4.5	SYSTEM STALLED
	9	NORMAL MODE, #2 OFF	+1.8	-0.2	SYSTEM STALLED
	10	NORMAL MODE	----	-4.5	SYSTEM STALLED
	11-20	NORMAL MODE			SYSTEM STALLED
2222	1	NORMAL MODE, #2 OFF	-0.6	-0.2	CLEARED STALLED CONDITION
	2	BACKUP MODE	----	-5.5*	

* NOT UNUSUAL FOR BACKUP MODE OPERATION

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TABLE 1

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test series included a secondary converter OFF, normal mode operate followed by a backup mode operate. The system at first backed up as before, but more than previously (the cycle counter backed up one count) and then cleared itself and began its runaway in the forward direction due to the loss of -5 V (H). Subsequent operations were conducted with secondary ON and the system transport ran normally (i.e., no transport hangup) for the remainder of solo activities.

6.4.5 Thermal Shutter Emergency Open OPS 1-h

On rev 2094, ops day 130, a 3 second operate sequence, followed 17 seconds later by the normal backup ON/OFF commands was executed to effect the thermal shutter emergency open contingency.

The thermal shutter did not open during the 3 second operate time but did open 17 seconds later with the backup ON/OFF commands. The opening time was just over 220 milliseconds. (This time is defined as the time the shutter travels between approximately 30° to 90°).

Preliminary Analysis

1. This flight unit was the first system to have the "reworked" thermal shutter emergency open release mechanism. During ground testing, the mechanism released at 18 VDC.
2. This was the first flight where the main bus power was turned OFF between the RV-5 recovery and the solo activity. This resulted in a loss of temperature control for 73 days. A spot check of the APSA temperature monitor A712, which is closest to the thermal shutter, indicated temperature excursions of 9-88° prior to turning on the main bus power for solo testing. Before the emergency open attempt was executed, the system was thermally controlled to within normal operating temperatures and several operates were successfully completed.
3. When the thermal shutter did respond during the backup ON/OFF commands, S284 thermal shutter open/close monitor indicated the thermal shutter opened in approximately 220 milliseconds. The normal time in which S284 indicates thermal shutter opening or closing has historically been approximately 200 milliseconds. This 200 milliseconds measurement has been very predictable and stable since the circuit was modified to indicate "opening" and "closing" of the shutter. Because the time to open was normal, "sluggish" operation of the motor/gear drive mechanism does not appear to be the cause of the delayed thermal shutter response.

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4. The most probable cause of this problem is the failure of the emergency open release mechanism to respond to the first command. The backup ON/OFF command served as a "second pulse" to the release mechanism which apparently tripped the mechanism, opening the thermal shutter.

6.4.6 Terrain Thermal Shutter Reset OPS 1-i

The terrain thermal shutter had been opened via the emergency open command on rev 2094. On the same rev the shutter was reset from the emergency open condition. The reset command, ST Power +, with safety shutter commands enabled, was executed just prior to the last cycle. The camera internal shutter commands closed the shutter on the last cycle. The thermal shutter operation was normal on all subsequent solo activities.

6.4.7 Stellar Capping Shutter Operation OPS 1-j

On rev 2094 both stellar safety capping shutters were successfully commanded closed as verified by telemetry points S246 and S247, stellar shutter close monitors.

6.4.8 Extended Operations Demo -10

The ST system was operated for 12 operates for 1692 frames in the normal mode and 4 operated for 550 frames in the backup mode. There were no anomalies observed throughout the entire extended operations - a cumulative total of 2242 frames.

6.4.9 Main Power OFF - Thermal Response Time ENGR-10

The main bus power was turned OFF on rev 2359. After 16 revs (1 day), main instrument temperatures were out of band low. The slope of the cooling curve was very similar to the slope encountered during the OFF periods of main bus cycling in the operational portion of the flight. (The K2/K3 relay failure in flight required vehicle power and ST temperature management procedures. This procedure required cycling the ST main bus power ON/OFF.)

6.4.10 Stellar Inhibit OPS 1-w

To verify the operation of the stellar inhibit function, the vehicle was yawed on rev 2431. Sun angles were such that the -Y sun output monitor was expected to have been illuminated for the first 5 frames of the operate. Analysis of the -Y sun output monitor, S261, and the -Y shutter open occurrence monitor, S215, indicated that the -Y shutter was inhibited from opening for the first 5 frames of the 16 frame operate. There was no sun impingement into the +Y baffle and operation of the +Y shutter was normal.

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6.5 Satellite Vehicle Performance and Solo Testing

6.5.1 OPS-1. The purpose of Solo Test OPS-1 was to verify performance of redundant systems as well as primary systems not used during the primary mission. The SBA OPS-1 tests performed by SBAC follow.

OPS-1(a) and OPS-1(h): DBS Redundant Heater/Oscillator.

The Doppler Beacon system redundant oscillator was selected during Rev 862 and redundant heaters were selected during Rev 878. The system remained in this configuration until Rev 910, at which time the Doppler Beacon system was deactivated. DBS performance remained within specification limits throughout the test span.

OPS-1(e): Redundant TCEA

The redundant TCEA was selected and remained ON from Rev 1883 to Rev 1884. Operation appeared normal.

OPS-1(m): Backup Timer (BUT)

A timing interval check of the Backup Timer was performed during Rev 2094 in conjunction with the DEMO-4 test. The timing interval was found to be 540.2 seconds which is well within design specification of 540 $\pm$ 54 seconds. Previously, the BUT was checked on the launch pad and during Rev 18, with a timing interval of 541 seconds on both occasions.

OPS-1(n): Switched Bus to Lifeboat Battery

OPS-1(o): Lifeboat Execute (Without Opening Gas Valve)

OPS-1(p): MCS Memory Load and Execute

Aft Switched Buses 1 and 2 were configured to the Lifeboat Battery on Rev 1984, nested with Lifeboat Execute and MCS Memory Load/Execute tests performed on the same rev. All associated equipment was verified to be functionally operational.

OPS-1(q): TCS Injector Manifold Heaters

OPS-1(r): TCT Propellant Valve Heaters

OPS-1(s): OAS Tank Heaters

OPS-1(t): RCS Tank Heaters

The objective of OPS-1(q) through (t) was to verify that each redundant heater was functionally operational. The redundant heaters were selected from Rev 1966 to Rev 1967. In all cases the heaters performed as required.

OPS-1(u): Lifeboat II Tank Heaters

The Lifeboat II Tank Heaters were programmed on from Rev 2002 to Rev 2003. An increase in tank temperature verified that the heaters were functionally operational.

OPS-1(v): Solar Array Position Switches

Solar Array Primary Position switches were operated during the rev span 2223-2286 in conjunction with Solo test ENCR-5, Battery Module Temperature Test. The position switches functioned normally during all operations.

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<u>Rev</u>	<u>Venturi</u>	<u>Calc</u>	<u>Rev</u>	<u>Venturi</u>	<u>Calc</u>
63	3393.8	3394.3	1182	1586.9	1588.3
111	3267.2		1230	1534.8	1527.5
113	3210.8	3206.9	1278	1495.3	1485.5
159	3178.8	3176.9	1328	1398.1	
209	3129.1	3124.9	1330	1353.2	1352.5
263	3090.3	3085.1	1376	1303.5	1304.2
306	2967.2		1431	1257.3	1255.8
308	2884.3	2876.9	1474	1212.5	1205.9
354	2846.5	2844.5	1522	1155.8	1151.8
403	2794.1	2793.0	1570	1095.5	1094.3
452	2700.4		1620	1014.7	
454	2642.3	2641.7	1622	975.0	983.1
500	2588.9	2585.0	1668	937.8	954.2
549	2544.5	2544.6	1717	890.8	893.5
599	2455.0		1737	862.0	863.1
601	2405.5	2404.3	1782	833.3	859.6
646	2357.1	2359.0	1830	754.6	765.3
695	2313.2	2311.9	1879	725.6	729.2
744	2225.1		1936	695.7	727.4
746	2173.4	2162.9	1951	662.6	690.6
792	2122.3	2122.1	1961	627.7	649.6
847	2078.7	2079.3	1993	592.9	613.4
890	2046.4	2050.1	2025	558.2	578.4
938	1940.8		2058	533.5	542.8
940	1887.2	1897.7	2090	498.9	506.5
986	1847.3	1829.7	2123	469.2	473.8
1036	1790.2	1794.5	2154	438.2	470.0
1084	1753.1	1759.6	2187	412.7	428.6
1133	1654.4		2220	366.0	378.7
1135	1616.6	1608.1	2300	262.6	300.2

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6.5.2 OPS-2: OAS Propellant Mass Status

The object of this test was to obtain data to be used to improve the accuracy of OAS propellant mass uncertainty determination and assess a bias observed between the TCA venturi and OAS gas volume methods of measuring on-board propellant quantity.

Sixty (60) OAs and a two segmented deboost burn were performed on this mission. The table following lists the 60 orbit adjusts with a comparison of the propellant remaining between the known flow through the venturi and the calculated mass remaining using temperature measurements B511, B521 and B542 with pressure measurements B502 and B551. Good correlation was obtained throughout the mission. During certain maneuvers or tests where the OA tank heaters are on, the resulting increase in the tank surface temperatures will indicate a higher than actual volume temperature and subsequent error in the mass calculation.

The burn to depletion, scheduled for the mass uncertainty evaluation, was not performed due to the RCS anomaly on Rev 2433 and subsequent deboost using the LB system.

6.5.3 OPS-3: SV Life Capability (150 Days)

The objective of this evaluation was to verify that the SBA station keeping subsystems will maintain a proper operational environment for an extended period on-orbit.

Launch of SV-10 (IRON 6381) was at 1900:004Z on 8 June 1975. Deboost of the SBA was accomplished on Rev 2436, Subcycle 3, Ops Day 151, using the ECS/LBII systems. Throughout the primary mission to Ops Day 120, the SBA performance satisfied the life capability objective utilizing both primary and redundant systems. During the Solo portion of the flight, Ops Day 121-150, the SBA performed varied tests in the execution of the planned Solo experiments. A specific test was performed throughout the Solo segment to operate the primary payload by simulate mission operation for obtaining thruster lifetime data in keeping with this objective. On Rev 2433, Ops Day 150, during the execution of a pitch maneuver associated with Solo Test DEMO-15, RV-5 VBE Enable, the SBA lost stability control apparently due to degraded RCS-2 thruster performance. A subsequent attempt to recapture vehicle attitude control on Rev 2434 using RCS-1 failed. Therefore, the SBA was deboosted from orbit utilizing the LBII attitude control system.

6.5.4 DEMO-2: Extended RCS Lifetime Evaluation

The objective of this test was to provide vehicle dynamics by operating the primary payload system, simulating daily mission requirements, for evaluation of the RCS thruster lifetime.

Following recovery of RV-4 on Ops Day 121 and through Ops Day 150, the primary payload was operated a total of 127 times. Of these

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operates, 102 simulated the stereo mode of operation, including nested sequences and 25 utilized the Mono A and B sequences. On the average, approximately four (4) stereo and one (1) mono operations were performed each day of Solo, except for the first and last days of Solo and for six (6) days during which other conflicting tests were performed. Based on the duration of each operate sequence and other P.L conditioning parameters, approximately 1000 feet of material per day would have been exposed during the Solo simulated period.

On Ops Day 81, the controlling RCS was transferred from the primary (RCS-1) to the redundant (RCS-2) system. During the Solo portion of the flight, RCS-2 was the controlling system except for 19 revs when the Solo test ENGR-1, Simultaneous Thruster Operation, was performed and during the last three revs prior to deboost on Rev 2436. Thrust level output of the RCS-1 thrusters prior to Solo and near the end of Solo are shown below.

RCS-1 THRUSTERS

Rev No.	<u>Primary Mission</u>		<u>Solo Segment</u>		
	1622	1948	2172-2174	2431	2433
Ops Day	100	121	134	150	150
Maneuver	Yaw Rev	Pitch	ENGR-1	Yaw Rev	Pitch
Qual Level - 1b.	<u>3.2</u>	<u>3.2</u>	<u>2.8</u>	<u>2.6</u>	<u>2.6</u>
REA No. 1	3.3	-	2.3	*	-
2	-	2.2	1.7	-	0.6
3	-	3.5	4.0	-	0.4
4	2.8	-	1.9	*	-
5	3.2	-	3.2	*	-
6	-	3.3	2.0	-	1.8
7	-	2.3	2.7	-	2.3
8	3.2	-	-	*	-

*REA 1 and 8 5.1 lb combined;

REA 4 and 5 3.8 lb combined.

6.5.5 DEMO-3: Magnetometer Measurement Evaluation

This evaluation was run to obtain additional information on the attitude measurement capability of the Lifeboat magnetometers.

The evaluation was successfully performed during Revs 1963 and 1964 on October 6, 1975, Ops Days 121 and 122. Magnetometer data was obtained from the following 10 zones around the orbit path for comparison with DGMAP (magnetic field data) predictions; converted to engineering units and compared with ACS attitude information.

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<u>Zone</u>	<u>Approximate Latitude</u>	<u>Pass</u>	<u>Select Latitude Criteria</u>
1	80°N - 70°N	N-S	P from DGMAP less than 50 mg
2	60°N - 50°N	N-S	P from DGMAP less than 110 mg
3	10°N - 10°S	N-S	R from DGMAP less than 110 mg
4	20°S - 30°S	N-S	R from DGMAP less than 205 mg
5	60°S - 80°S	N-S	P from DGMAP less than 100 mg
6	80°S - 70°S	S-N	P from DGMAP less than 110 mg
7	60°S - 50°S	S-N	P from DGMAP less than 205 mg
8	10°S - 10°N	S-N	R from DGMAP less than 110 mg
9	50°N - 60°N	S-N	P from DGMAP less than 205 mg
10	70°N - 80°N	S-N	P from DGMAP less than 75 mg

Data Modes 126.3 and 127.2 were obtained for all the recorded segments.

Comparison of the magnetometer outputs with the DGMAP data indicated operation of the magnetometers were within specification.

6.5.6 DEMO-4: MCS (LB) Receiver Test

The primary objective of this test was to determine the acceptability of a 6 db reduction in the MCS receiver sensitivity. Secondly, it was to observe the SGLS uplink and downlink characteristics with the antenna 180 degrees away from the RTS.

The test was conducted at Rev 2092 COOK. Maximum elevation - 11.53 degrees, descending pass, COOK on right side of vehicle. The Helix transmitter power was reduced from the specification value of 1 kw to 250 watts. The SGLS 46-foot dish was operated with a transmitter power of 50 watts, carrier only (50 watts is normal operating power). Prior to acquisition, the vehicle was rolled so that at 5 degrees elevation, ascending, the vehicle antenna was pointed 180 degrees (in roll) from COOK Tracking Station. MCS Initialize command was sent every 10 seconds from TRAN -60 seconds to FADE +60 seconds. The entire operation was recorded on the vehicle tape recorder.

Commanding

<u>Delta Time</u>	<u>VTCW</u>	<u>Command</u>
-317	238257	Geocentric rate off
-315	238259.6	Roll positive
-168	238407.0	Roll Stop
- 30	238545	SGLS Transponder On
0	238575	Decoder On (TRAN)

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(Commanding - cont'd)

Delta Time	VTCW	Command
0	238897	Decoder Off (FADE)
+138	239034.6	Roll Negative
+286	239182.0	Roll Stop
+422	239318	Geocentric Rate On
+425	239319.6	Pitch Negative
+527	239422.0	Pitch Stop

MCS Initialize was sent every 10 seconds for 44 transmissions starting at VTCW 238527.

Test Geometry

Time	R T S		Normal Attitude		Roll From Cook deg	Pitchup From Horizontal deg
	EL deg	Range NM	ϕ deg	ϕ deg		
238575	1.4	722	13.10	29.25	182.8	21.62
238629	5.0	547	13.94	40.33	180.0	25.30
238691	10.0	395	16.37	65.03	177.4	29.51
238731	11.6	360	17.38	90.00	177.0	32.23
238769	10.0	395	16.37	114.97	177.4	34.82
238833	5.0	547	13.94	139.67	180.0	39.17
238897	0.8	746	13.05	151.79	183.3	43.52

Vehicle Altitude = 92 n.m.

System Time = VTCW - 173877

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~~SECRET~~46-Foot Antenna Signal Strength

<u>V T C W</u>	<u>Duration</u>	<u>Signal Strength</u>
238575 - 634	59	-108 to -116
635 - 636	1	Noise (> -140) (DL)
637 - 648	11	-107 to -110
650 - 652	2	Noise (> -140) (DL)
653 - 667	14	-101 to -109
668 - 669	1	-127 (DL)
670 - 686	16	-103 to -112
687 - 688	1	-130 (DL)
689 - 695	6	-108 to -110
696 - 697	1	-127 (DL)
698 - 739	41	Heavy Fluctuations and 4 Data Losses
740 - 759	19	-100 to -108
760 - 896	36	- 94 to -103

Sequence of Events

<u>Delta Time</u>	<u>V T C W</u>	<u>E V E N T</u>
-30	239545	SGLS 1 on, BUT reset
-14	238561	SGLS 1 Coherent
-11	238564	BUD on, MCS interrogate on
- 8	238567	PCM Sync
0	238575	Decoder on (exit obscura)
	238814	MCS interrogate off
	238815	BUD off for 400 ms
	238816	MCS interrogate on
	238889	MCS interrogate off
	238890	MCS interrogate on
0	238897	Decoder off (enter obscura)
		SGLS 1 off
+12	238909	BUD off, MCS interrogate off
	239086	BUD time out
		BUT /

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~~SECRET/H~~Results and Operational ConsiderationsMCS Command Capability

MCS Commanding could have been accomplished for all but 3 seconds of the pass. With the vehicle antenna oriented away from COOK (Roll $180^{\circ} + 3.3 - 3.0$) and the ground transmitter power reduced 6 db, the command link was solid from TRAN -11 seconds to FADE +12 seconds except for the following two interruptions:

1. At 6.3 degrees descending the MCS receiver lost signal for 2 seconds and the MCS went to "sleep" for 400 ms.
2. At 1.2 degrees descending the MCS receiver lost signal for 1 second.

Worse case vehicle attitude was considered to be at 5° ascending since the antenna was well masked by the vehicle. The reason for the interruptions on the descending side have not been determined.

SGLS Uplink

The SGLS uplink had solid command capability from TRAN -14 seconds to SGLS turn off. The minimum effect of predict ephemeris errors low elevations and the ability of the 46-foot antenna to auto-track the entire pass contributed, significantly to this capability.

SGLS Downlink

The SGLS downlink was unusable for tape recorder readout or command verification due to the random data losses experienced during the majority of the pass. The downlink did provide usable realtime data.

The data losses experienced during the pass usually lasted for 1 or 2 seconds with a severe drop in signal strength (20 to 35 db). They had the same characteristic as "holes" experienced on passes with elevations above 40 degrees.

The periodic data losses during the first half of the pass gave an initial impression that the vehicle was tumbling; however, a tumbling vehicle would have also caused the average signal strength to display a cyclic rate. Signal strength is not a very good indication of vehicle attitude.

If this test had been conducted at POGO using the 14-foot dish, little or no usable data would have been received (14 db less sensitivity). Also, if the 60-foot dish had been used the data losses would have been more severe due primarily to the narrower beamwidth of the 60-foot dish.

Backup Timer

The Backup Timer clockout occurred 541 seconds after reset (specification is 540 ± 54).

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~~SECRET/H~~6.5.7 DEMO-5: RCS-1 Status

The objective of this experiment was to evaluate the effect of a 843-rev storage period on the degraded RCS-1 system.

The status of the RCS-1 system was determined during the simultaneous thruster operation experiment during Revs 2142 to 2161. Pitch, yaw and roll maneuvers were performed on Revs 2157, 2158 and 2160 respectively to determine thruster output. Thruster output was determined for all thrusters except REA #6 using Pc, Pf and thruster temperature. For REA #6, thruster output was determined from moment of inertia method due to failure of REA #6 pressure transducer which occurred early in the primary mission.

Thrust levels for the individual RCS-1 thrusters during this experiment were as follows:

1 = 2.98 lbf	5 = 2.07 lbf
2 = 0.77 lbf	6 = 1.82 lbf
3 = 1.09 lbf	7 = 2.91 lbf
4 = 2.78 lbf	8 = 1.58 lbf

Vehicle performance during this RCS-1/RCS-2 simultaneous thruster operation test, was normal.

Note: See paragraph 6.8.4 (DEMO-2 Extended RCS Lifetime Evaluation) for additional RCS-1 thruster data before and after the subject test.

6.5.8 DEMO-6: Orbit Adjust System Evaluation

The object of this test was to evaluate the OAS engine performance for up to 60 ambient starts.

A total of fifty-two (52) ambient orbit adjusts were performed between OA-1 on 6-12-75 to OA-61, for deboost on 11-5-75. There were nine (9) negative OAs which are not included in this ambient performance evaluation.

All of the OAs except OA-1, -4 and -6 were over 40 seconds long, providing good start data. Engine performance was nominal throughout with eleven (11) burns over 110 seconds longer. The longest single burn prior to deboost was on OA-60 which was for 183.8 seconds. The deboost was segmented into a 200-second burn followed by a 5-second "off" and refired for another 134.8 seconds.

The average delta velocity achieved was +1.2% of predicted for the above positive orbit adjusts. Total impulse accumulated was 812797.0 lb/sec.

Orbit Adjusts 50 through 60 were performed during this Solo portion of IRON 6381. OA-60 was a 183.8 second burn on Day 142 to raise the orbit and increase orbital lifetime to 150 days with minimum propellant expenditure. The propellant usage for the orbit adjusts was 433.1 pounds. Deboost propellant was an additional 186.0 pounds.

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The Solo orbit adjust summary is shown below.

OA No./ Type	Ops Day	Rev No.	Delta Velocity		Burn Dur. Sec	Prop Used Lbs	Aver OA Tank Temp °F	Aver OA Tank Press. psia
			(Predict)	(Actual)				
			FPS	FPS				
50/P	121	1951	20.000	20.086	56.6	33.1	91.6	92.0
51/P	121	1961	21.166	21.651	59.8	34.9	91.8	92.0
52/P	123	1993	21.142	21.321	60.0	34.8	92.4	90.8
53/P	125	2025	21.138	21.454	60.2	34.7	92.3	89.6
54/P	127	2058	15.004	14.997	43.0	24.7	92.5	89.2
55/P	129	2090	21.265	21.167	60.2	34.6	92.5	88.8
56/P	131	2123	18.243	18.288	52.0	29.7	92.3	88.0
57/P	133	2154	19.041	19.646	54.4	31.0	92.7	87.3
58/P	135	2187	15.685	15.897	45.0	25.5	93.2	86.9
59/P	137	2220	29.308	29.415	82.6	46.7	93.4	86.1
60/P	142	2300	66.000	66.670	183.8	103.4	98.5	85.7
61/P	151	2436	123.1	Deboost	334.8	186.5	94.0	83.7

Actual velocity increases compared very favorably with predicted velocity increases during these OAs.

6.5.9 DEMO-11: TWPS #1 Output Time Word Verification

The purpose of DEMO-11 was to determine 1) whether Time Word Power Supply #1 was still periodically indicating invalid Vehicle Time Code Words, and 2) whether a hard failure would occur before the end of flight.

Time Word Power Supply #1 was reselected on Rev 2202 and was found to be functionally operational throughout the remainder of the flight. No erroneous VTCW samples were observed.

6.5.10 ENGR-1: Simultaneous Thruster Operation

The objective of this experiment was to demonstrate that acceptable force levels for vehicle control could be obtained using both the primary and redundant thrusters simultaneously.

This experiment was conducted on Revs 2142 through 2160 by providing FCEA output from ACS-1 to the valve drives for the primary (RCS-1) and redundant (RCS-2) thrusters. During this test the vehicle was subjected to pitch, roll and yaw maneuvers and simulated P/L operations.

Vehicle performance during maneuvers and P/L operations was nominal and no adverse effects were noted due to the simultaneous thruster operation. Also no increase in RCS propellant usage was noted during this period. All maneuvers and simulated P/L operations were repeated following this experiment after transfer to single side (RCS-2) thruster operation. Following switch to single side operation, vehicle performance remained nominal.

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6.5.11 ENGR-2: Gyro Drift Calibrate

The objective of this experiment was to measure gyro drift in roll and pitch during a quiescent one rev period. Data was taken while flying inertially stabilized during Revs 1996 and 1997. The gyro drift measurement from this test provides an additional data point for the comparison of "in flight" gyro-drift measurements. Vehicle performance during the experiment was nominal, the calibration was considered successful.

6.5.12 ENGR-3: Horizon Sensor Mapping

The object of this experiment was to obtain Horizon Sensor noise data which is latitude and seasonally dependent.

With both PACS and RACS ON, one complete rev was recorded (Rev 2110) using both tape recorders. This was during a quiescent period with no disturbing torques applied to the vehicle.

The data received was adequate and the test was considered to be satisfactory.

6.5.13 ENGR-5: Battery Module Temperature Test

The object of this test was to evaluate battery performance at temperatures above the heater set point, in order to possibly extend the Beta (B) angle constraints below the current -8 degree limit.

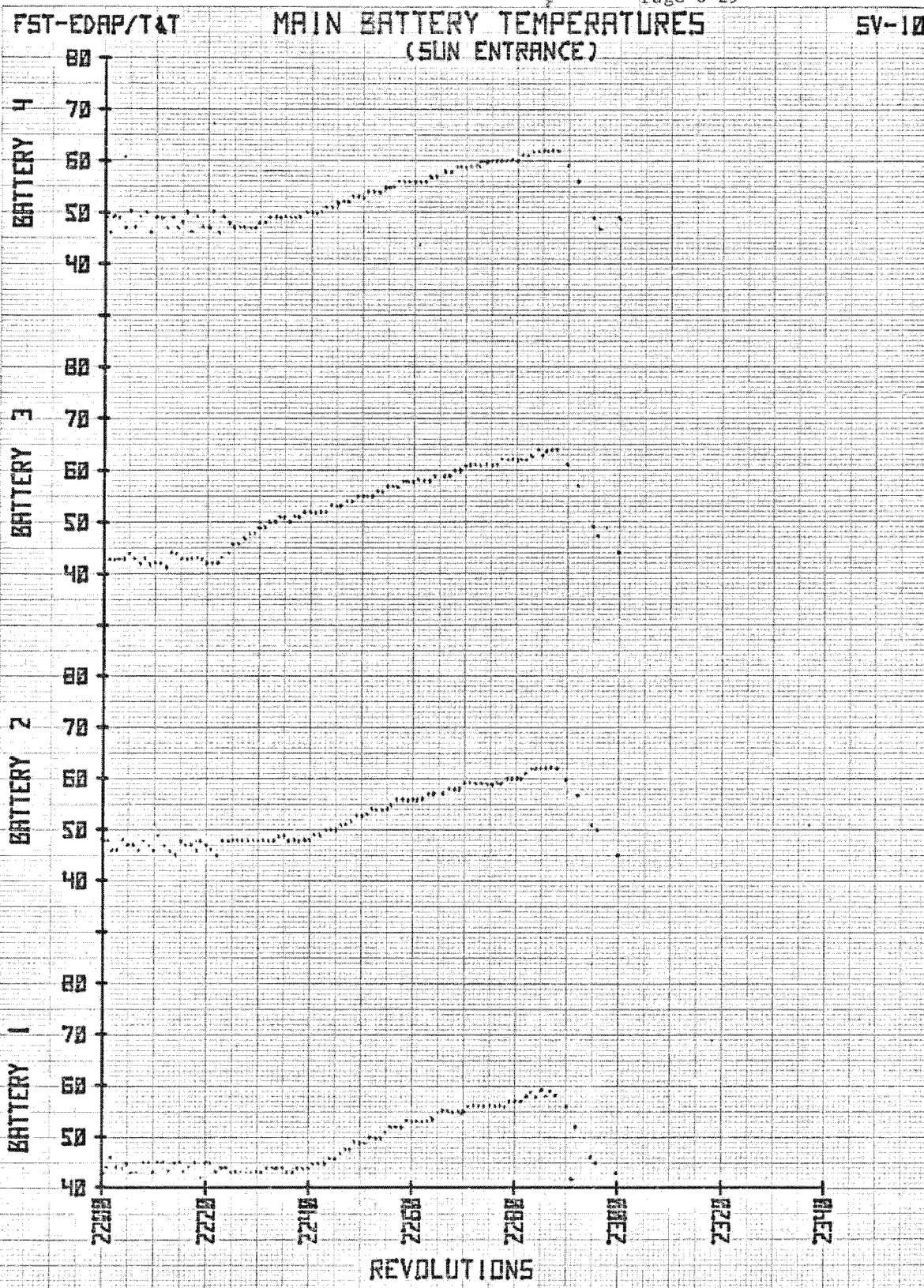
With the Beta (B) angle approximately $+24^{\circ}$, the vehicle was maneuvered during Rev 2223, to fly reverse, resulting in a B angle of approximately -24° . The Solar Arrays, originally at an angle of $+18^{\circ}$ were then moved to 0° at 2235P and subsequently to -18° at 2238C. The Solar Array repositioning was to provide normal main battery system charging performance while flying reversed. The vehicle then was allowed to continue orbiting tail first for approximately four days.

As expected, the temperature of a considerable number of vehicle components began changing after the vehicle began flying reverse. The primary area of concern was the vehicle battery temperatures, all of which began to rise. The following two graphs show the temperature of both the primary and the secondary battery systems during the fly reverse period. The specified maximum permissible temperature of the secondary (Main Batteries) battery system was 65°F , which Battery #3 closely approached by Rev 2283 (Rev 2288 was the intended end of the fly reverse period). On Rev 2284P, the Solar Array angle was changed to 0° to reduce Main Battery charge rate and, as a result, reduced the temperature increase rate of the batteries. Main Battery #3 (the battery with the most direct solar input) then stabilized at 64°F .

The "fly forward" command was given during Rev 2289; Solar Array positioning was returned to $+18^{\circ}$ during Rev 2305H; and the experiment terminated.

The test was considered to be successful.

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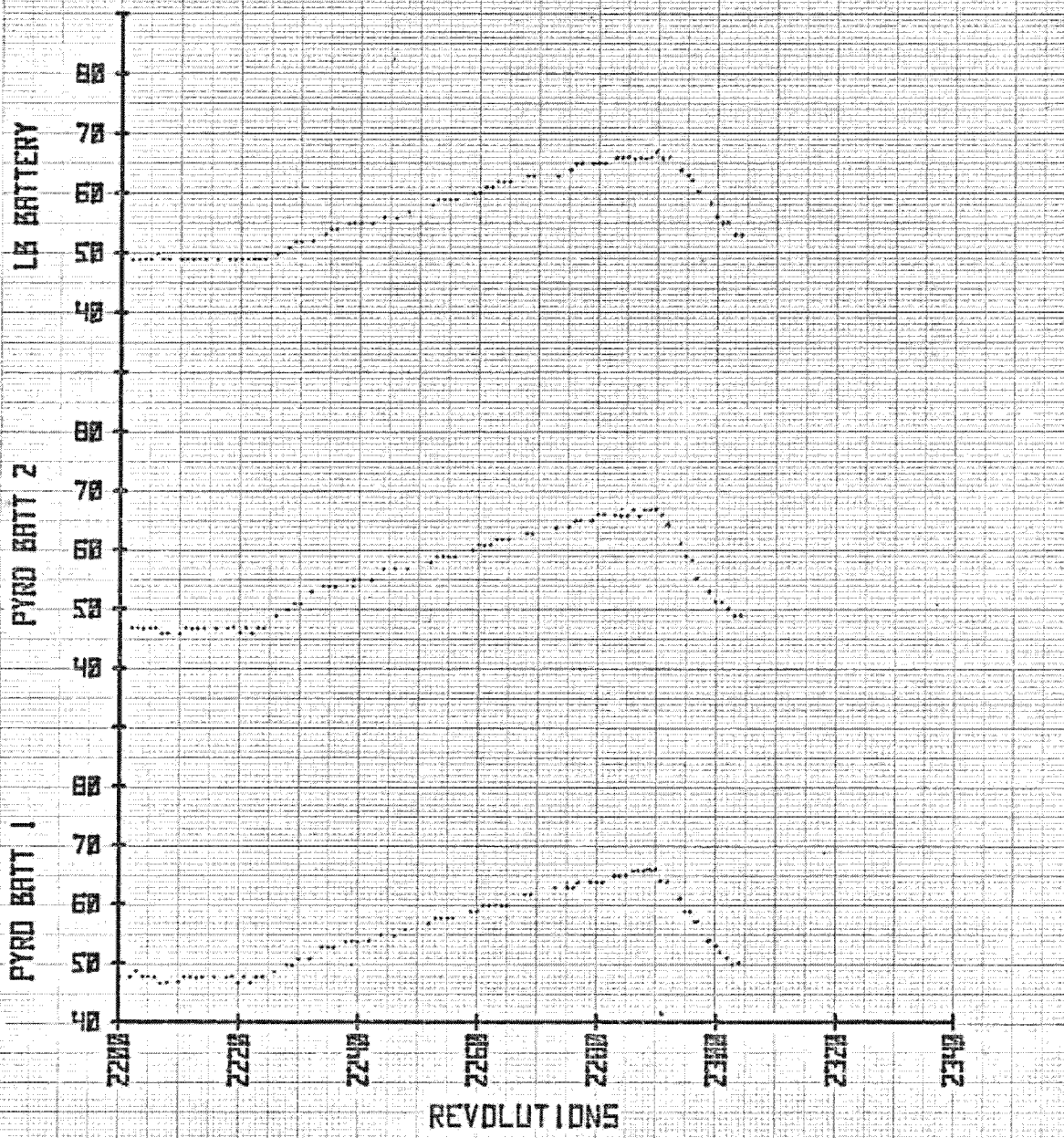
46 1521

10 X 10 TO THE CENTIMETER 16 X 25 CM.
NEIDFEL & ESSER CO. MADE IN U.S.A.

FST-EDAP/T&T

PRIMARY BATTERY TEMPS

SV-10



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46 1521

10 X 10 TO THE CENTIMETER
K&E NEAPTEL & ESSER CO. MADE IN U.S.A.

0162

0161

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6.5.14 ENGR-6: Molecular Shield Evaluation

The object of this test was to correlate the actual thermal effects of the shield by pitching the vehicle down to approximately 25 degrees and exposing the Forward Section Bay 4 thermal surfaces to the free molecular stream.

On Rev 1955, at approximately 76°N latitude, descending, a vehicle pitch down maneuver was initiated by disconnecting the horizon sensor control from the controlling ACS. The difference in the actual and the programmed geocentric rates resulted in a continuously increasing pitch down attitude of approximately 5.3° per rev. By Rev 1959 at approximately 27°S latitude, descending, the vehicle was at 25° nose down. The vehicle was then pitched up by the RCS system to the horizontal by normal coarse mode control with the horizon sensors.

Data recovery was adequate and the test was considered to be successful.

6.5.15 ENGR-7: Drag Coefficient Evaluation

The objective of this experiment was to provide flight data to compute a drag coefficient for comparison with a theoretical evaluation of drag coefficient.

Orbital parameters were taken from selected orbits of the best fit ephemeris data during Revs 2300 through 2431. No drag makeup orbit adjusts were performed during this 131 rev period.

The test was successfully completed per plan.

6.5.16 ENGR-11: ACS Off/Restart Capability

The objective of the ACS Off/Restart experiment was to determine the effects of long term use on the restart capability of gyros after being "off" for ten revs.

The "off" for ACS-1 gyros was sent on Rev 2415 and the Enable was sent on Rev 2425. The gyros started normally and were operative. The ACS-1 gyros were turned "off" on Rev 2425 after the successful start, for the remainder of the flight.

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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 1210, IRON 6381. A total of eighteen hundred and forty-eight command messages were planned by the flight profile throughout the flight, of which six hundred eighty-four were cancelled. The remaining eleven hundred sixty-four were reviewed by the Technical Advisor (TA) staff. Eleven hundred and forty-eight of these messages were loaded into the vehicle. Additional information regarding these messages may be found in Sections 2 through 7 of this report.

During the solo phase of the flight, one hundred forty-six command messages were planned by the flight profile, of which nine were cancelled. The remaining one hundred thirty-seven command messages were received and reviewed by the Technical Advisor (TA) staff. One hundred and nineteen were accepted, and eighteen were rejected. All of the rejected messages were subsequently altered and loaded into the vehicle. The reasons for rejecting the eighteen messages are summarized below.

Rev No. and
Load Station

Reason for Rejection

1960 BOSS	Rev 1964 HULA and BOSS required station capability modification because of station conflict with solo engineering test.
1960 BOSS	Altered because load station MFA- and I- commands in the SP were deleted due to an ephemeris shift.
2024 GUAM	Station capabilities in the SP message required modification.
2029 HULA	Altered because of improper timing of a Sequence 256.

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Load StationReason for Rejection

2093 COOK	Changed engineering test from 2094 P FADE to 2094 H FADE to prevent a tape recorder overflow.
2202 GUAM	Insufficient commands in PMU A to utilize the emergency VBE blocks.
2206 COOK	Inserted two TALE COMMANDS to make VBE compatible for the add-on message.
2221 INDI	NEC Sequence 153 was too close to Sequence 149, requiring a change to Sequence 153 reference time by 15 seconds.
2234 GUAM	Because of a GUAM station failure, an alter to the add-on message was required to provide station OFF commands for a subsequent BOSS pass which was utilized because of GUAM's outage.
2289 HULA	A Tumble and Capture message was required because of an ACS failure.
2301 BOSS	Message altered to add ACS 1 enable commands.
2305 HULA	Message altered to change an incorrect ACS command.

2380 GUAM	Altered to change the format of 2399 BOSS for the ENGR 12 test.
2422 BOSS	Altered to provide the proper number of repeats for NEC command 13644.

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

Rev No. and
Load StationReason for not Loading

1997 HULA	The contingency tumbling capture message was not required.
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~~SECRET~~Rev No. and
Load StationReason for not Loading

2029 HULA	The contingency tumbling capture message was not required.
2207 POGO	The emergency VBE message was not required.
2433 POGO	The original deboost message was not loaded because of a developed tumbling problem.

Summary

Total Planned Messages:	146
Messages Cancelled:	- 9
Total SOLO Messages:	137
Messages Rejected:	- 18
Messages Altered:	+ 18
Total Messages Accepted:	137
Messages Not Required:	- 4
Total Messages Accepted and Loaded:	<u>133</u>

6.6.2 'TUNITY Software Problems

The Flight 10 'TUNITY software problem itemized below pertains only to the period for RV-4 Recovery through DEBOOST.

Itemized Software Problems

- Problem Description: In message 830, a manual sequence 95 with 6 repeats was input. 'TRANFUN assembled four sequence 95's and then requested a sequence 64. There is no sequence 64 in the 'TSQTAB. Sequence 64 was not requested in the message and sequence 95 does not have a redundant sequence. An attempt was made to generate the message on two different systems.
- Solution or Work-Around: The request for sequence 95 should be put in the front of the 'TLOAD run deck.
- Operational Impact: Using the above mentioned work-around procedure, there is no operational impact.
- Comment: It is a software problem, the solution is known, and it should be fixed prior to the support of SV-11.

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6.6.3 Hardware/Software Interface Changes

For IRON 6381, thirty change requests were processed from RV-4 recovery through the deboost message (as shown in Table 6.6.3-1).

These requests were implemented via requests SV10-132 through SV10-162, and have been incorporated into the flight data base and hardware/software interface documentation. (Note: Request SV10-148 applied to RV-4 and is not reflected here.)

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

<u>Request No.</u>	<u>Identification</u>	<u>Data Base Effectivity</u>
SV10-132	Contained a multiplicity of sequence deletes to provide room in the TSC for solo sequences.	SV-10 only
SV10-133 thru SV10-143	New Sequences 450 through 460 for Solo Tests.	SV-10 only
SV10-144 thru SV10-147	New Sequences 500 through 503 for Solo tests.	SV-10 only
SV10-149	New Sequence 461 for Solo tests.	SV-10 only
SV10-150	New Sequence 459 for Solo tests.	SV-10 only
SV10-151 & SV10-152	Modified Sequences 502 and 450 for Solo tests.	SV-10 only
SV10-153	Modified Sequence 238 for Solo tests.	SV-10 only
SV10-154	Modified Sequence 452 for Solo tests.	SV-10 only
SV10-155 & SV10-156	New Sequence 504 and modified Sequence 34 for Solo tests.	SV-10 only
SV10-157 thru SV10-161	New Sequences 239, 245, 246, 247 and 249 for Solo tests.	SV-10 only
SV10-162	New Sequence 505 for Solo tests.	SV-10 only

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6.7

Flight Ephemeris and B-Factor Tables

DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
JUN 8	1	0.00	0.327	88.90	44.5	157.10	88 53.7	0.143	70.0
	1	5.31	0.318						
JUN 9	2	10.00	0.330	89.10	47.2	156.30	88 52.1	0.159	63.2
	2	15.89	0.312						
	2	22.97	0.319						
JUN 10	3	25.00	0.315	89.30	50.8	155.30	88 49.8	0.155	65.1
	3	32.69	0.320						
	3	39.02	0.333						
JUN 11	4	41.00	0.363	89.40	54.9	154.20	88 47.2	0.169	59.6
	4	47.97	0.407						
	4	54.95	0.377						
JUN 12	5	58.00	0.422	89.40	58.7	152.50	88 43.9	0.221	45.3
OR #	1	63.00	BEFORE	89.40		152.10	88 43.1	7.81 FPS	
OR #	1	64.00	AFTER	89.30		156.30	88 47.8	0.00 FPS	
	5	64.20	0.402						
	5	70.96	0.389						
JUN 13	6	73.00	0.385	89.20	61.1	155.00	88 45.7	0.203	50.6
	6	79.75	0.380						
	6	86.62	0.366						
JUN 14	7	89.00	0.360	89.20	64.7	153.20	88 42.4	0.196	51.5
	7	96.65	0.357						
	7	104.66	0.355						
JUN 15	8	106.00	0.432	89.20	68.6	151.30	88 39.0	0.245	40.6
OR #	2	111.00	BEFORE	88.90		150.90	88 38.1	44.30 FPS	
OR #	3	113.00	AFTER	88.30		155.70	88 53.1	-19.40 FPS	
	8	114.70	0.366						
	8	120.68	0.372						
JUN 16	9	122.00	0.393	88.50	42.3	154.70	88 51.5	0.194	49.6
	9	128.76	0.382						
	9	135.68	0.369						
JUN 17	10	138.00	0.375	88.50	46.1	153.20	88 48.4	0.193	50.0
	10	144.74	0.368						
	10	151.61	0.377						
JUN 18	11	154.00	0.362	88.60	49.9	151.50	88 45.3	0.192	50.2
OR #	4	159.00	BEFORE	88.30		151.30	88 44.2	10.80 FPS	
OR #	4	160.00	AFTER	88.50		156.50	88 51.1	0.00 FPS	
	11	161.71	0.359						
JUN 19	12	170.00	0.371	88.60	50.9	155.40	88 49.1	0.193	51.9
	12	176.73	0.361						
	12	184.50	0.346						
JUN 20	13	188.00	0.367	88.70	55.5	153.60	88 45.6	0.197	50.6
	13	195.36	0.345						
	13	201.17	0.341						
JUN 21	14	203.00	0.389	88.70	58.8	152.20	88 42.8	0.217	45.7
OR #	5	209.00	BEFORE	88.70		151.70	88 41.7	17.30 FPS	
OR #	5	210.00	AFTER	88.60		160.40	88 52.4	0.00 FPS	
	14	211.35	0.349						
	14	216.17	0.352						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
JUN 22	15	219.00	0.355	88.50	59.1	159.50	88 50.5	0.187	56.4
	15	226.25	0.342						
	15	232.18	0.340						
JUN 23	16	237.00	0.349	88.70	63.3	157.60	88 47.1	0.190	55.1
	16	243.36	0.335						
	16	250.19	0.319						
JUN 24	17	252.00	0.322	88.60	66.7	156.20	88 44.4	0.181	57.0
	17	261.23	1.670						
RV #	1	261.23							
	17	261.40	0.337						
OR #	6	263.00	BEFORE	88.20		155.10	88 42.0	14.30 FPS	
OR #	6	264.00	AFTER	88.40		162.10	88 50.9	0.00 FPS	
	17	268.06	0.354						
JUN 25	18	269.00	0.350	88.70	67.4	161.30	88 49.9	0.187	57.7
	18	275.07	0.373						
	18	281.98	0.370						
JUN 26	19	285.00	0.373	88.60	70.8	159.40	88 46.7	0.207	51.3
	19	290.27	0.377						
	19	296.35	0.372						
JUN 27	20	300.00	0.385	88.60	74.0	157.40	88 43.6	0.219	47.4
OR #	7	306.00	BEFORE	88.20		157.00	88 42.6	46.60 FPS	
OR #	8	308.00	AFTER	88.50		154.00	88 51.1	-31.40 FPS	
	20	306.58	0.358						
	20	313.59	0.366						
JUN 28	21	316.00	0.360	88.66	41.9	153.24	88 50.1	0.178	53.2
	21	324.05	0.360						
	21	330.47	0.358						
JUN 29	22	333.00	0.371	88.78	46.2	151.75	88 46.8	0.190	50.2
	22	339.81	0.430						
	22	346.57	0.443						
JUN 30	23	349.00	0.438	88.83	50.3	149.93	88 43.5	0.234	40.6
OR #	9	354.00	BEFORE	88.48		149.62	88 42.4	14.72 FPS	
OR #	9	355.00	AFTER	88.48		156.77	88 51.2	14.72 FPS	
	23	356.72	0.443						
	23	362.58	0.423						
JUL 1	24	365.00	0.406	88.59	51.3	155.10	88 48.6	0.213	47.0
	24	372.04	0.408						
	24	378.79	0.414						
JUL 2	25	381.00	0.392	88.60	54.8	153.33	88 45.3	0.214	46.6
	25	388.71	0.395						
	25	395.69	0.395						
JUL 3	26	398.00	0.426	88.67	58.9	151.23	88 41.5	0.214	40.9
OR #	10	403.00	BEFORE	88.29		151.01	88 40.5	19.97 FPS	
OR #	10	404.00	AFTER	88.49		160.53	88 52.9	0.00 FPS	
	26	405.85	0.382						
	26	411.71	0.377						
JUL 4	27	415.00	0.379	88.64	58.2	159.08	88 50.5	0.200	52.8
	27	421.71	0.380						
	27	427.79	0.370						
JUL 5	28	430.00	0.376	88.57	61.6	157.52	88 47.5	0.205	50.9
	28	436.75	0.360						
	28	442.66	0.368						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
JUL 6	29	446.00	0.379	88.60	65.1	155.61	88 44.2	0.214	48.1
OR #	11	452.00	BEFORE	88.38		155.25	88 43.2	35.77 FPS	
OR #	12	454.00	AFTER	88.50		153.84	88 51.4	-22.26 FPS	
	29	455.67	0.362						
	29	460.74	0.390						
JUL 7	30	461.00	0.386	88.50	41.2	152.94	88 49.8	0.193	48.7
	30	469.68	0.423						
	30	475.65	0.467						
JUL 8	31	479.00	0.520	88.71	46.1	150.82	88 46.0	0.217	34.9
	31	486.58	0.487						
	31	492.67	0.474						
JUL 9	32	495.00	0.540	88.62	50.2	148.45	88 41.7	0.298	31.5
OR #	13	500.00	BEFORE	88.27		147.97	88 40.4	20.58 FPS	
OR #	13	501.00	AFTER	88.69		156.00	88 53.1	0.00 FPS	
	32	502.75	0.479						
	32	508.73	0.434						
JUL 10	33	511.00	0.439	88.76	46.8	155.20	88 50.6	0.221	44.9
	33	517.66	0.443						
	33	523.74	0.426						
JUL 11	34	527.00	0.428	88.82	50.7	153.18	88 46.9	0.225	43.8
	34	533.77	0.433						
	34	540.64	0.405						
JUL 12	35	543.00	0.410	88.79	54.5	151.18	88 43.3	0.225	43.4
OR #	14	549.00	BEFORE	88.59		150.71	88 42.0	16.97 FPS	
OR #	14	550.00	AFTER	88.53		159.53	88 52.6	0.00 FPS	
	35	551.80	0.391						
	35	557.66	0.370						
JUL 13	36	560.00	0.403	88.59	55.8	158.29	88 50.4	0.213	49.1
	36	566.76	0.410						
	36	573.74	0.407						
JUL 14	37	576.00	0.413	88.53	59.7	156.44	88 46.9	0.227	45.5
	37	582.65	0.427						
	37	589.63	0.425						
JUL 15	38	595.00	0.405	88.51	63.8	153.56	88 42.2	0.234	43.2
OR #	15	599.00	BEFORE	88.26		153.56	88 41.6	34.60 FPS	
OR #	16	601.00	AFTER	88.42		153.52	88 50.7	-19.17 FPS	
	38	604.70	0.427						
	38	607.71	0.397						
JUL 16	39	608.00	0.412	88.53	41.3	152.37	88 49.3	0.207	45.5
	39	615.86	0.407						
	39	622.92	0.410						
JUL 17	40	625.00	0.420	88.71	45.7	150.42	88 45.6	0.220	43.0
	40	631.76	0.417						
	40	638.63	0.418						
JUL 18	41	641.00	0.464	88.70	49.8	148.55	88 42.1	0.254	37.0
OR #	17	646.00	BEFORE	88.40		148.18	88 40.9	18.81 FPS	
OR #	17	647.00	AFTER	88.61		156.64	88 52.5	0.00 FPS	
	41	649.37	0.422						
	41	657.07	0.407						
JUL 19	42	658.00	0.405	88.75	47.8	155.07	88 50.0	0.207	48.3
	42	665.24	0.428						
	42	673.05	0.408						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
JUL 20	43	673.00	0.405	88.79	51.4	153.30	88 46.8	0.214	46.4
	43	680.96	0.397						
	43	689.06	0.386						
JUL 21	44	690.00	0.411	88.87	55.5	151.27	88 43.1	0.226	43.6
OR #	18	695.00	BEFORE	88.57		151.07	88 42.1	16.96	FPS
OR #	18	696.00	AFTER	88.46		159.87	88 52.6	0.00	FPS
	44	697.78	0.389						
	44	702.68	0.392						
JUL 22	45	707.00	0.405	88.69	56.8	158.31	88 50.2	0.214	49.1
	45	714.32	0.386						
	45	720.23	0.372						
JUL 23	46	723.00	0.407	88.63	60.5	156.56	88 46.8	0.224	46.4
	46	729.16	0.385						
	46	736.45	0.378						
JUL 24	47	738.00	0.411	88.67	63.9	154.64	88 43.6	0.232	44.0
	47	743.73	0.361						
OR #	19	744.00	BEFORE	88.29		154.32	88 42.5	34.63	FPS
OR #	20	746.00	AFTER	88.52		153.41	88 50.9	-20.23	FPS
	47	749.64	0.397						
JUL 25	48	754.00	0.472	88.58	41.5	152.59	88 49.4	0.238	39.8
	48	763.76	0.451						
	48	769.62	0.449						
JUL 26	49	771.00	0.459	88.73	46.1	150.23	88 45.3	0.241	39.1
	49	778.85	0.419						
	49	784.60	0.394						
JUL 27	50	787.00	0.463	88.66	50.1	148.32	88 41.6	0.256	36.8
OR #	21	792.00	BEFORE	88.36		147.94	88 40.5	20.17	FPS
OR #	21	793.00	AFTER	88.56		157.03	88 52.9	0.00	FPS
	50	794.76	0.406						
	50	800.68	0.395						
JUL 28	51	804.00	0.411	88.74	47.7	155.51	88 50.5	0.209	47.9
	51	810.45	0.394						
	51	815.68	0.396						
JUL 29	52	818.00	0.382	88.72	51.0	154.05	88 47.7	0.202	49.4
	52	823.57	0.395						
	52	829.23	1.474						
RV #	2	829.23							
	52	829.39	0.415						
	52	834.61	0.443						
JUL 30	53	836.00	0.413	88.84	55.5	151.62	88 43.4	0.228	43.6
	53	842.73	0.443						
	53	845.23	0.803						
RV #	5	845.23							
	53	845.39	0.398						
OR #	22	847.00	BEFORE	88.48		150.23	88 40.6	19.04	FPS
OR #	22	848.00	AFTER	88.69		159.06	88 52.6	0.00	FPS
	53	850.62	0.417						
JUL 31	54	853.00	0.400	89.07	54.0	158.16	88 51.5	0.203	51.7
	54	859.73	0.401						
	54	865.69	0.427						
AUG 1	55	869.00	0.463	89.07	57.9	156.32	88 48.0	0.244	42.8
	55	875.84	0.444						
	55	882.99	0.422						
AUG 2	56	885.00	0.464	89.95	61.4	154.05	88 44.1	0.256	40.0
OR #	23	890.00	BEFORE	88.85		153.59	88 43.0	14.22	FPS
OR #	23	891.00	AFTER	88.77		161.18	88 51.7	0.00	FPS
	56	892.05	0.444						
	56	898.82	0.442						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
AUG 3	57	900.00	0.453	88.75	63.6	159.61	88 49.3	0.244	43.8
	57	907.93	0.458						
	57	915.02	0.450						
AUG 4	58	917.00	0.470	88.64	67.6	156.97	88 44.9	0.266	39.4
	58	924.16	0.458						
	58	930.92	0.472						
AUG 5	59	934.00	0.640	88.34	71.5	154.13	88 40.3	0.384	26.6
OR #	24	938.00	BEFORE	88.07		153.58	88 39.3	47.47	FPS
OR #	25	940.00	AFTER	88.43		155.62	88 53.2	-23.71	FPS
	59	941.18	0.506						
	59	948.06	0.495						
AUG 6	60	950.00	0.506	88.54	42.3	153.91	88 50.6	0.255	37.9
	60	956.60	0.465						
	60	963.69	0.437						
AUG 7	61	965.00	0.455	88.53	46.0	151.80	88 46.9	0.240	40.0
	61	973.14	0.452						
	61	979.00	0.499						
AUG 8	62	981.00	0.522	88.55	50.0	149.42	88 42.0	0.289	33.0
OR #	26	986.00	BEFORE	88.14		148.98	88 41.4	17.78	FPS
OR #	26	987.00	AFTER	88.58		156.42	88 52.4	0.00	FPS
	62	988.70	0.491						
	62	994.62	0.494						
AUG 9	63	998.00	0.492	88.93	47.9	154.37	88 49.5	0.251	39.8
	63	1004.74	0.507						
	63	1011.67	0.532						
AUG 10	64	1014.00	0.555	88.77	52.0	152.01	88 45.2	0.300	33.0
	64	1020.79	0.513						
	64	1027.67	0.496						
AUG 11	65	1030.00	0.515	88.58	55.7	149.16	88 40.4	0.296	32.8
OR #	27	1036.00	BEFORE	88.31		148.56	88 38.8	25.72	FPS
OR #	27	1037.00	AFTER	88.64		160.14	88 54.7	0.00	FPS
	65	1038.84	0.477						
	65	1045.50	0.473						
AUG 12	66	1046.00	0.480	88.79	51.9	158.38	88 52.2	0.246	42.6
	66	1052.79	0.472						
	66	1059.65	0.460						
AUG 13	67	1062.00	0.496	88.72	55.7	156.11	88 48.2	0.266	38.7
	67	1069.67	0.485						
	67	1076.54	0.516						
AUG 14	68	1078.00	0.559	88.56	59.7	153.66	88 43.8	0.317	32.1
OR #	28	1084.00	BEFORE	88.30		152.76	88 42.1	16.68	FPS
OR #	28	1085.00	AFTER	88.57		160.29	88 52.2	0.00	FPS
	68	1086.69	0.517						
	68	1093.45	0.507						
AUG 15	69	1096.00	0.569	88.57	59.5	158.19	88 48.9	0.309	34.3
	69	1103.97	0.543						
	69	1109.66	0.512						
AUG 16	70	1112.00	0.514	88.35	63.2	155.04	88 43.9	0.297	34.7
	70	1119.80	0.474						
	70	1125.66	0.499						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
AUG 17	71	1128.00	0.533	88.18	66.9	152.00	88 39.2	0.331	38.6
OR #	29	1133.00	BEFORE	88.77		151.51	88 37.8	45.09	FPS
OR #	30	1135.00	AFTER	88.49		156.91	88 54.8	-16.74	FPS
	71	1137.79	0.459						
	71	1142.64	0.470						
AUG 18	72	1144.00	0.474	88.77	42.0	155.49	88 52.7	0.233	42.3
	72	1151.79	0.453						
	72	1157.64	0.435						
AUG 19	73	1160.00	0.456	88.75	46.2	153.47	88 48.9	0.253	41.9
	73	1167.71	0.444						
	73	1173.60	0.423						
AUG 20	74	1178.00	0.455	88.63	49.9	151.38	88 45.1	0.247	39.4
OR #	31	1182.00	BEFORE	88.39		151.02	88 43.7	13.34	FPS
OR #	31	1183.00	AFTER	88.65		156.77	88 51.9	0.00	FPS
	74	1184.79	0.496						
	74	1189.63	0.528						
AUG 21	75	49.00	0.520	129.70	50.3	151.38	88 48.7	0.273	37.0
	75	0.71	0.486						
	75	6.57	0.487						
AUG 22	76	1209.00	0.495	88.73	54.0	152.32	88 44.6	0.273	36.6
	76	1215.76	0.469						
	76	1221.62	0.462						
AUG 23	77	1225.00	0.533	88.62	58.2	149.83	88 40.2	0.309	31.7
OR #	32	1230.00	BEFORE	88.17		149.36	88 38.9	23.89	FPS
OR #	32	1231.00	AFTER	88.53		160.06	88 53.6	0.00	FPS
	77	1232.67	0.455						
	77	1238.76	0.453						
AUG 24	78	1241.00	0.458	88.65	54.8	158.34	88 50.9	0.242	43.6
	78	1249.70	0.452						
	78	1254.61	0.470						
AUG 25	79	1256.00	0.486	88.56	58.1	156.23	88 47.3	0.268	38.7
	79	1263.74	0.471						
	79	1269.65	0.497						
AUG 26	80	1274.00	0.452	88.54	62.6	153.06	88 42.1	0.266	38.7
OR #	33	1278.00	BEFORE	88.11		152.81	88 41.1	17.96	FPS
OR #	33	1279.00	AFTER	88.57		160.90	88 52.3	0.00	FPS
	80	1280.65	0.453						
	80	1286.63	0.502						
AUG 27	81	1290.00	0.477	88.76	61.2	159.81	88 49.2	0.257	41.7
	81	1297.70	0.462						
	81	1303.61	0.465						
AUG 28	82	1307.00	0.482	88.49	65.3	156.23	88 44.7	0.276	37.9
	82	1313.75	0.482						
	82	1319.67	0.544						
AUG 29	83	1323.00	0.621	88.30	68.8	153.21	88 40.0	0.376	27.0
OR #	34	1328.00	BEFORE	87.91		152.62	88 38.6	45.38	FPS
OR #	35	1330.00	AFTER	88.53		155.42	88 53.2	-20.47	FPS
	83	1331.95	0.574						
	83	1336.76	0.543						
AUG 30	84	1339.00	0.578	88.60	41.8	153.75	88 50.6	0.294	33.2
	84	1345.52	0.522						
	84	1351.60	0.520						

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	DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
	AUG 31	85	1355.00	0.512	88.53	46.1	151.00	88 46.0	0.276	35.1
		85	1361.74	0.496						
		85	1368.50	0.495						
SEP 1	86		1372.00	0.593	88.51	50.5	148.23	88 41.2	0.337	28.3
OR #	36		1376.00	BEFORE	88.02		148.01	88 40.2	23.27 FPS	
OR #	36		1377.00	AFTER	88.54		157.66	88 54.4	0.00 FPS	
		86	1378.99	0.506						
		86	1384.74	0.502						
SEP 2	87		1388.00	0.535	88.81	46.3	155.64	88 51.3	0.271	37.2
		87	1394.73	0.511						
		87	1401.60	0.523						
SEP 3	88		1404.00	0.504	88.67	50.2	153.09	88 46.9	0.270	36.8
		88	1410.72	0.501						
		88	1416.64	0.493						
SEP 4	89		1420.00	0.505	88.59	54.2	150.51	88 42.4	0.287	34.5
		89	1429.22	1.821						
RV #	3		1429.22							
		89	1429.37	0.489						
OR #	37		1431.00	BEFORE	88.06		148.81	88 39.0	23.76 FPS	
OR #	37		1432.00	AFTER	88.49		159.02	88 53.6	0.00 FPS	
		89	1433.72	0.550						
SEP 5	90		1436.00	0.547	88.97	50.3	157.85	88 52.5	0.277	37.9
		90	1443.26	0.549						
		90	1449.93	0.557						
SEP 6	91		1452.00	0.609	88.80	54.4	155.23	88 47.8	0.327	31.5
		91	1458.04	0.633						
		91	1466.14	0.597						
SEP 7	92		1469.00	0.620	88.43	58.4	151.58	88 41.8	0.361	27.7
OR #	38		1474.00	BEFORE	88.12		150.92	88 40.4	23.26 FPS	
OR #	38		1475.00	AFTER	88.52		161.28	88 54.6	0.00 FPS	
		92	1478.32	0.565						
		92	1482.04	0.586						
SEP 8	93		1484.00	0.597	88.53	55.2	159.16	88 51.6	0.323	33.2
		93	1491.15	0.615						
		93	1498.01	0.633						
SEP 9	94		1502.00	0.690	88.30	59.7	155.26	88 45.3	0.395	26.2
		94	1508.38	0.701						
		94	1515.18	0.689						
SEP 10	95		1517.00	0.731	87.92	63.5	151.20	88 39.1	0.454	21.9
OR #	39		1522.00	BEFORE	87.48		150.19	88 37.1	2980.00 FPS	
OR #	39		1523.00	AFTER	88.47		162.84	88 55.4	0.00 FPS	
		95	1524.85	0.660						
		95	1532.07	0.655						
SEP 11	96		1533.00	0.685	88.42	58.0	160.21	88 51.6	0.370	29.1
		96	1541.50	0.666						
		96	1548.92	0.624						
SEP 12	97		1550.00	0.650	87.97	62.0	156.10	88 45.0	0.383	27.2
		97	1557.95	0.622						
		97	1563.08	0.633						
SEP 13	98		1565.00	0.629	87.71	65.6	152.12	88 39.1	0.397	25.1
OR #	40		1570.00	BEFORE	87.17		151.29	88 37.3	31.96 FPS	
OR #	40		1571.00	AFTER	88.66		164.61	88 57.0	0.00 FPS	
		98	1578.25	0.579						
		98	1579.11	0.607						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
SEP 14	99	1582.00	0.639	88.74	59.8	162.06	88 53.5	0.336	33.0
	99	1589.23	0.594						
	99	1595.07	0.554						
SEP 15	100	1599.00	0.577	88.38	64.0	158.64	88 47.7	0.326	33.0
	100	1606.23	0.568						
	100	1612.18	0.556						
SEP 16	101	1615.00	0.630	88.15	67.6	155.14	88 42.3	0.378	27.4
OR #	41	1620.00	BEFORE	87.77		154.51	88 40.9	43.11	FPS
OR #	42	1622.00	AFTER	88.43		156.31	88 54.3	-20.68	FPS
	101	1623.41	0.526						
	101	1628.19	0.552						
SEP 17	102	1631.00	0.551	88.66	42.1	154.55	88 51.5	0.278	35.5
	102	1637.94	0.564						
	102	1645.18	0.580						
SEP 18	103	1646.00	0.610	88.60	45.9	151.86	88 47.1	0.324	30.0
	103	1654.92	0.581						
	103	1661.15	0.581						
SEP 19	104	1663.00	0.653	88.59	50.5	148.32	88 41.4	0.370	26.0
OR #	43	1668.00	BEFORE	88.08		147.76	88 39.8	19.06	FPS
OR #	43	1669.00	AFTER	88.65		155.84	88 51.9	0.00	FPS
	104	1670.69	0.558						
	104	1676.67	0.551						
SEP 20	105	1679.00	0.579	88.72	47.5	153.75	88 48.7	0.304	32.8
	105	1686.61	0.550						
	105	1692.69	0.553						
SEP 21	106	1695.00	0.579	88.49	51.5	150.85	88 43.7	0.325	30.2
	106	1701.72	0.560						
	106	1708.54	0.568						
SEP 22	107	1712.00	0.635	88.40	55.8	147.30	88 33.1	0.386	25.1
	107	1718.75	0.541						
	107	1724.68	0.585						
SEP 23	108	1728.00	0.560	88.76	51.0	154.93	88 48.7	0.297	34.5
	108	1734.73	0.495						
OR #	45	1737.00	BEFORE	88.38		153.70	88 46.1	15.11	FPS
OR #	45	1738.00	AFTER	88.47		160.54	88 55.3	25.38	FPS
	108	1740.64	0.559						
SEP 24	109	1744.00	0.576	88.88	50.8	159.18	88 53.6	0.292	36.4
	109	1751.77	0.530						
	109	1757.62	0.531						
SEP 25	110	1761.00	0.575	88.73	55.1	156.31	88 48.6	0.310	33.8
	110	1767.56	0.538						
	110	1773.53	0.548						
SEP 26	111	1776.00	0.595	88.50	58.5	153.49	88 44.0	0.341	30.0
OR #	46	1782.00	BEFORE	88.21		152.70	88 42.2	15.08	FPS
OR #	46	1783.00	AFTER	88.56		159.25	88 51.3	0.00	FPS
	111	1784.78	0.658						
	111	1789.85	0.666						
SEP 27	112	1792.00	0.712	88.49	58.0	156.78	88 47.9	0.395	26.6
	112	1801.00	0.703						
	112	1807.08	0.651						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	RPO ALT	PERIOD	P DOT	T-LIFE
SEP 28	113	1809.00	0.640	88.12	62.6	152.31	88 40.8	0.389	26.2
	113	1815.88	0.622						
	113	1822.98	0.614						
SEP 29	114	1826.00	0.676	88.61	66.9	147.92	88 33.9	0.454	21.3
OA #	47	1830.00	BEFORE	87.13		147.25	88 32.5	42.97	FPS
OA #	47	1831.00	AFTER	88.67		165.48	88 59.1	0.00	FPS
	114	1832.98	0.568						
	114	1839.92	0.577						
SEP 30	115	1841.00	0.607	88.76	56.5	163.24	88 55.9	0.312	36.0
	115	1848.66	0.569						
	115	1854.73	0.585						
OCT 1	116	1857.00	0.592	88.62	60.4	160.12	88 50.8	0.321	34.0
	116	1863.85	0.592						
	116	1870.95	0.589						
OCT 2	117	1873.00	0.597	88.41	64.3	156.72	88 45.5	0.344	30.9
OA #	48	1879.00	BEFORE	87.98		155.85	88 43.6	15.59	FPS
OA #	48	1880.00	AFTER	88.49		162.71	88 53.1	0.00	FPS
	117	1881.93	0.547						
	117	1886.84	0.565						
OCT 3	118	1889.00	0.577	88.45	63.9	160.67	88 50.8	0.321	34.3
	118	1896.96	0.625						
	118	1903.04	0.654						
OCT 4	119	1906.00	0.667	88.06	68.0	156.76	88 43.9	0.405	26.0
	119	1913.18	0.617						
	119	1919.94	0.628						
OCT 5	120	1923.00	0.627	87.46	71.9	152.08	88 36.9	0.415	24.0
	120	1928.76	0.504						
	120	1935.86	0.648						
OCT 6	121	1938.00	0.667	86.99	71.7	155.77	88 40.6	0.440	23.2
	121	1945.85	0.716						
	121	1948.23	1.529						
	121	1948.32	0.810						
OCT 7	122	1955.00	0.767	86.09	74.5	160.87	88 44.6	0.528	20.0
	122	1955.83	1.398						
OA #	51	1961.00	BEFORE	85.51		158.03	88 40.5	21.65	FPS
OA #	51	1962.00	AFTER	91.76		160.42	88 52.4	20.08	FPS
	122	1961.24	0.884						
	122	1968.68	0.815						
OCT 8	123	1971.00	0.862	91.63	69.7	157.54	88 48.4	0.406	27.7
	123	1978.13	0.908						
	123	1984.88	0.856						
OCT 9	124	1988.00	0.858	90.86	73.5	152.47	88 40.8	0.453	23.4
OA #	52	1993.00	BEFORE	90.97		151.42	88 38.8	21.23	FPS
OA #	52	1994.00	AFTER	92.00		159.53	88 51.8	0.00	FPS
	124	1993.01	0.853						
	124	1994.12	4.420						
	124	1996.39	0.823						
OCT 10	125	2003.00	0.794	91.66	68.8	155.97	88 46.9	0.378	29.1
	125	2010.81	0.777						
	125	2016.83	0.745						
OCT 11	126	2019.00	0.746	91.05	72.5	151.89	88 40.6	0.390	27.2
	126	2027.37	0.720						
	126	2034.20	0.722						

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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
OCT 12	127	2053.00	0.751	92.02	68.4	156.51	88 48.0	0.348	32.1
	127	2070.79	0.764						
	127	2076.58	0.726						
OCT 13	129	2053.00	0.717	91.33	72.2	152.47	88 41.7	0.366	29.4
OCT 14	129	2068.00	0.762	19.80	69.9	155.16	88 45.8	0.364	30.2
	129	2076.36	0.772						
	129	2086.00	0.627						
OCT 15	130	2084.00	0.733	91.24	74.0	151.02	88 39.6	0.384	27.7
OR #	55	2090.00	BEFORE	90.62		150.01	88 37.5	21.16	FPS
OR #	55	2091.00	AFTER	92.03		158.29	88 50.3	0.00	FPS
	130	2092.32	1.759						
	130	2092.54	0.728						
OCT 16	131	2101.00	0.713	91.91	70.1	155.71	88 46.5	0.337	33.0
	131	2109.89	0.707						
	131	2125.67	0.730						
OCT 17	132	2118.00	0.786	91.22	73.3	151.00	88 40.4	0.409	26.2
	132	2121.62	0.732						
OR #	56	2123.00	BEFORE	90.95		150.90	88 38.8	18.28	FPS
OR #	56	2124.00	AFTER	92.02		158.29	88 49.9	0.00	FPS
	132	2129.77	0.698						
OCT 18	133	2134.00	0.719	90.46	70.9	155.76	88 46.1	0.346	32.1
	133	2140.82	0.697						
OCT 19	134	2151.00	0.859	91.20	75.0	151.77	88 40.0	0.450	23.6
OR #	57	2154.00	BEFORE	90.69		151.40	88 39.1	19.64	FPS
OR #	57	2155.00	AFTER	92.20		158.85	88 50.8	0.00	FPS
	134	2157.80	0.697						
	134	2163.65	0.675						
OCT 20	135	2166.00	0.745	92.11	70.5	156.19	88 47.0	0.348	32.1
	135	2174.89	0.700						
	135	2180.63	0.689						
OCT 21	136	2182.00	0.731	91.41	74.8	152.66	88 41.3	0.374	28.7
OR #	58	2187.00	BEFORE	91.00		151.67	88 39.7	15.89	FPS
OR #	58	2188.00	AFTER	91.96		158.26	88 49.3	0.00	FPS
	136	2189.80	0.674						
	136	2197.58	0.679						
OCT 22	137	2199.00	0.703	91.62	73.0	155.69	88 45.3	0.342	32.3
	137	2207.24	2.740						
	137	2207.34	0.706						
OCT 23	139	2215.00	0.714	91.11	76.5	151.44	88 39.2	0.387	28.1
OR #	59	2220.00	BEFORE	90.49		150.85	88 37.7	29.41	FPS
OR #	59	2221.00	AFTER	92.15		163.41	88 55.8	0.00	FPS
	138	2223.83	0.728						
	138	2229.89	0.753						
OCT 24	139	2230.00	0.789	91.08	70.5	161.26	88 52.6	0.320	36.4
	139	2241.11	0.703						
OCT 25	140	2247.00	0.684	91.36	74.5	157.61	88 46.9	0.334	33.6
	140	2255.98	0.684						

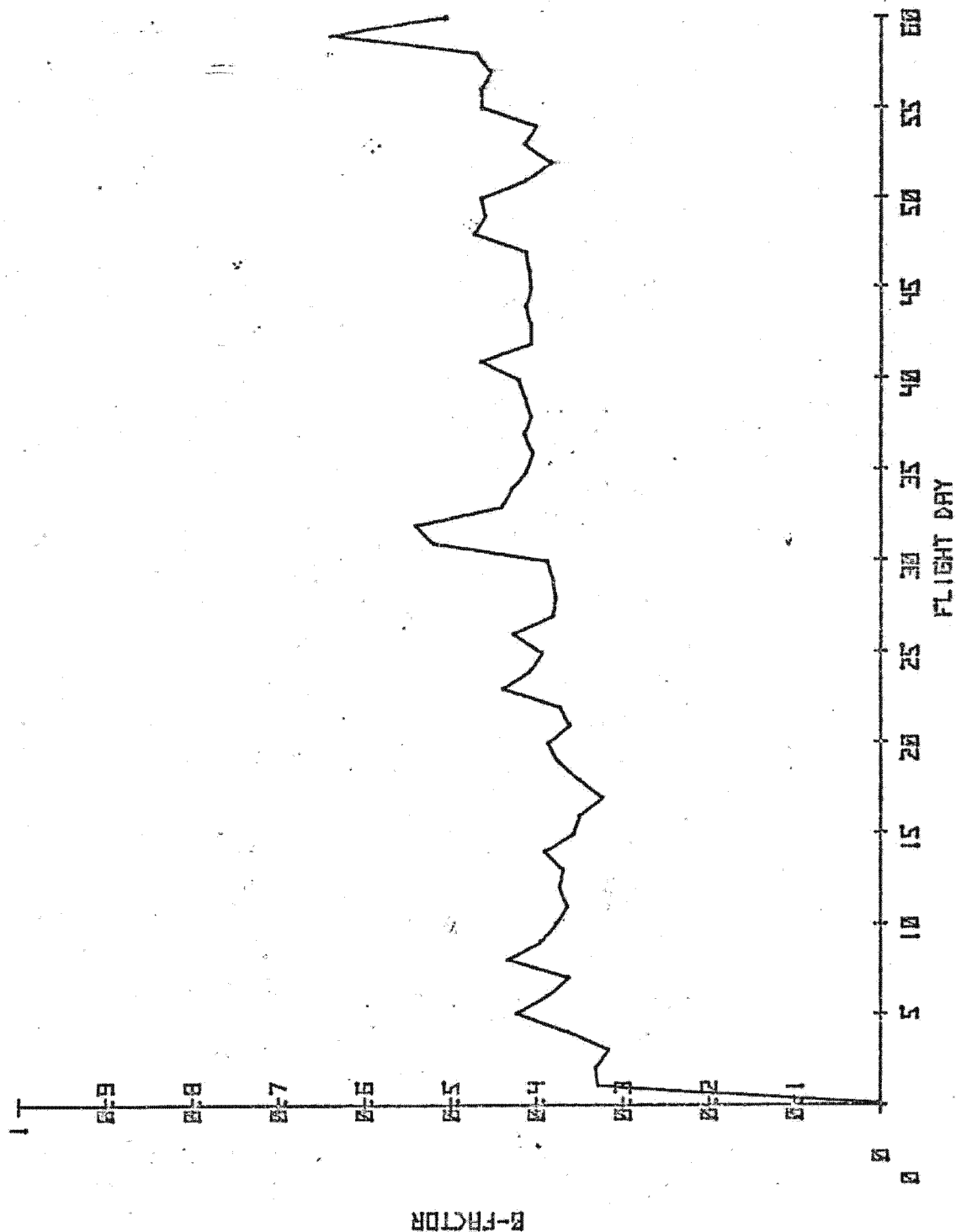
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DATE	DAY	REV	B-FACT	PER ALT	ARG PER	APD ALT	PERIOD	P DOT	T-LIFE
OCT 26	141	2263.00	0.701	90.62	77.9	154.02	88 43.1	0.375	28.7
	141	2274.24	0.729						
OCT 27	142	2280.00	0.644	89.86	82.1	149.05	88 34.2	0.385	26.6
	142	2285.77	1.049						
	142	2289.50	1.943						
	142	2290.42	0.687						
OCT 28	143	2294.00	0.695	88.66	84.5	143.64	88 26.5	0.482	19.8
OA #	60	2300.00	BEFORE	88.08		141.79	88 23.6	66.67	FPS
OA #	60	2301.00	AFTER	99.94		158.10	89 4.9	0.00	FPS
	143	2305.43	0.719						
OCT 29	144	2313.00	0.719	100.18	54.0	156.67	89 2.5	0.196	59.1
	144	2322.41	0.692						
OCT 30	145	2328.00	0.690	100.03	57.8	155.40	88 59.5	0.196	59.4
	145	2337.75	0.698						
OCT 31	146	2345.00	0.752	99.78	61.7	153.76	88 56.0	0.225	51.7
	146	2352.15	0.725						
	146	2358.63	0.656						
NOV 1	147	2361.00	0.669	99.44	65.1	151.87	88 52.4	0.211	54.5
	147	2368.12	0.664						
	147	2374.64	0.689						
NOV 2	148	2377.00	0.727	99.14	68.6	150.03	88 48.8	0.242	47.2
	148	2383.25	0.892						
	148	2388.43	0.927						
NOV 3	149	2394.00	0.945	98.44	72.4	147.12	88 43.7	0.343	32.6
	149	2400.86	0.961						
	149	2410.02	0.774						
NOV 4	150	2410.00	0.714	98.22	74.8	146.14	88 41.6	0.268	31.1

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FLIGHT B-FACTOR



B-FACTOR

FLIGHT B-FACTOR

