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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1006
5-12 JUNE 1964

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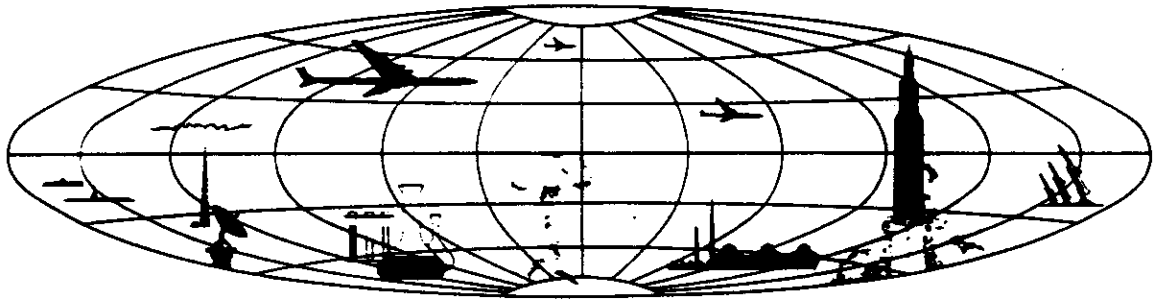

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SYNOPSIS

Mission 1006 (system J-09) was a two-part satellite reconnaissance mission. Photography was accomplished on 5 - 12 June 1964. The "A" bucket was ejected and recovered dry in an air catch on pass 65D, 8 June 1964. A "confidence run" of 17 frames was cycled to check the camera system. Telemetry indicated everything was in good working order and the mission continued. The "B" bucket was recovered dry in an air catch on orbit 128, 12 June 1964.

A lower than average orbit was attained (approximately 84 nm at perigee), giving rise to speculation that image motion compensation (IMC) might be inadequate near perigee. However, the photography displayed no image smear that could be credited to inadequate IMC. The low orbit, in fact, enhanced image quality due to the larger scale of photography. The only adverse effect of the low altitude was an inherent loss in forward overlap. There were targets covered that could not be viewed stereoscopically. This is a definite detriment to the PI suitability of the affected targets.

The door of the Slave (AFT) panoramic camera failed to jettison during the first two passes, resulting in a complete loss of imagery on the aft camera prior to frame 1 of pass 3D.

All auxiliary equipment related to the Master (FWD) panoramic camera became erratic in operation at the second camera operation of pass 103D. The binary is intermittently smeared; the horizon imagery is intermittently smeared; the horizon fiducials and the camera number appear intermittently; and the Stellar Index camera exposed only four more frames.

No significant difference in image quality of the panoramic camera photography was observed between the "A" and "B" buckets.

GENERAL FLIGHT DATA

Date of Launch: 5 June 1964

Orbital Parameters

Planned	Actual (revolution 01)
Period: 90.57 min	90.59 min
Perigee: 99.92 nm	84.0 nm
Perigee Latitude: 40.60°N	63.20°N
Apogee: 270.50 nm	261.00 nm
Eccentricity: 0.0209	0.0239
Inclination Angle: 80.00°N	79.97°N

PART I. CAMERA OPERATION

1. Master (FWD) Panoramic Camera No 148:

Minus density streaks approximately parallel to the major axis of the film are intermittent throughout the mission. The presence of these streaks is of little consequence; however, they do represent a potentially serious degradation.

Scratches, just inside the format at each edge under the camera number, and just inside the format at each edge at the take-up end, appear on every frame of the mission. Because

[redacted]

[redacted]

of their location the scratches are a minor degradation. Severe emulsion scratches are present along the major axis of pass 15D.

Light leaks resulted in areas of fog on the first and last three frames of most passes. The density of the fog is commensurate with the duration of the camera off period and solar elevation. The last five feet of film is fogged.

Dendritic static discharges caused fog along both edges intermittently throughout the mission. On rare occasions the fog intrudes into the format (Example: pass 9D, frames 05-26).

Flare at the supply end of pass 52D, frames 13-19, degrades the imagery in an area up to six square inches on each affected frame. The flare tends to be smeared along the major axis of each format and appears to be associated in that respect with "cloud smearing" as reported in previous missions.

A corona burst associated with the film wrap-up of the "A" bucket caused minor fog on pass 56D, frame 68. Due to corona discharges there is a small area of fog between the third and fourth frame of nearly every pass after pass 56D.

2. Slave (AFT) Panoramic Camera No 149:

The camera door failed to jettison on command and remained in a closed position during the first two operational passes.

The binary word, camera number, and horizon camera fiducials were inoperative between pass 1D, frame 09, and pass 3D, frame 18.

Emulsion scratches appear just inside the format at the same four locations as described as being present on the photography of the Master panoramic camera. Rail scratches are continuous along both edges throughout the mission.

Light leaks result in fog on the first and last few frames of most passes. This fog occurs during camera off periods and the intensity of it is dependent on the duration of the camera off period and the solar elevation. The last nine feet of film is fogged in varying degrees.

Flare, associated with solar azimuth and scan, degrades the imagery of pass 70D, frame 66-71. The flare is smeared along the major axis much the same as "cloud smearing."

3. Master (FWD) Horizon Cameras:

The port (supply) horizon camera was operational through the first camera operation of pass 103D. The horizon imagery is intermittently smeared thereafter. It appears that the film was being advanced during exposure. The amount of smear varies from very little to extreme. The imagery not affected by the malfunction is generally good.

The starboard (take-up) horizon camera was adversely affected in the same degree and on the same frames as the port horizon camera. The exposure was adequate on most passes but a veiling of the imagery is present from the beginning of the mission through pass 56D. The veiling is very pronounced at the beginning of the mission but gradually dissipates and finally disappears at pass 65D. A probable cause of the diffusion of the imagery is jettisoned fuel hanging near the starboard horizon camera window during the flight.

4. Slave (AFT) Horizon Cameras:

The port (take-up) horizon camera was operational throughout the mission. The exposure varied from under to adequate and generally good horizons were recorded.

The starboard (supply) horizon camera operated throughout the mission. The imagery of the first 56 passes is veiled like that of the Master starboard horizon camera. The exposure was usually adequate and the frames not degraded by the veiling, display good horizon imagery.

5. Stellar Camera No 45 (1006-1):

The stellar photography is degraded by a variety of malfunctions. The shutter failed to

[redacted]

[redacted]

FIGURE 1. EXAMPLE OF IMAGE QUALITY - MASTER CAMERA.

[illegible]

FIGURE 2. EXAMPLE OF IMAGE QUALITY - SLAVE CAMERA.

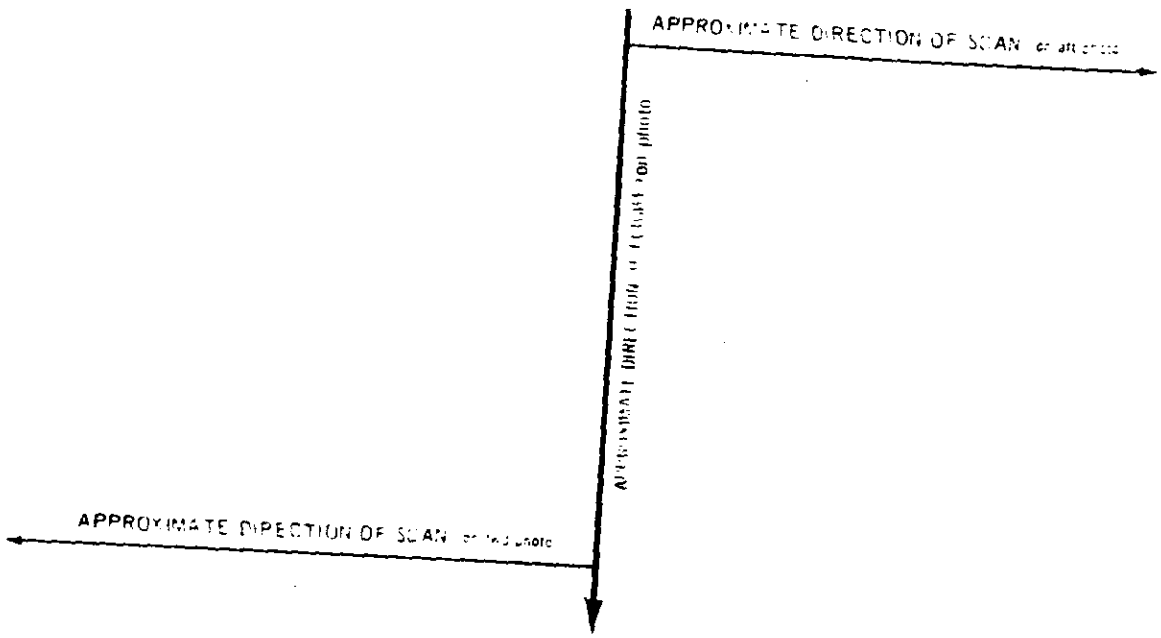
[illegible]

The following two photographs show a comparison of image quality between the Master (FWD) and Slave (AFT) panoramic cameras.

[redacted]

[redacted]

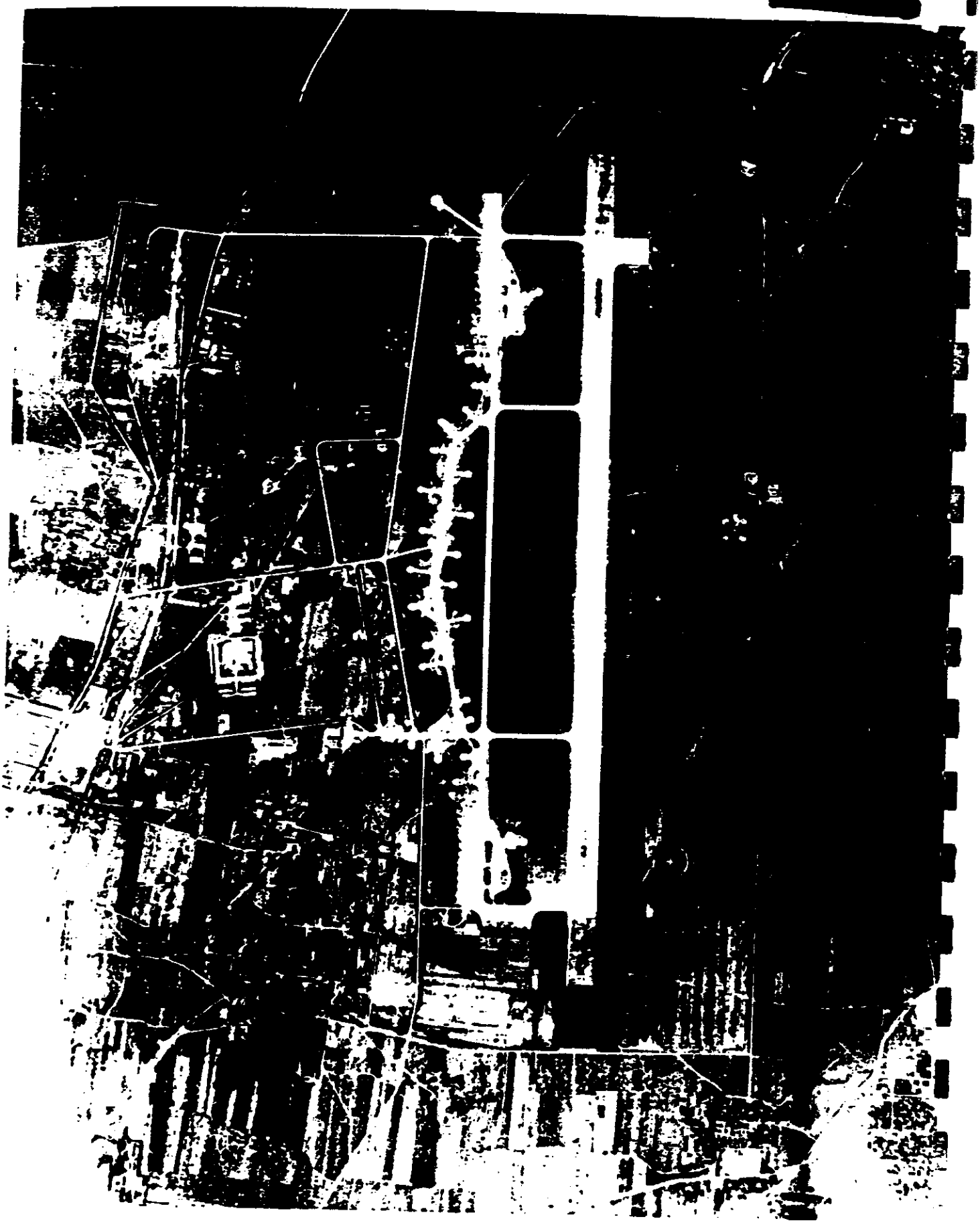
	Figure 1	Figure 2
Pass	21D	21D
Frame	83 FWD	87 AFT
Enlargement Factor	20X	20X
Solar Elevation	53°	53°
Solar Azimuth	257°	257°
Altitude	92.4 nm	92.4 nm

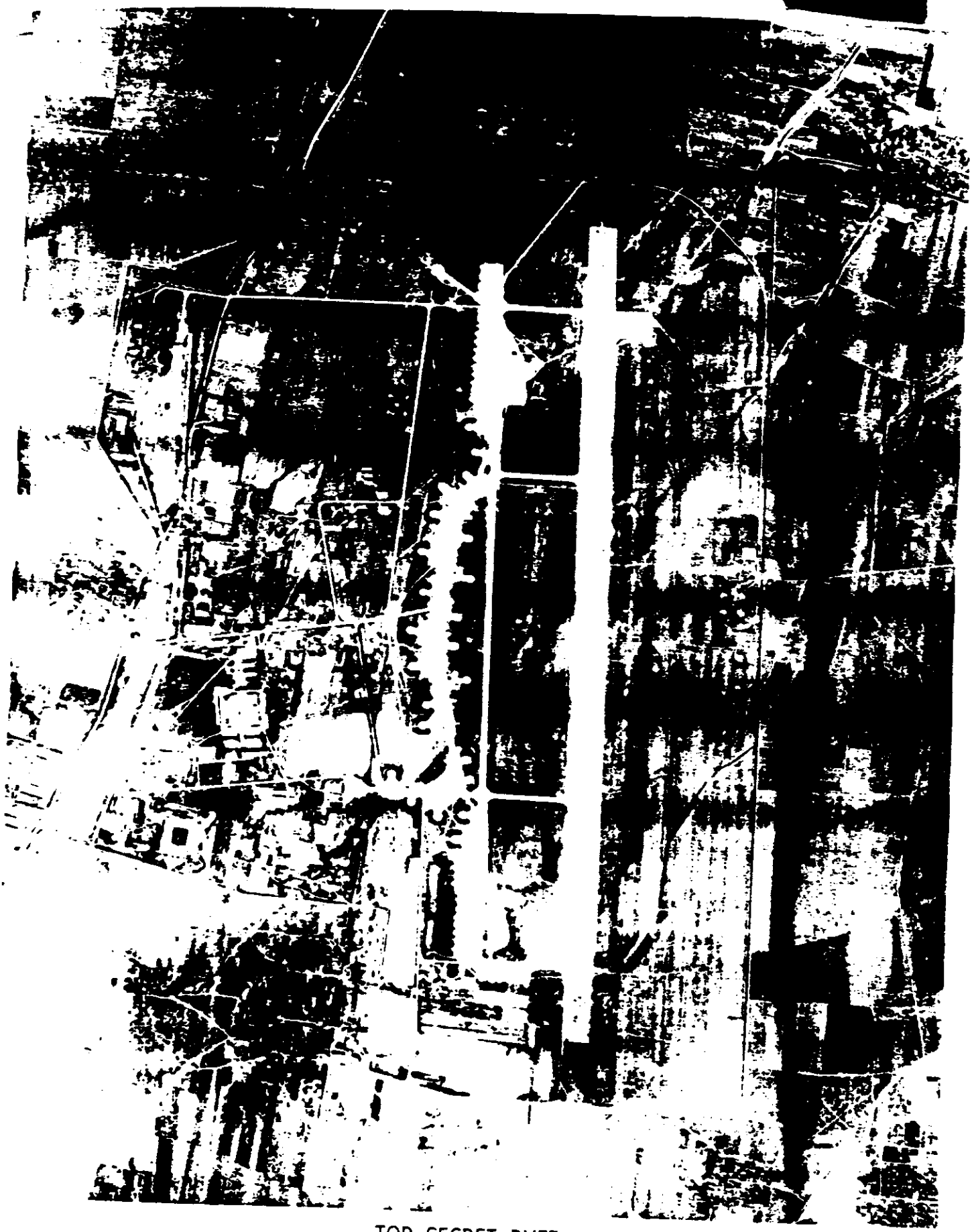


APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

Figure 1 • • Figure 2

[redacted]





[redacted]

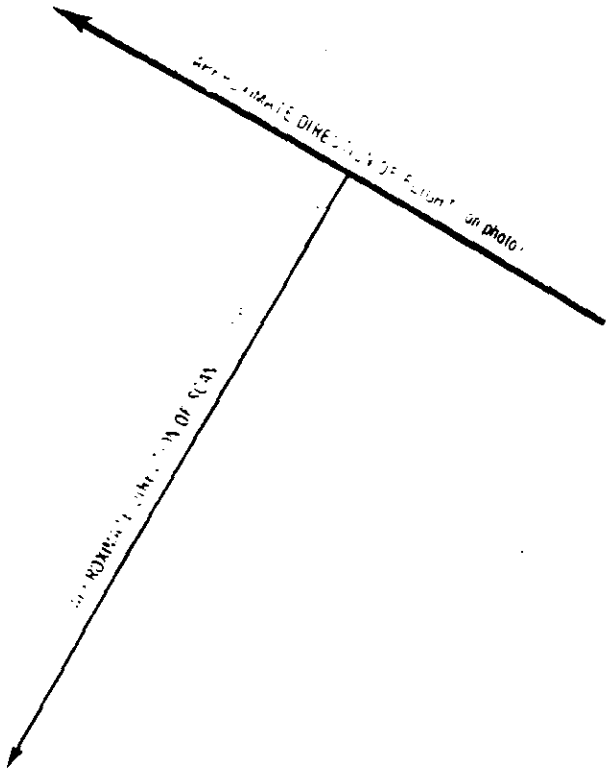
FIGURE 3. GOOD IMAGE QUALITY NEAR END OF MISSION.

NPIC [illegible]

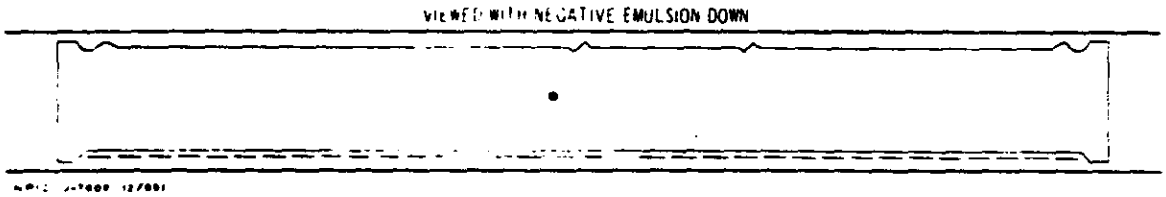
[redacted]

[redacted]

Pass	119D
Frame	96 AFT
Enlargement Factor	20X
Solar Elevation	52.2°
Solar Azimuth	140°
Altitude	93.11 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT



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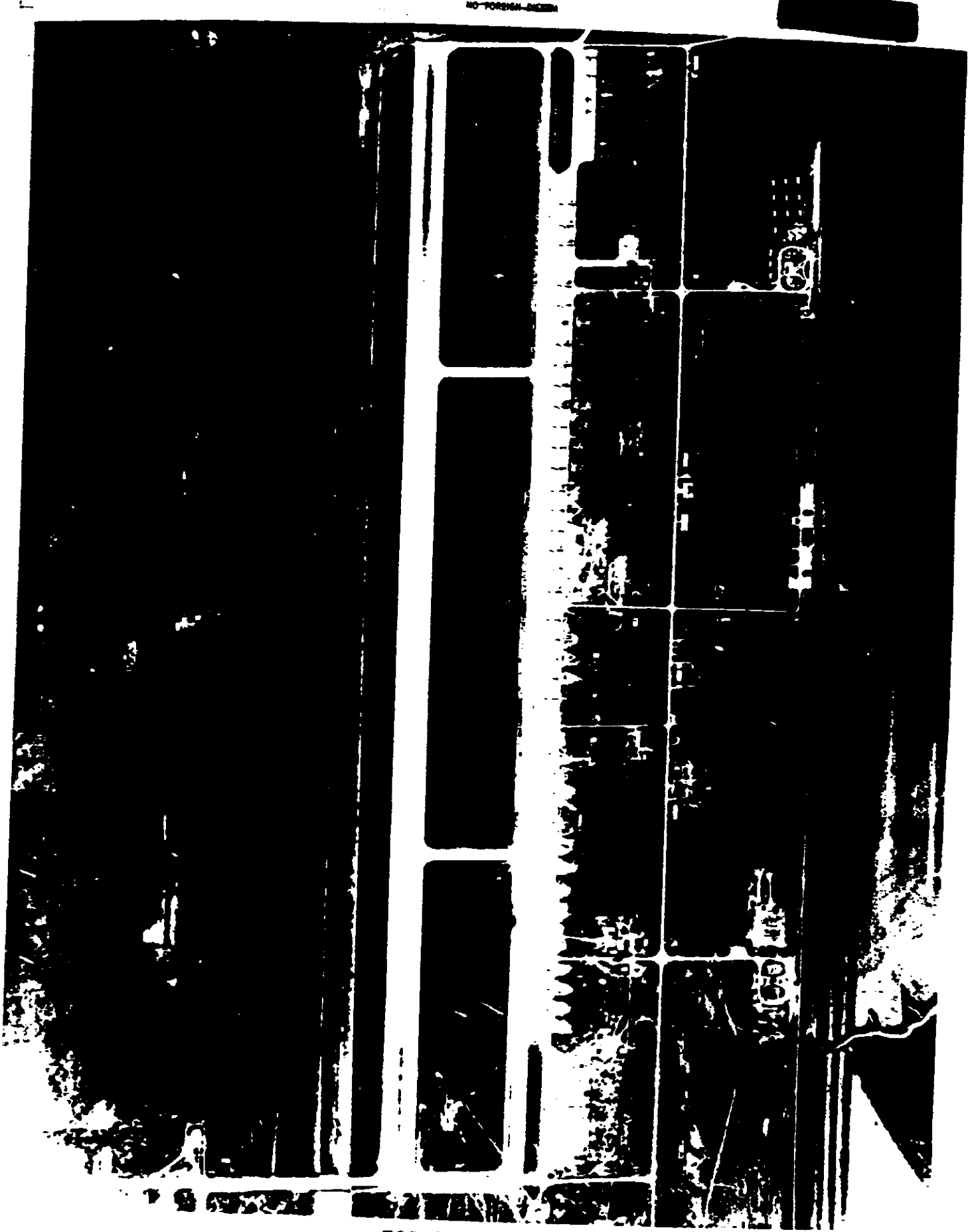

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FIGURE 4. EFFECT OF FLARE.

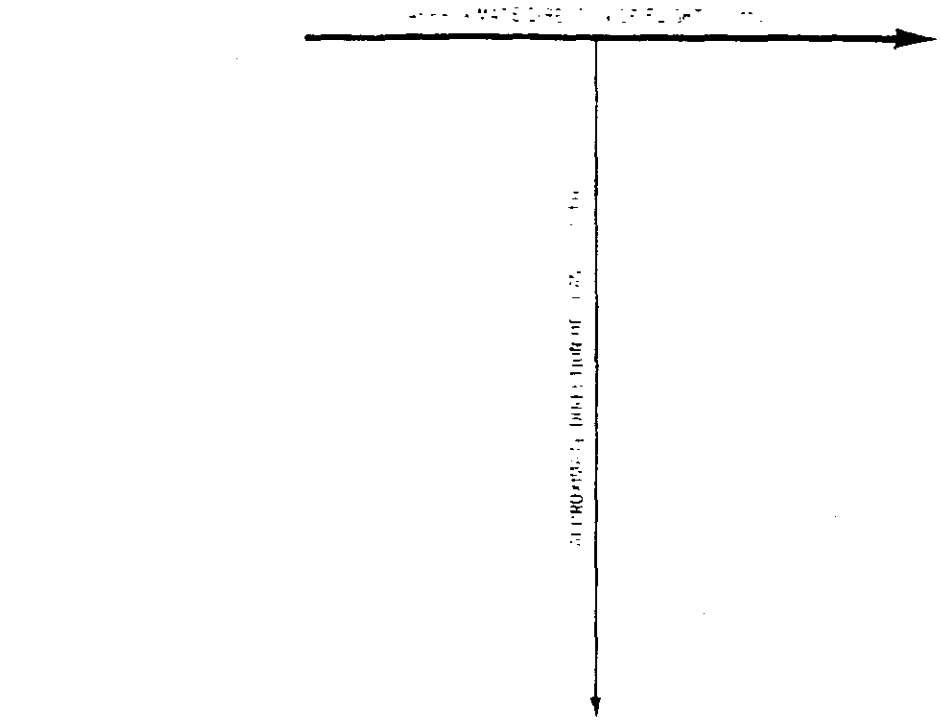
[redacted]

The following photograph shows the degradation of PI suitability caused by flare.

[redacted]

[redacted]

Pass	52D
Frame	19 FWD
Enlargement Factor	Contact
Solar Elevation	53°
Solar Azimuth	230°
Altitude	88.99 nm



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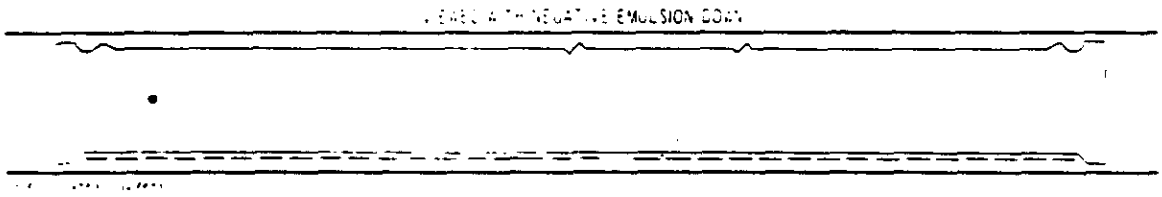

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FIGURE 5. EXAMPLE OF IMAGE QUALITY - PORT HORIZON CAMERA.

NPIC J-8148 (2/68)

FIGURE 6. EXAMPLE OF IMAGE QUALITY - STARBOARD HORIZON CAMERA.

NPIC J-8150 (2/68)

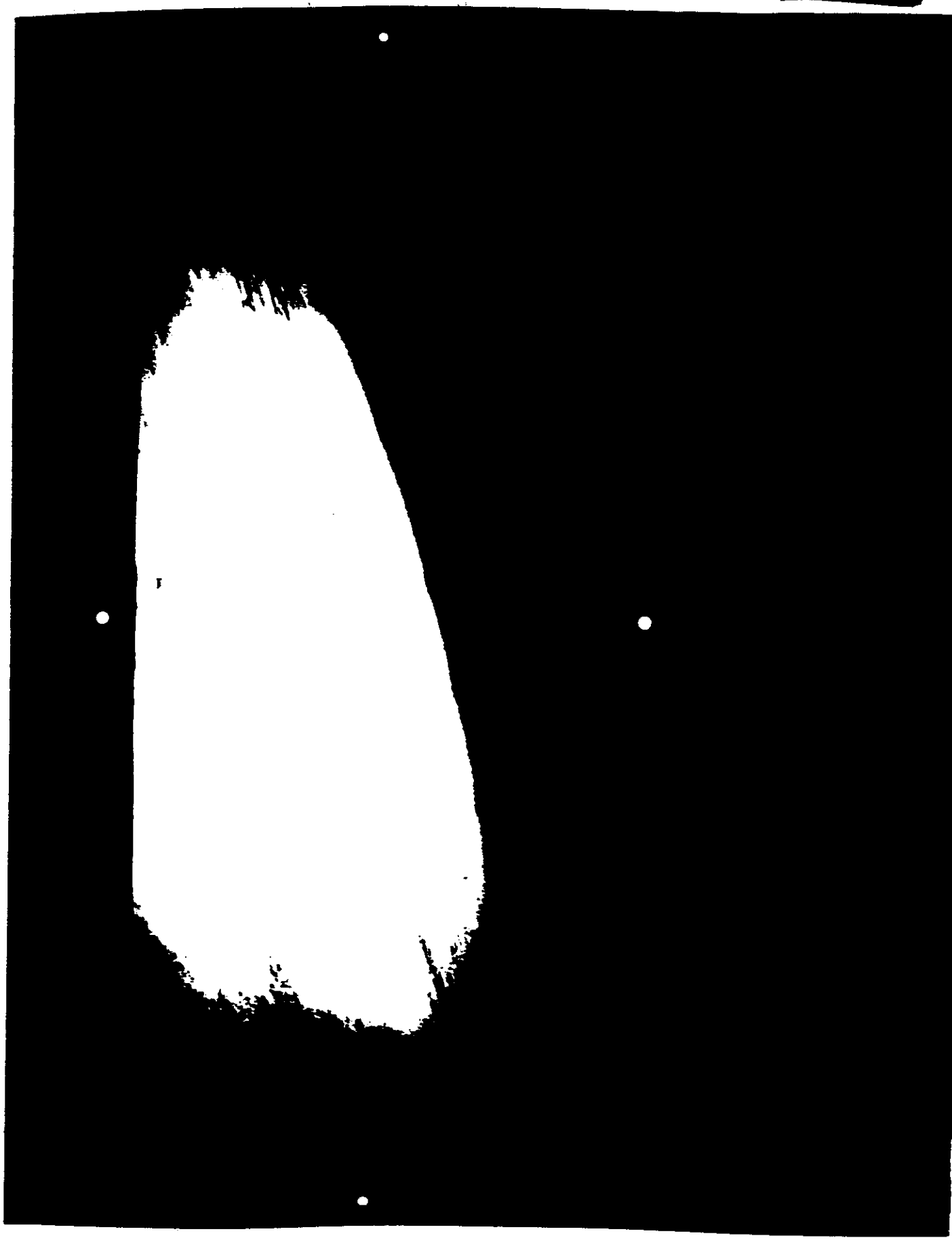
The following two photographs provide a comparison of horizon image quality from the starboard and port horizon cameras.

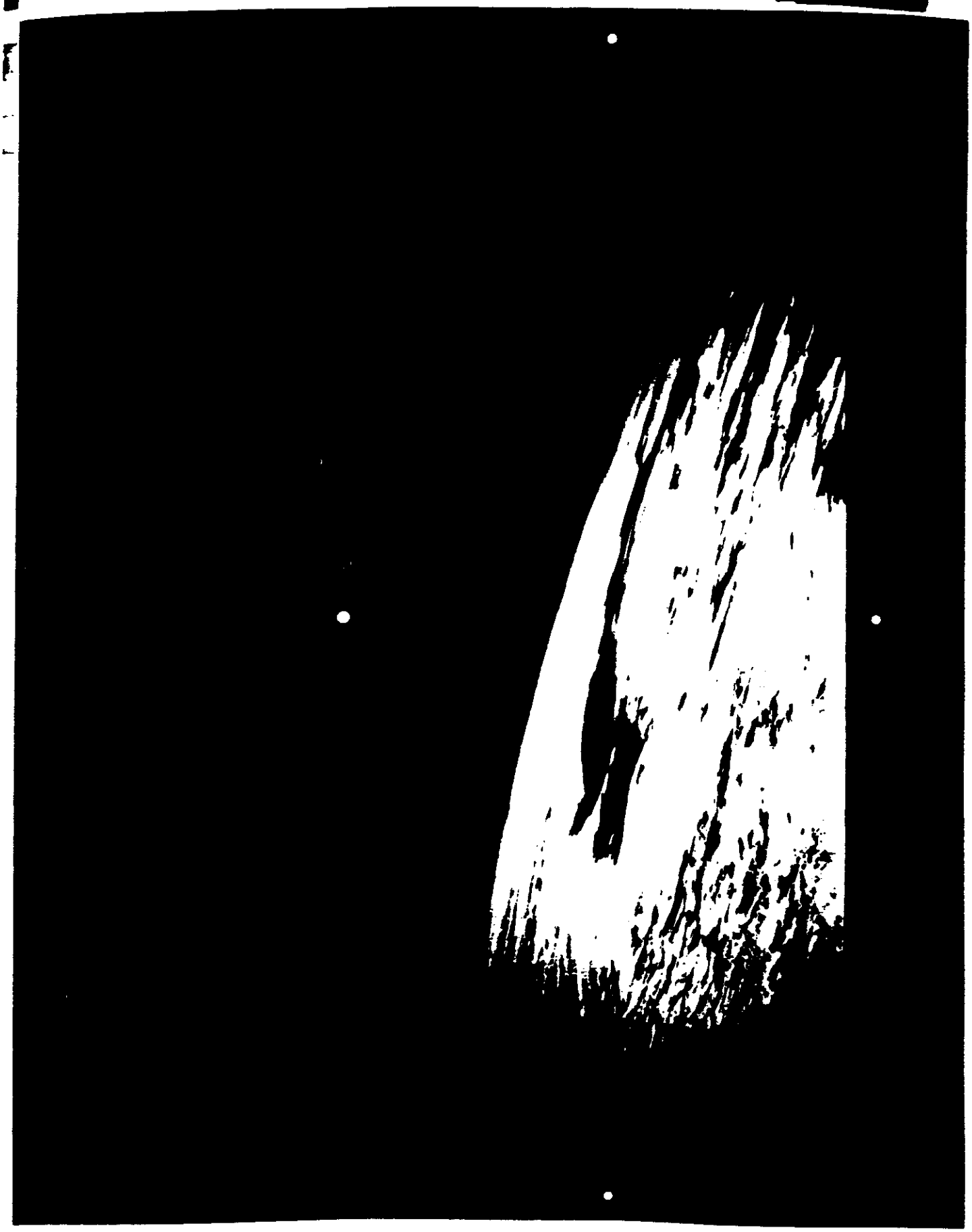
[redacted]

[redacted]

Pass	01D
Panoramic Frame	04 FWD
Enlargement Factor	04X
Solar Elevation	Not available
Solar Azimuth	Not available
Altitude	Not available

[redacted]





[redacted]

FIGURE 7. HORIZON IMAGERY BEFORE MALFUNCTION.

NPIC J-8191 (2/68)

FIGURE 8. HORIZON IMAGERY AFTER MALFUNCTION.

NPIC J-8192 (2/68)

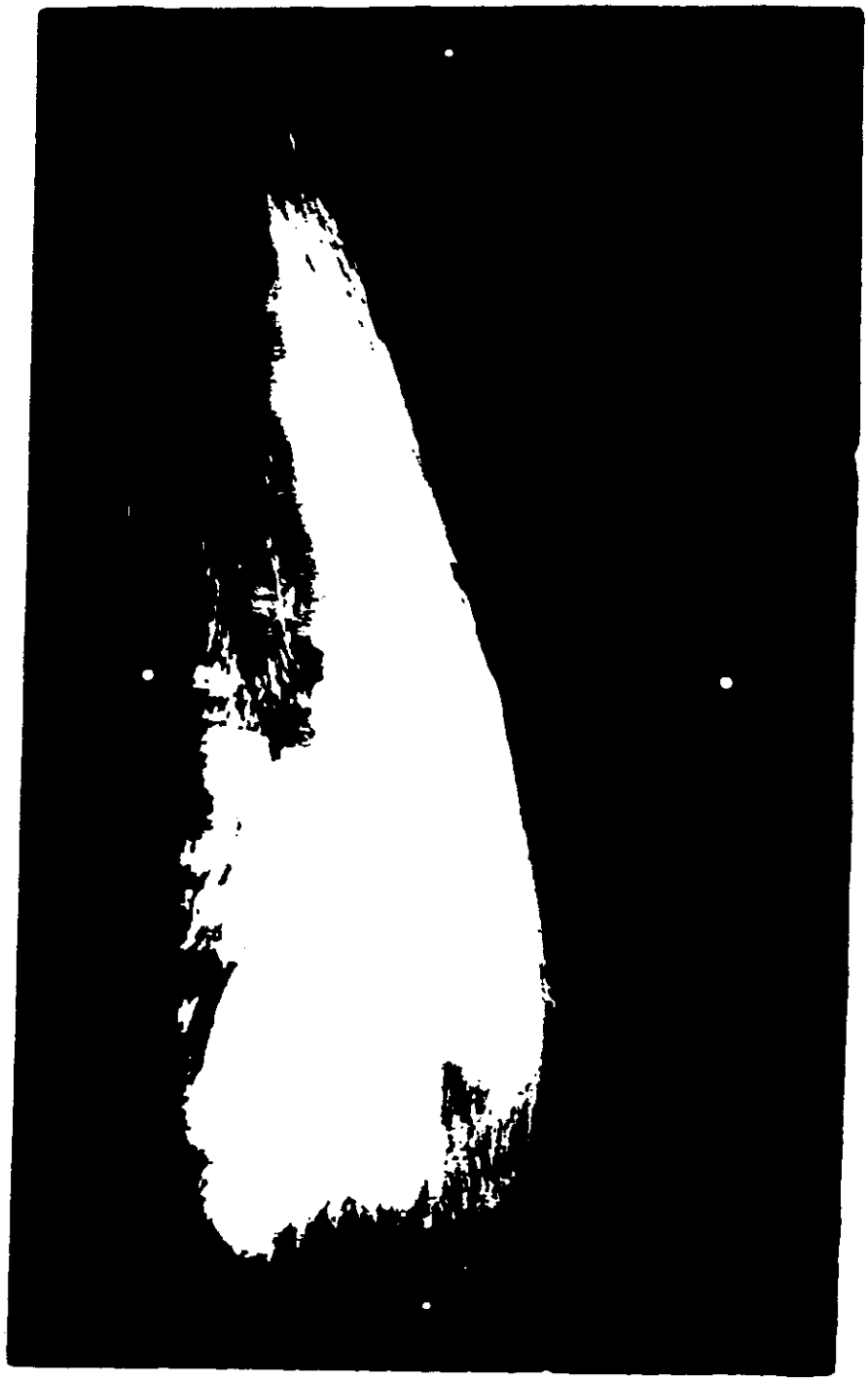
The first photograph is the last good horizon exposure preceding the horizon camera malfunction. The second photograph is the first frame affected by image smear.

[redacted]

[redacted]

	Figure 7	Figure 8
Pass	103D	103D
Panoramic Frame	60 FWD	62 FWD
Enlargement Factor	3.5X	3.5X
Solar Elevation	56.3°	56.3°
Solar Azimuth	135°	135°
Altitude	96.5 nm	96.5 nm

[redacted]



open 33 times and it remained open during film transport 36 times. There is a ghost stellar image offset slightly from each true image on several frames of the photography. The stellar reduction process was not seriously impaired because it is possible to segregate the true image from the ghost image. A study of the doubled imagery follows the stellar film density readings in Appendix D.

The reseau is well defined and is not double exposed.

When viewing the film through the base, the fiducial to the right of the frame correlation fiducial is grossly overexposed. It is bloomed into the format and degrades the stellar imagery. Due to this flare and the more common flares (side curtain and earth flare) approximately 40 percent of each format is obscured.

Edge fog due to static discharges is intermittent along the edge opposite the frame correlation fiducial.

Emulsion scratches parallel to the major axis of the film are continuous on the first 20 frames and intermittent thereafter.

Where not affected by degradations, contrast and density are sufficient to determine the presence of stellar images.

6. Stellar Camera No 42 (1006-2):

The exposure and contrast are adequate to determine the presence of stellar images.

Flare affects 30 percent of each frame. Semicircles, associated with the four fiducials, are imaged in the format of each frame. This is probably caused by halation from the mounting plates of the fiducial lamps.

Due to a malfunction which affected all of the auxiliary equipment keyed to the "center of format switch," there are only four frames after the first camera operation of pass 103D. The four frames following the malfunction are randomly located (not in sequence).

A streak of fog due to a light leak extends into each format from the camera number edge. The fog is degrading only on the frames that were at rest in the platen during a camera off period.

Emulsion cracks along the minor axis are present throughout.

There is a slight fogging each 8.0 inches along the major axis. The fog appears to be the result of corona discharges.

7. Index Camera No D47 (1006-1):

The first frame is double exposed.

Static discharge traces are heavy on the last five frames of photography. Throughout the rest of the mission, fog due to static is intermittent and minor.

The density and acuity of the imagery is good throughout.

8. Index Camera No D49 (1006-2):

Frame 1 is double exposed. Beginning at frame 22 there is a wavering minus density streak approximately 0.5 inches from and roughly parallel to the edge of the film opposite the frame correlation fiducial mark. The density of the frame correlation fiducial mark is quite low; however, it is readable throughout the mission.

Static discharges intermittently cause minor fog along the camera number edge of the film. There is fog due to a corona discharge on frame 185.

A light leak results in a streak of fog projected about 0.1 inches into the format from the camera number edge of each frame. The fog is very faint except at camera off periods.

9. Associated Equipment:

The frequency marks of both cameras are imaged outside the format and are readable. However, a reflected image does appear just inside the format edge.

The binary data block of the Slave panoramic camera failed to operate between Pass 1D, frame 09, and Pass 3D, frame 18. Throughout the remainder of the mission it is slightly bloomed but readable. The binary data block of the Master

[redacted]

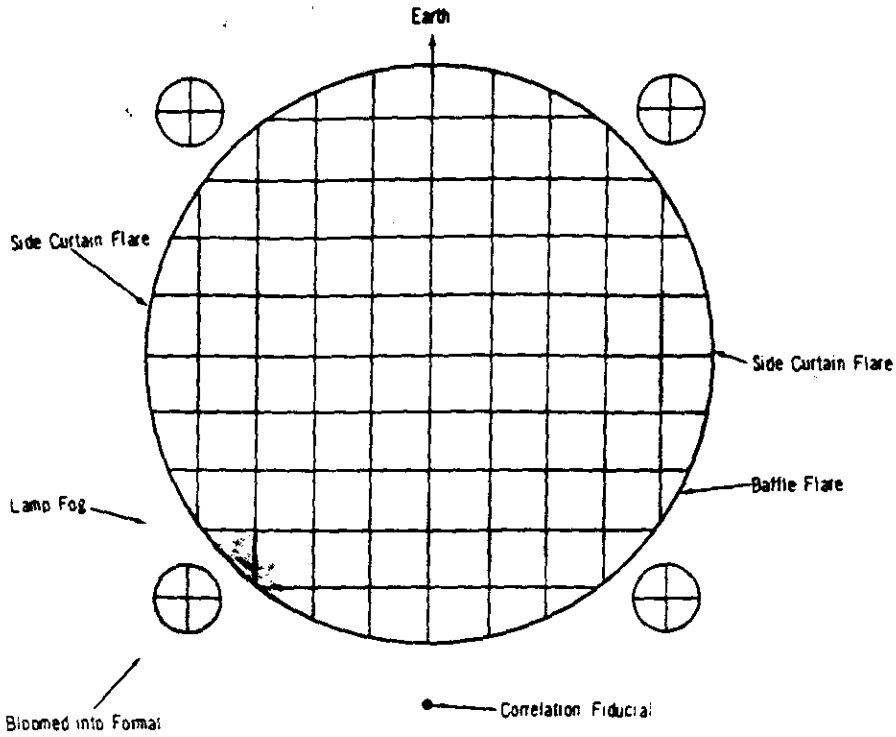
panoramic camera is slightly bloomed but readable through the first camera operation of Pass 103D. Beginning at the second camera operation of Pass 103D a variety of malfunctions began. The binary randomly failed to operate, was imaged during film transport causing it to be smeared, or appear twice on a single frame. There are occasions when the binary word is properly imaged, but more often than not a malfunction occurred.

The camera number of the Slave panoramic camera failed to operate between Pass 1D, frame 9, and Pass 3D, frame 18. The camera number of the Master camera and binary data block malfunctioned simultaneously.

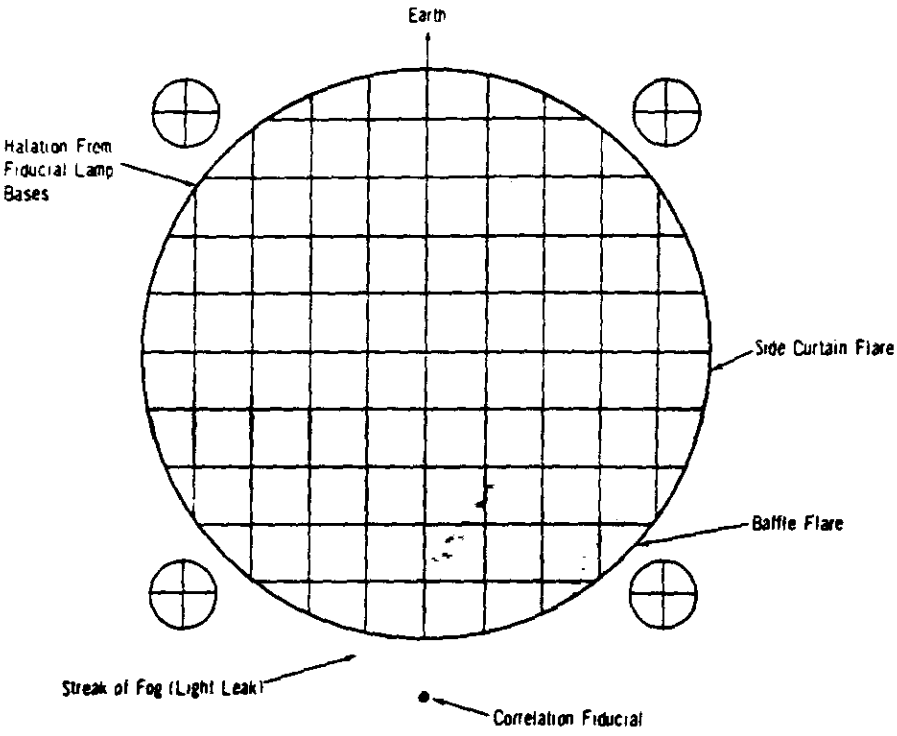
The horizon camera fiducial marks of the Master camera were also inoperative when the binary word and camera number failed.

An end-of-pass marker appears twice on the last frame of each camera operation, once at the binary word and again near the end of the frame.

[redacted]



MISSION 1006-1



MISSION 1006-2

NPIC J-7612 (2/65)

FIGURE 9. TYPICAL STELLAR FORMAT FLARES AND DENSITIES.

[redacted]

FIGURE 10. EFFECT OF STELLAR CAMERA SHUTTER MALFUNCTION.

NPIC [illegible] (2/68)

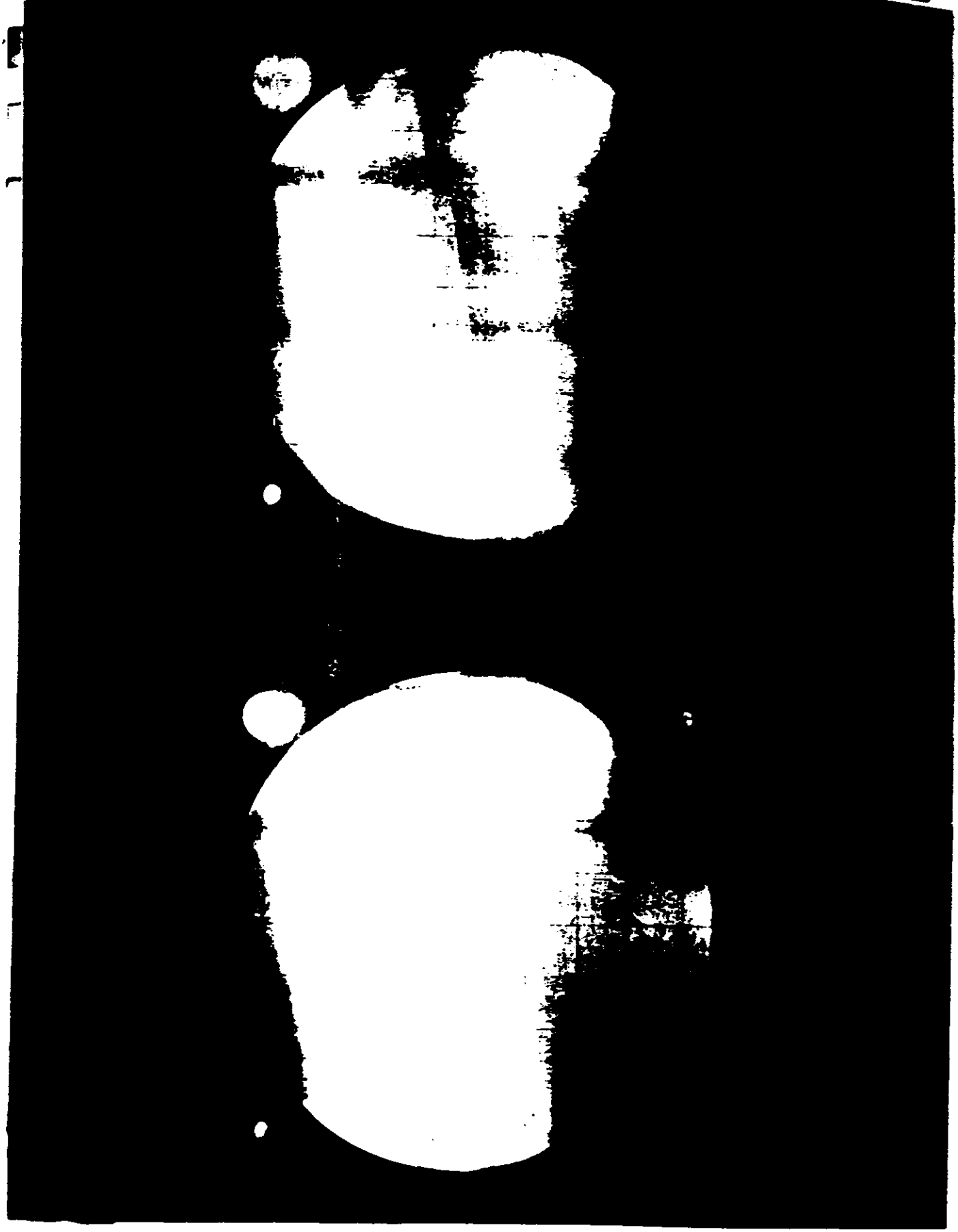
The following photograph illustrates the image degradation caused by the shutter remaining open during film transport. Note the severely bloomed fiducial.

[redacted]

[redacted]

Stellar Frame	249	250
Pass	37D	37D
Panoramic Frame	17 FWD	24 FWD
Enlargement Factor	4X	4X
Solar Elevation	49°	50°
Solar Azimuth	228°	231°
Altitude	86 nm	87 nm

[redacted]



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[redacted]

FIGURE 11- EXAMPLE OF FUEL PARTICLE IMAGES.

[redacted]

The following photograph shows the images of fuel particles that are photographed during the vehicle fuel jettison procedure. This usually occurs during the first few orbits of each mission.

[redacted]

[redacted]

Stellar Frame	02 (1006-1)
Pass	01D
Panoramic Frame	15 FWD
Enlargement Factor	4X
Solar Elevation	Not available
Solar Azimuth	Not available
Altitude	Not available

[redacted]

FIGURE 12. GOOD QUALITY INDEX CAMERA PHOTOGRAPHY.

NPIC J-6185 .2/65.

[redacted]

Index Frame	81
Pass	09D
Panoramic Frame	27 FWD
Enlargement Factor	2X
Solar Elevation	53°
Solar Azimuth	234°
Altitude	86.11 nm

[redacted]

[redacted]

PART II. FILM

1. Film Processing:

This section evaluates processing, exposure, and density of the original negatives.

The exposure of the Panoramic, Stellar, Index, and Horizon cameras was generally good throughout the mission.

The film exposed in the panoramic cameras and retrieved in the "A" bucket received approximately 50 percent full and 50 percent intermediate development. The "B" bucket panoramic photography received about 30 percent full, 40 percent intermediate, and 30 percent primary development.

A much greater variation in density is present in the panoramic photography of the "A" bucket than on that of the "B" bucket. Atmospheric conditions and terrain reflectance were the apparent reason for the large density spread. As a result of variations in exposure, the density difference within a single frame or between adjacent frames sometimes is large. According to the processing contractor the range of densities (exposure latitude) of some frames taxed the capabilities of the straight line portion of the characteristic curve for type 4404 film. Even though these large variations in density exist, a large majority of the film was judged to be good with respect to density.

Approximately 7.0 inches of film was destroyed in the processor at a cut between two processing parts. The accident occurred on Pass 18D, frame 17, of the Slave panoramic photography.

Film footage processed per camera (approximate):

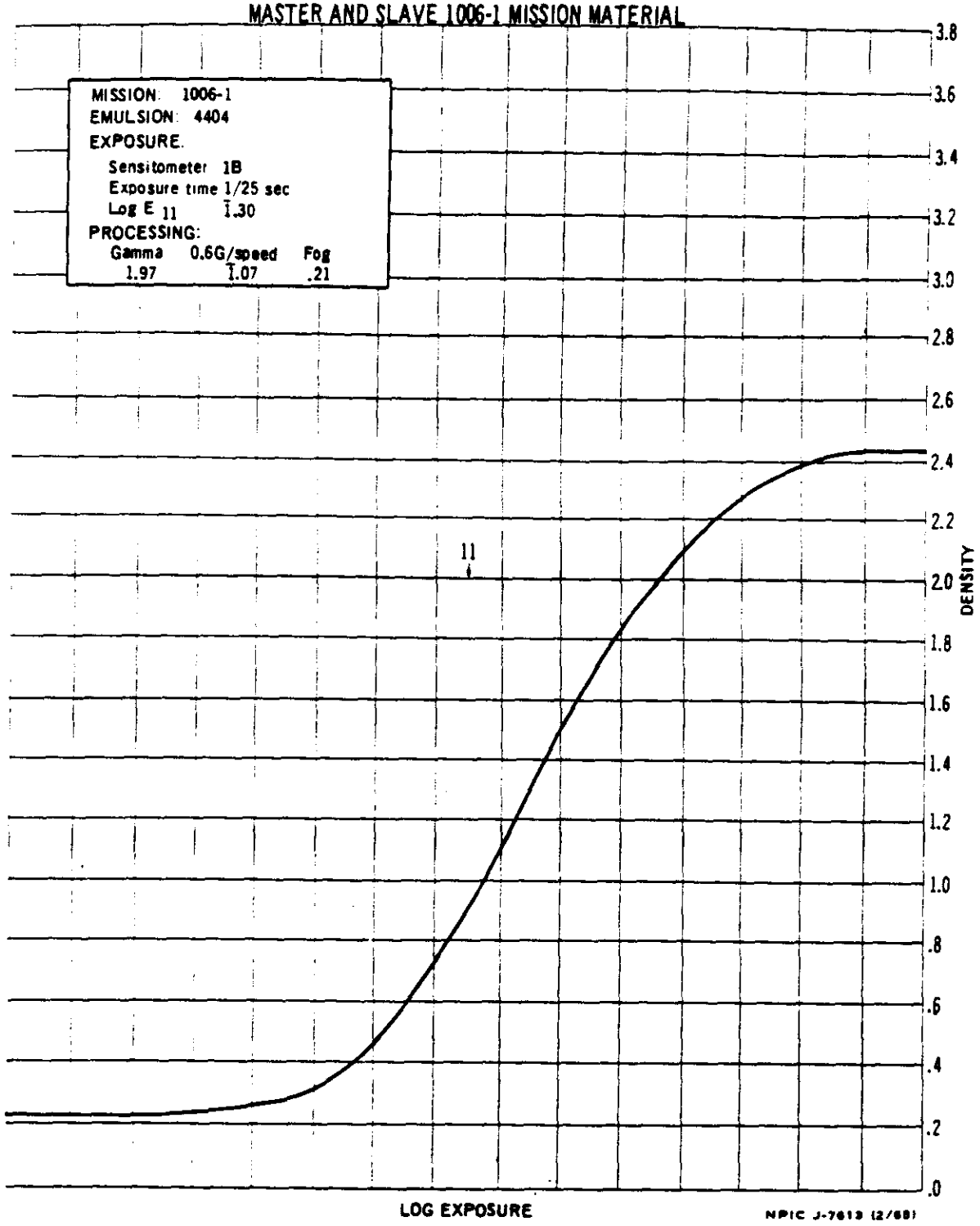
Camera	45 (stellar)	75 ft	412 frames
Camera	D47 (index)	135 ft	392 frames
Camera	42 (stellar)	75 ft	279 frames
Camera	D49 (index)	135 ft	276 frames
Camera	145 (1006-1)	7943 ft	2683 frames
Camera	149 (1006-1)	7862 ft	2647 frames
Camera	145 (1006-2)	7879 ft	2971 frames
Camera	149 (1006-2)	8005 ft	3021 frames

The following processing curves were produced by the processing contractor.

[redacted]

[redacted]

SENSITOMETRIC CURVE FROM
MASTER AND SLAVE 1006-1 MISSION MATERIAL



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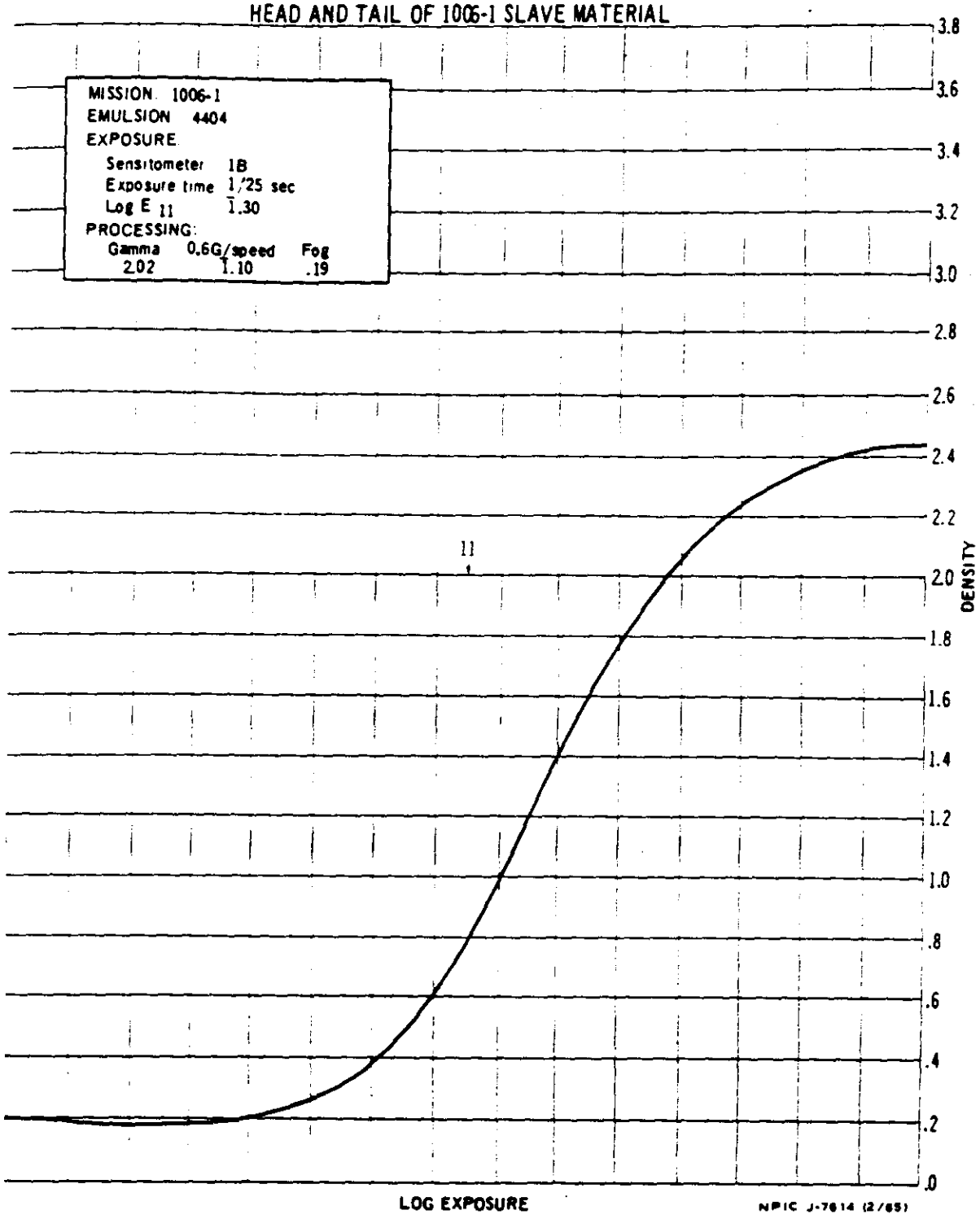
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1006-1 SLAVE MATERIAL



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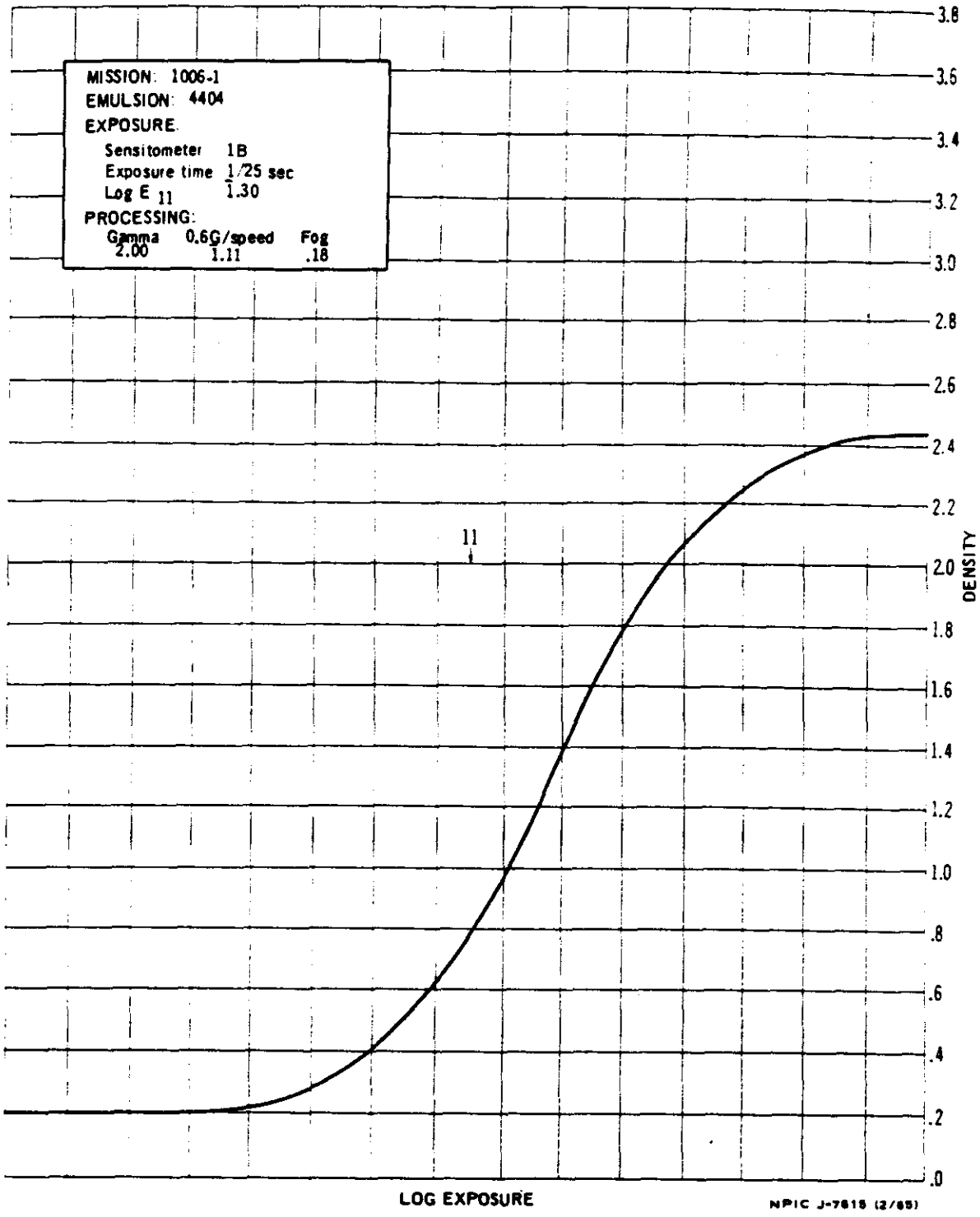
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1006-1 MASTER MATERIAL



[redacted]

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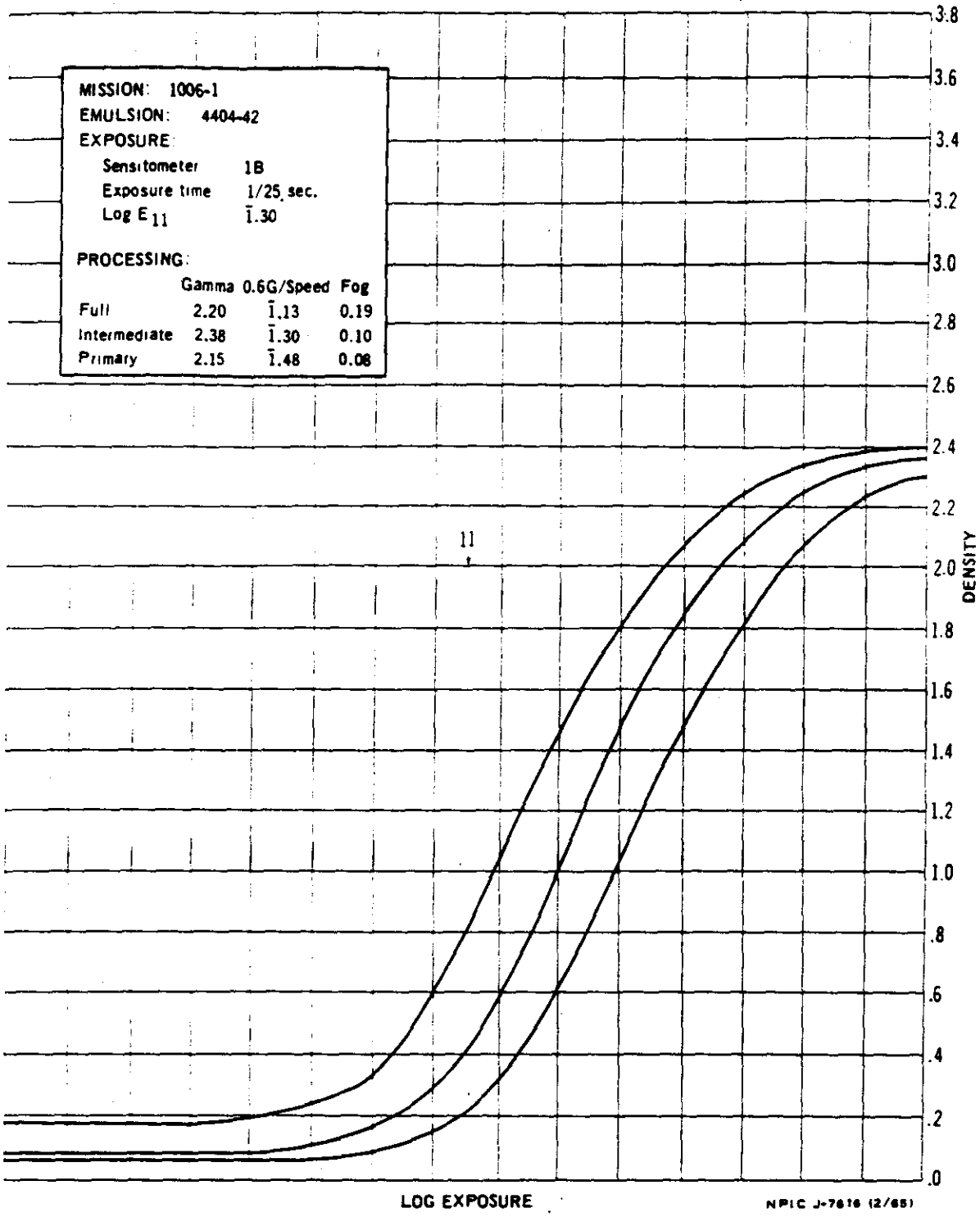
STANDARD SENSITOMETRIC CONTROL CURVES



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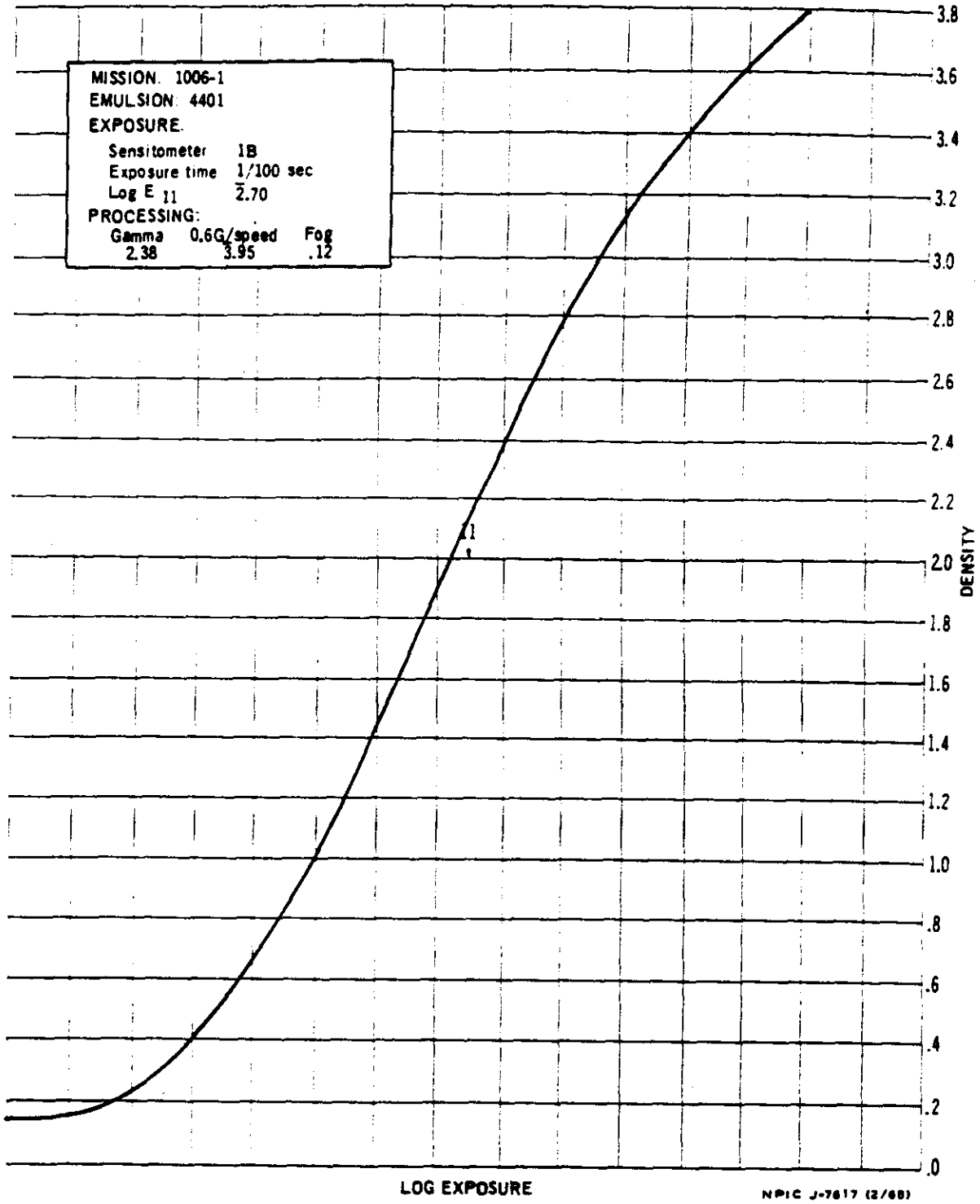
SENSITOMETRIC CURVE FROM
HEAD AND TAIL OF 1006-1 STELLAR MATERIAL



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2. Stellar Densities:

The Dmax and Dmin of the first and last frame of each operational pass were measured on a Macbeth QuantaLog densitometer Model EP 1000 with a 0.5mm aperture and an ET 20 attachment. All readings include gross fog.

The gross fog of each frame of this mission was read in conjunction with a radiation study conducted on this mission. The gross fog of each stellar frame follows the radiation study (appendix D).

Stellar Camera Number 45 (Mission 1006-1)

Reading	Pass	Frame	Limiting		Reading	Pass	Frame	Limiting	
			Dmin	Dmax				Dmin	Dmax
1	01D	1	0.57	2.64	32	25AE	204	0.25	0.26
2	01D	2	0.52	2.28	33	25D	205	0.35	2.05
3	02D	3	0.72	2.34	34	25D	222	0.55	2.55
4	02D	7	0.34	2.02	35	31D	223	0.64	2.66
5	03D	8	0.37	2.25	36	31D	227	0.26	0.29
6	03D	13	0.39	2.30	37	35D	228	0.24	0.25
7	05D	14	0.40	2.48	38	35D	233	0.28	0.30
8	05D	27	0.34	2.22	39	36D	234	0.32	0.35
9	06D	28	0.47	2.62	40	36D	246	0.62	2.71
10	06D	47	0.34	2.08	41	37D	247	0.20	0.20
11	07D	48	0.47	2.43	42	37D	275	0.42	2.52
12	07D	75	0.42	2.30	43	38D	276	0.75	2.82
13	09AE	76	0.25	0.25	44	38D	304	0.41	0.42
14	09AE	77	0.30	0.31	45	40AE	305	0.40	0.42
15	09D	78	0.58	2.61	46	40D	306	0.85	2.92
16	09D	86	0.40	2.39	47	40D	312	0.57	2.65
17	15D	87	0.40	2.37	48	49D	313	0.48	2.67
18	15D	93	0.45	2.43	49	49D	318	0.39	2.26
19	15D	94	0.53	2.48	50	52D	319	0.75	2.94
20	16D	101	0.64	2.17	51	52D	332	0.19	0.20
21	19D	102	0.52	2.58	52	53D	333	0.20	0.20
22	19D	113	0.40	2.44	53	53D	362	0.50	2.78
23	21D	114	0.47	2.58	54	54D	363	0.65	2.82
24	21D	141	0.34	2.33	55	54D	382	0.44	2.62
25	22D	142	0.42	2.51	56	55D	383	0.70	2.85
26	22D	160	0.36	2.46	57	55D	400	1.06	3.15
27	23D	161	0.33	2.14	58	56AE	401	0.34	0.60
28	23D	175	0.38	2.36	59	56AE	402	0.40	0.53
29	24D	176	0.40	2.42	60	56D	403	0.56	2.94
30	24D	202	0.51	2.65	61	56D	412	0.38	2.40
31	25AE	203	0.24	0.25					

3. Index Densities:

The terrain and limiting Dmax and Dmin values, together with three gross fog readings, were made on the first and last frame of each pass. The densities were read with a Macbeth QuantaLog densitometer model EP 1000 with a 0.5mm aperture and an ET 20 attachment. The terrain and limiting densities include gross fog.

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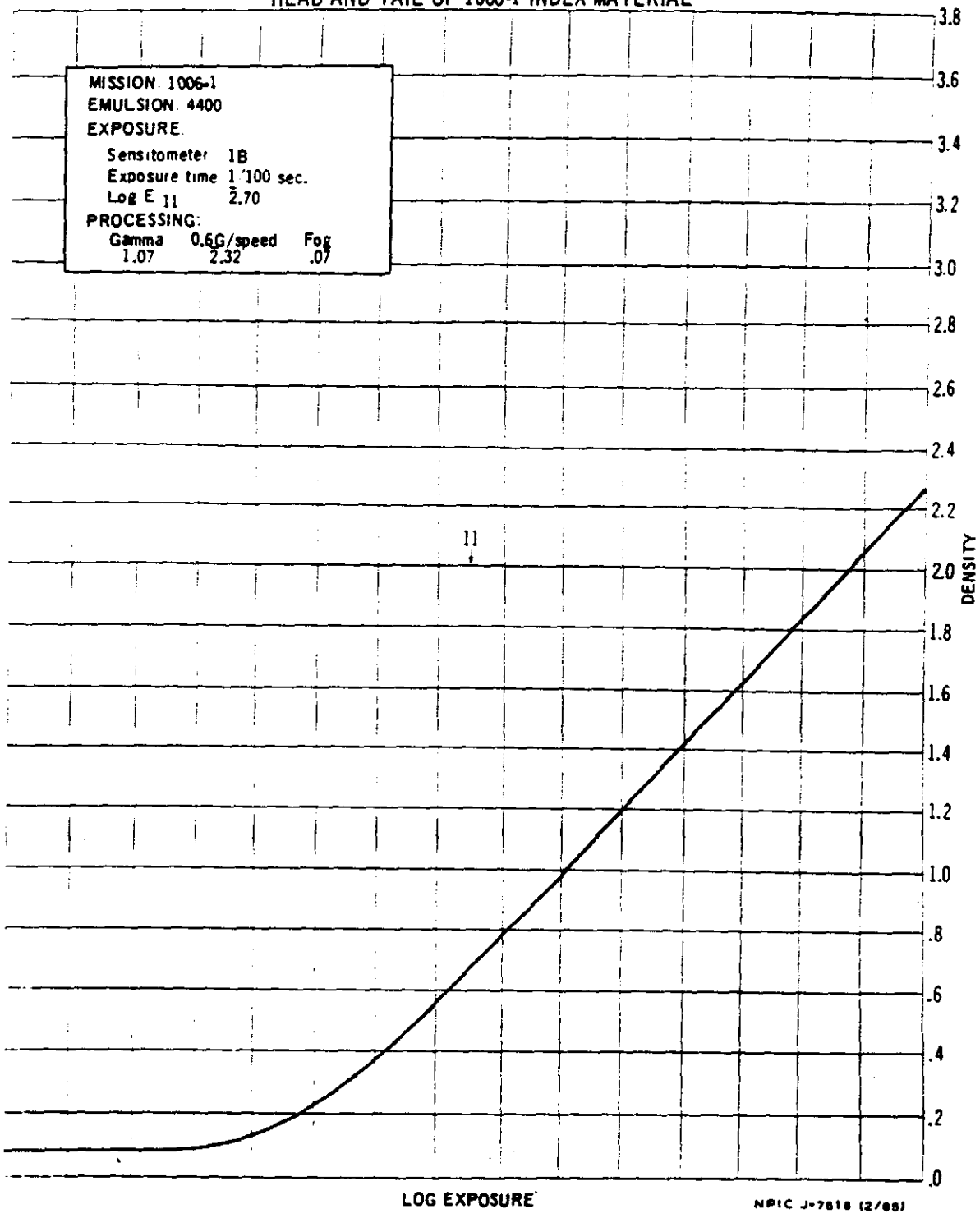
SENSITOMETRIC CURVE FROM
HEAD AND TAIL OF 1006-1 INDEX MATERIAL



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Camera Number D-47 (Mission 1006-1)

Reading	Pass	Frame	Terrain		Limiting		Gross Fog		
			Dmin	Dmax	Dmin	Dmax	Title Edge	Center Btwn Frs	Cam No Edge
1	01D	1	NR	NR	1.16	2.30	0.09	0.09	0.09
2	01D	2	NR	NR	0.46	1.93	0.09	0.09	0.09
3	02D	3	0.44	1.76	0.25	1.80	0.06	0.06	0.06
4	02D	7	NR	NR	0.16	1.47	0.14	0.14	0.15
5	03D	8	0.26	1.97	0.21	1.97	0.14	0.15	0.16
6	03D	13	NR	NR	0.16	1.63	0.10	0.10	0.10
7	05D	14	0.30	0.99	0.16	1.92	0.06	0.06	0.06
8	05D	27	0.26	0.57	0.16	1.92	0.07	0.07	0.07
9	06D	28	0.46	0.82	0.44	2.03	0.07	0.07	0.07
10	06D	47	NR	NR	0.42	1.96	0.06	0.06	0.06
11	07D	48	0.13	0.86	0.13	1.93	0.06	0.06	0.06
12	07D	75	0.40	1.32	0.24	1.72	0.06	0.06	0.06
13	09AE	76	NR	NR	0.06	0.09	0.06	0.06	0.06
14	09AE	77	NR	NR	0.06	0.06	0.06	0.06	0.06
15	09D	78	0.45	0.64	0.40	1.95	0.06	0.06	0.06
16	09D	86	0.35	1.22	0.29	1.99	0.07	0.07	0.07
17	15D	87	0.50	1.02	0.31	1.96	0.06	0.06	0.06
18	15D	93	0.61	1.30	0.32	2.12	0.06	0.06	0.06
19	16D	94	0.22	1.66	0.22	1.66	0.07	0.07	0.07
20	16D	101	0.62	1.37	0.12	2.05	0.06	0.06	0.06
21	19D	102	0.56	1.46	0.56	1.75	0.06	0.06	0.06
22	19D	113	NR	NR	0.40	1.73	0.06	0.06	0.06
23	21D	114	NR	NR	0.42	1.65	0.06	0.06	0.06
24	21D	141	NR	NR	0.51	1.63	0.06	0.06	0.06
25	22D	142	NR	NR	0.56	1.65	0.06	0.06	0.06
26	22D	160	0.20	0.62	0.20	1.96	0.06	0.06	0.06
27	23D	161	0.20	1.06	0.20	1.51	0.07	0.07	0.07
28	23D	175	0.30	1.67	0.30	2.03	0.06	0.06	0.06
29	24D	176	NR	NR	0.12	2.00	0.06	0.07	0.06
30	24D	202	0.51	1.34	0.16	1.34	0.06	0.06	0.06
31	25AE	203	NR	NR	0.06	0.06	0.06	0.06	0.06
32	25AE	204	NR	NR	0.06	0.06	0.06	0.06	0.06
33	25D	205	0.23	0.66	0.23	1.90	0.06	0.06	0.06
34	25D	222	0.16	0.94	0.16	2.06	0.06	0.06	0.06
35	31D	223	0.79	0.92	0.54	2.01	0.06	0.06	0.06
36	31D	227	0.43	1.47	0.36	2.00	0.06	0.06	0.06
37	35D	228	0.20	1.69	0.20	1.69	0.10	0.10	0.10
38	35D	233	NR	NR	0.13	1.87	0.06	0.06	0.06
39	36D	234	0.12	0.60	0.12	1.91	0.06	0.06	0.06
40	36D	246	NR	NR	0.34	1.97	0.08	0.08	0.08
41	37D	247	NR	NR	0.53	1.83	0.06	0.07	0.07
42	37D	275	NR	NR	0.22	2.01	0.06	0.06	0.06
43	38D	276	NR	NR	0.30	1.82	0.06	0.06	0.06
44	38D	304	0.50	0.94	0.40	2.04	0.06	0.06	0.06
45	40AE	305	NR	NR	0.06	0.06	0.06	0.06	0.06
46	40D	306	0.24	0.72	0.21	1.65	0.06	0.06	0.06
47	40D	312	0.16	1.14	0.16	1.17	0.06	0.06	0.06
48	49D	313	NR	NR	0.15	1.94	0.10	0.10	0.10
49	49D	318	NR	NR	0.14	1.82	0.06	0.06	0.06
50	52D	319	0.20	0.76	0.20	2.43	0.06	0.07	0.07
51	52D	332	NR	NR	0.20	1.97	0.06	0.06	0.06
52	53D	333	NR	NR	0.45	1.76	0.06	0.06	0.06
53	53D	362	0.24	0.76	0.24	2.03	0.06	0.06	0.06
54	54D	363	0.23	1.60	0.23	1.60	0.06	0.06	0.06
55	54D	382	0.44	1.62	0.44	2.11	0.06	0.06	0.06
56	55D	383	0.52	0.66	0.40	1.92	0.06	0.06	0.06
57	55D	392	0.54	0.92	0.50	2.06	0.20	0.30	0.34

Note: NR denotes no reading made

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Camera Number D-49 (Mission 1006-2)

Reading	Pass	Frame	Terrain		Limiting		Gross Fog		
			Dmin	Dmax	Dmin	Dmax	Title Edge	Center Btwn Frs	Cam No Edge
1	65D	1	NR	NR	0.46	2.14	0.08	0.08	0.08
2	65D	2	0.28	0.54	0.14	2.10	0.08	0.08	0.08
3	66D	3	0.16	0.83	0.16	2.02	0.10	0.10	0.10
4	66D	17	0.16	0.84	0.16	1.89	0.10	0.08	0.09
5	69D	18	0.16	0.72	0.16	1.84	0.10	0.10	0.10
6	69D	33	NR	NR	1.04	1.93	0.09	0.09	0.09
7	70D	34	0.15	0.50	0.15	2.64	0.10	0.09	0.10
8	70D	61	0.26	1.60	0.12	1.92	0.08	0.08	0.08
9	71D	62	0.12	0.60	0.12	1.58	0.10	0.10	0.10
10	71D	75	0.36	1.30	0.16	1.61	0.10	0.10	0.10
11	72AE	76	NR	NR	0.10	0.10	0.10	0.10	0.10
12	72AE	77	NR	NR	0.10	0.10	0.10	0.10	0.10
13	72D	78	0.24	0.86	0.24	2.04	0.10	0.10	0.10
14	72D	86	0.25	0.76	0.16	2.00	0.08	0.08	0.08
15	73D	87	0.20	0.80	0.12	1.96	0.10	0.10	0.10
16	73D	92	0.26	0.65	0.24	1.94	0.10	0.10	0.10
17	78D	93	0.20	1.05	0.20	1.38	0.10	0.10	0.10
18	78D	98	0.20	0.72	0.20	1.87	0.09	0.09	0.09
19	81D	99	NR	NR	0.14	1.98	0.08	0.08	0.08
20	81D	100	NR	NR	0.14	2.05	0.08	0.08	0.08
21	84D	101	0.30	0.92	0.30	2.05	0.08	0.08	0.08
22	84D	116	NR	NR	0.58	1.86	0.08	0.07	0.07
23	85D	119	NR	NR	0.24	1.93	0.09	0.08	0.08
24	85D	144	NR	NR	0.36	1.84	0.08	0.08	0.08
25	86D	145	0.26	0.62	0.17	1.98	0.08	0.08	0.08
26	86D	159	0.46	1.94	0.22	1.95	0.08	0.08	0.08
27	87D	160	0.52	0.67	0.36	1.75	0.08	0.08	0.08
28	87D	185	0.40	1.37	0.32	2.07	0.10	0.10	0.10
29	88AE	186	NR	NR	0.08	0.10	0.09	0.09	0.09
30	88AE	187	NR	NR	0.08	0.10	0.10	0.09	0.09
31	96D	188	0.27	0.35	0.12	1.82	0.08	0.08	0.08
32	96D	192	NR	NR	0.12	1.67	0.09	0.09	0.09
33	99D	193	0.35	0.63	0.14	1.83	0.08	0.08	0.09
34	99D	205	NR	NR	0.12	1.68	0.10	0.09	0.10
35	100D	206	0.27	1.19	0.25	2.04	0.10	0.10	0.10
36	100D	221	NR	NR	0.11	1.44	0.08	0.08	0.08
37	101D	222	0.20	0.64	0.16	1.70	0.10	0.10	0.10
38	101D	242	0.21	1.72	0.17	2.11	0.10	0.10	0.10
39	102D	243	0.27	0.66	0.16	1.90	0.10	0.10	0.10
40	102D	258	0.40	1.82	0.29	2.02	0.10	0.08	0.10
41	103AE	259	NR	NR	0.08	0.13	0.08	0.08	0.08
42	103AE	260	NR	NR	0.08	0.10	0.09	0.09	0.09
43	103D	261	0.25	0.46	0.20	1.96	0.09	0.09	0.09
44	103D	273	0.33	1.26	0.26	1.82	0.09	0.08	0.08
45	104D	274	0.17	0.75	0.17	1.74	0.10	0.09	0.09
46	110D	275	0.30	1.85	0.30	2.04	0.10	0.09	0.10
47	112D	276	NR	NR	0.15	1.95	0.10	0.09	0.10
48	112D	277	NR	NR	0.09	0.10	0.10	0.09	0.09
49	115D	278	0.14	1.08	0.14	1.80	0.10	0.10	0.10
50	115D	279	0.23	0.64	0.22	1.94	0.10	0.10	0.10

Note: NR denotes no reading made.

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4. Film Degradations:

A. Master (FWD) Panoramic Camera

Light Leaks - Minor and few. The normal fog associated with camera off periods appears on the first and last three frames of most passes (Example: pass 2D). The density of the fog is commensurate with the duration of the camera off period and the solar elevation. The last few feet of film from the "A" bucket and the first few feet from the "B" bucket are heavily fogged.

Corona Static - Fog due to corona static is usually present between the third and fourth frame following a camera on (Example: pass 70D). A single corona burst appears on frame 13 of pass 88AE. The presence of this static induced fog is apparent only because the frame is clear (no imagery). This fact may suggest that corona discharges occur at other places on the film but the resultant fog is obscured by the presence of imagery.

Dendritic Static - Fog from minor dendritic static discharges originates at both film edges intermittently throughout the mission. On rare occasions it intrudes into the format (Example: pass 18D).

Manufacturing Splices - Occur on passes 65D, frame 04; 87D, frame 56; and 118D, frame 140.

Emulsion Scratches - There are emulsion scratches on both edges of each frame just inside and parallel to the format edge at the camera number and at the supply end. There are numerous longitudinal emulsion scratches on pass 15D. Severe scratches and abrasions on pass 18D, frame 17, are associated with the heat splice on frame 16. Other scratches are minor and intermittent throughout the mission.

Blisters and Pinholes - Minor and intermittent.

B. Slave (AFT) Panoramic Camera

Light Leaks - Fogged areas caused by minor light leaks affect the first and last three frames of each camera operation. This light leak is characteristic of this camera system. The last few feet of film recovered in the "A" bucket and the first few feet recovered in the "B" bucket are fogged.

Corona Static - There is a small area of fog induced by corona static between the third and fourth frames of most passes (Example: pass 110D). Other randomly located corona discharges are rare and minor (Example: 85D, frames 41 and 61).

Dendritic Static - Fog induced by dendritic static discharges is present on both edges of pass 71D and intermittently thereafter throughout the mission.

Manufacturing Splices - Occur on passes 5D, frame 59; 23D, frame 62; and 85D, frame 44.

Emulsion Scratches - The scratches, described as being just inside the format of the Master panoramic photography, are also present on the photography of this camera. Rail scratches are continuous along each edge (outside the format).

Pinholes and Blisters - Minor and intermittent.

C. Stellar Camera No 45 ("A" bucket)

Dendritic Static - There are intermittent fogged spots caused by dendritic static discharges along the edge opposite the frame correlation fiducial. The degradation is minor.

Heat or Radiation - Areas of general fog associated with camera off periods are intermittent throughout the mission. The fog is minor and has only the effect of raising the gross fog level. The fog is believed to be the result of nuclear energy radiation. A correlation of the afore-

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mentioned fog and its association to an area of known radiation in the outer atmosphere is contained in the appendix of this report.

Scratches - Longitudinal emulsion scratches are continuous throughout the mission. They are intermittently severe (Example: frames 01 - 20).

Camera Number - Sharp and well defined.

Reseau - Sharp and well defined.

Fiducials - With the film oriented emulsion down and the camera number at the bottom, the fiducial to the right of the frame correlation fiducial is severely bloomed and intermittently intrudes into the format.

D. Stellar Camera No 42 ("B" bucket)

Dendritic Static - Fog induced by dendritic static discharges is present along an emulsion scratch which runs through the last two feet of the film.

Light Leaks - There is a diagonal streak of fog entering the format of one frame at each camera off period. The fog streak has its genesis at the camera number edge.

Heat or Radiation - There is no evidence of radiation fog on the film of this camera. Because of the physical position of the camera in the vehicle and the film path, radiation fog would be less likely to exist on the film of the "B" bucket.

Scratches - Minor and few.

Camera Number - Flared but readable.

Reseau - Sharp and well defined.

Fiducials - The fiducials are sharp and readable, but the circular plate used in the installation of the fiducial lamps is imaged in the format of each frame.

E. Index Camera No D45 ("A" bucket)

Dendritic Static - Fog due to static discharges is frequent and degrading on the last five frames in conjunction with film exhaustion. Other minor discharges occur at each edge intermittently throughout the mission.

Reseau - Sharp and well defined.

Camera Number - Sharp and well defined.

Frame Correlation Fiducial - Sharp and well defined.

F. Index Camera No D49 ("B" bucket)

Dendritic Static - Fog due to dendritic static discharges is present intermittently along the camera number edge.

Corona Static - Fog caused by corona static discharges is present on frame 185 and on the last two frames of the mission.

Light Leaks - A streak of fog caused by a light leak enters each frame from the camera number edge. The presence of the fog is nearly undetectable except on the frames affected while the film was at rest during camera off periods.

Streaks - There is a continuous wavering minus density streak parallel to the major axis of the film beginning at frame 22.

Fiducials - The frame correlation fiducial is recorded faintly, but is readable throughout.

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FIGURE 13. EFFECT OF DENDRITIC STATIC.

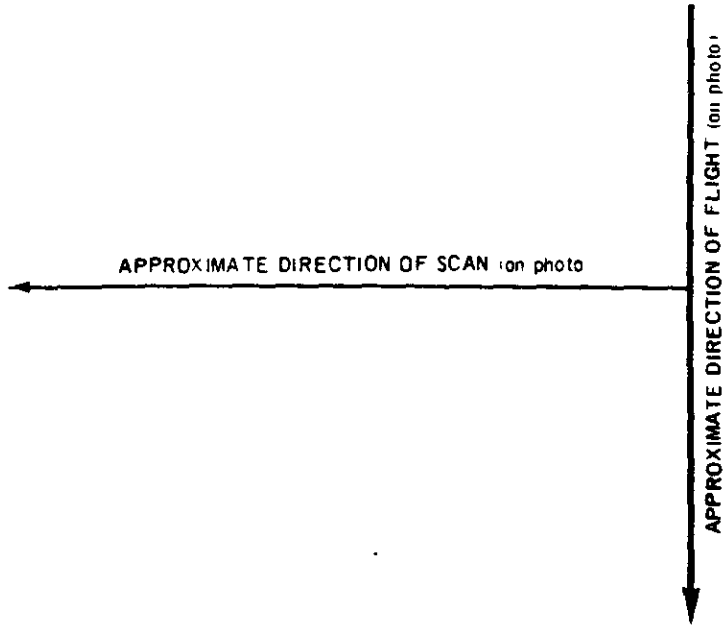
NPIC J-8198 (2/68)

The following is an example of fogging caused by dendritic static discharges entering the format.

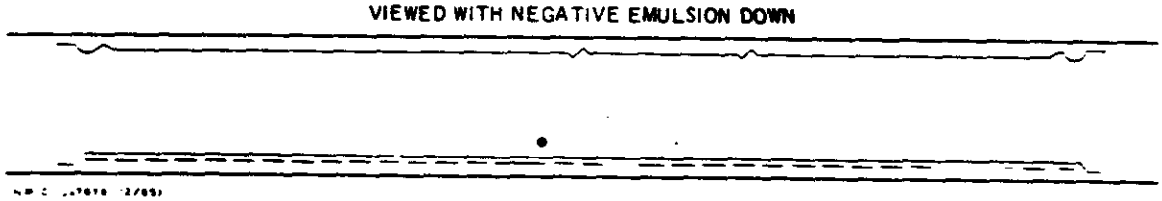
[redacted]

[redacted]

Pass	09D
Panoramic Frame	27 FWD
Enlargement Factor	10X
Solar Elevation	53°
Solar Azimuth	234°
Altitude	86.11 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT
VIEWED WITH NEGATIVE EMULSION DOWN



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PART III. IMAGE QUALITY

1. Photographic Interpretation (PI) Suitability:

This is an assessment of the information content of photographic reconnaissance material and its interpretability. A number of interrelated factors are involved, such as the quality of the photography, the extent of target coverage, scale, weather limitations, and similar considerations. However, the fundamental criteria for assigning a PI suitability rating may be reduced to (a) the scope of the photographic coverage and (b) the degree to which a photo interpreter may extract useful and reliable information from the material.

PI suitability ratings are categorized as Excellent, Good, Fair, Poor, and Unusable. These ratings refer to the overall interpretive value of the photography obtained from a particular reconnaissance mission. Individual targets may also be assigned PI suitability ratings if that is necessary or desirable. The standards that determine assignment of the various ratings are as follows:

Excellent: The photography is free of degradation by camera malfunctions or processing faults and weather conditions are favorable throughout. The imagery contains sharp, well-defined edges and corners with no unusual distortions. Contrast is optimal and shadow details, as well as details in the highlight areas, are readily detectable. Observation of small objects and a high order of mensuration are made possible by the consistently good quality of the photography.

Good: The photography is relatively free of degradation or limiting atmospheric conditions. Edges and corners are well defined. No unusual distortions are present. Detection and accurate mensuration of small objects are feasible, but to a lesser degree than in material rated as "Excellent."

Fair: Degradation is minimal but the acuity of the photography is less than optimum. Edges and corners are not crisply defined and there is loss of detail in shadow and/or highlight areas. Detection and identification of small objects are possible but accuracy of mensuration is reduced by the fall-off in image quality and the less-than-optimal contrast that prevails.

Poor: Camera-induced degradations and or weather limitations severly reduce the effectiveness of the photography. Definition of edges and corners is not sharp. Only gross terrain features and culture may be detected or identified and distortion of form may exist. Accurate mensuration of even large objects is doubtful.

Unusable: Degradation of photography completely precludes detection, identification, and mensuration of cultural details.

2. PI Suitability for Mission 1006:

The PI suitability of Mission 1006 is good. The most degrading aspect of the mission is the lack of overlap caused by the low orbit. The low orbit was also a favorable factor because it produced the largest scale photography to date. The low orbit necessitated a faster scan rate resulting in less exposure than normal. The exposure difference from normal amounts to approximately one-fourth of an f stop; however, no under-exposure was noted.

Photo interpreters reported on 103 targets in the preliminary read-out of Mission 1006-1. A quality rating of poor was assigned to 7 targets. Clouds and haze were the degrading factor in 6 of the poor quality ratings, while small scale due to obliquity was the cause of the remaining poor quality rating. There were 109 targets covered on the preliminary scan of Mission 1006-2. Of the 109, a quality rating of poor was given to 9. Eight were degraded by haze and clouds and one by obliquity.

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Image streaking along the major axis of the film is present in association with areas of high reflectivity (clouds, beaches, etc). This streaking, caused by reflections within the camera, has much the same appearance as haze. Examples of image streaking may be observed on pass 49D, frames 1-9.

[redacted]

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FIGURE 14. DEGRADATION BY HAZE.

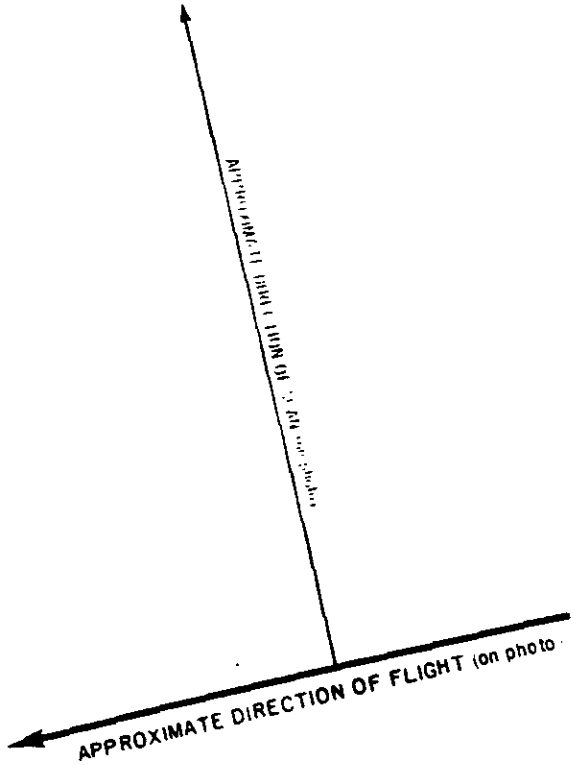
NRO [illegible]

The following photograph of an airfield was assigned a PI suitability rating of poor. Degradation of this target is a result of haze.

[redacted]

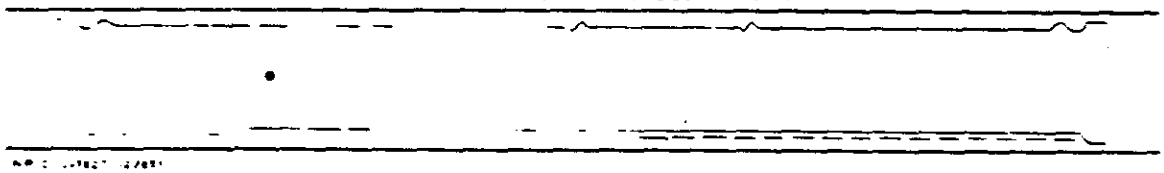
[redacted]

Pass	70D
Panoramic Frame	47 FWD
Enlargement Factor	20X
Solar Elevation	54.3°
Solar Azimuth	123°
Altitude	91.31 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



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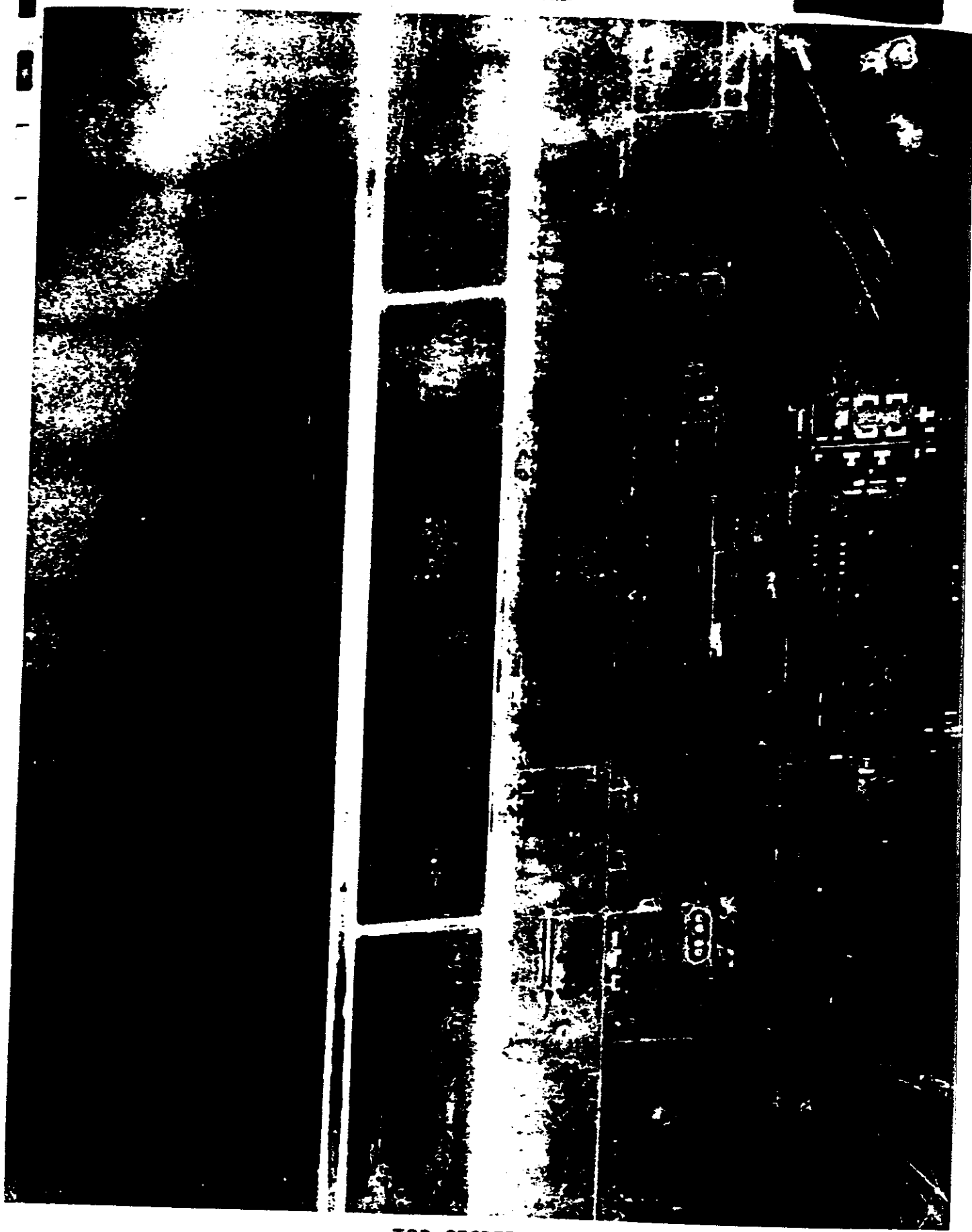

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FIGURE 15. EFFECT OF OBLIQUITY.

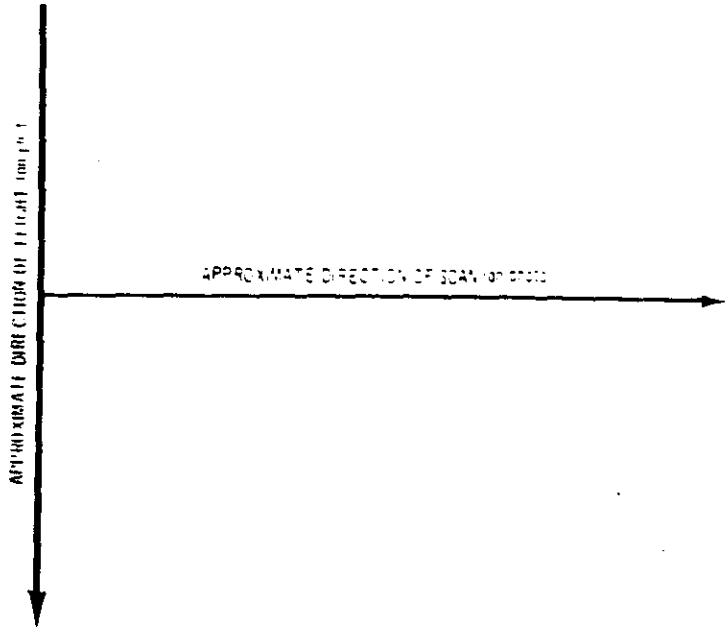
NRIC J-6150 (2/68)

The following photograph is an example of a target that received a *PI* quality rating of poor. Degradation in this case was due to obliquity, which made it difficult to view the target stereoscopically. Low contrast was also a major factor in the assignment of this rating.

[redacted]

[redacted]

Pass	24D
Panoramic Frame	180 AFT
Enlargement Factor	20X
Solar Elevation	51°
Solar Azimuth	250°
Altitude	89.55 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN

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~~NOFORN/NOCONTRACT/ORCON~~

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FIGURE 16. IMAGE QUALITY VERSUS OBLIQUITY.

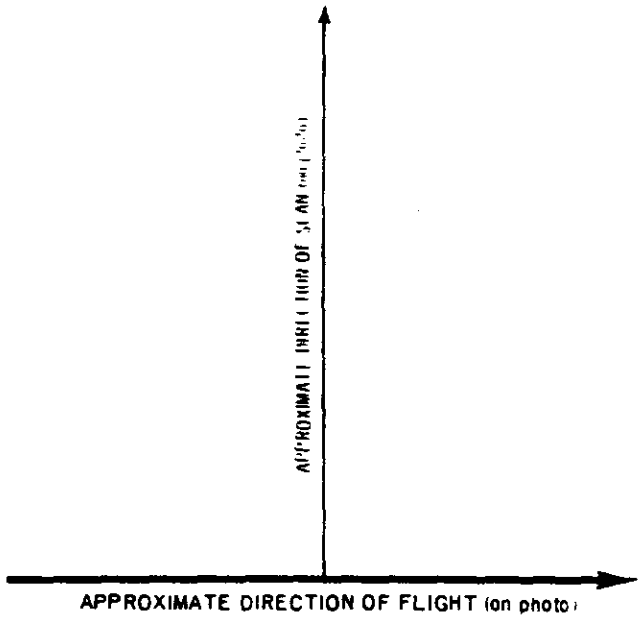
NPIC J-0188 (2/68)

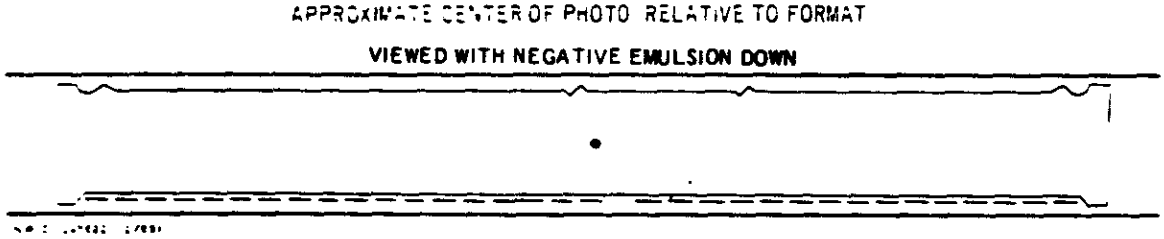
The following photograph, taken from an area near the principal point of the format, illustrates the relationship of image quality and obliquity.

[redacted]

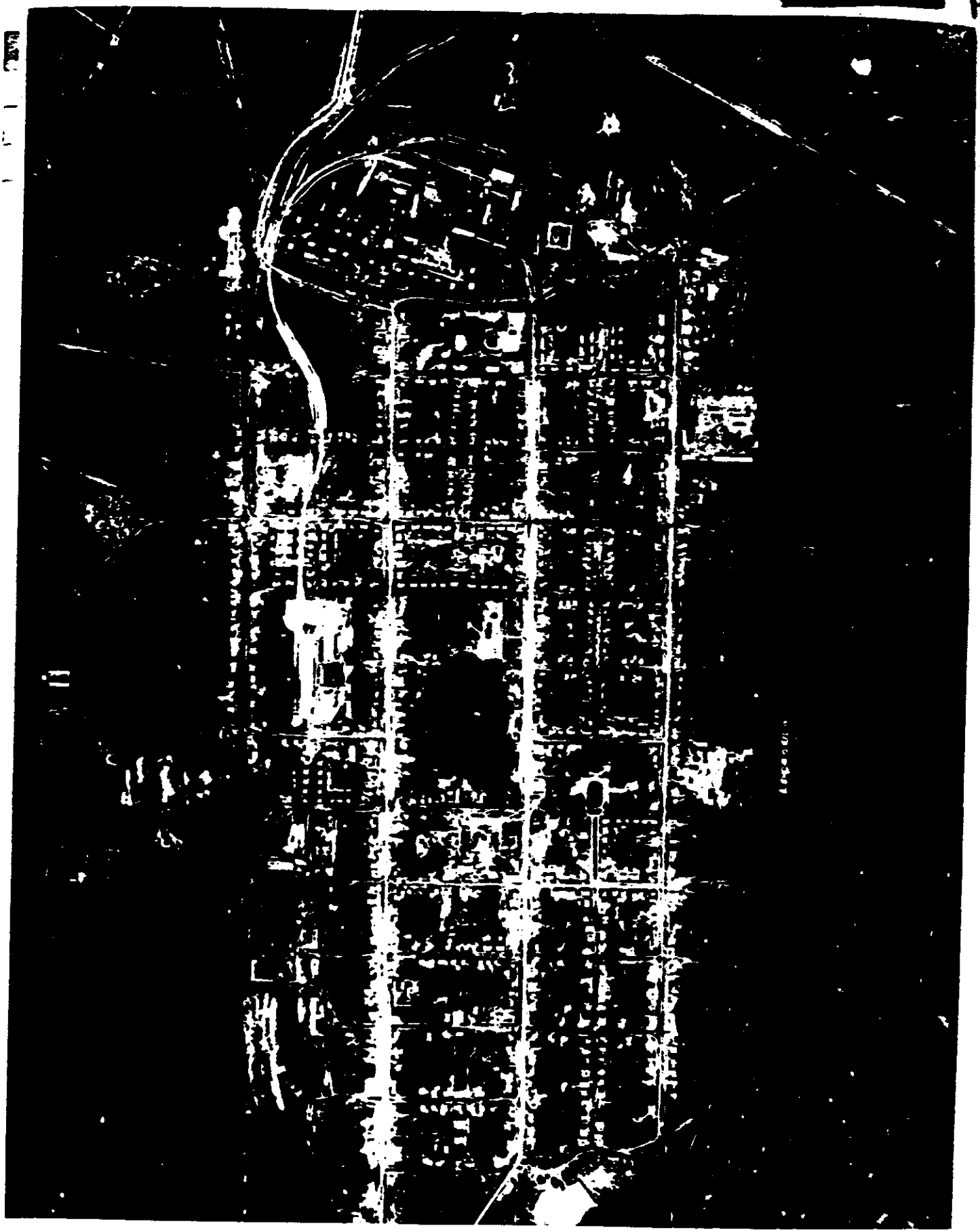
[redacted]

Pass	07D
Panoramic Frame	18 AFT
Enlargement Factor	20X
Solar Elevation	49°
Solar Azimuth	240°
Altitude	86.60 nm





[redacted]



[redacted]

FIGURE 17. IMAGE QUALITY VERSUS OBLIQUITY.

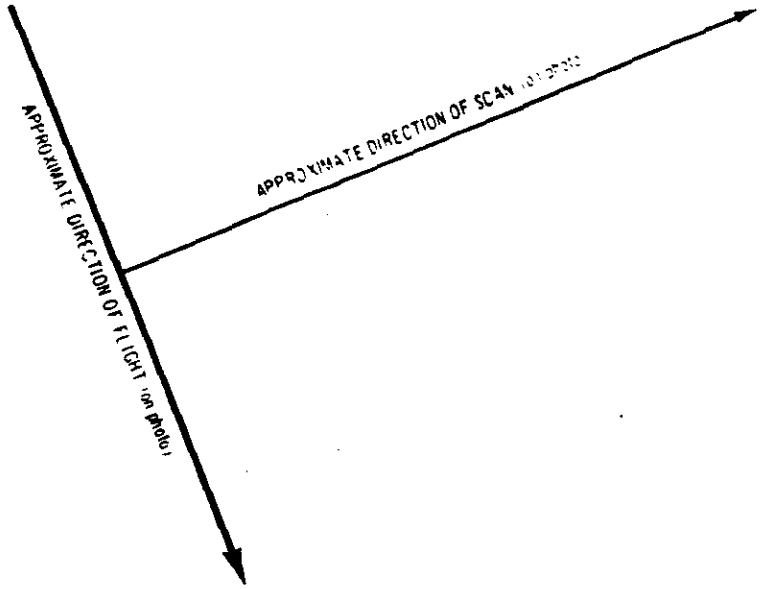
NPIC J-6160 (2/88)

The following photograph, taken from an area 6.5 inches toward the take-up end from the principal point of the format, illustrates the relationship of image quality and obliquity.

[redacted]

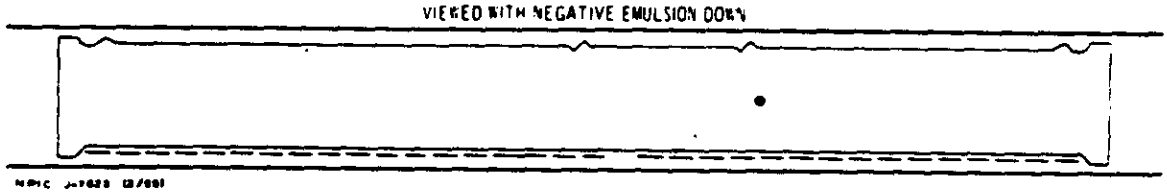
[redacted]

Pass	07D
Panoramic Frame	18 AFT
Enlargement Factor	20X
Solar Elevation	49°
Solar Azimuth	240°
Altitude	86.60 nm



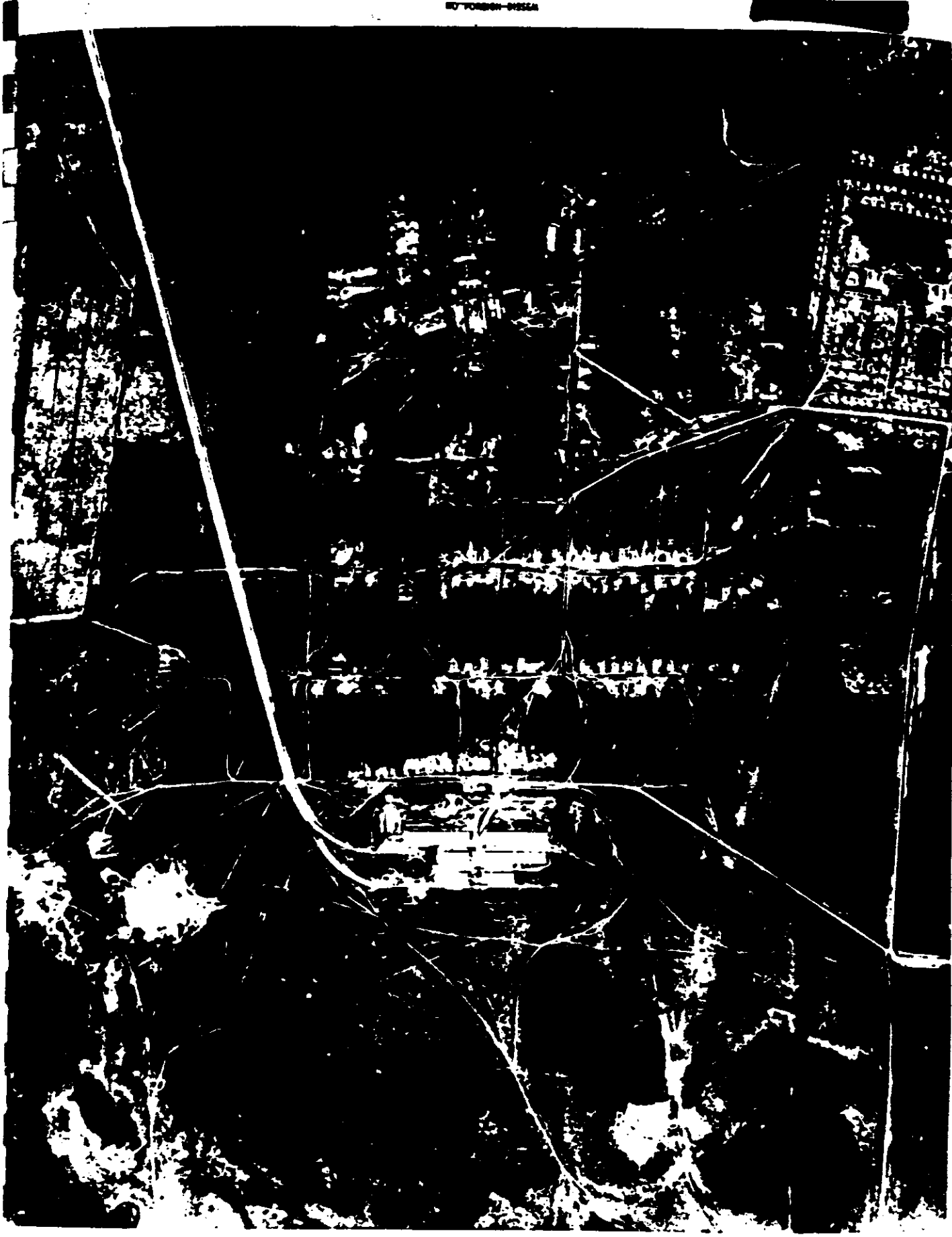
APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



~~TOP SECRET RUFF~~
~~NO FOREIGN DISSEM~~

[redacted]



[redacted]

FIGURE 18. IMAGE QUALITY VERSUS OBLIQUITY.

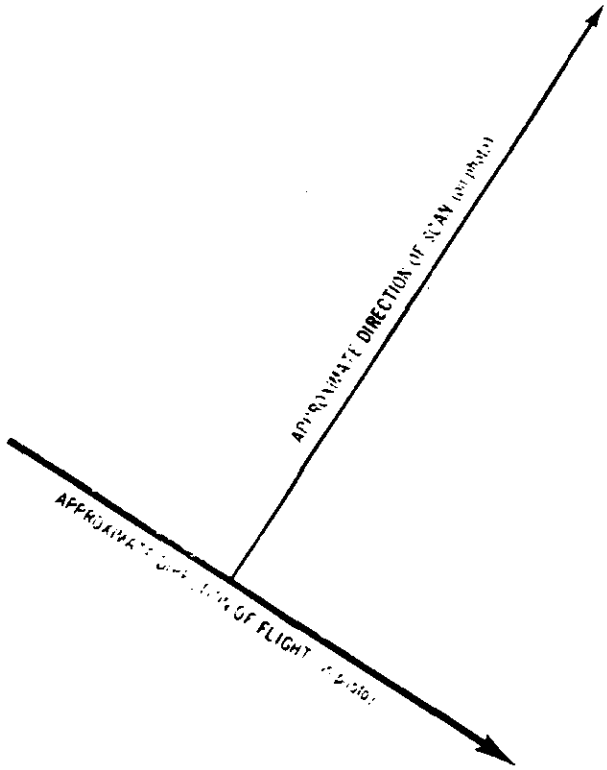
NPIC J-8161 12/65

The following photograph, taken from an area 10.0 inches toward the take-up end from the principal point of the format, shows the relationship of image quality and obliquity.

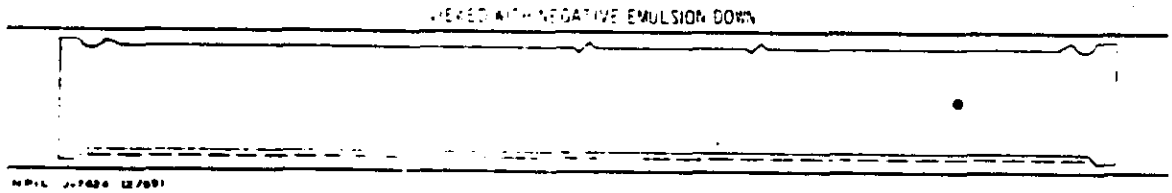
[redacted]

[redacted]

Pass	07D
Panoramic Frame	18 AFT
Enlargement Factor	20X
Solar Elevation	49°
Solar Azimuth	240°
Altitude	86.60 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT



[redacted]

FIGURE 19. IMAGE QUALITY VERSUS OBLIQUITY.

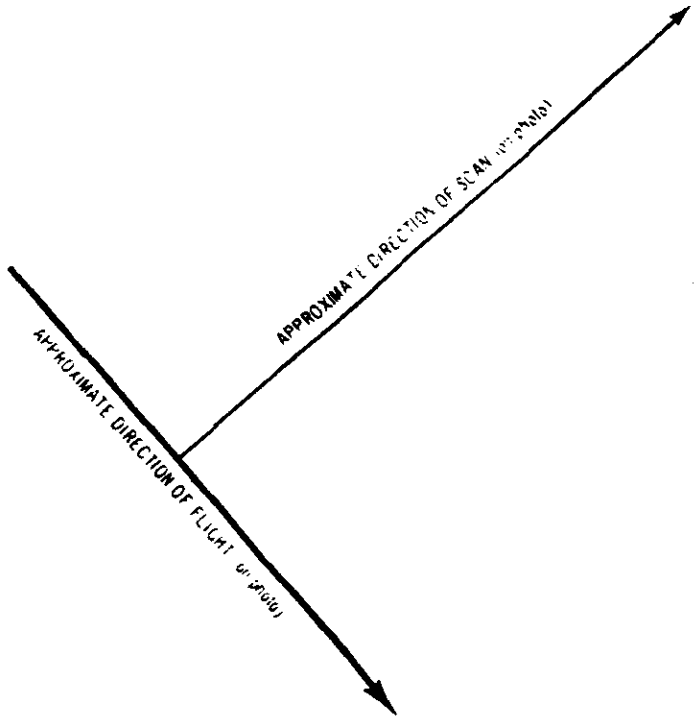
NPIC J-8162 (2/68)

The following photograph, taken from an area 14.0 inches toward the take-up end from the principal point of the format, shows the relationship of image quality and obliquity.

[redacted]

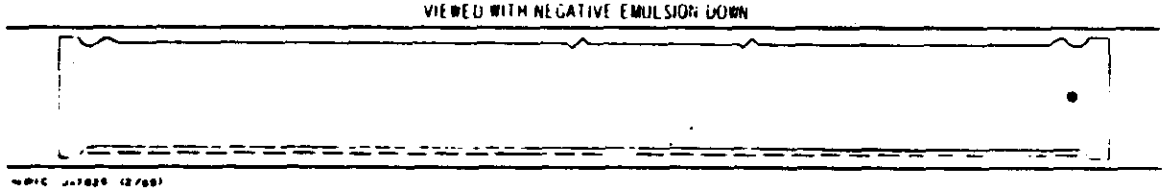
[redacted]

Pass	07D
Panoramic Frame	18 AFT
Enlargement Factor	20X
Solar Elevation	49°
Solar Azimuth	240°
Altitude	86.60 nm



APPROXIMATE CENTER OF PHOTO. RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



Highlights of this mission are:

a. Clear, good-quality photography of a missile test center and observation of continued construction activities.

b. Discovery of an electronics facility at a missile launch site.

c. Evidence of abandoned construction of a new missile launch site.

d. Study of a missile test center and related activities.

e. Observation of construction of a new missile test facility at an established missile engine plant.

f. Discovery of 2 new fixed field missile sites at a known launch site.

g. Identification of construction work on a chemical separation plant at an atomic energy complex.

h. Observation of a sensitive operations complex and related activities.

Degradations having a bearing on PI suitability are:

Corona Static - The amount of fog from corona static and its bearing on PI suitability is minor.

Light Leaks - Fog associated with camera off periods affects the first and last three frames of most passes. The density of the fog and its related affect on PI suitability is commensurate with the duration of the camera off period and the solar elevations during the period.

Scratches and Abrasions - Minor and intermittent. The amount of degradation is of little consequence.

Atmospherics - Approximately 50 percent of the mission is covered by clouds. Cloud shadows are dependent on cloud cover and constitute an additional degradation. Haze is the degrading factor in 14 of the 16 poor image quality ratings assigned to this mission.

Solar Elevation - Most photography was accomplished with the benefit of high solar elevations.

Image Motion - The first 4 to 6 frames following a camera start-up display image motion due to incorrect IMC. The image motion (smear) occurs until the camera overcomes inertia and the proper scan rate is accomplished. The first few frames of pass 23D are a good example of the degradation resulting from incorrect IMC.

Splices - A manufacturing splice is a necessary evil in the production of film to be used in aerial photo reconnaissance. The splice is particularly undesirable when the scale of photography is as small as it is in this system; i.e., on photography exposed from an altitude of 90 nm, a 1.0 inch splice covers an area representing 1,143,648,000 square feet or approximately 41 square nautical miles. A heat splice on pass 18D, frame 17 AFT, joins two processing parts. There was approximately 7.0 inches of film destroyed at the end of the processing part. This represents approximately 287 square nautical miles of ground cover.

[redacted]

FIGURE 20. SMEAR ASSOCIATED WITH CAMERA START-UP.

NPIC J-6163 (2/68)

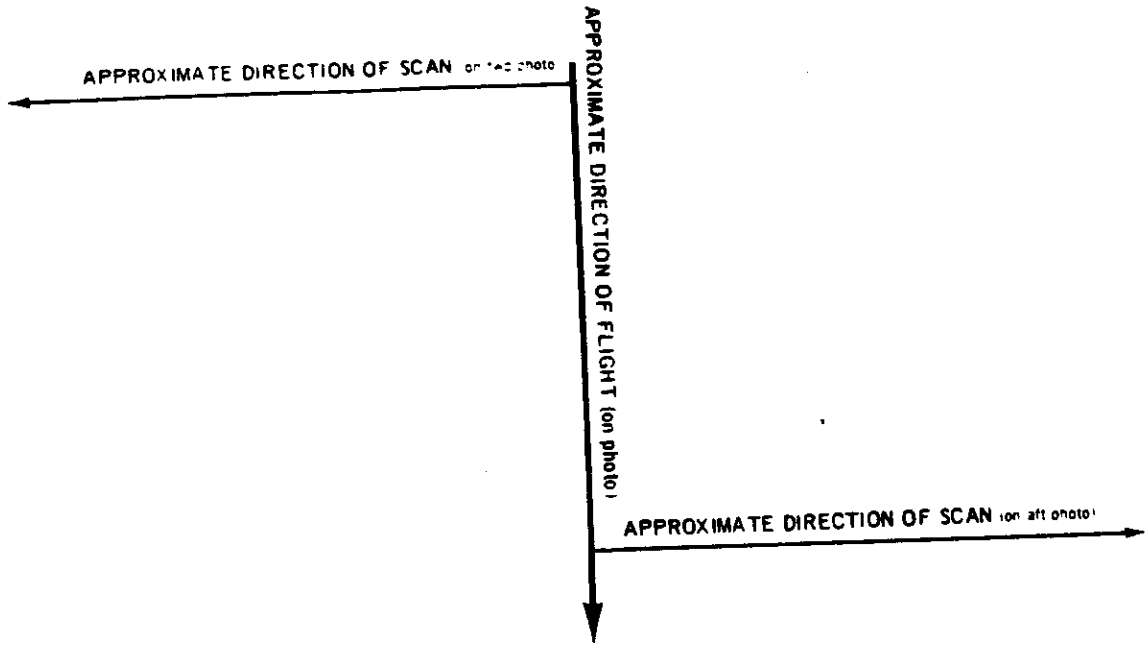
FIGURE 21. SMEAR ASSOCIATED WITH CAMERA START-UP.

NPIC J-6164 (2/68)

These two photographs and the two following (Figures 22 and 23) illustrate the effect of camera start-up on image quality. Figures 20 and 21 cover approximately the same area, but Figure 20 is from frame 06 of the AFT camera and Figure 1 is from the first frame of the FWD camera. Figures 22 and 23 are from frames 2 and 4 of the FWD camera and show the improvement in image quality as the master camera system overcomes inertia.

[redacted]

	Figure 20	Figure 21
Pass	23D	23D
Frame	06 AFT	01 FWD
Enlargement Factor	20X	20X
Solar Elevation	46°	Not available
Solar Azimuth	261°	Not available
Altitude	87.54 nm	Not available



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

EMULSION DOWN

Figure 20 ● ● Figure 21

[redacted]

TOP SECRET RUFF

NO FOREIGN DISSEM

[redacted]

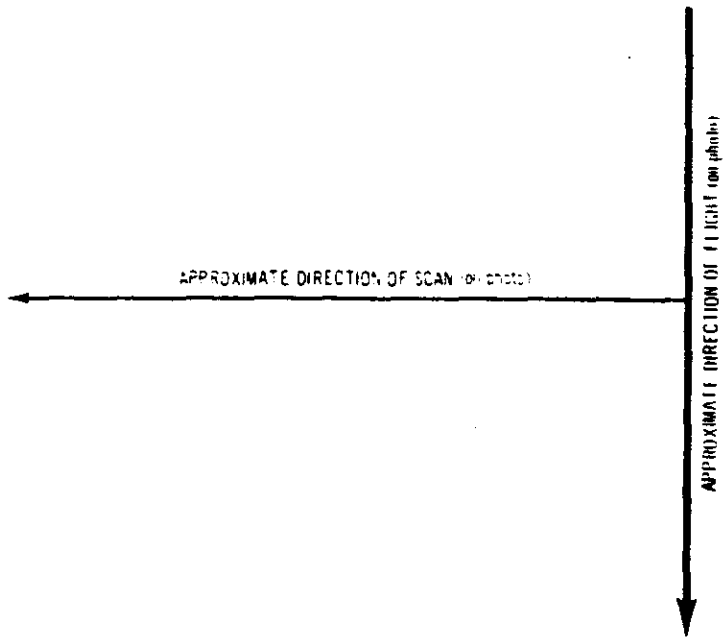
FIGURE 22. SMEAR ASSOCIATED WITH CAMERA START-UP.

NPIC [illegible] (2/68)

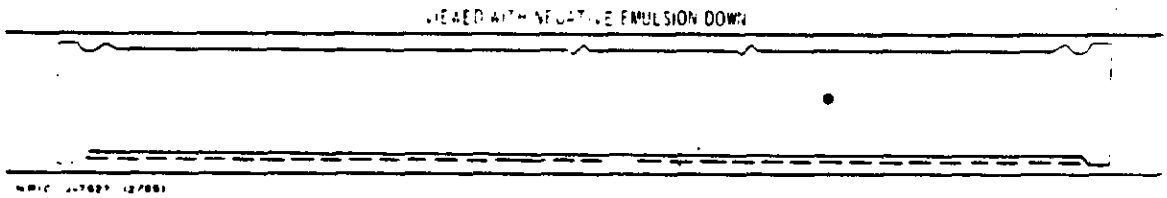
[redacted]

[redacted]

Pass	23D
Frame	02 FWD
Enlargement Factor	20X
Solar Elevation	51°
Solar Azimuth	243°
Altitude	87.95 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT



[redacted]

[redacted]

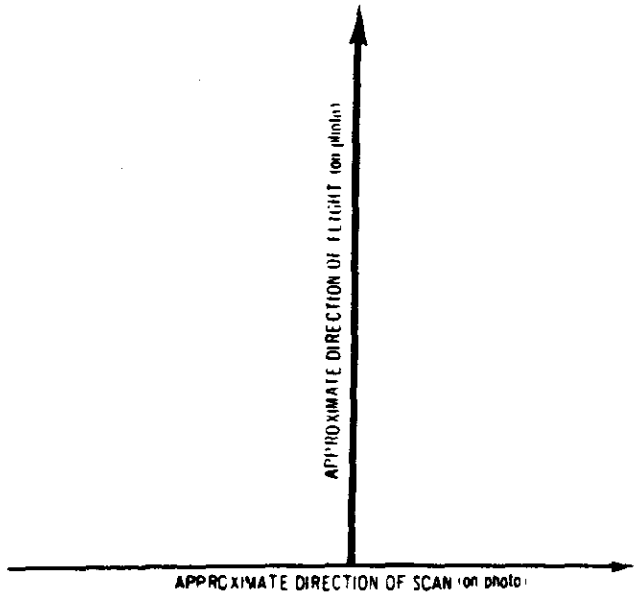
FIGURE 23. SMEAR ASSOCIATED WITH CAMERA START-UP.

[redacted]

[redacted]

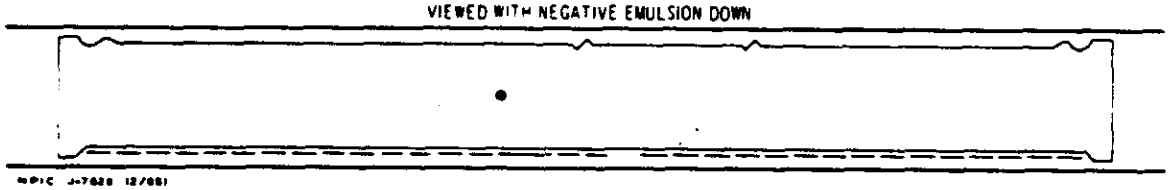
[redacted]

Pass	23D
Panoramic Frame	04 FWD
Enlargement Factor	20X
Solar Elevation	51°
Solar Azimuth	243°
Altitude	88.25 nm



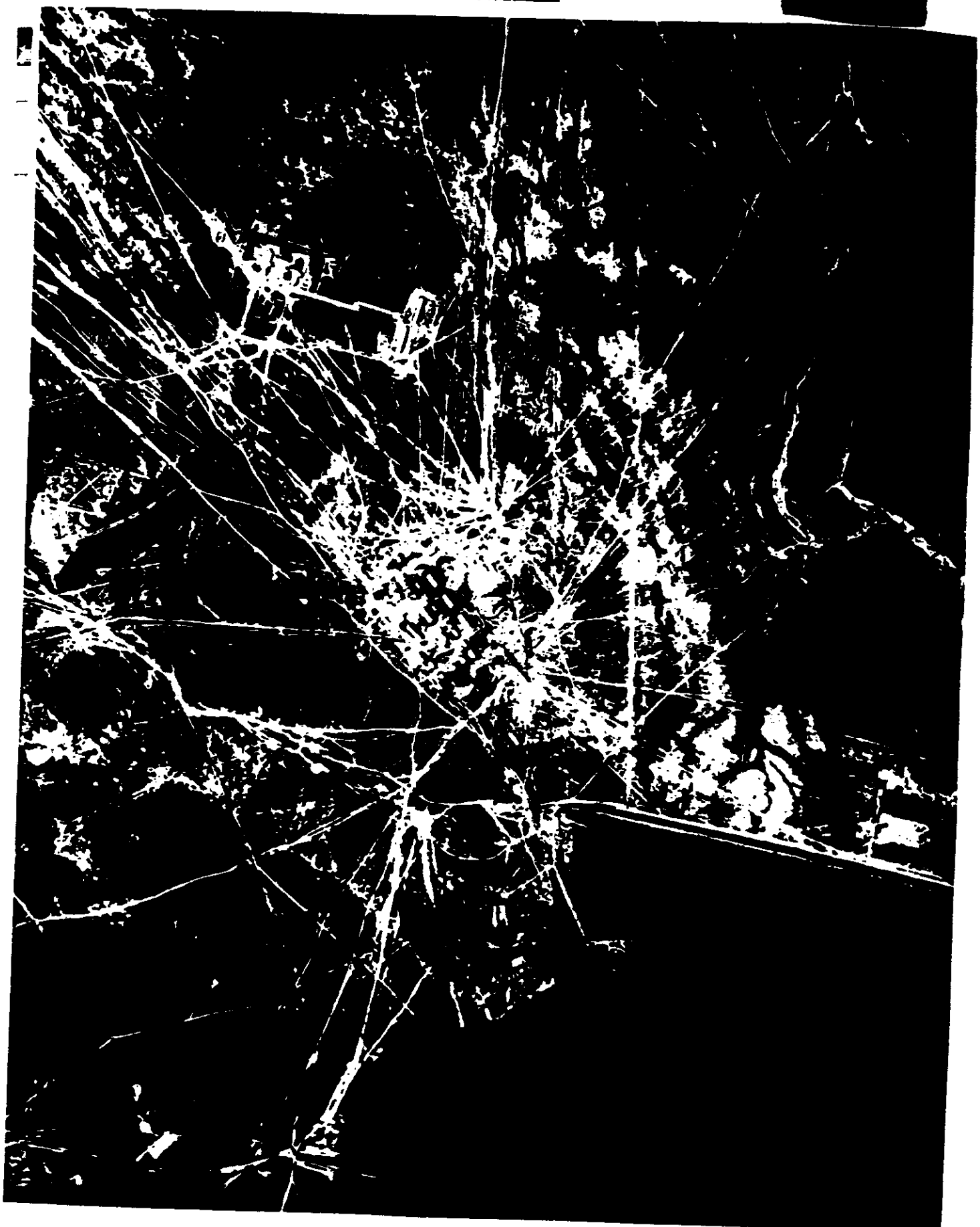
APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



NPIC J-7628 12/68

[redacted]



[redacted]

FIGURE 24. DEGRADATION DUE TO ATMOSPHERIC ATTENUATION.

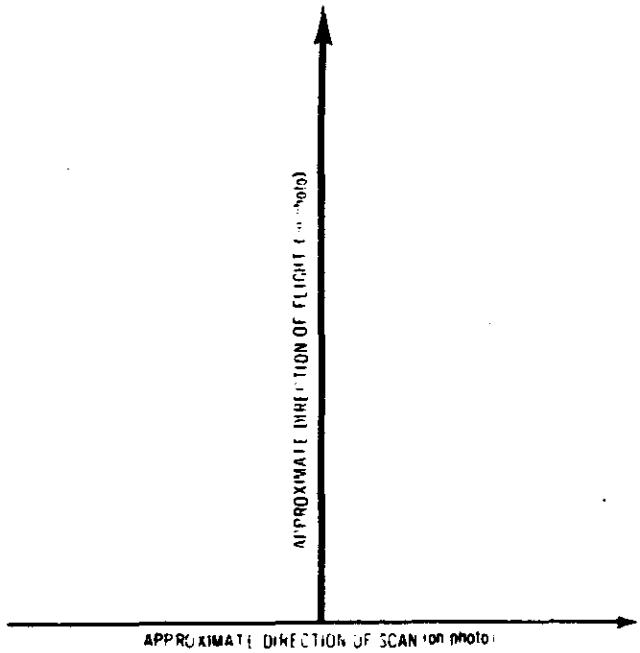
NPIC J-8187 (2/68)

This target was assigned a quality rating of poor by the photo interpreters.

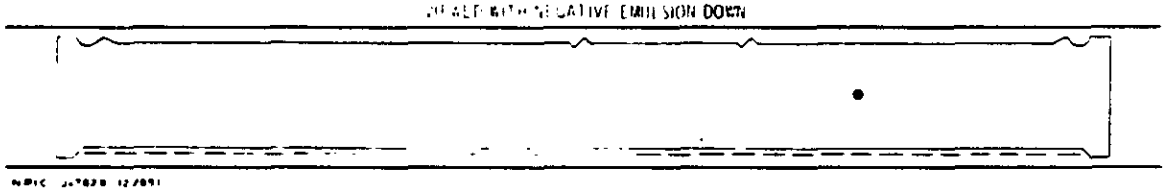
[redacted]

[redacted]

Pass	56D
Panoramic Frame	51 FWD
Enlargement Factor	20X
Solar Elevation	52°
Solar Azimuth	228°
Altitude	89.16 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT



[redacted]

[redacted]

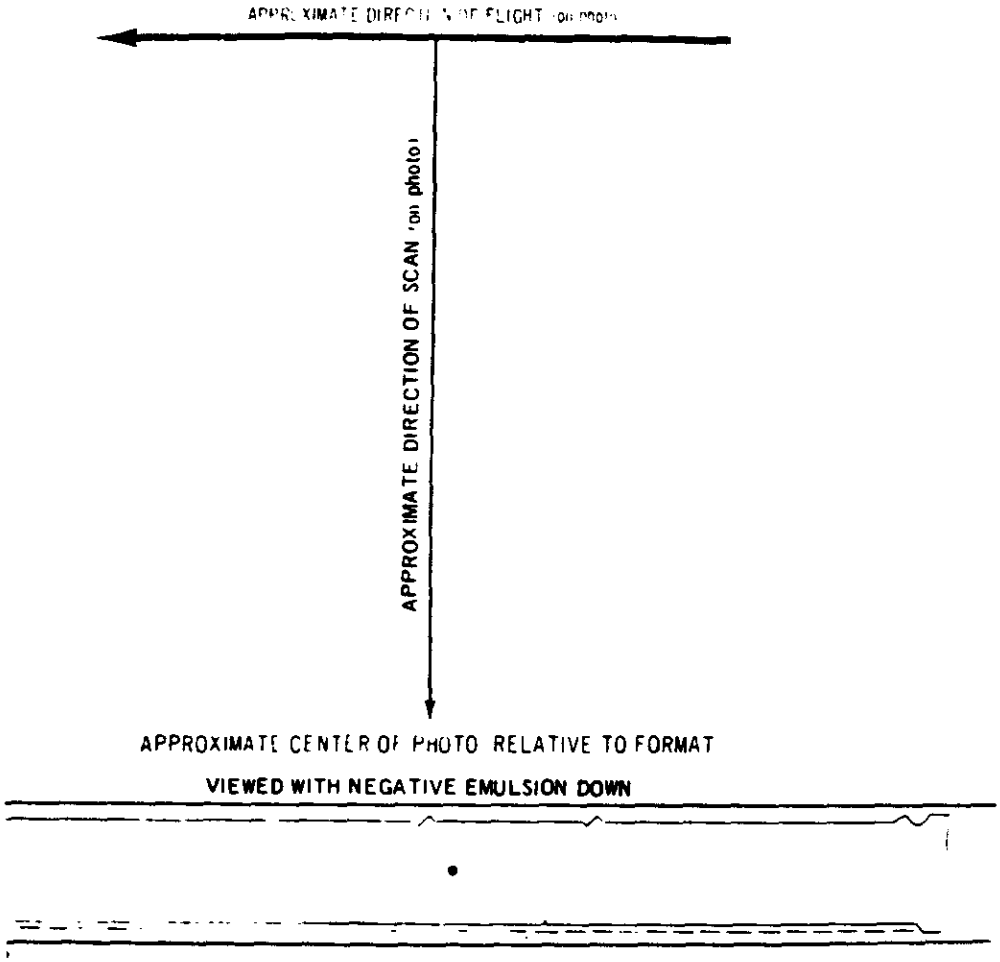
FIGURE 25. CLOUD SHADOW VERSUS PI SUITABILITY.

NPIC J-6168 (2/68)

[redacted]

[redacted]

Pass	07D
Panoramic Frame	10 AFT
Enlargement Factor	10X
Solar Elevation	48°
Solar Azimuth	236°
Altitude	86.34 nm



[redacted]

3. Mission Information Potential (MIP):

The MIP is an arbitrary number, not limited by terminal values, which is subjectively assigned to the panoramic photography of a mission and which compares it to the other missions. It is meant to be a measure of the camera's maximum capability for recording information, discounting adverse atmospheric conditions, minimal solar elevations, camera malfunctions, or other factors which reduce the quality of the photography.

The MIP is based on the best photography found in a mission, even though the photography may be limited to a few frames. Since these frames are considered to be the best in the mission, they do not indicate the overall success, average quality, or general interpretability of the photography.

Criteria for selection of the MIP frame:

a. Eliminate all portions of the mission affected by system malfunctions.

b. Select frames which are free of clouds or atmospheric attenuation.

c. Eliminate the first 10 frames and last frame of a pass because these may be affected by incorrect scan speed.

d. Select frames that are in a continuous strip of approximately 10 frames because cloud shadows from distant weather fronts are cast for great distances.

e. Determine from the horizon cameras that the panoramic photography is not affected by apparent vehicle perturbations.

f. Select targets that are near the center of the formats and on frames as close as possible to perigee for scale purposes and to eliminate obliquity.

g. Select frames having near optimum solar elevation, thus eliminating frames having either overexposure or underexposure.

h. Select a high contrast target (preferably an airfield) and compare the target to a previous mission which has been given an MIP rating.

4. MIP Rating for Mission 1006:

Pass 09D, frame 38 AFT, is the MIP frame of the "A" bucket photography for this mission. It has been assigned an MIP rating of 90, which is equal to the best ever assigned to this system. The detail discernible on this photography is such that engine nacelles on most airplanes are detectable under moderate magnification.

Pass 78D, frame 19 AFT, is the MIP frame of the "B" bucket photography. The quality is very similar to that of the "A" bucket photography and the MIP rating is 90.

[redacted]

[redacted]

FIGURE 26. MIP FRAME (1006-1).

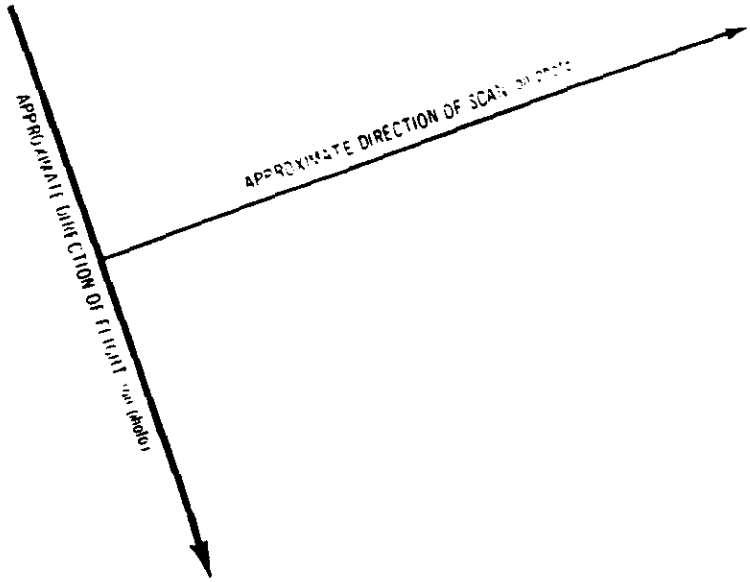
NPIC J-6166 12/68

The imagery on the following photograph is equal to the best ever attained by this system. It has been assigned an MIP of 90.

[redacted]

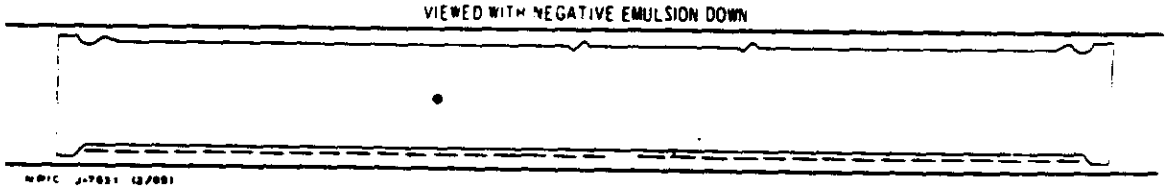
[redacted]

Pass	09D
Panoramic Frame	38 AFT
Enlargement Factor	20X
Solar Elevation	55°
Solar Azimuth	228°
Altitude	86.71 nm



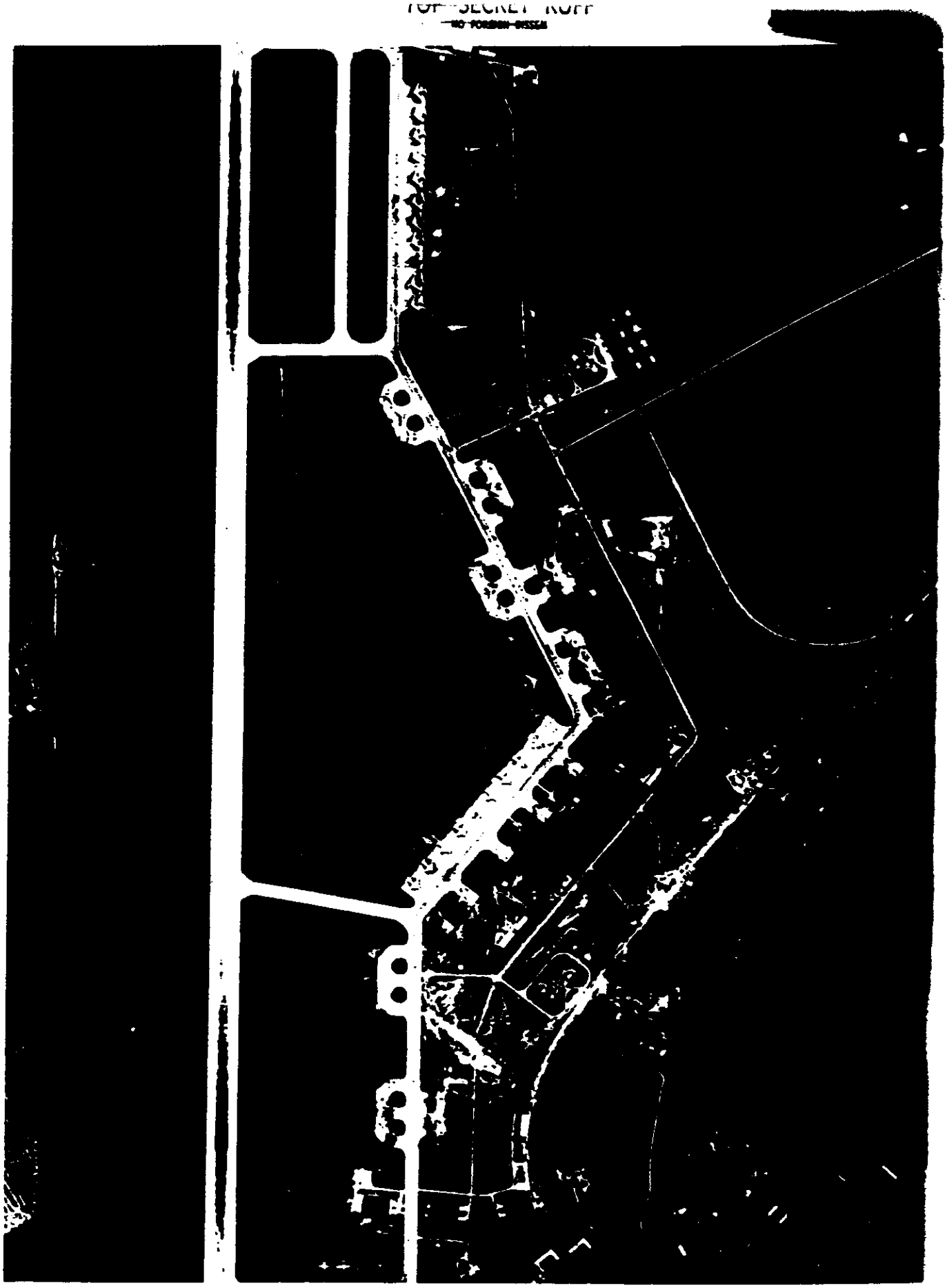
APPROXIMATE CENTER OF PHOTO. RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



NPIC J-7631 (2/68)

[redacted]



[redacted]

FIGURE 27. GOOD IMAGE QUALITY MASTER CAMERA.

NPIC J-8170 (2/68)

FIGURE 28. MIP FRAME (1006-2).

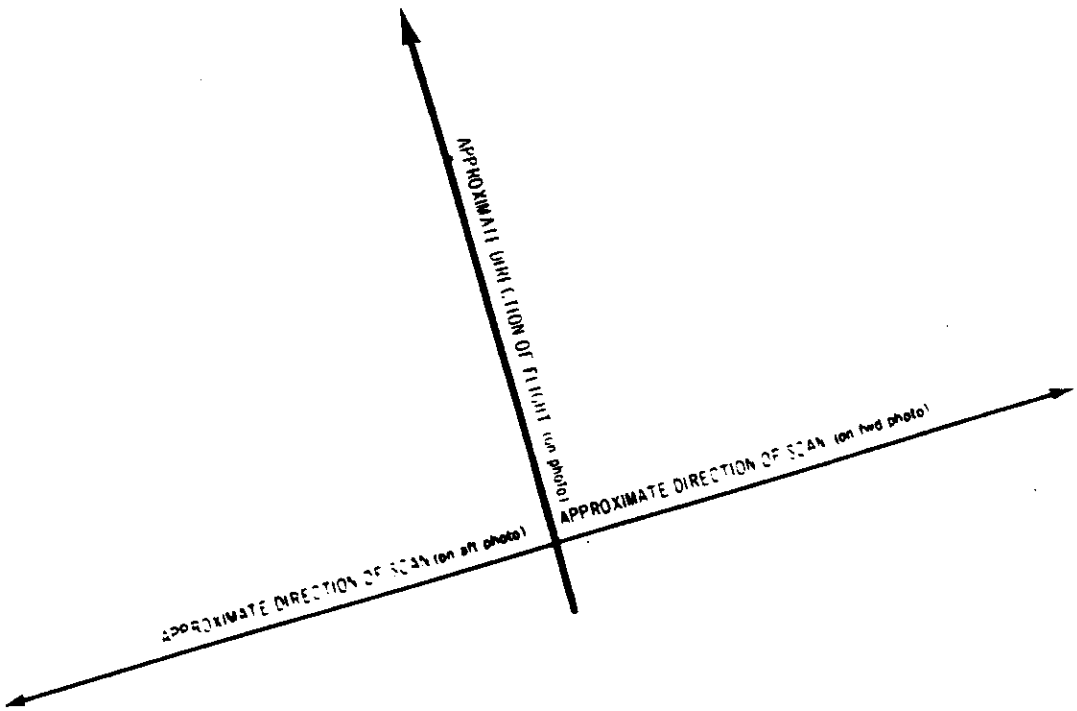
NPIC J-8171 (2/68)

The following two photographs cover the same area. The first represents good image quality by the master (FWD) camera and the second, from the slave (AFT) camera is the MIP frame (MIP 90) of Mission 1006-2).

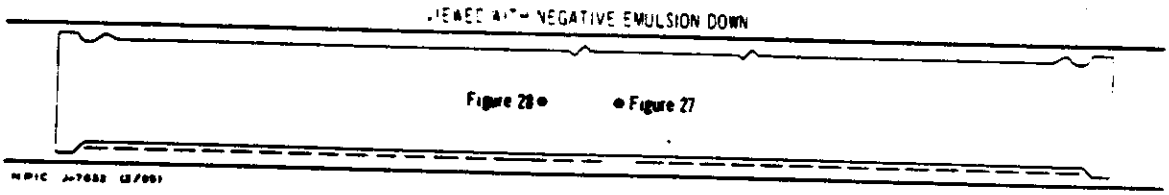
[redacted]

[redacted]

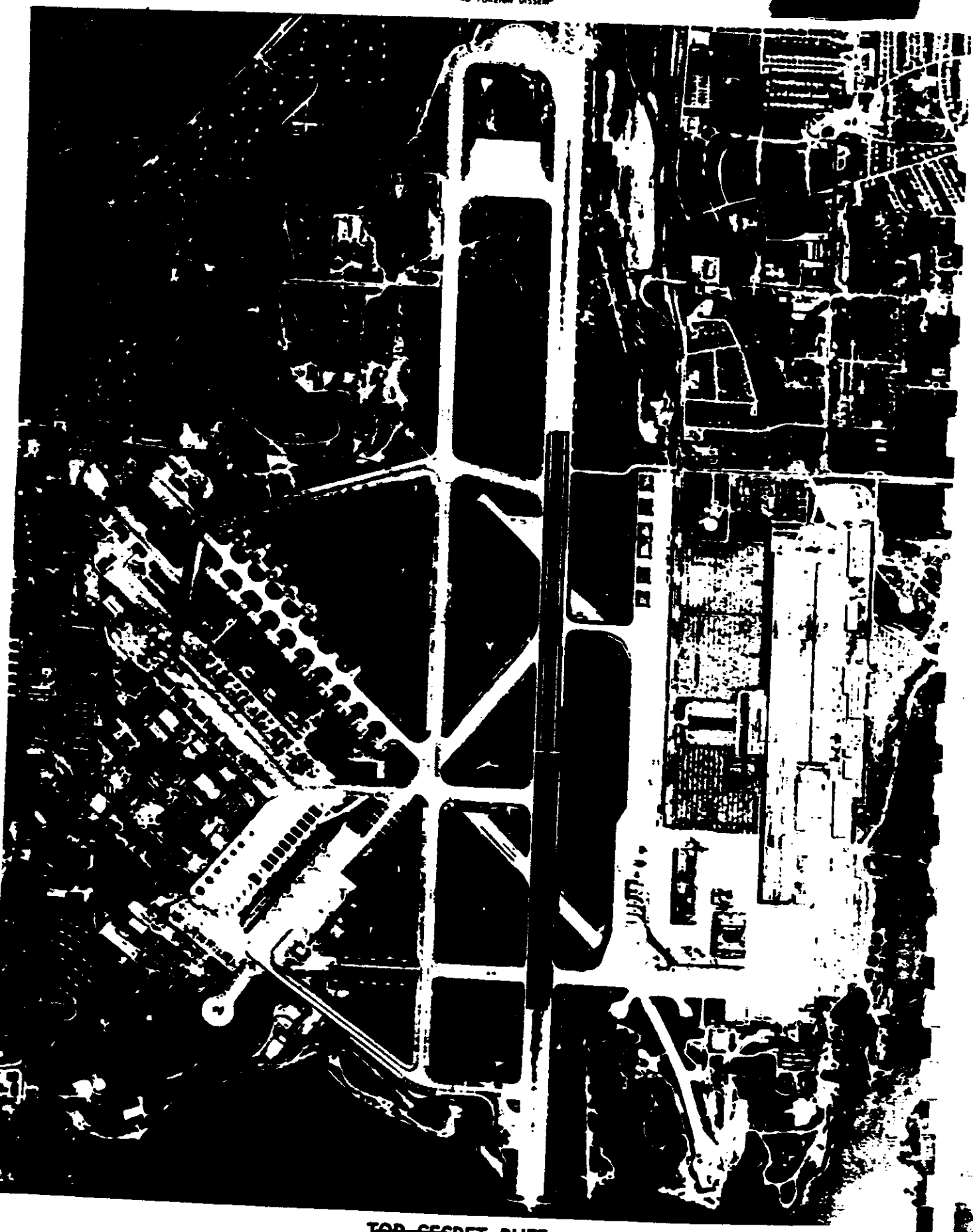
	Figure 27	Figure 28
Pass	78D	78D
Panoramic Frame	13 FWD	19 AFT
Enlargement Factor	20X	20X
Solar Elevation	58.8°	58.8°
Solar Azimuth	77°	77°
Altitude	104.36 nm	104.36 nm

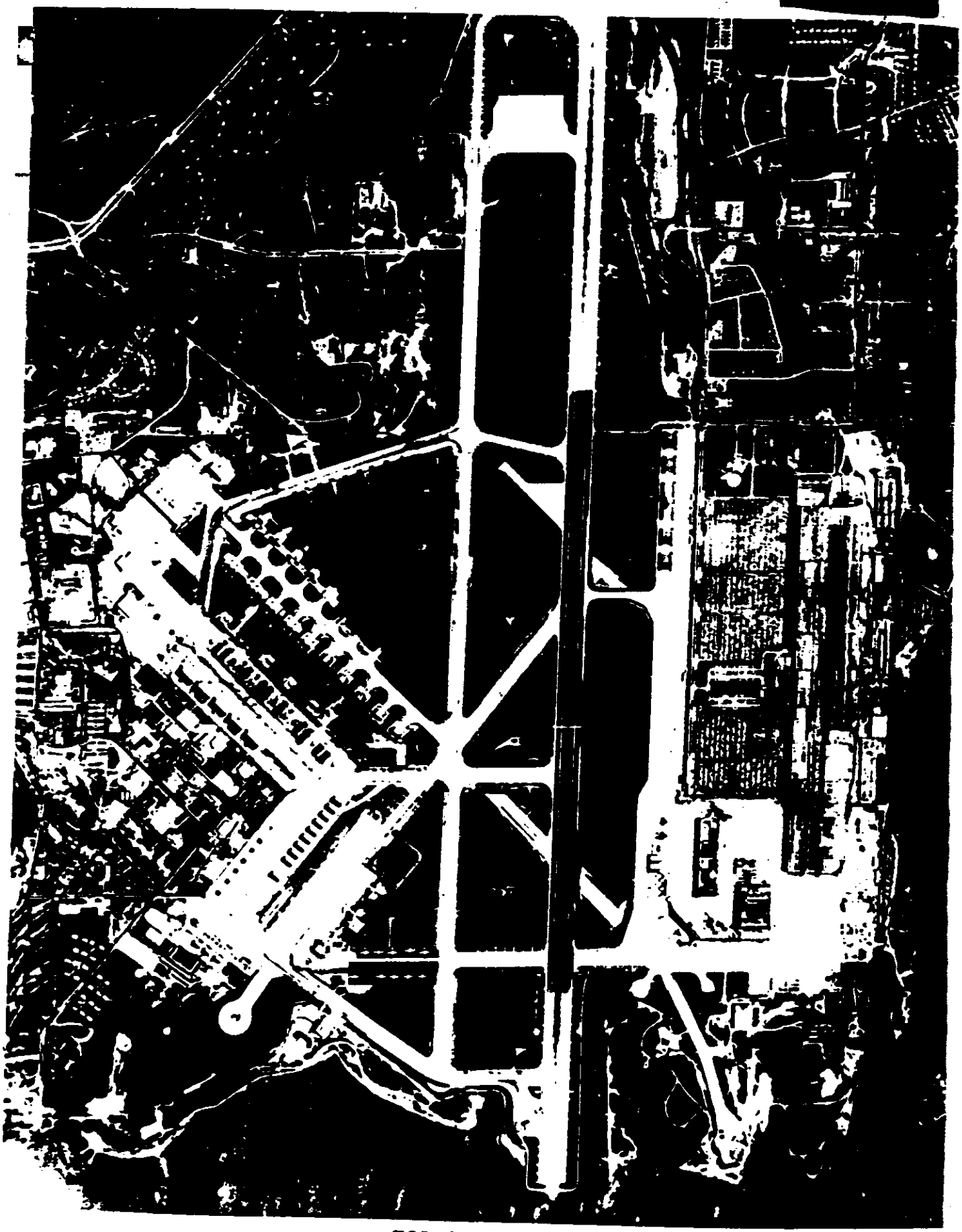


APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT



[redacted]





[redacted]

5. Edge Spread Function:

In an attempt to establish an objective measurement of image quality in mission photography, the technique of obtaining the spread function from microdensitometric edge traces is being investigated. The spread function curve represents the whole photographic system, and is a summation of the separate elements: lens, film, and uncompensated image motion due to vibration, velocity, roll, pitch, yaw, and aerial turbulence. By taking the Fourier Transform of the Spread Function the Modulation Transfer may be obtained.

To assign a single number to the spread function, the width is measured at 50 percent amplitude. This number, usually expressed in microns, may be converted by use of the scale factors to ground distance in feet.

Edges meeting the criteria described below have been found on domestic passes of missions in the same frame as resolution targets and have been scanned. The ground distance in feet, thus determined, has been approximately that determined from the resolution target. Although the techniques used are not refined and are considered to be still in the development stage, the potential of this type of objective analysis should be realized. The 7 examples of edge scans and their respective spread functions are included.

Any optical image can be thought of as being composed of an infinite number of image points of light, each being conjugate with points in the object. While the object points can be infinitesimal light sources, the image points are always mounds of distributions of light having finite size. The blurring of light points in a photographic system comes from diffraction and aberration in the lens, light spreading and diffusion in the emulsion, and image motion caused by camera movement and atmospheric shimmering. The fundamental building block of the image is the distribution of light in any of the image points. This distribution is called the spread function of the photographic system.

Lamberts and others have explained the mathematical and experimental correspondence of a sharp edge and its spread function. An analogy exists in the techniques of studying electrical system response. The analysis requires that the source or object fulfill the conditions of a unit step function, i.e., exist for an appreciable time or distance at a fixed signal level and instantaneously or abruptly change to a new level which is maintained for an appreciable time or distance. The spread function is obtained by differentiating the signal output curve point by point; i.e., measuring the rate of change or signal with time or distance, and plotting signal amplitude versus time or distance.

As a starting point the mission is examined to locate examples of best photography with edges long enough and straight enough for use in the microdensitometer, and having uniform density on each side of the edge to fulfill the conditions of a unit step function. This requirement is usually achieved by rooftops of buildings in large-scale photography, and only aircraft runways or taxiways in small-scale photographs.

The microdensitometer used is a Joyce-Lobel Double Beam Model IIIC. It is used with an effective slit of 1 micron by 100 or 125 microns. The recording table and sample table are directly linked with a ratio arm of 1000:1. The speed of the scan is variable and is determined by the amount of pen deflection (as the pen is deflected the speed decreases giving the pen time to reach its maximum response). The chart thus produced represents a plot of chart displacement versus distance. This plot is manually smoothed by the analyst and is a judgment of what the edge would be if grain and other anomalies were absent.

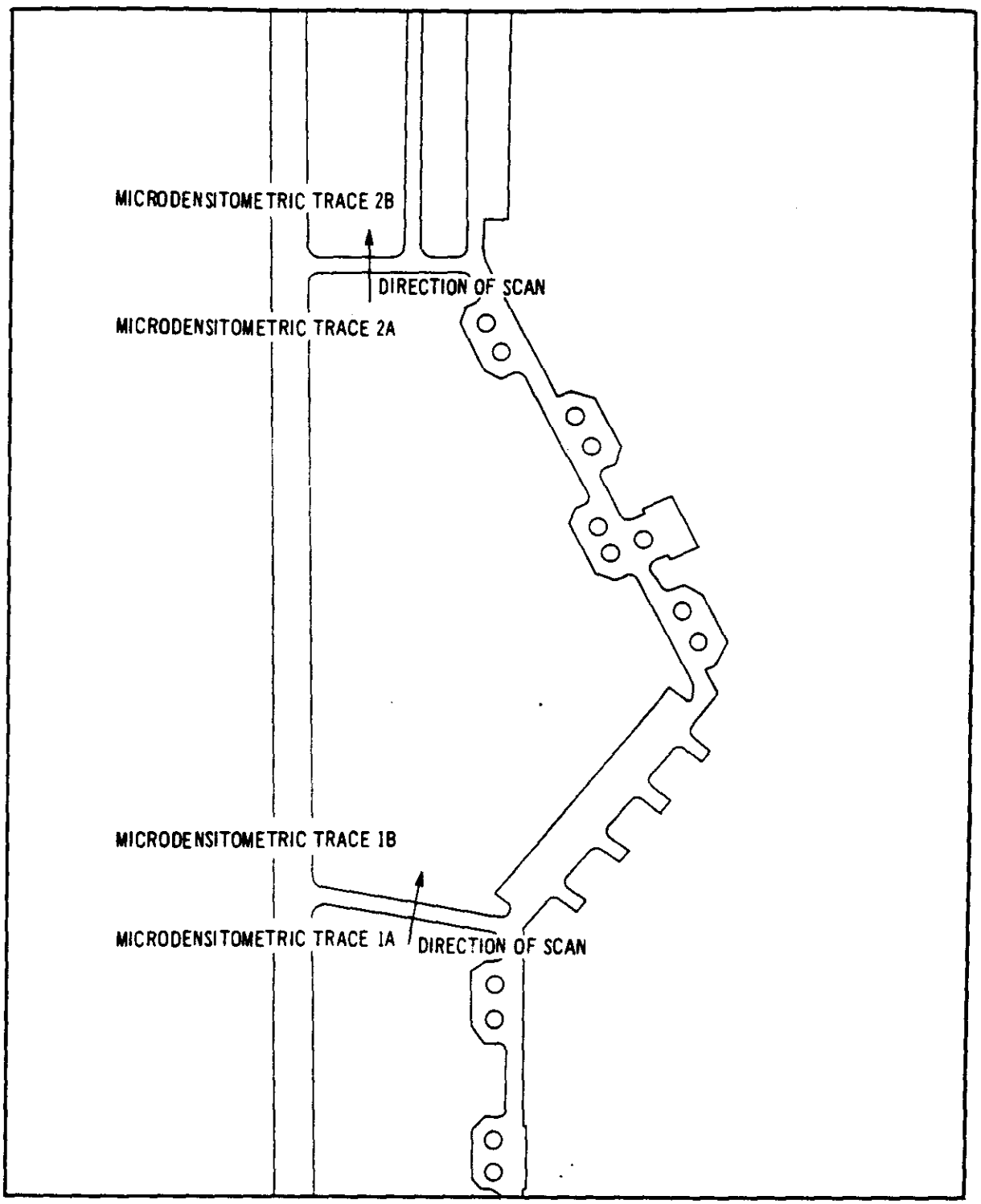
The data reduction is done manually at

[redacted]

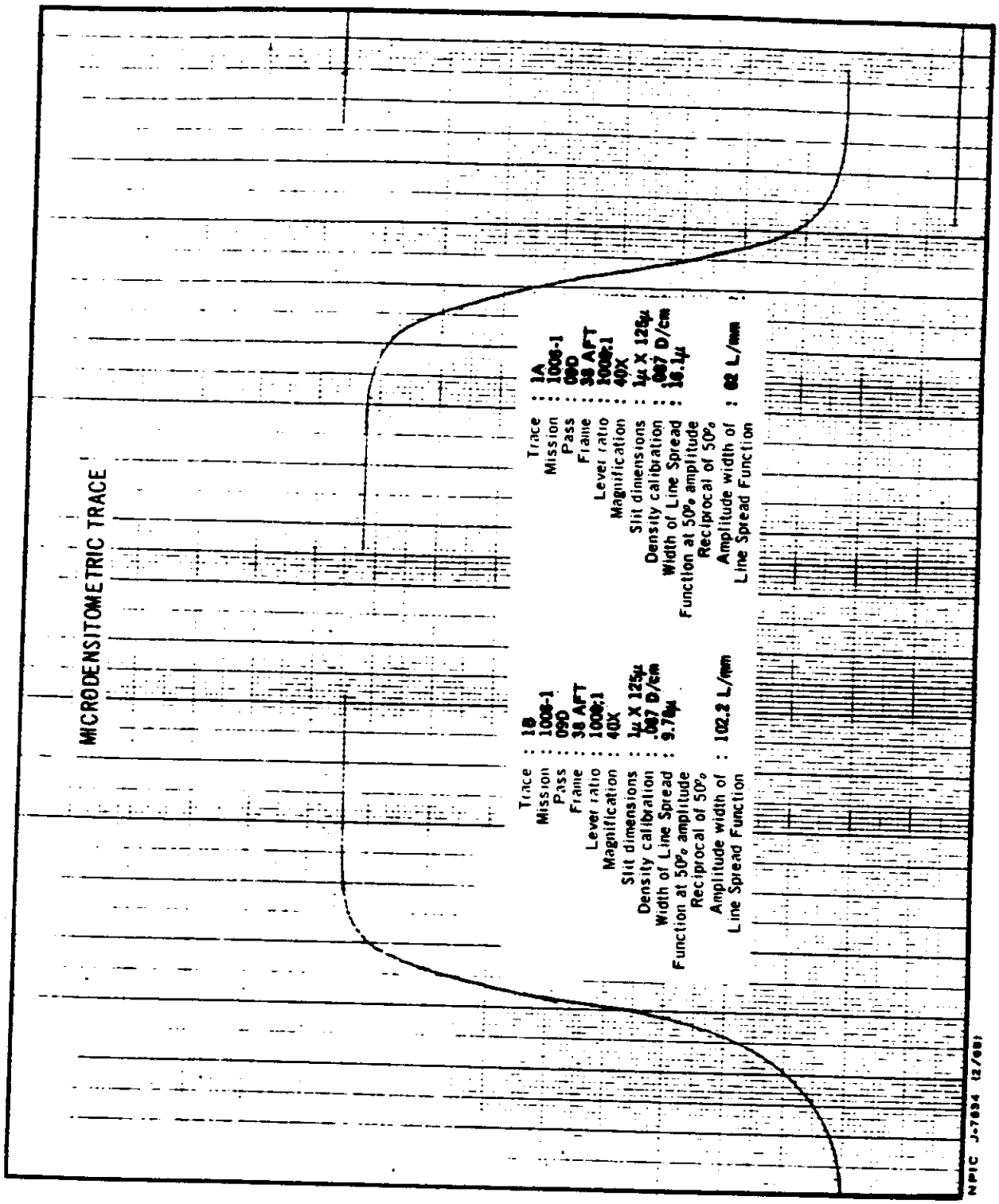
present, but the feasibility of using the UNIVAC 490 computer is being investigated. The linear slope of the calibrated step wedge in the microdensitometer is used to determine the densities at measured distance increments along the trace. The curve for the material showing density versus log exposure (Dlog E) is used to determine the Log E and the anti-log is obtained to yield the exposure (E) required to produce the determined densities. The difference between adjacent values of E is divided by the corresponding difference of the measured distance increments to produce the slope values (dE/dX) of the original scene reflectance distribution. Finally, 50 percent of the maximum slope is computed, and the distance between the 50 percent slope values is determined by interpolation. The value thus obtained represents the 50 percent amplitude width of the Line Spread Function of the original edge. The actual Line Spread Function Curve may also be plotted and the 50 percent amplitude width measured for verification of the computed value.

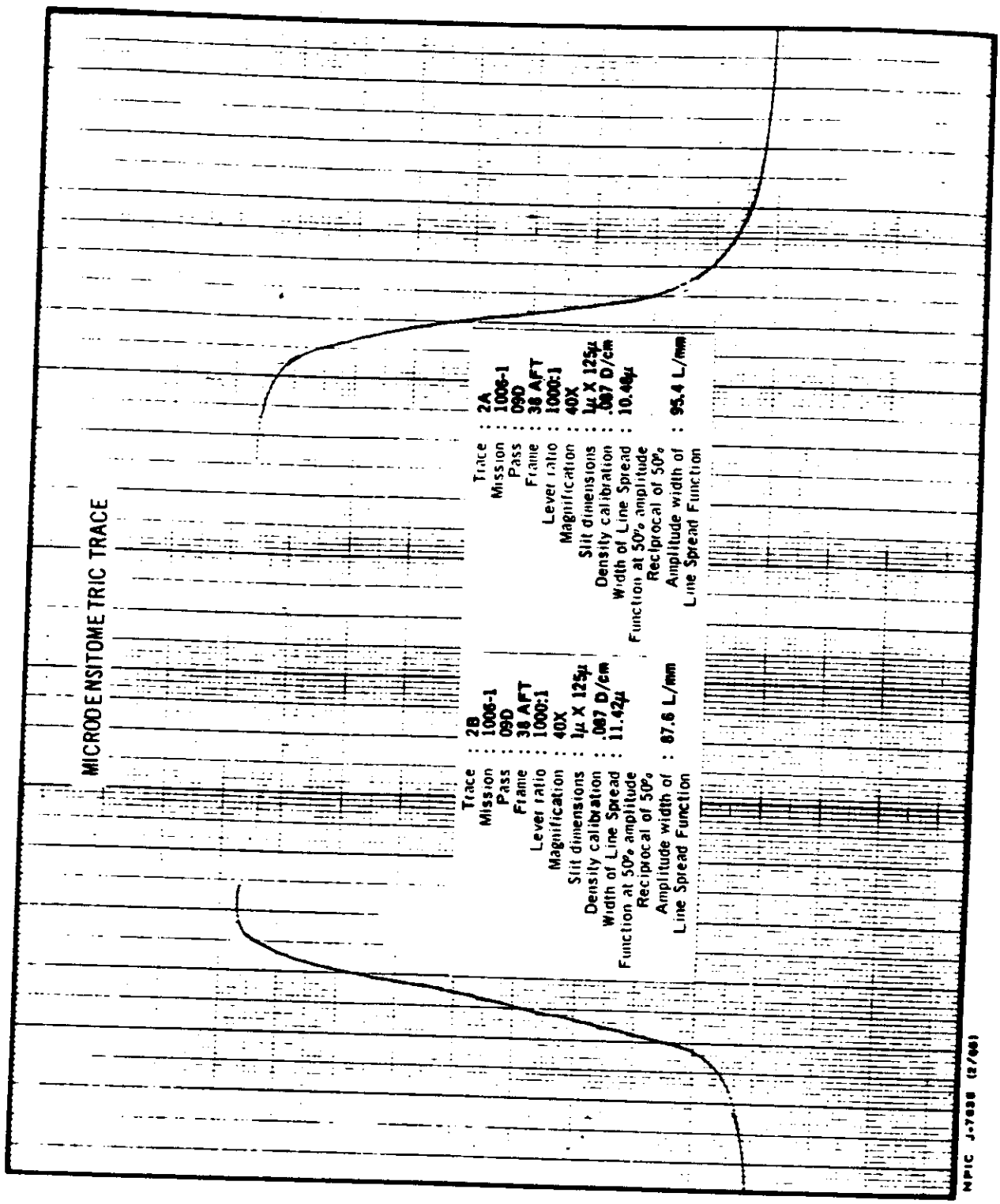
The 50 percent amplitude width value is shown on the enclosed original traces in terms of microns on the negative.

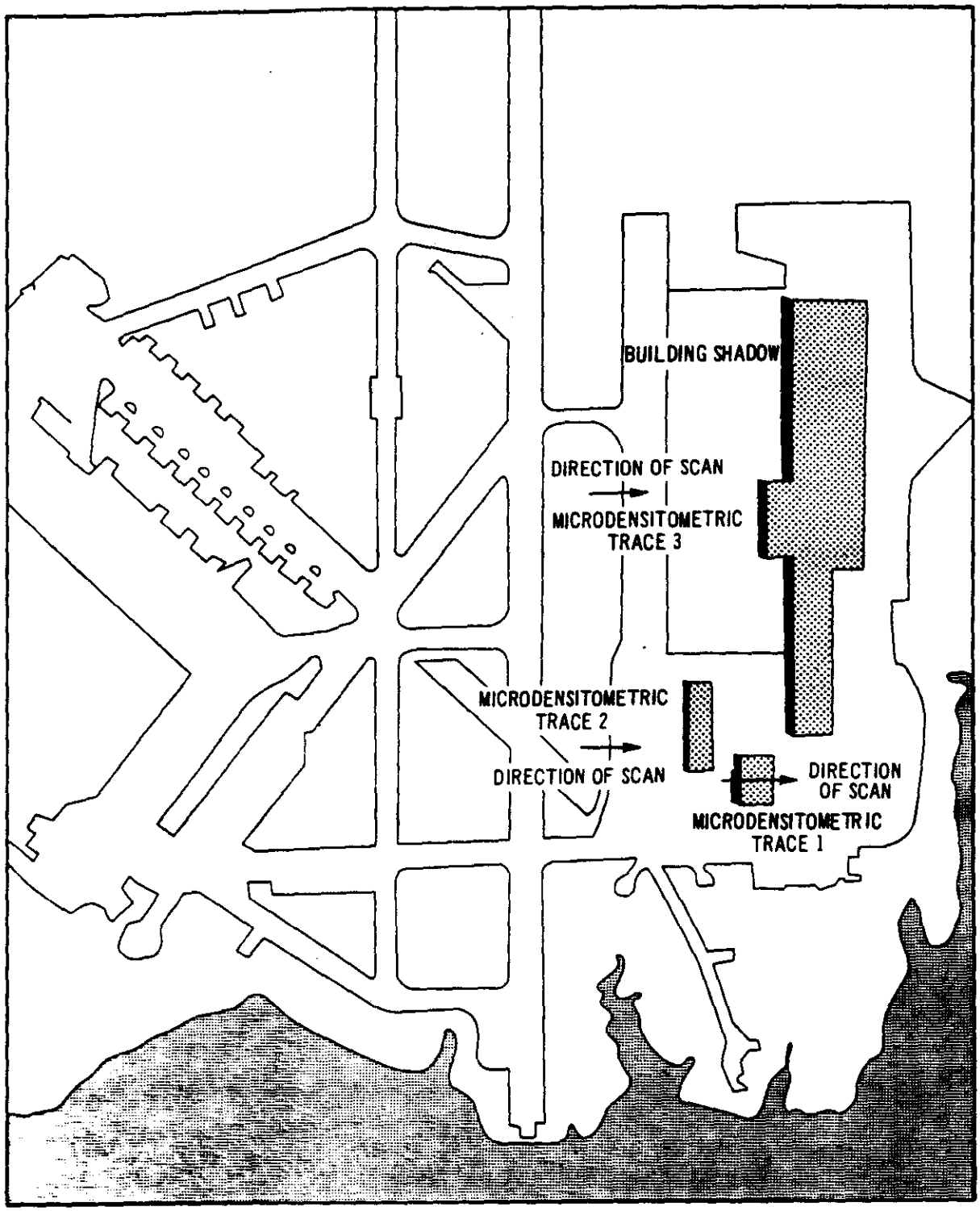
The following traces were taken from the MIP frames of this mission.



NPIC J-7633 (2/68)


MICRODENSITOMETRIC TRACE
Trace : 1A
Mission : 1008-1
Pass : 090
Frame : 38 AFT
Lever ratio : 1008:1
Magnification : 40X
Slit dimensions : 1μ X 125μ
Density calibration : .067 D/cm
Width of Line Spread Function at 50% amplitude : 10.1μ
Reciprocal of 50% Amplitude width of Line Spread Function : 82 L/mm
Trace : 1B
Mission : 1008-1
Pass : 090
Frame : 38 AFT
Lever ratio : 1008:1
Magnification : 40X
Slit dimensions : 1μ X 125μ
Density calibration : .067 D/cm
Width of Line Spread Function at 50% amplitude : 9.7μ
Reciprocal of 50% Amplitude width of Line Spread Function : 102.2 L/mm
NPIC J-7834 (2/68)

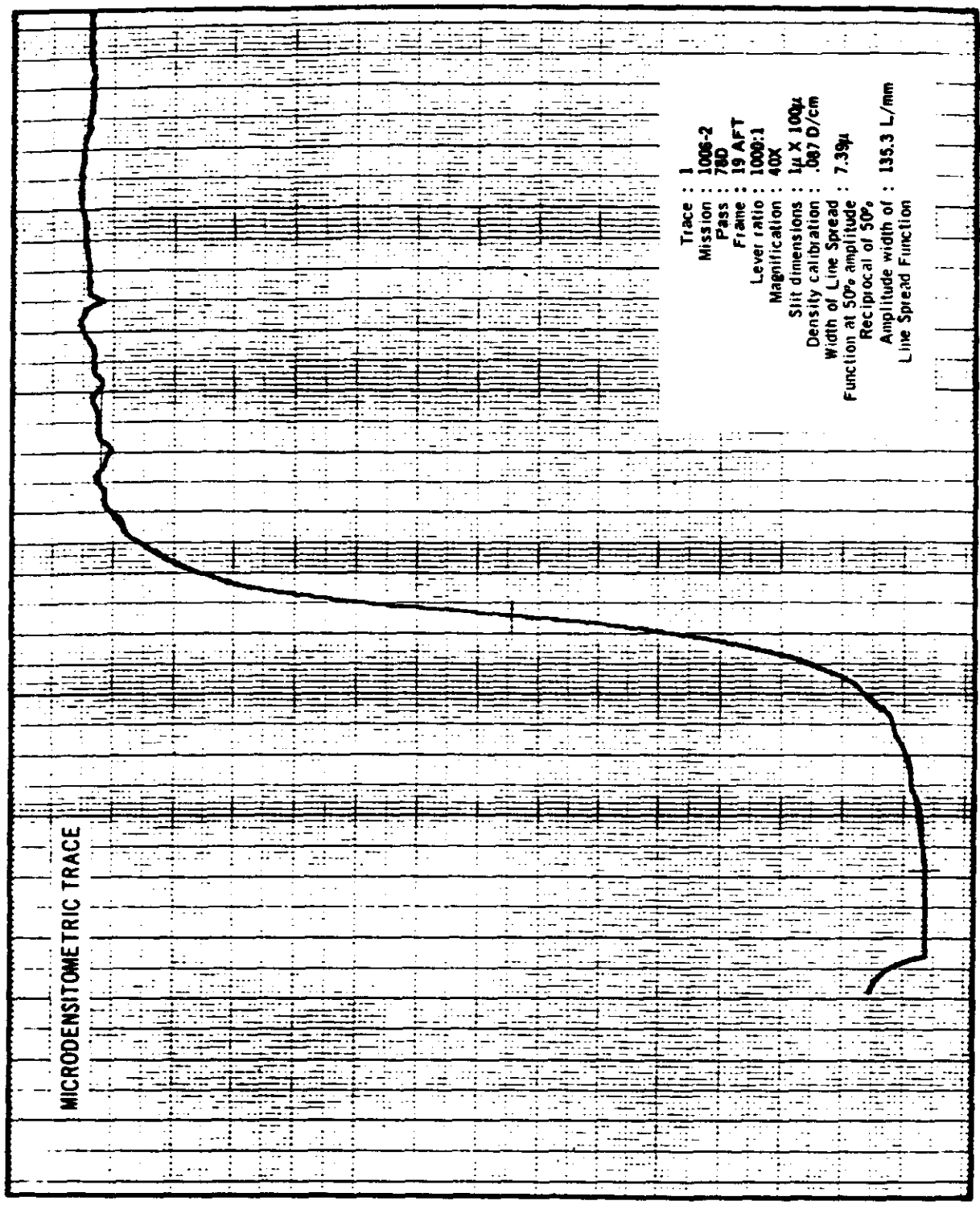

MICRODENSITOMETRIC TRACE
Trace : 2A
Mission : 1006-1
Pass : 09D
Frame : 38 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 125μ
Density calibration : .087 D/cm
Width of Line Spread Function at 50% amplitude : 10.46μ
Reciprocal of 50% Amplitude width of Line Spread Function : 95.4 L/mm
Trace : 2B
Mission : 1006-1
Pass : 09D
Frame : 38 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 125μ
Density calibration : .087 D/cm
Width of Line Spread Function at 50% amplitude : 11.42μ
Reciprocal of 50% Amplitude width of Line Spread Function : 87.6 L/mm
NPIC J-7888 (2/66)



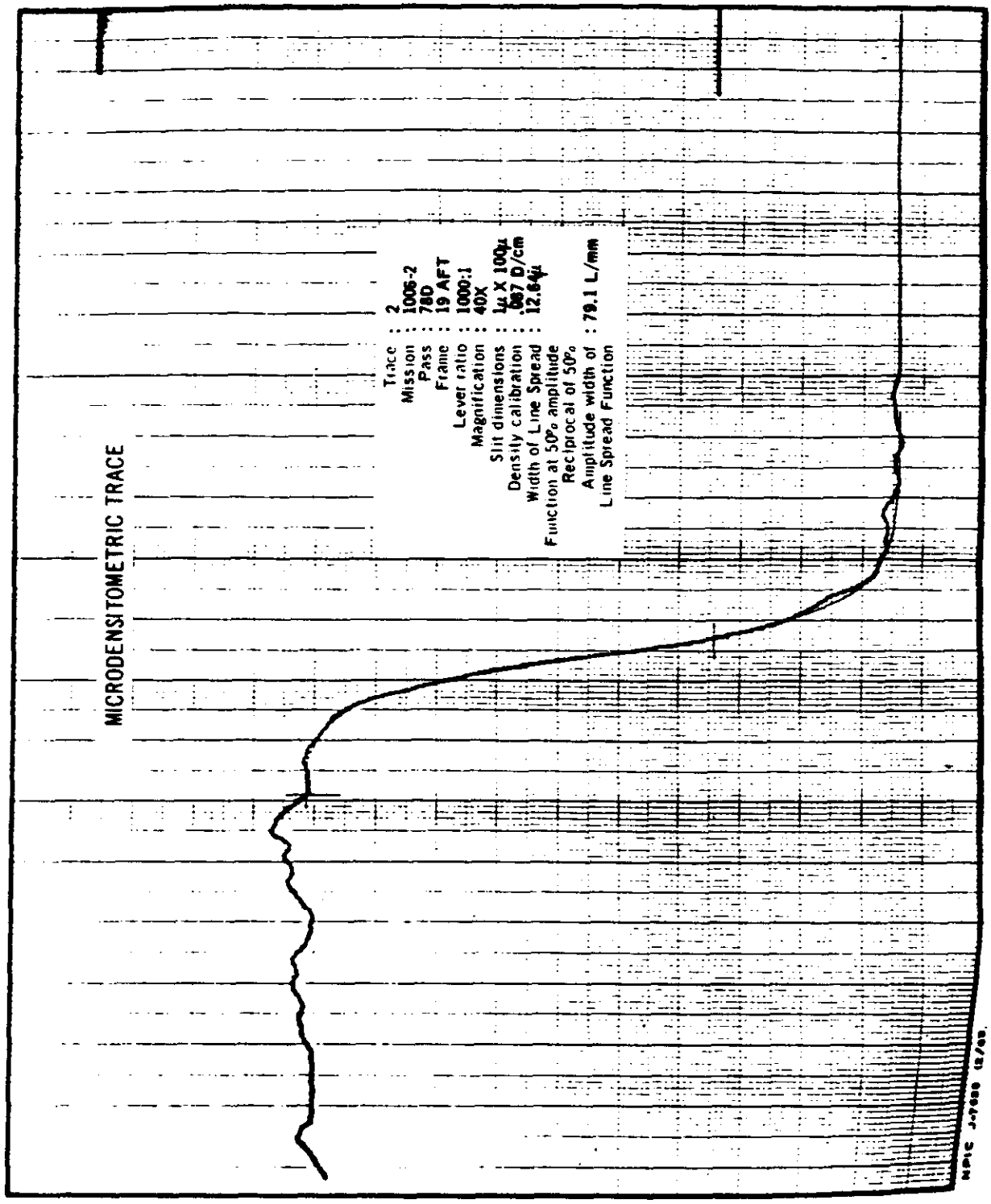
NPIC J-7636 (2/65)

~~TOP SECRET RUFF~~

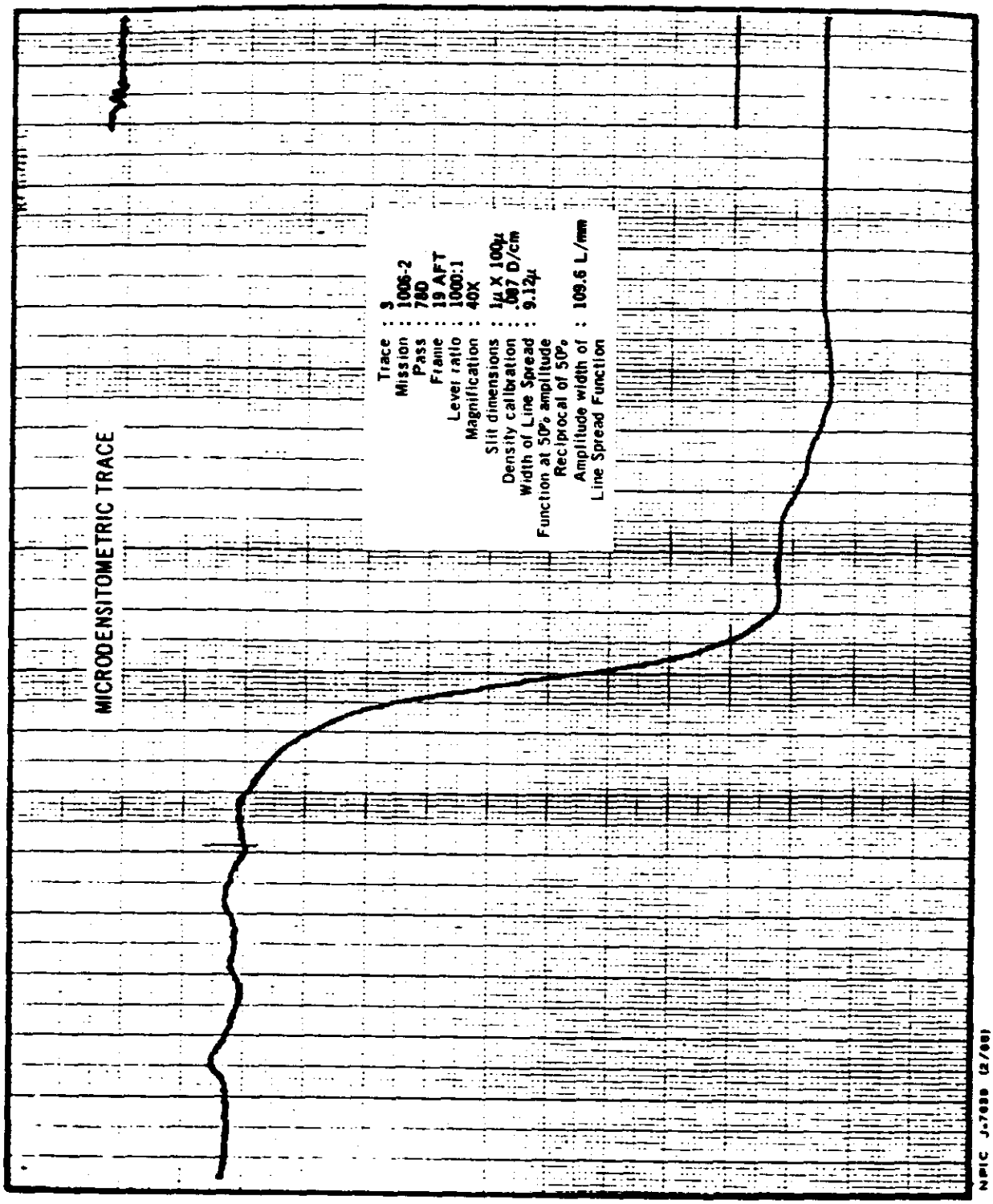
[redacted]


MICRODENSITOMETRIC TRACE
Trace : 1
Mission : 1006-2
Pass : 78D
Frame : 19 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : .087 D/cm
Width of Line Spread Function at 50% amplitude : 7.39μ
Reciprocal of 50% Amplitude width of Line Spread Function : 135.3 L/mm
NPIC J-7687 (2/68)

[redacted]


MICRODENSITOMETRIC TRACE
Trace : 2
Mission : 1006-2
Pass : 78D
Frame : 19 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : .087 D/cm
Width of Line Spread Function at 50% amplitude : 12.64μ
Reciprocal of 50% Amplitude width of Line Spread Function : 79.1 L/mm

[redacted]



[redacted]

[redacted]

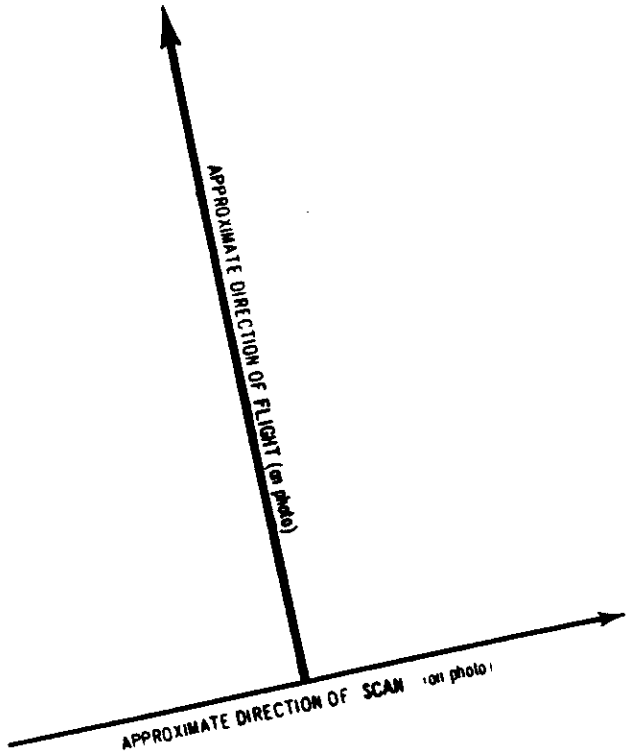
FIGURE 29. GOOD IMAGE QUALITY - MASTER CAMERA.

NPIC J-8172 (2/65)

[redacted]

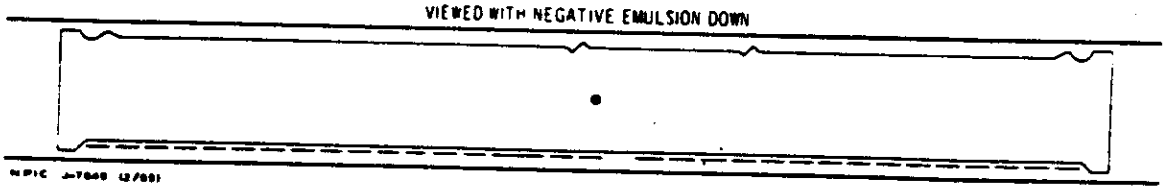
[redacted]

Pass	09D
Panoramic Frame	33 FWD
Enlargement Factor	20X
Solar Elevation	55°
Solar Azimuth	228°
Altitude	86.71 nm



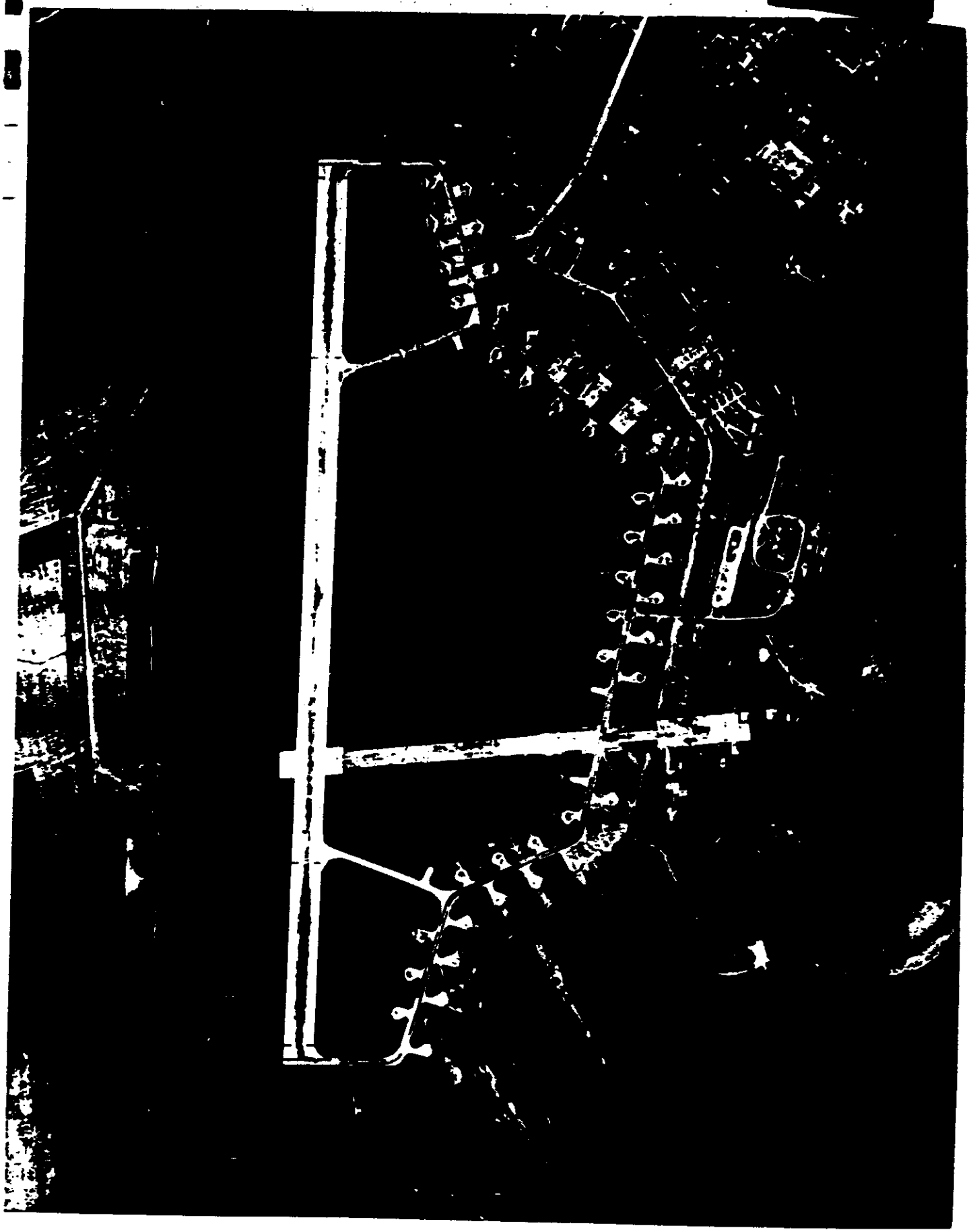
APPROXIMATE CENTER OF PHOTO, RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



NPIC [illegible]

[redacted]



[redacted]

FIGURE 30. COMPARISON OF IMAGE QUALITY - MASTER CAMERA.

NPIC J-6173 (2/68)

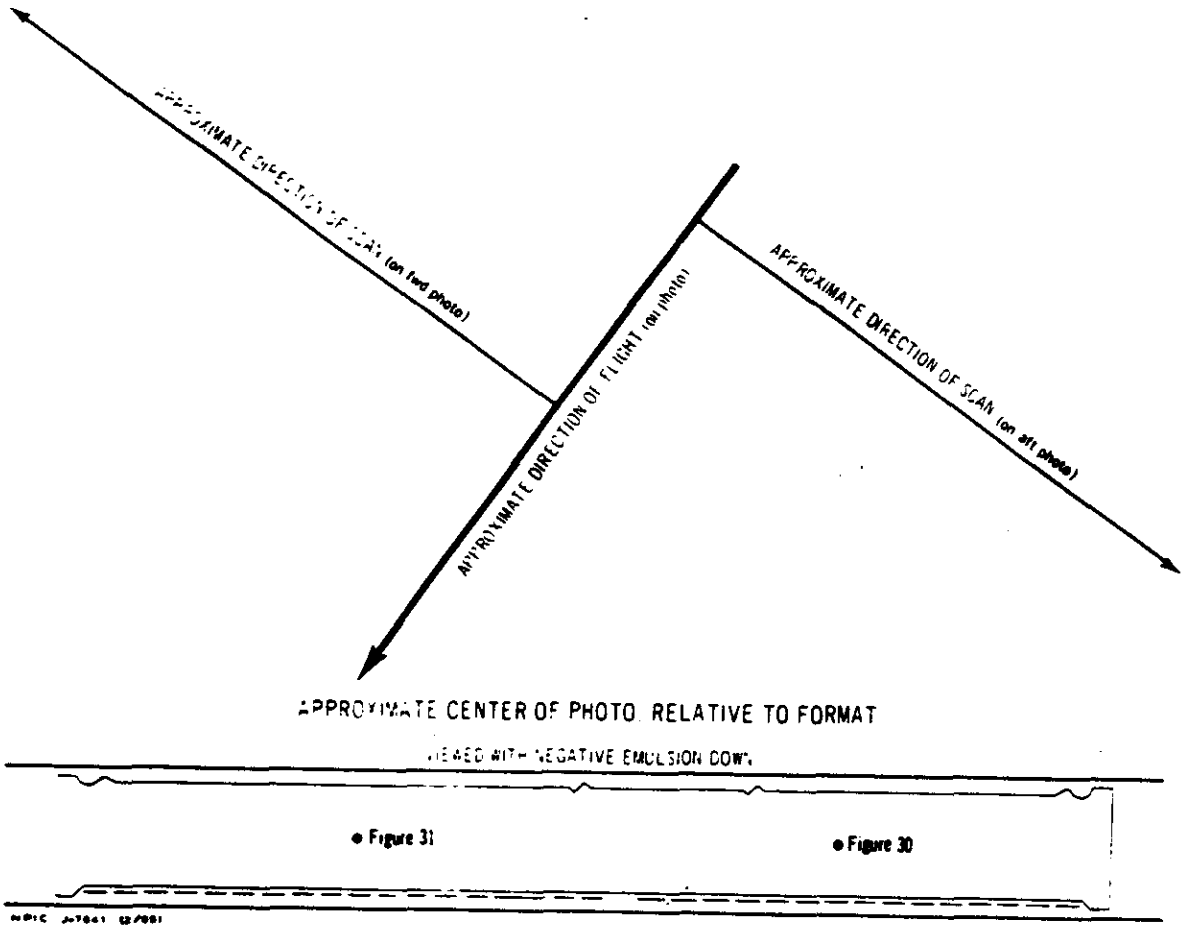
FIGURE 31. COMPARISON OF IMAGE QUALITY - SLAVE CAMERA.

NPIC J-6174 (2/68)

[redacted]

[redacted]

	Figure 30	Figure 31
Pass	40D	40D
Panoramic Frame	23 FWD	28 AFT
Enlargement Factor	20X	20X
Solar Elevation	49°	49°
Solar Azimuth	225°	225°
Altitude	86.96 nm	86.96 nm



[redacted]

~~TOP SECRET RUFF~~

~~NO FOREIGN DISSEM~~

[redacted]

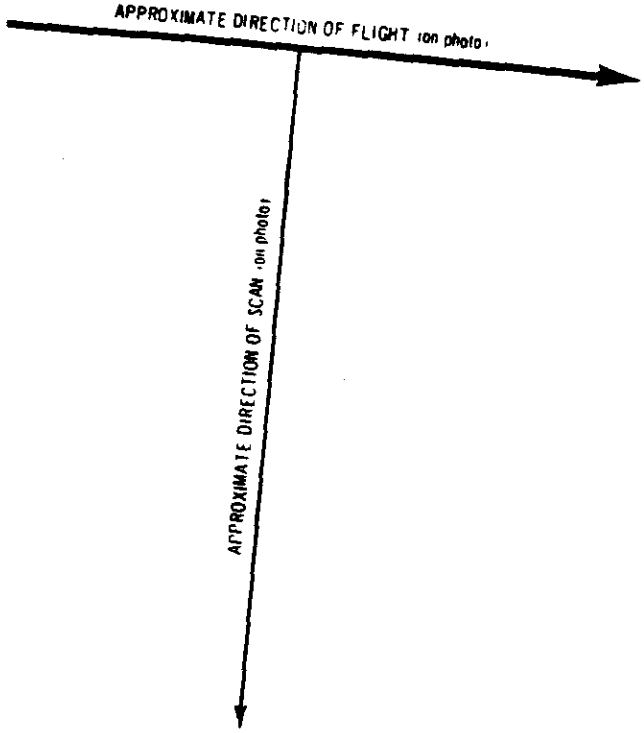
FIGURE 32. GOOD IMAGE QUALITY - MASTER CAMERA.

NPIC J-8175 (2/68)

[redacted]

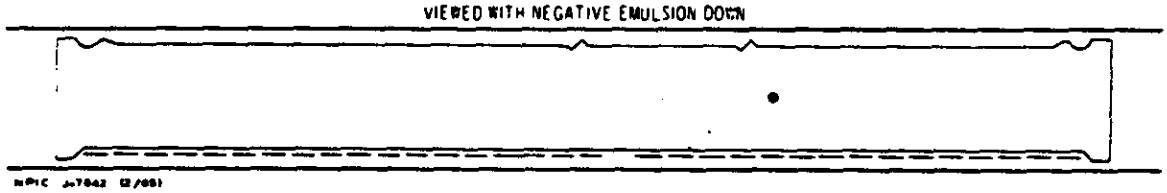
[redacted]

Pass	56D
Panoramic Frame	47 FWD
Enlargement Factor	20X
Solar Elevation	51°
Solar Azimuth	226°
Altitude	88.32 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



NPIC [illegible]

[redacted]

FIGURE 33. COMPARISON OF IMAGE QUALITY - MASTER CAMERA.

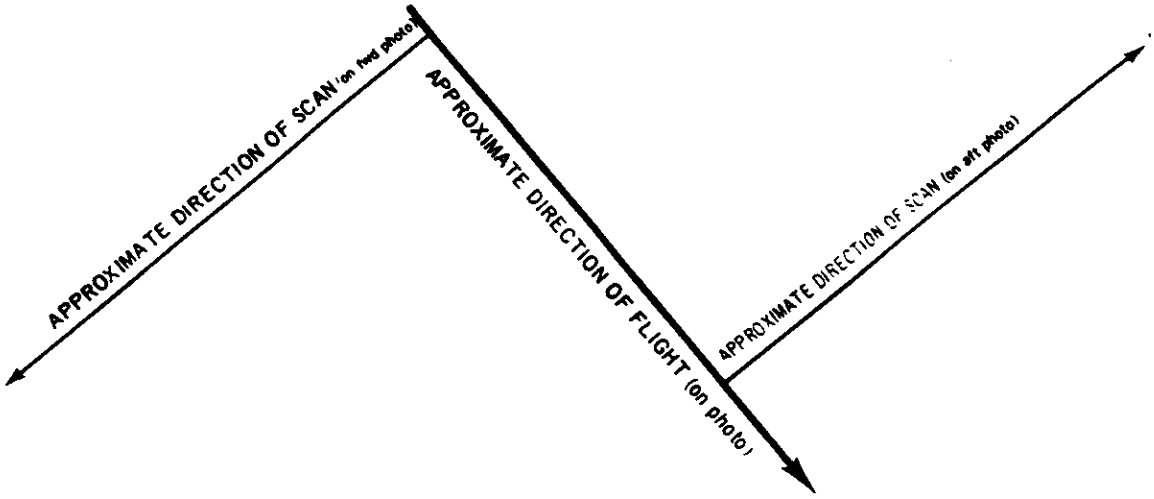
NPIC J-8176 (2/69)

FIGURE 34. COMPARISON OF IMAGE QUALITY - SLAVE CAMERA.

NPIC J-8177 (2/69)

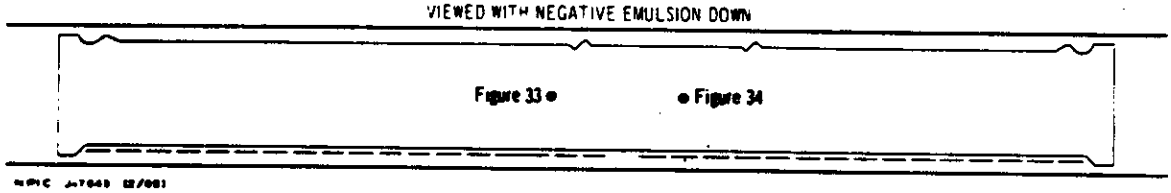
[redacted]

	Figure 33	Figure 34
Pass	70D	70D
Panoramic Frame	72 FWD	76 AFT
Enlargement Factor	20X	20X
Solar Elevation	52.2°	52.2°
Solar Azimuth	121°	121°
Altitude	90.07 nm	90.07 nm



APPROXIMATE CENTER OF PHOTO RELATIVE TO FORMAT

VIEWED WITH NEGATIVE EMULSION DOWN



APPENDIX A. SYSTEM SPECIFICATIONS

1. Panoramic Cameras

	Master (FWD)	Slave (AFT)
Camera No	148	149
Lens Serial Number	1242435	1262435
Slit Width	0.200"	0.200"
Filter	Wratten 21	Wratten 21
Operational Focal Length	609.602 mm	609.602 mm
Film Type	4404	4404
Film Length	15,800'	15,800'
Splices	4	4
Emulsion	48-5-1-4	48-5-7-1-4
Static Bench Test		
High Contrast	241 L/mm	252 L/mm
Low Contrast	146 L/mm	138 L/mm
Dynamic Test		
I. High Contrast	174 L/mm	168 L/mm
I. Low Contrast	129 L/mm	129 L/mm
P. High Contrast	181 L/mm	180.5 L/mm
P. Low Contrast	109.5 L/mm	106 L/mm

Camera No 148

Resolution	Take-Up							Supply				
Angle Off Axis	0°	5°	10°	15°	20°	25°	27.5°	0°	10°	15°	20°	25°
Radial Resolution (L/mm)	164	153	153	133	125	112	58	170	112	87	80	68
Tangential Resolution (L/mm)	164	153	142	121	97	64	44	170	116	89	66	55

Camera No 149

Resolution	Take-Up						Supply					
Angle Off Axis	0°	10°	15°	20°	25°	30°	0°	10°	15°	20°	25°	27.5°
Radial Resolution (L. mm)	170	61	87	79	87	71	170	132	92	80	97	63
Tangential Resolution (L 'mm)	170	96	79	66	55	40	170	116	95	75	55	43

2. Horizon Cameras

	Starboard (Take-Up)	Port (Supply)	Starboard (Supply	Port (Take-Up)
Camera No	148	146	149	149
Lens Serial No	812296	813549	813536	813559
Exposure Time	1/100 sec	1/100 sec	1/100 sec	1/100 sec
Aperture	f/8.0	f/6.8	f/6.8	f/8.0
Filter	Wratten 25	Wratten 25	Wratten 25	Wratten 25
Operational Focal Length	54.75 mm	54.83 mm	55.12 mm	54.24 mm
Average Lines/mm	120 L/mm	101 L/mm	99 L/mm	89 L/mm
Radial Distortion				
10° off axis	.000 mm	.001 mm	.004 mm	.004 mm
20° off axis	.007 mm	.004 mm	.009 mm	.006 mm
Tangential Distortion	.002 mm	.004 mm	.001 mm	.001 mm

3. Stellar and Index Cameras (Mission 1006-1)

	Stellar	Index
Camera No	D45/47/45	D45/47/45
Lens Serial No	11053	813062
Reseau Serial No	45	47
Filter	None	Wratten 21
Aperture	f/1.8	f/4.5
Exposure Time	2.0 sec	1/500 sec
Operational Focal Length	NA	38.249 mm
Film Type	4401	4400
Film Length	75'	135'
Emulsion	7-3-3-4	26-1-1-4
Perpendicularity of Reseau	.0005"-.937"	.0008"-2.25"
Location of Principal Point	NA	NA
Awar	NA	71 L/mm

Note: NA denotes Not Available.

Camera No D45/47/45 (Mission 1006-1)

Resolution	Stellar					Index				
Angle Off Axis	0°	10°	20°	30°	35°	NA	NA	NA	NA	NA
High Contrast (L mm)	62	96	104	83	70	NA	NA	NA	NA	NA
Low Contrast (L mm)	92	89	75	45	26	NA	NA	NA	NA	NA

Note: NA denotes Not Available.

4. Stellar and Index Cameras (Mission 1006-2)

	Stellar	Index
Camera No	D49/53/42	D49/53/42
Lens Serial No	11303	813061
Reseau Serial No	42	53
Filter	None	Wratten 21
Aperture	f/1.8	f/4.5
Exposure Time	2.0 sec	1/500 sec
Operational Focal Length	NA	38.08 mm
Film Type	4401	4400
Film Length	75'	135'
Splices	None	None
Emulsion	7-3-3-4	26-1-1-4
Perpendicularity of Reseau	.0004"-.937"	.009"-2.25"
Location of Principal Point	NA	NA
Awar	NA	72.2 L/mm

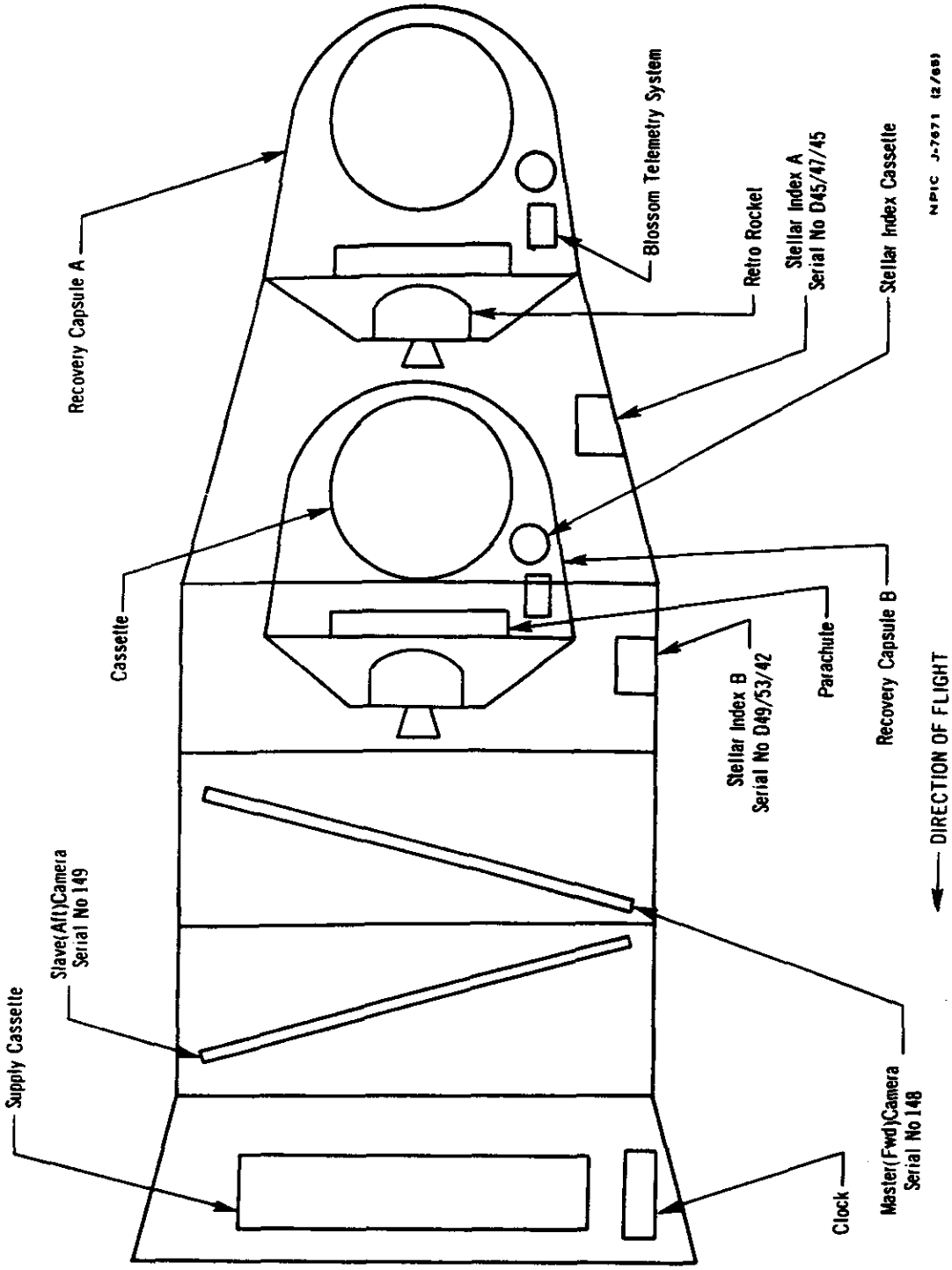
Note: NA denotes Not Available.

Camera No D49 '53 '42 (Mission 1006-2)

Resolution	Stellar					Index				
Angle Off Axis	NA	NA	NA	NA	NA	0°	10°	20°	30°	35°
High Contrast	NA	NA	NA	NA	NA	82	87	104	84	79
Low Contrast	NA	NA	NA	NA	NA	82	87	84	47	40

Note: NA denotes Not Available.

VEHICLE LAYOUT



6. Panoramic Camera Format Calibrations:

Measurements are made with respect to collimator targets fixed with respect to the mechanical interface between the total payload assembly and the orbital vehicle.

Two sets, of three targets each, are aligned to be coplanar within ±5" of arc so positioned to form an angle of -15.00° ±5" to the mechanical interface for master camera calibrations and an angle of +15.00°±5" to the mechanical interface for slave camera calibrations.

One target, Target 1 of each set, is imaged on the Terrain format.

The second and third targets of each set are at angles of 75.00°±5" from target one and are imaged on the horizon formats.

The indicated center of format for the panoramic cameras is given by the intersection of a line through the center of mass of the central shrinkage marker drawn normal to the edge of format containing the shrinkage marker and a line parallel to the same edge located at a position half-way between the format edges.

The indicated principal points of the horizon cameras are the points of intersection of lines joining opposite fiducials.

Xvo and Yvo are the offsets of Target 1 from the indicated center of format of the panoramic cameras as defined in Paragraph 3.

Xs, Ys and Xt, Yt are the offsets of Targets 2 and 3 from the indicated principal points of the supply and take-up horizon cameras respectively.

The indicated flight direction is the direction of vehicle travel during orbit. The forward edge of format is the edge opposite the shrinkage markers for the master camera and is the edge containing the shrinkage markers for the slave camera.

Dimensions A, B, and C are the spacings of the shrinkage markers and dimensions D and E are the spacings of the Y Axis fiducials. Techniques for exact measurement of these dimensions have not been developed. The figures quoted are measurements made on hand processed film without control of shrinkage.

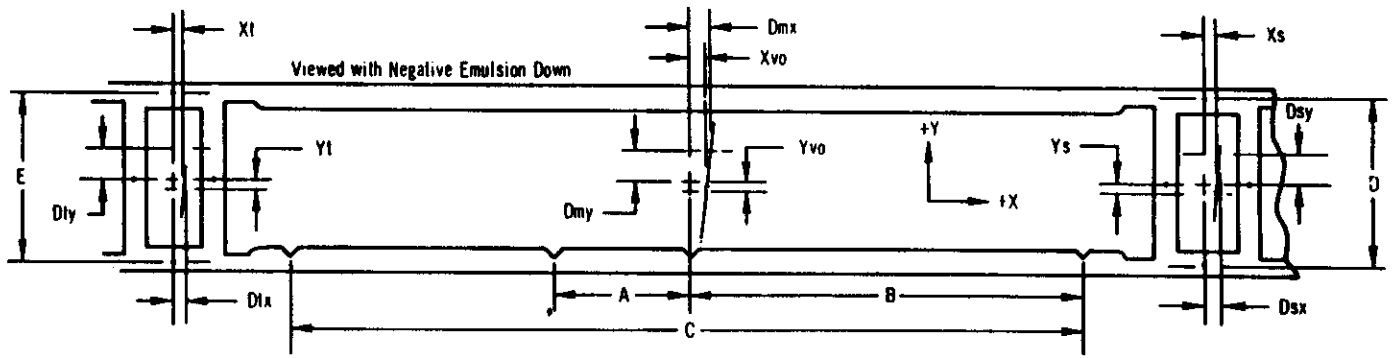
The format dimensions are measured to the best estimate of format edge.

Measurement of the angle between the indicated axis of the panoramic cameras and the line of intersection of the plane defined in Paragraph 2 on the format is obtained from the offset dimensions Dmx and Dmy of Target 1 for each camera.

Measurement of the angle between the indicated axis of the horizon cameras and the line of intersection of the plane defined in Paragraph 2 on the format is made by measuring the scan direction offset of the targets defined in Paragraph 2.2 at a fixed distance from the target center in the Y direction. Dimensions Dtx, Dty, Dsx, and Dsy are the offsets of these measurements.

FILM SPECIFICATIONS

FORMAT SPECIFICATIONS



Master(Fwd) Camera		Vehicle Motion		Scan Direction	
A	76.10	Xt	NA	Dtx	-0.010
B	355.30	Yt	-0.058	Dty	+2.000
C	710.40	Xs	-0.093	Dsx	+0.008
D	NA	Ys	-0.125	Dsy	+2.000
E	NA	Xvo	+1.243	Dmx	-0.002
		Yvo	+0.502	Dmy	-2.000

Format dimensions:

	Panoramic	Take-Up	Supply
Height	55.70	NA	NA
Width	753.20	NA	NA

Slave(Aft) Camera		Vehicle Motion		Scan Direction	
A	76.10	Xt	-0.049	Dtx	-0.007
B	355.20	Yt	-0.088	Dty	+2.000
C	710.20	Xs	-0.565	Dsx	+0.004
D	56.464	Ys	+0.024	Dsy	-2.000
E	56.511	Xvo	-0.540	Dmx	+0.005
		Yvo	-0.703	Dmy	+2.000

Format dimensions:

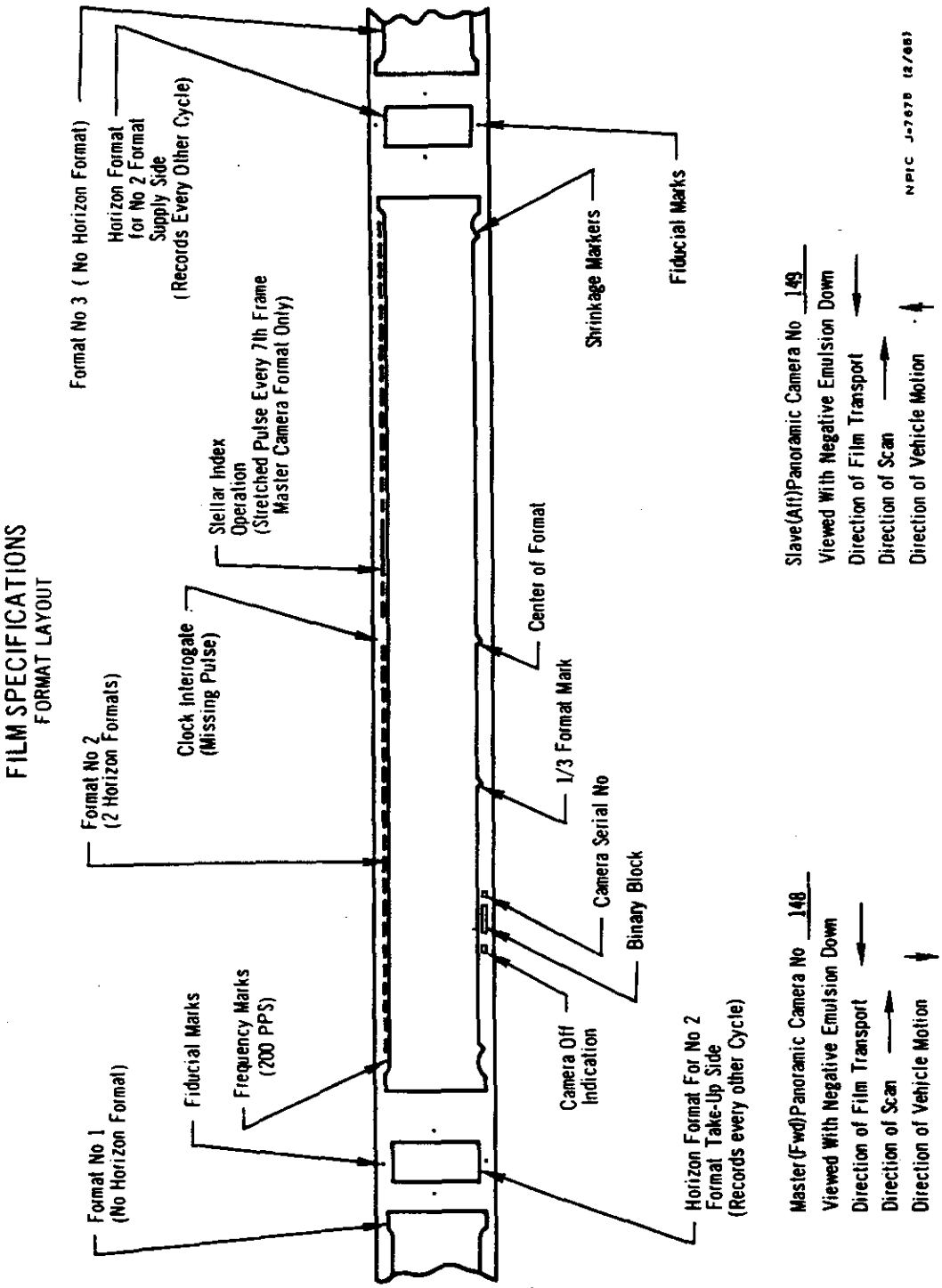
	Panoramic	Take-Up	Supply
Height	56.00	NA	NA
Width	752.30	NA	NA

NOTE: 1. All dimensions are in millimeters and are average dimensions of three formats
2. Height of main format is taken at center of format
3. Dt, Dm, Ds, X and Y dimensions are taken 10 MM above point defining target center
4. Format Sign Convention

−X+Y	+X+Y
−X−Y	+X−Y

NPIC J-7674 (2/69)

Handle Via
~~TALENT-KEYHOLE~~
Control System Only

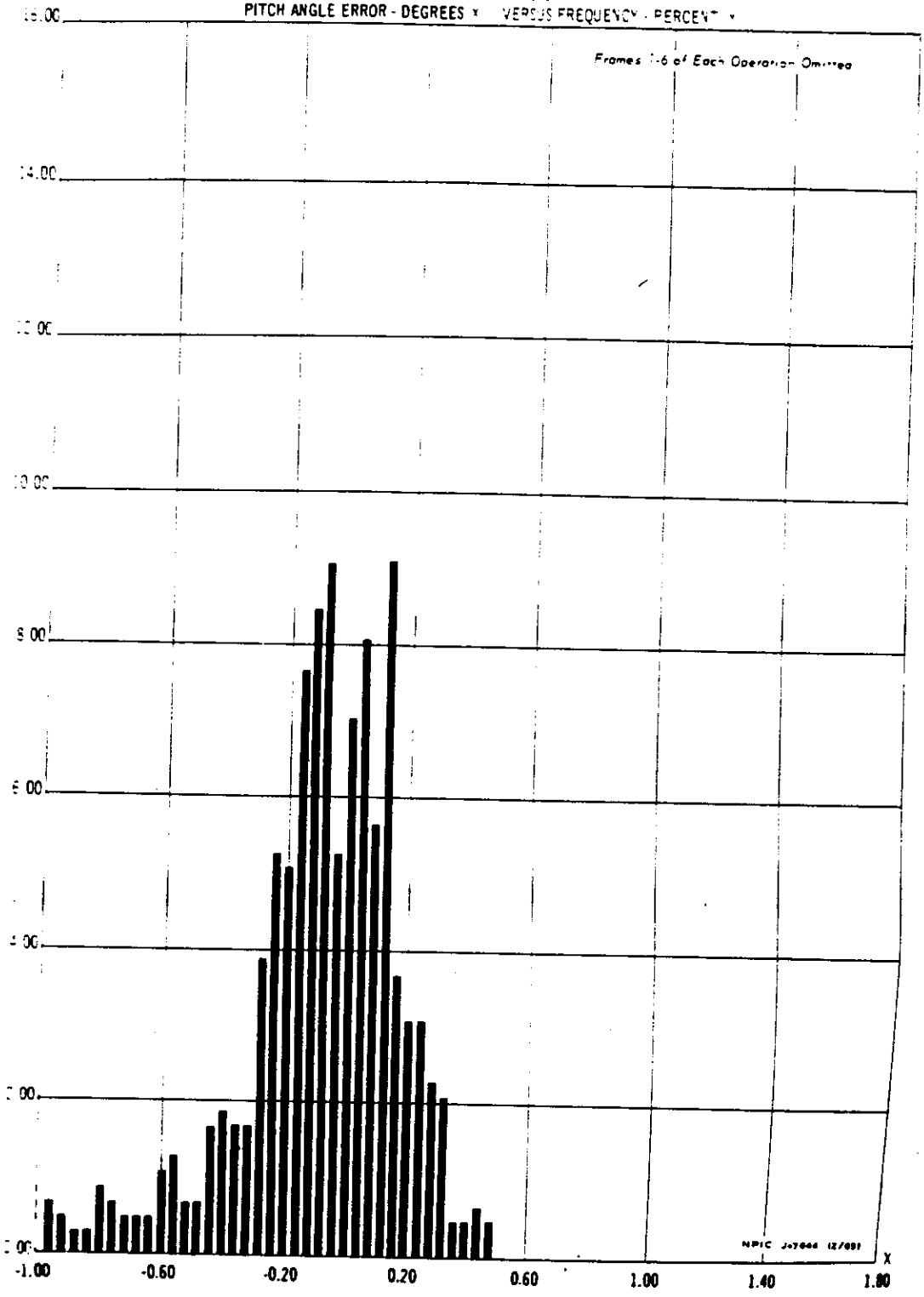


Handle Via
~~TALENT-KEYHOLE~~
Control System Only

APPENDIX B. VEHICLE ATTITUDE

The following graphs describe pitch angle error, roll angle error, yaw angle error, pitch rate error, roll rate error, yaw rate error, V/H ratio error, along track resolution limit, and cross track resolution limit. They were compiled and made available for this publication by the vehicle manufacturer. "Resolution Limits" are theoretical figures derived from system limitations and vehicle attitude deviations.

MISSION 1006-1



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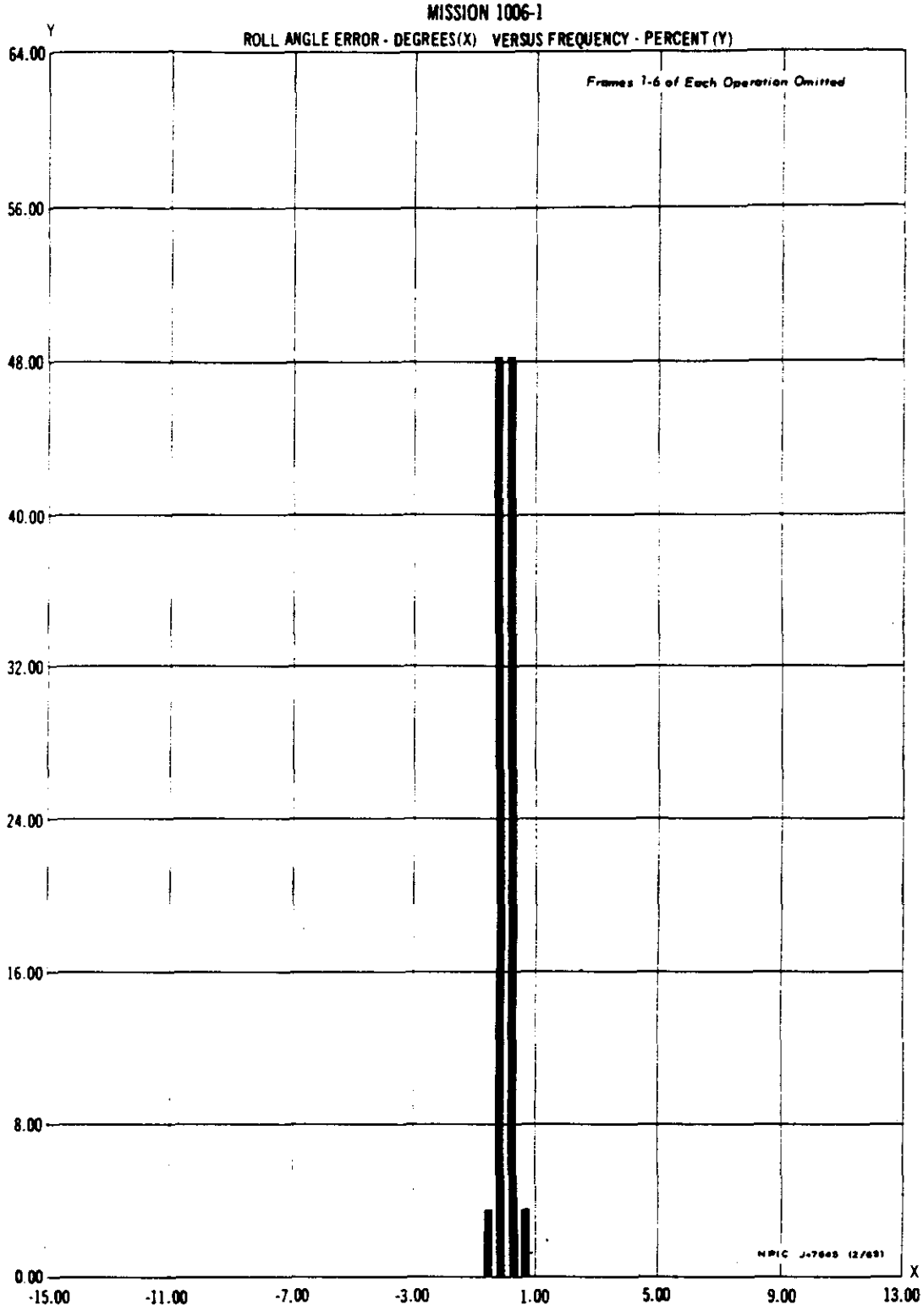
MISSION 1006-1

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



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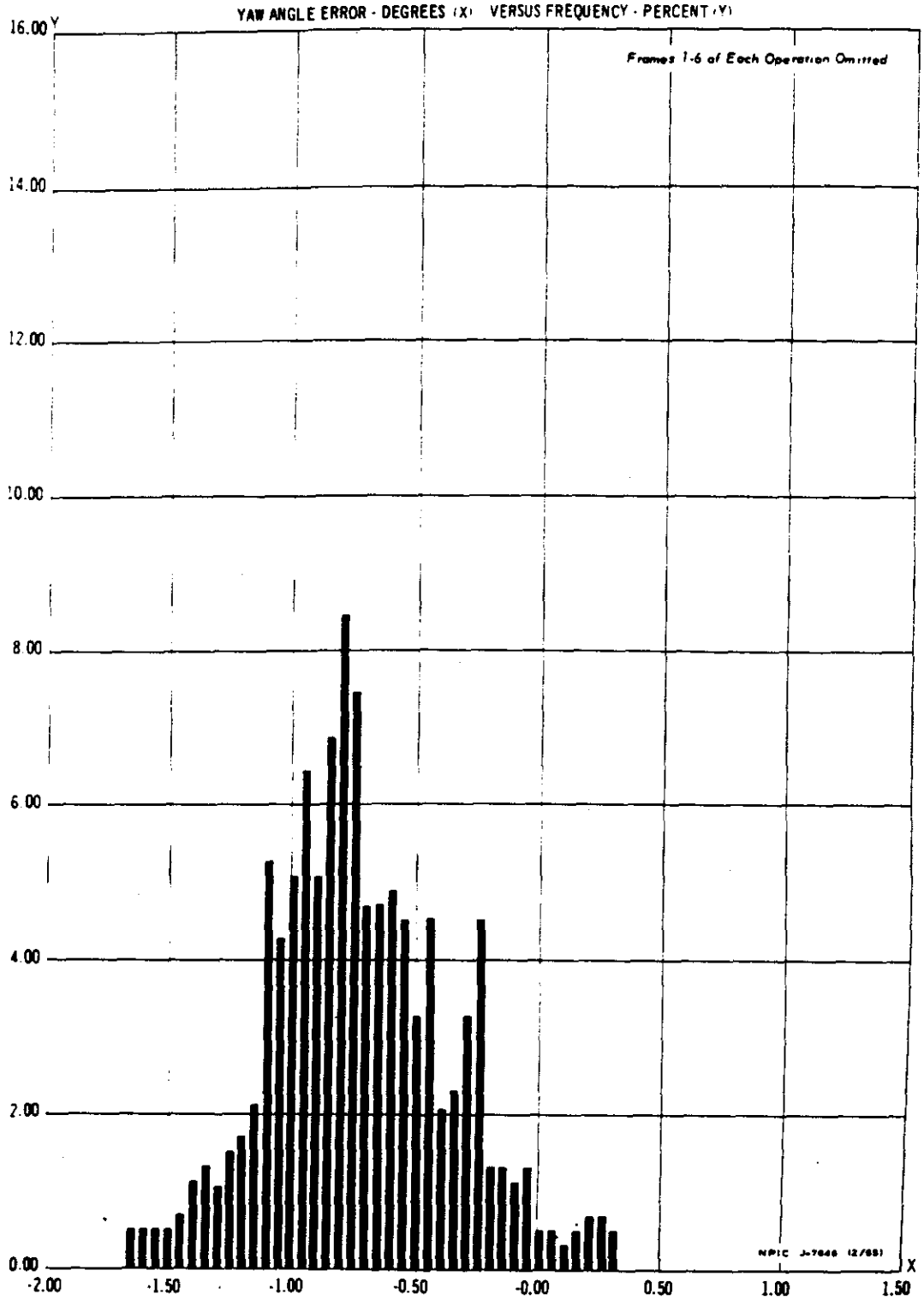
MISSION 1006-I

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



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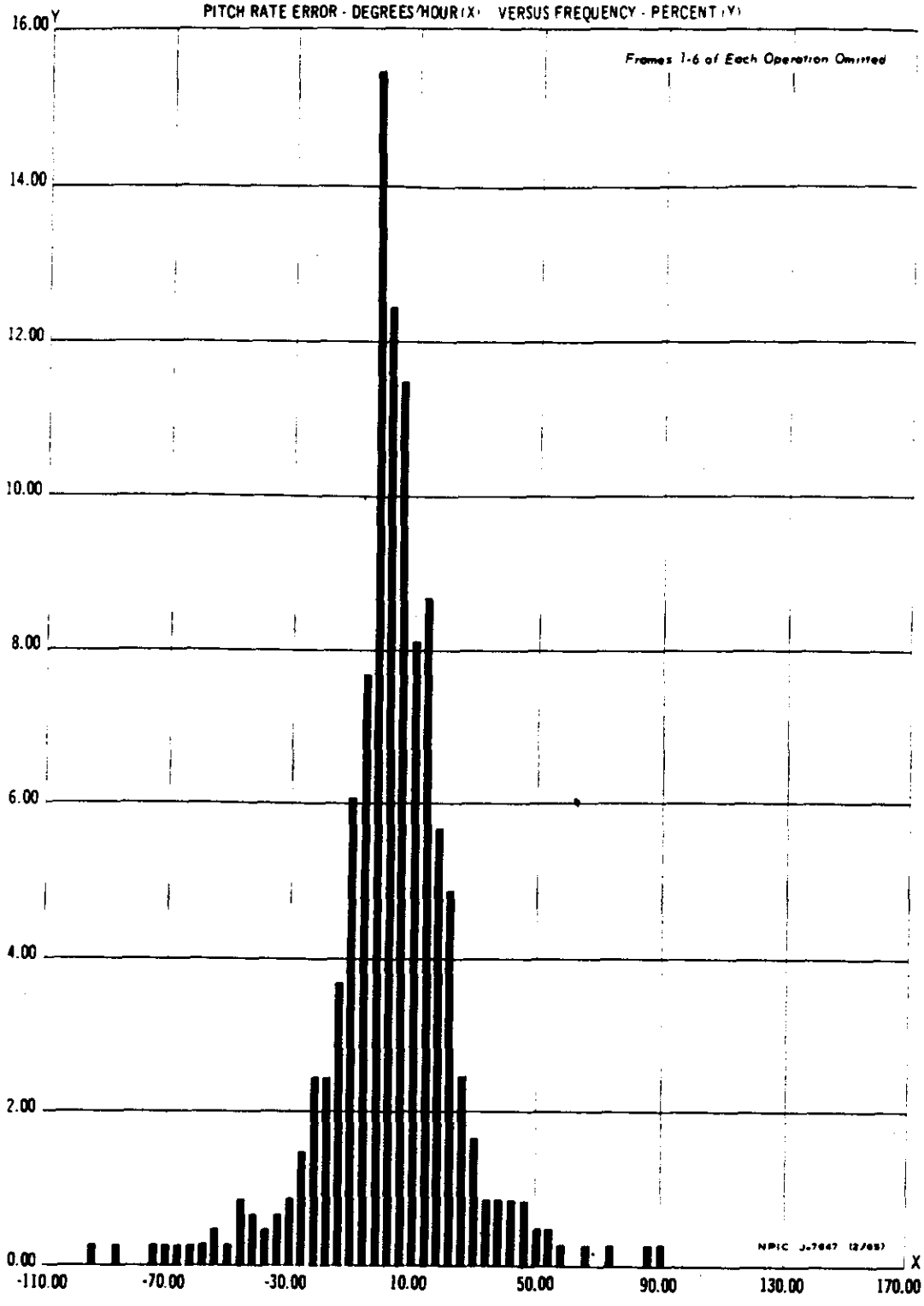
MISSION 1006-1



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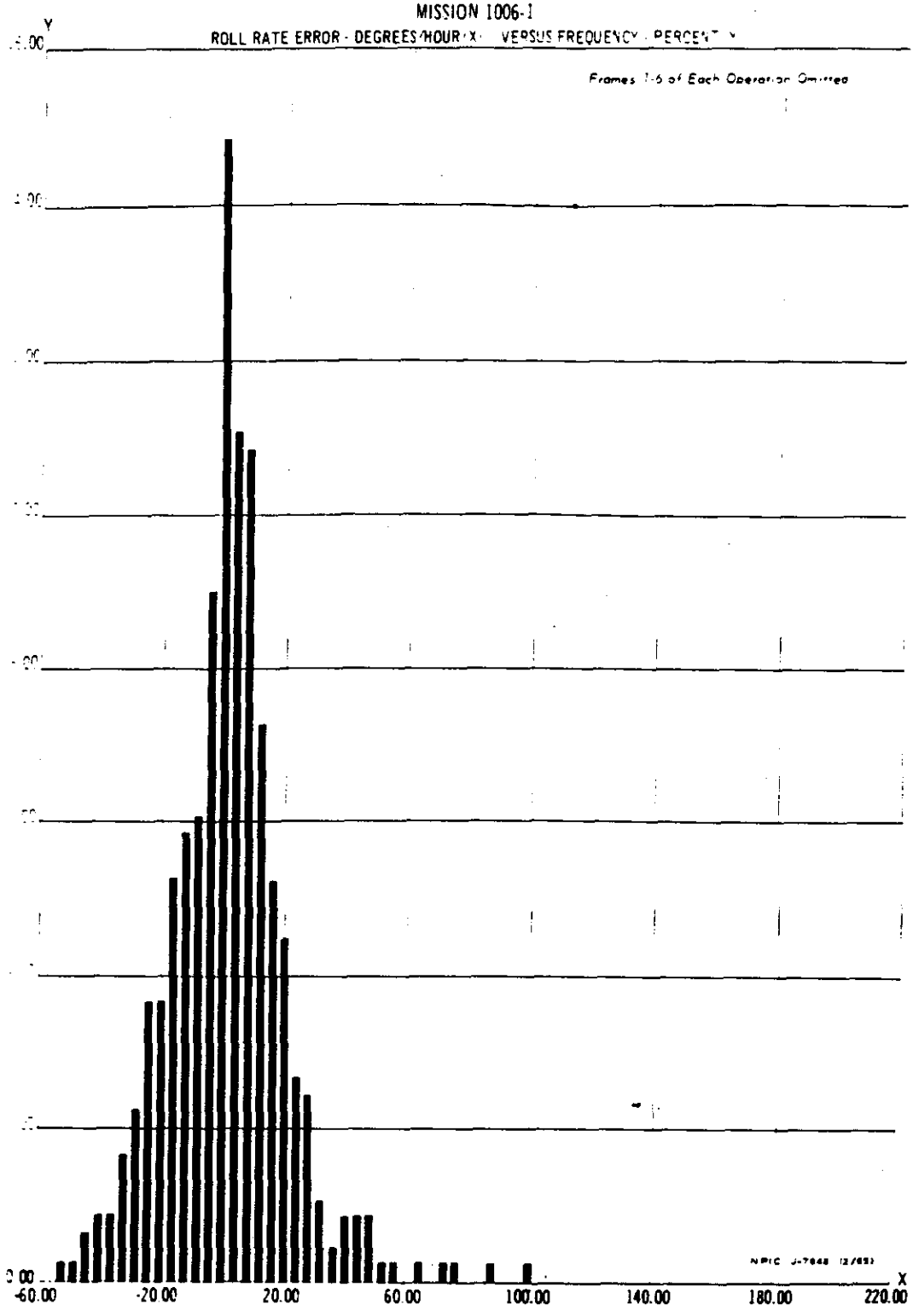
MISSION 1006-1



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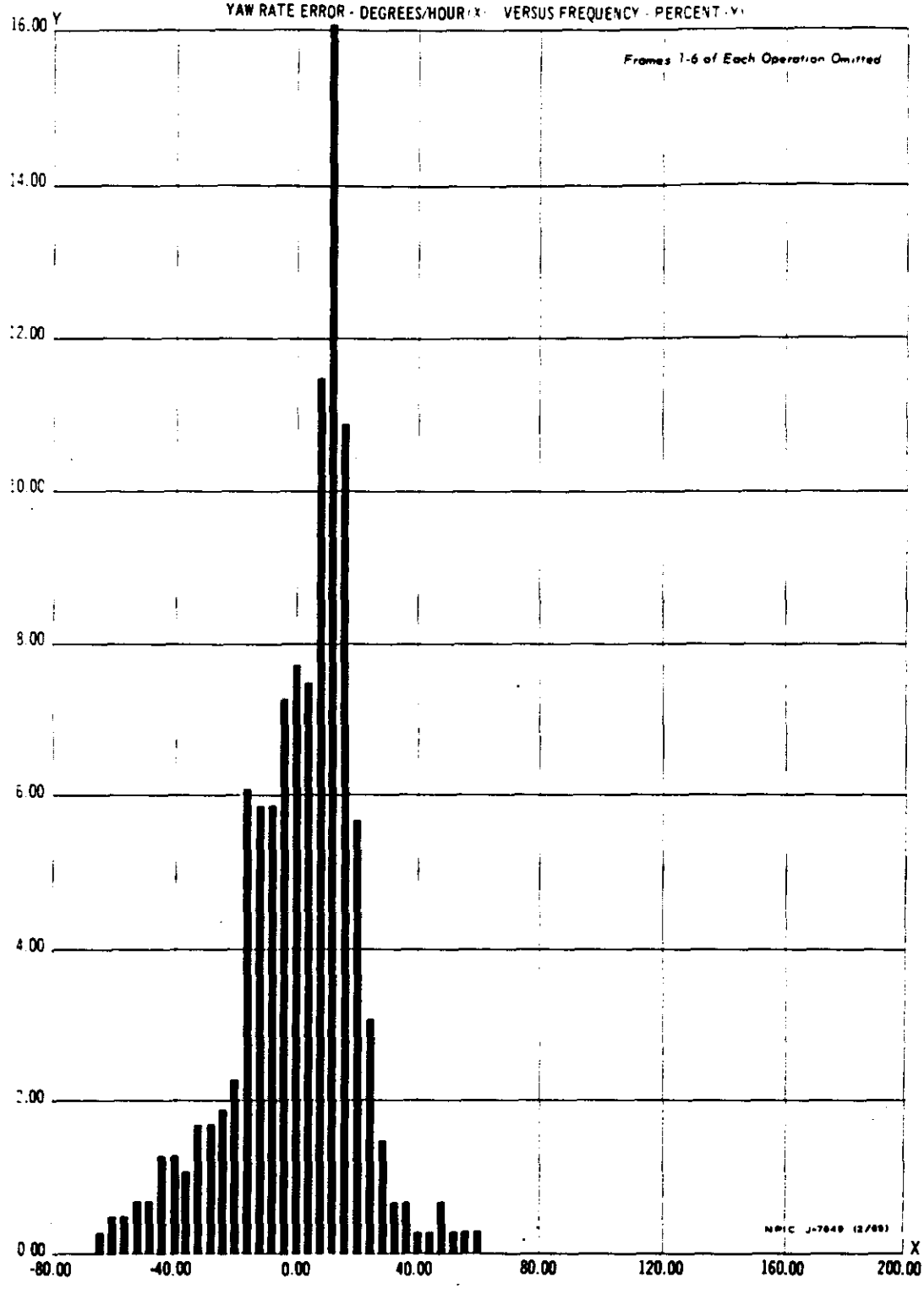
MISSION 1006-1



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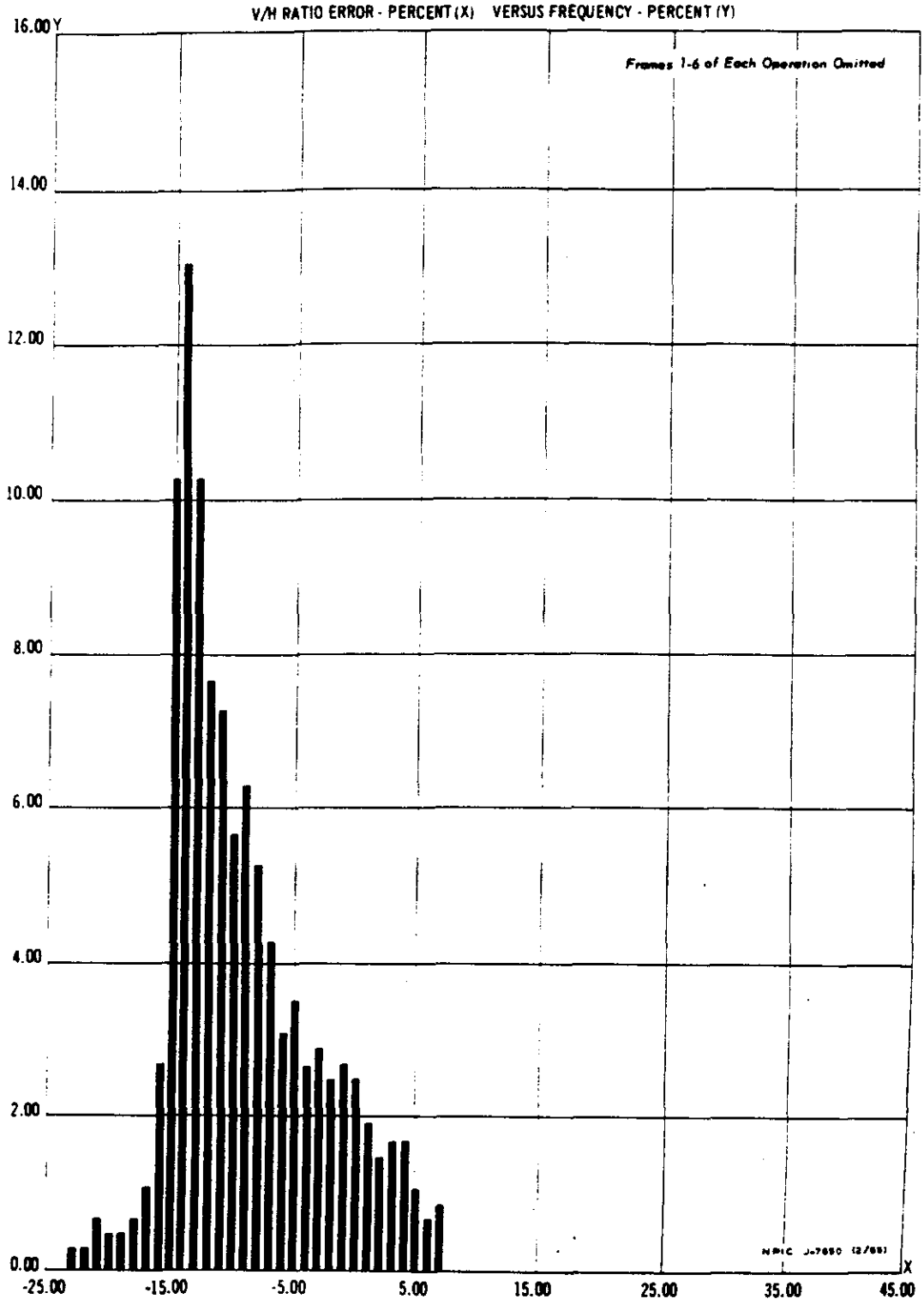
MISSION 1006-1

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



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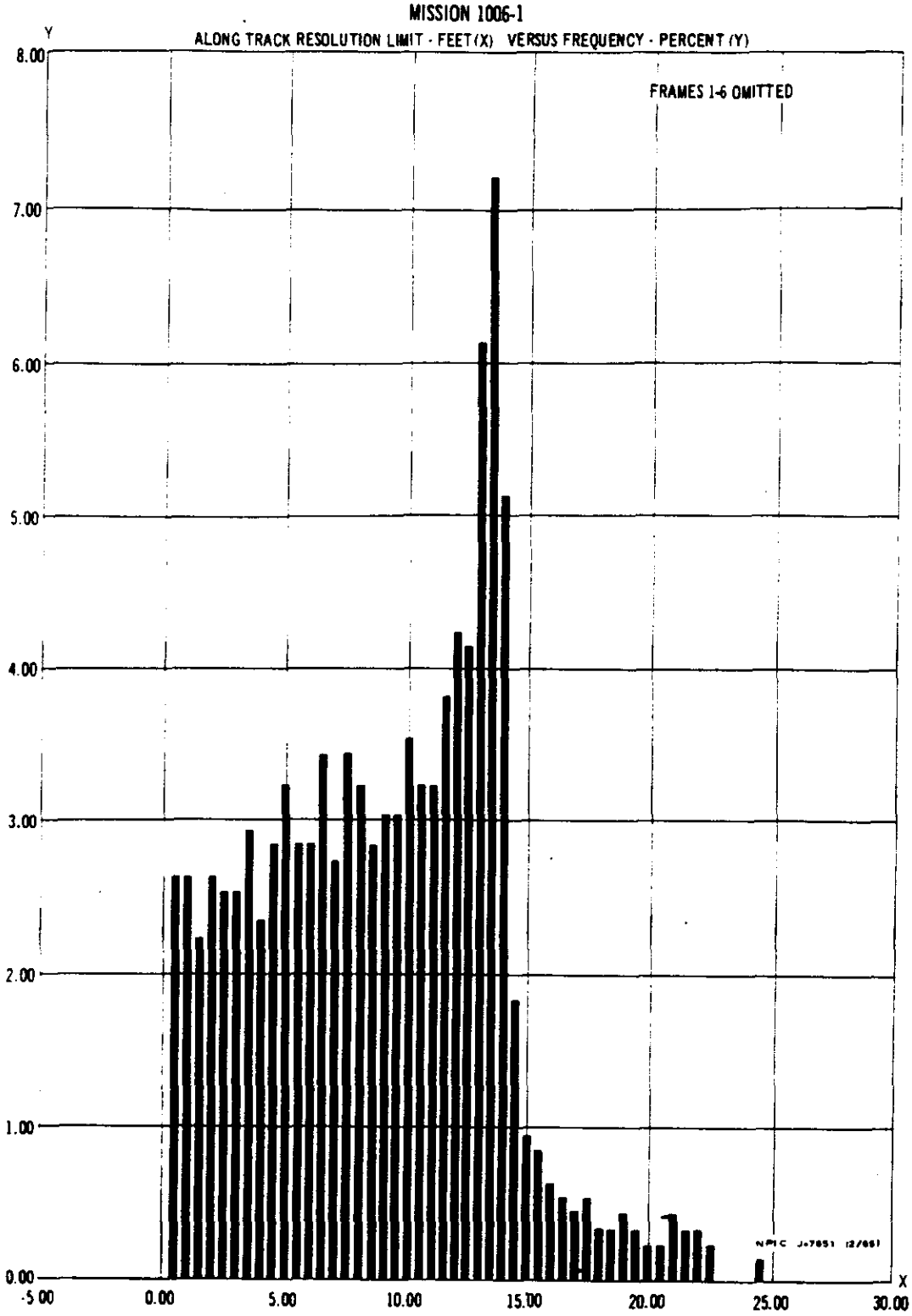
MISSION 1006-1



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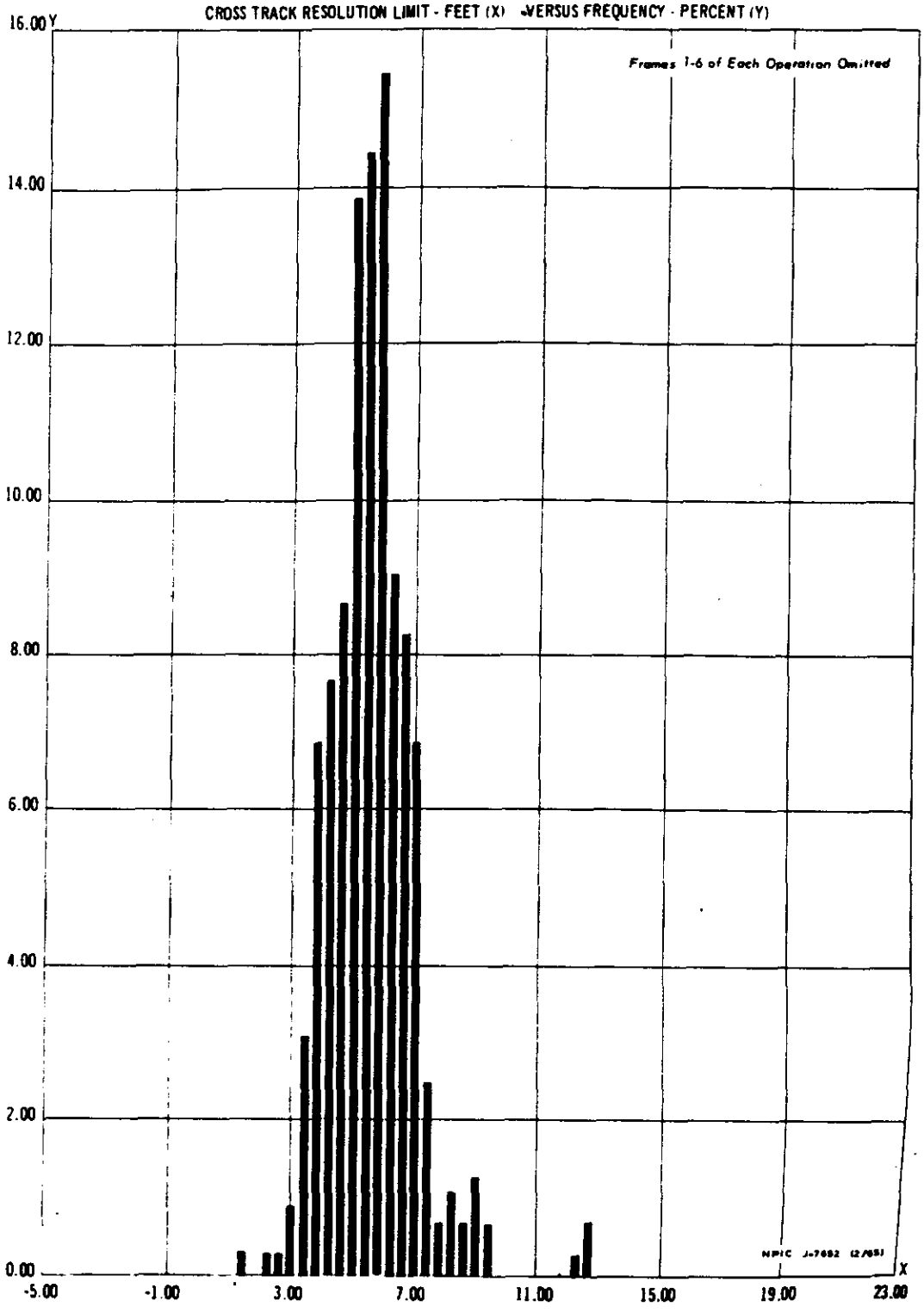
MISSION 1006-1



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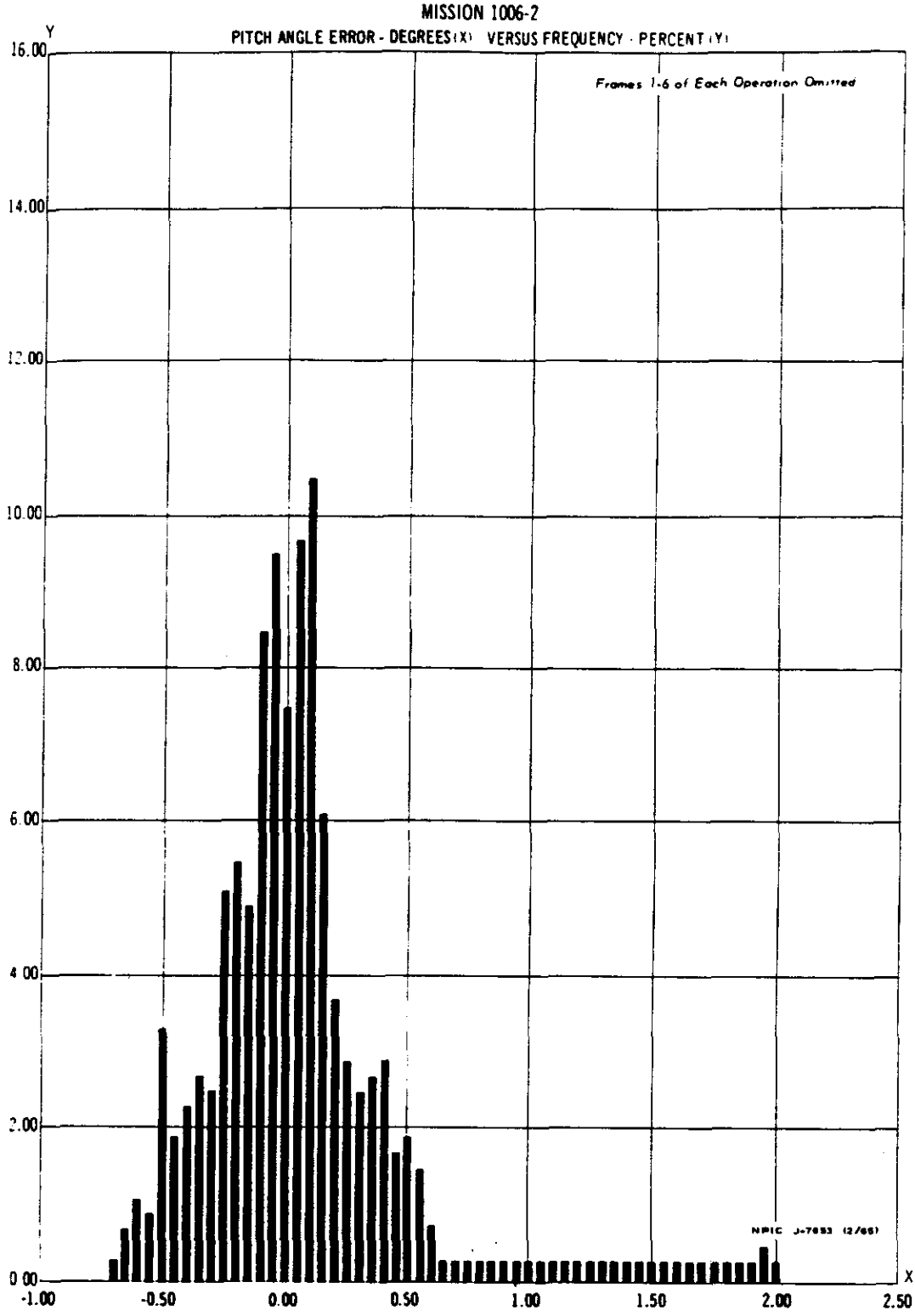
MISSION 1006-2



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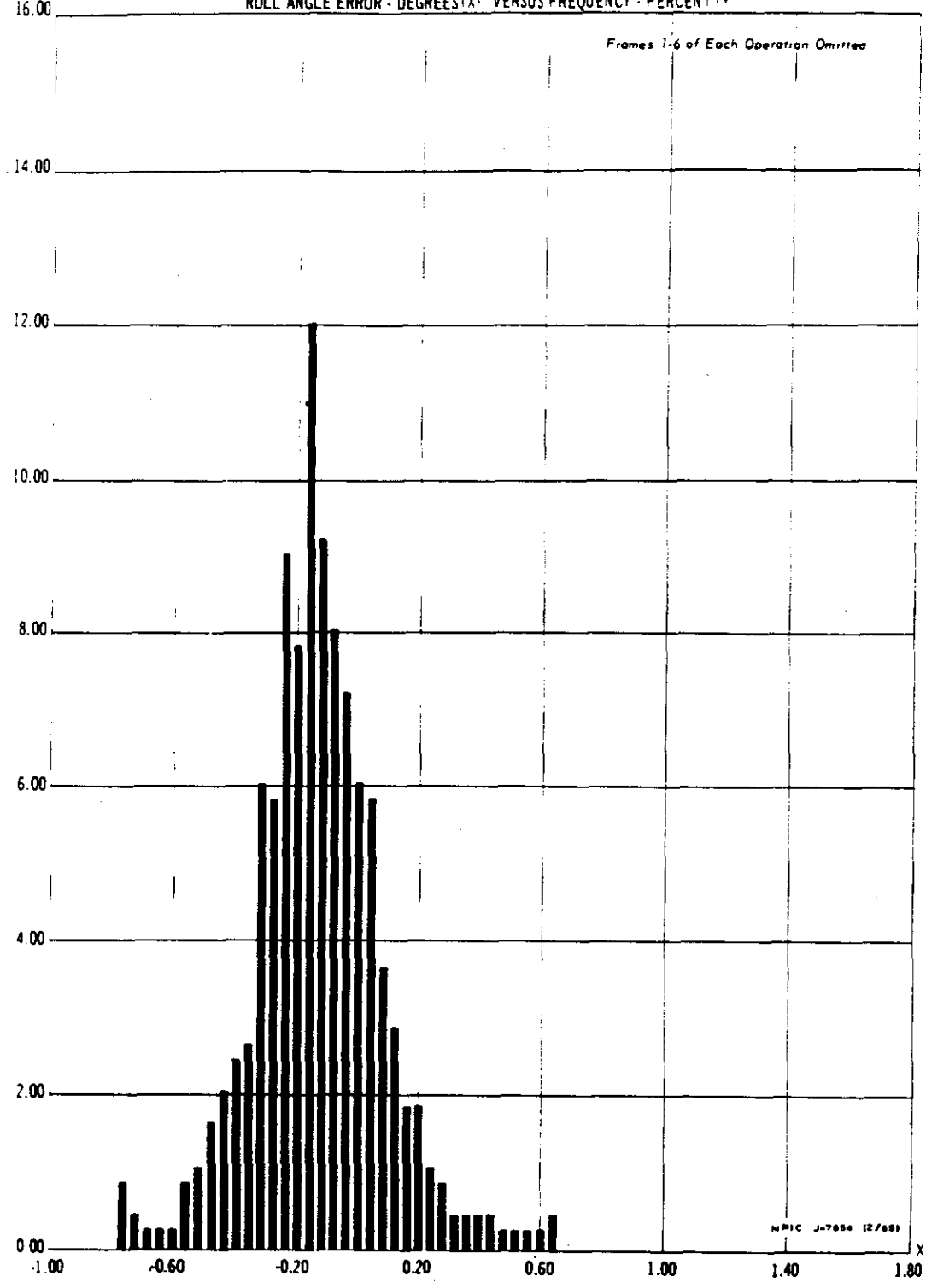
MISSION 1006-2
ROLL ANGLE ERROR - DEGREES (X) VERSUS FREQUENCY - PERCENT (Y)



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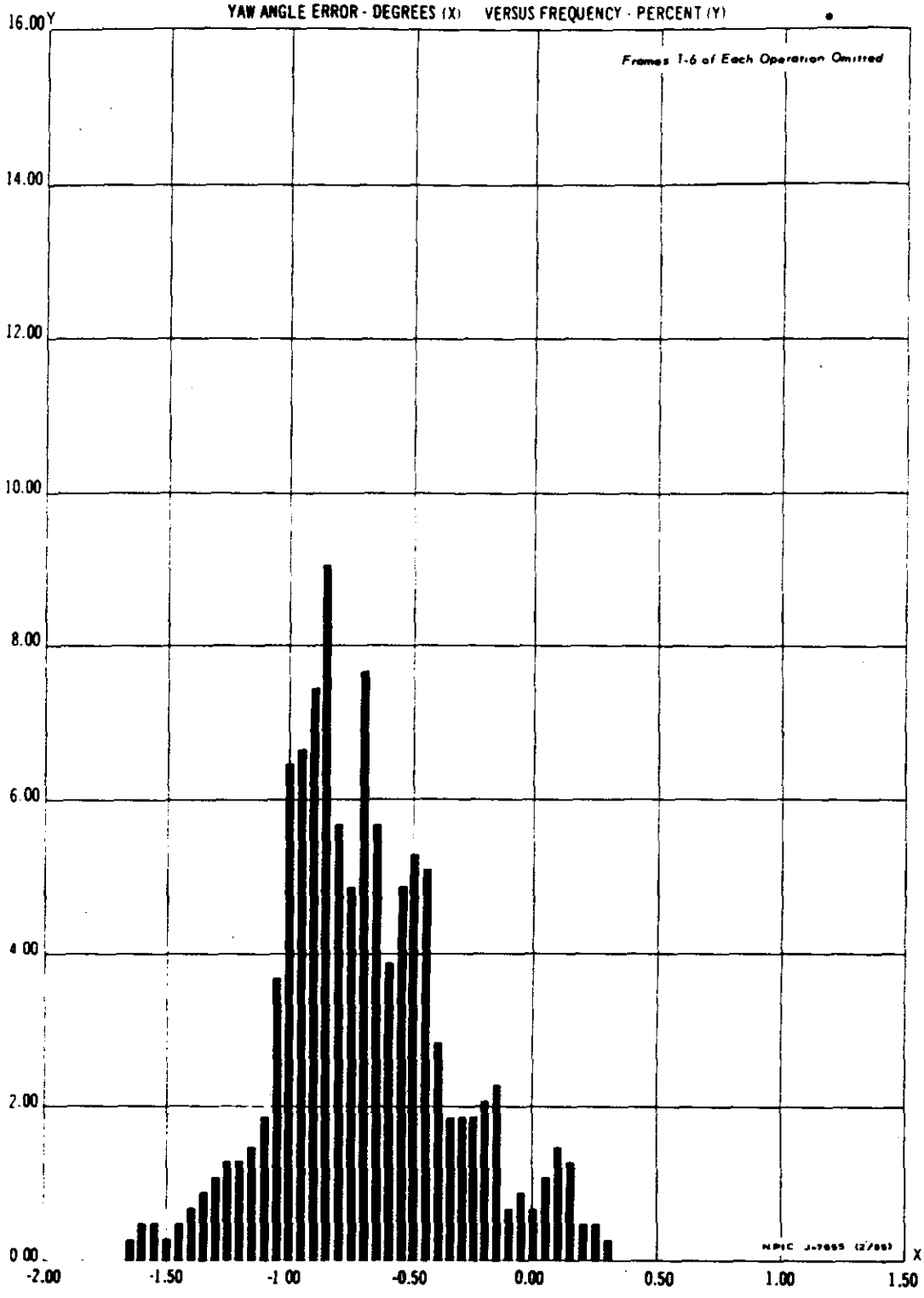
MISSION 1006-2

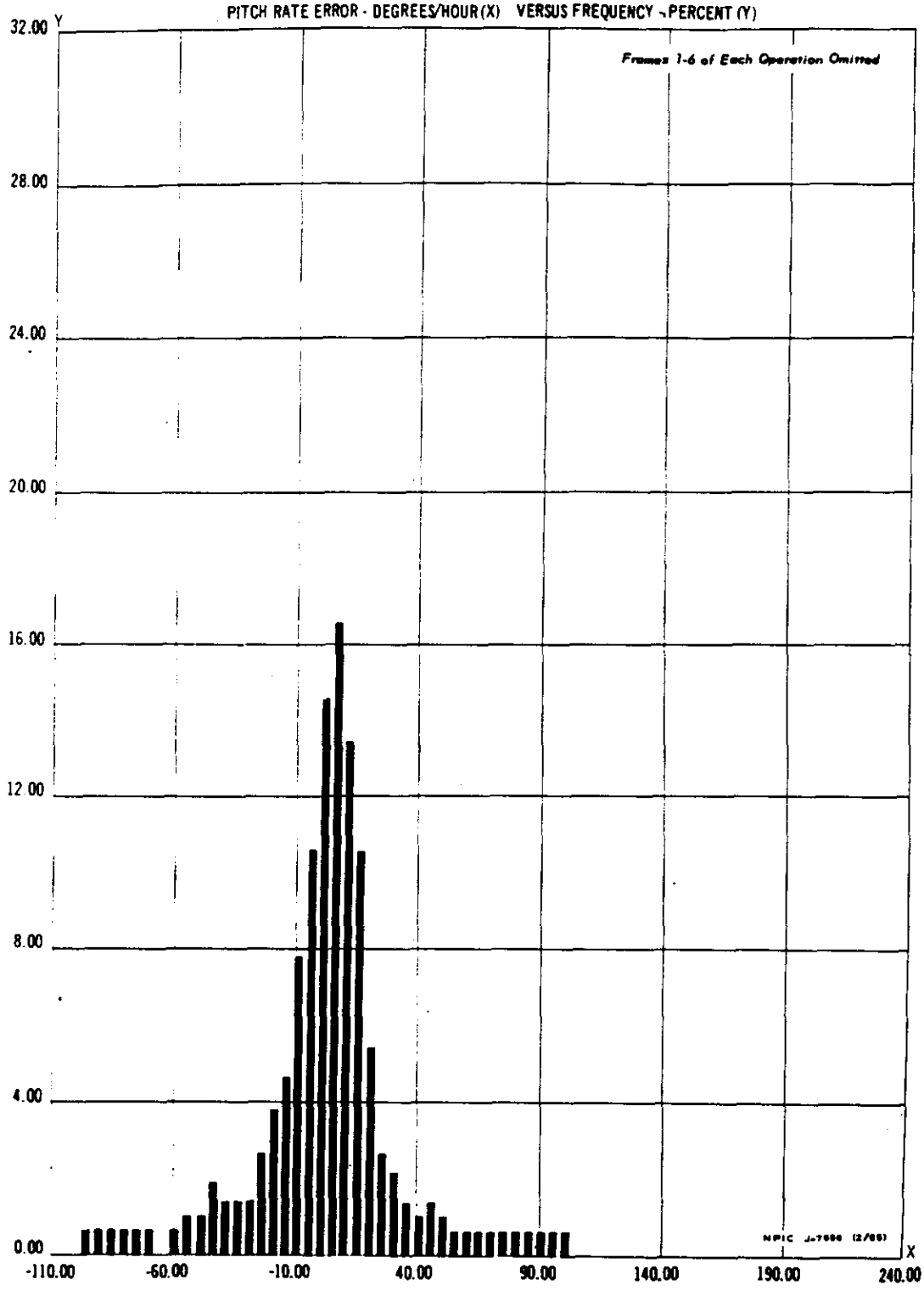


[redacted]

[redacted]

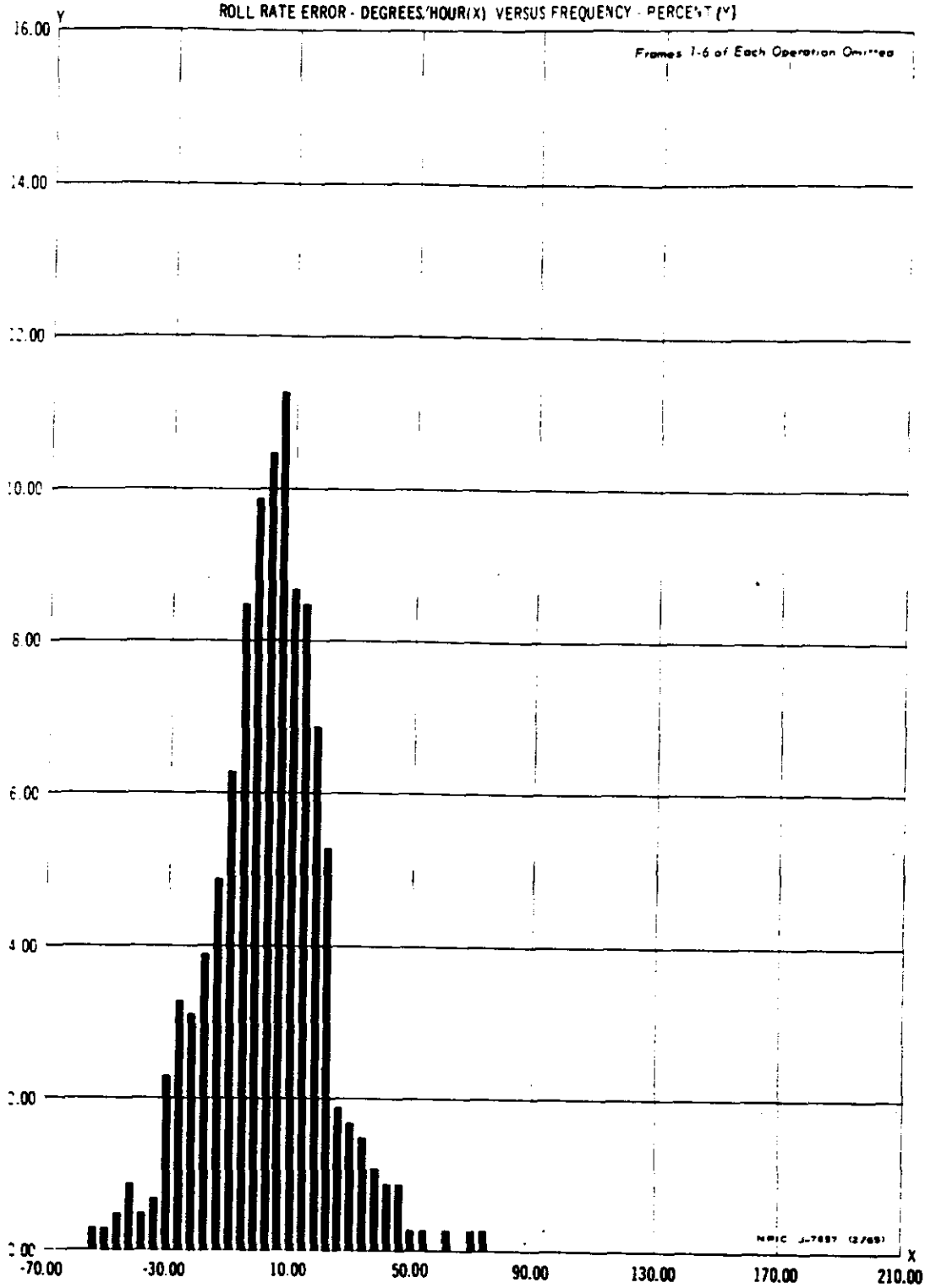
MISSION 1006-2

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



MISSION 1006-2

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



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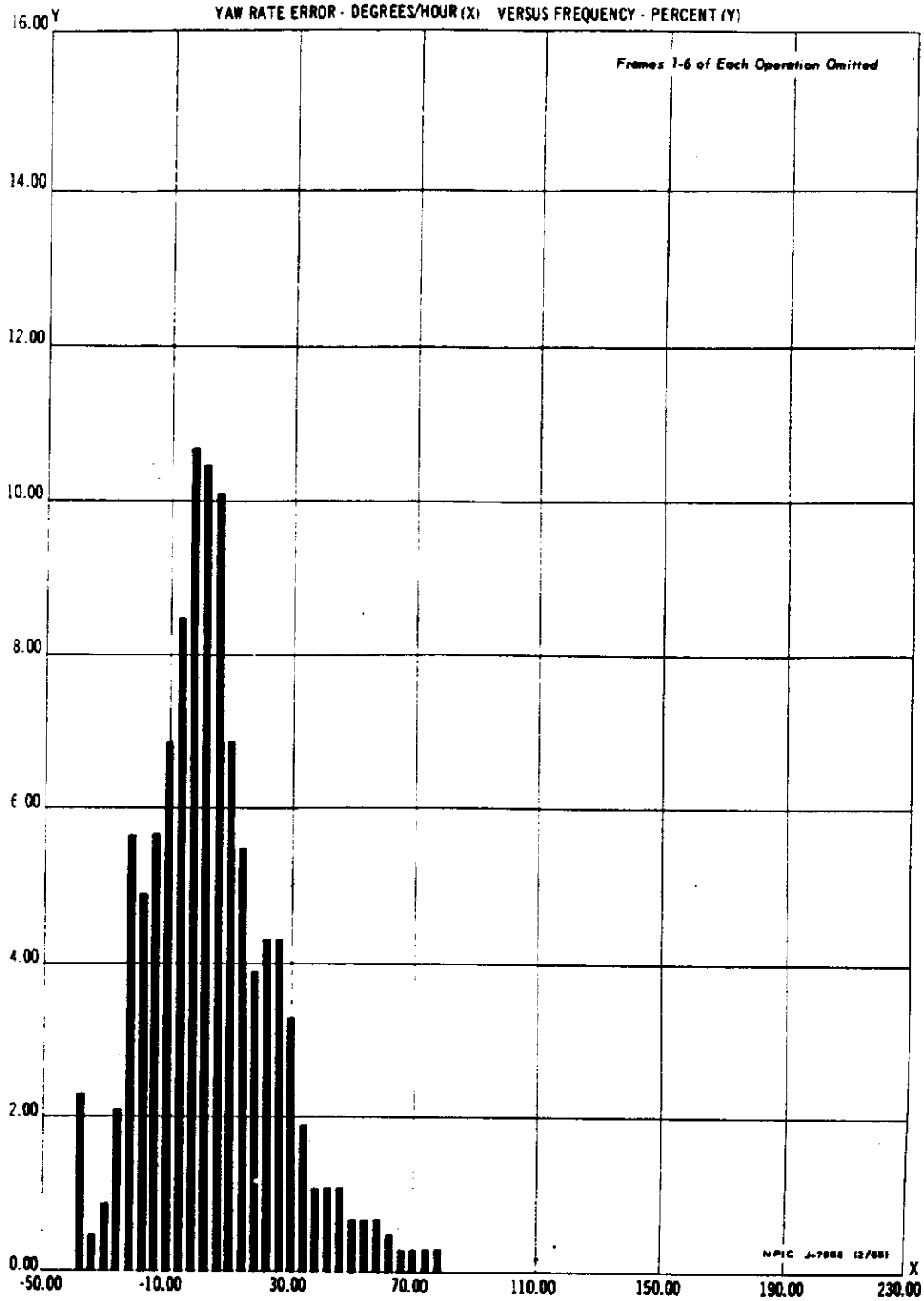
MISSION 1006-2

YAW RATE ERROR - DEGREES/HOUR (X) VERSUS FREQUENCY - PERCENT (Y)



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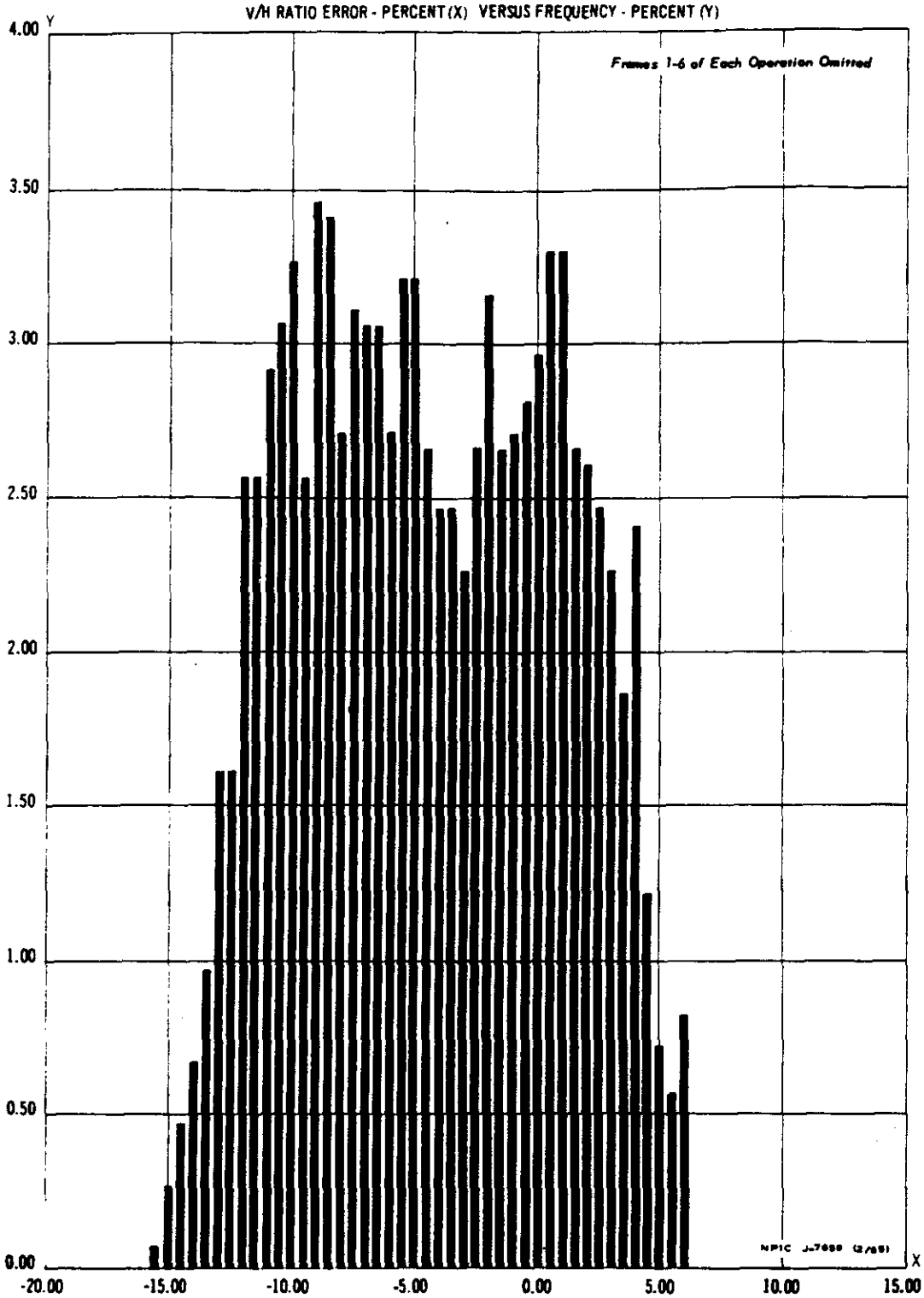
MISSION 1006-2

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



[redacted]

[redacted]

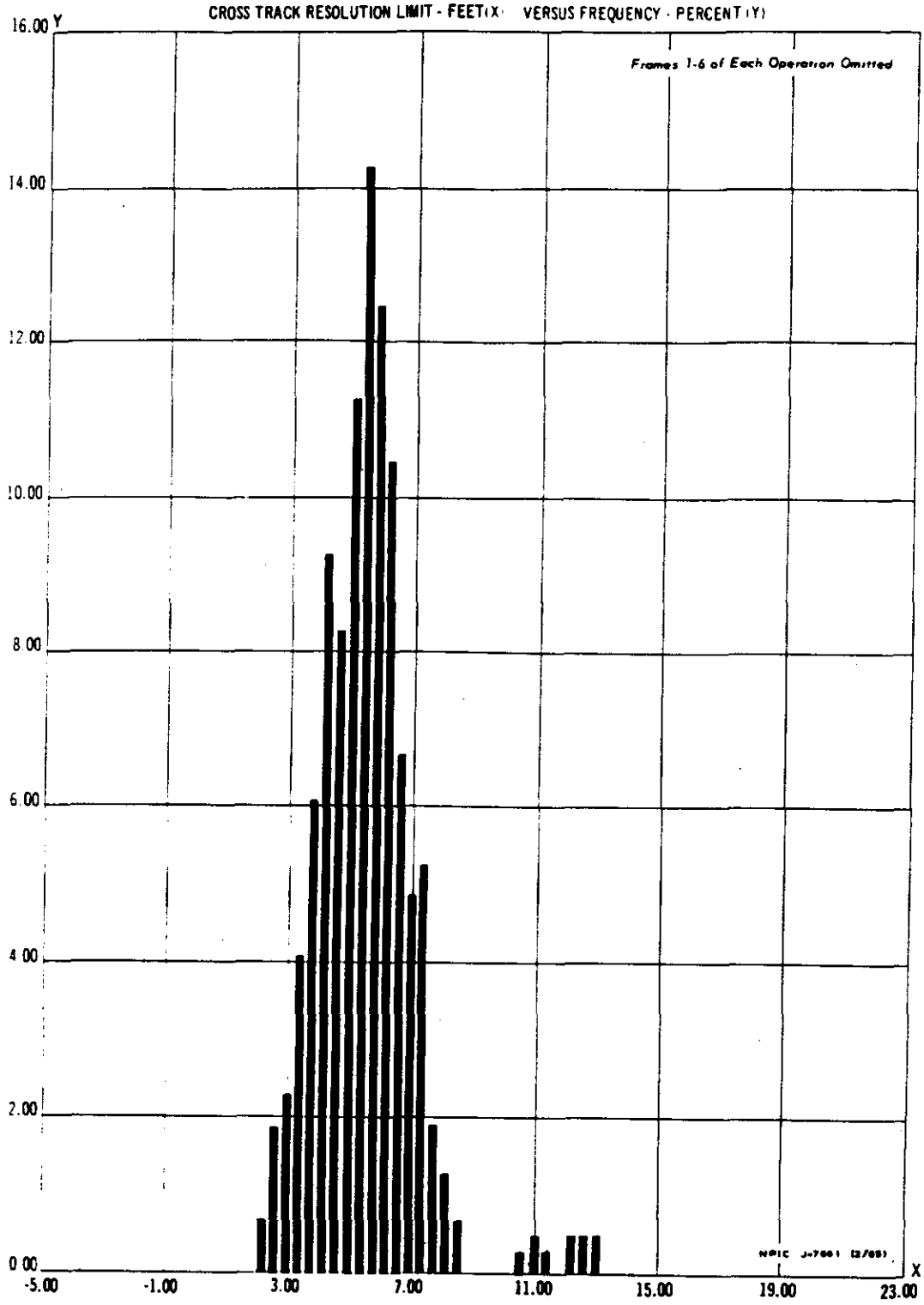
MISSION 1006-2

[redacted]

[redacted]

MISSION 1006-2

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



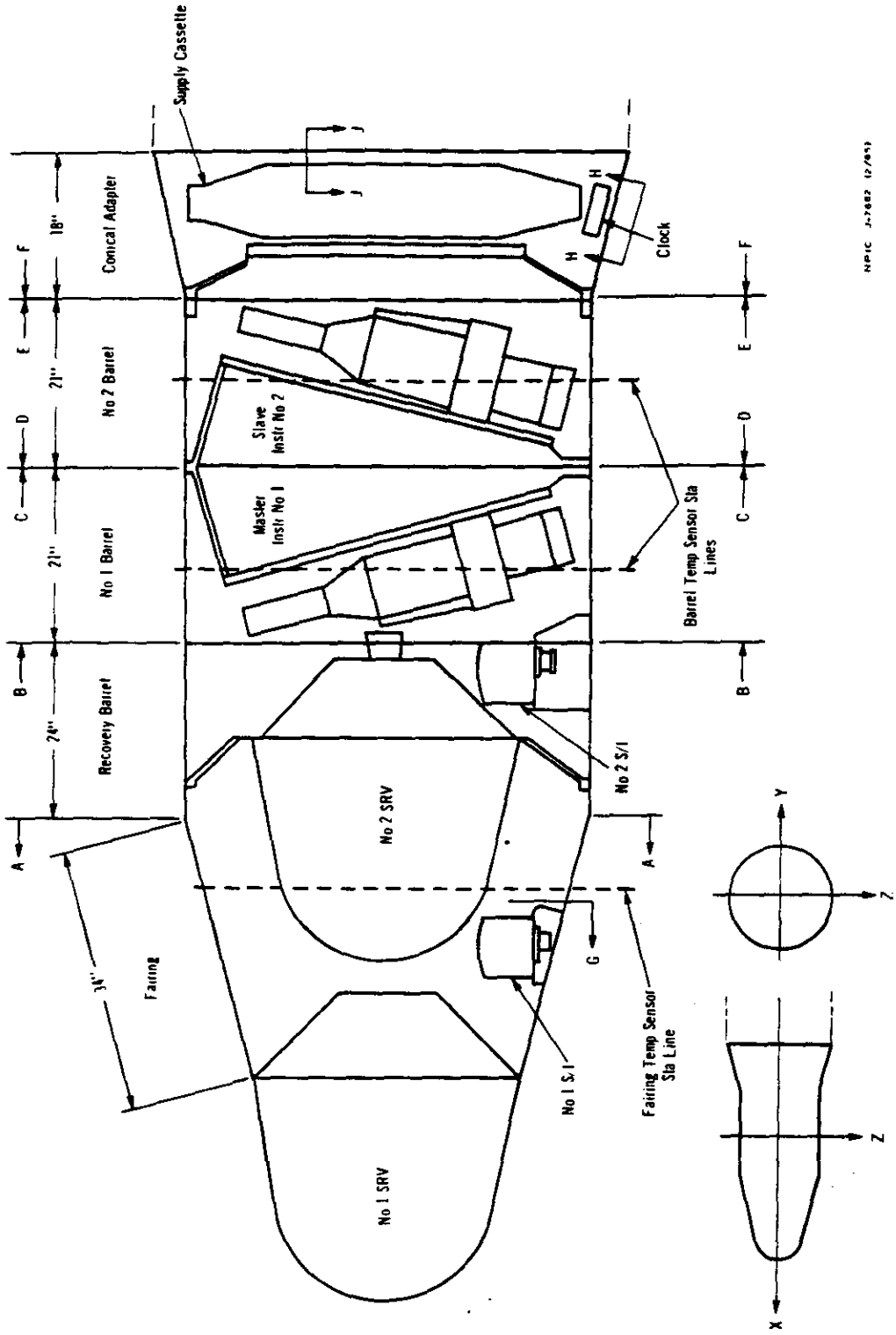
[redacted]

[redacted]

APPENDIX C. IN-FLIGHT TEMPERATURE SAMPLINGS AND SENSOR LOCATIONS

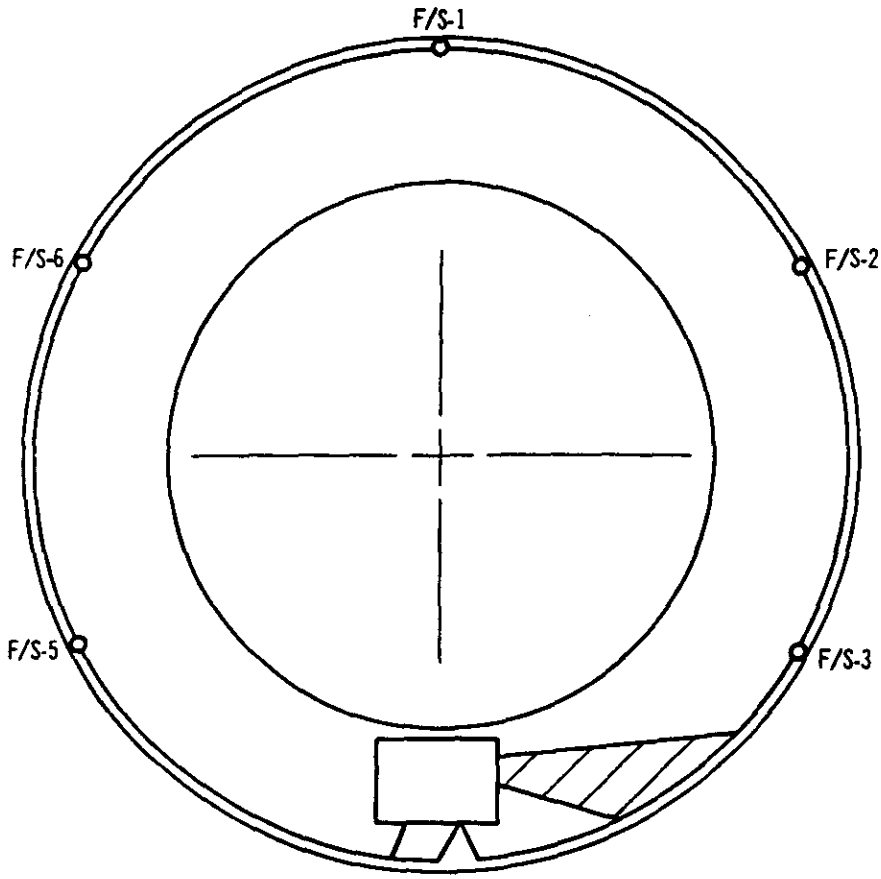
The following data were supplied by the camera manufacturer for this publication.

"J" PROFILE TO SHOW APPROXIMATE TEMP SENSOR LOCATIONS



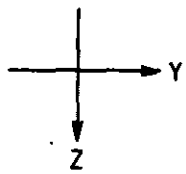
[redacted]

FAIRING TEMP SENSORS



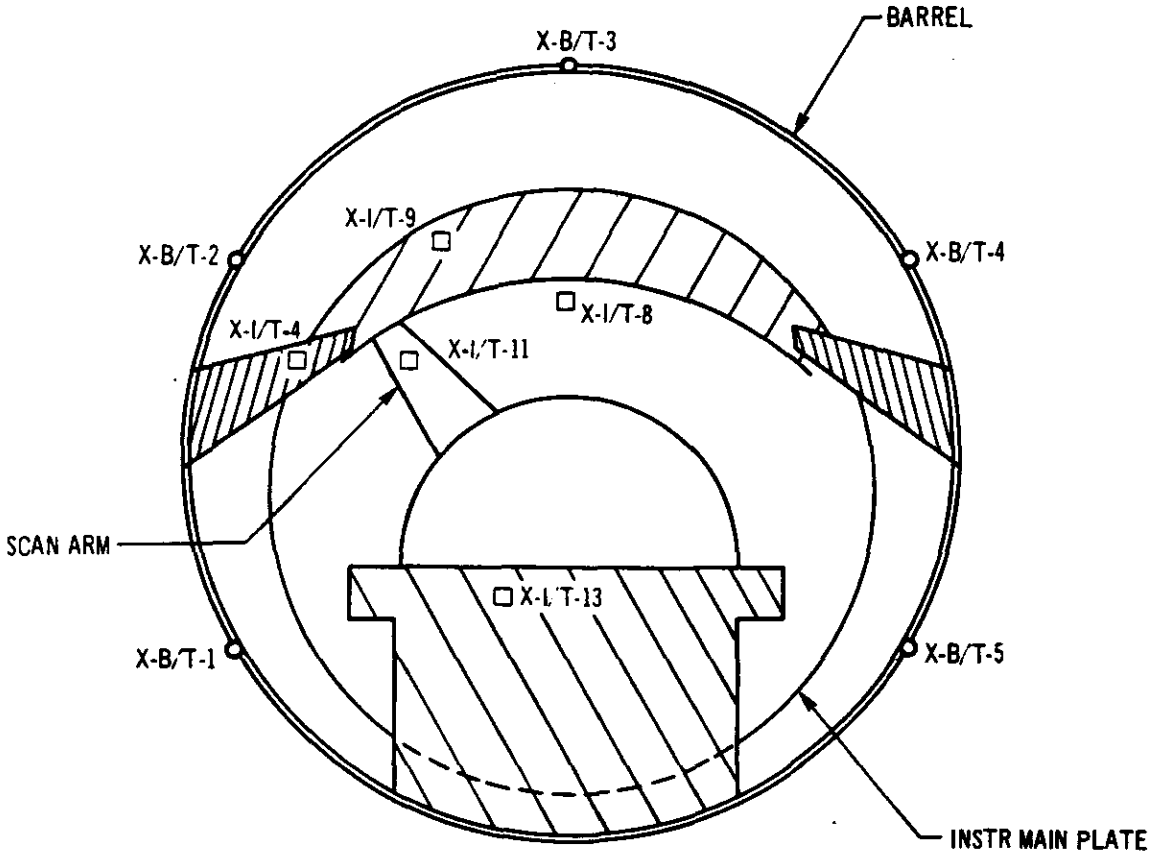
VIEW A-A
LOOKING FORWARD

NPIC J-7663 (2/65)

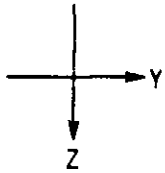


[redacted]

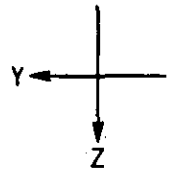
NO 1 & NO 2 TEMP SENSORS (FRONT FACE)
NO 1 & NO 2 BARREL TEMP SENSORS (SKIN)



VIEW B-B & F-F
INSTR NO 1 LOOKING AFT
INSTR NO 2 LOOKING FWD



INSTR NO 2



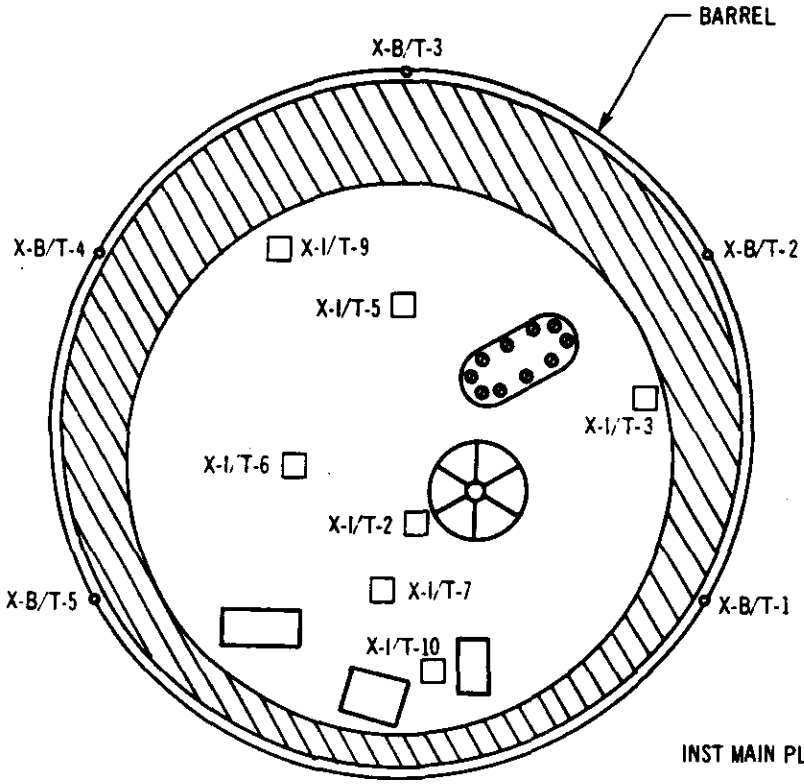
INSTR NO 1

NPIC J-6257 12/65

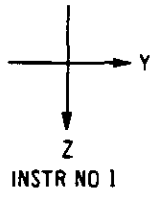
[redacted]

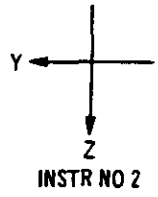
[redacted]

NO 1 & NO 2 INSTR TEMP SENSORS (BACKFACE)
NO 1 & NO 2 BARREL TEMP SENSORS (SKIN)



VIEW C-C & D-D
INSTR NO 2 LOOKING AFT
INSTR NO 1 LOOKING FWD

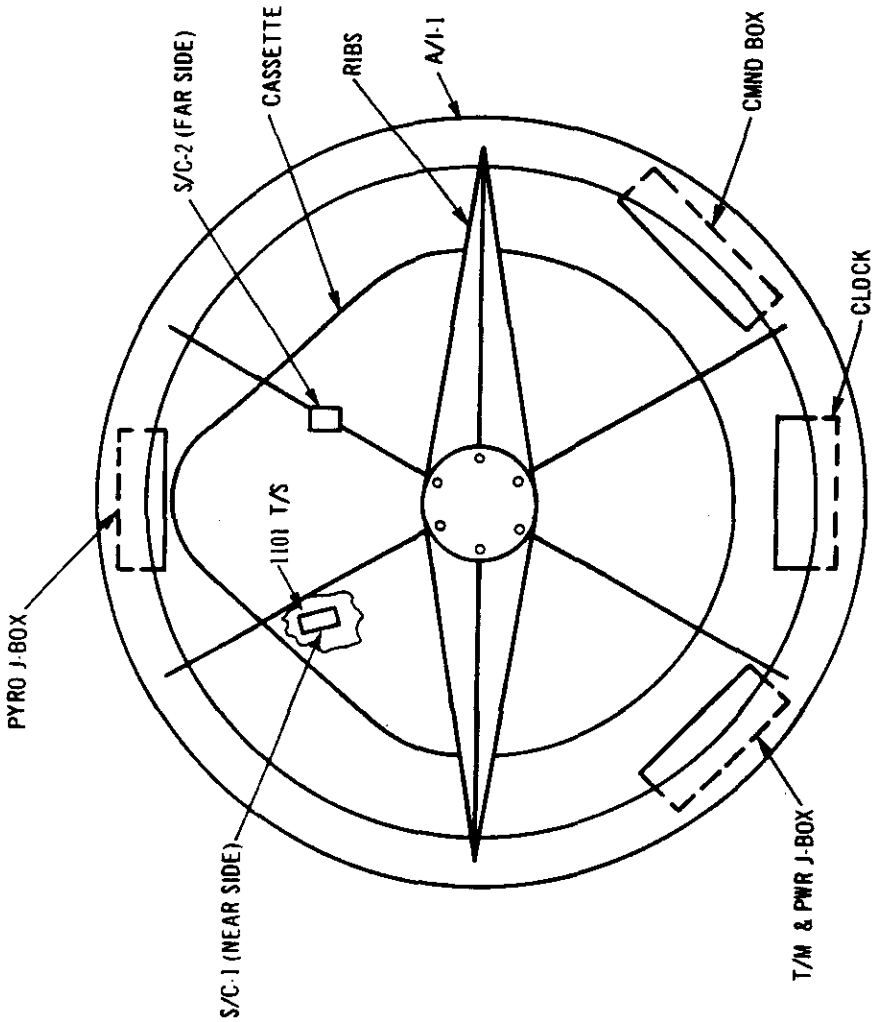




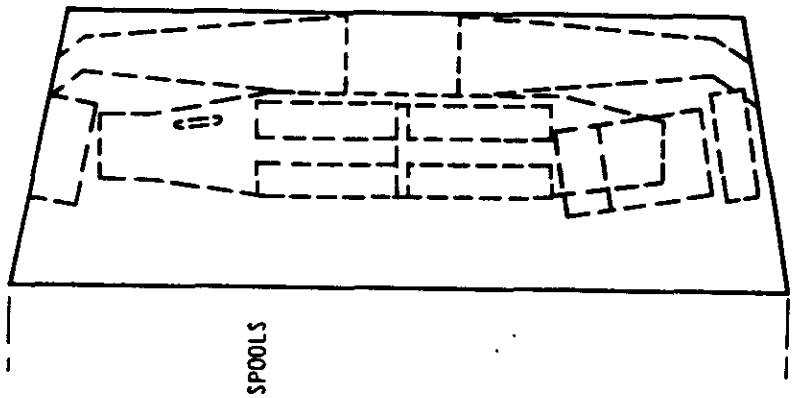
KEY:
X denotes No 1 or No 2 instr on barrel
e.g. X-I/T-6 is No 1 or No 2 instr-instr temp sensor No 6
X-B/T-4 is No 1 or No 2 barrel temp sensor No 4

NPIC J-8258 (2/65)

VIEW E-E SUPPLY CASSETTE LOOKING AFT

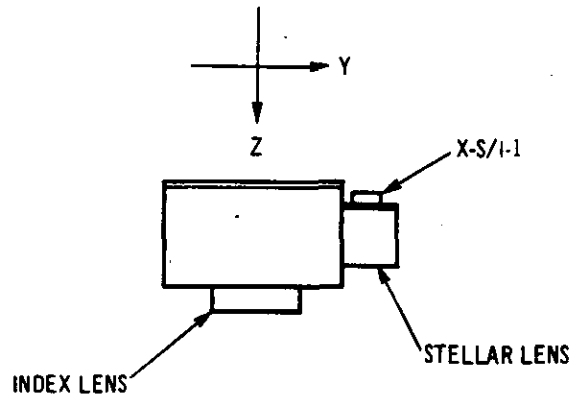


SIDE VIEW SHOWING SPOOLS

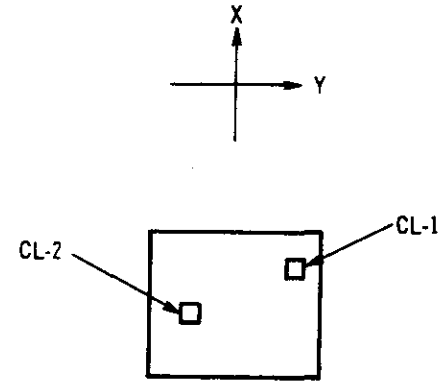


NPIC J-8259 2/65

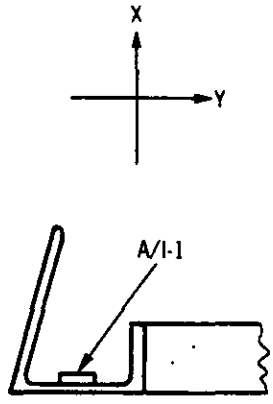
VIEW G-G
S/I TEMP SENSOR



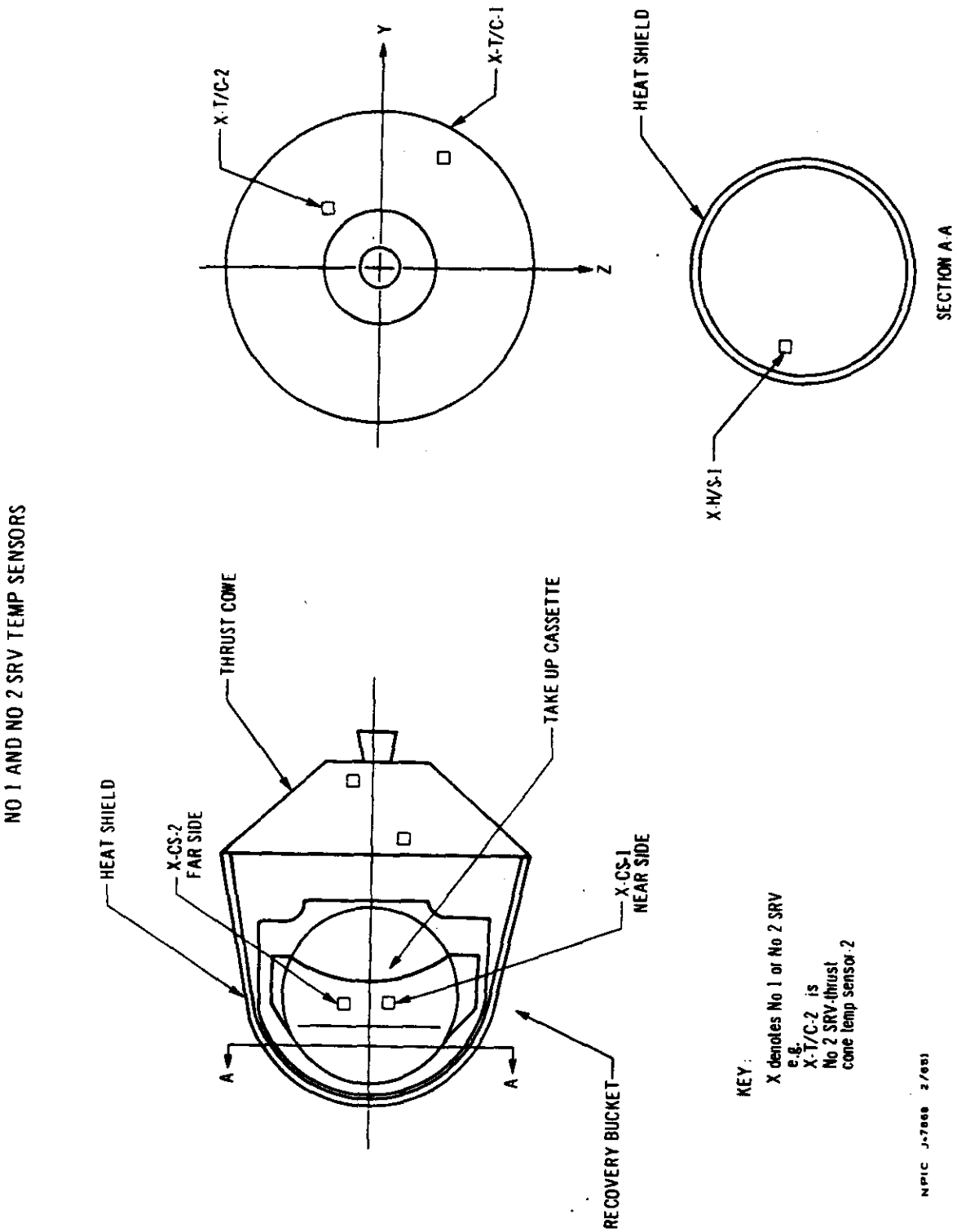
VIEW H-H
CLOCK TEMP SENSOR



VIEW J-J
INTERFACE TEMP SENSOR
(SENSOR ON-Y AXIS)



NPIC J-8260 (2/68)


NO 1 AND NO 2 SRV TEMP SENSORS
X-T/C-2
Y
X-T/C-1
Z
HEAT SHIELD
X-H/S-1
SECTION A-A
HEAT SHIELD
X-CS-2
FAR SIDE
THRUST COWE
TAKE UP CASSETTE
X-CS-1
NEAR SIDE
A
A
RECOVERY BUCKET
KEY:
X denotes No 1 or No 2 SRV
e.g.
X-T/C-2 is
No 2 SRV-thrust
cone temp sensor-2
NPIC J-7868 2/851

J SYSTEM TEMP SENSOR DATA

Note: All BN 2400 Sensors Except Dreamboat Battery Corrected for Self Heating

System No. J-09 Orbit No. In-Flight

Orbit No.	72	79	88	95	103	110	119
Sensor	Temperature (Degrees)						
INSTRUMENT NO 1							
03	48	46	47	44	47	43	47
04	55	52	53	50	53	49	53
05	60	56	57	55	57	53	56
06	69	63	65	61	64	61	64
07	69	65	66	64	65	63	65
08	62	58	62	57	60	55	59
09	66	61	63	59	63	58	53
10	62	62	60	62	59	58	59
11	61	62	68	51	56	58	58
12	53	46	50	47	49	45	49
13	69	64	64	60	64	61	62
INSTRUMENT NO 2							
03	64	62	61	59	63	56	59
04	66	62	64	58	67	58	63
05	63	56	58	53	61	52	56
06	59	53	53	51	56	49	53
07	63	57	58	56	58	54	56
08	59	55	57	51	58	51	54
09	55	49	52	48	54	56	50
10	65	61	60	61	63	59	59
11	56	54	54	60	58	52	54
12	63	51	58	55	61	52	56
13	66	63	61	65	65	60	61
RECOVERY BATTERY (DREAMBOAT)							
01	78	75	74	84	74	82	76
Stellar Index No 1 Switches to Stellar Index No 2							
01	55	55	51	55	55	51	48
02	45	42	42	42	45	39	39

Orbit No	72	79	88	95	103	110	119
Sensor	Temperature (Degrees)						
BARREL NO 1 SKIN TEMPS (AFTER RECOVERY NO 1)							
01	11	94	11	37	11	34	8
02	1	11	4	14	4	7	4
03	21	107	24	115	24	102	21
04	44	130	41	133	41	116	38
05	49	87	40	87	40	18	36

Calibration Points (0) 11, 26, 57 (+) 06, 30, 49½, 01

BARREL NO 2 SKIN TEMPS							
01	47	82	44	79	41	76	38
02	43	126	40	124	37	115	33
03	17	87	17	95	17	87	17
04	0	7	3	3	7	7	3
05	12	31	9	34	15	31	12
THERMAL SHIELD AT VEHICLE INTERFACE							
01	43	71	36	71	36	59	33
CLOCK							
01	62	66	60	65	60	58	60
02	58	60	60	60	60	56	56
THRUST CONE REC NO 1 SWITCHES TO REC NO 2							
01	48	46	47	46	45	43	45
02	60	56	56	55	56	54	55
SUPPLY SPOOL							
01	56	51	51	50	50	47	51
02	60	54	57	53	55	51	54

[redacted]

APPENDIX D. RADIATION STUDY

A large accumulation of radioactive contamination was discovered in July 1963. It is thought to be the result of atomic testing in the South Pacific. The lower limits are approximately 230 miles above ground. At apogee this system enters only the lower limits of the anomaly.

The discovery of the anomaly was made when it was noted that the film of Mission 9039 (M-8) was fogged each time the vehicle passed through the particular area. When first discovered the intensity of radiation was such that the film of all cameras in the system was effected. The concentration of radiation soon dissipated to such an extent that it did not fog the film of the panoramic cameras (emulsion type 4404) or the index camera (emulsion type 4400). However, the film of the stellar cameras (emulsion type 4401) having a relative E-1 speed of 64, compared to 1.6 for 4404 and 20 for 4400, continues to be affected.

The area of noticeable degradation is confined to the film that is in the "chute" between the camera system and recovery bucket while the vehicle passes through the anomaly. The film in the chute is also more likely to be affected by light leaks during "soak periods." The "soak period" is the term commonly used to describe an extended period of inactivity. The following chart will point out the "soak periods," gross fog readings made with Macbeth densitometer model 1000 with an ET 20 attachment, and the relationship of the high gross fog readings to the anomaly.

It should be noted that there are approximately 8 frames of stellar photography between the stellar platen and the chute. Therefore, the following chart will be concerned with the frames within the chute while passing through the anomaly rather than the frame in the platen.

The stellar film of 1006-2 is not considered to be adversely affected by radiation; therefore, the following study does not include data on the stellar film of 1006-2.

Pass Number	Frames in Chute	Gross Fog	Pass Number	Frames in Chute	Gross Fog
01A	Pre-Flt		12D	66-78	0.20 - 0.31
01D	Pre-Flt		13A	66-78	0.20 - 0.31
02A	Pre-Flt		13D	66-78	0.20 - 0.31
02D	Pre-Flt		14A	66-78	0.20 - 0.31
03A	Pre-Flt - 01	0.36 - 0.61	14D	66-78	0.20 - 0.31
03D	Pre-Flt - 05	0.36 - 0.61	15A	66-78	0.20 - 0.31
04A	Pre-Flt - 05	0.36 - 0.61	15D	75-85	0.21 - 0.31
04D	Pre-Flt - 05	0.36 - 0.41	16A	75-85	0.21 - 0.31
*05A	Pre-Flt - 05	0.36 - 0.61	16D	75-85	0.21 - 0.31
05D	06-19	0.19 - 0.21	17A	75-85	0.21 - 0.31
06A	06-19	0.20 - 0.21	17D	75-85	0.21 - 0.31
06D	20-38	0.19 - 0.21	18A	75-85	0.21 - 0.31
07A	26-36	0.18 - 0.20	18D	86-93	0.21 - 0.31
07D	39-67	0.19 - 0.21	19A	89-93	0.21 - 0.31
08A	57-67	0.19 - 0.21	19D	94-105	0.31 - 0.62
08D	52-67	0.19 - 0.21	20A	95-105	0.31 - 0.62
09A	59-69	0.20 - 0.21	20D	95-105	0.31 - 0.62
09D	66-78	0.20 - 0.31	*21A	95-105	0.31 - 0.62
10A	66-78	0.20 - 0.31	21D	106-133	0.31 - 0.62
10D	66-78	0.20 - 0.31	22A	123-133	0.19 - 0.37
11A	66-78	0.20 - 0.31	22D	134-152	0.19 - 0.23
11D	66-78	0.20 - 0.31	23A	142-152	0.20 - 0.23
12A	66-78	0.20 - 0.31			

[redacted]

[redacted]

Pass Number	Frames in Chute	Gross Fog	Pass Number	Frames in Chute	Gross Fog
23D	153-167	0.19 - 0.22	40A	287-297	0.19 - 0.24
24A	157-167	0.19 - 0.22	40D	294-304	0.21 - 0.42
24D	168-194	0.19 - 0.21	41A	294-304	0.21 - 0.42
25A	186-196	0.19 - 0.20	41D	294-304	0.21 - 0.42
25D	197-214	0.20 - 0.34	42A	294-304	0.21 - 0.42
26A	204-214	0.22 - 0.34	42D	294-304	0.21 - 0.42
26D	204-214	0.22 - 0.34	43A	294-304	0.21 - 0.42
27A	204-214	0.22 - 0.34	43D	294-304	0.21 - 0.42
27D	204-214	0.22 - 0.34	44A	294-304	0.21 - 0.42
28A	204-214	0.22 - 0.34	44D	294-304	0.21 - 0.42
28D	204-214	0.22 - 0.34	45A	294-304	0.21 - 0.42
29A	204-214	0.22 - 0.34	45D	294-304	0.21 - 0.42
29D	204-214	0.22 - 0.34	46A	294-304	0.21 - 0.42
30A	204-214	0.22 - 0.34	46D	294-304	0.21 - 0.42
30D	204-214	0.22 - 0.34	47A	294-304	0.21 - 0.42
31A	204-214	0.22 - 0.34	47D	294-304	0.21 - 0.42
31D	209-219	0.26 - 0.34	48A	294-304	0.21 - 0.42
32A	209-219	0.26 - 0.34	48D	294-304	0.21 - 0.42
32D	209-219	0.26 - 0.34	49A	294-304	0.21 - 0.42
33A	209-219	0.26 - 0.34	49D	300-310	0.36 - 0.47
33D	209-219	0.26 - 0.34	50A	300-310	0.36 - 0.47
34A	209-219	0.26 - 0.34	51A	300-310	0.36 - 0.47
34D	209-219	0.26 - 0.34	51D	300-310	0.36 - 0.47
35A	209-219	0.26 - 0.34	*52A	300-310	0.36 - 0.47
35D	215-225	0.26 - 0.46	52D	314-324	0.22 - 0.36
36A	215-225	0.26 - 0.46	*53A	314-324	0.22 - 0.36
36D	226-238	0.24 - 0.41	53D	325-354	0.19 - 0.21
*37A	226-238	0.37 - 0.41	54A	344-354	0.19 - 0.21
37D	239-267	0.19 - 0.30	54D	355-374	0.19 - 0.51
38A	257-267	0.19 - 0.20	55A	364-374	0.20 - 0.51
38D	268-296	0.19 - 0.22	55D	372-382	0.20 - 0.21
39A	286-296	0.21 - 0.22	56A	374-384	0.20 - 0.21
39D	286-296	0.21 - 0.22	56D	385-412	0.20 - 0.34

*- Indicates passes on which vehicle passed through the anomaly.

EVALUATION OF STUDY

1. While this study is basic and not conclusive, it does point out the feasibility of an association between the fogging of the stellar film and the radiation anomaly.

2. The vehicle passed through the anomaly during passes 5A, 21A, 37A, 52A, and 53A. Note the high gross fog of the frames in the chute during those periods.

3. Note the periods of long inactivity (soak periods) and the relationship of gross fog densities.

STELLAR GROSS FOG DENSITIES

In conjunction with the study of fog and its association to radiation, the gross fog density of each frame of both stellar cameras was measured and the readings follow:

[redacted]

[redacted]

Stellar Gross Fog Mission 1006-1

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
1D	0	0.60	7D	59	0.19	21D	117	0.20
1D	1	0.61	7D	60	0.20	21D	118	0.22
1D	2	0.61	7D	61	0.20	21D	119	0.19
2D	3	0.60	7D	62	0.20	21D	120	0.20
2D	4	0.53	7D	63	0.20	21D	121	0.22
2D	5	0.36	7D	64	0.20	21D	122	0.21
2D	6	0.20	7D	65	0.21	21D	123	0.20
2D	7	0.22	6D	66	0.20	21D	124	0.22
3D	8	0.19	7D	67	0.21	21D	125	0.21
3D	9	0.20	7D	68	0.20	21D	126	0.19
3D	10	0.19	7D	69	0.21	21D	127	0.20
3D	11	0.19	7D	70	0.20	21D	128	0.22
3D	12	0.19	7D	71	0.20	21D	129	0.20
3D	13	0.20	7D	72	0.22	21D	130	0.19
5D	14	0.19	7D	73	0.23	21D	131	0.21
5D	15	0.20	7D	74	0.24	21D	132	0.20
5D	16	0.20	7D	75	0.29	21D	133	0.19
5D	17	0.21	9AE	76	0.31	21D	134	0.21
5D	18	0.20	9AE	77	0.30	21D	135	0.20
5D	19	0.21	9D	78	0.26	21D	136	0.19
5D	20	0.21	9D	79	0.25	21D	137	0.21
5D	21	0.21	9D	80	0.22	21D	138	0.23
5D	22	0.19	9D	81	0.23	21D	139	0.20
5D	23	0.20	9D	82	0.22	21D	140	0.20
5D	24	0.20	9D	83	0.22	21D	141	0.23
5D	26	0.19	9D	84	0.23	22D	142	0.20
5D	27	0.19	9D	85	0.21	22D	143	0.20
6D	28	0.20	9D	86	0.21	22D	144	0.21
6D	29	0.20	15D	87	0.22	22D	145	0.20
6D	30	0.19	15D	88	0.22	22D	146	0.21
6D	31	0.20	15D	89	0.22	22D	147	0.20
6D	32	0.20	15D	90	0.23	22D	148	0.21
6D	33	0.20	15D	91	0.23	22D	149	0.20
6D	34	0.19	15D	92	0.27	22D	150	0.21
6D	35	0.18	15D	93	0.29	22D	151	0.22
6D	36	0.20	18D	94	0.31	22D	152	0.20
6D	37	0.20	15D	95	0.31	22D	153	0.20
6D	38	0.20	15D	96	0.30	22D	154	0.22
6D	39	0.20	16D	97	0.30	22D	155	0.23
6D	40	0.21	18D	98	0.34	22D	156	0.20
6D	41	0.20	18D	99	0.36	22D	157	0.21
6D	42	0.20	18D	100	0.47	22D	158	0.20
6D	43	0.21	18D	101	0.56	22D	159	0.20
6D	44	0.21	19D	102	0.60	22D	160	0.21
6D	45	0.20	19D	103	0.62	23D	161	0.21
6D	46	splice	19D	104	0.61	23D	162	0.21
6D	47	splice	19D	105	0.54	23D	163	0.22
7D	48	0.19	19D	106	0.37	23D	164	0.21
7D	49	0.20	19D	107	0.23	23D	165	0.19
7D	50	0.21	19D	108	0.26	23D	166	0.20
7D	51	0.20	19D	109	0.22	23D	167	0.21
7D	52	0.19	19D	110	0.22	23D	168	0.20
7D	53	0.19	19D	111	0.22	23D	169	0.20
7D	54	0.20	19D	112	0.20	23D	170	0.20
7D	55	0.19	19D	113	0.20	23D	171	0.20
7D	56	0.19	21D	114	0.21	23D	172	0.19
7D	57	0.20	21D	115	0.22	23D	173	0.20
7D	58	0.20	21D	116	0.21	23D	174	0.19

[redacted]

[redacted]

Stellar Gross Fog Mission 1006-1 (Continued)

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
23D	175	splice	35D	233	0.31	38D	291	0.20
24D	176	0.21	36D	234	0.34	38D	292	0.21
24D	177	0.20	36D	235	0.41	38D	293	0.21
24D	178	0.20	36D	236	0.37	38D	294	0.22
24D	179	0.20	36D	237	0.36	38D	295	0.21
24D	180	0.20	36D	238	0.35	38D	296	0.22
24D	181	0.20	36D	239	0.26	38D	297	0.24
24D	182	0.20	36D	240	0.23	38D	298	0.27
24D	183	0.20	36D	241	0.24	38D	299	0.33
24D	184	0.20	36D	242	0.20	38D	300	0.36
24D	185	0.21	36D	243	0.30	38D	301	0.39
24D	186	0.20	36D	244	0.29	38D	302	0.39
24D	187	0.20	36D	245	0.24	38D	303	0.42
24D	188	0.20	36D	246	splice	38D	304	splice
24D	189	0.20	37D	247	0.19	40AE	305	0.42
24D	190	0.20	37D	248	0.20	40D	306	0.43
24D	191	0.20	37D	249	0.21	40D	307	0.46
24D	192	0.19	37D	250	0.19	40D	308	0.47
24D	193	0.19	37D	251	0.21	40D	309	0.46
24D	194	0.20	37D	252	0.20	40D	310	0.47
24D	195	0.20	37D	253	0.21	40D	311	0.31
24D	196	0.20	37D	254	0.20	40D	312	0.25
24D	197	0.20	37D	255	0.21	49D	313	0.24
24D	198	0.21	37D	256	0.21	49D	314	0.22
24D	199	0.20	37D	257	0.19	49D	315	0.22
24D	200	0.20	37D	258	0.19	49D	316	0.22
24D	201	0.20	37D	259	0.20	49D	317	0.22
24D	202	0.21	37D	260	0.19	49D	318	0.22
25AE	203	0.23	37D	261	0.20	52D	319	0.24
25AE	204	0.22	37D	262	0.20	52D	320	0.26
25D	205	0.22	37D	263	0.20	52D	321	0.26
25D	206	0.21	37D	264	0.20	52D	322	0.29
25D	207	0.21	37D	265	0.20	52D	323	0.33
25D	208	0.22	37D	266	0.20	52D	324	0.36
25D	209	0.26	37D	267	0.20	52D	325	0.24
25D	210	0.30	37D	268	0.19	52D	326	0.20
25D	211	0.32	37D	269	0.21	52D	327	0.20
25D	212	0.34	37D	270	0.20	52D	328	0.20
25D	213	0.34	37D	271	0.20	52D	329	0.20
25D	214	0.34	37D	272	0.20	52D	330	0.19
25D	215	0.32	37D	273	0.19	52D	331	0.20
25D	216	0.28	37D	274	0.20	52D	332	0.19
25D	217	0.28	37D	275	0.20	53D	333	0.20
25D	218	0.28	38D	276	0.19	53D	334	0.20
25D	219	0.30	38D	277	0.20	53D	335	0.21
25D	220	0.34	38D	278	0.18	53D	336	0.20
25D	221	0.38	38D	279	0.19	53D	337	0.19
25D	222	0.41	38D	280	0.19	53D	338	0.20
31D	223	0.42	38D	281	0.18	53D	339	0.22
31D	224	0.44	38D	282	0.19	53D	340	0.20
31D	225	0.46	38D	283	0.19	53D	341	0.20
31D	226	0.32	38D	284	0.20	53D	342	0.20
31D	227	0.24	38D	285	0.19	53D	343	0.21
33D	228	0.27	38D	286	0.19	53D	344	0.20
33D	229	0.27	38D	287	0.22	53D	345	0.20
33D	230	0.25	38D	288	0.19	53D	346	0.20
33D	231	0.25	38D	289	0.20	53D	347	0.20
33D	232	0.28	38D	290	0.20	53D	348	0.20

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Stellar Gross Fog Mission 1006-1 (Continued)

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
53D	349	0.21	54D	371	0.23	55D	392	0.22
53D	350	0.19	54D	372	0.22	55D	393	0.23
53D	351	0.19	54D	373	0.20	55D	394	0.22
53D	352	0.20	54D	374	0.20	55D	395	0.22
53D	353	0.21	54D	375	0.20	55D	396	0.22
53D	354	0.20	54D	376	0.21	55D	397	0.23
53D	355	0.20	54D	377	0.20	55D	398	0.26
53D	356	0.20	54D	378	0.21	55D	399	0.26
53D	357	0.20	54D	379	0.20	55D	400	0.33
53D	358	0.20	54D	380	0.20	56AE	401	0.37
53D	359	0.20	54D	381	0.20	56AE	402	0.36
53D	360	0.20	54D	382	0.21	56D	403	0.34
53D	361	0.20	55D	383	0.21	56D	404	0.32
53D	362	0.19	55D	384	0.20	56D	405	0.29
54D	363	0.20	55D	385	0.20	56D	406	0.20
54D	364	0.20	55D	386	0.20	56D	407	0.21
54D	365	0.32	55D	387	0.22	56D	408	0.20
54D	366	0.36	55D	388	0.21	56D	409	0.20
54D	367	0.45	55D	389	0.20	56D	410	0.20
54D	368	0.51	55D	390	0.20	56D	411	0.20
54D	369	0.26	55D	391	0.21	56D	412	0.20
54D	370	0.21						

Stellar Gross Fog Mission 1006-2

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
65D	1	0.22	69D	26	0.27	70D	51	0.33
65D	2	0.23	69D	27	0.27	70D	52	0.30
68D	3	0.24	69D	28	0.35	70D	53	0.26
68D	4	0.28	69D	29	0.34	70D	54	0.24
68D	5	0.44	69D	30	0.25	70D	55	0.36
68D	6	0.30	69D	31	0.26	70D	56	0.26
68D	7	0.28	69D	32	0.36	70D	57	0.26
68D	8	0.29	69D	33	0.31	70D	58	0.25
68D	9	0.44	70D	34	0.25	70D	59	0.37
68D	10	0.28	70D	35	0.26	70D	60	0.25
68D	11	0.29	70D	36	0.37	70D	61	0.26
68D	12	0.30	70D	37	0.26	71D	62	0.30
68D	13	0.46	70D	38	0.27	71D	63	0.33
68D	14	0.28	70D	39	0.27	71D	64	0.24
68D	15	0.29	70D	40	0.40	71D	65	0.24
68D	16	0.30	70D	41	0.27	71D	66	0.32
68D	17	0.42	70D	42	0.26	71D	67	0.26
69D	18	0.25	70D	43	0.30	71D	68	0.24
69D	19	0.28	70D	44	0.40	71D	69	0.23
69D	20	0.32	70D	45	0.25	71D	70	0.35
69D	21	0.42	70D	46	0.26	71D	71	0.23
69D	22	0.26	70D	47	0.32	71D	72	0.24
69D	23	0.28	70D	48	0.36	71D	73	0.26
69D	24	0.32	70D	49	0.25	71D	74	0.32
69D	25	0.42	70D	50	0.26	71D	75	0.25

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Stellar Gross Fog Mission 1006-2 (Continued)

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
72AE	76	0.26	85D	134	0.28	96D	192	0.30
72AE	77	0.32	85D	135	0.24	99D	193	0.43
72D	78	0.27	85D	136	0.26	99D	194	0.26
72D	79	0.24	85D	137	0.28	99D	195	0.30
72D	80	0.24	85D	138	0.23	99D	196	0.31
72D	81	0.36	85D	139	0.26	99D	197	0.31
72D	82	0.26	85D	140	0.28	99D	198	0.30
72D	83	0.33	85D	141	0.30	99D	199	0.27
72D	84	0.34	85D	142	0.26	99D	200	0.26
72D	85	0.36	85D	143	0.25	99D	201	0.27
72D	86	0.27	85D	144	0.28	99D	202	0.26
73D	87	0.26	86D	145	0.22	99D	203	0.26
73D	88	0.36	86D	146	0.24	99D	204	0.26
73D	89	0.26	86D	147	0.27	99D	205	splice
73D	90	0.31	86D	148	0.22	100D	206	0.24
73D	91	0.32	86D	149	0.24	100D	207	0.25
73D	92	0.36	86D	150	0.27	100D	208	0.27
78D	93	0.26	86D	151	0.25	100D	209	0.26
78D	94	0.24	86D	152	0.24	100D	210	0.27
78D	95	0.30	86D	153	0.24	100D	211	0.27
78D	96	0.27	86D	154	0.28	100D	212	splice
78D	97	0.27	86D	155	0.24	100D	213	0.27
78D	98	0.24	86D	156	0.23	100D	214	0.33
81D	99	0.32	86D	157	0.29	100D	215	0.26
81D	100	0.25	86D	158	0.24	100D	216	0.25
84D	101	0.24	86D	159	0.24	100D	217	0.27
84D	102	0.25	87D	160	0.27	100D	218	0.27
84D	103	0.29	87D	161	0.24	100D	219	0.25
84D	104	0.26	87D	162	0.23	100D	220	0.27
84D	105	0.27	87D	163	0.24	100D	221	0.27
84D	106	0.31	87D	164	0.27	101D	222	0.27
84D	107	0.23	87D	165	0.24	101D	223	0.27
84D	108	0.26	87D	166	0.23	101D	224	0.25
84D	109	0.29	87D	167	0.25	101D	225	0.27
84D	110	0.30	87D	168	0.23	101D	226	splice
84D	111	0.28	87D	169	0.26	101D	227	0.24
84D	112	0.26	87D	170	0.31	101D	228	0.27
84D	113	0.30	87D	171	0.24	101D	229	0.25
84D	114	0.24	87D	172	0.29	101D	230	0.26
84D	115	0.27	87D	173	0.30	101D	231	0.26
84D	116	0.30	87D	174	0.25	101D	232	0.24
84D	117	0.26	87D	175	0.26	101D	233	0.25
84D	118	0.24	87D	176	0.28	101D	234	0.26
85D	119	0.26	87D	177	0.30	101D	235	0.23
85D	120	0.30	87D	178	0.31	101D	236	0.25
85D	121	0.23	87D	179	0.31	101D	237	0.27
85D	122	0.26	87D	180	0.32	101D	238	0.24
85D	123	0.26	87D	181	0.27	101D	239	0.26
85D	124	0.27	87D	182	0.30	101D	240	0.28
85D	125	0.25	87D	183	0.30	101D	241	0.24
85D	126	0.26	87D	184	0.28	101D	242	0.27
85D	127	0.30	87D	185	0.26	102D	243	0.29
85D	128	0.23	88AE	186	0.30	102D	244	0.40
85D	129	0.25	88AE	187	0.24	102D	245	0.29
85D	130	0.29	96D	188	0.27	102D	246	0.27
85D	131	0.24	96D	189	0.26	102D	247	0.24
85D	132	0.24	96D	190	0.25	102D	248	0.24
85D	133	0.26	96D	191	0.26	102D	249	0.25

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Stellar Gross Fog Mission 1006-2 (Continued)

Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog	Pass No	Frame No	Gross Fog
102D	250	0.48	103AE	260	0.26	103D	270	0.34
102D	251	0.26	103D	261	0.28	103D	271	0.33
102D	252	0.24	103D	262	0.28	103D	272	0.32
102D	253	0.24	103D	263	0.28	103D	273	0.28
102D	254	0.27	103D	264	0.31	104D	274	0.27
102D	255	0.24	103D	265	0.34	110D	275	0.27
102D	256	0.27	103D	266	0.33	112D	276	0.27
102D	257	0.28	103D	267	0.35	Malfunction	277	0.25
102D	258	0.26	103D	268	0.32	115D	278	0.26
103AE	259	0.28	103D	269	0.34	115D	279	0.24

MICRODENSITOMETRIC TRACES OF STELLAR IMAGES

The following data have been compiled in conjunction with a study of the double stellar images that appear on Mission 1006-1:

1. Two images of the same star appear on a single frame on several occasions.

2. One stellar image is invariably recorded less dense than the other (ghost image).

3. The ghost image is always displaced diagonally from the major axis of the film; i.e., not along the major or minor axis.

4. On frames where the double images exist, the duplicate images are more separated as the difference from the center of the format is increased.

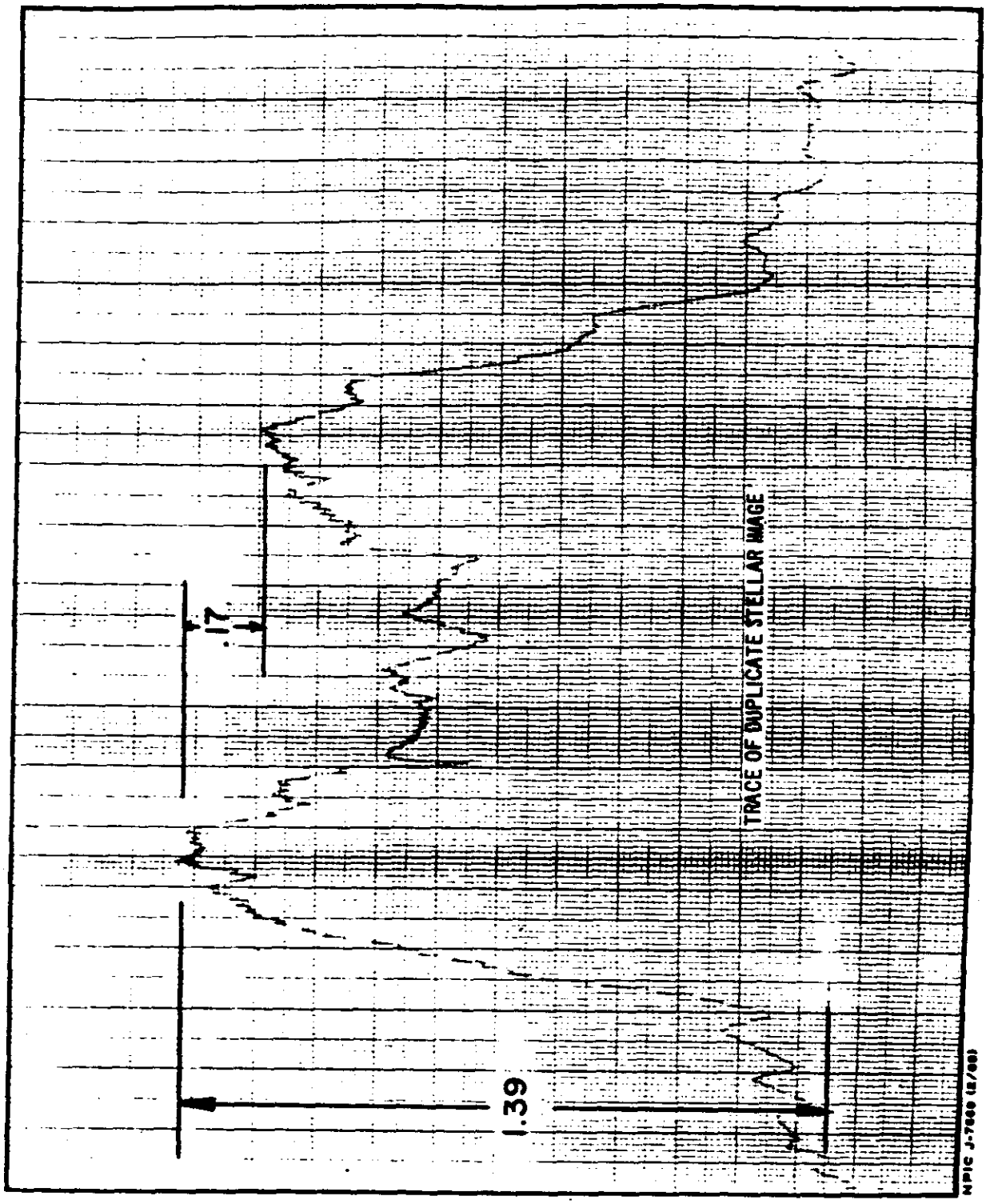
5. Example of micro trace data: The microdensitometer traces of the double imaged star shows two distinct peaks. The more dense peak is 1.39 density above gross fog. The less dense peak is 1.22 density above gross fog. Relative density difference is 0.17.

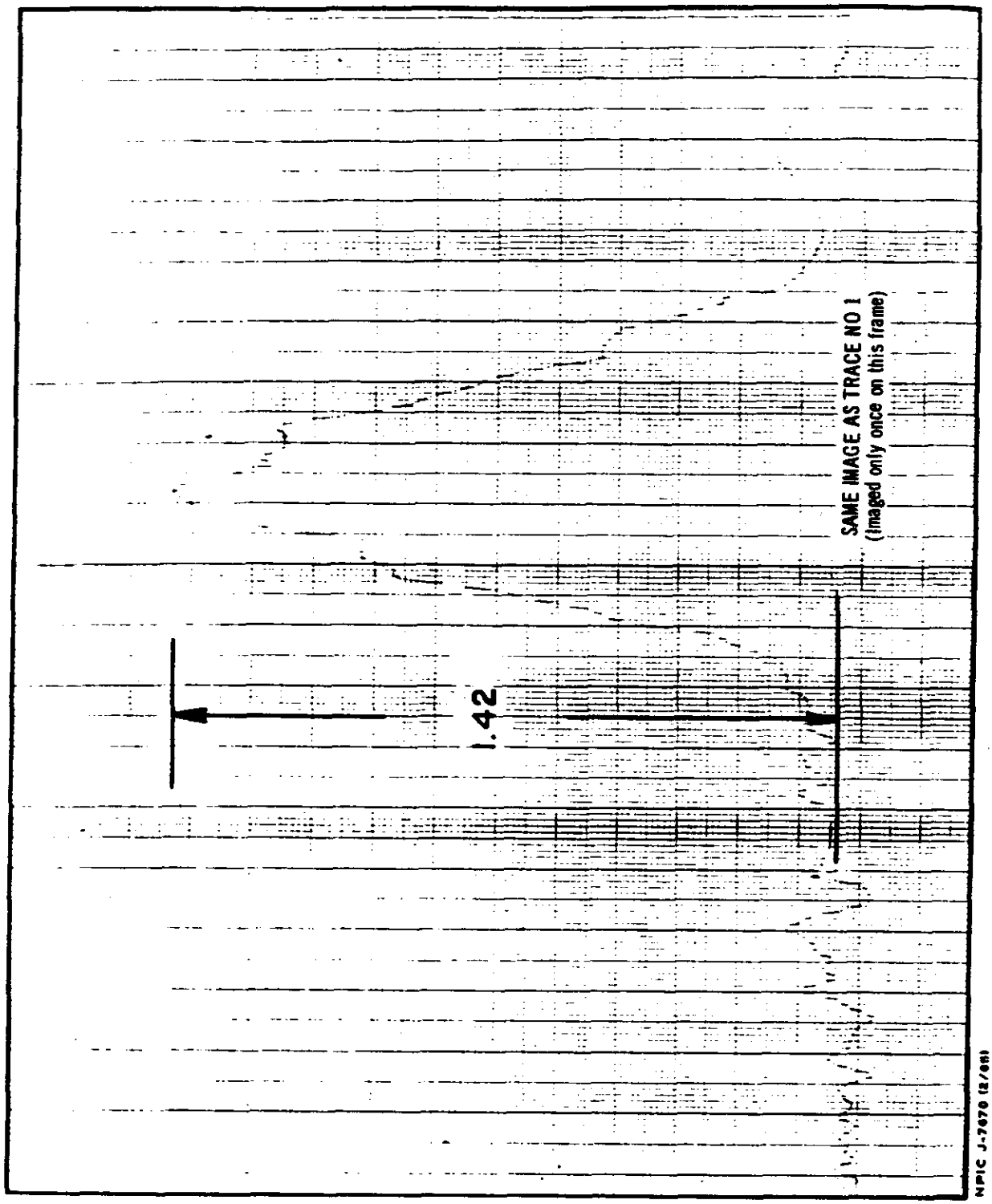
6. The trace of the same star on an adjacent frame, where the star is imaged only once, shows a peak density of 1.42. The relative density difference between the two traces is 0.03.

7. The microdensitometer trace data are as follows:

   a. Lever Ratio: 1000:1
   b. Magnification: 40X
   c. Slit Dimensions: 1μ x 50μ
   d. Density Wedge Calibration: 0.13 d/cm

[redacted]


.17
1.39
TRACE OF DUPLICATE STELLAR IMAGE
NPIC J-7800 12/001


SAME IMAGE AS TRACE NO 1
(Imaged only once on this frame)
1.42
NPIC J-7670 (2/68)

APPENDIX E. TECHNICAL COMPENDIUM

The following technical compendium is a random sampling of data pertinent to this mission.

The cloud categories are represented by numbers 1-5. Each frame listed is considered from west to east (scene oriented) and is recorded in one-quarter frame increments.

The value of the numbers are:

1 = 0 - 10 percent cloud cover
2 = 11 - 25 percent cloud cover
3 = 26 - 50 percent cloud cover
4 = 51 - 99 percent cloud cover
5 = 100 percent cloud cover

In this report:

Solar Elevation is the angular elevation of the sun above a plane tangent to the surface of the earth at nadir. A minus solar elevation indicates that the sun is below the plane.

Solar Azimuth is the angular measurement of the rays of the sun measured from true north clockwise.

Altitude is expressed in nautical miles, considering a nautical mile to be 6,080 statute feet.

Exposure is expressed in fractions of a second and is computed from scan rate and slit width.

Density values all include gross fog.

Overlap of successive frames is not listed. The amount or lack of overlap is so variable that these random readings would not be indicative of system performance.

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Mission 1006-1 Forward

Pass	Frame	Cloud Category	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Yaw	Alt. (nm)	Exp	TERRAIN Dmax	TERRAIN Dmin	TERRAIN Delta	LIMITING Dmax	LIMITING Dmin	LIMITING Delta	Gross Fog
03D	8	1111	1420	48°	232°	15°02'	-00°14'	01°13'	86.35	NA	NR	NR	--	2.15	0.21	1.97	0.10
05D	81	3213	1454	48	261	1503	-00 13	01 36	89.94	1/333	1.04	0.33	0.71	2.17	0.25	1.92	0.11
06D	42	3113	1452	49	255	15 53	-00 15	00 13	89.05	1/333	1.68	0.88	0.80	2.03	0.84	1.19	0.10
07D	5	3333	1426	48	236	15 02	-00 16	01 35	86.34	NA	0.88	0.64	0.24	2.10	0.46	1.64	0.09
07D	13	1111	1430	49	240	15 07	-00 19	01 30	86.60	1/339	1.42	0.52	0.90	1.92	0.61	1.31	0.16
07D	177	1134	1503	49	270	15 26	00 04	00 42	96.58	1/343	1.32	0.73	0.59	2.25	0.44	1.81	0.11
09D	27	3211	1414	53	234	15 03	-00 23	00 55	86.11	1/341	1.64	0.44	1.20	2.32	0.44	1.88	0.17
09D	33	3221	1417	55	226	15 02	-00 22	00 53	86.71	1/341	1.60	0.54	1.06	2.28	0.54	1.74	0.16
15D	32	1114	NA	NA	NA	15 02	-00 03	00 14	NA	1/341	1.44	0.38	1.06	2.24	0.38	1.86	0.10
18D	11	3211	1342	42	279	15 01	-00 21	01 13	86.42	1/336	2.02	0.33	1.69	2.18	0.33	1.85	0.12
18D	39	1111	1359	45	216	15 03	-00 22	00 51	86.16	1/340	2.19	1.13	1.06	2.23	0.73	1.51	0.17
19D	28	2112	1319	NA	NA	15 01	-00 18	01 08	87.99	1/336	2.02	0.64	1.38	2.10	0.52	1.58	0.10
19D	52	1333	1421	38	255	14 38	00 02	00 59	86.65	1/339	NR	NR	--	2.22	0.44	1.78	0.18
21D	18	3233	1430	51	244	14 01	-00 07	00 53	87.52	1/340	2.04	1.47	0.57	2.26	1.04	1.22	0.18
21D	83	1111	1445	53	257	14 49	00 07	00 34	92.42	1/341	1.77	1.05	0.72	1.80	0.66	1.70	0.18
22D	26	4334	NA	NA	NA	14 52	-00 17	00 40	NA	1/341	NR	NR	--	2.23	0.44	1.79	0.10
22D	46	2133	1516	45	263	14 33	-00 14	00 48	89.53	1/338	1.80	0.81	0.99	2.21	0.42	1.79	0.10
22D	104	4424	NA	NA	NA	14 56	00 05	-00 06	NA	1/342	1.14	0.27	0.87	2.22	0.27	1.95	0.10
23D	1	1111	1504	46	251	14 56	00 11	00 49	87.54	NA	1.97	1.04	0.93	2.18	0.64	1.44	0.10
23D	2	1111	1429	51	243	14 56	00 10	00 49	87.95	NA	1.75	0.54	1.21	2.04	0.34	1.70	0.10
23D	4	1111	1430	51	243	14 56	00 10	00 49	86.25	NA	1.53	0.37	1.16	2.05	0.28	1.77	0.10
23D	101	2344	1447	54	262	14 57	00 19	00 52	94.82	1/342	NR	NR	--	2.25	0.40	1.85	0.11
24D	12	2344	1323	NA	NA	14 45	-00 11	01 07	87.53	1/336	0.78	0.34	0.44	2.14	0.22	1.92	0.10
24D	100	4111	1413	NA	NA	15 11	-00 21	01 29	86.44	1/341	1.66	0.50	1.16	2.24	0.38	1.86	0.20
24D	156	2244	1433	50	246	14 34	-00 19	01 10	86.13	1/342	1.57	0.72	0.85	2.22	0.72	1.50	0.18
24D	175	1111	1437	51	250	14 36	-00 22	01 09	89.55	1/342	NR	NR	--	2.12	0.52	1.60	0.18
25D	62	1111	1409	55	234	15 13	-00 07	00 38	86.81		1.85	0.50	1.35	2.17	0.38	1.79	0.17
31D	22	4434	NA	NA	NA	14 02	-00 09	00 57	NA	1/339	NR	NR	--	2.20	0.50	1.70	0.10
35D	18	1111	1358	NA	NA	14 51	-00 09	01 15	86.51	1/339	2.15	0.61	1.54	2.28	0.58	1.70	0.17
36D	80	4444	NA	NA	NA	14 52	00 02	00 47	NA	1/339	NR	NR	--	2.25	0.95	1.30	0.19
37D	39	4444	1417	51	238'	14 55'	00 00'	00 35'	88.11	1/341	NR	NR	--	2.28	0.94	1.34	0.19
37D	69	4333	1433	53	253	14 40	-00 10	00 44	93.21	1/340	1.50	0.53	0.97	2.72	0.47	2.25	0.10
37D	101	2113	1438	54	264	14 25	-00 20	01 01	95.67	1/341	1.49	0.75	0.74	1.72	0.55	1.17	0.11
37D	172	1123	1448	54	276	15 05	-00 35	01 31	105.26	1/339	1.75	0.50	1.25	2.28	0.63	1.65	0.18
38D	26	1113	1406	50	226	14 54	-00 12	00 47	86.86	1/341	1.23	0.40	0.83	2.25	0.40	1.85	0.19
38D	168	4314	1443	53	268	15 04	-00 11	00 33	100.20	1/342	2.15	0.37	1.78	2.24	0.31	1.93	0.10
40D	23	1112	1402	49	225	15 05	-00 14	00 43	86.96	1/342	1.54	0.37	1.17	2.10	0.37	1.73	0.16
52D	19	4332	1405	53	230	15 16	-00 13	00 56	86.99	1/338	1.30	0.74	0.56	2.32	0.52	1.80	0.15
53D	19	1111	1355	51	224	15 04	-00 13	00 56	86.50	1/339	0.97	0.35	0.62	2.31	0.35	1.96	0.15
53D	188	4444	1435	55	270	14 51	-00 07	00 40	105.49	1/336	1.38	0.52	0.86	2.22	0.42	1.80	0.10
54D	12	4111	1407	55	239	14 57	-00 09	00 39	92.76	1/338	1.83	0.81	1.02	2.14	0.53	1.61	0.18
55D	71	1111	1405	53	230	14 47	-00 17	00 59	90.19	1/341	1.61	0.83	0.78	2.12	0.58	1.54	0.18
55D	111	1111	1415	55	242	15 07	-00 09	00 53	91.96	1/342	1.82	1.04	0.78	2.29	0.29	2.00	0.12
56D	47	2212	1357	51	226	15 13	-00 03	01 15	86.32	1/324	1.62	0.52	1.10	2.22	0.40	1.82	0.16
56D	51	3333	1358	52	228	15 15	-00 03	01 15	89.16	1/340	1.55	0.70	0.85	2.22	0.54	1.68	0.17
56D	67	4322	1401	53	230	NA	NA	NA	89.60	NA	1.26	0.70	0.56	2.14	0.48	1.66	0.18

*NA indicates data not available.
NR indicates no reading made.

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Mission 1006-1 Aft

Pass	Frame	Cloud Category	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Yaw	Alt. (nm)	Exp	TERRAIN Dmax	TERRAIN Dmin	TERRAIN Delta	LIMITING Dmax	LIMITING Dmin	LIMITING Delta	Gross Fog
03D	12	1111	1421	48°	232°	-15°00'	-00°07'	00°48'	86.35	1/339	2.22	0.59	1.63	2.22	0.21	2.01	0.10
05D	85	3313	1455	48	261	-14 49	-00 17	01 16	89.94	1/333	NR	NR	--	2.34	0.57	1.77	0.20
06D	47	2113	1453	49	255	-15 06	-00 09	-00 06	89.05	1/333	1.98	1.56	0.42	2.29	1.38	0.91	0.20
07D	10	3333	1429	46	236	-14 55	-00 21	01 08	86.34	NA	1.72	0.79	0.93	2.24	0.48	1.76	0.19
07D	18	1111	1431	49	240	-14 56	-00 22	00 59	86.60	1/339	1.30	0.60	0.70	2.14	0.55	1.59	0.20
07D	182	1134	1504	49	270	-14 40	00 02	00 18	96.58	1-343	1.62	0.86	0.76	2.37	0.69	1.68	0.20
09D	32	3211	1415	53	234	-14 49	-00 24	00 28	86.11	1/341	1.71	0.55	1.16	2.37	0.55	1.82	0.18
09D	36	3321	1418	55	228	-14 49	-00 22	00 27	86.71	1/341	1.66	0.54	1.12	2.37	0.52	1.85	0.18
15D	37	1114	NA	NA	NA	-14 59	-00 02	-00 14	NA	1/341	1.85	1.00	0.85	2.36	0.95	1.41	0.21
18D	16	3211	1443	42	279	-14 59	-00 23	00 45	86.42	1/336	2.20	0.64	1.56	2.27	0.64	1.63	0.20
18D	44	1111	1400	45	216	-15 02	-00 22	00 23	86.16	1/340	2.23	1.17	1.06	2.26	0.82	1.44	0.19
19D	33	2112	1320	NA	NA	-15 00	-00 19	00 34	87.99	1/336	2.05	0.90	1.15	2.15	0.86	1.29	0.15
19D	57	1333	1422	38	255	-15 28	-00 02	00 34	86.65	1/339	1.95	1.25	0.70	2.26	0.54	1.72	0.20
21D	23	3233	1431	51	244	-15 01	-00 06	00 19	87.52	1/340	1.82	1.48	0.34	2.28	1.14	1.14	0.20
21D	87	1111	1446	53	257	-15 07	00 07	00 05	92.42	1/341	1.75	1.04	0.71	1.87	0.71	1.16	0.19
22D	22	4334	NA	NA	NA	-15 06	-00 19	00 18	NA	1/341	NR	NR	--	2.32	1.43	0.89	0.18
22D	50	2133	1517	45	263	-15 27	-00 14	00 23	89.53	1/338	1.57	1.26	0.51	2.31	0.67	1.64	0.11
22D	108	4424	NA	NA	NA	-15 05	00 06	-00 28	NA	1/342	1.47	0.28	1.19	2.30	0.24	2.06	0.11
23D	06	1111	1505	46	251	-15 05	-00 16	00 24	87.54	NA	1.82	0.67	1.15	2.03	0.64	1.39	0.19
23D	07	1111	1430	51	243	-15 05	-00 16	00 23	87.95	NA	1.74	0.62	1.12	2.03	0.57	1.46	0.18
23D	09	1111	1431	51	243	-15 06	-00 16	00 23	88.25	NA	2.02	0.77	1.25	2.10	0.54	1.56	0.18
23D	105	2344	1446	54	262	-15 01	-00 07	00 32	94.62	1/342	1.38	0.41	0.97	2.29	0.38	1.91	0.12
24D	17	2344	1324	NA	NA	-15 15	-00 15	00 37	87.53	1/336	2.10	0.58	1.52	2.24	0.27	1.97	0.10
24D	104	4111	1414	NA	NA	-14 52	-00 27	01 06	86.44	1/341	1.55	0.49	1.06	2.28	0.42	1.86	0.16
24D	160	2244	1434	50	248	-15 28	-00 24	00 47	88.13	1/342	NR	NR	--	2.29	0.81	1.48	0.19
24D	180	1111	1438	51	250	-15 17	-00 33	00 33	89.55	1/342	NR	NR	--	2.17	0.54	1.63	0.19
25D	67	1111	1410	55	234	-14 50	-00 06	00 14	86.81	1/340	1.43	0.52	0.91	2.22	0.37	1.85	0.17
31D	26	4434	NA	NA	NA	-15 56	-00 10	00 33	NA	1/340	1.32	0.92	0.40	2.17	0.92	1.25	0.14
35D	23	1111	1359	NA	NA	-15 11	-00 10	00 50	86.51	1/339	1.60	0.62	0.98	1.60	0.50	1.10	0.12
36D	64	4434	NA	NA	NA	-15 09	00 00	00 22	NA	1/341	NR	NR	--	2.15	0.88	1.27	0.11
37D	44	4444	1416	51	238	-15 04	00 00	00 07	88.11	1/341	1.15	0.98	0.17	2.23	0.98	1.25	0.16
37D	74	4333	1434	53	253	-15 24	-00 15	00 25	93.21	1/341	1.34	0.69	0.65	2.12	0.58	1.54	0.10
37D	115	2113	1439	54	264	-15 34	-00 21	00 33	95.67	1/340	1.04	0.68	0.36	1.46	0.68	0.78	0.11
37D	177	1123	1449	54	276	-14 53	-00 43	01 11	105.28	1/339	1.81	0.42	1.39	2.18	0.42	1.76	0.15
38D	31	1113	1407	50	226	-15 04	-00 17	00 24	86.66	1/341	1.51	0.50	1.01	2.11	0.50	1.61	0.17
38D	172	4314	1444	53	266	-14 55	-00 11	00 11	100.21	1/342	1.08	0.42	0.66	1.85	0.30	1.55	0.08
40D	28	1122	1403	49	225	-14 55	-00 16	00 15	86.96	1/342	1.73	0.50	1.23	2.15	0.38	1.77	0.15
52D	24	4332	1406	53	230	-14 45	-00 16	00 24	86.99	1/339	1.49	0.90	0.59	2.12	0.61	1.51	0.15
53D	24	1111	1356	51	224	-14 59	-00 17	00 29	88 50	1/338	1.79	0.48	1.31	1.79	0.40	1.39	0.18
53D	193	4444	1436	55	270	-15 10	-00 09	00 11	105.49	1/336	NR	NR	--	2.23	1.13	1.10	0.18
54D	17	4111	1408	55	239	-15 03	-00 11	00 10	92.76	1-338	2.05	0.72	1.33	2.05	0.62	1.43	0.17
55D	76	1111	1406	53	230	-15 11	-00 16	00 34	90.19	1/340	1.56	0.82	0.74	2.07	0.60	1.47	0.16
55D	116	1111	1416	55	242	-14 55	-00 09	00 26	91.96	1/341	2.01	1.68	0.33	2.09	0.87	1.22	0.16
56D	47	2212	1356	51	226	-14 48	-00 05	00 50	88.32	1/324	1.72	0.55	1.17	2.26	0.46	1.80	0.17
56D	56	3333	1359	52	228	-14 44	-00 05	00 50	89.16	1/336	1.72	0.94	0.78	2.38	0.77	1.61	0.17
56D	72	4322	1402	53	230	NA	NA	NA	89.60	NA	1.30	0.80	0.50	2.10	0.77	1.33	0.22

*NA indicates data not available.
NR indicates no reading made.

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Mission 1006-2 Forward Camera

Pass	Frame	Cloud Cat	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Yaw	Alt. NM	Exp	TERRAIN Dmax	TERRAIN Dmin	TERRAIN Delta	LIMITING Dmax	LIMITING Dmin	LIMITING Delta	Gross Fog
65D	7	4431	1433	55	279°	14 59	-00 14	NA	112.44	NA	NR	NR	--	2.24	0.46	1.78	0.16
65D	10	4444	1433	56	279	14 58	-00 12	NA	112.95	1/310	NR	NR	--	2.25	0.40	1.85	0.18
68D	65	4444	1410	77	242	15 22	-00 29	NA	95.16	1/339	1.50	0.65	0.85	2.26	0.52	1.74	0.18
69D	12	4432	1343	51	218	15 01	-00 21	NA	88.74	1/337	0.78	0.43	0.35	2.22	0.34	1.88	0.16
69D	44	4434	1407	57	242	15 00	-00 30	NA	95.55	1/332	1.48	0.51	0.97	2.21	0.34	1.87	0.12
70D	47	3441	1356	54	230	14 52	00 11	NA	91.51	1/339	NR	NR	--	2.29	0.54	1.75	0.12
70D	72		1402	56	234	14 55	-00 03	NA	93.32	1/341	1.50	0.52	0.98	2.34	0.48	1.86	0.17
70D	156	4213	1416	58	260	15 33	00 05	NA	101.50	1/339	1.95	0.51	1.44	2.05	0.31	1.74	0.08
71D	12	1233	1335	50	216	15 05	-00 12	NA	86.14	1/338	1.58	0.42	1.16	2.08	0.36	1.72	0.19
71D	72	1111	1359	55	234	14 56	-00 16	NA	92.61	1/339	0.81	0.31	0.50	2.20	0.28	1.92	0.13
72D	7	2222	1345	52	219	15 00	-00 04	NA	89.79	1/334	1.24	0.53	0.89	2.30	0.38	1.92	0.12
73D	27	1351	1351	54	233	15 05	-00 13	NA	91.52	1/338	1.24	0.48	0.76	2.24	0.42	1.82	0.10
78D	13	1113	1414	59	262	14 53	-00 23	NA	104.36	1/330	1.72	0.51	1.21	2.18	0.42	1.76	0.15
81D	9	4214	1413	57	262	14 47	-00 04	NA	116.75	1/304	NR	NR	--	2.26	0.38	1.90	0.18
84D	30	4444	1347	55	223	15 06	-00 20	NA	92.84	1/336	NR	NR	--	1.92	0.25	1.67	0.08
84D	111	5555	1409	60	257	14 52	00 11	NA	103.74	1/333	NR	NR	--	2.01	1.86	0.15	0.08
85D	19	2341	1329	51	214	14 45	00 03	NA	89.59	1/339	1.18	0.57	0.61	2.22	0.46	1.76	0.20
86D	7	4244	1346	56	226	15 08	-00 19	NA	93.93	1/331	NR	NR	--	2.28	0.30	1.98	0.10
86D	91	3111	1405	60	249	14 50	-00 01	NA	102.12	1/334	1.00	0.74	0.26	1.97	0.31	1.66	0.08
87D	152	4423	1355	58	238	14 08	00 05	NA	97.09	1/337	1.12	0.63	0.49	2.01	0.32	1.69	0.08
96D	18	4343	1442	35	287	14 52	-00 07	NA	167.52	NA	NR	NR	--	2.11	0.18	0.93	0.08
99D	11	4342	1335	56	226	14 44	-00 14	NA	94.11	1/333	1.25	0.42	0.83	2.16	0.28	1.86	0.10
99D	74	1444	1351	60	240	14 57	-00 14	NA	99.88	1/335	NR	NR	--	2.20	0.48	1.72	0.18
100D	59	4443	1409	61	274	14 22	-00 07	NA	NA	1/306	0.84	0.40	0.40	2.15	0.26	1.89	0.10
100D	109	3343	1411	61	278	15 01	-00 04	NA	101.12	1/299	1.10	0.82	0.28	2.22	0.33	1.89	0.10
101D	23	4444	1326	53	214	14 53	-00 10	NA	92.21	1/335	1.24	0.71	0.53	2.25	0.56	1.69	0.18
101D	91	4322	1357	62	252	14 35	00 10	NA	104.86	1/331	1.98	0.59	1.39	2.18	0.42	1.76	0.10
102D	13	1122	1320	52	211	15 01	-00 06	NA	91.18	1/337	1.40	0.44	0.96	1.99	0.38	1.61	0.17
102D	76	1144	1345	60	231	14 52	-00 11	NA	96.74	1/335	1.43	0.42	1.01	2.14	0.28	1.86	0.12
102D	91	4212	1352	61	243	14 59	-00 13	NA	102.22	1/331	1.76	0.58	1.18	2.22	0.54	1.67	0.09
103D	29	4444	1322	53	211	15 05	-00 16	NA	92.00	1/338	1.76	0.58	1.18	2.22	0.54	1.68	0.18
103D	109	4411	1346	60	239	15 02	-00 09	NA	100.51	1/336	1.31	0.84	0.47	2.02	0.35	1.67	0.09
104D	73	4444	1342	59	230	14 59	-00 03	NA	97.63	1/332	1.06	0.44	0.62	2.18	0.38	1.80	0.10
110D	23	1112	1352	36	250	15 03	-00 26	NA	106.61	NA	1.52	0.53	0.99	2.16	0.27	1.89	0.10
112D	5	4444	1430	34	224	14 54	-00 05	NA	168.41	1/187	1.67	0.79	0.88	2.28	0.42	1.86	0.10
115D	61	1111	1340	62	236	14 56	-00 03	NA	102.42	1/331	1.52	0.84	0.68	2.22	0.67	1.55	0.18
116D	66	3434	1340	62	236	14 37	-00 25	NA	102.50	1/330	1.54	0.53	1.01	2.23	0.44	1.79	0.10
116D	125	3311	1346	63	246	14 46	-00 10	NA	107.35	1/320	1.62	0.62	1.00	2.15	0.41	1.74	0.10
116D	161	3244	1353	64	261	14 43	-00 17	NA	112.98	1/309	1.17	0.48	0.69	2.22	0.39	1.83	0.11
117D	12	4324	1336	61	232	14 39	-00 11	NA	101.05	1/330	1.02	0.32	0.70	2.08	0.22	1.86	0.08
117D	111	4444	1353	64	261	14 31	-00 02	NA	114.22	1/309	2.05	0.32	1.73	2.06	0.27	1.79	0.10
118D	34	4444	1242	47	NA	14 57	-00 11	NA	89.70	1/337	1.00	0.52	1.48	2.17	0.34	1.83	0.18
118D	147	1111	1327	56	217	15 09	-00 14	NA	98.01	1/335	1.38	0.34	1.04	1.98	0.31	1.67	0.10
118D	226	1124	1344	63	242	14 57	-00 18	NA	106.97	1/323	2.09	0.40	1.69	2.14	0.29	1.85	0.10
119D	49	4444	1306	52	204	15 07	-00 04	NA	93.46	1/335	1.71	0.65	1.06	2.23	0.56	1.67	0.16
119D	91	1111	1323	57	216	15 02	-00 05	NA	96.96	1/335	1.32	0.46	0.86	2.06	0.46	1.60	0.20

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Mission 1006-2 Aft Camera

Pass	Frame	Cloud Cat	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Yaw	Alt. NM	Exp	TERRAIN Dmax	TERRAIN Dmin	TERRAIN Delta	LIMITING Dmax	LIMITING Dmin	LIMITING Delta	Gross Fog
65D	12	4431	1433	55°	279	15°04'	-00°12'	NA	113.32	1/313	NR	NR	–	2.22	0.52	1.70	0.16
65D	16	4444	1433	54	279	-14 33	00 10	NA	91.39	1/336	1.63	0.93	0.70	2.31	0.80	1.51	0.18
68D	70	4444	1410	56	242	-14 40	00 25	NA	95.57	1/339	1.26	0.67	0.61	2.33	0.56	1.77	0.20
69D	18	4432	1343	51	218	-15 08	-00 28	NA	89.17	1/337	1.07	0.48	0.59	2.27	0.40	1.87	0.19
69D	50	4434	1407	58	242	-15 00	-00 40	NA	96.12	1/338	1.74	0.67	1.07	2.23	0.46	1.77	0.12
70D	53	3441	1356	54	230	-15 11	00 09	NA	91.98	1/341	NR	NR	–	2.20	0.58	1.62	0.11
70D	76		1402	56	234	-15 04	-00 06	NA	93.74	1/342	1.38	0.42	0.96	2.21	0.28	1.93	0.10
70D	160	4213	1418	58	260	-14 30	00 00	NA	102.25	1/338	2.06	0.53	1.53	2.13	0.30	1.83	0.09
71D	17	1233	1335	50	218	-14 57	-00 13	NA	88.46	1/340	1.68	0.50	1.18	2.13	0.34	1.79	0.18
71D	77	1111	1359	55	234	-15 14	-00 27	NA	93.08	1/340	1.45	0.46	0.99	2.24	0.44	1.80	0.13
72D	12	2222	1345	52	219	-15 06	-00 13	NA	90.07	1/337	1.25	0.43	0.82	2.23	0.34	1.89	0.11
73D	32	4334	1351	54	233	-14 54	-00 12	NA	91.91	1/339	1.32	0.48	1.84	2.26	0.48	1.78	0.09
78D	19	1113	1414	59	262	-14 56	-00 22	NA	105.19	1/339	1.62	0.32	1.30	2.16	0.32	1.84	0.11
81D	14	4214	1413	57	282	-15 10	-00 07	NA	117.69	1/305	NR	NR	–	2.22	0.20	2.02	0.10
84D	35	4444	1347	55	223	-14 56	-00 17	NA	93.27	1/338	NR	NR	–	2.24	0.47	1.77	0.10
84D	116	5555	1409	60	257	-15 06	00 07	NA	104.64	1/333	NR	NR	–	2.11	1.97	0.14	0.08
85D	24	2341	1329	51	214	-15 14	00 02	NA	89.88	1/338	1.24	0.53	0.71	2.20	0.37	1.83	0.16
86D	12	4244	1346	56	226	-14 50	-00 15	NA	94.35	1/335	1.30	0.61	0.69	2.26	0.36	1.90	0.10
86D	96	3111	1405	60	249	-15 20	-00 04	NA	102.97	1/333	1.10	0.53	0.57	2.04	0.40	1.64	0.08
87D	157	4423	1355	58	236	-14 58	-00 06	NA	97.90	1/338	1.22	0.78	0.44	2.05	0.58	1.47	0.08
96D	23	4343	1442	35	287	-15 01	-00 07	NA	169.51	NA	1.05	0.34	0.71	2.12	0.20	1.92	0.08
99D	16	4342	1335	56	226	-15 16	-00 18	NA	94.55	1/333	0.85	0.50	0.35	2.16	0.38	1.78	0.11
99D	79	1444	1351	60	240	-15 04	-00 11	NA	100.62	1/335	1.47	0.71	0.76	2.21	0.44	1.77	0.16
100D	93	4443	1409	61	274	-15 37	00 08	NA	117.16	1/305	0.74	0.20	0.54	1.97	0.16	1.81	0.08
100D	114	3444	1411	60	276	-14 58	-00 06	NA	101.72	1/329	1.22	0.44	1.78	2.22	0.27	1.95	0.10
101D	28	4444	1326	53	214	-15 08	-00 11	NA	92.60	1/328	1.52	0.68	0.84	2.25	0.67	1.58	0.18
101D	96	4322	1357	62	252	-15 28	00 01	NA	105.77	1/328	2.02	0.74	1.28	2.20	0.51	1.69	0.10
102D	18	1122	1320	52	211	-14 56	-00 08	NA	91.51	1/336	1.38	0.50	0.88	2.12	0.44	1.68	0.17
102D	61	1144	1345	60	231	-15 01	-00 25	NA	101.32	1/328	2.13	0.53	1.60	2.16	0.45	1.73	0.10
102D	96	4212	1352	61	243	-15 03	-00 07	NA	103.07	1/332	1.62	0.44	1.18	2.22	0.37	1.85	0.10
103D	34	4444	1322	53	211	-14 56	-00 15	NA	92.38	1/337	1.58	0.45	1.13	2.19	0.30	1.89	0.10
103D	114	4411	1348	60	239	-14 59	-00 13	NA	101.06	1/334	1.80	0.78	0.52	2.02	0.30	1.72	0.08
104D	78	4444	1342	59	230	-15 03	-00 06	NA	98.63	1/331	1.18	0.52	0.66	2.24	0.58	1.66	0.10
110D	28	1112	1352	63	250	-14 50	-00 25	NA	105.57	1-321	1.64	0.30	1.34	2.20	0.26	1.94	0.10
112D	13	4444	1430	36	224	-15 03	-00 02	NA	172.12	NA	1.53	0.85	0.68	2.26	0.38	1.88	0.10
115D	86	1111	1340	62°	236	-15° 02'	-00°03'	NA	103.58	1/330	NR	NR	–	2.22	0.35	1.87	0.15
116D	91	3434	1340	62	236	-15 22	-00 25	NA	103.67	1/327	1.22	0.51	0.71	2.24	0.37	1.87	0.10
116D	130	3311	1346	63	246	-15 16	-00 09	NA	106.71	1/320	1.64	0.57	1.07	2.11	0.43	1.68	0.12
116D	166	3244	1353	64	261	-15 19	-00 16	NA	114.08	1/307	NR	NR	–	2.21	0.74	1.47	0.12
117D	17	4324	1336	61	232	-15 25	-00 12	NA	101.61	1/329	0.88	0.42	0.46	2.13	0.30	1.83	0.08
117D	116	4444	1353	64	261	-15 32	00 00	NA	115.02	1/305	2.02	0.63	1.39	2.10	0.34	1.76	0.08
118D	39	4444	1242	47	NA	-15 02	-00 09	NA	89.96	1/336	1.17	0.58	0.59	2.16	0.37	1.79	0.17
118D	152	1111	1327	58	217	-14 53	-00 15	NA	98.50	1/336	1.41	0.42	0.99	1.83	0.36	1.47	0.11
118D	231	1124	1344	63	242	-15 13	-00 17	NA	107.63	1/321	2.04	0.84	1.20	2.12	0.36	1.76	0.10
119D	44	4444	1306	52	204	-14 55	-00 07	NA	93.11	1/335	1.38	0.54	0.84	2.22	0.44	1.78	0.12
120D	12	4422	1314	54	213	-15 08	-00 13	NA	94.94	1/329	1.66	0.82	0.86	2.24	0.77	1.47	0.16
120D	65	3431	1329	60	223	-14 27	-00 12	NA	99.97	1/324	1.65	0.58	1.07	2.28	0.52	1.76	0.20
126D	4	1111	1104	36	NA	NA	NA	NA	67.34	NA	NR	NR	--	2.20	1.47	0.73	0.20
119D	96	1111	1323	57	216	-15 00	-00 09	NA	97.44	1/335	0.57	1.85	1.28	0.43	1.85	1.42	0.19

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APPENDIX F. SYSTEM DEVELOPMENT

1. Image Streaking:

Plus density streaks associated with areas of high reflectivity (beaches, clouds, etc.), have been noted on every mission. The associated degradation has been generally ignored. Recently it was discovered that the photo interpreters, assigned the task of exploiting the photography, have been hampered by this anomaly for some time but have been referring to it as atmospheric attenuation. It is thought that the cause of the problem is due to reflections within the camera. Remedial steps are now being considered.

2. Radiation Effects:

Recently, there has been some concern on the part of the manufacturer of the stellar camera that radiation fog is degrading the imagery of the stellar camera. Appendix D of this report deals with this anomaly.

3. Microdensitometry:

There are several sources of microdensitometric data available to the intelligence community. Unfortunately, there is little or no correlation between the data of the various sources. In a step to rectify this situation, members of NPIC and the major processing center met in order to exchange thoughts on image quality evaluation. Hopefully, the discussion between these groups will develop a standard for image quality evaluation.

4. Weather Predictions:

Prior to each satellite mission weather predictions are made to determine the likelihood of covering targets photographically. On Mission 1006 the "initial breakdown team" was supplied with the predicted weather information and was asked to report on its reliability. The results were promising but inconclusive. While the predictions were generally close, the percentage of accuracy varied from 0 - 100 percent.

5. Stellar Imagery:

The stellar photography of the most recent missions has been intermittently effected by unexplained objects passing the vehicle during stellar exposures. These objects of unknown origin appear after the jettisoned fuel has cleared the field of view. They appear as plus density streaks, much the same as jettisoned fuel particles. The cause of this phenomena is now under study.

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APPENDIX G. SUMMARY OF PLOTTABLE PHOTOGRAPHIC COVERAGE

Mission 1006-1 5 - 8 June 1964

Fwd

Country	Linear nm	Square nm
USSR	9,214	1,070,031
China	7,515	898,330
Mongolia	292	37,960
Pakistan	264	34,320
Rumania	222	26,000
South Korea	205	2,730
India	205	26,650
Hawaii	126	3,250
North Korea	123	4,610
Bulgaria	111	10,140
Turkey	111	10,140
Poland	107	13,910
Taiwan	103	5,330
Nepal	82	10,660
Canada	69	8,970
Greece	55	7,150
Burma	51	6,630
Bhutan	41	5,330
Tuamotu Archipelago	41	520
Norway	33	1,690
Afghanistan	21	2,730
Sikkim	10	1,300
TOTAL	19,001	2,168,581
Continental US	736	95,680
GRAND TOTAL	19,737	2,264,261

Aft

Country	Linear nm	Square nm
USSR	9,847	1,156,480
China	7,302	872,830
Mongolia	334	43,420
Rumania	271	35,230
India	233	30,290
Nepal	144	18,720
North Korea	134	35,110
South Korea	134	1,690
Hawaii	126	3,250
Poland	90	11,700
Bulgaria	90	8,190
Greece	90	11,700
Turkey	90	8,190
Taiwan	82	3,250
Norway	74	3,900
Canada	69	8,970
Burma	43	5,590
Bhutan	43	5,590
Tuamotu Archipelago	41	520
Afghanistan	35	4,550
Pakistan	35	4,550
Finland	21	2,730
Sikkim	6	780
TOTAL	19,334	2,277,230
Continental US	723	93,990
GRAND TOTAL	20,057	2,371,220

FWD and AFT

Country	Linear nm	Square nm
USSR	19,061	2,226,511
China	14,817	1,771,160
Mongolia	626	81,380
Rumania	493	61,230
India	438	56,940
South Korea	339	4,420
Pakistan	299	38,870
North Korea	257	39,920
Hawaii	252	6,500
Nepal	226	29,380
Bulgaria	201	18,330
Turkey	201	18,330
Poland	197	25,610
Taiwan	185	8,580
Greece	145	18,850
Canada	138	17,940
Norway	107	5,590
Burma	94	12,220
Bhutan	84	10,920
Tuamotu Archipelago	82	1,040
Afghanistan	56	7,280
Finland	21	2,730
Sikkim	16	2,080
TOTAL	38,835	4,465,611
Continental US	1,459	189,670
GRAND TOTAL	39,794	4,655,481

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Mission 1006-2 9 - 12 June 1964

Fwd

Country	Linear nm	Square nm
USSR	11,656	1,653,536
China	6,589	994,094
Tuamotu Archipelago	676	2,280
Mongolia	454	70,582
Japan	288	26,600
North Korea	216	17,064
East Germany	181	26,064
West Germany	180	25,920
Rumania	123	16,650
Kashmir	115	18,520
Hawaii	72	1,316
Burma	65	11,570
India	60	10,246
Pakistan	53	8,586
Czechoslovakia	45	6,480
Denmark	45	4,464
Bulgaria	31	900
South Korea	31	1,422
Afghanistan	27	4,374
Mexico	2	344
TOTAL	20,909	2,901,014
Continental US	857	143,712
GRAND TOTAL	21,766	3,044,726

Aft

Country	Linear nm	Square nm
USSR	12,584	1,708,552
China	6,231	936,374
Mongolia	716	111,366
Tuamotu Archipelago	546	2,280
Poland	320	46,720
Japan	307	27,020
Rumania	258	36,560
North Korea	213	33,226
East Germany	172	24,766
West Germany	129	18,576
Hawaii	90	1,692
Denmark	86	9,936
Kashimir	65	10,570
Czechoslovakia	43	6,192
India	33	5,476
Afghanistan	23	3,726
Pakistan	22	3,564
Burma	8	1,328
TOTAL	21,846	2,987,930
Continental US	855	148,456
GRAND TOTAL	22,701	3,136,386

FWD and AFT

Country	Linear nm	Square nm
USSR	24,240	3,362,088
China	12,820	1,930,466
Tuamotu Archipelago	1,222	4,560
Mongolia	1,170	181,948
Japan	595	53,620
North Korea	429	50,292
Rumania	361	53,210
East Germany	353	50,832
Poland	320	46,720
West Germany	309	44,496
Kashmir	180	29,090
Hawaii	162	3,008
Denmark	131	14,400
India	93	15,726
Czechoslovakia	88	12,672
Pakistan	75	12,150
Burma	73	12,898
Afghanistan	50	8,100
Bulgaria	31	900
South Korea	31	1,422
Mexico	2	344
TOTAL	42,755	5,888,944
Continental US	1,712	292,170
GRAND TOTAL	44,467	6,181,111

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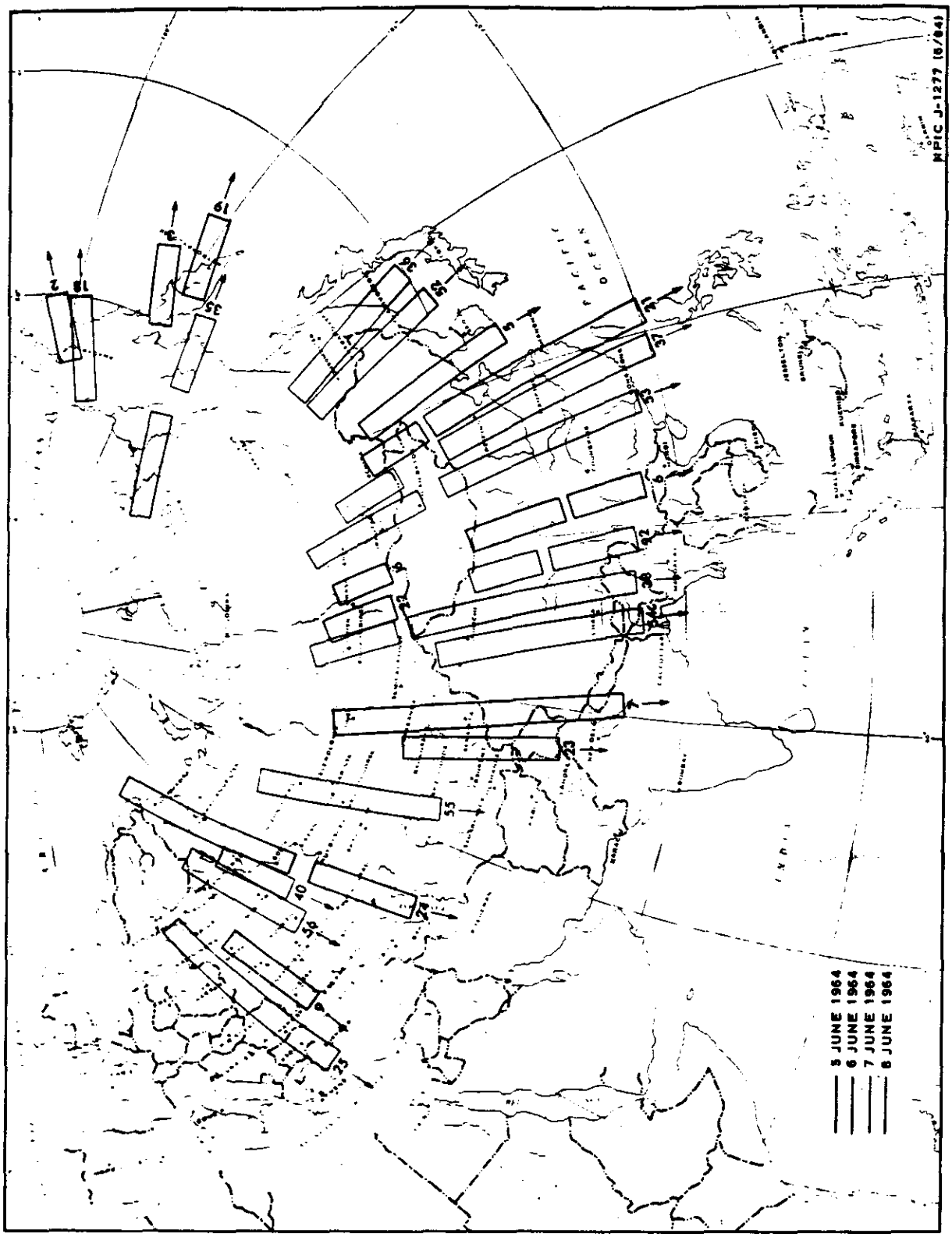
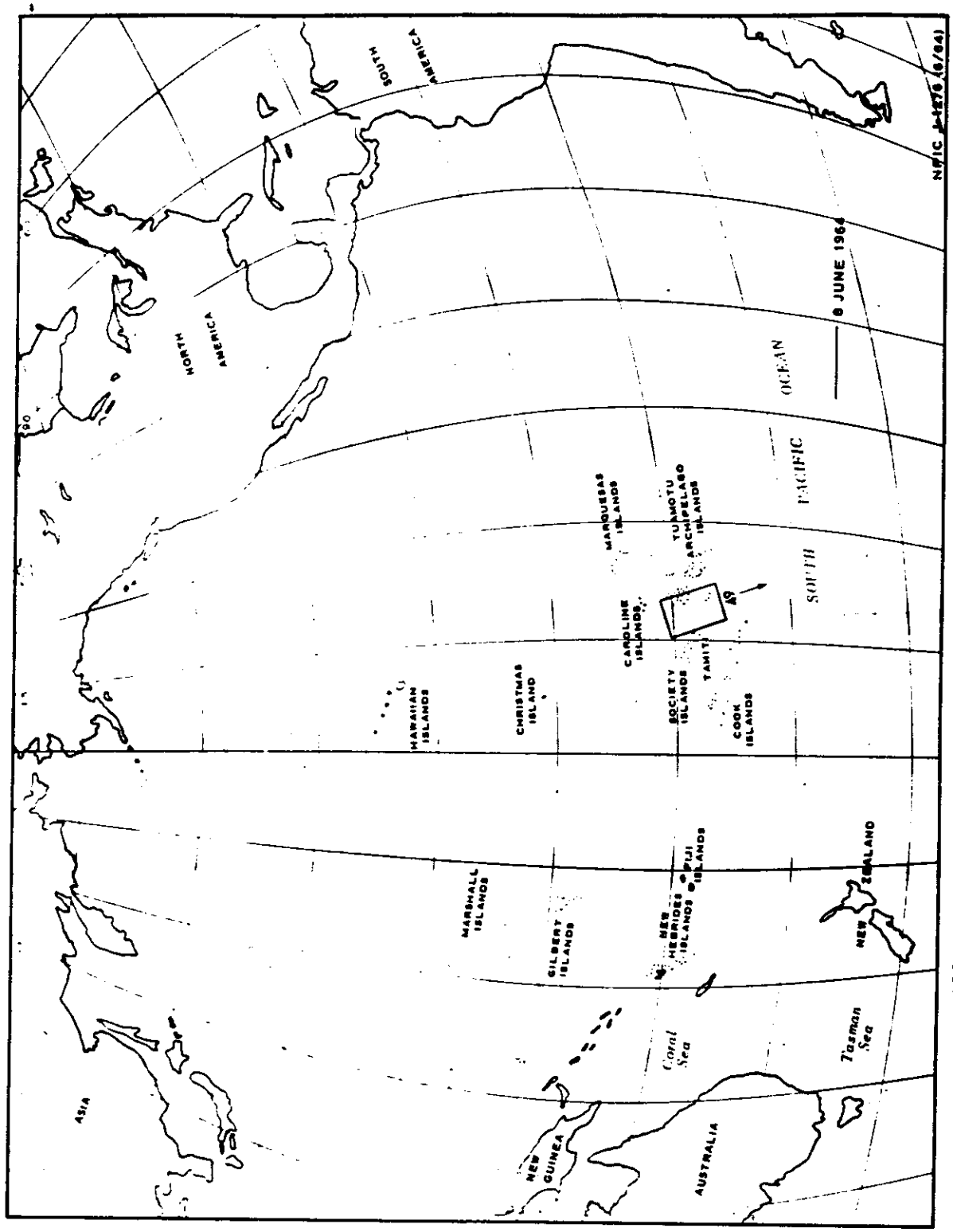
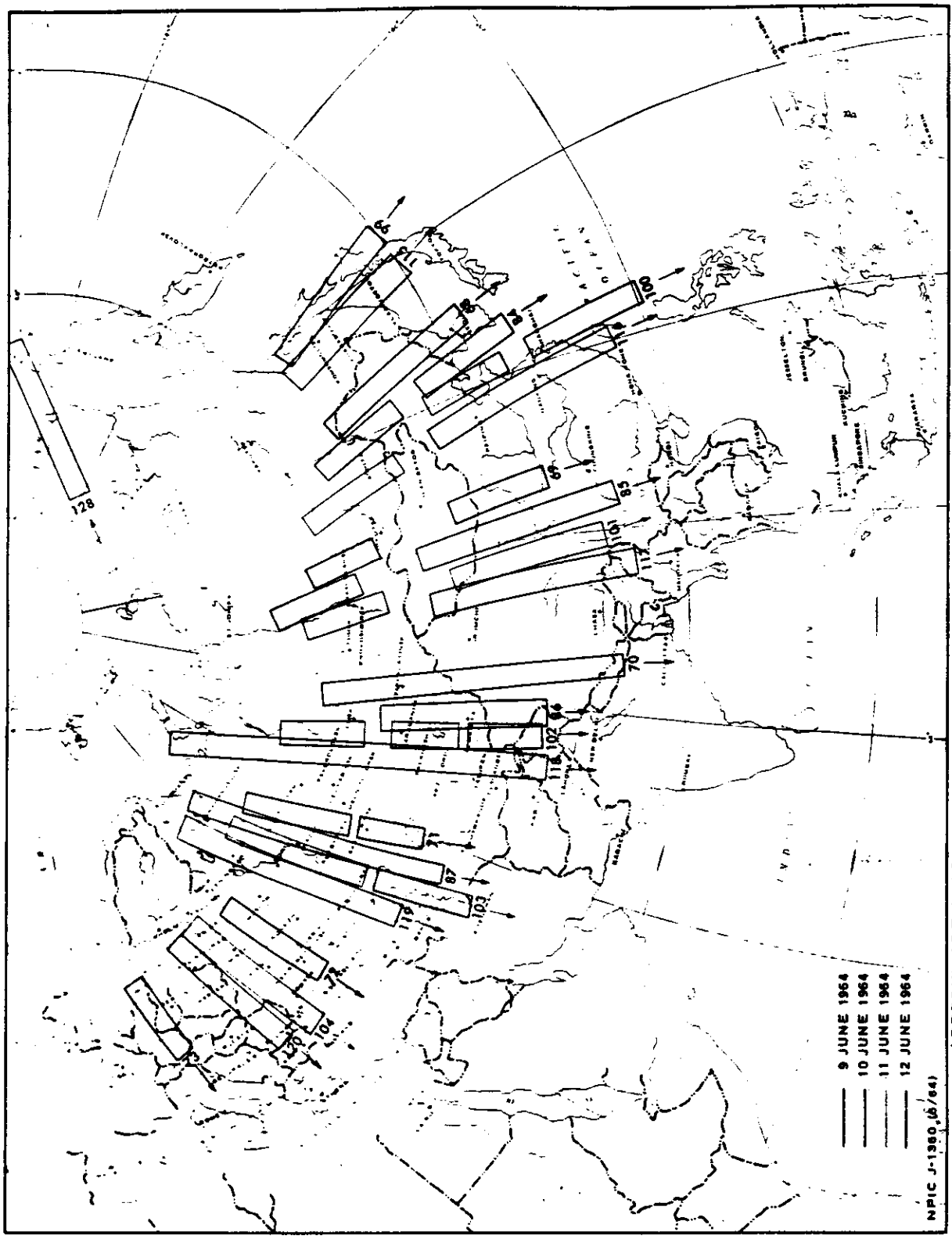


APPROXIMATE TRACK OF MISSION 1006-1, 5-8 JUNE 1964 OVER USSR, FAR AND MIDDLE EAST.



APPROXIMATE TRACK OF MISSION 1006-1, 5-8 JUNE 1964 OVER SOUTH PACIFIC.



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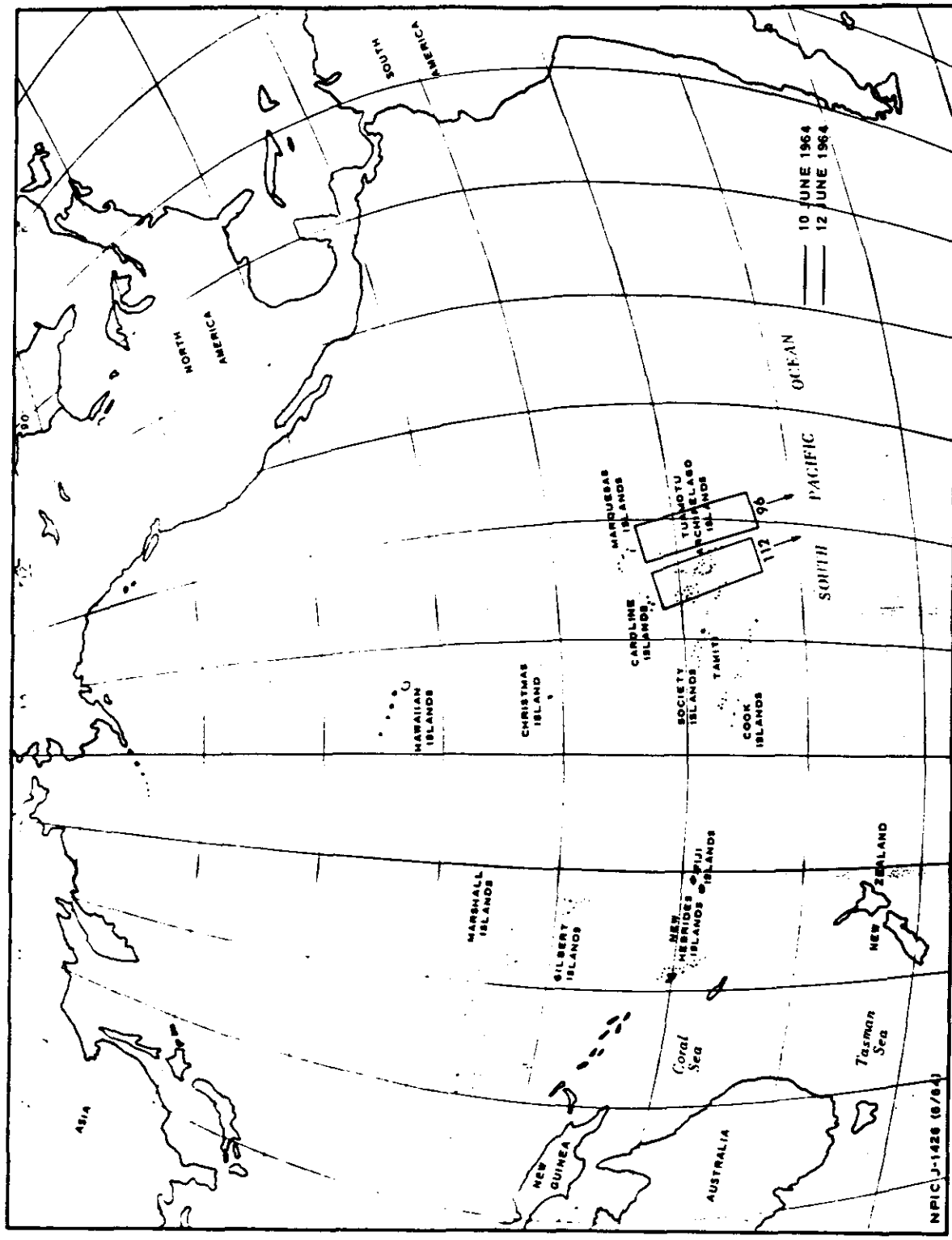

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