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4 August 1966

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THRU: [REDACTED]

FROM: [REDACTED]

SUBJECT: MISSION 1020-1 AND 1020-2 FINAL REPORT

Enclosed is the Final Performance Evaluation Report
for Mission 1020-1 and 1020-2.

[REDACTED] Manager
Advanced Projects

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CORONA J

PERFORMANCE EVALUATION REPORT

MISSION 1020-1 and 1020-2

FTV 1613; J-20

8 July 1966

Approved: [REDACTED]

Manager

Advanced Projects

Approved: [REDACTED]

Manager

Program [REDACTED]

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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 1613.

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 1020-1 and 1020-2 which was launched on 9 June 1965.

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INTRODUCTION

This report presents the final performance evaluation of Missions 1020-1 and 1020-2 of the Corona Program. The purpose of this report is to define the performance characteristics of the J-20 payload system, to identify the source of in-flight anomalies and recommend the appropriate corrective action.

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, visual RES values 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 1020, placed into orbit by Flight Test Vehicle #1613 and LV-2A booster #444, 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-20 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 six and a five day photographic operation with no deactive period.

B. MISSION DESCRIPTION

The payload was launched from Vandenberg Air Force Base (VAFB) at 21:58:16 Z (14:58:16 PDT) on 9 June 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 1020-1 consisted of six days operation and was completed by air recovery on orbit 97, 15 June 1965. The second air recovery was accomplished on 16 June 1965 during orbit 113 using the secondary recovery system (Life Boat). Life Boat was used for Mission 1020-2 because unstable vehicle attitude developed after pass 97D.

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

ORBITAL PARAMETERS

<u>Parameter</u>	<u>Predicted</u>	<u>Orbit 1 Actuals</u>
Period (Min.)	90.01	89.88
Perigee (N. M.)	100.00	96.00
Apogee (N. M.)	200.11	199.09
Inclination (Deg.)	75.0	75.07
Perigee Latitude (Deg. N.)	22.24	32.61
Eccentricity	0.01398	0.01437

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C. PANORAMIC CAMERAS

The Master and Slave panoramic cameras operated throughout both missions with no significant problems and Mission 1020 produced fair photographic coverage. The cloud cover (45%) and atmospheric haze observed in the photography was relatively high.

D. STELLAR-INDEX CAMERAS

The Mission 1020-1 Stellar-Index camera operated properly throughout the mission and produced very high quality photography. The Mission 1020-2 Stellar-Index camera operated properly during the mission.

E. OTHER SUB -SYSTEMS

The clock, instrumentation, pressure make-up, command and thermal control sub-systems performed satisfactorily through both missions. The vehicle guidance system became inoperative after pass D-97.

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SCHEMATIC INBOARD PROFILE - CORONA J SYSTEM

MISSION 1020

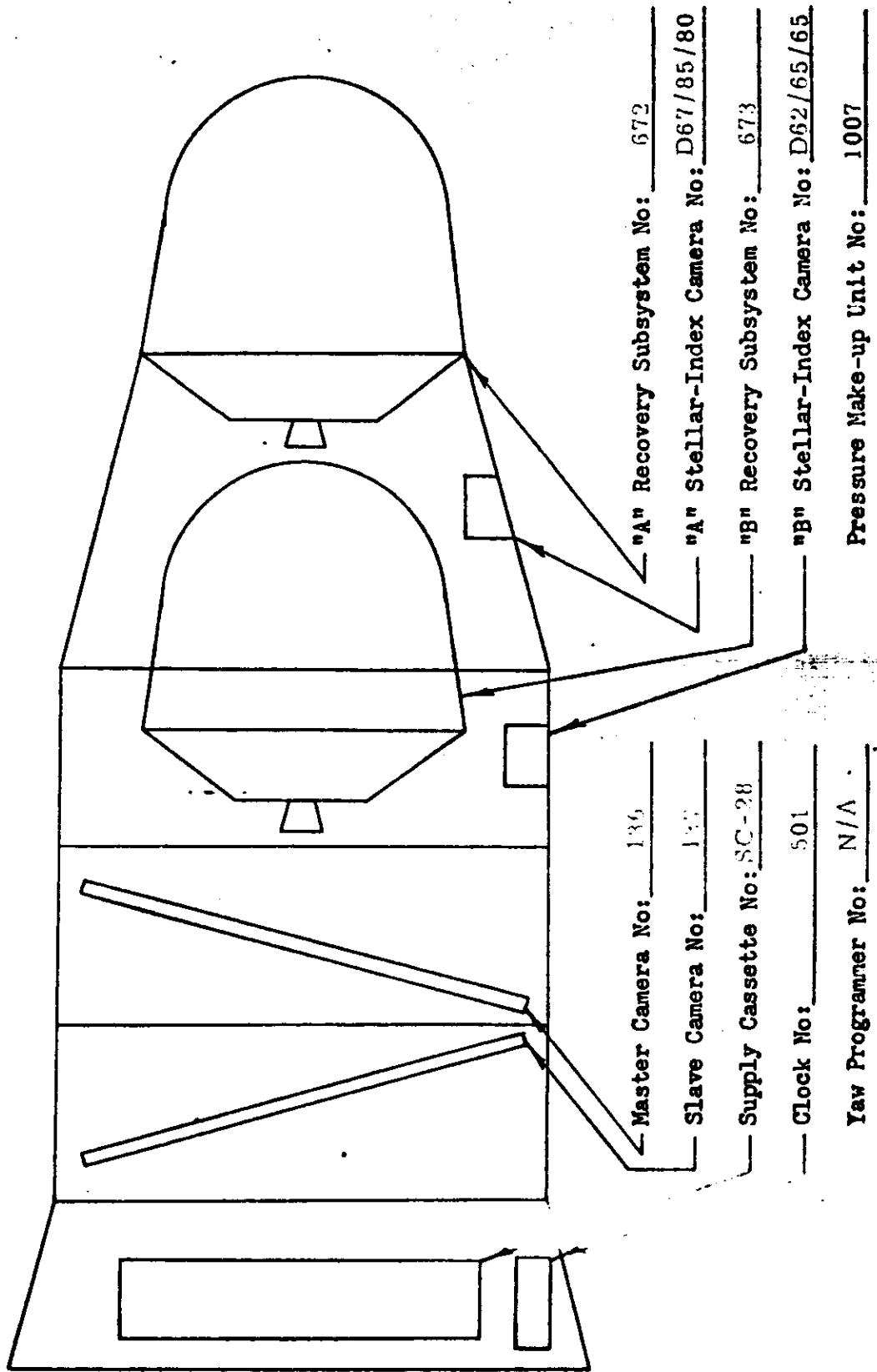


FIGURE 1-1

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SECTION 2

PRE-FLIGHT SYSTEMS TESTS

A. ENVIRONMENTAL TESTING

1. Test Objective

As a standard procedure, the J payload systems are subject 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 J-20 payload system was in the TASC chamber at Sunnyvale for environmental testing three times as follows:

TASC Test 1 - Jan. 26 to 28, 1965

TASC Test 2 - Jan. 30 to Feb. 5, 1965

TASC Test 3 - Mar. 2 to 4, 1965

TASC Test 1 was the first attempt to subject the system to an environmental test. The test was programmed for 16 active orbits in both the "A" and "B" modes with one day soak in between. The test was interrupted by a fail-safe condition at instrument startup on Rev. 4, "A" mode operation. When an attempt to reapply power to the instrument takeup was unsuccessful, the system was returned to A/P for investigation of the problem.

TASC Test 2 was the second effort to complete the programmed testing attempted during TASC Test 1. The system was returned to the TASC chamber after extensive testing at A/P on a system and component level. These tests failed to isolate the problem which caused the fail-safe in TASC Test 1. Further fail-safes occurred during "A" mode operations. Active operations consisted of 11 Revs. in the "A" mode and 12 Revs. in the "B" mode.

TASC Test 3 was a special test designed primarily to test the system in the "A" configuration to verify that a new "A" takeup unit eliminated the fail-safe problem. The test consisted of 50 cycle bursts of stereo operation at 15 minute intervals for a total of 2500 cycles in the "A" mode and 500 cycles in the "B" mode.

The J-20 system subjected to these tests consisted of panoramic instruments 136 and 137. Stellar/Index cameras D17 ("A" unit) and D24 ("B" unit) were aboard for TASC Test 1. The "B" unit was replaced with D62 prior to TASC Test 2. Takeup cassette unit T13 replaced unit T35 in the SRV "A" system prior to TASC Test 3.

3. Summary

TASC Test 1:

- 1) A fail-safe condition occurred at instrument startup during Rev. 4, "A" mode operation. The following instrument #2 dynamics were observed at and prior to fail-safe:
 - a. Erratic payload takeup throughout operations in the "A" mode.
 - b. The 99/101 clutch ratios of 7/6, 8/6, and 6/5 for the operation prior to the fail-safe.
 - c. The clutch shifted from the 99 position, to the 101 position during the metering portion of the 5th frame.

TASC Test 2:

- 1) Two fail-safes occurred during "A" mode operations, Rev. 10 and 11. The following instrument #2 dynamics were observed:
 - a. Erratic payload takeup throughout "A" mode operations.
 - b. The 99/101 clutch ratios for Rev. 10 operation were 7/5 and 7/7.
 - c. The clutch ratios for Rev. 11 operation was 6/4 for most of the operation and changed to 5/4, 7/6, 4/3, 8/5 and 5/4 prior to fail-safe.

- d. The clutch shifted from the 99 to 101 position during the metering portion of the cycle prior to fail-safe in both cases.
- 2) A fail-safe occurred during the "B" mode operation after instrument #2 ran out of payload on Rev. 12.
 - 3) Smooth payload transport was observed on instrument #2 takeup monitor during "B" mode operations.
 - 4) Instrument #1 operation was satisfactory throughout the test.
 - 5) Cycle rate predictability error was $\pm 2\%$. Instrument #1 operated at rates up to 2% slower than instrument #2.
 - 6) Both stellar/index cameras operated satisfactorily as indicated by the shutter pulse and payload metering monitors.
 - 7) Clock performance was satisfactory.
 - 8) Both "A" and "B" recovery sequences were satisfactory. Both instruments stowed properly during cut and wrap operation. S/I slewing occurred normally at "arm" signal.
 - 9) The corona marking level met the criteria established for the J-program.
 - 10) Several vehicle deactivate commands were given during both "A" and "B" modes of operation. The instruments operated for 5 cycles and stowed normally in each case.
 - 11) The PMU system operated satisfactorily.

TASC Test 3:

Both panoramic instruments operated satisfactorily. The erratic payload takeup and abnormal changes in 99/101 clutch ratios observed during TASC Test 1 and 2 "A" mode operations were absent from any of the TASC 3 operations.

There was no recurrence of the "fail-safe" problem after changing the "A" takeup cassette unit prior to the test.

A deactivate command was given successfully between "A" and "B" operations. Both instruments stowed normally after 5 cycles.

4. Panoramic Camera Performance

Throughout the "A" mode operations of TASC Tests 1 and 2 erratic film transport was observed on instrument #2 takeup monitor.

Four fail-safes occurred during TASC Tests 1 and 2 as follows:

- Fail-Safe 1 - TASC Test 1 at Instrument #2 startup Rev. 4 operation during second day in "A" mode.
- Fail-Safe 2 - TASC Test 2 after 51 cycles of Rev. 10 operation in "A" mode.
- Fail-Safe 3 - TASC Test 2 after 142 cycles of Rev. 11 operation in "A" mode.
- Fail-Safe 4 - TASC Test 2 after instrument #2 ran out of payload during Rev. 12 in the "B" mode.

The dynamic performance of both instruments was satisfactory for TASC test 3 as indicated by the monitors showing center-of-format, lens rotation and film transport. The average 99/101 percent clutch ratios for this test were 6/6 and 7/6 for Instrument #1 and 6/5 and 7/5 for instrument #2. The erratic payload movement experienced on instrument #2 during TASC Tests 1 and 2 was not observed on TASC Test 3. Neither were there any abnormal changes of 99/101 clutch ratios such as experienced in TASC Test 2 when the fail-safes occurred.

The cycle rate data from TASC Test 2 is summarized in Table 2-1.

During TASC Test 3 the instruments were operated at the R2-All level (zero amplitude) throughout the test. The V/h programmer was not run. Instrument #1 ran 1.3% slower than nominal and instrument #2 ran 1.5% faster. Instrument #1 operated approximately 1% slower than instrument #2 throughout the test.

J-20.136/137 TASC TEST 2 CYCLE RATES 1-30 TO 2-5-65

REV/MODE	RAMP	T.U.R.	INST 136			INST 137			136/137 DIFF.	
			ACT.	NOM.	DEV.	ACT.	NOM.	DEV.		
00	A	7 7	0	3.695	3.638	-1.55	3.655	3.645	-0.29	-1.08
00	A	7 7	0	3.680	3.638	-1.14	3.650	3.645	-0.15	-0.82
01	A	7 7	390	3.545	3.500	-1.28	3.505	3.508	0.07	-1.13
02	A	4 1	1420	2.185	2.205	0.89				
02	A	4 1	1600				2.173	2.195	1.02	
02	A	4 1	2120	2.170	2.189	0.88	2.158	2.192	1.53	-0.55
02	A	5 8	725	2.887	2.867	-0.68	2.857	2.880	0.79	-1.04
03	A	5 8	1545	2.443	2.434	-0.35	2.428	2.448	0.83	-0.61
04	A	7 7	2275	2.590	2.578	-0.46	2.580	2.592	0.45	-0.39
04	A	8 2	345	5.080	5.085	0.10	5.020	5.070	0.98	-1.18
05	A	11 1	1415	2.700	2.680	-0.76	2.687	2.693	0.21	-0.48
06	A	11 1	1950	2.280	2.274	-0.25	2.278	2.289	0.47	-0.09
06	A	5 8	1075	2.733	2.672	-2.27	2.710	2.685	-0.92	-0.84
06	A	5 8	1425	2.520	2.481	-1.59	2.510	2.494	-0.63	-0.40
07	A	7 7	1155	2.896	2.861	-1.23	2.866	2.873	0.25	-1.04
07	A	7 7	1580	2.580	2.551	-1.13	2.566	2.565	-0.05	-0.54
08	A	7 7	2510	2.773	2.739	-1.25	2.757	2.752	-0.19	-0.58
08	A	4 1	995	2.723	2.695	-1.02	2.707	2.708	0.05	-0.59
08	A	4 1	1730	2.195	2.188	-0.33				
09	A	4 1	2605				2.353	2.361	0.32	
09	A	4 1	3195	3.500	3.469	-0.89	3.450	3.477	0.78	-1.43
09	A	11 1	885	4.440	4.373	-1.54	4.380	4.370	-0.24	-1.35

TABLE 2-1

REV/MODE	RAMP	T.U.R.	INST 136			INST 137			136/137	
			ACT.	NOM.	DEV.	ACT.	NOM.	DEV.	DIFF.	
10	A	11 1	1875	2.308	2.271	-1.61	2.295	2.286	-0.41	-0.56
01	B	7 7	365	3.550	3.516	-0.98	3.510	3.523	0.37	-1.13
02	B	4 1	1425	2.210	2.204	-0.26				
02	B	4 1	1605				2.178	2.195	0.78	
02	B	4 1	2135	2.190	2.190	-0.01	2.165	2.192	1.24	-1.14
02	B	5 8	730	2.910	2.865	-1.58	2.893	2.877	-0.56	-0.58
03	B	5 8	1545	2.468	2.434	-1.38	2.442	2.448	0.26	-1.05
04	B	8 2	341	5.100	5.096	-0.08	5.000	5.080	1.57	-1.96
05	B	8 2	1703	2.230	2.217	-0.61				
05	B	8 2	2246				2.270	2.294	1.04	
05	B	11 1	1452	2.610	2.615	0.19	2.590	2.628	1.46	-0.77
06	B	11 1	2026	2.280	2.296	0.69	2.280	2.310	1.30	-0.
06	B	5 8	1084	2.700	2.667	-1.24	2.680	2.680	0.00	-0.74
06	B	5 8	1433	2.500	2.477	-0.92	2.480	2.491	0.44	-0.80
07	B	5 8	0	3.160	3.111	-1.59	3.130	3.121	-0.28	-0.95
07	B	7 7	1177	2.900	2.840	-2.12	2.870	2.852	0.63	-1.03
07	B	7 7	1584	2.600	2.549	-1.98	2.570	2.563	-0.27	-1.15
08	B	7 7	0	3.650	3.638	-0.32	3.610	3.645	0.95	-1.10
08	B	8 2	0	5.560	5.633	1.29	5.440	5.606	2.95	-2.16
08	B	4 1	1089	2.550	2.539	-0.43	2.520	2.553	1.28	-1.18
08	B	4 1	1751	2.180	2.187	0.34				
08	B	7 7	2614	2.860	2.831	-1.02	2.860	2.844	-0.58	-0.

TABLE 2-1

REV/MODE	RAMP	T.U.R.	INST 136			INST 137			136/137 DIFF.		
			ACT.	NOM.	DEV.	ACT.	NOM.	DEV.			
09	B	11	1	890	4.355	4.351	-0.09	4.311	4.348	0.86	-1.01
09	B	4	1	2784				2.650	2.673	0.87	
09	B	4	1	3211	3.500	3.504	0.11	3.450	3.511	1.75	-1.43
10	B	11	1	1860	2.272	2.273	0.04	2.258	2.287	1.28	-0.62
10	B	11	1	3030	4.905	4.919	0.28	4.815	4.906	1.86	-1.83
10	B	7	7	241	3.550	3.580	0.85	3.510	3.587	2.15	-1.13
11	B	7	7	1910	2.485	2.479	-0.26	2.470	2.492	0.90	-0.60
11	B	7	7	2290	2.587	2.586	-0.03	2.573	2.600	1.03	-0.54
11	B	7	7	0	3.595	3.638	1.19	3.540	3.645	2.87	-1.53
12	B	8	2	1230	2.733	2.740	0.27	2.713	2.753	1.46	-0.73
12	B	8	2	1840				2.175	2.221	2.09	

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 2-1

5. Stellar/Index Camera Performance

S/I payload metering occurred normally at every 7th cycle of instrument #1. Other S/I events as shutter and platen operations also occurred in the proper sequence. Metering ratios were 7/3, 8/3 for both "A" and "B" units. The "B" index camera metered abnormally during one metering cycle.

The "B" - S/I unit (D24) was changed prior to TASC Test 2. The unit was removed for updating of the shutter assembly for increased reliability. No problem was experienced. This S/I unit will be used on a subsequent payload system.

No S/I units were aboard for TASC Test 3.

6. Clock Performance

Various clock correlation checks with the IRIG-C time indicated differences of -.016 sec. in 28 hours, +.011 sec. in 4 hours, -.006 sec. in 3 hours, and +.017 in 7 hours.

7. Thermal Environment

Table 2-2 lists the system temperatures for several Revs. in the "A" and "B" modes. Instrument temperatures are average values, excluding T/S 11 on the scan arm. Table 2-3 contains the self-heating corrections used for BN 2400 type T/S in "A" and "B" configurations, respectively. The "Time" column represents the time in minutes that the TLM is on while the other columns represent the correction in °F applied to recorded temperature values.

8. Pressure Make-Up System Performance

The PMU system operated satisfactorily for TASC Test 2. The gas was dumped after Rev. 6 of the "B" mode. The pressure level at dump was 740 psig. The gas depletion rate was 6.4 psi per minute of instrument operation during normal usage.

The PMU system was out of gas for TASC Test 3.

TASC TEST 2 TEMPERATURE SUMMARY

		<u>"A" MODE</u>			<u>"R" MODE</u>	
<u>Orbit</u>	<u>0</u>	<u>5</u>	<u>11</u>	<u>1</u>	<u>I</u>	<u>12</u>
Inst. #1	70	61	67	68	72	73
Inst. #2	69	59	65	66	70	72
Supply Spool	78	60	61	62	68	68
Fairing	86	70	70	-	-	-
Barrel #2	84	67	70	73	69	48
Conic Adapter	85	47	48	51	60	38
Clock	87	79	80	80	85	74
Thrust Cone	68	54	51	59	69	60
T/V Cassette	71	63	60	-	-	-
Stellar/Index	78	64	66	56	65	40
Barrel #1	-	-	-	71	69	45

NOTE:

- 1) Temperature values are average.
- 2) Scan arm temperature (T/S 11) was not included in averages for the instruments.
- 3) Values were not corrected for self-heating.

TABLE 2-2

VEHICLE 16130. PAYLOAD J-20 SELF HEATING TEST. A

SUMMARY OF SELF HEATING CORRECTION CURVES

53 BAT 09 TC2 33 204 55 213 28 113 50 211
 40 SS2 46 209 15 108 44 CAL 23 111
 38 206 03 103 52 212
 21 SS1 37 TC1 05 104
 13 107 08 105
 20 110 43 208
 41 207
 18 109
 10 106
 48 210
 25 112
 31 203
 36 205

TIME	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6
0.10	0.2	0.8	0.9	0.9	1.8	2.5
0.13	0.3	1.0	1.1	1.1	2.3	3.1
0.16	0.4	1.3	1.4	1.4	2.9	3.9
0.20	0.8	1.8	1.9	1.9	3.5	5.2
0.25	1.5	2.5	2.7	2.6	4.4	7.0
0.32	2.4	3.3	3.6	3.5	5.5	9.2
0.40	3.6	4.4	4.7	4.6	6.8	12.1
0.50	5.0	5.8	6.1	6.0	8.5	15.6
0.63	5.2	6.0	6.4	6.4	9.1	16.7
0.79	5.5	6.3	6.8	6.9	9.7	18.0
1.00	5.8	6.7	7.3	7.6	10.6	19.8
1.26	5.8	6.8	7.5	7.9	11.0	20.6
1.58	5.8	6.8	7.6	8.3	11.4	21.5
2.00	5.7	6.8	7.6	8.6	11.7	22.0
2.51	5.5	6.7	7.7	8.9	12.1	22.7
3.16	5.3	6.7	7.8	9.3	12.4	23.3
3.98	5.1	6.6	7.8	9.6	12.7	23.6
5.01	4.9	6.5	7.8	10.1	13.0	24.1
6.31	4.8	6.5	8.0	10.5	13.2	24.3
7.94	4.7	6.5	8.1	11.0	13.4	24.6
10.00	4.6	6.5	8.3	11.6	13.8	24.9
12.59	4.8	6.8	8.6	12.2	14.0	25.2
15.85	5.0	7.1	9.1	13.0	14.4	25.5
19.95	5.3	7.5	9.6	13.9	14.8	25.9
25.12	5.7	7.9	10.3	15.1	15.4	26.5
31.62	6.2	8.6	11.2	16.4	16.0	27.1
39.81	7.0	9.4	12.2	17.7	16.7	27.8
50.12	8.0	10.5	13.5	19.4	17.5	28.7
63.10	9.2	11.8	15.0	21.4	18.4	29.9
79.43	10.7	13.2	16.7	23.5	19.5	31.1
100.00	12.6	15.1	18.8	26.0	20.8	32.8

TABLE 2-3

VEHICLE 1613 PAYLOAD J-20 SELF HEATING TEST B

SUMMARY OF SELF HEATING CORRECTION CURVES

39 TC2 21 SS1 31 203 08 105 55 213 50 211
40 SS2 37 TC1 15 108 05 104 28 113 29 111

53-BAT-36-205

46 209 48 210

41 207 52 212

38-206

25 112

20 110

43 208

33 204

03 103

18 109

13 107

10 106

TIME	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6
0.10	0.9	1.2	1.3	2.0	1.9	4.2
0.13	1.2	1.5	1.6	2.5	2.4	5.2
0.16	1.5	1.9	2.0	3.1	3.1	6.6
0.20	1.6	2.1	2.2	3.4	3.5	7.6
0.25	1.8	2.2	2.4	3.5	3.8	8.7
0.32	2.0	2.4	2.7	3.7	4.2	10.0
0.40	2.3	2.7	3.0	3.9	4.8	11.7
0.50	2.6	3.0	3.3	4.2	5.5	13.9
0.63	2.8	3.1	3.6	4.4	5.9	14.9
0.79	2.9	3.3	3.9	4.7	6.5	16.2
1.00	3.1	3.6	4.3	5.1	7.3	17.8
1.26	3.2	3.7	4.5	5.4	7.8	18.6
1.58	3.3	3.9	4.8	5.8	8.4	19.8
2.00	3.4	4.2	5.2	6.3	9.2	21.2
2.51	3.5	4.4	5.5	6.7	9.8	22.1
3.16	3.5	4.6	5.9	7.1	10.4	23.2
3.98	3.6	4.8	6.2	7.5	11.0	24.0
5.01	3.7	5.0	6.6	8.0	11.7	25.0
6.31	3.7	5.2	6.9	8.3	12.1	25.5
7.94	3.8	5.4	7.2	8.8	12.6	26.2
10.00	3.8	5.7	7.7	9.3	13.3	27.1
12.59	3.9	5.8	7.9	9.5	13.5	27.3
15.85	3.9	6.0	8.2	9.8	13.8	27.6
19.95	4.0	6.3	8.5	10.2	14.1	27.9
25.12	4.1	6.5	9.0	10.6	14.6	28.4
31.62	4.2	6.9	9.4	11.1	15.0	28.8
39.81	4.2	7.1	9.7	11.3	15.1	28.8
50.12	4.3	7.3	10.1	11.6	15.2	28.8
63.10	4.5	7.6	10.5	11.9	15.3	28.8
79.43	4.6	7.9	10.8	12.1	15.3	28.5
100.00	4.7	8.2	11.2	12.3	15.2	28.2

TABLE 2-3

9. Instrumentation

Footage pot and cycle counter correlation for several Revs. in the "B" mode is summarized in Table 2-4. Both cycle counters operated satisfactorily throughout all the TASC Testing.

The instrumentation system performance was satisfactory for all TASC tests.

B. RESOLUTION TEST

The final resolution and theodolite tests for J-20 system was completed at A/P on 13 February 1965. Test results are summarized as follows:

1. Theodolite test material was evaluated and found to be acceptable for both instruments.
2. Thru focus resolution tests were completed, graphically plotted (See Figures 2-1, 2-2) and evaluated. The collimator position of peak focus and the peak resolution is shown in the table below:

Master Instrument #136

Max Hi Con 184 Li/MM
Max Lo Con 107 Li/MM Peak focus at $-.001''$

Slave Instrument #137

Max Hi Con 194 Li/MM
Max Lo Con 102 Li/MM Peak focus at $-.001''$

All aspects of the resolution data for both instruments was normal.

Instruments 136 and 137 have demonstrated a resolution performance at A/P and Boston that meet test and flight requirements.

C. FLIGHT READINESS

The flight readiness test was completed without incident. Processed film exhibits from instruments 136 and 137 were analyzed. All data recording was present. Horizon fiducials and the horizon camera shutter function were acceptable. The time word, serial number, index lamps, 200 pps track,

"B" MODE PAYLOAD CONSUMPTION

INSTRUMENT #1

<u>Rev.</u>	<u>Footage Pot</u>		<u>Cycle Counter</u>	
	<u>Volts</u>	<u>Cycles</u>	<u>Reading</u>	<u>Cycles</u>
4	2.1	720	3945	711
5	2.3	856	4109	875
6	2.48	986	4222	988
7	2.95	1348	4580	1346
8	3.45	1761	5034	1800
9	3.6	1882	5194	1960

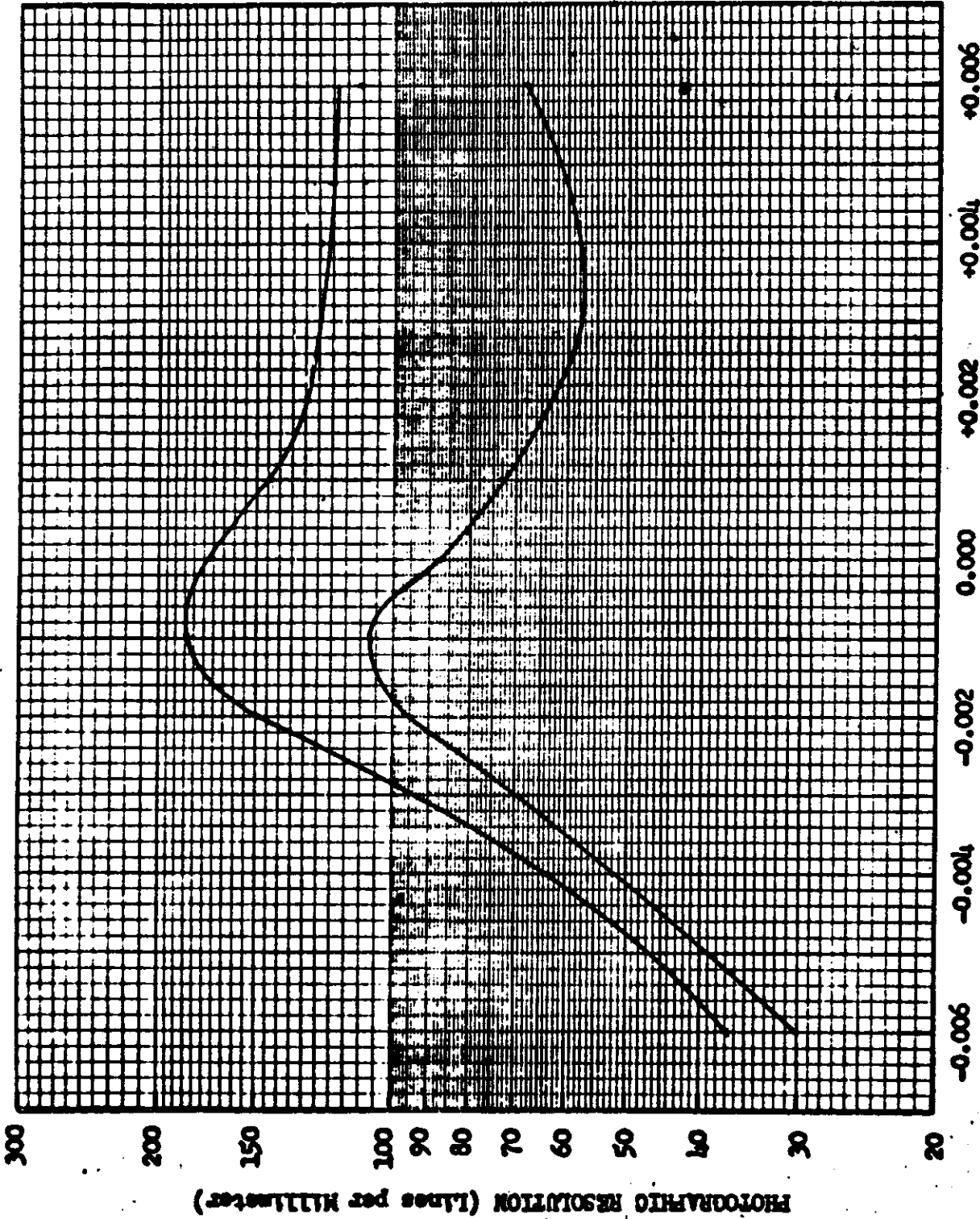
INSTRUMENT #2

4	2.1	716	3091	718
5	2.35	874	3258	885
6	2.52	989	3372	999
7	3.0	1351	3734	1361
8	3.54	1798	4193	1820
9	3.73	1967	4373	1999

TABLE 2-4

~~TOP SECRET~~

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 136
Payload No: J-20
Resolution (1/mm): 186
High Contrast: 186
Low Contrast: 107
Film Type: 3M06
Test Date: 2/16/65

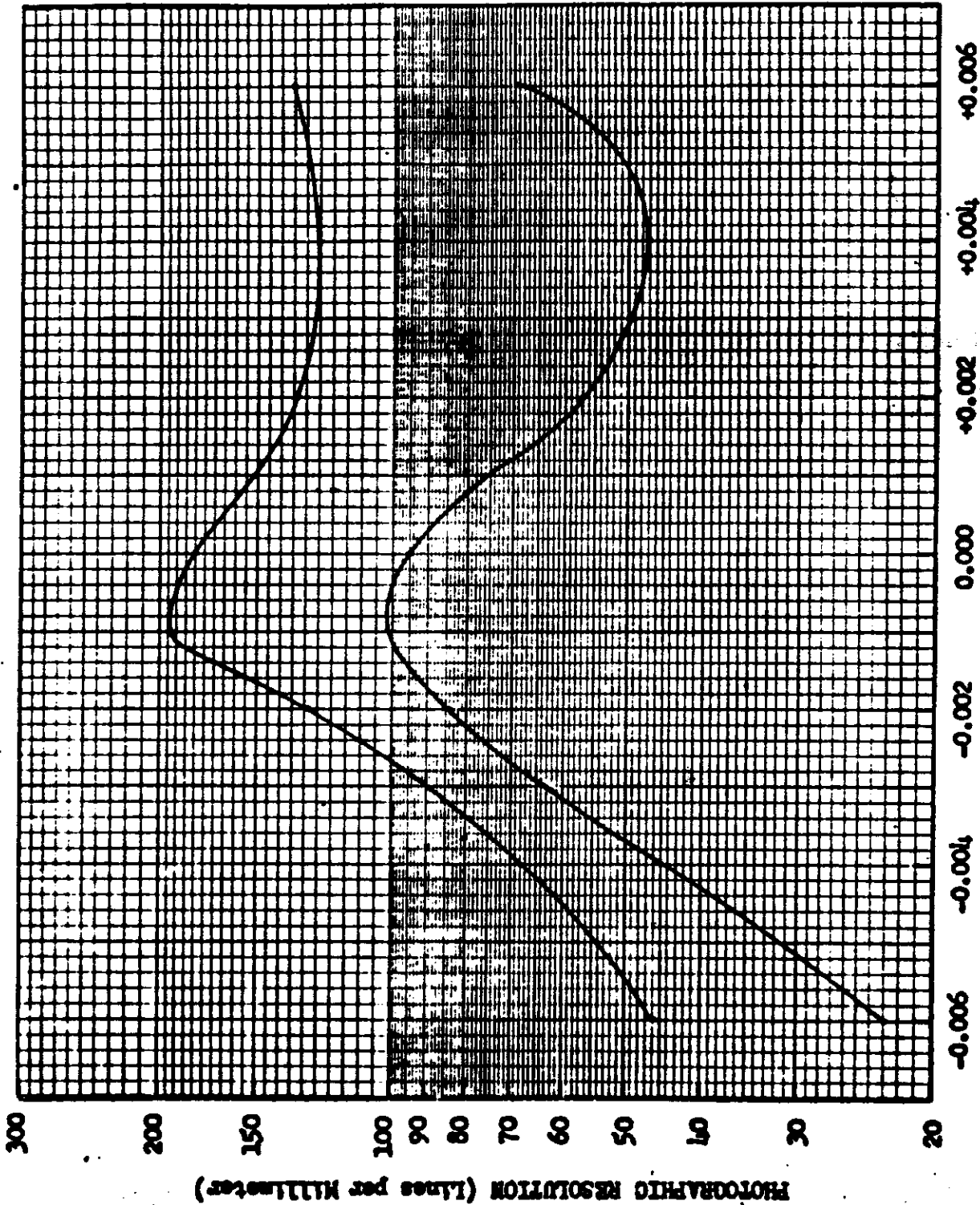
THROUGH FOCUS INCREMENTS (Inches)

FIGURE 2-1

~~TOP SECRET~~

~~TOP SECRET~~

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 137
Payload No: J-20
Resolution (1/mm): 194
High Contrast: 194
Low Contrast: 102
Film Type: 3404
Test Date: 2/6/65

THROUGH FOCUS INCREMENTS (Inches)

FIGURE 2-2

~~TOP SECRET~~

~~TOP SECRET~~ [REDACTED]

blanked pulse and end of pass mark were present and acceptable in all formats of panoramic photography. Controlled fogging of the panoramic format revealed stove banding to be absent and the 200 pps timing track was outside the active format area. Several very minor minus density streaks parallel to the film edge in both panoramic film exhibits were observed. No other film defects attributable to flight hardware were observed in the final flight readiness film exhibits. Flight readiness film exhibits indicated that J-20 system was ready for flight.

~~TOP SECRET~~ [REDACTED]

SECTION 3

FLIGHT OPERATIONS

A. SYSTEM PERFORMANCE SUMMARY

All launch, ascent, and injection events occurred as programmed and the desired orbit was achieved. The Agena vehicle performance was satisfactory through the first mission. Failure in the regulated voltage supply caused the second mission to be terminated early.

Both panoramic cameras operated satisfactorily throughout the flight.

Both Stellar/Index cameras operated satisfactorily for the flight.

The telemetry and command system performance was satisfactory throughout both missions with one exception. The cycle counter on instrument No. 2 randomly lost counts throughout both missions.

The clock system operated normally throughout both missions.

The pressure make-up system operated throughout both missions. However, the gas consumption was higher than any previous systems. The flight data indicates that a possible high-pressure leak was present at the beginning of Phase 1.

The thermal environment for both instruments was within tolerance for the entire flight.

The -1 SRV unit was recovered successfully. The impact point was within tolerance.

The -2 SRV unit was recovered successfully also but the secondary vehicle recovery system (lifeboat) was required because the vehicle guidance system was not functioning. Impact was approximately 200 miles down range of the predicted point.

B. PANORAMIC CAMERA PERFORMANCE

Instrument system dynamics were observed on TLM during several Tracking Station acquisitions. Table 3-1 presents the cycle rate summary of both panoramic cameras for these orbits.

J-20/1613 MISSION 1020 CYC RATE SUMMARY-ENGR. OPERATIONS

REV/MODE	RAMP	T.U.R.	INST 136			INST 137			136/137 DIFF.	
			ACT.	NOM.	DEV.	ACT.	NOM.	DEV.		
9	A	6 5	280	3.815	3.762	-1.41	3.813	3.767	-1.23	-0.05
16	A	6 5	1774	2.280	2.217	-2.83	2.252	2.228	-1.08	-1.23
25	A	6 4	345	3.932	3.900	-0.83	3.931	3.903	-0.72	-0.03
32	A	6 4	1858	2.246	2.211	-1.58	2.249	2.220	-1.33	0.13
41	A	5 4	398	3.682	3.621	-1.69	3.685	3.627	-1.59	0.08
48	A	5 4	1895	2.250	2.204	-2.08	2.240	2.210	-1.34	-0.44
57	A	5 4	435	3.680	3.574	-2.97	3.675	3.581	-2.64	-0.14
63	A	5 4	2002	2.239	2.205	-1.54	2.236	2.211	-1.11	-0.13
79	A	5 4	2037	2.226	2.206	-0.92	2.249	2.212	-1.66	1.03
95	A	5 4	2080	2.248	2.207	-1.87	2.248	2.214	-1.55	-0.
04	B	5 4	545	3.477	3.423	-1.58	3.460	3.431	-0.85	-0.49

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 3-1

Instrument dynamics were good for each of the engineering operations observed. Payload transport was smooth as indicated by the supply and horizon idler monitors. Normal instrument start-up and shut-down was indicated in each case.

Cycle rate data obtained for these operations indicated that both instruments were running up to 3% slower than nominal. The instruments operated within + 1% of each other. Average 99/101 clutch ratios were 6/6 and 6/5 for the master and slave, respectively.

Panoramic Film Consumption - Frames

	Nominal	Actual Master	Slave
Pre-Launch	100	101	101
-1 Mission	3000	2912	2910
-2 Mission	2900	*1019	*1010
Total	6000	4032	4021

*These values obtained from cycle counters

FMC Match

Several V/h ramp reference level, amplitude, and delay (RTC 6, 8 and 10) position changes were made during the flight to improve the FMC match, as follows:

<u>Orbit</u>	<u>RTC 6-8-10</u>	<u>Approx. Match</u>	<u>Comments</u>
Launch	6-5-6	9% slow	Settings for nominal conditions
7	6-5-4	4% slow	RTC 10 changed to compensate for non-nominal perigee latitude
17	6-5-4	2% slow	To improve orbit match - Instruments operating slow
39	5-4-3	>1% slow	To adjust for slow instrument rates
97	5-4-4	>1% slow	Increments in delay steps changed from 60 to 80 sec. for second mission

C. STELLAR/INDEX CAMERA PERFORMANCE

Both the -1 and -2 stellar/index units operated normally during the flight. The frames exposed during the 97 orbits of the first mission were 412 for the stellar and 414 for the index. The second S/I unit exposed approximately 146 frames during the shortened second mission.

S/I events were observed on all of the engineering operations acquired at [REDACTED]. Metering was normal for both units. Shutter pulses were indicated during all of the daytime passes over [REDACTED]. The index camera payload was out prior to the engineering operation on Orbit 95 which was the last time the system was operated during the first mission. All S/I events occurred in the proper sequence for both units.

D. INSTRUMENTATION AND COMMAND SYSTEM

Instrumentation - The telemetry instrumentation operated satisfactorily except for the cycle counter on the slave camera. This counter intermittently failed to advance at the cycle requiring the "tens" digit to advance. This condition was observed on several engineering passes and appeared to be more prevalent after long inactive periods. Similar failures occurred on the two previous missions, 1019 and 1021. Improved cycle counters are being installed on J-25 and up.

Commands - Normal response was obtained from all stored and real time commands throughout both missions. Difficulty was encountered in the receipt of S-band commands after the vehicle became unstable. This was due to vehicle attitude and not the command system.

E. CLOCK PERFORMANCE

Good correlation was obtained between the clock and [REDACTED] system time. Table 3-2 contains the clock/system time correlation.

F. PRESSURE MAKE-UP SYSTEM PERFORMANCE

The PMU supply pressure decay history is plotted on Figure 3-1 as a function of accumulated camera operate time. The gas consumption rate was approximately 12.5 psi/min. during the first 40 orbits of flight.

J-2C CLCK/SYSTEM TIME CORRELATION
MISSION 102C-1 AND 1020-2

ORDER FIT 1

SYS TIME I/P	CL TIME I/P	CGMP SYS TM	DELTA ST	REV	STA
60023.058	77883.51090	60023.06380	-0.00487	0	1
39989.467	144249.92990	39989.46790	0.00005	9	1
79186.582	183447.05790	79186.58710	-0.00413	16	1
39811.258	230471.74090	39811.25950	-0.00056	25	1
79019.317	269679.80890	79019.31870	-0.00074	32	1
39634.097	316694.59490	39634.09410	0.00383	41	1
78825.148	355885.65690	78825.14730	0.00164	48	1
39423.947	402884.46890	39423.94870	-0.00079	57	1
73309.930	436770.45290	73309.92510	0.00582	63	1
33615.817	483476.35090	33615.81260	0.00533	72	1
72882.594	522743.13890	72882.59180	0.00315	79	1
33544.997	32934.63590	33544.99020	0.00774	88	1
72687.902	72077.55990	72687.90540	-0.00246	95	1
33257.067	119046.73390	33257.06890	-0.00090	104	1
72451.257	158240.94490	72451.27100	-0.01309	111	1

A0=-0.1786042962D 05 A1= 0.999999775157D 00

SIGMA=0.00481 NO. POINTS= 15

RATIO OF CLCK TIME TO SYS TIME= 0.10000022484D 01

ORDER FIT 2

SYS TIME I/P	CL TIME I/P	CGMP SYS TM	DELTA ST	REV	STA
60023.058	77883.51090	60023.05670	0.00228	0	1
39989.467	144249.92990	39989.46490	0.00306	9	1
79186.582	183447.05790	79186.58610	-0.00311	16	1
39811.258	230471.74090	39811.26040	-0.00148	25	1
79019.317	269679.80890	79019.32090	-0.00290	32	1
39634.097	316694.59490	39634.09730	0.00063	41	1
78825.148	355885.65690	78825.15100	-0.00204	48	1
39423.947	402884.46890	39423.95260	-0.00462	57	1
73309.930	436770.45290	73309.92870	0.00221	63	1
33615.817	483476.35090	33615.81550	0.00240	72	1
72882.594	522743.13890	72882.59380	0.00119	79	1
33544.997	32934.63590	33544.99060	0.00737	88	1
72687.902	72077.55990	72687.90410	-0.00112	95	1
33257.067	119046.73390	33257.06500	0.00293	104	1
72451.257	158240.94490	72451.26480	-0.00680	111	1

A0=-0.1786044287D 05 A1= 0.999999862140D 00

A2=-0.110728097C6040-12

SIGMA=0.00338 NO. POINTS= 15

TABLE 3-2