~~TOP SECRET~~ C/[redacted]
NO. [redacted]

21 September 1967

TO: [redacted]

THRU: [redacted]

From: [redacted]

SUBJECT: MISSION 1036-1 and 1036-2 FINAL REPORT

Enclosed is the Final Performance Evaluation Report for Mission 1036-1 and 1036-2.

[redacted]
Manager
Advanced Projects

~~TOP SECRET~~ C/[redacted]

CORONA J

PERFORMANCE EVALUATION REPORT

MISSION 1036-1 and 1036-2

FTV 1631, J-32

30 JUNE 1967

Approved [redacted] Manager
Advanced Projects

Approved [redacted] Mgr.
Program

FOREWORD

This report details the performance of the payload system during the operational phase of the Program [redacted] Flight Test Vehicle 1631.

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 1036-1 and 1036-2 which was launched on 9 August 1966.

TABLE OF CONTENTS

	Page
TITLE PAGE	
FORWARD	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iii
LIST OF ILLUSTRATIONS	iv
INTRODUCTION	1
SECTION 1 - SYSTEM PERFORMANCE	2
SECTION 2 - PRE-FLIGHT SYSTEMS TEST	5
SECTION 3 - FLIGHT OPERATIONS	13
SECTION 4 - MISSION 1036-1 RECOVERY SYSTEM	26
SECTION 5 - MISSION 1036-2 RECOVERY SYSTEM	28
SECTION 6 - MASTER (FWD) PANORAMIC CAMERA	30
SECTION 7 - SLAVE (AFT) PANORAMIC CAMERA	33
SECTION 8 - PANORAMIC CAMERA EXPOSURE	36
SECTION 9 - DIFFUSE DENSITY MEASUREMENTS	49
SECTION 10 - PERFORMANCE MEASUREMENTS	53
SECTION 11 - MISSION 1036-1 STELLAR-INDEX CAMERA	54
SECTION 12 - MISSION 1036-2 STELLAR-INDEX CAMERA	56
SECTION 13 - VEHICLE ATTITUDE	58
SECTION 14 - IMAGE SMEAR ANALYSIS	71
SECTION 15 - RADIATION DOSAGE	85
SECTION 16 - RELIABILITY	86
SECTION 17 - SUMMARY DATA	91
SECTION A - APPENDIX	100

LIST OF TABLES

Table		Page
2-1	J-32 TASC Pan Cycle Rates	10-11
2-2	J-32 TASC Clock Correlation Data	12
3-1	Flight Cycle Period Data	16
3-2	Clock/System Correlation	17-18
3-3	Mission Temperature Summary	19-20
4-1	Mission 1036-1 Recovery Sequence	27
5-1	Mission 1036-2 Recovery Sequence	29
9-1	Processing - Exposure Summary	52
14-1	Mission 1036 V/h Ratio and Resolution Limits	72
16-1	Estimated Reliability Summary	88-90
17-1	Mission Summary	92-93
17-2	Performance Summary	94-96
17-3	Exposure - Processing Summary	97-99
A-1	Mission 1036-1 FWD Camera Density Distribution	A1 - A6
A-2	Mission 1036-1 AFT Camera Density Distribution	A19 - A24
A-3	Mission 1036-2 FWD Camera Density Distribution	A34 - A39
A-4	Mission 1036-2 AFT Camera Density Distribution	A49 - A54

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Mission 1036 Inboard Profile	4
2-1	Master Camera Pre-Flight Resolution	8
2-2	Slave Camera Pre-Flight Resolution	9
3-1 to 3-3	System Temperatures Predicted vs Actual	21-23
3-4 & 3-5	Ascent Heating Plot	24-25
8-1	Mission 1036-1 Solar Elevations	37
8-2	Mission 1036-1 Solar Azimuth	38
8-3	Mission 1036-2 Solar Elevations	39
8-4	Mission 1036-2 Solar Azimuth	40
8-5 to 8-12	Nominal Exposure Points	41-48
9-1	Density Range Chart	51
13-1 to 13-6	Mission 1036-1 Attitude Angle & Rate Error Distributions	59-64
13-7 to 13-12	Mission 1036-2 Attitude Angle & Rate Error Distributions	65-70
14-1 to 14-6	Mission 1036-1 V/H Error & Resolution Limits Distribution	73-78
14-7 to 14-12	Mission 1036-2 V/H Error & Resolution Limits Distribution	79-84
A-1 to A-12	Mission 1036-1 FWD Camera Density Distribution Plots	A7-A18
A-13 to A-21	Mission 1036-1 AFT Camera Density Distribution Plots	A25-A33
A-22 to A-30	Mission 1036-2 FWD Camera Density Distribution Plots	A40-A48
A31 to A-39	Mission 1036-2 AFT Camera Density Distribution Plots	A55-A63

INTRODUCTION

This report presents the final performance evaluation of Missions 1036-1 and 1036-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the J-32 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 1036, placed into orbit by Flight Test Vechicle #1631 and THORAD Booster #506, 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 equipment. Figure 1-1 presents an inboard profile of the J-32 payload system. This Corona "J" system is designed to acquire search and reconnaissance photography of selected areas of the earth from orbital altitudes. A six day -1 mission and a seven day -2 mission was planned.

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 2046:03 Z (1346:03 PDT) on 9 August 1966. 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 1036-1 consisted of a 7 day operation and was completed by air recovery on 16 August 1966. Mission 1036-2 was completed with an air recovery on 22 August 1966 following a 6 day photographic operation.

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

ORBITAL PARAMETERS

Parameter	Predicted	Orbit 56 Actuals
Period (Min.)	89.48	89.323
Perigee (N.M.)	105.1	102.399
Apogee (N.M.)	164.9	159.830
Inclination (Deg.)	100.2	100.114
Perigee Latitude (Deg. N.)	14.025	22.919
Eccentricity	0.008362	0.00804

C. PANORAMIC CAMERAS

The Master instrument produced good image quality. The image quality was better on the -2 mission due to less atmospheric haze.

The Slave instrument operated satisfactorily and produced slightly better imagery than the Master.

D. STELLAR-INDEX CAMERAS

The "A" S/I operated satisfactorily and most Stellar images appear as points rather than the usual odd shaped stars.

The "B" S/I operated normally.

The base plus fog density of the -1 and -2 Stellar film was unusually high at 0.54 density units.

E. OTHER SUB-SYSTEMS

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

SCHEMATIC INBOARD PROFILE - CORONA J-32 SYSTEM

MISSION 1036

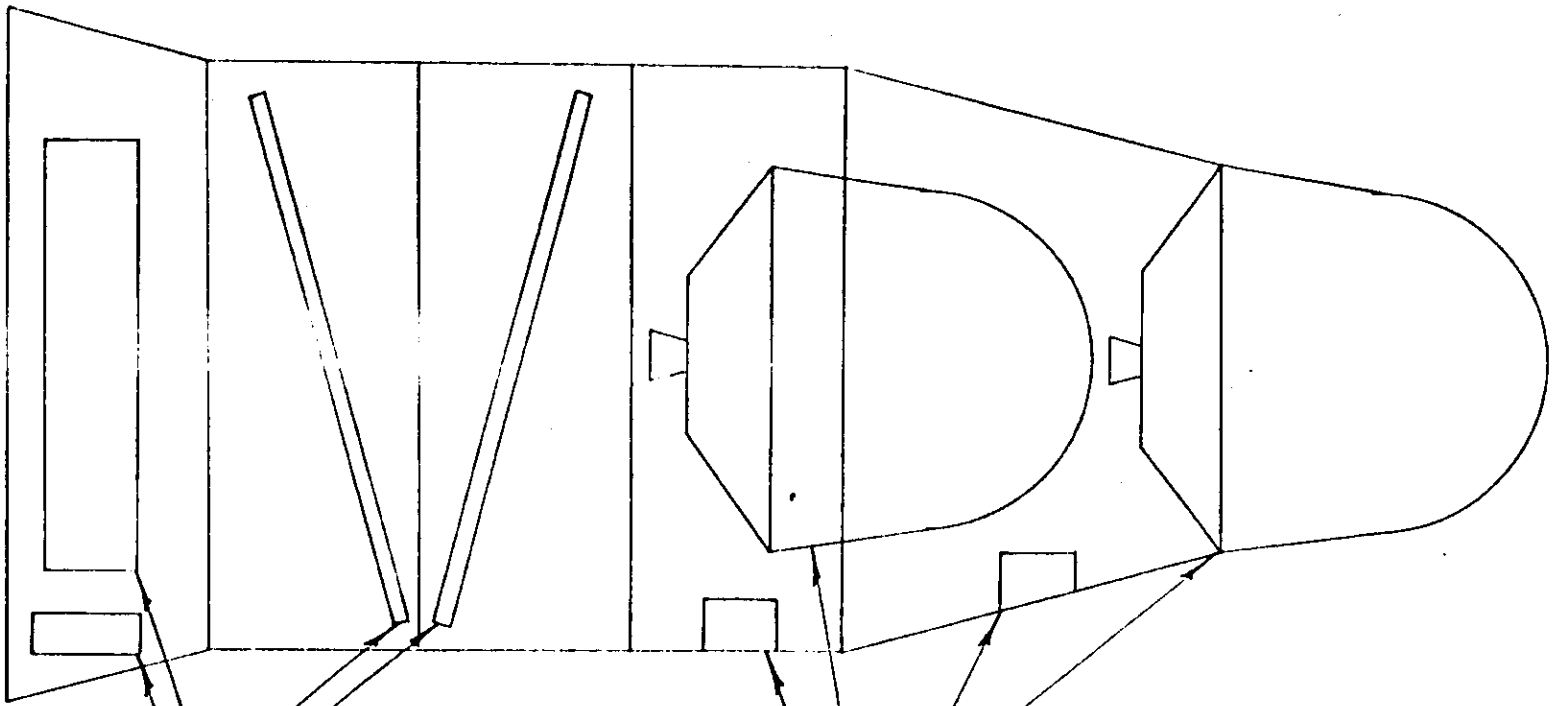


FIGURE 1-1

SECTION 2

PRE-FLIGHT SYSTEMS TESTS

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-32 payload system was subjected to an environmental TASC Chamber test from January 7 through January 14, 1966.

Performance of the payload system was generally satisfactory except for excessive corona marking on the payload of the Master and Slave instruments. The input and output metering rollers were replaced and the system was returned to the test chamber on 9 February. Five orbits of dynamic instrument operations were conducted in the "A" mode only. There were 1200 cycles of payload exposed during the test. The corona markings met specifications.

The panoramic instruments operated satisfactorily. Instrument cycle periods varied from 2.8% fast to 2.5% slow. Cycle period data are tabulated in Table 2-1. The new DYMEC cycle period equipment was utilized for the first time and it compared closely ($\pm$0.5%) with the Sanborn records. This equipment produces a continuous record of cycle period and V/h voltage. Analysis of the DYMEC data revealed that the panoramic cameras increased their rate by approximately 1% between the tenth and fortieth cycle.

The shutter in Stellar camera #106 failed to open during the first TASC run. The shutter was replaced and the S/I cameras operated satisfactorily during TASC test 2.

The clock accuracy was satisfactory. The clock/IRIG time correlation is shown in Table 2-2.

The pressure make-up system operated normally. Average gas consumption was 4.9 lbs/min.

The command system functioned properly for both bucket tests with no evidence of any malfunctions.

Cut/wrap and switchover to the "B" recovery sequence was normal.

B. RESOLUTION TEST

Resolution and theodolite tests were performed on 24 January 1966. Results of the thru-focus resolution tests of pan instruments 190 and 191 show the following characteristics:

Master Pan Instrument No. 190

Maximum high contrast resolution 168 lines/mm at +.001 focal position.

Maximum low contrast resolution 106 lines/mm at -.001 focal position.

Slave Instrument No. 191

Maximum high contrast resolution 172 lines/mm at 0.000 focal position.

Maximum low contrast resolution 112 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 J-32 system was tested for light leaks on 2 March and 4 March 1966. The reason for the second test was a light leak in a H.O. boot of both instruments. The second light leak test proved that the system was L/L acceptable.

D. FLIGHT LOADING AND CERTIFICATION

J-32 system was shipped by trailer truck from A/P to VAFB, 1 August 1966, as the first Interim Phase III Factory to PAD delivery.

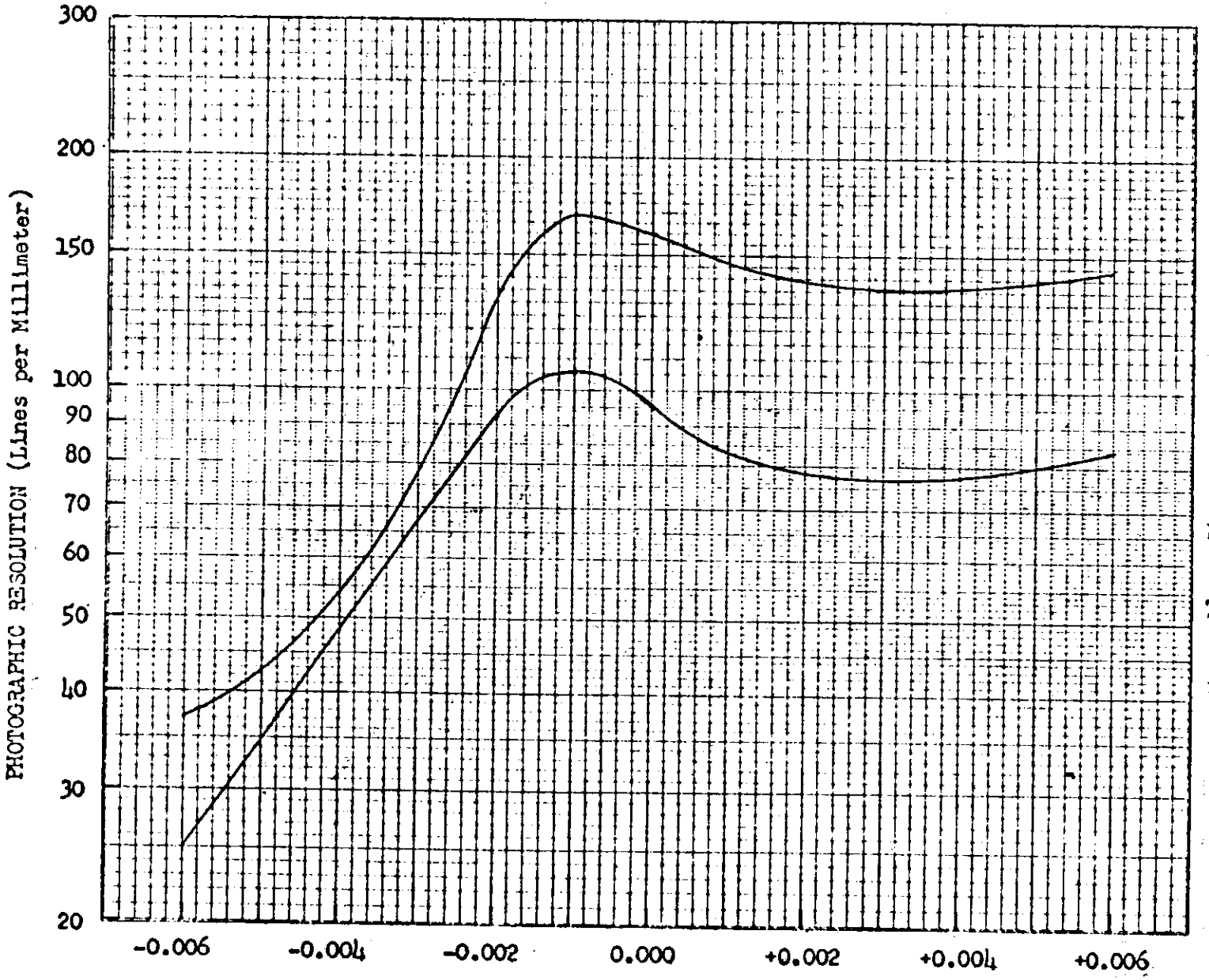
On 2 August, the system was available in the shipping trailer for inspection at the L Building. All access and camera doors were removed and the Master and Slave camera film paths examined. It was noted that the Master camera film was normally taut from supply to take-up cassette with the film riding over each roller in an acceptable manner. The Slave camera film was noticeably loose between the supply cassette and the input metering roller, but normally taut between the input metering roller and the take-up cassette. It appears that approximately 1 to 2 inches of film were pulled from the Slave supply spool during shipment to VAFB. The loose film in the Slave camera necessitated a rigorous examination, through access doors, of the entire film path to assure acceptable film thread-up before and during camera operation. Both the Master and Slave film tracked properly throughout the film path during camera operation. No special corrective action was necessary.

The shutters of the four horizon cameras and the two Stellar/Index cameras appeared to open and close normally.

The four horizon camera boots, stellar baffles, and stellar boots were all painted dull black at A/P and rated acceptable for flight when examined for the last time at VAFB.

Interrogation of J-32 telemetry points demonstrated that no significant change occurred in system performance during camera operation at VAFB compared to camera operation at A/P.

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 190

Payload No: J-32

Resolution (1/mm)

High Contrast: 168

Low Contrast: 106

Film Type: 3404

Test Date: 1/27/66

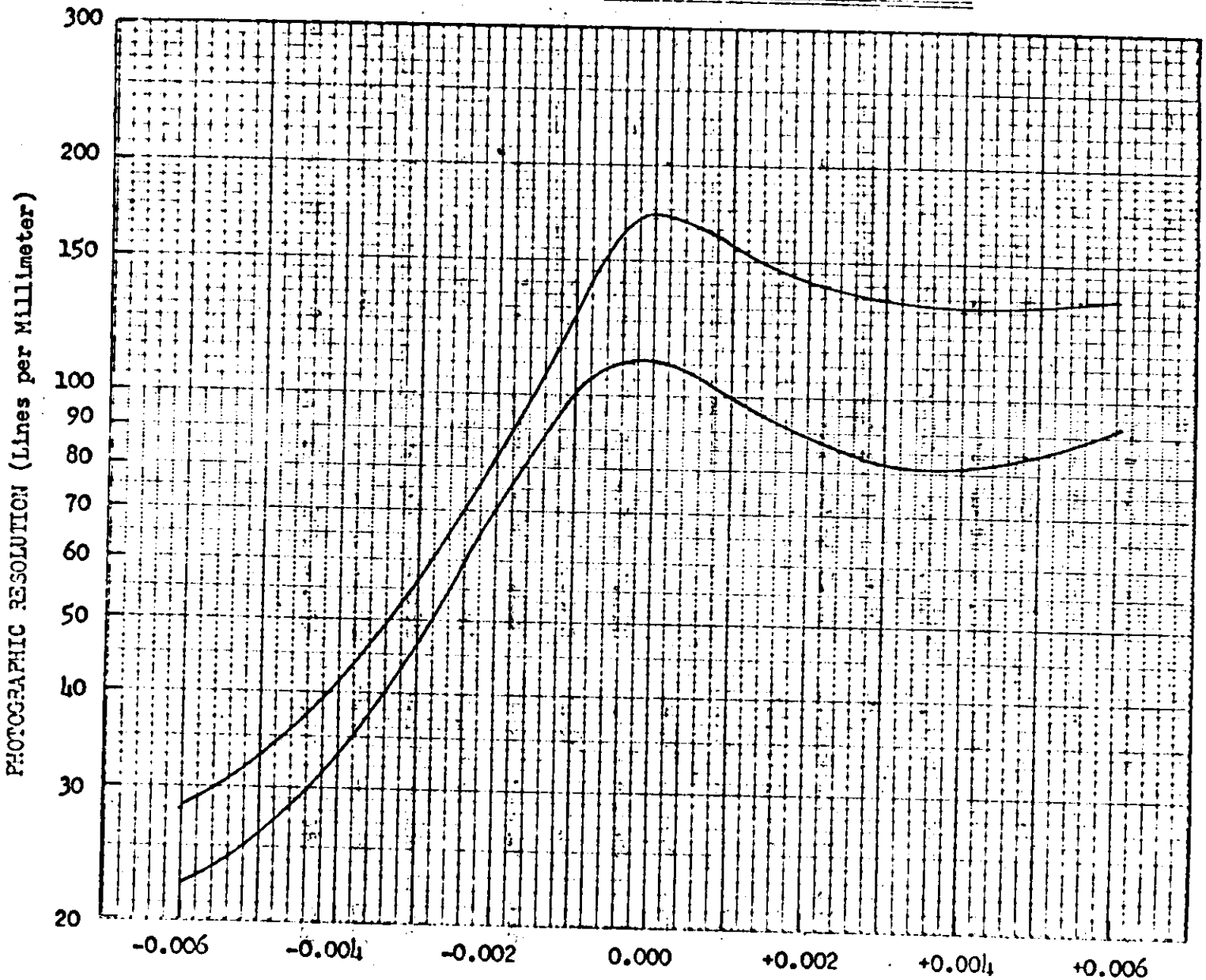
FIGURE 2-1

1A 1 07 7 3513 3551 60296

REV/MODE		RAMP	T.U.R.	INST 190 ACT.	CAL.	DEV.	INST 191 ACT.	CAL.	DEV.	190/19 DIFF.
11A	1	7	7 -0	3.514	3.550	1.00F	3.549	3.576	0.75F	1.00
11A	1	7	7 -0	3.513	3.550	1.03F	3.550	3.576	0.72F	1.05
11A	2	7	7 -0	3.547	3.550	0.07F	3.571	3.576	0.14F	0.68
11A	2	7	7 -0	3.531	3.550	0.52F	3.552	3.576	0.67F	0.59
11A	2	7	7 -0	3.526	3.550	0.95F	3.550	3.576	0.72F	0.97
11A	3	8	2 915	3.452	3.456	0.10F	3.481	3.481	0.01S	0.84
11A	3	8	2 976	3.301	3.313	0.37F	3.327	3.337	0.29F	0.79
11A	3	8	2 1068	3.095	3.116	0.66F	3.113	3.136	0.74F	0.58
11A	3	8	2 1150	2.915	2.932	0.58F	2.935	2.950	0.50F	0.69
12A	1	8	2 1761				2.189	2.206	0.77F	
12A	1	8	2 1818				2.175	2.203	1.29F	
12A	1	8	2 1890				2.170	2.202	1.44F	
12A	2	8	2 457	4.680	4.710	0.63F	4.719	4.744	0.52F	0.83
12A	2	8	2 574	4.340	4.380	0.91F	4.370	4.413	0.97F	0.69
12A	2	8	2 714	3.940	3.981	1.03F	3.977	4.012	0.86F	0.94
12A	2	8	2 860	3.561	3.591	0.84F	3.594	3.618	0.66F	0.93
13A	1	4	1 -0	4.346	4.323	0.53S	4.377	4.356	0.49S	0.71
13A	1	4	1 -0	4.325	4.323	0.05S	4.367	4.356	0.26S	0.97
13A	1	4	1 -0	4.312	4.323	0.26F	4.356	4.356	0.01S	1.02

TABLE 2-1

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 191

Payload No: J-32

Resolution (1/mm)

High Contrast: 172

Low Contrast: 112

Film Type: 3404

Test Date: 1/27/66

FIGURE 2-2

REV/MODE	RAMP	T.C.R.	INST 190 ACT.	CAL.	DEV.	INST 192 ACT.	CAL.	DEV.	190/19 DIFF.
13A 2	11	1710	2.337	2.317	0.85S	2.353	2.323	1.27S	0.68
13A 2	11	1745	2.293	2.296	0.12F	2.314	2.301	0.56S	0.92
13A 2	11	1772	2.281	2.282	0.04F	2.294	2.287	0.29S	0.67
13A 3	11	1790	2.242	2.274	1.41F				
13A 3	11	1817	2.234	2.264	1.34F				
13A 4	11	1858	2.241	2.254	0.57F	2.277	2.259	0.82S	1.61
13A 4	11	1873	2.247	2.251	0.19F	2.265	2.256	0.40S	0.80
13A 5	11	1885				2.246	2.254	0.38F	
13A 5	11	1903				2.236	2.253	0.76F	
13A 6	11	1936	2.256	2.248	0.43S	2.251	2.253	0.09F	-0.31
13A 6	11	1968	2.249	2.252	0.12F	2.258	2.256	0.07S	0.40
13A 6	11	1977	2.245	2.253	0.37F	2.256	2.258	0.09F	0.49
14A 1	11	2821	3.894	3.863	0.80S	3.912	3.893	0.50S	0.46
14A 1	11	2889	4.105	4.122	0.42F	4.135	4.154	0.45F	0.73
14A 1	11	2975	4.473	4.493	0.44F	4.512	4.526	0.31F	0.87
14A 1	11	3074	4.957	4.982	0.50F	5.007	5.016	0.19F	1.01
PS 1	8	2 C	5.464	5.419	0.84S	5.484	5.452	0.58S	0.37
PS 1	8	2 C	5.418	5.419	0.01F	5.457	5.452	0.09S	0.72
PS 1	8	2 C	5.406	5.419	0.23F	5.445	5.452	0.13F	0.72
PS 1	8	2 C	5.394	5.419	0.46F	5.437	5.452	0.28F	0.80

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

TABLE 2-1

J-32 CLOCK CORR. TASC TEST NO. 1

REV	IRIG DAY-HR-MIN-SEC	IRIG SECONDS	CLOCK SECONDS	DELTA IRIG	DELTA CLOCK	ERROR
01	8 8 48 12.390	722892.390	80744.249	---	---	---
02	8 11 25 48.080	732348.080	90199.944	9455.690	9455.695	0.005
04	8 13 28 58.680	739738.680	97590.530	7390.600	7390.586	-0.014
05	8 15 37 48.175	747468.175	105320.034	7729.495	7729.504	0.009
07	9 10 3 56.550	813836.550	171688.378	66368.375	66368.344	-0.031
09	9 12 49 9.235	823749.235	181601.052	9912.685	9912.674	-0.011
11	10 6 25 37.860	894337.860	252189.735	70588.825	70588.682	0.058
13	10 11 14 13.031	904453.031	262304.895	10115.171	10115.160	-0.011
15	11 9 1 43.790	982903.790	340755.619	78450.758	78450.723	-0.035
16	11 11 57 8.300	993428.300	351280.142	10524.510	10524.523	0.013
01	11 14 33 55.925	1002835.925	360687.749	9407.625	9407.607	-0.018
02	12 8 53 6.290	1068786.290	426638.168	65950.364	65950.419	0.055
03	12 10 26 26.398	1074386.398	432238.277	5600.108	5600.109	0.001
04	12 11 57 16.537	1079836.537	437688.408	5450.139	5450.131	-0.008
07	13 8 57 59.138	1155479.138	513331.016	75642.600	75642.607	0.007
09	13 11 43 14.230	1165394.230	523246.107	9915.092	9915.091	-0.001
12	13 15 23 21.520	1178601.520	536453.388	13207.290	13207.281	-0.009
	5 6 35 9.130-DELTA TIME			TOTAL ACCUM. ERROR		0.009

TABLE 2-2

SECTION 3

FLIGHT OPERATIONS

A. SUMMARY

All launch, ascent, and injection events occurred as programmed which resulted in achieving the desired orbit. The Agena tape recorder was used to record ascent thermal environment but failed 127 seconds into the ascent phase.

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

The pressure make-up system operated satisfactorily throughout the flight ending with 340 PSIA supply remaining.

The -1 and -2 Stellar/Index cameras, the clock, and the command system operated properly throughout the flight.

The instrumentation system operated properly throughout the flight except an intermittent accelerometer on ascent and the effects of the Agena tape recorder on commutated channels 11 and 13.

The internal environment was within tolerance throughout the flight. An ascent fairing temperature profile was obtained.

Both recovery systems operated properly. However 7 to 8 amps of current was present on the regulated return for 0.8 seconds from "A" bucket transfer to electrical disconnect.

B. PANORAMIC CAMERA PERFORMANCE

The camera system dynamics were normal on all engineering operations observed throughout the mission. The film transport system was smooth and had 99/101 clutch ratios of 6/6 for both instruments. Cycle rate data (Table 3-1) was less than 2 per cent from the pre-flight calibrations. The individual instrument rates matched to less than 0.5%. This close match of the individual rates was reflected in the overall consumption depleting the supply only 10 frames apart. The film supply was depleted on orbit 211, the last operate prior to the second recovery.

Panoramic Film Consumption

	Actual	
	Master	Slave
Sample - Off Spooling	19	19
Pre-Launch	147	142
-1 Mission	2905	2904
-2 Mission	2996	3001
Total	6067	6066

FMC Match

The V/H ramp to orbit match was acceptable throughout the flight. The following settings of RTC 6, 8 and 10 were used to attain the best match during the mission:

RTC 6	8	10	Remarks
6	7	6	Launch settings for nominal orbit.
6	6	6	Changed at Rev. 4, [redacted] to compensate for orbit dispersions at launch.
5	7	6	Changed at Rev. 14, [redacted] This change was based on more optimum orbital elements than was available for the previous change.
5	6	7	Changed at Rev. 30, [redacted] Required to compensate for orbit decay. This setting was satisfactory for rest of flight.

C. STELLAR/INDEX CAMERA PERFORMANCE

The -1 Stellar/Index camera operation was normal throughout the mission with telemetry indicating proper shutter, meter, programmer, and slew functions.

The -2 Stellar/Index operation was normal throughout the mission. Telemetry indicated proper shutter, meter, programmer and slewing functions. A post flight report indicated that the recovered length of the slewed index material was short

D. INSTRUMENTATION AND COMMAND SYSTEM PERFORMANCE

The instrumentation system operated properly throughout the flight except for one ascent accelerometer and the Agena tape recorder. The Agena tape recorder failed and lost power 126 seconds after lift-off. This caused severe loading to data connected to the input. Channel 11, temperature data, was affected on launch and several orbits for short periods of time. Channel 13, payload status was affected from orbit 115 thru orbit 118 and required command selector position verification from the Link II backup channel. This condition for channel 13 occurred again on orbit 212 and remained until orbit 215.

The radial accelerometer mounted on the transfer box cover became intermittent on ascent and produced unreliable data.

The command system operated properly throughout the mission. The mono-overlap delay operated properly at 12.0 seconds.

E. CLOCK SYSTEM PERFORMANCE

The payload clock system performed satisfactorily throughout the mission. The clock/system time correlation data obtained from the [redacted] acquisitions are included in Table 3-2.

F. PRESSURE MAKE-UP SYSTEM PERFORMANCE

The pressure make-up system performed satisfactorily throughout the mission. The mission consumed 2210 PSIA supply pressure for a duration of 239 minutes of operate. This resulted in an average consumption of 9.25 PSIA/minute.

G. THERMAL ENVIRONMENT

Temperature data obtained from the [redacted] acquisitions are contained in Table 3-3. Average master instrument temperatures started at 77°F and ended at 65°F through the flight. The average Slave instrument temperature range was from 73° to 61°.

Specific temperature plots vs Beta angle are included in Figures 3-1, 3-2, and 3-3.

Thermal environment of the fairing and aft barrel were recorded from Link II during ascent. These temperatures are summarized in Figures 3-4 and 3-5.

J-32 190/191 FLIGHT CYCLE PERIOD DATA 8/1/66 THRU 8/22/66

REV. MODE	OP	RAMP R	RAMP A	TUR SECS	SYSTEM CALIB.	INST. 190 ACTUAL	INST. 190 UNIT DEV.	INST. 190 SYSTEM DEV.	INST. 191 ACTUAL	INST. 191 UNIT DEV.	INST. 191 SYSTEM DEV.	190/191 DIFF.
008	A	6	6	40	3.590	3.630	1.49S	1.12S	3.645	1.16S	1.54S	0.41
016	A	5	7	1605	2.309	2.342	1.55S	1.42S	2.365	2.29S	2.42S	0.98
032	A	5	6	1540	2.274	2.300	1.27S	1.16S	2.300	1.04S	1.16S	-0.00
048	A	5	6	1600	2.243	2.247	0.30S	0.20S	2.247	0.10S	0.20S	-0.00
064	A	5	6	1655	2.219	2.257	1.58S	1.69S	2.260	1.77S	1.83S	0.13
081	A	5	6	1700	2.217	2.250	1.37S	1.49S	2.260	2.06S	1.94S	0.44
105	A	5	6	190	3.387	3.415	1.17S	0.91S	3.428	0.84S	1.20S	0.38
113	A	5	6	1730	2.216	2.225	0.30S	0.42S	2.225	0.54S	0.42S	-0.00
121	B	5	6	230	3.372	3.410	1.48S	1.12S	3.413	0.85S	1.21S	0.09
129	B	5	6	1770	2.214	2.250	1.49S	1.61S	2.255	1.96S	1.84S	0.22
145	B	5	6	2033	2.213	2.235	0.85S	0.98S	2.230	0.88S	0.75S	-0.22
161	B	5	6	1895	2.212	2.232	0.77S	0.91S	2.228	0.86S	0.72S	-0.18
178	B	5	6	1850	2.212	2.250	1.57S	1.70S	2.245	1.60S	1.47S	-0.22

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 SUMMARY

ORDER FIT 1

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV
0.245248450 05	0.132243629D 06	0.245248549D 05	-0.0099	7
0.743750210 05	0.182093788D 06	0.743750178D 05	0.0032	16
0.291158600 05	0.223234637D 06	0.291158700D 05	-0.0100	24
0.737762980 05	0.267895058D 06	0.737762945D 05	0.0034	32
0.285089080 05	0.309027674D 06	0.285089137D 05	-0.0057	40
0.731664040 05	0.353685160D 06	0.731664032D 05	0.0008	48
0.278849080 05	0.394803666D 06	0.278849124D 05	-0.0044	56
0.726884910 05	0.439607238D 06	0.726884879D 05	0.0031	64
0.273676980 05	0.480686453D 06	0.273677061D 05	-0.0081	72
0.771492720 05	0.530468008D 06	0.771492650D 05	0.0070	81
0.269161730 05	0.297639950D 05	0.269161668D 05	0.0062	89
0.318437930 05	0.346916160D 05	0.318437882D 05	0.0048	89
-0.766806330 05	0.795284490D 05	0.766806247D 05	0.0083	97
0.261469430 05	0.115394762D 06	0.261469405D 05	0.0025	104
0.757236780 05	0.164971493D 06	0.757236754D 05	0.0026	113
0.305388960 05	0.206186707D 06	0.305388926D 05	0.0034	121
0.749812550 05	0.250629062D 06	0.749812511D 05	0.0039	129
0.297657530 05	0.291813557D 06	0.297657493D 05	0.0037	137
0.741907500 05	0.336238550D 06	0.741907458D 05	0.0042	145
0.288316400 05	0.377279438D 06	0.288316370D 05	0.0030	153
0.733812680 05	0.421829065D 06	0.733812675D 05	0.0005	161
0.334349240 05	0.466282718D 06	0.334349241D 05	-0.0001	169
0.778188460 05	0.512666638D 06	0.778188476D 05	-0.0016	178
0.272714060 05	0.116482810D 05	0.272714054D 05	0.0006	185
0.769175060 05	0.612943840D 05	0.769175122D 05	-0.0062	194
0.263704790 05	0.971473530D 05	0.263704840D 05	-0.0050	201
0.762020880 05	0.146078963D 06	0.762020979D 05	-0.0099	210

A0=-0.1077187844D 06 A1= 0.100000007811D 01
SIGMA=0.00526 NO. POINTS= 27
RATIO OF CLOCK TIME TO SYS TIME= 0.999999921890D 00

ORDER FIT 2

SYS TIME I/P	CL TIME I/P	COMP SYS TM	DELTA ST	REV
0.245248450 05	0.132243629D 06	0.245248470D 05	-0.0020	7
0.743750210 05	0.182093788D 06	0.743750120D 05	0.0090	16
0.291158600 05	0.223234637D 06	0.291158658D 05	-0.0058	24
0.737762980 05	0.267895058D 06	0.737762918D 05	0.0062	32
0.285089080 05	0.309027674D 06	0.285089123D 05	-0.0043	40
0.731664040 05	0.353685160D 06	0.731664031D 05	0.0009	48
0.278849080 05	0.394803666D 06	0.278849133D 05	-0.0053	56
0.726884910 05	0.439607238D 06	0.726884897D 05	0.0013	64
0.273676980 05	0.480686453D 06	0.273677086D 05	-0.0106	72
0.771492720 05	0.530468008D 06	0.771492682D 05	0.0038	81
0.269161730 05	0.297639950D 05	0.269161704D 05	0.0026	88
0.318437930 05	0.346916160D 05	0.318437919D 05	0.0011	89
0.766806330 05	0.795284490D 05	0.766806287D 05	0.0043	97
0.261469430 05	0.115394762D 06	0.261469446D 05	-0.0016	104
0.757236780 05	0.164971493D 06	0.757236795D 05	-0.0015	113
0.305388960 05	0.206186707D 06	0.305388966D 05	-0.0006	121
0.749812550 05	0.250629062D 06	0.749812547D 05	0.0003	129
0.297657530 05	0.291813557D 06	0.297657525D 05	0.0005	137
0.741907500 05	0.336238550D 06	0.741907484D 05	0.0016	145

TABLE 3-2

0.288316400 05	0.377274[illegible] 06	0.2883163890 05	0.0011	193
0.733812680 05	0.421829965D 06	0.7338126840 05	-0.0034	161
0.334349240 05	0.468282718D 06	0.3343492390 05	0.0001	169
0.778188460 05	0.512666638D 06	0.7781884620 05	-0.0002	178
0.272714060 05	0.116482310D 05	0.2727140280 05	0.0032	195
0.769175060 05	0.612043840D 05	0.7691750800 05	-0.0020	194
0.263704790 05	0.271473530D 05	0.2637047840 05	0.0006	201
0.762020880 05	0.146978960D 06	0.7620209030 05	-0.0023	210

A0=-0.1077187980D 06 A1= 0.1000000132540 01
A2=-0.4007009760564D-13
SIGMA=0.00373 NO. POINTS= 27
$IBSYS

TABLE 3-2

TABLE 3-3

J-32 TEMPERATURE SUMMARY

SENSOR	ORBITS ACQUIRED																								
Master Camera	1	16	24	32	40	48	56	64	72	81	88	97	104	A 113	B 121	129	137	145	153	161	169	178	185	194	201	210
3	71	65	70	62	68	65	70	64	70	65	69	67	70	64	68	58	64	57	64	60	65	57	64	58	64	60
4	76	69	73	67	72	69	74	68	73	69	73	70	73	69	71	63	69	62	69	65	70	61	69	62	69	65
5	81	75	79	73	78	75	80	75	80	75	79	77	80	76	77	70	75	68	75	71	76	68	75	70	76	71
6	77	72	75	71	75	73	76	73	76	74	75	75	76	73	73	68	71	67	71	70	72	67	71	68	73	69
7	76	72	74	70	73	72	75	72	75	73	74	75	74	72	72	67	69	66	69	68	70	66	69	67	70	68
8	79	71	77	69	75	71	77	71	77	71	76	73	76	71	75	67	72	65	72	67	73	66	72	67	73	67
9	81	73	78	72	77	74	79	74	80	74	78	75	79	74	77	70	75	68	75	71	76	68	75	70	76	71
11	75	70	72	69	71	70	73	70	74	70	73	72	74	70	70	66	68	64	68	66	70	65	69	65	70	67
12	80	70	76	69	74	70	76	70	76	70	75	72	76	69	73	66	71	64	71	66	72	64	70	64	71	66
13	73	68	71	67	70	69	72	68	72	69	71	72	71	70	68	63	65	61	65	63	66	61	65	63	66	64
AVG	77	70	75	69	73	71	75	71	75	71	74	72	75	71	72	66	70	64	70	67	71	64	70	65	70	67
Slave Camera																										
3	66	61	65	61	64	63	66	63	66	64	66	65	66	63	64	59	62	57	62	60	64	57	63	59	65	61
4	71	63	69	62	68	65	70	66	71	68	70	68	71	65	68	62	67	61	67	62	68	61	67	62	68	63
5	77	70	74	69	74	71	75	70	75	71	75	73	75	71	72	66	70	65	70	67	71	65	70	66	71	67
6	72	68	70	67	70	68	72	68	72	68	70	70	70	68	67	63	64	61	64	63	65	61	65	63	65	63
7	75	70	72	70	72	71	74	71	74	71	73	73	73	72	69	66	67	65	67	67	69	64	69	66	69	66
8	77	69	74	68	73	69	74	69	75	69	75	71	75	69	72	66	70	64	70	66	71	63	71	66	71	66
9	77	69	74	68	73	69	75	69	76	69	74	71	74	69	72	65	69	63	69	65	70	64	70	64	70	65
11	70	65	68	67	67	66	69	65	69	65	68	67	70	65	65	60	62	57	62	61	63	56	63	59	63	66
12	71	64	69	63	69	65	70	66	71	70	70	68	71	66	69	62	69	60	69	63	69	59	69	62	69	65
13	71	66	68	66	64	67	70	67	70	67	69	70	70	68	66	62	63	61	63	63	65	61	64	62	66	64
AVG	73	66	71	66	69	68	71	67	71	68	70	70	71	68	68	63	66	61	66	64	67	61	67	63	67	65
Supply Spool																										
1	66	61	64	61	63	64	66	63	67	64	66	65	67	63	65	61	62	58	62	61	63	58	62	60	63	61
2	65	60	64	60	64	63	65	62	66	64	66	64	66	62	65	59	62	55	62	59	64	56	64	59	64	61

TABLE 3-3

J-32 TEMPERATURE SUMMARY

SENSOR	ORBITS ACQUIRED																								
Fair ("A") Barrel #1 ("B")	07	16	24	32	40	48	56	64	72	81	88	97	104	113	121	129	137	145	153	161	169	178	185	194	201	210
1	29	72	29	65	22	58	22	58	29	51	22	58	22	65	20	33	20	36	20	43	20	33	16	33	20	33
2	17	25	10	10	10	17	10	17	10	10	3	17	10	10	59	68	62	72	62	68	65	68	59	68	62	65
3	-10	25	4	18	4	18	4	4	4	OBL	-10	18	-2	11	62	124	67	133	69	124	70	124	63	130	67	130
4	37	51	37	37	37	44	37	44	37	37	30	30	37	44	25	61	28	70	28	64	32	67	28	70	32	70
5	38	52	38	38	38	45	38	38	23	38	30	45	38	45	28	38	28	42	28	45	32	38	28	45	32	45
6	38	52	31	45	31	52	31	45	31	45	31	52	31	59	--	--	--	--	--	--	--	--	--	--	--	--
Barrel #2																										
1	27	33	27	33	20	36	23	33	27	36	27	40	27	40	20	30	20	30	20	33	23	27	20	33	20	33
2	28	61	25	57	18	57	21	61	28	61	25	64	28	67	28	57	28	67	30	64	31	64	28	70	31	70
3	72	131	65	128	59	125	62	128	65	122	65	128	65	122	69	113	69	122	69	116	69	111	66	119	69	119
4	69	81	66	81	56	78	66	78	66	78	63	78	63	78	63	66	60	69	60	66	60	60	56	66	60	63
5	59	66	55	66	52	69	59	62	59	69	59	69	59	69	42	49	38	52	38	59	42	49	38	52	38	49
Conic Adapter																										
1	33	30	33	27	27	33	33	33	37	33	33	37	37	33	27	24	27	30	27	27	27	24	27	24	30	30
Clock																										
1	68	66	68	62	64	66	66	66	70	68	68	68	70	66	62	58	60	58	60	60	62	56	62	58	62	58
2	68	66	68	64	66	66	66	66	70	68	68	68	70	70	62	58	60	60	60	60	62	58	62	60	62	58
Thrust Cone "A" to "B" SRV																										
1 (Skin)	36	28	30	25	28	26	30	28	31	29	31	30	31	30	58	53	56	54	56	55	57	54	57	53	57	55
2 (Retro)	54	43	45	41	42	41	45	42	46	43	45	44	46	43	64	59	61	57	61	60	63	58	63	58	63	61
Stellar/Index "A" to "B"																										
1	45	42	42	39	36	42	42	42	45	42	42	45	42	42	47	44	44	44	43	47	44	44	47	44	44	44
2	45	35	41	31	35	38	41	35	41	38	41	41	41	41	50	44	44	41	44	44	47	41	47	44	47	44
Recovery Battery "B" SRV																										
1	64	56	56	54	54	56	57	57	57	58	57	59	58	58	84	83	77	81	78	82	82	75	82	81	78	83
Faster Cassette "A" SRV																										
2	68	61	62	60	62	64	67	64	66	65	65	66	64	64	--	--	--	--	--	--	--	--	--	--	--	--

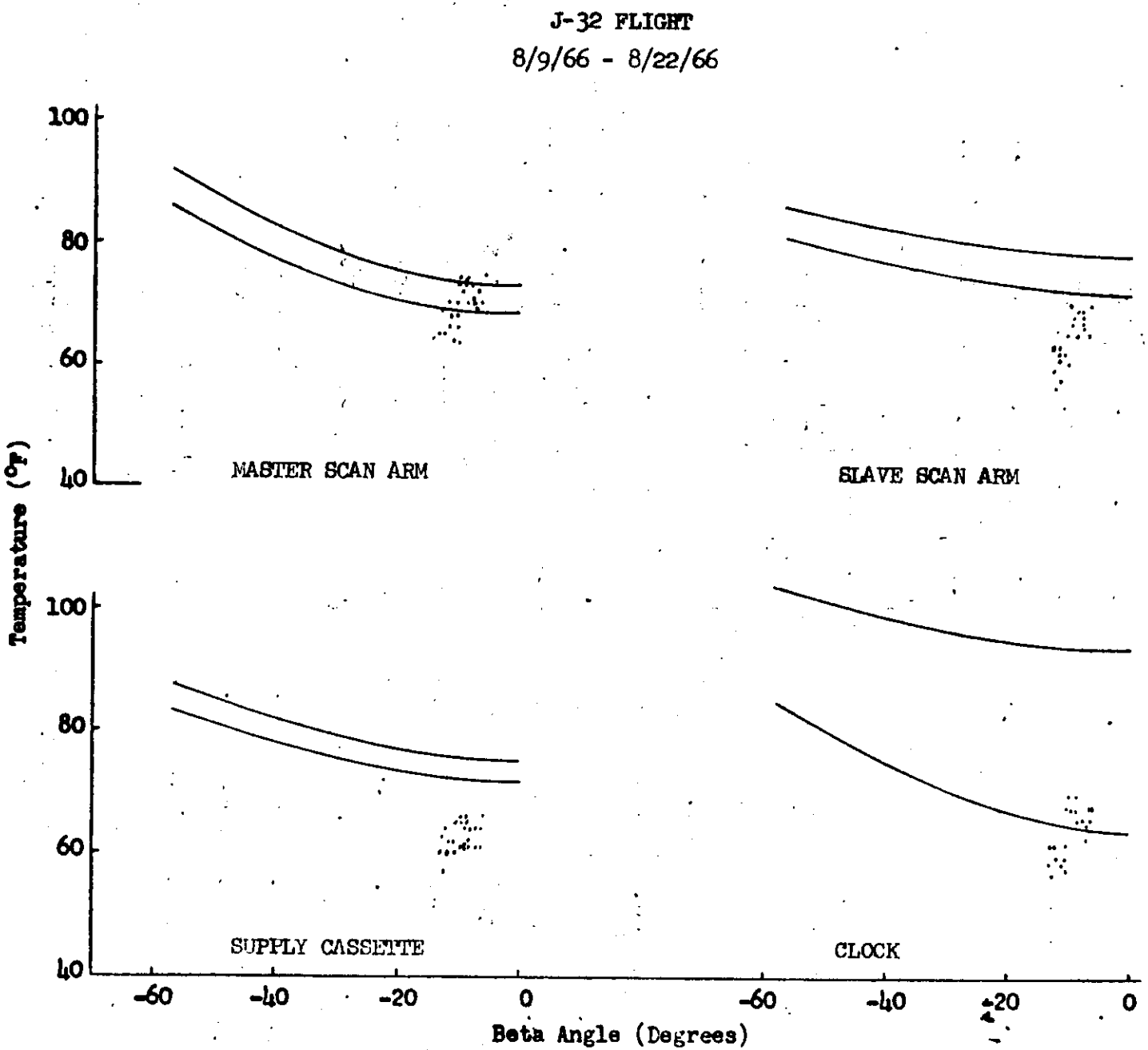

J-32 FLIGHT
8/9/66 - 8/22/66
Temperature (°F)
100
80
60
40
MASTER SCAN ARM
SLAVE SCAN ARM
SUPPLY CASSETTE
CLOCK
-60
-40
-20
0
Beta Angle (Degrees)

FIGURE 3-1

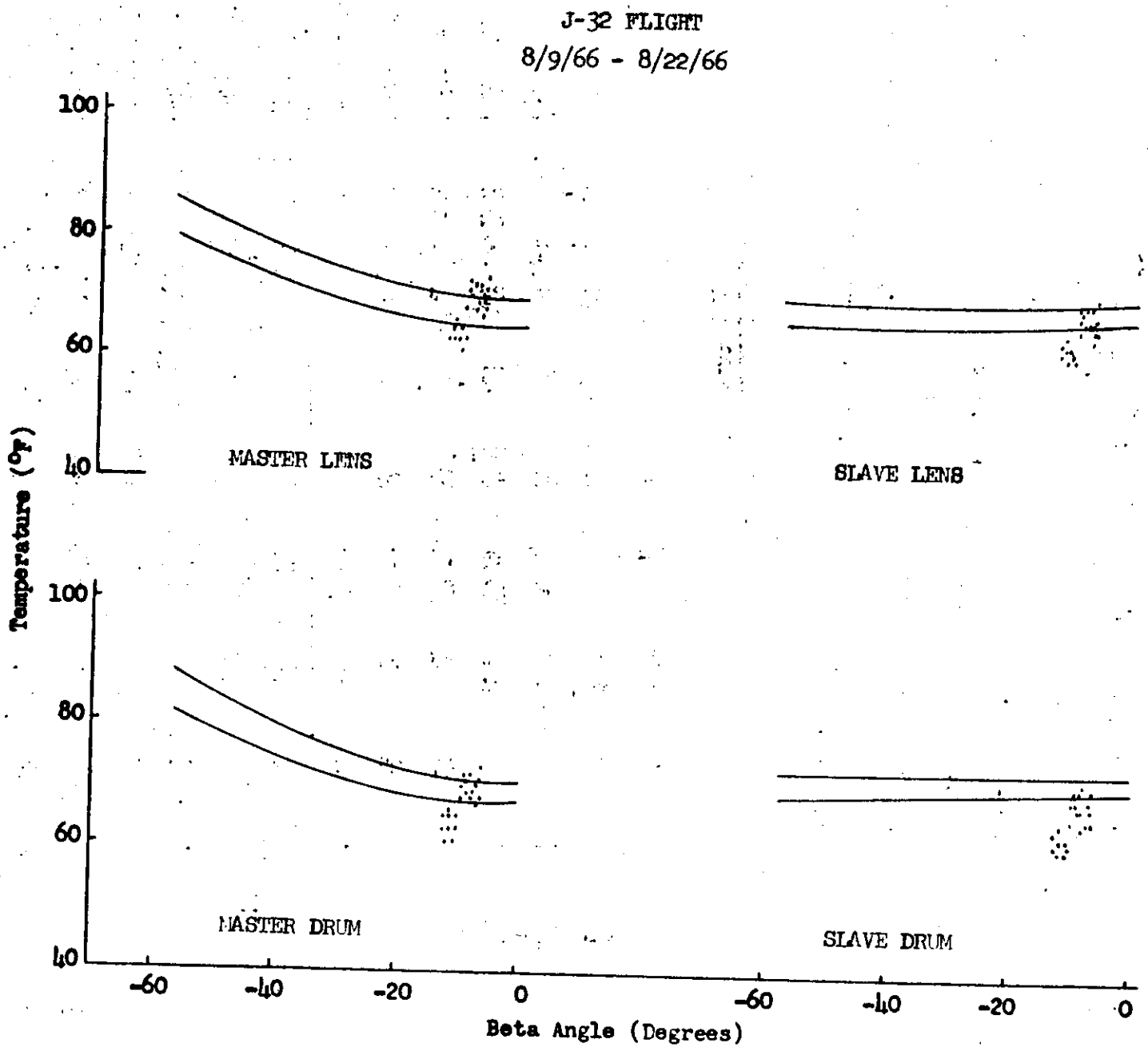

J-32 FLIGHT
8/9/66 - 8/22/66
Temperature (°F)
100
80
60
40
MASTER LENS
SLAVE LENS
MASTER DRUM
SLAVE DRUM
-60
-40
-20
0
Beta Angle (Degrees)

FIGURE 3-2

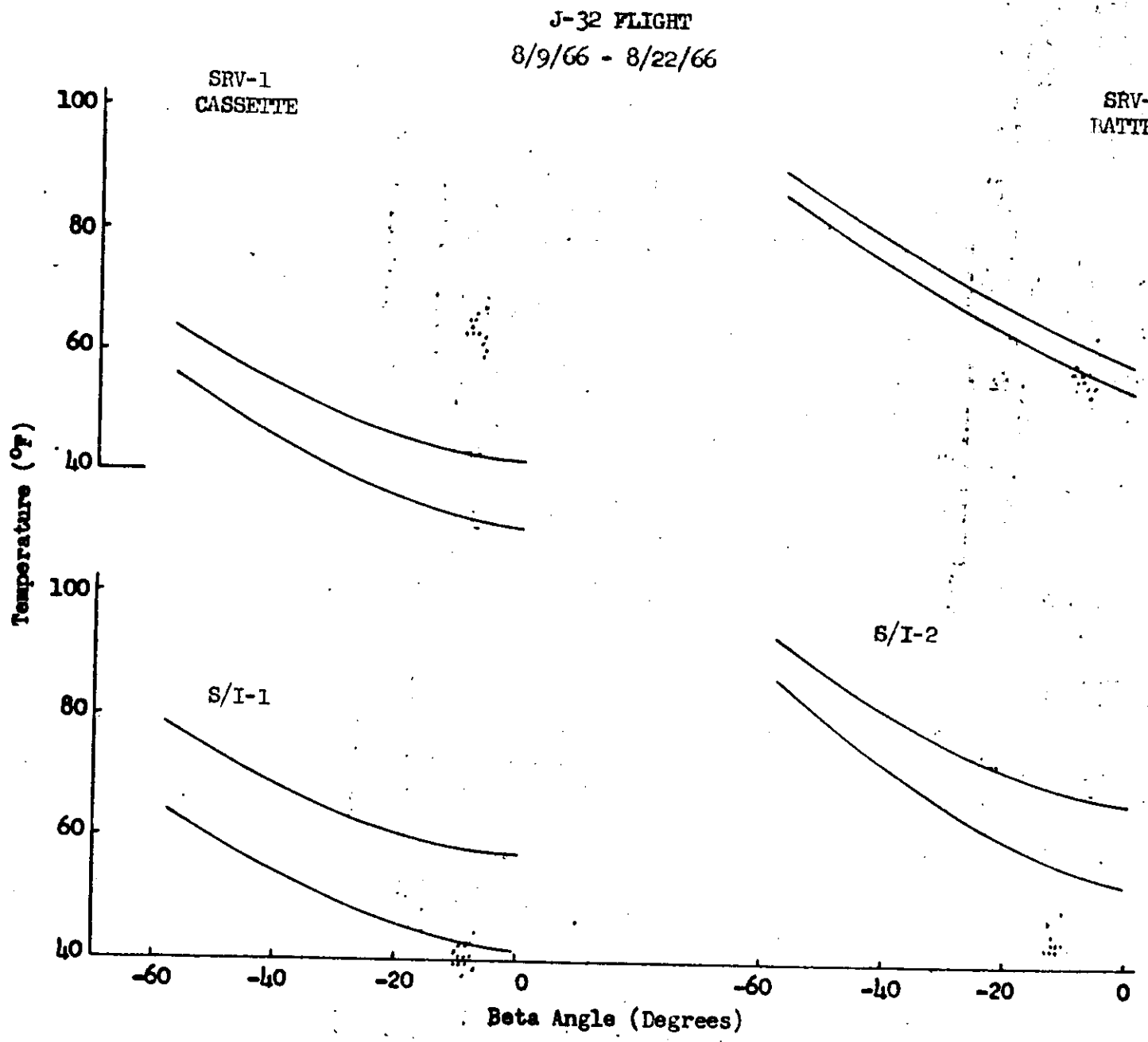

J-32 FLIGHT
8/9/66 - 8/22/66
SRV-1
CASSETTE
SRV-2
BATTERY
S/I-1
S/I-2
Temperature (°F)
100
80
60
40
-60
-40
-20
0
Beta Angle (Degrees)

FIGURE 3-3

ASCENT HEATING

THORAD BOOSTER
AGENA 1631
PAYLOAD J-32

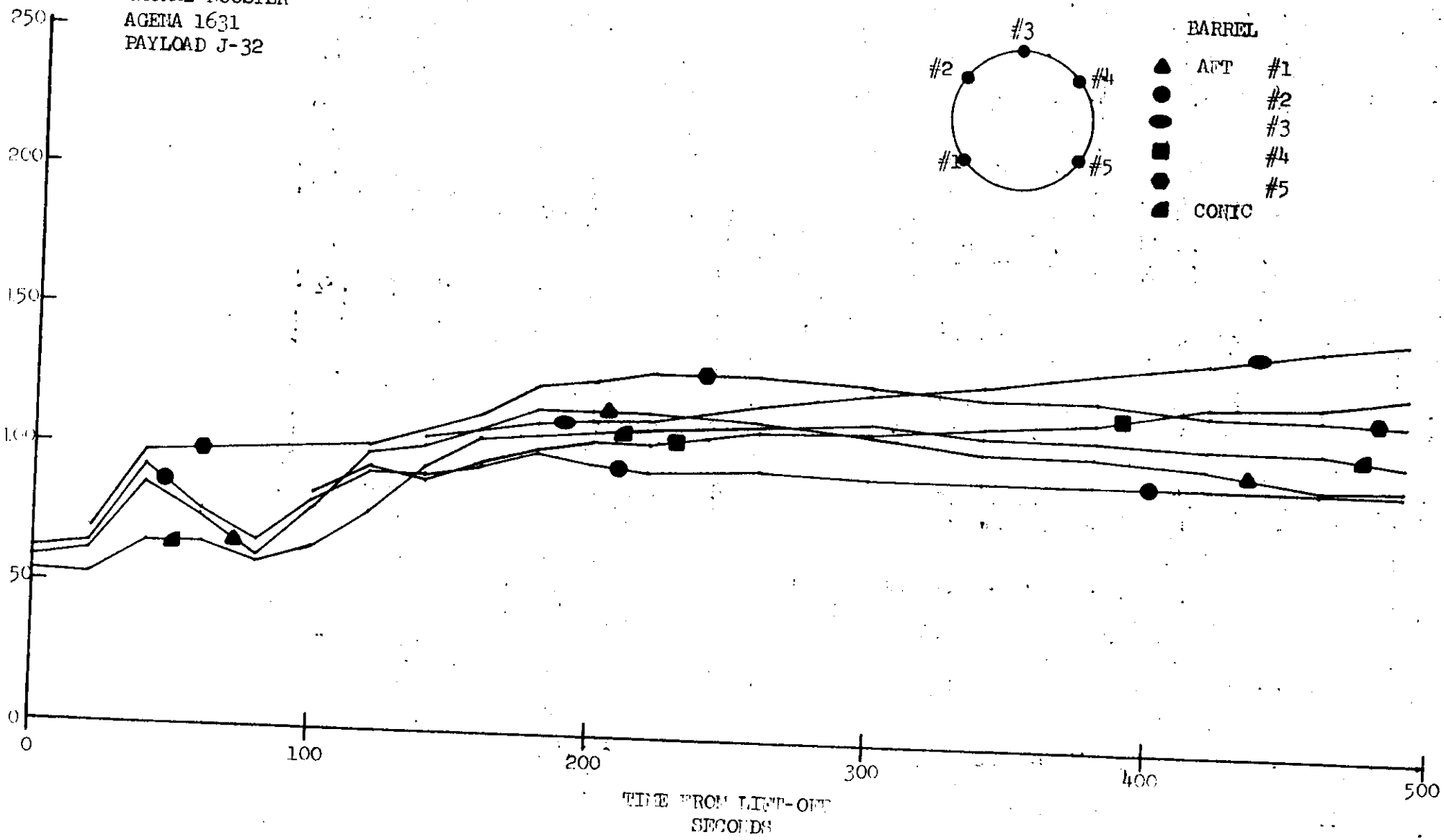
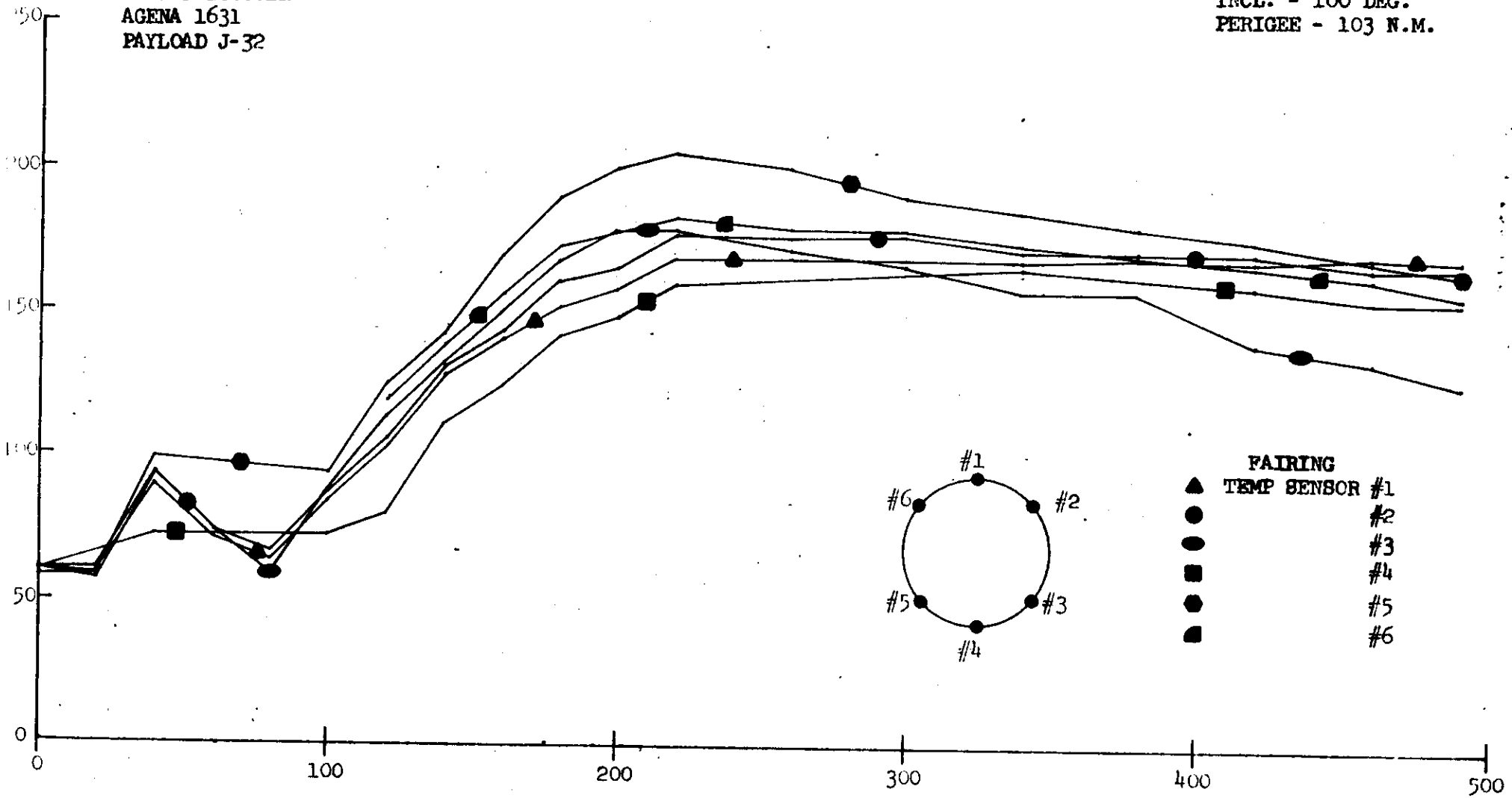


FIGURE 3-4

ASCENT HEATING

THORAD BOOSTER
AGENA 1631
PAYLOAD J-32

INCL. - 100 DEG.
PERIGEE - 103 N.M.



TIME FROM LIFT-OFF
SECONDS

FIGURE 3-5

SECTION 4

MISSION 1036-1 RECOVERY SYSTEM

SRV #715 was received at A/P on 27 September 1965. The receiving weight was 149.69 pounds. After modifications and incorporation of outstanding E.O.'s, the SRV was delivered to Systems Test for incorporation into the J-32 system.

The capsule was shipped to VAFB on 1 August 1966.

The -1 mission was successfully terminated by air-catch on orbit 115 on 16 August 1966. The predicted and actual impact points were as follows:

	Latitude	Longitude
Predicted	23° 4.4' N	168° 6.2' W
Actual	22° 46' N	168° 2' W

Telemetry data indicated that 7 to 8 amps of current was present on the +28V regulated return between transfer and electrical disconnect. The time duration was 0.80 seconds. The current was supplied by the pyro battery. Recovery event times are included in Table 4-1.

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

MISSION 1036-1

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Actual	Nominal
*Arm	76.91	77.0 ± 1.0
*Transfer	2.0	2.0 ± 0.25
Electrical Disconnect	0.82	0.900 ± 0.430
Separation	- - -	- - -
**Spin	3.34	3.4 ± 0.30
Retro	7.58	7.55 ± 0.45
Despin	10.68	10.75 ± 0.59
T/C Separation	1.50	1.5 ± 0.15
***"G" Switch Open	507.55	506.8
Parachute Cover Off	33.50	34.0 ± 1.5
Drogue Chute Deployed	0.68	0.63 ± 0.08
Main Chute Bag Separate	12.10	10.0 + 3.0 - 8.2
Main Chute Deployed	0.55	0.52 ± 0.13
Main Chute Disreef	4.77	4.5 ± 0.80

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

TABLE 4-1

SECTION 5

MISSION 1036-2 RECOVERY SYSTEM

SRV #716 was received at A/P on 27 September 1965. The receiving weight was 147.23 pounds. After modifications and incorporation of outstanding E.O.'s the unit was delivered to Systems Test for mating to the J-32 system.

The capsule was shipped to VAFB on 1 August 1966.

The -2 mission was successfully terminated by air-catch from orbit 212 on 22 August 1966. The impact point was as follows:

	Lattitude	Longitude
Predicted	22° 31.7' N	165° 55.8' W
Actual	22° 31.0' N	165° 58' W

Event times are shown in Table 5-1.

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

MISSION 1036-2

RECOVERY SEQUENCE OF EVENTS

Event	Delta Time (Seconds)	
	Actual	Nominal
*Arm	76.92	77.0 ± 1.0
*Transfer	2.0	2.0 ± 0.25
Electrical Disconnect	0.71	0.900 + 0.430
Separation	- - -	- - -
**Spin	3.33	3.4 ± 0.30
Retro	7.56	7.55 ± 0.45
Despin	10.72	10.75 ± 0.59
T/C Separation	1.54	1.5 ± 0.15
***"G" Switch Open	504.81	506.6
Parachute Cover Off	34.18	34.0 ± 1.5
Drogue Chute Deployed	0.66	0.63 ± 0.08
Main Chute Bag Separate	12.06	10.0 $^{+3.0}_{-2.2}$
Main Chute Deployed	0.55	0.52 ± 0.13
Main Chute Disreef	4.33	4.45 ± 0.80

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

TABLE 5-1

SECTION 6

MASTER PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Main Camera	190
Main Camera Lens	1842435
Supply Horizon Camera	287-G6
Supply Horizon Camera Lens	E12893
Take-up Horizon Camera	287-G5
Take-up Horizon Camera Lens	E12891
Supply Cassette	SC-43

B. CAMERA DATA AND FLIGHT SETTINGS

Main Camera:

Lens	24"f/3.5
Slit Width	0.200"
Filter Type	Wratten 23A
Film Type	Eastman Type 3404

Supply (Port) Horizon Camera:

Lens	55 mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

Take-up (Starboard) Horizon Camera:

Lens	55 mm f/6.3
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25

C. POST FLIGHT PERFORMANCE EVALUATION (Master Camera)

The Master camera produced 2852 frames (7933 feet) of photography during Mission 1036-1 and 3099 frames (7948 feet) during Mission 1036-2. The image quality was consistently good and rated better than Mission 1034 and comparable to Mission 1033.

Image quality produced by the Master camera was rated lower in sharpness than that produced by the Slave camera for Missions 1036-1 and 1036-2. The comparison was made by a visual evaluation at 20 to 50 x magnification of original negative and Duplicate Positive films. Master camera imagery is considered of lower quality primarily because of the added effect of haze light in the forward looking Master camera. The Master camera also used a wider exposure slit. The overall image quality of Mission 1036-2 was judged to be better than Mission 1036-1. This is attributed to the lower haze level in Mission 1036-2 as evidenced by viewing the Index camera photography.

One fixed target of unknown contrast and condition was recorded at Pahrump, Nevada. The average resolution from this target was judged to be somewhat greater than 12.5 feet. The MIP frames were rated 85.

Auxillary data recording such as H.O. fiducials, timing track, binary word, serial number, index marks, S/I slur pulse, and blanked pulse were operational throughout Mission 1036-1 and 1036-2. The start of pass mark failed after pass D-39 apparently due to lamp failure. Dendritic static discharge marks were present at random intervals along the film edge in Mission 1036-1 only. Edge static caused no degradation of terrain imagery.

The scan head rollers caused the usual minor scratch marks just within the format area under the binary word and at the take-up end of the mission on every frame of Mission 1036-1 and 1036-2. Normal heavy rail scratches are present throughout the mission. The format edge on the binary word side gradually became ragged as a result of emulsion dust accumulated from the rail scratches. No other degrading effect was observed.

Although extensive effort had been directed to elimination of light leaks, minor fog marks were present on the first, fifth and last frame of most passes. Degradation from light leaks was minor.

SECTION 7

SLAVE PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Main Camera	191
Main Camera Lens	2022435
Supply Horizon Camera	285-G6
Supply Horizon Camera Lens	E12904
Take-up Horizon Camera	281-G5
Take-up Horizon Camera Lens	E12905
Supply Cassette	SC-43

B. CAMERA DATA AND FLIGHT SETTINGS

Main Camera:	
Lens	24"f/3.5
Slit Width	0.150"
Filter Type	Wratten 21
Film Type	Eastman Type 3404
Supply (Starboard) Horizon Camera:	
Lens	55 mm f/6.3
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25

Take-up (Port) Horizon Camera:

Lens	55 mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

C. POST FLIGHT PERFORMANCE EVALUATION (Slave Camera)

This camera produced 2853 frames (7955 feet) of photography during Mission 1036-1 and 3009 frames of photography (7958 feet) during Mission 1036-2. Visual comparison of the MIP frames for Mission 1036-1 and 1036-2 indicate that AFT camera photography is sharper than forward camera photography. Aft camera imagery is considered better primarily because of the reduced effect of haze light present in aft camera photography. It is also noted that the AFT camera used a narrower slit. The overall image quality of Mission 1036-2 was judged to be slightly better than Mission 1036-1. This is attributed to the lower haze level in Mission 1036-2 as evidenced by viewing the Index camera photography.

One fixed target of unknown contrast and condition was recorded at Pahrump, Nevada. The average resolution from this target was judged to be 8.5 feet on the aft-looking camera. The MIP frames were rated 85.

A minor region of soft imagery encompassing an area of approximately one square inch located at the camera number edge at the supply end of the format was first observed on pass D-203 and continued until the mission ended. The exact cause is unknown but may be caused by irregular tracking tension. Because of the minor significance of this anomaly at the end of the format no action will be taken.

Auxillary data recording such as H.O. fiducials, timing track, binary word, serial number, index marks, blanked pulse, and start of pass mark were operational throughout Missions 1036-1 and 1036-2.

A few minor dendritic static discharge marks were noted along the film edge at random intervals. Dendritic static marks did not degrade terrain imagery.

Rail scratches were heavy and present throughout Mission 1036-1 and 1036-2. Minor scan head roller scratches were observed in each frame of the -1 and -2 missions. Scan head roller scratches were located inside the format under the binary word and at the take-up end of each frame. Degradation to terrain imagery was very minor. An intermittent emulsion scratch was found 1.22 inches into the format area measured from the camera number edge. Although this scratch occurred intermittently throughout the mission no known cause of the scratch was determined. The scratch was very fine and had no significant degrading effect upon terrain imagery.

Light leak fog was evidenced on the third from the last frame of some passes. Degradation to terrain imagery was minor.

SECTION 8

PANORAMIC CAMERA EXPOSURE

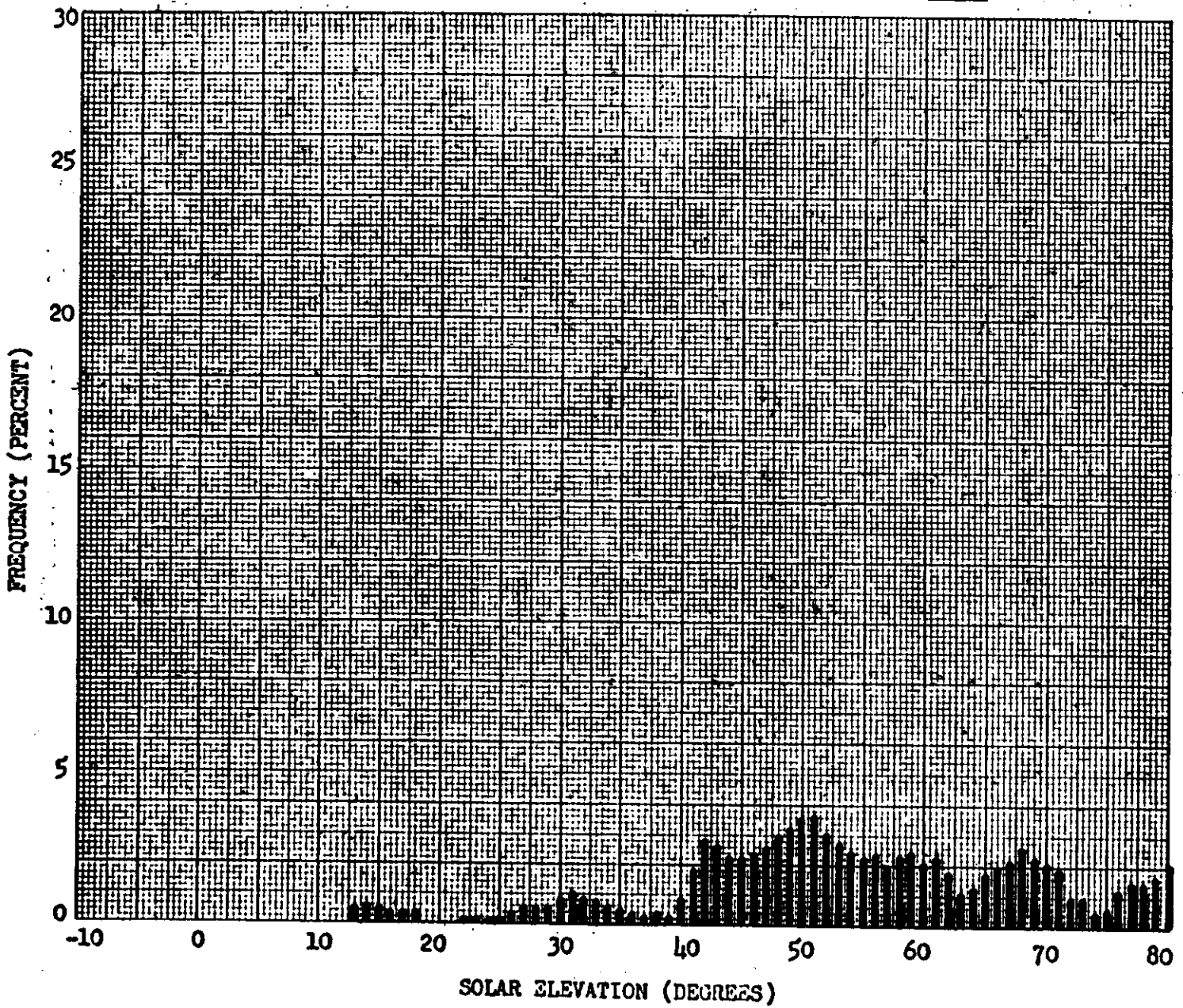
The Master camera contained a 0.200 inch slit and a Wratten 23A filter. The Slave camera had a 0.150 inch slit and a Wratten 21 filter. These conditions placed the nominal exposure between the full and the intermediate processing curve.

The frequency distributions of the solar elevations and solar azimuths encountered during the photographic operations are shown in Figures 8-1 to 8-4.

The nominal exposure times of the Master and Slave cameras are shown as a function of latitude for passes D-8, D-72, D-137 and D-201 in Figures 8-5 to 8-12. The predicted level of processing for the original negative is based on the in-flight performance estimate and is tabulated below with the processing levels reported by [redacted]

Mission	Camera		% Primary	% Intermediate	% Full
1036-1	FWD	Predicted	0	66.4	33.6
		Reported	8	14	78
1036-1	AFT	Predicted	0	4.7	95.3
		Reported	3	9	88
1036-2	FWD	Predicted	0	15.1	84.9
		Reported	1	19	80
1036-2	AFT	Predicted	0	3.5	96.5
		Reported	3	20	77

SOLAR ELEVATION FREQUENCY DISTRIBUTION



Mission No: 1036-1

Payload No: J-32

Camera No: 190

Launch Date: 8/9/66

Launch Time: 2046 Z

Inclination: 100°

FIGURE 8-1