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CORONA J

PERFORMANCE EVALUATION REPORT

MISSION 1037-1 and 1037-2

FTV 1632, J-38

22 September 1967

Approved: [redacted]
Manager
Advanced Projects

Approved [redacted]
Manager
[redacted]ogram

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NO. [redacted]

17 October 1967

TO: [redacted]
C. Murphy
A. Johnson
[redacted]

THRU: [redacted]

FROM: [redacted]

SUBJECT: MISSION 1037-1 and 1037-2 FINAL REPORT

Enclosed is the Final Performance Evaluation Report for Mission 1037-1 and 1037-2.

[redacted]
Manager
Advanced Projects

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FOREWORD

This report details the performance of the payload system during the operational phase of the Program [redacted] Flight Test Vehicle 1632.

Lockheed Missiles and Space Company has the responsibility for evaluating payload performance under the Level-of-Effort and "J" System contracts.

This document is the final payload test and performance evaluation report for Missions 1037-1 and 1037-2 which was launched on 8 November 1966.

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INTRODUCTION

This report presents the final performance evaluation of Missions 1037-1 and 1037-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the J-38 payload system and to identify the source of in-flight anomalies.

The performance evaluation was jointly conducted by representatives of Lockheed Missiles and Space Company (LMSC) and ITEK at the facilities of NPIC and AFSPPF. The off-line evaluation using Corona engineering photography acquired over the United States was performed at the individual contractors plants.

The quantitative data used for this report is obtained from government organizations. The diffuse density data, and MTF/AIM resolution are produced by AFSPPF. The vehicle attitude error values, frame correlation times are made at NPIC who also supply the Processing Summary reports published by [redacted]

Computer programs developed by A/P are utilized to calculate and plot the frequency distribution of the various contributors to image smear to permit analysis and correlation of the conditions of photography to the information content and quality of the acquired pictures. Computer analysis of the exposure, processing and illumination data provides the necessary data to analyze the exposure criteria selected for the mission.

SECTION 1

SYSTEM PERFORMANCE

A. MISSION OBJECTIVES

The payload section of Mission 1037, placed into orbit by Flight Test Vehicle #1632 and a Thorad booster #507, consisted of two panoramic cameras, two Stellar-Index cameras, two Mark 5A recovery capsules and a space structure to enclose the cameras and provide mounting surfaces for all equipments. Figure 1-1 presents an inboard profile of the J-38 payload system. This Corona "J" system is designed to acquire search and reconnaissance photography of selected areas of the earth from orbit altitudes. The planned mission was a seven day -1 mission followed by a five day -2 mission.

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 1957:00 Z (1157:00 PST) on 8 November 1966. Ascent and injection were normal and the achieved orbit was within the 3 sigma predicted dispersions. Tracking and command support was effected by the Air Force Satellite Control Facility consisting of tracking and command stations at [redacted] under central control of the Satellite Test Center at Sunnyvale, California. Mission 1037-1 consisted of a 4 day operation and was completed by air recovery on 12 November 1966. Mission 1037-2 was completed with an air recovery on 20 November 1966 following an 8 day photographic operation.

The comparison of the planned and actual orbit parameters is tabulated as follows:

ORBITAL PARAMETERS

Parameter	Predicted	Orbit 32 Actuals	Orbit 130 Actuals
Period (Min.)	89.48	89.378	89.239
Perigee (N.M.)	98.1	91.785	98.846
Apogee (N.M.)	171.9	171.30	166.83
Inclination (Deg.)	100.0	100.074	100.74
Perigee Latitude (Deg. N.)	16.0	14.534	45.035
Eccentricity	0.0102	0.01112	0.00952

C. PANORAMIC CAMERAS

The image quality produced by both cameras was consistently good. The horizon camera imagery was normal and no "veiling". The PG traces were denser than desired in several frames.

D. STELLAR-INDEX CAMERAS

Both stellar cameras operated satisfactorily and produced imagery adequate for attitude determination.

Both index cameras produced excellent imagery due in part to extensive cloud free areas.

E. OTHER SUBSYSTEMS

The clock-instrumentation, command and thermal control subsystems performed satisfactorily.

FTV 1632 carried 3 Orbit Adjust (OAS) rockets with a boost capability only. A single OAS was successfully fired on orbit 86.

The first 5-1H type battery pack was successfully utilized on this mission.

This was the second panoramic camera modified for panoramic geometry (PG).

An Orbital Sine Function Generator (OSFG) was not flown due to pre-flight predicted power limitations.

SCHEMATIC INBOARD PROFILE - CORONA J SYSTEM

MISSION 1037

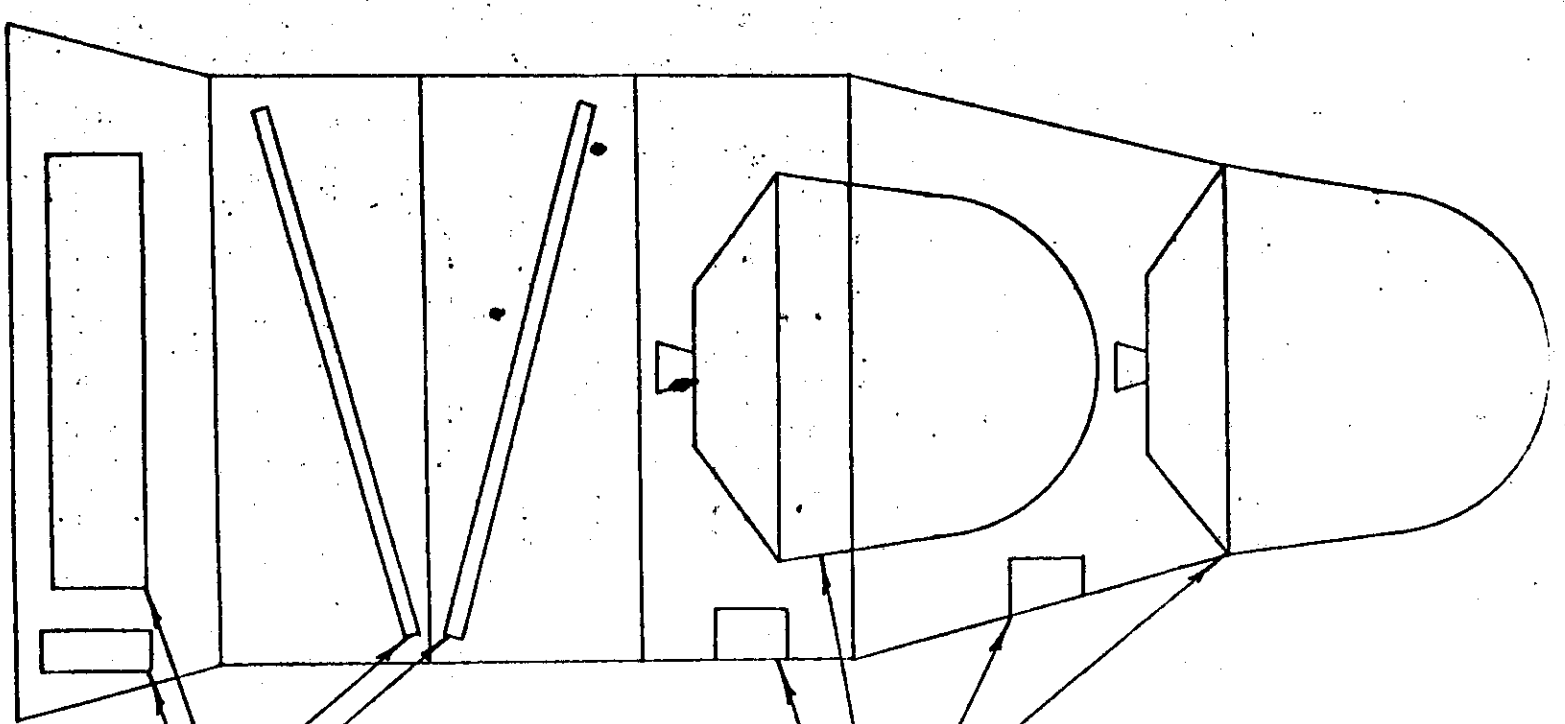


FIGURE 1-1

SECTION 2

PRE-FLIGHT SYSTEMS TEST

A. ENVIRONMENTAL TESTING

1. Test Objective

As a standard procedure, the J payload systems are subjected to a thermal/altitude environmental testing which simulates orbital environment. One of the purposes of this test is to demonstrate the system susceptability to corona discharge. Such discharge fogs the film thus degrading the operational photography.

2. General Test Information

The J-38 payload system was subjected to an environmental HIVOS chamber test from 15 through 22 September 1966. A complete "J" mission was simulated with approximately 15,100 feet (5741 cycles) of payload through the master instrument #198 and 15,350 feet (5838 cycles) through the slave instrument number 199. The minimum internal system pressures of 2.9, and 1.1 microns were attained during the "A" and "B" operates respectively.

3. Panoramic Camera Performance

The dynamic performance of both instruments was satisfactory for center of format switch, lens rotation, and film transport. The 99/101 percent clutch ratios were 5/5 on the master and 5/7 on the slave.

Instrument cycle rates were satisfactory except on Revs. 14A and all Revs in "B" which were 1 to 3 percent slow. The slow rates are attributed to low temperatures which averaged 55 to 60 degrees Fahrenheit during the "B" Revs.

Both instruments produced unacceptably low density data recording on the film. After correction of the regulated power supply, adjustment and replacement of lamps, acceptable data was produced.

3. Panoramic Camera Performance (continued)

The PG rail hole images produced in the HIVOS test were also of low density or non-existent. Additional tests performed with the system in a horizontal position produced acceptable rail hole images. In HIVOS the system is in a vertical position and on a previous PG system (J-36) a similar condition was experienced. The J-36 flight results were satisfactory.

Both instruments exhibited an unusually low frequency and degree of corona fog.

4. Stellar/Index Performance

Only one unit (D-105) was available and it was operated in the "B" mission position. The index unit functioned normally and it was free of corona fog. The stellar unit shutter failed open and was returned to Boston for shutter repair and optical calibration.

5. Clock Performance

The clock accuracy was satisfactory. The clock readouts were correlated with the IRIG "C" time and the results are shown in Table 2-1.

6. Command & Instrumentation Performance

The instrumentation command performance was satisfactory. A BR 44 command did not get in during Rev. 8B and the operation failed to go. There were several other minor anomalies.

7. Pressure Make-up System Performance

The average gas consumption for both missions was 8.7 psi/min. The pressure ranged from 48 microns during operates to 1.1 microns during a non-operate.

8. Temperature Summary

Average instrument temperatures (^{o}F) for several days in the -1 and -2 modes are listed below:

-1 Mission	Master		Slave		
Day	High	Low	High	Low	Beta Angle
1	90	72	91	72	-53
2	99	92	91	86	-53
3	82	74	72	66	-53
4	86	76	82	73	-53

-2 Mission	Master		Slave		
Day	High	Low	High	Low	Beta Angle
1	75	48	73	47	0
2	57	51	55	50	0
3	66	52	65	52	0
4	62	55	61	56	0

9. Yaw Programmer (OSFG) Performance

The OSFG cycled once during each mission. The periods of one cycle was 87.5 minutes and the peak amplitude was plus or minus 20 millivolts. The operations were satisfactory.

10. Vehicle Deactivate

The main instruments operated for 4 cycles and stowed properly. The 30 second timer and the S/I operation were satisfactory. The deactivate capability was not available in flight.

11. Recovery System Performance

The transfer from the -1 to -2 mission was accomplished by the secure real time command (KZ-38) and all transfer functions occurred normally. The instrument operated for 3 cycles during the cut and wrap sequence and stowed properly.

B. RESOLUTION TEST

Resolution and theodolite tests were performed on 5 October 1966. Results of the thru-focus resolution tests of pan instruments 198 and 199 show the following characteristics:

Master Pan Instrument No. 198

Maximum high contrast resolution 169 lines/mm at 0.000 focal position.

Maximum low contrast resolution 106 lines/mm at 0.000 focal position.

Slave Instrument No. 199

Maximum high contrast resolution 179 lines/mm at 0.000 focal position.

Maximum low contrast resolution 104 lines/mm at 0.000 focal position.

The test data is shown in Figures 2-1 and 2-2. Both instruments met the system requirements specification.

C. LIGHT LEAK TEST

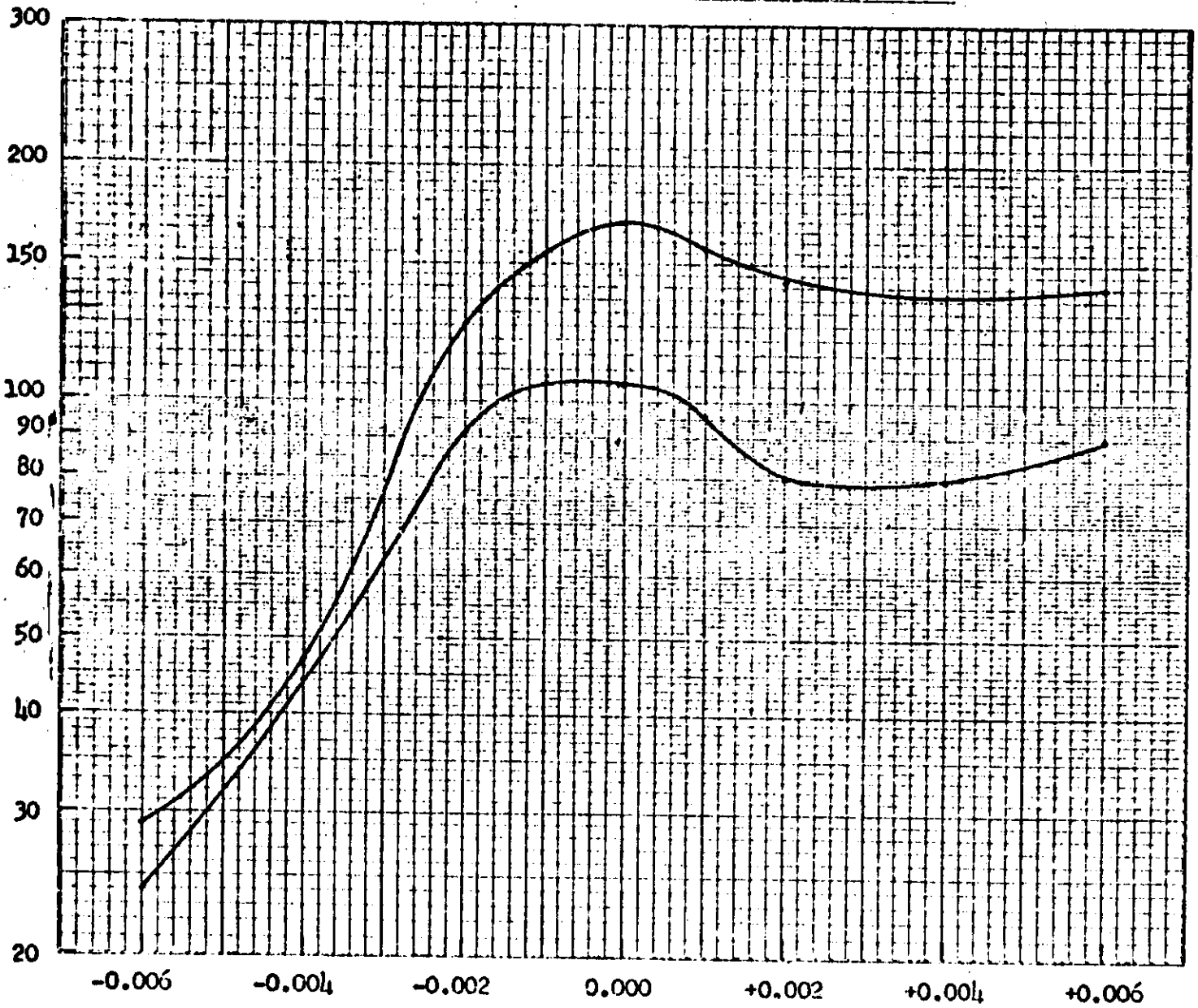
The J-38 system was tested for light leaks on 13 September 1966. Evaluation of the payload material disclosed only one fogged area. It was in the forward end of the fairing section on the master film. RTV rubber was applied to a tear drop fitting in this area and the leak was eliminated.

D. FLIGHT LOADING AND CERTIFICATION

The J-38 readiness tests were evaluated on 26 October 1966. All data recording was considered acceptable. The rail hole images were satisfactory and the PG lens scan lines were continuous and well defined. The instruments operated with no anomalies.

The loading of the flight payload into the supply cassette was performed on 30 October 1966. After final system assembly payload splices and tracking were observed to be normal.

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 198

Payload No: J-38

Resolution (l/mm)

High Contrast: 169

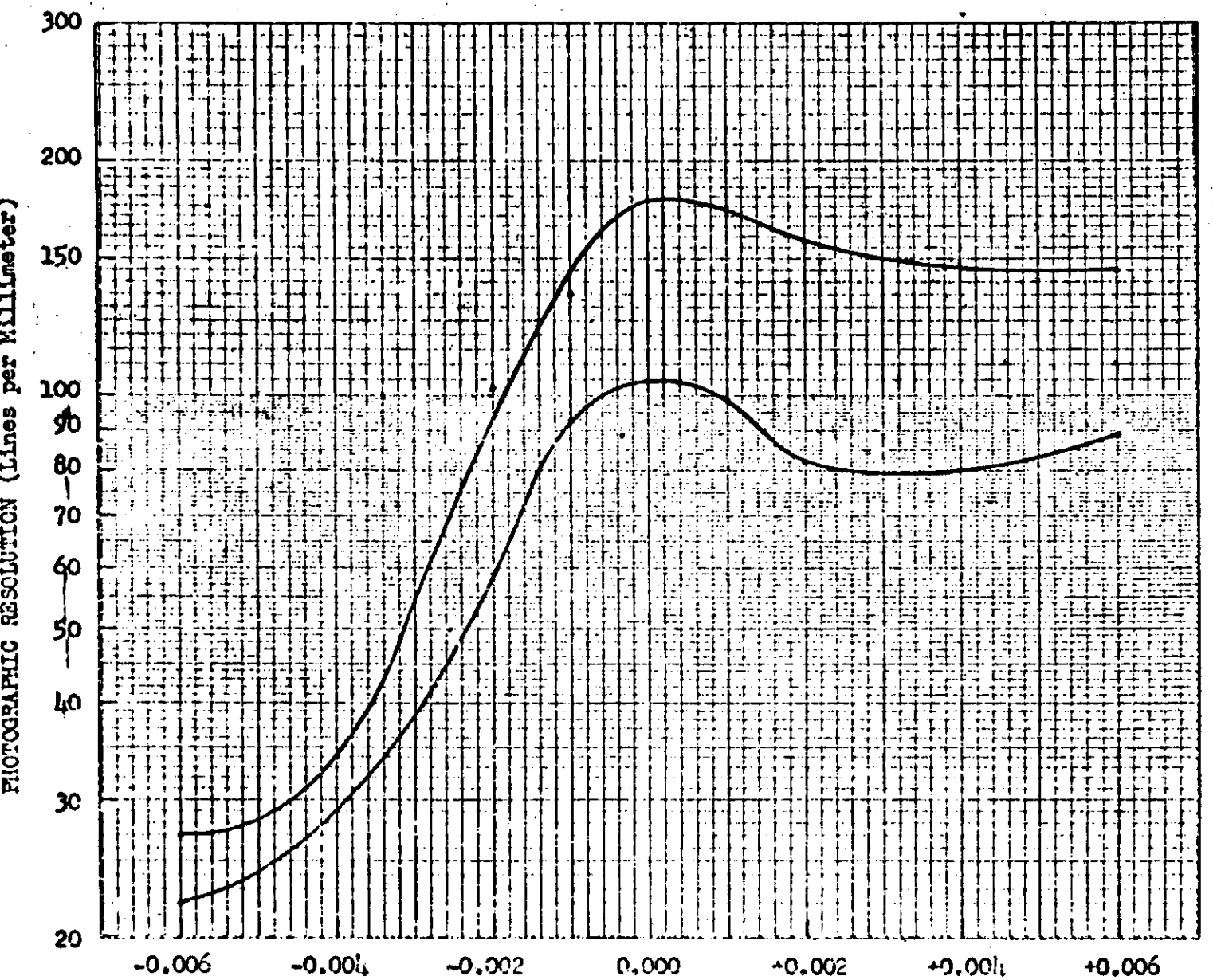
Low Contrast: 106

Film Type: 3404

Test Date: 10/5/66

Figure 2-1

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 199

Payload No: E-38

Resolution (l/mm)

High Contrast: 179

Low Contrast: 104

Film Type: 3404

Test Date: 10/5/66

Figure 2-2

HIVCS CLOCK DATA

REV	IRIG DAY-HR-MIN-SEC	IRIG SECONDS	CLOCK SECONDS	DELTA IRIG	DELTA CLOCK	ERRO
4	259 14 49 43.775	22430983.775	102560.500	---	---	---
5	259 15 52 48.495	22434768.495	106345.203	3784.720	3784.703	-0.01
11	261 9 20 56.565	22584056.565	255433.297	149288.068	149288.092	0.02
12	261 10 24 1.280	22587841.280	259417.997	3784.715	3784.700	-0.01
	1 19 34 17.505-DELTA TIME			TOTAL ACCUM. ERROR		-0.00
20	263 10 25 15.360	22760715.360	432292.166	---	---	---
21	263 12 22 15.425	22767735.425	439312.217	7020.065	7020.051	-0.01
25	264 10 48 37.240	22846717.240	518294.061	78981.814	78981.843	0.02
27	264 13 45 31.570	22859131.570	530708.385	12414.330	12414.324	-0.00
	1 3 20 16.210-DELTA TIME			TOTAL ACCUM. ERROR		0.00

Table 2-1

SECTION 3

FLIGHT OPERATIONS

A. SUMMARY

All launch, ascent, and injection events occurred as programmed. The orbit achieved was within the 3 sigma predicted dispersions.

Both panoramic cameras operated satisfactorily throughout the flight. Average cycle rates for both cameras deviated from the pre-flight calibrations by less than 2 per cent.

Both the -1 and -2 Stellar Index cameras, the clock, and the command system operated normally throughout the flight.

The pressure make-up system operated normally throughout the flight with 520 PSIA supply remaining.

The instrumentation system operated properly with the following exceptions:

An apparent intermittent accelerometer in the capsule, an intermittent temperature sensor on the conic adapter and a problem with the 10's position on the cycle counter for the Slave instrument.

Ascent vibration data appeared normal and good data was acquired with the exception noted above.

The internal temperatures were within tolerances for the flight. Ascent and two orbital profiles were obtained.

Both recovery systems operated normally, however the -1 recovery system impacted approximately 56 miles downrange and 4 miles west of the predicted impact point.

KIK-Zorro 38 (early A to B switchover) was not utilized on this flight.

B. PANORAMIC CAMERA PERFORMANCE

Both panoramic cameras operated normally throughout the flight. Cycle period data for the engineering passes monitored are tabulated in Table 3-1.

Camera system dynamic operation, 99/101 per cent clutch operation, start-up, shutdown, and transport functions were normal for all passes monitored. Cut and wrap and transfer of the -2 system occurred as programmed with the first recovery arm signal.

Panoramic Film Consumption - Cycles

	Actual	
	Master	Slave
Sample - Off Spooling	19	19
Pre-Launch	148	149
-1 Mission	2907	2899
-2 Mission	2963	2982
Total	6037	6049

C. FMC MATCH

The V/H ramp to orbit match was acceptable throughout the flight. The following settings for Real Time Commands (RTC) 6, 8, and 10 were used to attain the optimum match during the flight:

RTC Position			Remarks
6	8	10	
4	6	6	Launch thru Rev. 3
4	6	5	Rev. 4 thru Rev. 13
4	5	5	Rev. 14 thru Rev. 29
4	5	8	Rev. 30 only
4	3	8	Rev. 31 thru Rev. 61
3	4	7	Rev. 62 thru Rev. 85
4	5	5	Rev. 86 thru Rev. 158
4	5	7	Rev. 159 thru End of Mission

D. ORBITAL PARAMETERS AND OAS EFFECTS

Parameter - Rev. 2	Predicted	Actual - APF
Period - Min.	89.48	89.54
Apogee - N. M.	171.9	179.1
Perigee - N. M.	98.1	94.1
Eccentricity	0.0103	0.0117
Inclination - Deg.	100.0	100.1
Argument of Perigee - Deg.	164	172.38

A single Orbital Adjust System rocket was fired on Rev. 86. All telemetry monitors and subsequent orbital parameters confirmed successful operation. Orbital parameters are given below:

Parameter	Prior to OAS - Rev. 82	After OAS - Rev. 89
Period - Min.	89.10	89.36
Apogee - N. M.	165.4	170.7
Perigee - N. M.	91.8	98.6
Eccentricity	0.0102	0.0101
Inclination - Deg.	100.1	100.1
Argument of Perigee - Deg.	153.5	143.6

E. INSTRUMENTATION AND COMMAND SYSTEM PERFORMANCE

The instrumentation and command systems operated properly throughout the flight with the following exceptions:

1. Intermittent output of accelerometer mounted on the ring of thrust cone. (Capsule Telemetry Channel 18)

2. Intermittent output of temperature sensor mounted on conic adapter.

3. Ten's digit of Slave cycle counter. (Counter took 2 cycles to advance 10's digit from 9 to 0, however resultant count was correct.)

There were no adverse effects on the mission due to the above instrumentation anomalies.

F. STELLAR/INDEX CAMERA PERFORMANCE

Both the -1 and -2 Stellar Index cameras operated normally with no anomalies noted in the programmer, shutter monitors, or metering data.

G. CLOCK PERFORMANCE

Clock system operation was normal for the flight. Good correlation between the clock and [redacted] Tracking station time was obtained. Table 3-2 contains these correlation data.

H. PRESSURE MAKE-UP SYSTEM PERFORMANCE

Pressure Make-up System performance was normal. Average gas consumption was 8.88 lbs/min. for 232 minutes operating time. The system had a surplus of 520 PSIA at the end of the mission.

I. THERMAL ENVIRONMENT

Temperature data for the [redacted] Tracking Station acquisitions are included in Table 3-3. The average instrument temperatures ranged from a high of 85°F on the Master and 82°F on the Slave to a low of 74 and 70°F on the Master and Slave instruments respectively. Ascent temperature data for all skin temperature sensors was obtained and is plotted as Figures 3-1 to 3-3. Temperature data for two orbits (23 and 87) were reduced and are included in Table 3-4.

J. ASCENT VIBRATION ENVIRONMENT

A total of 11 accelerometers were installed in the payload system for monitoring ascent vibrations. Eight of these were located in the payload area and the data transmitted on Link IV during ascent. The other three were located in the -1 recovery system and transmitted on the capsule telemetry. Figure 3-4 shows accelerometer locations and "Pogo" acceleration level and frequency.

J-38 FLIGHT

REV. MODE	OP. R	RAMP A	TUR SECS	SYSTEM CALIB.	INST. 198 ACTUAL	INST. 198 UNIT DEV.	INST. 198 SYSTEM DEV.	INST. 199 ACTUAL	INST. 199 UNIT DEV.	INST. 199 SYSTEM DEV.	198/19 DIFF.
8	A	4	6 80	3.324	3.330	0.29F	0.17S	3.335	0.79S	0.32S	0.15
16	A	4	5 1632	2.221	2.225	0.25S	0.20S	2.252	1.35S	1.41S	1.21
32	A	4	3 1554	2.212	2.235	1.12S	1.03S	2.250	1.62S	1.71S	0.67
48	A	4	3 1620	2.207	2.205	0.02S	0.08F	2.210	0.04S	0.15S	0.23
64	A	3	4 1711	2.201	2.210	0.54S	0.42S	2.260	2.56S	2.69S	2.26
72	B	3	4 150	3.496	3.500	0.37F	0.12S	3.500	0.61S	0.12S	-0.00
81	B	3	4 1707	2.201	2.222	1.08S	0.95S	2.235	1.42S	1.55S	0.59
113	B	4	5 1877	2.212	2.242	1.47S	1.38S	2.232	0.84S	0.93S	-0.45
145	B	4	5 2000	2.212	2.220	0.47S	0.38S	2.224	0.47S	0.56S	0.18
161	B	4	5 1942	2.211	2.245	1.62S	1.53S	2.245	1.44S	1.53S	-0.00

DEV. AND DIFF. ARE IN PERCENT
THE (-) SIGN INDICATES THAT INST 1 IS SLOWER THAN INST 2.
F=FAST AND S=SLOW

Table 3-1

CLOCK CORRELATION SUMMARY

ORDER FIT ONE

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
0.213291800 05	0.4777999990 06	0.2132918020 05	-0.0002	7	[redacted]
0.712730230 05	0.5277438480 06	0.7127302310 05	-0.0001	16	
0.208587700 05	0.2685868400 05	0.2085876660 05	0.0032	23	
0.706255310 05	0.7662545700 05	0.7062553360 05	-0.0028	32	
0.255045980 05	0.1179045270 06	0.2550459880 05	-0.0006	40	
0.700002000 05	0.1624001340 06	0.7000020040 05	-0.0004	48	
0.248678040 05	0.2036677430 06	0.2486780440 05	-0.0004	56	
0.693996730 05	0.2481996190 06	0.6939967500 05	-0.0020	64	
0.242282460 05	0.2894281990 06	0.2422825000 05	-0.0040	72	
0.738998400 05	0.3390997920 06	0.7389983700 05	0.0030	81	
0.234292760 05	0.3750292300 06	0.2342927070 05	0.0053	88	
0.732968680 05	0.4246968520 06	0.7329688660 05	0.0014	97	
0.227951690 05	0.4607951390 06	0.2279516930 05	-0.0003	104	
0.726210090 05	0.5106209860 06	0.7262101030 05	-0.0013	113	
0.274295760 05	0.1495864300 05	0.2742957430 05	0.0017	121	
0.718905010 05	0.5941957200 05	0.7189049790 05	0.0031	129	
0.267814980 05	0.1007105860 06	0.2678150690 05	-0.0089	137	
0.711315500 05	0.1450606330 06	0.7113154860 05	0.0014	145	
0.259275310 05	0.1862566190 06	0.2592752960 05	0.0014	153	
0.703754650 05	0.2307045580 06	0.7037546320 05	0.0018	161	
0.251075310 05	0.2718366310 06	0.2510753120 05	-0.0002	169	
0.747664850 05	0.3214955900 06	0.7476648420 05	0.0008	178	
0.242289360 05	0.3573580450 06	0.2422893490 05	0.0011	185	
0.738689000 05	0.4069980190 06	0.7386690290 05	-0.0029	194	

A0=-0.45647076110 06 A1= 0.9999998790850 00

SIGMA=0.00275 NO. POINTS= 24

RATIO OF CLOCK TIME TO SYS TIME= 0.1000000120910 01

ORDER FIT TWO

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
0.213291800 05	0.4777999990 06	0.2132917980 05	0.0002	7	[redacted]
0.712730230 05	0.5277438480 06	0.7127302280 05	0.0002	16	
0.208587700 05	0.2685868400 05	0.2085876660 05	0.0034	23	
0.706255310 05	0.7662545700 05	0.7062553360 05	-0.0026	32	
0.255045980 05	0.1179045270 06	0.2550459870 05	-0.0007	40	
0.700002000 05	0.1624001340 06	0.7000020040 05	-0.0004	48	
0.248678040 05	0.2036677430 06	0.2486780450 05	-0.0005	56	
0.693996730 05	0.2481996190 06	0.6939967510 05	-0.0021	64	
0.242282460 05	0.2894281990 06	0.2422825020 05	-0.0042	72	
0.738998400 05	0.3390997920 06	0.7389983720 05	0.0028	81	
0.234292760 05	0.3750292300 06	0.2342927090 05	0.0051	88	
0.732968680 05	0.4246968520 06	0.7329688690 05	0.0011	97	
0.227951690 05	0.4607951390 06	0.2279516950 05	-0.0005	104	
0.726210090 05	0.5106209860 06	0.7262101050 05	-0.0015	113	
0.274295760 05	0.1495664300 05	0.2742957450 05	0.0015	121	
0.718905010 05	0.5941957200 05	0.7189049810 05	0.0029	129	
0.267814980 05	0.1007105860 06	0.2678150710 05	-0.0091	137	
0.711315500 05	0.1450606330 06	0.7113154860 05	0.0014	145	
0.259275310 05	0.1862566190 06	0.2592752960 05	0.0014	153	
0.703754650 05	0.2307045580 06	0.7037546320 05	0.0018	161	
0.251075310 05	0.2718366310 06	0.2510753110 05	-0.0001	169	
0.747664850 05	0.3214955900 06	0.7476648400 05	0.0010	178	
0.242289360 05	0.3573580450 06	0.2422893460 05	0.0014	185	
0.738689000 05	0.4069980190 06	0.7386690250 05	-0.0025	194	

A0=-0.45647076320 06 A1= 0.9999998839610 00

A2=-0.2489124709564D-14

SIGMA=0.00275 NO. POINTS = 24

J-38 TEMPERATURE SUMMARY

DEGREES - FAHR

SENSOR	ORBITS ACQUIRED																					
Master Camera	8	16	23	32	40	48	56	64	72	81	88	97	104	113	121	129	137	145	153	161	169	178	185
3	83	80	83	81	83	80	82	78	74	73	72	72	74	71	74	71	74	69	75	70	75	70	74
4	90	86	91	88	92	86	90	84	83	81	81	80	83	78	83	78	84	77	83	78	83	78	83
5	86	84	86	86	87	84	84	83	81	77	77	78	80	77	79	77	80	75	80	77	81	75	80
6	82	82	81	83	82	82	79	81	75	74	71	74	74	73	74	73	75	72	75	74	75	72	75
7	86	85	86	87	87	85	84	83	78	77	75	77	78	77	77	77	79	75	79	77	79	75	78
8	89	84	87	87	87	84	87	83	81	77	78	77	80	76	80	76	81	74	80	75	80	75	80
9	87	84	87	86	89	85	87	83	80	78	78	78	80	78	79	78	81	75	81	77	81	75	81
11	80	78	79	80	82	79	78	78	73	72	71	71	73	70	75	70	75	69	76	72	75	70	75
12	91	85	90	86	91	84	89	83	83	78	81	77	82	77	82	77	83	75	83	76	83	75	82
13	80	80	80	82	81	81	79	79	72	71	69	72	72	70	72	71	73	70	73	72	73	70	72
Avg. Inst. Temp.	85	83	85	85	85	83	84	82	78	76	75	76	78	75	78	77	79	73	79	75	79	74	79
Slave																							
3	70	68	69	70	71	69	68	67	63	62	61	61	63	61	63	61	64	60	65	62	65	61	64
4	78	76	77	77	79	78	78	75	72	69	69	70	72	69	71	69	73	68	74	69	73	68	74
5	85	83	85	85	86	84	85	83	79	77	76	76	79	77	78	76	80	75	80	77	79	76	79
6	86	84	85	86	86	86	84	83	78	78	75	76	77	76	76	76	77	74	79	76	77	74	77
7	83	81	82	83	84	82	81	80	74	74	71	73	74	70	73	72	74	71	76	73	75	71	74
8	86	83	85	85	87	84	85	82	80	77	77	76	79	77	79	76	80	75	81	77	80	76	79
9	90	86	88	87	90	86	88	84	83	77	80	77	81	65	79	77	82	75	82	77	82	77	81
11	78	75	78	78	80	78	79	75	70	67	68	68	71	67	71	67	72	66	72	68	72	66	70
12	76	73	76	75	79	74	77	73	71	67	68	66	71	67	70	67	72	66	83	67	72	67	71
13	77	78	77	79	79	79	77	77	70	69	67	69	70	69	69	69	71	68	71	69	71	68	70
Avg. Inst. Temp.	82	80	81	80	82	80	80	78	76	72	71	71	74	70	74	70	75	70	76	72	75	70	74
Supply Spool																							
1	66	65	68	68	72	69	71	69	65	63	63	63	65	63	66	63	65	61	66	63	66	63	67
2	68	67	69	70	72	70	71	70	66	64	63	62	66	63	65	63	66	61	66	64	67	63	67

TABLE 3-3

J-38 TEMPERATURE SUMMARY

DEGREES - FAHR

SENSOR	ORBITS ACQUIRED																					
Fairing/Barrel #1 ("A") ("B")	8	16	23	32	40	48	56	64	72	81	88	97	104	113	121	129	137	145	153	161	169	178	185
1 (6 1 2)	47	28	44	25	57	31	57	28	34	31	28	37	40	37	40	41	43	31	43	34	37	28	40
2 (5 3)	42	15	35	12	48	15	48	12	83	77	80	77	89	83	94	86	97	73	94	83	89	67	97
3 (4)	18	11	11	4	25	8	25	8	75	66	72	78	81	93	90	35	90	84	93	96	84	69	93
4 (4 3 2)	45	39	45	39	52	39	49	39	23	17	17	20	27	23	23	26	33	20	33	27	30	17	33
5 (5 1)	43	39	39	33	43	39	46	36	23	23	16	26	26	23	29	23	29	26	32	23	29	19	32
6	39	23	36	23	46	26	46	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barrel No. 2																							
1	31	34	31	31	34	34	34	31	19	16	12	22	82	19	22	25	25	16	25	34	25	16	28
2 (2 3 4)	29	22	26	19	39	26	32	22	22	13	19	16	26	22	29	26	29	16	32	26	26	13	32
3 (1 5)	80	88	77	77	91	91	88	91	71	65	68	80	77	83	83	97	83	80	85	91	77	62	85
4	95	95	92	86	98	92	98	92	80	68	77	74	86	80	92	86	89	74	92	83	83	65	89
5	75	72	75	72	81	72	75	69	51	48	45	51	57	46	57	51	57	42	60	45	54	45	57
Conic Adapter																							
1	32	41	38	45	38	25	41	32	22	Open	32	25	32	22	32	32	OBH	18	38	25	58	22	48
Rec. Barrel																							
1	60	63	57	57	66	66	60	63	51	44	47	51	54	57	60	66	60	54	60	63	57	47	60
2	77	77	74	71	86	80	86	77	68	58	61	64	71	71	77	74	67	61	80	74	74	55	80
Clock																							
1	76	76	78	76	82	76	78	76	67	63	63	63	69	65	71	65	69	61	74	65	71	65	71
Thrust Cone "A" to "B"																							
1 (Skin)	47	40	45	39	47	40	48	40	67	67	66	65	69	65	67	66	70	64	70	66	70	65	69
2 (Retro)	54	49	49	49	50	49	49	48	67	66	65	66	67	66	67	66	67	65	68	67	68	65	67
Master Cassette "A" SRV																							
2	55	62	61	61	62	62	64	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Recovery Batt. "B" SRV																							
1	63	65	64	67	66	67	66	67	76	77	76	76	77	77	77	77	77	76	78	78	78	78	78

TABLE 3-3

J-38 TEMPERATURE SUMMARY REV. 23

DEGREES - FAHR

Latitude No.	1	2	3	4	5	6	7	8	9
Time (secs) from Ascending Node	595	1192	1790	2387	2983	3580	4179	4771	78
SENSOR									
Master									
3	84	82	79	78	78	79	82	84	84
4	92	89	86	85	85	87	90	93	92
5	87	86	83	83	82	83	85	87	87
6	82	82	81	82	81	81	81	82	82
7	86	86	85	84	85	85	85	86	86
8	87	86	85	84	83	84	86	87	88
9	88	86	84	83	83	84	86	88	89
11	81	80	78	78	78	79	81	83	82
12	91	89	85	83	84	87	91	93	93
13	81	80	80	79	79	79	80	80	82
Avg. Instr. Temp.	86	85	83	82	82	82	85	86	86
Slave									
3	71	69	67	67	67	67	68	70	70
4	78	78	76	75	75	75	77	78	80
5	85	85	83	83	83	82	83	85	86
6	86	85	85	85	84	83	84	85	86
7	82	82	81	81	82	82	83	84	83
8	86	85	83	82	81	81	84	86	87
9	89	88	86	84	84	86	87	89	90
11	79	78	75	75	75	76	79	80	81
12	77	75	74	72	72	74	76	78	78
13	78	78	77	76	77	76	77	78	78
Avg. Instr. Temp	81	80	79	78	78	78	80	81	82
Supply Spool									
1	68	67	65	65	65	65	67	69	69
2	70	68	67	67	66	66	68	70	71

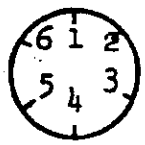
No./Latitude			System Time
1	138°	58'	20951
2	175	30	21546
3	258	57	22142
4	219	19	22739
5	320	58	23335
6	360	11	23931
7	474	55	24527
8	438	39	25123
9	105	04	25796

TABLE 3-4

J-38 TEMPERATURE SUMMARY REV 23

DEGREES - FAHR

	Latitude No.	1	2	3	4	5	6	7	8	9
	Time (secs) from Ascending Node	595	1192	1790	2387	2983	3580	4179	4771	78
Fairing/Barrel #1 ("A") ("B")										
1		47	35	18	38	91	135	135	94	67
2		42	22	9	19	58	101	115	89	61
3		18	1	-6	8	15	38	74	61	31
4		49	39	32	36	45	55	61	65	55
5		43	36	30	36	43	49	56	56	49
6		43	29	19	23	43	72	82	66	53
Barrel No. 2										
1		31	25	22	34	37	43	43	37	37
2		9	22	13	29	52	65	58	49	39
3		80	68	59	106	165	189	162	123	100
4		95	83	71	101	139	158	153	130	110
5		75	72	63	69	75	90	96	96	84
Conic Adapter										
1		38	51	32	38	45	48	51	51	48
Press. Make-Up Bottle										
1		57	51	44	69	102	117	99	82	69
2		77	64	55	86	129	157	146	116	94
Clock										
1		76	76	71	74	74	74	78	80	82
2										
Thrust Cone "A" to "B"										
1 (Skin)		46	43	39	37	38	40	44	48	48
2 (Retro)		49	49	48	47	47	46	47	49	49
Master Cassette "A" SRV										
2		62	62	62	62	63	62	62	62	62
Recovery Batt. "B" SRV										
1		64	64	64	63	64	63	63	63	63



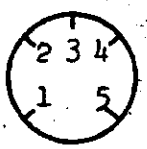


TABLE 3-4

J-38 TEMPERATURE SUMMARY REV. 87

DEGREES - FAHR

Latitude No.	1	2	3	4	5	6	7	8	9
Time (secs) from Ascending Node	600	1204	1790	2386	2981	3578	4174	4770	80
SENSOR									
MASTER									
3	74	73	71	70	69	71	73	74	75
4	83	82	79	78	77	79	81	83	84
5	80	78	77	76	75	76	78	80	80
6	74	74	73	73	72	72	73	74	74
7	78	77	76	76	76	78	78	79	80
8	80	78	76	75	74	76	78	79	80
9	80	79	79	77	75	78	79	81	81
11	73	72	70	69	70	72	74	75	75
12	83	81	78	76	75	79	82	84	84
13	72	71	70	70	69	70	71	72	72
AVG. INSTR. TEMP.	78	76	75	74	73	75	77	78	79
SLAVE									
3	63	63	61	60	59	60	61	63	63
4	72	71	69	68	67	69	70	72	72
5	79	78	77	76	75	75	76	78	79
6	77	77	76	75	75	74	76	77	77
7	74	73	72	71	72	73	74	75	74
8	80	79	77	75	74	75	77	79	80
9	82	81	78	76	76	78	80	82	82
11	71	70	67	66	66	68	71	71	72
12	71	69	67	65	65	68	70	71	72
13	70	70	68	67	67	68	69	69	70
AVG. INSTR. TEMP.	74	73	71	70	70	71	72	74	74
SUPPLY SPOOL									
1	65	65	63	62	61	63	64	66	66
2	65	64	63	61	60	62	63	65	65

No./Latitude	System Time (Secs.)
1 139° 10'	18245
2 175 46	18851
3 258 27	19437
4 218 49	20033
5 321 20	20628
6 360 21	21225
7 474 54	21821
8 438 42	22417
9 105 07	23090

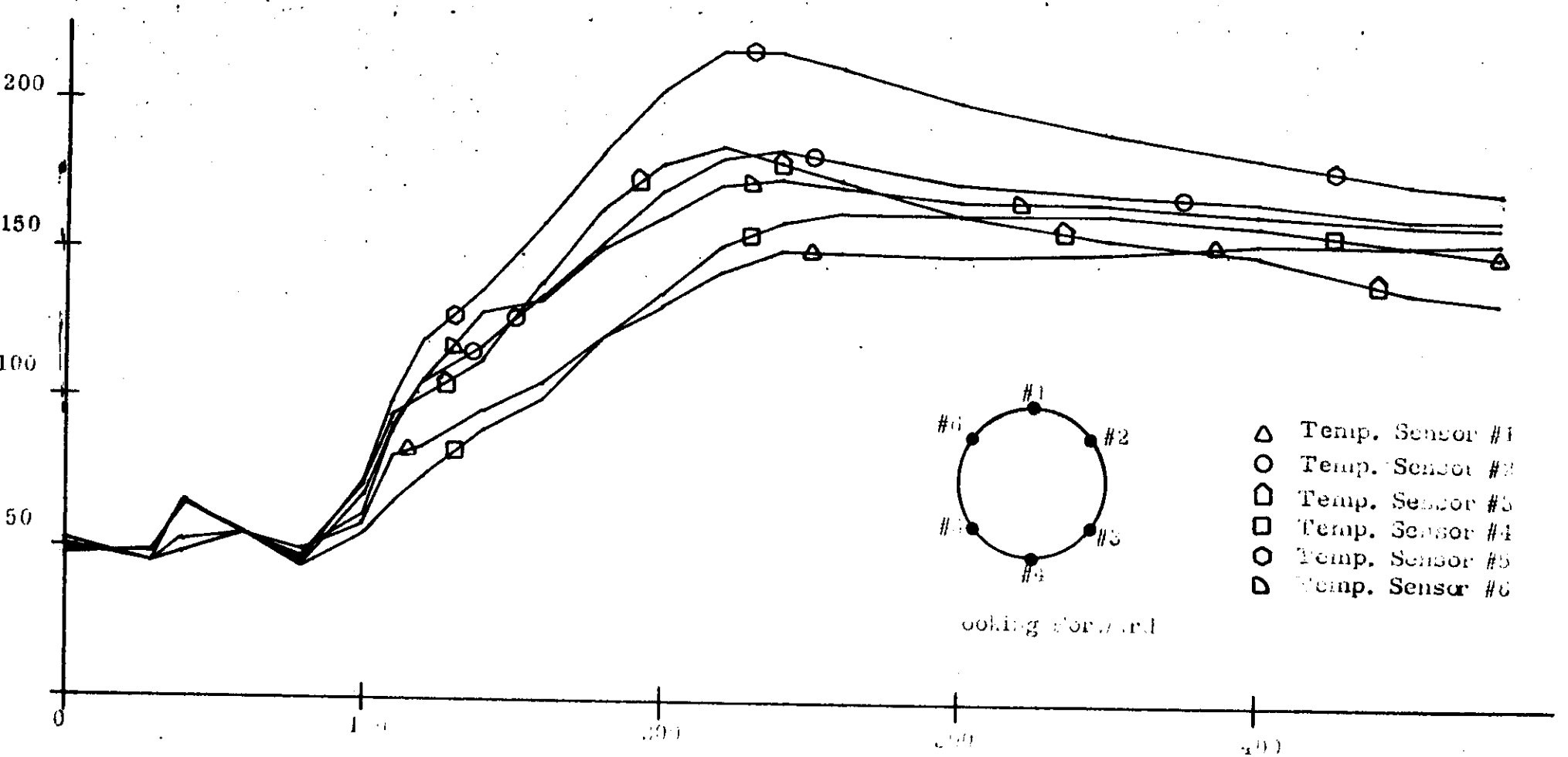
TABLE 3-4

J-38 TEMPERATURE SUMMARY REV. 87
DEGREES - FAHR

Latitude No.	1	2	3	4	5	6	7	8	9
Time (secs) from Ascending Node	600	1204	1790	2386	2981	3578	4174	4770	80
SENSOR									
Fairing/Barrel #1									
("A") ("B")									
1	37	28	22	40	49	61	67	58	49
2	92	77	63	89	127	158	155	130	109
3	84	69	57	105	171	205	182	135	105
4	27	17	10	27	49	72	65	49	36
5	23	16	13	23	29	38	41	35	29
Barrel No. 2									
1	22	12	9	19	25	34	43	26	22
2	22	16	6	22	45	65	61	45	32
3	80	62	50	97	157	186	162	123	97
4	86	74	62	86	121	147	142	119	101
5	54	45	39	51	60	72	78	72	63
Conic Adapter									
1	28	25	22	22	22	28	48	48	45
Press. Make-Up Bottle									
1	54	47	38	63	96	111	96	85	63
2	74	58	49	77	121	149	141	112	88
Clock									
1	69	65	61	61	63	65	69	74	71
2									
Thrust Cone "A" to "B"									
1 (Skin)	69	66	65	64	64	64	66	68	68
2 (Retro)	67	66	65	65	65	65	66	67	66
Recovery Batt. "B" SRV									
1	77	77	76	76	77	78	77	77	77

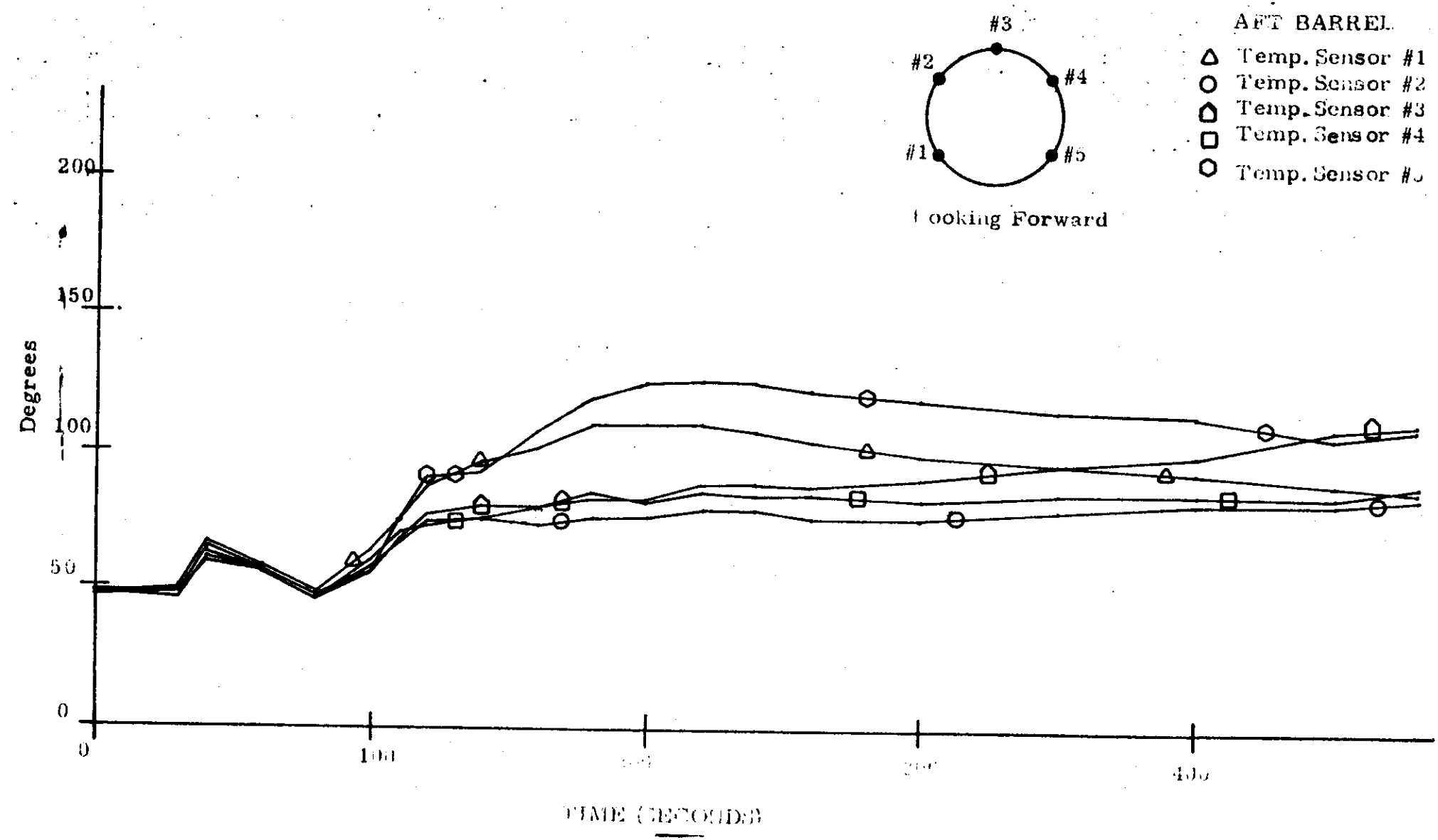
TABLE 3-4

J-33 ASCENT TEMPERATURE



TIME (SECONDS)

J-38 ASCENT TEMPERATURE



J-38 ASCENT TEMPERATURE

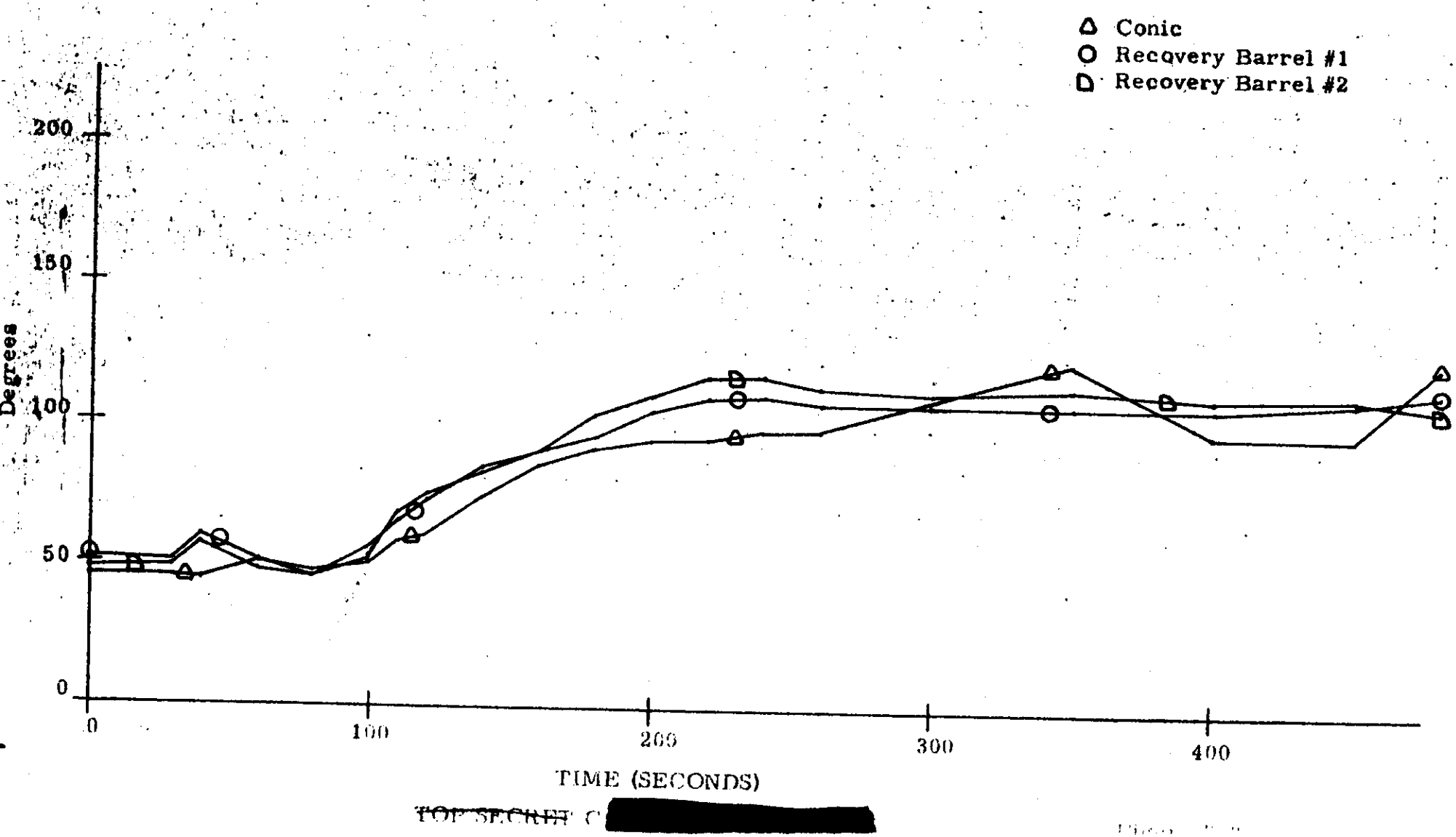
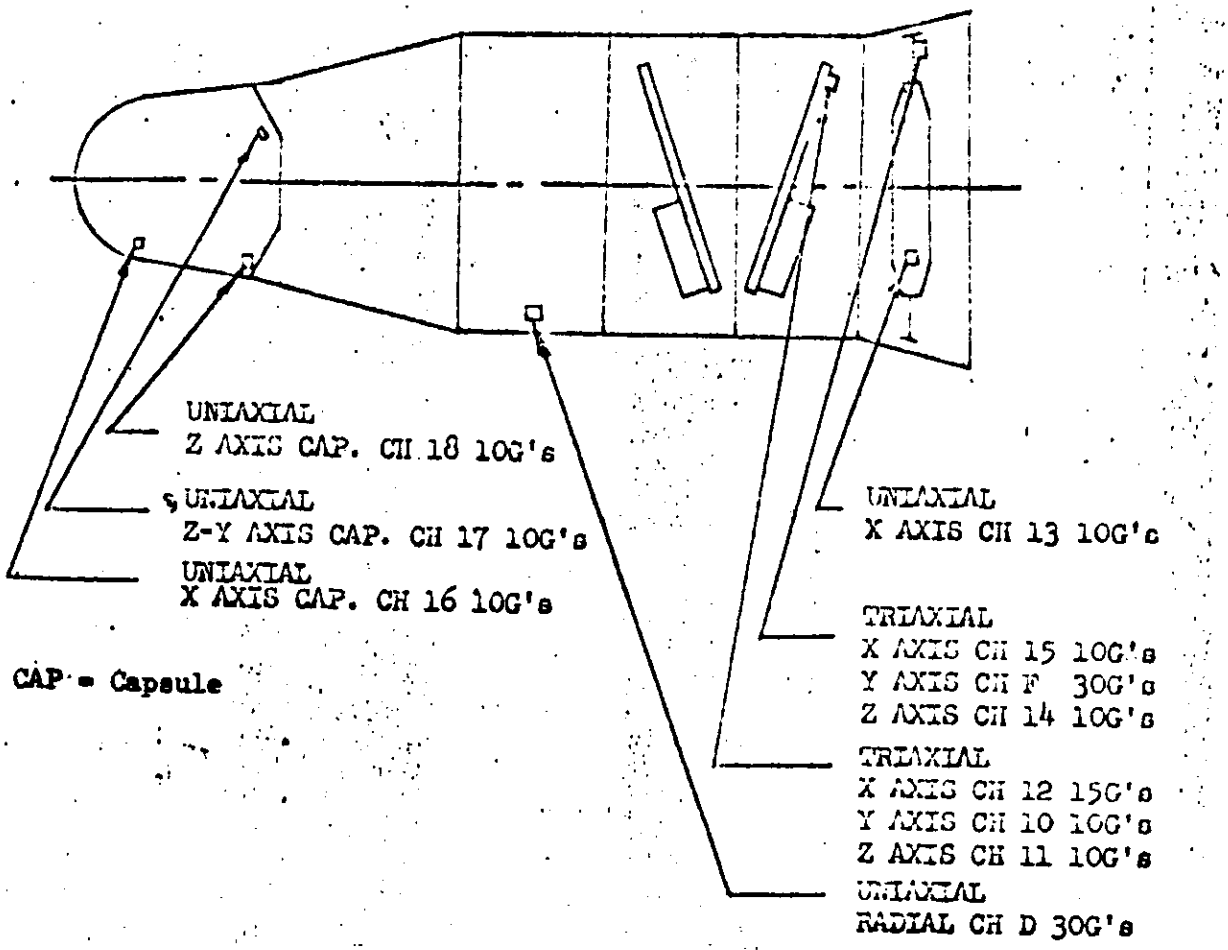


Figure 3-4
ACCELEROMETER LOCATIONS AND CALIBRATION LEVELS



ASCENT VIBRATION LEVELS MONITORED

CH	Liftoff (G's Rms)	*(G's Rms)	Transonic (G's Rms)	THORAD Burnout (Pogo)(G's O-P)
17	---	4.6	---	1.85 at 17.5 CPS
D	4.54		5.4	----
F	6.6		3.8	----
12	---		---	2.8 at 17.5 CPS
13	---		---	2.8 at 17.5 CPS
14	---		---	2.5 at 17.5 CPS
16	---		---	3.05 at 17.5 CPS

*Between Liftoff and Transonic
O-P = Zero to Peak

Figure 3-4

SECTION 4

MISSION 1037-1 RECOVERY SYSTEM

SRV #727 was received at A/P on 10 February 1966. The receiving weight was 153.7 pounds. After modifications and incorporation of outstanding E.O.'s, the SRV was delivered to Systems Test for incorporation into the J-38 system.

The capsule was shipped to VAFB on 13 October 1966.

The -1 recovery capsule was successfully recovered by air-catch on Rev. 66. All re-entry sequence of events monitored appeared normal and occurred within tolerance. The actual impact point was approximately 54 miles down range and 4 miles west of the predicted impact point. However, the actual impact point was within the pre-flight predicted dispersions.

Predicted impact	25^{o} 07.6'N/155^{o} 55.4'W
Actual impact	24^{o} 14'N/155^{o} 59'W

The re-entry sequence of events is contained in Table 4-1. The cause of the longer than normal downrange dispersions is under investigation

MISSION 1037-1

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Actual	Nominal
*Arm	76.77	77.0 ± 1.0
*Transfer	1.99	2.0 ± 0.25
Electrical Disconnect	0.85	0.900 $^{+0.430}_{-0.400}$
Separation	--	--
**Spin	3.35	3.4 ± 0.30
Retro	7.53	7.55 ± 0.45
Despin	10.90	10.75 ± 0.59
T/C Separation	1.51	1.5 ± 0.15
***"G" Switch Open	477.41	468.4
Parachute Cover Off	33.99	34.0 ± 1.5
Drogue Chute Deployed	0.65	0.63 ± 0.08
Main Chute Bag Separate	12.31	10.25 ± 1.5
Main Chute Deployed	0.50	0.52 ± 0.13
Main Chute Disreef	4.49	4.5 ± 0.80

*From Separation
**From Electrical Disconnect
***From Retro

Spin Rate 59.2 RPM
Despin Rate 11.7 RPM
Retro Velocity 1024 ft./sec.

TABLE 4-1

SECTION 5

MISSION 1037-2 RECOVERY SYSTEM

SRV #728 was received at A/P on 10 February 1966. The receiving weight was 151.6 pounds. After modifications and incorporation of outstanding E.O.'s the unit was delivered to Systems Test for mating to the J-38 system.

The capsule was shipped to VAFB on 13 October 1966.

The -2 recovery capsule was successfully recovered by air-catch on Rev. 195. All recovery events monitored occurred within tolerance and appeared normal. Re-entry sequence of event times are included in Table 5-1.

Predicted impact	21° 52.3'N/148° 59.9'W
Actual impact	22° 03'N/148° 54'W

MISSION 1037-2

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Actual	Nominal
*Arm	76.80	77.0 ± 1.0
*Transfer	1.98	2.0 ± 0.25
Electrical Disconnect	0.77	$0.900^{+0.430}_{-0.400}$
Separation	--	---
**Spin	3.31	3.4 ± 0.30
Retro	7.45	7.55 ± 0.45
Despin	10.55	10.75 ± 0.59
T/C Separation	1.49	1.5 ± 0.15
***"G" Switch Open	469.07	469.7
Parachute Cover Off	33.88	34.0 ± 1.5
Drogue Chute Deployed	0.59	0.63 ± 0.08
Main Chute Bag Separate	11.05	10.25 ± 1.5
Main Chute Deployed	0.55	0.52 ± 0.13
Main Chute Disreef	4.45	4.45 ± 0.80

From Separation
From Electrical Disconnect

Spin Rate 63 RPM
Despin Rate 10.6 RPM
Retro Velocity 1000 ft./sec.

TABLE 5-1

SECTION 6

MISSION 1037 PANORAMIC CAMERAS

A. COMPONENT ASSIGNMENT

Component	Master (FWD)	Slave (AFT)
Main Camera	198	199
Main Camera Lens	2112435	2082435
Supply Horizon Camera	292-G6	295-G6
Supply Horizon Camera Lens	E12855	E12840
Take-up Horizon Camera	293-G5	303-G5
Take-up Horizon Camera Lens	E12834	E12856
Supply Cassette	SC-46	SC-46

B. CAMERA DATA AND FLIGHT SETTINGS

Main Camera:		
Lens	24"f/3.5	24"f/3.5
Slit Width	0.225"	0.175
Filter Type	Wratten 23A	Wratten 21
Film Type (E.K.)	3404	3404
Supply Horizon Cameras	Port	Starboard
Lens	55 mm f/6.3	55 mm f/6.3
Aperture Setting	f/6.3	f/8.0
Exposure Time	1/100 second	1/100 second
Filter Type	Wratten 25	Wratten 25
Take-up Horizon Cameras	Starboard	Port
Lens	55 mm f/6.3	55 mm f/6.3
Aperture Setting	f/8.0	f/6.3
Exposure Time	1/100 second	1/100 second
Filter Type	Wratten 25	Wratten 25

C. POST FLIGHT PERFORMANCE EVALUATION

The image quality produced from both panoramic cameras on this mission was consistently good and equal to the best obtained from any recent mission. The image quality is closely comparable to that obtained from Mission 1035, which was launched in late September 1966, and was the most recent Corona mission prior to the present one. In both cases the high image quality is attributed to the usual seasonal improvement in atmospheric conditions along with uniquely high percentages of cloud free areas. Visual examination of original negative and duplicate positive films showed the usual condition of slightly better detail in aft-looking camera imagery. The MIP rating for the -1 and -2 missions was 85, and in both cases the selected frames were from the aft-looking camera. No Corn targets were recorded on this mission.

Mission 1037 was the second Corona J system flown with the photogrammetric configuration. Photo interpreters indicated that in several instances the nodal traces interfered with analysis of targets. Also the traces were found to be disturbing during rapid scanning of the film. These conditions result from high density of the traces and are to be corrected in fugure PG systems by reduction of nodal trace light intensity. The quality of the PG rail hole images from both instruments was generally poorer than had been anticipated from pre-flight tests. Photogrammetric evaluation of this condition is beyond the scope of this report.

Aside from the photogrammetric recording conditions noted above, both panoramic cameras were free of significant photographic or data recording anomalies. Light leakage fog produced during non operate periods was considered to be of very minor significance.

All horizon camera imagery was normal, without "veiling", and adequate for attitude measurement.

SECTION 7

MISSION 1037 STELLAR-INDEX CAMERAS

A. COMPONENT ASSIGNMENT

Component	-1 Mission Serial Number	-2 Mission Serial Number
Camera	D-101	D-106
Index Reseau	128	136
Stellar Reseau	124	134

B. CAMERA DATA AND FLIGHT SETTINGS

Stellar Camera:		
Lens	85 mm f/1.8	85 mm f/1.8
Exposure Time	1 second	2 seconds
Filter Type	None	None
Film Type (E.K.)	3401	3401
Index Camera:		
Lens	38 mm f/4.5	38 mm f/4.5
Exposure Time	1/500 second	1/500 second
Filter Type	Wratten 21	Wratten 21
Film Type (E.K.)	3400	3400

C. POST FLIGHT EVALUATION

Stellar Cameras

Both stellar cameras were operational throughout their assigned mission segments. Although many stellar images were elongated or smeared, they were adequate for attitude determination.

There were three instances of double-exposed stellar and index images. One of these instances was a normal cycling condition for the first stellar and index frames of the 1037-2 mission. The other two instances, one each in the -1 and -2 missions, has been determined to be inherent in the design of switching of S/I programmer control from forward to

aft camera. This switching, used for the first time on this mission, will cause double exposures a very small number of times in any mission, and has been determined to be adequate without modification.

Index Cameras

Both index cameras were operational throughout their assigned mission segments. Due to the unusually extensive cloud free areas recorded, the quality of images from both index cameras appeared to be particularly good.

There were three instances of double exposed index camera images, one in the -1 mission segment, and two in the -2 mission segment. All three instances are due to normal S/I control conditions which have been described in the paragraph on stellar cameras.