No. [redacted]

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CORONA J

PERFORMANCE EVALUATION REPORT

MISSION 1016-1 AND 1016-2

FTV 1608, J-18

31 October 1966

Approved: [redacted]
Manager
Advanced Projects

Approved: [redacted]
Manager
Program [redacted]

FOREWORD

This report details the performance of the payload system during the operational phase of the Program [redacted] Flight Test Vehicle 1608.

Lockheed Missiles and Space Company has the responsibility for evaluating payload performance under the Systems Integration and "J" System contracts.

This document is the final payload test and performance evaluation report for Missions 1016-1 and 1016-2 which was launched on 15 January 1965.

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INTRODUCTION

This report presents the final performance evaluation of Missions 1016-1 and 1016-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the J-18 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 and MTF/AIM resolution 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 I

SYSTEM PERFORMANCE

A. MISSION OBJECTIVES

The payload section of Mission 1016, placed into orbit by Flight Test Vehicle # 1608 and LV-2A booster # 414, 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-18 payload system. This Corona "J" system is designed to acquire search and reconnaissance photography of selected areas of the earth from orbital altitudes. The planned mission was a 5 and a 6 day photographic period with no deactivate period.

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 2100:44 Z (1300:44 PST) on 15 January 1965. Ascent and injection were normal and the achieved orbit was within nominal tolerances. 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 1016-1 consisted of a 5 day operation and was completed by air recovery on 20 January 1965. Mission 1016-2 was completed with air recovery on 25 January 1965 following a 5 day photographic operation.

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

SCHEMATIC INBOARD PROFILE - CORONA J SYSTEM

MISSION 1016

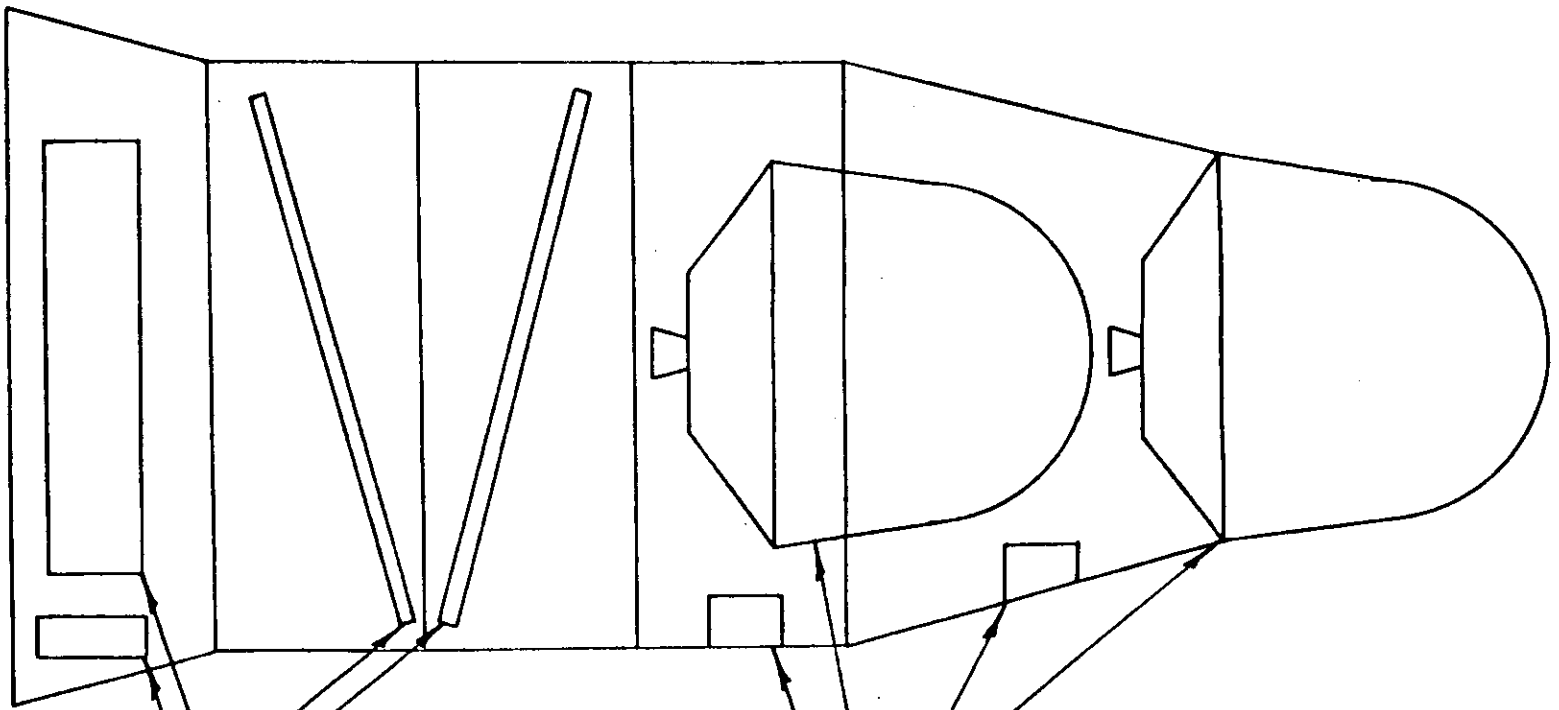


FIGURE 1-1

ORBITAL PARAMETERS

Parameter	Predicted	Orbit 32 Actuals
Period (Min.)	90.67	90.77
Perigee (N.M.)	99.3	95.12
Apogee (N.M.)	235.8	240.6
Inclination (Deg.)	75.00	74.98
Argument of Perigee	157	148.54
Eccentricity	0.0190	0.0189

C. PANORAMIC CAMERAS

Both instruments operated normally throughout both missions. The information content of the photography was considered excellent by the photo interpreters. The Master camera was rated better than the Slave. The 40% cloud cover and atmospheric haze produced the normal quality variations.

D. STELLAR-INDEX CAMERAS

The "A" S/I produced excellent photo data.

The stellar shutter malfunctioned throughout the "B" mission causing gross over-exposure.

E. OTHER SUBSYSTEMS

The clock, instrumentation, command and pressure make-up subsystems performed satisfactorily. The average instrument temperature decreased from 75°F to 57°F during the 159 orbits.

SECTION 2

PRE-FLIGHT SYSTEMS TEST

A. ENVIRONMENTAL TESTING

1. Test Objective

As a standard procedure, the J payload systems are subjected to 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. Test Summary

The J-18 system contained a flight pressure make-up system and it operated satisfactorily. Telemetry data indicated the following abnormalities during the TASC test:

SRV-A Stellar/Index shutter fire pulse did not appear during the eight (8) orbits of the test.

SRV-B Stellar/Index indicated noise from the index idler at the initial contact of the T/M wiper with the long commutator segment of the index idler.

Telemetry data indicated a presence of noise on the supply idler of Instrument #1. The noise was predominant with faster cycle rates and more acute during the SRV-B Bucket operation.

The last center-of-format pulse before instrument shut-down on Instrument #2 had practically no pulse width (less than 40 milliseconds).

During Orbit #15, first day of the SRV-B operation, there was an unusual high noise level on Channel 13 - Pts. 34 and 44 during instrument operation. These points are the drive motor armature voltage monitors for Instruments 1 and 2 respectively.

During the SRV-B recovery sequence Channel 13 - Pt. 54 (continuity loop and water seal) changed voltage from 5.2 VDC to 2.16 VDC at the arm signal. However, at transfer signal Pt. 54 remained at 2.16 VDC rather than switching to 0.75 VDC. This indicates the S/I water seal was not activated.

3. Thermal Environment

The TASC chamber thermal environment was programmed to simulate the on-orbital temperature conditions that the J-18 payload system would experience in flight.

Average instrument temperatures during various times throughout the test are shown below. They are not corrected for self-heating characteristics.

	SRV-A		SRV-B	
	Orbit #1	Orbit #5	Orbit #10	Orbit #13
Instrument #1	79.7°	71.7°	81.1°	89.8°
Instrument #2	81.9	78.9	89.7	97.0

4. Pressure Environment

Telemetry pressure data were reduced. All operations were listed chronologically with each operation's starting and maximum pressure. The reduced data were tabulated, and presented to payload analysis for evaluation.

Pressures recorded on the SRV-B mission were two microns prior to operate command with a one micron increase with gas off. A forty micron increase was observed with gas on.

5. Instrument Performance

The instrument system operation was normal throughout the test, with the exception that the last center-of-format pulse before shutdown on Instrument #2 had practically no pulse width. At fastest cycle period this pulse width was recorded at less than 40 milliseconds.

Cycle rate errors were within normal tolerances, except for the first operation of the SRV-B mission. This first operation occurred after a twelve hour soak period. This condition after a "soak" period has been witnessed before.

Instrument #1 averaged 0.2% fast, and Instrument #2 averaged 0.5% fast. Table 2-1 shows cycle rate errors and averages.

	Max. Fast	Max. Slow
* Instrument #1	2.6%	1.4%
Instrument #2	4.0%	1.3%

*Does not include first operate of the SRV-B mission.

6. Stellar/Index Performance

The SRV-A mission stellar index operated satisfactorily, with the exception that the shutter fire pulse did not appear during the eight (8) orbits of the test. This abnormality will be corrected.

The SRV-B mission stellar index operation was satisfactory, with the exception that telemetry data indicated the presence of T/M noise on the index idler at the initial contact of the T/M wiper with the long commutator segment of the index idler. The processed film did not indicate any metering anomalies nor shutter failures.

7. Clock Performance

The clock operated throughout both SRV-A and SRV-B missions. The console power was turned off during the SRV-A mission. This prevented any clock correlation due to unscheduled clock restart. Three readings were taken from the SRV-B mission commencing with Orbit 9, Day 1. The second and third readings were taken at Orbit 16, Day 1; and Orbit 8, Day 2. They indicated the clock was running slow by .014 and .037 milliseconds respectively.

8. Instrumentation & Commanding System Performance

Telemetry data indicated that all brush commands were

acknowledged. On Orbit 15 of the SRV-B mission, data indicated that the drive motor armature voltage monitors (13 - 34 & 44) experienced an unusual high-noise level.

During the SRV-B recovery sequence telemetry data indicated that the S/I water seal was not activated. Water seal and telemetry monitors were tested by A/P Bucket Personnel and no abnormalities or failures were found. However, from the time of the failure to further tests, the bucket was jostled in removal from the chamber and in transportation to A/P. The seal or the TLM switch may have been freed during transportation.

9. Corona

The J-1 System was altitude tested from 6 thru 11 November 1964. Internal system pressures ranged from 0.3 to 50 microns during instrument operations. Approximately 2000 feet of 3404 type film was programmed into SRV #1 and 8000 feet into SRV #2. The test film was pre-dried 7 days to assist in achieving low pressures during the TASC testing. S/I #59 and #55 were also operated in the TASC environment. Examination of the film indicated that the system met the specifications for corona marking.

B. RESOLUTION TEST

Resolution and theodolite tests were performed on 17 November 1964. Results of the thru-focus resolution tests of pan instruments 132 and 133 show the following characteristics:

Master Pan Instrument No. 132

Maximum high contrast resolution 189 lines/mm at 0.000 focal position.

Maximum low contrast resolution 119 lines/mm at 0.000 focal position.

Slave Instrument No. 133

Maximum high contrast resolution 198 lines/mm at 0.000 focal position.

Maximum low contrast resolution 126 lines/mm at 0.000 focal position.

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

C. LIGHT LEAK TEST

The examination of the film threaded in the J-18 system during the light leak test determined that the light tight integrity of the system was acceptable for flight.

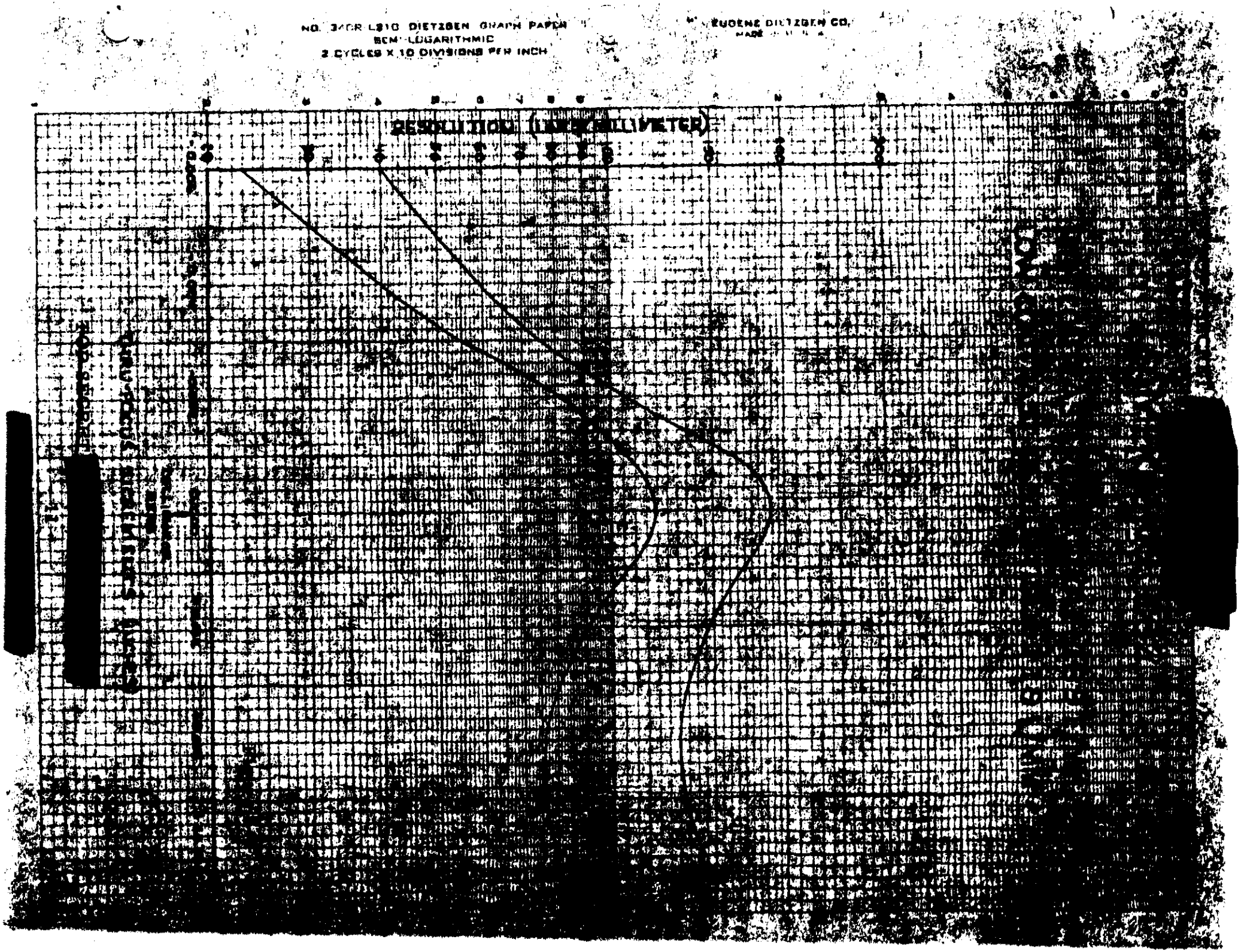
D. FLIGHT LOADING AND CERTIFICATION

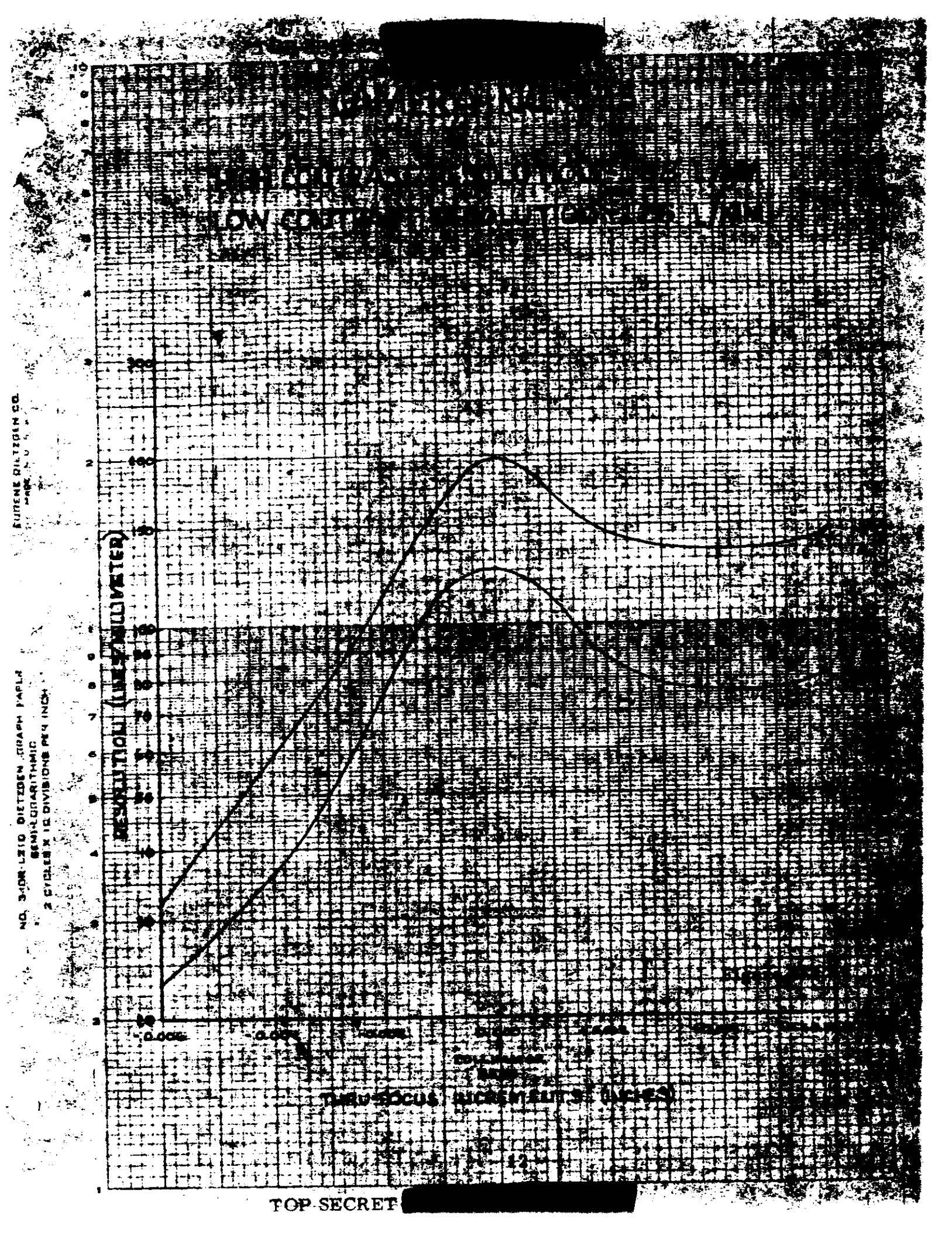
J-18 system was loaded with flight film on 12 January 1965. J-18 flight loading operations went well. Several faint minus density streaks were observed in the processed payload from both main instruments.

The cassette loading phase of the operation took 68 minutes. Green light was used for approximately the first 45 minutes of the cassette loading operation up to but not including the mating operation. Flight spools were protected from exposure to direct green light when not in use. This action reduced the exposure of the flight spools to direct green light to approximately 15 minutes. It is expected that only the outer wrap of flight film will be light fogged appreciably when exposed 15 minutes. The outer film wrap from each flight spool along with the adjacent 3 wraps were removed and used for film evaluation purposes.

Actual cassette mating and alignment functions were performed under bright yellow light over a period of 20 minutes. Actual direct yellow light exposure of the supply spools was 5 minutes. Direct yellow light exposure of the supply film is expected to fog the outer two to three film layers. Since approximately 16 layers of film are removed in the L Building subsequent to cassette loading, flight film is expected to contain no light fog.

The final J-18 system flight splices were made using white light according to the new procedure and based upon recommendations made by Performance Evaluation. Since approximately 30 layers of main supply film is removed subsequent to the 5 - 10 minute final splicing operation, flight film is expected to contain no light fog. J-18 system was certified for flight.


NO. 340R L810 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
2 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.
MADE
RESOLUTION (LINES/MILLIMETER)


RESOLUTION (LINES/MILLIMETER)
NO. 3-DR-LZ10 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
2 CYCLES X 10 DIVISIONS PER INCH
EUGENE DIETZGEN CO.

CYCLE RATE ANALYSIS

LEVEL	AMP.	ORBIT	TUR	CP #1	NOM.	% ERROR	CP #2	NOM.	% ERROR
4	1	2 - A	1910	2.210	2.180	S 1.4%	2.220	2.192	S 1.3%
4	1	9 - B	2740	3.297	2.747	S 20.0%	3.250	2.744	S 19.1%
4	1	13 - B	2690	2.650	2.650	0.0%	2.630	2.645	? 0.6%
4	1	2 - B	1900	2.174	2.180	F 0.3%	2.120	2.192	? 0.6%
4	1	9 - B	3045	3.295	3.374	F 2.4%	3.290	3.377	F 2.6%
4	1	13 - B	2635	2.610	2.632	F 0.3%	2.605	2.627	F 0.8%
5	8	3 - A	1550	2.375	2.384	F 0.4%	2.365	2.376	F 0.5%
5	8	6 - A	865	3.095	3.121	F 0.3%	3.120	3.122	F 0.6%
5	8	3 - B	1550	2.375	2.384	F 0.4%	2.355	2.376	F 0.9%
7	7	1 - A	300	4.300	4.258	S 0.9%	4.290	4.266	S 0.6%
7	7	4 - A	2070	2.405	2.384	S 0.8%	2.375	2.376	0.0%
7	7	7 - A	1400	2.645	2.641	S 0.2%	2.640	2.639	0.0%
7	7	8 - A	2480	2.710	2.695	S 0.6%	2.725	2.690	S 1.3%
7	7	11 - B	1900	2.355	2.362	F 0.3%	2.325	2.354	F 1.2%
7	7	1 - B	300	4.275	4.258	S 0.4%	4.260	4.265	F 0.2%
7	7	4 - B	2075	2.370	2.386	F 0.7%	2.370	2.378	F 0.3%
7	7	7 - B	2075	3.100	3.105	F 0.2%	3.075	3.106	F 1.0%
7	7	8 - B	2500	2.710	2.711	F 0.4%	2.710	2.707	S 0.1%
7	7	11 - B	1975	2.360	2.365	F 0.2%	2.355	2.356	0.0%
8	2	5 - A	1725	2.235	2.217	S 0.9%			
8	2	5 - A	2250				2.325	2.303	S 0.9%
8	2	12 - B	575	4.750	4.739	S 0.2%	4.720	4.747	F 0.8%
8	2	15 - B	1825	2.210	2.210	0.0%	2.240	2.222	S 0.8%
8	2	16 - B	BOR	6.025	6.109	F 1.4%	5.975	6.111	F 2.2%
8	2	12 - B	630	4.550	4.565	F 0.3%	4.540	4.573	F 0.7%
11	1	10 - B	1775	2.355	2.340	S 0.6%	2.325	2.331	F 0.3%
11	1	14 - B	2920	4.250	4.275	F 0.6%	4.225	4.283	F 1.4%
11	1	5 - B	2035	2.310	2.329	F 0.8%	2.275	2.320	F 1.9%
11	1	6 - B	BOR	8.305	8.520	F 2.0%	8.140	8.482	F 4.3%
11	1	10 - B	2815	3.755	3.855	F 2.6%	3.275	3.860	F 3.5%

TABLE 2-1

SECTION 3

FLIGHT OPERATIONS

A. SYSTEMS PERFORMANCE SUMMARY

Performance of the J-18 system was acceptable throughout the flight. Cycle rate errors ranged from 1% slow during the "A" operation, to 2% slow during the "B" operation. Both panoramic instruments operated satisfactorily during both "A" and "B" operations.

Stellar/Index camera operation was satisfactory as indicated by shutter pulse and payload metering monitors on TLM.

Average instrument temperature environment decreased from 75° to 57° during the ten days (159 orbits) of both missions.

Clock performance was satisfactory. Good clock-system time correlation was obtained throughout the flight.

The pressure make-up system (PMU) also performed satisfactorily throughout the flight.

Both "A" and "B" SRV units were recovered successfully. The "A" capsule contained 2879 cycles of the master camera payload and 2865 cycles of the slave camera payload. The "B" capsule contained 3020 cycles of "Master" payload and 3022 cycles of "Slave" payload.

The impact points for both the "A" SRV and the "B" SRV were within tolerance.

B. INSTRUMENTATION AND COMMAND PERFORMANCE

The telemetry and command system performed satisfactorily throughout the flight. However, three spurious commands were received. U4 and U1 commands were received on orbit 92, demobilizing the beacon. On Orbit 93 the beacon was recommanded on. During Orbit 109 another U4 was received and the beacon was again turned off. On Orbit 110 the beacon was again re-commanded and no further spurious commands were received.

The cycle counters functioned properly. The payload consumption, as correlated with the counters, agreed closely with the payload weight figures obtained after recovery of both buckets. The film footage pot data read low throughout the flight by approximately 50 cycles except for the master instrument during "A" operation which read high by approximately 30 cycles.

The cut and wrap sequence performed satisfactorily between the "A" mission - "B" mission switchover.

C. PANORAMIC CAMERA PERFORMANCE

Instrument operations were observed on orbits listed in Table 3-1. Telemetry monitors for center-of-format, lens rotation, and payload movement indicated smooth instrument dynamics and film movement during each operation observed.

Table 3-1 contains cycle period data of operations observed on TLM. The master and slave instruments ran approximately 1% and 2% slow respectively during the "A" mission. During the "B" mission both instruments ran approximately 2% slow. The difference in operating rates between instruments was within ± 1%.

Payload consumption for the flight was as follows:

	Master	Slave
"A" MISSION		
Cycles	2879	2865
Feet	7950	7887
"B" MISSION		
Cycles	3020	3022
Feet	7977	8005

FMC Match

The FMC match was well within specifications during the flight with the exception of one operation on orbit 89; V/H programmer start times had been programmed with a transition after orbit 88 to allow for possible de-activation. Since the vehicle was not de-activated, there should have been a change in the nominal start time selector switch setting after Rev. 88. The change was not initiated until orbit 95 which instigated a slightly higher FMC mismatch than desirable. The only significant error occurring during this period was on Rev. 89 when the estimated error in matching the calibrated ramp to the actual orbit was about 12-13% on the slow side. This anomaly also should have resulted in loss of endlap for this one operation.

D. CLOCK PERFORMANCE

Satisfactory clock correlation was obtained for both operations. Table 3-2 contains clock/system time correlation data for both operations. The smoothed system time values are computed from the equation $y = A_2 x^2 + A_1 x + A_0$, where y = smoothed system time and x = clock time. The data from both operations were best fitted to this second order equation by an IBM 7040 digital computer using double precision. The coefficients A_0, A_1, and A_2 are included in Tables 3-2.

E. STELLAR/INDEX CAMERA PERFORMANCE

Normal payload metering was observed on TLM for both "A" and "B" S/I cameras during all operations listed in Table 3-1. Metering ratios were 8/3, 6/3 for the "A" S/I; and 6/3, 8/2 for the "B" S/I.

The shutter pulse was observed at proper sequence for all daytime operations over VAFB tracking station. These occurred during orbits 16, 32, 47, 63, 79, 94, 110, 126, 142, and 158.

F. THERMAL ENVIRONMENT

The temperatures monitored on TLM during the flight are listed in Table 3-3. Predicted and actual flight temperatures are compared in Figures 3-1 to 3-3.

Average instrument temperatures decreased approximately 18° F from orbit 9 to orbit 158 due to normal orbit plane precession. Instrument temperatured dropped below the 70° F ± 10° by 5° during the "B" operation.

G. PRESSURE MAKE-UP SYSTEM PERFORMANCE

The PMU system operated satisfactorily throughout both missions of the flight. The supply pressure history for the PMU system is shown on Figure 3-4, where the supply pressure decay is plotted as a function of total instrument operate time. The pressure values plotted were obtained from [redacted] acquisitions.

The irregular slope of the curve indicates that gas was passing through the PMU system when the instruments were inoperative.

J-18/1608 FLIGHT CYCLE RATE DATA INSTS. 132/133

REV/MODE	RAMP	T.U.R.	INST 132 ACT.	NOM.	DEV.	INST 133 ACT.	NOM.	DEV.	132/13 DIFF.
9 A	7 4	212	4.920	4.947	0.55	4.920	4.956	0.72	-0.
16 A	7 4	1714	2.262	2.249	-0.58	2.250	2.239	-0.50	-0.53
32 A	7 4	1745	2.270	2.235	-1.56	2.285	2.229	-2.52	0.66
47 A	7 4	1774	2.250	2.224	-1.16	2.270	2.227	-1.91	0.89
63 A	7 4	1835	2.249	2.214	-1.60	2.280	2.225	-2.45	1.38
79 A	7 4	1870	2.260	2.213	-2.13	2.280	2.225	-2.48	0.88
88 B	7 4	417	4.680	4.579	-2.21	4.640	4.587	-1.15	-0.85
94 B	7 4	2157	2.320	2.265	-2.42	2.320	2.255	-2.87	-0.
110 B	7 4	1923	2.252	2.212	-1.79	2.274	2.224	-2.23	0.98
126 B	6 5	1935	2.230	2.211	-0.87	2.270	2.223	-2.13	1.79
142 B	6 5	1974	2.260	2.211	-2.21	2.280	2.223	-2.56	0.88
158 B	6 5	2009	2.310	2.212	-4.44	2.300	2.224	-3.43	-0.43

DEV. AND DIFF. ARE IN PERCENT
THE (-) SIGN INDICATES THAT THE INST IS SLOWER THAN PREDICTED OR THAT INST 1 IS SLOWER THAN INST 2

TABLE [illegible]

[redacted]

CLOCK/SYSTEM TIME CORRELATION

PAYLOAD J-18 VEH 1608 MISSION 1016-1

ORDER FIT 1

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
36932.055	215619.82890	36932.05390	0.00183	9	1
76481.012	255168.79190	76481.01320	-0.00042	16	1
37537.861	302625.64590	37537.86270	-0.00075	25	1
77078.281	342166.06590	77078.27900	0.00218	32	1
38125.745	389613.53890	38125.74750	-0.00213	41	1
72224.753	423712.54790	72224.75330	-0.00003	47	1
33263.768	471151.56890	33263.76980	-0.00117	56	1
72786.652	510674.45990	72786.65710	-0.00476	63	1
33816.371	21233.26390	33816.36860	0.00306	72	1
73347.239	60764.13590	73347.23690	0.00220	79	1

A0=-0.17868775470 06 A1= 0.9999999057330 00

SIGMA=0.00217 NO. POINTS= 10

RATIO OF CLOCK TIME TO SYS TIME= 0.1000000094270 01

ORDER FIT 2

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
36932.055	215619.82890	36932.05580	-0.00003	9	1
76481.012	255168.79190	76481.01390	-0.00111	16	1
37537.861	302625.64590	37537.86230	-0.00040	25	1
77078.281	342166.06590	77078.27800	0.00311	32	1
38125.745	389613.53890	38125.74620	-0.00086	41	1
72224.753	423712.54790	72224.75200	0.00124	47	1
33263.768	471151.56890	33263.76890	-0.00024	56	1
72786.652	510674.45990	72786.65670	-0.00441	63	1
33816.371	21233.26390	33816.36930	0.00236	72	1
73347.239	60764.13590	73347.23870	0.00034	79	1

A0=-0.17868774170 06 A1= 0.9999998355130 00
A2= 0.86343391711050-13

SIGMA=0.00187 NO. POINTS= 10

[redacted]

[redacted]

CLOCK/SYSTEM TIME CORRELATION

PAYLOAD J-18 VEH 160R MISSION 1016-2

ORDER FIT 1

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
34356.167	108173.07190	34356.16260	0.00440	88	1
68521.208	142338.12290	68521.20950	-0.00139	94	1
34875.884	195092.80690	34875.88710	-0.00261	104	1
69034.484	229251.40890	69034.48500	-0.00059	110	1
29946.130	276563.05990	29946.13040	0.00005	119	1
30422.236	363439.17790	30422.23790	-0.00143	135	1
69895.[illegible]	402912.14890	69895.20420	-0.00065	142	1
30880.921	450297.87290	30880.92250	-0.00114	151	1
70364.352	489781.30390	70364.34870	0.00337	158	1

A0=-0.7381689634D 05 A1= 0.999999879748D 00

SIGMA=0.00209 NO. POINTS= 9

RATIO OF CLOCK TIME TO SYS TIME= 0.100000012025D 01

ORDER FIT 2

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV	STA
34356.167	108173.07190	34356.16490	0.00206	88	1
68521.208	142338.12290	68521.21040	-0.00232	94	1
34875.884	195092.80690	34875.88640	-0.00190	104	1
69034.[illegible]	229251.40890	69034.48360	0.00082	110	1
29946.[illegible]	276563.05990	29946.12840	0.00198	119	1
30422.236	363439.17790	30422.23640	0.00007	135	1
69895.203	402912.14890	69895.20340	0.00007	142	1
30880.921	450297.87290	30880.92320	-0.00185	151	1
70364.352	489781.30390	70364.35100	0.00106	158	1

A0=-0.7381688771D 05 A1= 0.999999808715D 00
A2= 0.11866760166740-12

SIGMA=0.00150 NO. POINTS= 9

TABLE 3-3

J-18 TEMPERATURE SUMMARY

SENSOR		ORBITS ACQUIRED																			
Master Camera	Launch + 440	ϕ 09	ϕ 16	ϕ 25	ϕ 32	ϕ 41	ϕ 47	ϕ 56	ϕ 63	ϕ 72	79	88	94	104	110	119	126	135	142	151	158
3	75	70	67	70	64	69	64	67	62	66	62	60	57	58	55	57	56	57	56	59	57
4	76	73	70	74	68	73	68	70	66	68	65	62	60	61	59	59	55	59	59	62	59
5	75	77	74	77	72	75	70	72	68	71	67	63	62	62	61	59	55	59	59	61	59
6	71	80	76	79	74	76	73	73	70	72	68	64	62	61	60	58	59	58	57	58	57
7	73	77	74	76	74	75	70	72	68	70	67	63	63	61	60	59	59	59	59	60	59
8	77	77	74	77	72	77	70	73	68	72	68	65	63	63	61	61	55	59	59	62	60
9	75	83	78	81	75	80	74	76	71	75	69	67	64	65	61	61	61	61	60	61	60
10	74	73	70	73	68	72	67	69	64	68	63	61	60	59	56	58	55	57	56	58	55
11	100	76	73	78	70	76	68	73	66	71	64	61	57	61	57	59	55	59	55	59	55
12	82	75	70	74	70	74	68	72	67	71	65	65	61	64	61	62	60	63	60	64	61
13	77	75	74	74	72	73	70	69	69	68	66	60	62	58	58	56	59	55	58	55	57
AVG	78	76	73	76	71	75	70	71	67	70	66	63	61	61	59	59	57	59	58	60	58
Slave Camera																					
3	75	79	74	79	72	76	70	73	67	71	65	62	58	58	56	56	52	55	53	53	51
4	76	77	73	77	71	77	71	72	67	71	65	62	59	58	56	56	53	55	53	55	52
5	58																				
6	76	77	74	76	72	75	72	72	69	71	68	65	63	63	61	62	60	60	61	62	61
7	73	76	73	75	70	74	69	72	67	71	67	63	61	62	59	59	59	59	58	59	58
8	77	73	70	73	69	73	68	70	65	68	65	61	59	59	60	57	57	57	56	57	55
9	76	73	70	74	70	74	69	72	67	71	67	64	62	63	59	62	60	62	60	62	60
10	75	71	69	72	68	72	66	68	65	66	64	60	59	58	56	57	55	56	54	56	53
11	98	66	63	67	63	67	63	66	61	65	60	57	54	57	54	54	52	55	52	55	52
12	79	75	69	74	69	73	66	70	64	68	62	60	54	58	54	54	52	53	50	53	49
13	75	66	66	66	65	67	64	63	63	62	61	53	56	53	52	51	52	50	51	51	51
AVG	76	74	71	74	70	73	69	70	66	68	65	61	59	59	57	57	56	56	55	57	55
Supply Spool																					
1	72	62	62	64	62	64	62	61	60	60	59	52	53	50	51	48	50	47	48	48	50
2	76	69	67	70	70	68	66	67	63	62	62	57	55	53	52	51	41	50	51	50	50

NOTE: All data corrected for self-heating, except injection.

TABLE 3 - 3

J-18 TEMPERATURE SUMMARY

SENSOR		ORBITS ACQUIRED																			
Fair ("A") Barrel #1 ("B")	Launch + 440	09	16	25	32	41	47	56	63	72	79	88	94	104	110	119	126	135	142	151	158
1	OHB	56	33	61	29	58	29	58	26	58	26	27	30	27	27	27	23	30	23	33	27
2	OHB	26	06	34	06	31	06	34	3	34	6	70	58	74	58	74	58	77	61	83	64
3	OHB	08	04	19	08	16	04	16	4	19	4	86	83	86	80	86	71	86	71	89	71
4	221	61	48	66	45	63	45	60	41	60	41	45	48	42	38	38	28	32	25	32	19
5	227	72	56	77	50	74	46	68	43	68	40	31	28	25	22	22	15	19	12	19	12
6	234	71	61	76	49	73	49	70	39	67	36	--	--	--	--	--	--	--	--	--	--
Barrel No. 2																					
1	142	57	63	62	60	59	54	56	47	53	41	31	31	28	25	25	18	22	15	22	12
2	140	66	75	68	72	65	66	62	60	59	53	43	47	40	37	37	27	30	24	30	17
3	205	88	82	96	82	93	82	93	79	93	82	82	82	85	76	82	73	82	70	85	70
4	227	72	56	81	56	77	59	77	56	81	62	72	59	75	59	75	62	79	66	85	72
5	221	56	50	65	50	62	50	62	53	62	50	50	47	50	40	50	43	53	43	59	47
Conic Adapter																					
1	155	75	69	80	65	77	59	74	53	68	50	40	30	37	24	34	21	27	17	24	14
Clock																					
1	88	68	61	71	61	71	59	69	59	67	57	53	46	53	44	51	44	49	44	51	42
2	94	72	63	75	65	73	59	71	61	71	61	57	51	55	46	55	46	53	46	55	44
Thrust Cone "A" to "B" SRV																					
1	OBH	54	48	46	42	45	42	44	41	44	39	61	59	60	61	59	61	58	58	60	58
2	85	65	64	59	56	57	56	54	53	52	52	63	62	60	64	58	63	57	58	57	58
Stellar/Index "A" to "B"																					
1	85	63	57	68	54	68	54	62	50	62	50	55	55	55	51	51	48	51	48	55	48
2	78	65	60	67	55	64	55	64	52	64	52	55	52	55	49	52	49	52	49	52	46
Recovery Batt. "B" SRV																					
1	77	67	73	75	72	74	70	71	68	70	65	88	88	83	83	83	84	86	86	88	87
Master Cassette "A" SRV																					
2	93	66	57	63	57	63	59	60	59	60	57	--	--	--	--	--	--	--	--	--	--

NOTE: Only Thrust Cone Data corrected for self-heating (exception launch).

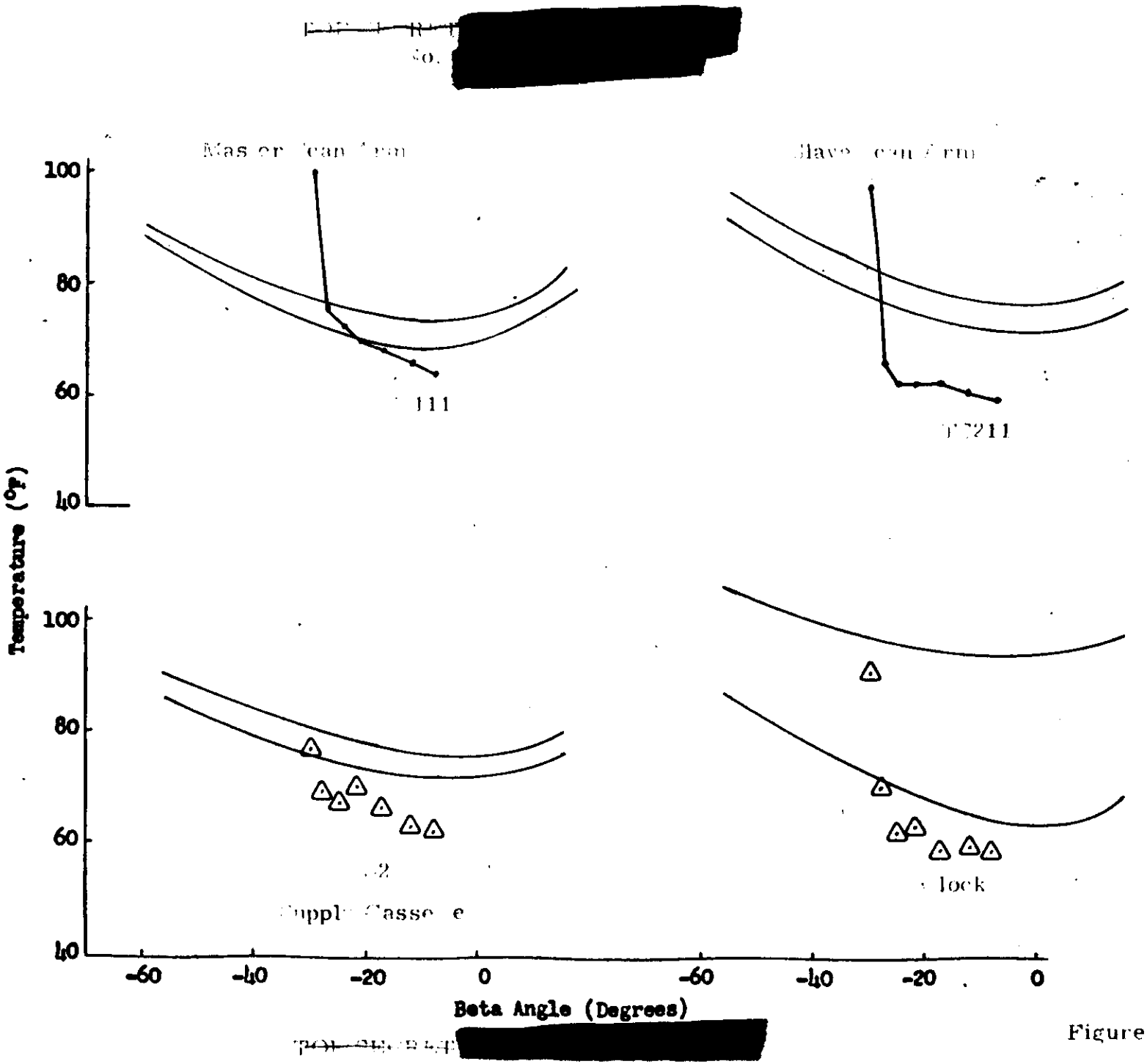

100
80
60
40
Temperature (°F)
111
211
-60
-40
-20
0
Beta Angle (Degrees)

Figure 3-1

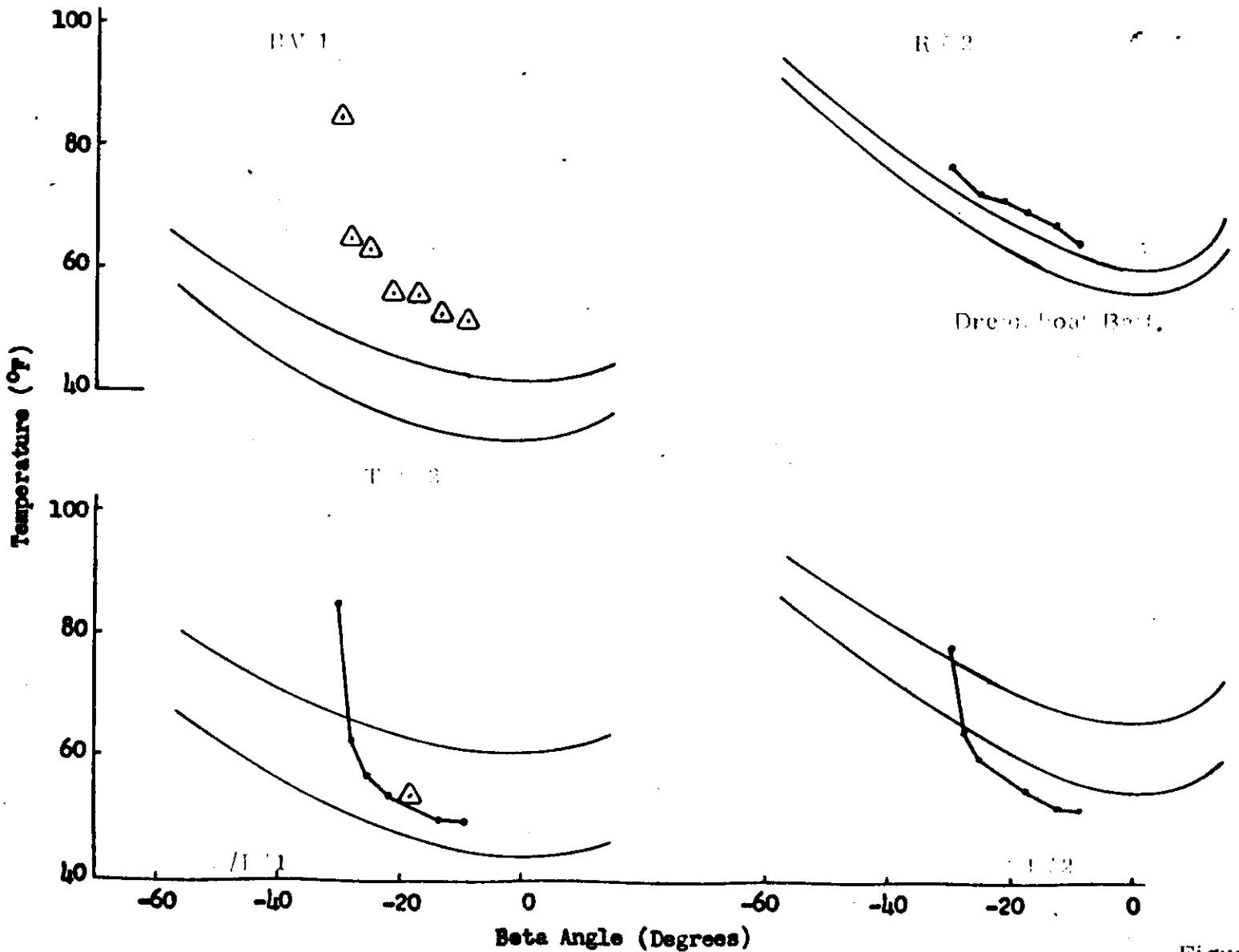


Figure 3-2

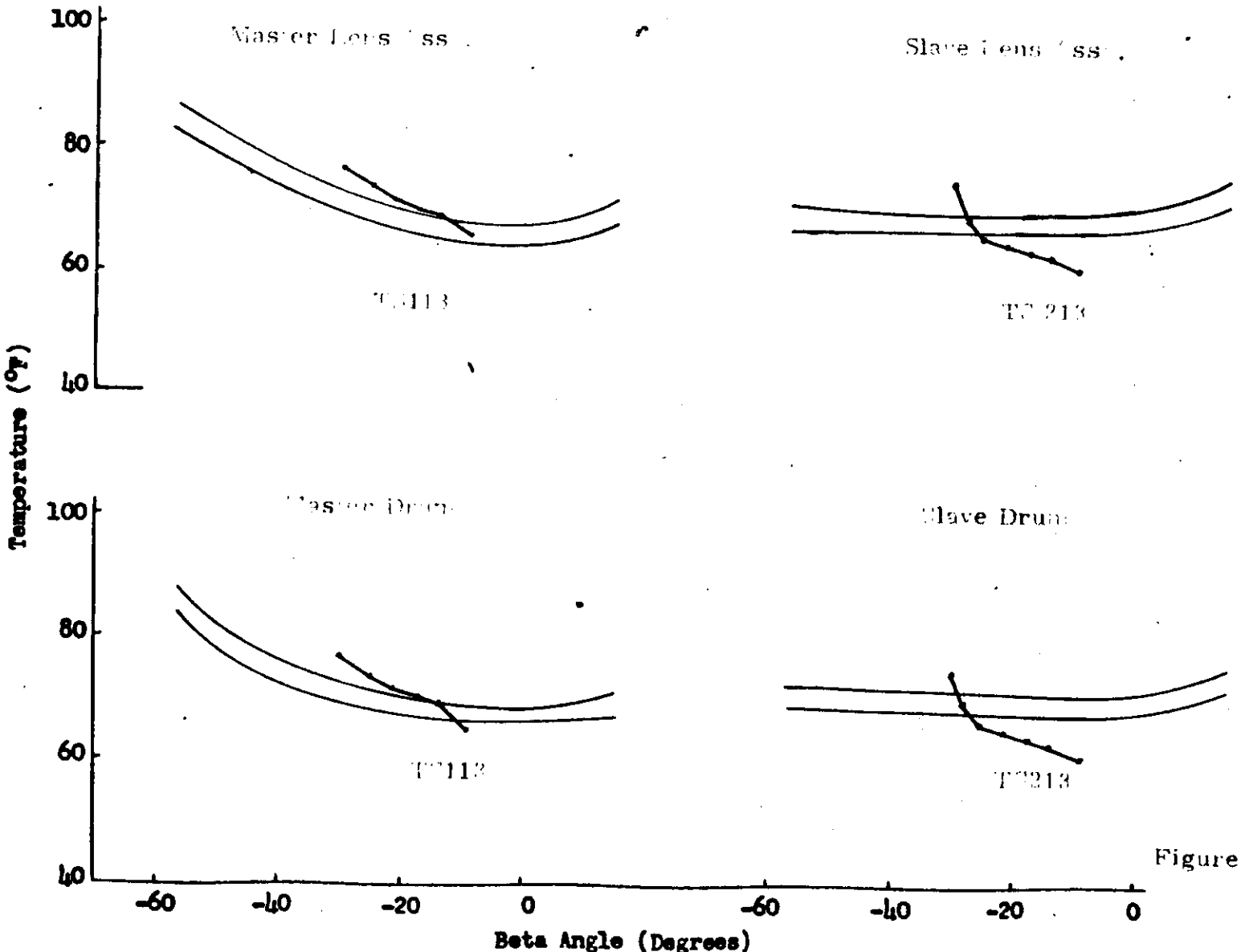

Master Lens Ass'y
Slave Lens Ass'y
T°113
T°213
Master Drum
Slave Drum
T°113
T°213
Temperature (°F)
100
80
60
40
-60
-40
-20
0
Beta Angle (Degrees)

Figure 3-3

[redacted]

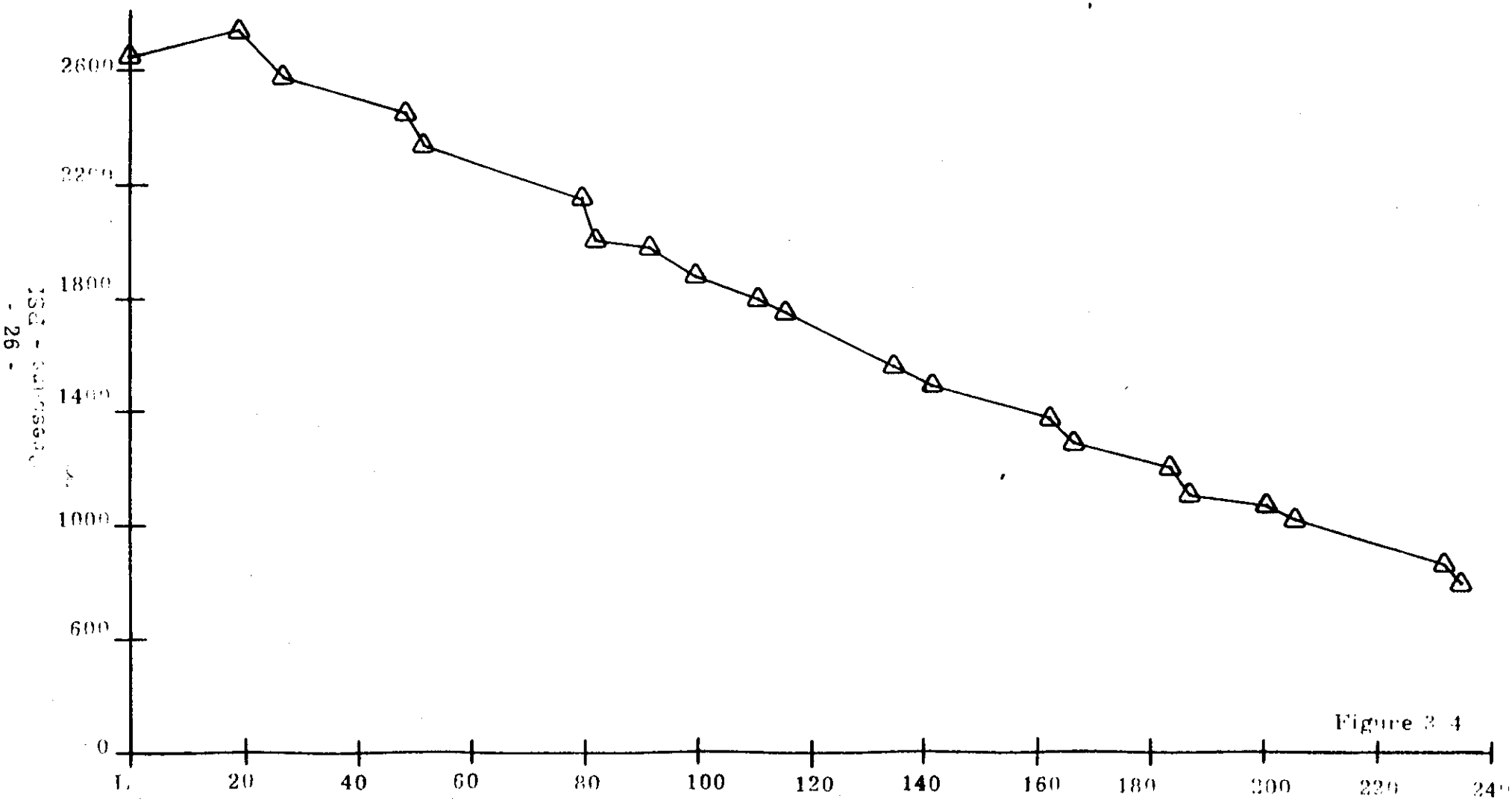


Figure 3-4

[redacted]

SECTION 4

MISSION 1016-1 RECOVERY SYSTEM

SRV #665 was received at A/P on 10 June 1964. The receiving weight was 148.98 pounds. After modifications and incorporation of outstanding E.O.'s, the SRV was delivered to Systems Test for incorporation into the J-18 system.

The capsule was shipped to VAFB on 24 November 1964.

The -1 recovery system was successfully recovered by air catch from orbit 81 at 1557 PST on 20 January 1965. The impact point was within tolerance.

The condition of the recovered capsule was satisfactory with no damage other than normal paint blistering due to the re-entry environment.

Event times are shown in Table 4-1.

MISSION 1016-1

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Actual	Nominal
Transfer	--	--
Electrical Disconnect	1.06	0.900 $^{+0.430}_{-0.400}$
*Separation	2.00	2.0 ± 0.25
**Spin	3.40	3.4 ± 0.30
Retro	7.54	7.55 ± 0.45
Despin	10.74	10.75 ± 0.54
T/C Separation	1.51	1.5 ± 0.15
Parachute Cover Off	34.76	34.0 ± 1.5
Drogue Chute Deployed	0.64	0.63 ± 0.08
Main Chute Bag Separate	10.19	10.14 $^{+0.48}_{-0.40}$
Main Chute Deployed	0.57	0.52 ± 0.13
Main Chute Disreef	4.60	4.46 $^{+0.49}_{-0.29}$

* From Transfer
**From Electrical Disconnect

Spin Rate 66 RPM
Despin Rate 8.8 RPM
Retro Velocity 1022.4 ft./sec.

TABLE 4-1

SECTION 5

MISSION 1016-2 RECOVERY SYSTEM

SRV #666 was received at A/P on 10 June 1964. The receiving weight was 151.24 pounds. After modifications and incorporation of outstanding E.O.'s the unit was delivered to Systems Test for mating to the J-18 system.

The capsule was shipped to VAFB on 24 November 1964.

The -2 recovery system was successfully recovered by air catch from orbit 159 at 1331 PST on 25 January 1965. The impact point was within tolerance.

Event times are shown in Table 5-1.

The condition of the recovered capsule indicated no abnormal re-entry effects.

MISSION 1016-2

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Actual	Nominal
Transfer	--	--
Electrical Disconnect	0.98	$0.900^{+0.430}_{-0.400}$
Separation	2.00	2.0 ± 0.25
Spin	3.37	3.4 ± 0.30
Retro	7.51	7.55 ± 0.45
Despin	10.77	10.75 ± 0.54
T/C Separation	1.43	1.5 ± 0.15
Parachute Cover Off	N/A	34.0 ± 1.5
Drogue Chute Deployed	N/A	0.63 ± 0.08
Main Chute Bag Separate	N/A	$10.14^{+0.48}_{-0.40}$
Main Chute Deployed	N/A	0.52 ± 0.13
Main Chute Disreef	N/A	$4.46^{+0.49}_{-0.29}$

* From Transfer

** From Electrical Disconnect

Spin Rate 70.5 RPM
Despin Rate 6.6 RPM
Retro Velocity 968 ft./sec.

TABLE 5-1

SECTION 6

MASTER PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Main Camera	132
Main Camera Lens	1082435
Supply Horizon Camera	167-B
Supply Horizon Camera Lens	814012
Take-up Horizon Camera	168A
Take-up Horizon Camera Lens	813551
Supply Cassette	SC-23

B. CAMERA DATA AND FLIGHT SETTINGS

Main Camera:	
Lens	24"f/3.5
Slit Width	0.250"
Filter Type	Wratten 25
Film Type	Eastman Type 3404
Supply (Port) Horizon Camera:	
Lens	55 mm f/6.8
Aperture Setting	f/6.8
Exposure Time	1/100 second
Filter Type	Wratten 25
Take-up (Starboard) Horizon Camera:	
Lens	55 mm f/6.8
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25