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CORONA J
PERFORMANCE EVALUATION REPORT
MISSIONS 1006-1 & 1006-2
FTV 1176 - J9

26 October 1964

Approved by [redacted] 11-18-64
Date
Advanced Proj[redacted]

Approved by [redacted] 11/18/6
Mgr. Date
Program[redacted]

[redacted]

[redacted]

[redacted]

FORWORD

This report details the performance of the payload section of the Program [redacted] Vehicle 1176.

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

This document is the final payload test and performance evaluation report for Missions 1006-1 and 1006-2 which was launched on 4 June 1964.

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SECRET

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[redacted]

[redacted]

LIST OF ILLUSTRATIONS

[redacted]

[redacted]

LIST OF TABLES

[redacted]

[redacted]

INTRODUCTION

A. PURPOSE

The purpose of this Performance Evaluation Report is 1) to define and establish the performance parameters of Mission 1006-1 and 1006-2, and 2) to identify the problem areas associated with these missions and recommend the appropriate corrective action.

B. INFORMATION SOURCES

The information employed in this report is from government facilities and their sources are:

AFSPPL - Diffuse Densities, RES, and Edge Trace Data

NPIC - Vehicle attitude data, Frame Correlation, [redacted] Edge Trace Reports and Processing Summary

ACIC - Special Yaw Error Reduction

C. PHASES OF EVALUATION

The evaluation was conducted in two phases. Phase one, the in-line [redacted] utilized the original negative and duplicate positive material generated [redacted] those missions and was conducted at customer facilities (AFSPPL, NPIC, [redacted] ACIC). The total mission material was available for the in-line evaluation. Phase two, the off-line evaluation, utilized only that material which was generated from the engineering passes over the continental limits of the United States and was conducted at the Advanced Projects facilities of LMSC.

The effort involved in conducting such an evaluation, and the personnel in such an effort may be more than is readily apparent. The in-line conducted at the customer facilities during other evaluation activities [redacted] accomplished by LMSC Advanced Projects and Itek personnel whose [redacted] experience makes them qualified [redacted]. The [redacted] participants were [redacted]. Itek participants were [redacted]. The off-line evaluation was conducted at the Advanced Projects facilities with equally capable personnel utilizing material obtained from the engineering passes over the Zone of Interior. Advanced Projects' participants, in addition to the above, included [redacted] and [redacted].

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[redacted]

SECTION I

SYSTEM PERFORMANCE

A. MISSION OBJECTIVES

Flight Test Vehicle No. 1176 payload consisted of two Panoramic cameras, two Stellar-Index cameras, two Mark 5 recovery capsules, and a space structure to enclose the cameras and provide mounting for the recovery subsystems. The space structure also includes the payload clock, payload telemetry, and electrical cabling and junction boxes. This equipment is designed to obtain search reconnaissance photography of selected areas of the earth.

The planned mission was a two-phase 8 day camera operational mission with no deactivate period.

B. FLIGHT RESULTS

The mission was launched from Vandenberg Air Force Base at 3:59:22 PM PDT on 4 June 1964. The first phase was completed and a successful air catch was made on orbit 65 on 8 June 1964. The second phase of the mission was completed on orbit 128 on 12 June 1964 with a successful air catch recovery of the second capsule.

The comparison between predicted and actual orbit parameters is tabulated below:

	PLANNED	ACTUAL
Inclination	80.00°	79.97°
Period	90.87'	90.59'
Perigee Altitude	99.92 nm	84.00 nm
Initial Perigee Location	40.60°N	63.20°N
Apogee Altitude	250.50 nm	261.00 nm
Eccentricity	0.0209	0.0239

The space structure door covering the slave panoramic camera did not eject on command and remained in place through pass D02. Prior to the photographic operations during pass D03 the door was ejected.

[redacted]

[redacted]

C. PANORAMIC CAMERAS

The Master and Slave panoramic cameras functioned satisfactorily throughout both missions and produced excellent photography despite the V/H errors caused by orbit mismatch. In part this is due to the 10-15% scale improvement resulting from the low perigee. It was possible to observe motor vehicles and identify aircraft types throughout the mission indicating that the cameras produced high resolution photography. No ground resolution targets were photographed. Microdensitometer edge trace measurements by [redacted] reduced to resolution in lines per millimeter indicate that the Fwd camera averaged 84 lines and the Aft camera averaged 87 lines. However, these measurements show a high coefficient of dispersion which indicates caution should be used in interpreting the results. Detailed comments on the edge trace measurements may be found in Section VII of this report.

Intermittent failures in the center-of-format switch closures in both cameras caused the loss of some auxillary data and some Stellar-Index photography.

D. STELLAR INDEX CAMERAS

The Stellar-Index camera operations during Mission 1006-1 were satisfactory for approximately 60% of the mission life. The stellar shutter either failed to close, failed to open or produced multiple exposures during the remainder of the mission. The index camera operated properly throughout Mission 1006-1 however film depletion occured twenty frames early. Both the stellar and terrain photography were rated good during proper camera operation.

The Stellar-Index camera functioned properly through frame 274 of Mission 1006-2. The faulty Master camera center-of-format switch permitted only five additional camera operations to the end of the mission. All of the photography required was rated good.

E. MISSION SUMMARY

A brief summary of Missions 1006-1 and 1006-2 is shown on Tables 1 and 2 on pages 4 and 5. A schematic inboard profile is shown on page 5A.

F. CONCLUSIONS

Missions 1006-1 and 1006-2 achieved the major objective of obtaining search reconnaissance photography.

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UMBRA [redacted]

Payload No. J-9		Mission No. 1006-1	Booster No. 403		Vehicle No. 1176		SRV No. 638
Launch Date 6-4-64		Launch Time 2259 Z	Recovery Date 6-8-64		Recovery ~~Time~~ REV 65		Recovery Mode AIR
Orbit Parameters -	Planned	Actual (REV 1)	Vehicle Attitude -	Error (90%)	Range	Rate (90%)	Range
Inclination	80.00°	79.97°	Pitch	0.41°	-0.44 to +0.45°	26.8°/HR	-96.9 to +86.3°/HR
Period	90.87	90.59	Roll	0.42°	-0.92 to +0.38°	28.5°/HR	-52.0 to +97.5°/HR
Perigee Altitude	99.92 N.M.	84.0 N.M.	Yaw	1.14°	-1.69 to +0.37°	27.8°/HR	-65.4 to +57.1°/HR
Perigee Location	40.60°N	63.20°N	Resolution Limit	Along Track (90%) 13.8'		Range 0' to 24.5'	
Apogee Altitude	250.50 N.M.	261.00 N.M.		Cross Track (90%) 6.7'		Range 0' to 12.6'	
Eccentricity	0.0209	0.0239					

Instrument	MASTER (FWD)	SLAVE (AFT)	STELLAR	INDEX
Serial No.	148	149	D45/47/45	D45/47/45
Pre-Flight Resolution	181 H.C., 110 L.C.	181 H.C., 106 L.C.	-	71 H.C.
Slit or Exposure Time	0.200"	0.200"	2 SEC (f/1.8)	1/500 (f/4.5)
Filter/Film	W-21/4404	W-21/4404	NONE/4401	W-21/4400
Footage Recovered	2883 FRAMES (7943')	2847 FRAMES (7862')	412 FRAMES	392 FRAMES
Photo Quality EDGE TRACE [redacted] SPEC	ALL-83.7, HIGH 99.9 350μ-65, 43μ-88, RES-90 VERY GOOD	ALL-86.7, HIGH-90.9 350μ-71, 43μ-90, RES-84 VERY GOOD	FAIR. SHUTTER FAILED TO OPEN 35 TIMES. INTERMITTENT FOR PATHS (EDGE STATIC)	GOOD. STATIC LAST FIVE FRAMES.
Exposure	MAJORITY GOOD, SOME OVER	SAME	ADEQUATE	
Density	LOW 5%, MED 35%, HIGH 60%	SAME	"	GOOD LOW 5%, MED 50, HIGH 45%
Processing PRED ACT.	PRIMARY 1/L INTER 99/21 FULL 0/98	PRIMARY 1/0 INTER 99/23 FULL 0/77	FULL 100/100	
V/H Error (90%)	-	15.4% (-23.1% to +7.0%)	-	
Time Track	OK.	OK	-	-
Data Block	OK.	OK EXCEPT WHEN C/C SWITCH FAILED.	-	-
End of Pass Mark	OK.		-	-
Port H. O. Quality (f/6.8)	GOOD	GOOD OUT WHEN C/C SWITCH FAILED	-	
Port H. O. Fiducials	O.K.	O.K.	-	-
Starboard H. O. Quality (f/8)	SOFT OUT OF FOCUS. SLIGHT IMPROVEMENT AFTER D-35	SOFT. OVEREXPOSED	-	-
Starboard H. O. Fiducials	OK	OK	-	-
S/I Fiducials	-	-	-	-
S/I Correlation Lamp	-	-	ONE GROSSLY OVEREXPOSED OK	OK OK
Temperature	NORMAL - 68°F TO 79°F	NORMAL - 57°F - 74°F	61°F TO 70°F	SAME
Remarks	MINOR EDGE STATIC. NO CORONA	SLAVE DOOR ON THRU 301-4 302; OFF AT D03-1. C/C SWITCH FAILED D01-10 THRU D03-17. NO STATIC OR CORONA		OUT OF FILM 20 FRAMES EARLY.

[redacted]

[redacted]

Payload No. J-9 | Mission No. 1006-2 | Booster No. 403 | Vehicle No. 1176 | SRV No. 639

Launch Date 6-4-64 | Launch Time 2259 Z | Recovery Date 6-12-64 | Recovery ~~Time~~ Rev 128 | Recovery Mode AIR

Orbit Parameters -	Planned	Actual (Rev 1)
Inclination	80.00°	79.97°
Period	90.81'	90.59'
Perigee Altitude	99.92 N.M.	84.0 N.M.
Perigee Location	40.60°N	63.20°N
Apogee Altitude	250.50 N.M.	261.00 N.M.
Eccentricity	0.0209	0.0239

Vehicle Attitude -	Error (90%)	Range	Rate (90%)	Range
Pitch	0.49°	-0.75° TO +2.00°	31°/HR	-100 TO +100 °/HR
Roll	0.40°	-0.80° TO +0.45	28°/HR	-58 TO +74 °/HR
Yaw	1.08°	-1.70° TO +0.30	30°/HR	-42 TO +78 °/HR

Resolution Limit — Along Track (90%) 10.1' — Range 0' TO 15.0' — Cross Track (90%) 7.0' — Range 2.2' TO 13.0'

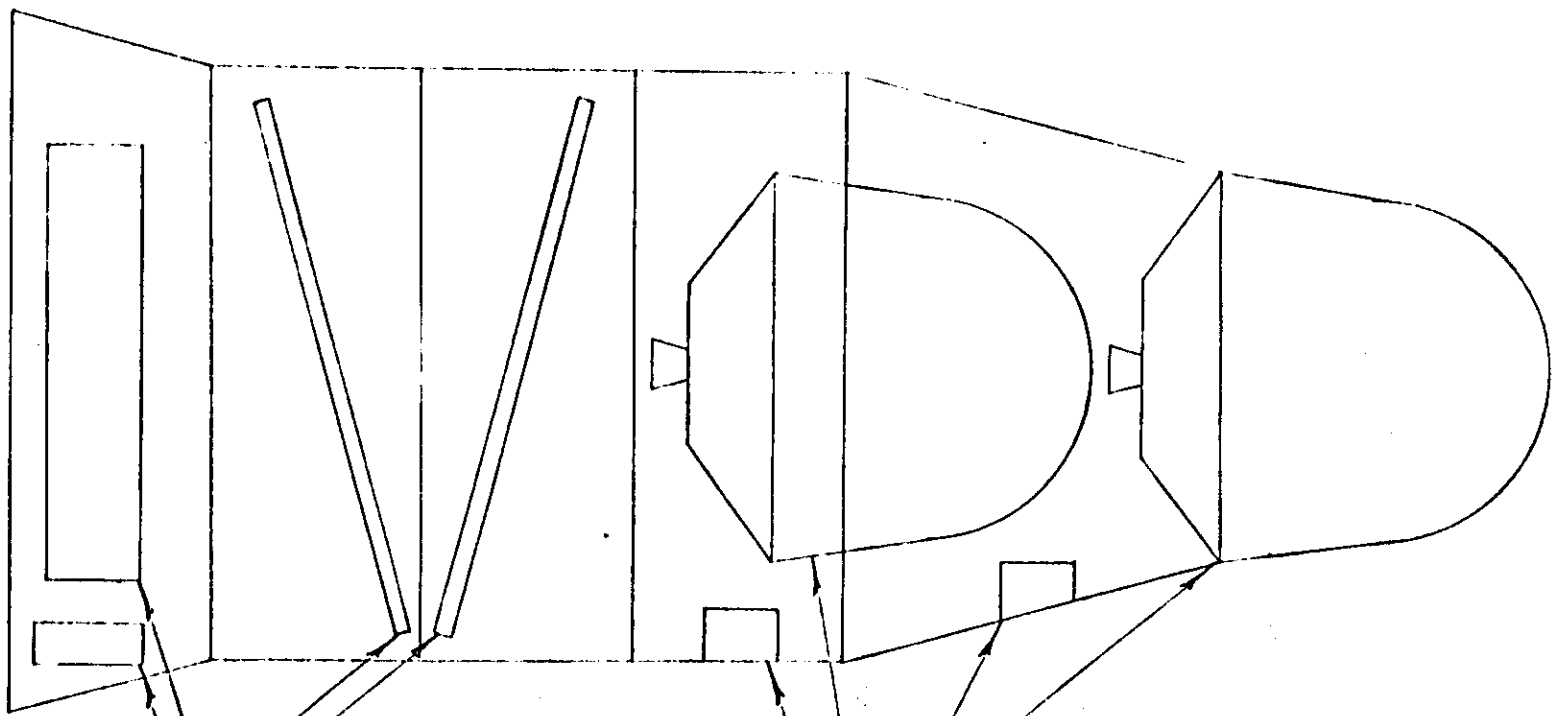
Instrument	MASTER (FWD)	SLAVE (AFT)	STELLAR	INDEX
Serial No.	148	149	D49/53/42	D49/53/42
Pre-Flight Resolution	181 H.C, 110 L.C	181 H.C, 106 L.C	-	72 H.C.
Slit of Exposure Time	0.200"	0.200"	2 SEC (f/1.8)	1/300 (f/4.5)
Filter/Film	W-21/4404	W-21/4404	NONE / 4401	W-21/4400
Footage Recovered	2971 FRAMES (1879')	3021 FRAMES (1005')	274 FRAMES (28')	279 FRAMES (55')
Photo Quality	EDGE TRACE [redacted] ALL - 83.6, HIGH - 90.4 350μ - 64, 43μ - 81 RES - 89	ALL - 87.1, HIGH - 93.9 350μ - 72, 43μ - 90, RES - 89	FAIR. FINE INTERMITTENT FRAMES AFTER D103-1 DUE TO C/P SWITCH.	GOOD. C/P PROBLEM.
Exposure	VERY GOOD	VERY GOOD	ADEQUATE	GOOD
Density	GOOD. BEST OBSERVED TO DATE	SAME	"	LOW 5%, MED 50%, HIGH 45%
Processing (PREDICTED / ACTUAL)	LOW 5%, MED 45%, HIGH 50% PRIMARY 2 / 30 INTER. 46 / 41 FULL 0 / 29	SAME PRIMARY 3 / 35 INTER 48 / 40 FULL 0 / 25	FULL 100 / 100	
F/H Error (90%)	-	11.6% (-16.0% TO +6.0%)	-	-
Time Track	OK	OK	-	-
Data Block	OK TO D103-1 ERRATIC THERE AFTER DUE TO FAULTY C/P SWITCH	OK	-	-
End of Pass Mark	SAME AS DATA BLOCK.	OK	-	-
Port H. O. Quality	GOOD. ERRATIC & SMEARED AFTER D103-1	OK	-	-
Port H. O. Fiducials		OK	-	-
Starboard H. O. Quality	FAIR.	OK	-	-
Starboard H. O. Fiducials		OK	-	-
F/I Fiducials	-	-	OK	OK
F/I Correlation Lamp	-	-	OK	OK
Temperature	51°F TO 69°F	52°F TO 69°F	39°F. TO 55°F.	SAME.
Remarks	C/P SWITCH ERRATIC AFTER D103-1 INTERMITTENT EDGE STATIC. START-UP CORONA. SCRATCHES NEAR D[redacted]	SAME STATIC, CORONA & SCRATCHES AS MASTER.	INTERMITTENT FOR PATCHES.	1° DIAGONAL LIGHT LEAK IN APX 30 FRAMES INTERMITTENT EDGE STATIC. CORONA IN FRAME #186 & LAST TWO FRAMES.

[redacted]

[redacted]

[redacted]

SCHEMATIC LEEWARD PROFILE - CORONA J SYSTEM



Master Camera No: 148

Slave Camera No: 149

Supply Cassette No: SC-11

Clock No: 508

Yaw Programmer No: N/A

"A" Recovery Subsystem No: 638

"A" Stellar-Index Camera No: D45/47/45

"B" Recovery Subsystem No: 639

"B" Stellar-Index Camera No: D49/53/42

Pressure Make-up Unit No: N/A

[redacted]

[redacted]

[redacted]

Failure of the Stellar camera shutter during Mission 1006-1 and failure of the master camera center of format switch caused loss of stellar-index photography during the latter part of Mission 1006-2. This will seriously affect cartographic use of the photography obtained during the mission.

G. RECOMMENDATIONS

Investigation and failure mode analysis resulting from the past flight analysis have resulted in the following actions:

1. Perform complete re-evaluation of the factors that produce uncompensated image motion in the Corona System.
2. Analyze and modify the main door and surrounding structure design to assure normal door injection. LMSC has accomplished this for all future flight units.
3. Modify the center of format switch to reduce future failures. Itek has accomplished this on all future flight units.
4. Study the problems of horizon camera exposure to determine if correct settings are used or whether "fuzzy" horizon images are due to external causes. Joint effort by Itek and LMSC is underway.
5. Review horizon camera boot installation to assure proper tension. LMSC accomplished this review and verified procedures are proper.
6. Improve reliability of stellar camera shutter and eliminate shutter open condition during shutter cock. Itek is phasing in an improved shutter as rapidly as possible.
7. Review Stellar-Index camera supply spool capacity requirements to preclude early depletion.
8. Modify fiducial lamp neutral density filter attachment to assure permanent filter positioning.

[redacted]

[redacted]

SECTION II

SPACE STRUCTURE SUBSYSTEM

A. COMPONENT ASSIGNMENT

Component	Serial Number
Clock	508
Telemeter "A"	T/M 107
Telemeter "B"	T/M 104

B. PREFLIGHT TESTING

The panoramic cameras were installed into their respective barrel sections on 6 March 1964. Command System Test and Pyro tests were completed on 16 March 1964 with no problems. The clock functional testing was accomplished with no recorded anomalies.

The System Light Leak Test was successfully completed on 6 April 1964. Subsequent investigation disclosed a light leak at the Felt Door Assembly. The component was replaced and the light leak removed.

A new Flight Commutator was installed on 26 April 1964 to cure the presence of some bad data points. Point 1152 (Separation Monitor) showed that the wire had pulled from the pins in connectors J100 and J61.

C. ENVIRONMENTAL TESTING

Summary

The J-09 Payload System completed a six-day orbit simulation test at the Sunnyvale HIVOS Chamber. A seven-day test was planned but was shortened as all primary objectives had been met. The chamber program was set for on-orbit temperature and pressure environment.

Pressure data as recorded by an alphatron gage indicated that the instrument pressures were below the suspected corona range. As the instruments were operated, the pressure increased through the corona region. Corona markings were reported to be acceptable on both panoramic instruments and the "A" Stellar/Index. The "B" Stellar/Index was reported as unsatisfactory.

The Electrical and Mechanical operation of the system was generally acceptable, except for the following: (1) The "B" Stellar/Index failed; (2) Cycle rate predictability exceeded limits; (3) Instrument #1 failed to meter

[redacted]

[redacted]

for 1/2 frame on one occasion; and (4) The V/H programmer potentiometer developed an electrical open.

The instrument temperatures varied from 73°F to 82°F for Instrument #1 and 66° to 75°F for Instrument #2 after a nominal 10° self-heating correction.

Two self-heating tests were conducted and showed good repeatability.

A pressure make-up system was tested on selected operations throughout the HIVOS test. Results are reported in T9-4-028, "J-9 Pressure Make-up System Test (4-9-64)".

Instrument Performance

Cycle Counter versus film footage pot deviations ranged from -445 feet on #1 Instrument to + 275 feet on #2 Instrument during the "A" Operation. These deviations are not a good indication of calibration accuracy, since the "A" spools loose wrapped during the test.

Cycle Counter versus film footage pot deviation ranged from -143 feet on the #2 Cassette to +122 feet on the #1 Cassette, during the "B" Mission.

Separation monitor (11-52) read 5V+ throughout the "A" Mission and 0V throughout the "B" Mission. Normal is 0.5 in "A" and 1.2 in "B".

A 3V 60 CPS Voltage appeared on top of the tape recorder channel #1 during the cut and wrap sequence.

Tape recorder Channel #2 was extremely noisy. Data (Status Channel #11) would be unusable.

The "A" S/I Index metering Idler was noisy.

Both film footage pots had as much as .15V level change during a commutator sample.

Serious ground loop problems exist during Instrument Operates. T.M. monitors referenced to 28V regulated return shift as much as 3.0V when both instrument center formats fall together.

Clock Performance

Clock correlation with IRIG "C" showed a maximum of 87 milliseconds slow for the first three days of operation. In the "B" Phase of the HIVOS test, a 3600 second error was detected in the IRIG "C" time generator. Correlation

[redacted]

between the clock and IRIG "C" in the "B" Phase of operation showed the clock to be 96 milliseconds fast after the 3600-seconds error had been corrected.

Temperature Summary

Three self-heating tests were conducted to determine repeatability of self-heating corrections. These were conducted near the beginning, prior to soak, and prior to second recovery during the HIVOS test. The test prior to soak was not a good test as the first part of the test was not recorded. The first and third tests showed good repeatability. The self-heating versus time curve to be used is shown in Figure 1, page 10. Sample instrument temperatures are listed. They are the average temperature and a 10^{o} self-heating correction is applied:

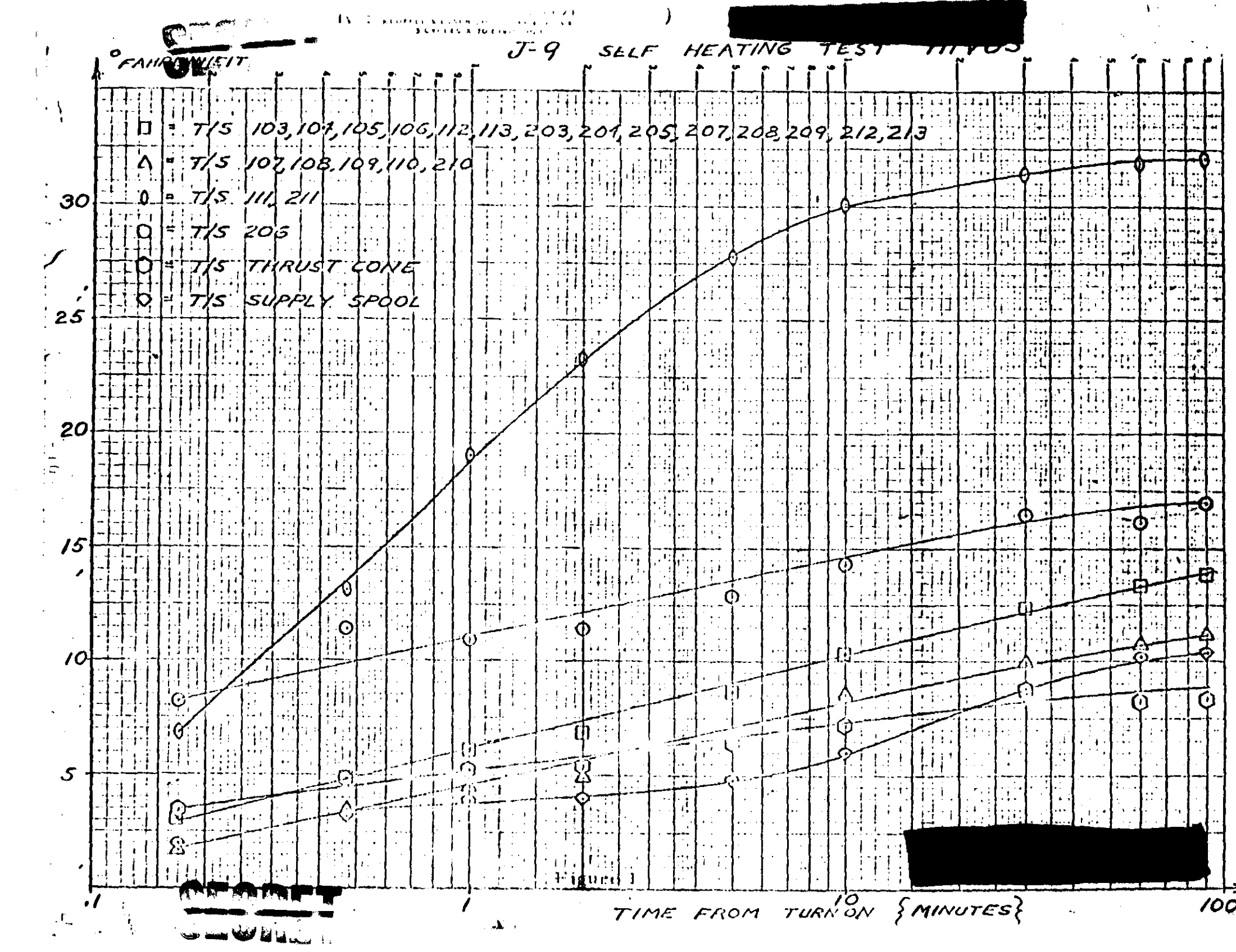
Day	Orbit	Instrument #1	Instrument #2
1	1	70^{o}	70^{o}
2	6	76^{o}	68^{o}
3	11	82^{o}	77^{o}
5	1	70^{o}	62^{o}
5	16	64^{o}	56^{o}
6	11	66^{o}	60^{o}

Pressure Summary

An alphatron gage was used to monitor the internal pressure of the system. A pressure make-up system was used for selected orbits during the "A" Mission. The pressure of the system passed through the suspected corona range during instrument operation without the use of the Pressure-Make-up System. Data taken from Selected Orbits are shown below:

Mission	Orbit	Mode	No. of Cycles	Pressure - Microns of Hg Start	End
A	2	Mono 1	40	15	33
A	2	Mono 2	40	23	40
A	42	Stereo	30	2	10
A	42	Mono 1	16	2	4.5
B	Confidence After Soak	Stereo	17	1.6	4.9
B	1	Stereo	23	1.4	5.0
B	Last	Mono 1	38	0.6	2.7
B	Last	Mono 2	29	0.6	3.4

Note: Pressure make-up system was not used during the operates listed above.


J-9 SELF HEATING TEST
°FAHRENHEIT
□ = T/S 103, 104, 105, 106, 112, 113, 203, 201, 205, 207, 208, 209, 212, 213
△ = T/S 107, 108, 109, 110, 210
0 = T/S 111, 211
○ = T/S 206
⬡ = T/S THRUST CONE
◇ = T/S SUPPLY SPOOL
30
25
20
15
10
5
.1
1
10
100
TIME FROM TURN ON {MINUTES}

[redacted]

D. VAFB TESTING

One main door ejector was replaced as it would not release within the specified pressure range.

E. IN-FLIGHT DATA

Instrumentation and Command Performance

The command system operated properly. No problems were reported. The Instrumentation System functioned normally, except the recovery system separation monitor (11-1-52), and the film footage pot consumption indicators (11-1-25, 31). All temp sensors, status points and continuous channels functioned normally.

The recovery system separation monitor (11-1-52) stepped to 0.9 volts at in-flight reset. The normal level was 0.5 volts. Preflight calibration indicated that 1.0 volts corresponds to "A" SRV demated and "B" SRV mated, and 0.75 volts correspond to "A" SRV mated and "B" SRV demated. Each condition could be caused by either one of two switches being improperly adjusted, allowing a switch to relax during vibration at inflight reset. Changes being considered to prevent recurrence are as follows:

1. Install a new type switch to provide more over-travel capability.
2. Change mounting to produce more over-travel.
3. Epoxy bond switch to mounting bracket after adjustment to prevent slipping.

The film footage pots, both missions, indicated approximately 10% less payload consumption than the cycle counter monitors. The voltage reading was approximately 5% less than was expected. It was determined that the tape recorder input impedance was 250K ohms and the VCO input impedance was 1.0 megohms. This results in a 200K load being connected to the film footage pot wiper during commutator sample time. The pot impedance is 20K maximum and this load reduces the output from a normal 5.0 volts to 4.75 volts. This loading would not appear on channel 8-2-56 and 8-2-47 as the load is only connected while channel 11 commutator is sampling the points. Future system calibration techniques will be revised to allow for VCO and T/R loading.

Panoramic Camera Performance

Both Panoramic cameras operated throughout both missions. Camera operation was monitored on 10 orbits during the flight. Significant items

[redacted]

[redacted]

of operation and malfunctions are as follows:

1. Slave center-format switch failed open on orbit 1[redacted] through mid-orbit 3.
2. Slave door failed to eject at inflight reset but ejected after orbit 2[redacted]
3. Master center-format switch failed closed intermittently after orbit 103.
4. First and second recovery performance was normal.
5. Maximum cycle rate deviations were 2.6 and 3.5 percent for the master and slave respectively.
6. Payload in both instruments was depleted at D-Timer start on orbit 128 over[redacted].

Two anomalies were noted with center-format switches. The first failure was noted on the Aft camera on orbit 1 over[redacted] where the center-format switch failed to close from frame 10 to the end of a 16-frame operation. Comparison of cycle counter readings and post-flight payload analysis showed that the switch is considered as the most probable cause of failure.

The second failure occurred on the Fwd camera center-format switch just after an operation on orbit 103 over[redacted] The center-format switch failed closed intermittently. The switch would close at the appropriate time, but would open randomly. A broken switch is considered to be the most probable cause of failure.

The following steps are being taken to prevent recurrence:

1. Modified techniques to check switch adjustment and operation.
2. Engineering investigation for a new type switch.

The Aft camera door failed to eject at inflight-reset. Telemetry data indicated that the squibs were initiated properly. The payload data report indicated that the slave camera door separated on frame 18 of orbit #3. Thermal deformation is considered as most likely cause of failure. The ejector held pressure and ejected the door when thermal equilibrium in the structure was reached.

The following changes were made to prevent recurrence of this problem:

1. Provide additional relief in areas where binding could occur.
2. Change attachment bolts from aluminum to titanium close tolerance bolts.

[redacted]

[redacted]

[redacted]

3. Increase torque from 40 - 50 inch/pounds to 100 + inch/pounds.
4. Install modified lifter bars.
5. Study paint change to modify thermal response.

Variations of the cycle period repeatability were evident throughout the mission with maximum errors of 2.6 and 3.5 percent for the master and slave instruments respectively. A tabulation of the cycle period data and percent error from the predicted cycle period are included in the listing below.

CYCLE PERIOD DATA

ORBIT	TIME UP RAMP	MASTER Nominal	MASTER Actual	MASTER % Error	SLAVE Nominal	SLAVE Actual	SLAVE %Error
1	2010	2.307	2.290	0.75S	2.322	2.322	0%
9	1010	3.791	3.777	0.37F	3.780	3.843	1.63S
25	1075	3.639	3.640	0	3.629	3.680	1.4 S
40	1136	3.503	3.488	0.43F	3.495	3.536	1.18S
56	1200	3.368	3.360	0.24F	3.361	3.413	1.54S
72	1266	3.220	3.230	0.3 F	3.237	3.290	1.6 S
88	1330	3.117	3.123	0.19S	3.160	3.193	1.04S
103	1390	3.003	3.01	0.2 S	3.004	3.070	2.2 S
110	2975	2.302	2.353	2.11S	2.318	2.400	3.54S
119	1457	2.860	2.923	2.20S	2.862	2.948	3.00S

The cut and wrap sequence occurred over [redacted] All operations, functions and switchover was normal.

The second recovery was initiated over [redacted] Tracking Station and all functions performed normally. At initiation both cameras were observed to be out of film. The 99/101% shuttles were on the take-up side indicating normal film depletion. The film length summary is:

	MASTER	SLAVE
Off Spool Length	210	210
Control Strips (Run through camera and retrieved)	82	64
Recovered in "A" Capsule	7,943	7,862
Recovered in "B" Capsule	7,879	8,005
TOTAL ON SPOOL	16,114 Ft.	16,141 Ft.

Note: Film length should be 16,000 ± 80 Feet

[redacted]

Stellar/Index Camera Performance

Mission 1006-1

The stellar camera functioned normally for 60% of the mission. The stellar shutter failed open, closed and double-pulsed for 40% of the frames taken during the mission.

The index camera functioned properly throughout the mission with no anomalies reported. Film depleted approximately 20 frames prior to the end of the Mission 1006-1.

Mission 1006-2

The stellar and the index cameras operated properly with no shutter, metering or recording abnormalities reported. The master center-format switch failure after orbit 103 caused the S/I to expose 279 frames instead of the nominal 428 frames.

Clock Performance

The clock operation was normal with the time accuracy within the reading accuracy of the analog records used for correlation. A linear clock offset of .209 seconds was indicated between orbits 9 and 126.

Recovery System Performance

Mission 1006-1

A successful air catch of the capsule was made on orbit 65. The impact point was within normal tolerances. All capsule re-entry events, except the thrust-cone physical separation switches, occurred within tolerance. This monitor indicated a 0.75 second delay between the separate signal and the switch actuation. Similar delays have been noted on previous recovery systems with delays ranging up to 1.0 seconds.

The condition of the recovered capsule was satisfactory with damage limited to normal paint blistering. Post-flight inspection and test showed no anomalies.

[redacted]

Below is a tabulation of the sequence to re-entry and recovery event times.

RECOVERY SEQUENCE OF EVENTS (Mission 1006-1)

Event	System Time	Delta Time Actual	Delta Time Nominal
Transfer	3703.84		
Elect. Disconnect	3704.91	1.07	$0.90^{+.430}_{-.400}$
Separation	3705.83	1.99 *	2.0 ± .25
Spin	3708.35	3.44 **	3.4 ± .30
Retro	3715.98	7.63	7.55 ± .45
Despin	3726.58	10.60	10.75 ± .54
T/C Separation	3728.84	2.26	1.5 ± .15
"G" Switch Open	4252.32	-	-
Parachute Cover Off	4285.71	33.39	34.0 ± 1.5
Drogue Parachute Deployed	4286.38	.67	0.75 ± .08
Drogue Parachute Released	4296.72	10.34	10.05 ± 1.5
Main Parachute Deployed	4297.26	.54	1.2 ± .15
Main Parachute Disreefed	4301.35	4.09	4.0 ± 1.7

* From Transfer

** From Electrical Disconnect

Spin Rate - 64.1 RPM

Despin Rate - 11 RPM

Retro Velocity 911 Ft/Sec

Recovery Battery Voltage At Arm 13.7 V

Mission 1006-2

The second recovery unit was successfully recovered by air catch on orbit 128. The impact point was within normal tolerances.

Post-flight inspections and tests showed all events to be normal. Damage to the recovery capsule was limited to normal blistering of paint.

[redacted]

[redacted]

Below is a tabulation of the sequence of monitored re-entry and recovery event times.

RECOVERY SEQUENCE OF EVENTS (Mission 1006-2)

Event	System Time	Delta Time Actual	Delta Time Nominal
Transfer	85696.72		
Elect. Disconnect	85697.76	1.04	$.9 \pm .43 \atop - .40$
Separation*	85698.82	2.10	$2.0 \pm .25$
Spin**	85701.19	3.43	$3.4 \pm .30$
Retro	85708.79	7.60	$7.55 \pm .4$
Despin	85719.49	10.70	$10.75 \pm .81$
T/C Separation	851721.04	1.55	$1.5 \pm .15$
Volt Monitor Closed	85806.96	85.92	100 ± 40
Volt Monitor Open	-	-	-
"G" Switch Open	86299.20		

Spin Rate - 65 RPM

Despin Rate - 12 RPM

Retro Velocity - 884 Ft/Sec.

* From Transfer

** From Electrical Disconnect

De-Activate/Re-Activate Performance

A vehicle de-activate sequence was initiated on orbit 133. All functions performed normally. The vehicle was re-activated again on orbit 149. The proper attitude and stability was regained and maintained.

A Lifeboat Real-Time Recovery Sequence was initiated on orbit 174. All vehicle functions performed as required.

The vehicle power was expended between orbit 191 and orbit 199 where all electrical functions were lost.

The vehicle orbital life ended on 6/17/64 or 6/19/64.

[redacted]

[redacted]

[redacted]

Temperature Summary

Temperature environment of the system is presented in Tables 3 and 4 on pages 18 and 19. Data were obtained from real-time orbits acquired at [redacted] Tracking Station. Self-heating corrections were made based on self-heating data taken during the HIVOS Environmental Chamber Tests. Self-heating correction curves were shown in Figure 1 on page 10.

[redacted]

J-9 1176 [illegible]

OK IT

SENSOR	L	9	16	25	31	40	47	56	63	72	79	88	95	103	110
Focusing Barrel #1															
1	240+	42	98	45	106	42	106	45	103	11	–	11	37	11	34
2	240+	18	21	25	25	15	54	18	24	1	11	4	14	4	7
3	240+	6	35	10	35	10	35	10	32	21	107	24	115	24	102
4	240+	56	81	56	78	56	75	56	75	44	130	41	133	41	116
5	240+	83	113	88	111	82	105	76	99	49	87	40	87	40	78
6	240+	73	15?	70	154	67	118	67	138						
Barrel No. 2															
1	177	79	107	76	101	70	99	57	93	47	82	44	79	41	76
2	164	56	142	59	145	56	140	43	134	43	126	40	124	37	115
3	208	14	87	20	95	20	95	23	95	17	87	17	95	17	87
4	210	6	13	7	13	7	13	10	13	0	7	3	3	7	7
5	185	21	47	21	44	25	44	25	44	12	31	9	34	15	31
Conic Adapter															
1	178	59	92	59	92	59	86	66	83	43	71	36	71	36	59
Clock															
1	99	71	75	73	73	73	73	73	73	62	62	60	65	60	58
2	103	69	73	71	73	73	72	71	71	58	60	60	60	60	56
Thrust Cone															
1	130+	46	46	44	44	42	44	44	44	48	46	47	46	48	43
2	67	69	63	64	60	64	59	62	55	60	56	56	55	56	54
Stellar Index															
1	88	67	70	64	67	64	64	64	64	55	55	51	55	55	51
2	77	67	64	67	64	64	61	64	61	45	42	42	42	45	39
Recovery Batt. #1															
1	67	68	68	65	66	65	64	64	64	78	75	74	84	74	82
Master Cassette															
2	94	58	54	54	53	53	51	53	52						

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TABLE 3

SENSOR																
Vector	1	9	16	25	31	40	47	56	63	72	79	88	95	103	110	119
3	56	57	55	55	57	55	53	56	62	48	46	47	44	47	43	47
4	65	63	62	61	64	62	57	61	57	55	52	53	50	53	49	53
5	59	68	67	66	66	65	62	64	62	60	56	57	55	57	53	56
6	57	79	75	77	67	75	90	73	69	69	63	65	61	64	61	64
7	62	79	76	75	74	73	72	72	73	69	65	66	64	65	63	65
8	66	72	69	69	67	68	64	66	66	62	58	62	57	60	55	59
9	61	76	71	71	71	71	66	71	68	66	61	63	59	63	58	53
10	60	72	73	69	72	69	68	69	69	62	62	60	62	59	58	59
11	73	72	75	70	76	69	71	70	69	61	62	68	51	58	58	58
12	67	59	57	57	60	56	55	57	54	53	48	50	47	49	45	49
13	61	79	77	76	77	75	71	75	71	69	64	64	60	64	61	62
Slave																
3	54	74	74	71	76	71	72	70	69	64	62	61	59	63	58	59
4	61	73	71	72	73	74	70	71	68	66	62	64	58	67	58	63
5	55	68	65	66	66	68	61	65	62	63	56	58	53	61	52	56
6	53	62	61	62	62	65	59	61	59	59	53	53	51	56	49	53
7	53	63	68	66	69	69	64	65	63	63	57	58	56	58	54	56
8	55	64	63	64	64	66	51	63	58	59	55	57	51	58	51	54
9	56	58	57	58	60	60	54	58	53	55	49	52	48	54	56	56
10	61	70	74	69	73	70	69	68	72	65	61	60	61	63	59	59
11	68	60	58	60	61	64	56	61	57	56	54	54	60	58	52	54
12	58	68	66	66	69	68	64	66	63	63	57	58	55	61	52	56
13	61	73	72	71	74	74	68	70	69	66	63	61	65	65	60	61
Supply Spool																
1	57	55	53	58	58	59	55	58	57	56	51	51	50	50	47	51
2	61	62	61	62	64	64	60	62	62	60	54	57	53	55	51	54

TABLE-4

[redacted]

SECTION III

MASTER (FWD) PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT:

Component	Serial Number
Main Camera	148
Main Camera Lens	1242435
Supply Horizon Camera	161B
Supply Horizon Camera Lens	813549
Take-up Horizon Camera	157A
Take-up Horizon Camera Lens	812206
Supply Cassette	SC-11

B. CAMERA DATA AND FLIGHT SETTINGS:

Main Camera:

Lens	24" f/3.5
Slit Width	0.200"
Filter Type	Wratten 21
Film Type	Eastman Type 4404

Supply (Port) Horizon Camera:

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

Take-up (Starboard) Horizon Camera:

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

[redacted]

C. PRE-FLIGHT DATA

Camera number 148 was received at A/P on 27 January 1964 for contractor Receiving Inspection and Acceptance Testing. During these phases the following problems were encountered and action taken:

1. The horizon camera fiducial lamps were inoperative. The burned out lamps were replaced.
2. The intermediate roller assembly would not turn freely. The assembly was replaced as a defective bearing was located.
3. The shuttle assembly did not move freely. This anomaly was waived by Itek.

The camera underwent the normal System Functional Test during which the sticky shuttle assembly caused Fail-Safe #1 to trip. Disassembly of the shuttle determined that some epoxy was in the bearings; the items were cleaned and reinstalled. The cycle rate check recorded rates that were approximately 3% slower than the original settings. The tachometer motor voltages were adjusted to produce the correct rates. The dynamic photographic resolution test results are shown in Figure 2, page 22.

The V/H potentiometer was replaced during Environmental Testing as noise developed at the top of the ramp. The corona discharge marking was confined to the third frame after start and was considered within the acceptable level.

A new design V/H potentiometer was installed during VAFB testing and the V/H transducer with gold plated stepper switch contacts was incorporated.

D. IN-FLIGHT DATA

The detailed summary of the telemetry data obtained during the mission is in Section II. The failure of the center-of-format switch at the start of pass D103 during Mission 1006-2 was observed in-flight.

E. POST-FLIGHT PERFORMANCE EVALUATION

The photographic quality of the FWD camera film was excellent. This is primarily attributed to the processing of the original negative which was much closer to the exposure-processing criteria than achieved on previous missions. The informational content of the photography was exceptionally high because of the low perigee which improved the scale factor by 10% to 15%. The abnormal V/H error that resulted from the orbital anomalies did not significantly affect

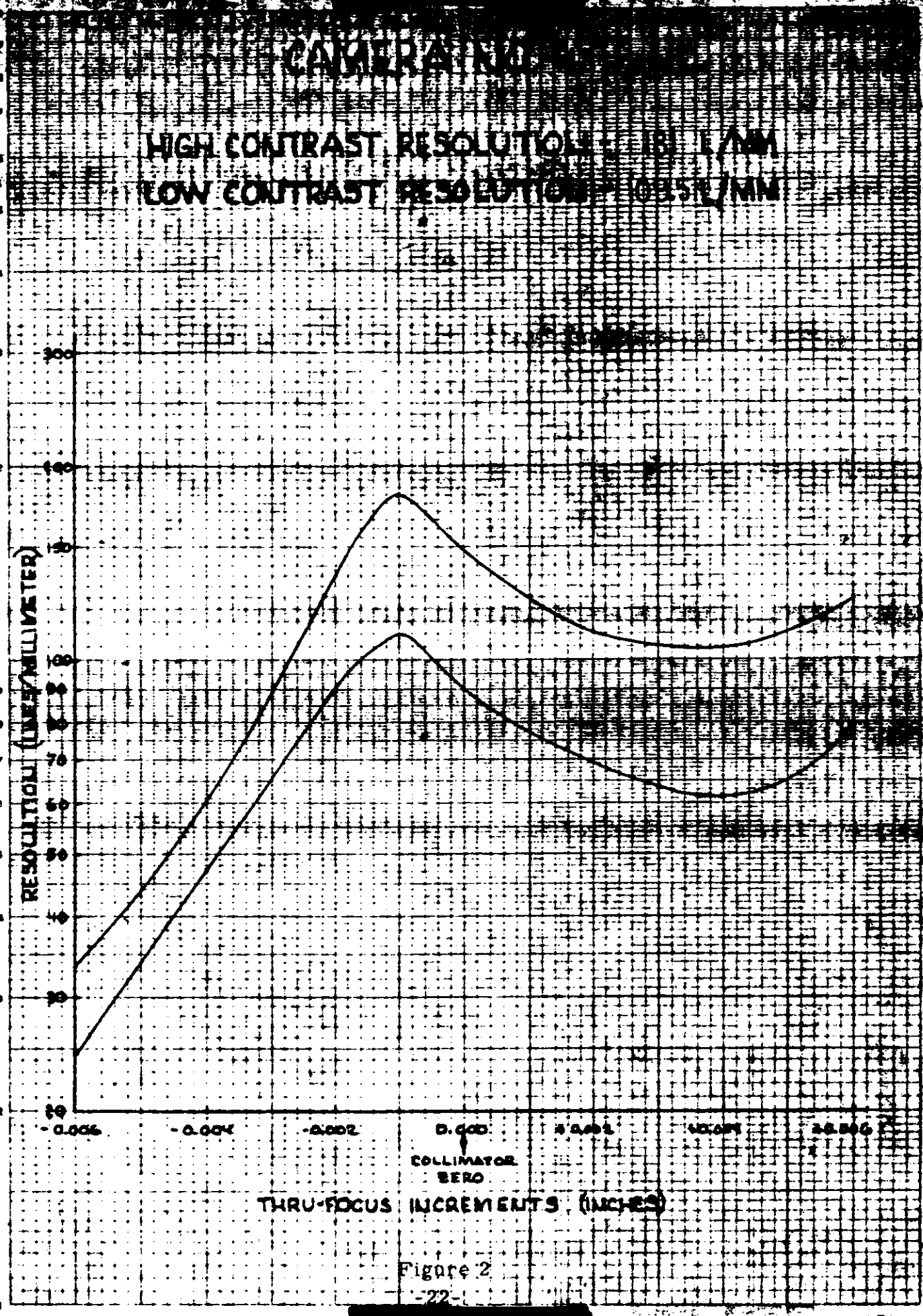

HIGH CONTRAST RESOLUTION: 181 L/MM
LOW CONTRAST RESOLUTION: 0.85 L/MM
RESOLUTION (LINES/MILLIMETER)
300
200
100
90
80
70
60
50
40
30
20
- 0.006
- 0.004
- 0.002
0.000
COLLIMATOR ZERO
THRU-FOCUS INCREMENTS (INCHES)

Figure 2

the resolution of the imagery as the error was below 15.4% during 90% of Mission 1006-1 operations and 11.6% for 90% of Mission 1006-2 operations. The analysis of image smear is contained in Section XV.

The camera center-of-format switch failed intermittently from the start of pass D103 to the end of the mission. This resulted in the loss of the binary data block time word, normal end of pass marks and horizon fiducials. The horizon cameras continued to function however the images were heavily smeared. Testing subsequently conducted by Itek simulated this failure mode when one of the dual center-of-format switches, #S-104, operated normally while the second switch, #S-105, was continually closed.

The dual switches were incorporated to improve reliability; however they actually reduced the reliability. As a result switch #S-105 has been removed from the circuit as recommended by Itek.

During the period of proper center-of-format switch operation the data block, end-of-pass mark and horizon cameras operated properly. The 200 cps time track functioned properly throughout both missions.

The starboard horizon camera photography was very soft through pass D35. The quality was somewhat improved thereafter however it was significantly inferior to the quality of the port camera photography. This was the first case of poor imagery since the incorporation of the 55mm horizon camera lenses. Several theories exist as to the cause of the poor quality however the current studies have been inconclusive to date.

The micro-densitometer traces made of the typical port and starboard horizon line photography are shown in Figure 3, page 24. The poor starboard photography is shown by the low slope of the pass D06 trace and the improvement after D35 corresponds to the increase in slope. The port image trace shows the normal slope that results from usual horizon camera photography.

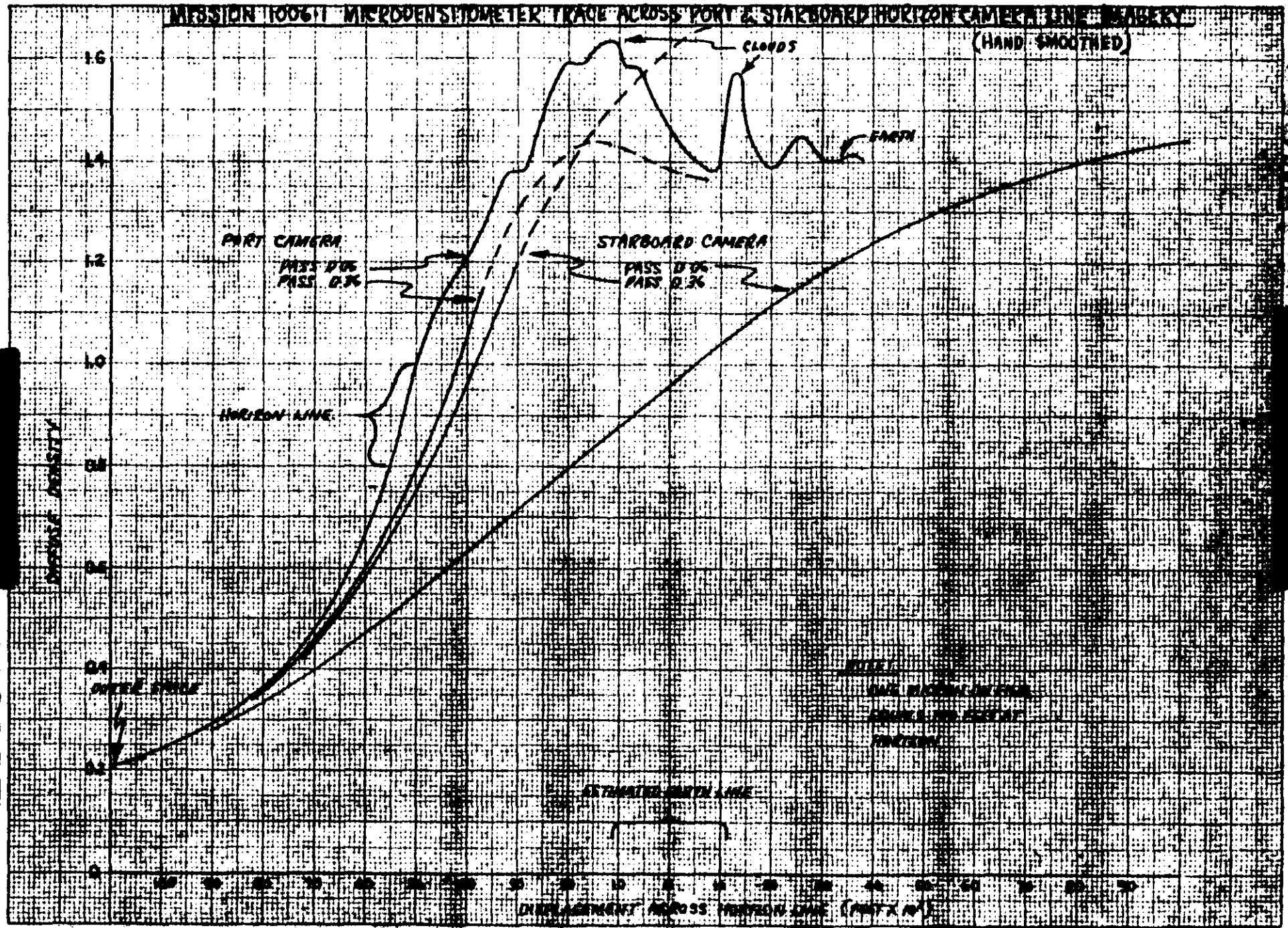


Figure 3

[redacted]

SECTION IV

SLAVE (AFT) PANORAMIC CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Main Camera	149
Main Camera Lens	1262435
Supply Horizon Camera	156B
Supply Horizon Camera Lens	813536
Take-up Horizon Camera	156A
Take-up Horizon Camera Lens	813559
Supply Cassette	SC-11

B. CAMERA DATA AND FLIGHT SETTINGS:

Main Camera:

Lens	24" f/3.5
Slit Width	0.200"
Filter Type	Wratten 21
Film Type	Eastman Type 4404

Supply (Starboard) Horizon Camera:

Lens	55mm f/6.8
Aperture Setting	f/8.0
Exposure time	1/100 second
Filter type	Wratten 25

Take-up (Port) Horizon Camera:

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

[redacted]

C. PRE-FLIGHT DATA

Camera number 149 was received at A/P on 27 January 1964. No anomalies were reported during Receiving Inspection, Acceptance Testing and Systems Functional Testing. The dynamic, photographic resolution test results are shown in Figure 4, page 27.

The film passed through the camera during Environmental Testing showed a fog pattern in the third frame after start-up caused by corona discharge. This level of marking is within the flight acceptance criteria.

No anomalies were encountered during the Pre-Ship Tests at A/P and the testing at VAFB.

D. IN-FLIGHT DATA

The detailed summary of the telemetry data obtained during flight is in Section II. The failure of the main camera door to eject on command, the eventual door absence and the center-of-format switch failure were observed in flight.

E. POST FLIGHT PERFORMANCE EVALUATION

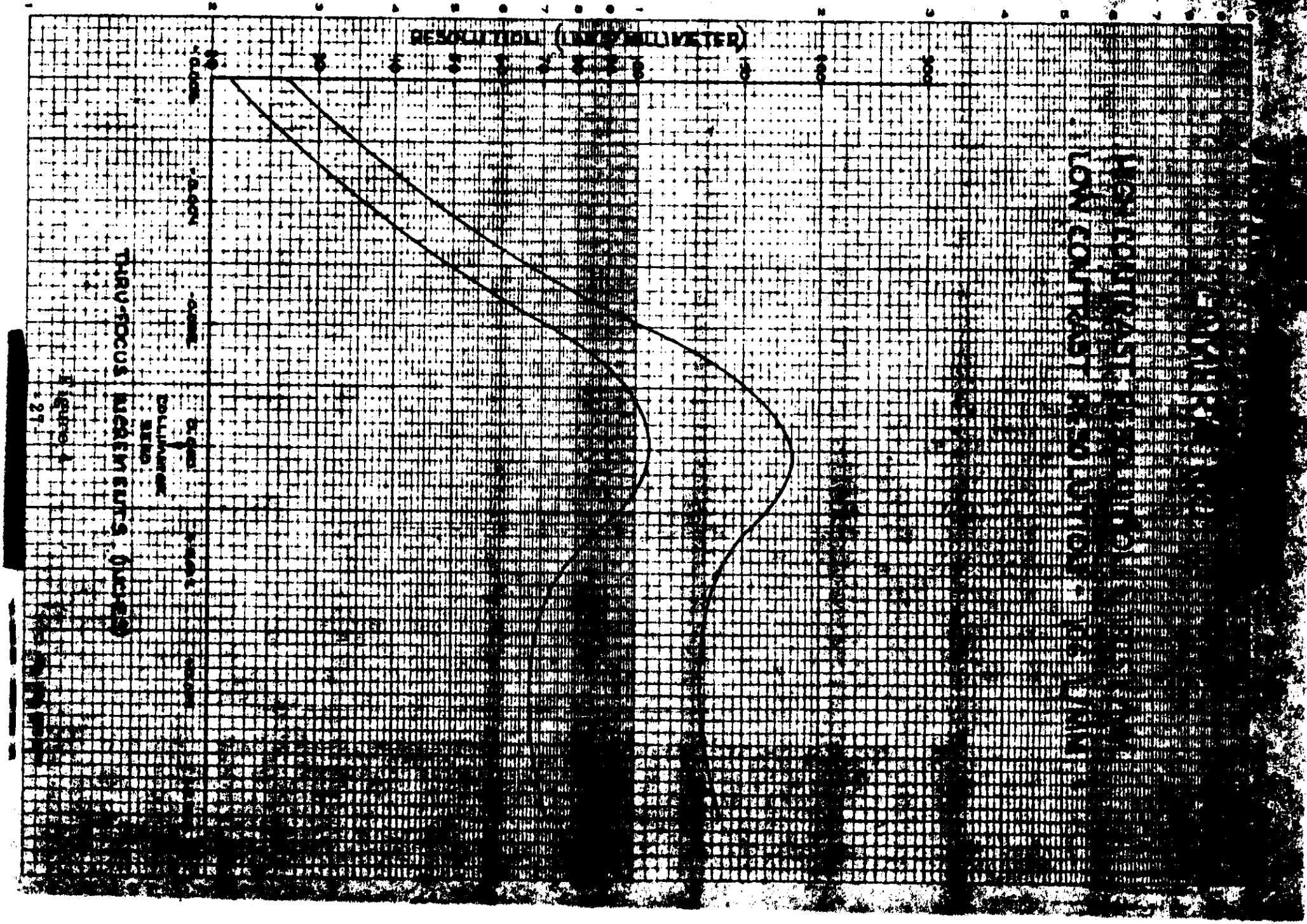
The photographic quality and informational content of the AFT camera was as excellent as the FWD camera. The excessive processing given to the Mission 1006-1 original negative was not readily apparent. This problem is discussed in more detail in Section VI.

The main camera door did not eject at the pyro firing command during ascent. The door did not eject until after camera operations during pass D02. It is postulated that manufacturing tolerances and ascent thermal aggravation created a bind between the door and structure. The piston chamber in the door ejection pin puller retained its pressure and caused door ejection after thermal stabilization during passes D02 and D03. A redesign of this area has been completed and incorporated on all future flights.

The center of format switch failed from frame D01-10 through frame D03-17. The binary data block, horizon camera imagery and fiducials were absent during this period however they operated properly throughout the remainder of both missions. It has been concluded that this malfunction was caused by a jammed switch that released after repeated cam action.

NO. 340R L31D DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
2 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U.S.A.



[redacted]

The horizon camera imagery was essentially the same as noted in the FWD camera. The port camera produced sharp photography throughout the missions while the starboard imagery was soft. The microdensitometer traces plotted in Figure 3, page 24, are also typical of the AFT camera horizon photography.

[redacted]

[redacted]

[redacted]

SECTION V

PANORAMIC CAMERA EXPOSURE

The exceptionally low perigee resulted in the panoramic cameras operating at the maximum cycle rate for the majority of both missions. Figures 5 and 6 on pages 30 and 31 show the nominal exposure time versus latitude for the three levels of processing. If the orbital parameters had been as planned the actual exposure time would follow the "orbit" curve however the high speed cycle rate limit of the cameras would not permit exposure times above the dashed line marked "ramp".

The illumination conditions during the missions were relatively consistent as the flight took place near the summer solstice. The range of solar elevations and solar azimuth values are shown below for operations in the northern and southern hemisphere. The values of solar azimuth consider the heading of the payload at 0° with plus values clockwise and minus values counterclockwise. All values below are positive.

MISSION	HEMISPHERE	RANGE OF SOLAR ELEVATION	RANGE OF SOLAR AZIMUTH
1006-1	North	38.2° to 55.7°	51.2° to 111.9°
	South	27.4° to 30.6°	138.3° to 139.9°
1006-2	North	42.6° to 63.9°	35.9° to 112.3°
	South	32.2° to 38.0°	142.4° to 147.2°

The actual exposure time that occurred during passes D31 and D110 was calculated from the data block time word and the 200 cycles timing mark count. This analysis was limited to ZI engineering material due to availability.

The exposure time during pass D31 was programmed at a constant rate as controlled by the cycle rate limiter in the V/H programmer. The actual exposure times are shown in Figure 7 on page 32. The first six frames are not shown as they are significantly affected by instrument start-up; some effects of start-up are seen through frame 12. The slight variation in exposure time obtained from the data block is not considered significant as it is in the order of 1%. The variation in the timing mark exposure time is somewhat larger in magnitude. The shape of the anomaly is similar to cases previously observed when the V/H potentiometer center-tap point was crossed. The cause of this particular exposure time variation is under study.

[redacted]

[redacted]

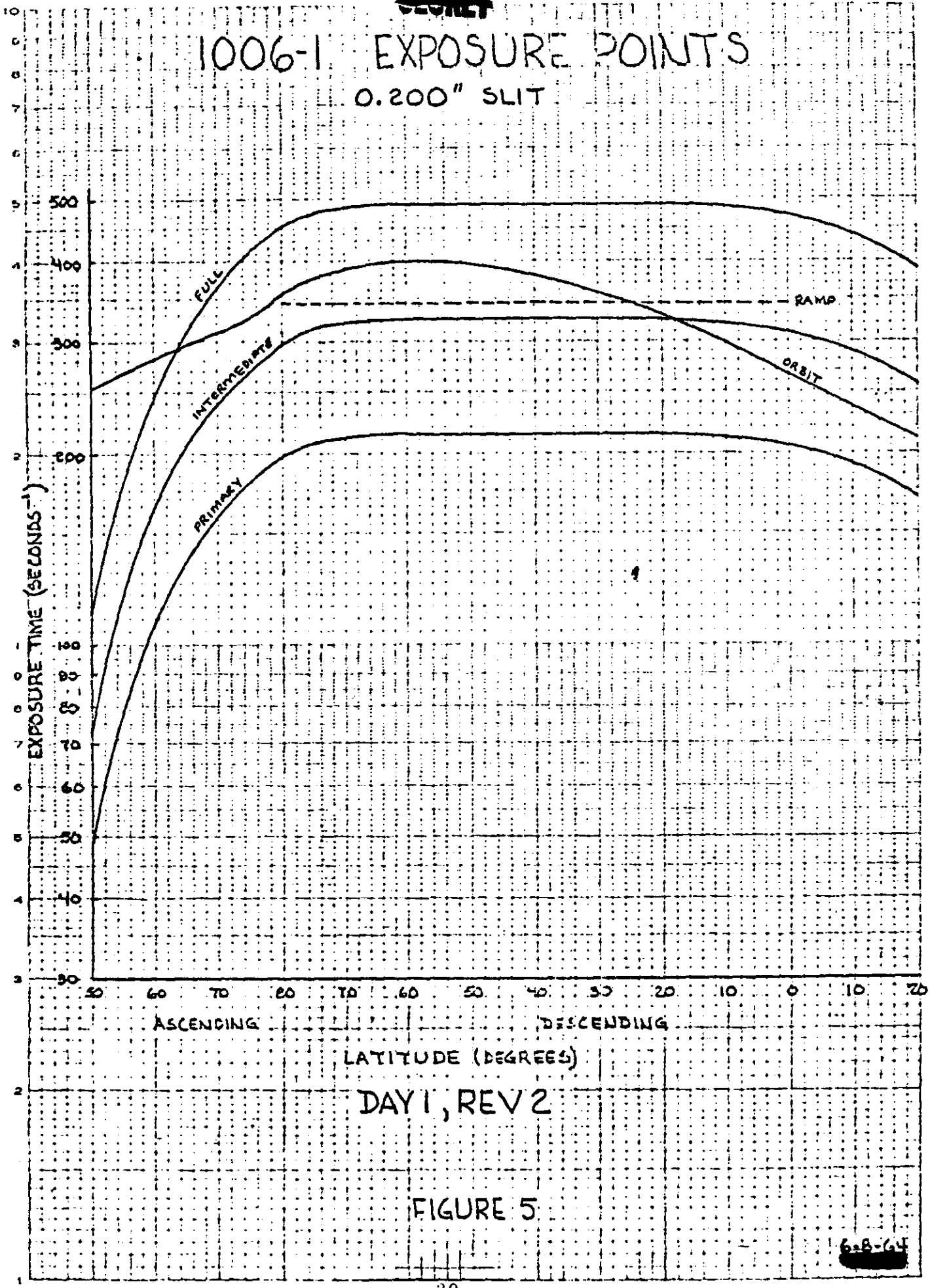

1006-1 EXPOSURE POINTS
0.200" SLIT
FULL
INTERMEDIATE
PRIMARY
RAMP
ORBIT
EXPOSURE TIME (SECONDS⁻¹)
500
400
300
200
100
90
80
70
60
50
40
30
50 60 70 80 70 60 50 40 30 20 10 0 10 20
ASCENDING
DESCENDING
LATITUDE (DEGREES)
DAY 1, REV 2

FIGURE 5

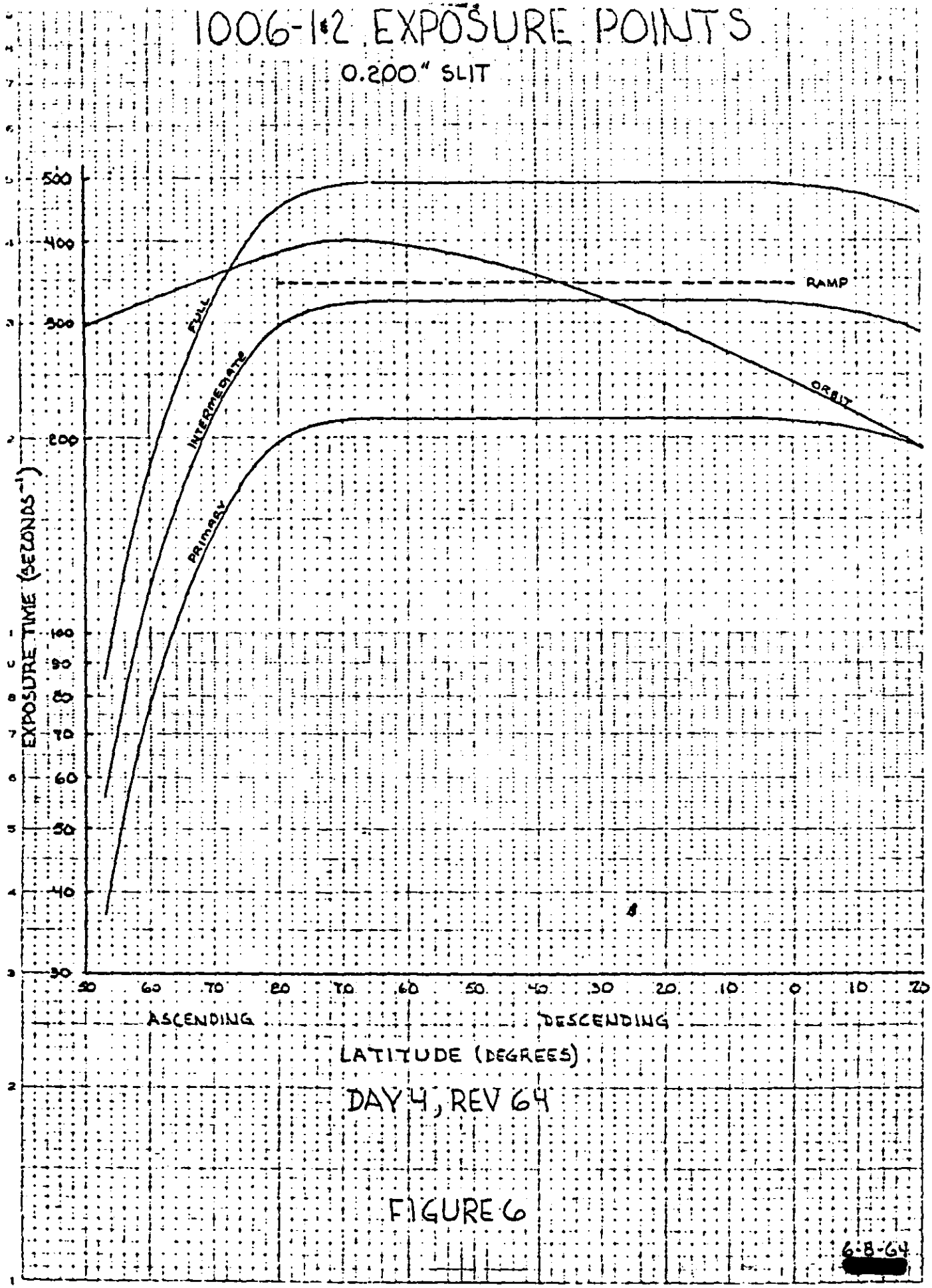


FIGURE 6

6-8-64 [redacted]

SECRET

MISSION 006
360
350
340
330
320
310
300
ELAPSED TIME (SECONDS)
0
10
20
30
40
50
FRAME NUMBER

Figure 7

The exposure times that occurred during pass D110 are plotted in Figure 8, page 34. The general shape of the curves is normal as the V/H programmer was on the decreasing portion of the potentiometer.

The most significant factor shown in the two figures is the shorter exposure time, approximately 5%, calculated from the time marks. This calculation of exposure time is considered more accurate than the time derived from the data block as it is an absolute measure of the motion of the scan head, and hence slit, during photography. The exposure time calculated from the data block assumes uniform camera velocities throughout a cycle which is apparently incorrect.

The non-uniformity of scan rate is discussed in more detail in Section VIII. The data shown in Figures 7 and 8 do indicate that at least a portion of the non-uniformity of scan rate is produced by the scan head only and not associated with the lens rotation.

The level of processing that is given to the film is predicted for each mission based on the known factors of camera cycle rate, hence exposure time, and solar elevation. The effects of the unknown factors of weather, such as cloud and snow cover, and mission anomalies are normalized by variations in the processing level.

The predicted and actual processing levels, in percent, for the missions are:

MISSION	CAMERA		PRIMARY	INTERMEDIATE	FULL
1006-1	FWD	predicted	1	99	0
		actual	1	51	48
1006-1	AFT	predicted	1	99	0
		actual	0	23	77
1006-2	FWD	predicted	2	98	0
		actual	30	41	29
1006-2	AFT	predicted	2	98	0
		actual	35	40	25

The significant variation in processing levels used on the four film spools is not normal. Generally, the processing levels used on Corona missions approximate the percentages used on the AFT camera film from Mission 1006-1. The reasons for the decrease in full processing on the remaining three film spools is not understood. However, it is considered to be one of the major contributors to the exceptionally good photography acquired during the missions.

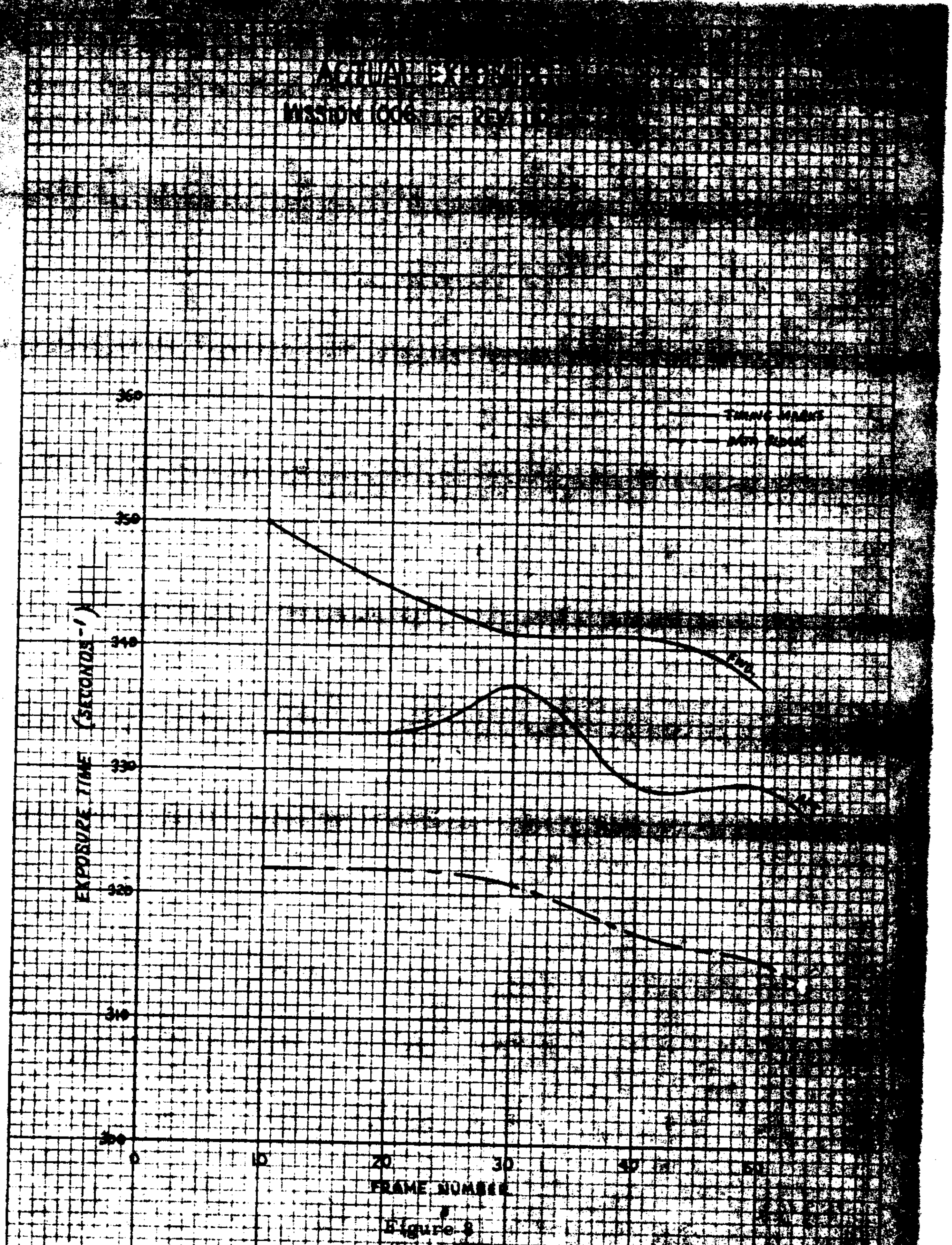


Figure 8

[redacted]

SECTION VI
DIFFUSE DENSITY MEASUREMENTS

Tables 4 and 5, pages 37 to 61, list mission data supplied by AFSPTL. This data includes the visual Reciprocal Edge Spread (RES) values, the area on the format in which the value was obtained and the general characteristics of the edge as shown on the data key page. The densitometric measurements of the base plus fog, minimum and maximum terrain densities and the maximum cloud densities are also listed with other general data such as solar elevation, latitude and overlap.

The columns are arranged in the following order:

COLUMN NUMBER	HEADING	DATA
1	-	Ascending or Descending pass
2-4	Pas Nbr	Pass Number
5	-	FWD or AFT camera
6-8	Frm Nbr	Frame Number
9-17	Area 1 RES	RES data in area 1
9-11	WWW	With flight RES value
12-14	AAA	Across flight RES value
15	S	Subject - see key
16	T	Terrain - see key
17	Q	Qualifiers - see key
18-26	Area 2 RES	RES data in area 2
27-35	Area 3 RES	RES data in area 3
36-44	Area 4 RES	RES data in area 4
45-53	Area 5 RES	RES data in area 5
54-56	D min	Terrain minimum density
57-59	D max	Terrain maximum density
60-62	D B+F	Base plus fog density
63-65	LIM max	Cloud maximum density

[redacted]

[redacted]

COLUMN NUMBER	HEADING	DATA
66-68	LAT	Latitude
68	T	0 = North, 1 = South
69-71	Sun Ele	Solar Elevation
73-74	CLD	Percent cloud cover
75-76	OL	Percent overlap

The data key for the listings of the "Subject", "Terrain" and "Qualifiers" is shown below.

I SUBJECT

1. Buildings
2. Roads, runways
3. Tanks, A/C, other man-made
4. Non-cultural

II TERRAIN

1. Flat
2. Hilly
3. Mountains
4. Flat and snow
5. Hilly and snow
6. Mountains and snow

III EDGE QUALIFIERS

1. Clear
2. Snow
3. Hazy
4. Shadow
5. Snow and Haze
6. Snow and Shadow
7. Haze and Shadow
8. Snow, Haze and Shadow

PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLDCL

PAS NBR	FRM NBR	AREA1	AREA2	AREA3	AREA4	AREA5	RES D D D LIM SUN
D001	F011						012226500+4910099
D001	F005						012230500+4910099
D002	F006			067070411			121223011 640+4300000
D002	F021				078078411		026134011 620+4500099
D002	F030			075070411			023121011 610+4600099
D003	F006				078085411		092231011 580+4600099
D003	F016		072075431				038226011 570+4700099
D003	F029					070075432	099214011207540+4709099
D003	F037						011198530+4810099
D005	F005			085078121			049147011219490+4905000
D005	F023	067067112					098150017228470+4909599
D005	F036			085085111			079175014227450+4905000
D005	F046			072072111			044161010217430+4907000
D005	F058		063065112				086135010214410+5009799
D005	F066		063063111				046155010219400+5005099
D005	F076					075078211	047160011219380+5000599
D005	F088					075075411	069144011211360+5005099
D005	F098					078072411	069119011216350+5007099
D006	F005						092112011230560+4709000
D006	F015						011233550+4710000
D006	F025						011240540+4810000
D006	F032			078085433			055182011233530+4807500
D006	F042			075072433			096166011189410+5002000
D006	F052						011221400+5000000
D006	F062						011211380+5000000
D006	F072						011231370+4910000
D006	F082						011233350+4909000
D006	F092				072078433		044105011225340+4909000
D006	F099		063063432				046092011131330+4907500
D006	F109						011195200+4910000
D006	F119						011201200+4810000
D006	F129						011238200+4710000
D006	F132						017207280+4710000
D007	F005			078072212			059191019227550+4703000
D007	F015			082085112			057199019 540+4700000
D007	F025			094094111			071177020000520+4700000
D007	F035			072085311			057194020000510+4700000
D007	F045			085089121			053158019198490+4700500
D007	F055						020217400+4710099
D007	F065				078059412		067196019228460+4708099
D007	F075				085075111		096176018229450+4705000
D007	F085	078072121					078160017228440+4704000
D007	F095		082075432				129231018225420+4707000
D007	F105						019224410+4810099
D007	F115						019223390+4810099
D007	F125						019231380+4810099
D007	F135	067082433					124226018230560+4809099
D007	F145	065072433					067112011218350+4808099
D007	F155			082075433			053220011221330+4803099
D007	F165			094078433			048213010214320+4801000

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  D LIM   SUN
NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLDC

DC07F175          082075422                                 052147011229300+480709
DC07F185                    C82C82311                       055163010224290+480050
A009F006                                                          011000400- 49999
D009F008                    C75078111                       059119011220530+480909
D009F018                    C99090111                       029114011220520+490200
DC09F029                    C94090111                       063149010230500+490050
DC09F039                    C85085111                       091141010232490+490600
DC09F054                    C67072112                       082152010236470+500750
D009F060                                          065065411 092149019232460+500100
DC15FC05                              063055432             091151018234430+500850
D015F015          065055131                                 094134019231420+500900
DC15F025                    C85090111                       060156014226400+500100
DC15F035                    C85094111                       052149012222390+500300
DC15F045                    C78082111                       039160012225370+500300
DC15F047                    C82082111                       042130012223370+500600
DC18F004                              070072421             082212018000660+420000
DC18F014                    C72C67411                       042221018000660+430000
DC18F024                    C82C82421                       067179018000660+440000
DC18FC34                    C85C75431                       072209018000660+450000
DC18F044                    C72C75422                       082169018192220+460000
DC19FC05                    C62C61412                       181216013000720+380000
DC19F015                    C69072413                       120216011000720+390000
DC19F025                    C55062413                       049178009000710+410000
DC19F035                    C57052412                       072198019200700+420050
DC19FC45                    C63063412                       049156019000660+430000
DC19FC55067065412                                           129212019214540+490300
DC19FC65                                                          019216520+500600
DC19F075                                                          019229510+500900
DC19F082                                                          019222500+511000
DC21FC10          063067412                                 120160020230500+500750
D021FC24                    C78C67412                       123154020230400+510600
DC21F039                    C75075432                       118162020234400+520000
DC21FC51                    C82C85132                       130152020200420+530700
D021F062                    C82C82112                       131172019204400+510500
DC21FC75                              085094211             118182019170380+510020
DC21FC83                    C67075111                       110174018000370+510000
DC21FC95067072112                                           100168020218350+510100
DC21F105                    C72072111                       094158019000340+500000
DC21F115                              C65063112             122170020226320+500500
DC21F125                    C90078111                       084146019210310+500400
DC21F135                    C72072112                       095136019220290+500850
DC21F145                                                          020220280+491000
DC21F157          078078211                                 052130020223260+490200
DC21F169078067211                                           064100019225240+490400
DC21F179                                                          018232230+481000
DC21F192                                                          020233210+481000
DC22FC05                                                          017228570+481000
DC22F015                                                          013223560+491000
DC22FC21          067059412                                 076110012223550+490950
DC22F031075061411                                           066104011221530+500900
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PAS NBR	FRMAREA1 NBRWWWAAASTQ	RESAREA2 WWWAAASTQ	RESAREA3 WWWAAASTQ	RESAREA4 WWWAAASTQ	RESAREA5 RES D D D LIM SUN WWWAAASTQMINMAXB+FMAXLATELECLOC
DC22F044		C72065312			086136011230410+52070S
D022F054			C72070431		C72187011224400+520509
D022F064	070000222				082167011230380+520209
C022F074			070075411		056162011214370+520100
DC22FC84		C67C55432			C001340122263 20+520959
D022F094	072065132				038137012228310+510909
D022F104		082075131			029153012225290+510500
C022F114			070064332		055159012229280+510909
DC22F124					012227260+501009
D023F005		C90082211			042200012148480+560059
C023F015		C82078421			C40179011145470+510050
C023F025		C76C72421			C47194010000450+510000
D023F035		C85085111			053188011000440+510000
C023F045		C85085422			C55210010214420+510400
DC23FC55		C37082111			035202010215410+520300
C023FC65		C78069431			050210010215390+520200
CC23F075		C78082432			C70223012221380+520300
C023F085		C72072432			111164011222360+520900
DC23F095		C62050432			127219011221350+520809
CC24FC05090085413					050117011220710+400009
CC24F015					011210690+410909
DC24F025					011215680+421009
C024F035					011216660+431001
CC24FC38			078085411		C46090011220660+430509
C024F048					014222640+441000
CC24F058		C75072112			C70110020220630+450700
CC24FC68			072065111		C45112020190620+450300
CC24F078		104C94111			072122019229600+460400
DC24FC88	094099112				049124019230590+470800
CC24F098		C99104111			060099019229570+480400
CC24F108		C99C94111			062136019226560+480010
CC24F120		C85C72112			076136019232510+500200
DC24F130072085112					122166019236500+500900
C024F140	082072112				122152020218490+510400
CC24F150		C67C59412			102177020224470+510500
CC24F160065051412					072190020230460+510409
D024F170			C47000412		155195020227440+520109
D024F180				067061412180198020192430+52010	
AC25FC06					019000390- 7999
CC25F005		C94C94111			071132019222570+480100
C025F015		C85C90111			052128020228560+480100
CC25F025		C82C90111			C48148020000540+490000
CC25F035		C85078111			046184020000530+490000
CC25F045		C94C85111			052159020225510+490050
DC25F055		C82C82111			C52150020222500+500050
CC25FC65		C94C94111			C43152020220490+50003
CC25FC75		C85C90111			049155020223470+50005
CC25F085		C85C85111			069166020226460+510100
CC25FC95		C78C85111			060160020226440+51010
C025F105		C90C85111			085132020229430+51020

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLOC

D025F115			082075111			079142020233410+520150
D025F124			082078111			060132020228400+520200
D031F005		078075112				069130014231490+500850
D031F015						011224480+510950
D031F023			090090131			048106011224470+510750
D031F033				085090132		111161017240460+520700
D035F005			090078431			056210020000620+460000
D035F015			085090433			068210020220610+470000
D035F025			090090433			085229020176590+480100
D035F035						020212580+490800
D036F005						021224530+51100
D036F015						020229520+51100
D036F025						020229500+52100
D036F035						020227490+52100
D036F045						019227470+52100
D036F055						020232460+53100
D036F064	085094412					086152020226450+53090
D036F070						020226440+53100
D036F080						020230420+54100
D036F090						020228410+54100
D037F005						020210540+50100
D037F015						020228530+51100
D037F025						021226520+51100
D037F032		075082411				070125021224510+51000
D037F040	085082411					066128019225500+52085
D037F050			078075411			072168013216430+50030
D037F060			075085131			056130013222420+53040
D037F070			082078431			050104012222400+53040
D037F080			085090111			070142012219380+52020
D037F090			078082111			079140012220370+52030
D037F100			082085111			064133012204350+52010
D037F110			094085111			091127012180340+52010
D037F120			094085111			075144013220320+520[illegible]
D037F130						012221310+51095
D037F141			078072412			064100013216290+51090
D037F151					072078412	077136016222220+51090
D037F161			085090411			054148020222260+51025
D037F171			085085111			0[illegible]3163020224250+51010
D037F181						020224230+50090
D037F191						020222220+50095
D037F199						020226200+50090
D038F010			082094111			080136020229580+49035
D038F020			104118111			049172020000570+49035
D038F030			095090111			052185020000550+50000
D038F040			090082111			040227018160540+51005
D038F050			094099411			049223013228490+52000
D038F060						087166011224470+52000
D038F063					090094411	045197011229470+52035
D038F073					063059412	089169011223450+52040
D038F083			094104411			029222011226440+52055

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PAS NBR FRM NBR	AREA1 RES WWWAAASTQ	AREA2 RES WWWAAASTQ	AREA3 RES WWWAAASTQ	AREA4 RES WWWAAASTQ	AREA5 RES WWWAAASTC	D D D LIN SUN MINMAXB+FMAXLATELECLOC
D038F093						011220420+521009
D038F114		075078412				095187011225390+520909
D038F124		072072431				0772060[illegible]
D038F134		111085431				067223011225360+530900
D038F144			078085411			055217011227350+530300
D038F154				065078411		106223011227340+530700
D038F164			078082411			064177011231320+530800
D038F174					078075411	099163012231310+530900
D039F184						011226290+531009
D038F194						0112252[illegible]
AC40F006						011000390- 99999
D040F006				061055112		080134015224530+430950
D040F016			094104111			060115018217520+480050
D040F026			094111111			044142017000500+490000
D040F040			085090111			050140019000490+490000
D049F010	061063411					088110018210220+520609
D049F025	055055412					090140019228161+280209
D049F033					000052412	114132019231191+270909
D049F039						019220191+260909
D052F006			061055411			049124018230530+510500
D052F016			078072111			048133018224520+520200
D052F026				067063111		068164018227510+520509
D052F036			072072111			0401040[illegible]
D052F046				065065111		0441180132[illegible]
D052F056			047055421			045110013220460+54095[illegible]
D052F066			085085111			044080012220450+54085[illegible]
D052F076				067072111		0491300122[illegible]
D052F086						012[illegible]
D052F095						012[illegible]
D053F006						017223580+49100[illegible]
D053F012			082085411			048123018191580+50010[illegible]
D053F022			072078411			039220018000560+50000[illegible]
D053F032			094094111			0461140[illegible]
D053F042		085085111				044104016172530+52050[illegible]
D053F052						012229520+52100
D053F062						011227510+53100
D053F079						011217440+55100
D053F089						011222420+55100
D053F099						011222410+551[illegible]
D053F113				067063422		105147011221380+5509[illegible]
D053F123			065065431			048142011220370+5506[illegible]
D053F133			072075112			079137011212350+55090[illegible]
D053F145						011228340+54100
D053F155						011226320+54100
D053F165						011223310+54100
D053F176			072078412			062126011227290+54090
D053F188			075075411			046128011218270+54085
D053F198			067070111			045090011219260+54085
D053F205			075067111			044110011220250+54085
D054F005	067072412					106139015000450+54000

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  D LIN  SUN

ABR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXD+FMAXLATELECLDC

DC54F015          078085421                                   048230019000440+540000
DC54F025                    067072431                         074169017225420+540100
DC54F035          072063411                                   069161013187410+540020
DC54F046                                             085090411087152013000390+540000
DC54F056                    065061431                         077205012220380+540200
DC54F066067067411                                             122220011220370+540800
DC54F076          063067421                                   091162011225350+550600
DC54F086                    072082411                         072157011222340+550600
DC54F096070067411                                             033144012226320+550400
DC54F106                    078072411                         084161018227310+550500
DC54F116          072075421                                   061159019232290+550250
DC54F126                    070078411                         109150019235280+550850
DC55F005                    090092112                         092146018229600+480005
DC55F015                    075072412                         101132018290590+490000
DC55F025                    099087111                         040120018220580+490050
DC55F035                    104104111                         041120018000560+500000
DC55F045                    104082111                         045101018220550+510050
DC55F055                    118111111                         069123018220540+510500
DC55F065                    118115111                         072123018202520+520500
DC55F075                    104094111                         076156018220510+520010
DC55F085                    078069112                         056140011000490+530000
DC55F095                    082075412                         045140011000480+530000
DC55F105                    085082111                         089190011000470+540000
DC55F115                    078065211                         091212011000450+540000
AC56F006                                                           011000390-109999
DC56F005                                             072075111078120018220610+470000
DC56F015                                                           018222500+481000
DC56F021          078085411                                   077124018218550+490850
DC56F031                    104099111                         040145018210580+500050
DC56F041                    072078411                         042128018219560+500050
DC56F051                    085090111                         051140018214540+520050
DC56F061                    085090111                         051140013214540+520050
D    F                                                                   +-0
DC01AC05                                                           018000510+489999
DC01AC15                                                           018000500+499999
DC02AC05                                                           019    050+439999
DC02AC15                                                           019    640+449999
DC02AC25                                                           019000620+449999
DC03AC05                              075069411               056226012   590+460000
DC03AC15                    067072421                         036218012   580+470000
DC03AC25                                                           013126560+470100
DC03AC35                                                           015216540+481009
DC05AC05                    061055422                         078150017231500+490500
DC05AC15                    065059422                         099177018236490+490950
DC05AC25                    061055422                         078140019234470+490900
DC05AC35                                                           019236400+491000
DC05AC39                    072067412                         [illegible]
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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN[illegible]

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXD+FMAXLATELECEDG

D005A079				067060212112164020236390+500059
D005A089				020224370+500309
D005A096				020226360+50[illegible]
D006A005				020232570+460909
D006A015				020230560+471009
D006A025				020234550+471009
D006A035				020239530+480959
D006A042	067063422			095162020204420+500600
D006A052				021222410+501009
D006A062				020218390+50[illegible]
D006A072				021222380+491009
D006A082				021226360+490959
D006A092				020236350+490959
D006A095			072063132	090145020228340+490909
D006A108				020234290+491009
D006A118				020236280+491009
D006A128				020238260+480999
D007A006		047052112		079134022114550+470200
D007A016		090085111		058141022212540+470010
D007A026		075082211		082[illegible]020 520+47 [illegible]
D007A036		067067411		07017[illegible]020 510+47 [illegible]
D007A046		082085111		07217[illegible]020 490+47 [illegible]
D007A056		063061412		138166022220[illegible]
D007A068		063063412		103180022225460+470600
D007A079	059061412			111172022233440+470409
D007A089	085085111			108167022232430+470209
D007A100	063061412			13023202223341[illegible]
D007A110				022235400[illegible]
D007A120				022232380+48100[illegible]
D007A130				022236370+48100[illegible]
D007A141	055062413			10323201822[illegible]350+49090[illegible]
D007A150	067067432			094234018230340+420859
D007A160		072067431		098235022229320[illegible]
D007A170		070075431		100229022235310+48010[illegible]
D007A180	057059431			105144021235290+48080[illegible]
D007A190	072070111			102159022 260+48 [illegible]
A009A006				021 300- 6999
D009A006		067075112		130171019232540+47090[illegible]
D009A016		078072111		088152019231530+48075[illegible]
D009A026		094094111		056154019216510+48010[illegible]
D009A036		094090111		062166020233500+49010[illegible]
D009A046	078072111			082134018232490+49040[illegible]
D009A056072067112				114170019238470+50095[illegible]
D015A005		065070222		128162022237440+50080[illegible]
D015A015				022235430+50100[illegible]
D015A017	067060112			124192023236420+50090[illegible]
D015A027	078075112			092179022238410+50050[illegible]
D015A037		070075111		108198022238390+50015[illegible]
D015A047		075072221		094198021226380+50015
D018A005		090094413		076210022 680+42000

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES C D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLOC

D018A015		094104413			084222022000670+43000
D018A025		094090413			088194020000650+44000
D018A035		094094413			070176020000640+45000
D018A045		094094413			096222020216520+45010
D018A048		090094413			064108022164620+46010
D019A005					014 740+38999
D019A015					159218012000730+39999
D019A019067063422					126214012000720+40999
D019A029061055422					091202011000710+40999
D019A039		067070412			072201021217690+41010
D019A055			063069411		087231020186540+49000
D019A065					020230530+50080
D019A075					019230520+50090
D019A082					020230510+51100
D021A005					022232510+50100
D021A008		061069312			119188020234510+50080
D021A018				000065212	122178022220500+51070
D021A028				067062412	131171021231400+51070
D021A038	072077111				110180020230440+52070
D021A048		068065112			156229020234420+52095
D021A058067071112					139182020204410+51010
D021A068	078075212				110135022198390+51050
D021A078075067312					070170020171380+51005
D021A088		082079212			080171021000360+51000
D021A098067075212					076184022215350+50020
D021A108	085082212				092180021000330+50000
D021A118			078078212		142180020214320+50050
D021A128		067060312			128168020222300+5050
D021A138072077322					078142020222290+49070
D021A148					022228270+49070
D021A158					024204[illegible]+49010
D021A162078075211					062196025215[illegible]+49010
D021A172065072211					068142024222230+49015
D021A182					020234220+48100
D021A189					019234210+48100
D022A015					020232170+48100
D022A025	075075112				120150021234550+49090
D022A033	078082112				120158021228540+50090
D022A043070063423					108172014228420+52080
D022A053		072082111			076184013222410+52010
D022A063		067061433			096210014230390+52040
D022A073		078072112			044186013230380+52040
D022A083		078082413			102158012226340+52090
D022A093		063067433			058142012226320+52098
D022A103		082085433			0[illegible]2123012230300+51085
D022A113		085072433			051121012221290+51080
D022A117			061054434		065148013226280+51095
D022A126					020234270+50100
D023A006		085094111			077170019174480+51000
D023A016		072075411			099180020000470+51000

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXD+FMAXLATELECLOC

DC23AC26		C90C94111		12218602C000450+51000C
DC23A036			078072411	130152020000440+51000C
DC23A046			057070111	077170019230420+51010C
DC23A056	078078111			074162019229410+52010C
DC23AC66		C67C72431		126231010234400+52030C
DC23A078		C67C72431		120220020230380+52040C
DC23AC88			C63061431	13620101623230+52080
DC23A100			061061431	165230011230350+52090
DC24AC05067072433				070156012219710+40050
DC24A015		C78085411		060206011220700+41020
DC24A025				012220690+42100
DC24A035				013220670+43100
DC24AC45				013210660+44050
DC24A047				063055413006C9601222165O+44065
DC24AC57				01222364O+44095
DC24A060		C85078113		086137019230640+45090C
DC24A070	072072111			053104019220620+45020
DC24A080		C85C72111		053120022230610+46015
DC24AC90	078072111			053124020226590+470
DC24A100		C82078111		050146020230580+48020
DC24A110		C85C82111		050158020226570+49020
DC24A120				019230520+50075
DC24A122		C75078112		09218002022052O+50020
DC24A132		C67C61112		126164018228510+51090
DC24A142		C67C72112		066160021230400+51040C
DC24A152		C61C52412		128192022222400+51030C
DC24A162				022230460+51060
DC24A172	059061411			112200020226450+52010
DC24A178				022000440+52
AC25A006				020 350- 7999
DC25A006		C45C41212		120154020234570+47050
DC25AC16		C74C70111		089160020234500+48005
DC25A026		C78078111		06418002O[illegible]
DC25A036		C85C94111		053190020 550+48
DC25AC46		C90C90111		049164018 520+49
DC25A056		C85C95111		055189020220500+49000C
DC25AC66		C94C99111		047179020224490+50
DC25A076		C90C85111		057179020 470+50
DC25A086		C85C85111		061171019232460+50005
DC25A096		C94C90111		063150019228440+51010
DC25A106		C75C85111		079170019231430+51040
DC25A116		C75C75112		103162019233410+52050
DC25A121		C78078411		072140019229410+52020
DC31A010	059059412			134174018233500+50098
DC31AC20070072112				123202019234430+51095
DC31A034	065063412			128157018232480+51097
DC35A005		C63C72411		069187019000620+46
DC35AC15		C72C72431		086215017000610+47
DC35A025		C63C59421		072157017000600+48
DC35A034				017210590+49050

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  D LIM   SUN
NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLDO

D036A005                                  063055422          130170018230530+500909
D036A015                                                           018228520+511009
D036A025                                                           018226510+511009
D036A029                         067057422                   118151018232500+510909
D036A039                                                           018229490+521009
D036A049                                                           018233470+521009
D036A056                                  065060422          114130018232460+520909
D036A066               078080122                             094162018227450+530709
D036A076                                                           018220430+530709
D036A086                                                           018230420+540959
D037A005                                                           019230550+491009
D037A015                                                           018230540+501009
D037A020085072412                                            072158018229530+500959
D037A030                                                           019222520+511009
D037A035               078082412                             083160019224510+510959
D037A040               075078122                             080107019222510+520909
D037A050                         065065421                   142150019208490+530030
D037A060                         099104112                   080130019210470+530200
D037A070                         094104131                   050170012224450+530200
D037A080076085132                                            080110019228430+520959
D037A090                                           078067112124150013224410+520959
D037A100                         090082112                   070150012209390+520100
D037A110                         094094111                   072145012160370+520030
D037A120                         090094111                   050104012190360+520100
D037A130                                                           011224340+520909
D037A140                                                           011221320+520959
D037A145                                           078067421076180011212310+520909
D037A155                                                           014226290+521009
D037A165                         094099111                   046145019229270+510300
D037A175                         085082111                   046159018222250+510100
D037A185                                                           019224240+520909
D037A195                                                           019233220+511009
D037A198                                                           019232210+510809
D038A005                                                           019223590+481009
D038A014               078067412                             084152018232500+490800
D038A024                         075085111                   055154018000570+500000
D038A034                         094082111                   053152019000550+500000
D038A044                         085078111                   045229020205530+510100
D038A054                         094099411                   063110017220490+520100
D038A064                         067063412                   067195019227400+520500
D038A074                         059061432                   103210019229460+520150
D038A084063070412                                            085106018230440+520350
D038A094                                                           018230430+520900
D038A104                                                           018238410+521000
D038A114                                                           018234400+52100
D038A119               070063432                             150180019253390+52090
D038A129               065063432                             123215017234370+53080
D038A139               063063432                             069230012230360+53075
D038A149                                  067061412          060201012231340+53080
D038A159059063412                                            055224011227330+53080
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 PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  D LIM  SUN
 NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLDC

D038A169085075412                                    055201012230310+530000
D038A179063063432                                    037210011228300+530050
D038A189072085422                                    074129011230280+530959
D038A192                                                   011230270+531009
A040A006                                                   012   370-109999
D040A005                           082085111         086162018208600+470909
D040A015                                                   018232590+481009
D040A018                  065072112                  118162018228590+480600
D040A028                  104088111                  066179016196590+490930
D040A038                  072085111                  056164016000560+500000
D049A005                                                   017178230+520019
D049A013                                                   017230210+510109
D049A023                                                   019220141+290209
D049A032         063061411                           072121015219161+200209
D049A037                                                   018220171+270909
D052A005                  094094121                  053118020232540+510100
D052A015         085082121                           062125018228530+520155
D052A025         089080111                           061153019228510+520[illegible]
D052A035                  092092111                  059120019228500+530[illegible]
D052A045                                                   019230480+53[illegible]
D052A050                           085080112         102184020228480+54[illegible]
D052A060         085077312                           090138020232460+540009
D052A070                  094090111                  094151020235440+550600
D052A080                           078072212         116154019226430+550900
D052A090                                                   019225410+561009
D053A006                                                   019229590+481009
D053A016                  063063411                  070101018198580+490580
D053A026                  063061411                  047123018000560+500000
D053A036                  072078111                  048101018000550+500000
D053A046         072078111                           065130018140580+510609
D053A056                                                   018222520+521009
D053A068                                                   018222500+531009
D053A078                                                   016230450+551009
D053A088                                                   018230430+551009
D053A093                                                   018226410+551009
D053A108                                                   018227400+551009
D053A122                                    055052421120190018230380+550859
D053A136                                                   018228350+550900
D053A146                                                   018230340+541009
D053A160                                                   019226310+541009
D053A170                                                   019228300+541009
D053A180                  067075112                  130185020222280+540901
D053A191                  070070422                  088170019231270+540952
D053A204                  063061422                  110160018226240+540959
D054A005                  067071112                  100200018224460+540020
D054A015                  060060112                  096190018196450+540100
D054A025                  078070431                  070224018000430+540000
D054A035         072078411                           082200020000420+540000
D054A045                           067060411         124196018219400+540050
D054A055                  065057412                  106186018000390+540000
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PAS NBR	FRMAREA1 NBRWWWAAAST	RESAREA2 QWWWAAAST	RESAREA3 QWWWAAAST	RESAREA4 QWWWAAAST	RESAREA5 QWWWAAAST	RES D D D LIM SUN QMINMAXB+FMAXLATELECLOOL
DC54A065					057062412	112222010228370+549990
DC54A075	067071421					098218012222350+550400
D054A085				078072423		088222012224340+550900
DC54A095			067055423			079210010222320+550300
DC54A105			072063413			054172010220310+550200
DC54A115			072082413			048170011220290+550300
DC54A125			075094423			044202012206280+550150
DC54A132			067063421			059140011220270+550450
DC55A005						012207610+471009
DC55A013			078067412			088150012210600+480959
DC55A023						025220590+480959
DC55A025			078078112			094148019228580+490500
DC55A035			090090111			064154018000570+490000
DC55A045			094099111			058164012204550+500030
DC55A055			085078112			076108020212540+510200
DC55A065		085094111				078132020220520+510500
DC55A075			082078411			062180020198510+520000
DC55A085			082075411			[illegible]82140200222[illegible]0+530150
DC55A095			085078411			100204018000480+530000
DC55A105			072072411			100202018000470+540000
DC55A115			082078411			090210020000450+550000
AC56A006						019 370-219999
DC56A006			078078111			077124019234620+470206
DC56A016						019228610+481009
DC56A026		057052111				[illegible]70120019230590+490[illegible]
DC56A036			094065111			050140019000500+490000
DC56A046			075072111			058160019220560+500010
C056A060			078075111			080172019232540+510206

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXB+FMAXLATELECLOC

DC56F				+-0
D065F009				082078111094199022229210+560309
D065F016				022227190+550305
D068F005		C78079411		060156019228520+530400
D068F015		C90094411		062130018222510+540300
D068F025		C67075412		059153018222490+540250
D068F035		C94094111		064145018220480+550250
D068F045		C90094211		070131018230460+550400
D068F055		C72085411		048150019229450+560350
D068F065		C78078111		056182018228430+560250
D068F075		C94094111		047148018229420+570350
D068F085				011222400+570905
D068F092		C85099112		033173009190390+570359
DC68F102		104094111		062160017220380+580859
DC69F006		C94094111		059100022219520+500300
D069F016		C67078411		038099022212570+510050
DC69F026		C75078211		042110022213550+520100
D069F044		C70070411		035151019229430+570200
DC69FC54		C67072411		072100015 420+570000
D069FC64		C63075411		055106011 400+570000
DC69F074		C72072112		043000011176390+580950
DC69FC84				011185370+581000
CC69F091		C78085411		074122011206360+580951
DC69F104				011214340+581009
DC70FC05	078085411			089124019230560+510959
DC70FC15	063078111			090131010231550+520974
DC70F025			C82085112	057209011228530+520554
DC70F035		C99090111		047167010221520+520+00
DC70FC45	099085111			048122010220510+530500
DC70F055		C85085111		029131010217490+530100
DC70F065		C99111111		039107011208410+530300
DC70F075		C85090111		044178019000480+530000
DC70F085		C78075111		057160017238450
DC70F095		C90085211		052131016229430+540200
D070F105		C72078412		092160010225420+550800
DC70F115				007108400+550201
DC70F125				007108390+56003
DC70F135		C85090411		058110007178370+560200
DC70F145				008207360+56100
DC70F147				0780724131114167007207360+560951
DC70F157		C94094413		046192008212340+57050
DC70F167		C72073413		031189008212330+570151
DC70F177		C75078413		021193008185310+57010
DC70F187		C94111413		037216008220300+58000
DC71FC05		C94099111		039128020219600+48050
DC71F015		C82090111		039120020180590+49005
DC71FC25		104090111		043124019030580+50000
DC71FC35		104090111		049144019192560+51010
DC71FC45		C78078112		060150019230550+52050
DC71F055		C94085111		061104019226530+53060

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PAS	FRMAREA1	RESAREA2	RESAREA3	RESAREA4	RESAREA5	RES_D	D	D	LIM	SUN
NBR	NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQ					HINMAXB+FMAXLATELECLDC				
D071F068			104104111			032130019231500+550250				
D071F078			C67078422			052130013000480+550000				
D071F088			C85075411			090177012000470+560000				
DC71FC93			C67065412			051170011000460+560009				
AC72F007						011000391-119999				
DC72F005			C78078111			035128014224550+510200				
DC72F015			C94085111			065162023229540+520300				
DC72FC25			C82078111			072166023222530+530100				
DC72FC35		111104111				074118022220510+540209				
DC72F045			C99104112			082172022229500+540500				
D072F055			118118111			054130022228490+550400				
DC72FC61						022231480+560009				
DC73F006			C85072111			064223022232540+520150				
DC73F016			C85078112			056170020228530+530200				
DC73FC26			C90C78111			054132014224520+540250				
D073F036				082085212		066140014226500+540900				
DC78F005			C85087211			035150014219340+580100				
DC78F015			C90C94111			051173020224330+550080				
DC78F025			C85085111			076164021229310+580400				
DC81F006						024225340+550050				
DC81F013						018223330+580050				
DC84F005			C82C85412			052104014226550+530650				
DC84F015						014224540+540950				
DC84FC25094104412						C25065010192520+550950				
DC84FC35085090412						046C85010206510+550950				
DC84F045						010214500+561000				
DC84F055070085412						048132013215460+570950				
DC84F065						012222430+590000				
DC84FC75						012226410+590000				
DC84F085						010201300+590000				
DC84FC95						010202300+590000				
DC84F105						010205360+590000				
DC84F115						010211340+590000				
DC84F119						010204340+600000				
DC85FC05						009224610+491000				
DC85FC11		085C82412				092146010232600+530900				
DC85FC21		094094112				044112019220590+510400				
DC85F031						019230570+521000				
DC85FC41			C78090112			106150019230560+530950				
DC85F048		067063412				064122017226550+530600				
DC85FC58			C78C85411			039140011223470+570100				
DC85FC68			C85078411			040158011194450+570030				
DC85FC78			C90C99411			063170011000430+580000				
DC85FC88099104111						043143010000420+580000				
DC85FC98			104094411			031125008160+580020				
DC85F108			C85C82412			058119000166390+560200				
DC85F118						008206370+580850				
DC85F121			C85090131			041101008206370+590400				
DC85F131				094094121		077161018233350+590850				
DC85F141		104090121				043191021230340+590100				

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PAS NBR	FRMAREA1 NBR	RESAREA2 WWWAAASTQ	RESAREA3 WWWAAASTQ	RESAREA4 WWWAAASTQ	RESAREA5 RES D D D LIM SUN WWWAAASTQMINMAXB+FMAXLATELECLDC
DC85F151094094412					C63110015226320+590009
DC85F161					010210300[illegible]
DC85F171					010206290+601009
DC85F180					010201270+601009
DC86F005	085090411				035119012222500+550400
DC86F015		C90085411			043158014228490+560400
DC86FC25		104118111			059172014000470+560000
DC86F035		C78C78411			051166014000460+570000
DC86F045		C75082411			C4016001422[illegible]
DC86FC55		104104111			042152014224430+580400
DC86F065					010211410+581009
DC86F068		C78C75431			051122010212410+580400
DC86F078					010205390+590209
DC86F088			C78072411		C44112010000350+590009
DC86F098	C85094433				046198010210360+6000[illegible]
DC86F102090078433					C48202010208360+600809
DC87F005					008199650+451009
DC87F007			094085411		039091007131650+450909
DC87FC14	067078412				C52129011216[illegible]+4[illegible]
DC87FC24					011219630+47100[illegible]
DC87F034					011222610+48100[illegible]
DC87FC40		C94094411			0961630192260[illegible]
DC87F050		118125111			04414[illegible]019142390+490020
DC87F060		C94C99111			[illegible]0171735[illegible]0+500150
DC87F070		C85078311			056[illegible]017159[illegible]0+500020
DC87F080		C99C99111			039127017156550+5100[illegible]
DC87FC90		104118111			039179016000530+52[illegible]
DC87F100		C90104111			C49132017000520+5300[illegible]
DC87F110		C90C94111			C5417[illegible]015000519+54000
DC87F120		C82C94112			C341[illegible]+54000
DC87F130		104C99111			0561[illegible]01[illegible]91[illegible]+55005
DC87F140		C82094112			C55170[illegible]
DC87F150		C67C70412			C42122[illegible]201[illegible]+57030
DC87F1600		C76C82412			041130010208[illegible]+58045
DC87F170		C82C78412			056155010[illegible]+58055
DC87F173		C78C78411			C44130010208[illegible]+59045
AC88FC07					000000[illegible]-13999
DC96F005					010193131+36050
DC96FC10	072078411				C24106010212141+35040
DC96FC20					010210171+33040
DC96FC22067072411					025087010194171+33025
DC96FC29	075067411				C37127011219191+31025
DC99F005		C94C87112			C49090013219530+55050
DC99FC15		C67C60412			C62090011210520+56050
DC99FC25					010186500+57100
DC99FC35				061069412	C52080010187490+57095
DC99FC45					010180470+58100
DC99F055					010183460+59100
DC99F060		C90075312			051081010212450+59095
DC99F070		C94C87112			C84209019225430+60080

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PAS NBR	FRMAREA1 NBR...			RES D D D LIM SUN ... B+FMAXLATELECLOC
D099F080		C99090111		08616601621542C+6004[illegible]
D099F087				013217410+610089
D100F005		118090111		060168014220420+600409
D100F015		118104211		024094010192410+610059
D100F025		118094111		021056010168390+610101
D100F035		094094211		047150010220370+610309
D100F045				015177360+620109
D100F055				015214300+621009
D100F065				010197290+620409
D100F075				013228270+611009
D100F085				013220250+610609
D100F088				0940992110291360132[illegible]250+610409
D100F098				0121[illegible]20[illegible]+610209
D100F108				0121[illegible]210+610109
D101F006				0122[illegible]+511009
D101F022		C78094111		079132020225570+530800
D101F032			094099111	043141020228550+540050
D101F042		067072421		024106014218540+550200
D101F052		072072421		043195010220[illegible]
D101F062		067067421		[illegible]
D101F072		075085111		[illegible]+610[illegible]
D101F082		078078431		[illegible]20122[illegible]+610[illegible]
D101F092		085094111		055194014218370+610309
D101F102		072078431		041166013221350+610500
D101F112		075078431		044134012222340+610401
D101F122		075075431		031146012222320+620201
D101F132		067072431		033217012224310+620102
D101F137		082090121		041132012222300+620509
D102F005	082085412			067140017207600+500609
D102F015		072080312		052140017202500+520050
D102F025		085072312		043147016000570+530000
D102F035		085090111		045196017200500+540020
D102F050		099104111		03715701[illegible]7300[illegible]
D102F060		085085211		030140010217400+580150
D102F070	085099111			034167011218470+590109
D102F085		067075432		049219010220410+610501
D102F095		037085111		039227010222[illegible]+610101
D102F105		085094431		045176000200[illegible]+620509
D102F114		078082431		043204000197170+620401
A103F007				00800000[illegible]-14999
D103F005				00920[illegible]00+500609
D103F011		078090112		056151011212000+510730
D103F021			075082112	061142016209580+520400
D103F031		082094111		047129016225570+530200
D103F041				0152[illegible]550+541000
D103F051				0101[illegible]540+550950
D103F055		082090112		028076010210540+550700
D103F065				012223510+551000
D103F070		067072412		077122012210510+560800
D103F080		099082411		050112011200500+570100

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUM

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXD+FMAXLATELECLOC

D103F092					[illegible]
D103F096		C70070412			096[illegible]940112124[illegible]0+590609
D103F106		C67070411			C60161009191440+600401
D103F116				067065411	029[illegible]
D103F126			C72070411		[illegible]
D103F136		C78082411			[illegible]
D104F005		C89104111			[illegible]
D104F015		C82082112			[illegible]
D104F025		C99104111			04215[illegible]
D104F035		C99089111			043172021202520+550050
D104F045		C94095211			[illegible]
D104F055		C94098111			[illegible]
D104F065			082078112		[illegible]
D104F075	070070412				[illegible]
D104F085		C82072111			[illegible]
D110F005		C94085411			[illegible]27174012216[illegible]+610[illegible]
D110F015		C72085412			[illegible]
D110F025		C7[illegible]85412			[illegible]
D110F035				070[illegible]312[illegible]	[illegible]
D110F045		[illegible]7809[illegible]311			[illegible]
D110F050		[illegible]72065411			[illegible]
D112F005	082067411				[illegible]
D112F015			07[illegible]5411		[illegible]1217[illegible]0142[illegible]191+330205
D115F005		[illegible]5411			[illegible]
D115F015		C8[illegible]784[illegible]1			[illegible]
D115F025		C75085111			[illegible]
D115F035				072078422	[illegible]
D115F045		C72075422			09[illegible]110019224470+59050[illegible]
D115F055	067062412				[illegible]
D115F065					[illegible]
D115F075				099094111	[illegible]
D115F085		C99[illegible]94411			[illegible]
D116F006					01522[illegible]+52100[illegible]
D116F016		082075421			[illegible]
D116F026		C7[illegible]784[illegible]1			[illegible]
D116F036		C72[illegible]85421			[illegible]
D116F046	075078211				[illegible]+56070
D116F056		C94094111			[illegible]+57010
D116F066		C72078411			[illegible]+5[illegible]040
D116F086		C70072421			[illegible]+61060
D116F096		C67[illegible]67421			[illegible]+61070
D116F107		C67072112			[illegible]+61090
D116F117		C82085111			[illegible]+62060
D116F127		C82087111			[illegible]+6[illegible]000
D116F137		C67075111			[illegible]010
D116F147		C72[illegible]78111			[illegible]+6[illegible]025
D116F157		C78078111			[illegible]+62010
D116F167					[illegible]+62100
D116F177					[illegible]+63100
D116F187					[illegible]+63100

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAX[illegible]

PAS NBR / FRM NBR	FRMAREA1	RESAREA2	RESAREA3	RESAREA4	RESAREA5	RES D D D LIM SUN
D116F197						0131202[illegible]+0[illegible]100[illegible]
D117F006			072078431			043172012220[illegible]+030050
D117F016			067070432			0381020101944[illegible]+600305
D117F026		082085111				0213[illegible]0101[illegible]430+610400
D117F036		075078411				[illegible]10+610207
D117F046			07[illegible]078411			[illegible]+010[illegible]
D117F056			07[illegible]078431			[illegible]+620[illegible]
D117F066	055052411					[illegible]570+020[illegible]
D117F076						[illegible]350+621000
D117F086			055-59432			005171010210350+630995
D117F096			067078432			[illegible]207220+630959
D117F106		059059431				[illegible]
D117F115				076082431		[illegible]
D117F127			07508241[illegible]			039[illegible]70+[illegible]
D118F005		078072411				[illegible]
D118F015						[illegible]+431[illegible]
D118F021			085090411			0021[illegible]40[illegible]+4[illegible]
D118F031			078085411			[illegible]
D118F041			085085411			[illegible]
D118F051						[illegible]
D118F061						[illegible]
D118F071						[illegible]
D118F081						0102145[illegible]0+49100[illegible]
D118F091						[illegible]
D118F101						[illegible]
D118F111						[illegible]
D118F114			087085112			002[illegible]200[illegible]40+52[illegible]
D118F124						00019255[illegible]+53[illegible]
D118F126					090085111	[illegible]+53000
D118F136			094[illegible]111			[illegible]
D118F146		111104111				[illegible]
D118F156			09[illegible]099[illegible]1			[illegible]
D118F166			111099111			0621000120004[illegible]0+570000
D118F176			09[illegible]094112			[illegible]+57000
D118F186		099099311				[illegible]+51000
D118F196			09[illegible]104111			[illegible]+59000
D118F206			104111111			[illegible]+60000
D118F216			094085422			[illegible]+[illegible]1015
D118F226			099099411			03121[illegible]+[illegible]
D118F236			076[illegible]5432			0511220[illegible]+[illegible]060
D118F246			085092431			04014201022[illegible]+[illegible]4030
D119F007						[illegible]-[illegible]099
D119F008						[illegible]+40100
D119F018						0111[illegible]020+49100
D119F028						[illegible]+[illegible]100
D119F038			090094111			[illegible]22[illegible]+51095
D119F048			085090111			[illegible]+52060
D119F058			104118111			0451710[illegible]21[illegible]+53030
D119F068			113125111			[illegible]+54005
D119F078			104125111			0451500210[illegible]530+55000

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SU

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQ[illegible]AXD+F[illegible]AXLATELECLOC

D119F088		145157111		[illegible]
D119F098		180157111		0501[illegible]500+070000
D119F108		118104111		0671460[illegible]2490+580200
D119F118		094104111		[illegible]470+[illegible]
D119F128		094104111		0421[illegible]460+600001
D F				+-0
D065A010		085090112		[illegible]
D068A005	094094421			[illegible]
D068A015		082069122		[illegible]
D068A025		078069322		076140021234500+540250
D068A035		094104111		[illegible]
D068A045		099104111		[illegible]
D068A055		078082122		[illegible]
D068A065			085085412	[illegible]
D068A075		090099411		[illegible]
D068A085	094094221			0701840202[illegible]410+570500
D068A095075078412				[illegible]
D068A099085085312				[illegible]
D069A005		067[illegible]412		[illegible]
D069A015		078[illegible]411		[illegible]
D069A024		[illegible]94111		[illegible]
D069A034		085085111		[illegible]
D069A044		0[illegible]049412		[illegible]01222144 0+570200
D069A054		[illegible]		[illegible]
D069A064		[illegible]67411		[illegible]
D069A074		072078411		[illegible]
D069A084				[illegible]
D069A085085078112				072110[illegible]+489500
D069A095	082072412			[illegible]
D069A103				[illegible]
D070A006				[illegible]
D070A016067078111				[illegible]
D070A027063067111				[illegible]540+510950
D070A037		075078112		[illegible]
D070A047		[illegible]082112		[illegible]
D070A057		[illegible]		[illegible]
D070A067		[illegible]		[illegible]
D070A077		[illegible]72111		[illegible]
D070A087		072[illegible]		[illegible]05
D070A097		094[illegible]		[illegible]+00005
D070A107		07[illegible]085431		[illegible]4010
D070A117		067[illegible]75411		[illegible]410+540090
D070A127				[illegible]0+00001
D070A137		067[illegible]07411		[illegible]55
D070A147		[illegible]083412		[illegible]025
D070A157		085090411		[illegible]398
D070A167		078078411		[illegible]125
D070A177		072075411		[illegible]010
D070A187		085085421		[illegible]
D071A005		071082211		0451[illegible]220010+480070

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PAS	FRMAREA1	RESAREA2	RESAREA3	RESAREA4	RESAREA5	RES	D	D	L	LIN	SUN
NBR	NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQXINMAXC+FMAXLATELECLDC										
DC71A015			C72C72112								0471473[illegible]
DC71AC25			C67070112								041176022 590+500000
DC71A035			C85087111								049164022 570+510000
DC71A045			C94085111								0831[illegible]
LC71AC55			C9409411.								0801[illegible]
DC71AC67			104.11111								0641[illegible]
DC71A077			C85085212								0491[illegible]
DC71AC87			C82085412								0471[illegible]
DC71AC91			C63061412								0551[illegible]
AC72AC06											069 381-13999
DC72A005			C94085411								0401[illegible]
LC72AC15			C9409411								041[illegible]
DC72AC25			104111111								0411[illegible]
LC72AC35			104111111								0[illegible]
DC72A045			134134111								0[illegible]
LC72AC55			104094111								03[illegible]
LC72AC61			C94104111								0[illegible]
DC73AC05			C85082111								[illegible]
DC73AC15			104.04111								[illegible]
LC73AC25			C9409011.								[illegible]
LC73AC35			C94104111								[illegible]
LC73AC39		104118111									[illegible]
DC78AC05			C82094111								0491360142123[illegible]
DC78AC15			11012511.								[illegible]
LC78AC25			C94111111								[illegible]
DC78AC31			C94104111								0401[illegible]
DC81AC05											0172[illegible]
DC81AC13											0112[illegible]
LC84AC05			C59059422								052[illegible]
DC84AC15			C63067242								[illegible]
.C84AC25							C6306724121[illegible]				
DC84AC35		063065412									[illegible]
LC84AC45		059067412									1001420112225[illegible]
DC84AC53067072412											0801[illegible]
DC84AC63090078111											0821[illegible]
DC84AC73											[illegible]
DC84AC83											[illegible]
DC84AC93											[illegible]
LC84A103											[illegible]
LC84A113											[illegible]
DC84A116											[illegible]
LC85AC05											[illegible]
DC85AC15											[illegible]
DC85AC18		078085221									0[illegible]
DC85AC28			C85[illegible]112								0591[illegible]
DC85AC38											[illegible]
DC854046			C72C65122								0[illegible]
LC85AC57			C94111121								0441[illegible]
DC85AC67			C65072411								0801[illegible]
DC85AC77		072094421									0491[illegible]

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMIN MAXB+FMAXLATELECLOC

DC85A087		085082421				058[illegible]010 430+50 [illegible]
DC85A097		072078411				030144000 410+50 [illegible]
DC85A107				082094111		040140000150400+50001C
DC85A117			072078312			0031[illegible]
DC85A127				085064311		[illegible]
DC85A137			082075122			07[illegible]
DC85A147			087087432			044[illegible]
DC85A157				078094322		065138[illegible]+590[illegible]
DC85A167						[illegible]
DC85A177						008194280+60100
DC86A005						[illegible]+55[illegible]
DC86A007	055057412					[illegible]
DC86A017			085070421			070[illegible]
DC86A027			085094411			[illegible]
DC86A037			072063411			[illegible]
DC86A047			094104121			0421[illegible]+57[illegible]
DC86A057		094099121				[illegible]430+[illegible]
DC86A067	075078432					[illegible]
DC86A077		072072122				[illegible]
DC86A087						[illegible]
DC86A091				075067411		[illegible]
DC86A098			075085431			[illegible]
DC87A005						011216650+45100
DC87A012				072072112		[illegible]
DC87A022						[illegible]
DC87A032						[illegible]
DC87A045				075082112		0911[illegible]+49040
DC87A055			085067111			050152018 550+49000
DC87A065			085090111			0701[illegible]975[illegible]+50005
DC87A075			[illegible]			[illegible]+51000
DC87A085			[illegible]			[illegible]+52000
DC87A095			[illegible]			[illegible]
DC87A105			104099111			058138015 520+53000
DC87A115			[illegible]			[illegible] 520+[illegible]
DC87A125			094099111			[illegible]+55[illegible]2
DC87A135			[illegible]			[illegible]
DC87A145			[illegible]			[illegible]
DC87A155			[illegible]			[illegible]
DC87A165			[illegible]			[illegible]
DC87A169				067072411		064142[illegible]+59[illegible]
DC88A007						[illegible]
DC96A005						[illegible]
DC96A015		075072412				032[illegible]
DC96A025						[illegible]+50025
DC96A027	075085412					[illegible]
DC99A005				067078412		[illegible]
DC99A015			070067411			[illegible]
DC99A025					059057412	078138[illegible]
DC99A035						[illegible]+57[illegible]
DC99A040					085075412	112140[illegible]+50090

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUN

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQMINMAXD+FMAXLATELECLOC

D099A050 [illegible]70+5[illegible]09
D099A060 009192450+591009
D099A064 125111411 056100009221450+590959
D099A074 094094411 [illegible]
D099A084 078085411 05017[illegible]
D100A006 087094111 [illegible]
D100A016 078085111 [illegible]
D100A026 094094211 [illegible]
D100A036078082111 043141011 [illegible]
D100A044 085088111 0521460112[illegible]570+820[illegible]
D100A056 [illegible]
D100A067057061411 [illegible]
D100A077 [illegible]
D100A087 [illegible]
D100A092065065112 [illegible]
D100A107 010165220+[illegible]
D101A009 059063412 062072[illegible]
D101A016 [illegible]
D101A027 072072111 [illegible]
D101A036 068059411 [illegible]
D101A049 [illegible]741[illegible] [illegible]
D101A056 059059411 [illegible]
D101A066 065061411 [illegible]
D101A076 [illegible]72111 [illegible]
D101A086 078078431 [illegible]
D101A096 072065421 [illegible]
D101A106 075070421 [illegible]
D101A116 070070421 0621510122[illegible]
D101A126 078072431 [illegible]
D101A133 072067421 [illegible]
D102A005 [illegible]
D102A009082085111 [illegible]
D102A019 070068111 062150322211[illegible]+590048
D102A029 0[illegible] 94111 [illegible]
D102A039 094104111 [illegible]
D102A049 104111111 [illegible]
D102A059 078090411 [illegible]
D102A069 075082421 [illegible]
D102A082 078075421 [illegible]
D102A092 094094413 [illegible]
D102A102 094085111 [illegible]
D102A112 78067433 [illegible]
A103A007 [illegible]-15099
D103A005 10411111[illegible]
D103A015 0[illegible]104111 [illegible]
D103A025 099104411 [illegible]
D103A035 094111411 [illegible]
D103A045 [illegible]
D103A047 059059412 [illegible]
D103A057 011220030+54100

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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  C LIN   SC

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQ
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PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D D D LIM SUM

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQ[illegible]AXLATLLECLDG

0116A121	085072112			10417[illegible]0370+62[illegible]009
0116A131		085085311		0501520142[illegible]+62[illegible]01.
0116A141		099094111		0611400141[illegible]340+600201.
0116A151		09910411[illegible]		0661510122[illegible]+620[illegible]
0116A161		111099211		040155[illegible]+6[illegible]
0116A171				[illegible]+631[illegible]
0116A181				[illegible]+641[illegible]9
0116A191				[illegible]22[illegible]+641[illegible]
0116A195				[illegible]22[illegible]041009
0117A005		072067412		06616401220460+500400
0117A015		067059412		[illegible]01400119[illegible]400+600[illegible]0
0117A025	072078422			[illegible]
0117A035		07206541[illegible]		[illegible]
0117A045	069075411			[illegible]
0117A055		067072433		[illegible]
0117A065	000067212			0821100[illegible]
0117A075				[illegible]+620[illegible]
0117A085				[illegible]
0117A090		072082422		[illegible]
0117A100 070072433				[illegible]
0117A110	072078432			[illegible]
0117A120			072078432	[illegible]
0118A005				0091927[illegible]0+41[illegible]09
0118A007			072078411	[illegible]
0118A017				[illegible]
0118A025		072078411		[illegible]
0118A035		078082411		[illegible]
0118A045		067072411		0571400172[illegible]
0118A055			078072412	0581770112[illegible]+500000
0118A065				048094010214[illegible]
0118A075				[illegible]
0118A083		061059412		[illegible]
0118A093				[illegible]
0118A103				00920557O+501009
0118A113				[illegible]+51[illegible]
0118A123				[illegible]
0118A128				[illegible]
0118A138		07207311[illegible]		059065412[illegible]204[illegible]
0118A148		07[illegible]72411		[illegible]51[illegible]000
0118A158		059[illegible]3412		041[illegible]09214[illegible]
0118A168		0[illegible]7521[illegible]		[illegible]460+560000
0118A178		[illegible]2085411		072171[illegible]460+570000
0118A188		072[illegible]7412		074177[illegible]+4[illegible]000
0118A198		099[illegible]411		[illegible]440+[illegible]000
0118A208		[illegible]70[illegible]72411		041157[illegible]420+590000
0118A218		070078412		[illegible]
0118A228		072067412		[illegible]+610200
0118A238		111104411		0382000002040[illegible]0+320300
A119A007				[illegible]0+62[illegible]
0119A005				[illegible]071-17[illegible]
				094085411046096012216050+470705

[redacted]

SECRET

SECRET [redacted]

```
PAS FRMAREA1 RESAREA2 RESAREA3 RESAREA4 RESAREA5 RES D  D  [illegible]  [illegible]

NBR NBRWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQWWWAAASTQ[illegible]

C119AC15                                                        [illegible]
C119AC25                                                        [illegible]
C119A028                                        0670634120570990111[illegible]620+100989
C119A038                        094094111                       [illegible]
C119A048                        085090111                       [illegible]
C119A058                        094104111                       [illegible]
C119AC68                                        094090112[illegible]
C119A078                        104094111                       [illegible]
C119AC88                        090099111                       [illegible]
C119A098                        104111111                       06714[illegible]0510+[illegible]
C119A108                        094094111                       [illegible]
C119A118085082411                                               [illegible]
C119A128                        072078112                       [illegible]
C119A138085078412                                               [illegible]
C120A005                                 082082212              [illegible]
C120AC15                        090099111                       0731[illegible]2223[illegible]
C120AC25                                 067079112              [illegible]
C120A035                        [illegible]                     [illegible]
C120A045                        [illegible]                     [illegible]
C120A055                        [illegible]                     [illegible]
C120AC65                        [illegible]                     [illegible]
C120AC75               078094112                                [illegible]

END-OF-DATA ENCOUNTERED ON SYSTEM INPUT FILE.
```

SECRET

The following series of graphs shows the frequency distribution of minimum and maximum terrain diffuse densities and maximum cloud density values recorded in the original negative panoramic photography during Missions 1006-1 and 1006-2. Graphical plots, Figures 9 to 26 on pages [illegible] to [illegible], show the density frequency distributions as a function of primary, intermediate and full processing for the forward and aft looking panoramic cameras for these missions. Basic data was measured and tabulated by AFSPPL.

The processing of the panoramic camera film is controlled through the infra-red densitometric measurements of the minimum, terrain diffuse density values. These values are maintained within the density range of 0.40 to 0.90 in order to keep the scene densities on the straight line portion of the characteristic curve.

Analysis of the AFSPPL density measurements for the four film spools shows that the minimum density values from the AFT camera film of Mission 1006-1 went outside of the 0.40 to 0.90 density range more frequently than measured in the other three spools of film. The percentage of values that were outside of the minimum density control range are:

MISSION	FWD CAMERA	AFT CAMERA
1006-1	27.6	42.5
1006-2	27.4	23.0

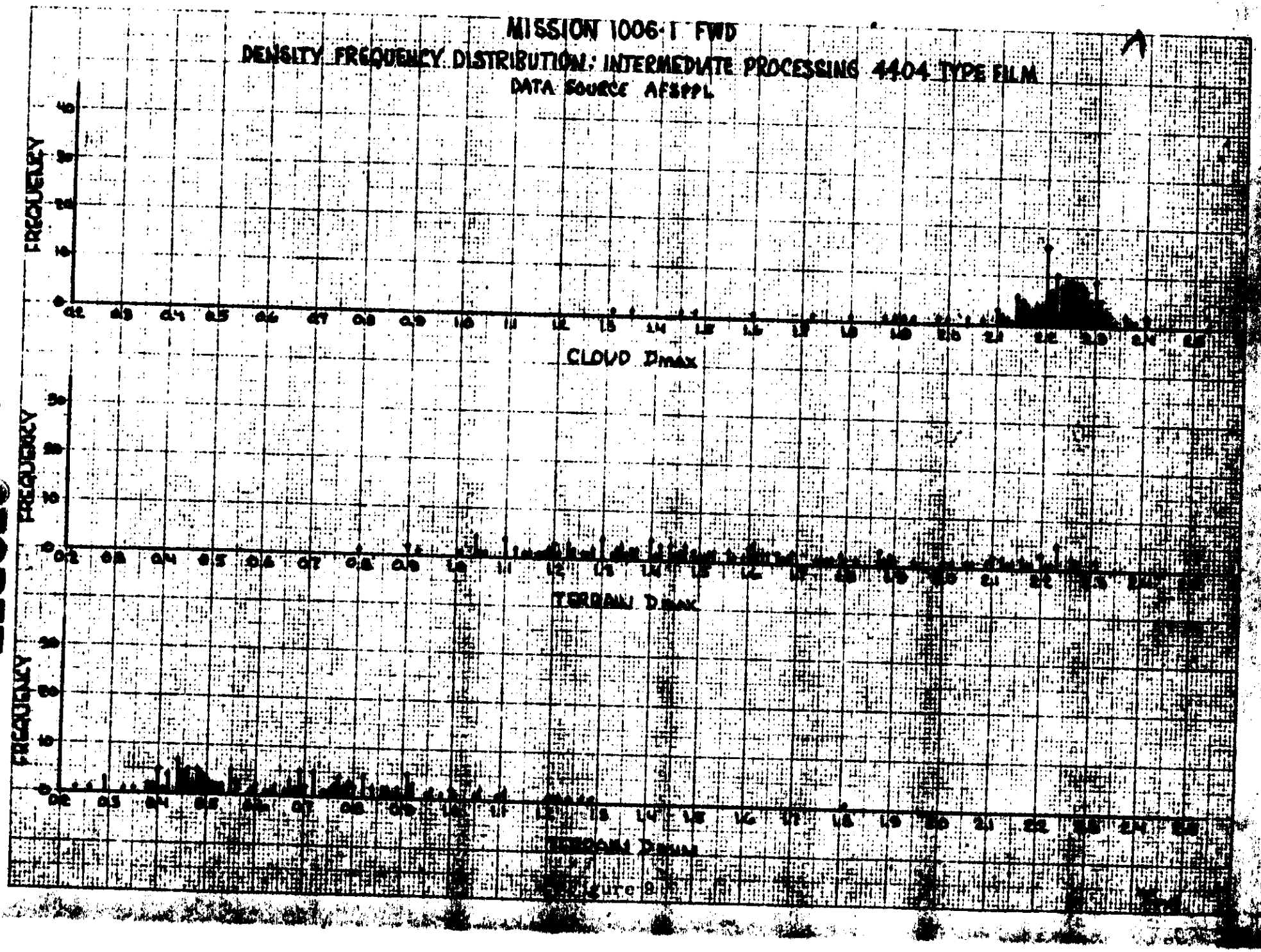
The excessive deviation from the control range of the 1006-1 AFT camera film is strong evidence of overprocessing and the subsequent loss of information content of the film.

Film processing is varied to produce a minimum density (D min.) in the panoramic terrain scene ranging between 0.4 and 0.9 through use of the primary, intermediate and full processing levels employed by [redacted].

Minimum density values that cannot be brought within the 0.4 - 0.9 density range by either primary, intermediate or full processing are, by definition, either under- or over-exposed. These ranges are shown on the nominal [redacted] processing curves in Figure 27, page [illegible]. Values that exceed the 0.4 - 0.9 density range because of the process employed but could have been placed within range by using a different level process are classified in Table 6, page [illegible], as either under or over processed, depending on whether the D min. value is less than 0.4 or more than 0.9.

[redacted]

[redacted]


MISSION 1006-1 FWD
DENSITY FREQUENCY DISTRIBUTION: INTERMEDIATE PROCESSING 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
TERRAIN Dmax
FREQUENCY
TERRAIN Dmax

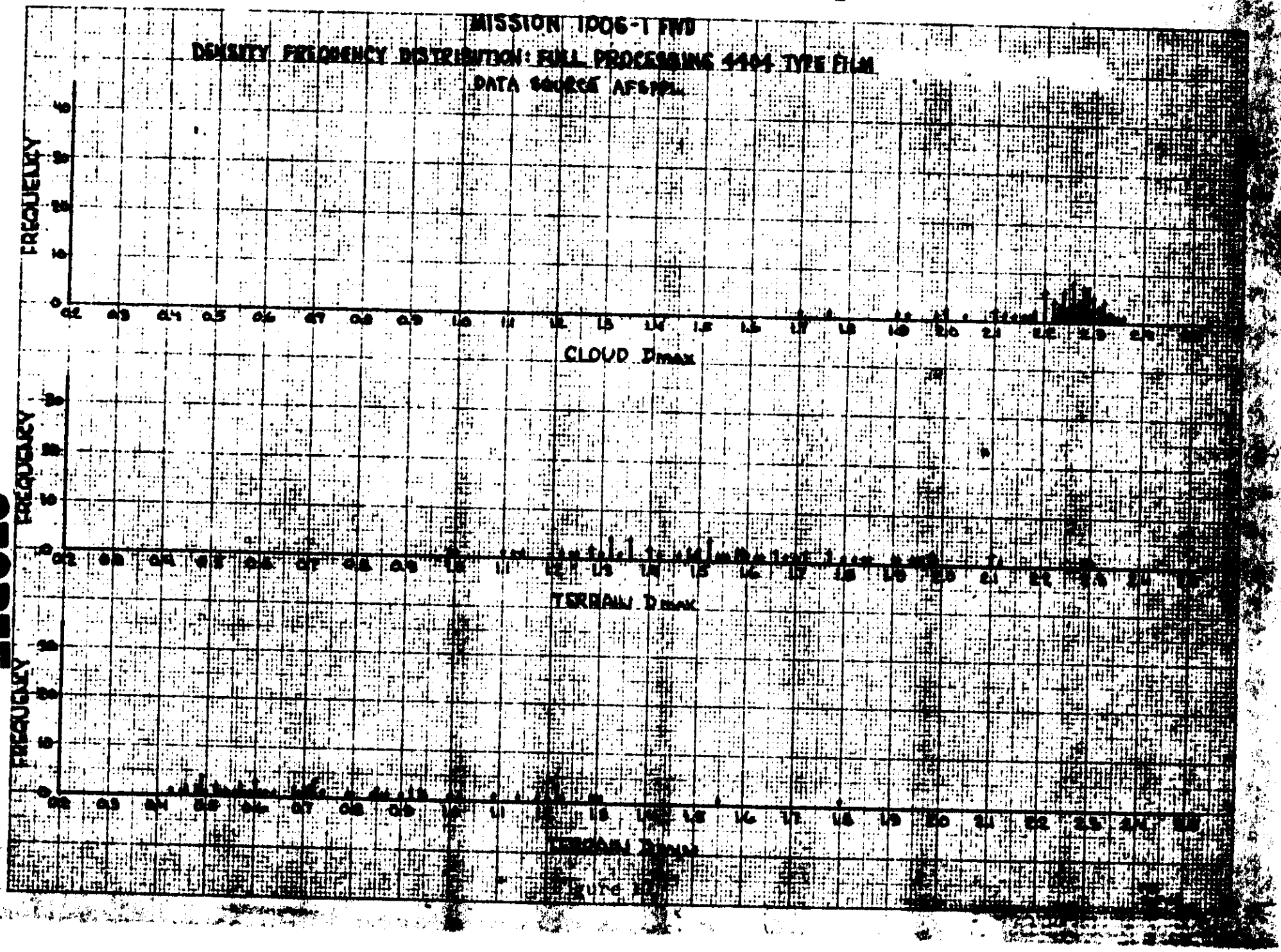


Figure 21

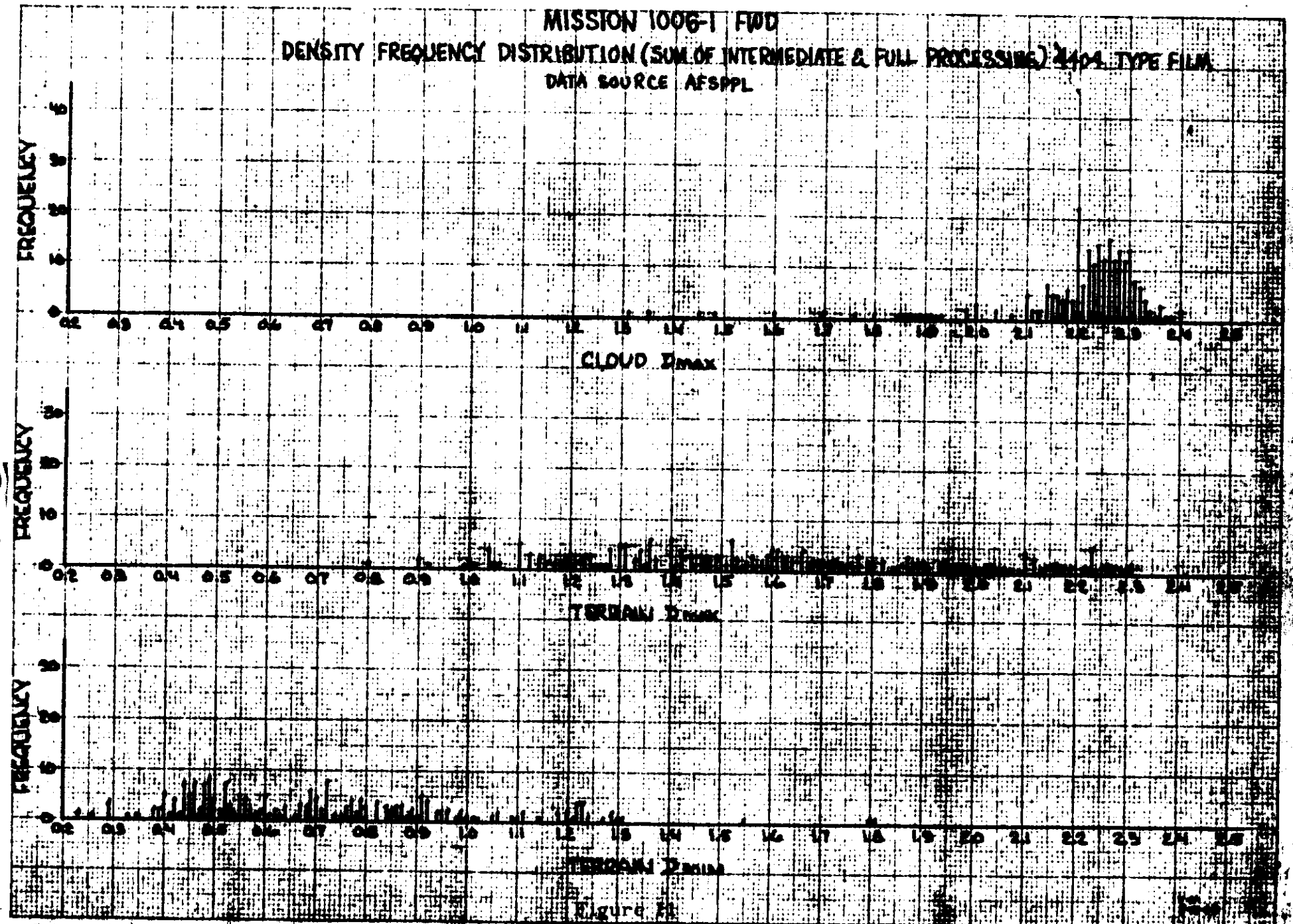

MISSION 1006-1 FWD
DENSITY FREQUENCY DISTRIBUTION (SUM OF INTERMEDIATE & FULL PROCESSING) 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
TERRAIN Dmax
TERRAIN Dmin

Figure 31

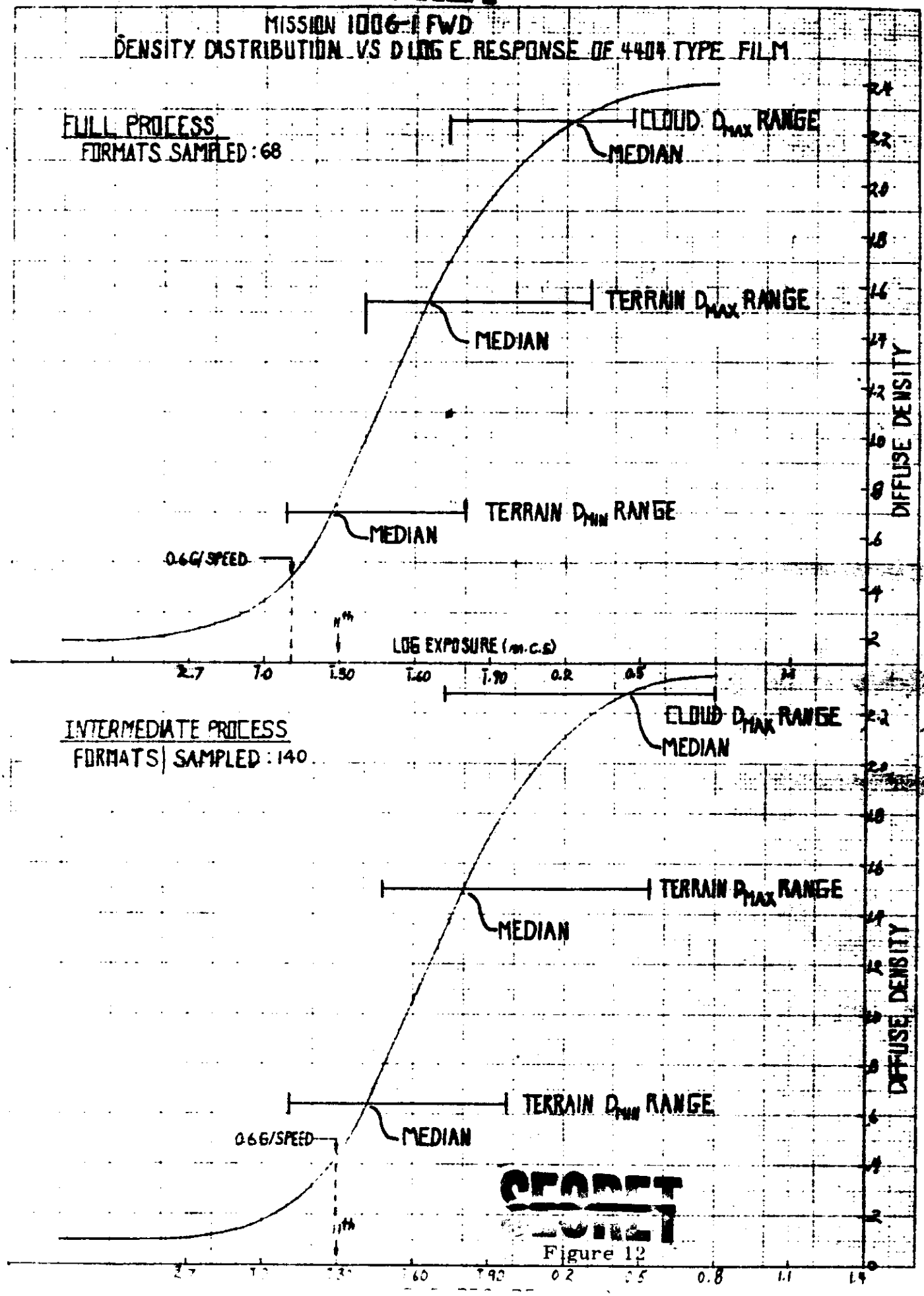


Figure 12

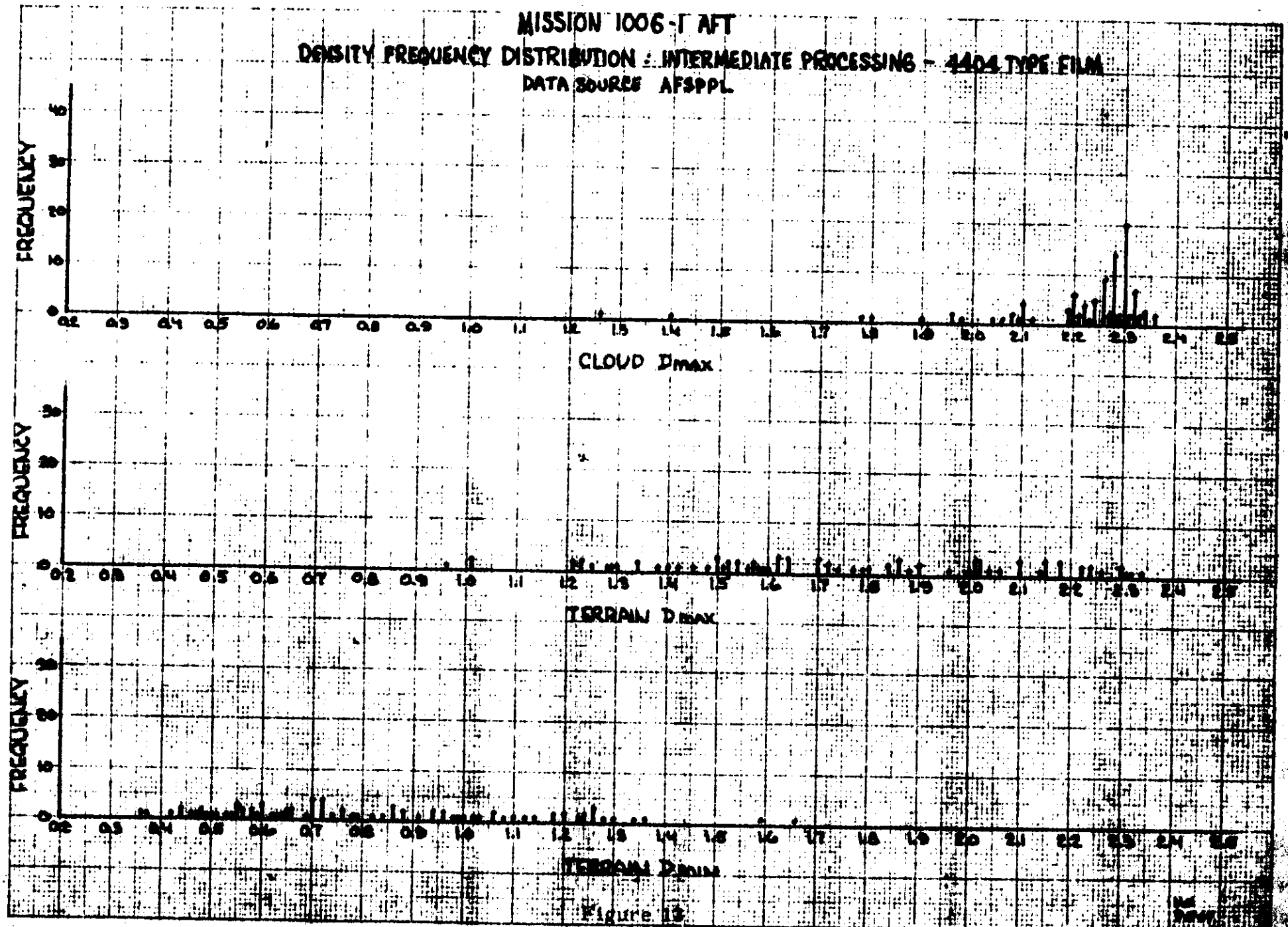

MISSION 1006-I AFT
DENSITY FREQUENCY DISTRIBUTION : INTERMEDIATE PROCESSING - 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
FREQUENCY
TERRAIN Dmax
FREQUENCY
TERRAIN Dmin

Figure 13

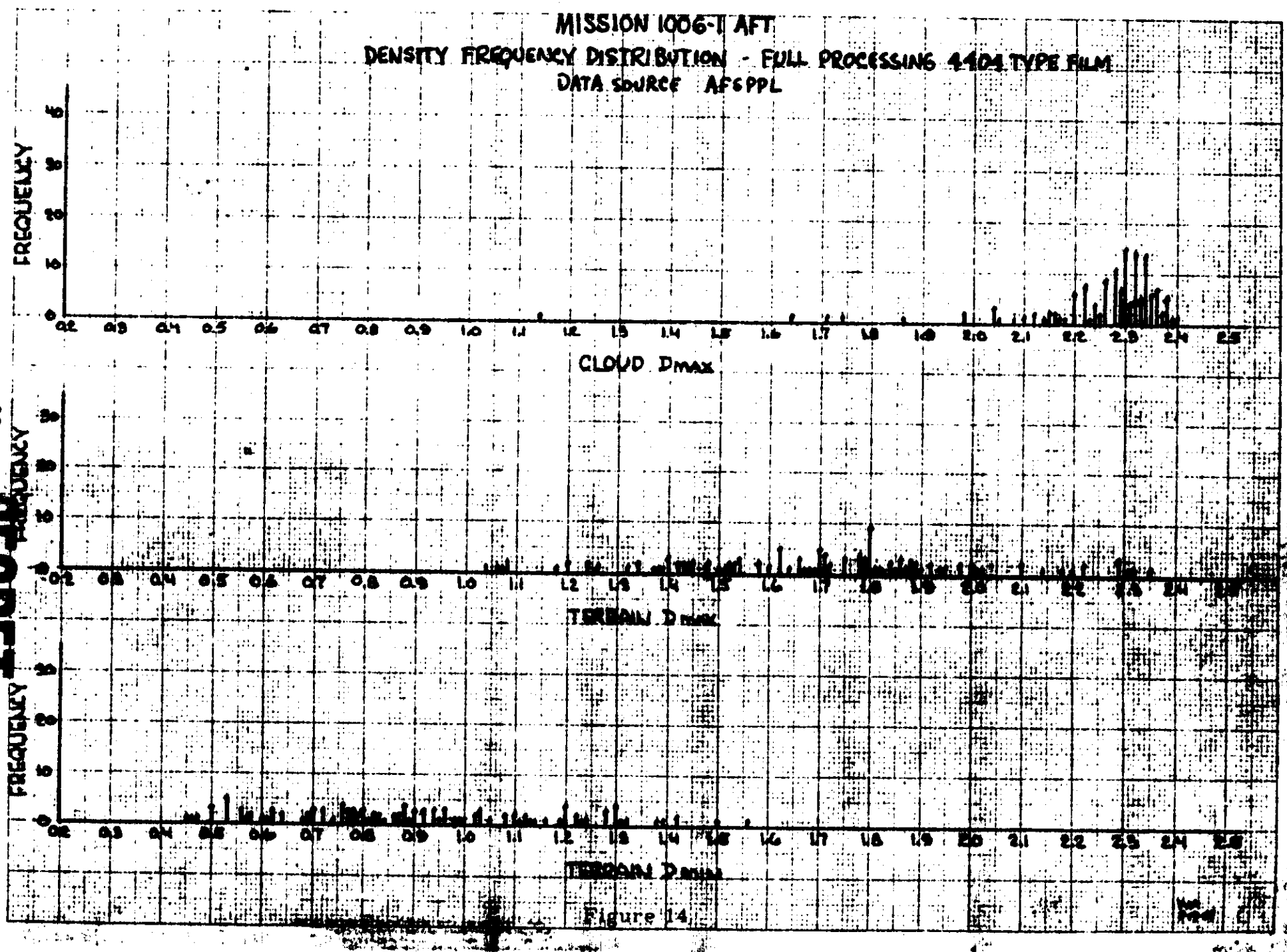

MISSION 1006-I AFT
DENSITY FREQUENCY DISTRIBUTION - FULL PROCESSING 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
TERRAIN Dmax
FREQUENCY
TERRAIN Dmin

Figure 14

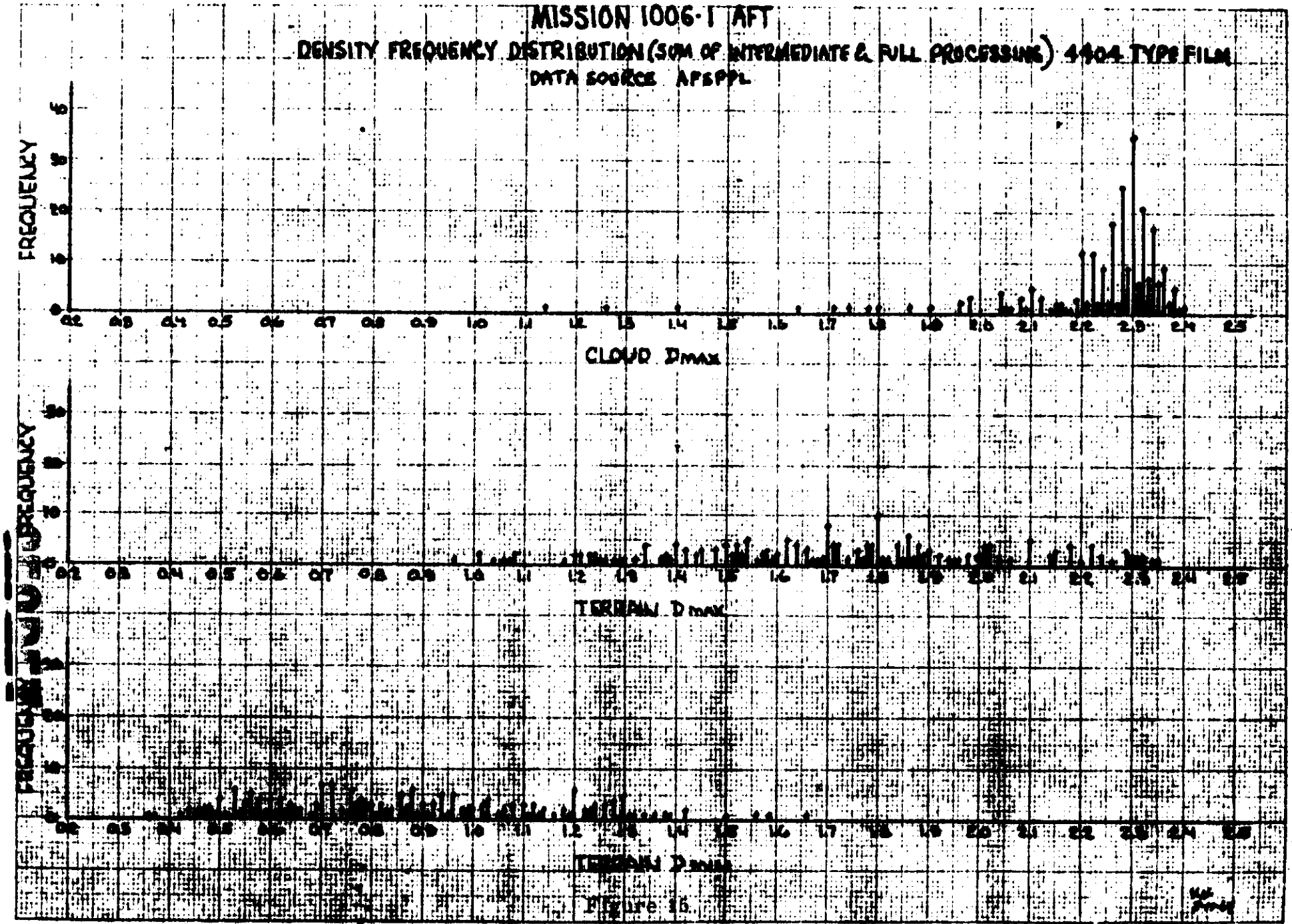


Figure 16.

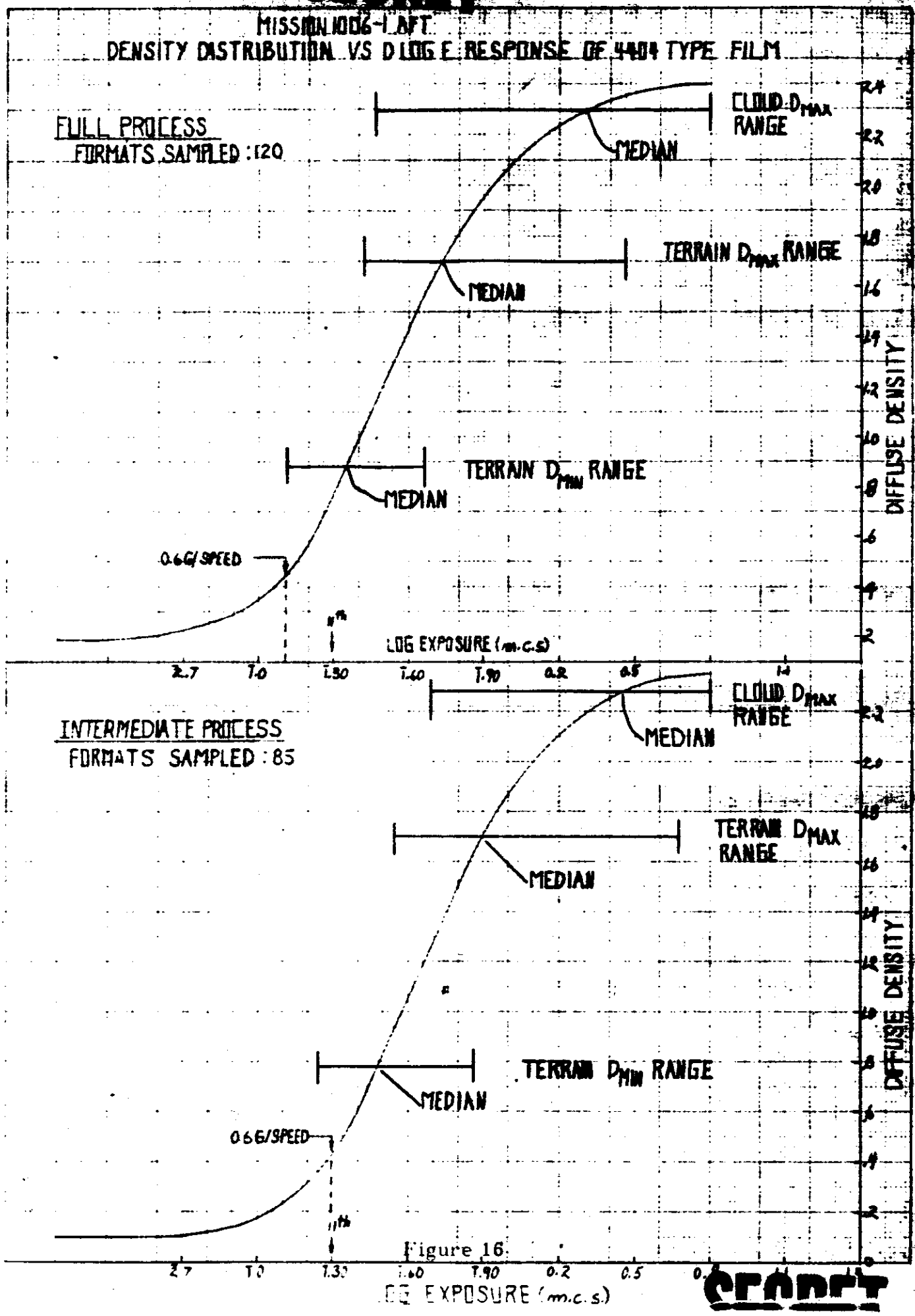

MISSION 1006-1 AFT
DENSITY DISTRIBUTION VS D LOG E RESPONSE OF 4404 TYPE FILM
FULL PROCESS
FORMATS SAMPLED : 120
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
MEDIAN
0.6G/SPEED
LOG EXPOSURE (m.c.s)
2.7
1.0
1.30
1.60
1.90
0.2
0.5
1.4
DIFFUSE DENSITY
INTERMEDIATE PROCESS
FORMATS SAMPLED : 85
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
MEDIAN
0.6G/SPEED
LOG EXPOSURE (m.c.s)
2.7
1.0
1.30
1.60
1.90
0.2
0.5
DIFFUSE DENSITY

Figure 16

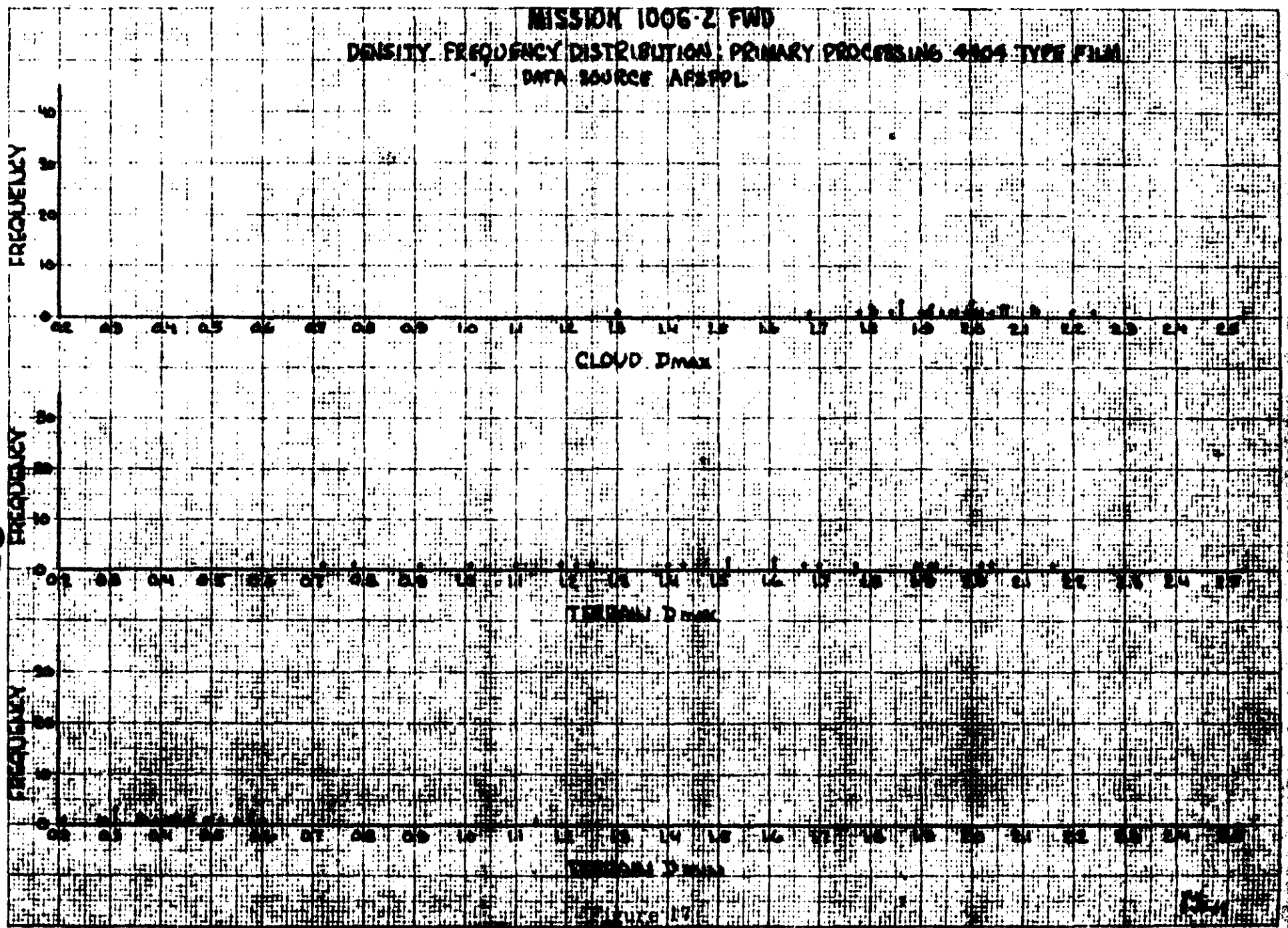

MISSION 1006-2 FWD
DENSITY FREQUENCY DISTRIBUTION: PRIMARY PROCESSING 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
FREQUENCY
FREQUENCY

Figure 17

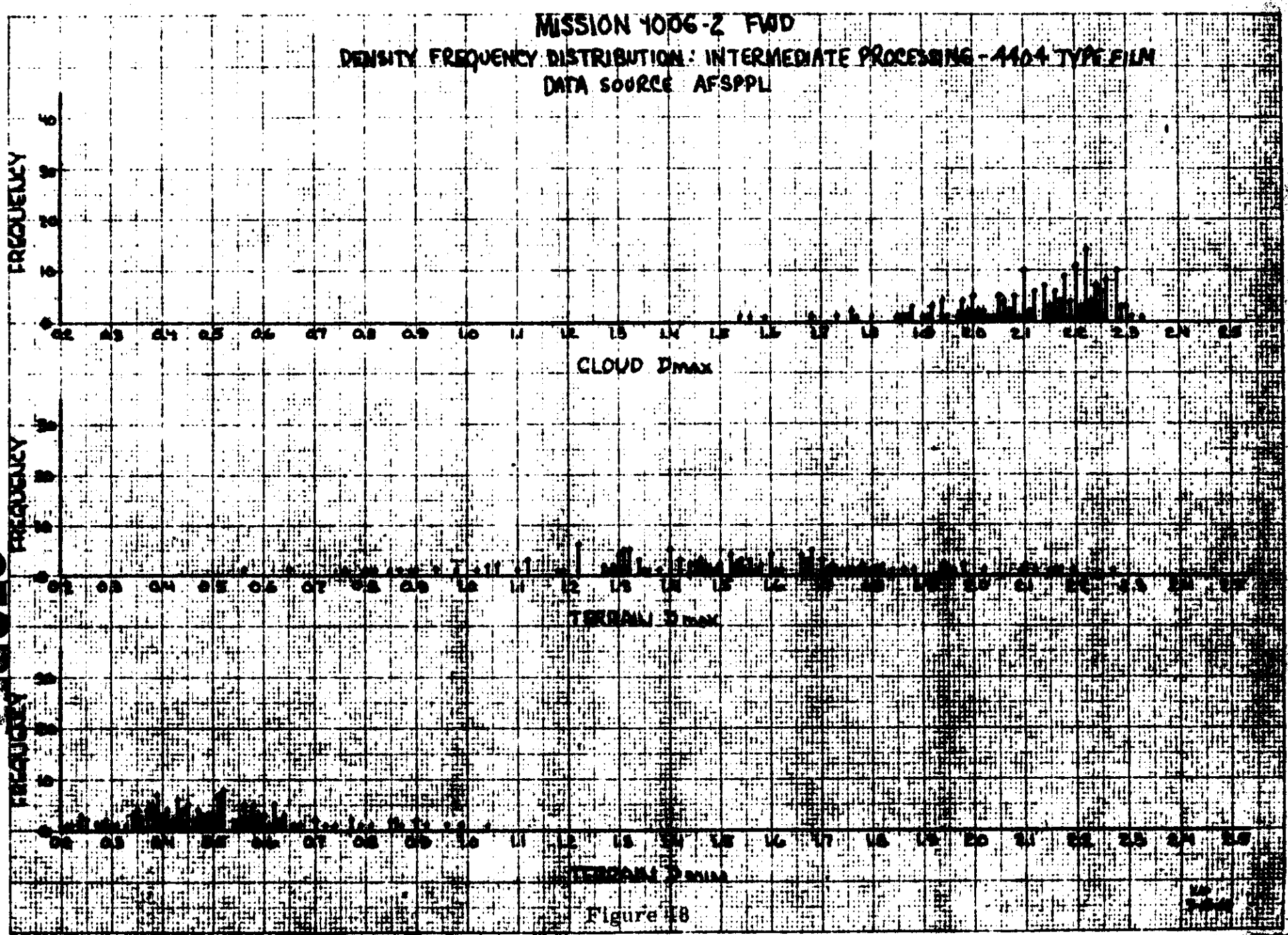

MISSION 1006-2 FWD
DENSITY FREQUENCY DISTRIBUTION: INTERMEDIATE PROCESSING - 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
FREQUENCY
TERRAIN Dmax
FREQUENCY
TERRAIN Dmax

Figure 48

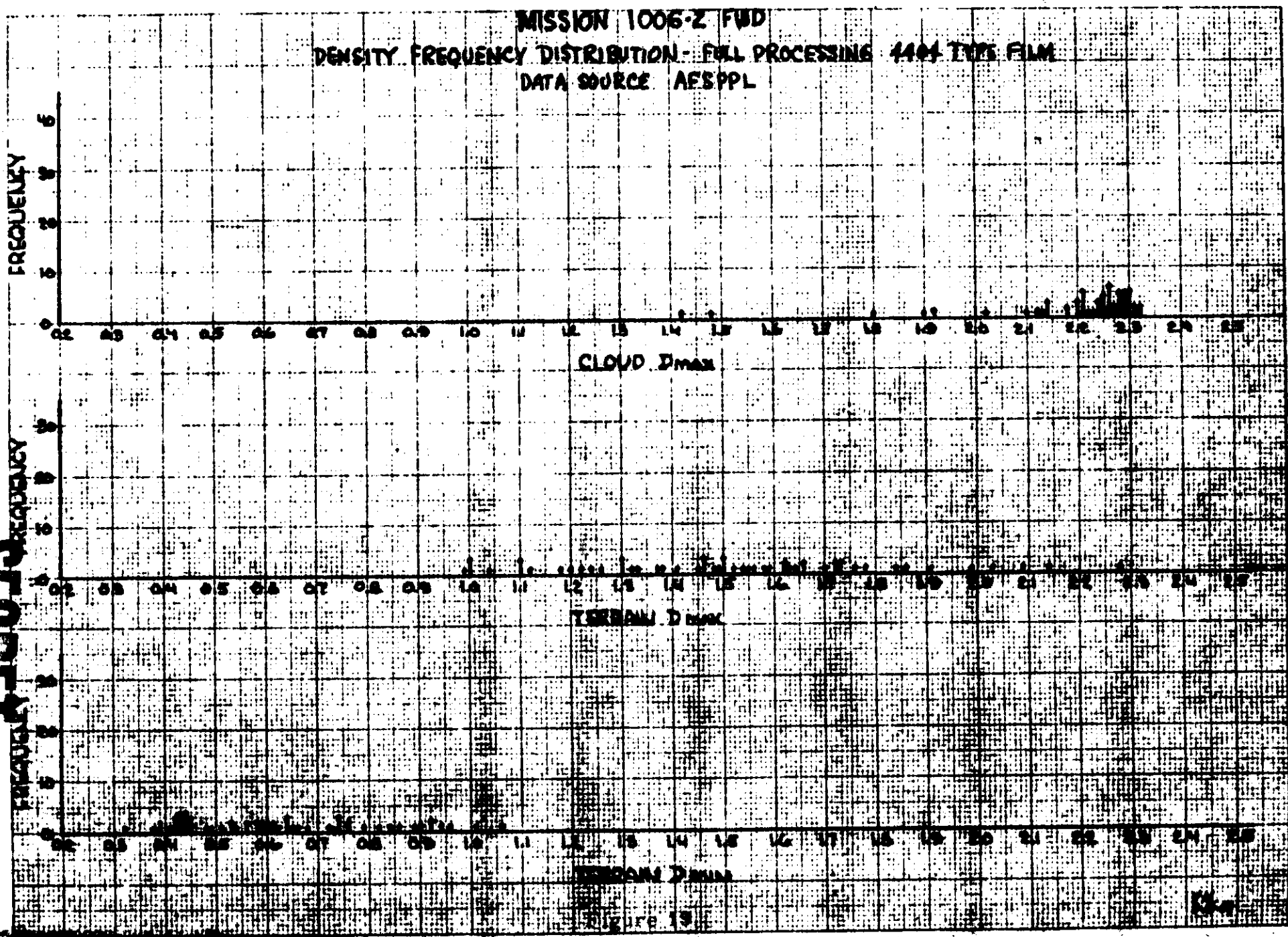


Figure 15

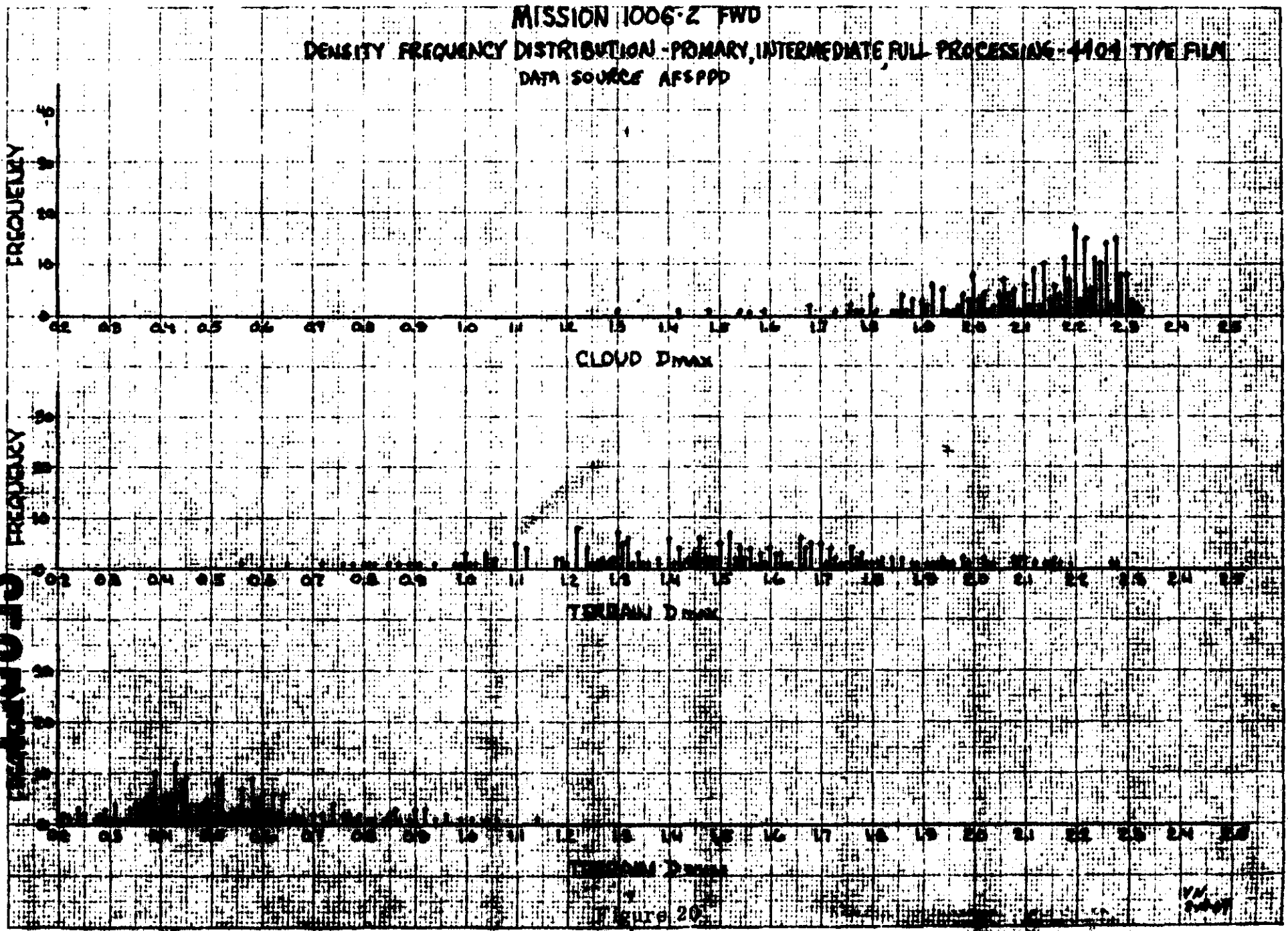

MISSION 1006-2 FWD
DENSITY FREQUENCY DISTRIBUTION - PRIMARY, INTERMEDIATE FULL PROCESSING - 4404 TYPE FILM
DATA SOURCE AFSPPD
FREQUENCY
CLOUD Dmax
FREQUENCY
TERRAIN Dmax

Figure 20

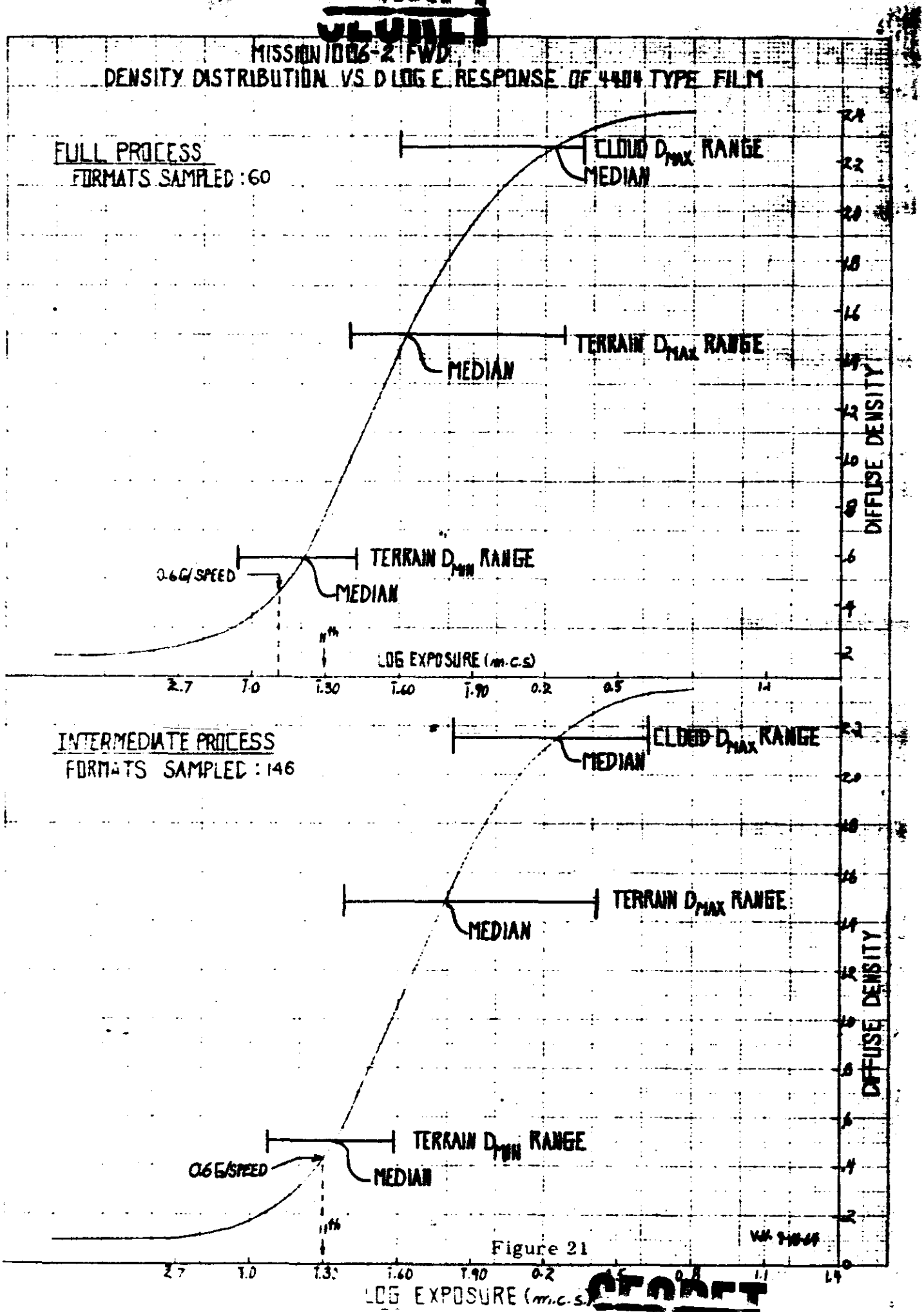

MISSION 1006-2 FWD
DENSITY DISTRIBUTION VS D LOG E RESPONSE OF 4404 TYPE FILM
FULL PROCESS
FORMATS SAMPLED : 60
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
0.6G/SPEED
MEDIAN
LOG EXPOSURE (m.c.s)
2.7
1.0
1.30
1.60
1.90
0.2
0.5
1.4
DIFFUSE DENSITY
INTERMEDIATE PROCESS
FORMATS SAMPLED : 146
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
0.6G/SPEED
MEDIAN
LOG EXPOSURE (m.c.s)
DIFFUSE DENSITY

Figure 21

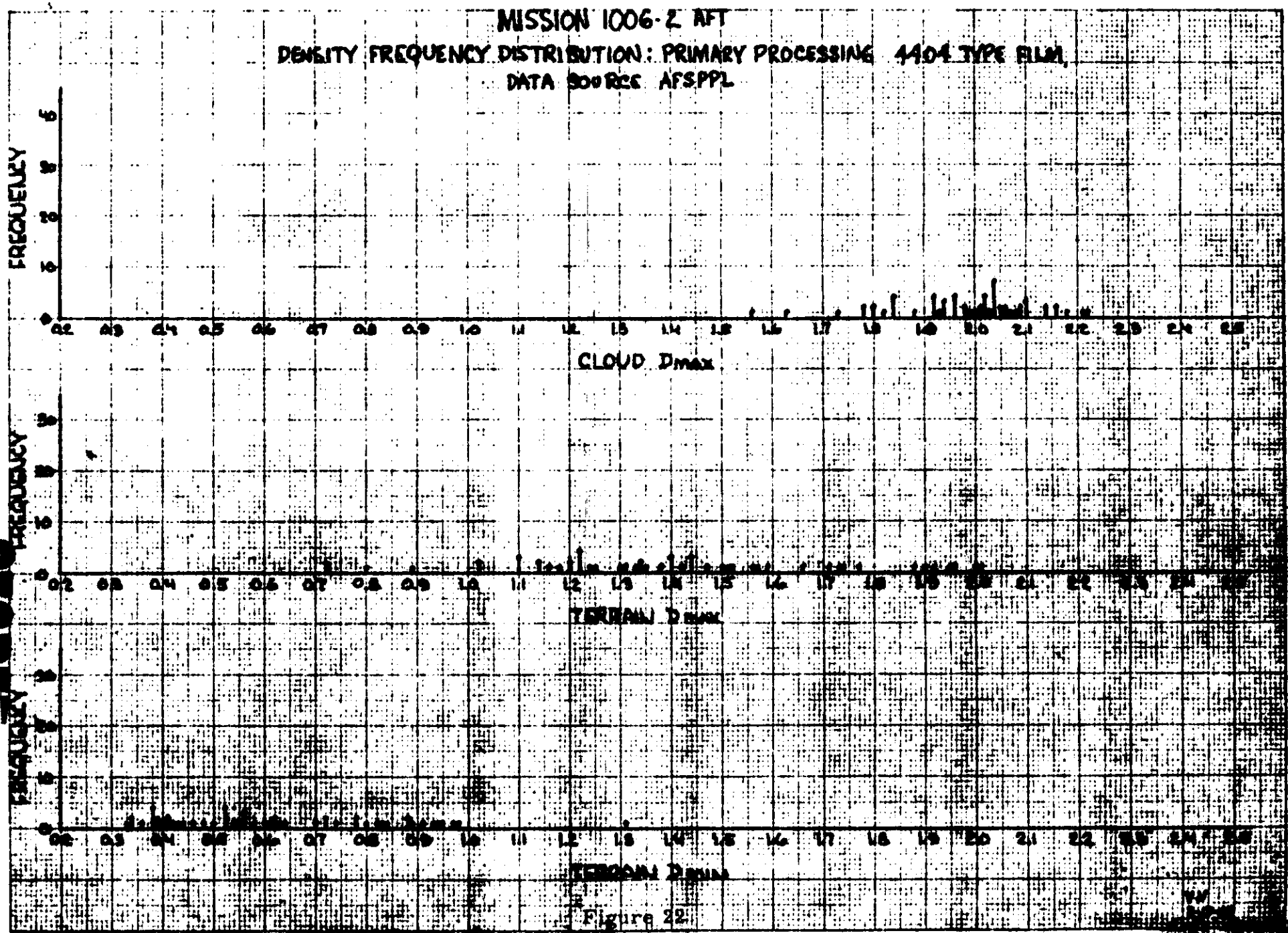

MISSION 1006-2 AFT
DENSITY FREQUENCY DISTRIBUTION: PRIMARY PROCESSING 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
FREQUENCY
TERRAIN Dmax
FREQUENCY
TERRAIN Dmin

Figure 22

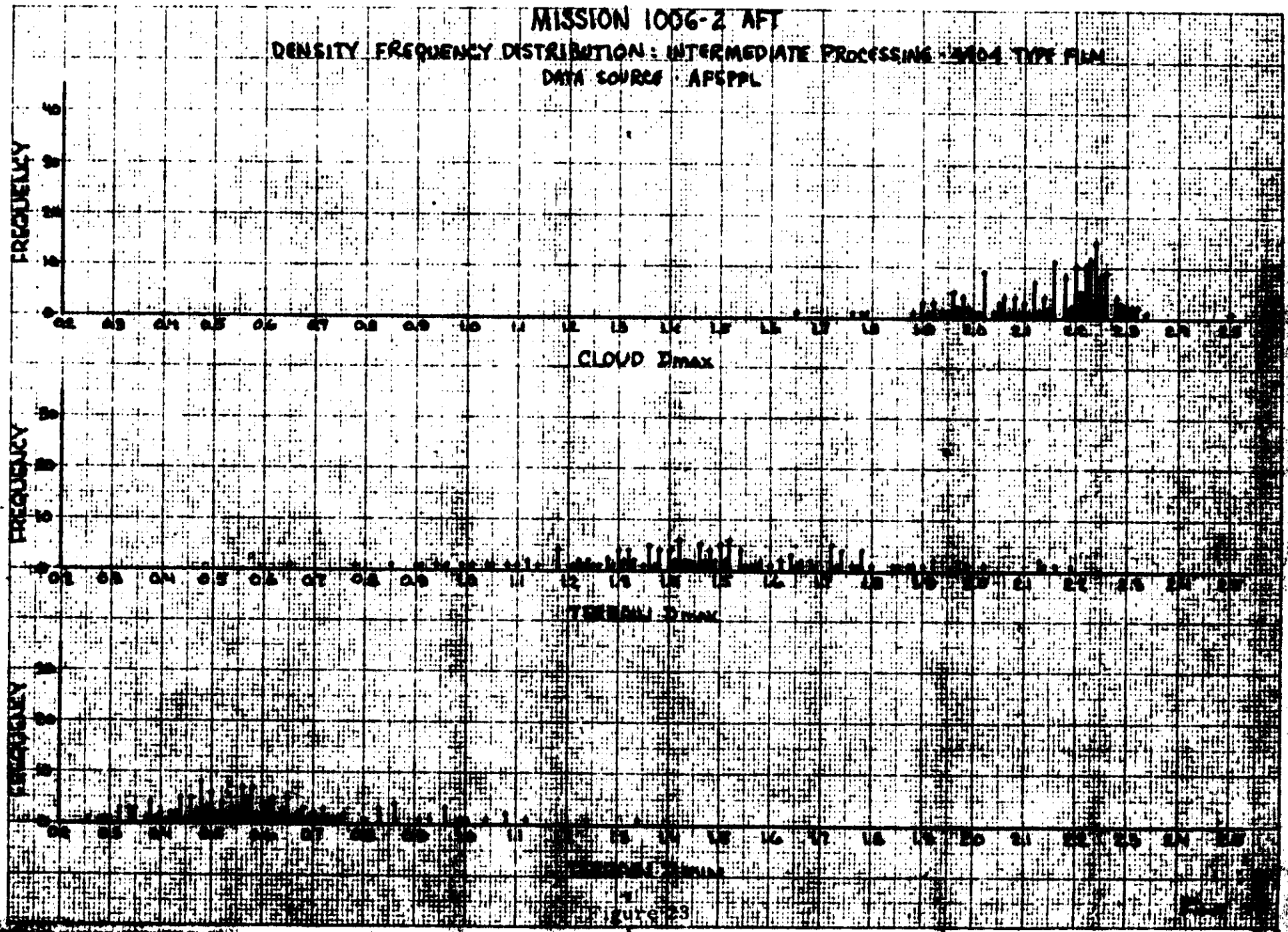


Figure 23

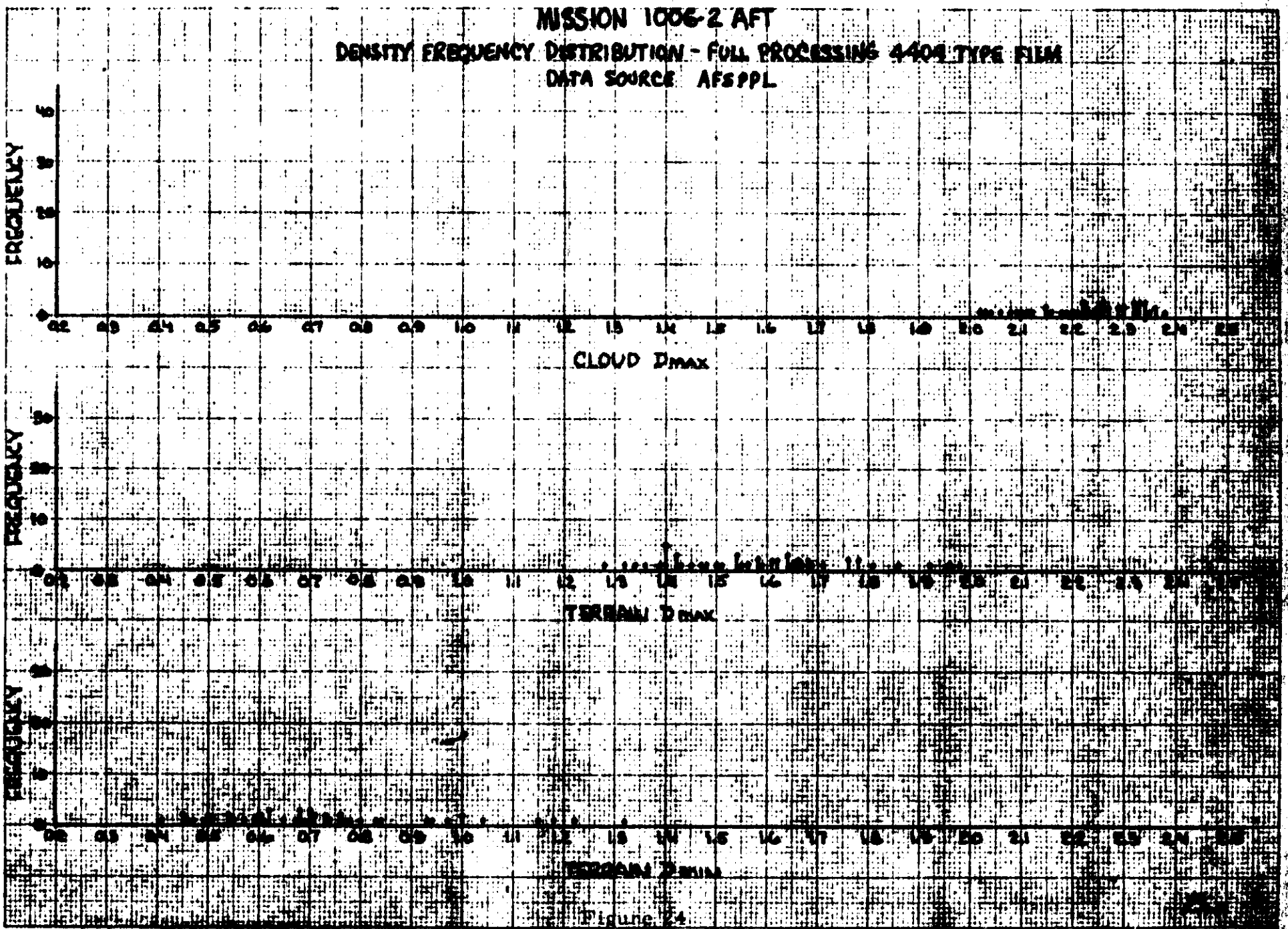
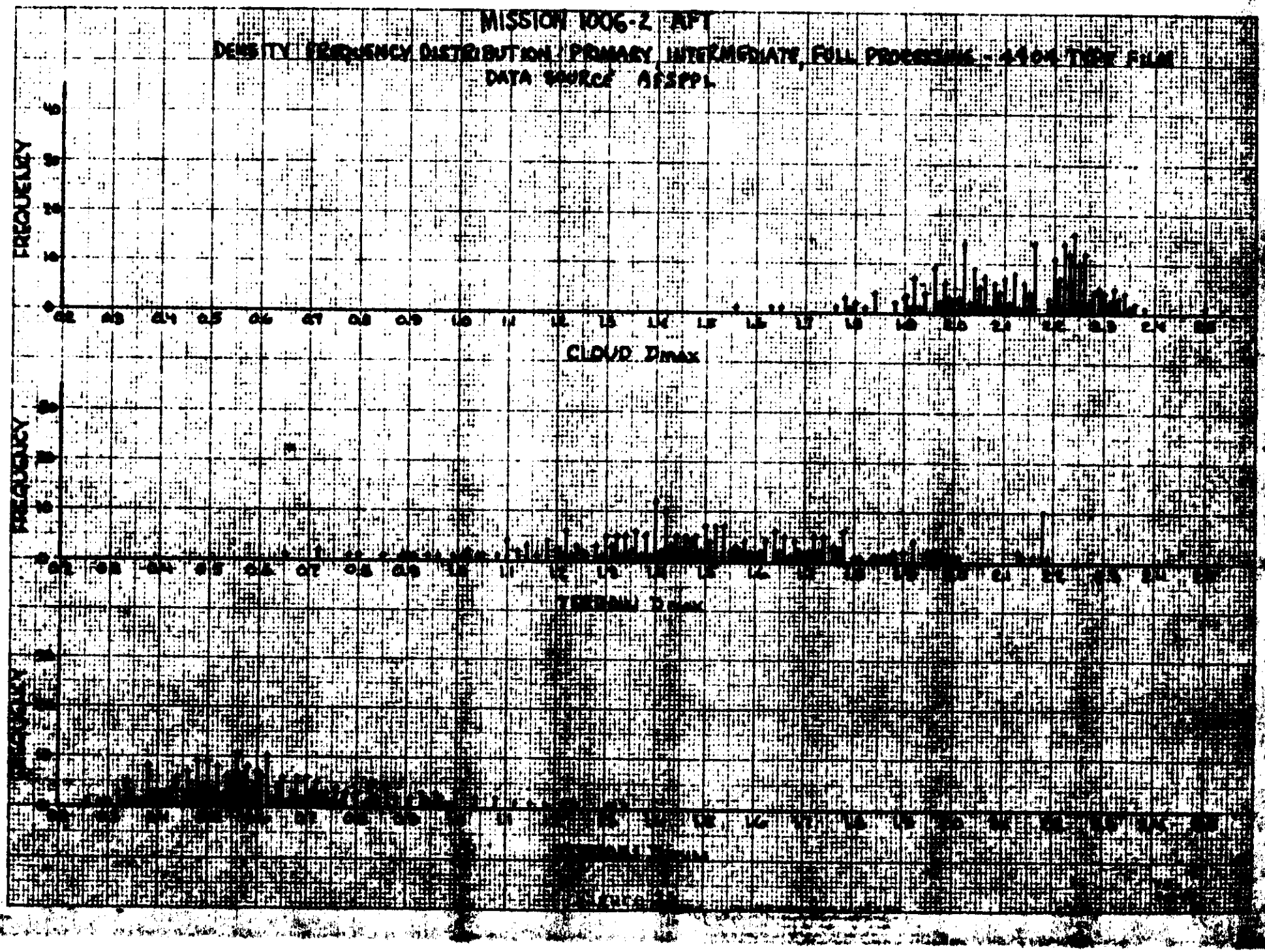

MISSION 1006-2 AFT
DENSITY FREQUENCY DISTRIBUTION - FULL PROCESSING 4404 TYPE FILM
DATA SOURCE AFSPPL
FREQUENCY
CLOUD Dmax
TERRAIN Dmax
TERRAIN Dmin

Figure 74



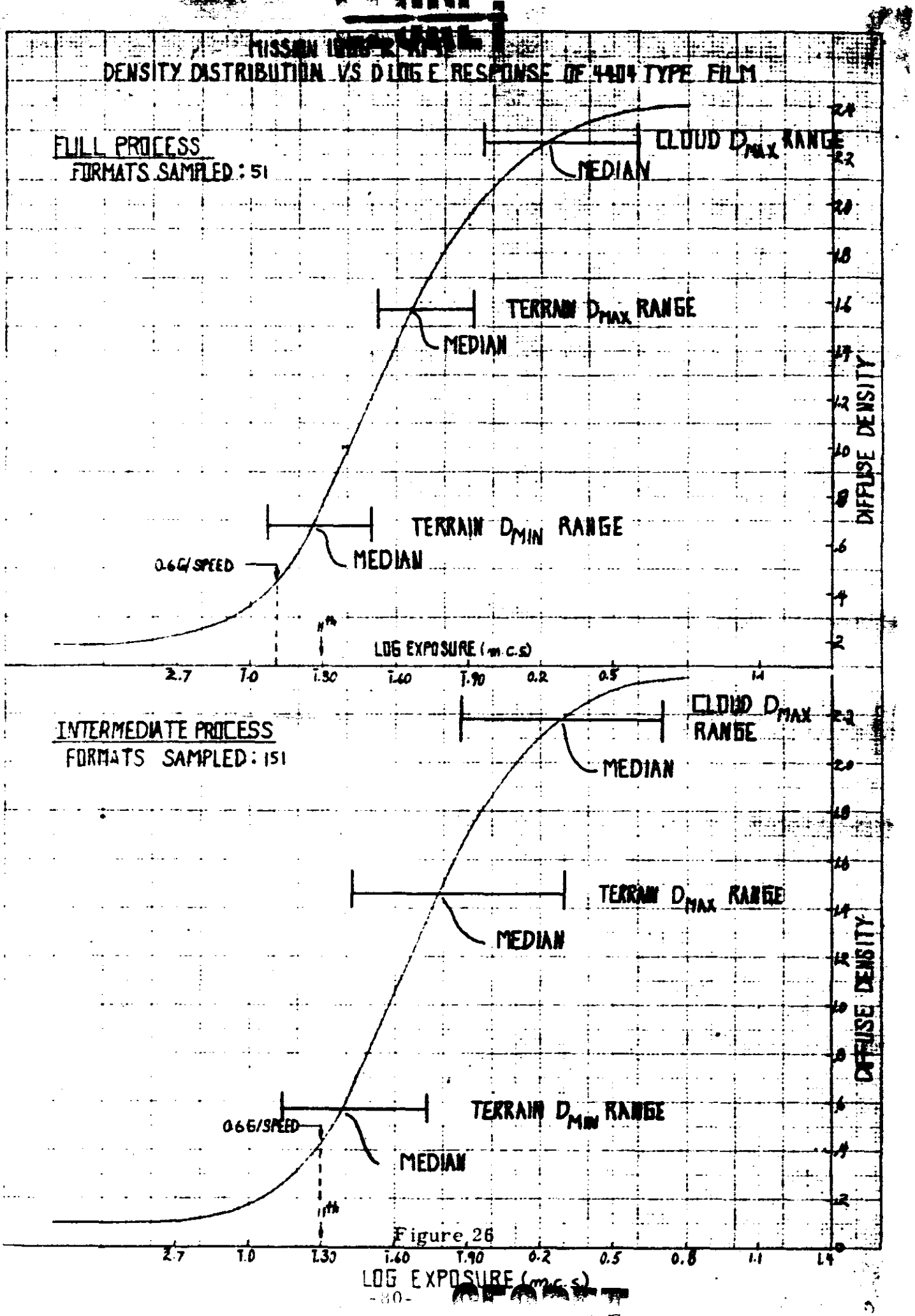

DENSITY DISTRIBUTION VS DLOG E RESPONSE OF 4404 TYPE FILM
FULL PROCESS
FORMATS SAMPLED: 51
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
MEDIAN
0.6G/SPEED
LOG EXPOSURE (m.c.s)
2.7
1.0
1.30
1.60
1.90
0.2
0.5
1.4
DIFFUSE DENSITY
INTERMEDIATE PROCESS
FORMATS SAMPLED: 151
CLOUD D_{MAX} RANGE
MEDIAN
TERRAIN D_{MAX} RANGE
MEDIAN
TERRAIN D_{MIN} RANGE
0.6G/SPEED
MEDIAN
2.7
1.0
1.30
1.60
1.90
0.2
0.5
0.8
1.1
1.4
LOG EXPOSURE (m.c.s)
DIFFUSE DENSITY

Figure 26

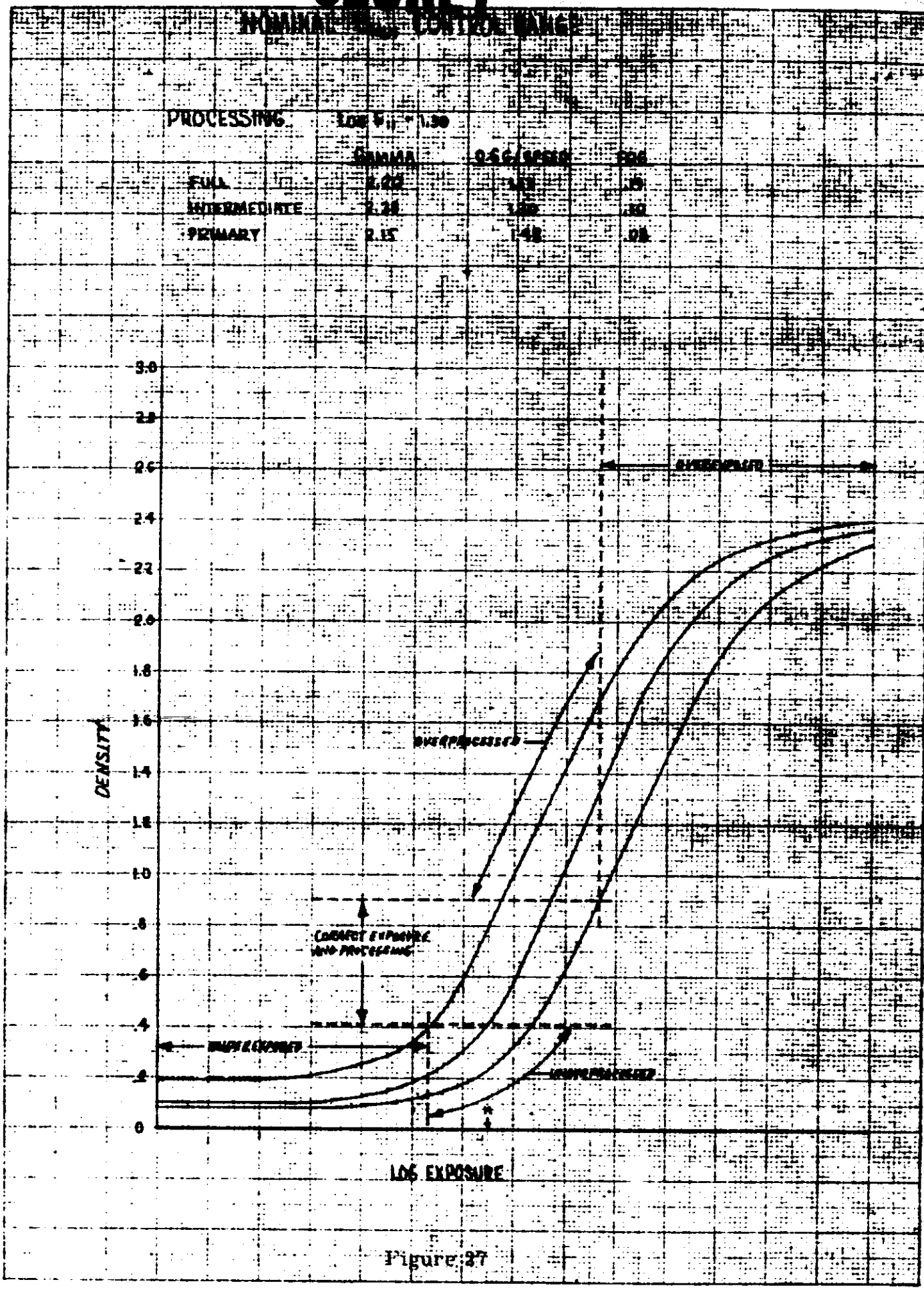

PROCESSING
FULL
INTERMEDIATE
PRIMARY
DENSITY
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
LOG EXPOSURE

Figure 27

[redacted]

TABLE 6

PROCESSING AND EXPOSURE SUMMARY
MISSION 1006

PROCESS LEVEL	SAMPLE SIZE	UNDER EXPOSED	UNDER PROCESSED	CORRECT EXPOSURE & PROCESS	OVER PROCESSED	OVER EXPOSED
			1006-1 FORWARD CAMERA			
PRIMARY	0	-	-	-	-	-
INTERMEDIATE	140	0%	5%	50%	13%	0%
FULL	68	0%	-	23%	9%	0%
TOTAL	218	0%	5%	73%	22%	0%
			1006-1 AFT CAMERA			
PRIMARY	0	-	-	-	-	-
INTERMEDIATE	85	0%	1%	25%	14%	1%
FULL	120	0%	-	33%	26%	0%
TOTAL	205	0%	1%	58%	40%	1%
			1006-2 FORWARD CAMERA			
PRIMARY	25	0%	4%	6%	-	0
INTERMEDIATE	161	0%	17%	44%	2%	0
FULL	60	2%	-	22%	3%	0
TOTAL	231	2%	21%	72%	5%	0
			1006-2 AFT CAMERA			
PRIMARY	56	0%	4%	14%	-	3%
INTERMEDIATE	161	0%	8%	47%	5%	0%
FULL	51	0%	-	15%	4%	0%
TOTAL	268	0%	12%	76%	9%	3%

[redacted]

[redacted]

Table 6, shows the percentage of Mission 1006 film that was exposed and processed to produce the correct D min. value (within the 0.4 to 0.9 density range) and the percentage that was under and over exposed and/or under or overprocessed. The percentages are based upon the samples and sample sizes supplied by AFSPPL.

It is concluded that the deviations from the minimum density control range caused by exposure is insignificant. Essentially all of the values outside of this range were the result of improper processing. The difficulty in achieving proper control with continuous film motion is recognized and the future use of the frame-by-frame processor should help considerably.

The exposure criteria published by [redacted] and utilized to establish camera slit width appears to be sound. A comparison of the deviations from the minimum density control range approximates the deviations from the predicted processing range. It is recommended that the present study of the exposure and processing criteria be completed as soon as possible.

The frequency distribution of the maximum density values also indicate that the AFT camera film from Mission 1006-1 contained a significant amount of frames that exceeded the 1.90 density level which is considered the upper limit. The FWD camera film from this mission also had a large percentage of values beyond this desired point. The percentage of readings beyond this maximum density point of 1.90 are:

MISSION	FWD CAMERA	AFT CAMERA
1006-1	22.6	29.2
1006-2	12.4	7.8

[redacted]

[redacted]

SECTION VII

PERFORMANCE MEASUREMENTS

Several techniques were used to determine the quality of the photographic imagery produced by the panoramic cameras during Mission 1006-1 and 1006-2. These techniques are the Mission Information Potential (MIP) value assigned by NPIC, the Reciprocal Edge Spread (RES) value determined by AFSPPL and NPIC.

The MIP value for both Mission 1006-1 and 1006-2 was 90 for both the Master and Slave camera. Generally, the quality of the Slave was considered slightly inferior to the Master; however, further examination concluded that the variation in quality was due to over processing.

The visual RES values furnished by AFSPPL are listed in Section VI. The average values are:

	Mission 1006-1	Mission 1006-2
Master Camera	78	85
Slave Camera	74	83

The values derived by microdensitometer traces of scene edges on the original negative by AFSPPL are shown for Mission 1006-1 in Tables 7 and 8, pages [illegible] and [illegible], and in Tables 9 and 10, pages 102 and 103 for Mission 1006-2. The data acquisition and reduction process is described in detail in reports published by AFSPPL. The MTF/AIM values are in lines per millimeter.

The complete reports published by [redacted] for the edge spread measurements made on the original negative of Missions 1006-1 and 1006-2 are included as Enclosure I, pages [illegible] to 101, and Enclosure II, pages 104 to 117, respectively. The image location and orientation system shown in these reports is the same system used by AFSPPL.

The average MTF/AIM resolution in lines per millimeter values for the missions are:

[redacted]

[redacted]

MISSION 10[illegible]-1 FWD CAMERA

Mission Data			Machine RES		Spread Function Width 50% Amplitude				MTF/AIM		RES	Density		Subject
PASS Nr.	FRAME Nr.	TRACE Nr.	1.4x 350m	1.4x 43m	1.4x 350m Microns	1.4x 43m Microns	1.4x 350m Reciprocal	1.4x 43m Reciprocal	1.4x 350m	1.4x 43m		1.4x 350m Dmin	1.4x 350m Dmax	
105	076	1	55.9	59.8	15.01	14.59	66.3	68.5	65	74	082	0.66	1.62	Rnwy B-11 15
107	005	2	46.3	58.9	16.44	13.82	60.8	72.4	51	61	075	0.84	1.55	Rnwy B-7 10
109	029	3	41.5	46.3	13.13	11.62	76.2	86.1	85	110	099	0.91	1.75	Rnwy B-2 45
109	033	4	64.4	65.6	13.42	11.59	74.5	86.3	72	76	085	0.79	1.64	Rnwy B-7 15
125	008	5	58.6	82.3	14.01	8.84	67.1	113.1	59	122	104	1.09	1.64	Rnwy C-5 16
025	019	6	58.6	41.0	15.53	20.86	64.4	47.9	59	135	085	1.06	1.77	Rnwy C-2 10
125	038	7	56.9	53.9	16.19	16.25	62.8	61.5	58	66	094	0.76	1.72	Rnwy A-2 97
025	060	8	73.1	65.0	13.23	12.60	75.0	79.4	72	106	104	0.70	1.83	Rnwy C-8 17
125	062	9	70.7	93.[illegible]	12.[illegible]	9.60	78.2	104.2	84	105	099	0.85	1.80	Rnwy C-4 43
124	104	10	52.4	64.[illegible]	17.40	14.9[illegible]	57.5	66.8	52	60	082	0.90	1.69	Rnwy B-2 83
D56	033	12	43.2	37.9	20.75	19.09	48.2	52.4	41	46	065	0.93	1.72	Rnwy B-11 16
D56	039	13	51.0	57.6	14.11	12.04	70.9	83.1	66	86	094	0.73	1.75	Rnwy C-1 89
D56	046	14	73.3	76.6	13.66	13.46	73.2	74.3	69	70	096	0.60		Rnwy C-7 10
D56	046	15	63.5	75.4	15.26	13.07	65.5	76.5	66	100	085	1.05	1.70	Rnwy B-13 23
D56	047	16	77.2	84.6	11.93	10.82	83.5	92.4	84	90	078	0.83	1.69	Rnwy B-10 13
D25	086	17	66.0	76.1	12.64	11.[illegible]	79.1	86.2	87	108	104	1.07	1.66	Rnwy B-8 12
125	087	18	50.9	51.3	14.[illegible]	15.09	67.2	66.3	60	60	085	1.01	1.73	Rnwy B-10 13
125	095	19	56.3	84.3	16.00	10.68	62.5	93.6	58	92	094	1.00	1.77	Rnwy A-2 11
125	098	20	53.3	57.6	17.98	12.69	55.6	78.8	59	151	094	1.31	1.73	Rnwy A-10 02
125	09[illegible]	21	53.1	54.3	17.74	17.69	56.4	56.5	58	56	085	1.17	1.87	Rnwy C-11 00
125	104	22	49.0	53.1	16.61	18.87	60.2	53.9	63	66	104	0.94	1.63	Rnwy B-6 76
AVER[illegible]			57.[illegible]	64.[illegible]	15.23	13.39	66.9	77.6	65	88	90			

TABLE

MISSION 1[illegible]-1 AFT CAMERA

Mission Data			Machine RES		Spread Function Width 50% Amplitude				MTF/AIM		RES	Density		Subject
PASS Nr.	FRAME Nr.	TRACE Nr.	1 m x 350 m	1 m x 43 m	1 m x 350 m Microns	1 m x 43 m Microns	1 m x 350 m Reciprocal	1 m x 43 m Reciprocal	1 m x 350 m	1 m x 43 m		1 m x 350 m Dmin	1 m x 350 m Dmax	
D05	090	1	67.1	70.9	13.33	14.37	75.0	69.6	63	140	078	1.28	1.98	Rnwy C-3 16
D07	010	2	63.7	62.5	13.34	14.45	75.0	69.2	78	101	094	0.96	1.73	Rnwy B-6 10
D09	034	3	38.0	43.1	14.68	11.31	68.1	88.4	64	71	072	0.91	1.68	Rnwy C-12 38
D09	038	4	70.8	75.3	13.10	11.21	76.3	89.2	78	101	072	0.90	1.72	Rnwy C-7 15
D25	013	5	55.6	70.9	14.05	9.91	71.2	100.9	70	120	099	1.11	1.63	Rnwy A-9 16
D25	024	6	69.2	67.9	13.40	13.27	74.6	75.4	90	66	095	1.00	1.72	Rnwy A-12 10
D25	042	7	67.7	75.3	13.06	12.48	76.6	80.1	70	70	094	0.72	1.64	Rnwy A-12 95
D25	076	8	73.6	80.3	13.15	13.85	76.0	72.2	67	69	104	0.90	1.86	Rnwy C-6 17
D25	067	9	65.7	79.5	12.73	11.75	78.6	85.1	75	75	092	0.87	1.79	Rnwy C-4 39
D24	108	10	66.3	78.7	13.54	11.04	73.9	90.6	64	68	078	0.86	1.73	Rnwy B-12 83
D56	038	12	54.2	66.3	17.51	14.29	56.1	70.0	52	58	075	1.27	1.94	Rnwy C-3 26
D56	044	13	52.9	54.6	13.21	15.89	54.0	63.0	47	48	067	0.86	1.58	Rnwy B-13 90
D56	051	14	78.1	98.8	10.72	8.96	93.3	111.4	92	105	067	1.15	1.50	Rnwy C-7 10
D56	051	15	80.2	95.0	12.53	9.27	79.8	108.0	69	120	090	1.42	1.94	Rnwy C-1 34
D56	052	16	74.4	63.6	12.62	13.65	79.2	73.3	59	80	078	1.20	1.92	Rnwy C-4 13
D25	090	17	68.4	79.9	11.83	14.58	84.5	68.6	77	125	090	1.19	1.70	Rnwy A-6 11
D25	091	18	69.0	69.4	13.15	12.33	76.0	80.8	74	73	094	1.20	1.83	Rnwy A-4 14
D25	092	19	88.1	92.9	10.24	10.57	98.7	94.6	105	75	085	1.03	1.80	Rnwy B-12 10
D25	102	20	56.3	73.8	15.82	9.89	63.2	101.1	78	97	078	1.42	1.85	Rnwy C-4 11
D25	103	21	77.9	81.0	11.91	10.10	84.0	99.0	83	95	075	1.25	1.95	Rnwy A-3 11
D25	103	22	35.3	46.3	23.44	21.63	42.7	46.2	35	125	085	1.05	1.62	Rnwy B-8 76
AVG	92		68.4	72.5	12.98	12.61	78.2	82.3	73	90	84			

TABLE 8

ENCLOSURE F

July 1, 1964

TITLE:

Summary of Microdensitometer Derived Image Quality Data Collected from Mission 1006-1

SECTION I: INTRODUCTION

Microdensitometer tracing of scene edges has been used as an objective technique for evaluating photographic system performance. In this report, the evaluation data is presented as spread function width in microns and resolving power in lines per millimeter. A statistical summary of the edge data is presented in Section II, giving the arithmetic mean, standard deviation, coefficient of dispersion, and number of edges. Section III is a tabulation of the location, description, and image quality data for each edge. Frequency plots of the spread function and resolving power data are presented as Section IV, to show the distribution of values.

Section V is included to show the sensitometric data for this mission.

Appendix A is a diagram of the reference system used in describing the orientation of an edge. The edge orientation is recorded as the angular rotation of the edge in a clockwise direction away from a line parallel to the longitudinal direction of the strip of film. Appendix B is a temporary coordinate system used to locate the edges within a frame. A revision of the grid coordinate system is under study.

The image quality data was obtained from sharp scene edges in the original negative by scanning with a Kodak Model 5 microdensitometer. A 1 X 320 micron slit was used. The data reduction consisted of the following steps:

(a) hand smoothing of the microdensitometer strip chart recording,

(b) key punching of chart (density) values at sample distance increments of 0.277 microns,

(c) I.B.M. 1620 computer conversion of chart values to relative exposure values, and

(d) computer conversion of exposure data to line spread function and modulation transfer function by numerical methods.

The edge resolving power was predicted graphically as the intersection of the MTF curve and the aerial image modulation curve for 4404 film at a test object contrast of 2:1. The spread

function width was calculated from the first differences of relative exposure as the width at which the gradient became 50% of the maximum gradient.

Analysis of Photographic Image to Evaluate System Performance

SECTION II SUMMARY SHEET

Mission 1006-1

Resolution in lines/mm based on the aerial image modulation - 4404 curve from edge trace data reduced by computer techniques.

Arithmetic Mean	85.3
Standard Deviation	26.4
Coefficient of Dispersion	31.%
Number of edges	93.

Spread function width at 50% amplitude in microns from edge trace data reduced by computer techniques.

Arithmetic Mean	12.0
Standard Deviation	4.3
Coefficient of Dispersion	36.%
Number of Edges	93.

Analysis of Photographic Image to Evaluate System Performance

Mission 1008-1

Section III

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
1A	Aft.	D07	010	B-6	15	Airfield	15.8	50
2A	Aft.	D07	025	A-9	160	Building	13.9	61
3	Aft.	D09	060	C-5	60	Airfield	15.3	80
3A	Aft.	D09	060	C-5	60	Airfield	6.5	128
4	Aft.	D09	038	A-9	120	Airfield	9.6	84
4A	Aft.	D09	038	A-9	120	Airfield	8.4	99
5	Aft.	D09	038	A-9	120	Airfield	8.8	102
5A	Aft.	D09	038	A-9	120	Airfield	10.1	99
6	Aft.	D09	034	C-3	130	Airfield	14.2	55
6A	Aft.	D09	034	C-3	130	Airfield	18.7	49
7	Aft.	D09	034	C-3	130	Airfield	15.9	66
7A	Aft.	D09	034	C-3	130	Airfield	13.4	62
8	Aft.	D21	084	B-2	120	Airfield	17.9	40
8A	Aft.	D21	084	B-2	120	Airfield	21.1	39
9	Aft.	D21	087	B-5	90	Airfield	11.3	71
9A	Aft.	D21	087	B-5	90	Airfield	11.0	75
10	Aft.	D21	087	A-7	90	Airfield	6.6	127
10A	Aft.	D21	087	A-7	90	Airfield	6.9	120
11	Aft.	D21	088	A-8	90	Airfield	11.0	87
12	Aft.	D21	106	A-4	40	Airfield	6.6	126
12A	Aft.	D21	106	A-4	40	Airfield	9.1	98

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
13	Aft.	D21	125	C-4	40	Airfield	14.4	100
13A	Aft.	D21	125	C-4	40	Airfield	11.5	88
14	Aft.	D24	124	B-3	20	Airfield	14.5	03
14A	Aft.	D24	124	B-3	20	Airfield	12.8	63
15A	Aft.	D24	124	B-3	20	Airfield	10.2	77
16-1	Aft.	D37	085	C-4	100	Airfield	11.2	111
16-2	Aft.	D37	085	C-4	100	Airfield	15.4	75
16A-2	Aft.	D37	085	C-4	100	Airfield	12.8	62
17	Aft.	D52	080	C-9	170	Airfield	8.9	107
17A	Aft.	D52	080	C-9	170	Airfield	11.3	84
19	Fwd.	D09	029	B-12	140	Airfield	12.5	60
19A	Fwd.	D09	029	B-12	140	Airfield	12.1	59
20-1	Fwd.	D09	029	B-5	100	Airfield	15.0	88
20A-1	Fwd.	D09	029	B-5	100	Airfield	19.0	88
20-2	Fwd.	D09	029	B-5	100	Airfield	15.4	37
20A-2	Fwd.	D09	029	B-5	100	Airfield	26.8	39
21	Fwd.	D09	033	C-7	70	Airfield	6.7	127
21A	Fwd.	D09	033	C-7	70	Airfield	13.0	89
22	Fwd.	D09	055	C-9	80	Airfield	6.0	135
22A	Fwd.	D09	055	C-9	80	Airfield	17.1	82
23	Fwd.	D09	055	C-9	80	Airfield	14.5	57
23A	Fwd.	D09	055	C-9	80	Airfield	9.0	135

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
24	Fwd.	D21	121	A-10	30	Airfield	7.6	90
24A	Fwd.	D21	121	A-10	30	Airfield	7.5	127
25	Fwd.	D21	084	C-11	80	Airfield	10.8	84
26	Fwd.	D21	083	C-8	90	Airfield	12.0	83
26A	Fwd.	D21	083	C-8	90	Airfield	6.3	90
27	Fwd.	D21	083	A-9	100	Airfield	9.0	100
28	Fwd.	D21	080	B-4	120	Airfield	12.5	88
28A	Fwd.	D21	080	B-4	120	Airfield	6.1	134
29	Fwd.	D21	158	C-12	30	Airfield	11.8	70
29A	Fwd.	D21	158	C-12	30	Airfield	9.3	82
30	Fwd.	D21	158	C-12	30	Airfield	13.5	61
30A	Fwd.	D21	158	C-12	30	Airfield	13.0	84
31	Fwd.	D21	159	C-13	30	Airfield	9.1	108
31A	Fwd.	D21	159	C-13	30	Airfield	8.3	125
32	Aft.	D25	067	C-5	130	Airfield	11.0	100
32A	Aft.	D25	067	C-5	130	Airfield	8.5	92
33	Aft.	D25	024	A-2	10	Airfield	15.6	53
33A	Aft.	D25	024	A-2	10	Airfield	10.7	73
34A	Aft.	D25	020	A-13	115	Airfield	10.9	107
35	Aft.	D25	018	A-B-10	110	Airfield	11.0	95
35A	Aft.	D25	018	A-B-10	110	Airfield	8.8	103
36	Aft.	D25	013	A-6	170	Airfield	9.0	81

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
37	Aft.	D40	041	A-1	100	Airfield	9.8	90
37A	Aft.	D40	041	A-1	100	Airfield	9.0	90
38	Aft.	D38	037	B-8	45	Building	8.2	100
38A	Aft.	D38	037	B-8	45	Building	8.4	122
39	Aft.	D38	037	A-8	0	Canal Edge	14.5	90
39A	Aft.	D38	037	A-8	0	Canal Edge	10.7	[illegible]
39B	Aft.	D38	037	A-8	0	Canal Edge	8.5	133
40	Fwd.	D07	005	B-7	45	Airfield	12.2	80
40A	Fwd.	D07	005	B-7	45	Airfield	15.1	61
40B	Fwd.	D07	005	B-7	45	Airfield	15.1	65
41A	Fwd.	D07	027	A-10	120	Buildings	7.7	110
41C	Fwd.	D07	027	A-10	120	Buildings	8.0	110
41D	Fwd.	D07	027	A-10	120	Buildings	7.5	133
42	Fwd.	D24	101	C-12	25	Dam	17.3	52
42A	Fwd.	D24	101	C-12	25	Dam	14.5	61
43	Fwd.	D24	101	C-12	115	Building	-	-
44	Fwd.	D24	104	B-12	170	Airfield	14.3	80
44A	Fwd.	D24	104	B-12	170	Airfield	13.2	82
45	Fwd.	D24	120	A-12	30	Airfield	12.8	81
45A	Fwd.	D24	120	A-12	30	Airfield	13.9	83
46	Fwd.	D22	046	B-8	90	Dam	20.9	51
46A	Fwd.	D22	046	B-8	90	Dam	9.9	100
47	Fwd.	D23	001	B-3	90	Dam	30.3	30

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
49	Fwd.	D23	008	A-12	155 All Direct-ions	Airfield	14.7	61
49A	Fwd.	D23	008	A-12	155	Airfield	15.5	82
50	Aft.	D56	038	C-11	120	Airfield	10.0	83
50A	Aft.	D56	038	C-11	120	Airfield	11.3	77
51	Aft.	D56	042	B-7	80	Airfield	11.2	79
51A	Aft.	D56	042	B-7	80	Airfield	8.7	103

[redacted]

SECTION IX

OBSERVED DATA

Study of the engineering passes at A/P revealed that the performance of both panoramic cameras was excellent and stable. Differences between the master and slave camera appeared to be minor.

Study of the photographs also showed that the system was imaging small enough details of industrial complexes, oil fields, airfields, and transportation networks to conclude that the intelligence needs for search and surveillance would be satisfactorily met.

Detailed examination of individual frames, resulted in identification of automobiles in the parking lot of an industrial plant and identification of isolated automobiles possible. Small private aircraft were visible on airfields but could not be identified. Military fighter, bombers, and transport aircraft could be identified. The catwalk and pipes in the primary clarifier of a large water treatment plant were visible. Compared to a known local installation, similar in configuration, these distribution arms are 60" wide. No observable smear nor focus anomalies were detected during this detailed analysis.

In order to evaluate the actual resolution capability of the panoramic cameras on Mission 1006 (J9), all engineering passes were searched to find targets under the following conditions:

1. No clouds
2. Minimum haze
3. Low IMC error
4. Near center of format
5. Objects of known characteristics with dimensions near the limit of system resolution, with discernability the criterion.

The target area selected was Carswell AFB near Fort Worth, Texas, where all of the above conditions were met on descending pass #78, frames 19 Aft, 13 Fwd. 2-1/2" West of the center fiducial mark.

[redacted]

[redacted]

The specific conditions at this point were:

Location	32° 50'N, 97° 12'W
Solar Elevation	58.80
Solar Azimuth	92.2°
Slant Range	661911'
Photo Scale	1/332,000
Exposure Time	1/330 sec.
Resolution Limit:	
Along Track	3.9'
Cross Track	7.4'

Three B-52 bombers were parked on a concrete apron facing southeast. Across the taxi-strip, facing northwest were five additional B-52's also on a concrete pad. Due to the different orientation of the aircraft on opposite sides of the taxi strip with respect to sun position, those facing southeast cast a shadow on the ground against which the engine nacelles and fuel pods were clearly discernable in the aft-looking format. The foreward looking format showed no such shadow because of the different "look-angle" and here the difference in contrast between the aircraft and the sunlite concrete was so low that the fuel pods could not be seen, though a slight vestage of the engine nacelles remained. (Perhaps only because they are known to be there.) In a like manner the aircraft facing northwest, being obliquely lighted from a front quarter, cast their shadows further back under the wing and these nacelles and fuel pods again were contrasted against bright concrete. The pods could not be seen in either fore or aft photography. The width across these pods is 3 - 4 feet and the engine nacelles is 6 - 8 feet as determined by scaling a silhouette from an observer's handbook.

A taxi strip running East - West with blacktop pads on both sides contained 10 C-119's. 5 were parked facing north, and 5 facing south. Against this dark surface the engine nacelles were visible on all aircraft, and the tail booms could be seen for nearly their entire length, even though the booms taper to about 2 feet at the tail. In this respect, the aft view appeared to have slightly better contrast than the forward.

The C-119 tail boom dimension is considerably smaller than the calculated cross track object size limit of 3.7 feet. It must be remembered that the resolution limit is based on a standard three bar target where the bars are separated by an equa. width space. If objects have adequate contrast and are widely separated, as in the case of the booms, they can still be detected. The smear will reduce the apparent object contrast but will not obliterate the object until the contrast is reduced to the limit of detection.

[redacted]

SECTION X

MISSION 1006-1 STELLAR-INDEX CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Camera	D 45
Index Reseau	47
Stellar Reseau	45

B. CAMERA DATA AND FLIGHT SETTINGS

Stellar Camera:

Lens	85mm f/1.8
Exposure Time	2 seconds
Filter Type	none
Film Type	Eastman 4401

Index Camera:

Lens	38mm f/4.5
Exposure Time	1/500 second
Filter Type	Wratten 21
Film Type	Eastman 4400

C. PREFLIGHT TESTING

Stellar-Index camera D45/47/45 operated normally throughout all test phases at A/P and VAFB. Corona discharge fogging was within specifications.

D. INFLIGHT DATA

No anomalies were observed on telemetry records during the mission.

[redacted]

E. POSTFLIGHT EVALUATION

The Stellar camera shutter malfunctioned during a significant portion of the mission. There were 412 frames of photography acquired of which only 212 were fully acceptable. The shutter failed closed during 36 frames, failed open 37 times resulting in overexposure in 74 frames and produced double imagery on 90 frames.

The double stellar imagery observed suggested double shutter operation in a frame. The microdensitometer trace, in Figure 40, page 141. shows the density of double recorded stellar imagery obtained in stellar frame #140 and displacement between imagery. The sensitometric curve for Eastman 4401 emulsion in Figure 41, page . , was used in conjunction with star micro-densities to obtain shutter open times for the double exposure for frame #140 of 1.3 and 1.5 seconds.

The time laps between double imagery recorded in frame #140 is estimated to be approximately 4 seconds. This estimate is based on a stellar shutter failure mode observed at A/P wherein the shutter abnormally opened and closed during shutter cock followed by a time lapse portional to the V/h setting of the master instrument before final shutter open and close.

Stellar quality was adequate to meet program objectives for approximately 357 out of a total of 412 frames exposed. Star imagery was recorded throughout 64% of the available stellar format area. Star imagery was denied in 22% of the available format area due to baffle flare light fog and in 16% of the format area due to baffle vignetting. Extention of the black paint pattern on the space structure outside the stellar camera of future flights is expected to reduce baffle flare problems.

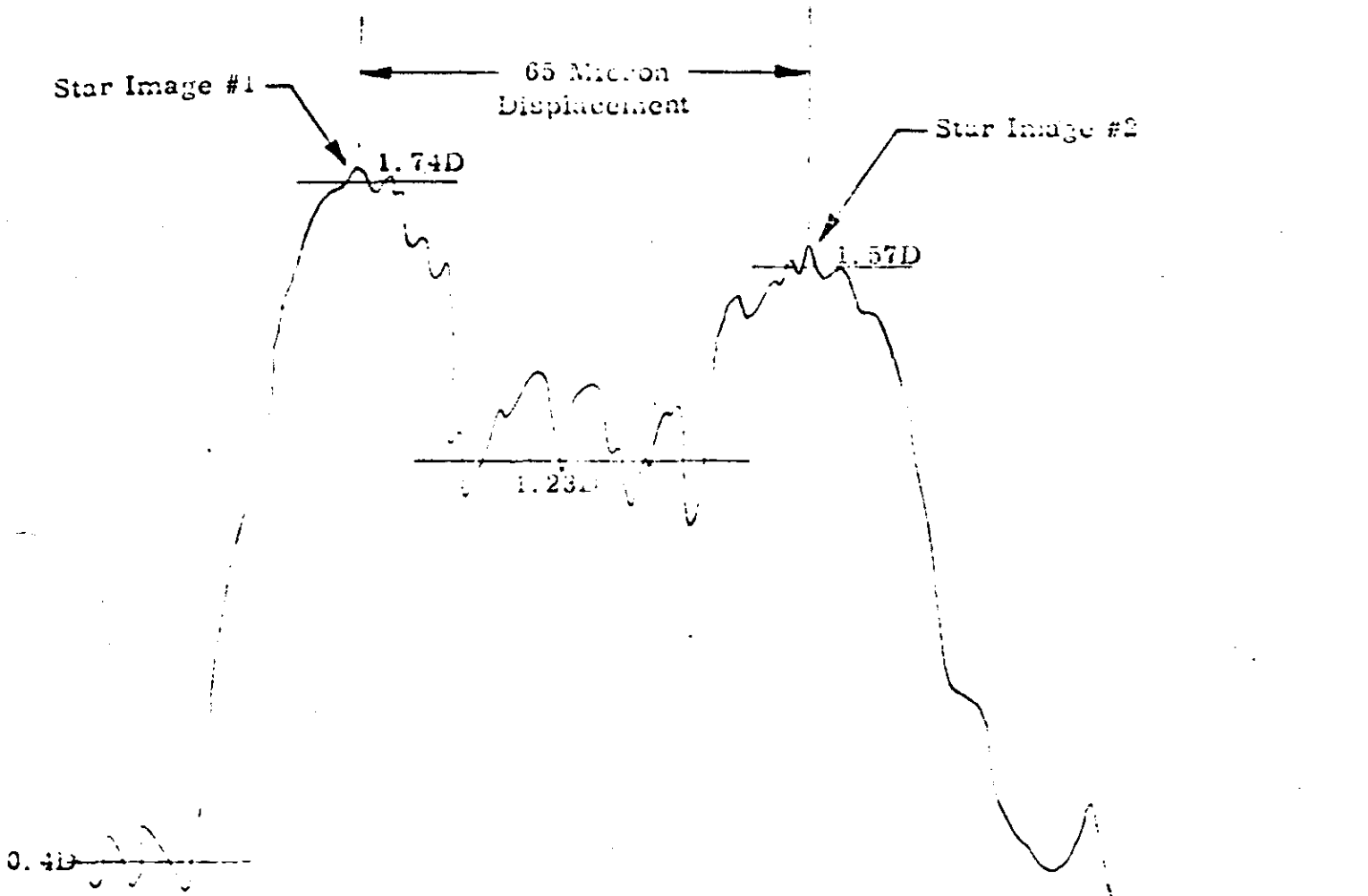
The stellar film was free of light leaks. Electrostatic corona was present along both film edges but did not degrade imagery.

The correlation lamp was operational throughout mission. Three out of four fiducial crosses were present in all flight photography. The fourth fiducial was excessively bloomed with resulting loss of the fiducial cross. The bloomed fiducial is attributed to the loss of the neutral density gelatin filter which apparently fell off the lamp housing during vehicle ascent, due to ascent vibration.

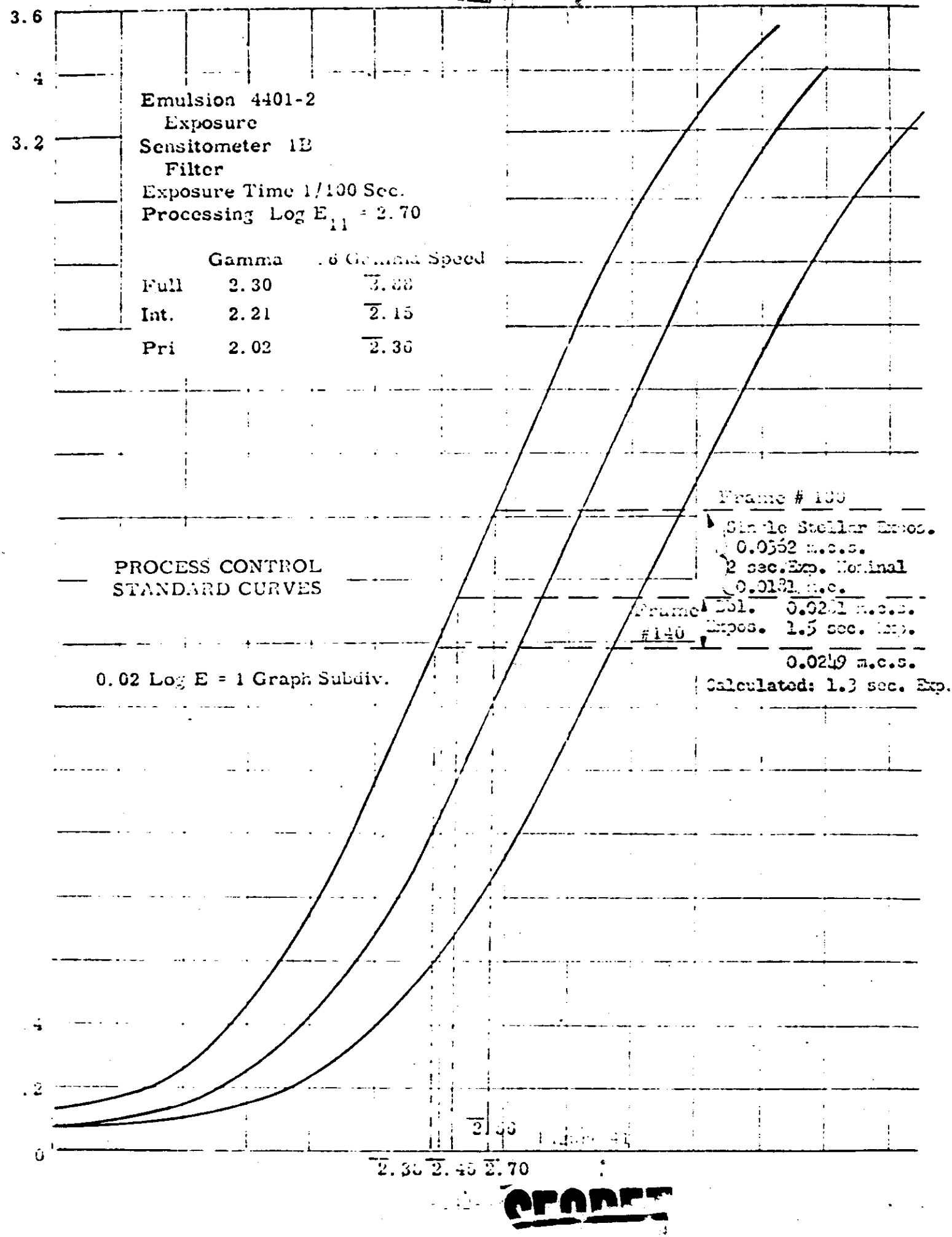
It appears that the stellar baffle was deployed into a normal flight configuration. Baffle flare and vignetting is described under "stellar qualtiy" above. Figure 42, page . , shows typical stellar format densities resulting from suspected baffle flare light.

[redacted]

MICRODENSITOMETER TRACE SHOWING DOUBLE STELLAR IMAGE
Mission 1006-1, S/I #D-45, Frame #140

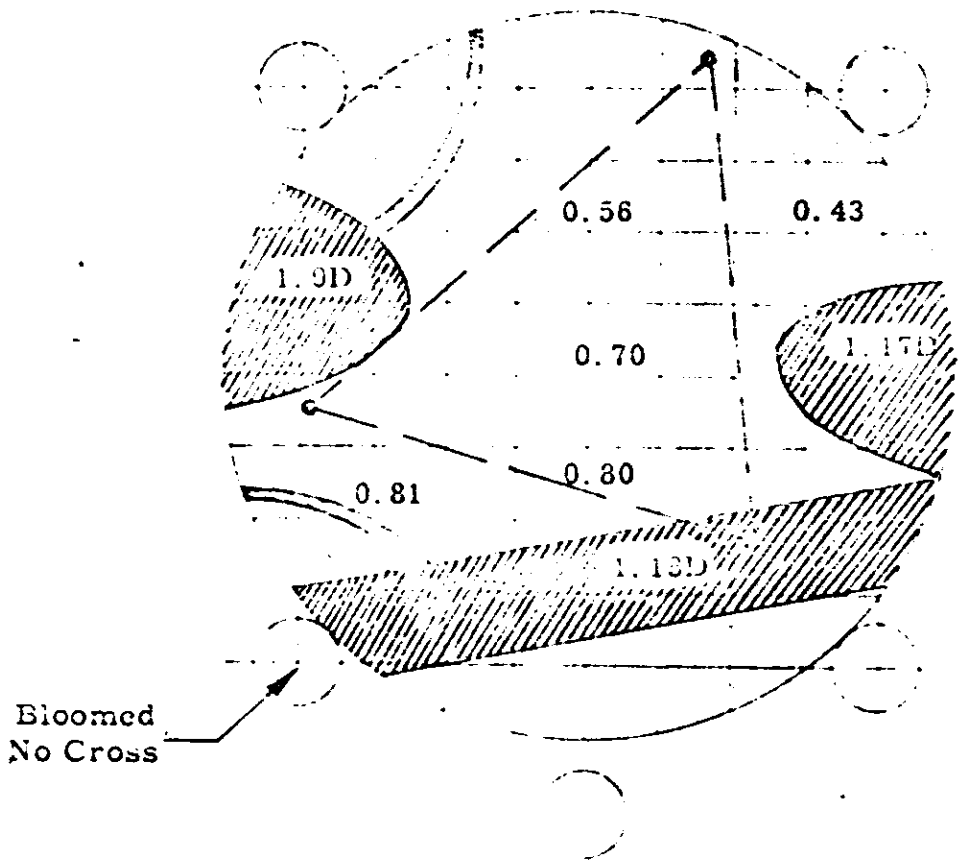


[redacted]


3.6
4
3.2
Emulsion 4401-2
Exposure
Sensitometer 1B
Filter
Exposure Time 1/100 Sec.
Processing Log E11 = 2.70
Gamma .6 Gamma Speed
Full 2.30 3.38
Int. 2.21 2.15
Pri 2.02 2.36
PROCESS CONTROL
STANDARD CURVES
0.02 Log E = 1 Graph Subdiv.
Frame # 139
Single Stellar Expos.
0.0362 m.c.s.
2 sec. Exp. Nominal
0.0181 m.c.s.
Frame #140
Expos. 1.5 sec. Exp.
0.0249 m.c.s.
Calculated: 1.3 sec. Exp.
4
.2
0
2.30 2.45 2.70

[redacted]

MISSION 1006-1 (J-9)
Normal Stellar Imagery Showing Stars Recorded and Flare Density
23 Stars Recorded at Beginning of Mission
36 Stars Recorded at End of Mission



B.F. = 0.19

S/I D-45
2 Sec. Exposure Nominal

Note: 90 Exposures Contained Double Imagery With 65 Microns Separation

[redacted]

391 out of 392 frames of Index Camera photography acquired were good with no anomalies present. The first frame of the mission was double exposed.

The Index Camera ran out of film after frame 392 resulting in 20 frames of stellar photography without corresponding index frames. Post flight measurements show that a total of 82.5 feet of index film was on the supply spool which is 2.4 feet shorter than planned. An additional 4 feet was required to complete the mission program.

Evaluation of duplicate positive film at A/P showed that cloud cover ranged from 10% to 20% on some engineering passes to about 80% on others. Large geographic features of the South Platt River Basin and Western Montana mountains were easily discernible even though most frames were of low contrast. Visual observation at 10x showed grain.

[redacted]

SECTION XI

MISSION 1006-2 STELLAR-INDEX CAMERA

A. COMPONENT ASSIGNMENT

Component	Serial Number
Camera	D 49
Index Reseau	53
Stellar Reseau	42

B. CAMERA DATA AND FLIGHT SETTINGS

Stellar Camera:	
Lens	85mm f/1.8
Exposure Time	2 seconds
Filter Type	none
Film Type	Eastman 4401
Index Camera:	
Lens	38mm f/4.5
Exposure Time	1/500 second
Filter Type	Wratten 21
Film Type	Eastman 4400

C. PREFLIGHT TESTING

Stellar-Index camera D49/53/42 functioned properly through all testing plans at A/P and VAFB. During environmental testing the film take-up failed resulting in film wrapping around the camera metering roller. Examination showed no damage to the camera. The take-up unit was replaced.

D. INFLIGHT DATA

The telemetry records showed the intermittant failure of the Master Camera center-of-format switch which resulted in the loss of function switching to the S/I Camera stepper switch.

[redacted]

[redacted]

[redacted]

E. POSTFLIGHT EVALUATION

The Stellar and Index Cameras functioned properly during the mission until the failure of the Master Camera center-of-format switch at the start of pass D103. Five frames were produced after the switch failure.

Minor light streaking was observed in Stellar Camera frames 268, 269, 279 and 273. The typical format is shown in Figure 43, page [illegible].

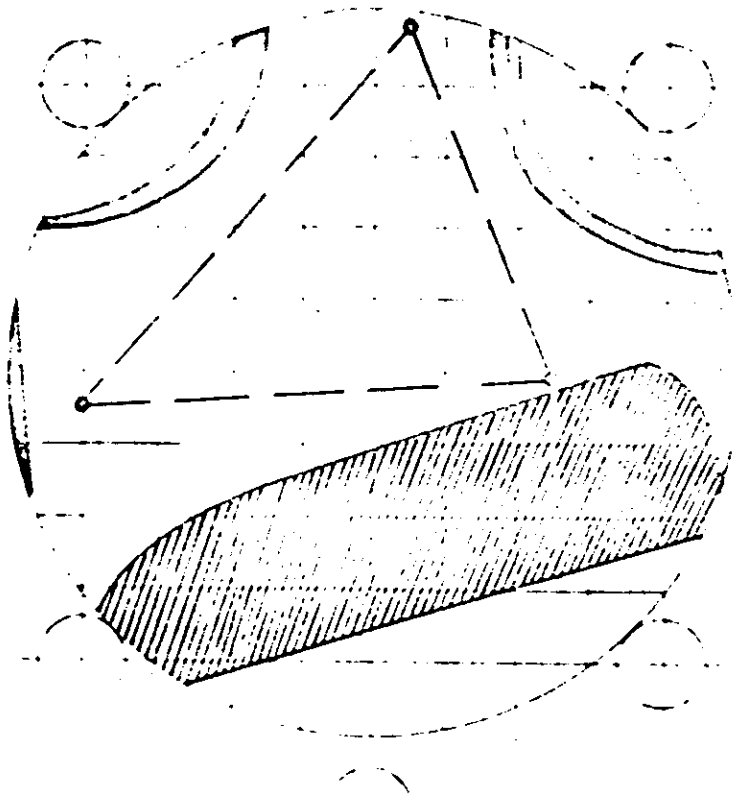
Evaluation of the Index Camera duplicate positive engineering film at A/P showed that cloud cover ranged from about 25% to 80% toward the latter part of the mission. Geographic features of the Dallas-Fort Worth area, at low contrast, were clear to the naked eye. Runways on airfields were clear at 5x magnification, and the Denver area was visible through scattered clouds. 10x magnification revealed street and freeway patterns and other details despite slight haze.

[redacted]

[redacted]

MISSION 1006-2 (J-9)

Typical Stellar Imagery
25 to 30 Stars Recorded Each Exposure



S/I D-49
2 Sec. Exposure Nominal

[redacted]

[redacted]

SECTION XII

MISSION 1006-1 RECOVERY SUBSYSTEM

A. COMPONENT ASSIGNMENT

Component	Serial Number
Recovery Subsystem	638
Take-Up Cassette	T-21/TJ-14

B. PREFLIGHT TESTING

SRV 638 was received at A/P on August 23, 1963, weighing in at 155 pounds. Normal disassembly was completed prior to A/P modifications. After modifications and E. O. incorporations testing was completed for SRV 638 integration to the J9 system.

The following items are noteworthy of being above the normal testing required and the rework/mods required thus effecting additional A/P effort in rework and acceptance testing.

Date	Item	Discrepancy	Action
3-10-64	Haydon timer/ arm ckt.	Fuse blew in GSE in arm circuitry	Reworked arm ckt. ground in SRV
4-17-64	Haydon timer	Failed Post TASC	Replaced same
4-23-64	Thrust cone	Torn light leak shield	Replaced same

On April 24, 1964, all A/P testing per procedures J13xxxx, installations, modifications, alignments, and cleanup were completed. Then SRV 638 was shipped to VAFB on April 26, 1964.

VAFB pre pad installations and testing functions were completed May 19, 1964. The Mission 1006, Vehicle 1176, SRV Systems pad run was completed successfully May 22, 1964.

After the pad run additional flight preparations were completed on May 24, 1964. Then the entire J9 payload left for the launch pad #1, PALC, May 27, 1964. Launch occurred 1600 June 4, 1964.

[redacted]

C. INFLIGHT DATA

Sequence of events, commands, temperatures and other payload functions are discussed in Section II.

D. POSTFLIGHT EVALUATION

SRV 638 was recovered in the air June 8, 1964, after the 65th orbit. It was transported by air from Hawaii and arrived at A. P 0650, June 9, 1964 for film retrieval. It weighed in at 174. 5#. Retrieval operations proceeded normally. Weight of the recovered cassette #1 plus film was 70 pounds. Weight of the cassette #2 plus film was 69 pounds. The cassettes with film were packaged for shipment and turned over to A/P security for shipment to the customer.

SRV post flight testing was per A/P procedure #5110. The beacon, recovery programmer, and telemetry were within specification. Film footage pots approximated the final flight TM readings of 4. 0 volts.

Various components of this SRV could possibly be used for flight again. However, this will be at the direction of the customer.

SECTION XIII

MISSION 1006-2 RECOVERY SUBSYSTEM

A. COMPONENT ASSIGNMENT

Component	Serial Number
Recovery Subsystem	639
Take-Up Cassette	T-30/TJ-30

B. PREFLIGHT TESTING

SRV 639 was received at A/P September 5, 1963, weighing in at 152 pounds. Normal disassembly was completed prior to A/P modifications. After modifications and E.O. incorporations, testing was completed for SRV 639 integration to the J9 system.

The following items are noteworthy of being above the normal testing required and the rework/mods required, thus effecting additional A/P effort in rework and acceptance testing.

Date	Item	Discrepancy	Action
4-21-64	Forebody	Outer shell had small separation from inner shell	Replaced a dowel and sealed
4-21-64	W4 Harness	Shield tie pin loose	Replaced W4 harness
5-13-64	Forebody	Shorted to thrust cone	Forebody filed to isolate contact with T/C

On April 21, 1964, all A/P testing per procedures J13xxxx, installations, modifications, alignments, and cleanups were completed. Then SRV 639 was shipped to VAFB on April 26, 1964.

VAFB pre pad installations and testing functions were completed May 19, 1964. The Mission 1006, Vehicle 1176, SRV Systems pad run was completed successfully on May 22, 1964.

After the pad run additional flight preparations were completed on May 24, 1964. Then the entire J9 payload left for the launch pad #1, PALC on

May 27, 1964. On June 1, 1964 at the launch pad, the beacon came on during launch checks. The payload was demated from the vehicle and shook, and retested. Interface connectors were cleaned and rechecked. Then the payload was remated and launch activities continued. Launch occurred 1600 June 4, 1964.

C. INFLIGHT DATA

Sequence of events, commands, temperatures and other payload functions are discussed in Section II.

D. POSTFLIGHT EVALUATION

SRV 639 was recovered in the air June 12, 1964, after the 128th orbit. It was transported by air from Hawaii and arrived at A/P 0500, June 13, 1964 for film retrieval. It weighed in at 176.5 pounds. Retrieval operations proceeded normally. Weight of the recovered cassette #1 plus film was 69.8 pounds. Weight of the cassette #2 plus film was 70 pounds. There was 8 feet of unwrapped slave camera film inside the capsule. It was wrinkled back four feet. The tag end was badly torn. The cassettes, with film, were packaged for shipment and turned over to A/P security for shipment to the customer.

SRV Post Flight testing was per A/P procedure #5110. The beacon, recovery programmer, and telemetry were within specifications.

Various components of this SRV would possibly be used for flight again. However, this will be at the direction of the customer.

[redacted]

SECTION XIV

VEHICLE ATTITUDE CONTROL

The vehicle attitude control errors are obtained from the Horizon Camera and Stellar Camera photographs and are sent to A/P on the Frame Correlation magnetic tape. The attitude control rates are calculated on the A/P computer. Frequency distribution graphs are plotted by the computer. The graphs for Mission 1006-1 attitude control errors and rates are on Figures 44 to 47 on pages [illegible] to [illegible], and for Mission 1006-2 on Figures [illegible] to [illegible] on pages [illegible] to [illegible].

The summary below of the attitude errors and rates shows the maximum value that occurred during 90% of the photographic operations and the range of values during all photography. The predicted 90% values of attitude errors and rates are also listed.

		MISSION 1006-1		MISSION 1006-2	
	Predicted	90%	Range	90%	Range
Errors (^{o})					
Pitch	1.0	0.41	-0.99/+0.45	0.49	-0.75/+2.00
Roll	0.5	0.42	-0.92/+0.38	0.40	-0.80/+0.64
Yaw	1.1	1.14	-1.69/+0.27	1.08	-1.70/+0.30
Rates (^{o}/hr)					
Pitch	30	27	-97 +86	31	-100/+100
Roll	30	28	-53 +98	28	-58/+74
Yaw	30	27	-63 +57	30	-42/+78

The vehicle attitude control performed as predicted and the resulting image motion was below the detectable limit of the Panoramic Camera Subsystem.

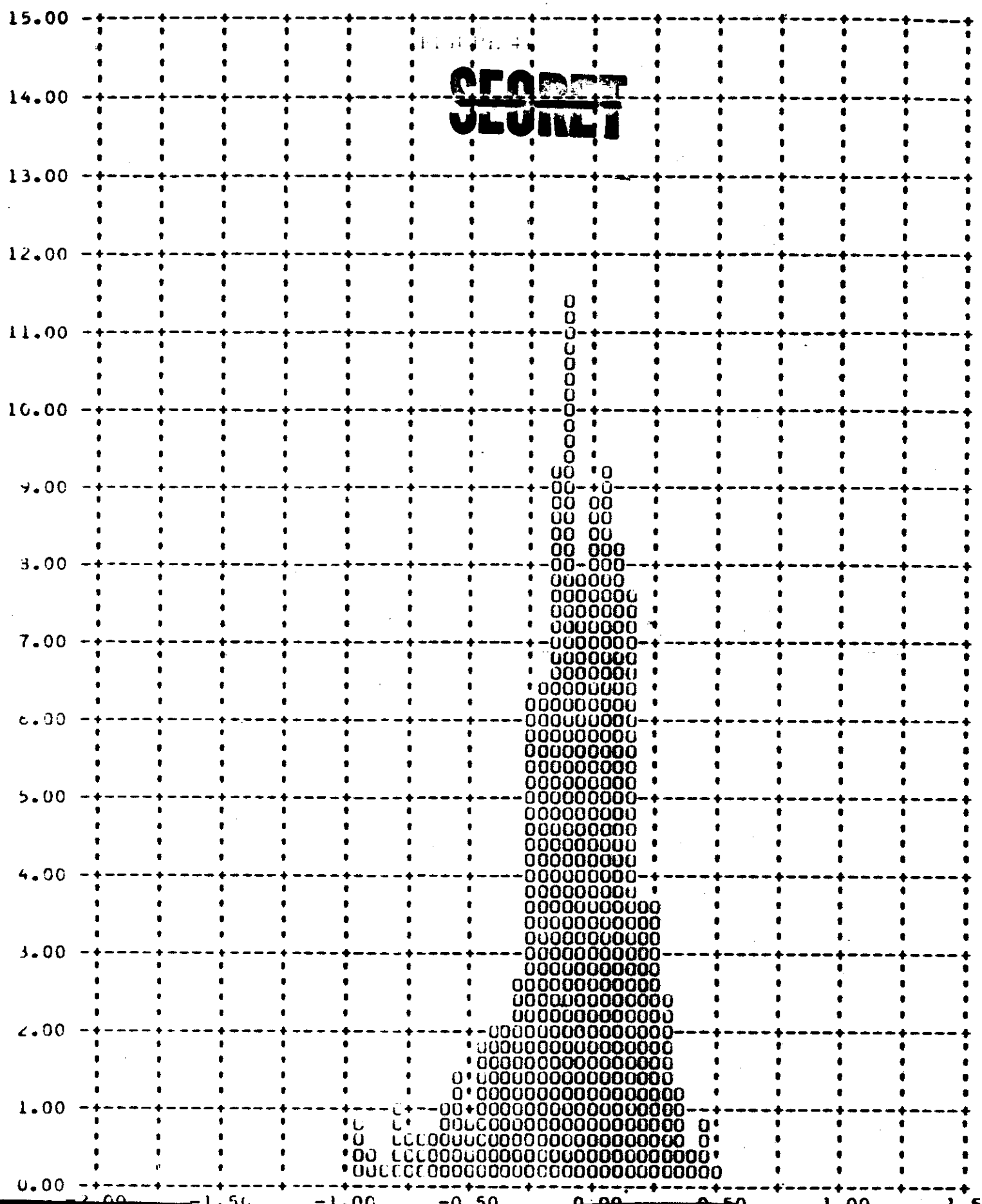
Attitude control ranges obtained from inflight telemetry data was tabulated for passes 9, 31, 47, 56, 103 and 126. The values from the attitude control horizon sensor and gyro are compared with photographic values in Table II, page [illegible].

[redacted]

[redacted]

J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 0.41

Y PITCH ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)

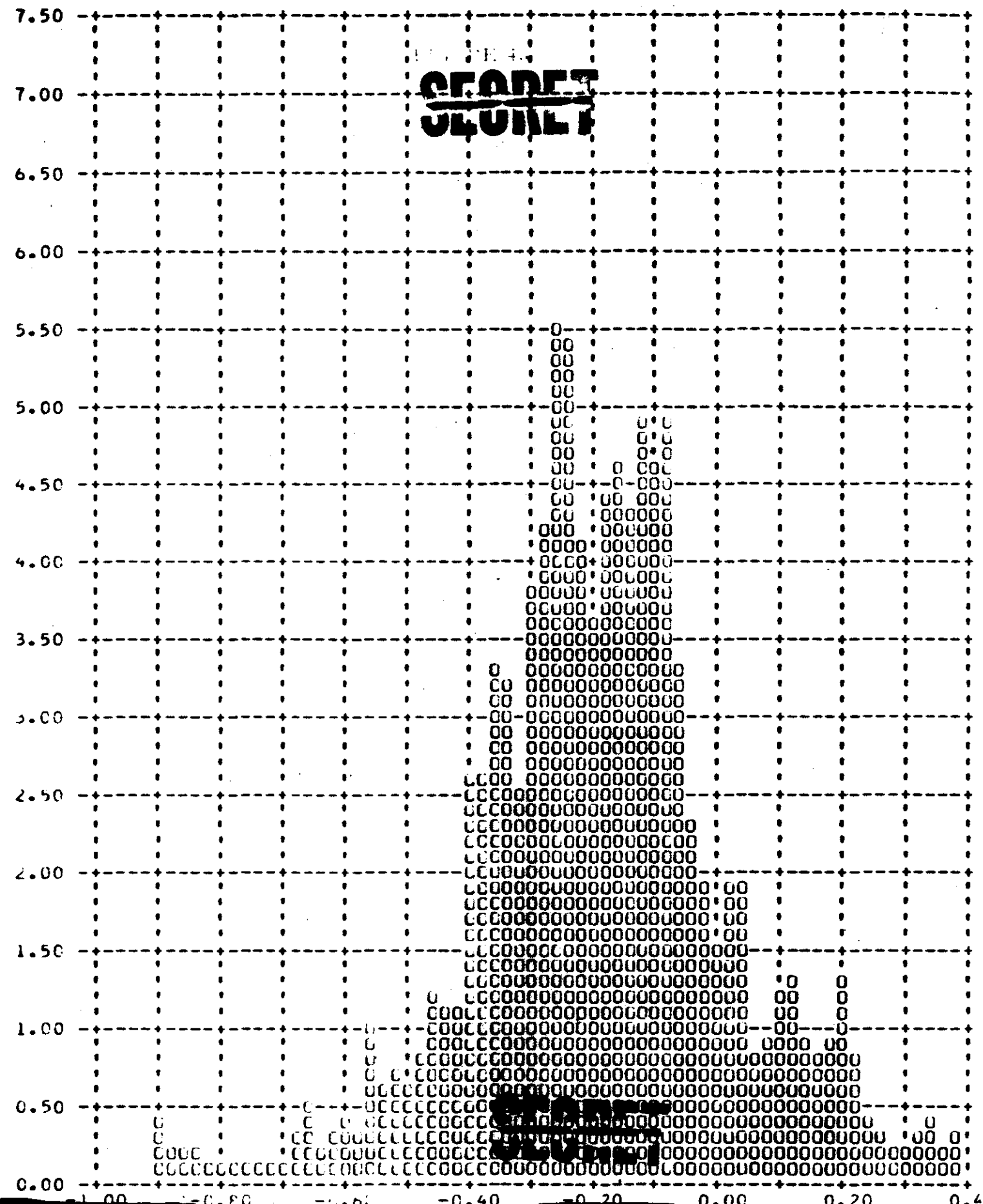


MISSION 1006-1

MISSION 1006-

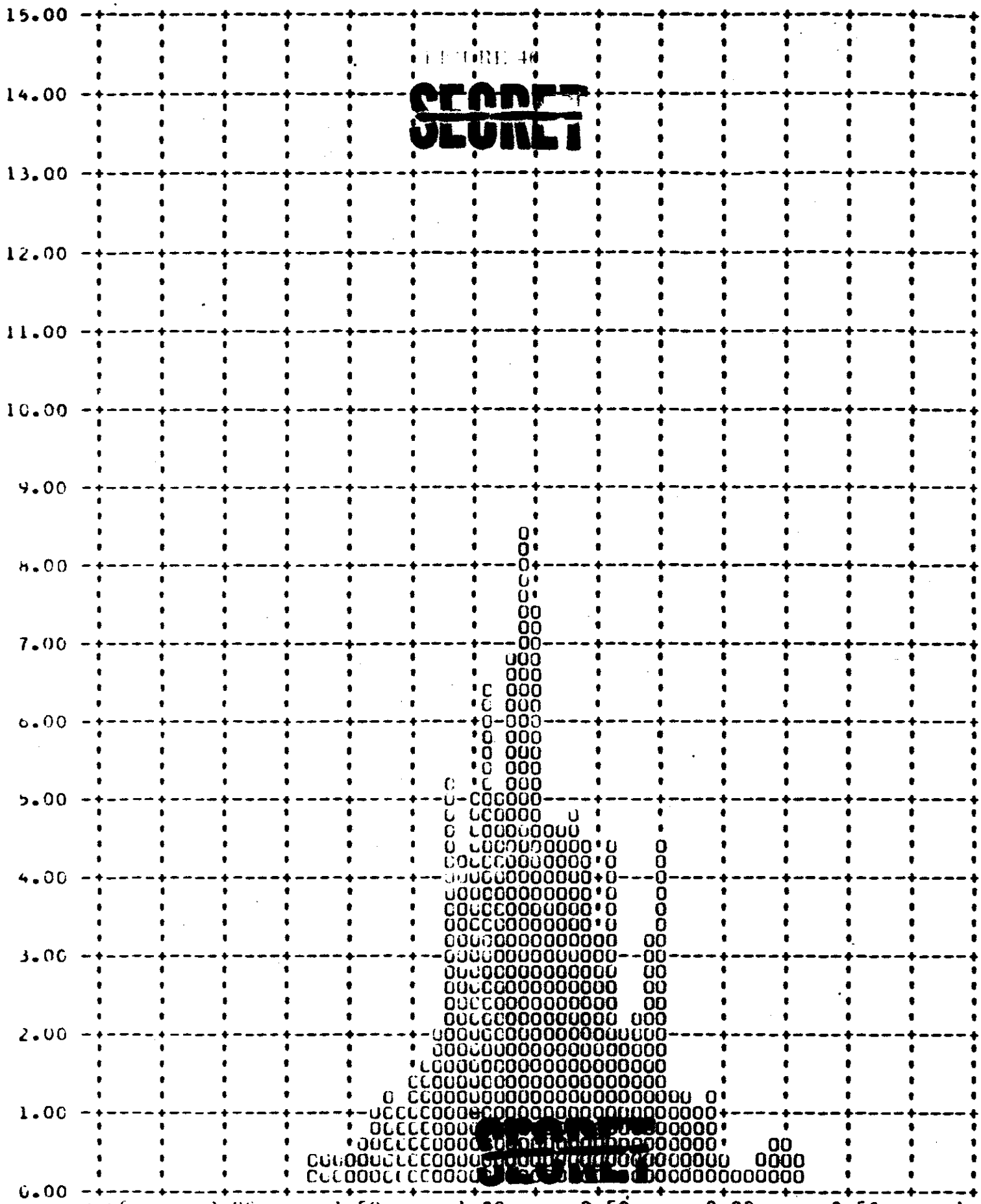
J-09 A BUCKET 9-22-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 0.42

Y ROLL ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)



J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 1.14

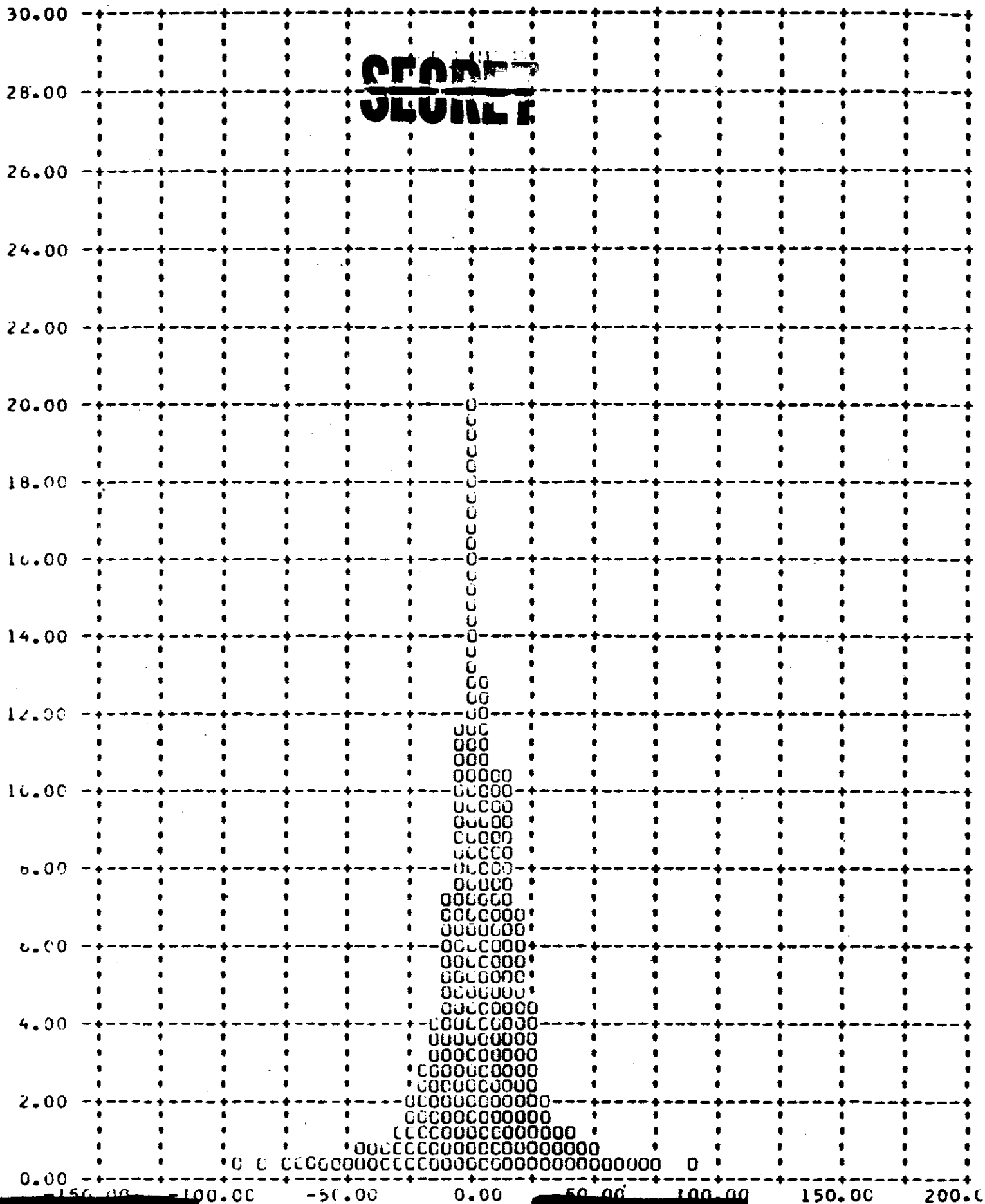
Y YAW ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)



[redacted] MISSION 1006-1 [redacted] MISSION 1006-

J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 26.78

Y PITCH RATE ERROR - DEG/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)



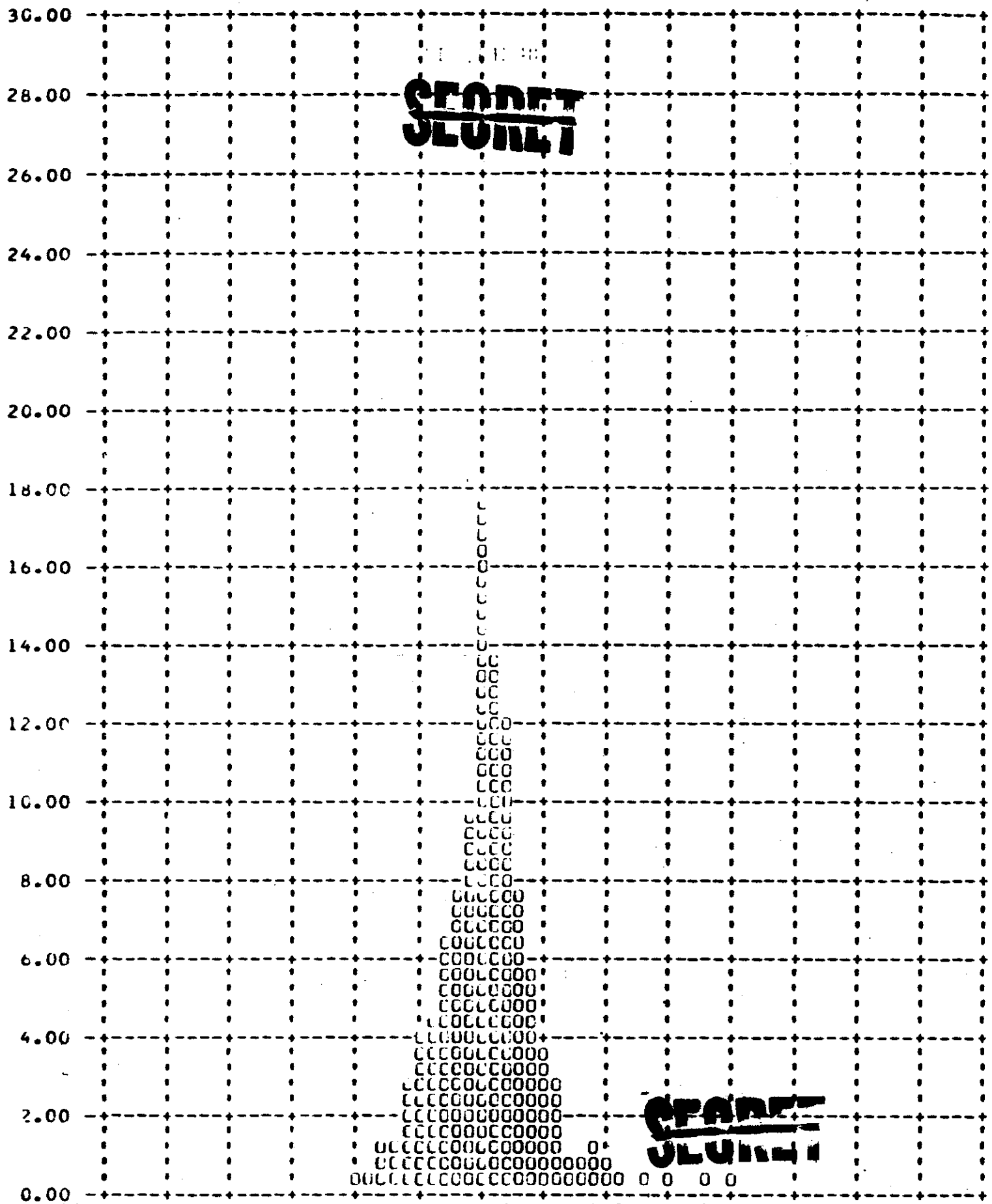
MISSION 1006-1

MISSION 1006-

[redacted] MISSION 1006-

J-09 A BUCKET 9-22-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 28.4%

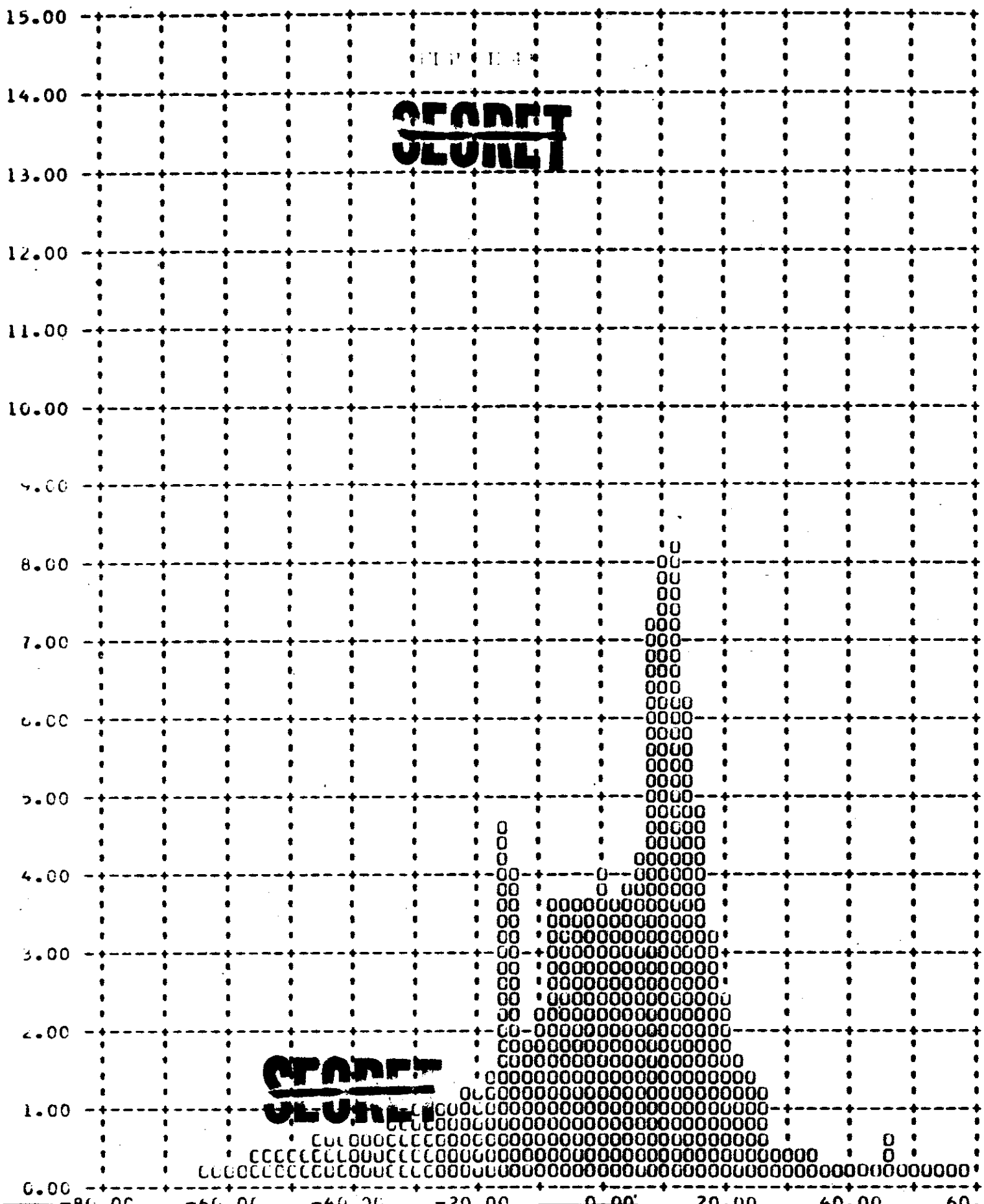
Y ROLL RATE ERROR - DEG/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)



[redacted] MISSION 1006-1 [redacted] MISSION 1006-1

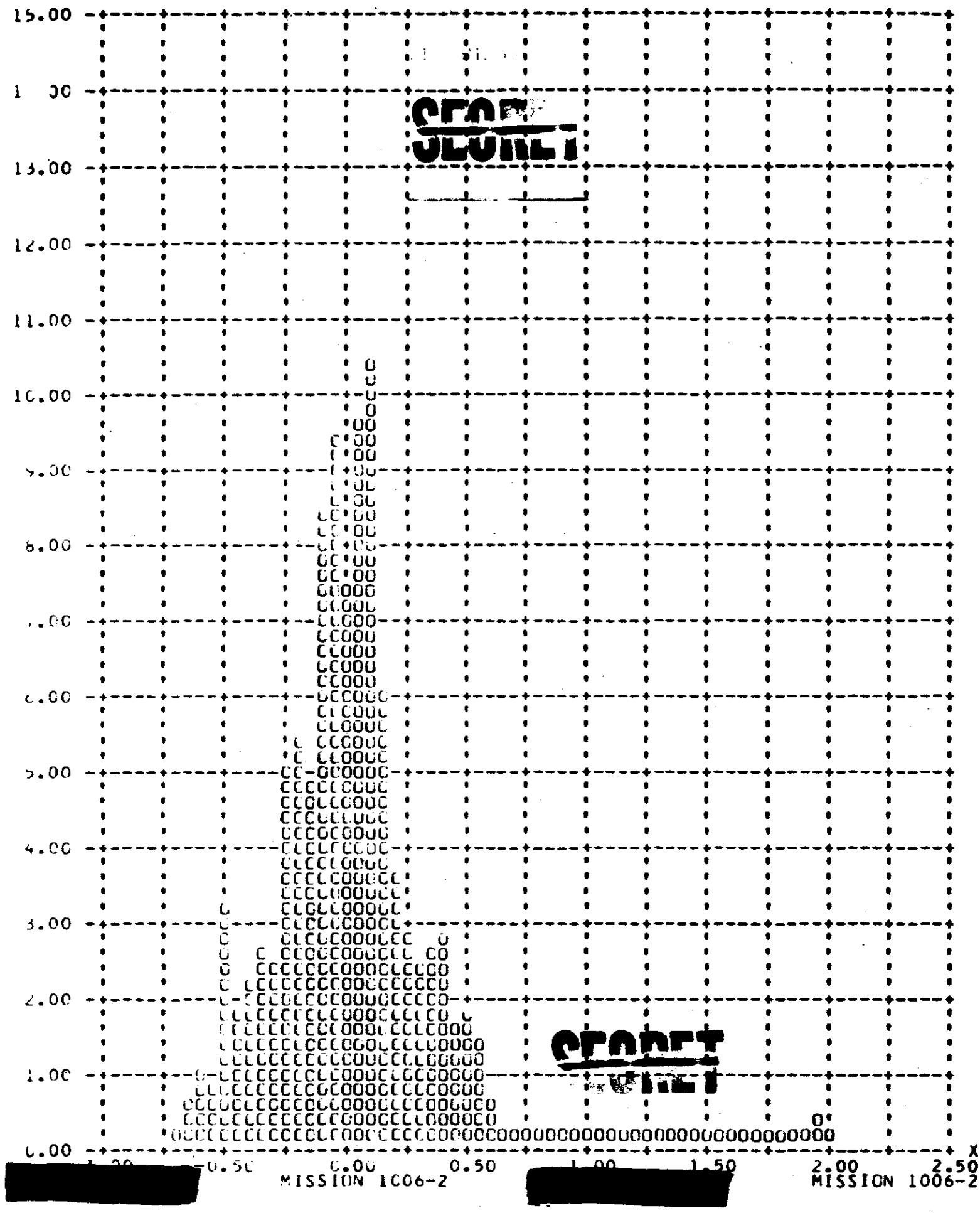
J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 27.82

Y YAW RATE ERRCR - DEG/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)

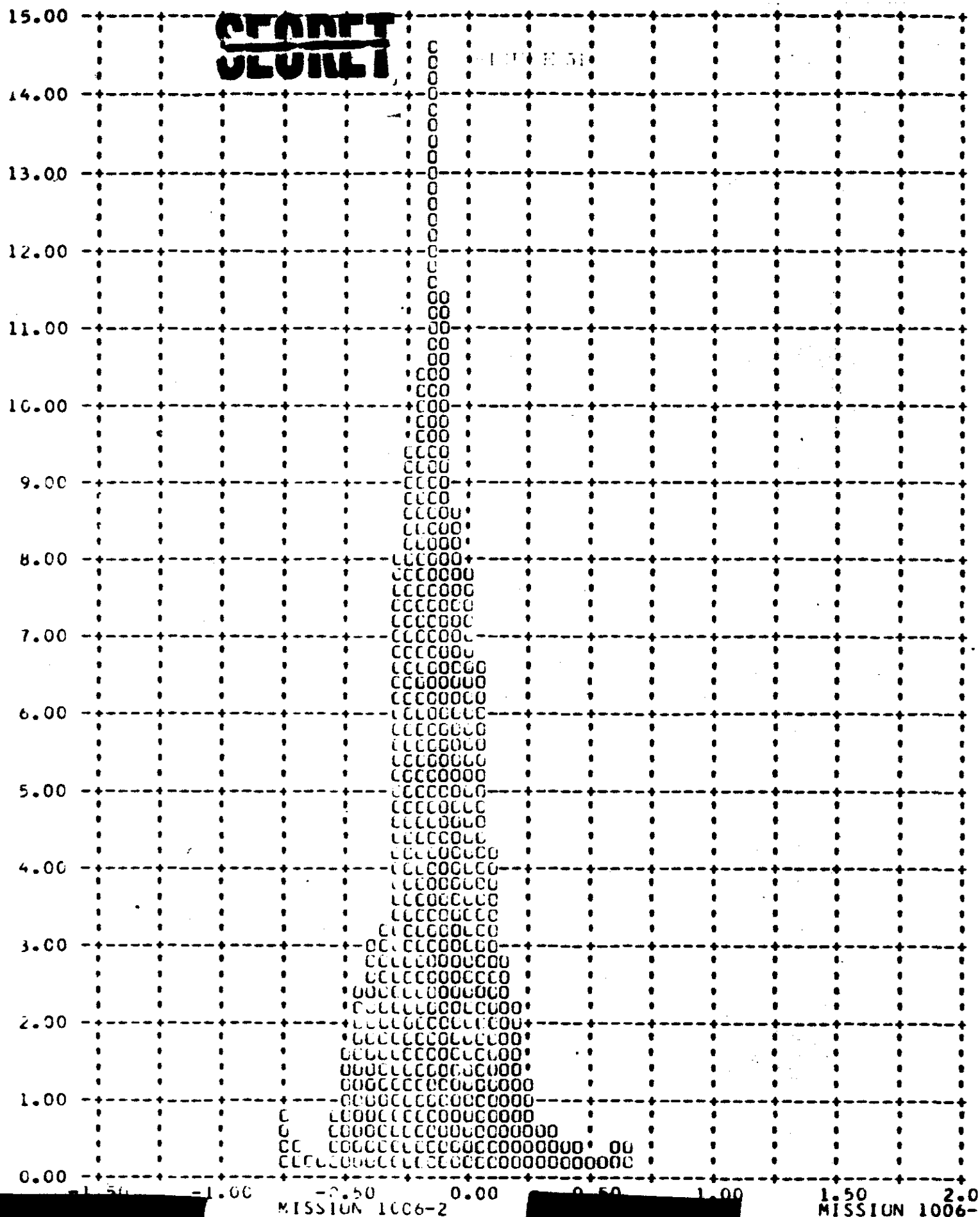


MISSION 1006-1

MISSION 1006-

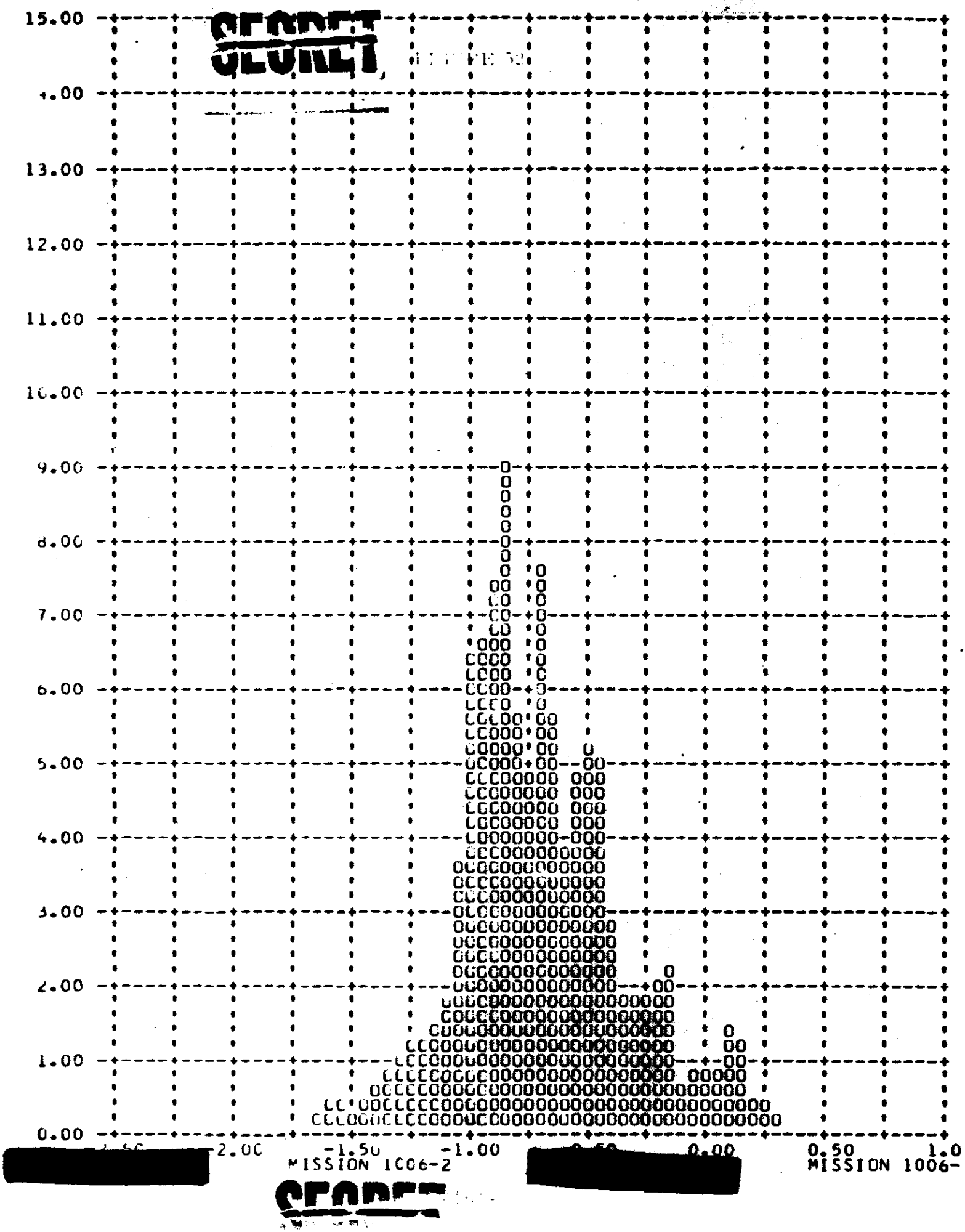

Y PITCH ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)
15.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-0.50
0.00
0.50
1.00
1.50
2.00
2.50
X
MISSION 1006-2
MISSION 1006-2

Y ROLL ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)



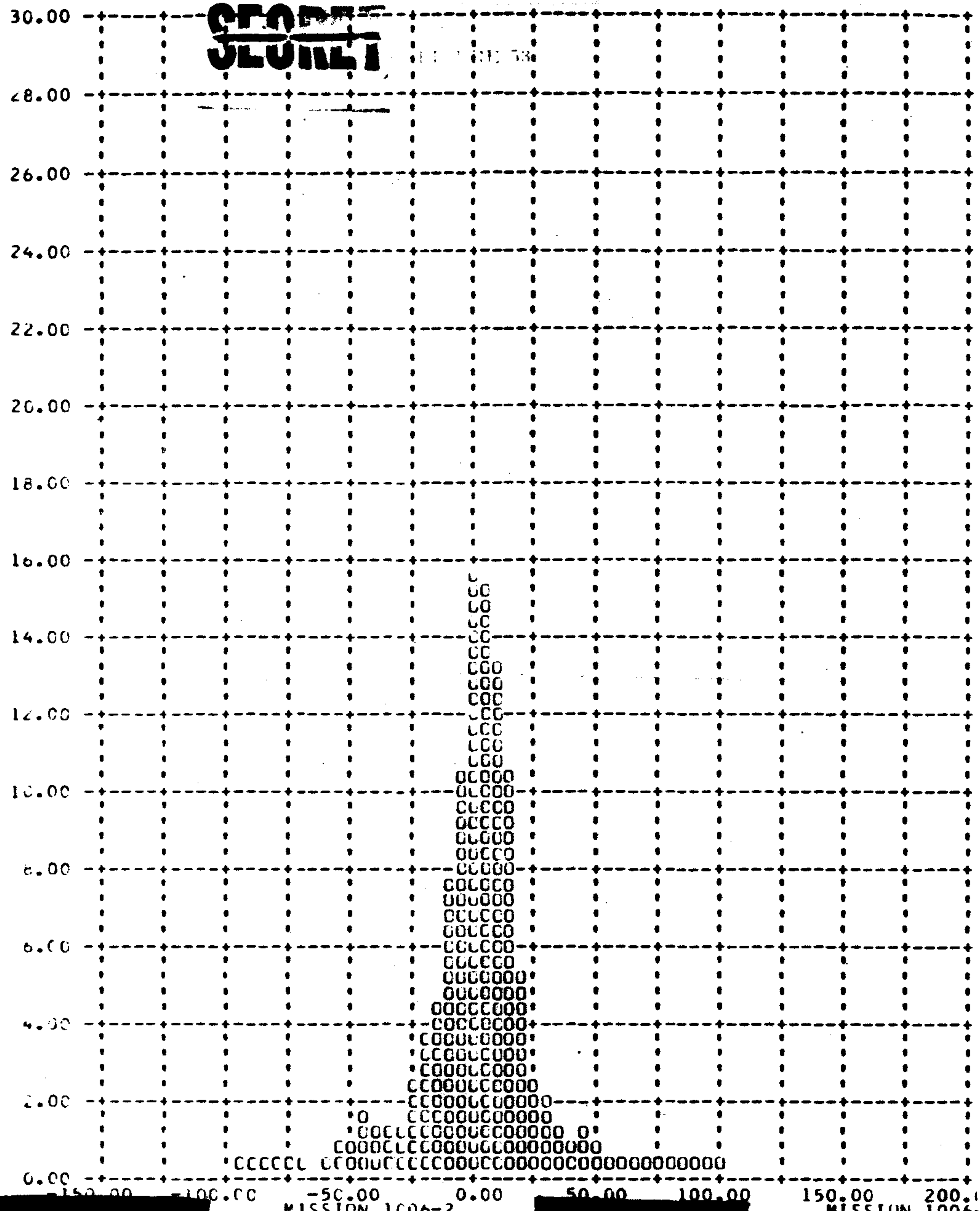
MISSION 1006-2

MISSION 1006-


Y YAW ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)
15.00
4.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-2.00
-1.50
-1.00
0.00
0.50
1.0
MISSION 1006-2
MISSION 1006-

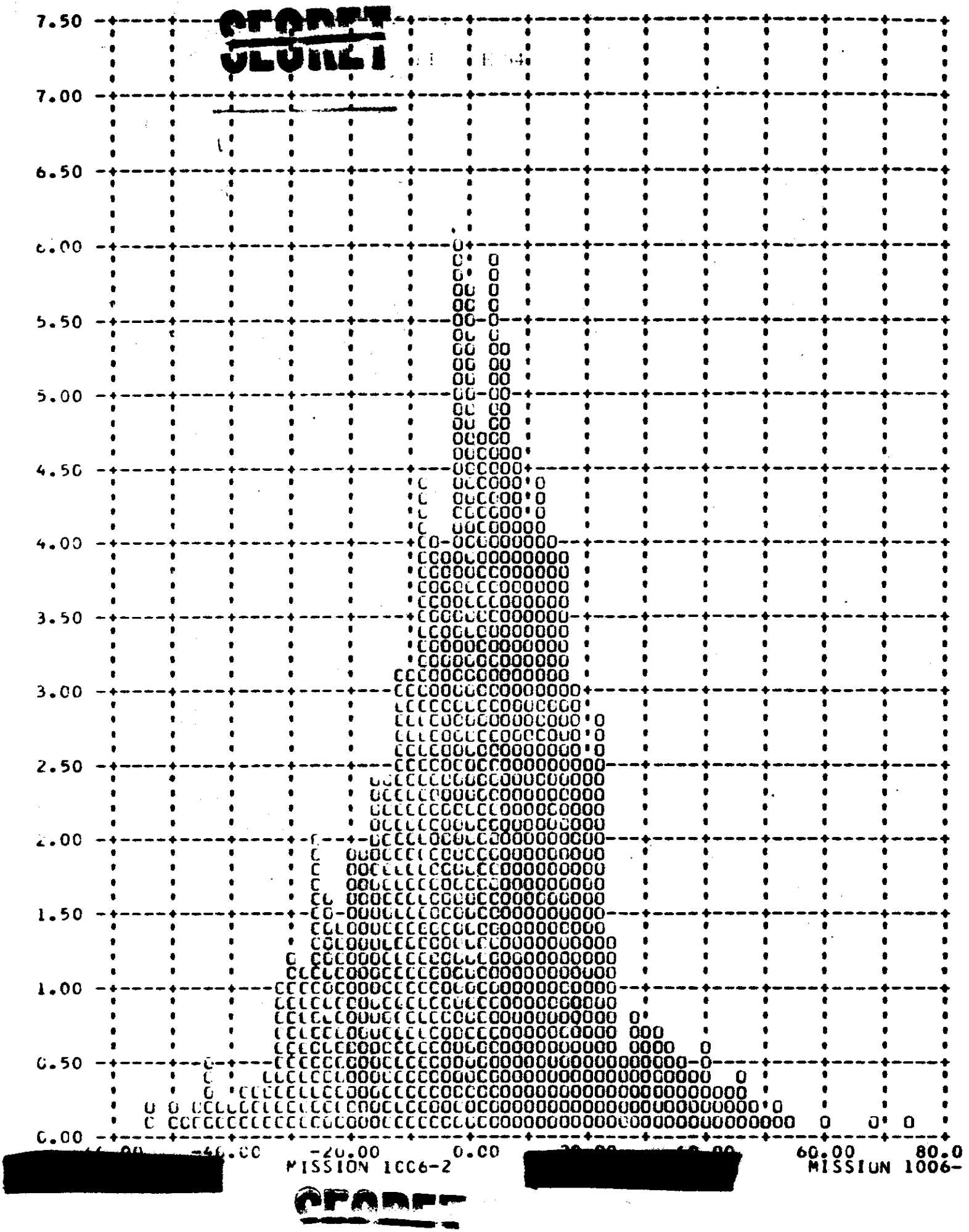
Y PITCH RATE ERRCR - DEG/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)

SECRET

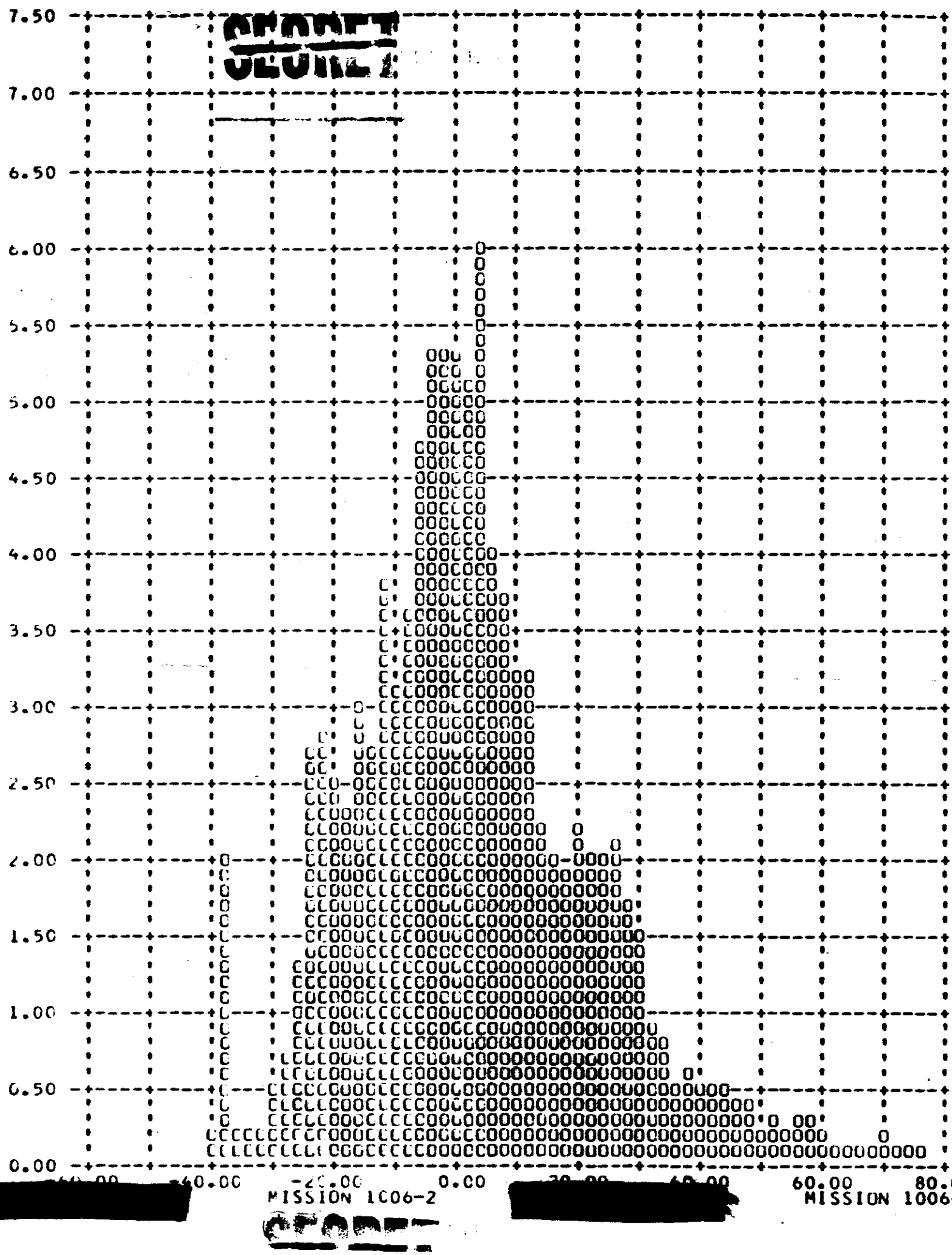


[redacted] MISSION 1006-2 [redacted] MISSION 1006-

SECRET


Y ROLL RATE ERROR - DEG/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-40.00
-20.00
0.00
60.00
80.0
MISSION 1CC6-2
MISSION 1006-

J-09 B BUCKET 9-11-84 FRAMES 1-8 OF EACH 8 SAMPLES



[redacted]

TABLE II

ATTITUDE CONTROL DATA COMPARISON

Pass Number		9	31	47	56	103	126
Errors (°)							
Pitch	Sensor	+0.1/-0.5	+0.3/-0.8	-0.1/1.0	0/-0.6	0/-0.9	-0.1/-0.8
	Gyro	+0.3/-0.1	+0.4/-0.6	+0.4/-0.6	+0.4/-0.6	+0.3/-0.7	+0.4/-0.5
	Photo	+0.1/-0.2	-0.9/-1.0	-	-0.3/+0.2	+0.1/-0.1	-
Roll	Sensor	+0.1/-0.3	+0.3/-0.5	+0.3/-0.2	+0.4/-0.5	+0.3/-0.4	+0.4/-0.3
	Gyro	+0.3/-0.5	0/-0.2	0/-0.2	+0.3/-0.4	+0.2/-0.4	-0.1/0.3
	Photo	-0.1/-0.2	0/-0.2	-	-0.1	-0.1/-0.5	-
Yaw	Gyro	+0.2/-0.3	+0.4/-0.6	-0.5/-0.7	+0.4/-0.4	+0.4/-0.5	+0.4/-0.6
	Photo	-0.9	No Data	-	No Data	-1.3/-0.7	No Data
Rates (°/hr)							
Pitch	Sensor	43	48	34	38	40	32
	Gyro	40	44	41	32	48/40	22
	Photo	22	45	-	35	17	-
Roll	Sensor	41/60	42	49/74	74/42	43/50	140
	Gyro	103/36	19	10	44	33	19
	Photo	14	27	-	9	27	-
Yaw	Gyro	37	61	26	22	36	36
	Photo	2	No Data	-	No Data	30	-

[redacted]

SECTION XV

IMAGE SMEAR ANALYSIS

The V/h error encountered during both missions was much larger than usual due to the low perigee. The frequency distribution of the errors for Mission 1006-1 are computer plotted in Figure 56, page [illegible] and for Mission 1006-2 in Figure 59, page [illegible]. These V/h values are derived from the time word in the binary data block and compared against the ephemeral data which defines the proper V/h value.

A computer program at A/P has been developed to calculate the total image motion resulting from the various attitude errors and rates, earth rotation and the V/h errors. The resulting image motion is then used to calculate a theoretical ground resolution limit along the flight path and across the flight path, based on a 70% allowable smear factor. The resolution limit values would apply to any camera system attached to the vehicle having the same errors and using the same exposure time. The resolution limit value indicates the minimum ground resolution that can be recorded and not the actual resolution that was recorded. Normally the computed resolution limit is well below the system capability. The resolution limit frequency distribution plots for Mission 1006-1 are shown in Figures 57 and 58 on, page [illegible] and [illegible], and for Mission 1006-2 in Figures 60 and 61, page [illegible] and [illegible].

A summary of the maximum V/h errors, along track and cross track resolution limits that occurred during 90% of the photographic operations is shown below.

	1006-1	1006-2
V/h Error	15.4%	11.6%
Along Track Resolution Limit	13.8'	10.1'
Cross Track Resolution Limit	6.7'	7.0'

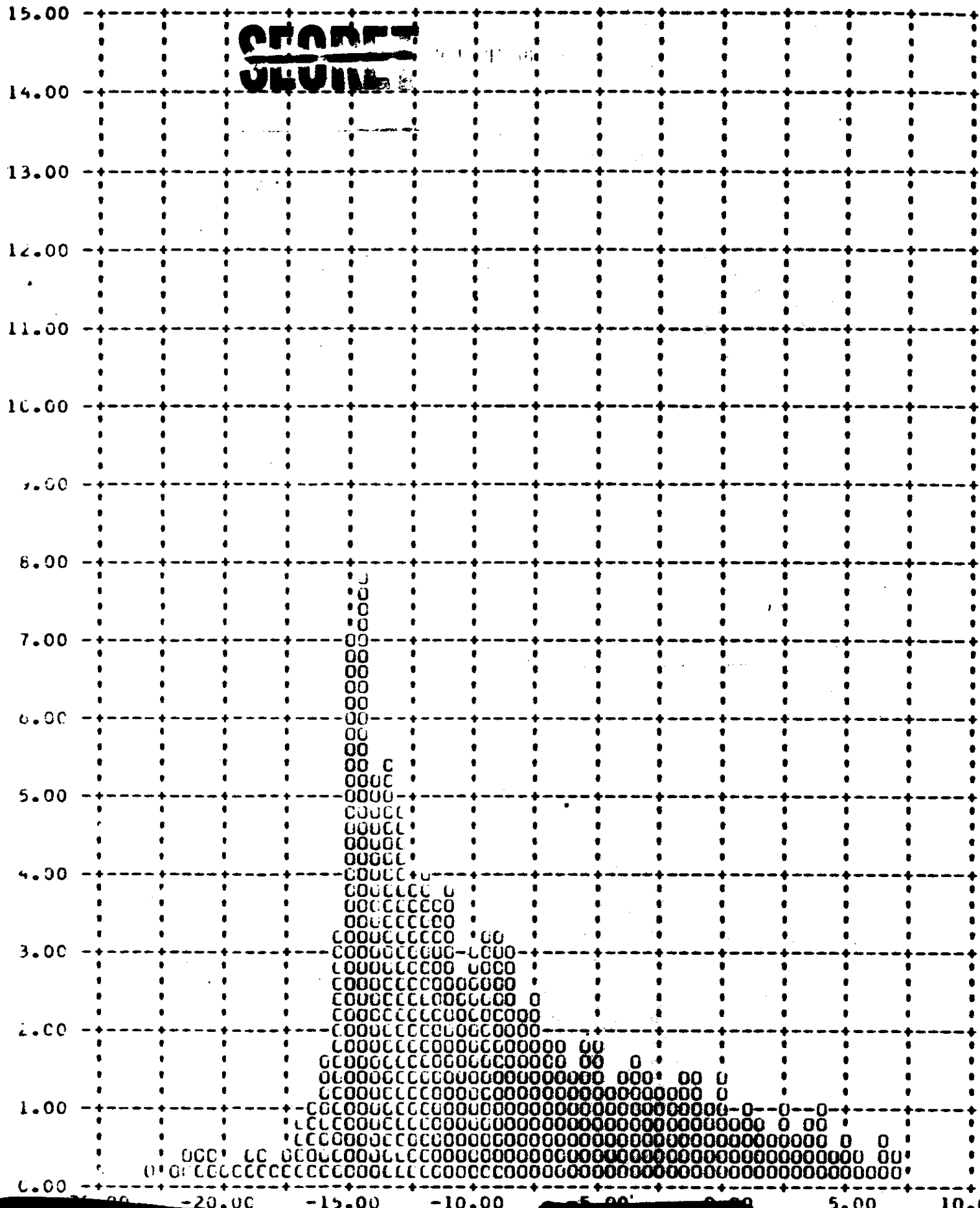
It is apparent that some degradation occurred in the information content of the photography however five foot objects, ten foot ground resolution, were within the system limits for the majority of Mission 1006-1 and 90% of Mission 1006-2.

The horizon sensor and gyro data for passes 31 and 56 was obtained during camera operation whereas the remaining data was in a non-operating mode. There were no camera operations during passes 47 and 126 therefore no attitude values from photography are available.

Generally, the attitude error data from the vehicle telemetry correlates quite well with the photographic data. Far less correlation is present in the rate values particularly in the roll axis.

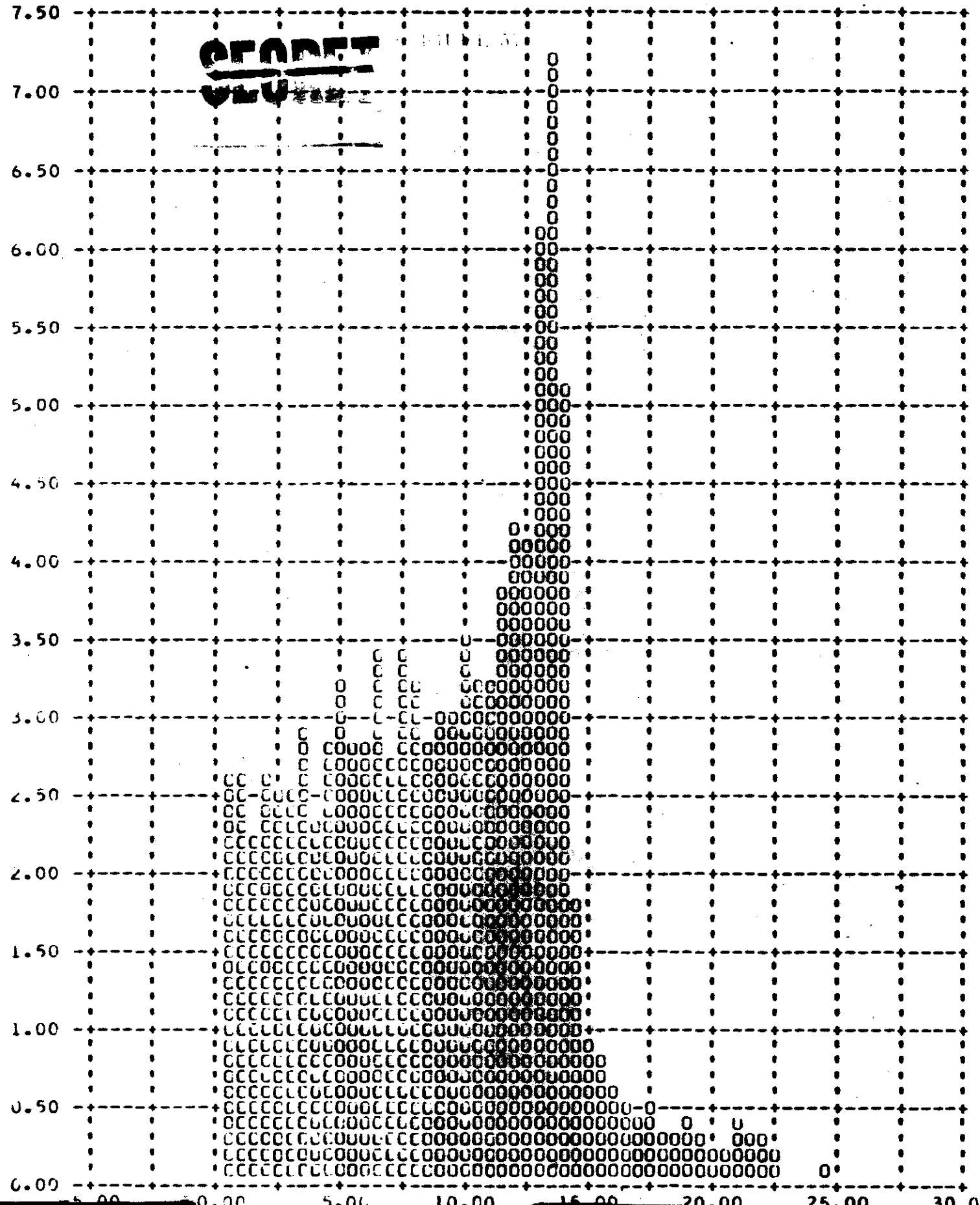
J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 15.38

Y V/H RATIO ERROR - PERCENT (X) VERSUS FREQUENCY - PERCENT (Y)



J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 13.76

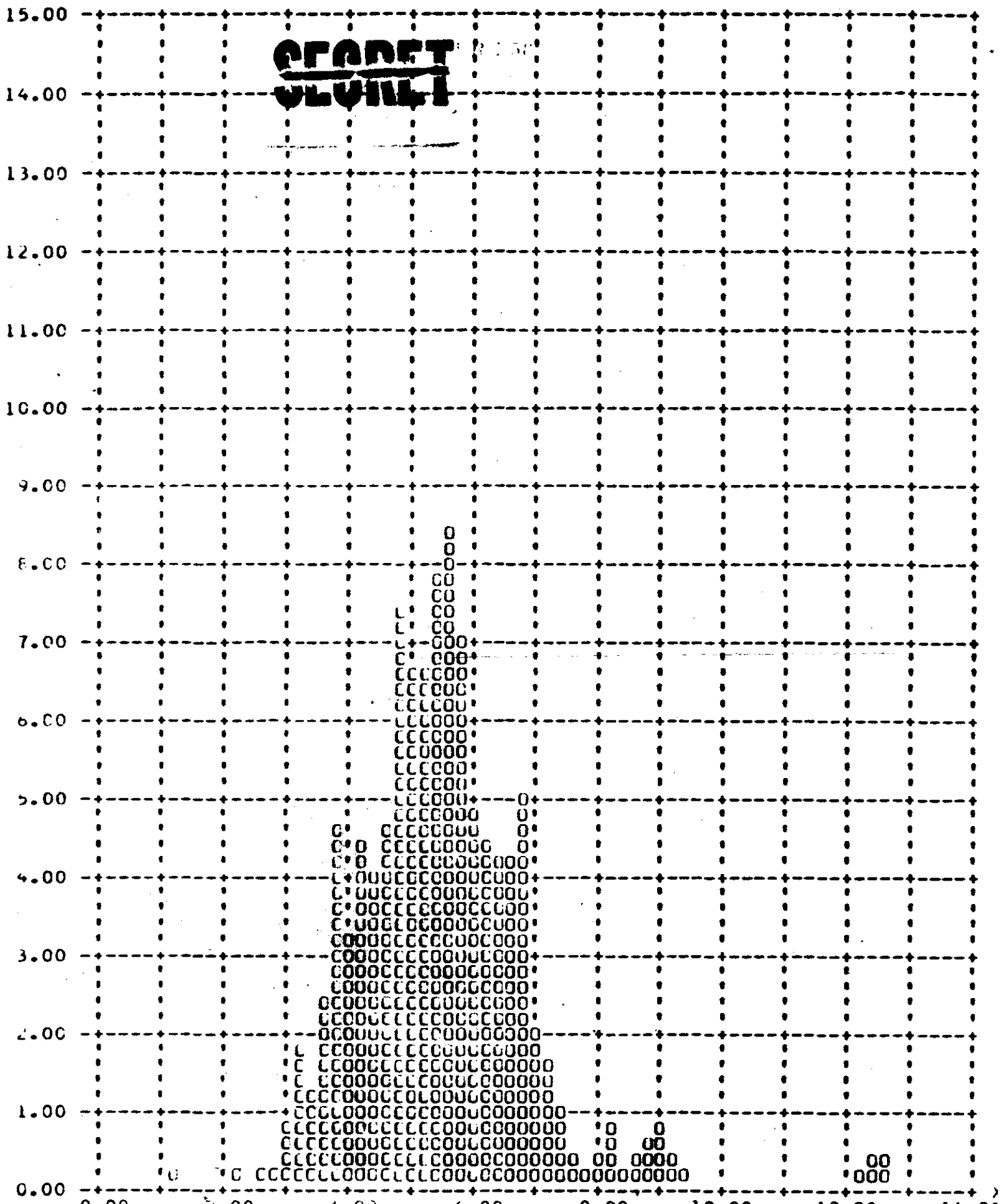
Y ALONG TRACK RESOLUTION LIMIT - FEET (X) VERSUS FREQUENCY - PERCENT (Y)

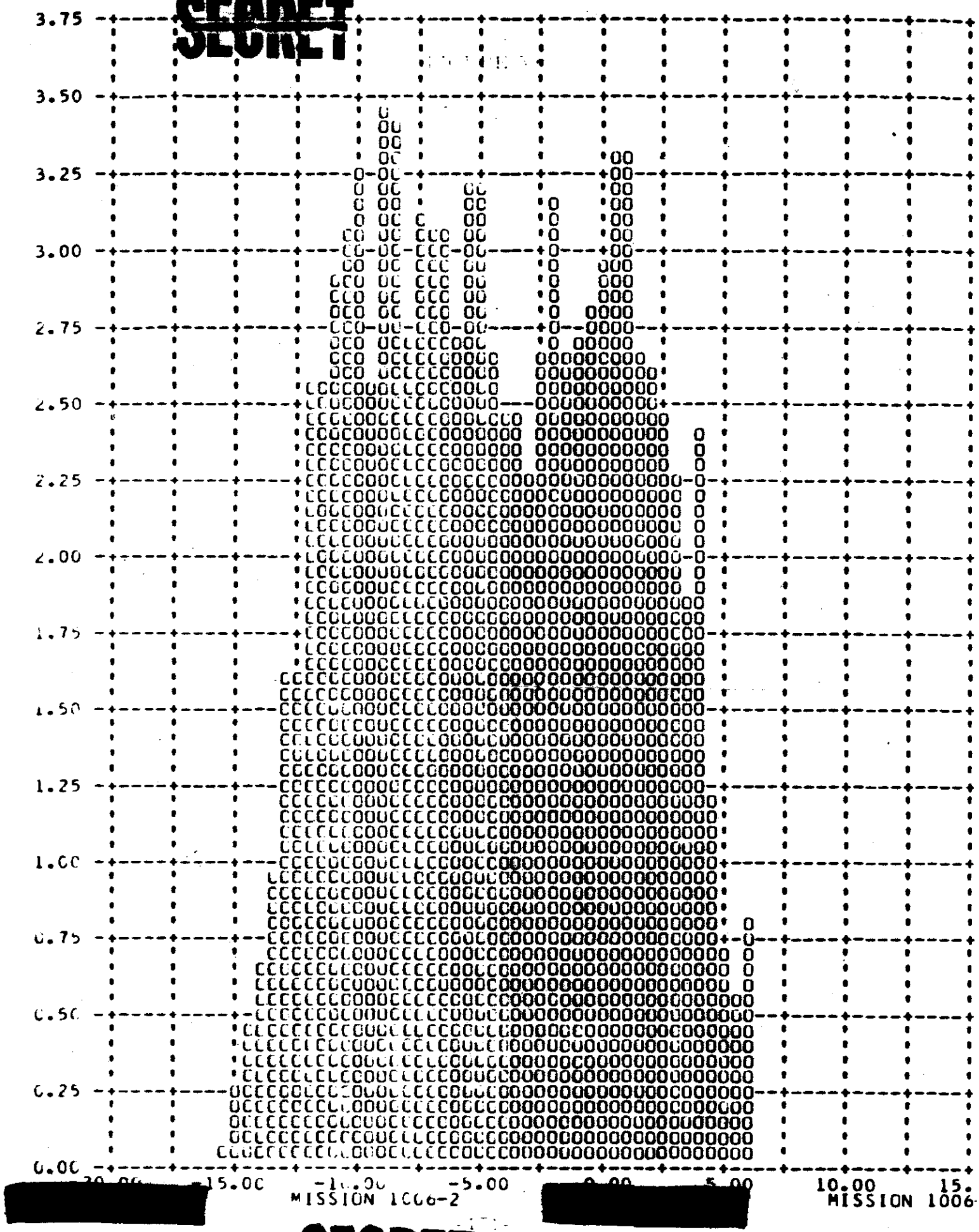


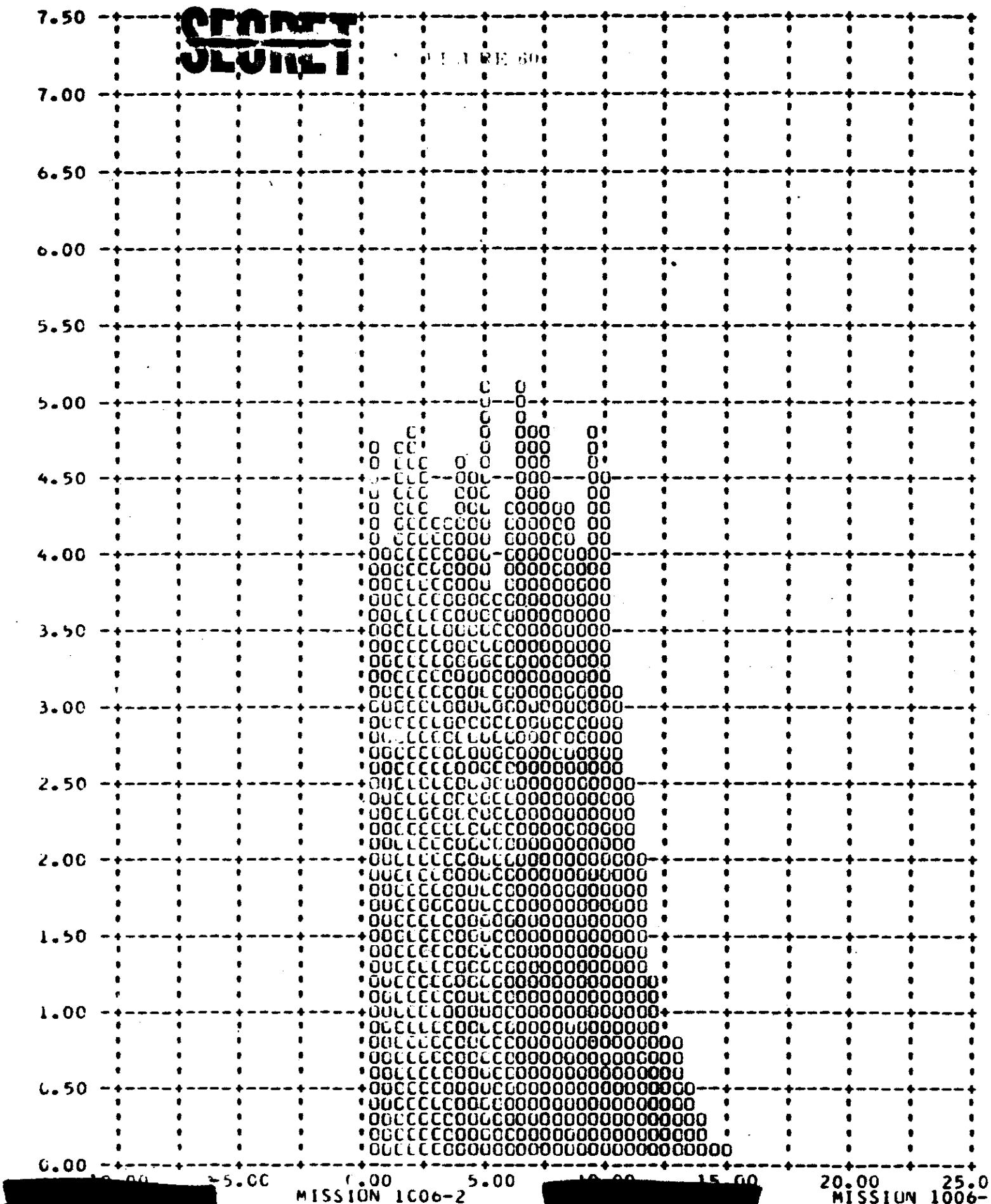
MISSION 1006-1 MISSION 1006-

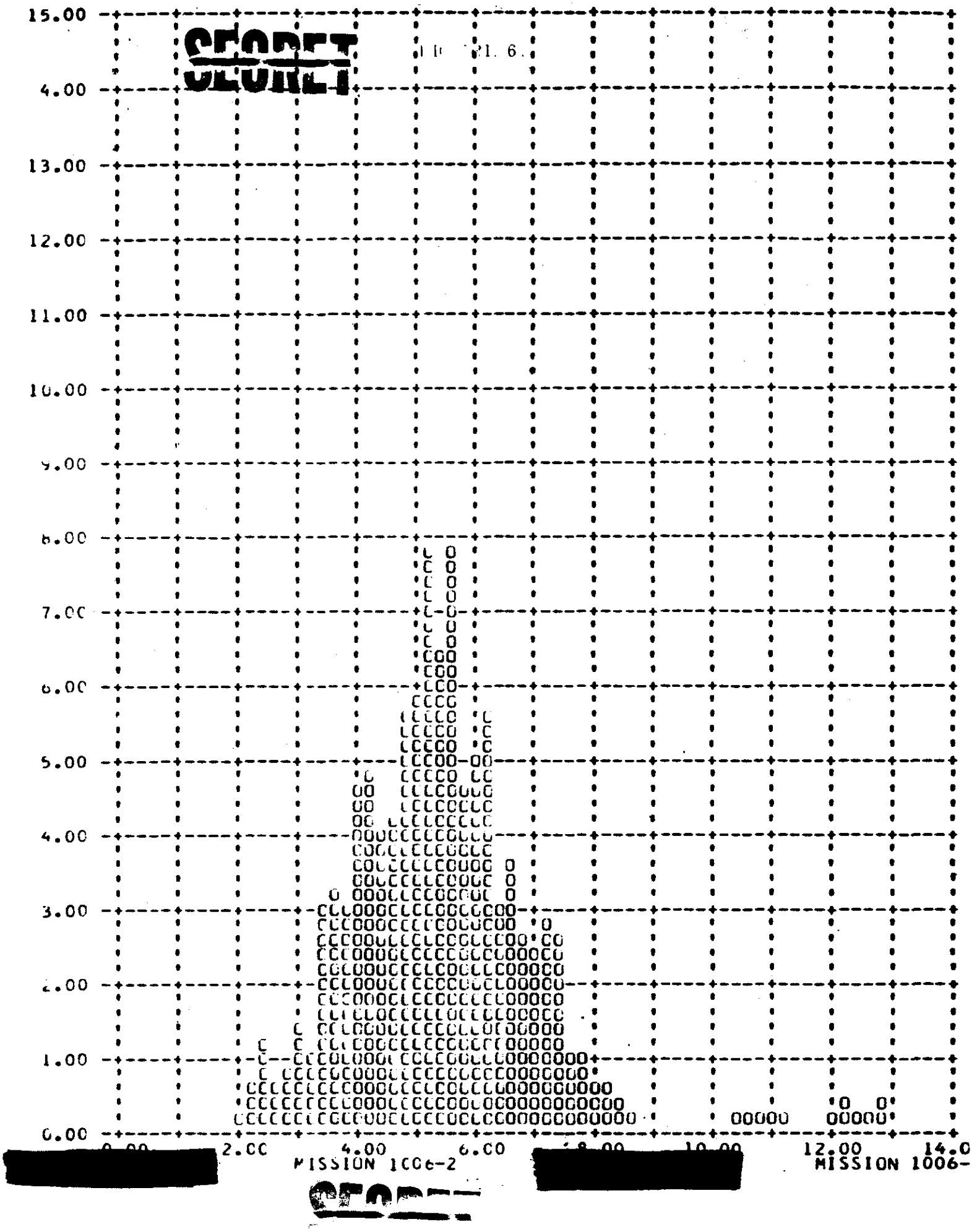
J-09 A BUCKET 9-14-64 FRAMES 1-6 OF EACH OP OMITTED 90 PERCENT = 6.74

Y CROSS TRACK RESOLUTION LIMIT - FEET (X) VERSUS FREQUENCY - PERCENT (Y)






Y ALONG TRACK RESOLUTION LIMIT - FEET (X) VERSUS FREQUENCY - PERCENT (Y)
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-5.00
0.00
5.00
10.00
15.00
20.00
25.0
MISSION 1006-2
MISSION 1006-


Y CROSS TRACK RESOLUTION LIMIT - FEET (X) VERSUS FREQUENCY - PERCENT (Y)
15.00
4.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.0
MISSION 1006-2
MISSION 1006-

[redacted]

SECTION XVI

RADIATION DOSAGE - MISSION 1006

The dosimeter pack from Mission 1006 was recovered, processed, and evaluated for radiation fog received in orbit. Approximately one roentgen of radiation was [illegible] by the dosimeter over a period in orbit of eight days. The radiation [illegible] received by Mission 1006 is [illegible] the same as [illegible]. Film type 4401 and [illegible] were used [illegible] registered [illegible] including [illegible] was not [illegible] to [illegible] low speed. [illegible] page [illegible] shows radiation [illegible] roentgen dose received for processed 4401 film type and Royal X Pan.

[redacted]

SECRET

[redacted]

It was noted in Section IX that the tail booms of the C-119's could be detected even though they are smaller than the calculated resolution limit. As stated the booms were detectable since they were relatively high contrast and widely separated. It is believed that this explains why smear is not apparent when the image motion is known to be excessive, as during Mission 1006.

The incorporation of equipment and techniques to reduce image [illegible] [illegible] yaw programmer [illegible] to aid only in the [illegible] [illegible] high contrast objects and [illegible] offer limited gain [illegible] cases where the objects are very close [illegible] is correct. [illegible] the average objects are not that close together; therefore the gain [illegible] will be in the low contrast, fine objects which are high predominant in cultural areas. The gains that can be realized by such equipment as the yaw programmer will, therefore, be much more significant.

[redacted]

[redacted]

SECTION XVII

RELIABILITY

Reliability calculations for the payload are based on a sample beginning with M7. Hence both the major part of the Mural Program and the "J" Program are covered in the evaluation. For certain auxiliaries, i. e., the stellar-index camera and the horizon cameras, the sample size is changed to recognize incorporation of modified equipment of new designs where reliability was one of the principal reasons for the modification. However, for primary mission functions the sample size is consistent with reliability reporting for the vehicle.

The reliability estimates of this section deal exclusively with the payload. Failures to achieve orbit or vehicle induced failures are here excluded. Recoveries before a complete mission has been completed are considered as full missions providing that early termination was caused by reasons not connected with payload operation. Film quality is not considered in the reliability estimate calculation. Hence, only electrical and mechanical functioning are considered.

The reliability estimate is also divided into primary and secondary functions. The primary functions are operation of the panoramic camera, main camera door operation, operation of the payload clock, and recovery operations. The secondary mission functions are horizon camera operation excluding catastrophic open shutter failure mode, auxiliary data recording, and stellar-index camera operation.

A. Panoramic Camera Reliability

Sample size = 56 opportunities to operate

One failure - capping shutter on slave instrument subsystem

Assume = 7000 cycles per camera per mission

Estimated Reliability = 98.2% at 50% confidence level

B. Main Camera Door Reliability

28 vehicles x 2 doors = 56 opportunities to operate

1 malfunction - door failed to eject but [redacted]

Estimated Reliability = 97.0% at 50% confidence level

[redacted]

[redacted]

C. Payload Clock Reliability

28 completed missions in sample

No failures

Estimated Reliability 97.6% at 50% confidence level

D. Estimated Reliability of On-Orbit functioning of payload is

.982 x .970 x .976 = 92.3

E. Recovery System Reliability

24 opportunities to recover

1 failure - improper separation due to water seal cutter failure

Estimated Reliability = 95.6% at 50% confidence

F. Stellar-Index Camera Reliability

Sample begins with M13

Sample size = 16

Number of failures = 5

Estimated Reliability = 73.0% at 50% confidence level

G. Horizon Camera Reliability

Sample includes M27, J5A, J5B, J6A and J6B. The
the redesigned 55mm focal length horizon camera

One failure has occurred - center-of-format switch

Estimated Reliability of a Single Camera = 81.8%

Estimated Reliability of Four Horizon Camera
installed redundant system = 90.8% at

H. Horizon Camera Door Reliability

Sample Size 22 x 4 = 88 opportunities to operate

No failures have occurred

Estimated Reliability = 99.2% at 50% confidence

[redacted]

1. Stellar-Index Camera Door Reliability

   Terrain Door, Stellar Door and Deployment of Stellar Baffle are functions considered

   Sample Size = 16 x 3 = 48 chances to operate

   One failure; stellar baffle failed to deploy

   Estimated Reliability = 95.7% at [redacted]

[redacted]

RADIATION DOSAGE
MISSION 1006-2

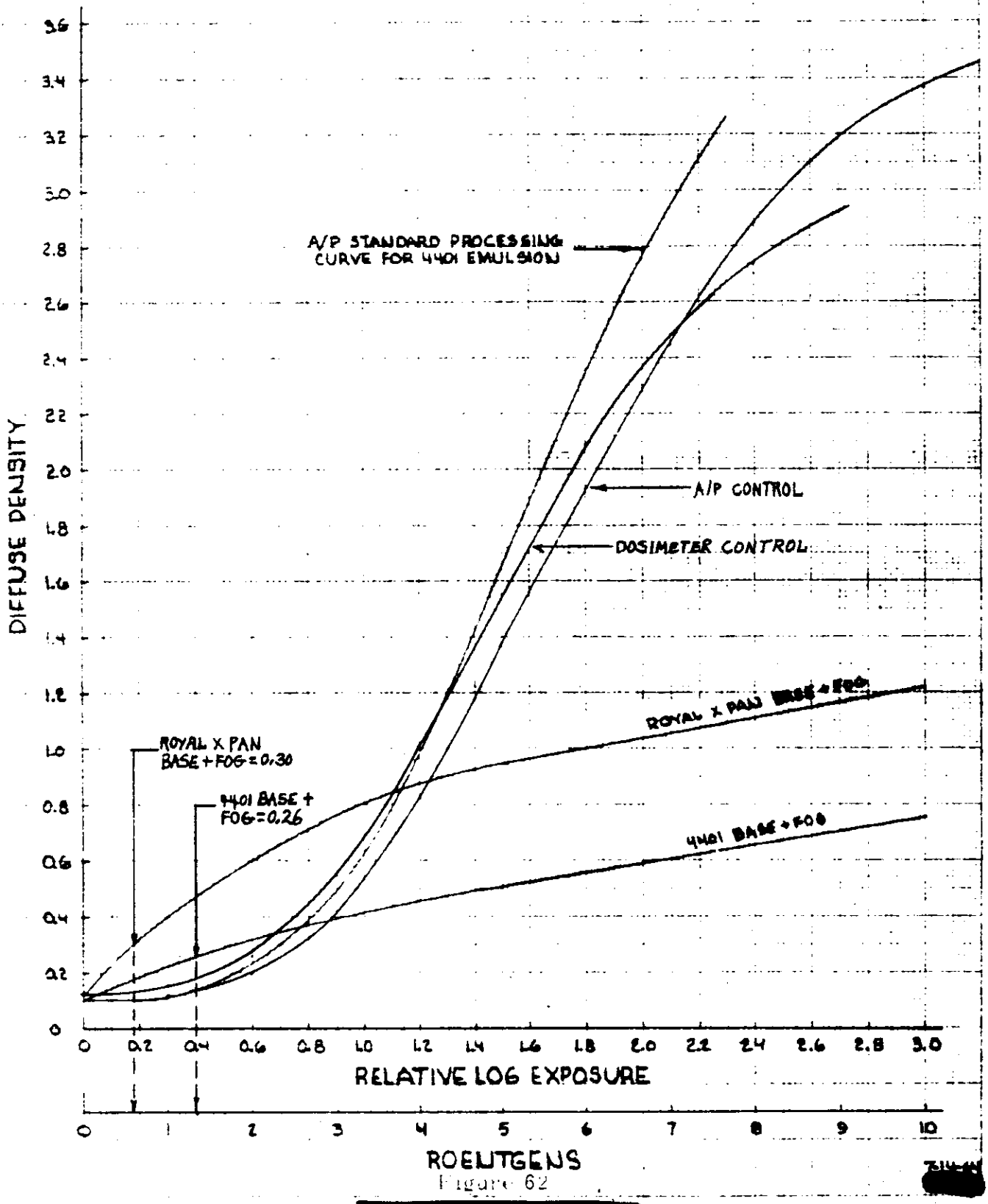
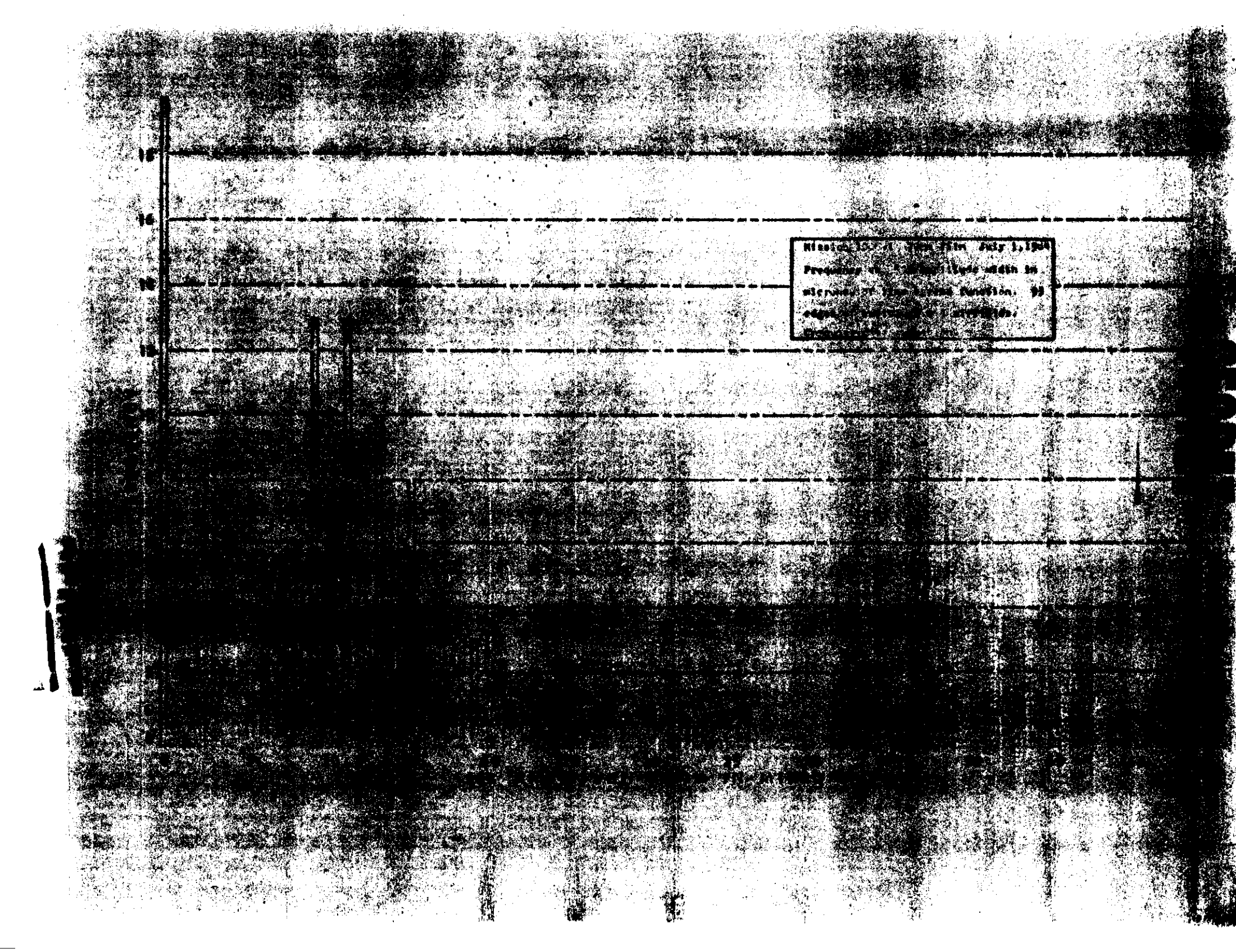


Figure 62


FREQUENCY
data reduction



Section [illegible]

[illegible]

Mission [illegible]

Film Manufacturer: [illegible]

Exposure Date: [illegible]

Emulsion No.: [illegible]

[illegible] No.: [illegible]

[illegible] Time: [illegible]

Wedge No.: 711-1[illegible]

Filter: Daylight [illegible]

Development Conditions: [illegible]

Primary: [illegible]

Intermediate: [illegible] 13DX90, 23", [illegible]

Full: Primary [illegible] 1' 10", 85° F

Absolute Log E [illegible]

Page 2

[illegible] Data

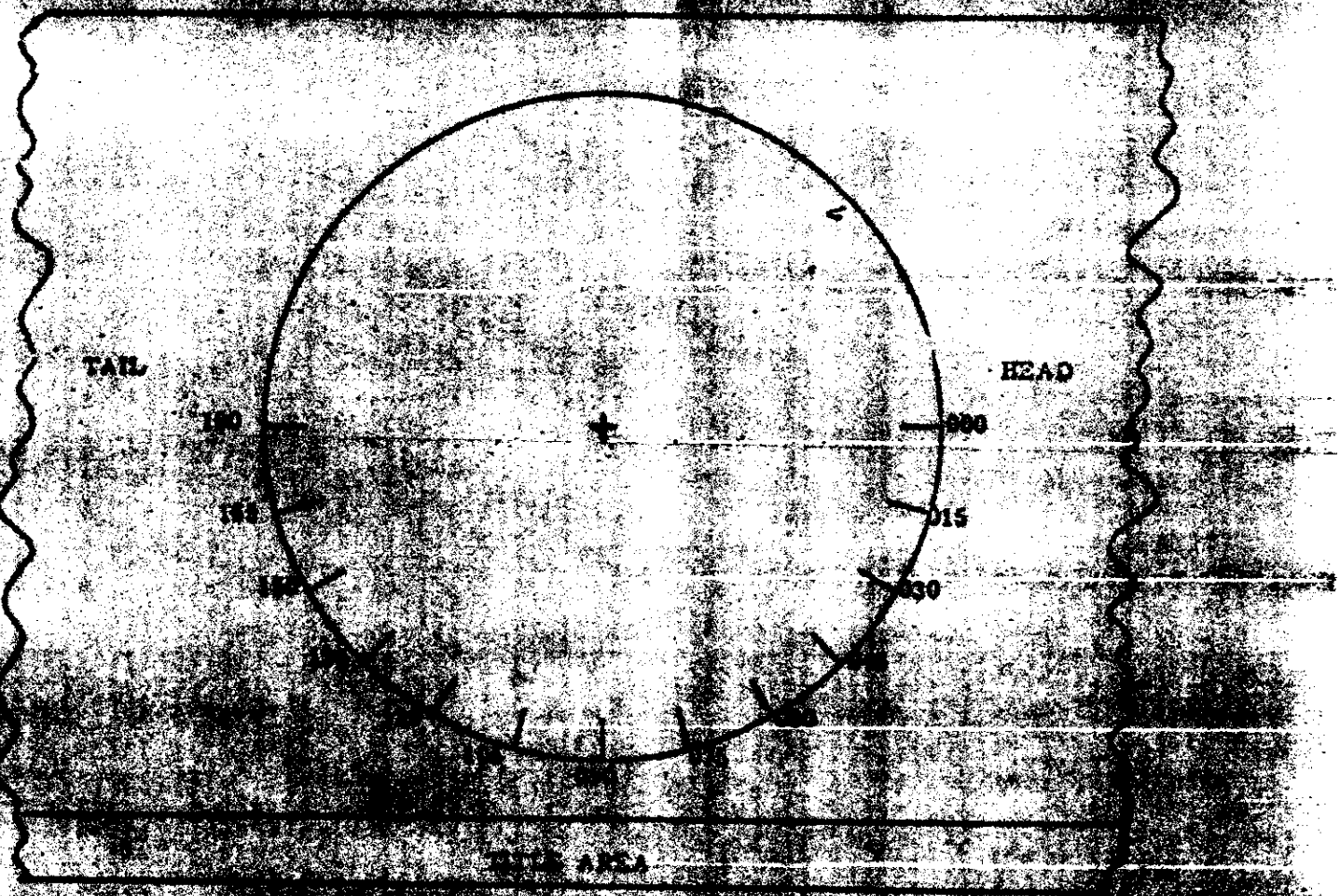
	Pressure [illegible]		Start Up		
	Primary	[illegible]	Primary	Intermed.	[illegible]
Fog	[illegible]	[illegible]	.07	[illegible]	[illegible]
1					
2					
3					
4					.10
5		10			.20
6		[illegible]		.03	[illegible]
7	[illegible]	[illegible]	.07	.12	.24
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Σ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	[illegible] Control Standard			Start Up		
	[illegible]	Intermed.	Full	Primary	Intermed.	Full
0.[illegible]	[illegible]	1.30	1.1[illegible]	1.[illegible]	1.[illegible]	1.1[illegible]

	Head and Tail Forward Camera		Head and Tail Aft Camera		Mission Nat'l
	Head	Tail	Head	Tail	Full
[illegible]	.19	.19	.19	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]					.21
[illegible]	.19	.19	.19	.18	.22
[illegible]	.20	.20	.22	.20	.24
[illegible]	.23	.24	[illegible]	.22	.27
[illegible]	[illegible]	[illegible]	[illegible]	.27	.34
[illegible]	.37	[illegible]	.38	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	.54	[illegible]	[illegible]
[illegible]	.78	[illegible]	.78	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1.06	1.07	[illegible]
[illegible]	[illegible]	[illegible]	1.38	[illegible]	[illegible]
[illegible]	1.67	[illegible]	1.66	[illegible]	[illegible]
[illegible]	[illegible]	1.93	1.91	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	2.11	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	2.27	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	2.43	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	2.47	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	2.02	2.02	[illegible]
[illegible]G/Speed	[illegible]	[illegible]	1.12	1.12	[illegible]

APPENDIX

REFERENCE SYSTEM FOR ORIENTATION OF "J" MISSION EDGES



APPENDIX "B"

Data for Positive Identification of Edges

ORIGINAL NEGATIVE "B" EMULSION UP

TABLE [illegible]

PASS Nr.	FRAME Nr.	[illegible]	[illegible]	[illegible]	Lx 350 [illegible]	[illegible]	[illegible]	Lx 41 [illegible]	Lux [illegible]	[illegible]	[illegible]	Density Lx 350		[illegible]		
D78	07[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	66.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	77.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59.4	49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49	[illegible]	89	0.84	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	66	[illegible]	90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	91.8	53	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	86.1	[illegible]	[illegible]	87	0.64	[illegible]	[illegible]	[illegible]	[illegible]
D78	[illegible]	8	[illegible]	[illegible]	15.25	13.57	[illegible]	73.7	60	[illegible]	94	0.78	[illegible]	Rowy	[illegible]	[illegible]
D78	013	9	63.0	94.[illegible]	14.23	9.93	70.3	100.7	57	150	104	1.07	1.68	Rowy	[illegible]	3
D78	015	10	69.1	75.4	[illegible]	11.63	81.8	86.[illegible]	76	74	94	0.08	1.59	Rowy	[illegible]	3
D78	[illegible]	11	[illegible]	64.[illegible]	14.97	1[illegible].65	66.8	93.9	66	[illegible]	94	0.87	1.65	Rowy	[illegible]	2
D87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	110.4	74	[illegible]	90	0.84	1.68	Rowy	[illegible]	3
D87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	66	[illegible]	94	0.75	1.49	Rowy	[illegible]	[illegible]
D[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	85	[illegible]	[illegible]	Rowy	[illegible]	[illegible]
D1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	55.7	66	[illegible]	85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60	[illegible]	104	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D10[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D10[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D10[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D11[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVE[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 8

SECRET

TABLE 10

MISSION 1000-2 AFT CAMERA

Mission Data			Machine MTF		Spread Function Width 50% Amplitude				MTF		RES	Density		Subject	
PASS Nr.	[illegible] Nr.	TRACK Nr.	1μ x 350μ	1μ x 43μ	1μ x 350μ Microns	1μ x 43μ Microns	1μ x 350μ Reciprocal	1μ x 43μ Reciprocal	1μ x 350μ	[illegible]		Dmin	Dmax		
168	084	1	74.8	41.9	10.89	12.20	97.2	82.0	103	---	72	1.60	1.98	Rnwy	C-[illegible] 13
173	032	2	[illegible]	[illegible]	10.74	10.09	93.1	94.1	95	86	85	0.66	1.31	Rnwy	[illegible]
178	014	3	[illegible]	[illegible]	12.87	12.69	[illegible]	78.8	76	[illegible]	85	0.57	1.18	Rnwy	[illegible]
178	[illegible]	[illegible]	[illegible]	82.1	12.02	9.76	81.2	102.5	75	[illegible]	78	1.02	1.73	Rnwy	[illegible]
178	[illegible]	5	[illegible]	88.9	11.87	9.39	84.3	106.5	72	[illegible]	99	0.67	1.53	Dam	[illegible]
178	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12.97	[illegible]	77.1	72	[illegible]	90	9.52	1.43	Dam	[illegible]
178	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11.80	[illegible]	90.3	83	[illegible]	63	0.46	1.16	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	86	[illegible]	[illegible]	0.62	1.45	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.86	1.59	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.59	1.42	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.67	1.58	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1115	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	72	[illegible]	99	[illegible]	[illegible]	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	70	[illegible]	[illegible]	[illegible]	1.38	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Rnwy	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVG			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	86.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SECRET

TABLE 10

July 15, 1964

TITLE:

Summary of Microdensitometer [illegible] Image Quality Data Collected from Mission 1006-2

SECTION I: INTRODUCTION

Microdensitometer [illegible] has been used as the objective technique of evaluating [illegible] spread function [illegible] summary of the edge data [illegible] Section II, giving the [illegible] deviation, coefficient of dispersion, and number of edges. Section III is a tabulation of the location, description, and image quality data for each edge. Frequency plots of the spread function and resolving power data are presented in Section IV, to show the distribution of values. Section V is included to show the [illegible] mission. A diagram of the [illegible] system used in describing the [illegible] and a temporary [illegible] system used to locate the edges within a frame [illegible] Appendix A.

The image quality [illegible] sharp [illegible] negative by scanning with a [illegible] (A [illegible] was used.) The data reduction consisted of:

(a) [illegible] densitometer strip [illegible]

(b) [illegible] at [illegible]

(c) [illegible] of [illegible] and

(d) [illegible] to line [illegible]

The edge [illegible] graphically [illegible] the aerial [illegible] of a [illegible] function [illegible] differences [illegible] the gradient [illegible]

SECRET

[redacted] Photographic Image to Evaluate System Performance

SECTION II SUMMARY SHEET

Mission 1006-2

Resolution is [redacted] on the aerial image densities - 4404 curve [redacted] reduced by

Arithmetic Mean	35.5
Standard Deviation	22.1
Coefficient of Dispersion	26%
Number of edges	109

Spread function [redacted] amplitude in microns from edge trace data reduced by [redacted] techniques.

Arithmetic Mean	11.4
Standard Deviation	3.3
Coefficient of [redacted]	29%
Number of Edges	109

Analysis of Photographic Image to Evaluate System Performance

Mission 1006-2

Section III

Camera	Pass	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width	A.I.M. Resolution
Aft.	D73	[illegible]	[illegible]	165	[illegible]	[illegible]	59
Aft.	D73	[illegible]	[illegible]	165	Airfield	[illegible]	105
Fwd	D73	[illegible]	B-11	005	Airfield	[illegible]	126
Fwd	D73	044	B-11	005	Airfield	12.6	70
Fwd	D73	028	A-6	175	Airfield	6.8	121
Fwd	D73	[illegible]	B-12	148	Airfield	11.8	70
Fwd	D73	[illegible]	B-8	000	Airfield	[illegible]	90
Fwd	D73	[illegible]	B-14	168	Airfield	[illegible]	93
Fwd	D73	[illegible]	B-14	168	Airfield	[illegible]	101
Fwd	D73	[illegible]	A-10	068	Airfield	[illegible]	134
Fwd	D73	[illegible]	A-10	068	Airfield	[illegible]	116
Fwd	D73	[illegible]	C-11	137	Airfield	[illegible]	52
Fwd	D73	[illegible]	C-11	137	Airfield	[illegible]	73
Aft.	D73	[illegible]	B-11	140	Airfield	[illegible]	98
Aft.	D73	[illegible]	A-9	186	Airfield	[illegible]	116
Aft.	D73	[illegible]	A-7	180	Airfield	[illegible]	63
Aft.	D73	[illegible]	[illegible]	090	Airfield	[illegible]	84
Aft.	D73	[illegible]	C-7	090	Airfield	[illegible]	78
Aft.	D73	[illegible]	[illegible]	180	Airfield	[illegible]	88
Aft.	D73	[illegible]	C-7	186	Airfield	[illegible]	88

Edge No.								
[illegible]	Aft.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	141
15	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19A	Aft.	D73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Fwd.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20A	Fwd.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Aft.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21A	Aft.	[illegible]	[illegible]	[illegible]	075	[illegible]	[illegible]	[illegible]
22A	Aft.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Aft.	[illegible]	[illegible]	[illegible]	072	[illegible]	[illegible]	[illegible]
23A	Aft.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Fwd.	[illegible]	[illegible]	[illegible]	135	[illegible]	[illegible]	[illegible]
24A	Fwd.	[illegible]	[illegible]	[illegible]	125	[illegible]	[illegible]	[illegible]

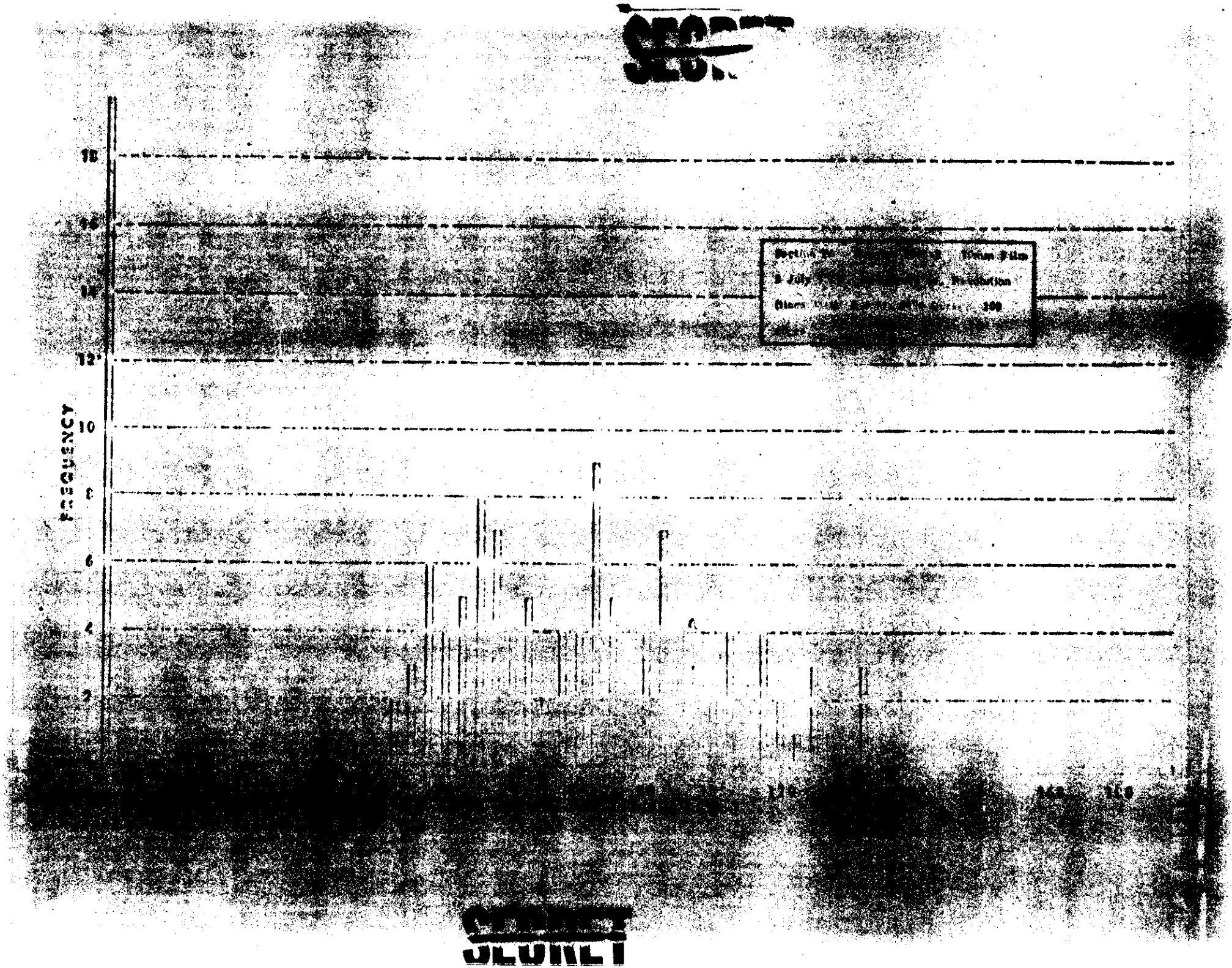
Edge No.	Camera	Roll	Frame	Location	Orientation	Subject	50% Amplitude Spread Function Width (Microns)	A.I.M. Resolution
25	Fwd	[illegible]	[illegible]	A-7	[illegible]	Bridge	9.6	[illegible]
25A	Fwd	[illegible]	[illegible]	A-7	[illegible]	Bridge	[illegible]	[illegible]
26	Fwd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26A	Fwd	[illegible]	[illegible]	[illegible]	[illegible]	Airfield	[illegible]	[illegible]
27	Fwd	[illegible]	[illegible]	C-13	[illegible]	Airfield	[illegible]	[illegible]
27A	Fwd	[illegible]	[illegible]	C-13	022	Airfield	15.0	66
28	Fwd	[illegible]	001	A-13	.022	Airfield	14.0	63
28A	Fwd	[illegible]	[illegible]	A-13	022	Airfield	18.7	[illegible]
29	Fwd	[illegible]	070	A-2	000	Airfield	9.2	131
29A	Fwd	[illegible]	[illegible]	A-2	000	Airfield	[illegible]	[illegible]
30	Fwd	[illegible]	[illegible]	A-6	035	Airfield	12.9	[illegible]
30A	Fwd	[illegible]	[illegible]	A-6	[illegible]	Airfield	[illegible]	[illegible]
31	[illegible]	[illegible]	[illegible]	C-9	[illegible]	Airfield	[illegible]	[illegible]
31A	[illegible]	[illegible]	[illegible]	[illegible]	105	Airfield	14.0	[illegible]
32A	[illegible]	[illegible]	[illegible]	A-10	040	Airfield	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	B-13	025	Airfield	7.8	[illegible]
33A	[illegible]	[illegible]	[illegible]	B-13	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	C-4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	C-4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	C-4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	C-4	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	B-5	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	B-5	[illegible]	[illegible]	[illegible]	[illegible]

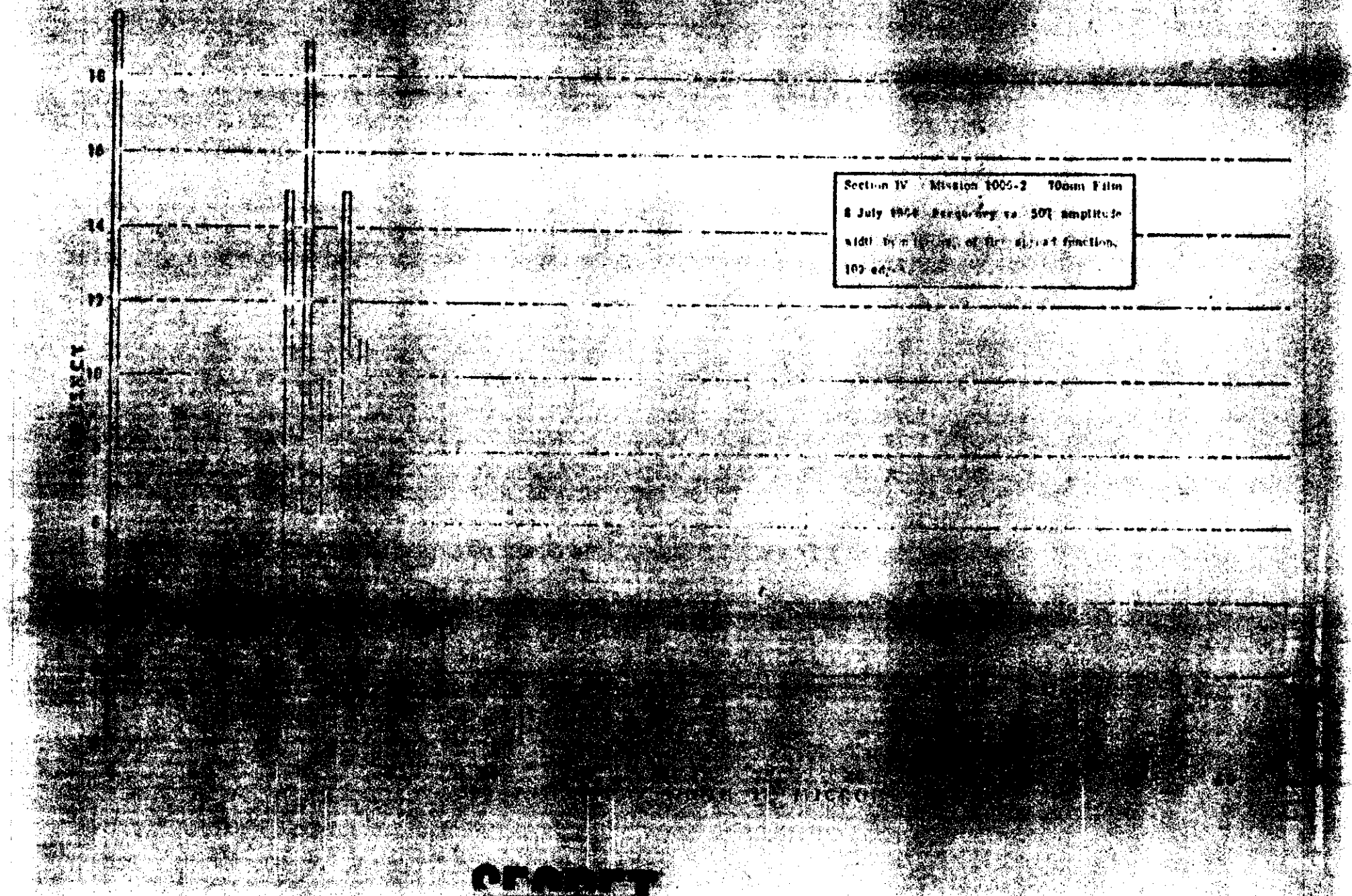
[illegible]	Camera (?)	Pass (?)	Frame (?)	Location (?)	Orientation	Subject	Object Approx. Size Feature Width (Microns) (?)	[illegible]
[illegible]	Fwd	[illegible]	[illegible]	[illegible]	020	Airfield	[illegible]	[illegible]
[illegible]	[illegible]	D119	[illegible]	[illegible]	[illegible]	Airfield (?)	[illegible]	[illegible]
[illegible]	[illegible]	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	D119	[illegible]	[illegible]	[illegible]	Airfield	[illegible]	[illegible]
[illegible]	Aft.	D119	[illegible]	B-6	[illegible]	Airfield	11.0	[illegible]
[illegible]	Aft.	D119	[illegible]	B-6	025	Airfield	6.5	[illegible]
[illegible]	Aft.	D119	095	[illegible]	115	Airfield	10.0	[illegible]
[illegible]	Aft.	D119	090	B-6	035 (?)	Airfield	6.0 (?)	[illegible]
[illegible]	Aft.	D119	[illegible]	B-6	025	Airfield	[illegible]	[illegible]
[illegible]	Aft.	D119	[illegible]	A-6	020	Break-water	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	180 (?)	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	180	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	170	Airfield	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	B-6	170	Airfield	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	100	Break-	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	020	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Fwd	D119	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	Amplitude Spread Function Width (Microns)	[illegible]
54A	Pan	[illegible]	046	A-8-11	030	[illegible]	11.7	[illegible]
55	Aft	[illegible]	040	B-6	[illegible]	[illegible]	6.8	[illegible]
55A	Aft	[illegible]	[illegible]	B-6	[illegible]	[illegible]	[illegible]	[illegible]
57	Aft	[illegible]	041	C-8	[illegible]	[illegible]	8.0	[illegible]
57A	Aft	[illegible]	[illegible]	C-8	150	[illegible]	8.3	[illegible]
58	Aft	D1[illegible]	028	A-9	030	Airfield	10.0	[illegible]
58A	Aft	[illegible]	028	A-9	[illegible]	Airfield	7.0	[illegible]
59	Aft	D1[illegible]	028	C-10	[illegible]	[illegible]	[illegible]	[illegible]
60	Aft	D1[illegible]	026	B-10	[illegible]	[illegible]	[illegible]	[illegible]
60A	Aft	D1[illegible]	026	B-10	[illegible]	[illegible]	10.0	[illegible]
61	Aft	D1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61A	Aft	D1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
62	Aft	[illegible]	[illegible]	B-[illegible]	015	[illegible]	10.5	[illegible]
62A	Aft	[illegible]	[illegible]	B-6	[illegible]	[illegible]	9.5	[illegible]
64	Aft	[illegible]	[illegible]	E-7	000	[illegible]	11.5	[illegible]
64A	Aft	D1[illegible]	018	E-7	[illegible]	[illegible]	10.2	[illegible]
65	Aft	[illegible]	[illegible]	A-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
65A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
66	Aft	[illegible]	[illegible]	C-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
66A	Aft	[illegible]	[illegible]	C-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
67	Aft	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
67A	Aft	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Edge No.	Camera	Pass	Frame	Location	Orientation	Subject	Sc... Amplitude Spread Function Width (Microns)	A... Exposition
89	Alt.	D103	133	A-4	070	Settling bed	9.0	32
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Settling bed	[illegible]	[illegible]

DRAFT


FREQUENCY
12
10
6
4
2



Sensitometric Data

Mission 10[illegible]

[illegible]

[illegible]

Emulsion No.: 440[illegible]

Lamp No.: 1983

Exposure Time: 1/25 [illegible]

Wedge No.: [illegible]1-15

Filter: Daylight

Development Conditions:

Primary: [illegible]

Intermediate: [illegible] Pi[illegible] 120X[illegible]0, [illegible]

Full: [illegible]

Absolute Log [illegible]

[redacted]

[redacted] Page 3

[redacted] Data

	Process Control Standard			Start Up		
	Primary	Intermed.	Full	Primary	Intermed.	Full
Fog	.08	[redacted]	.48	.07	[redacted]	.29
1						
2						
3						
4						[redacted]
5			.16			.20
6		[redacted]	[redacted]		[redacted]	[redacted]
7	.08	[redacted]	[redacted]	.03	[redacted]	[redacted]
8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9	[redacted]	[redacted]	[redacted]	.13	.20	[redacted]
10	[redacted]	[redacted]	[redacted]	.18	[redacted]	[redacted]
11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
14	[redacted]	[redacted]	1.72	[redacted]	[redacted]	[redacted]
15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

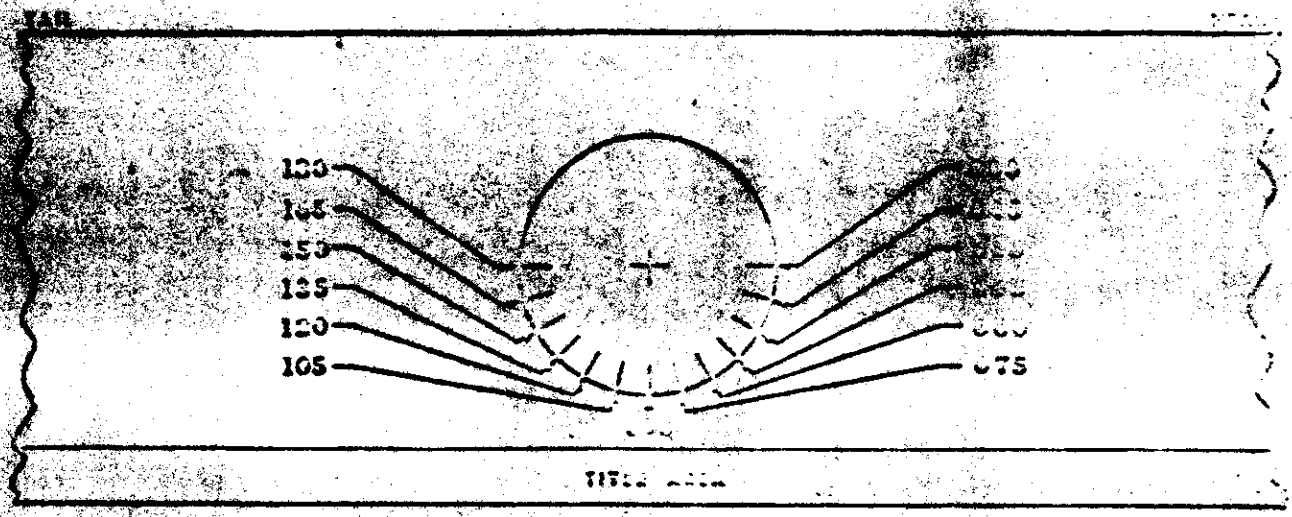
	Head and Tail Forward Camera		Head and Tail Aft Camera		[illegible]
	Head	Tail	Head	Tail	Full
Fog	[illegible]	.10	.10	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	.19	[illegible]	[illegible]
5	[illegible]	.19	.20	.19	[illegible]
6	.2[illegible]	.20	.21	.20	[illegible]
7	[illegible]	.22	[illegible]	[illegible]	[illegible]
8	[illegible]	.27	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	1.20
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	2.01	[illegible]	[illegible]	[illegible]	1.07
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[redacted]

APPENDIX "A"

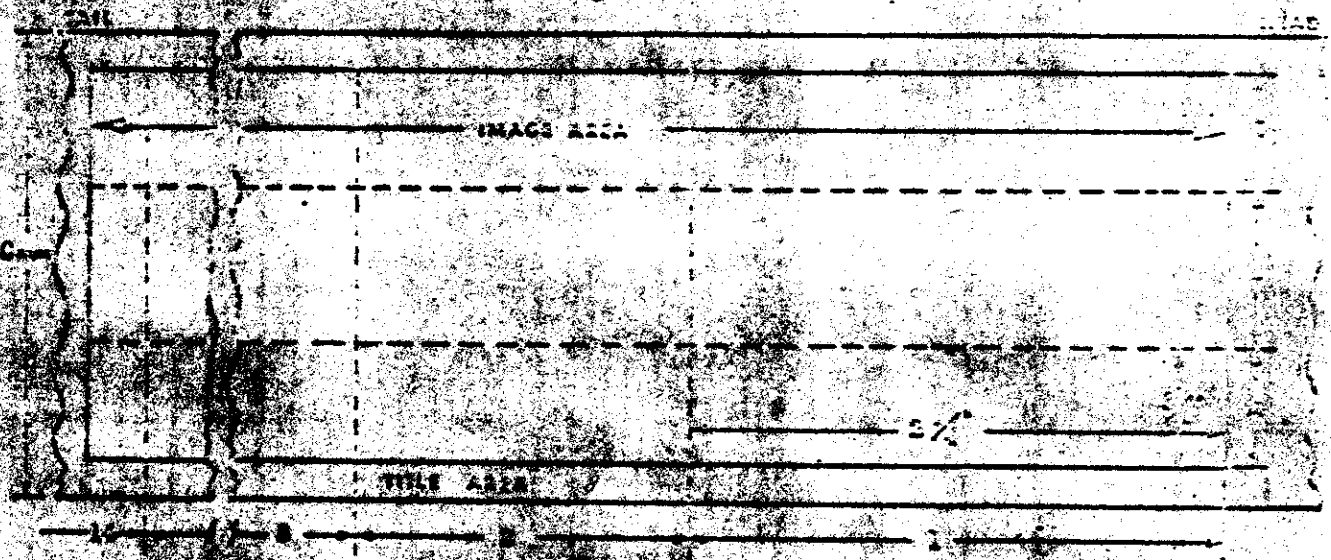
Reference System For Orientation Of C/[illegible] Mission Edges

original negative - - emulsion up



Grid For Position Of C/[illegible] Mission Edges

original negative - - emulsion up



[redacted]

	Mission 1006-1	Mission 1006-2
Master Camera - AFSPPL	65/88	64/81
- [redacted]	84	84
- [redacted]	97	90
Slave Camera - AFSPPL	71/90	72/90
- [redacted]	87	87
- [redacted]	92	94

The data from [redacted] shows that in most cases two traces were made over the same edge. Assuming that this repeated measurement was made by the same operation and at nearly the same time as the first measurement, it would be expected that the results should be fairly close to each other. An examination of the data, however, shows that in many cases the reduced MTF/AIM values differ by a factor greater than two. This lack of repeatability is most probably caused by minor error in aligning the slit to the edge or by positioning the slit to another portion of the imaged edge. If the former is the cause of the difference, it is admissable to argue that the lower value is an incorrect value as misalignment would tend to spread the true edge. Following this line of argument, the [redacted] values were re-averaged and are shown in the table as asterisked values. If the latter cause of lack of repeatability is the case, the measurements then represent two different edges of differing quality some of which may be due to changes in the actual edge itself. Under such a circumstance, averaging of all the results represents the most logical statistical treatment of the data. In actuality, the differences most probably are due to a combination of both causes. Since it is not apparent that these variables and others can be separated, some caution is therefore required in using edge traces as absolute measures of quality. However, their value as a relative quantized measure of quality is recognized, and further refinement of techniques and possibly instruments could result in a reliable and reproducible method of measuring system quality largely free of subjective judgement which is inherent in other techniques.

The AFSPPL data is reduced for a 350 micron and 43 micron long slit. It is noted that in most cases the values obtained with the 43 micron slit are higher. This should be expected as an edge should be straighter and of more uniform reflectivity over an approximate 40 foot length than an edge approximately 350 feet in length. However, it is noted that there are cases in which the 43 micron slit shows a lower value than the 350 micron slit. From what is known of the technique and practices at AFSPPL, no reason is apparent for this difference. It is also noted that the AFSPPL values for the 350 micron slit

generally are lower than the values for the 320 micron slit used by [redacted] This difference is attributed to machine sensitivity, operator skill, selection of edges, data reduction or some combination thereof. It further suggests that standardization may be necessary before adopting the edge trace measurement as a measure of system quality. It is understood that this is a matter of primary concern for the governmental-industry team on image quality.

While difficulties such as these exist in using the edge trace data, attempts are nevertheless being made to correlate edge trace values with other known system parameters. At this time, no definite correlations are apparent. Continuing efforts are underway and will be reported at a later date if significant correlations are established.

SECTION VIII

SCAN RATE ANALYSIS

A. GENERAL

Since the first operational engineering film became available at Advanced Projects (Mission 1004), studies have been conducted of the panoramic camera scan velocity as measured by the spacing of the 200 cps timing light marks on the payload material. While the velocity for any given frame is specified to be a constant, the value of which depends on the V/H setting, actual velocity patterns with variations of more than 20% have been observed in frames of each mission. Velocity profiles for ground tests are very similar to those obtained from flight material. Further, there are strong similarities between the profiles of different cameras when operated at similar speeds.

Unfortunately, neither the causes nor the effects of the scan velocity variations are fully understood. Both the causes, which relate to camera characteristics, and the effects, which relate to image quality, are being extensively investigated by the contractor. The availability of operational payload material at contractor facilities has been an important contribution to these investigations.

B. EFFECTS OF SCAN HEAD VELOCITY VARIATIONS

The effects with which we are concerned are ones that produce a displacement of an image ray with respect to the film during exposure and thus result in a degradation of the image. If the deviation from a constant velocity involved only the scan head, as distinguished from the rotation of the lens cell, the effects whould be only those of exposure variation and perhaps some lens distortions. These effects would clearly be very small. The exposure variation, which would appear as banding, has not been apparent in coverage of land areas. NPIC personnel have occasionally noted a slight banding in coverage during past missions over water areas which have a very constant tone value. This effect is consistent with the velocity profiles collected to date.

Although the drum and scan arm structures will allow some relative movement of the scan head, the magnitude of velocity deviations, as well as other test data, show that the disturbances affect other parts of the camera. Since the shape of the cam that compensates for forward motion is based on a constant scan velocity assumption, it follows that a deviation in FMC adjustment of the system, the scan rate deviations then would equate to a proportional FMC error and image smear.

[redacted]

Finally, the scan velocity data suggests a variety of noise or unresolvable motion elements. Since these elements can not be directly or analytically related to image ray film relative motions, the effects appear as residual degradations. The residuals may be sufficiently large to obscure systematic effects noted above. The geometry and dynamics of pan systems introduce particularly difficult problems in relating causes and effects. Several structural and analytical approaches are now being explored. It is expected that some significant correlations will be obtained.

C. MEASUREMENT CONDITIONS

The 200 cps timing marks are produced by a neon bulb controlled by the system clock through an amplifying circuit. The clock signals are accurate to five parts in 10^8. The bulb and circuit are known to have some self-heating effects, but these are considered to be entirely negligible in this case. The neon bulb is located in the scan head assembly approximately one inch behind the shutter slit (with respect to the direction of scan motion). The spacing of the timing marks is considered to be a direct measure of scan velocity. However, strictly speaking, it should be noted that the spacing is the resultant of scan head and film motion.

The timing marks on the film are of variable shape and density. Variations result from adjustment of the instrument, rail reflections, operating speed, and image density in the adjacent format area. While these variations lead to some variability in measurement accuracy, it has been found that with a suitable crosshair reticle the center-to-center spacing can be measured to about 0.001 inch. The measurements contained in this report as well as other made at Advanced Projects have been obtained with a 7x tube magnifier with a reticle graduated in 0.005 inch units. These data appear to have a probable error of less than 0.003 inch. The data generally has been recorded by 0.005 inch increments so that some smoothing of small fluctuations has occurred.

D. PRESENTATION OF DATA

Because of the lack of significant differences in velocity characteristics between the two panoramic cameras or their performances on the two parts of the mission, the description and analysis of data has been combined into a single presentation. Figures 28 to 39, pages 122 to [illegible], show velocity profiles for the following conditions:

a. Master camera (#148), four consecutive frames of high speed operation during HATS test, Figures 28 and 29.

[redacted]

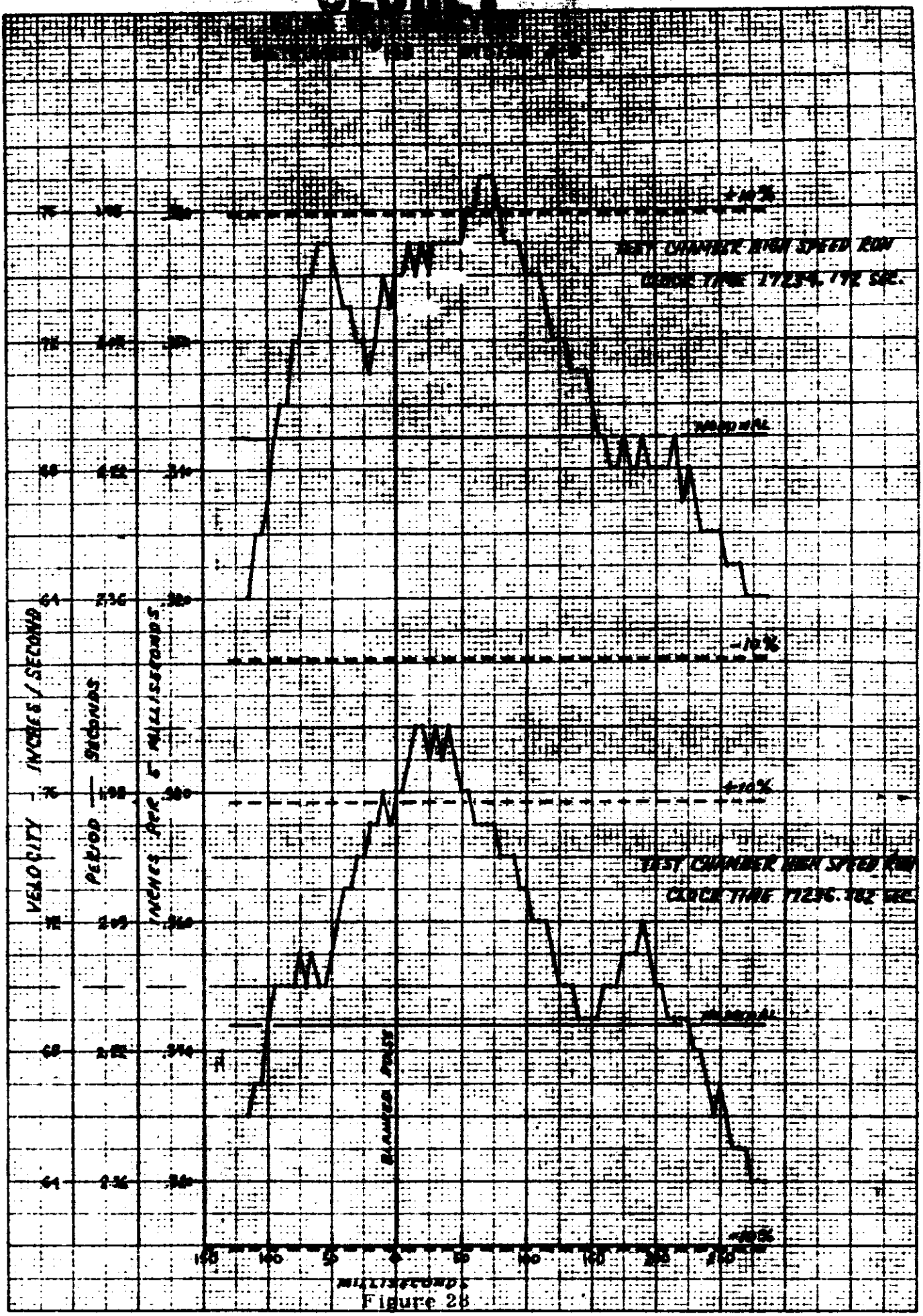


Figure 28

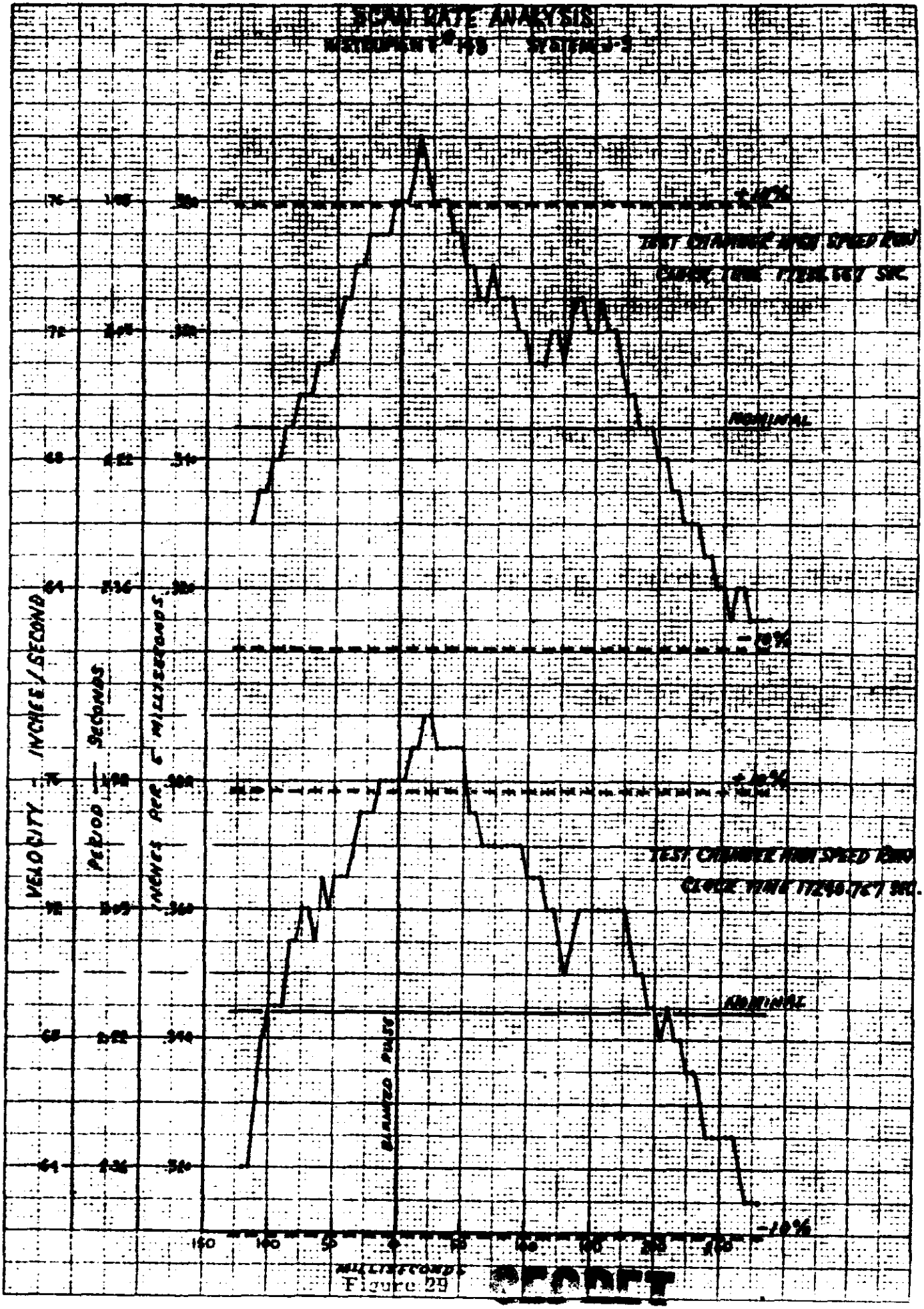

SCAN RATE ANALYSIS
INSTRUMENT #155 SYSTEM 3-1
+10%
TEST CHAMBER HIGH SPEED RUN
CLOCK TIME 1726.167 SEC.
NOMINAL
-10%
+10%
TEST CHAMBER HIGH SPEED RUN
CLOCK TIME 1726.167 SEC.
NOMINAL
-10%
VELOCITY - INCHES/SECOND
PERIOD - SECONDS
INCHES PER MILLISECONDS
MILLISECONDS
BLANKED PULSE

Figure 29

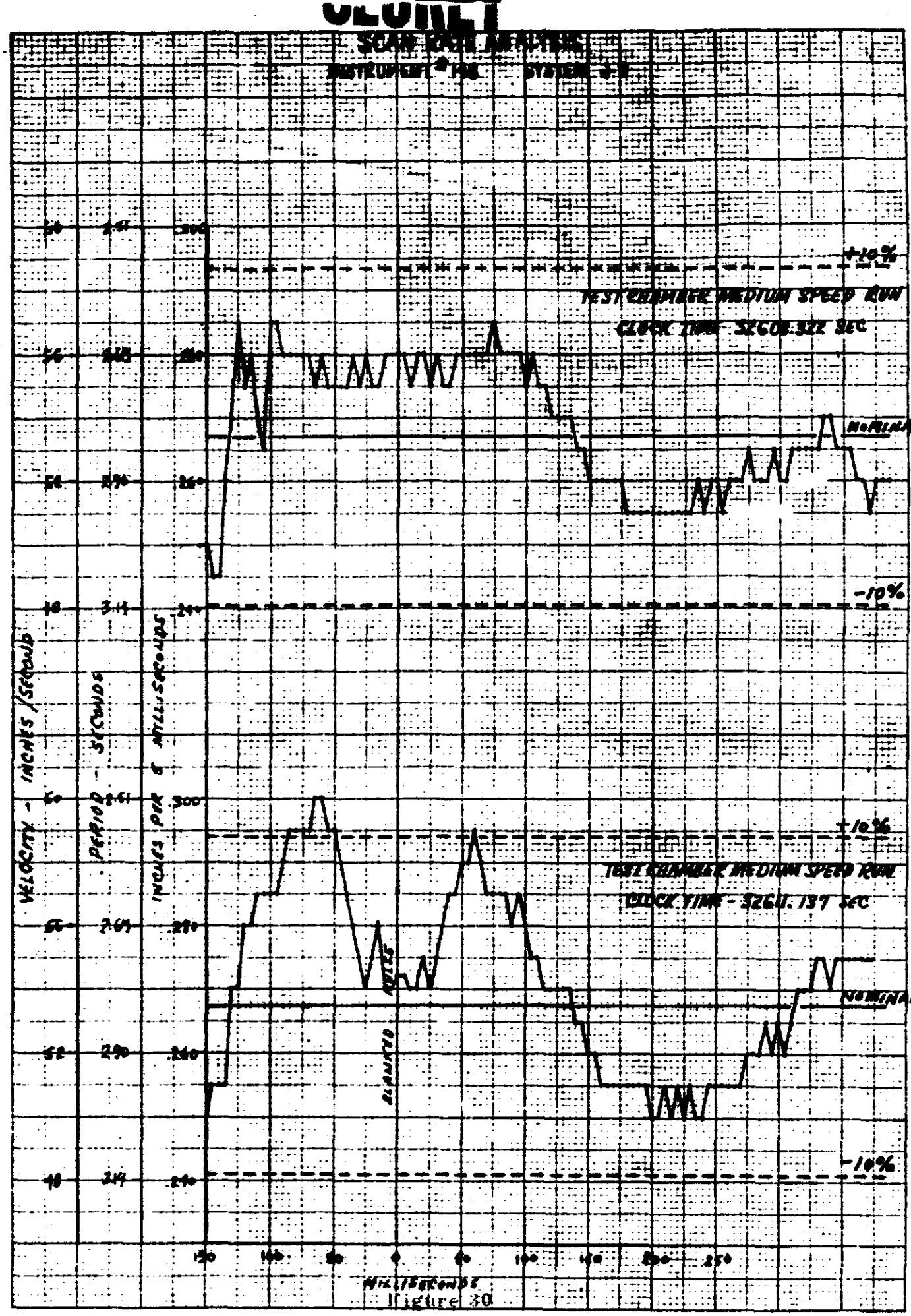
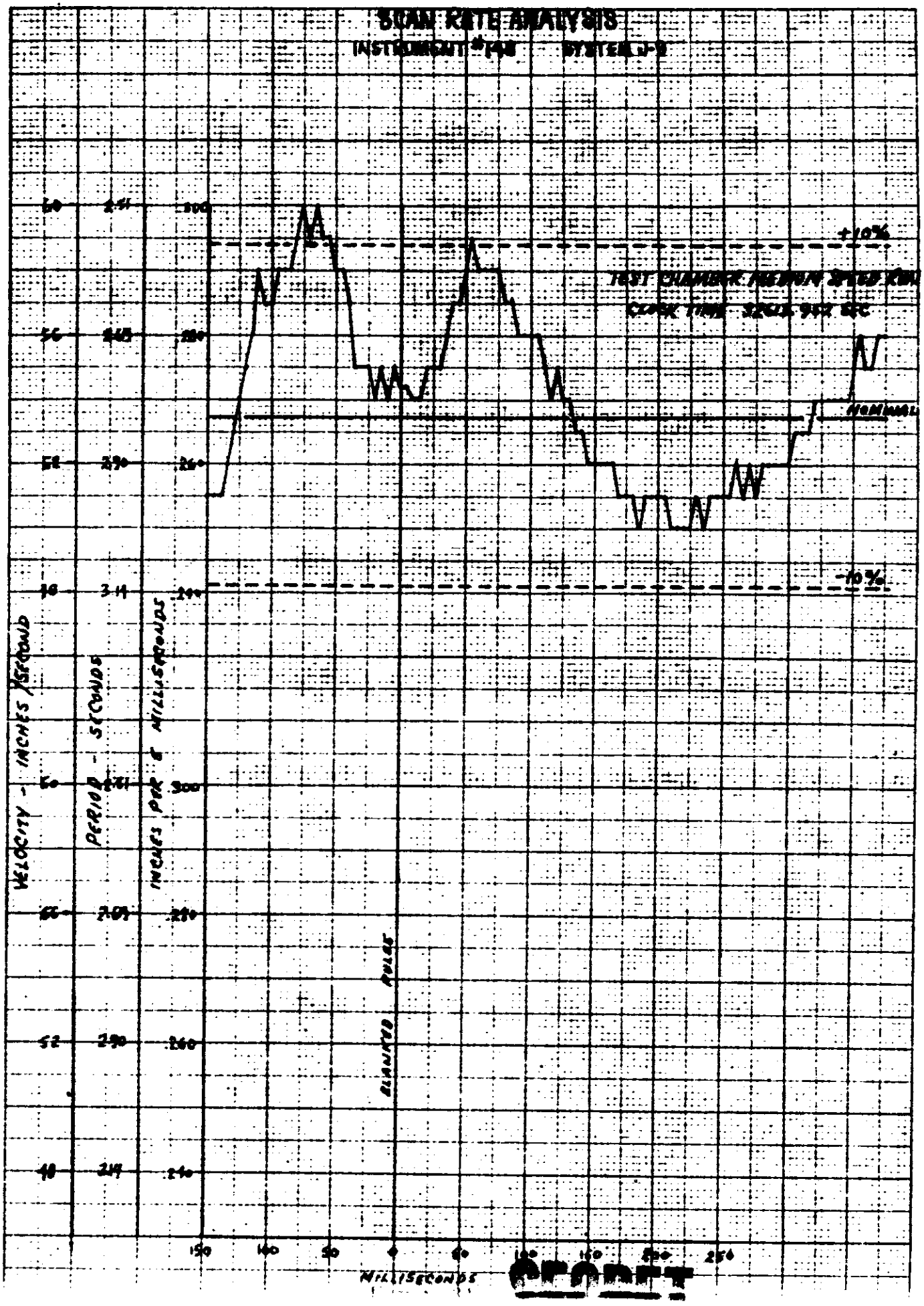

SCAN DATA ANALYSIS
+10%
TEST CHAMBER MEDIUM SPEED RUN
CLOCK TIME - 32608.322 SEC
NOMINAL
-10%
+10%
TEST CHAMBER MEDIUM SPEED RUN
CLOCK TIME - 32611.137 SEC
NOMINAL
-10%
VELOCITY - INCHES/SECOND
PERIOD - SECONDS
INCHES PER 6 MILLISECONDS
MILLISECONDS

Figure 30


SCAN RATE ANALYSIS
INSTRUMENT
SYSTEM
+10%
-10%
NOMINAL
WELOCITY - INCHES/SECOND
PERIOD - SECONDS
INCHES PER 4 MILLISECONDS
ELAPSED PULSE
MILLISECONDS

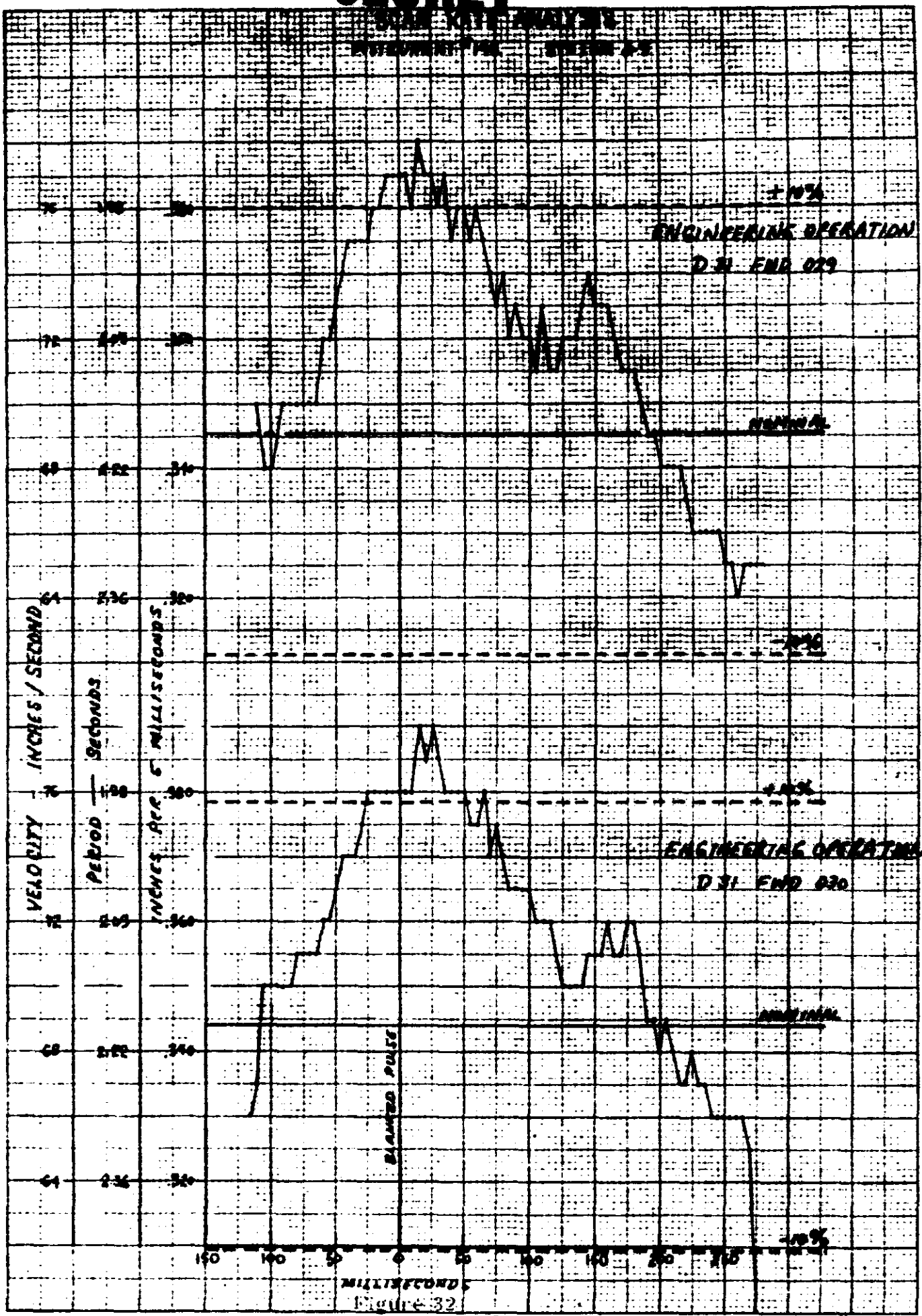

+10%
ENGINEERING OPERATION
D 31 END 029
NOMINAL
-10%
+10%
ENGINEERING OPERATION
D 31 END 030
NOMINAL
-10%
VELOCITY INCHES / SECOND
PERIOD — SECONDS
INCHES PER 5 MILLISECONDS
BALANCED PULSE
MILLISECONDS

Figure 32

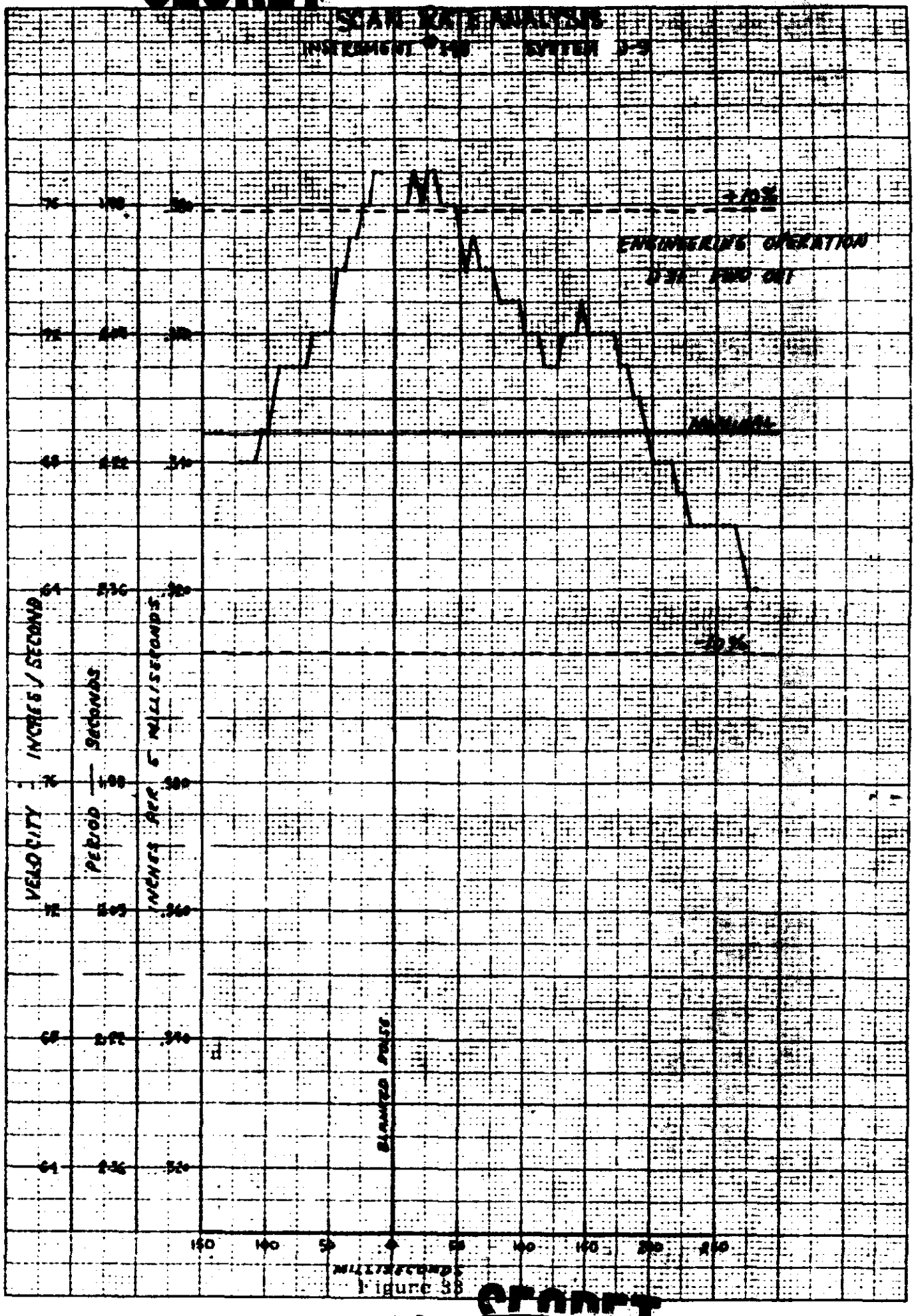

+10%
-10%
VELOCITY — INCHES / SECOND
PERIOD — SECONDS
INCHES PER 5 MILLISECONDS
MILLISECONDS

Figure 38

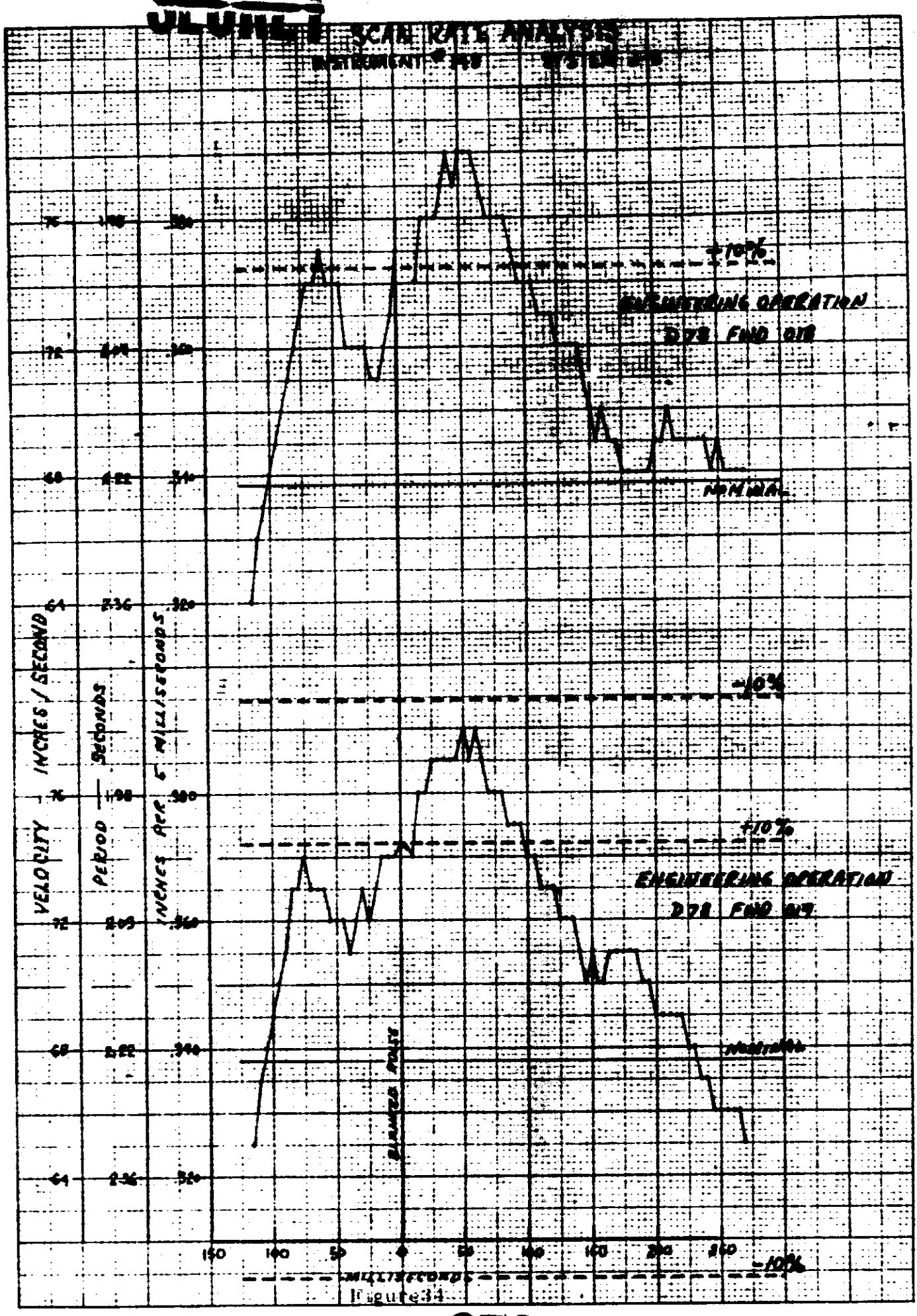


Figure34

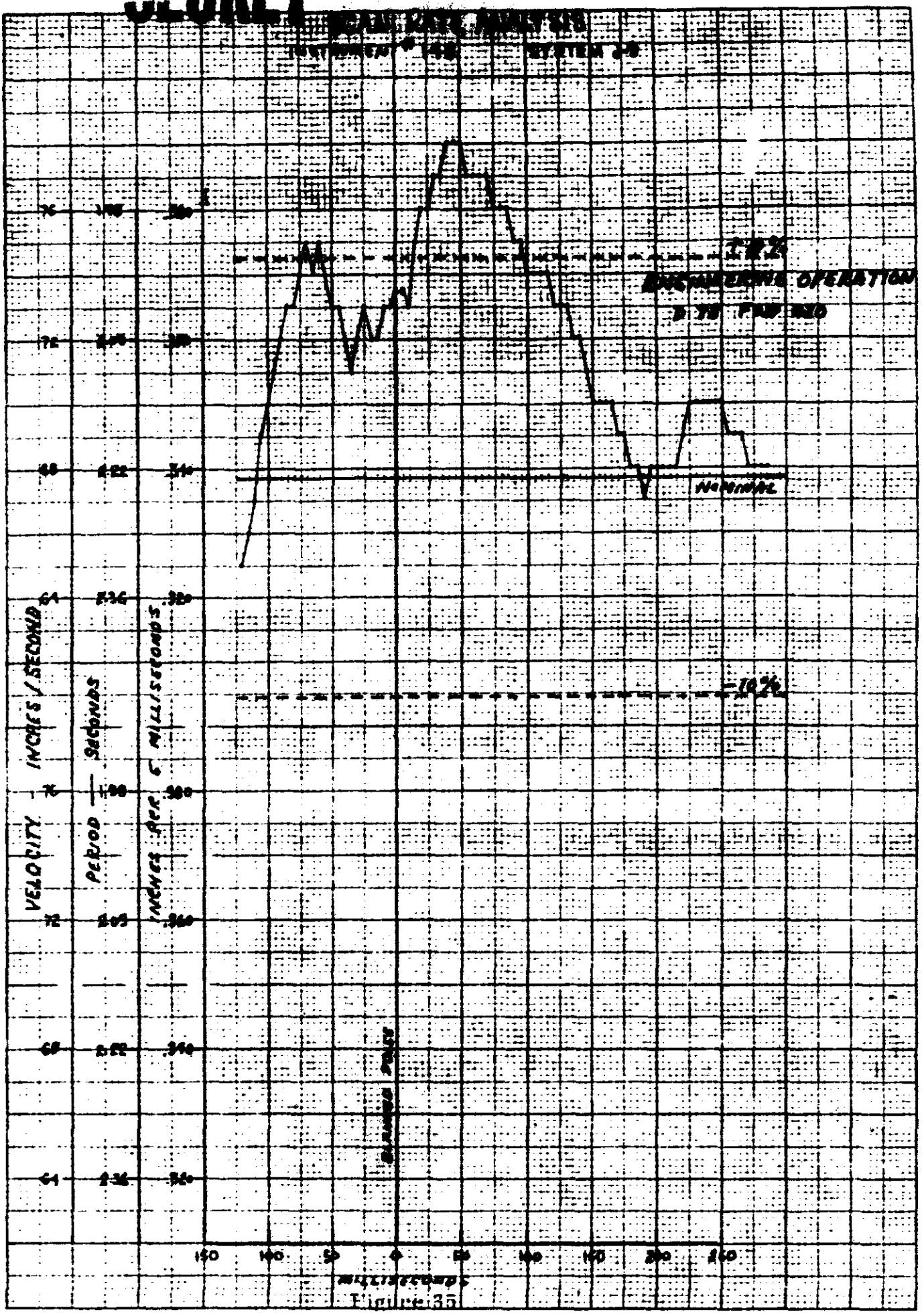

VELOCITY
INCHES / SECOND
PERIOD — SECONDS
INCHES PER 5 MILLISECONDS
MILLISECONDS
-10%

Figure 35

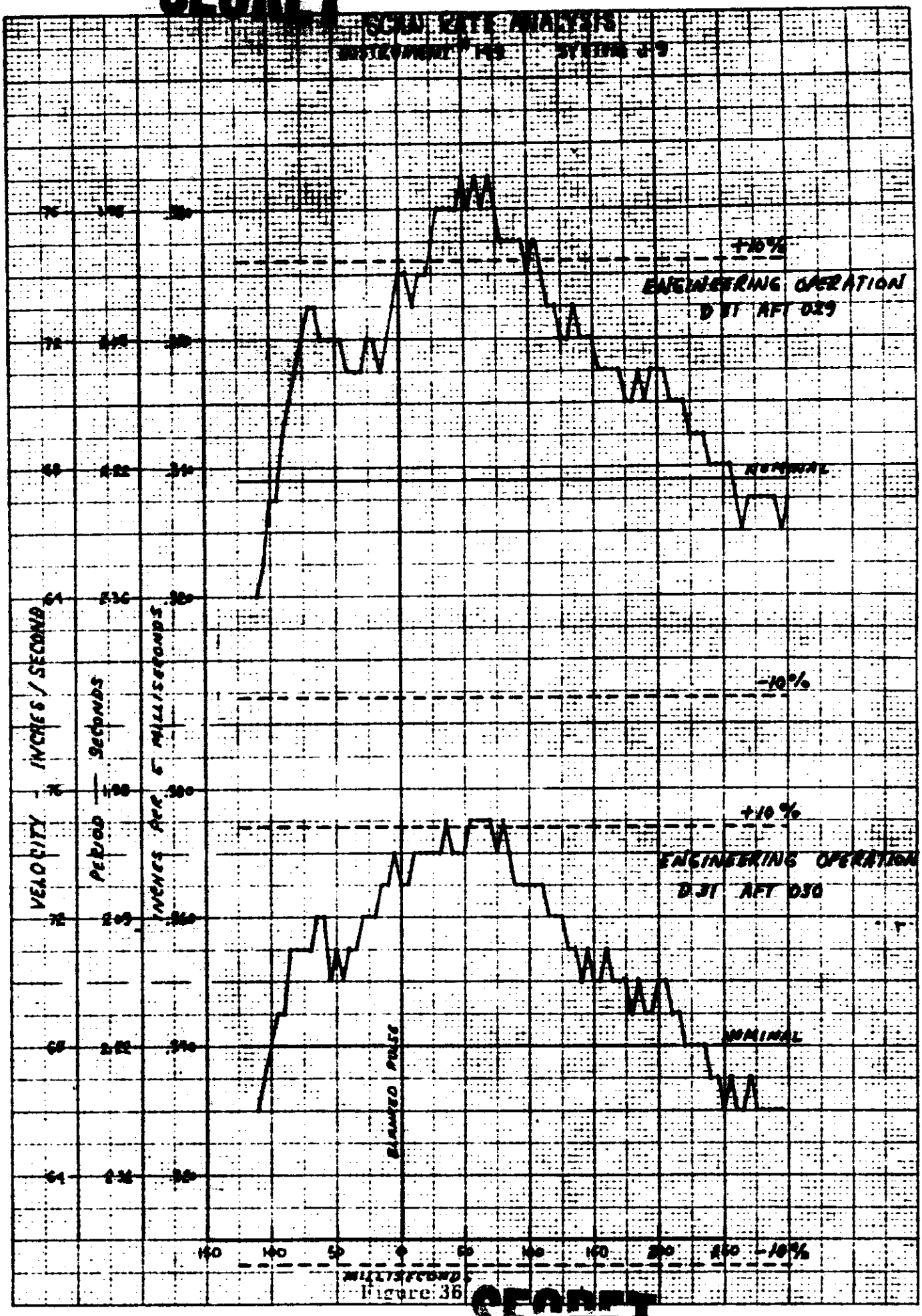


Figure 36

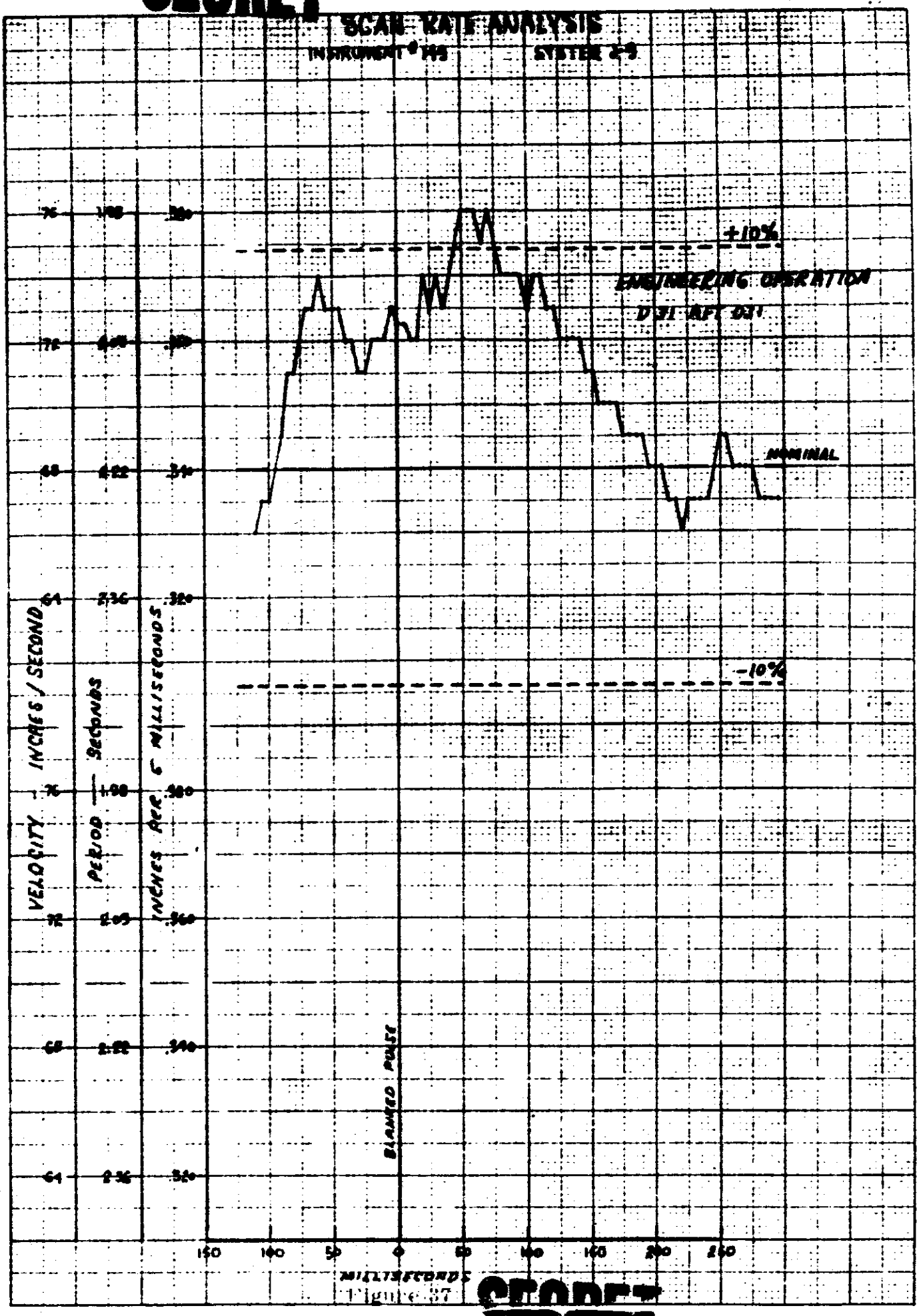

SCAN RATE ANALYSIS
+10%
ENGINEERING OPERATION
D31 AFT D31
NOMINAL
-10%
VELOCITY — INCHES / SECOND
PERIOD — SECONDS
INCHES PER 5 MILLISECONDS
BLANKED PULSE
MILLISECONDS

Figure 37

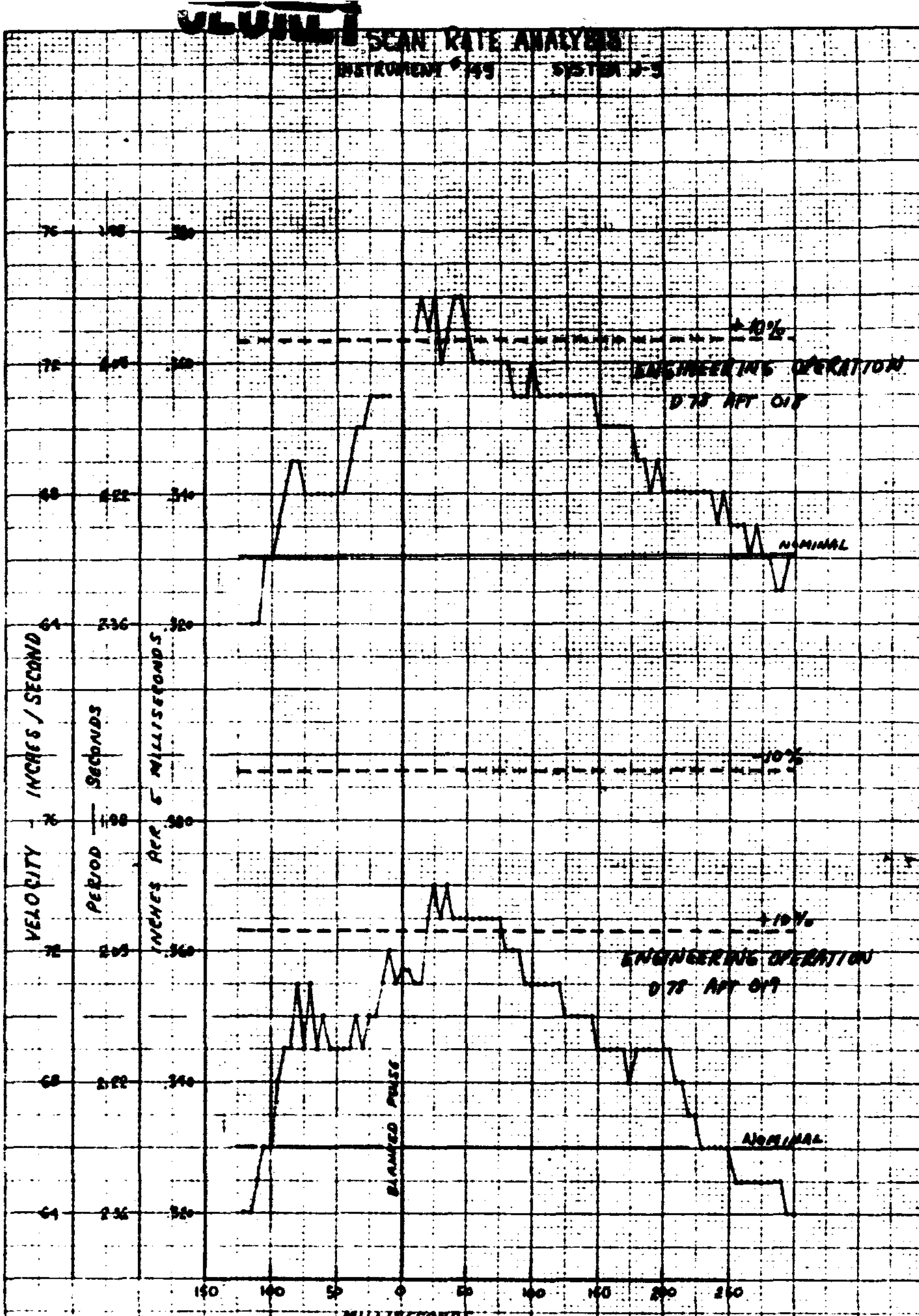

SCAN RATE ANALYSIS
INSTRUMENT # 49
+10%
ENGINEERING OPERATION
NOMINAL
-10%
VELOCITY — INCHES / SECOND
PERIOD — SECONDS
INCHES PER 6 MILLISECONDS
BLANKED PULSE
64
68
72
76
2.36
2.22
2.09
1.98
.320
.340
.360
.380
150
100
50
0
50
100
150
200
250
MILLISECONDS

Figure 38

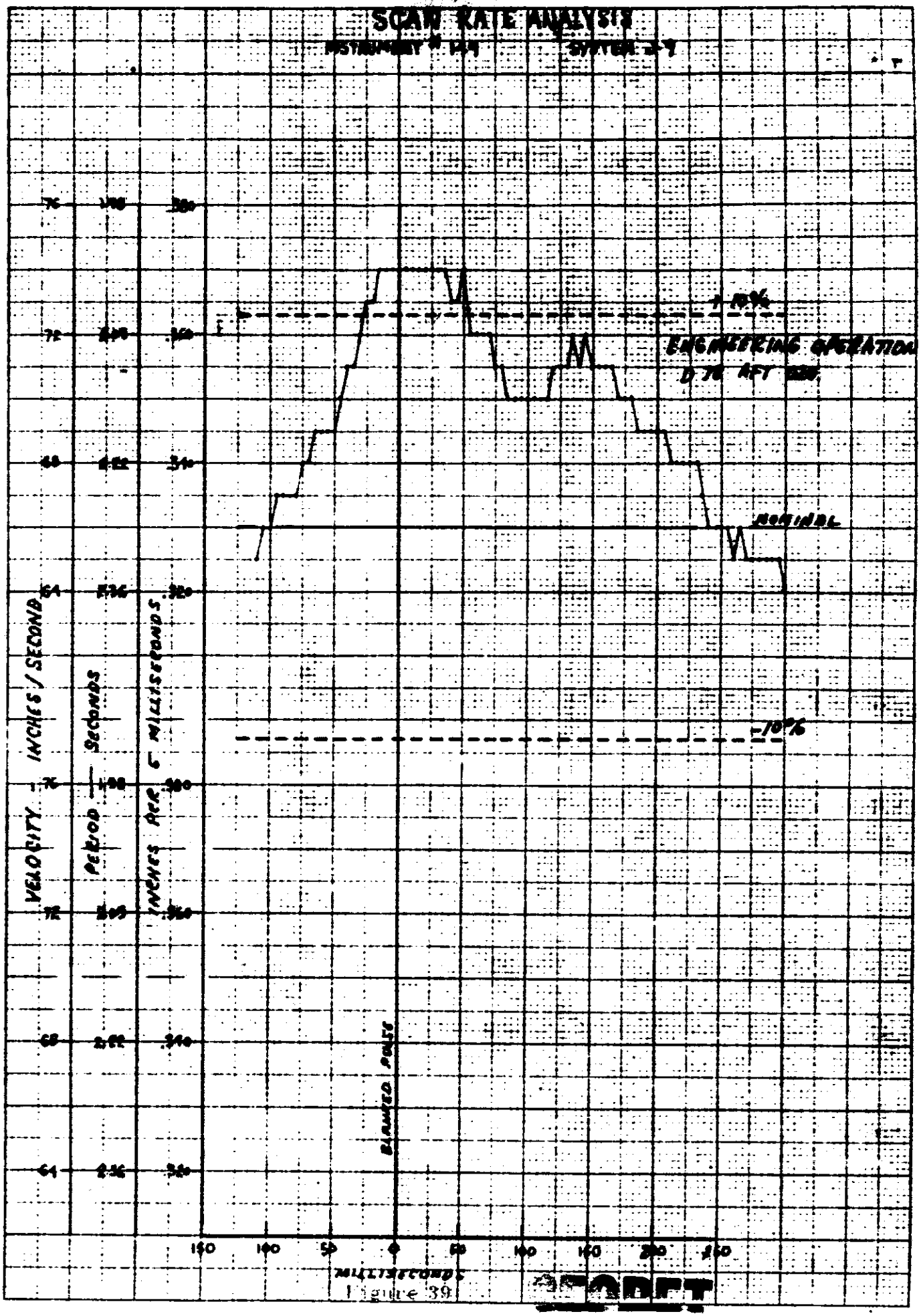


Figure 39

[redacted]

b. Master camera (#148); three consecutive frames of intermediate speed operation during HATS test, Figures 30 and 31.

c. Master camera (#148); three consecutive frames of high speed operation during Mission 1006-1, Figures 32 and 33.

d. Master camera (#148); three consecutive frames of high speed operation during Mission 1006-2, Figures 34 and 35.

e. Slave camera (#149); three consecutive frames of high speed operation during Mission 1006-1, Figures 36 and 37.

f. Slave camera (#149); three consecutive frames of high speed operation during Mission 1006-2, Figures 38 and 39.

Only high speed operation data is shown on flight film since, except for night engineering operations, nearly all operations for this mission were at high camera speeds due to the abnormal orbit.

The graphs of Figures 28 through 39 show the scan head velocity as measured by the timing mark spacing as a function of scan time. The ordinate or scan time scale is referenced to the blanked pulse which occurs when the center-of-format switch is actuated. The amplitude is a direct measure of the five millisecond incremental scan velocity and is shown as a linear velocity as well as an equivalent cycle period.

E. MASTER PANORAMIC CAMERA

Figures 28 and 29 show velocity profiles for four consecutive frames of high speed operation of camera #148 during West Coast high altitude chamber tests. These can be compared with Figures 32 through 35 showing three frame sequences of similar high speed operation of the same camera during Missions 1006-1 and 1006-2.

The first profile of Figure 28 is typical of the high speed velocity profiles collected to date. At the starting edge of the format there is a continuation of the rapid acceleration that should have been completed before the scan head reached the format region. The velocity quickly reaches a value above nominal and continues to increase to some point near the middle of the format, after which it declines gradually to some value below the nominal. Superimposed on the gross pattern is evidence of a secondary cyclical pattern. The frequency of this secondary pattern is about 8 cps which is similar to other instruments examined to date. A third order effect is minor variations observed near

[redacted]

regions of roughly constant velocity. It may be surmised that such values are due merely to the measurement precision used. However, it has been verified that such regions do contain significant variations in the spaces between successive time marks.

Figures 30 and 31 show velocity profiles for three consecutive frames of intermediate speed operation during West Coast high altitude chamber tests. Here the velocity pattern has changed to show an increase near the end of scan. In these cases the percentage deviation of velocity values is almost the same as in the high speed cases. Operating speeds during Missions 1006-1 and 2 were consistently higher than these test values.

F. SLAVE PANORAMIC CAMERA

Figures 36 through 39 show three frame sequences of high speed operation of camera #149 during Missions 1006-1 and 2. Each of these frame sequences was made at the same time as those shown for the master camera in Figures 32 through 35. It will be observed that the velocity profiles of the two cameras are very similar. For the frames shown, the percentage deviation of velocities of the slave camera appear to be slightly smaller.