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TECHNICAL PUB ATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1026-1

28 OCTOBER - 2 NOVEMBER 1965

MISSION 1026-2

3-7 NOVEMBER 1965

[redacted]

FEBRUARY 1966

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1026-1
28 OCTOBER - 2 NOVEMBER 1965
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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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SYNOPSIS

Mission 1026 (J-25) was launched at 2116Z on 28 October 1965. Both portions of the mission (1026-1 and 1026-2) were recovered dry, in good condition, by air catch. The mission consisted of 67 operational, 11 domestic, and 4 engineering passes. All cameras operated properly throughout the mission.

Three minor malfunctions occurred in potentially dangerous areas. First, the sticking of a manufacturer's splice to a successive film wrap caused 4 frames of the forward-looking panoramic material, on the second portion of the mission, to be creased. This condition could have easily resulted in the jamming of the forward camera. Second, a shutter malfunction on 4 frames of stellar photography in Mission 1026-1 indicates that its operation was not positive. If it had failed completely, more than half of the stellar frames on the first portion of the mission would not have been recorded. Third, the least serious of the 3 anomalies was the intermittent failure of the center of format switch on the aft panoramic camera. This switch controls the recording of the binary word, camera number, and horizons on the aft record. It failed numerous times on the first portion of the mission but operated properly on the second part (1026-2).

The interpretation of the material is limited by cloud cover which degrades or obscures approximately 45 percent of the mission photography. Low solar elevations and cloud shadow also hamper its useability.

The quality of the photography is considered to be good, and an MIP of 85 was assigned.

The Trenton vs Yardleigh processor evaluation planned for the second half of the mission was inconclusive because of the high percentage of full-level processing used.

Due to a command error, the V/h programmer was not started on pass 87D of Mission 1026-2. Therefore, the photography was taken at the bottom of the V/h ramp and the imagery is affected by overexposure and displays excessive image motion. This pass consists of 37 forward and 37 aft frames.

GENERAL FLIGHT DATA

1. Launch and Recovery Dates

Launch Date, Mission 1026-1	28 October 1965, 2116Z
Recovery Date, Mission 1026-1	3 November 1965, 0012Z
Reactivation Date, Mission 1026-2	3 November 1965
Recovery Date, Mission 1026-2	7 November 1965, 2319Z

2. Orbital Parameters

	Mission 1026-1 (Rev 40)	Mission 1026-2 (Rev 150)
Period	90.615 min	90.256 min
Perigee	92.951 nm	[illegible]
Apogee	236.970 nm	225.[illegible]
Eccentricity	0.01996	0.01822
Inclination Angle	74.97°	[illegible]
Perigee Latitude	16.97°N	28.[illegible]°N

3. Photographic Operations

	Mission 1026-1	Mission 1026-2
Operational Passes	32	32
Domestic Passes	6	5
Operational-Domestic Passes	3	[illegible]
Engineering Passes	2	2

4. Recovery Revolution

a. Mission 1026-1: 81
b. Mission 1026-2: 160

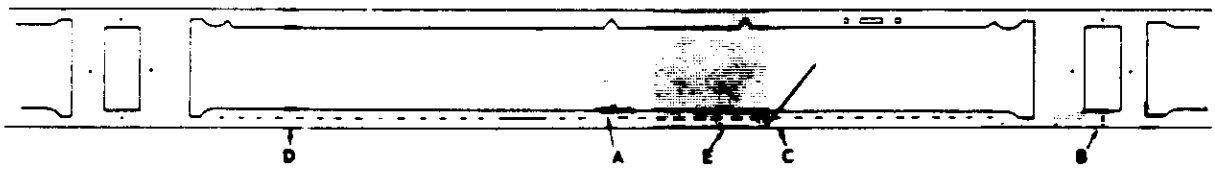
PART I. CAMERA OPERATIONS

1. Forward-Looking (Master) Panoramic Camera No 174

The forward-looking panoramic camera functioned properly throughout the mission. The photography is not affected by any major degradations. However, a few of minor severity are present.

a. The location of fog patterns caused by light leaks is illustrated below. These areas of fog are present throughout the mission, their density level being proportionate to the time span between camera operations. Although none are considered to be of a serious nature, action is being taken to eliminate them on future flights.

Approximate Location of Fog Patterns



A. 1st frame from start of pass.
B. 2nd frame from start of pass.
C. 3rd frame from start of pass.
D. 5th frame from start of pass.
E. 6th frame from end of pass.

b. Fine emulsion scratches are present under the camera number just inside the format at the binary edge. A series of extremely fine, short, emulsion scratches parallel to the major axis of the film is located under the camera number and in the bonus area at the take-up end of each frame. This raking is present across the width of the format at these locations.

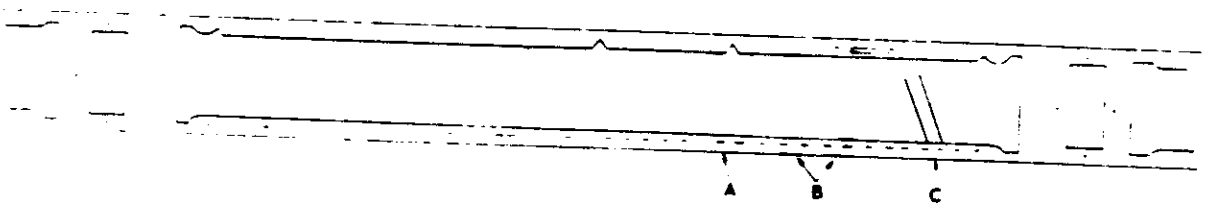
c. Traces of dendritic static discharges are present along the binary edge of the film in passes 5D, frames 35 thru 38; 51D, frames 25 thru 43; 52D, frames 1 thru 7; and 86D, frames 28 and 86. Static traces are present along the frequency mark edge of the film in pass 116D, frames 95 thru 98, and at both film edges in pass 8-D, frames 58 thru 112.

2. Aft-Looking (Slave) Panoramic Camera No 175

The aft-looking panoramic camera operated properly throughout the mission. The photography is not affected by any serious degradations. However, a few minor ones were noted.

a. The configuration of the fog patterns on the material is illustrated below. Elimination of the light leaks which cause these patterns is in progress. The fogged areas were present throughout the mission, and their density level is commensurate with the duration of the sit time between camera operations.

Approximate Location of Fog Patterns



A. [illegible] frame from start of pass.
B. [illegible] frame from end of pass.
C. [illegible] frame from end of pass.

- - -

b. Fine emulsion scratches are present just inside the format area under the camera number at both the binary and frequency mark edges. A series of extremely fine emulsion scratches, parallel to the major axis of the film, is located under the camera number and in the bonus area. These scratches form a raking pattern which is present across the width of the format at these locations.

c. Traces of dendritic static are present along the binary edge of the film in passes 7D, frame 3; 55D, frames 96 thru 111; and 56D, frames 9 thru 21. Both film edges contain static traces in pass -1D, frames - thru 16.

d. Streaks of minus density appear intermittently throughout the first half of the mission. In some instances, these streaks appear to follow the path of the field flatten. Others are parallel to the major axis of the film, and a few are randomly oriented. Examples can be found in passes 3D, frame 1, and 12D, frame 5.

3. Forward-Looking (Master) Horizon Cameras

Both master horizon cameras were operational throughout the mission. In the first pass (1D), the starboard horizon imagery is normal. From the second operational pass (3D) through pass 14D the imagery of this camera appears to be out-of-focus. When studied under magnification, the photography was discovered to display a sharp (in-focus) but veiled condition. The cause of this phenomenon, which has occurred on previous missions, is unknown. Most starboard horizons in part 2 of the mission are slightly to grossly overexposed. This heavy exposure is believed to be a combination of look angle and high reflectivity due to considerable cloud cover. An area of fog enters each starboard horizon format at the frequency-mark/supply corner. The level of fog is commensurate with the density of the horizon imagery. This area may result from a reflection on an external surface. The port horizon imagery is of good quality and the exposure is normal. Both horizons contain small traces of dendritic static. These occur intermittently along the frequency-mark edge of the format and affect neither the imagery nor the horizon area.

4. Aft-Looking (Slave) Horizon Cameras

Both slave horizon cameras were operational throughout the mission. The starboard horizon displayed a veiled condition on all passes from 1D through 116D. Veiling was so severe on the first half of the mission that it could not be determined whether the imagery was veiled or out-of-focus. This condition continued into the second half of the mission, where veiling gradually became less severe and cleared up by pass 117D.

Although this phenomenon has been experienced on previous missions, it is generally not present on the first pass and has always dissipated by the 25th pass. The condition experienced here is unusual in that it is present on the first pass and continues more than half way through the second bucket operation. The cause of this apparent veiling has not been determined but is being studied. Due to an intermittent malfunction of the center of format switch, several pairs of horizons were missing (see part 9 of this section for additional information). Both horizon formats contain small dendritic static traces. These occur intermittently along both the binary and frequency-mark edges of the format but affect neither the horizon imagery nor the arcs.

5. Stellar Camera No D75 Reseau No 93 (Mission 1026-1)

The stellar camera operated properly on all but 4 frames. The shutter did not open on frames 182 and 183. Frame 184 is slightly over-exposed. However, star images are detectable. Frame 185 is grossly overexposed. The area between frames 184 and 185 is fogged, indicating that the stellar shutter failed while in an open position on frame 184, remained open during film transport, and closed only after frame 185 had received an extremely long exposure. The stellar frame correlation with the forward-looking (master) camera for these frames is:

Mission 1026-1

Stellar Frame No.	Pass	Forward-Looking Camera Frame	Total Frames
177	30D	6	
178	30D	13	
179	30D	20	
180	30D	27	
181	30D	34	
182	30D	41	41
183	31D	7	
184	31D	14	20
185	34M	1	
186	34M	8	

The density level of the flare is low, and stellar images are detectable throughout the format area. The stars generally appear doubled or elongated, indicating slight vehicle instability. This vacillating is minor and within system specifications. Handling marks degrade frames 378 through 381, and a plus density streak with associated emulsion cracking is located between the correlation mark and the stellar format on frames 357 through 384. Film supply was depleted prior to mission completion, the last titled frame being 404. Approximately the last 2 feet of film were fogged and abraded due to runout. The quality of the stellar imagery is considered to be good, and no major problems were encountered in the stellar reduction. Streaked images, believed to be particles of crystallized jettisoned fuel, are present on the first 18 frames. A few isolated particles appear at random thereafter through the first half of the mission.

6. Stellar Camera No D72 Reseau No 85 (Mission 1026-2)

The stellar camera functioned properly through film exhaustion, the last titled frame being 388. The star images are of good quality although most are elongated or doubled. The last 30 frames are abraded due to runout, the last half of these being severely abraded. Emulsion cracks parallel to the minor axis are present throughout the material. A row of plus density dots with associated emulsion cracking is located 0.1 inch from the correlation mark edge of the film. These dots are spaced 1.58 inches apart and occur throughout the material. An irregular area of minus density located near the center of the format is imaged on every frame. It is believed to be caused by an obstruction on the reseau plate.

7. Index Camera No D75 Reseau No 92 (Mission 1026-1)

The index camera operated well throughout the mission, and the photographic quality is good. Some frames contain an image of a portion of the edge of the reseau. These images are caused by internal light scatter within the glass being refracted by the edge of the reseau to form an outline of its edge.

8. Index Camera No D72 Reseau No 89 (Mission 1026-2)

The index camera functioned properly throughout the mission, providing 434 titled frames. Two small minus density dots, caused by specks of foreign matter on the grid throughout the mission, and runout-induced fog on the final 2 frames are the only degradations. The quality of the imagery is considered to be good.

9. Associated Equipment

This equipment records part of the information required for correlation and mensuration of the panoramic cameras.

a. No binary word was recorded on the following forward-looking frames.

Pass	Frame
1D	3
37D	97
100D	35
130D	3
148D	21

b. An intermittent malfunction of the center of format switch on the aft-looking camera resulted in the camera number, binary word and index marks, and horizon exposures and fiducials (when required) not being recorded on the following frames. No pulse was skipped in the frequency-mark track on these frames, indicating that the clock was not interrogated.

Pass	Frames
3D	11, 12
6D	108, 139
7D	50
8D	16
19D	42
24D	51-56
37D	5, 6
38D	10-19 and 63-66
39D	58, 59 and 63-66
40D	37-43 and 63
52D	52, 53 and 62-72
53D	105
54D	1, 48
68D	26-29, 92, and 93
70D	21
82D	1
88D	12
111D	21
150D	75 and 76 present but smeared due to runout

FIGURE 1. DESCRIPTION OF PHOTOGRAPHIC DATA

The data pertaining to photographs contained in this publication are defined as follows:

PASS: A pass is the operational portion of an orbital revolution. A suffix D indicates that the photography was acquired during the descending portion, a suffix A indicates that the photography was acquired during the ascending portion, and a suffix M indicates that the photography was acquired during a pass that includes both ascending and descending portions. An additional suffix E indicates that the pass was an engineering operation or that a portion of the pass has been edited.

DATE OF PHOTOGRAPHY: The date of photography indicates the day, month, and year (GMT) that the photography was acquired.

UNIVERSAL GRID COORDINATES: These coordinates are included to locate the illustrated photography within the panoramic format.

ENLARGEMENT FACTOR: The enlargement factor is included to indicate the number of diameters the original material has been enlarged in the photographic illustration.

GEOGRAPHIC COORDINATES: These coordinates are included to indicate the latitude and longitude of the center of the panoramic format.

ALTITUDE: This measurement is the vertical distance from the vehicle to the Hough Ellipsoid at the time of the acquisition of the photography.

PITCH: Rotation of the camera about its transverse axis. Using appropriate aeronautical terminology, positive readings indicate nose-up attitude and negative readings indicate nose-down attitude.

ROLL: Rotation of the camera about its longitudinal axis. Using appropriate aeronautical terminology, positive readings indicate left wing-up attitude and negative readings indicate right wing-up attitude.

YAW: Rotation of the camera about its vertical axis. Positive readings indicate counterclockwise rotation when viewing the ground nadir from the vehicle-mounted camera in flight.

LOCAL SUN TIME: This time is included to present to the viewer a realistic time of acquisition of the photography illustrated.

SOLAR ELEVATION: The solar elevation is the angular elevation of the sun above a plane tangent to the surface of the earth at the center of the panoramic format. A negative solar elevation indicates that the sun is below the plane.

SOLAR AZIMUTH: The solar azimuth is the angular measurement of the rays of the sun measured from true north in a clockwise direction.

EXPOSURE: The exposure is the duration of the photographic exposure expressed in a fraction of a second and is computed from the scan rate and slit width.

PROCESSING LEVEL: The particular degree of development given to the film to attain negatives of the highest possible quality. Three levels of processing, Primary, Intermediate, and Full, are currently employed.

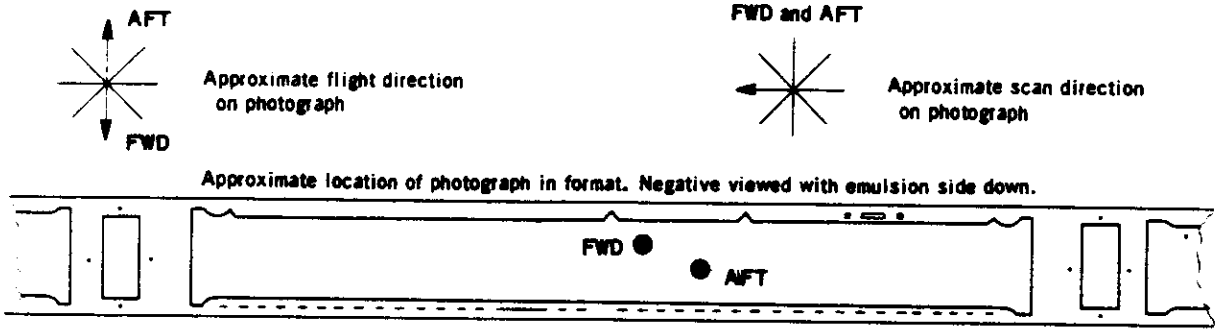
VEHICLE AZIMUTH: The clockwise measurement from true north to the longitudinal axis of the vehicle heading.

FIGURES 2 AND 3. EXAMPLE OF GOOD QUALITY PHOTOGRAPHY

The industrial complexes illustrated here indicate the good quality of the photography throughout the mission. The acuity of the aft-looking material is slightly better than that of the forward-looking.

NPIC K-6170 (2/66) NPIC K-6171 (2/66)

	FIGURE 2	FIGURE 3
Camera	Fwd-Looking	Aft-Looking
Pass	14D	46D
Frame	5	11
Date of Photography	29 Oct 65	31 Oct 65
Universal Grid Coordinates	48.5 - 13.5	56 - 10.1
Enlargement Factor	20X	20X
Geographic Coordinates	39-53N 82-59W	39-09N 94-14W
Altitude (feet)	645,120	616,220
Camera:		
Pitch	14°29'	-15°12'
Roll	0°18'	0°7'
Yaw	0°2'	0°9'
Local Sun Time	1241	1217
Solar Elevation	33°43'	35°13'
Solar Azimuth	192°	186°
Exposure (fractions of second)	1/111	1/177
Processing Level	Full	Full
Vehicle Azimuth	159°50'	160°36'



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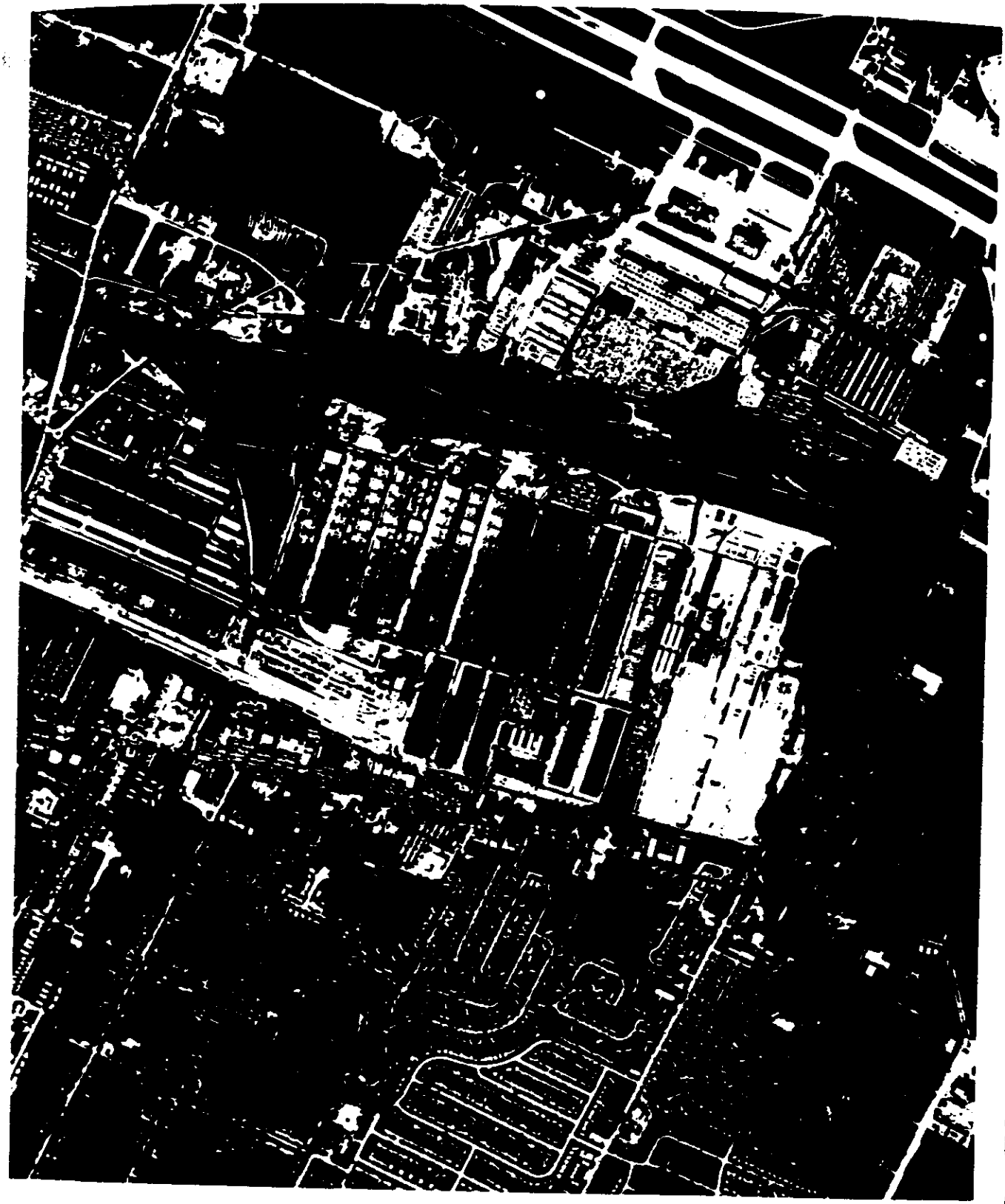

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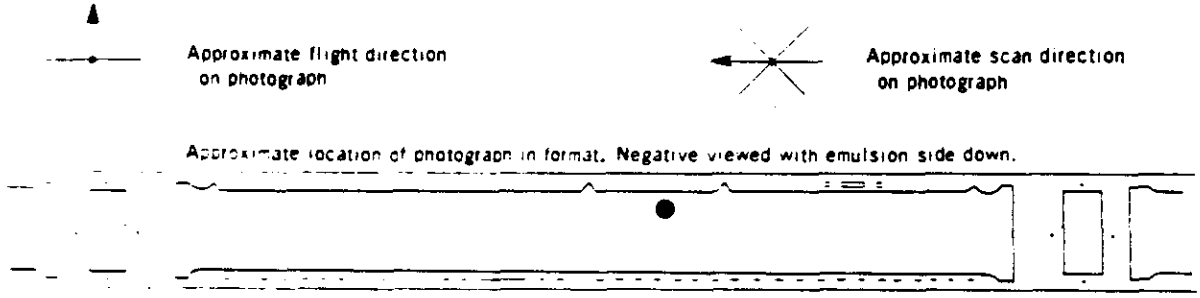
FIGURE 4. EXAMPLE OF IMPROPER IMC

The image smear, which is easily detectable on the accompanying photography, is the result of improper IMC. Due to a command error, the V/h programmer was not started for this pass. Therefore, the photography was accomplished at the bottom of the V/h ramp.

Camera	Aft-Looking
Pass	87D
Frame	34
Date of Photography	3 Nov 65
Universal Grid Coordinates	55 - 14
Enlargement Factor	20X
Geographic Coordinates	39-19N 49-28E
Altitude (feet)	597,158
Camera:	
Pitch	-15°10'
Roll	-0°9'
Yaw	Not Available
Local Sun Time	1216
Solar Elevation	31°52'
Solar Azimuth	138°
Exposure (fractions of second)	1/79
Processing Level	Full
Vehicle Azimuth	160°23'



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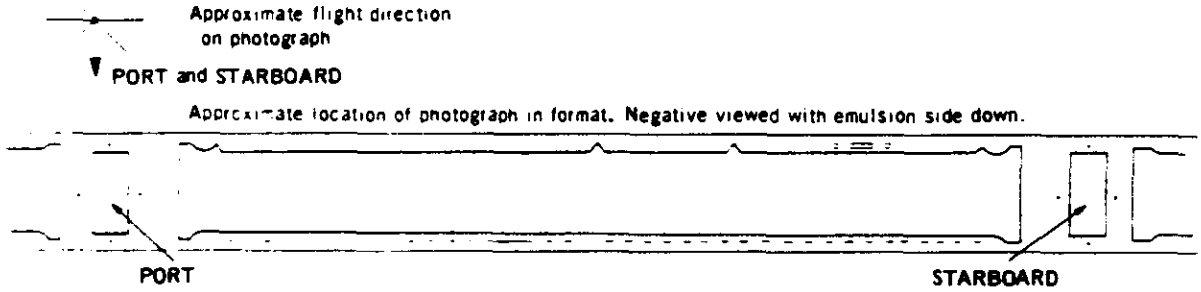
FIGURES 5 AND 6. EXAMPLE OF NORMAL AND VEILED HORIZON IMAGERY OF THE FORWARD HORIZON CAMERAS

The port horizon appears normal while the starboard horizon of the same panoramic frame displays a veiled condition. This veiling is present on passes 3D through 14D on the material of the forward starboard horizon camera.

NPIC K-6173 (2/66) NPIC K-6174 (2/66)

	FIGURE 5	FIGURE 6
Camera	Fwd Port Horizon	Fwd Starboard Horizon
Pass	6D	6D
Frame	152	152
Date of Photography	29 Oct 65	29 Oct 65
Universal Grid Coordinates	5.5 - 12	87 - 12
Enlargement Factor	3X	3X
Geographic Coordinates of Vehicle Nadir	31-59S 117-52E	31-59S 117-52E
Altitude (feet)	721,528	721,528
Camera:		
Pitch	14°41'	14°41'
Roll	0°3'	0°3'
Yaw	-1°9'	-1°9'
Local Sun Time	1449	1449
Solar Elevation	46°21'	46°21'
Solar Azimuth	154°	154°
Exposure (fractions of second)	1/100	1/100
Processing Level	Intermediate	Intermediate
Vehicle Azimuth	162°15'	162°15'



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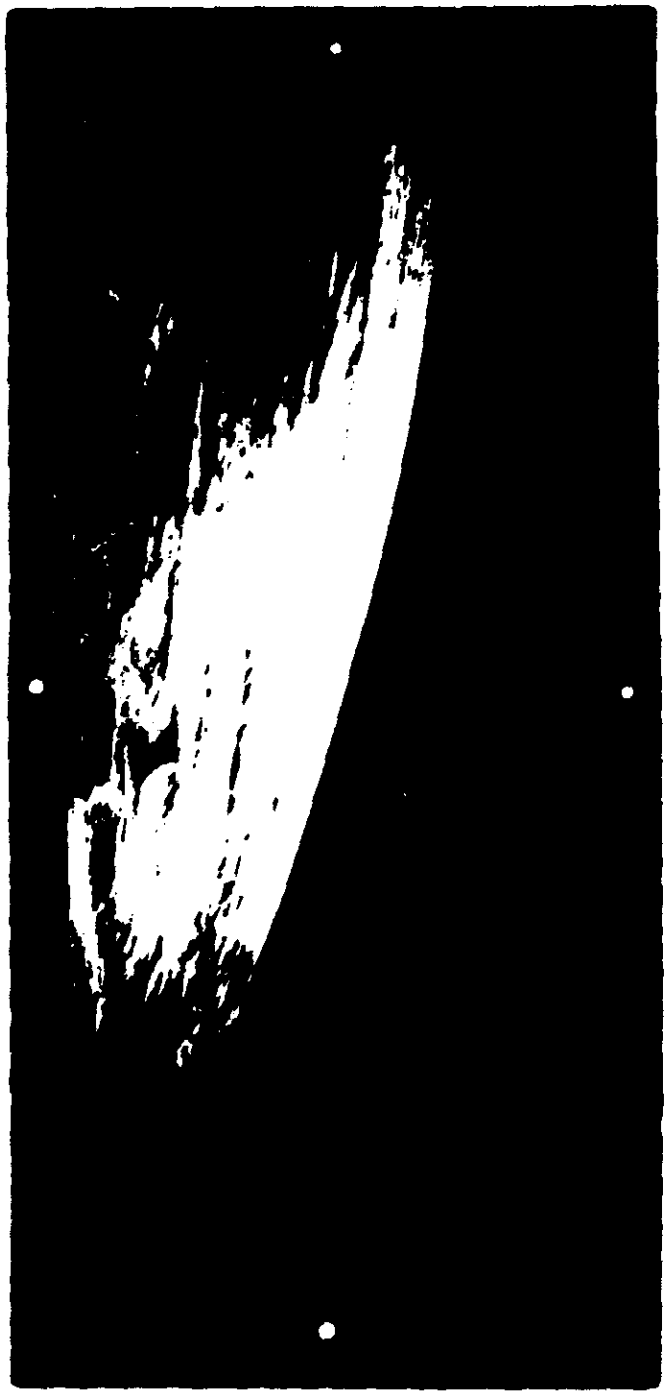

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FIGURES 7 AND 8. EXAMPLE OF NORMAL AND VEILED HORIZON IMAGERY OF THE FWD AND AFT STARBOARD HORIZON CAMERAS

The veiled condition of the aft starboard horizon can be compared with the normal condition of the fwd starboard horizon. These photographs were taken at approximately the same time. It is felt that the difference in look angle (fwd vs aft) of the horizon cameras accounts for the variance in the quality.

NPIC K-6178 (2/66) NPIC K-6178 (2/66)

	FIGURE 7	FIGURE 8
Camera	Fwd Starboard Horizon	Aft Starboard Horizon
Pass	84D	84D
Frame	13	13
Date of Photography	3 Nov 65	3 Nov 65
Universal Grid Coordinates	87 - 12	5.5 - 12
Enlargement Factor	3X	3X
Geographic Coordinates of Vehicle Nadir	41-39N 116-59E	41-39N 116-59E
Altitude (feet)	601,654	601,793
Camera:		
Pitch	14°30'	-15°30'
Roll	-0°4'	-0°4'
Yaw	Not Available	Not Available
Local Sun Time	1214	1214
Solar Elevation	34°43'	33°52'
Solar Azimuth	184°	184°
Exposure (fractions of second)	1/100	1/100
Processing Level	Full	Full
Vehicle Azimuth	159°46'	159°46'

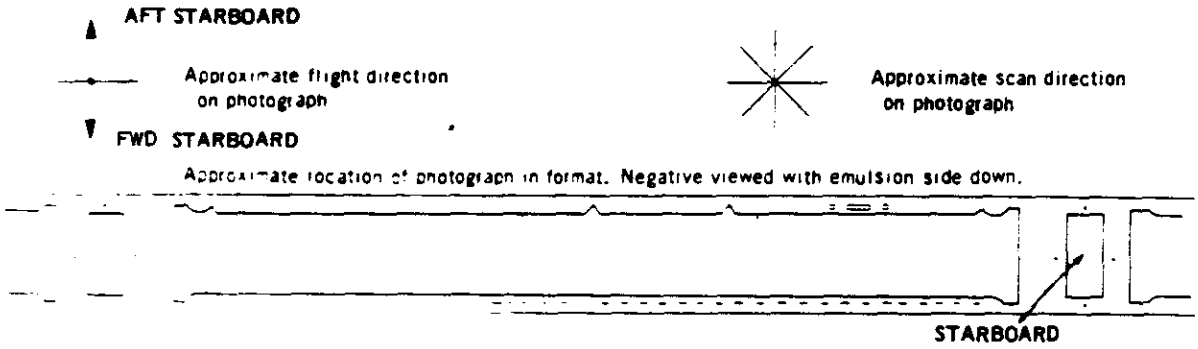

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FIGURE 9. QUALITY OF INDEX PHOTOGRAPHY ON MISSION 1026-1

The quality of the index photography of Mission 1026-1 is shown here. The location of the image of the reseau edge is indicated in the drawing on page 10 1.

NPIC K-6177 (2/66)

Camera	Index (1026-1)
Pass	64D
Frame	351
Date of Photography	1 Nov 65
Enlargement Factor	2X
Geographic Coordinates	65-28N 166-48W
Altitude (feet)	662,898
Camera:	
Pitch	15°7'
Roll	0°5'
Yaw	-0°2'
Local Sun Time	1030
Solar Elevation	9°24'
Vehicle Azimuth	141°32'

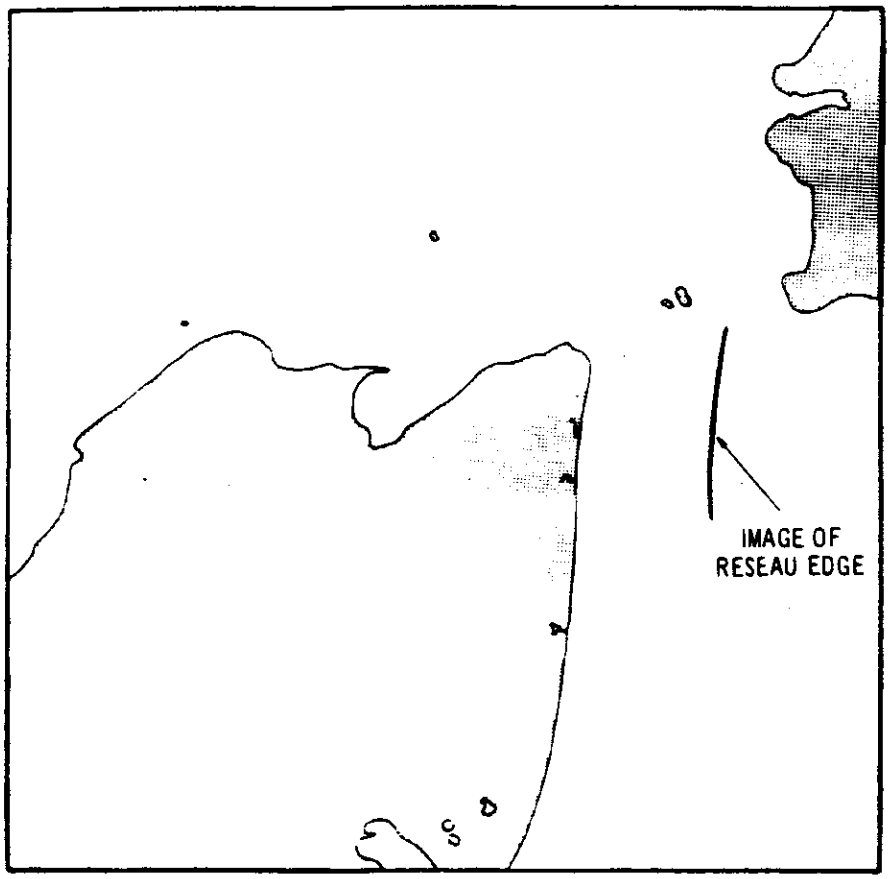

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FIGURE 10. EXAMPLE OF MALFUNCTION OF THE STELLAR UNIT ON MISSION 1021-1

Those frames involved with the slight malfunction of the stellar camera are illustrated. This anomaly is described in Part I, section 5, of this report. The frames on which the malfunction occurred are 182, 183, 184, and 185.

NPIC K-6178 (2/66)

Camera	Stellar (1026-1)
Pass	30D & 31D
Frame	180 - 185
Date of Photography	30 Oct 65
Enlargement Factor	Contact
Exposure (second)	2

[redacted]

[redacted]

PART II. FILM

1. Film Processing

This section provides an evaluation of exposure, processing, and densities of the original negatives from Mission 1026.

a. The following slit width and filter combination were employed on the panoramic cameras in this mission.

	Slit Width	Filter
Forward-Looking Camera	0.225"	25
Aft-Looking Camera	0.150"	21

Solar elevations ranged from -4°48' to 72°57' on operational photography. About 35 percent of the photography was accomplished with solar elevations of 20 degrees or less. The processing contractor reported that densities read on the original negatives of this mission ranged lower than normally observed on previous missions even though most of this mission received the full level of processing. Although the same slit width and filter combinations were utilized on missions 1023 and 1024, it is felt that this mission received less exposure because of the difference in solar elevation. Also, due to the high percentage of cloud cover, a larger amount of photography than usual was accomplished of areas in cloud shadow. It is felt that additional exposure would have helped those areas affected by low solar elevation and/or cloud shadow. An increase in exposure would not have hindered the photography in areas of relatively high solar elevation and good weather conditions, and would have enabled more processing to be carried out at a lower level, reserving the full processing level for special areas. The exposure level of the index photography appeared slightly less than usual, indicating a lower level of illumination throughout the mission. The exposure of stellar photography is considered to be good.

SOLAR ELEVATION OF FORWARD-LOOKING FRAMES

Pass	Solar Elevation Less than 10°	Solar Elevation 10° to 20°	Solar Elevation Greater than 20°
1D	1-27	28-45	
3D	1-28	29-39	40-58
5D	1-5	6-49	50-87
6D			1-169
7D		1-14	15-79
8D	1	2-67	68-72
9D		1-9	10-90
14D			1-95
16D			1-11
19D	1-29	30-51	
20D	1-10	11-74	
21D			1-108
23D		1-19	20-72
24D		1-12	12-101
25D			1-31
26D			1-79
30D			1-41
31D			1-20
34M	1-84	85-93	
35M	1-76	77-85	
37D		1-13	14-164
38D			1-153
39D	1-19		20-109
40D		1-19	20-98
41D			1-61
46D			1-21
47DE			1-19
51D		1-45	
52D			1-72
53D		1-34	35-105
54D	1-32	33-65	66-91
61D			1-17
63D			1-16
64D	1-19		
66D			1-20
68D	1-51	52-69	70-125
69D	1-29	30-86	87-114
70D			1-42
72D		1-31	32-129
76D			1-16
79D			1-11
82D		1-6	7-40
83D			1-34

SOLAR ELEVATION OF FORWARD-LOOKING FRAMES
(cont'd)

Pass	Solar Elevation Less than 10°	Solar Elevation 10° to 20°	Solar Elevation Greater than 20°
84D			1-123
85D	1-6	7-68	69-121
86D	1-6	7-68	69-135
87D			1-37
88D		1-22	23-131
89D			1-82
94D	1-21		22-62
95D	1-35		
98D	1-2	3-41	
99D	1-23	24-62	63-90
100D	1-2	3-65	66-104
101D	1-54	55-78	
102D		1-39	40-82
103D		1-52	53-159
104D		1-26	27-91
105D			1-48
110D			1-20
116D	1-37	38-84	85-158
117D	1-2	3-65	66-105
118D		1-42	43-91
119D			1-62
120D		1-2	3-42
126D			1-21
130D		1-27	28-57
131D	1-55	56-75	76-131
132D	1-30	30-94	95-122
133D		1-48	49-126
134D		1-42	43-105
135D		1-49	50-78
142D			1-11
144D			1-18
148D		1-38	39-159
149D		1-54	55-71
150D		1-40	41-78
151D		1-42	

b. The entire footage from both the forward and aft panoramic cameras on the first half of the mission (1026-1) was processed in the Trenton processor. This machine employs infrared detection densitometry to determine the optimum level of development. Seventeen processing changes were required for the forward and 12 for the aft material. The percentages of Mission 1026-1 processed at the various levels are as follows:

Development Level	Forward	Aft
Primary	0	0
Intermediate	20.8	4.2
Full	79.2	95.8

c. Approximately half of the material from both panoramic cameras on the second portion of the mission (1026-2) was processed in the Yardleigh processor in order to determine the advantages or disadvantages of this machine. The Yardleigh is a frame-by-frame processor capable of changing the processing level for each frame according to the Dmin value as read by infrared densitometry. It utilizes the same 3 levels of processing as the older Trenton machine but provides an immediate, rather than gradual, change in development level. The Trenton requires up to 40 feet of film in which to complete an entire processing level change. Through the primary level of development, the operation of the Yardleigh is the same as that of the Trenton; both employ the spray technique. The full and intermediate levels of development in the Yardleigh, however, are accomplished by utilizing the developing agent suspended in a viscose medium. The application of the viscose developer is automatically controlled according to the density of the negative as read by an infrared densitometer. Changes in processing levels are almost instantaneous, affording frame-by-frame control of the processing level. The forward and aft panoramic material from the first half of Mission 1026-2 was processed in the Trenton. The second half of each panoramic camera was processed in the Yardleigh. The percentages processed at the various levels for each machine are as follows:

First Half	Mission 1026-2	Trenton Processor
Development Level	Forward	Aft
Primary	0%	0%
Intermediate	5%	4%
Full	95%	96%
Number of Processing Level Changes	4	4

Second Half	Mission 1026-2	Yardleigh Processor
Development Level	Forward	Aft
Primary	3%	4%
Intermediate	5%	6%
Full	92%	90%
Number of Processing Level Changes	109	93

Because of the high percentage of full processing, an evaluation of the advantages or disadvantages of the Yardleigh processor is impossible. No difference in the quality of the material processed in either machine was detected. It was necessary to cut the panoramic film to enable the processing to be accomplished on the 2 machines. A night engineering pass was programmed to provide approximately 25 feet of blank footage in which to perform this cut. Since there is no accurate way of determining film footage prior to processing without jeopardizing the safety of the material, only a rough judgement regarding the location of this blank footage could be made. The cut in the forward-looking panoramic film was accomplished in frame 53 of pass 102D. This is 30 frames, or approximately 75 feet, before the blank footage. The aft-looking film was cut in frame 130 of pass 103D. This cut came 103 frames, or about 260 feet, after the blank material. Considering the method employed to determine the correct location for the cut, the areas chosen were suprisingly close. Although the cuts did fall in an area of imagery, the amount of film degraded is less than that normally covered by a manufacturer's splice.

2. Physical Film Degradations

Emulsion digs, scratches, pinholes, and handling marks are minor and considered nominal on the panoramic and index material. Handling marks degrade frames 378 thru 381 of the stellar material from Mission 1026-1. A biased crease, indented from the base side of the film, begins 0.8 inch from the frequency-mark edge of forward panoramic frame 43 of pass 100D. It continues and runs off the film at the frequency-mark edge in frame 46. Compressive forces caused the adhesive of a manufacturer's splice in frame 51 to cold flow and adhere to a successive film wrap. This caused a momentary hesitation in the film supply which created a tension transient and allowed the film to crease during transport. An adhesive transfer is present in frame 52, 4 feet 4.5 inches from the splice. Other manufacturer's splices on the forward material are located in passes 21D, frame 9; 38D, frame 150; 72D, frame 30, 126D, frame 8; and on the aft material in passes 30D, frame 35; 70D, frame 3; 104D, frame 12. The last frame of the aft and the last 2 frames of the forward panoramic material were severly abraded due to runout.

3. Film Footage

Camera	Footage	Frames
Forward-Looking Panoramic Camera No 174 Mission 1026-1	8030	2923
Aft-Looking Panoramic Camera No 175 Mission 1026-1	8103	2954
Stellar Camera No 75 Mission 1026-1	45	404
Index Camera No 75 Mission 1026-1	91	416
Forward-Looking Panoramic Camera No 174 Mission 1026-2	*	3023
Aft-Looking Panoramic Camera No 175 Mission 1026-2	*	2993
Stellar Camera No 72 Mission 1026-2	40	388
Index Camera No 72 Mission 1026-2	91	434

*Because the Trenton and Yardleigh processors were used for both the forward and aft panoramic material, only the total of all panoramic footage is available. Forward plus aft footage is 15,908 feet.

PART III. IMAGE QUALITY

1. Definition of Photographic Interpretation (PI) Suitability

PI suitability 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, and weather limitations. 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 photographic interpreter may extract useful and reliable information from the material.

PI suitability ratings are: Excellent, Good, Fair, Poor, and Unuseable. 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. The standards that determine assignment of the various ratings are:

Excellent: The photography is free of degradations 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 optimum 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 present, and the acuity of the photography is less than optimum. Edges and corners are not crisply defined, and there is loss of detail in shadow or highlight areas. Detection and identification of small objects are possible but accuracy of mensuration is limited by the fall-off in image quality and the less-than-optimum contrast.

Poor: Camera-induced degradations or weather limitations severely reduce the effectiveness of the photography. Edges and corners are not well defined. 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.

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

2. PI Suitability, Missions 1026-1 and 1026-2

The PI suitability of Missions 1026-1 and 1026-2 is considered to be fair to poor due to adverse weather conditions which greatly limited the informational content of both portions of the mission. Cloud cover degraded or obscured approximately 40 percent of the photography on Mission 1026-1 and about 47 percent on 1026-2. Only 246 targets were reported in the preliminary readout. The interpretability of most of these targets was reduced by scattered clouds, cloud shadow, haze, and other atmospheric influences. Photography in the extreme northern latitudes was restricted in informational content by the low solar elevations at this time of the year. Photography in areas of low solar elevation and in cloud shadow was reported to appear grainy. Such an appearance is directly attributed to the low level of illumination and, hence, the lack of sufficient exposure. Industrial haze, obliquities of greater than 25 degrees, and reduced scale of the photography, or a combination thereof, also hampered the interpretation of some targets.

The photographic interpreters reported that, for the most part, the quality of the photography in the domestic areas was good, withstanding enlargement of 40 times. However, due to the aforementioned degrading influences, the greater portion of the operational photography was considered to be of fair to poor quality. With this type of weather conditions, such a rating is to be expected.

3. Definition of 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, minimum 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 cloud-free frames because cloud shadows from 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 format and on frames as close as possible to perigee for scale purposes and to eliminate obliquity.

g. Select frames having near optimum solar elevation.

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, Missions 1026-1 and 1026-2

Based on the foregoing criteria, frame 13 of pass 78D from the aft-looking panoramic camera was selected as the MIP frame of Mission 1026-1. This frame displays good exposure, contrast, and small detail is readily discernible. The solar elevation is 34°57' and the film received the full level of processing. The aft camera photography is slightly better than that of the forward throughout the mission. Prevailing atmospheric conditions, coupled with the look angle of the forward-looking camera, could easily account for this slight difference in quality.

The selection of an MIP frame on Mission 1026-2 was made extremely difficult by the lack of suitable areas at the format center in cloud-free photography. Frame 21 of pass 84D from the aft-looking camera was chosen as the MIP frame of Mission 1026-2. The solar elevation was 35°00' and the film was processed at the intermediate level. An MIP rating of 85 was assigned for both parts of Mission 1026.

5. Highlights of the Mission

a. A large dome or dish-shaped object was observed on the ground adjacent to an electronic site.

b. The new termination point of a rail bed under construction toward a missile launch facility was established.

c. Six new launch facilities were discovered.

d. A previously identified tower-like object at a test area was determined to be a drill rig.

e. A new crater was observed at the center of a new test area.

f. The confirmation of 2 suspect missile launch sites under construction was accomplished.

6. Image Analysis of Resolution Targets

Six resolution target displays were photographed on Mission 1026-1. Five were recorded by both the forward and aft-looking cameras while the sixth was photographed by only the forward-looking camera. No target displays were recorded on the second phase (1026-2) of the mission. The ground resolution, as read by 3 experienced photographic analysts, on the original negatives and on a second generation positive print is presented in the following table. In target orientation, those bars which are most perpendicular to the line of flight determine the resolution in the flight direction. Those which are most perpendicular to the direction of scan resolve the resolution in the scan direction.

Resolution Target Readings

	Pass	Frame	Camera (Looking)	Target Type	Orientation On Film	Reading Of Original Negative — Analyst I	II	III	Reading Of Duplicate Positives — Analyst I	II	III
A	[illegible]	[illegible]	Fwd	Fixed	Flight	NR	NR	NR	NR	NR	NR
					Scan	NR	NR	NR	NR	NR	NR
A	[illegible]	[illegible]	Aft	Fixed	Flight	8'0''	8'0''	8'0''	NR	NR	NR
					Scan	NR	NR	NR	NR	NR	NR
B	[illegible]	[illegible]	Fwd	Portable	Flight	16'0''	16'0''	16'0''	NR	NR	NR
					Scan	7'0''	12'0''	12'0''	16'0''	12'0''	16'0''
[illegible]	[illegible]	[illegible]	Aft	Portable	Flight	12'0''	12'0''	12'0''	12'0''	12'0''	12'0''
					Scan	7'0''	12'0''	12'0''	12'0''	12'0''	12'0''
C	47DE	[illegible]	Fwd	Fixed	Flight	9'8''	10'10''	10'10''	9'8''	9'8''	9'8''
					Scan	NR	NR	NR	9'8''	9'8''	9'8''
C	47DE	14	Aft	Fixed	Flight	NR	NR	NR	9'8''	9'8''	9'8''
					Scan	NR	NR	NR	10'10''	9'8''	10'10''
D	47DE	[illegible]	Fwd	Fixed	Flight	12'12''	13'8''	13'8''	10'10''	13'8''	10'10''
					Scan	9'8''	12'2''	12'2''	13'8''	13'8''	13'8''
D_1	47DE	15	Aft	Fixed	Flight	8'7''	8'7''	8'7''	8'7''	8'7''	8'7''
					Scan	10'10''	10'10''	10'10''	9'8''	9'8''	9'8''
E	47DE	10	Fwd	Portable	Flight	7'3''	7'3''	7'3''	12'0''	16'0''	12'0''
					Scan	12'0''	12'0''	12'0''	12'0''	12'0''	12'0''
E_1	47DE	16	Aft	Portable	Flight	8'0''	8'0''	8'0''	16'0''	16'0''	16'0''
					Scan	8'0''	8'0''	8'0''	12'0''	12'0''	12'0''
F	61D	15	Fwd	Fixed	Flight	NR	NR	NR	NR	NR	NR
					Scan	NR	NR	NR	NR	NR	NR

NR - Denotes No Target Elements Readable

Resolution Targets [illegible]

[illegible]	[illegible]	A	B	B_1	C	C_1	D	D_1	E	E_1	F
[illegible] ([illegible])	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47DE	[illegible]	[illegible]	47DE	47DE	47DE	61D
[illegible]	[illegible]	[illegible]	16	16	8	[illegible]	[illegible]	15	16	16	15
Date of [illegible]	[illegible]	[illegible] Oct 65	31 Oct 65	31 Oct 65	31 Oct 65	[illegible]	31 Oct 65	31 Oct 65	31 Oct 65	31 Oct 65	1 Nov 65
[illegible] Grid Coordinates	[illegible]	[illegible]	[illegible] 12.3	43.4 12.6	62.8 12.7	[illegible]	[illegible]	[illegible] 14.5	[illegible]	[illegible]	46.6 15.5
[illegible] Coordinates of Target Center	[illegible]	[illegible]N 93-[illegible]W	48-[illegible] 93-[illegible]	39-24N 93-57W	36-00N 116-24W	[illegible]	[illegible]	36-[illegible] 116-[illegible]	[illegible]	36-[illegible] 116-[illegible]	38-[illegible] 76-[illegible]W
[illegible]	[illegible]	[illegible],695	61[illegible]	613,410	609,116	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]:											
[illegible]	NA										
R[illegible]	NA										
Yaw	NA										
Local Sun Time	[illegible]	1241	1213	1213	1220	[illegible]	1221	1221	1221	1221	[illegible]
Solar Elevation	[illegible]	33°35'	35°37'	35°52'	37°33'	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Solar Azimuth	192°	192°	183°	183°	186°	186°	186°	186°	186°	186°	181°
Exposure (Fractions Of Second)	1/1[illegible]	1/179	1/120	1/182	1/122	1/185	1/122	1/185	1/123	1/185	1/123
Processing Level	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Vehicle Azimuth	159°50'	159°51'	160°36'	160°36'	161°02'	161°02'	161°02'	161°02'	161°02'	161°02'	159°52'
Wratten Filter	25	21	25	21	25	21	25	21	25	21	25
Target Type	Fixed AB	Fixed AB	Portable T-Bar	Portable T-Bar	Fixed 1 Mill. Strd	Fixed 1 Mill. Strd	Fixed 1 Mill. Strd	Fixed 1 Mill. Strd	Portable T-Bar	Portable T-Bar	Fixed Non-standard
Target Contrast	High	High	Medium	Medium	High	High	High	High	Medium	Medium	High
Weather Conditions	NA	NA	NA	NA	NA	NA	NA	NA	Slight Haze	Slight Haze	NA

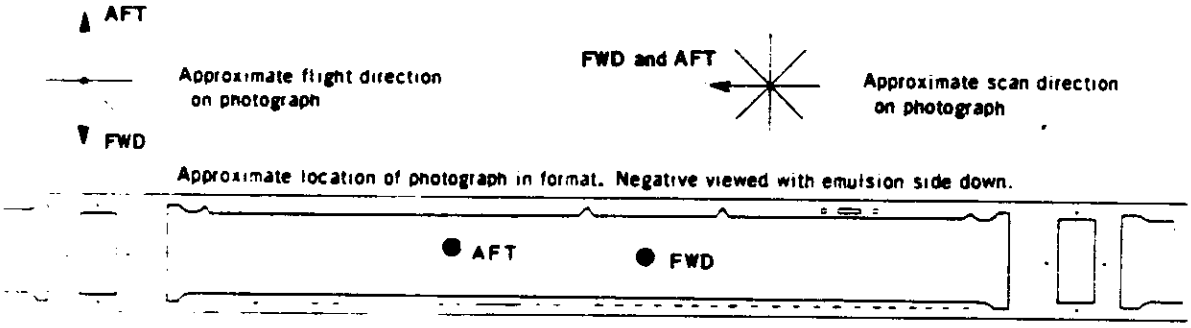
NA - Denotes not available

FIGURES 11 AND 12. EXAMPLE OF IMAGERY ON MIP AND CORRESPONDING FORWARD FRAME OF MISSION 1026-1

The quality of the photography illustrated here is considered good in that engine nacelles on the larger aircraft are discernible, edges and corners are well-defined, and no unusual distortions are present. The quality of the aft photography can be seen to be slightly better than that of the forward. This condition prevails throughout the mission.

NPIC K-6179 (2/66) NPIC K-6180 (2/66)

	FIGURE 11	FIGURE 12 MTP Frame 1026-1
Camera	Fwd-Looking	Aft-Looking
Pass	78D	78D
Frame	7	13
Date of Photography	2 Nov 65	2 Nov 65
Universal Grid Coordinates	55.3 - 10.8	34.8 - 13.6
Enlargement Factor	20X	20X
Geographic Coordinates	39-43N 105-14W	39-51N 105-21W
Altitude (feet)	603,456	600,778
Camera:		
Pitch	15°12'	-15°2'
Roll	-0°4	-0°8'
Yaw	Not Available	Not Available
Local Sun Time	1150	1150
Solar Elevation	34°57'	34°57'
Solar Azimuth	177°	177°
Exposure (fractions of second)	1/123	1/182
Processing Level	Full	Full
Vehicle Azimuth	159°47'	159°47'



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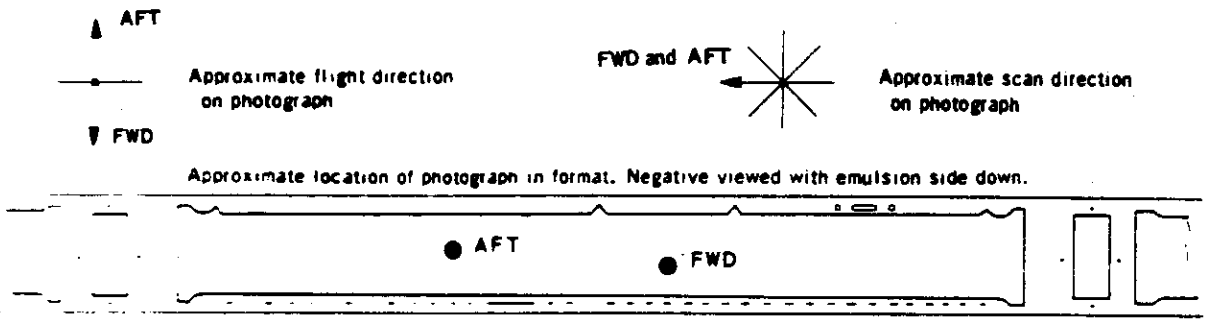
FIGURES 13 AND 14. EXAMPLE OF IMAGERY ON MIP AND CORRESPONDING FORWARD FRAME OF MISSION 1026-2

The quality of the photography on Mission 1026-2 is comparable to that of the first portion of Mission 1026-1. No unusual distortions are present and the atmospheric conditions are good. The quality of the photography as illustrated here is considered to be good. The aft-looking photography continues to be slightly better than the forward throughout the second part of the mission.

NPIC K-6181 (2/66) NPIC K-6182 (2/66)

	FIGURE 13	FIGURE 14 MIP Frame 1026-2
Camera	Fwd-Looking	Aft-Looking
Pass	84D	84D
Frame	15	21
Date of Photography	3 Nov 65	3 Nov 65
Universal Grid Coordinates	54 - 10.7	36.4 - 13.8
Enlargement Factor	20X	20X
Geographic Coordinates	39-38N 117-51E	39-38N 117-48E
Altitude (feet)	600,753	598,249
Camera:		
Pitch	$14^{o}30'$	$-15^{o}31'$
Roll	$-0^{o}4'$	$-0^{o}3'$
Yaw	Not Available	Not Available
Local Sun Time	1217	1217
Solar Elevation	$35^{o}00'$	$35^{o}00'$
Solar Azimuth	185°	185°
Exposure (fractions of second)	1/125	1/181
Processing Level	Full	Intermediate
Vehicle Azimuth	$159^{o}46'$	$159^{o}46'$



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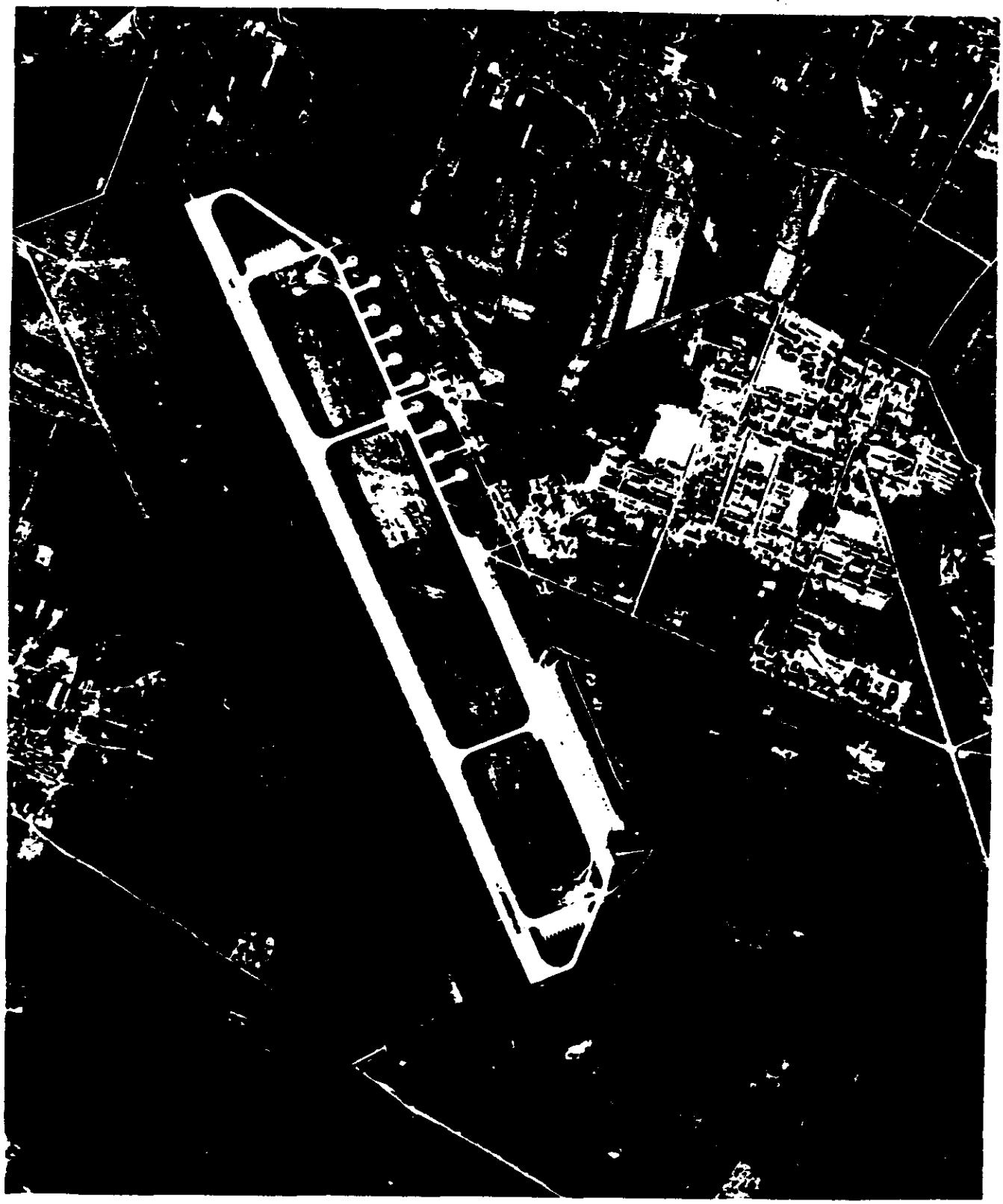

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APPENDIX A. SYSTEM SPECIFICATIONS

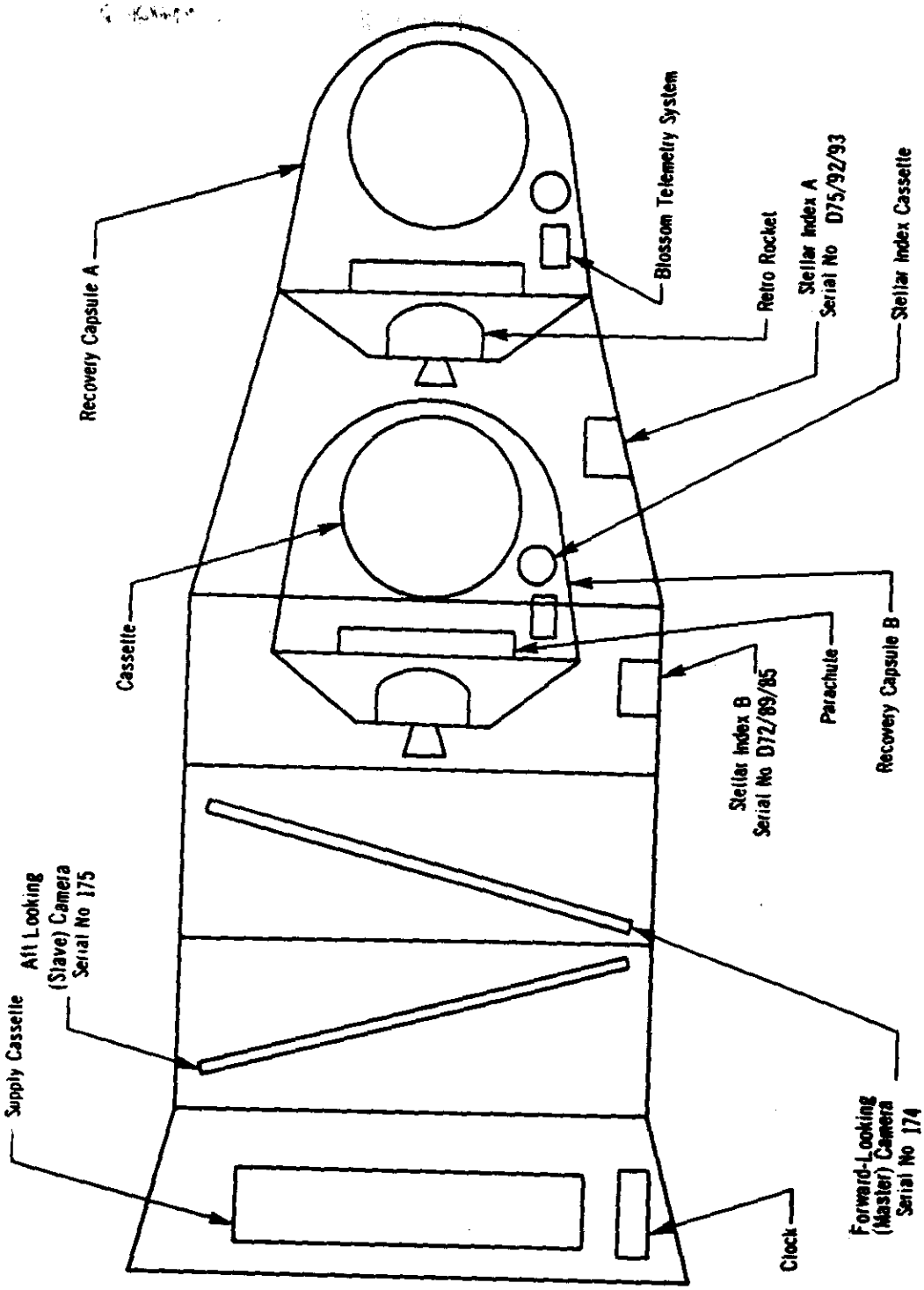
1. Camera

	Forward-Looking Master Pan	Forward Take-Up Horizon	Forward Supply Horizon	Aft-Looking (Slave) Pan	Aft Take-Up Horizon	Aft Supply Horizon	Mission 1026-1 Stellar	Mission 1026-1 Index	Mission 1026-2 Stellar	Mission 1026-2 Index
Camera No	178	*	*	175	*	*	D75	D75	D72	D72
Recon. No	N/A	N/A	N/A	N/A	N/A	N/A	93	92	85	89
Item Serial No	1722435	816625	816646	1722435	816631	816626	10690	817918	11515	817714
Slit Width	0.225	N/A	N/A	0.150	N/A	N/A	N/A	N/A	N/A	N/A
Aperture	F/3.5	F/8.0	F/6.8	F/3.5	F/6.8	F/8.0	F/1.8	F/4.5	F/1.8	F/4.5
Exposure Time Sec	1/[illegible] avg	1/100	1/100	1/410 avg	1/100	1/100	2 sec	1/500	2 sec	1/500 sec
Filter (Wratten)	25	25	25	21	25	25	None	21	None	21
Focal length (mm)	609.651	54.40	54.50	609.602	54.90	54.70	84 Nomial	38.60	84 Nomial	38.40
Film length (ft)	16,000	N/A	N/A	16,000	N/A	N/A	46	92	46	92
Splices	5	N/A	N/A	3	N/A	N/A	None	None	None	None
Emulsion	227-3-9-5	227-3-9-5	227-3-9-5	226-54/1-9-5	226-54/1-9-5	124-35-8-5	124-34-6-5	104-35-8-5	124-35-8-5	104-14-6-5
Film Type	3404	3404	3404	3404	3404	3404	3401	3400	3401	3400
Resolution Data (L/mm)										
Static										
High Contrast	281	185 avg	174 avg	238	187 avg	187 avg	*	72(A)	*	74(A)
Low Constrast	147	*	*	147	*	*	*	*	*	*
Dynamic										
I High Contrast	193	*	*	194	*	*	*	*	*	*
I Low Contrast	126	*	*	126	*	*	*	*	*	*
P High Contrast	194	*	*	194	*	*	*	*	*	*
P Low Contrast	120	*	*	120	*	*	*	*	*	*

N/A Not Applicable
* Not Available
(A) AWAR

TOP SECRET RUFF
NO FOREIGN DISSEM
Handle Via
Control System Only

2. VEHICLE LAYOUT

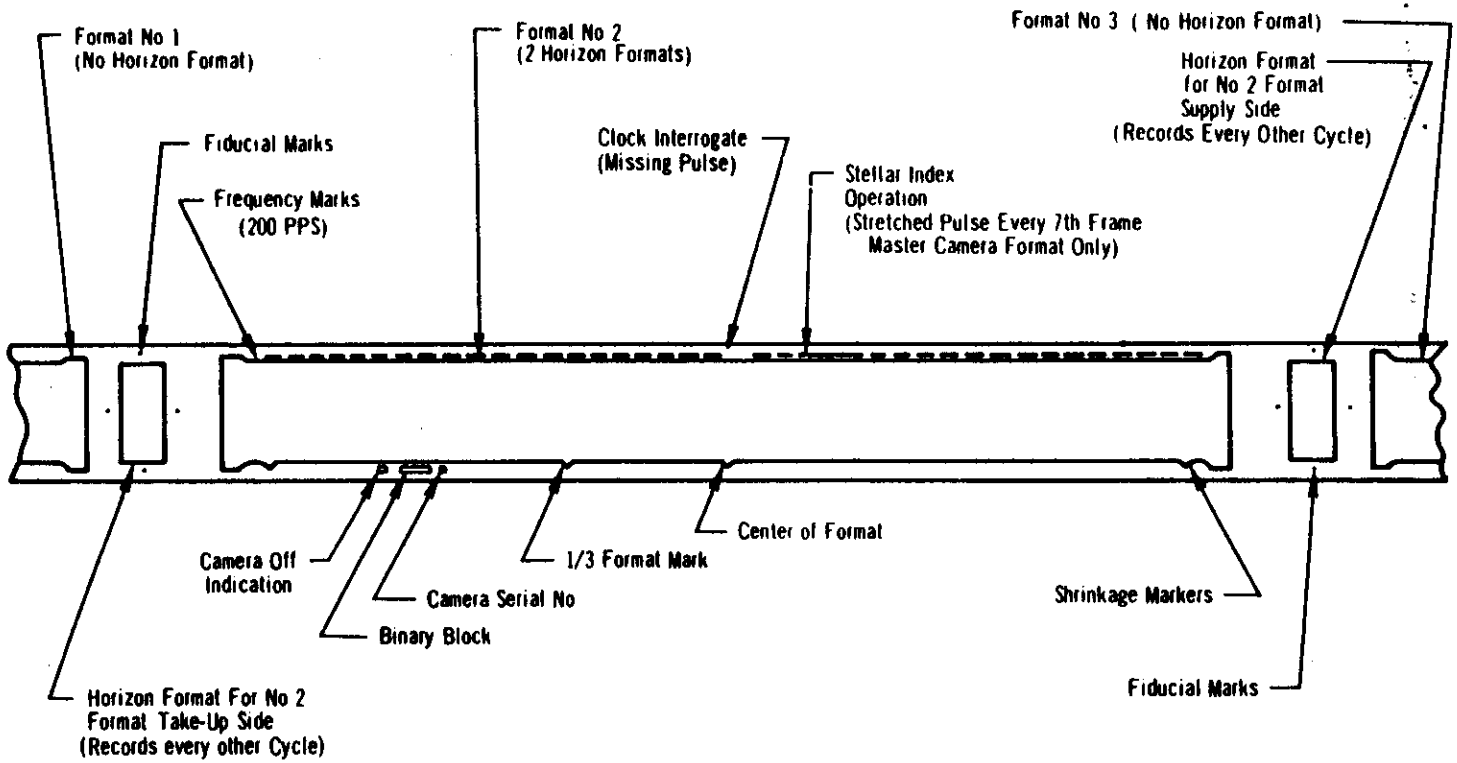


Handle Via
Control System Only

TOP SECRET RUFF
NO FOREIGN DISSEM

3. FILM SPECIFICATIONS

FORMAT LAYOUT



Forward-Looking (Master) Panoramic Camera No 174

Viewed With Negative Emulsion Down

Direction of Film Transport ←

Direction of Scan →

Direction of Vehicle Motion ↓

Aft-Looking (Slave) Panoramic Camera No 175

Viewed With Negative Emulsion Down

Direction of Film Transport ←

Direction of Scan →

Direction of Vehicle Motion ↑

NPIC K-8184 12/66)

Handle Via
Control System Only

TOP SECRET RUFF
NO FOREIGN DISSEM

APPENDIX B. DENSITY READINGS

The following pages contain a compilation of the stellar/index density values which were obtained with a Macbeth QuantaLog Densitometer, Model EP 1000, with an ET 20 attachment and an 0.50 millimeter aperature.

STELLAR CAMERA MISSION 1026-1

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
1D	1	1.13	0.18	0.95	0.18
	6	1.02	0.20	0.82	0.19
3D	7	0.24	0.18	0.06	0.18
	14	0.72	0.20	0.52	0.16
5D	15	0.34	0.16	0.18	0.16
	27	1.10	0.23	0.87	0.15
6D	28	1.10	0.24	0.86	0.16
	51	0.98	0.22	0.76	0.16
7D	52	0.70	0.18	0.52	0.16
	62	1.30	0.24	1.06	0.18
8D	63	0.40	0.18	0.22	0.18
	73	0.94	0.22	0.72	0.16
9AE	74	0.18	0.18	0.00	0.17
9D	75	0.92	0.20	0.72	0.17
	87	0.99	0.22	0.77	0.18
14D	88	1.10	0.23	0.87	0.18
	100	1.20	0.23	0.97	0.18
16D	101	1.08	0.24	0.84	0.18
	102	1.14	0.28	0.86	0.18
19D	103	0.29	0.20	0.09	0.18
	109	0.71	0.21	0.50	0.19
20D	110	0.29	0.21	0.08	0.18
	120	1.00	0.21	0.79	0.17
21D	121	1.33	0.23	1.10	0.17
	135	1.48	0.29	1.19	0.16
23D	136	0.92	0.20	0.72	0.16
	146	1.09	0.22	0.87	0.18
24D	147	1.11	0.24	0.87	0.17
	160	1.20	0.28	0.92	0.17
25D	161	1.20	0.24	0.96	0.20
	164	1.16	0.21	0.95	0.18
26D	165	1.46	0.30	1.16	0.18
	176	1.46	0.25	1.21	0.18
30D	177	0.99	0.22	0.77	0.17
	182	0.18	0.18	0.00	0.17
31D	183	0.18	0.18	0.00	0.17
	184	2.06	0.42	1.64	0.18
34M	185	3.80	3.80	0.00	0.17
	198	0.66	0.20	0.46	0.18
35M	199	0.20	0.20	0.00	0.19
	210	0.69	0.20	0.49	0.19
37D	211	1.02	0.22	0.80	0.18
	233	1.60	0.30	1.30	0.17
38D	234	1.28	0.28	1.00	0.17
	255	1.92	0.32	1.60	0.16

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
39D	256	0.32	0.17	0.15	0.17
	271	1.92	0.32	1.60	0.16
40AE	272	0.17	0.17	0.00	0.17
40D	273	0.92	0.20	0.72	0.17
	286	1.44	0.27	1.17	0.18
41D	287	1.28	0.24	1.04	0.19
	295	1.33	0.26	1.07	0.19
46D	296	1.42	0.28	1.14	0.19
	297	1.43	0.30	1.13	0.19
47DE	298	1.50	0.26	1.24	0.19
	299	1.38	0.26	1.12	0.18
51D	300	1.00	0.21	0.79	0.18
	305	1.13	0.23	0.90	0.18
52D	306	1.14	0.23	0.91	0.17
	315	1.28	0.24	1.04	0.18
53D	316	1.05	0.22	0.83	0.18
	330	1.55	0.30	1.25	0.17
54D	331	0.44	0.18	0.26	0.18
	343	1.58	0.30	1.28	0.20
61D	344	1.34	0.30	1.04	0.20
	346	1.70	0.30	1.40	0.19
63D	347	1.42	0.26	1.16	0.19
	348	1.44	0.28	1.16	0.19
64D	349	0.70	0.20	0.50	0.18
	351	0.74	0.20	0.54	0.18
66D	352	1.68	0.28	1.40	0.18
	354	1.68	0.30	1.38	0.18
68D	355	0.35	0.18	0.17	0.18
	372	1.84	0.32	1.52	0.18
69D	373	0.50	0.18	0.32	0.18
	388	1.55	0.38	1.17	0.17
70D	389	1.31	0.28	1.07	0.17
	394	1.21	0.24	0.97	0.18
72D	395	1.28	0.22	1.06	0.17
Range*	(Min)	0.18	0.18	0.00	0.16
	(Max)	1.92	0.42	1.64	0.20
Average*		1.07	0.24	0.84	0.18

*Does not include engineering passes or frames 184 or 185

STELLAR CAMERA MISSION 1026-2

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
82D	1	3.21	0.42	2.70	0.24
	5	3.31	0.50	2.81	0.26
83D	6	3.04	0.52	2.52	0.29
	10	3.34	0.51	2.83	0.28
84D	11	3.01	0.40	2.61	0.26
	28	3.22	0.52	2.70	0.22
85D	29	3.30	0.30	3.00	0.22
	45	3.18	0.48	2.70	0.22
86D	46	3.31	0.30	3.01	0.22
	64	3.24	0.52	2.72	0.22
87D	65	3.45	0.49	2.96	0.22
	70	3.17	0.42	2.75	0.22
88AE	71	0.22	0.22	0.00	0.22
88D	72	3.16	0.40	2.76	0.22
	90	3.20	0.40	2.80	0.22
89D	91	3.35	0.54	2.81	0.22
	102	3.20	0.39	2.81	0.22
94D	103	2.75	0.42	2.33	0.22
	110	3.31	0.52	2.79	0.23
95D	111	2.80	0.24	2.56	0.23
	115	3.11	0.28	2.83	0.23
98D	116	3.20	0.31	2.89	0.23
	121	3.31	0.38	2.93	0.23
99D	122	3.06	0.26	2.80	0.22
	134	3.10	0.38	2.72	0.22
100D	135	3.02	0.31	2.71	0.22
	149	3.40	0.74	2.66	0.22
101D	150	2.94	0.23	2.71	0.22
	160	2.99	0.32	2.67	0.22
102D	161	3.16	0.24	2.92	0.22
	172	3.40	0.52	2.88	0.22
103AE	173	0.21	0.21	0.00	0.21
103D	174	3.32	0.38	2.94	0.21
	196	3.10	0.42	2.68	0.22
104D	197	3.06	0.32	2.74	0.21
	209	3.22	0.52	2.70	0.23

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
105D	210	3.26	0.54	2.72	0.26
	216	3.06	0.42	2.64	0.22
110D	217	3.38	0.41	2.97	0.22
	219	3.16	0.46	2.70	0.21
116D	220	3.11	0.26	2.85	0.21
	241	3.26	0.51	2.75	0.21
117D	242	3.22	0.31	2.91	0.21
	256	3.14	0.49	2.65	0.21
118D	257	3.20	0.38	2.82	0.21
	269	3.32	0.56	2.76	0.21
119D	270	3.20	0.52	2.68	0.22
	278	3.16	0.48	2.68	0.23
120D	279	3.32	0.41	2.91	0.23
	284	3.28	0.51	2.77	0.23
126D	285	3.18	0.50	2.68	0.23
	287	3.20	0.46	2.74	0.23
130D	288	3.24	0.42	2.82	0.23
	295	3.22	0.49	2.73	0.22
131D	296	2.69	0.24	2.45	0.21
	314	2.75	0.38	2.37	0.21
132D	315	2.94	0.28	2.66	0.22
	331	3.12	0.54	2.58	0.21
133D	332	2.93	0.36	2.57	0.21
	349	3.23	0.60	2.63	0.21
134D	350	3.15	0.40	2.75	0.22
	364	3.15	0.58	2.57	0.21
135D	365	2.98	0.36	2.62	0.22
	376	2.71	0.55	2.16	0.24
142D	377	2.56	0.42	2.14	0.24
144D	378	2.33	0.48	1.85	0.26
	380	2.78	0.46	2.32	0.24
148D	381	2.46	0.38	2.08	0.24
Range*	(Min)	2.33	0.24	1.85	0.21
	(Max)	3.45	0.74	3.01	0.29
Average*		3.11	0.43	2.69	0.23

*Does not include engineering passes.

INDEX CAMERA MISSION 1026-1

Index	Frame	LIGHTING			Gross Fog	TERRAIN		
		Dmax	Dmin	Delta		Dmax	Dmin	Delta
1D	1	0.78	0.13	0.65	0.06	NR	NR	--
	6	1.57	0.28	1.29	0.06	1.57	0.48	1.09
5D	7	0.82	0.16	0.66	0.06	0.82	0.38	.44
	14	1.56	0.25	1.31	0.06	NR	NR	--
9D	15	1.17	0.34	0.83	0.06	1.17	0.34	0.83
	27	1.75	0.30	1.45	0.06	0.80	0.65	0.15
6D	28	1.54	0.34	1.20	0.06	1.00	0.84	0.16
	51	2.10	0.18	1.92	0.05	NR	NR	--
7D	52	1.53	0.55	0.97	0.05	NR	NR	--
	62	1.90	0.54	2.36	0.06	0.79	0.59	0.20
8D	63	1.12	0.11	1.01	0.06	0.30	0.11	0.19
	73	1.58	0.74	0.84	0.06	NR	NR	--
4D	74	0.96	0.06	--	0.06	NR	NR	--
	75	1.32	0.22	1.10	0.06	0.64	0.42	0.22
	87	1.44	0.28	1.16	0.06	0.72	0.46	0.26
14D	88	0.82	0.28	0.54	0.06	0.82	0.30	0.52
	100	2.02	0.66	1.36	0.06	2.02	0.66	1.36
16D	101	1.83	0.22	1.61	0.06	NR	NR	--
	102	1.83	0.32	1.51	0.06	NR	NR	--
19D	103	0.77	0.12	0.65	0.06	0.72	0.24	.48
	109	1.22	0.54	0.68	0.05	1.22	0.54	0.68
20D	110	0.91	0.32	0.59	0.06	0.85	0.69	0.16
	120	1.68	0.36	1.32	0.06	1.65	0.36	1.29
21D	121	1.61	0.42	1.19	0.06	1.13	0.42	0.71
	135	1.87	0.28	1.59	0.06	0.85	0.35	0.50
23D	136	1.63	0.40	1.23	0.06	0.64	0.40	0.24
	146	2.20	0.72	1.48	0.07	2.20	0.72	1.48
24D	147	1.72	0.25	1.47	0.07	0.75	0.44	0.31
	160	1.86	0.35	1.51	0.07	1.86	0.35	1.51
25D	161	1.58	0.23	1.35	0.06	0.52	0.44	0.08
	164	1.34	0.32	1.02	0.06	0.64	0.42	0.22
26D	165	1.46	0.54	0.92	0.06	1.46	0.54	0.92
	176	2.06	0.61	1.45	0.06	1.54	0.61	0.93
30D	177	2.01	0.54	1.47	0.06	2.01	0.54	1.47
	182	1.81	0.63	1.18	0.06	NR	NR	--
31D	183	1.52	0.32	1.20	0.06	1.52	0.32	1.20
	184	1.46	0.25	1.21	0.06	1.46	0.25	1.21
34M	185	0.06	0.06	--	0.06	NR	NR	--
	198	1.46	0.48	0.98	0.06	NR	NR	--
35M	199	0.06	0.06	--	0.06	NR	NR	--
	210	1.11	0.48	0.63	0.06	1.11	0.48	0.63
37D	211	1.52	0.66	0.86	0.06	NR	NR	--
	233	1.96	0.26	1.70	0.06	1.13	0.28	0.85

INDEX CAMERA MISSION 1026-1
(cont'd)

Pass	Frame	LIMITING			Gross Fog	TERRAIN		
		Dmax	Dmin	Delta		Dmax	Dmin	Delta
38D	234	1.76	0.90	0.86	0.06	NR	NR	
	255	2.01	0.65	1.36	0.06	1.00	0.65	0.35
39D	256	0.80	0.06	0.74	0.06	0.43	0.12	0.31
	271	1.70	0.74	0.96	0.06	1.19	0.74	0.45
40AE	272	0.06	0.06	--	0.06	NR	NR	--
40D	273	1.56	0.65	0.91	0.06	NR	NR	--
	286	1.57	0.49	1.08	0.06	NR	NR	--
41D	287	2.00	0.31	1.69	0.06	0.68	0.35	0.33
	295	1.83	0.21	1.62	0.06	0.95	0.21	0.74
46D	296	1.24	0.40	0.84	0.06	0.82	0.40	0.42
	298	0.88	0.42	0.46	0.07	0.88	0.42	0.46
47DE	299	1.50	0.34	1.16	0.07	1.50	0.43	1.07
51D	300	1.08	0.40	0.68	0.06	1.08	0.40	0.68
	305	1.44	0.24	1.20	0.06	1.05	0.31	0.74
52D	306	1.45	0.50	0.95	0.06	NR	NR	--
	315	1.04	0.22	0.82	0.06	0.91	0.22	0.69
53D	316	1.44	0.32	1.12	0.06	0.72	0.32	0.40
	330	1.98	0.19	1.79	0.06	NR	NR	--
54D	331	0.74	0.19	0.55	0.07	0.60	0.21	0.39
	343	1.46	0.33	1.13	0.06	1.00	0.33	0.67
61D	344	2.06	0.41	1.65	0.06	0.74	0.41	0.33
	346	1.81	0.16	1.65	0.06	0.75	0.40	0.35
63D	347	1.66	0.38	1.28	0.06	1.21	0.63	0.58
	348	1.66	0.41	1.25	0.06	0.86	0.56	0.30
64D	349	0.92	0.10	0.82	0.06	0.92	0.46	0.46
	351	1.11	0.11	1.00	0.06	1.11	0.26	0.85
66D	352	1.60	0.54	1.06	0.06	NR	NR	--
	354	1.74	0.45	1.29	0.06	NR	NR	--
68D	355	0.42	0.07	0.35	0.06	0.20	0.11	0.09
	372	2.04	0.26	1.78	0.06	0.67	0.56	0.11
69D	373	0.92	0.20	0.72	0.06	0.88	0.20	0.68
	388	2.12	0.20	1.92	0.06	0.92	0.54	0.38
70D	389	1.84	0.41	1.43	0.06	0.92	0.41	0.51
	394	1.84	0.34	1.50	0.06	1.20	0.43	0.77
72D	395	1.50	0.30	1.20	0.06	0.91	0.79	0.12
	412	1.11	0.25	0.86	0.06	0.63	0.27	0.36
78D	413	1.29	1.18	0.11	0.06	1.29	1.18	0.11
	415	1.58	0.24	1.34	0.06	1.11	0.24	0.87
79D	416	1.89	0.26	1.63	0.06	NR	NR	--

Average Limiting Dmax -- 1.48
Average Terrain Dmax -- 1.11
Average Limiting Dmin -- 0.38
Average Terrain Dmin -- 0.44
Average Limiting Delta -- 1.12
Average Terrain Delta -- 0.58
Limiting Dmax Range -- 0.06-2.20
Terrain Dmax Range -- 0.20-2.20
Limiting Dmin Range -- 0.06-0.90
Terrain Dmin Range -- 0.11-1.18
Average Gross Fog -- 0.06

Note: Readings on all ascending engineering passes are omitted from the ranges and averages.

Handle Via
Talent-Keyhole
Control System Only

TOP SECRET RUFF
NO FOREIGN DISSEM

INDEX CAMERA MISSION 1026-2

Index	Frame	LIGHTING Dmax	LIGHTING Dmin	LIGHTING Delta	Gross Fog	TERRAIN Dmax	TERRAIN Dmin	TERRAIN Delta
82D	1	1.11	0.14	0.97	0.06	1.40	0.60	0.80
	5	1.35	0.10	1.25	0.06	0.73	0.49	0.24
83D	6	1.39	0.14	1.25	0.06	0.26	0.14	0.12
	10	1.86	0.18	1.68	0.06	0.36	0.30	0.06
84D	11	1.31	0.18	1.13	0.06	0.65	0.30	0.35
	28	1.85	0.13	1.72	0.06	NR	NR	NR
85D	29	0.73	0.23	0.50	0.06	0.73	0.30	0.43
	45	1.76	0.20	1.56	0.06	NR	NR	NR
86D	46	0.56	0.12	0.44	0.05	NR	NR	NR
	64	1.30	0.20	1.10	0.06	0.65	0.20	0.45
87D	65	1.35	0.60	0.75	0.06	NR	NR	NR
	70	1.33	0.09	1.24	0.06	0.51	0.11	0.40
88AE	71	0.06	0.06	0.00	0.06	NR	NR	NR
88D	72	1.03	0.12	0.91	0.06	NR	NR	NR
	90	1.50	0.12	1.38	0.06	0.62	0.41	0.21
89D	91	1.20	0.32	0.88	0.06	1.20	0.32	0.88
	102	1.01	0.29	0.72	0.06	0.85	0.29	0.56
94D	103	0.39	0.06	0.33	0.05	0.39	0.14	0.25
	110	1.23	0.23	1.00	0.06	0.98	0.23	0.75
95D	111	0.24	0.06	0.78	0.06	0.24	0.12	0.12
	115	0.49	0.10	0.39	0.06	0.49	0.10	0.39
98D	116	0.88	0.21	0.67	0.06	0.88	0.21	0.67
	121	0.95	0.09	0.86	0.06	0.80	0.28	0.52
99D	122	0.48	0.10	0.38	0.06	0.48	0.23	0.25
	134	1.12	0.12	1.00	0.06	NR	NR	NR
100D	135	0.44	0.15	0.29	0.06	0.44	0.15	0.29
	149	1.58	0.26	1.32	0.06	0.71	0.26	0.45
101D	150	0.11	0.07	0.04	0.06	0.11	0.11	0.00
	160	0.81	0.10	0.71	0.06	0.81	0.10	0.71
102D	161	0.84	0.19	0.65	0.06	NR	NR	NR
	172	1.18	0.30	0.88	0.06	0.64	0.30	0.34
103AE	173	0.06	0.06	0.00	0.06	NR	NR	NR
103D	174	1.05	0.20	0.85	0.06	NR	NR	NR
	196	1.69	0.10	1.59	0.06	1.69	0.26	1.43
104D	197	0.79	0.16	0.63	0.06	NR	NR	NR
	209	1.34	0.16	1.18	0.06	0.28	0.16	0.12
105D	210	1.10	0.50	0.60	0.06	1.10	0.50	0.60
	216	1.40	0.28	1.12	0.06	0.58	0.31	0.27
110D	217	0.98	0.23	0.75	0.06	0.98	0.23	0.75
	219	1.00	0.12	0.88	0.06	1.00	0.19	0.81
116D	220	0.36	0.11	0.25	0.06	0.36	0.19	0.17
	241	1.47	0.20	0.27	0.06	0.44	0.30	0.14
117D	242	0.63	0.12	0.51	0.06	0.46	0.18	0.28
	256	0.99	0.14	0.85	0.08	0.73	0.33	0.40

TOP SECRET RUFF
NO FOREIGN DISSEM

Handle Via
Talent-Keyhole
Control System Only

INDEX CAMERA MISSION 1026-2
(cont'd)

Issue	Frame	LIMITING			Gross Fog	TERRAIN		
		Dmax	Dmin	Delta		Dmax	Dmin	Delta
118D	257	0.86	0.22	0.64	0.06	NR	NR	NR
	269	1.20	0.42	0.78	0.06	NR	NR	NR
119D	270	1.29	0.12	1.17	0.06	NR	NR	NR
	278	0.96	0.11	0.85	0.06	NR	NR	NR
120D	279	0.86	0.10	0.76	0.07	0.32	0.28	0.04
	284	1.17	0.14	1.03	0.06	0.43	0.14	0.29
126D	285	1.38	0.33	1.05	0.07	NR	NR	NR
	287	1.42	0.44	0.98	0.06	NR	NR	NR
130D	288	0.92	0.10	0.82	0.06	0.84	0.30	0.54
	295	1.32	0.15	1.17	0.07	0.40	0.32	0.08
131D	296	0.12	0.07	0.05	0.07	0.12	0.10	0.02
	314	0.88	0.08	0.80	0.06	0.52	0.22	0.30
132D	315	0.41	0.06	0.35	0.06	NR	NR	NR
	331	1.57	0.11	1.46	0.06	0.81	0.29	0.52
133D	332	0.79	0.12	0.67	0.06	NR	NR	NR
	349	1.44	0.29	1.15	0.06	NR	NR	NR
134D	350	0.80	0.22	0.58	0.07	NR	NR	NR
	364	1.27	0.62	0.65	0.06	NR	NR	NR
135D	365	0.85	0.09	0.76	0.06	0.22	0.11	0.11
	376	1.15	0.24	0.91	0.08	NR	NR	NR
142D	377	1.12	0.09	1.03	0.08	0.31	0.18	0.13
144D	378	1.53	0.15	1.38	0.07	NR	NR	NR
	380	1.38	0.12	1.26	0.07	NR	NR	NR
148D	381	0.59	0.18	0.41	0.07	0.59	0.21	0.38
	402	1.66	0.13	1.53	0.07	0.52	0.35	0.17
149D	403	0.82	0.09	0.73	0.07	0.44	0.12	0.32
	413	1.12	0.47	0.65	0.06	NR	NR	NR
150D	414	0.87	0.21	0.66	0.06	0.82	0.28	0.54
	424	0.90	0.16	0.74	0.06	NR	NR	NR
151D	425	0.76	0.07	0.69	0.06	NR	NR	NR
	432	1.41	0.18	1.23	0.05	NR	NR	NR

NR - Denotes No Reading Made.

Average Limiting Dmax -- 1.05
Average Terrain Dmax -- 0.63
Average Limiting Dmin -- 0.18
Average Terrain Dmin -- 0.24
Average Limiting Delta -- 0.86
Average Terrain Delta -- 0.38
Limiting Dmax Range -- 0.11-1.86
Terrain Dmax Range -- 0.11-1.40
Limiting Dmin Range -- 0.06-0.60
Terrain Dmin Range -- 0.10-0.60
Average Gross Fog -- 0.06

Note: Readings on all ascending engineering passes are omitted from the ranges and averages.

APPENDIX C. MICRODENSITOMETRY

1. Edge Spread Function

The spread function is obtained from microdensitometer edge traces to provide an objective measure of the image quality in mission photography. The spread function curve represents a summation of the separate elements of the photographic system. By taking the Fourier Transform of the spread function the modulation transfer function of the system is obtained.

To satisfy the desire to express image quality in terms of a value, a single number is determined from the spread function curve by measuring its width at 50 percent amplitude. This width is expressed as a micron distance in image space and may be converted to a distance on the ground. On domestic passes, where 3-bar resolution targets have been available, the ground distance determined from edge trace analysis and from the targets has been found to be comparable.

The microdensitometric analysis of edges in the image requires that the object edge fulfill the conditions of a unit step function, i.e., exist for an appreciable distance at a fixed brightness level and change abruptly to a new level which exists for an appreciable distance. This requirement is usually achieved by rooftops of buildings in large-scale photography, and aircraft runways or taxiways in small-scale photography.

The mission is examined to determine the MIP frame (Mission Information Potential) which is a subjective selection of the best photography. Straight edges in this imagery meeting the criteria of a step function for a length of at least 120 microns are selected for scanning with the microdensitometer.

The microdensitometer used for the traces in this report is located at the SPPF facility. The location of the traces was directed by representatives from NPIC at SPPF. The instrument is the Mann-Data Micro-Analyzer used with an effective slit of 1 micron by 80 microns. A scan speed of 0.05 mm/minute and a chart speed of 4.1 inches/minute was used for a recording to specimen expansion of 2083:1. One inch on the recording equals 12.2 microns on the specimen. The traces produced represent a plot of deflection versus distance. The deflection of the pen is essentially linear with density and the horizontal lines on the chart numbered 1 to 7 equal 0 to 3.0 density. At the same time the traces were made, the electronic output signals from the instrument were digitized as density values and recorded on paper tape for direct analysis by an IBM 1710 computer.

In the table on the next page, the following computer outputs are listed for each edge traced: The 50 percent amplitude width of the Line Spread Function is microns, the reciprocal of the 50 percent width in millimeters, and the intersection point of the modulation transfer curve and the aerial

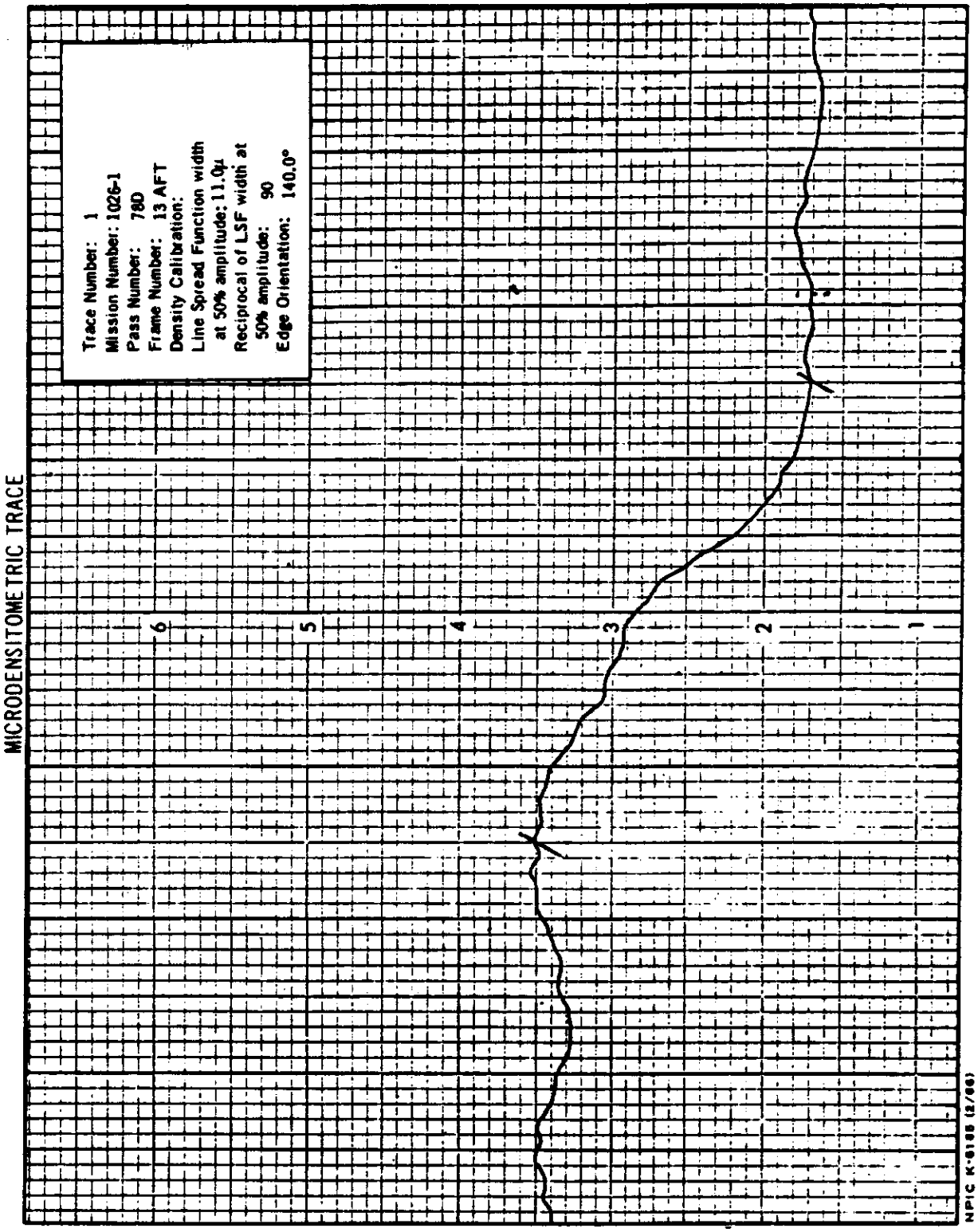
image modulation curve. The procedure used in the derivation of these values is described in the SPPL Technical Report No. 101-31 (page 79-82). The edge orientation angle is determined in the microdensitometer and is 0° when the edge is parallel to the major axis of the film and 90° when the edge is perpendicular to the major axis of the film.

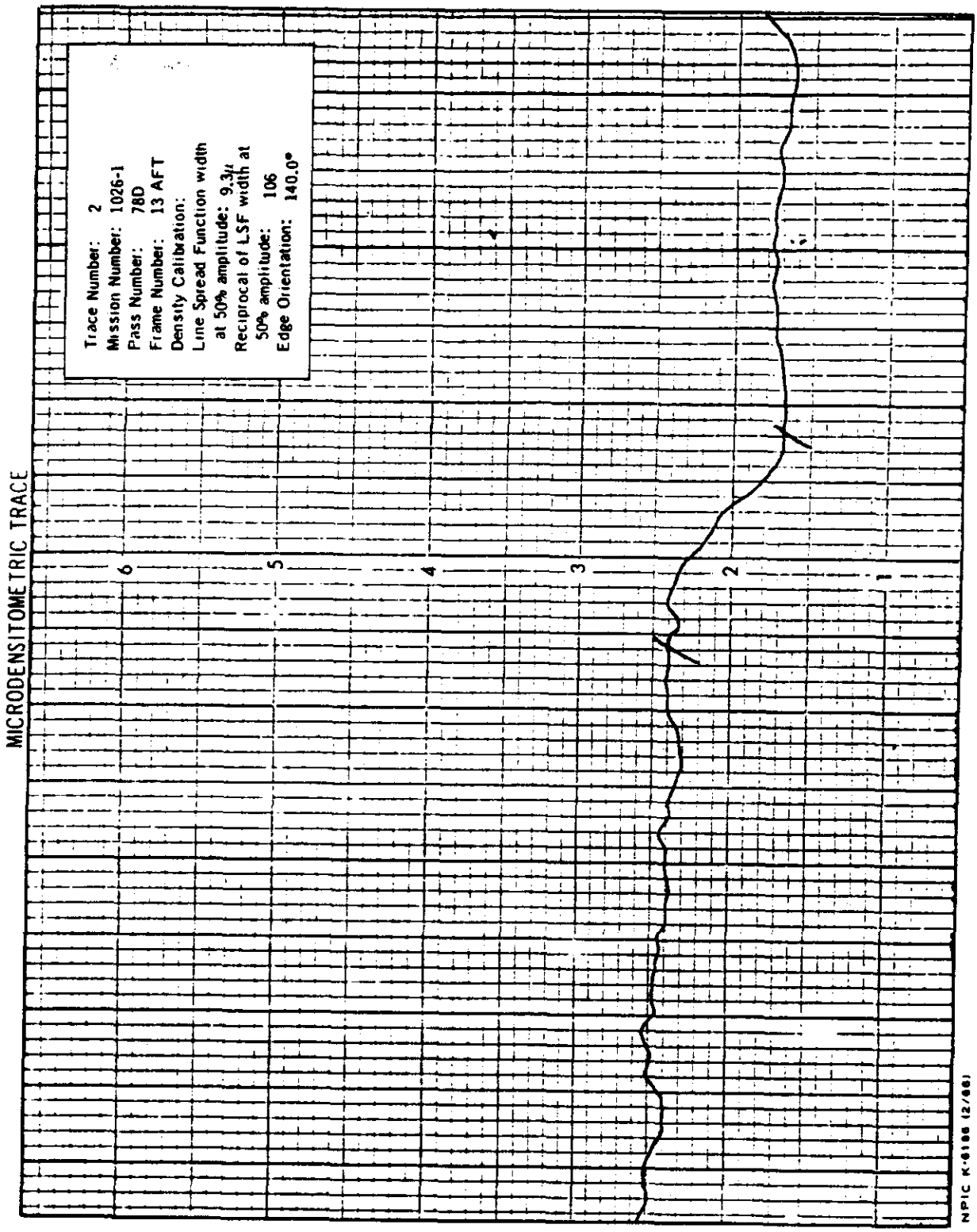
The edge traces were made on the original negative of this mission. The imagery traced is contained in the frames considered to be typical of the best in the mission.

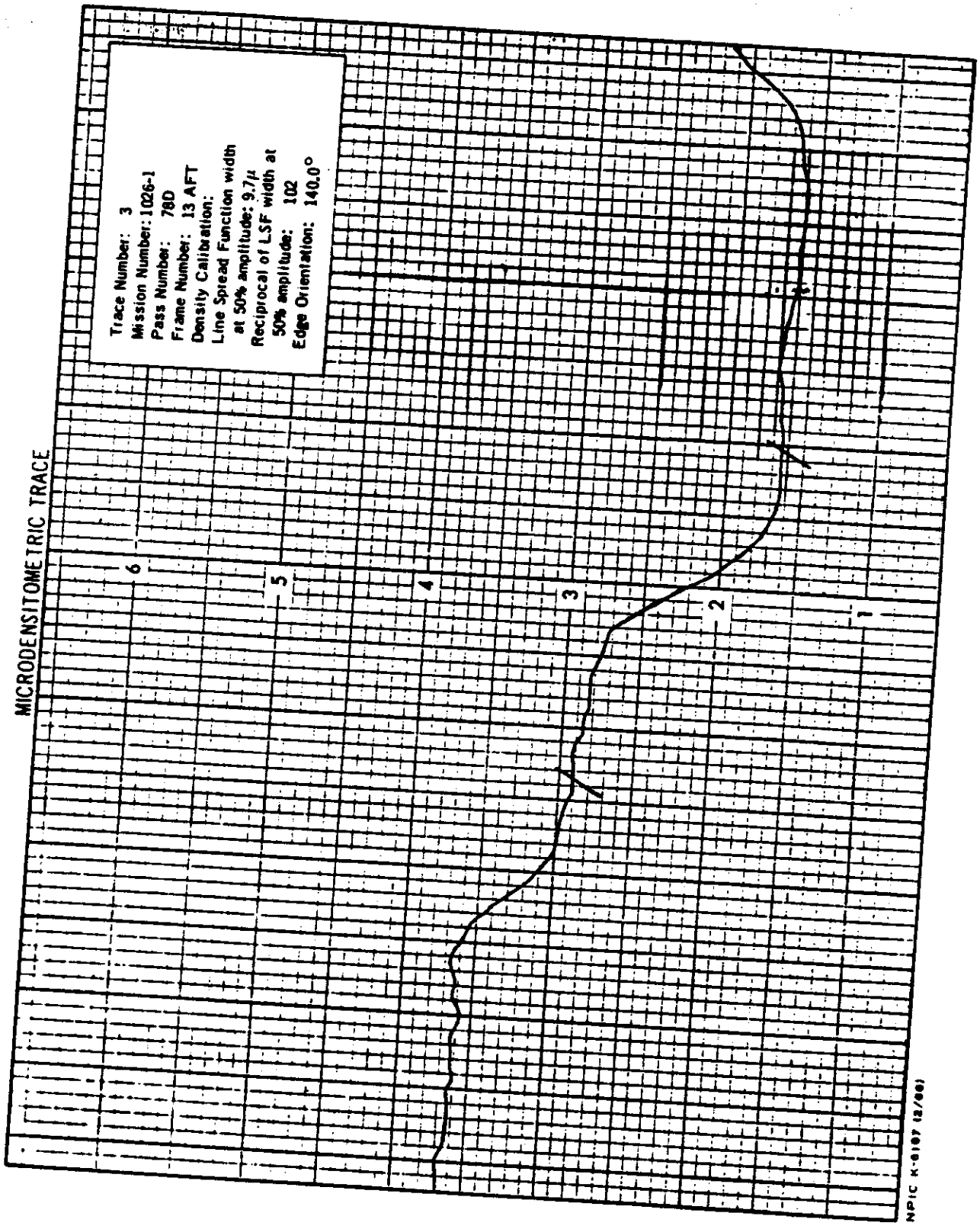
SUMMARY TABLE OF EDGE TRACES

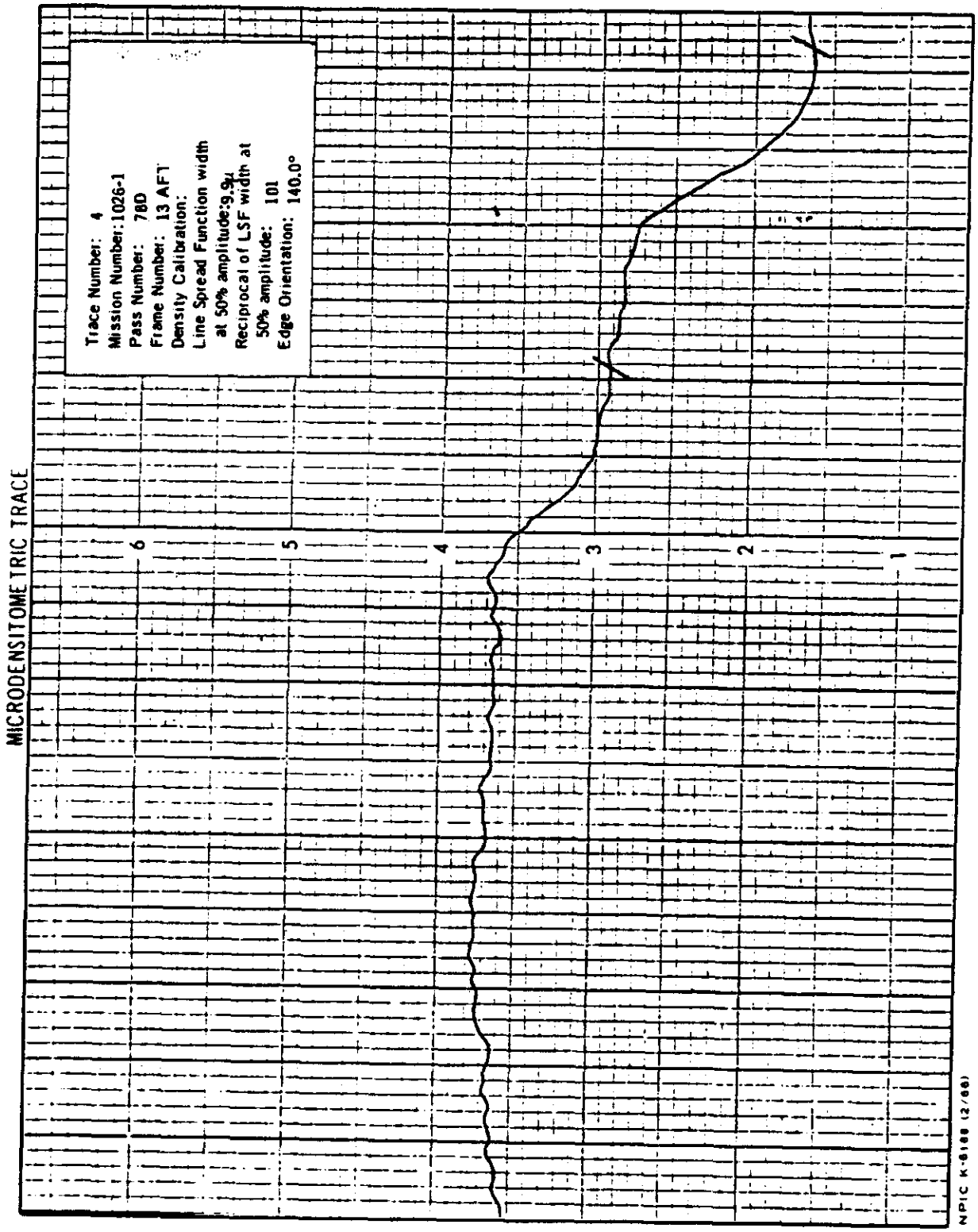
LINE SPREAD FUNCTION

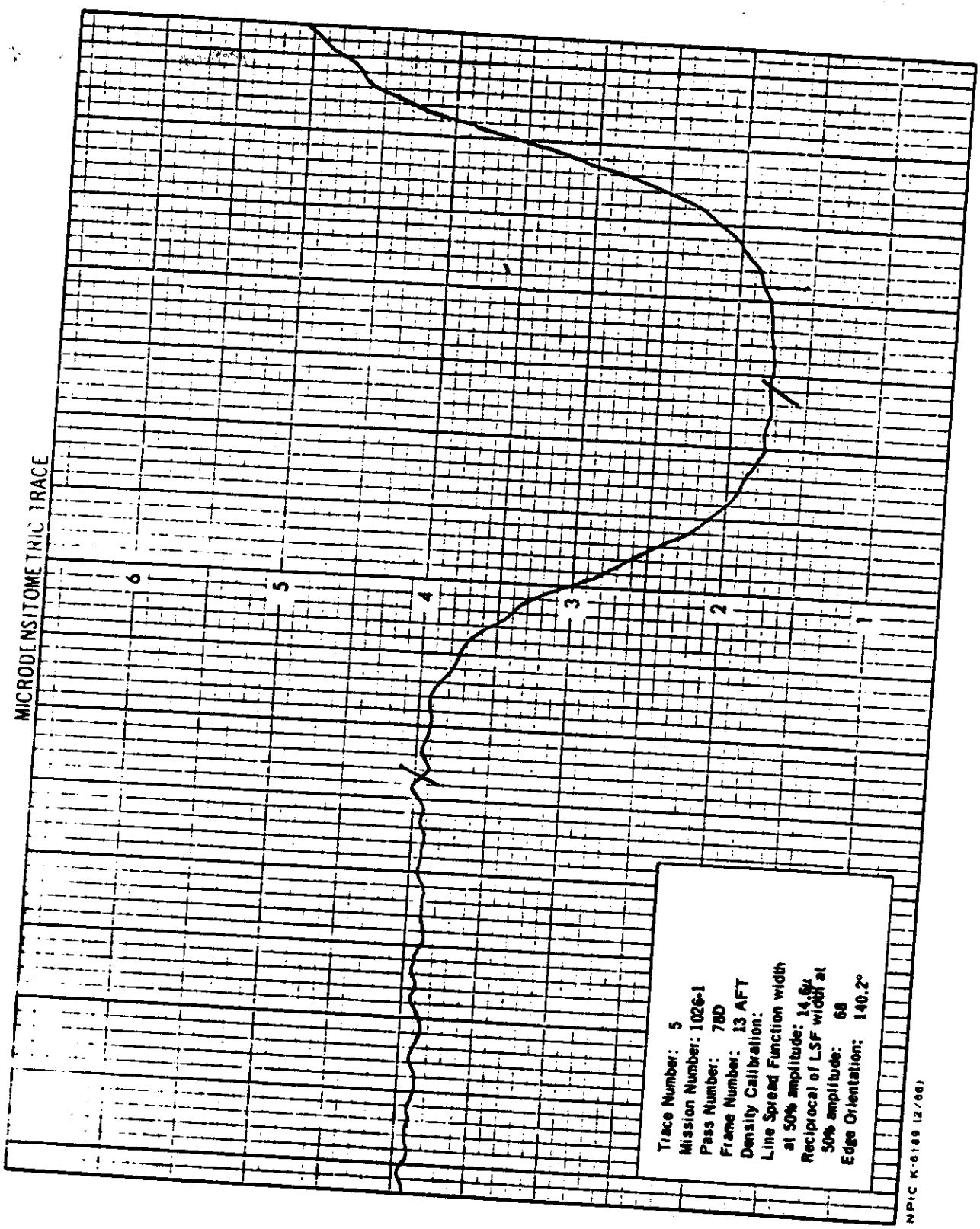
Trace Number	Pass Frame	50% Width	1000/50% Width	MTF/AIM Intersect	Edge Orientation
1	78D/13A	11.0	90	93	140.0°
2	78D/13A	9.3	106	96	140.0°
3	78D/13A	9.7	102	100	140.0°
4	78D/13A	9.9	101	107	140.0°
5	78D/13A	14.6	68	63	140.2°
6	78D/13A	12.5	80	76	140.2°
7	78D/13A	10.2	98	106	71.6°
8	78D/13A	11.0	91	87	99.4°
9	78D/13A	12.8	78	75	179.9°
10	84D/21A	9.8	101	116	151.5°

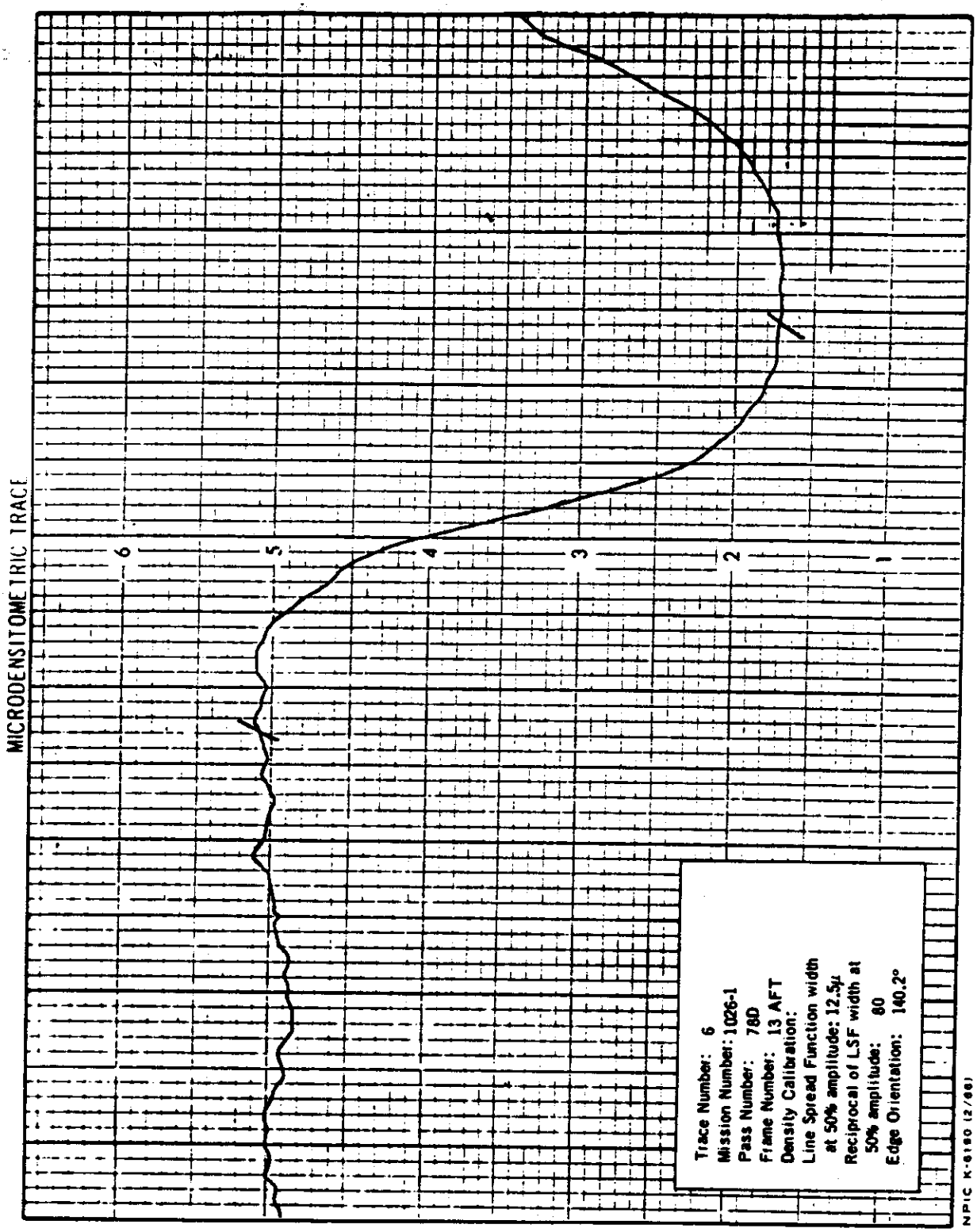

MICRODENSITOMETRIC TRACE
Trace Number: 1
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 11.0μ
Reciprocal of LSF width at 50% amplitude: 90
Edge Orientation: 140.0°
6
5
4
3
2
1
NPIC K-6188 (2/66)

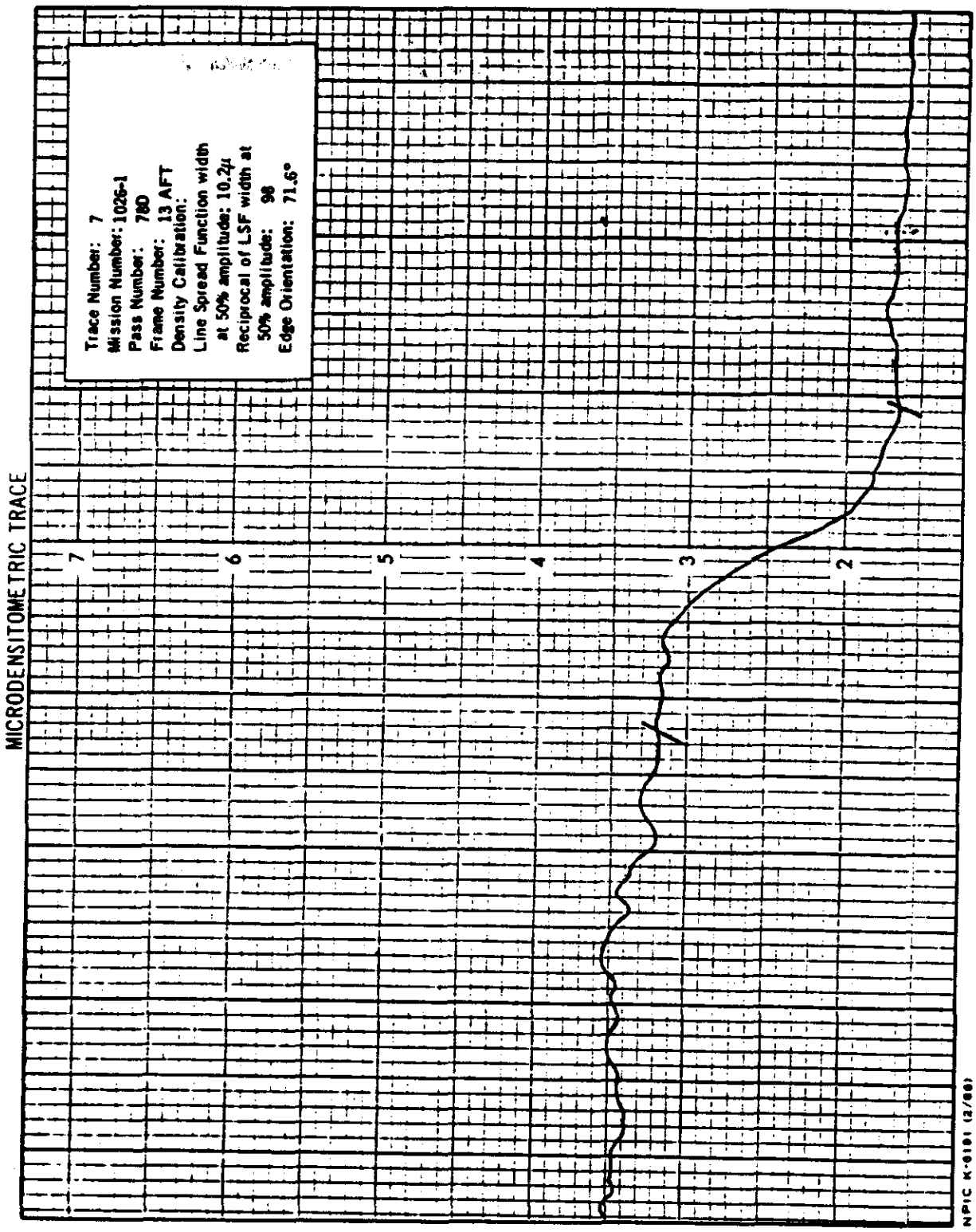

MICRODENSITOMETRIC TRACE
Trace Number: 2
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 9.3μ
Reciprocal of LSF width at 50% amplitude: 106
Edge Orientation: 140.0°
6
5
4
3
2
1
NPIC K-6186 (2/68)

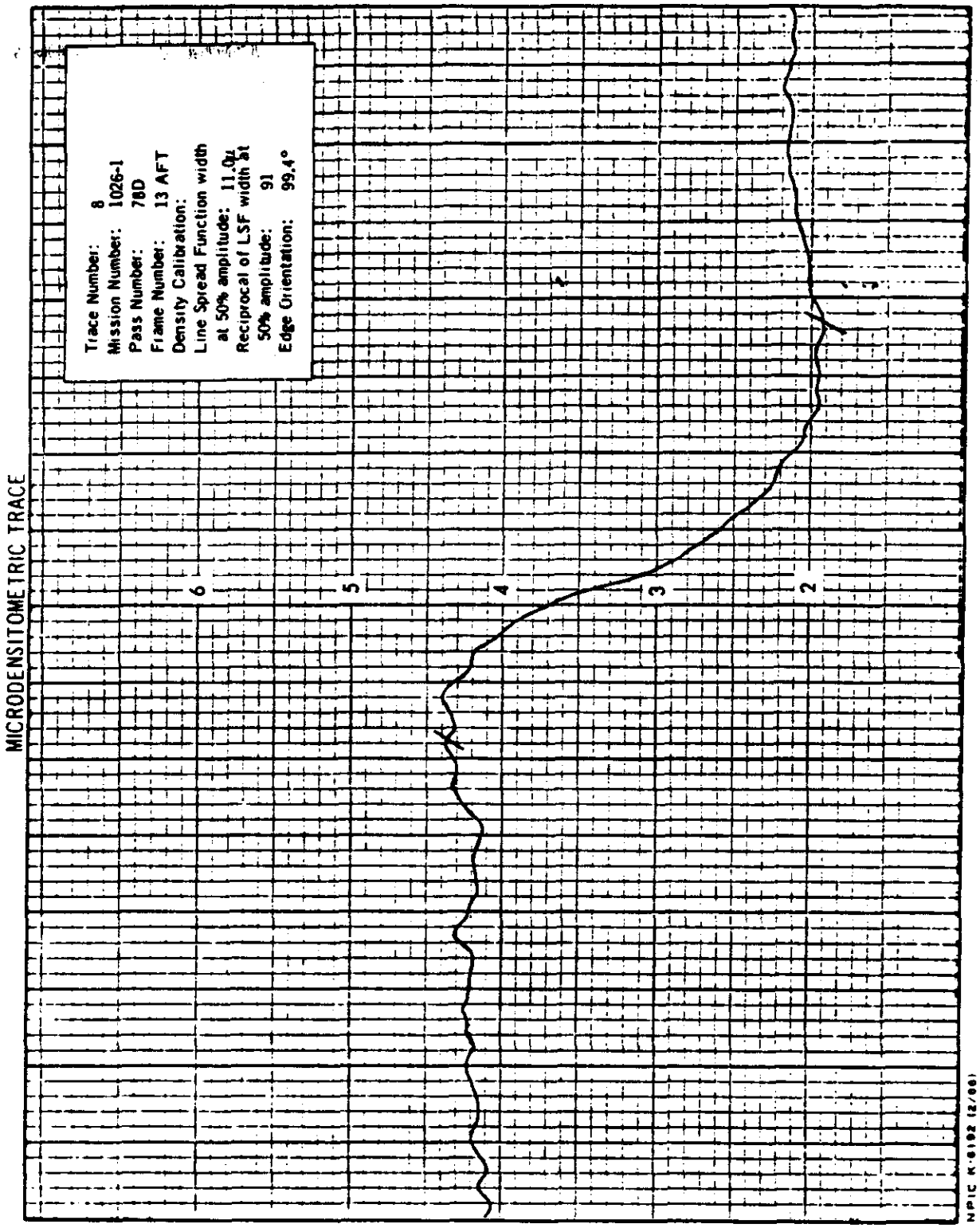

Trace Number: 3
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 9.7μ
Reciprocal of LSF width at 50% amplitude: 102
Edge Orientation: 140.0°
MICRODENSITOMETRIC TRACE
1
2
3
4
5
6
NPIC K-0197 12/68)

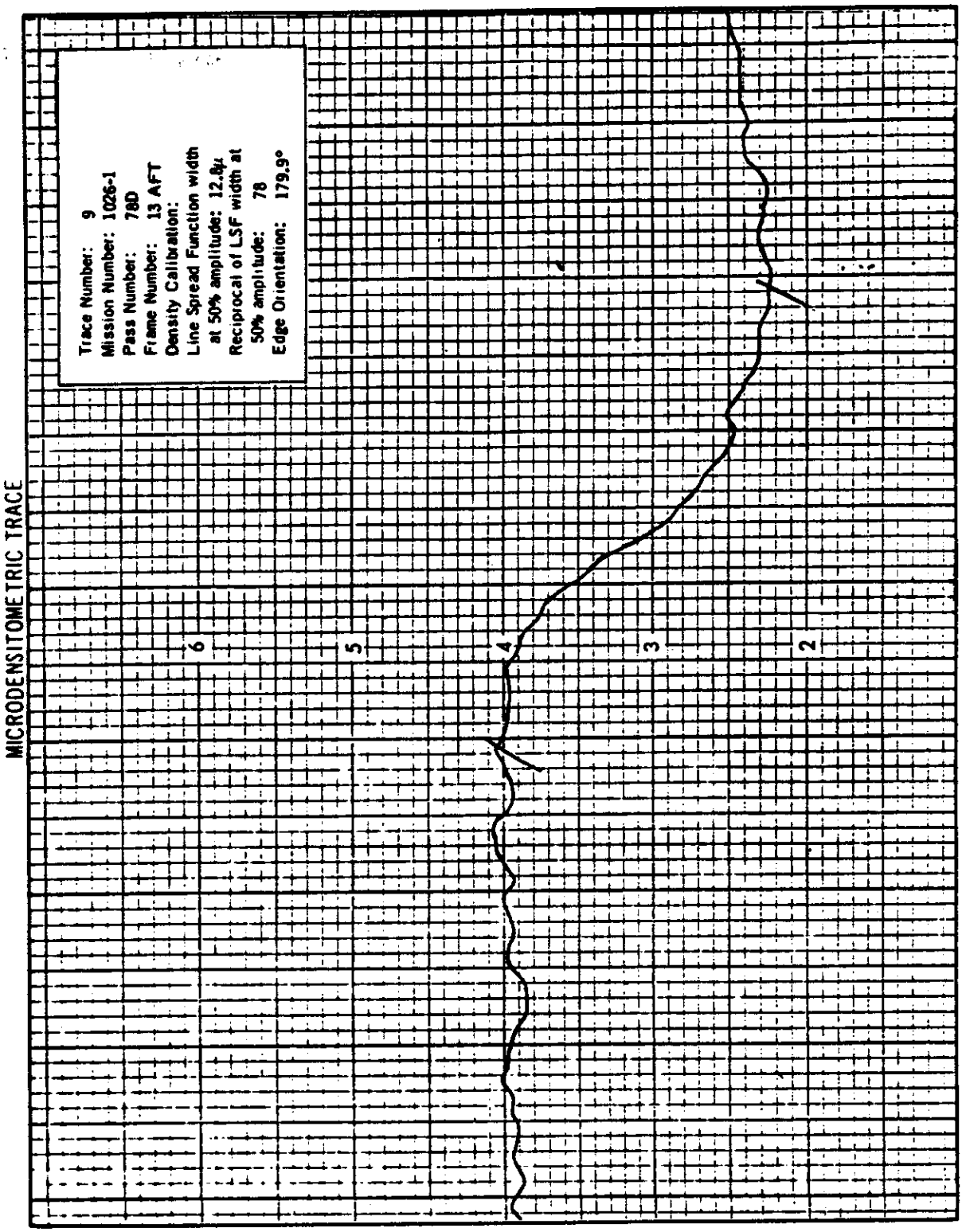

Trace Number: 4
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 9.9μ
Reciprocal of LSF width at 50% amplitude: 101
Edge Orientation: 140.0°
MICRODENSITOMETRIC TRACE
6
5
4
3
2
1
NPIC K-6188 (2/66)

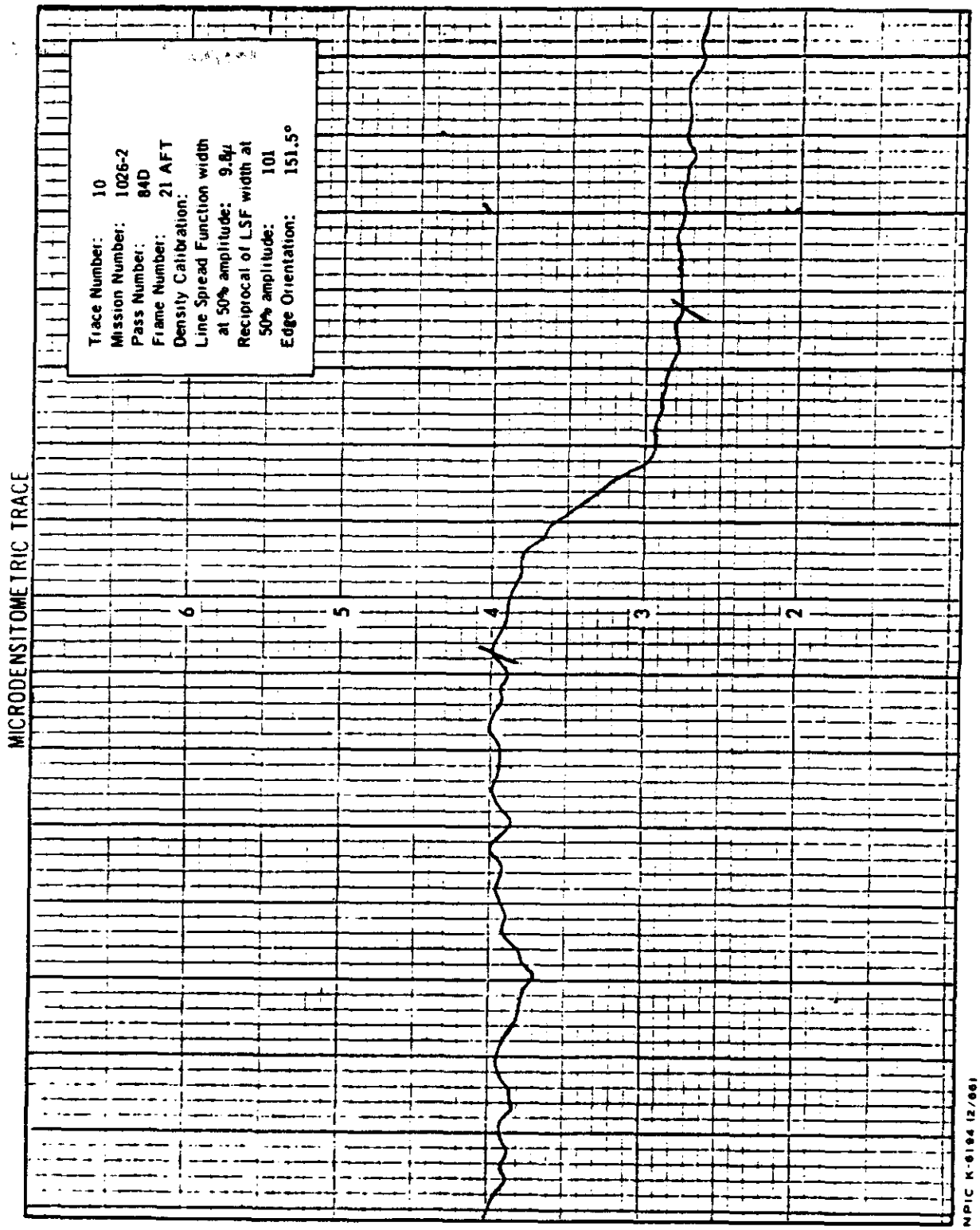

MICRODENSITOMETRIC TRACE
1
2
3
4
5
6
Trace Number: 5
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 14.6μ
Reciprocal of LSF width at 50% amplitude: 68
Edge Orientation: 140.2°
NPIC K-6189 (2/66)


MICRODENSITOMETRIC TRACE
6
5
4
3
2
1
Trace Number: 6
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 12.5μ
Reciprocal of LSF width at 50% amplitude: 80
Edge Orientation: 140.2°
NPIC K-6160 (2/66)


Trace Number: 7
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 10.2μ
Reciprocal of LSF width at 50% amplitude: 98
Edge Orientation: 71.6°
MICRODENSITOMETRIC TRACE
7
6
5
4
3
2
NPIC K-0181 (2/68)


Trace Number: 8
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 11.0μ
Reciprocal of LSF width at 50% amplitude: 91
Edge Orientation: 99.4°
MICRODENSITOMETRIC TRACE
1
2
3
4
5
6
NPIC K-6102 (2/66)


MICRODENSITOMETRIC TRACE
Trace Number: 9
Mission Number: 1026-1
Pass Number: 78D
Frame Number: 13 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 12.4μ
Reciprocal of LSF width at 50% amplitude: 78
Edge Orientation: 179.9°
6
5
4
3
2
NPIC K-6103 (2/66)


Trace Number: 10
Mission Number: 1026-2
Pass Number: 84D
Frame Number: 21 AFT
Density Calibration:
Line Spread Function width at 50% amplitude: 9.8μ
Reciprocal of LSF width at 50% amplitude: 101
Edge Orientation: 151.5°
MICRODENSITOMETRIC TRACE
6
5
4
3
2
NPIC K-0194 12/66

APPENDIX D. CLOUD SHADOW EXPOSURE ANALYSIS

1. This study was undertaken to determine whether a significant amount of information was lost in the cloud shadow areas on Mission 1026 when the solar elevation was 20 degrees or above.

2. Procedure

a. Mission 1026 was analyzed to determine the amount of information lost in cloud shadow areas.

b. Missions 1018, 1019, and 1022 were analyzed to ascertain whether the greater amount of exposure on these missions produced improved image quality in the cloud shadow areas.

c. Support was provided by the photographic interpreters in helping to determine if a significant amount of information was lost in the cloud shadow areas due to the reduced exposure of Mission 1026.

3. Basic Information

a. The slit width utilized on those missions studied were:

Mission	Fwd-Looking Pan Camera	Aft-Looking Pan Camera
1018	0.250"	0.175"
1019	0.250"	0.175"
1022	0.250"	0.175"
1026	0.225"	0.150"

b. The scene illumination level is commensurate with the solar elevation. Lower solar elevations mean less light, while higher solar elevations provide more light. Accordingly, cloud shadow areas in combination with high solar elevations receive a greater amount of illumination than those at lower solar elevations.

c. Areas in cloud shadow receive diffused rather than point source illumination. The light intensity is also less. Therefore, imagery in cloud shadow areas is generally degraded by a lower contrast ratio and by a lower level of exposure.

d. Density level information provided by the processing contractor substantiates visual observations that Mission 1026 is one of the thinnest missions to date, even though approximately 90 percent of the material was processed at the full level of development.

e. Whenever the exposure and processing are not optimum for a given subject, some detail is lost and the photographic interpreter rarely misses what he cannot perceive.

4. Conclusions

a. Many cloud shadow areas in Mission 1026 were completely void of visually detectable detail when the solar elevation was 20 degrees and above. These seemed more abundant on Mission 1026 than the other missions.

b. More detail was lost in the cloud shadow areas on Mission 1026 than on similar areas of previous missions.

c. Loss of information in shadow areas for solar elevations of less than 10 degrees is considerable.

d. The condition of apparent graininess associated with low exposure level was more prevalent in the cloud shadow areas of Mission 1026 than in previous missions.

e. The photographic interpreters stated that the amount of detail present in the cloud shadow areas was considered to be sufficient. It must be remembered, however, that these individuals are resigned to the fact that such areas are normally degraded and that a loss in image quality is to be expected.

f. It is felt that the image quality of the areas with least exposure, whether due to low solar elevation, cloud shadow, or a combination of both, would have been enhanced by more exposure. Furthermore, an increase in exposure would have permitted more processing at the primary and intermediate levels, thus reserving the full level for areas of least exposure.

APPENDIX E. CLOUD COVER ANALYSIS

1. Introduction

This study represents a statistical analysis of the cloud cover on the photography of Mission 1026. The basis of this study is the cloud cover data for each quarter segment of every individual frame of photography. The data is obtained by analysts specifically trained in estimating cloud cover by designated categories.

Five cloud categories have been formulated for use in this photography (Reference, Table 1). These categories allow for the wide latitude of cloud cover conditions commonly found on a frame of this photography. Note in Table 1 that a mean cloud percentage value has been calculated for each category for use in determining a combined cloud cover percentage for all operational passes of the mission.

The occurrence of each cloud category within an operational pass is expressed as a percentage of 100 and appears in Table 2. Each percentage is a ratio of the number of occurrences of a given cloud cover category to the total number of cloud observations in a photo pass. For example: if the number of category 1 occurrences in a given pass is 200 out of a total of 1,000 (250 frames x 4 quarters), all categories combined, then 20 percent of the pass would be classed as category 1.

Also a cloud cover percentage per pass is included in the last column of Table 2 under "Cloud Cover % Per Pass." This value is determined by the summation of the products of category percentage in each pass and the mean cloud percentage for that category as established in Table 1. For example: if it is determined that the following percentages exist in a given pass:

20% Category 1
15% Category 2
30% Category 3
25% Category 4
10% Category 5

Then, by using the mean cloud percentage established in Table 1 the following computations are made:

$$
\begin{aligned}
0.20 \times 5.0 &= 1.00\% \\
0.15 \times 17.5 &= 2.63\% \\
0.30 \times 38.0 &= 11.40\% \\
0.25 \times 75.0 &= 18.75\% \\
0.10 \times 100.0 &= 10.00\% \\
&\overline{43.78\%}
\end{aligned}
$$

Hence, 43.8 percent of this pass is cloud covered.

TABLE 1

CLOUD COVER CATEGORIES

Category Number	Percent Of Cloud Cover	Description	Mean Cloud Percentage
1	Less than 10%	Clear	5%
2	10% - 25%	Small Scattered Clouds	17.5%
3	26% - 50%	Large Scattered Clouds	38%
4	51% - 99%	Broken or Connected Clouds	75%
5	100%	Complete Overcast	100%

2. Cloud Cover Data, Missions 1026-1 and 1026-2

1026-1

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
1D	13.6	9.2	10.1	59.2	7.9	58.4
3D	53.2	7.9	8.2	30.0	0.7	30.4
5D	34.1	2.6	4.8	51.5	7.0	49.5
6D	47.4	7.9	10.6	34.1	0.0	33.4
7D	8.3	3.3	6.0	33.8	48.6	77.3
8D	0.0	0.3	2.3	96.4	1.0	74.2
9D	60.9	7.0	7.3	24.8	0.0	25.6
14D	71.5	3.3	2.3	20.3	2.6	22.9
19D	100.0	0.0	0.0	0.0	0.0	5.0
20D	60.6	7.2	11.6	20.6	0.0	24.2
21D	10.4	3.7	8.7	77.2	0.0	62.4
23D	43.2	0.0	0.0	56.8	0.0	44.8
24D	50.7	3.5	5.8	40.0	0.0	35.3
25D	6.8	15.5	49.3	28.4	0.0	43.1
26D	70.1	8.4	13.9	7.6	0.0	15.9
30D	16.5	2.1	12.2	69.2	0.0	57.7
34M	80.1	1.0	1.5	17.4	0.0	17.8
35M	71.4	4.9	8.0	15.7	0.0	19.2
37D	60.3	3.1	9.9	20.4	6.3	28.9
38D	32.1	4.7	5.8	45.1	12.3	50.7
39D	26.8	18.6	18.4	36.2	0.0	38.7
40D	37.4	2.8	11.2	35.5	13.1	46.4
41D	3.0	0.7	1.9	94.4	0.0	71.8
51D	81.4	0.5	1.5	16.6	0.0	17.2
52D	67.6	3.9	5.1	11.2	12.2	26.6
53D	12.2	24.6	5.3	57.9	0.0	50.4
54D	55.6	2.7	5.2	36.5	0.0	32.6
64D	100.0	0.0	0.0	0.0	0.0	5.0
66D	0.0	0.0	0.0	100.0	0.0	75.0
68D	54.6	7.0	11.9	26.5	0.0	28.3
69D	36.3	3.0	7.9	39.7	13.1	48.2
70D	80.7	3.1	6.3	9.9	0.0	14.4
72D	6.4	2.2	3.6	82.7	5.1	69.2
	43.1*	5.4*	7.7*	39.3*	4.5*	39.9**

* Average percentage by category for mission.
** Overall mission cloud cover percentage.

1026-2

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
82D	2.2	11.4	24.4	53.3	8.7	60.0
83D	22.5	6.9	33.7	35.0	1.9	43.3
84D	39.4	2.7	3.1	42.4	12.4	47.9
85D	43.7	13.1	9.4	32.6	1.2	33.7
86D	9.2	3.6	2.6	62.9	21.7	71.0
87D	14.5	2.9	4.7	23.8	54.1	74.9
88D	33.4	16.4	15.0	35.2	0.0	36.6
89D	100.0	0.0	0.0	0.0	0.0	5.0
98D	49.4	9.1	6.7	34.8	0.0	32.7
99D	52.7	5.2	7.4	34.7	0.0	32.4
100D	73.3	4.3	11.4	11.0	0.0	17.0
101D	100.0	0.0	0.0	0.0	0.0	5.0
102D	4.7	1.4	3.3	87.0	3.6	70.6
103D	24.2	3.6	4.4	35.5	32.3	62.4
104D	14.3	8.0	10.4	33.3	34.0	65.0
105D	100.0	0.0	0.0	0.0	0.0	5.0
116D	37.9	8.0	13.9	34.9	5.3	40.0
117D	72.5	7.7	3.2	11.9	4.7	19.8
118D	0.0	0.0	0.0	12.1	87.9	97.0
119D	0.7	0.0	3.3	35.3	60.7	88.4
120D	31.1	10.6	11.1	27.8	19.4	47.9
130D	8.1	8.5	16.1	56.4	10.9	61.2
131D	70.3	15.9	9.4	4.4	0.0	13.2
132D	56.0	14.9	13.2	15.9	0.0	22.3
133D	41.7	5.0	2.7	14.4	36.2	51.0
134D	0.0	0.0	0.0	7.0	93.0	98.2
135D	21.3	5.6	5.6	13.1	54.4	68.4
148D	65.2	12.9	6.4	10.8	4.7	20.7
149D	43.7	5.1	3.4	9.7	38.1	49.7
150D	0.0	0.0	0.0	24.7	75.3	93.8
151D	0.0	0.0	0.0	5.2	94.8	98.7
	38.7*	6.6*	6.9*	26.1*	21.7*	47.0**

* Average percentage by category for mission.
** Overall mission cloud cover percentage.

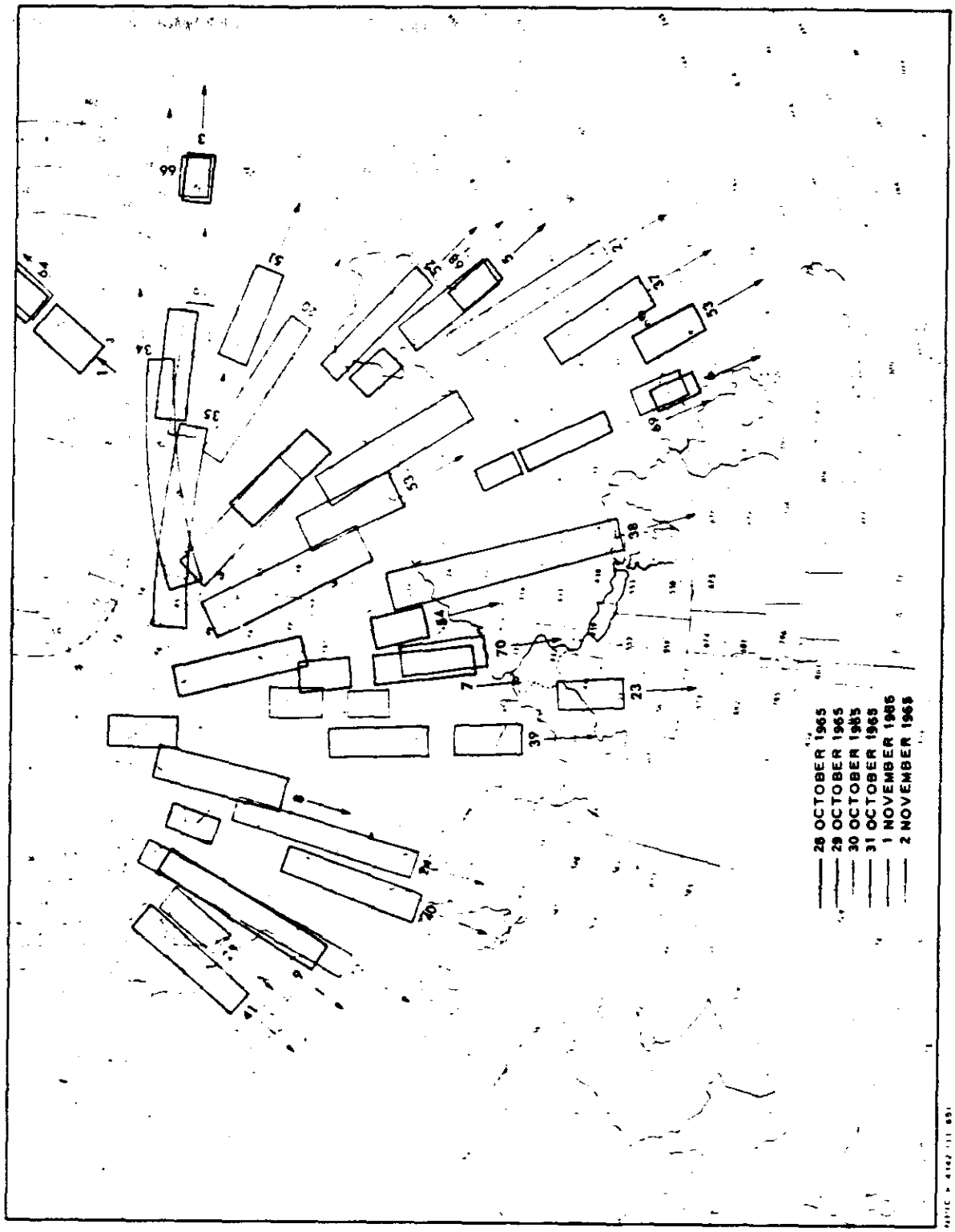
APPENDIX F. MISSION COVERAGE STATISTICS

[illegible] Photographic Coverage, Mission 1026-1

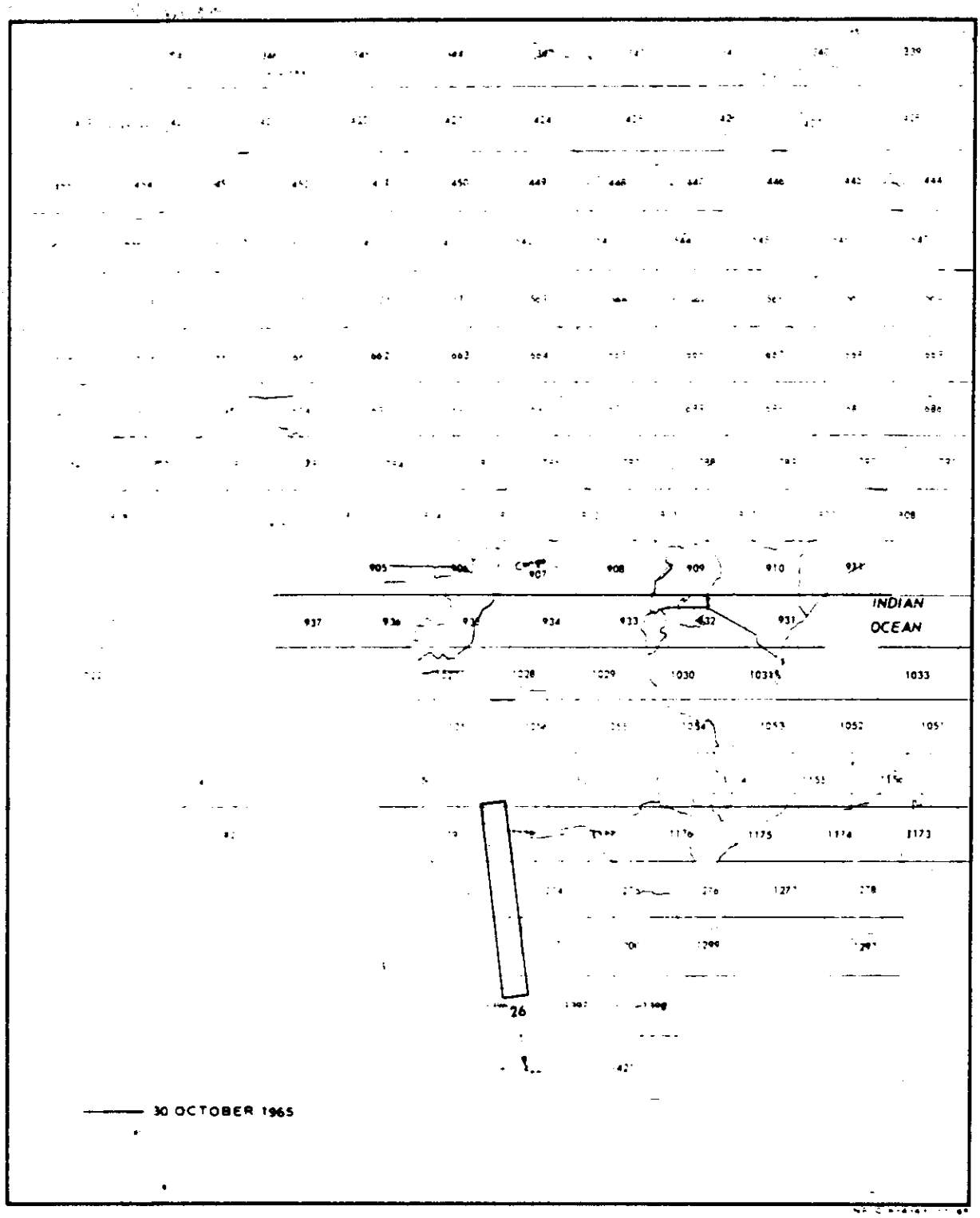
Country	FWD-LOOKING CAMERA		AFT-LOOKING CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
[illegible]	12,417	2,185,752	12,495	2,158,594	24,912	4,344,346
China	4,5[illegible]	642,398	4,504	631,318	9,064	1,273,716
Argentina	[illegible]	127,1[illegible]	1,072	189,364	1,802	316,484
Australia	[illegible]	111,2[illegible]	707	117,362	1,377	228,582
SW Africa	[illegible]	[illegible]	575	92,000	1,150	184,000
Mongolia	[illegible]	77,78[illegible]	508	81,730	991	159,510
Poland	3[illegible]	6[illegible],3[illegible]	408	66,528	777	126,836
Rumania	2[illegible]	12,388	267	11,896	566	24,284
Alaska US	3[illegible]	24,8[illegible]	161	12,800	471	37,600
N Vietnam	[illegible]	26,6[illegible]	193	21,560	447	48,160
Chile	[illegible]	31,5[illegible]	232	38,416	426	69,916
Turkey	[illegible]	37,358	188	27,224	422	64,582
Bolivia	[illegible]	31,570	205	31,570	410	63,140
Pakistan	[illegible]	35,040	53	7,738	293	42,778
Peru	136	20,944	136	20,944	272	41,888
India	56	8,176	213	31,098	269	39,274
E Germany	107	16,512	143	17,200	250	33,712
Czechoslovakia	136	23,624	64	11,008	200	34,632
Mexico	104	15,184	70	10,220	174	25,404
Bulgaria	86	2,924	86	2,924	172	5,848
Austria	107	18,404	64	11,008	171	29,412
Angola	72	11,520	72	11,520	144	23,040
Union Of South Africa	72	11,520	72	11,520	144	23,040
Sweden	21	376	117	3,100	138	3,476
Hungary	53	9,116	64	11,008	117	20,124
W Germany	53	8,256	64	3,268	117	11,524
Yugoslavia	53	9,116	64	11,008	117	20,124
N Korea	45	790	45	790	90	1,580
Finland	37	6,956	45	8,556	82	15,512
Taiwan	41	2,272	41	2,272	82	4,544
Laos	33	4,620	33	4,620	66	9,240
Denmark	--	--	64	3,268	64	3,268
Afghanistan	41	6,478	21	3,318	62	9,796
Norway	--	--	37	1,484	37	1,484
Bhutan	12	1,752	--	--	12	1,752
Iran	8	1,264	--	--	8	1,264
Total	22,813	3,675,638	23,083	3,668,234	45,896	7,343,872
Continential US	1,026	149,166	1,130	164,350	2,156	313,516
GRAND TOTAL	23,839	3,824,804	24,213	3,832,584	48,052	7,657,388

Mission 1026-2

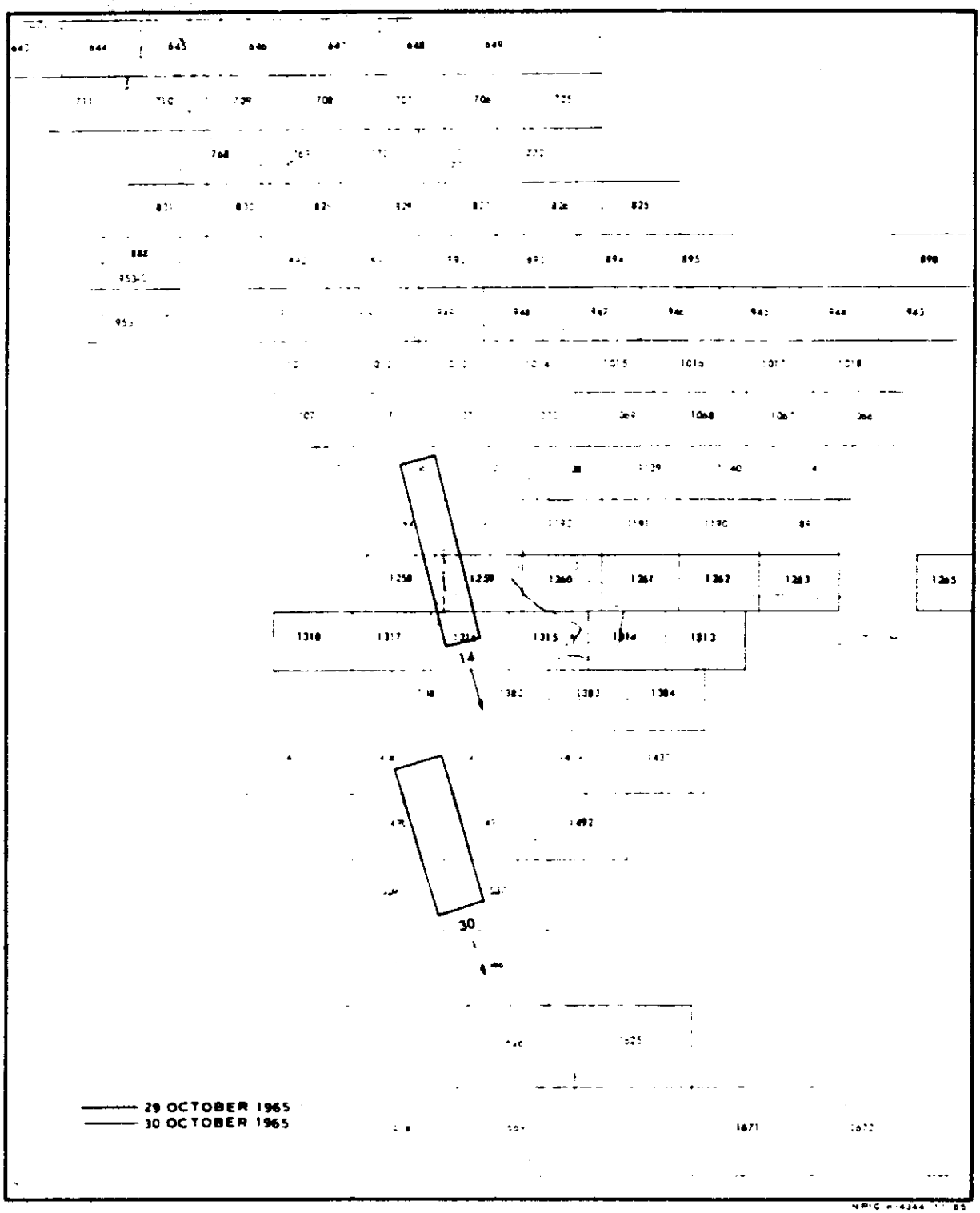
Country	FWD-LOOKING CAMERA		AFT-LOOKING CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
USSR	14,770	2,149,521	14,421	2,099,595	29,191	4,249,116
China	1,669	233,724	1,877	255,507	3,546	489,231
Indonesia	768	49,926	734	47,859	1,502	97,785
Niger	465	73,935	528	83,952	993	157,887
Nigeria	412	65,508	412	65,508	824	131,016
Poland	352	48,336	409	55,491	761	103,827
Alaska	393	56,604	352	31,005	745	87,609
Czechoslovakia	319	50,721	315	50,085	634	100,806
South Korea	236	22,578	236	22,578	422	45,156
Hungary	241	38,319	172	27,348	413	65,667
Turkey	214	25,281	169	23,532	383	48,813
North Korea	142	15,741	236	26,235	378	41,976
East Germany	182	24,963	182	27,030	364	51,993
Sweden	150	5,883	184	9,540	334	15,423
Norway	185	20,670	144	13,674	329	34,344
Canada	190	24,168	135	21,465	325	45,633
West Germany	156	22,260	156	22,260	312	44,520
Rumania	176	27,984	107	17,013	283	44,997
India	148	23,532	124	19,716	273	43,248
North Vietnam	144	22,896	115	18,285	259	41,181
Bulgaria	111	17,649	107	17,013	218	34,662
Greece	111	8,745	57	8,586	184	17,331
Mexico	127	20,193	65	8,904	169	29,097
Austria	104	14,469	61	10,335	135	24,804
Pakistan	74	11,766	63	9,699	126	21,465
Cameroons UK	63	10,071	49	10,071	111	20,142
Laos	62	9,858	104	7,791	104	17,649
Denmark	--	--	45	5,724	90	5,724
Malaysia	45	6,519	20	6,360	82	12,879
Japan	62	3,975	20	636	82	4,611
Taiwan	62	1,908	--	954	65	2,862
Yugoslavia	65	10,335	--	--	65	10,335
Cameroun	65	10,071	20	--	65	10,071
Afghanistan	25	3,975	28	3,180	45	7,155
Finland	--	--	--	2,226	28	2,226
Iran	16	2,544	6	--	16	2,544
Hong Kong	6	159	6	159	12	318
Macao	6	6	6	6	12	12
Total	22,316	3,134,793	21,766	3,029,322	44,082	6,164,115
Continential US	655	91,425	792	108,279	1,454	199,704
GRAND TOTAL	22,971	3,226,218	22,565	3,137,601	45,536	6,363,819



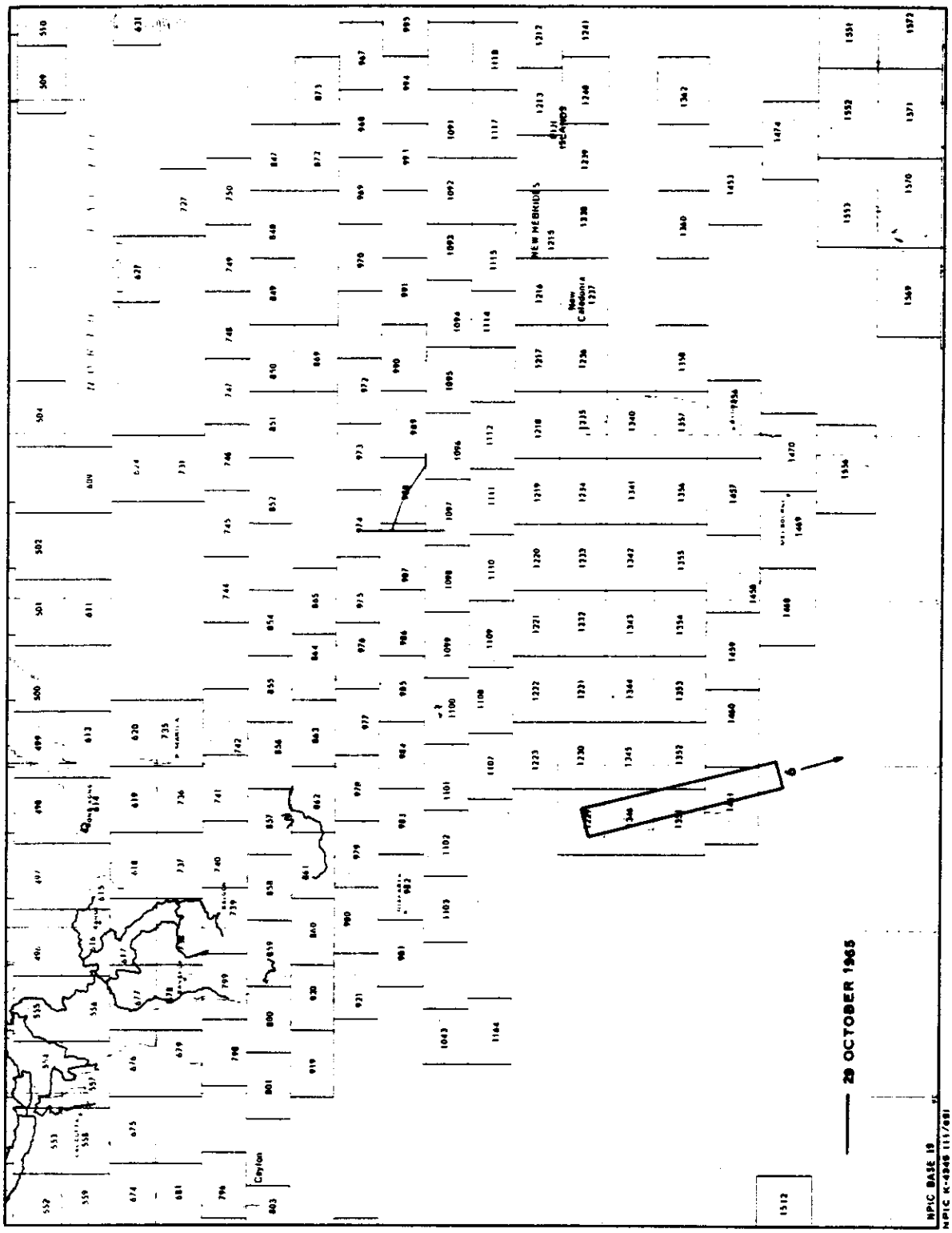
APPROXIMATE TRACK OF MISSION 1026-1, 28 OCTOBER - 2 NOVEMBER 1965 OVER USSR, FAR AND MIDDLE EAST



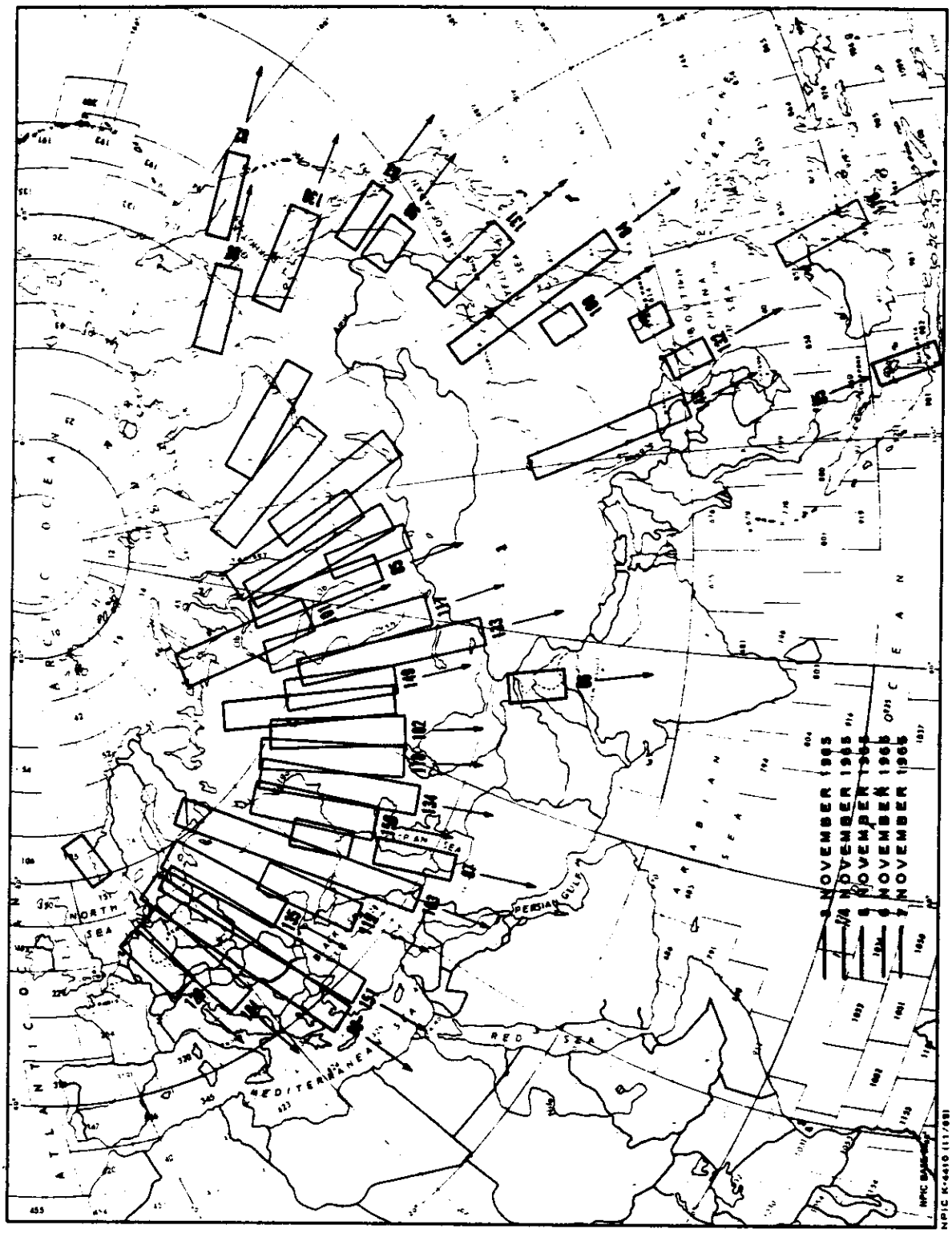
APPROXIMATE TRACK OF MISSION 1026-1, 28 OCTOBER - 2 NOVEMBER 1965 OVER AFRICA.



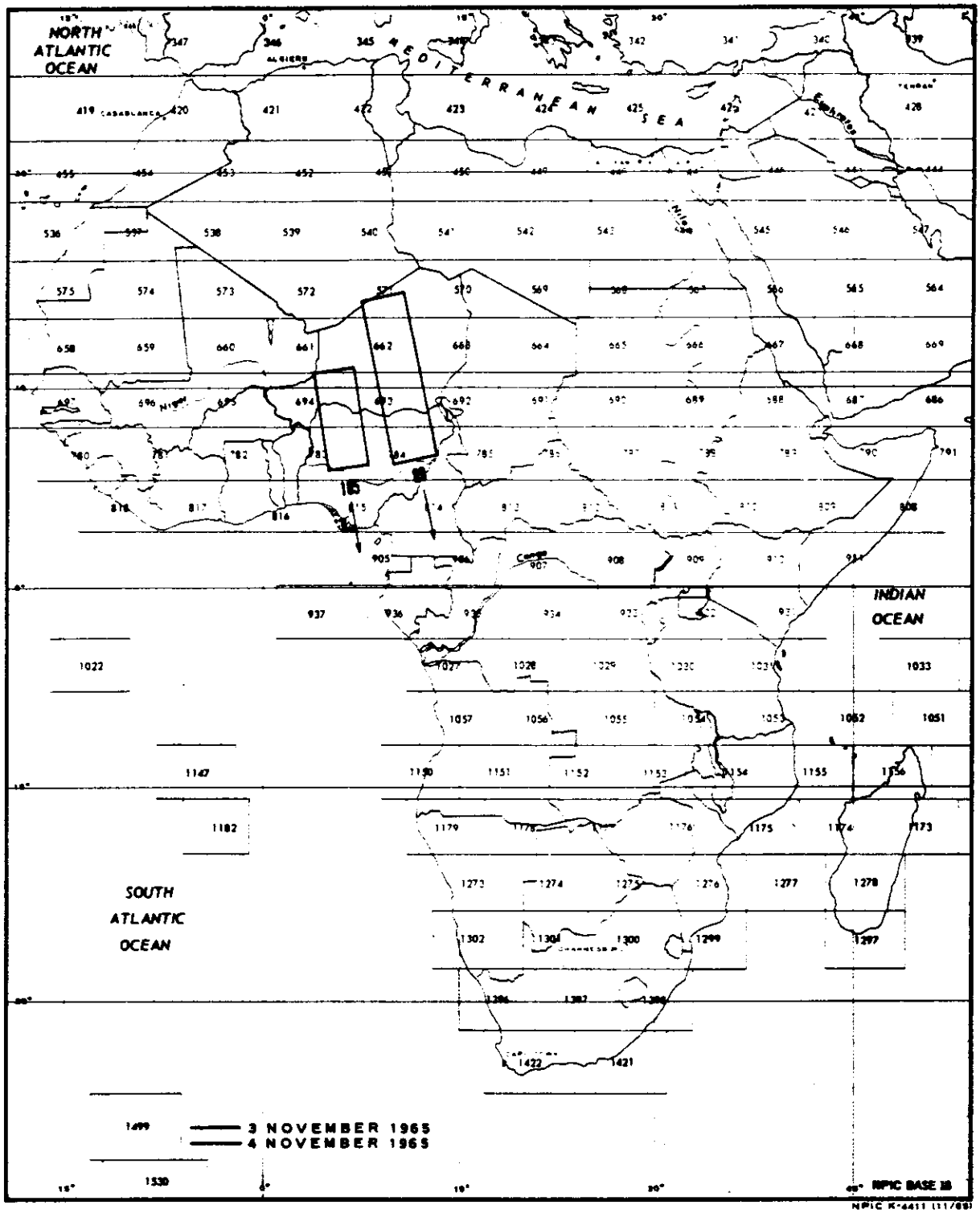
APPROXIMATE TRACK OF MISSION 1026-1, 28 OCTOBER - 2 NOVEMBER 1965 OVER SOUTH AMERICA



APPROXIMATE TRACK OF MISSION 1026-1, 28 OCTOBER - 2 NOVEMBER 1965 OVER AUSTRALIA



APPROXIMATE TRACK OF MISSION 1026-2, 3 - 7 NOVEMBER 1965 OVER USSR, FAR AND MIDDLE EAST



APPROXIMATE TRACK OF MISSION 1026-2, 3 - 7 NOVEMBER 1965 OVER AFRICA