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CORONA CR

MISSION SUMMARY

AND

TELEMETRY ANALYSIS

MISSION 1112

AGENA 1658/PAYLOAD QR-2R

31 January 1971

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MISSION SUMMARY

1.0 SUMMARY

Mission 1112 utilized a THORAD booster (SLV-2H) S/N 552, Agena vehicle 1658, and payload system QR-2R. The QR-2R payload system contained Panoramic cameras S/N 300 and 301, and DISIC camera S/N 08. Payload profile and additional component serial numbers are included in Figure 7.1.

Lift-off occurred at 1328 PST on 18 November 1970 from Vandenberg, SLC-3 west pad. All payload ascent events were normal with In-flight Reset (door ejection), A/P to orbit mode, instrumentation switchover, and panoramic camera transfer to orbit mode occurring as programmed. The orbit attained was within the three sigma of predicted.

The performance of panoramic camera S/N 300 was normal throughout the flight except for an abnormal camera shutdown on Rev. 3. The panoramic film supply for camera S/N 300 was exhausted during Rev. 298.

The following anomalies occurred on panoramic camera S/N 301 during the -1 mission. Film analysis revealed a triangular pressure mark began on Rev 5 Frame 62 and occurred at 6.25 inch intervals for the next 94 frames. A gouge on the film backing began coincident with the last triangular mark and continued from Frame 62, Rev 5 through Frame 1, Rev 35. The center of format pulses were missing on Frames 133, 134, 135 on Rev 6 and Frame 17 on Rev 7.

The following irregularities were observed during the A to B Transfer Sequence. Panoramic camera S/N 301 experienced a metering failure and all camera dynamic functions ceased. The SRV tape recorder failed after 13 seconds. The DISIC camera operated during the panoramic camera operation through a sneak circuit.

The DISIC camera A to B Transfer Sequence was normal. However, the camera stalled in the metering portion of a cycle on Rev. 107.

The clock system, command and instrumentation systems, pressure make up system, recovery systems and the thermal environment were normal throughout the flight.

The panoramic camera A to B Transfer Sequence was performed on Rev. 104 [redacted] and the DISIC camera A to B Sequence on Rev. 107, [redacted] The -1 mission recovery capsule was recovered by air catch on Rev. 147 at 1509 PST on 27 November 1970. The -2 mission recovery capsule was recovered by air catch on Rev 309 at 1414 PST on 7 December 1970.

The delay in the recovery of the -1 mission recovery capsule was necessitated by the need to further explore the failure mode experienced during the KZ-38 sequence and unsatisfactory weather conditions in the recovery zone. This was the first system to delay recovery after KZ-38 for more than one day.

2.0 SUBSYSTEM PERFORMANCE

2.1 Panoramic Cameras

Panoramic camera S/N 300 experienced an abnormal shutdown on Rev. 3. The SRV tape recorder telemetry data indicated the camera system lost its internal operate command prematurely, precluding normal shutdown. The camera system coasted down without take-up tension permitting film slack in the transport system. The film wrapped around the input metering roller forming a crease in the film. Due to the tension from the constant tension assembly negator spring and the application of the supply cassette brake, the film was freed from the input metering roller. The take-up pulled the slack film out of the system when power was applied with the next operate command. The 99/101 clutch was misphased and required approximately 20 camera cycles for the camera system to achieve stabilized operation. Film analysis disclosed a sharp crease approximately 90 degrees to the major axis extending across the web of the film. The most probable cause of the premature removal of the operate command was a drop out in the twenty second delay power relay.

The cause of the 20 second timer anomaly could not be determined. Therefore, to preclude a similar catastrophic failure, a modification was performed to hold take-up power on for five (5) seconds after removal of the internal operate command. This modification was performed on all remaining systems except CR-13.

Post flight analysis also revealed a possible catastrophic failure mode in the scan switch circuitry if the scan switch failed in the closed

position. A modification was performed on all remaining systems (CR-13 and up, CR-08) to provide a back-up capability by wiring the scan and stow switches in series. This prevents premature dropout of the twenty four (24) volt unregulated voltage in the shut down sequence.

The switch clusters from all remaining systems were removed and checked for switch resistance and switch overtravel to insure correct phasing of the timing sequence.

Panoramic camera S/N 300 film footage pot telemetry monitor indicated a hundred to two hundred cycles higher than the cycle counters from Rev 6 to the end of the -1 mission. Post flight de-spooling indicated the film on the take-up was indeed out of round and the telemetry monitor was correctly indicating an abnormal film condition. Subsequent film analysis revealed the film hump was due to a film backing build-up resulting from a gouge in the film backing.

The gouge was 0.007 inches wide longitudinally and 0.8 inches in from the time track edge on the backing side of the film. The gouge was preceded by a 0.1 inch triangular pressure mark at 6.25 inch intervals, indicating a small particle of unknown origin became lodged in the input metering roller. The particle apparently became detached and was carried along the film path to possibly wedge between a roller and a roller guide resulting in continuous gouging from frame 62, Rev 5, through a manufacturers splice and ending on frame 1, Rev 35. A series of minor base rubs were apparent through the remainder of the -1 mission which apparently resulted from the reorientation of the particle.

Panoramic camera S/N 301 did not stow properly on Frame 135, Rev. 6. Real Time telemetry data also indicated a perturbation occurred in the constant tension assembly probably resulting in a slack loop. Analysis of the SRV tape recorder telemetry data indicated that during the operation on Rev. 6, the center-of-format signals were missing on Frames 133, 134, and 135. Frame 134 should have been the normal stow frame. However, due to the loss of the center-of-format signal, the camera system operated an extra cycle during the 20 second power off delay period resulting in the stow and film slack loop anomaly. Another center-of-format signal was missed on Frame 17 of Rev. 7.

The missing center-of-format signals resulted in lost time words, camera serial numbers, slurred time pulses on four frames, and a missing horizon optic exposure on one frame. The most likely cause was either a defective center-of-format switch with an intermittent failure mode or a marginal adjustment of the switch travel.

Panoramic camera S/N 301 experienced a frame metering function failure during the A to B transfer sequence. Telemetry data indicated the film cut and take-up cinch were normal and camera functions were normal for more than half of the first cycle. A film metering anomaly occurred when the scan head was within 15 degrees of the platen area as depicted by a slow down in the frame metering function, increase in forward drive motor voltage, and an increase in unregulated current. Camera drive functions on the input side of the drive mechanism continued while all output functions ceased, indicating a mechanical failure, jamming, or a sheared pin in the

metering drive mechanism. The camera system remained in a stalled condition throughout the -2 mission and all Post Event 2 testing. The most probable cause of the camera failure is a mechanical failure, binding, or jamming of the gear train or star wheel drive mechanism by an object of unknown origin.

The available panoramic camera cycle periods were normal throughout the flight. Refer to Table 7.2.

2.1.1 Film Consumption and Type

	Frames	
	Pan 300	Pan 301
Sample	20	20
Pre-launch	177	178
-1 Mission	2841	2723
-2 Mission	3134	1
TOTAL	6172	2922

Film Supply Length and Type

Pan 300	Pan 301
7800 ft/3414	7800 ft/3414
1000 ft/3404	1000 ft/3404
7500 ft/3414	7500 ft/3414
16,300 ft total	16,300 ft total

2.2 DISIC Camera

The DISIC camera system performed normally throughout the -1 mission.

The DISIC camera system operated during the panoramic camera A to B Transfer sequence through a sneak circuit in the pressure make-up (PMU) control circuitry. This condition resulted in four frames

of unprogrammed index and accompanying stellar photography. The sneak circuit was erroneously added when modifying the transfer and command boxes for PMU operation with the DISIC camera independent mode operation.

The DISIC camera system operated properly during the engineering pass on Rev. 106. The DISIC camera A to B Transfer sequence was performed on Rev. 107 with all transfer functions occurring properly. However, on Rev. 108 only 33 cycles were registered on the terrain cycle counter instead of the programmed 71 cycles. The DISIC camera was stalled in the metering portion of the cycle. The DISIC camera was turned on in the independent mode three times during the -2 mission, however, the camera system failed to operate. Post flight material analysis indicated no flight terrain material was present and only 28 frames of stellar material. The most probable cause of the DISIC camera failure was the loss of the -2 mission terrain take-up. The flight take-up was tested at N.Y. for thermal altitude testing resulting in a failure after four minutes of operation. A detailed failure analysis report will be submitted by N.Y.

2.2.1 Film Consumption

	Frames
	Terrain
Sample	24
Pre-launch	94
-1 Mission	2451
-2 Mission	33
TOTAL	2602

Length/Type

Terrain	Stellar
2200 ft/3401	2000 ft/3400

2.3 Command and Control

2.3.1 Command System

The real time command (RTC) system operation was satisfactory throughout the flight.

2.3.2 FMC Match

A large perigee dispersion at launch produced a mismatch error between three (3) and six (6) percent during the first five (5) revs. However, a satisfactory ramp to orbit match was maintained throughout the remainder of the flight. The mismatch error was within plus or minus one (1) percent for 88.4 percent of the operations during the -1 Mission and within the same limits for 89.6 percent of the operations in the -2 Mission. Refer to Figures 7.3.1, 7.3.2, 7.3.3, and Tables 7.4.1, 7.4.2, and 7.4.3.

2.3.3 Exposure Control System

This slit width control programmer was the first to utilize the new Autronic Timers. Approximately 90% of all the camera operations were in the automatic mode. The slit width control programmer performed satisfactorily throughout the -1 and -2 missions.

2.4 Data System

2.4.1 Instrumentation

The instrumentation system performed satisfactorily throughout the flight. The panoramic camera No. 2 filter change selector appeared as an open T/M point during the engineering operation on Rev. 307. This condition lasted for approximately 20 seconds and then for the remainder of the pass the selector indicated position 4 instead of position 3. On pass 309 the

selector varied between position 3 to position 5 and remained in position 4. Nine RTC commands were issued to correct the selector to position 3. However, the selector stopped in position 10 and remained there thru fade. On Rev. 311 the selector monitor again appeared as an open T/M point. Two Commands were issued and the selector indicated Position 2. No other commanding was attempted.

The camera system had failed with the scan head approximately 25 degrees prior to the center-of-format. The physical condition of the scan head, film through the platen area, and the filter selection components are unknown. However, the slit width telemetry monitor also changed slightly on Rev. 307 indicating that the scan head suffered damage probably by a film obstruction from the failure of the panoramic camera. It is therefore assumed the filter change anomaly resulted from the camera failure and was not a separate failure.

The ascent pyro current sensor was inoperative due to an unknown cause. All remaining systems have been verified to be in proper operating condition. Circuit analysis of QR-2R indicates no wiring discrepancies. It is therefore postulated that the most probable cause was a failure of the sensor mechanism.

2.4.2 Clock System

The 1112 payload clock performed satisfactorily throughout the flight. The correlation equation and constants are:

First Order Fit

System Time = $A_0 + A_1$ (Clock Time)

A_0 = -0.1433609439203687 D 06

A_1 = 0.9999998356734852 D 00

Sigma = 0.00458252

Number of Points = 372

Second Order Fit

System Time = $A_0 + A_1$ (Clock Time) + A_2 (Clock Time)^2

A_0 = -0.1433609597502632 D 06

A_1 = 0.9999998783187686 D 00

A_2 = -0.2180828742766736 D - 13

Sigma = 0.00068056

Number of Points = 372

2.4.3 SRV Tape Recorder

The SRV tape recorder for the -1 mission operated normally recording 109 minutes of data. The SRV tape recorder for the -2 mission failed after 13 seconds of the first instrument operation. Post flight ground tests revealed the recorder would not operate in the record mode on the initial test. The reverse mode of operation performed satisfactorily. Several subsequent forward playbacks functioned normally. The recorder then failed at or near the forward playback start position. The recorder was then

sent to the vendor and investigation revealed that the Iso-drive belt was broken causing loss of tension. The break apparently was caused from a puncture by a sharp object. Manufacturer disassembly revealed loose flakes of glyptol. A glyptol chip apparently lodged between the Iso-belt drive and the transport case jamming the transport mechanism. The drive belt was apparently torn through during the operations performed after recovery.

2.5 Recovery

2.5.1 -1 Mission

The -1 recovery capsule was successfully recovered by air catch on Rev. 147 at 1509 PST on November 27, 1970. All re-entry events were within tolerance with the impact approximately 17 miles north of the predicted. Refer to Table 7.5.

	Actual	Predicted
Impact Location	18° 10'N/153° 45W	18° 0.1'N/153° 52.5W

2.5.2 -2 Mission

The -2 recovery capsule was successfully recovered by air catch on Rev. 309 at 1424 PST on December 7, 1970. All re-entry events were within tolerance with the impact occurring approximately 20 miles north of the predicted. Refer to Table 7.5.

	Actual	Predicted
Impact Location	29° 15'N/164° 59'W	28° 59'N/165° 12'W

3.0 ORBITAL PERFORMANCE

3.1 Orbital Parameters

Parameter	Predicted	Tolerance	Actual STC	Actual APF
Period (Min.)	88.61	(+.33,-.34)	88.56	88.56
Perigee (N.M.)	99.7	(+13,-14)	97.3	97.2
Apogee (N.M.	128.2	(+17,-18)	123.1	122.6
Eccentricity	.0043	(+.0029,-.0030)	.0041	.0036
Inclination (Deg.)	83.0	(+.14,-.12)	82.98	83.00
Arg. of Perigee (Deg.)	142	(+102,-88)	190.3	191
Repression Rate (Deg./Rev.)	22.28			22.23
Perigee Latitude (Deg.)	38N	(+98,-114)		11.3 S

3.2 DMU Operation

Ground track and period control were maintained during the flight by firing seven (7) of the eight (8) available DMU rockets. Refer to Table 3.2.1. The ground track error at the ascending node range from 41.6 nautical miles west of nominal to 38.6 nautical miles east of nominal. The seventh (7th) DMU rocket was fired on Rev. 279 to purposely move the ground track west of nominal to acquire a special requirement on Rev. 284. Refer to Figures 7.6.1, 7.6.2, and 7.7.

TABLE 3.2.1

DMU PERFORMANCE

Rocket No.	Rev. No.	System Time Seconds	Period Change Seconds	Velocity Change Ft/Sec.	Period at Firing Minutes	Impulse Lb./Sec.
1	29	58189	15.36	24.55	88.48	3140
2	70	17044	10.58	17.03	88.54	2140
3	120	25218	14.73	23.61	88.46	2963
4	152	22585	11.28	18.08	88.51	2022
5	204	38499	16.87	26.81	88.44	2973
6	254	45992	17.45	27.87	88.43	3069
7	279	06157	17.21	28.15	88.56	3081

Note: DMU rocket No. 8 was fired after Event 2.

4.0 ENVIRONMENTAL CONTROL

4.1 Pressure Make-Up System

The pressure make-up system (PMU) operated properly throughout the flight. The PMU was modified to operate in the low pressure range when the DISIC was operated in the independent mode. There were 116 panoramic camera operates for a total of 213 minutes which resulted in a gas consumption rate of 4.18 lbs/min of operate time. There were 352 DISIC camera operates for a total of 851 minutes for an alternate level gas consumption rate of 1.12 lbs/min. of operate time. The large number of DISIC operate time was due to the command logic (S324-DISIC Independent) and the sneak circuit in the PMU control unit which allowed the PMU to operate with every SPC Brush 48 from Rev 241 through Rev. 307.

4.2 Thermal Environment

The temperature data obtained during this flight indicated the temperature environment was within the pre-flight predictions for the duration of the flight. The averages of the panoramic camera temperatures ranged from 58°F to 62°F for S/N 300 and 59°F to 64°F for S/N 301 during the -1 mission and 58°F to 63°F for S/N 300 and 58°F to 62°F for S/N 301 during the -2 mission. Refer to Tables 7.8.1 and 7.9.1 - 7.9.6.

The on orbit temperature profiles for Revs. 24, 105, and 169 are included in Figures 7.8.2 - 7.8.11.

5.0 POST EVENT 2 TESTING

Both panoramic cameras were enabled on Rev. 328 in the emergency mode. The film tag end on camera S/N 300 had wrapped up during film exhaustion on Rev. 298 causing the camera system to remain in a stalled condition. Panoramic camera S/N 301 had failed on Rev. 104 and had remained in a stalled condition. Telemetry data indicated that the drive motors on both cameras had 18 volts on the plus side of the motor and $3\frac{1}{2}$ volts on the minus side of the motor, 20 amps on the A/P unregulated current monitor, and the tachometer reading 0.6 volts, reflecting current. On Rev. 329 approximately 69 minutes later the voltage on the minus side of the motor was reduced to almost zero volts probably due to heating and resistance change.

At fade on Rev. 330 at the [redacted] Tracking station, approximately 148 minutes since turn on, the telemetry monitors remained unchanged. Approximately 5 minutes later at the [redacted] Tracking Station acquisition both instruments indicated 18 volts on both sides of the motor with a slight decrease in the reflected current occurring on the tachometers. This condition indicates that there is no current thru the motor with increased resistance between the minus side of the motor and ground. This could have been caused by the failure of transister Q2 or diode CR2. During the first 24 seconds of the acquisition the voltage on both sides of the motor and the reflected current occurring on the tachometer, decreased to zero volts on Instrument No. 2. The most probable cause of this anomaly was a failure and opening of transister Q3 (Refer to Figure 7.10). The A/P unregulated current during this time period decreased from 20.0 to 7.5 amps. Telemetry data remained unchanged thru the last recorded rev (Rev. 352).

6.0 HARDWARE DEFINITIONS

6.1 Agena

FTV 1658 was an Agena vehicle (SS 01B) and a Thorad booster (SLV-2H) and was oriented nose first in orbit with the following configuration:

1) Eight Thiokol DMU rockets were installed with all rockets 3000 lb-sec. except position 2 and 4 which were 2000 lb-sec.
2) Three primary control gas spheres with the -5 control gas mixture.
3) -3 payload system with digital storage register and capability of accepting both Silo and Uncle commands.
4) Ten panel single wing solar array system with two 1H batteries (depleting system).
5) Aft Payload - SSU # 003 and Doppler Beacon # 4 [redacted] Six Silo/Uncle commands for real time Doppler Beacon control and SPC brush 18 (Doppler Beacon ON) and SPC brush 16 (Doppler Beacon OFF).
6) 3/4 Speed Type VIII Programmer (325 subcycles).
7) First vehicle to utilize High Density Acid (oxidizer) and new fuel Hyperzine 300 instead of IRFNA and UDMH.

6.2 Payload

The QR-2R payload configuration included the following:

1) Panoramic Camera
   a) Constant rotating type with a servo-controlled supply cassette.
   b) Digital Storage Register (DSR)/Cascade system utilized for camera enable/disable.

c) Emergency program back-up capability available by RTC.

UHF 116/SILO 316 Emergency Program Select

UHF 118/SILO 318 Emergency Intermix Select

UHF 120/SILO 320 Instrument Mode Select

d) Exposure Control

1) Programmer control by SPC (51, 52, 17) and RTC UHF 105/SILO 305.

2) Automatic slit width control. Override by RTC UHF 101-126/SILO 301-326.

3) First system with modification to hold power on the slit width servo system during the 20 second power delay shutdown to prevent oscillations on the telemetry monitor.

4) First switch programmer to utilize the new Autronic timers in place of the Haydon timers.

e) Filter Selection

1) Control by RTC UHF 103-104/SILO 303-304.

2) The automatic filter change capability through the material change detector (MCD), was disconnected prior to launch.

2) DISIC Camera

a) Mode select controlled by RTC UHF 124/SILO 124.

b) Both slave and independent modes of operation had a 1:1 ratio of stellar to terrain frames.

c) Operate off provided by RTC UHF 107/SILO 307.

3) FMC Programmer

a) Initiated by SPC 27 and RTC UHF 125/SILO 325.

b) Ramp profile provided by

UHF 121/SILO 321 eccentricity start level

UHF 122/SILO 322 eccentricity half cycle level

c) First Slope Programmer to utilize the new Autronic timer instead of a Haydon timer.

4) Pressure Make-Up System

a) Enable/disable controlled by RTC UHF 110/SILO 310.

b) Two bottle system with dual range capability.

c) PMU operation in low range with DISIC independent mode of operation.

5) Panoramic camera "A" to "B" transfer

Available by RTC KIK-SILO 38

6) DISIC camera "A" to "B" transfer

Available by RTC KIK-SILO 39.

7) Yaw steering

Available by RTC UHF 106/SILO 306.

8) Agena tape recorder

Time shared with vehicle data.

9) SRV tape recorder

Available in both -1 and -2 recovery capsules.

10) Payload weight

EWO = 1816 lbs.

11) Instrumentation

RTC UHF 127/SILO 327 operational-diagnostic data select.

12) Thermal configuration

The top black was reduced to 56 degrees on the fairing and 76 degrees on the barrel and conic.

13) Command system

The command system included a DSR for primary operation of the camera system with a two program/4 rev intermix emergency capability.

6.3 Camera and Programmer Settings

6.3.1 Panoramic Cameras

	300		301	
Filter Type				
Primary	W-25 - Glass(.037)		W-23A - Glass (.037)	
Alternate	W-25 - Glass(.040)		W-23A - Glass (.040)	
Slit Width (Inches)				
Position 1	0.125		0.154	
Position 2	0.160		0.189	
Position 3	0.205		0.250	
Position 4	0.267		0.320	
Failsafe	0.219		0.259	
Auxiliary Optics	Take-Up	Supply	Take-Up	Supply
Filter	W-25	W-25	W-25	W-25
Aperture	F6.3	F8.0	F8.0	F6.3

6.3.2 DISIC Camera

	Stellar	Terrain
Filter	None	W-12
Aperture	F2.8	F6.3
Cycle Period	12.500	12.500

6.3.3 Exposure Control Settings

		Seconds
T-1	40 sec. increment initial setting	360
T-2	DISIC exposure to 1/500	360
T-3	Slit width #3 duration	280
T-4	Slit width #4 duration	240
T-5	DISIC exposure to 1/250	40
T-6	840 sec. minus T-1 setting	480

*DISIC exposure time was constant at 1/500 second for this mission.

6.3.4 FMC Control Settings

Eccentricity function

1) Period - 4538.2 seconds

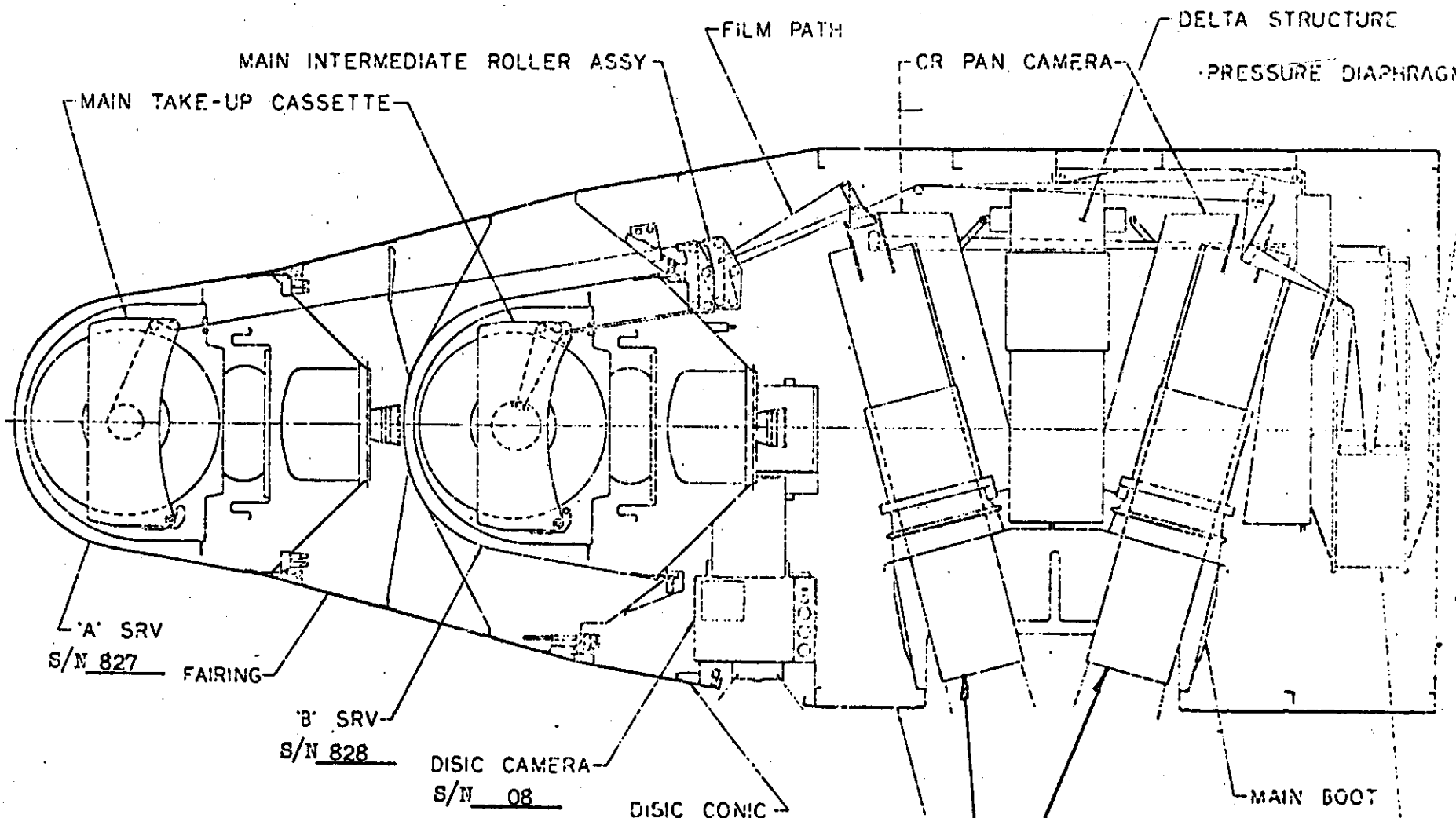
2) Delay step increment - 50 seconds

Oblateness function

1) Period - 5241 seconds

2) Gain factor - 0.0991

2. PAYLOAD PROFILE AND SERIAL NUMBERS



SYSTEM NO. QR-2R
TEST FLIGHT
PMU S/N 1021
SLOPE PROGRAMMER S/N 213
CLOCK S/N 613
SWITCH PROGRAMMER S/N 200

FIGURE 7.1

REV	P R	O P	S POS.	1/2	SYSTEM CALIB.	OBL TUR	ECC TUR	INST. 300 ACTUAL PERIOD	INST. 300 UNIT DEV.	INST. 300 SYSTEM DEV.	INST. 301 ACTUAL PERIOD	INST. 301 UNIT DEV.	INST. 301 SYSTEM DEV.	300/30 DIFF.
9	0	0	5	9	2.816	1755	0	2.822	0.19S	0.23S	2.825	0.36S	0.33S	-0.11
16	0	0	5	8	2.232	3460	1863	2.232	0.04F	0.00F	2.231	0.01F	0.05F	0.04
48	0	0	7	7	2.212	3493	2235	2.210	0.11F	0.07F	2.210	0.04F	0.07F	0.0
79	0	0	4	9	2.192	3369	2333	2.190	0.10F	0.07F	2.183	0.35F	0.39F	0.32
106	0	0	1	1	2.826	1848	1017	2.800	0.97F	0.93F	INSTRUMENT 301			
129	0	0	6	9	2.159	3522	2377	2.170	0.47S	0.50S	FAILED ON			
242	0	0	4	16	2.045	3426	2564	2.062	0.81S	0.85S	REV. 104			

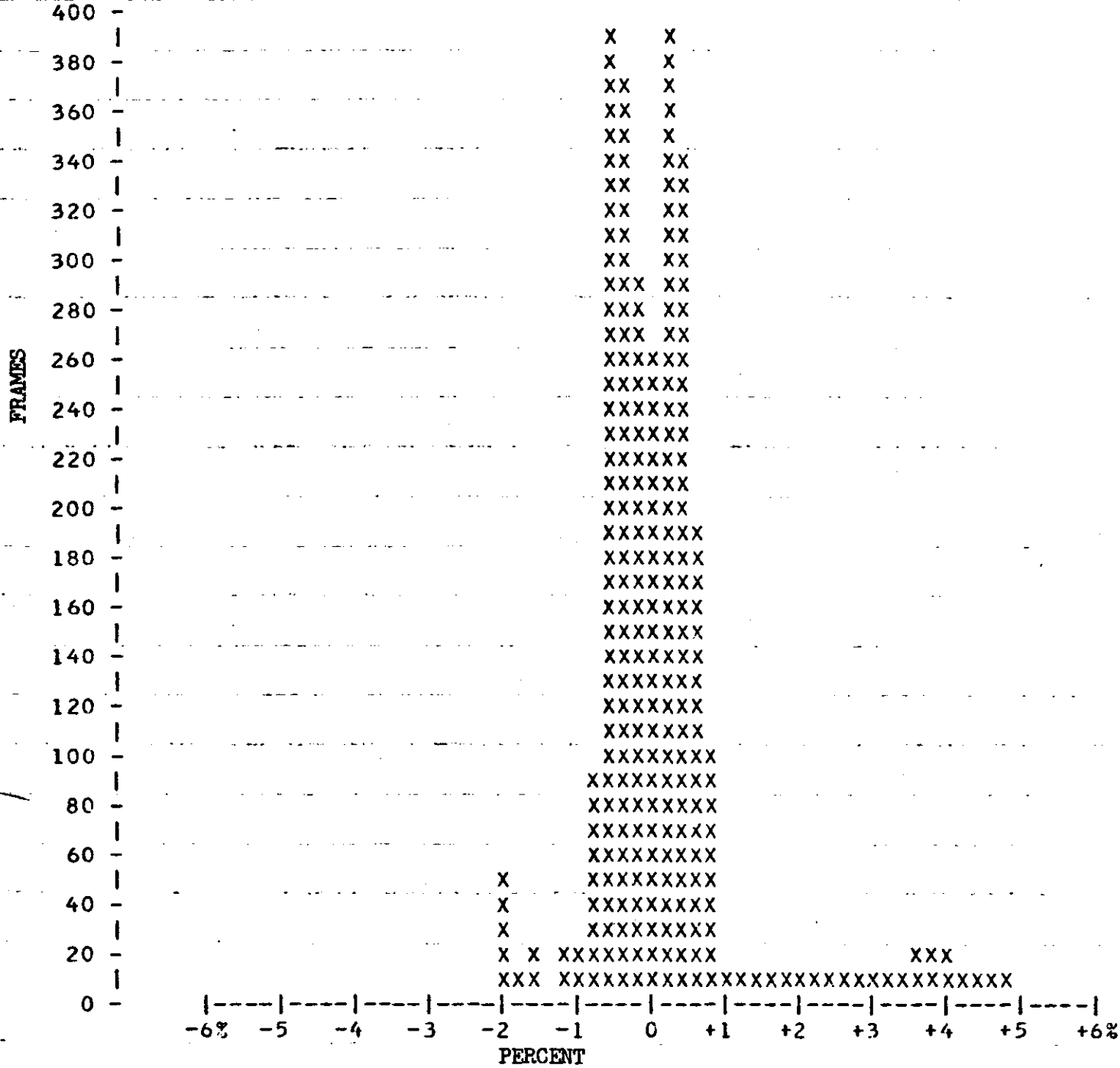
NOTE: "F" = FAST and "S" = SLOW from the calibrated value

TABLE 7.2

PANORAMIC CAMERA CYCLE RATE ERRORS

FIGURE 7.3.1

FMC MATCH ERROR

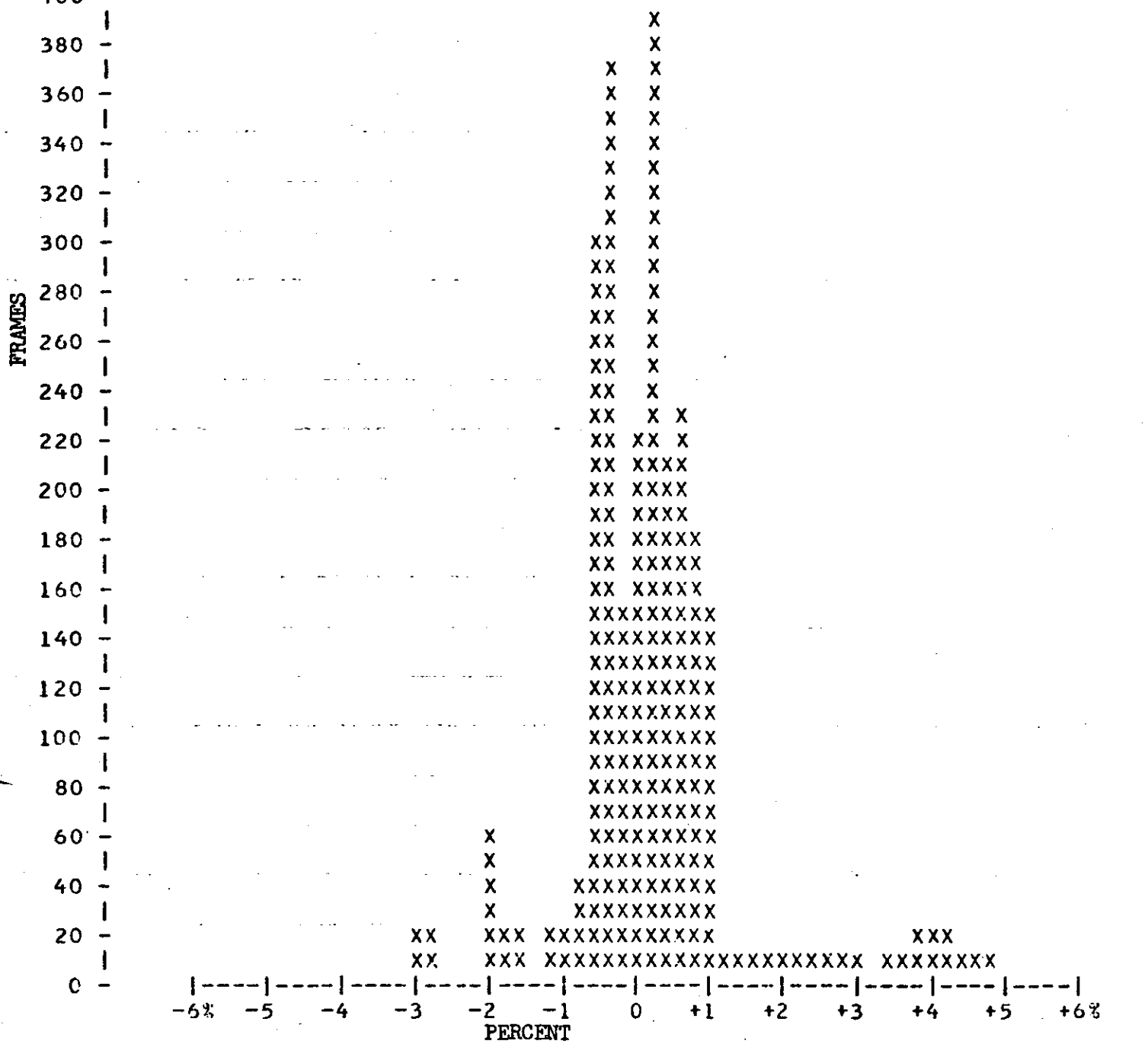


MISSION 1112-1 AFT LOOKING--ORBIT MATCH
MEAN= 0.09 ONE SIGMA= 0.99 TOTAL FRAMES=2718
2437 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 89.66%, OF THE MISSION

~~TOP SECRET~~ HANDLE VIA [redacted]

FIGURE 7.3.2

FMC MATCH ERROR



MISSION 1112-1 FWD LOOKING--ORBIT MATCH

MEAN= 0.17 ONE SIGMA= 1.12 TOTAL FRAMES=2598

2253 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 86.72%, OF THE MISSION

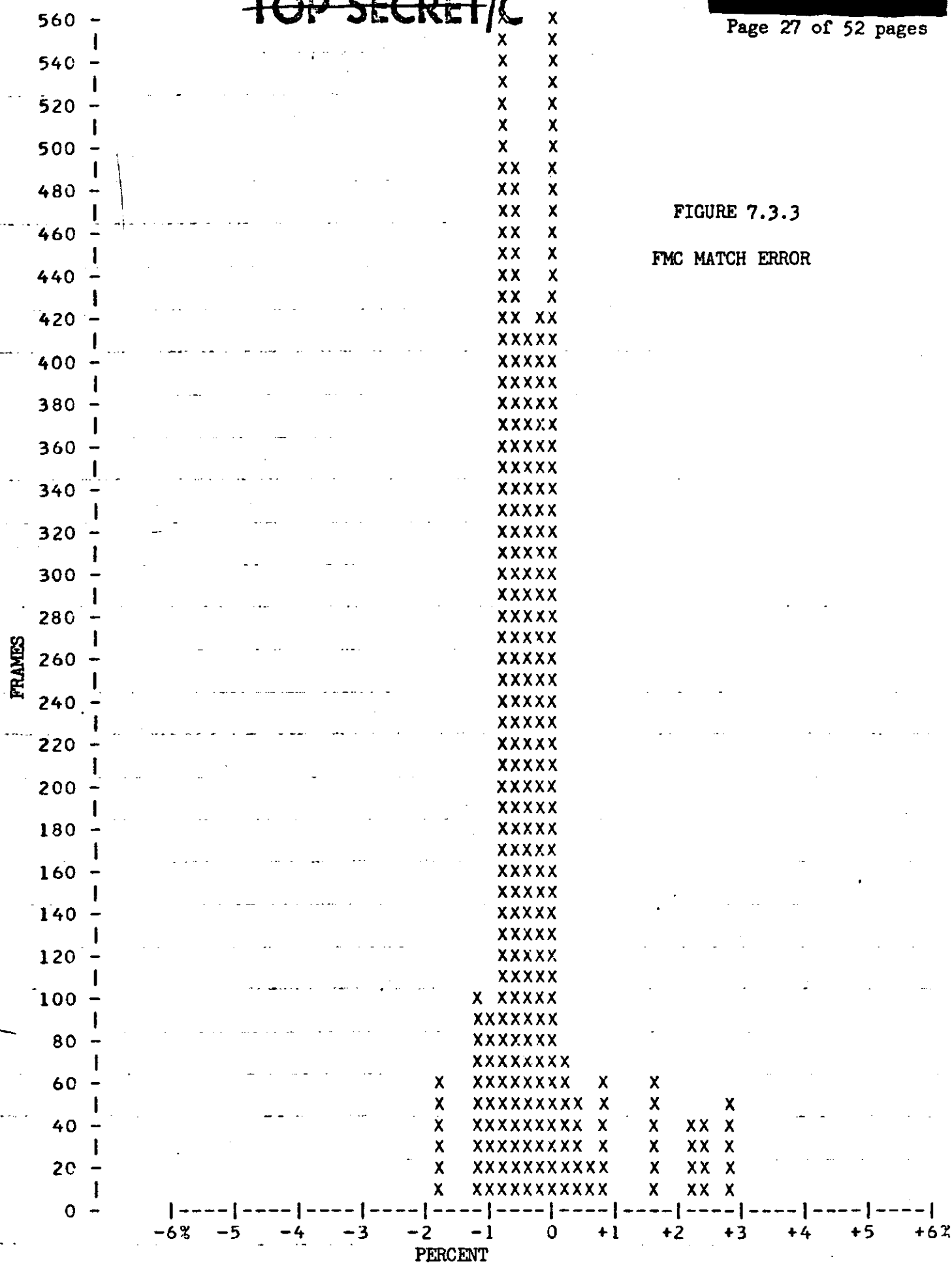


FIGURE 7.3.3

FMC MATCH ERROR

MISSION 1112-1 AFT LOOKING, TOTAL FRAME COUNT- 2718

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	257
-0.2	291	0.2	393
-0.4	369	0.4	335
-0.6	392	0.6	185
-0.8	86	0.8	99
-1.0	21	1.0	9
-1.2	21	1.2	9
-1.4	0	1.4	9
-1.6	22	1.6	8
-1.8	11	1.8	8
-2.0	50	2.0	8
-2.2	0	2.2	8
-2.4	0	2.4	8
-2.6	0	2.6	8
-2.8	0	2.8	8
-3.0	0	3.0	8
-3.2	0	3.2	8
-3.4	0	3.4	8
-3.6	0	3.6	15
-3.8	0	3.8	15
-4.0	0	4.0	15
-4.2	0	4.2	13
-4.4	0	4.4	7
-4.6	0	4.6	7
-4.8	0	4.8	7
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.1

MISSION 1112-1 FWD LOOKING, TOTAL FRAME COUNT- 2593

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	222
-0.2	148	0.2	392
-0.4	366	0.4	210
-0.6	297	0.6	229
-0.8	41	0.8	176
-1.0	21	1.0	151
-1.2	21	1.2	9
-1.4	0	1.4	9
-1.6	22	1.6	9
-1.8	23	1.8	9
-2.0	61	2.0	9
-2.2	0	2.2	9
-2.4	0	2.4	9
-2.6	0	2.6	9
-2.8	17	2.8	9
-3.0	16	3.0	9
-3.2	0	3.2	0
-3.4	0	3.4	9
-3.6	0	3.6	9
-3.8	0	3.8	16
-4.0	0	4.0	16
-4.2	0	4.2	15
-4.4	0	4.4	14
-4.6	0	4.6	8
-4.8	0	4.8	8
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.2

MISSION 1112-2 AFT LOOKING, TOTAL FRAME COUNT- 3206

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	605
-0.2	421	0.2	68
-0.4	414	0.4	45
-0.6	488	0.6	21
-0.8	633	0.8	58
-1.0	94	1.0	0
-1.2	103	1.2	0
-1.4	0	1.4	0
-1.6	0	1.6	56
-1.8	64	1.8	0
-2.0	0	2.0	0
-2.2	0	2.2	42
-2.4	0	2.4	44
-2.6	0	2.6	0
-2.8	0	2.8	50
-3.0	0	3.0	0
-3.2	0	3.2	0
-3.4	0	3.4	0
-3.6	0	3.6	0
-3.8	0	3.8	0
-4.0	0	4.0	0
-4.2	0	4.2	0
-4.4	0	4.4	0
-4.6	0	4.6	0
-4.8	0	4.8	0
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.3

RE-ENTRY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Nominal	Unit #1	Unit #2
D-Timer Start	0	0	0
Arm	6.0 ± .5	6.0	6.0
Transfer	81.0 ± .5	80.88	80.89
Elec. Disconn.	82.0 ± .5	81.88	81.89
Separation	83.0 ± .5	82.87	82.85
Spin	3.40 ± .30	3.44	3.38
Retro	7.55 ± .45	7.54	7.49
Despin	10.75 ± .54	10.71	10.72
Thrust Cone Sep.	1.50 ± .15	1.51	1.48
"G" Switch Open			
Parachute Cover Ejec.	26.0 ± 1.5	25.24	25.48
Deceleration Chute Deploy	.58 ± .08	.66	.66
Ablative Shell Disconn.	.58 ± .08	.66	.66
Main Chute Bag Sep.	10.25 ± 1.5	10.87	10.87
Main Chute Deploy	.52 ± .13	.55	.54
Main Chute Disreef	4.50 ± .80	4.46	4.30
K-10 Reset	28.0 ± 1.9	27.42	27.97

TABLE 7.5

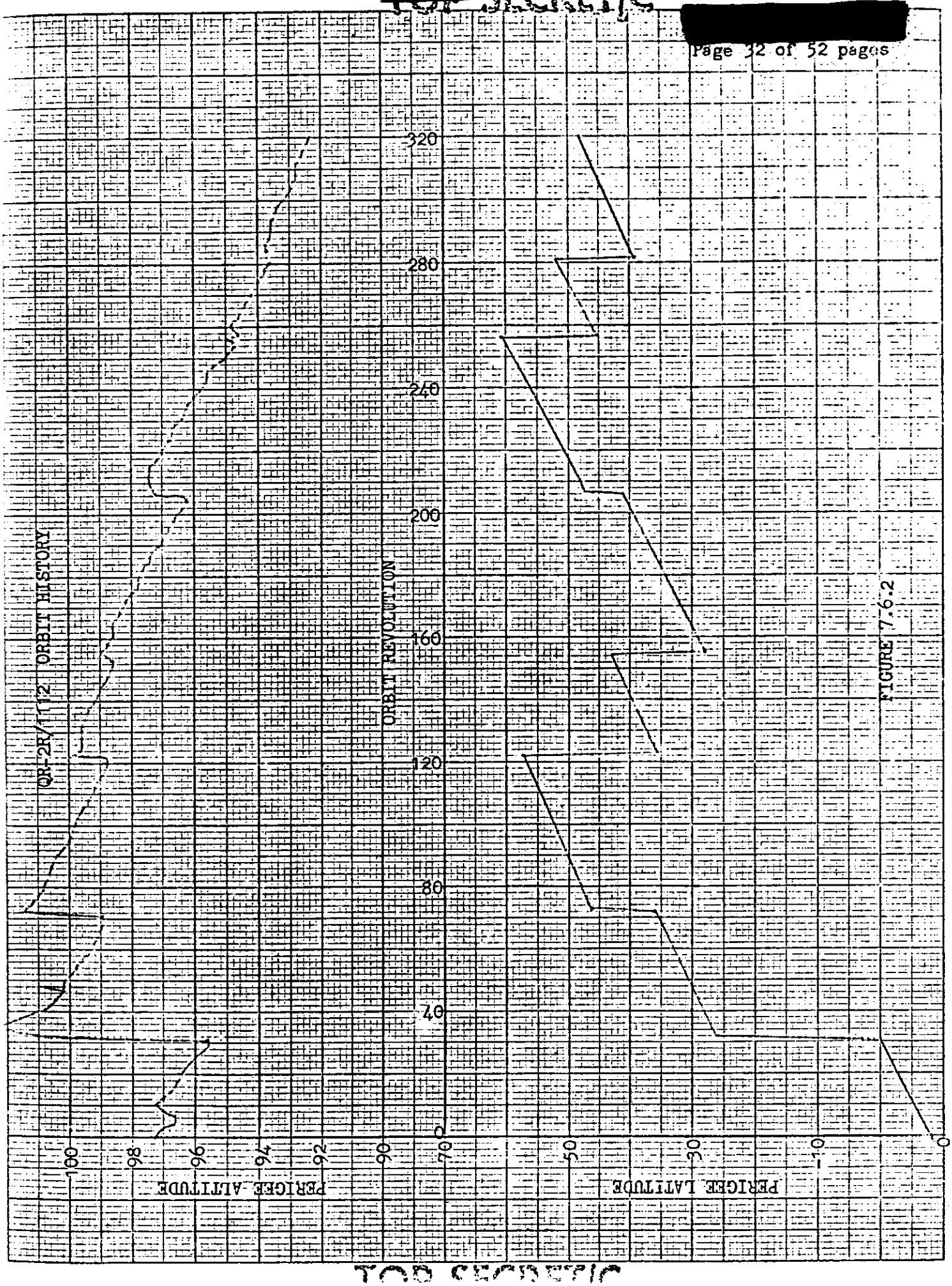

OR-2R/1112 ORBIT HISTORY
ORBIT REVOLUTION
320
280
240
200
160
120
80
40
0
PERIGEE ALTITUDE
100
98
96
94
92
90
PERIGEE LATITUDE
70
50
30
10
0

FIGURE 7.6.2

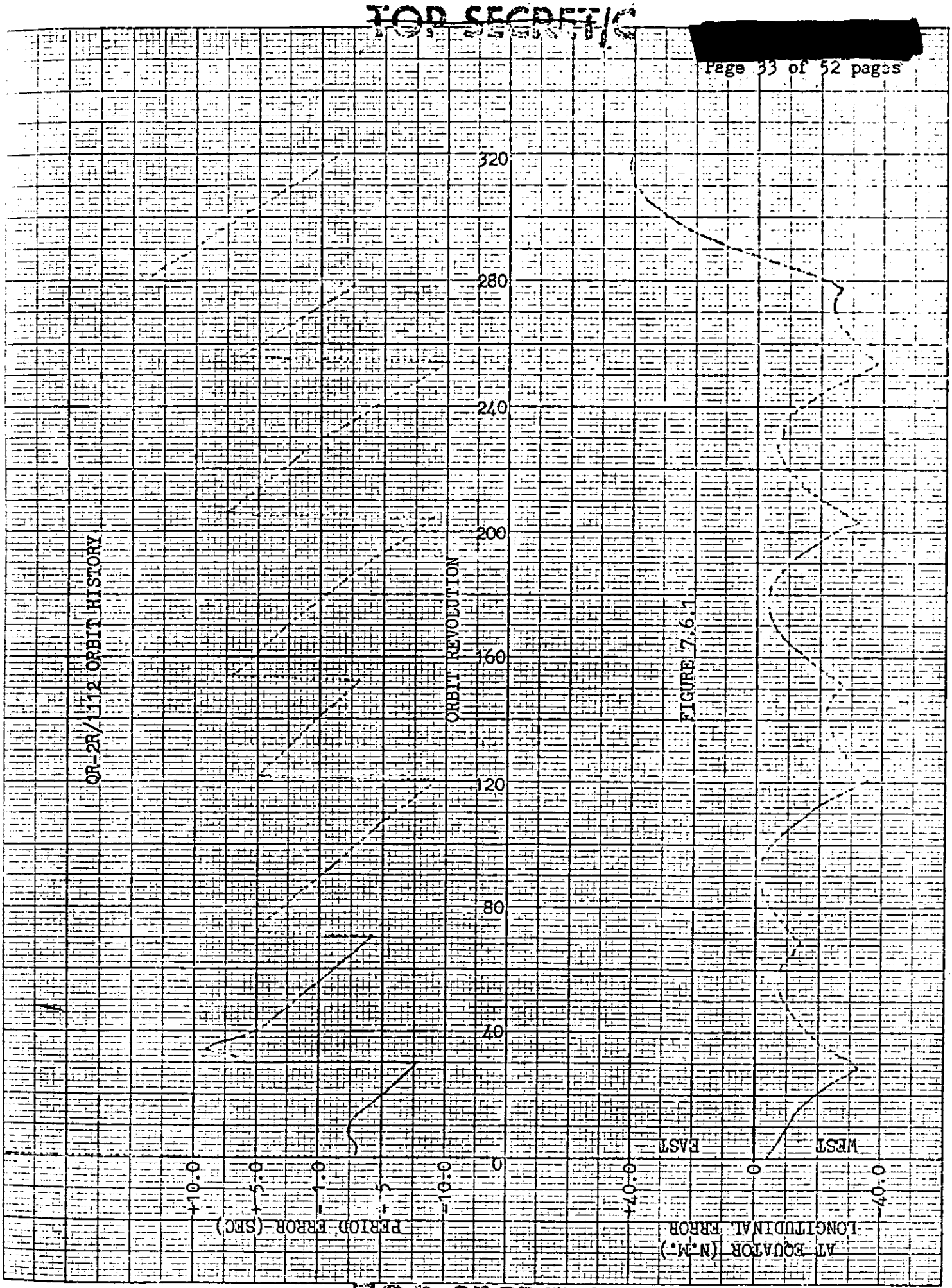


FIGURE 7.6.1

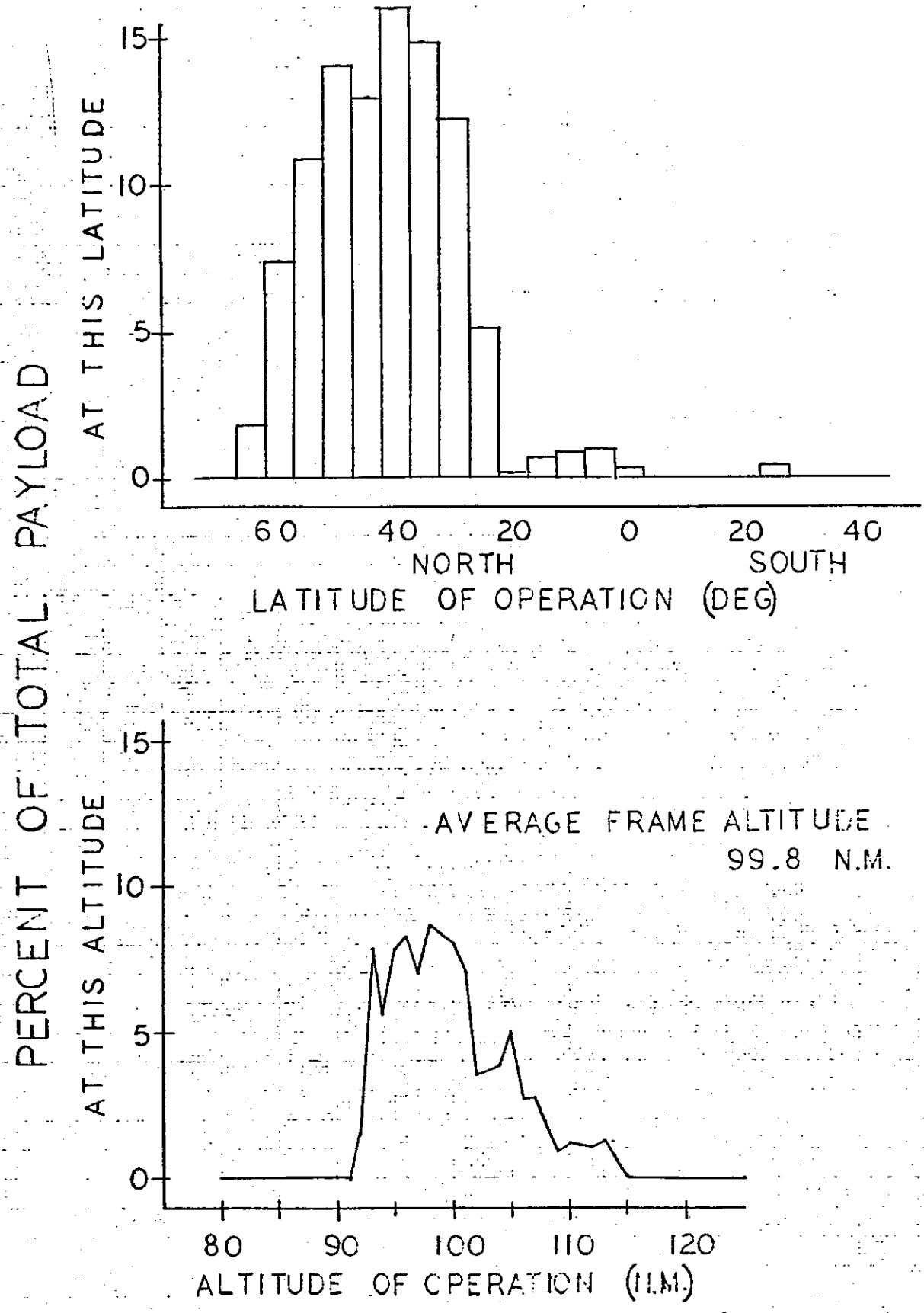

PERCENT OF TOTAL PAYLOAD AT THIS LATITUDE
15
10
5
0
60
40
20
0
20
40
NORTH
SOUTH
LATITUDE OF OPERATION (DEG)
PERCENT OF TOTAL PAYLOAD AT THIS ALTITUDE
AVERAGE FRAME ALTITUDE
99.8 N.M.
15
10
5
0
80
90
100
110
120
ALTITUDE OF OPERATION (N.M.)

FIGURE 7.7

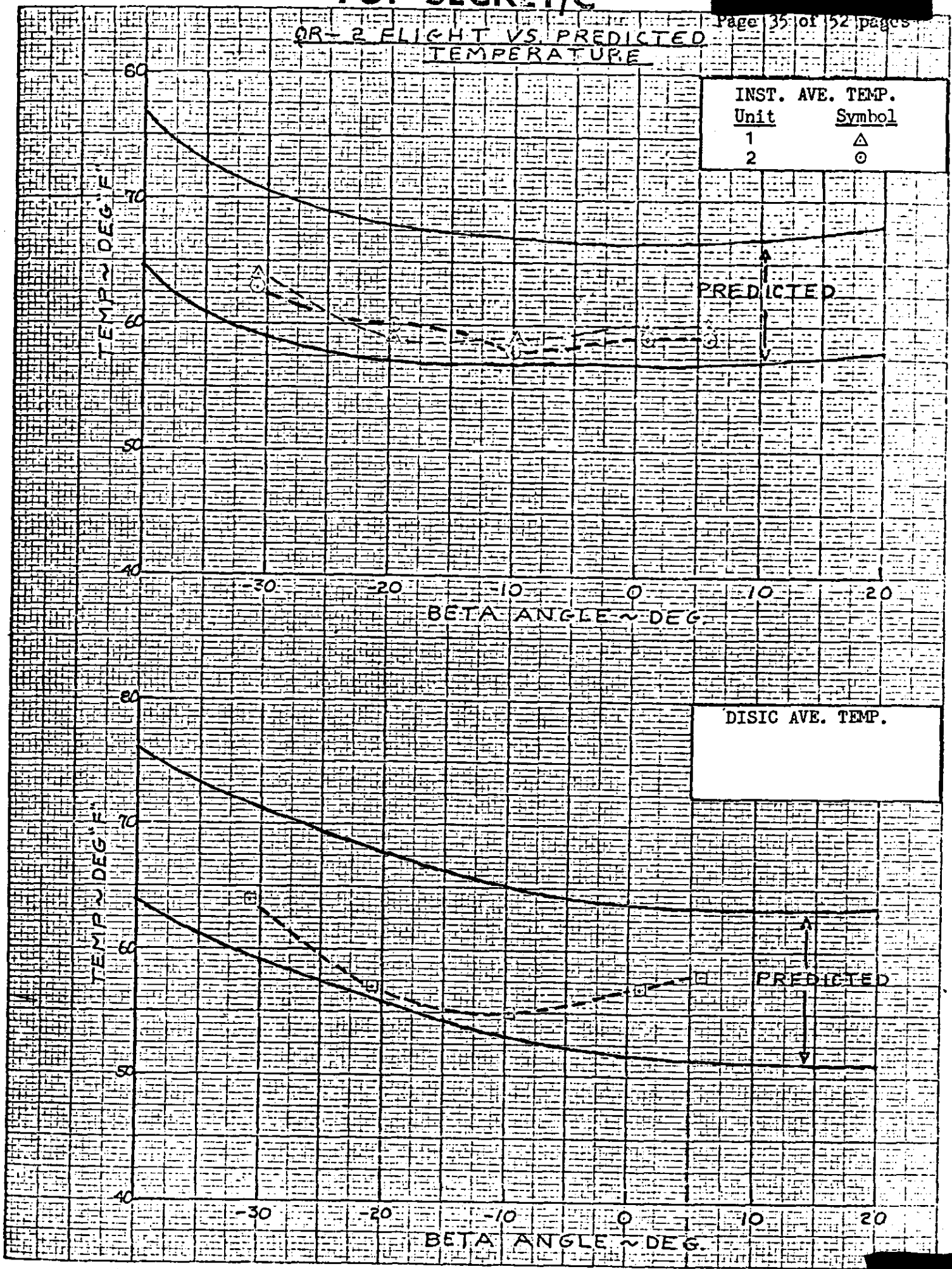

OR-2 FLIGHT VS. PREDICTED TEMPERATURE
INST. AVE. TEMP.
Unit Symbol
1 △
2 ⊙
PREDICTED
TEMP ~ DEG. F
60
70
50
40
-30
-20
-10
0
10
20
BETA ANGLE ~ DEG.
DISIC AVE. TEMP.
PREDICTED
TEMP ~ DEG. F
60
70
50
40
-30
-20
-10
0
10
20
BETA ANGLE ~ DEG.

FIGURE 7.8.1