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This document contains

14 pages.

Analysis of Photographic Image
to Evaluate System Performance

Mission Segments

1030-1 & 1030-2

by

Scientist/Consultant Team

28 March 1966

Page 1 of 14

Declassified and Released by the N R O

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SECTION I SUMMARY SHEET

Resolution in lines/mm based on the aerial image modulation - 3404 curve from edge trace data reduced by computer techniques.

Mission Segment 1030-1

	BOTH CAMERAS	FORWARD CAMERA	AFT CAMERA
Arithmetic Mean	70.5 l/mm	66.1 l/mm	76.6 l/mm
Standard Deviation	18.1 l/mm	13.6 l/mm	22.0 l/mm
Coefficient of Dispersion	26%	21%	29%
Number of Edges	36	21	15

Mission Segment 1030-2

Arithmetic Mean	70.9 l/mm	70.8 l/mm	71.1 l/mm
Standard Deviation	16.9 l/mm	17.6 l/mm	16.6 l/mm
Coefficient of Dispersion	24%	25%	23%
Number of Edges	29	18	11

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

Mission Segment 1030-1

Arithmetic Mean	12.6 μ	13.6 μ	11.2 μ
Standard Deviation	3.4 μ	3.0 μ	3.5 μ
Coefficient of Dispersion	27%	22%	32%
Number of Edges	36	21	15

Mission Segment 1030-2

Arithmetic Mean	12.3 μ	12.8 μ	11.6 μ
Standard Deviation	4.2 μ	4.6 μ	3.6 μ
Coefficient of Dispersion	34%	36%	31%
Number of Edges	29	18	11

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SECTION II - MISSION 1030

Summary of all C/M/J Missions Traced and Computed
With the New SWRDR Computer Program

Mission Number	Number of Edges	Spread Function Width at 50% Amplitude in Microns, Computer Calculations			Resolution in lines/mm from A. I. M. 3404 Curve, Computer Calculations		
		Arithmetic Mean	Standard Deviation	Coefficient of Dispersion	Arithmetic Mean	Standard Deviation	Coefficient of Dispersion
1007-2*	106	12.2	3.9	32%	71.0	18.0	25%
1008-1*	103	10.6	3.2	30%	83.0	21.1	25%
1008-2*	123	10.2	3.9	38%	84.3	21.0	25%
1009-1	80	11.7	4.2	36%	75.3	19.9	26%
1009-2	110	13.0	5.0	39%	74.1	21.7	29%
1010-1	119	9.8	3.3	33%	89.4	22.7	25%
1010-2	110	9.8	3.2	32%	84.3	21.4	25%
1011-1	115	10.9	3.8	35%	80.5	21.6	27%
1012-1	94	10.1	3.7	36%	86.1	20.4	24%
1012-2	100	10.2	3.1	31%	84.0	21.4	26%
1013-1	49	10.8	4.1	38%	83.3	27.3	33%
1014-1	92	10.8	4.5	41%	83.0	24.7	30%
1014-2	90	11.7	3.9	34%	74.2	20.1	27%
1015-1	35**	8.8	2.3	26%	93.1	16.5	18%
1015-2	40**	9.2	2.3	25%	89.7	17.8	20%
1016-1	31**	9.7	2.3	24%	88.0	18.6	21%
1016-2	33**	9.8	3.2	32%	91.5	16.1	18%
1017-1	42**	10.2	3.5	34%	86.6	18.8	22%
1017-2	45**	11.4	3.6	31%	82.2	17.8	22%
1018-1	34**	9.6	2.5	26%	88.7	18.3	21%
1018-2	44**	10.1	2.4	23%	84.8	17.4	21%

*A 1 x 320 micron slit was used

**Each edge was traced three or more times on the microdensitometer

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MISSION 1030

Mission Number	Number of Edges	Spread Function Width at 50% Amplitude in Microns, Computer Calculations			Resolution in lines/mm from A. I. M. 3404 Curve, Computer Calculations		
		Arithmetic Mean	Standard Deviation	Coefficient of Dispersion	Arithmetic Mean	Standard Deviation	Coefficient of Dispersion
1019-1	40**	9.6	2.4	25%	87.1	15.8	18%
1020-1	40**	9.7	2.3	23%	86.2	17.7	21%
1021-1	20**	9.4	2.9	31%	92.1	22.4	24%
1021-2	15**	9.8	1.4	14%	87.6	10.7	12%
1022-1	44**	10.0	2.8	28%	89.9	19.6	22%
1022-2	48**	10.6	3.9	37%	85.4	23.1	27%
1023-1	42**	9.2	2.6	28%	90.2	20.3	23%
1023-2	31**	11.9	3.9	33%	71.9	16.5	23%
1024-1	46**	8.7	2.9	33%	91.6	19.4	21%
1024-2	44**	8.3	2.0	24%	94.1	18.2	19%
1025-1	29**	8.7	2.0	23%	91.3	18.4	20%
1025-2	25**	8.8	2.6	30%	92.2	21.1	23%
1026-1	43**	8.9	2.8	32%	89.5	21.3	24%
1026-2	38**	8.6	2.2	26%	91.1	18.9	21%
1027-1	22**	10.4	3.8	37%	85.8	21.4	25%
1028-1	57**	8.4	1.8	22%	91.0	15.3	17%
1028-2	52**	9.4	2.8	29%	85.1	21.3	25%
1029-1	62**	11.4	2.8	24%	75.2	15.4	20%
1029-2	60**	10.6	2.8	27%	78.9	16.5	21%
1030-1	36**	12.6	3.4	27%	70.5	18.1	26%
1030-2	29**	12.3	4.2	34%	70.9	16.9	24%

**Each edge was traced three or more times on the microdensitometer

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SECTION III - MISSION 1030
Image Quality Ranking of C/M/J Missions

Mission Number	Average Resolution in lines/mm for A.I.M. - 3404 Curve	Mission Number	Average Resolution in lines/mm for A.I.M. - 3404 Curve
1024-2	94.1 1/mm	1027-1	85.8 1/mm
1015-1	93.1 1/mm	1022-2	85.4 1/mm
1025-2	92.2 1/mm	1028-2	85.1 1/mm
1021-1	92.1 1/mm	1018-2	84.8 1/mm
1024-1	91.6 1/mm	1008-2	84.3 1/mm
1016-2	91.5 1/mm	1010-2	84.3 1/mm
1025-1	91.3 1/mm	1012-2	84.0 1/mm
1026-2	91.1 1/mm	1013-1	83.3 1/mm
1028-1	91.0 1/mm	1008-1	83.0 1/mm
1023-1	90.2 1/mm	1014-1	83.0 1/mm
1022-1	89.9 1/mm	1017-2	82.2 1/mm
1015-2	89.7 1/mm	1011-1	80.5 1/mm
1026-1	89.5 1/mm	1029-2	78.9 1/mm
1010-1	89.4 1/mm	1009-1	75.3 1/mm
1018-1	88.7 1/mm	1029-1	75.2 1/mm
1016-1	88.0 1/mm	1014-2	74.2 1/mm
1021-2	87.6 1/mm	1009-2	74.1 1/mm
1019-1	87.1 1/mm	1023-2	71.9 1/mm
1017-1	86.6 1/mm	1007-2	71.0 1/mm
1020-1	86.2 1/mm	1030-2	70.9 1/mm
1012-1	86.1 1/mm	1030-1	70.5 1/mm

NOTE: Since this is a research and development effort, modifications and improvements are continually being made in the methods of collecting edge data and in the computer data reduction. Caution is advised in making system comparisons based on lines per millimeter resolution or spread function width until better methods become available for calibration of the edge tracing technique.



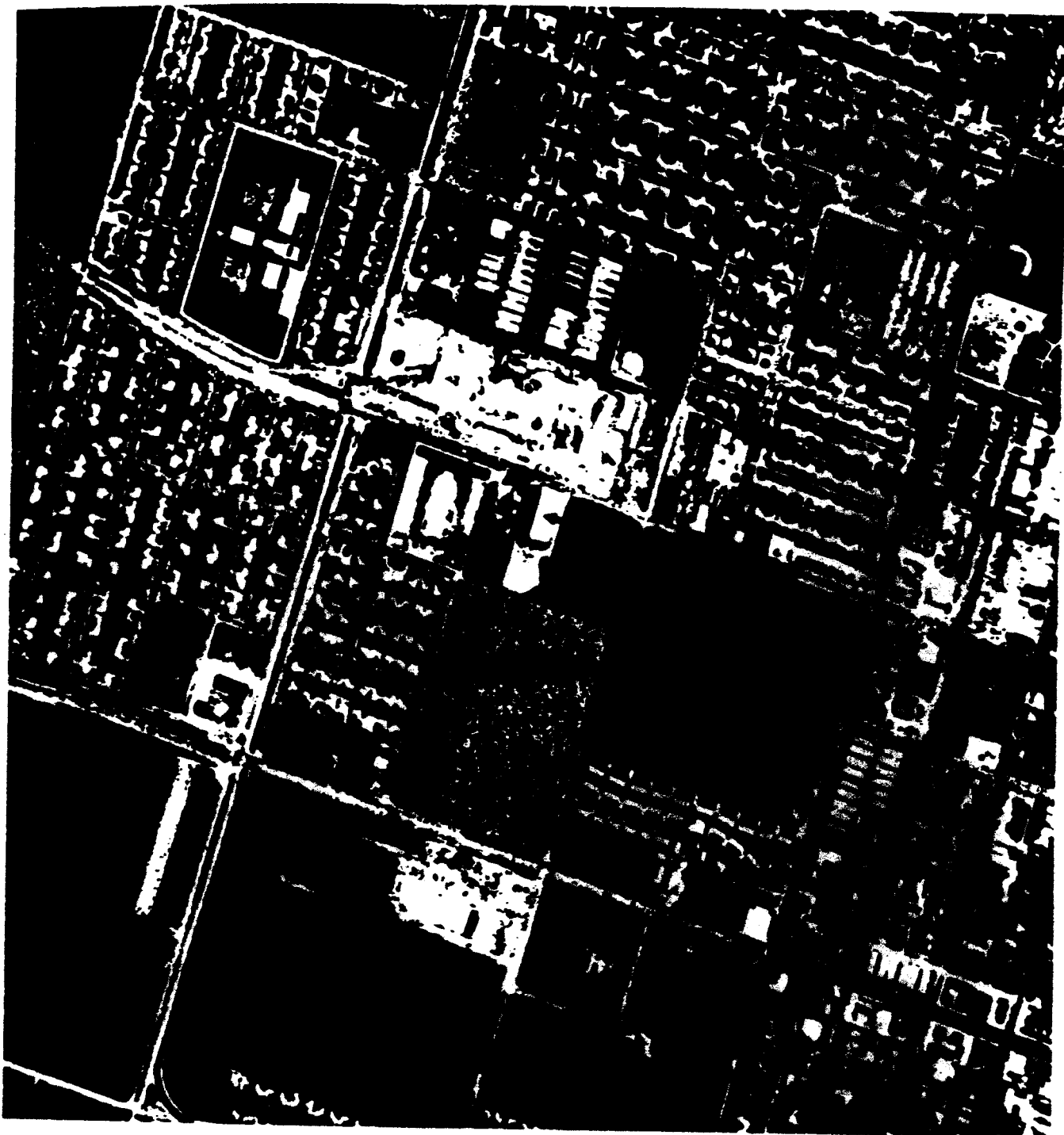
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Section IV Mission Segment 1030-1 40X Enlargement

Selected Frame FWD Camera

Edge Location: Pass D-63, Frame 011, X59.6 Y10.0



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Section IV Mission Segment 1030-2 40X Enlargement

Selected Frame FWD Camera

Edge Location: Pass D-110, Frame 008, X17.1 Y12.5



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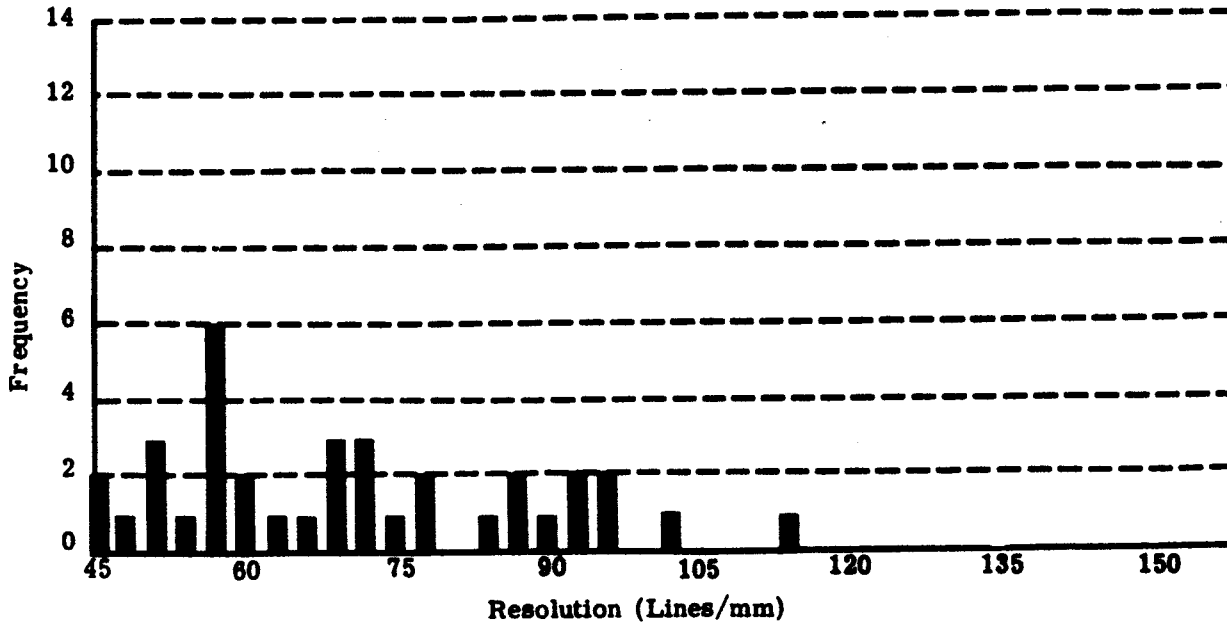
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Section V Mission Segment 1030-1 70mm Film

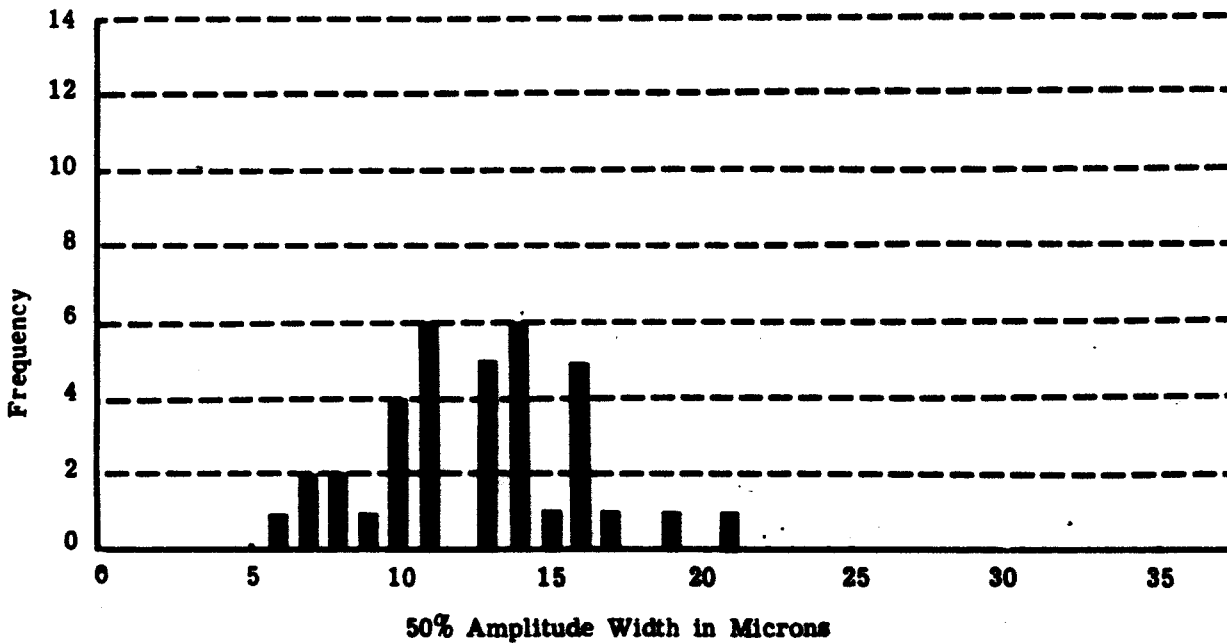
36 Edges

Average of Multiple Tracing

FREQUENCY VS. RESOLUTION A.I.M. 3404 CURVE



FREQUENCY VS. 50% AMPLITUDE WIDTH OF LINE SPREAD FUNCTION





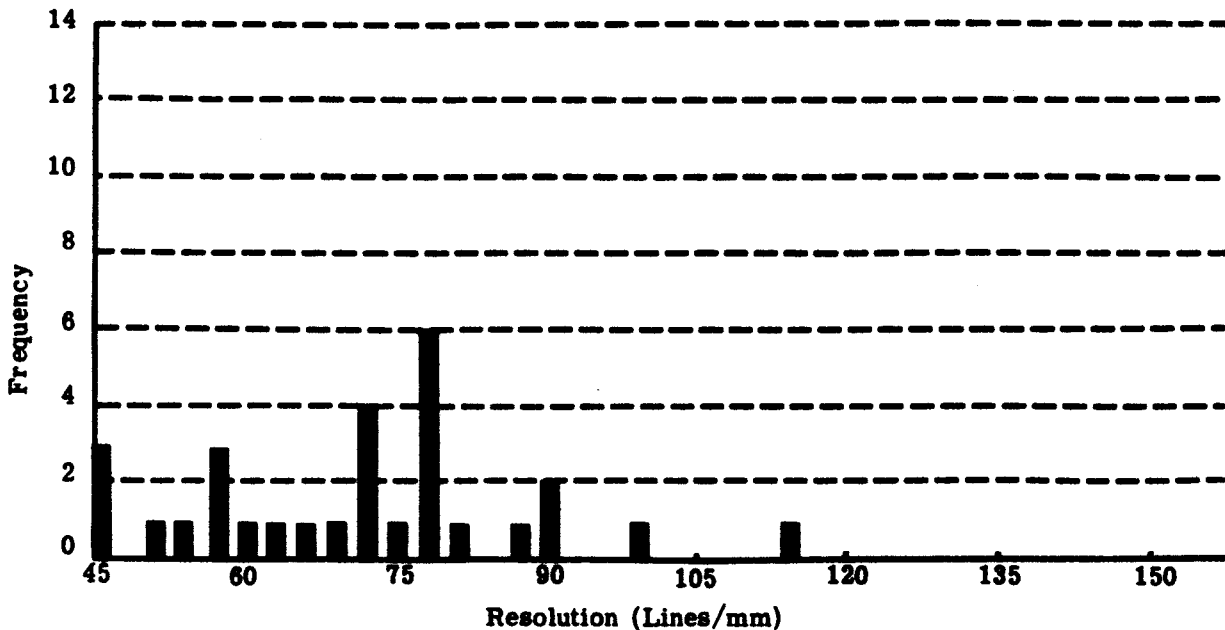
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Section V Mission Segment 1030-2 70mm Film

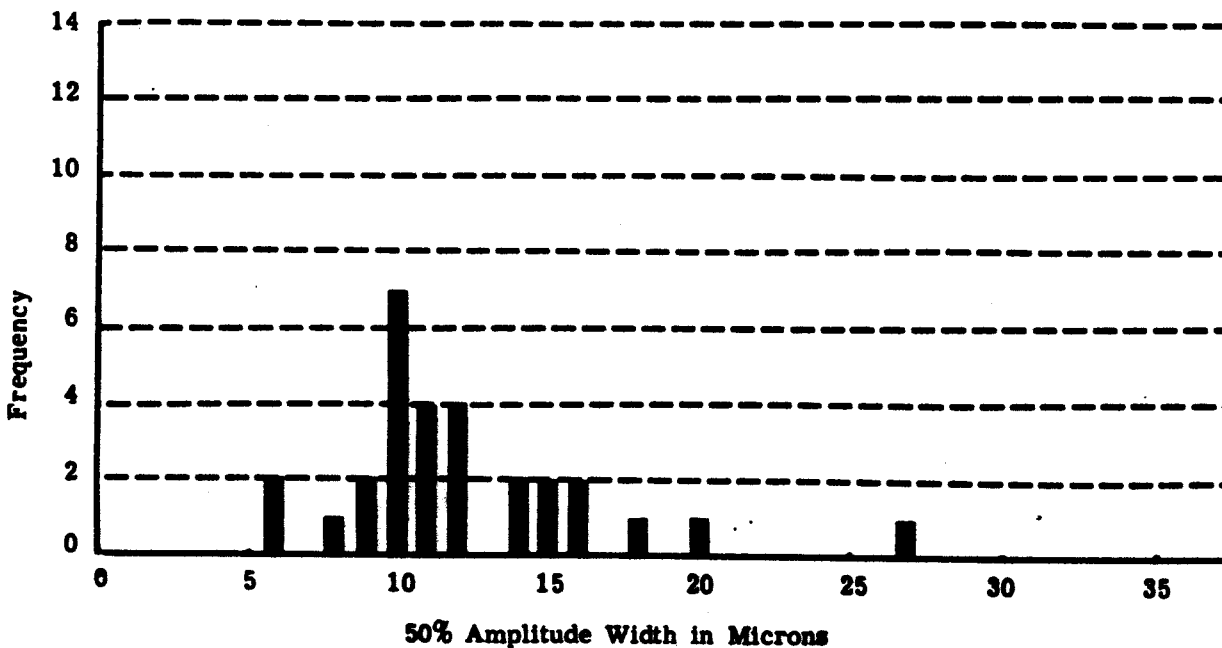
29 Edges

Average of Multiple Tracing

FREQUENCY VS. RESOLUTION A.I.M. 3404 CURVE



FREQUENCY VS. 50% AMPLITUDE WIDTH OF LINE SPREAD FUNCTION



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SECTION VI MISSION SEGMENT 1030-1

Trace No.	Pass	Frame	Location	Orientation	Sub-ject*	Density		Contrast	Spread Function		A. I. M. Resolution (lines/mm)	
						Dmin	Dmax		Width (microns)			
FORWARD CAMERA												
1	D-021	63	X 74.8 Y 9.8	080	X	0.87	1.55	2.08	16.4		57	
2	D-021	63	X 74.8 Y 10.2	055	X	0.87	1.43	1.84	18.8		45	
3	D-021	63	X 74.2 Y 10.2	120	X	0.85	1.58	2.17	10.1		97	
4	D-021	65	X 52.1 Y 12.1	055	D	0.88	1.29	1.56	11.2		75	
5	D-023	79	X 38.2 Y 14.2	085	B	1.29	1.95	2.16	13.9		63	
6	D-023	103	X 64.0 Y 11.1	095	B	0.66	1.62	2.90	13.0		59	
7	D-023	103	X 64.2 Y 10.8	030	B	0.65	1.47	2.49	13.6		88	
8	D-025	61	X 36.1 Y 11.8	075	B	0.99	1.78	2.33	11.0		84	
9	D-025	64	X 37.2 Y 14.2	010	B	0.62	1.43	2.53	13.5		58	
10	D-025	66	X 36.6 Y 10.2	045	B	0.60	1.57	3.00	12.6		65	
11	D-031	14	X 21.6 Y 12.6	095	B	0.87	2.21	6.19	13.8		70	
12	D-031	14	X 21.8 Y 12.4	060	B	0.61	1.29	2.21	9.6		77	
13	D-039	64	X 50.3 Y 13.2	045	B	0.54	0.89	1.61	13.9		58	
14	D-039	65	X 56.5 Y 11.2	060	B	0.54	1.30	2.48	16.1		52	
15	D-039	66	X 54.5 Y 10.5	010	B	0.56	1.57	3.19	20.9		47	
16	D-052	60	X 41.9 Y 10.9	065	B	0.67	1.26	1.97	11.1		69	
17	D-052	63	X 53.1 Y 10.7	015	B	0.89	1.72	2.43	14.2		57	
18	D-052	68	X 52.3 Y 13.3	040	B	0.62	1.44	2.57	10.5		71	
19	D-052	72	X 29.8 Y 12.1	045	B	0.86	1.74	2.58	10.2		78	
20	D-052	77	X 42.1 Y 12.1	005	B	0.90	1.60	2.10	16.2		51	
21*	D-063	11	X 59.6 Y 10.0	100	B	0.58	2.07	6.58	15.5		68	
AFT CAMERA												
22	D-021	51	X 35.4 Y 14.2	010	B	0.66	1.34	2.19	8.5		91	
23	D-021	70	X 23.0 Y 11.5	055	X	1.03	1.49	1.63	17.0		54	
24	D-021	73	X 55.2 Y 10.8	145	D	0.59	1.15	1.97	15.4		51	
25	D-025	67	X 66.7 Y 13.1	040	B	0.62	1.84	3.98	11.1		93	
26	D-039	71	X 40.6 Y 13.5	070	B	0.51	0.77	1.44	11.2		73	
27	D-039	73	X 34.3 Y 10.4	160	B	0.81	1.38	1.87	8.3		88	

* Selected Frame

*See Page 13

SECTION VI MISSION SEGMENT 1030-1

Trace No.	Pass	Frame	Location	Orientation	Sub-ject*	Density		Contrast	Spread	A. I. M. Resolution	
						Dmin	Dmax		Function Width (microns)		
AFT CAMERA											
28	D-052	65	X 55.8 Y 14.3	015	B	0.46	1.32	2.93	11.3	73	
29	D-052	68	X 48.6 Y 10.7	080	B	0.66	1.69	3.12	8.0	96	
30	D-052	68	X 49.2 Y 10.2	080	B	0.66	1.18	1.84	12.6	59	
31	D-052	71	X 37.7 Y 10.8	015	B	0.64	1.23	2.02	13.3	56	
32	D-052	75	X 38.5 Y 13.2	020	B	0.66	1.30	2.09	7.3	94	
33	D-052	77	X 49.4 Y 13.5	025	B	0.62	1.13	1.84	13.9	58	
34	D-052	85	X 49.2 Y 14.2	050	B	0.41	1.21	2.99	7.2	103	
35	D-052	86	X 47.5 Y 12.3	180	D	0.34	1.16	3.45	16.4	46	
36	D-C63	18	X 30.2 Y 11.3	090	B	0.65	2.10	6.23	6.1	115	

*See Page 13

SECTION VI MISSION SEGMENT 1030-2

Trace No.	Pass	Frame	Location	Orientation	Sub-ject*	Density		Contrast	Spread	A. I. M. Resolution (lines/mm)	
						Dmin	Dmax		Function Width (microns)		
FORWARD CAMERA											
1	D-102	97	X 34.2 Y 13.2	150	B	0.64	1.79	4.06	12.2	65	
2	D-103	10	X 43.2 Y 13.9	045	B	0.77	1.80	3.34	12.2	71	
3	D-103	110	X 66.8 Y 12.0	060	B	0.75	1.78	3.40	11.2	73	
4	D-110	7	X 74.0 Y 14.0	115	R	1.01	1.76	2.35	13.6	59	
5	D-110	8	X 17.1 Y 12.5	095	T	1.40	2.09	2.64	12.0	77	
6*	D-110	8	X 17.1 Y 12.5	005	T	1.46	2.11	2.53	9.3	87	
7	D-110	26	X 80.6 Y 12.2	095	B	1.45	2.42	6.14	11.2	72	
8	D-119	27	X 25.8 Y 10.6	040	B	0.40	1.42	3.99	26.7	41	
9	D-126	12	X 75.2 Y 10.1	025	B	0.91	1.96	3.83	11.4	79	
10	D-126	12	X 74.6 Y 9.8	015	B	1.07	2.13	4.35	8.2	90	
11	D-126	14	X 43.5 Y 12.8	160	B	0.77	2.25	7.71	6.5	115	
12	D-126	14	X 44.2 Y 12.5	025	B	0.47	1.99	7.43	11.4	79	
13	D-126	17	X 67.8 Y 10.2	105	B	1.01	1.87	2.73	19.7	42	
14	D-126	18	X 64.5 Y 14.3	140	B	0.87	1.65	2.44	15.1	53	
15	D-126	18	X 64.5 Y 13.9	165	B	0.85	1.50	2.12	12.4	64	
16	D-147	134	X 38.6 Y 12.2	015	B	0.54	1.05	1.94	16.2	57	
17	D-147	149	X 34.6 Y 10.8	010	B	0.97	1.49	1.77	10.1	78	
18	D-147	159	X 21.9 Y 13.5	005	B	0.71	1.66	2.80	10.2	72	
AFT CAMERA											
19	D-103	16	X 47.7 Y 12.5	045	B	0.85	1.82	3.15	15.2	58	
20	D-110	8	X 62.7 Y 10.0	050	D	0.87	1.66	2.49	15.7	52	
21	D-110	13	X 16.8 Y 11.1	095	R	0.95	1.54	1.93	8.7	89	
22	D-110	14	X 73.8 Y 12.8	095	T	1.39	1.64	1.35	10.3	82	
23	D-110	14	X 73.8 Y 12.8	005	T	1.30	1.66	1.52	10.3	77	
24	D-119	33	X 64.1 Y 12.5	090	B	0.45	1.37	3.32	14.0	57	
25	D-119	34	X 65.4 Y 10.3	035	B	0.49	1.53	3.66	18.1	44	
26	D-126	13	X 46.5 Y 11.2	075	B	1.03	1.90	2.77	9.6	79	
27	D-126	19	X 42.8 Y 10.7	085	B	0.90	2.12	5.00	6.1	98	

*Selected Frame *See Page 13

SECTION VI MISSION SEGMENT 1030-2

Trace No.	Pass	Frame	Location	Orien- tation	Sub- ject*	Density		Contrast	Spread	
						Dmin	Dmax		Function Width (microns)	A. I. M. Resolution (lines/mm)

AFT CAMERA

28	D-147	141	X 51.9 Y 12.4	010	B	0.64	1.24	2.00	10.0	70
29	D-147	166	X 68.8 Y 11.7	015	B	0.81	1.65	2.60	9.6	76

*SUBJECT

- B = Building
- D = Dam
- R = Reservoir or Settling Bed
- T = Test Object or Corn Target
- X = Breakwater

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