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TO: V. Webb
C. Murphy
A. Johnson

[REDACTED]
THRU: [REDACTED]

FROM: [REDACTED]

SUBJECT: MISSION 1015-1 AND 1015-2 FINAL REPORT

Enclosed is the Final Performance Evaluation Report
for Mission 1015-1 and 1015-2.

Declassified and Released by the NRO

In Accordance with E. O. 12958

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CORONA J
PERFORMANCE EVALUATION REPORT
MISSION 1015-1 and 1015-2

FTV 1607, J-17

July 5, 1966

Approved:



Mgr.

Advanced Projects

Approved:



Mgr.

Program

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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 1607.

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 1015-1 and 1015-2 which was launched on 19 December 1964.

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INTRODUCTION

This report presents the final performance evaluation of Missions 1015-1 and 1015-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the J-13 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 1

SYSTEM PERFORMANCE

A. MISSION OBJECTIVES

The payload section of Mission 1015, placed into orbit by Flight Test Vehicle #1607 and LV-2A booster #424, 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-17 payload system. This Corona "J" system is designed to acquire search and reconnaissance photography of selected areas of the earth from orbital altitudes. The flight was programmed for the following mission capability:

Mission "A" duration: 3/4/5 days
Mission "B" duration: 6/5/4/3 days
Deactivate - Reactivate: 72 Revs. active
110 Revs Inactive (Max.)
72 Revs. Reactivated

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 2110:17 Z (1310:17 PST) on 19 December 1964. Ascent and injection were normal and the achieved orbit was within nominal tolerances except for a low perigee altitude. Tracking and command support was effected by the Air Force Satellite Control Facility consisting of tracking and command stations at [REDACTED]

[REDACTED] under central control of the Satellite Test Center at Sunnyvale, California. Mission 1015-1 consisted of five days operation and was completed by air recovery on 24 December 1964. A deactivate - reactivate operation was successfully used over a period of 48 orbits. The 3 day "B" operation was air recovered on 30 December 1964. The "B" SRV was recovered 1 day early due to the questionable state of the pyro battery.

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

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SCHEMATIC INBOARD PROFILE - CORONA J SYSTEM

MISSION 1015

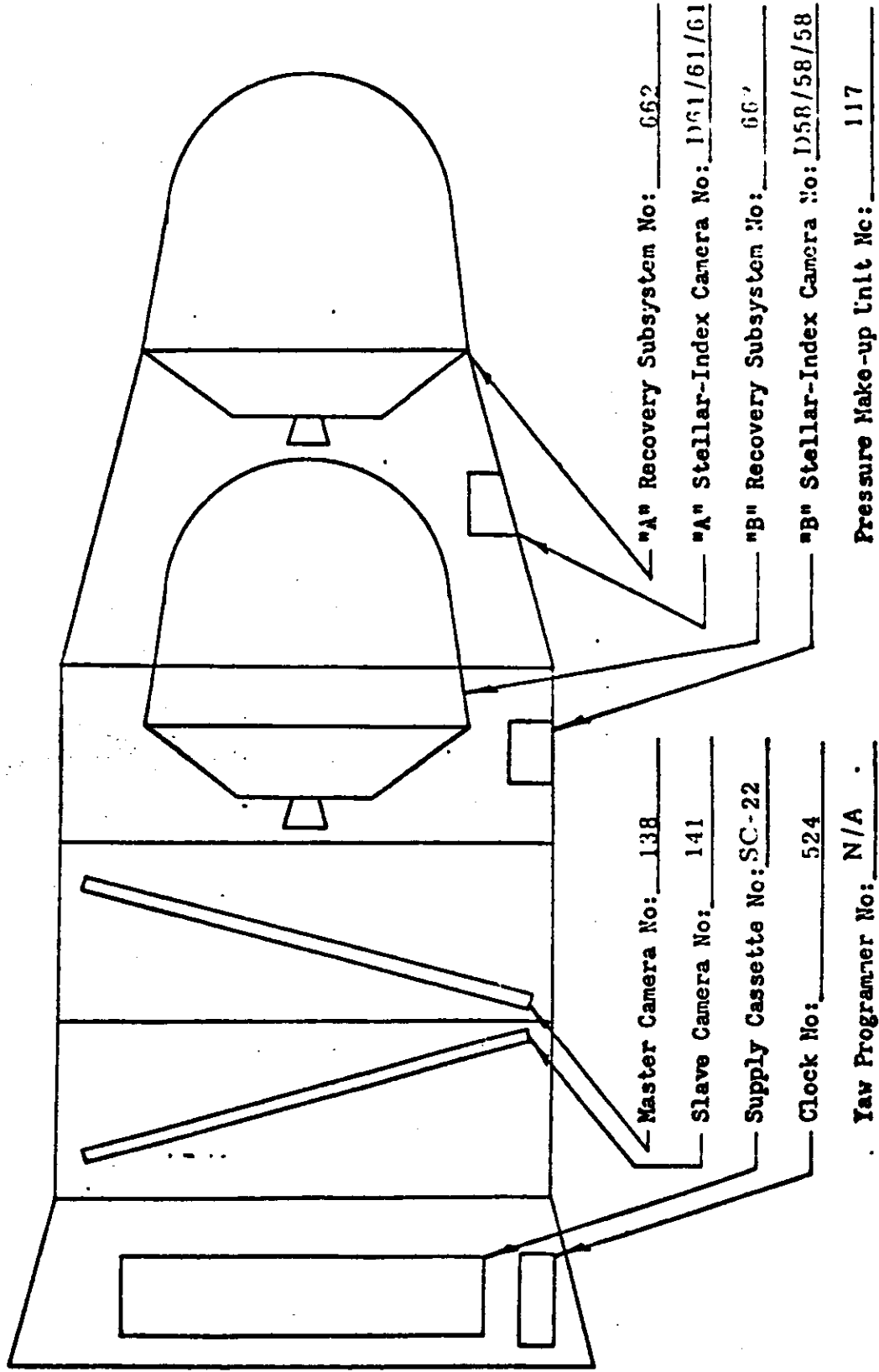


FIGURE 1-1

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ORBITAL PARAMETERS

| <u>Parameter</u> | <u>Predicted</u> | <u>Orbit 1 Actuals</u> |
|----------------------------|------------------|----------------------------|
| Period (Min.) | 90.675 | 90.556 |
| Perigee (N. M.) | 100.02 | 96.72 |
| Apogee (N. M.) | 235.38 | 230.96 |
| Inclination (Deg.) | 75.003 | 74.971 |
| Perigee Latitude (Deg. N.) | 22.358 | 21.543 |
| Eccentricity | 0.018782 | 0.018614 |

SRV #1 contained 98% of the normal amount of payload. SRV #2 was filled with payload to approximately 88% of full capacity.

C. PANORAMIC CAMERAS

The Master and Slave panoramic cameras operated throughout both missions and produced excellent photographic coverage. The cloud cover observed in the photography averaged 42% for the entire flight. The instruments were operating as much as 4% slower than nominal at perigee.

D. STELLAR-INDEX CAMERAS

The Stellar-Index cameras operated satisfactorily on both missions. The stellar camera exhibited 50% baffle flare fog, however adequate star imagery was obtained. The photographic quality of the index camera film was excellent on both missions.

E. OTHER SUBSYSTEMS

The telemetry instrumentation, command, clock, thermal control and pressure make-up systems performed satisfactorily throughout both missions.

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 susceptibility to corona discharge. Such discharge fogs the film thus degrading the operational photography.

2. Test Summary

The Environmental Test on the J-17 payload system was conducted at the TASC Chamber in Sunnyvale during October 25 through 29, 1964. The test consisted of 2 days "A" operations; 1 day soak; and 1 day "B" operations.

The J-17 system subjected to this test consisted of panoramic instruments 138 and 139 and Stellar/Index cameras D61/61/61 and D58/58/58.

Panoramic instrument operation was satisfactory. Cycle period predictability was $\pm 2\%$ and repeatability was $\pm 1\%$. The difference in cycle rates between the two instruments was within 1%.

Both "A" and "B" recovery sequences were satisfactory. Normal S/I slewing operations were obtained at "arm". Both instruments stowed properly during the "A" recovery cut and wrap operation.

A deactivate command was given between the "A" and "B" missions. The instruments operated for 5 cycles and stowed normally.

The corona marking level of the J-17 system met the corona criteria established for the J Program. J-17 is considered to have acceptable corona and is recommended for flight without further testing.

Clock performance was satisfactory. The IRIG was not available, but clock readings correlated within 1 second of the system time at which the clock was interrogated.

Following completion of the environmental test, the slave instrument 139 was transferred to the J-16 system. Instrument 141 from M-27 system replaced it.

3. Panoramic Instruments Dynamic Performance

Both instruments operated satisfactorily throughout the test as indicated by the center-of-format and lens rotation monitors. The monitors on the supply and take-up idlers indicated smooth film transport. Instrument start and shutdown was normal for each operation. Cycle rate data from each operation is summarized in Table 2-1.

The 99/101 percent clutch ratios were 5/5 and 6/6 for both instruments.

4. Panoramic Instrument Corona Performance

J-17 system was altitude tested for 4 days at pressures ranging between 0.3 to approximately 60 microns. Panoramic film was pre-dried 7 days in the Teal Chamber at 0.1 microns permitting pressures of 1 micron to be attained in the TASC Chamber at the end of the second day, at the start of instrument operation.

Film samples removed from instruments 138 and 139 exhibited up to 3 cycles of start-up corona to a density of 1.25 for internal camera pressures below 1.1 microns. Start-up corona marking was first observed after the 2-day non-operate soak period. Camera pressures prior to the 2-day soak ranged from 2.5 to 5.5 microns, but no corona marking was observed in this pressure range. Internal pressures above 5.5 microns did not induce corona.

Camera operations that employed the PMU system were all corona free.

J-17 CYCLE PERIOD DATA

| <u>RAMP</u> | <u>TUR.*</u> | <u>INSTRUMENT #1</u> | | | <u>INSTRUMENT #2</u> | | |
|--------------------|--------------|----------------------|-------------|----------------|----------------------|-------------|----------------|
| | | <u>ACT.</u> | <u>NOM.</u> | <u>% DIFF.</u> | <u>ACT.</u> | <u>NOM.</u> | <u>% DIFF.</u> |
| <u>"A" MISSION</u> | | | | | | | |
| R 7 - A 7 | 290 | 4.35 | 4.27 | 1.9 S | 4.32 | 4.27 | 2.2 S |
| R 4 - A 1 | 1420 | 2.23 | 2.21 | .9 S | | | |
| R 4 - A 1 | 1600 | | | | 2.17 | 2.18 | .5 F |
| R 4 - A 1 | 1900 | 2.19 | 2.180 | .5 S | 2.17 | 2.173 | .1 F |
| R 5 - A 8 | 1540 | 2.38 | 2.39 | .4 F | 2.38 | 2.38 | 0 |
| R 7 - A 7 | 2060 | 2.38 | 2.376 | .2 S | 2.36 | 2.366 | .25 F |
| R 8 - A 2 | 1715 | 2.22 | 2.218 | .1 S | | | |
| R 8 - A 2 | 2260 | | | | 2.29 | 2.305 | .65 F |
| R 11 - A 1 | 2030 | 2.30 | | | 2.29 | | |
| R 5 - A 8 | 850 | 3.15 | 3.147 | .1 S | 3.12 | 3.145 | .8 F |
| R 7 - A 7 | 1390 | 2.65 | 2.65 | 0 | 2.65 | 2.644 | .23 S |
| R 7 - A 7 | 2410 | 2.61 | 2.607 | .11 S | 2.58 | 2.599 | .73 F |
| R 10 - A 1 | 1740 | 2.24 | 2.278 | 1.7 F | | | |
| R 4 - A 1 | 2635 | | | | 2.50 | 2.524 | .95 F |
| R 4 - A 1 | 2980 | 3.23 | 3.241 | .34 F | 3.22 | 3.240 | .62 F |
| R 11 - A 1 | 1770 | 2.31 | 2.329 | .82 F | 2.30 | 2.318 | .78 F |
| <u>"F" MISSION</u> | | | | | | | |
| R 7 - A 7 | 300 | 4.24 | 4.26 | .47 F | 4.22 | 4.27 | 1.2 F |
| R 4 - A 1 | 1420 | 2.21 | 2.213 | .1 F | | | |
| R 4 - A 1 | 1600 | | | | 2.15 | 2.18 | 1.4 F |
| R 4 - A 1 | 1900 | 2.17 | 2.18 | .46 F | 2.15 | 2.17 | .9 F |
| R 5 - A 8 | 1540 | 2.35 | 2.39 | 1.7 F | 2.33 | 2.38 | 2.1 F |
| R 7 - A 7 | 2060 | 2.35 | 2.376 | 1.1 F | 2.37 | 2.366 | .17 S |

* TIME-UP-RAMP VALUES WERE NOT VERIFIED

TABLE 2-1

5. Stellar/Index Performance

S/I payload metering occurred normally at every 7th cycle of main instrument operation. Other S/I events as shutter and platen operation also occurred in the proper sequence. Meter ratios were 7/3 and 8/2 for S/I #1 and 7/2 and 8/4 for S/I #2.

6. Instrument Summary

Cycle counter readings for both instruments agreed exactly with the actual number of cycles metered during both "A" and "B" modes of operation. Reasonable correlation of the footage pots and cycle counters was obtained, considering the relative inaccuracy of the Sanborn calibrations and errors introduced in reading the Sanborn record. Footage pot and cycle counter readings from each operation are summarized in Table 2-2.

T/S 11 on Instrument #1 scan arm was indicating an abnormally low temperature throughout the test. A defective 2K resistor was the cause of the erroneous output.

7. Temperature Summary

Table 2-3 lists the average instrument temperature recorded during various times of "A" and "B" operations. Table 2-4 contains the self-heating corrections used for BN 2400 Type T/S. The "TIME" column represents the length of time in minutes that the TLM is on while the other columns represent the correction of °F applied to the recorded temperature values.

B. RESOLUTION TEST

The dynamic resolution test of the J-17 payload system was performed at the A/P facility on 10 November 1964. Each panoramic camera photographed high and low contrast resolution targets. The resulting through focus resolution data is shown in Figure 2-1 for the Master camera and in Figure 2-2 for the Slave camera.

J-17 EASC PAYLOAD CONSUMPTION

| <u>"A" MISSION</u> | <u>POT.</u> | <u>CYCLE COUNTER</u> | |
|--------------------|--------------|----------------------|----------------|
| <u>Rev.</u> | <u>Volts</u> | <u>Cycles</u> | <u>Reading</u> |
| | | <u>Instrument #1</u> | |
| Pre-TASC | 4.85 | 2 | 1783 |
| Conf. | 4.65 | 44 | 1828 |
| 0 | 4.50 | 79 | 1873 |
| 1 | 4.35 | 121 | 1902 |
| 2 | 4.2 | 170 | 1958 |
| 2 | 4.05 | 222 | 2003 |
| 3 | 3.85 | 299 | 2095 |
| 4 | 3.7 | 366 | 2140 |
| 5 | 3.6 | 414 | 2197 |
| 5 | 3.4 | 514 | 2304 |
| 6 | 3.3 | 567 | 2344 |
| 7 | 3.2 | 619 | 2391 |
| 8 | 3.15 | 645 | 2429 |
| 8 | 3.1 | 672 | 2485 |
| 9 | 3.0 | 728 | 2516 |
| 10 | 2.95 | 757 | 2562 |
| C & W | | | 2566 |

| | | <u>Instrument #2</u> | |
|----------|------|----------------------|------|
| Pre-TASC | .05 | 4 | 2271 |
| Conf. | .25 | 45 | 2316 |
| 0 | .5 | 104 | 2361 |
| 1 | .55 | 120 | 2390 |
| 2 | .75 | 187 | 2449 |
| 2 | .9 | 239 | 2495 |
| 3 | 1.1 | 317 | 2587 |
| 4 | 1.2 | 362 | 2633 |
| 5 | 1.35 | 433 | 2693 |
| 5 | 1.6 | 560 | 2800 |
| 6 | 1.65 | 587 | 2840 |
| 7 | 1.75 | 642 | 2867 |
| 8 | 1.8 | 671 | 2925 |
| 8 | 1.85 | 700 | 2966 |
| 9 | 1.9 | 729 | 2998 |
| 10 | 2.0 | 790 | 3044 |
| C & W | | | 3048 |

TABLE 2-2

"A" MISSION

| <u>Rev.</u> | <u>Pct.</u> <u>Reading</u> | <u>Cycles</u> | <u>G.C.</u> <u>Reading</u> | <u>Cycles</u> |
|----------------------|-------------------------------|----------------------|-------------------------------|---------------|
| | | <u>Instrument #1</u> | | |
| 0 | .5 | 0 | 2566 | 0 |
| 1 | .7 | 55 | 2616 | 50 |
| 2 | .85 | 101 | 2672 | 106 |
| 2 | 1.0 | 154 | 2718 | 152 |
| 3 | 1.2 | 231 | 2811 | 245 |
| 4 | 1.3 | 273 | 2857 | 291 |
| Post "B" Recovery | 1.9 | 597 | 3159 | 593 |

| | | | | |
|----------------------|-----|----------------------|------|-----|
| | | <u>Instrument #2</u> | | |
| 0 | .5 | 1 | 3018 | 0 |
| 1 | .7 | 56 | 3098 | 50 |
| 2 | .85 | 100 | 3153 | 105 |
| 2 | 1.0 | 157 | 3200 | 152 |
| 3 | 1.2 | 237 | 3293 | 245 |
| 4 | 1.3 | 279 | 3339 | 291 |
| Post "B" Recovery | 1.9 | 587 | 3641 | 593 |

TABLE 2-3

AVERAGE INSTRUMENT TEMPERATURES

"A" MISSION

| | <u>Rev. 1</u> | <u>Rev. 10</u> |
|---------------|---------------|----------------|
| Instrument #1 | 71 | 78 |
| Instrument #2 | 76 | 88 |

"B" MISSION

| | <u>Rev. 1</u> | <u>Rev. 4</u> |
|---------------|---------------|---------------|
| Instrument #1 | 86 | 75 |
| Instrument #2 | 95 | 84 |

NOTE:

- 1) Temperature values corrected for self-heating per Table V.
- 2) Temperature values on the scan arms (T/S 11) were not included in the averages.

TABLE 2-3

VEHICLE 1607 PAYLOAD J-17 SELF HEATING TEST

SUMMARY OF SELF HEATING CORRECTION CURVES

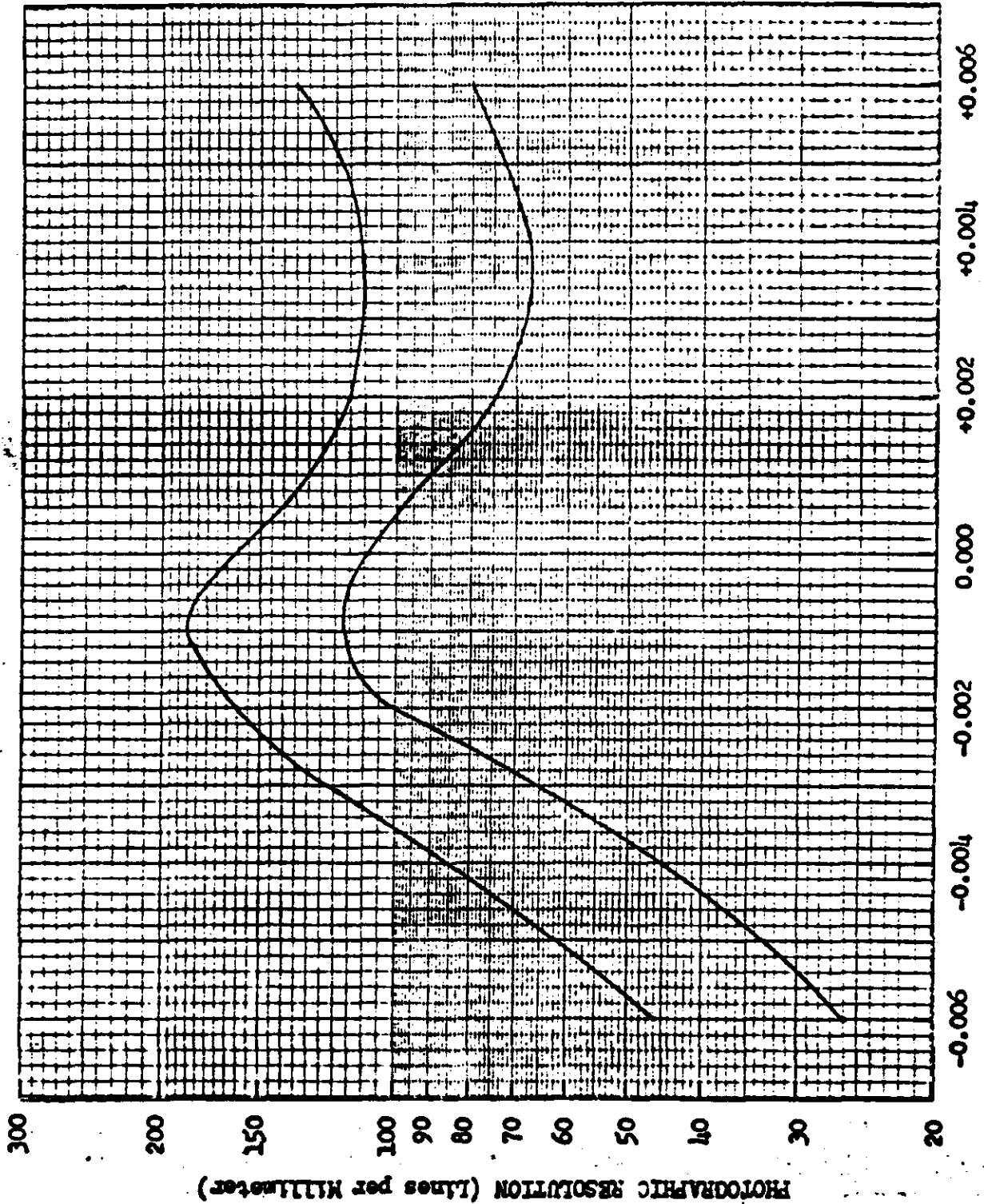
40 SS2 37 TC1 18 109 31 203 03 103 48 210 41 207 23 111
 21 SS1 39 TC2 53 BAT 36 205 55 215 50 211
 46 209 38 206 28 113
 10 106 08 105 15 108
 52 212 20 110
 43 208 25 112
 33 204
 13 107
 05 104

| TIME | NO. 1 | NO. 2 | NO. 3 | NO. 4 | NO. 5 | NO. 6 | NO. 7 | NO. 8 | NO. |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| 0.10 | 1.2 | 1.7 | 0.6 | 1.1 | 2.1 | 1.7 | 2.8 | 3.5 | |
| 0.13 | 1.3 | 1.7 | 0.7 | 1.2 | 2.3 | 1.9 | 3.2 | 4.2 | |
| 0.16 | 1.4 | 1.8 | 0.9 | 1.3 | 2.4 | 2.2 | 3.7 | 5.1 | |
| 0.20 | 1.5 | 1.8 | 1.1 | 1.5 | 2.6 | 2.5 | 4.2 | 6.2 | |
| 0.25 | 1.6 | 1.9 | 1.3 | 1.7 | 2.9 | 2.9 | 4.9 | 7.6 | |
| 0.32 | 1.8 | 1.9 | 1.6 | 1.9 | 3.2 | 3.4 | 5.8 | 9.4 | |
| 0.40 | 2.1 | 2.0 | 2.0 | 2.3 | 3.6 | 4.0 | 6.9 | 11.6 | |
| 0.50 | 2.4 | 2.1 | 2.5 | 2.7 | 4.2 | 4.9 | 8.3 | 14.4 | |
| 0.63 | 2.6 | 2.3 | 2.8 | 3.0 | 4.5 | 5.2 | 8.7 | 15.4 | |
| 0.79 | 2.8 | 2.5 | 3.1 | 3.3 | 4.8 | 5.7 | 9.3 | 16.5 | |
| 1.00 | 3.1 | 2.8 | 3.5 | 3.8 | 5.3 | 6.3 | 9.9 | 17.9 | |
| 1.26 | 3.3 | 3.0 | 3.8 | 4.1 | 5.6 | 6.7 | 10.3 | 19.7 | |
| 1.58 | 3.5 | 3.2 | 4.1 | 4.5 | 6.0 | 7.2 | 10.7 | 19.7 | |
| 2.00 | 3.8 | 3.5 | 4.5 | 4.9 | 6.5 | 7.8 | 11.3 | 21.0 | |
| 2.51 | 4.0 | 3.7 | 4.8 | 5.3 | 6.9 | 8.3 | 11.7 | 21.8 | |
| 3.16 | 4.2 | 4.0 | 5.1 | 5.7 | 7.3 | 8.8 | 12.2 | 22.7 | |
| 3.98 | 4.4 | 4.1 | 5.4 | 6.0 | 7.7 | 9.3 | 12.5 | 23.4 | |
| 5.01 | 4.6 | 4.4 | 5.7 | 6.4 | 8.2 | 9.8 | 13.0 | 24.3 | |
| 6.31 | 4.7 | 4.5 | 5.9 | 6.7 | 8.5 | 10.1 | 13.3 | 24.8 | |
| 7.94 | 4.8 | 4.7 | 6.1 | 7.0 | 8.8 | 10.6 | 13.8 | 25.3 | |
| 10.00 | 4.9 | 4.8 | 6.3 | 7.4 | 9.3 | 11.1 | 14.3 | 26.1 | |
| 12.59 | 4.9 | 4.9 | 6.4 | 7.5 | 9.5 | 11.3 | 14.5 | 26.3 | |
| 15.85 | 4.8 | 4.9 | 6.4 | 7.7 | 9.7 | 11.6 | 14.9 | 26.5 | |
| 19.95 | 4.7 | 4.9 | 6.5 | 7.9 | 10.0 | 12.0 | 15.3 | 26.8 | |
| 25.12 | 4.7 | 4.9 | 6.6 | 8.1 | 10.3 | 12.4 | 15.8 | 27.1 | |
| 31.62 | 4.6 | 4.9 | 6.6 | 8.3 | 10.7 | 12.8 | 16.4 | 27.4 | |
| 39.01 | 4.3 | 4.8 | 6.6 | 8.4 | 10.8 | 13.0 | 16.8 | 27.3 | |
| 50.12 | 4.0 | 4.7 | 6.4 | 8.4 | 11.0 | 13.3 | 17.3 | 27.3 | |
| 63.10 | 3.7 | 4.4 | 6.3 | 8.4 | 11.2 | 13.5 | 17.8 | 27.1 | |
| 79.43 | 3.3 | 4.2 | 6.0 | 8.3 | 11.3 | 13.6 | 18.3 | 26.8 | |
| 100.00 | 2.7 | 3.8 | 5.7 | 8.2 | 11.4 | 13.8 | 19.0 | 26.4 | |

TABLE 2-4

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PRE-FLIGHT DYNAMIC RESOLUTION

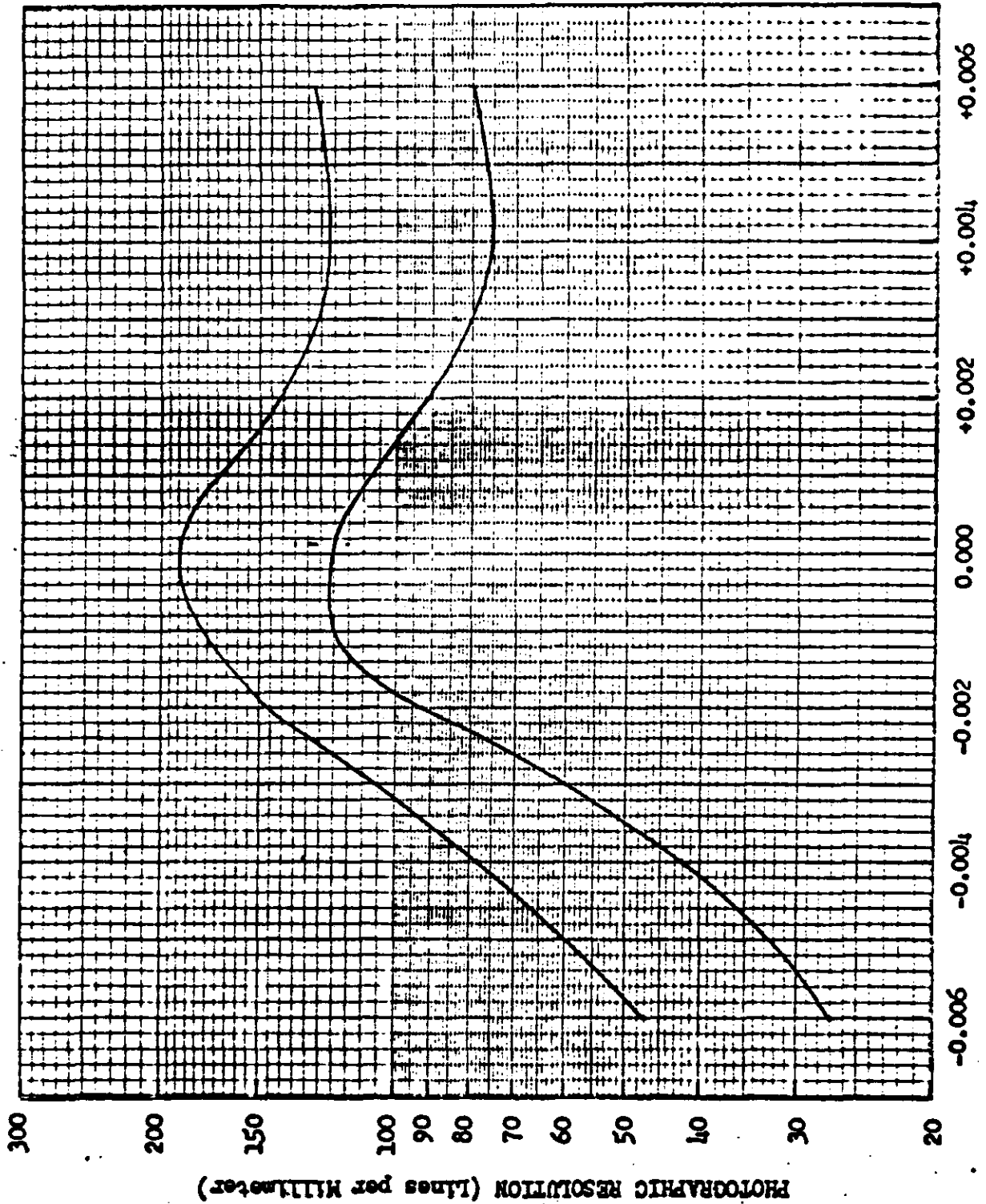


Camera No: 138
Payload No: J-17
Resolution (1/mm) 195
High Contrast: 195
Low Contrast: 117
Film Type: 3104
Test Date: 11/10/54

THROUGH FOCUS INCREMENTS (Inches) **FIGURE 2-1**

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PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 111
Payload No: J-17
Resolution (1/mm) 139
High Contrast: 139
Low Contrast: 121
Film Type: 3104
Test Date: 11/19/61

THROUGH FOCUS INCREMENTS (Inches)

FIGURE 2-2

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C. LIGHT LEAK TEST

The examination of the film threaded in the J-17 system during the light-leak test determined that no film fogging was present. The light tight integrity of the system was considered acceptable for flight.

D. FLIGHT LOADING CERTIFICATION

The flight readiness test and final film loading operations were completed without incidence at VAFB. Film exhibits showed J-17 system to be acceptable for flight. All data recording was acceptable.

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SECTION 3

FLIGHT OPERATIONS

A. SYSTEMS PERFORMANCE SUMMARY

The J-17 system performance was generally acceptable throughout the flight, which consisted of 3 days "A" operation; 3 days deactivate; and 3 days "B" operations. The deactivate - reactivate capability was successfully used during 48 orbits following the "A" mission recovery.

Some difficulty was experienced in matching the V/h ramp to the orbit due to a low orbit perigee, and the instruments running up to 5% slower than nominal.

Other than the large cycle rate predicability error experienced the panoramic instrument operation was satisfactory.

Both Stellar/Index cameras operated satisfactorily as indicated by the shutter pulse and payload metering monitors on TLM.

The average instrument temperature environment decreased from 65 to 41 °F during the eleven days (174 orbits) of both missions.

The clock performed satisfactorily. 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 was approximately 98% full and the "B" capsule was approximately 88% full at recovery. The impact points were down range approximately 50 miles for the "A" and 30 miles for the "B" from the predicted points.

B. INSTRUMENTATION AND COMMAND PERFORMANCE

The telemetry and command system performed satisfactorily throughout the flight. The events occurring during ascent are summarized as follows:

ASCENT SUMMARY

| <u>Event</u> | <u>Function</u> | <u>Remarks</u> |
|-----------------------------|---|-------------------------|
| Lift off | | Normal |
| In-flight reset | Redundant door ejection, instrument standby power | All doors off O. K. |
| Ascent/Orbit Switchover | TLM Channel Switching | Channels switched O. K. |
| Energize continuity loop | Power to SRV continuity Monitor | Continuity O. K. |

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 was reading low throughout the flight by approximately 100 cycles.

The deactivate/reactivate capability was used during the "B" mission and performed as expected.

The Agena vehicle was deactivated during Rev. 89, 12-25-64 and remained in this mode for 48 orbits. The vehicle was then successfully reactivated during Rev. 137, 12-28-64. All deactivate and reactivate functions performed normally. During the deactivate sequence the instruments operated for 5 cycles with the lens assembly stowing properly at shutdown.

C. THERMAL ENVIRONMENT

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

Average instrument temperatures decreased approximately 24°F from orbit 9 to 174 due to normal orbit plane precession.

TABLE 3-1

J-17 TEMPERATURE SUMMARY

| <u>SENSOR</u> | <u>ORBITS ACQUIRED</u> | | | | | | | | | | | | | | | | |
|----------------------|------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|
| <u>Master Camera</u> | <u>0</u> | <u>2</u> | <u>16</u> | <u>25</u> | <u>31</u> | <u>41</u> | <u>47</u> | <u>56</u> | <u>63</u> | <u>72</u> | <u>79</u> | <u>88</u> | <u>142</u> | <u>152</u> | <u>158</u> | <u>167</u> | <u>174</u> |
| 3 | 70 | 55 | 48 | 51 | 48 | 49 | 45 | 47 | 44 | 47 | 42 | 45 | 36 | 40 | 36 | 40 | 36 |
| 4 | 73 | 64 | 58 | 58 | 57 | 59 | 50 | 55 | 52 | 54 | 52 | 53 | 43 | 48 | 44 | 47 | 44 |
| 5 | 70 | 67 | 60 | 61 | 59 | 60 | 52 | 57 | 54 | 57 | 53 | 54 | 42 | 47 | 44 | 46 | 43 |
| 6 | 66 | 74 | 68 | 67 | 66 | 65 | 62 | 61 | 59 | 61 | 58 | 57 | 46 | 48 | 44 | 48 | 46 |
| 7 | 68 | 68 | 62 | 63 | 61 | 62 | 57 | 58 | 56 | 58 | 55 | 55 | 45 | 48 | 44 | 48 | 44 |
| 8 | 73 | 67 | 61 | 64 | 60 | 61 | 54 | 57 | 54 | 57 | 53 | 55 | 43 | 47 | 42 | 47 | 43 |
| 9 | 58 | 65 | 58 | 61 | 57 | 59 | 52 | 55 | 46 | 53 | 49 | 50 | 36 | 40 | 36 | 41 | 36 |
| 10 | 69 | 66 | 59 | 61 | 59 | 60 | 55 | 56 | 54 | 57 | 52 | 54 | 42 | 47 | 42 | 48 | 43 |
| 11 * | 95 | 75 | 71 | 70 | 69 | 72 | 63 | 66 | 64 | 65 | 60 | 61 | 46 | 50 | 50 | 53 | 50 |
| 12 | 77 | 61 | 55 | 56 | 53 | 56 | 49 | 54 | 49 | 54 | 49 | 52 | 41 | 47 | 42 | 48 | 42 |
| 13 | 63 | 65 | 61 | 57 | 60 | 59 | 53 | 54 | 53 | 51 | 52 | 52 | 40 | 43 | 41 | 44 | 41 |
| AVG | | 65 | 59 | 60 | 55 | 59 | 53 | 55 | 52 | 55 | 51 | 53 | 41 | 45 | 42 | 46 | 42 |
| <u>Slave Camera</u> | | | | | | | | | | | | | | | | | |
| 3 | 66 | 68 | 60 | 62 | 59 | 62 | 53 | 57 | 51 | 55 | 48 | 50 | 32 | 38 | 32 | 38 | 32 |
| 4 | 71 | 68 | 58 | 61 | 56 | 60 | 53 | 57 | 51 | 53 | 48 | 55 | 34 | 40 | 35 | 40 | 35 |
| 5 | 68 | 63 | 55 | 56 | 55 | 55 | 49 | 55 | 48 | 53 | 48 | 50 | 35 | 40 | 37 | 41 | 37 |
| 6 | 66 | 58 | 53 | 53 | 53 | 51 | 48 | 50 | 47 | 50 | 46 | 47 | 36 | 40 | 36 | 41 | 39 |
| 7 | 65 | 64 | 58 | 58 | 57 | 52 | 52 | 55 | 51 | 55 | 49 | 51 | 39 | 43 | 38 | 45 | 40 |
| 8 | 69 | 61 | 53 | 54 | 54 | 56 | 48 | 53 | 47 | 52 | 46 | 49 | 34 | 39 | 35 | 40 | 36 |
| 9 | - | 55 | 47 | 50 | 48 | 51 | 44 | 47 | 43 | 47 | 41 | 45 | 31 | 38 | 32 | 39 | 35 |
| 10 | 68 | 64 | 58 | 59 | 57 | 55 | 54 | 56 | 51 | 54 | 50 | 52 | 40 | 44 | 39 | 44 | 40 |
| 11 * | 92 | 58 | 53 | 51 | 50 | 56 | 49 | 51 | 49 | 50 | 47 | 46 | 34 | 38 | 36 | 38 | 35 |
| 12 | 71 | 67 | 61 | 62 | 56 | 62 | 51 | 57 | 49 | 56 | 47 | 51 | 32 | 39 | 32 | 40 | 34 |
| 13 | 75 | 61 | 58 | 54 | 57 | 59 | 52 | 54 | 53 | 53 | 51 | 50 | 40 | 42 | 41 | 43 | 41 |
| AVG | - | 62 | 56 | 57 | 55 | 56 | 50 | 54 | 49 | 53 | 47 | 50 | 35 | 40 | 36 | 41 | 37 |
| <u>Supply Spool</u> | | | | | | | | | | | | | | | | | |
| 1 | 75 | 58 | 55 | 52 | 53 | 54 | 50 | 50 | 49 | 50 | 48 | 48 | 33 | 37 | 37 | 39 | 38 |
| 2 | 71 | 61 | 55 | 56 | 54 | 55 | 50 | 53 | 49 | 52 | 48 | 48 | 32 | 37 | 29 | 38 | 35 |

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

* Not included in average

TABLE 3-1

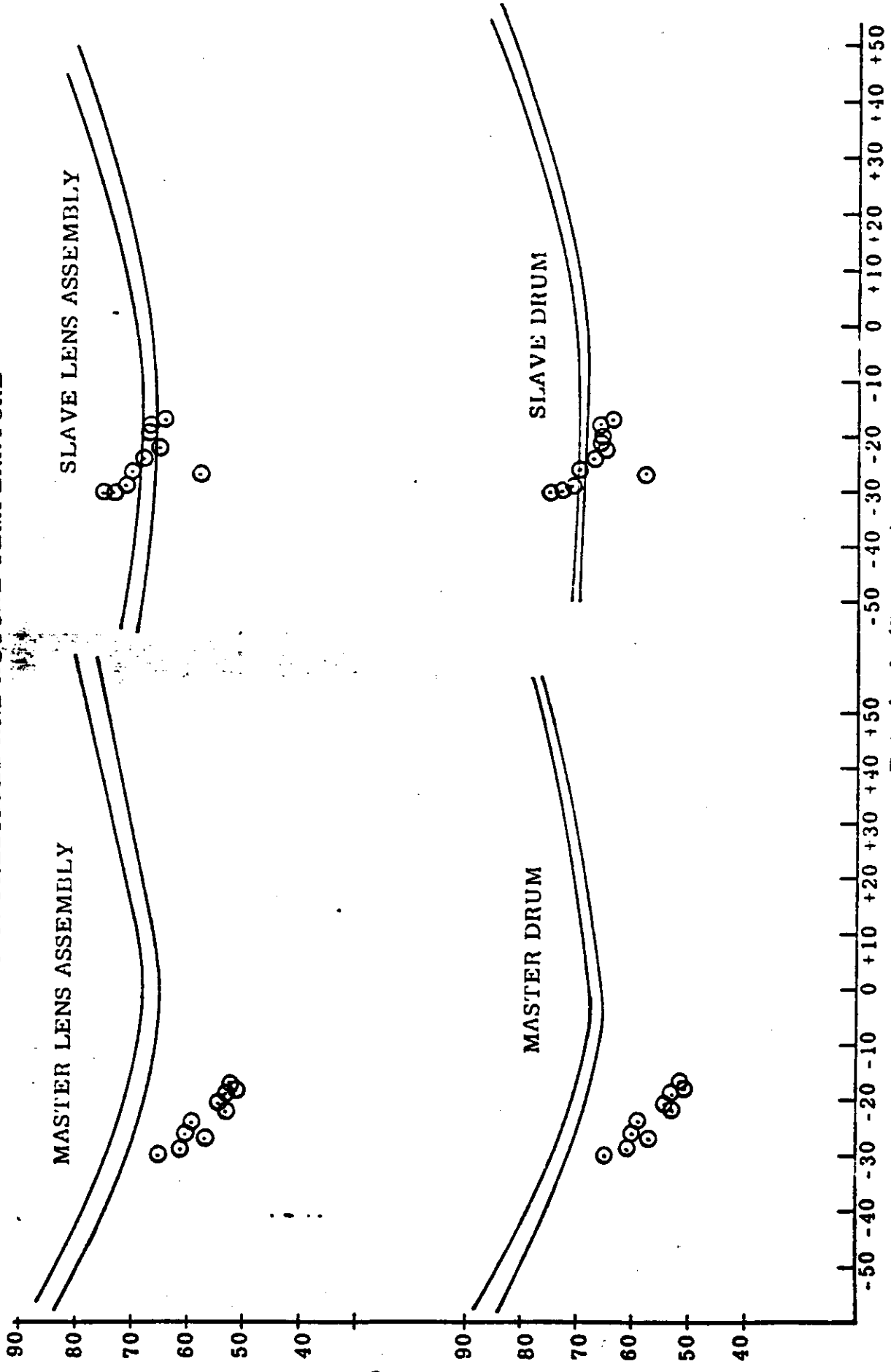
J-17 TEMPERATURE SUMMARY

| <u>SENSOR</u> | | <u>ORBITS ACQUIRED</u> | | | | | | | | | | | | | | | | |
|-----------------------------------|----------|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|--|
| <u>Fairing ("A")</u> | | | | | | | | | | | | | | | | | | |
| <u>Barrel #1 ("B")</u> | | | | | | | | | | | | | | | | | | |
| | <u>0</u> | <u>9</u> | <u>16</u> | <u>25</u> | <u>31</u> | <u>41</u> | <u>47</u> | <u>56</u> | <u>63</u> | <u>72</u> | <u>79</u> | <u>88</u> | <u>142</u> | <u>152</u> | <u>158</u> | <u>167</u> | <u>174</u> | |
| 1 | | 41 | 19 | 51 | 22 | 48 | 19 | 41 | 16 | 41 | 16 | 2 | -5 | 2 | -1 | 5 | 5 | |
| 2 | | 8 | -5 | 11 | -5 | 11 | -8 | 8 | -11 | 11 | -8 | 9 | -7 | 12 | -1 | 16 | 6 | |
| 3 | | 6 | 2 | 6 | -6 | 9 | 6 | 2 | 2 | 9 | 2 | 33 | 17 | 30 | 23 | 30 | 30 | |
| 4 | 219 | 57 | 44 | 57 | 44 | 57 | 41 | 50 | 41 | 50 | 38 | 40 | 11 | 20 | 8 | 18 | 8 | |
| 5 | 232 | 71 | 58 | 74 | 52 | 68 | 45 | 61 | 42 | 58 | 39 | 47 | 21 | 27 | 21 | 24 | 21 | |
| 6 | 228 | 72 | 59 | 78 | 59 | 72 | 53 | 62 | 43 | 59 | 37 | - | - | - | | | | |
| <u>Barrel #2</u> | | | | | | | | | | | | | | | | | | |
| 1 | 141 | 58 | 64 | 61 | 61 | 52 | 55 | 45 | 49 | 45 | 42 | 39 | 14 | 20 | 14 | 20 | 14 | |
| 2 | 134 | 59 | 71 | 65 | 71 | 59 | 65 | 49 | 55 | 46 | 49 | 42 | 13 | 23 | 13 | 23 | 13 | |
| 3 | 175 | 30 | 30 | 36 | 36 | 36 | 33 | 30 | 30 | 30 | 26 | 30 | 14 | 23 | 20 | 23 | 26 | |
| 4 | 184 | 7 | 1 | 11 | 1 | 11 | -3 | 11 | -3 | 11 | 1 | 11 | -3 | 14 | 4 | 17 | 11 | |
| 5 | 178 | 97 | 15 | 15 | 15 | 18 | 11 | 15 | 12 | 15 | 12 | 12 | 2 | 12 | 5 | 15 | 8 | |
| <u>Conic Adapter</u> | | | | | | | | | | | | | | | | | | |
| 1 | 156 | 62 | 56 | 66 | 53 | 59 | 46 | 53 | 43 | 49 | 36 | 40 | 10 | 23 | 10 | 20 | 10 | |
| <u>Clock</u> | | | | | | | | | | | | | | | | | | |
| 1 | 97 | 65 | 61 | 61 | 58 | 63 | 56 | 61 | 54 | 61 | 54 | 56 | 41 | 50 | 45 | 50 | 43 | |
| 2 | 93 | 63 | 56 | 58 | 56 | 61 | 52 | 56 | 52 | 56 | 54 | 54 | 39 | 46 | 39 | 48 | 41 | |
| <u>Thrust Cone "A" To "B" SRV</u> | | | | | | | | | | | | | | | | | | |
| 1 | 84 | 44 | 39 | 41 | 38 | 41 | 37 | 39 | 33 | 39 | 33 | 50 | 42 | 41 | 40 | 46 | 39 | |
| 2 | 109 | 59 | 52 | 54 | 48 | 50 | 40 | 46 | 41 | 45 | 41 | 53 | 44 | 44 | 44 | 44 | 49 | |
| <u>Stellar/Index "A" to "B"</u> | | | | | | | | | | | | | | | | | | |
| 1 | 88 | 73 | 63 | 66 | 63 | 66 | 60 | 63 | 57 | 57 | 57 | 57 | 44 | 48 | 44 | 48 | 44 | |
| 2 | 75 | 62 | 59 | 56 | 59 | 59 | 52 | 56 | 49 | 52 | 49 | 54 | 44 | 44 | 44 | 47 | 44 | |
| <u>Recovery Battery "E" SRV</u> | | | | | | | | | | | | | | | | | | |
| 1 | 77 | 76 | 74 | 66 | 70 | 69 | 68 | 66 | 67 | 65 | 64 | 96 | 88 | 84 | 98 | 84 | 86 | |
| <u>Master Cassette "A" SRV</u> | | | | | | | | | | | | | | | | | | |
| 2 | 95 | 69 | 63 | 55 | 61 | 60 | 60 | 59 | 60 | 61 | 59 | - | - | - | - | - | - | |

Note: Only thrust cone data corrected for self-heating

TOP SECRET

J-17 PREDICTED AND ACTUAL TEMPERATURE

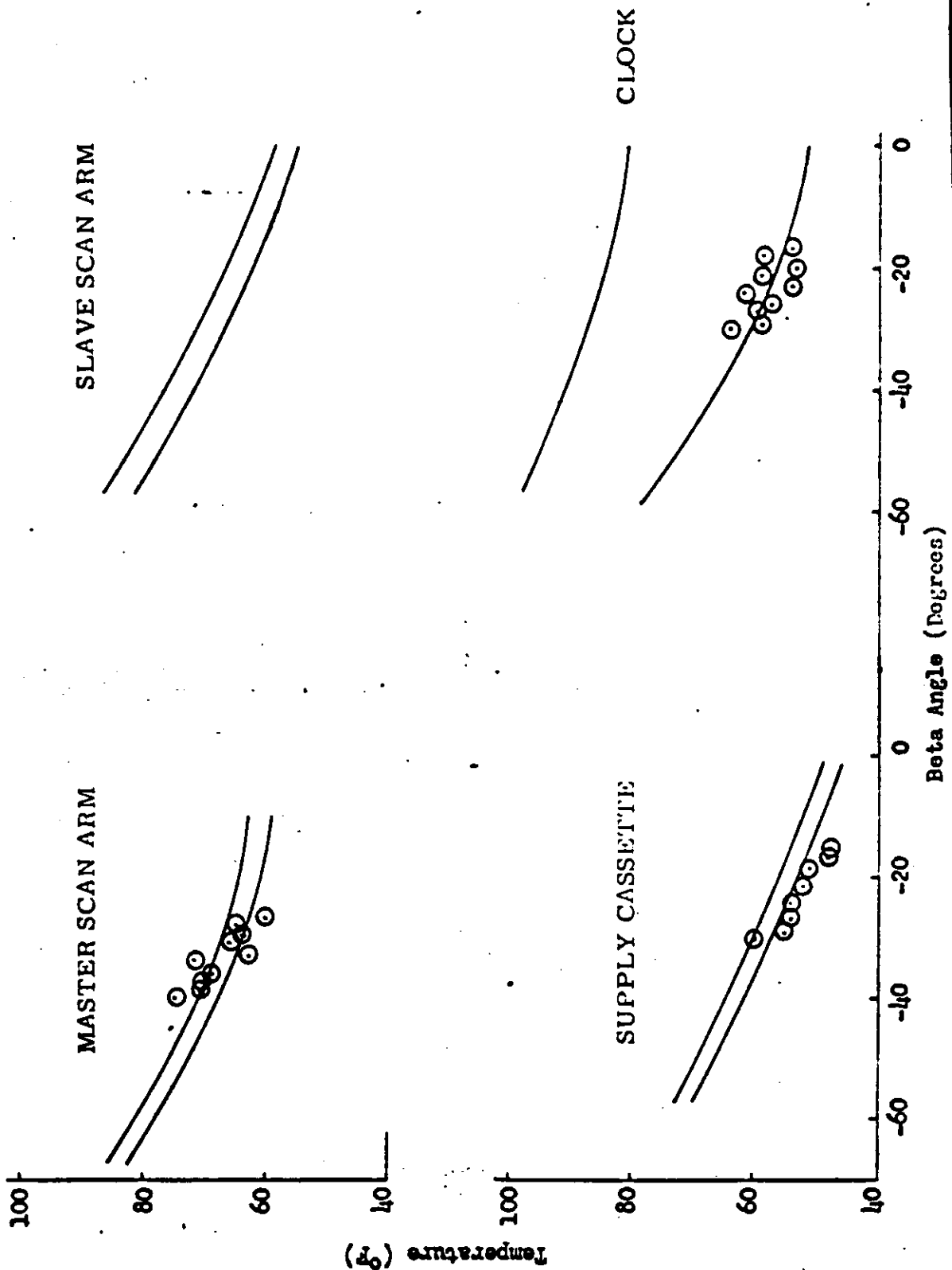


Beta Angle (Degrees)

FIGURE 3-1

TOP SECRET

J-17 PREDICTED AND ACTUAL TEMPERATURE



J-17 PREDICTED AND ACTUAL TEMPERATURE

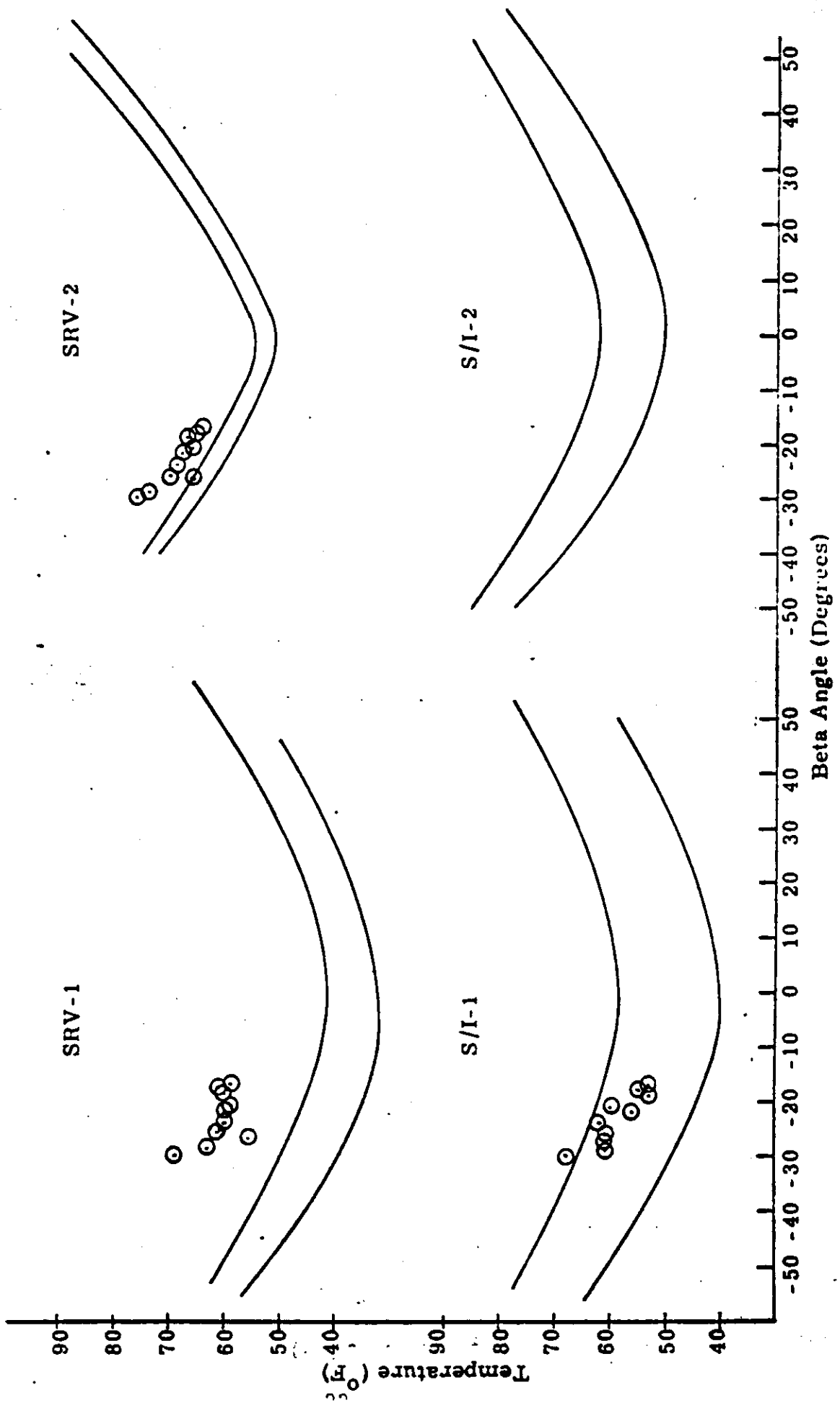


FIGURE 3-3

D. CLOCK PERFORMANCE

Satisfactory clock correlation was obtained for both active periods.

Table 3-2 contains clock/system time correlation data for the flight before and after the deactive period, respectively. 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 portions of the flight were best fitted to this second order equation. The coefficients A_0 , A_1 and A_2 are included on Table 3-2.

E. STELLAR/INDEX CAMERA PERFORMANCE

Normal payload metering was observed on TLM for both the "A" and "B" S/I cameras during all of the operations listed in Table 1. Metering ratios were 7/3, 8/3 for the "A" S/I and 7/4, 8/2 for the "B" S/I.

The shutter pulse was observed at the proper sequence for all day-time operations over [REDACTED] tracking station. These occurred during orbits 16, 31, 47, 63, 79, 142 and 174.

F. PANORAMIC CAMERA PERFORMANCE

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

Table 3-3 contains cycle period data of the operations observed on TLM. The instruments ran consistently slower than predicted throughout the flight. Ramp settings were changed several times during the flight to compensate for the discrepancies in cycle rate predicability errors which ran as high as 5%. The difference in operating rates between the instruments was within $\pm 1\%$.

Cycle rate predicability established from environmental test data was $\pm 2\%$, obtained when the J-17 system consisted of instruments 138 and 139. The slave instrument 139 was then replaced with instrument 141 which was part of the M-27 system. The separate Mag. Amp. calibrations from 138 and 141 were combined to obtain the cycle rate data used for matching the system with the flight orbit. These two instruments were not recalibrated as a system which probably accounts, in part, for the differences in cycle rate

CLOCK/SYSTEM TIME CORRELATION

PAYLOAD J-17 MISSIONS 1015-1

TIME CORRELATION

ORDER FIT 1

| SYS TIME I/P | CL TIME I/P | COMP SYS TM | DELTA ST | REV | STA |
|--------------|--------------|-------------|----------|-----|-----|
| 37345.257 | 102153.10490 | 37345.25380 | -0.00564 | 9 | 1 |
| 76952.907 | 141760.76090 | 76952.90970 | -0.00180 | 15 | 1 |
| 37526.884 | 188734.74490 | 37526.88180 | 0.00311 | 25 | 1 |
| 72101.597 | 223309.46590 | 72101.59410 | 0.00388 | 31 | 1 |
| 38229.084 | 275836.96690 | 38229.08180 | 0.00320 | 41 | 1 |
| 72574.358 | 310182.25090 | 72574.35700 | 0.00190 | 47 | 1 |
| 33457.124 | 357465.02990 | 33457.12410 | 0.00089 | 56 | 1 |
| 73025.176 | 397033.09590 | 73025.18000 | -0.00308 | 63 | 1 |
| 33482.972 | 443890.89890 | 33482.97110 | 0.00180 | 72 | 1 |
| 73391.545 | 483799.48790 | 73391.55000 | -0.00408 | 79 | 1 |

A0=-0.64807815260 05 A1= 0.9999997464690 00

SIGMA=0.00310 NO. POINTS= 10

RATIO OF CLOCK TIME TO SYS TIME= 0.1000000253530 01

ORDER FIT 2

| SYS TIME I/P | CL TIME I/P | COMP SYS TM | DELTA ST | REV | STA |
|--------------|--------------|-------------|----------|-----|-----|
| 37345.257 | 102153.10490 | 37345.25960 | -0.00166 | 9 | 1 |
| 76952.907 | 141760.76090 | 76952.90820 | -0.00026 | 16 | 1 |
| 37526.884 | 188734.74490 | 37526.88260 | 0.00231 | 25 | 1 |
| 72101.597 | 223309.46590 | 72101.59500 | 0.00191 | 31 | 1 |
| 38229.084 | 275836.96690 | 38229.08460 | 0.00034 | 41 | 1 |
| 72574.358 | 310182.25090 | 72574.35990 | -0.00096 | 47 | 1 |
| 33457.124 | 357465.02990 | 33457.12520 | -0.00122 | 56 | 1 |
| 73025.176 | 397033.09590 | 73025.18080 | -0.00388 | 63 | 1 |
| 33482.972 | 443890.89890 | 33482.96960 | 0.00333 | 72 | 1 |
| 73391.545 | 483799.48790 | 73391.54580 | 0.00010 | 79 | 1 |

A0=-0.64807829070 05 A1= 0.99999993606380 00

A2=-0.19487179522320-12

SIGMA=0.00192 NO. POINTS= 10

TABLE 3-2

CLOCK/SYSTEM TIME CORRELATION

PAYLOAD J-17 MISSIONS 1015-2

TIME CORRELATION

ORDER FIT 1

| SYS TIME I/P | CL TIME I/P | COMP SYS TM | DELTA ST | REV | STA |
|--------------|--------------|-------------|----------|-----|-----|
| 69301.082 | 47947.79890 | 69301.08350 | -0.00058 | 142 | 1 |
| 35453.016 | 100499.74490 | 35453.01360 | 0.00331 | 152 | 1 |
| 69484.506 | 134531.25190 | 69484.51030 | -0.00339 | 158 | 1 |
| 30219.562 | 181666.31890 | 30219.56310 | -0.00013 | 167 | 1 |
| 69659.462 | 221106.22990 | 69659.46220 | 0.00079 | 174 | 1 |

A0= 0.21353299050 05 A1= 0.9999996975250 00

SIGMA=0.00198 NO. POINTS= 5

RATIO OF CLOCK TIME TO SYS TIME= 0.1000000302480 01

ORDER FIT 2

| SYS TIME I/P | CL TIME I/P | COMP SYS TM | DELTA ST | REV | STA |
|--------------|--------------|-------------|----------|-----|-----|
| 69301.082 | 47947.79890 | 69301.08390 | -0.00097 | 142 | 1 |
| 35453.016 | 100499.74490 | 35453.01340 | 0.00355 | 152 | 1 |
| 69484.506 | 134531.25190 | 69484.51000 | -0.00302 | 158 | 1 |
| 30219.562 | 181666.31890 | 30219.56290 | 0.00002 | 167 | 1 |
| 69659.462 | 221106.22990 | 69659.46250 | 0.00042 | 174 | 1 |

A0= 0.21353300550 05 A1= 0.9999996704160 00

A2= 0.10040697893380-12

SIGMA=0.00196 NO. POINTS= 5

TABLE 3-2

J-17/1607

FLIGHT CYCLE RATE DATA

INST. 138/141

3640

| REV/MOD | RAMP | T.U.R. | INST 133 | | | INST 141 | | | 138/141 DIFF. | |
|---------|------|--------|----------|-------|-------|----------|-------|-------|------------------|-------|
| | | | ACT. | NOM. | DEV. | ACT. | NOM. | DEV. | | |
| 1 | A | 7 5 | 1421 | 2.562 | 2.553 | -0.37 | 2.578 | 2.520 | -2.29 | 0.62 |
| 9 | A | 7 5 | 182 | 4.796 | 4.769 | -0.56 | 4.832 | 4.743 | -1.89 | 0.75 |
| 16 | A | 7 5 | 1683 | 2.360 | 2.318 | -1.82 | 2.380 | 2.292 | -3.84 | 0.85 |
| 31 | A | 7 4 | 1806 | 2.260 | 2.213 | -2.12 | 2.275 | 2.186 | -3.97 | 0.66 |
| 47 | A | 7 4 | 1046 | 2.268 | 2.212 | -2.53 | 2.272 | 2.185 | -3.98 | 0.18 |
| 56 | A | 6 4 | 298 | 4.624 | 4.567 | -1.25 | 4.648 | 4.535 | -2.50 | 0.52 |
| 63 | A | 6 4 | 1834 | 2.250 | 2.206 | -2.02 | 2.260 | 2.180 | -3.67 | 0.44 |
| 72 | A | 6 4 | 338 | 4.705 | 4.503 | -4.49 | 4.710 | 4.469 | -5.39 | 0.11 |
| 79 | A | 6 4 | 1792 | 2.246 | 2.207 | -1.78 | 2.251 | 2.181 | -3.22 | 0.22 |
| 89 | B | 6 4 | 346 | 4.566 | 4.489 | -1.70 | 4.570 | 4.455 | -2.58 | 0.09 |
| 142 | B | 4 5 | 1909 | 2.240 | 2.197 | -1.95 | 2.240 | 2.173 | -3.06 | -0. |
| 152 | B | 4 5 | 491 | 3.840 | 3.736 | -2.79 | 3.835 | 3.691 | -3.91 | -0.13 |
| 167 | B | 4 5 | 533 | 3.768 | 3.670 | -2.67 | 3.768 | 3.625 | -3.95 | -0. |
| 174 | B | 4 5 | 2132 | 2.250 | 2.201 | -2.22 | 2.245 | 2.177 | -3.14 | -0.22 |

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 3-3

predictability between the environmental test and flight operations.

Payload consumption for the flight was as follows:

"A" MISSION

| | <u>Master</u> | <u>Slave</u> |
|--------|---------------|--------------|
| Cycles | 2949 | 2908 |
| Feet | 7800 | 7692 |

"B" MISSION

| | | |
|--------|------|------|
| Cycles | 2660 | 2650 |
| Feet | 7036 | 7009 |

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 is passing through the PMU system when the instruments are inoperative.

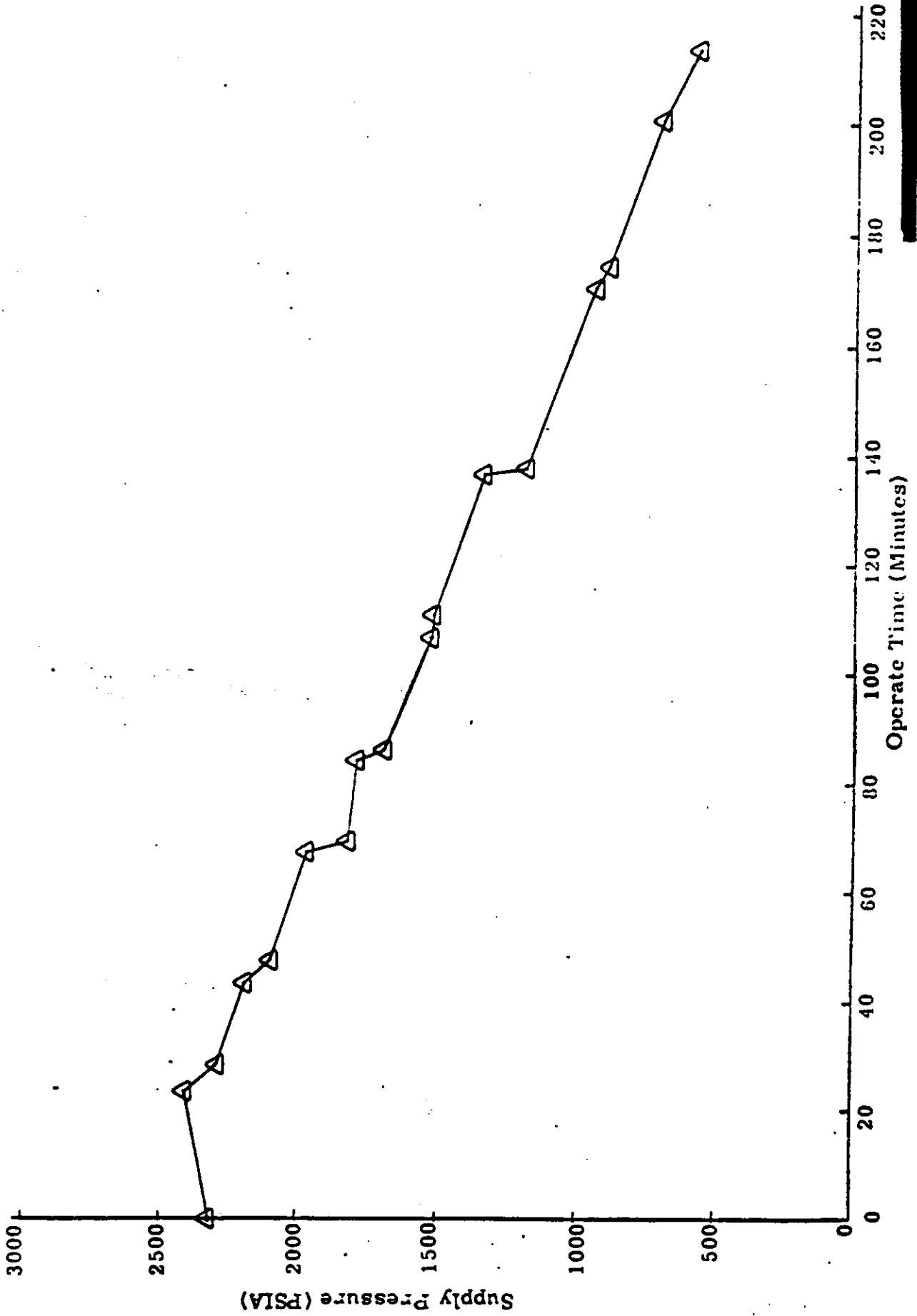
H. FMC MATCH

Early in the flight it was discovered that the instruments were cycling approximately 3% slow when the V/h ramp was not on the limiter. It was also determined that the limiter was imposing a maximum cycle rate 2% lower than nominally calibrated.

The error imposed by the limiter could not be compensated, but it was determined that the 3% slow cycle rate error could be compensated for by

~~TOP SECRET~~

J-17 PRESSURE MAKE-UP SUPPLY CONSUMPTION



~~TOP SECRET~~ [REDACTED]

stepping to a reference level one higher than nominal calibration data indicated. This was done by switching to R-6, A-4 when nominal calibration data indicated ramp R-7, A-4 was necessary to match the orbit.

Due to perigee being below nominal, the greatest part of the photography was taken in the area in which the limiter was active. This area yielded indicated V/h errors up to 4% at perigee due to the limiter while areas not in the limiter experienced approximately 1% to 2% mismatch.

~~TOP SECRET~~ [REDACTED]

~~TOP SECRET~~

SECTION 4

MISSION 1015-1 RECOVERY SYSTEM

SRV #662 was received at A/P on 17 February 1964. The receiving weight was 150.04 pounds. After modifications and incorporation of outstanding Engineering Orders, the SRV was delivered to Systems Test for incorporation into the J-17 system.

The recovery system was shipped to VAFB on 16 November 1964.

A successful air catch was made during orbit 81 on 24 December 1964. The impact point was approximately 50 miles down range from the predicted point. Table 4-1 lists the available telemetry data on the sequence of recovery events.

The condition of the recovered capsule was satisfactory with damage limited to normal paint blistering.

~~TOP SECRET~~

MISSION 1015-1
RECOVERY SEQUENCE OF EVENTS

| <u>Event</u> | <u>Delta Time (Seconds)</u> | |
|-------------------------|-----------------------------|---|
| | <u>Actual</u> | <u>Nominal</u> <u>Events + ΔT</u> |
| Transfer | - | - - |
| Electrical Disconnect | 1.14 | 0.900 + 0.430 - 0.400 |
| * Separation | 2.00 | 2.0 + 0.250 |
| ** Spin | 3.40 | 3.4 + 0.30 |
| Retro | 7.60 | 7.55 + 0.45 |
| Despin | 10.75 | 10.75 + 0.54 |
| T/C Separation | 1.47 | 1.5 + 0.15 |
| Parachute Cover Off | 34.20 | 34.0 + 1.5 |
| Drogue Chute Deployed | 0.65 | 0.63 + .08 - .06 |
| Main Chute Bag Separate | 10.28 | 10.14 + .48 - .40 |
| Main Chute Deployed | 0.50 | 0.52 + 0.13 - 0.12 |
| Main Chute Disreefed | 4.60 | 4.46 + .49 - .29 |

* From Transfer
** From Electrical Disconnect

Spin Rate: 64.5 RPM
Despin Rate: N/A
Retro Velocities: 1024 Ft/Sec.

N/A: Not Available

TABLE 4-1

~~TOP SECRET~~ [REDACTED]

SECTION 5
MISSION 1015-2 RECOVERY SYSTEM

SRV #663 was received at A/P on 10 June 1964. The receiving weight was 152.61 lbs. After modifications and incorporation of outstanding E.O's the SRV was delivered to systems test for incorporation into the J-17 System.

The capsule was shipped to VAFB on 16 November 1964.

The "B" SRV recovery system was successfully air recovered during orbit 175 on 30 December 1964. The available data for the re-entry events is listed in Table 5-1. The impact point was within tolerance for this recovery.

The "B" SRV system was recovered one day early due to the questionable state of the pyro battery. An unexplained current draw was experienced during orbits 144 and 169. This condition prompted the decision to recover before the unregulated supply dropped to the level where the pyro battery would be required for the recovery events.

The recovery bucket damage was limited to the normal paint blistering.

~~TOP SECRET~~ [REDACTED]

~~TOP SECRET~~

MISSION 1015-2
RECOVERY SEQUENCE OF EVENTS

| <u>Event</u> | <u>Delta Time (Seconds)</u> | |
|-------------------------|-----------------------------|---|
| | <u>Actual</u> | <u>Nominal</u> <u>Events + ΔT</u> |
| Transfer | - | - - |
| Electrical Disconnect | N/A | 0.900 +0.430 -0.400 |
| * Separation | N/A | 2.0 \pm 0.250 |
| ** Spin | N/A | 3.4 \pm 0.30 |
| Retro | N/A | 7.55 \pm 0.45 |
| Despin | N/A | 10.75 \pm 0.54 |
| T/C Separation | N/A | 1.5 \pm 0.15 |
| Parachute Cover Off | 33.83 | 34.0 \pm 1.5 |
| Drogue Chute Deployed | 0.59 | 0.63 + .08 - .06 |
| Main Chute Bag Separate | 10.21 | 10.14 + .48 - .40 |
| Main Chute Deployed | 0.59 | 0.52 + .13 - .12 |
| Main Chute Disreefed | 4.48 | 4.46 + .49 - .39 |

* From Transfer

** From Electrical Disconnect

Spin Rate: N/A

Despin Rate: N/A

Retro Velocity: N/A

No T/M Data available for Unit #2 Retro events.

TABLE 5-1

~~TOP SECRET~~

SECTION 6

MASTER PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

| <u>Component</u> | <u>Serial Number</u> |
|-----------------------------|----------------------|
| Main Camera | 138 |
| Main Camera Lens | 1152435 |
| Supply Horizon Camera | 165B |
| Supply Horizon Camera Lens | 813558 |
| Take-up Horizon Camera | 165A |
| Take-up Horizon Camera Lens | 813525 |
| Supply Cassette | SC-22 |

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 4404 |

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 | 35 mm f/6.8 |
| Aperture Setting | f/3.0 |
| Exposure Time | 1/100 second |
| Filter Type | Wratten 25 |

C. POST FLIGHT PERFORMANCE EVALUATION

The camera produced 2690 frames of panoramic photography during Mission 1015-1 and 2664 frames during Mission 1015-2. The aggregate in-flight frame count from telemetry data agreed exactly with the post-flight frame count. The overall photographic quality was judged to be similar to Mission 1014. There was no variation in the quality of the photography produced during Mission 1015-1 and 1015-2 hence the temperature variations experienced during flight had no apparent affect on camera performance.

The information content of the photography was considered excellent by the photo interpreters. They felt that the quality was comparable to Mission 1006, considering the climatic variations, and that the Master camera photography was, in general, slightly superior to the Slave camera photography.

There were some minor light leaks in the first and last few frames of photography during most passes. The only light leak considered degrading was on the film sitting between the camera and the take-up during the three day deactivate period. There was no observed fogging from dendritic static or corona discharge.

The 200 cycle time track was clearly defined and imaged outside of the active format. The extended pulse denoting Stellar-Index camera exposure was approximately five inches long. This length is considered excessive as too many time track bits are unusable for the restoration of time of photography of discrete ground areas.

~~TOP SECRET~~ [REDACTED]

The horizon cameras and associated fiducials operated normally throughout both missions. Some under exposure was observed in both cameras as a result of operations at or near the day - night line.

The binary data block, camera serial number and end-of-pass lamps operated normally throughout the mission. No data block lamp failures were noted. The data block time word did show that the two panoramic cameras were approximately 500 milliseconds out of synchronization at the start of Mission 1015-1. The time word was not present in frame 102 of pass D147; a total of 106 frames were exposed during the operation. The cause of this drop-out is not known.

~~TOP SECRET~~ [REDACTED]

SECTION 7

SLAVE PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

| <u>Component</u> | <u>Serial Number</u> |
|-----------------------------|----------------------|
| Main Camera | 141 |
| Main Camera Lens | 1182435 |
| Supply Horizon Camera | 155B |
| Supply Horizon Camera Lens | 813534 |
| Take-up Horizon Camera | 150A |
| Take-up Horizon Camera Lens | 813526 |
| Supply Cassette | SC-22 |

B. CAMERA DATA AND FLIGHT SETTINGS

Main Camera:

| | |
|-------------|-------------------|
| Lens | 24" f/3.5 |
| Slit Width | 0.175 |
| Filter Type | Wratten 21 |
| Film Type | Eastman Type 4404 |

Supply (Starboard) Horizon Camera:

| | |
|------------------|--------------|
| Lens | 55 mm f/6.8 |
| Aperture Setting | f/8.0 |
| Exposure Time | 1/100 second |
| Filter Type | Wratten 25 |

Take-up (Port) Horizon Camera:

| | |
|------------------|--------------|
| Lens | 55 mm f/6.8 |
| Aperture Setting | f/6.8 |
| Exposure Time | 1/100 second |
| Filter Type | Wratten 25 |

C. POST FLIGHT PERFORMANCE EVALUATION

The camera exposed 2690 frames of photography during Mission 1015-1 and 2654 frames during Mission 1015-2. The in-flight frame count was the same as the post-flight total.

The photographic image quality and information content was essentially identical to the Master camera however, as was previously noted, a general preference existed for the Master camera photography. It is of interest to note that the MIP frame for both missions was selected from the Slave camera photography.

Minor image degradation was caused by a small soft area at the supply end, data block edge of all frames after pass D06. The soft area was present but to a lesser degree during Mission 1015-2. The film also showed that the platen rails had severely scratched the emulsion outside of the active format. It is postulated that the resulting emulsion buildup on the ends of the rails produced a film lift greater than the lift of the scan head rollers and thus causing the out of focus area. A study has been proposed by the Customer to correlate the soft spots in all prior missions to observed system anomalies to determine if a trend can be found.

Density banding was observed near the start of scan on all frames. This anomaly had no affect on the image quality however it does indicate non-uniform scan arm velocity which may or may not have been in conjunction with non-uniform lens rotation. Further study will be made when the engineering photography is distributed.

The 200 cycle time track, horizon cameras and binary data block operation was normal throughout both missions with the exception of the absence of the time word on frame 27 of pass D167. The Slave camera contained the old type data block therefore the dot sizes were not as uniform as those produced in the Master camera.

SECTION 8

PANORAMIC CAMERA EXPOSURE

The Master camera contained a 0.250 inch wide slit and a Wratten 25 filter while the Slave camera contained a 0.175 inch wide slit and a Wratten 21 filter. These conditions place the nominal exposure between the intermediate and full level processing curves as published by [REDACTED] for 4404 emulsion.

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 are shown as a function of latitude for passes D-8, D-80, and D-169 in Figures 8-5 to 8-10. 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]

| <u>Mission</u> | <u>Camera</u> | | <u>Primary</u> | <u>Intermediate</u> | <u>Full</u> |
|----------------|---------------|-----------|----------------|---------------------|-------------|
| 1015-1 | FWD | Predicted | 0 | 8 | 92 |
| | | Reported | 2 | 2 | 96 |
| 1015-1 | AFT | Predicted | 0 | 30 | 70 |
| | | Reported | 0 | 5 | 95 |
| 1015-2 | FWD | Predicted | 0 | 10 | 90 |
| | | Reported | 0 | 10 | 90 |
| 1015-2 | AFT | Predicted | 0 | 21 | 79 |
| | | Reported | 0 | 9 | 91 |

An analysis was conducted independently by the evaluation team and photo interpreters to determine the solar elevation at which the image quality was reduced by underexposure. Both groups agreed that quality was adversely affected at solar elevations of 8 degrees or less by the reduction of contrast resulting from underexposure.