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PHOTOGRAPHIC

18-23 MAY 1965

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1021-1
18-23 MAY 1965
MISSION 1021-2
23-28 MAY 1965

JANUARY 1966

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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TABLE OF CONTENTS

	Page
SYNOPSIS	1
GENERAL FLIGHT DATA	2
1. Launch and Recovery Dates	2
2. Orbital Parameters (Actual)	2
3. Photographic Operations	2
A. Pass Information	2
B. Film Footage/Frame Totals	2
PART I. CAMERA OPERATIONS	3
1. Master (Aft-Looking) Panoramic Camera No 166	3
2. Slave (Fwd-Looking) Panoramic Camera No 167	4
3. Master (Aft-Looking) Horizon Cameras	4
4. Slave (Fwd-Looking) Horizon Cameras	5
5. Stellar Camera No D63 (1021-1)	5
6. Stellar Camera No D25 (1021-2)	5
7. Index Camera No D63 (1021-1)	6
8. Index Camera No D25 (1021-2)	6
9. Associated Equipment	6
PART II. FILM	9
1. Film Processing	9
2. Special Printing	9
3. Film Degradations	9
PART III. IMAGE QUALITY	11
1. Definition of Photographic Interpretation (PI) Suitability	11
2. PI Suitability, Missions 1021-1 and 1021-2	13
3. Mission Information Potential (MIP)	13
4. MIP Rating for Mission 1021	14
5. Analysis of Fixed, High-Contrast Resolution Targets	15



TABLE OF CONTENTS (CONTINUED)

	Page
APPENDIX A. SYSTEM SPECIFICATIONS	17
1. Cameras	17
2. Vehicle Configuration and Equipment Layout	18
3. Panoramic Format Specifications	19
APPENDIX B. DENSITY READINGS	20
1. Density Readings from Stellar Material	20
2. Index Material	25
APPENDIX C. MICRODENSITOMETRY	26
1. Edge Spread Function	26
2. Summary Table of Edge Traces	28
3. Edge Traces, Mission 1021-1	29
4. Edge Traces, Mission 1021-2	35
APPENDIX D. CLOUD COVER ANALYSIS	41
1. Introduction	41
2. Cloud Cover Data, Mission 1021-1	43
3. Cloud Cover Data, Mission 1021-2	44
APPENDIX E. MISSION COVERAGE STATISTICS	45
1. Summary of Plottable Photographic Coverage on Mission 1021	45
2. Mission Coverage Tracks, Mission 1021	49

LIST OF ILLUSTRATIONS

	Page
Figure 1. Description of Photographic Data	8a
Figure 2. Example of Foreign Matter Inside the Horizon Format .	8c
Figure 3. Example of Vignetting Inside the Horizon Format . . .	8e
Figure 4. Static Discharges Inside the Stellar Format	8g
Figure 5. Example of Index Camera Photography	8i
Figure 6. Example of Pan Camera Photography	8k
Figure 7. Example of Pan Camera Photography	8k
Figure 8. Print of Cut and Splice Which Caused Film to Come Out of the Rails	10a
Figure 9. Comparison of Fwd and Aft Photography After the Cut and Splice	10c
Figure 10. Comparison of Fwd and Aft Photography After the Cut and Splice	10c
Figure 11. Example of Degraded Photography Due to the Cut and Splice	10e
Figure 12. Example of Degraded Photography Due to the Cut and Splice	10e
Figure 13. Comparison of Fwd Photography With the MIP Frame of the Aft Material	14a
Figure 14. Comparison of Fwd Photography With the MIP Frame of the Aft Material	14a



LIST OF ILLUSTRATIONS (Continued)

	Page
Figure 15. MIP Selection, Mission 1021-2	14c
Figures	
16-25. Examples of Terrain Covered in Mission 1021	16a
Figure 26. Location of Edge Traces 1-6, Mission 1021-1	28a
Figure 27. Location of Edge Traces 7-12, Mission 1021-2	34a

SYNOPSIS

Mission 1021 (System J-21) was a 2-part photographic mission programmed to achieve coverage for cartographic purposes. The mission was intentionally flown with the camera system rotated horizontally 180 degrees from its normal position, orbiting nose-first instead of tail-first. As a result of this change in orientation certain variations in normal system parameters should be noted. At the descending mode, the stellar camera looks westward. The master camera is the aft-looking and the slave camera is the forward-looking camera.

A normal orbit was achieved. Photographic coverage was accomplished between 18 and 28 May 1965. Clouds covered approximately 30 percent of the entire mission. The panoramic cameras functioned properly on the first part. The Stellar/Index cameras of Mission 1021-1 performed normally through frame 359. From frame 360 through 380, there were several multi-exposure frames that were not usable. On the second part of the mission the forward-looking camera and associated photographic equipment functioned properly throughout. However, an anomaly occurred in the aft-looking camera causing a termination of the photographic record on pass 102D frame 8. As a result, only a total of 12 million square nautical miles of plottable photographic coverage was acquired.

The recovery capsules from missions 1021-1 and 1021-2 were retrieved by air catch during revolutions 81 and 161 respectively.

There is no significant differences in the image quality of the panoramic material between missions 1021-1 and 1021-2 except for the anomaly mentioned above. Both payloads were assigned an MIP rating of 85.

- 1 -



GENERAL FLIGHT DATA

1. Launch and Recovery Dates

Launch Date, Mission 1021-1	18 May 1965
Recovery Date, Mission 1021-1	23 May 1965
Activation Date, Mission 1021-2	23 May 1965
Recovery Date, Mission 1021-2	28 May 1965

2. Orbital Parameters (Actual)

	<u>Mission 1021-1</u> <u>Rev 40</u>	<u>Mission 1021-2</u> <u>Rev 120</u>
Period	89.81 Min	89.74 Min
Perigee	109.71 NM	110.52 NM
Apogee	180.06 NM	179.67 NM
Eccentricity	0.00988	0.00965
Inclination Angle	75.02°N	75.02°N
Perigee Latitude	24.288°N	37.707°N

3. Photographic Operations

A. Pass Information

	<u>Mission 1021-1</u>	<u>Mission 1021-2</u>
Operational Passes	44	38
Operational/Domestic Passes	1	
Domestic Passes	2	5
Domestic/Engineering Passes	2	5
Total Photo Passes	49	48
Recovery Revolution	81	161

B. Film Footage/Frame Totals

	<u>Master</u>	<u>Slave</u>
Footage Available	16,000 (Approx)	16,000 (Approx)
Preflight Footage	428	298
Process Footage (1021-1)	7,994	7,696
Process Footage (1021-2)	2,250	8,361
Titled Frames (1021-1)	2,841	2,772
Titled Frames (1021-2)	342	3,177

PART I. CAMERA OPERATION

1. Master (Aft-Looking) Panoramic Camera No 166

The master panoramic camera functioned properly on the first part of the mission and through a portion of pass 85D of the second part. Good quality photography was obtained up to this point. However, the film came out of the guide rails on pass 85D, frame 11, and severely degraded the imagery through pass 102D, frame 10. At this time, the film jammed and caused a premature termination of the master camera record. The malfunction was caused by a cut that existed in the film when it was transported into the platen area prior to exposure. Because of the cut the film slipped from the rails as it was being transported. The film contractor conceded that a cut is made during film manufacturing to signal the end of a useable roll of film. The conclusion is that the cut was made in the customary manner by the film manufacturer and a splice was erroneously made on the wrong side of the cut. For a more detailed analysis of the anomaly see Part II, Section 3. Degradations attributed to camera operation include:

- a. A group of longitudinal scratches just inside the format are present beneath the binary and at the take-up ends of the frames on the emulsion side of the film throughout the mission.
- b. Continuous scratches, parallel to the edges of the negative, are present throughout the mission. These scratches are attributed to the rails which support the film during transport.
- c. Banding is present on the take-up ends of most frames throughout the mission. Its noted severity is commensurate with contrast and density.
- d. Fog that appears to have been caused by light reflected from a curved surface is present near the take-up end of the next-to-last frame of most camera operations and extends partially into the supply end of the third frame from the end. Equipment shadowgraphs are present on the last frame of most camera operations. A transverse band of fog is located on the first frame of most camera operations. The degree of fog density is associated with the duration of the camera-off period and the sun angle during this time.

2. Slave (Fwd-Looking) Panoramic Camera No 167

The slave panoramic camera functioned properly throughout both parts of this mission. The majority of the detriments to the photographic record associated with the operation of this camera are similar to those present on previous missions of this type. These degradations include:

- a. A scratch is present just inside the format of both edges of the take-up end of each frame and on both edges of the format beneath the camera number. A group of short, fine emulsion scratches are located across the format beneath the camera number.
- b. Continuous scratches, parallel to the edges of the negative, are present throughout the mission. These scratches are attributed to the rails which support the film during film transport.
- c. Minus density streaks following the general path of the field flattener appear intermittently through pass 18D.
- d. Fogged areas of plus density and equipment shadowgraphs caused by extraneous light are present on the last 4 frames of most camera operations. Their pattern is repetitive and the degree of density is commensurate with the duration of the camera-off period and the sun angle during this time.

3. Master (Aft-Looking) Horizon Cameras

- a. The port (take-up) horizon camera functioned properly throughout the mission. However, due to the film jam (covered in Item 1 of Part I) there was a termination of the photographic record on pass 102D frame 10. Exposure was commensurate with the solar elevation. Vignetting occurred in the corners of the imagery but did not interfere with the determination of vehicle attitude.
- b. The starboard (supply) horizon camera functioned properly throughout the mission. However, due to the anomaly which caused the film to come out of the rails, the imagery is smeared and out of focus from pass 85D, frame 12, through pass 102D, frame 10. At this point the film jammed and caused a termination of photographic record. The exposure was commensurate with the solar elevation. Vignetting is more pronounced than in the port horizon camera, but did not interfere with the determination of vehicle attitude.

4. Slave (Fwd-Looking) Horizon Cameras

a. The port (supply) horizon camera functioned properly throughout the mission. The film has a veiled appearance which is attributed to atmospheric attenuation, but under magnification the imagery appears to be sharp. Vignetting is extensive in the corners of the format, but does not interfere with camera attitude determination. Exposure is commensurate with solar elevation.

b. The starboard (take-up) horizon camera functioned properly throughout the mission. Obstructions, possibly film scrapings, appear in the format edges but do not interfere with the determination of vehicle attitude. The obstructions are present throughout the mission. Exposure is commensurate with solar elevation.

5. Stellar Camera No D63 (1021-1)

The stellar camera performed extremely well through frame 359. There are 9 multiple exposed frames from 360 to 380 that were not usable. Of the 380 total frames, 369 were used for attitude determination. The photography provided stellar images with good geometric distribution. Approximately 25 stars are visible in the field of view. The change in the stellar field from pass to pass was minimal.

Earth flare was normal with stellar images visible in the fogged areas. A continuous plus density streak is located along the correlation mark edge throughout the first 75 percent of the mission. Emulsion cracking parallel to the minor axis is present on the last 50 percent of the film. Narrow bands of fog parallel to the mirror axis occur near the take-up end of several frames. The configuration of the fog is similar to that caused by corona static. The fog is more severe on the last 19 frames in association with the multiple exposures.

6. Stellar Camera No D25 (1021-2)

Although the film jammed in the master (aft-looking) camera, it continued to operate throughout the mission. Also, the stellar camera was operational throughout. However, due to the malfunction the binary record was not recorded on the panoramic material and the time could not be directly related for the 2 cameras. Therefore, the stellar material was not used for attitude determination in Mission 1021-2. The pitch and roll for the slave (fwd-looking) photography was determined from the horizon camera record.

Fog caused by dendritic static occurred on the film during the last 50 percent of the mission. The static is discharged inside the format on a few frames. Biased plus density streaks, located through the middle of the format, are present during the last 25 percent of the photography. They are about 0.5 inches long and when they occur are spaced about 0.25 inches apart. Minor emulsion cracking is noted on the last 50 percent of the film. Severe abrasions and fog on the last 4 feet of the film are associated with film exhaustion.

7. Index Camera No D63 (1021-1)

The index camera operated normally through frame 359. Thereafter, multiple exposures occurred on frames 360, 361, 362, 364, 371, 374, 378, 379, and 380. A continuous plus density streak, beginning in the preflight and in line with the camera number, is present through the first 75 percent of the mission. Toward the end of the mission the plus density streak becomes intermittent and faint. Emulsion cracks emanating from the plus density streak appear to be caused by an emulsion rub. Minor static traces occur along both edges of the film. Newton rings are visible on a number of frames. Small particles of foreign matter, possibly specks of emulsion, are present intermittently throughout the mission. Several particles of dirt on the reseau grid caused minus density spots on most frames.

8. Index Camera No D25 (Mission 1021-2)

The index camera was operational throughout the mission. The imagery is good in the middle of the frames, but the fall-off toward the edges is greater than normal. Newton rings are present on most frames throughout the mission. Abrasions and fog occurring on the last 4 feet of the film are caused by film run-out. The correlation lamp on this camera is slightly offset, allowing crescent-shaped ground images to appear on the film when the lamp is not lit. The film was titled over the correlation fiducial.

9. Associated Equipment

This equipment records technical information for the correlation and mensuration of the primary cameras.



Several horizon camera fiducials are slightly bloomed. Flare emanating from and adjacent to the camera number and the end of pass marker is present throughout the mission. The 200 cycles per second timing pips were recorded outside the format. However, the density is less than optimum and relative to the processing level used.

The binary time for missions 1021-1 and 1021-2 was read automatically from positives. Difficulties were experienced for the following reasons:

1021-1 Fwd

1. The No 17 binary light had the top one-third cut off, making it very difficult to read.
2. The alignment of the binary block was very irregular on many passes.
3. A light streak appeared on the third frame from the end of each pass.
4. The binary was missing on pass 25D, frame 50.
5. All lights were smaller than most previous missions.

1021-1 Aft

1. The No 19 light was faint on passes 2, 9, 30, 56, 57, 66, 72, and 73.
2. The No 23 light was faint on passes 2, 6, 11, 41, 45, 56, 72, 73, 75, and 79.
3. The No 24 light was faint on passes 2, 11, 73, and 75.
4. The No 3 light was faint on passes 6 and 73.
5. The No 21 light was faint on passes 9, 66, and 72.
6. The No 5 light was faint on passes 55 and 57.
7. The No 10 light was faint on pass 57.
8. The No 16 light was faint on pass 75.
9. The alignment was poor on most passes, but pass 66 appeared to be exceptionally poor.



10. The binary was missing on pass 37D, frame 39.
11. A light streak appeared on the third frame from the end of each pass.

1021-2 Fwd

1. The No 18 light was faint on passes 86 and 88.
2. The No 17 light was faint on passes 88, 89, and 90.
3. The binary was missing on pass 117D, frame 7, and pass 152D, frame 112.
4. On the last frame of the mission, frame 21, pass 158D, the binary lights were so smeared that they had to be translated manually.
5. A light streak appeared on the third frame from the end of each pass.

1021-2 Aft

1. Due to the film coming out of the rails only 15 frames had a binary block. These were pass 81D, frames 1 thru 5, and pass 85D, frames 1 thru 10.

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 data 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 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 the left wing-up attitude and negative readings indicate right wing-up attitude.

YAW: Rotation of the camera about its vertical axis. Positive readings indicate counter-clockwise 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.

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

FIGURE 2. EXAMPLE OF FOREIGN MATTER INSIDE THE HORIZON FORMAT

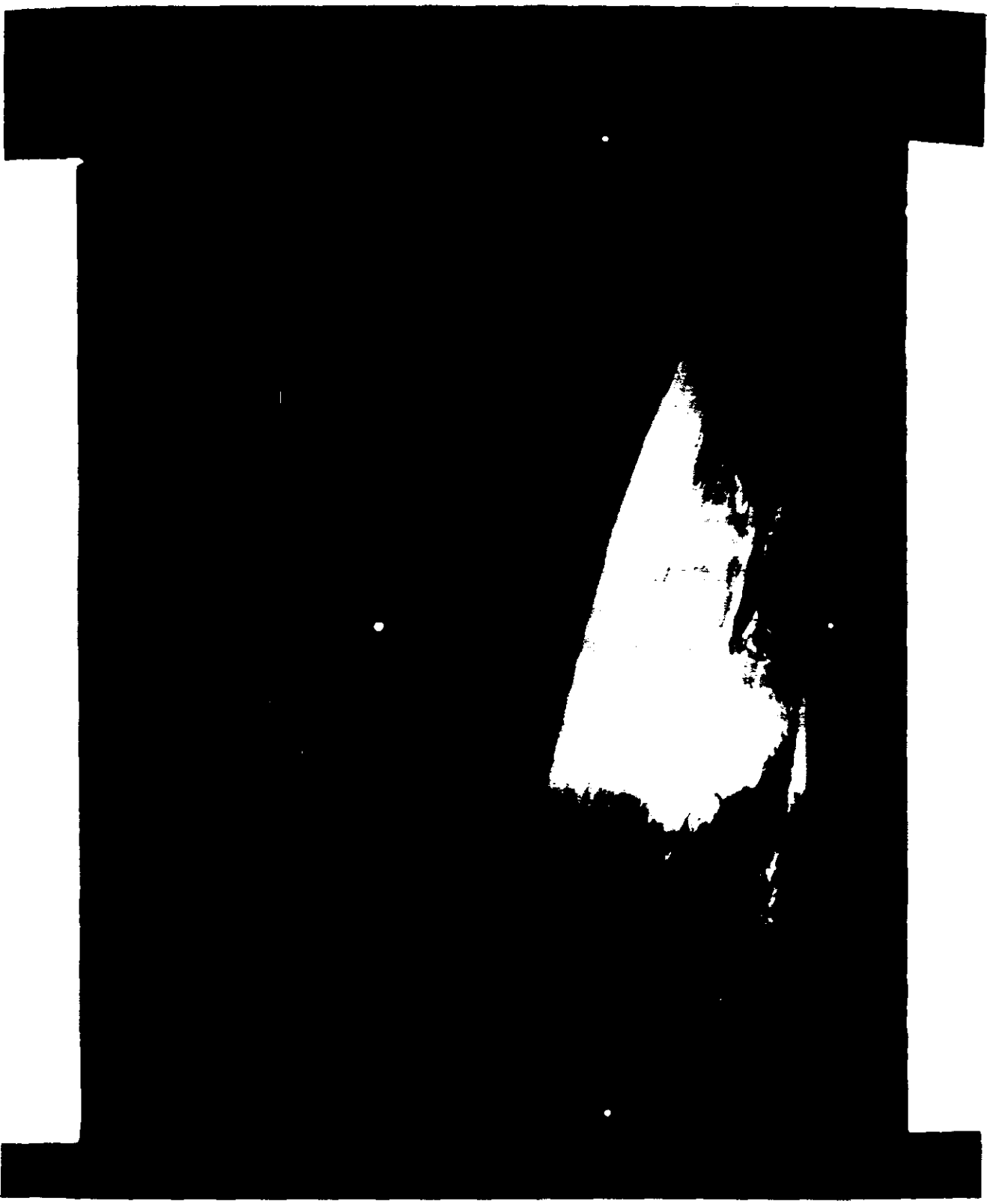
Note the lint-like obstructions in the supply edge of the format, and the vignetting that occurred on the titled and the frequency-mark edges of the horizon format.

NPIC K-8823 (12/65)

- 8c -

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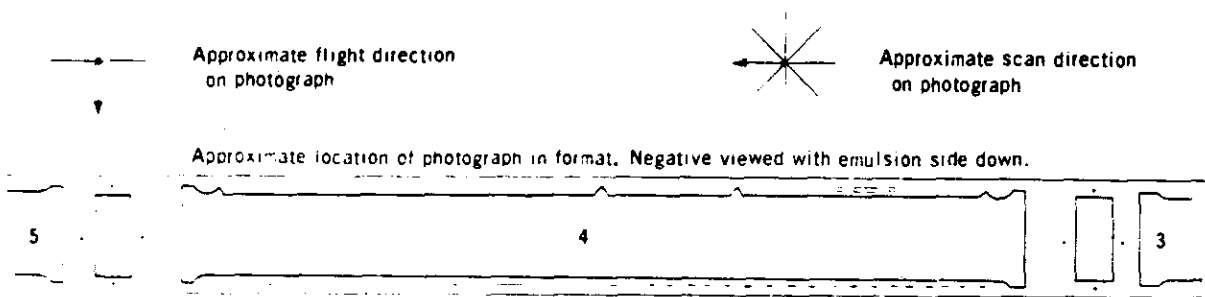
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Camera 167
Pass 73D
Frame. 4 fwd
Date of Photography. 23 May 65
Universal Grid Coordinates Not Applicable
Enlargement Factor 3X
Geographic Coordinates 29-00N 027-02E
Altitude (feet). 666,553
Camera:
Pitch 15°14'
Roll. -0°15'
Yaw -0°17'
Local Sun Time 0915
Solar Elevation. 51°45'
Solar Azimuth. 94°
Exposure (fractions of second) 1/263
Processing Level Intermediate
Vehicle Azimuth. 165°51'



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FIGURE 4. STATIC DISCHARGES INSIDE THE STELLAR FORMAT

NPIC K-5825 (12/65)

- 8g -



Stellar Frame Numbers 68, 69, & 70
Correlates with:
Aft Camera: 166
Pass 89D
Frame. *
Date of Photography 24 May 65
Enlargement Factor. 2.5X
Main Camera Attitude. Not Determined
Exposure Time 2 sec

*No Corresponding Master (aft-looking) Panoramic
Material.



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FIGURE 5. EXAMPLE OF INDEX CAMERA PHOTOGRAPHY

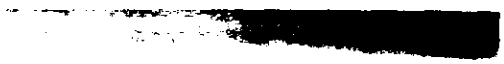
This photograph shows that the quality of this mission compares favorably to that obtained from past missions.

NPIC K-5826 (12/65)



Index Frame Number. 125
Correlates with:
 Aft Camera 166
 Pass 102D
 Frame. *
Date of Photography 25 May 65
Enlargement Factor. 2.5X
Main Camera Attitude. Not Determined
Exposure. 1/500 sec

*No Corresponding Master (aft) Panoramic Material.



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FIGURES 6 AND 7. EXAMPLES OF PAN CAMERA PHOTOGRAPHY

The following 2 photographs show a comparison between the forward and aft film. Note the subtle improvement of the aft material over the forward.

NPIC K-5827 (12/65)

NPIC K-5828 (12/65)

- 8k -



Figure 6

Figure 7

Camera	167	166
Pass	79D	79D
Frame.	T fwd	14 aft
Date of Photography.	23 May 65	23 May 65
Universal Grid Coordinates	28.1 - 10.6	62.5 - 10.0
Enlargement Factor	20X	20X
Geographic Coordinates	32-52N 109-58W	32-44N 110-00W
Altitude (feet).	670,622	669,478
Camera:		
Pitch	15°12'	-14°41'
Roll.	-0°15'	-0°15'
Yaw	Not Determined	Not Determined
Local Sun Time	905	905
Solar Elevation.	49°04'	49°07'
Solar Azimuth.	94°	94°
Exposure (fractions of second)	1/247	1/365
Processing Level	Full	Full
Vehicle Azimuth.	164°53'	165°08'

..... Approximate flight direction
on photograph

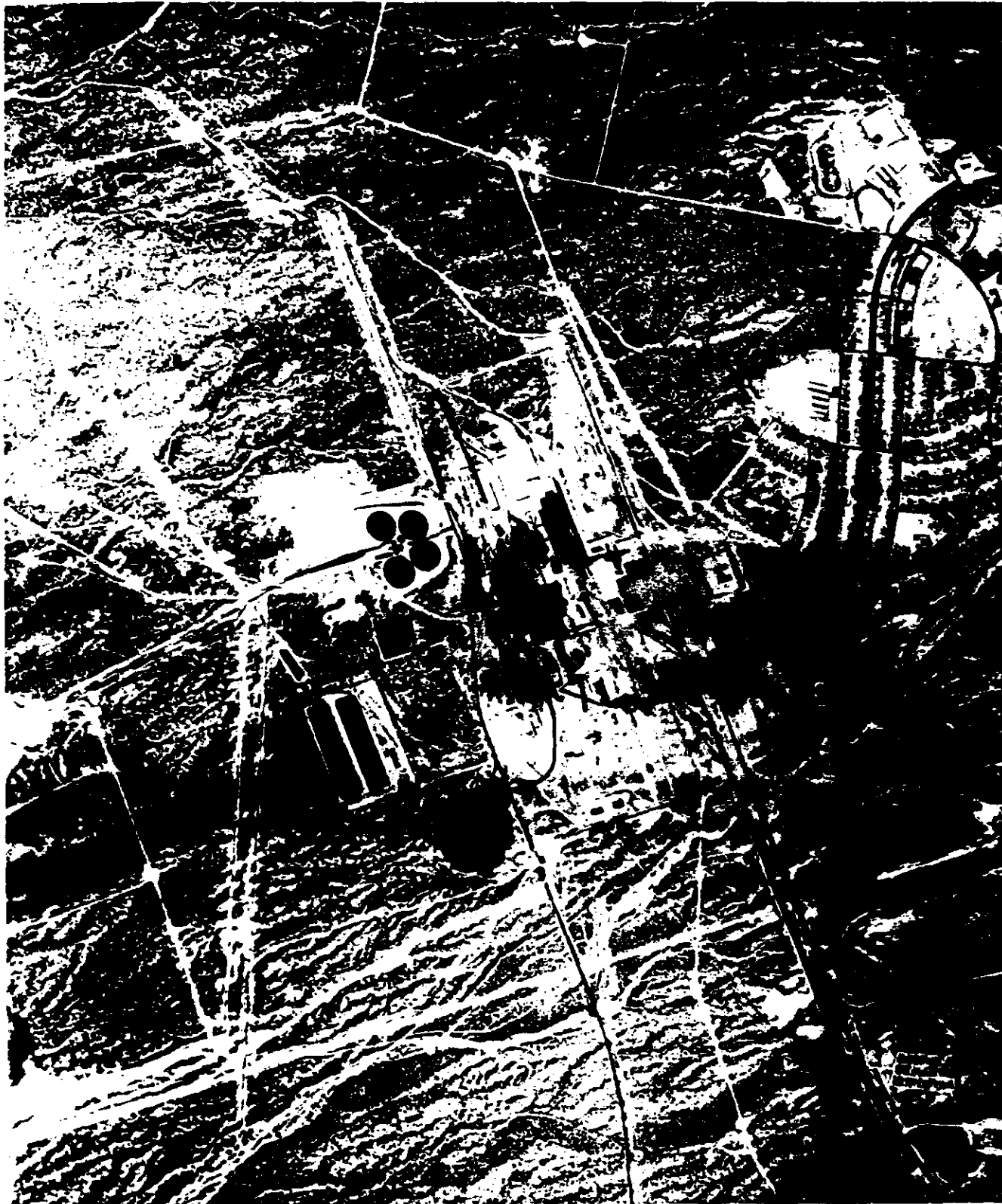
..... Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.

● FWD

● AFT

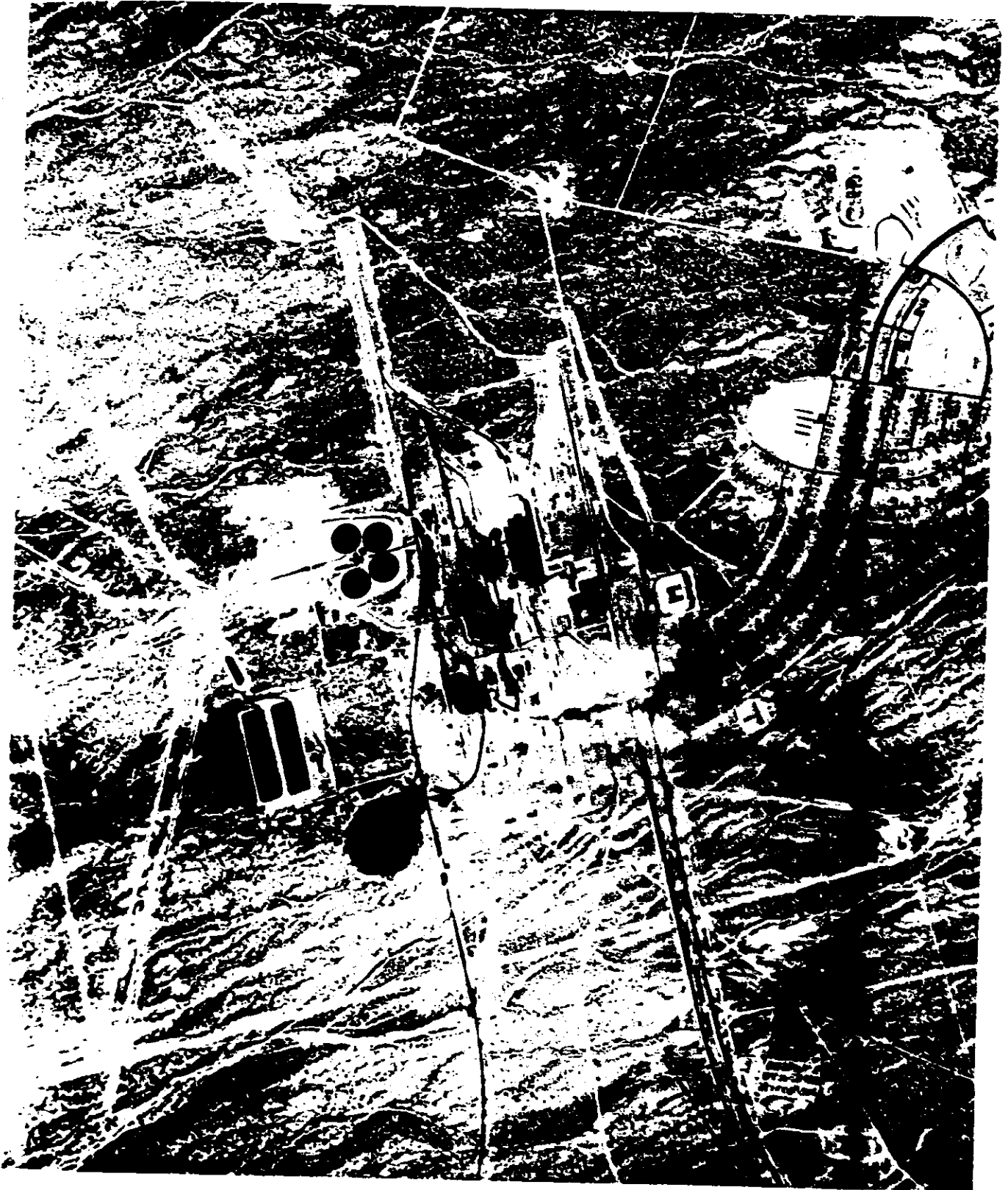
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PART II. FILM

1. Film Processing

This section provides an evaluation of the processing of the original negatives from missions 1021-1 and 1021-2.

a. The stellar and index negative material was processed at the optimum level of development to record imagery for the correlation and mensuration of the primary cameras.

b. Infrared densitometry was used to determine the optimum level of development needed for the various portions of the master and slave records. Sixty-four processing level changes were required on the master and 51 changes were required on the slave of Mission 1021-1. Twelve processing level changes were required on the master and 75 changes were required on the slave of Mission 1021-2. The percentage of film processed at each level was:

<u>Development Level</u>	<u>Mission 1021-1</u>		<u>Mission 1021-2</u>	
	<u>Master</u>	<u>Slave</u>	<u>Master</u>	<u>Slave</u>
Primary	15%	14%	53%	13%
Intermediate	38%	39%	25%	41%
Full	47%	47%	22%	46%

2. Special Printing

Fourteen parts of the master and 19 parts of the slave film required special printing on Mission 1021-1. Two parts of the master and 3 parts of the slave required special printing on Mission 1021-2. Special printing is required when the range of the negative is such that 2 levels of printing for duplicate positives are required to provide greater intelligence value from the original negative.

3. Film Degradations

The most severe degradation was the anomaly which caused the film to come out of the rails on pass 85D, frame 11 of the master camera (See Part I, Section 1). There is a manufacturing splice approximately 8.0 inches from the take-up end of frame 11, pass 85D. Approximately 2.0 inches from the splice, the film is separated from the frequency-mark edge toward the center of the film. Part of the separation had the characteristics of a cut rather than a tear.

At the cut/tear, the film was creased and folded. Through the inspection of the original negative it was concluded that a cut existed in the film when it was transported into the platen area prior to exposure. Because of the cut, the film slipped from the rails. The tension exerted by the camera induced tearing of the film at that point. The camera continued to operate throughout the mission, but the film jammed on pass 102D, frame 7. This resulted in a premature termination of the master camera record. The film was severely degraded beginning on frame 11, pass 85D. That and all subsequent frames were out-of-focus and contained severe base scratches 0.25 inches from and parallel to each film edge. Various longitudinal scratches, emulsion lifts, emulsion cracks, abrasions, and plus and minus density streaks occur intermittently throughout this portion of the film. Other degradations preceding this anomaly include:

- a. Pinholes and minus density comets appear intermittently throughout.
- b. The usual minor abrasions and scratches appear intermittently throughout.
- c. A severe base scratch ranging 0.3 to 0.9 inches from the titled edge is present on pass 25D, frames 39-43 and throughout passes 26D, 27D, and 30D of the fwd camera.
- d. Numerous longitudinal scratches are located on the supply end of pass 21D, frame 55 fwd. Severe irregular scratches are present on pass 32D, frame 2 fwd, and pass 69D, frame 4 fwd.
- e. Pass 6D, frame 11 aft was torn across the format, seriously degrading the imagery. This evidently occurred after the film left the processing site.
- f. A plus density scratch located approximately 0.85 inches from the titled edge, varying in length from 0.4 inches to being almost continuous, is present on pass 81D, frame 1, through pass 154D, frame 67 of the fwd camera.
- g. Titling was less than optimum in that the title was blocked up on numerous occasions. Also the titling was frequently transferred to adjacent areas of the film during wind-up. Examples appear on passes 26D, frames 5 through 25 aft, 42D, frames 1 through 68 fwd, and 93D, frames 1 through 57 fwd.

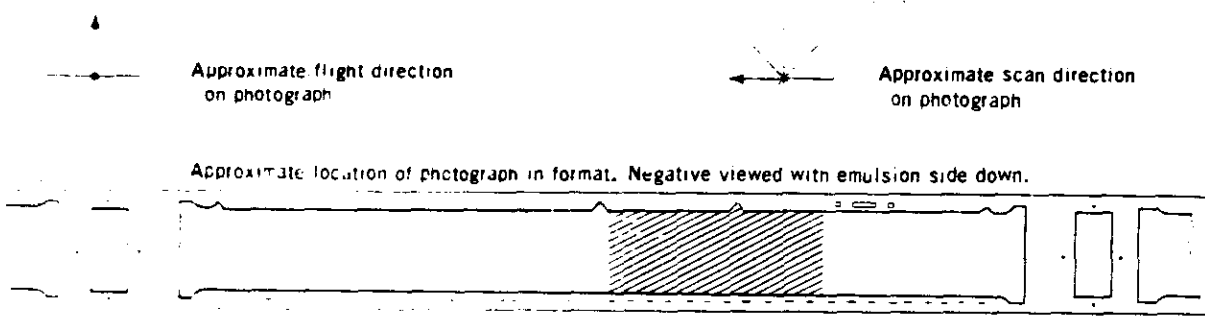
FIGURE 8. PRINT OF CUT AND SPLICE WHICH CAUSED FILM TO COME OUT OF THE RAILS

Note the well-defined line where the film was folded and cut. This caused the film to slip from the rails and induced tearing.

NPIC K-5529 (12/65)

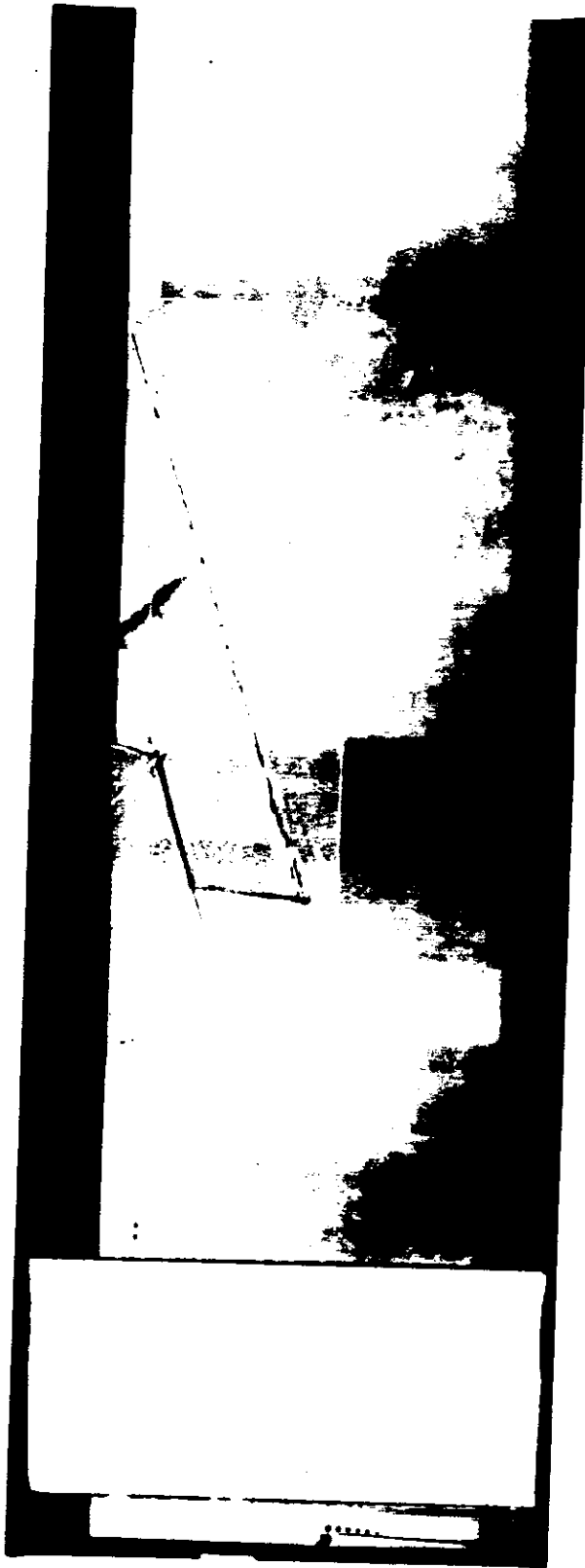
- 10a -

Camera 166
Pass 85D
Frame 11 aft
Date of Photography 24 May 65
Universal Grid Coordinates 46 - 65
Enlargement Factor Contact
Geographic Coordinates 53-08N 104-38E
Altitude (feet). 708,620
Camera:
Pitch -14°39'
Roll -0°06'
Yaw Not Determined
Local Sun Time 817
Solar Elevation. 36°36'
Solar Azimuth. 106°
Exposure (fractions of second) 1/334
Processing Level Full
Vehicle Azimuth. 156°14'



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FIGURES 9 AND 10. COMPARISON OF FWD AND AFT PHOTOGRAPHY AFTER THE
CUT AND SPLICE

Due to the cut and splice the film came out of the rails, causing
the aft material to be out of focus and severely degraded.

NPIC K-5830 (12/65)

NPIC K-5831 (12/65)

- 10c -

Figure 9

Figure 10

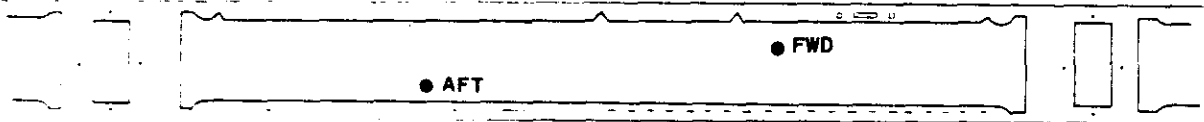
Camera	167	166
Pass	86D	86D
Frame.	72 fwd	81 aft
Date of Photography.	24 May 65	24 May 65
Universal Grid Coordinates	57.8 - 13.2	33.5 - 9.6
Enlargement Factor	10X	10X
Geographic Coordinates	21-13N 094-44E	21-13N 094-44E
Altitude (feet).	665,202	665,202
Camera:		
Pitch	15°14'	15°14'
Roll.	-0°15'	-0°15'
Yaw	Not Determined	Not Determined
Local Sun Time	907	907
Solar Elevation.	51°14'	51°26'
Solar Azimuth.	83°	83°
Exposure (fractions of second)	1/252	1/361
Processing Level	Full	Full
Vehicle Azimuth.	167°4'	167°15'

— Approximate flight direction
on photograph



Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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FIGURES 11 AND 12. EXAMPLE OF DEGRADED PHOTOGRAPHY DUE TO THE CUT
AND SPLICE

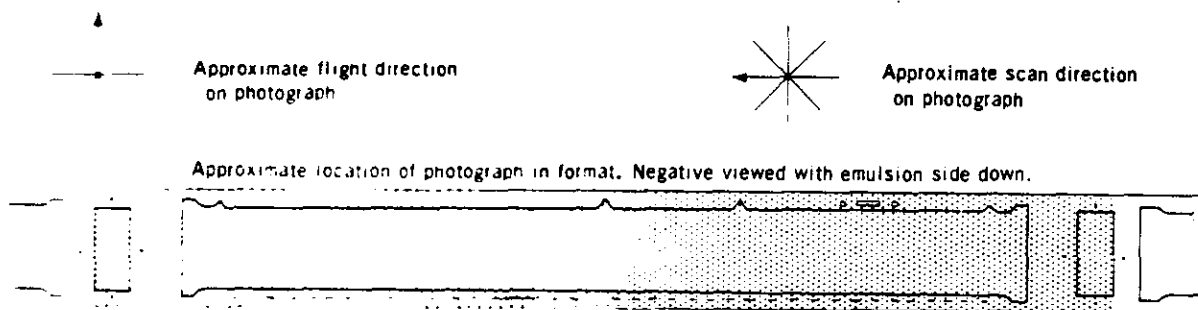
These photographs illustrate the abrasions parallel to the film
edge and the out of focus condition.

NPIC K-5832 (12/65)

NPIC K-5833 (12/65)

- 10e -

Camera 166
Pass 95D
Frame. 17 aft
Date of Photography. 24 May 65
Universal Grid Coordinates Not Applicable
Enlargement Factor Contact
Geographic Coordinates 33-27N 012-28W
Altitude (feet). 670,736
Camera:
Pitch Not Applicable
Roll. Not Applicable
Yaw Not Applicable
Local Sun Time Not Applicable
Solar Elevation. Not Applicable
Solar Azimuth. Not Applicable
Exposure (fractions of second) Not Applicable
Processing Level Intermediate
Vehicle Azimuth. Not Applicable



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0 95 017 D

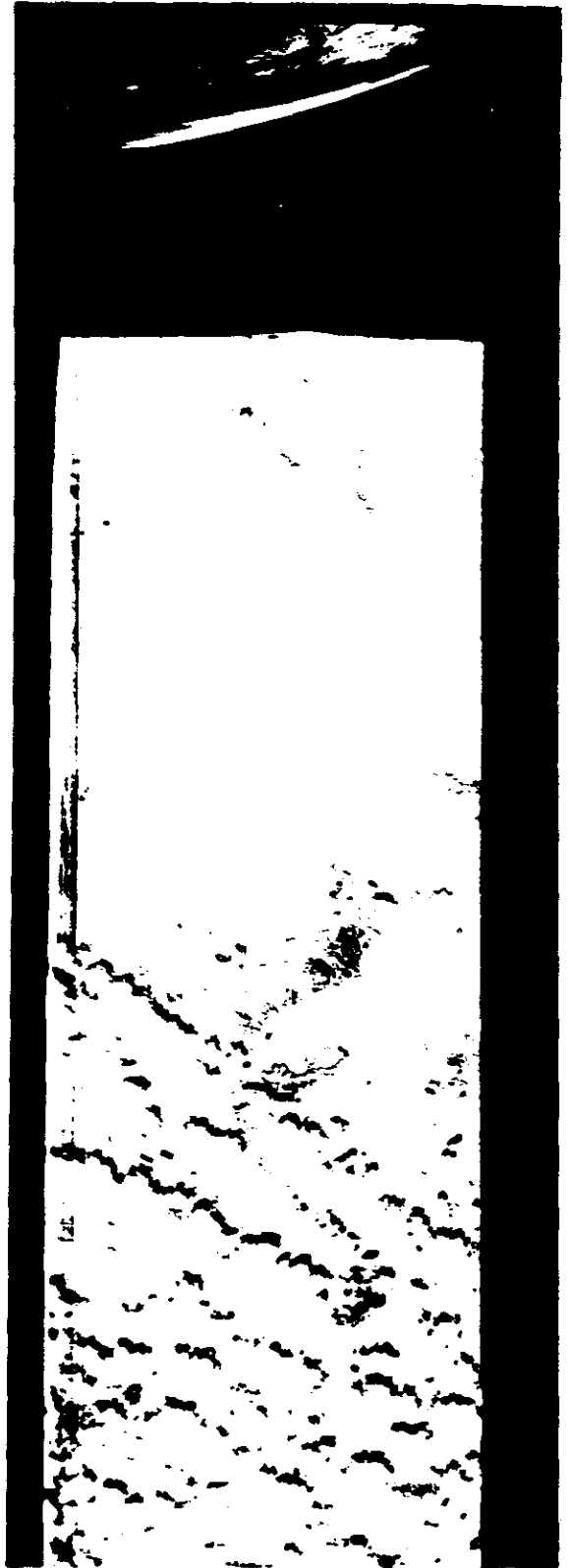
S. AFT 1021-2 24 MAY 65 TOP SECRET

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PART III. IMAGE QUALITY

1. 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 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. The standards that determine assignment of the various ratings are:

Excellent: The photography is free of degradations by camera malfunctions or processing faults and the 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 superior 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 prevails.

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.

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

2. PI Suitability for Missions 1021-1 and 1021-2

The PI suitability is good for the operational portions of missions 1021-1 and 1021-2. However, since it is primarily a mapping and charting mission, coverage of intelligence targets is limited. A total of 48 targets were reported on during the preliminary readout. Sixteen of the 48 targets were given a poor-quality rating. The poor-quality ratings resulted when a target fell within the bonus area of a frame or when there were poor weather conditions over a target area.

It should be noted that this report represents only the initial scan of the photography. This is accomplished in a short time and a more detailed study of the photography may develop additional information.

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 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 they may be affected by incorrect scan speed.

- d. Select frames that are in a continuous strip of approximately 10 cloud-free frames, since 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 Rating for Mission 1021

Frame 12 aft, pass 30D, has been selected as the MIP frame for Mission 1021-1. It has been assigned an MIP rating of 85. The detail discernible in this photography is such that engine nacelles on most aircraft are detectable under moderate magnification. The information potential of the area acquired by the fwd camera (frame 6 fwd) is almost identical to this MIP frame.

Frame 14 fwd, pass 143D, has been selected as the MIP frame for Mission 1021-2. It has been assigned an MIP rating of 85. The quality of this MIP compares favorably to that of Mission 1021-1. The area was not photographed by the aft camera.

FIGURES 13 and 14. COMPARISON OF FWD PHOTOGRAPHY WITH
THE MIP FRAME OF THE AFT MATERIAL.

Note the subtle improvement in the fine detail of
the aft material over the fwd.

NPIC K-5834 (12/65)

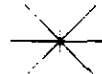
NPIC K-5835 (12/65)

- 14a -



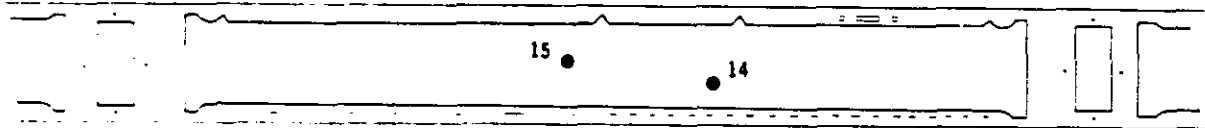
	Figure 13	Figure 14
Camera	167	166
Pass	30D	30D
Frame	6 fwd	12 aft
Date of Photography	20 May 65	20 May 65
Universal Grid Coordinates	50.6 - 11.8	40.7 - 12.7
Enlargement Factor	20x	20x
Geographic Coordinates	33-08S 064-27W	33-08S 064-32W
Altitude (feet)	771,576	771,670
Camera: Pitch	15°03'	-14°50'
Roll	0°11'	0°11'
Yaw	1°11'	-0°59'
Local Sun Time	1104	1104
Solar Elevation	34°55'	34°55'
Solar Azimuth	17°	17°
Exposure (fractions of second)	1/208	1/304
Processing Level	Full	Full
Vehicle Azimuth	165°05'	162°043'

→ Approximate flight direction on photograph



Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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FIGURE 15. MIP SELECTION 1021-2

Convergent stereo coverage of this area is not available.

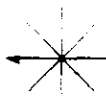
NPIC K-5836 (12/65)

- 14c -

Camera 167
Pass 143D
Frame 14 fwd
Date of Photography. 27 May 65
Universal Grid Coordinates 36.4 - 12.1
Enlargement Factor 20x
Geographic Coordinates 39-16N 121-04W
Altitude (feet). 672,673
Camera: Pitch 15°30'
Roll -0°11'
Yaw Not determined
Local Sun Time 803
Solar Elevation 36°26'
Solar Azimuth 92°
Exposure (fractions of second) 1/250
Processing Level Full
Vehicle Azimuth 163°01'

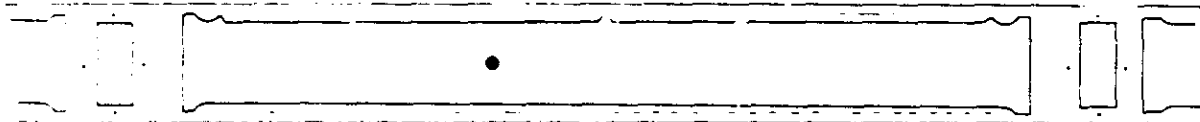


Approximate flight direction
on photograph



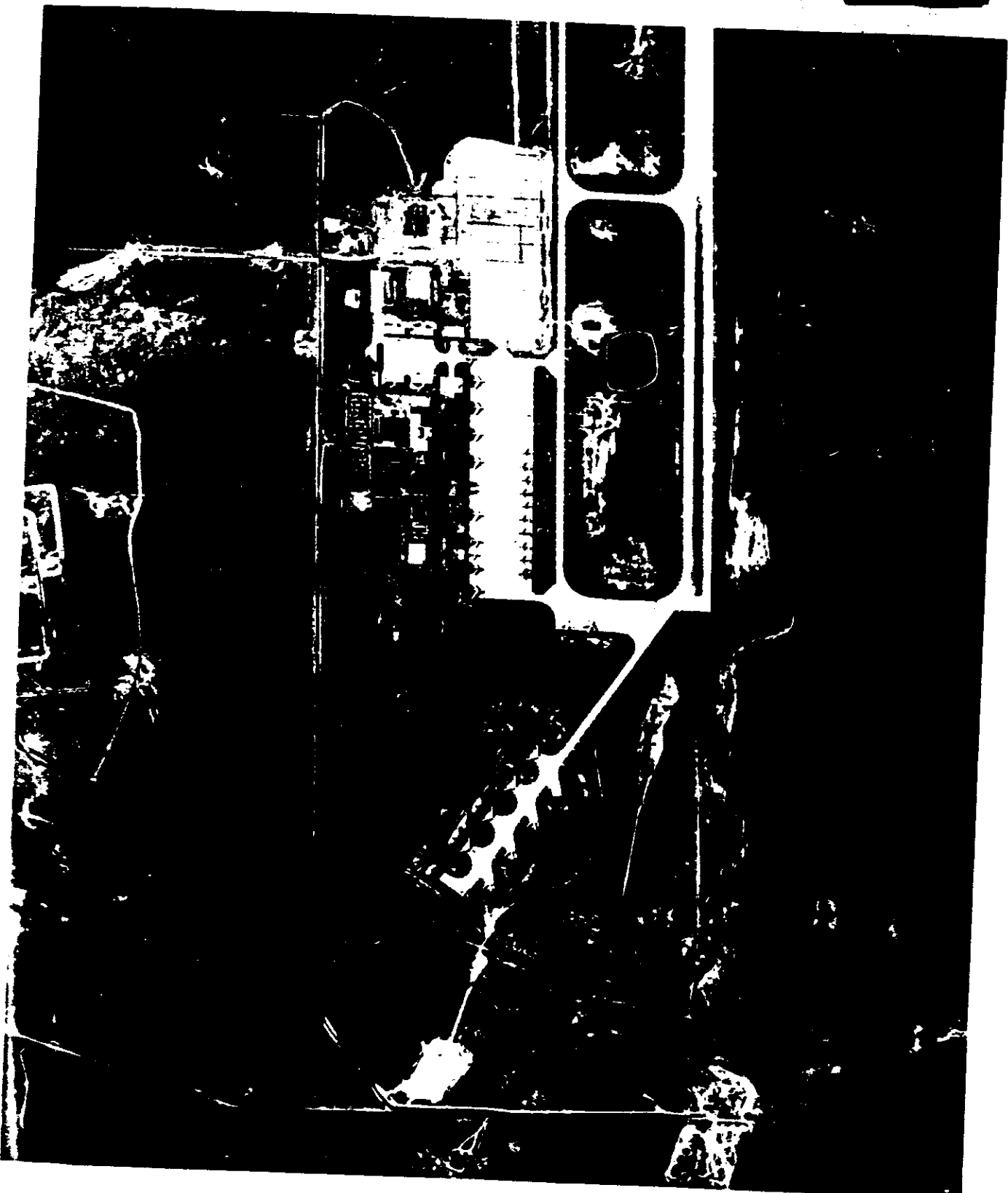
Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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5. Analysis of Fixed, High-Contrast Resolution Targets

Missions 1021-1 and 1021-2

Camera	167	166	167	167	167	167
Pass	79D	79D	95D	111DE	111DE	127D
Frame	14fwd	20aft	24fwd	5fwd	6fwd	10fwd
Date of Photography	23 May 65	23 May 65	24 May 65	25 May 65	25 May 65	26 May 65
Universal Grid Coordinates	27.7 13.2	63.3 13.1	82.7 10.6	54.7 14.1	37.9 11.9	35.6 12.3
Geographic Coordinates	31-35N 110-18W	31-35N 110-18W	31-35N 110-18W	36-42N 115-29W	36-19N 116-02W	35-04N 117-25W
Altitude (ft)	663,337	663,567	668,806	672,048	671,885	669,129
Camera:						
Pitch	15°10'	-14°13'	-14°37'	15°07'	15°07'	15°32'
Roll	-0°12'	-0°12'	-0°25'	-0°31'	-0°29'	-0°12'
Yaw			N O T D E T E R M I N E D			
Local Sun Time	0904	0904	0901	0835	0835	0820
Solar Elevation	49°31'	49°30'	47°01'	42°28'	42°28'	40°29'
Solar Azimuth	95°	95°	95°	96°	96°	92°
Exposure (fractions of second)	1/250	1/367	1/251	1/251	1/248	1/249
Processing Level	Full	Full	Full	Int.	Int.	Full
Vehicle Azimuth	165°09'	165°21'	165°15'	163°55'	163°52'	164°20'
Resolution on Original Negative:						
Flight Direction	11'2"	11'1"	*	**	**	16'0"
Scan Direction	11'2"	12'6"	*	**	**	10'1"

*Target is located inside the frame area and cannot be resolved.

**Target is not visible.

FIGURE 16. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

The main purpose of Mission 1021 was to acquire photographic coverage for cartographic rather than intelligence purposes. The following 11 photographs are included in this report to illustrate the extreme difficulty of achieving optimum quality of many varied targets in different locations on the earth.

Figure 16 is an example of jungle area located just below the equator. The texture of the jungle and lack of culture are the main causes for the apparent low contrast. Solar elevations over 40 degrees also reduce contrast through the virtual elimination of shadows. Atmospheric conditions such as heavy haze (steaming jungles) preclude good resolution. There is also the possibility that filtration, especially the use of the Wratten 25 filter, may cause some loss of contrast over verdant terrain by cutting out some of the light from the green portion of the electromagnetic spectrum.

NPIC K-5837 (12/55)

Camera 166
Pass 26D
Frame 48 aft
Date of Photography 20 May 65
Universal Grid Coordinates 46 - 12
Enlargement Factor 3x
Geographic Coordinates 08-30S 19-58E
Altitude (feet) 691,003
Camera: Pitch -15°13'
Roll 0°03'
Yaw -0°54'
Local Sun Time 1036
Solar Elevation 54°28'
Solar Azimuth 34°
Exposure (fractions of second) 1/351
Processing Level full
Vehicle Azimuth 54028'

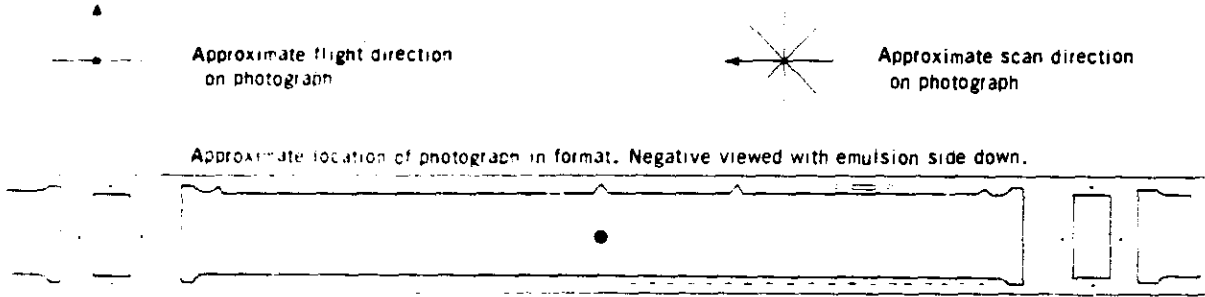




FIGURE 17. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

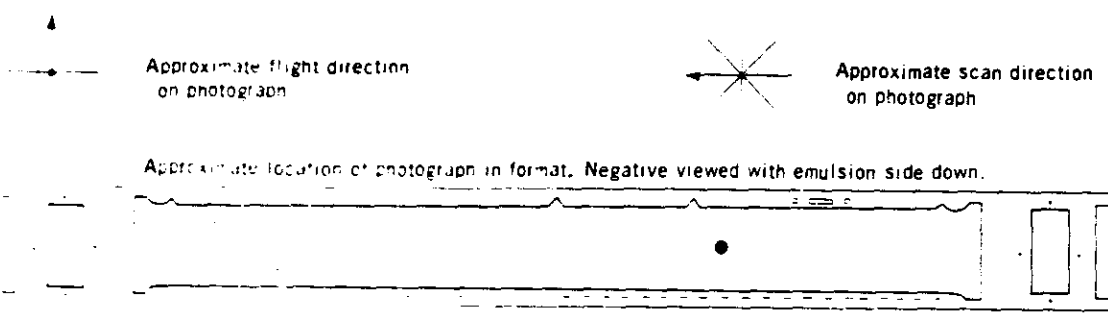
The following is a typical example of snow-covered mountainous terrain. The crispness of the imagery is due primarily to the high contrast between the snow, the terrain, and the terrain shadows. Good resolution is due primarily to a clear atmosphere. Depending on the type of target, the snow could either help or hinder the PI or cartographer.

NPIC K-5838 (12/65)

- 16c -



Camera : 166
Pass 35D
Frame 8 aft
Date of Photography 20 May 65
Universal Grid Coordinates 68.5 - 12.0
Enlargement Factor 3x
Geographic Coordinates 63-22N 146-32E
Altitude (feet) 760,428
Camera: Pitch -15°16'
 Roll 0°04'
 Yaw -0°20'
Local Sun Time 0812
Solar Elevation 32°25'
Solar Azimuth Not determined
Exposure (fractions of second) 1/309
Processing level Intermediate
Vehicle Azimuth 147°01'



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FIGURE 18. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

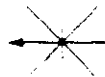
The following photograph is a typical example of a port city located in the Western Hemisphere in the southern latitudes. Of particular interest is the loss of detail due to poor resolution. This may be due to atmospheric conditions or to over-exposure and over-development. Note also that the altitude is higher than usual, thus the scale of the photography is smaller.

NPIC K-8839 (12/65)



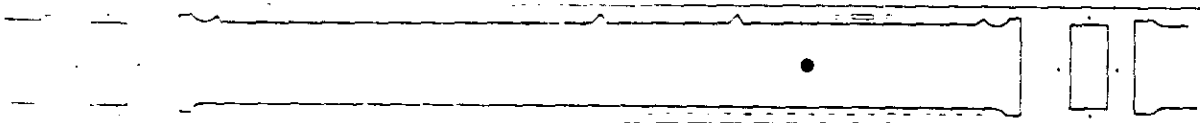
Camera 167
Pass 93D
Frame 107 fwd
Date of Photography 24 May 65
Universal Grid Coordinates 68.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 30-21S 052-10W
Altitude (feet) 788,530
Camera:
Pitch 14°51'
Roll 0°34'
Yaw Not Determined
Local Sur. Time 1009
Solar Elevation 31°59'
Solar Azimuth 33°
Exposure (fractions of second) 1/205
Processing Level Full
Vehicle Azimuth 165°43'

Approximate flight direction
on photograph



Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.





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FIGURE 19. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

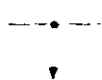
The following photograph illustrates a low contrast target difficult to expose or process properly, due to high reflectivity and the lack of well-defined detail in the sand. The high solar elevation again precludes shadow detail.

NPIC K-5640 (12/65)

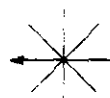
- 16g -



Camera 167
Pass 106D
Frame. 23 fwd
Date of Photography. 25 May 65
Universal Grid Coordinates 68.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 23-18N 001-23E
Altitude (feet). 664,848
Camera:
Pitch 15°15'
Roll. -0°18'
Yaw Not Determined
Local Sun Time 857
Solar Elevation. 47°12'
Solar Azimuth. 85°
Exposure (fractions of second) 1/252
Processing Level Intermediate
Vehicle Azimuth. 166°46'



Approximate flight direction
on photograph



Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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FIGURE 20. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

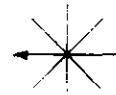
The following photograph is an example of glacier patterns in snow-covered mountains. High contrast and good resolution result from the snow and atmospheric conditions.

NPIC K-5841 (12/65)

Camera 167
Pass 134D
Frame. 14 fwd
Date of Photography. 27 May 65
Universal Grid Coordinates 63.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 27-56N 086-18E
Altitude (feet). 667,263
Camera:
Pitch $14^{\circ}36'$
Roll. $-0^{\circ}59'$
Yaw Not Determined
Local Sun Time 828
Solar Elevation. $41^{\circ}14'$
Solar Azimuth. 85°
Exposure (fractions of second) 1/217
Processing Level Full
Vehicle Azimuth. $165^{\circ}58'$

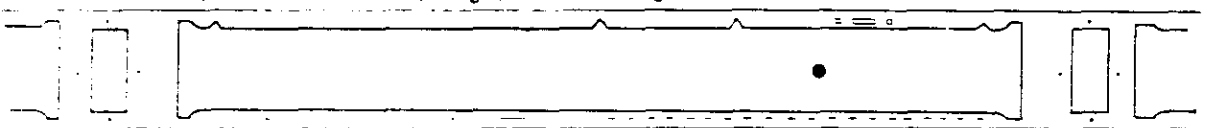


Approximate flight direction
on photograph



Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.





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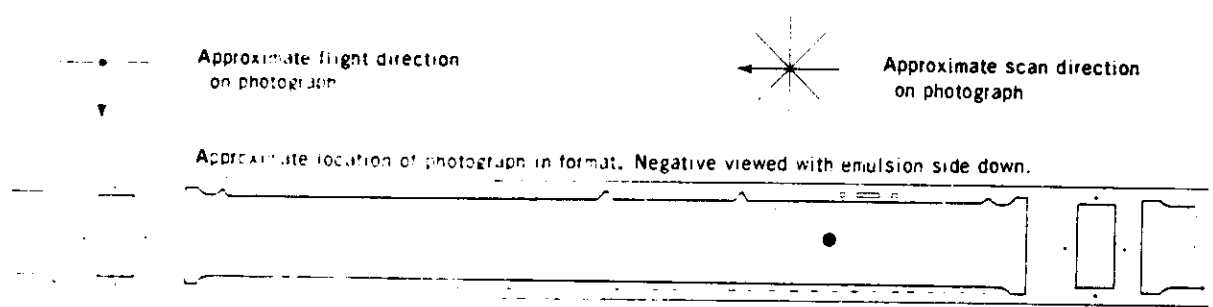
FIGURE 21. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

Note the difference in texture density and contrast on this photograph of mountains and plains. The density range of the negative caused a loss of detail in both the highlight and shadow areas.

NPIC K-8842 (12/65)

- 16k -

Camera 167
 Pass 134D
 Frame. 22 fwd
 Date of Photography. 27 May 65
 Universal Grid Coordinates 68.5 - 12.0
 Enlargement Factor 3X
 Geographic Coordinates 26-41N 086-39E
 Altitude (feet). 667,251
 Camera:
 Pitch 14°32'
 Roll -0°48'
 Yaw Not Determined
 Local Sun Time 83°
 Solar Elevation. 41°30'
 Solar Azimuth. 85°
 Exposure (fractions of second) 1/251
 Processing Level Full
 Vehicle Azimuth. 166°12'



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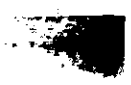




FIGURE 22. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

The following photograph is an example of a highly populated city in the Western Hemisphere. This is typical of the quality found in this mission. Shadow detail due to solar angles and atmospheric conditions appear close to optimum.

NPIC K-5843 (112/66)





Camera 167
Pass 143D
Frame. 17 fwd
Date of Photography. 27 May 65
Universal Grid Coordinates 32.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 38-48N 120-53W
Altitude (feet). 672,267
Camera:
Pitch 15°29'
Roll. -0°07'
Yaw Not Determined
Local Sun Time 803
Solar Elevation. 36°36'
Solar Azimuth. 90°
Exposure (fractions of second) . . . 1/251
Processing Level Full
Vehicle Azimuth. 163°10'

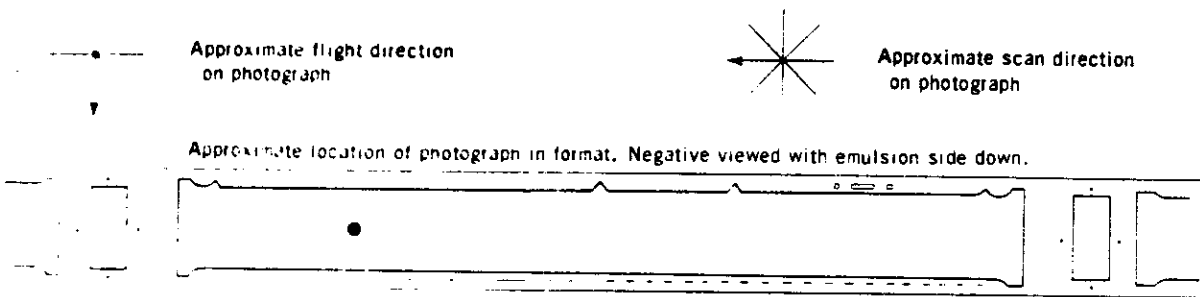




FIGURE 23. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

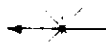
This photograph shows a small community surrounded by farming areas. The subtle gradations in tone between the different cultivated fields are indicative of the tonal range of this system.

NPIC K-5844 (12/85)



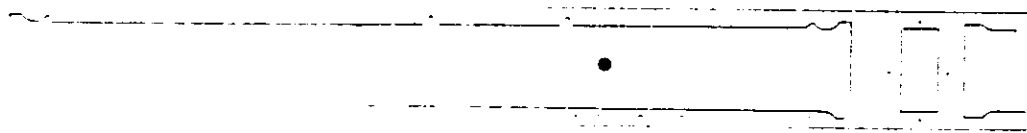
Camera 167
 Pass 143D
 Frame. 23 fwd
 Date of Photography. 27 May 65
 Universal Grid Coordinates 57.5 - 12.0
 Enlargement Factor 3X
 Geographic Coordinates 35-30N 119-42W
 Altitude (feet). 669,868
 Camera:
 Pitch 15°12'
 Roll. -0°18'
 Yaw Not Determined
 Local Sun Time 809
 Solar Elevation. 37°42'
 Solar Azimuth. 89°
 Exposure (fractions of second) 1/244
 Processing Level Full
 Vehicle Azimuth. 164°11'

Approximate flight direction
on photograph

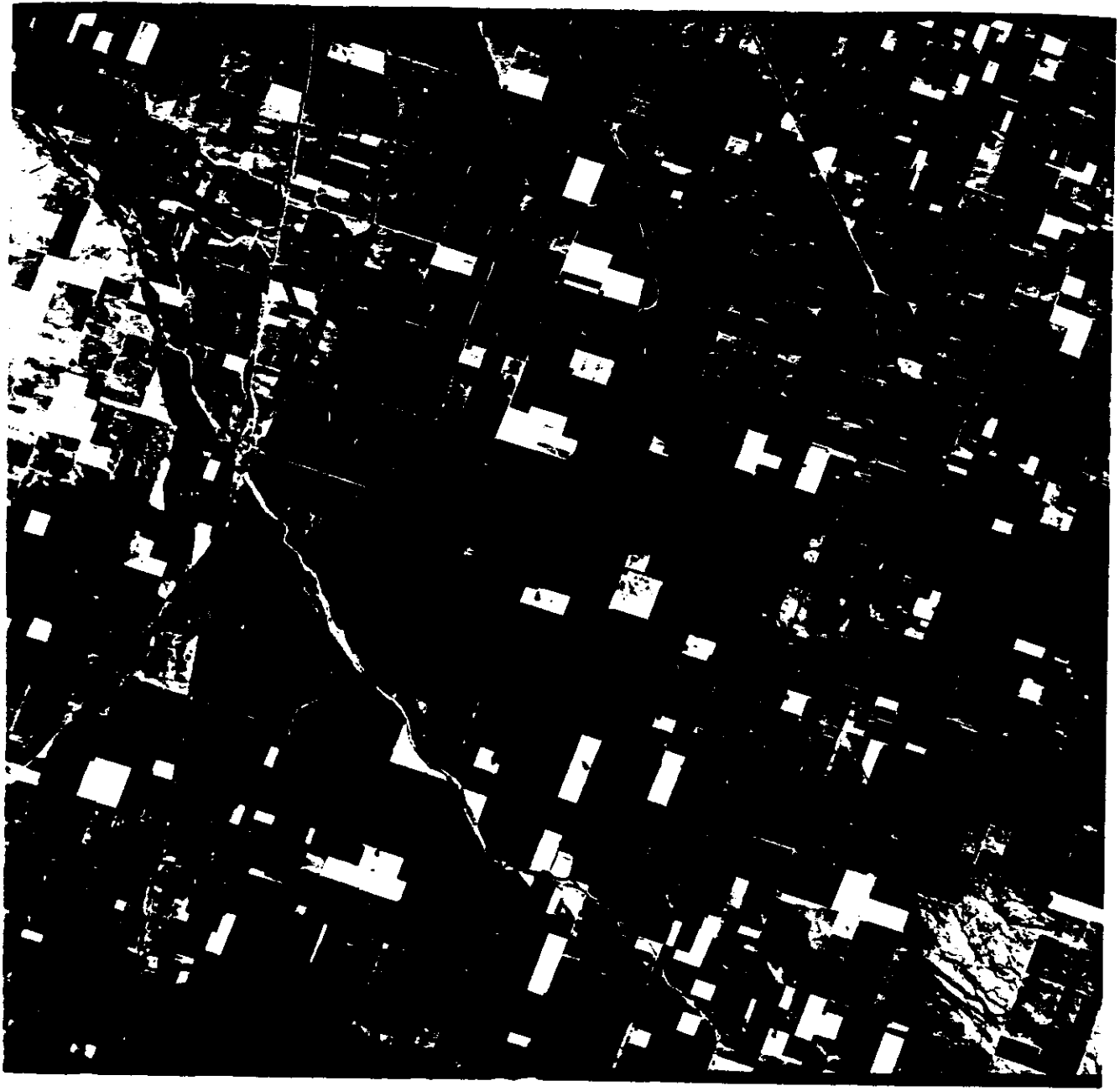


Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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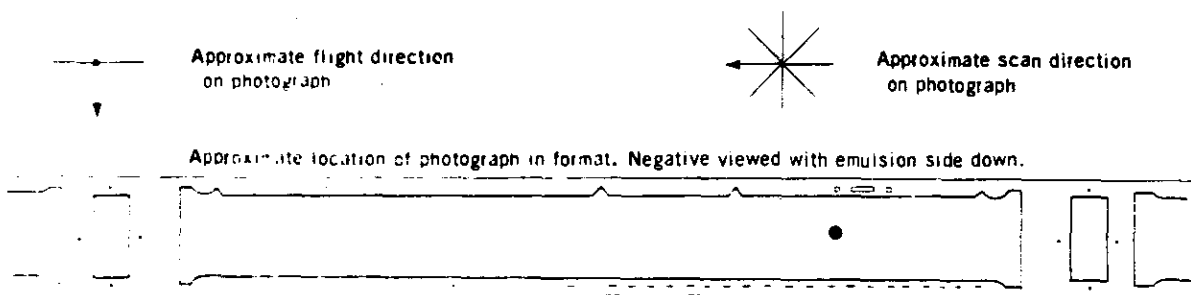
FIGURE 24. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

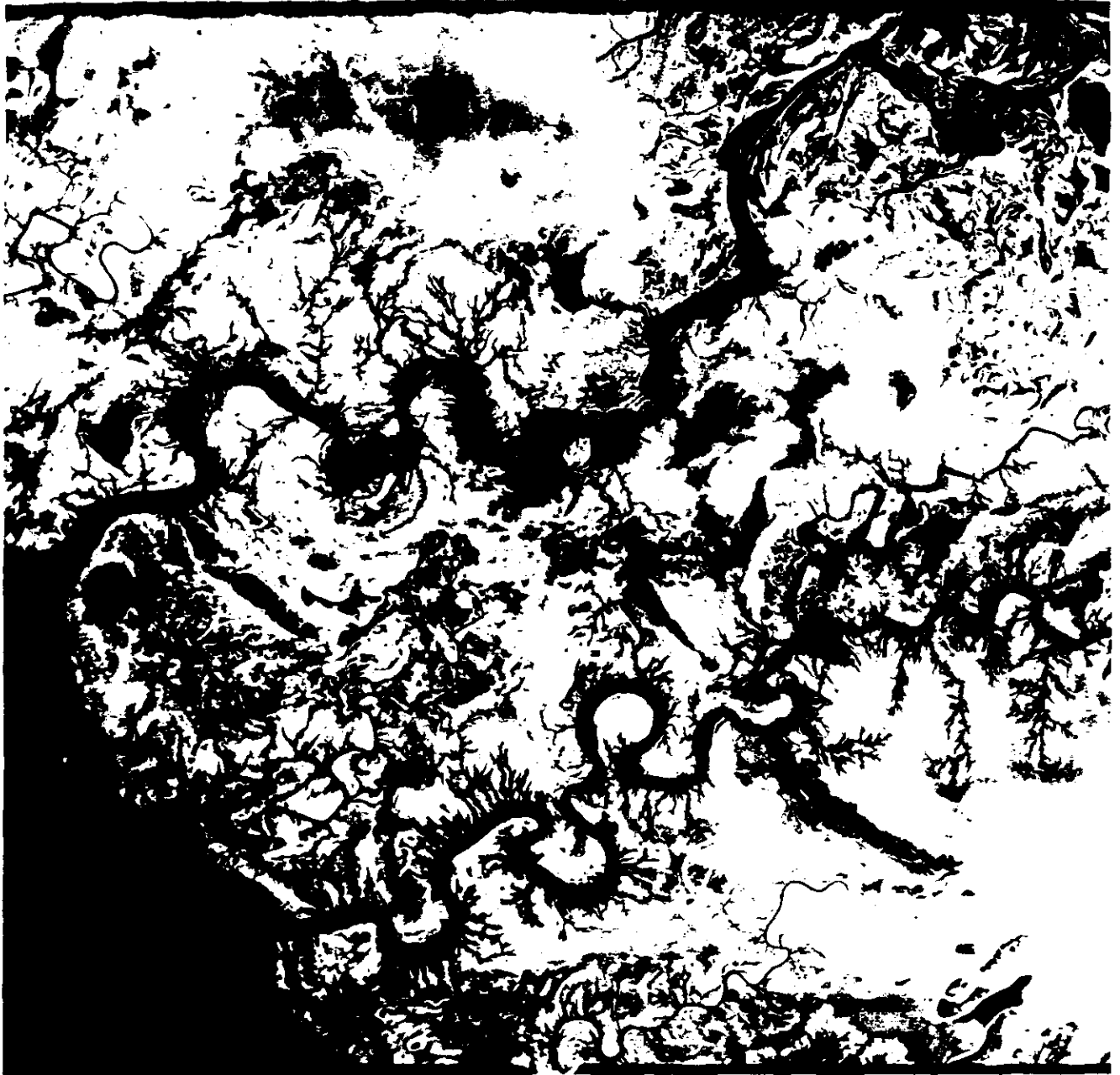
The following photograph is an illustration of swamp and marsh areas covered by this mission. High contrast between the water and land greatly assist the cartographer in interpreting terrain features. However, occasional specular reflections from the water may obliterate imagery.

NPIC K-5845 (12/65)

- 16q -

Camera 167
Pass 148D
Frame 44 fwd
Date of Photography 27 May 65
Universal Grid Coordinates 68.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 17-34S 139-32E
Altitude (feet). 760,520
Camera:
Pitch 15°49'
Roll 0°05'
Yaw Not Determined
Local Sun Time 908
Solar Elevation. 32°16'
Solar Azimuth. 51°
Exposure (fractions of second) 1/212
Processing Level Full
Vehicle Azimuth. 167°40'





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

~~Handle With~~
~~TALENT KEYHOLE~~
Control System Only

FIGURE 25. EXAMPLE OF TERRAIN COVERED IN MISSION 1021

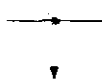
Note the crater-like configurations caused by volcanic eruptions. This photograph illustrates that low and high contrast areas can occur within a very few miles of each other. The difficulty of exposing and processing correctly for such areas is apparent.

NPIC K-5846 (12/65)

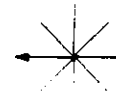
- 16s -



Camera 167
Pass 152D
Frame 129 fwd
Date of Photography 28 May 65
Universal Grid Coordinates 55.5 - 12.0
Enlargement Factor 3X
Geographic Coordinates 25-38N 039-37E
Altitude (feet). 668,022
Camera:
Pitch 15°10'
Roll 0°04'
Yaw Not Determined
Local Sun Time 816
Solar Elevation. 38°16'
Solar Azimuth. 84°
Exposure (fractions of second) . . . 1/252
Processing Level Full
Vehicle Azimuth. 166°23'

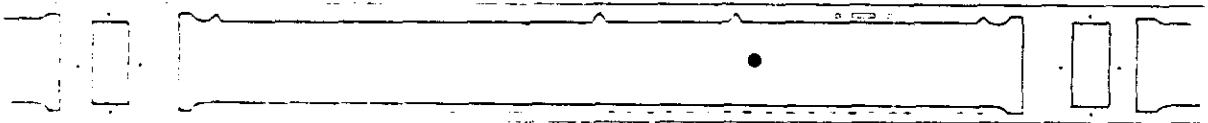


Approximate flight direction
on photograph



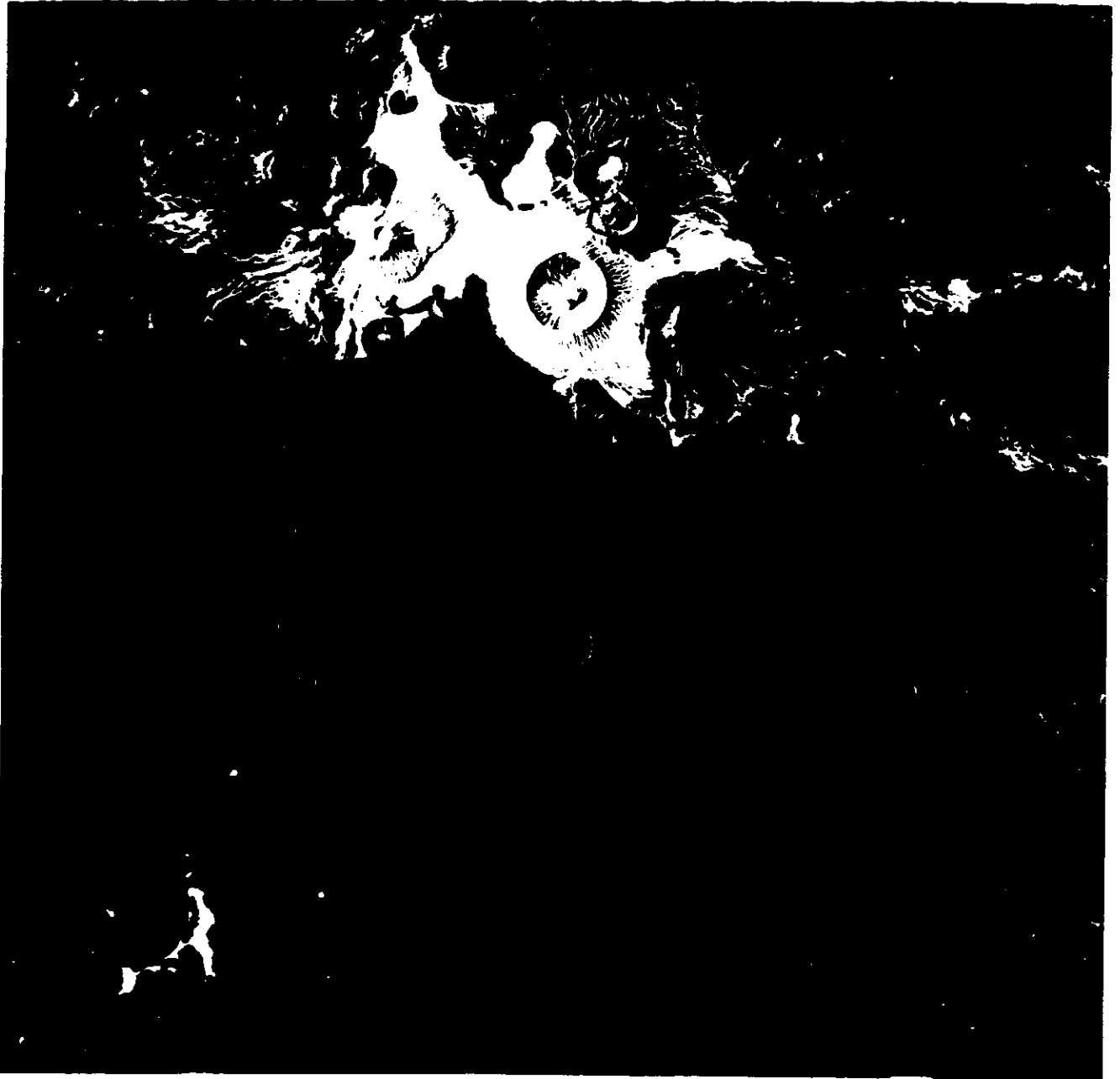
Approximate scan direction
on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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

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



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

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



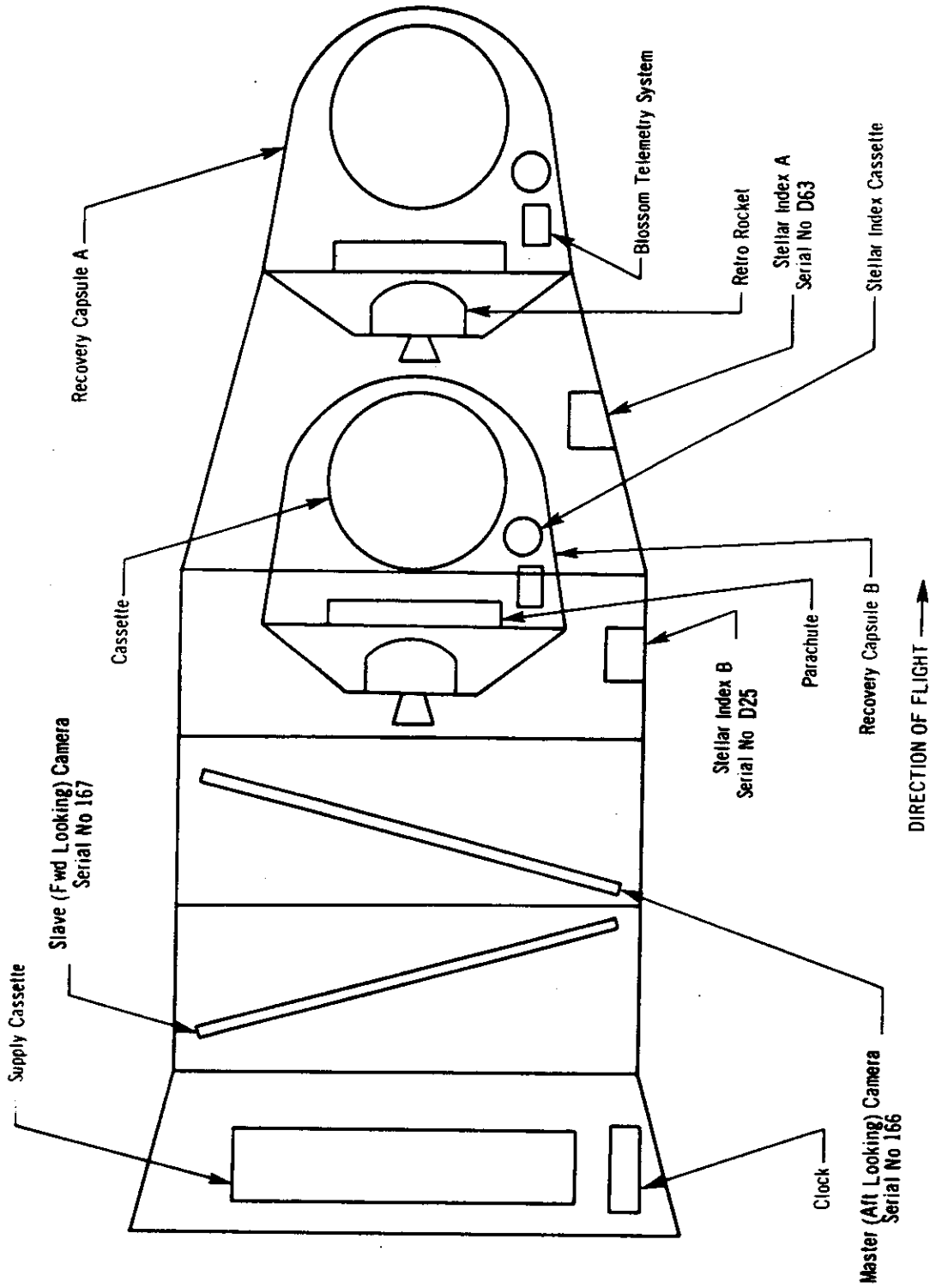
APPENDIX A. SYSTEM SPECIFICATIONS

Camera No.	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	SLAVE TAPE-TO TAPE-TO	MISSION INDEX	MISSION INDEX	MISSION INDEX
266	167	*	167	*	*	D63	D63	D63	D25	D25	D25	D25	D25
146	N/A	N/A	N/A	N/A	N/A	69	69	69	25	25	25	25	25
195, 235	150, 243	81, 224	150, 243	81, 224	81, 224	166, 5	166, 5	166, 5	166, 5	166, 5	81, 709	81, 709	81, 709
117	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
173, 5	1/3, 5	1/6, 8	1/3, 5	1/6, 8	1/6, 8	1/1, 8	1/1, 8	1/1, 8	1/1, 8	1/1, 8	1/1, 8	1/1, 8	1/1, 8
1/350	1/100	1/100	1/275**	1/100	1/100	2	2	2	2	2	1/500	1/500	1/500
21	25	25	25	25	25	Note	Note	Note	Note	Note	21	21	21
6, 160	55, 53	55, 53	60, 60	55, 53	55, 53	86, 60	86, 60	86, 60	86, 60	86, 60	86, 60	86, 60	86, 60
16, 100	N/A	N/A	16, 100	N/A	N/A	75	75	75	75	75	135	135	135
5	N/A	N/A	5	N/A	N/A	Note	Note	Note	Note	Note	None	None	None
1-2-1-5	81-2-1-5	81-2-1-5	81-2-7-1-5	81-2-1-5	81-2-7-1-5	51-10-12-4	51-10-12-4	51-10-12-4	51-10-12-4	51-10-12-4	37-1-12-4	37-1-12-4	37-1-12-4
140	140	140	140	140	140	140	140	140	140	140	140	140	140
266	166(A)	174(A)	239	166(A)	170(A)	*	*	*	*	*	73(A)	73(A)	73(A)
146	*	*	146	*	*	*	*	*	*	*	*	*	*
208	*	*	177	*	*	*	*	*	*	*	*	*	*
127	*	*	134	*	*	*	*	*	*	*	*	*	*
208	*	*	187	*	*	*	*	*	*	*	*	*	*
107	*	*	116	*	*	*	*	*	*	*	*	*	*

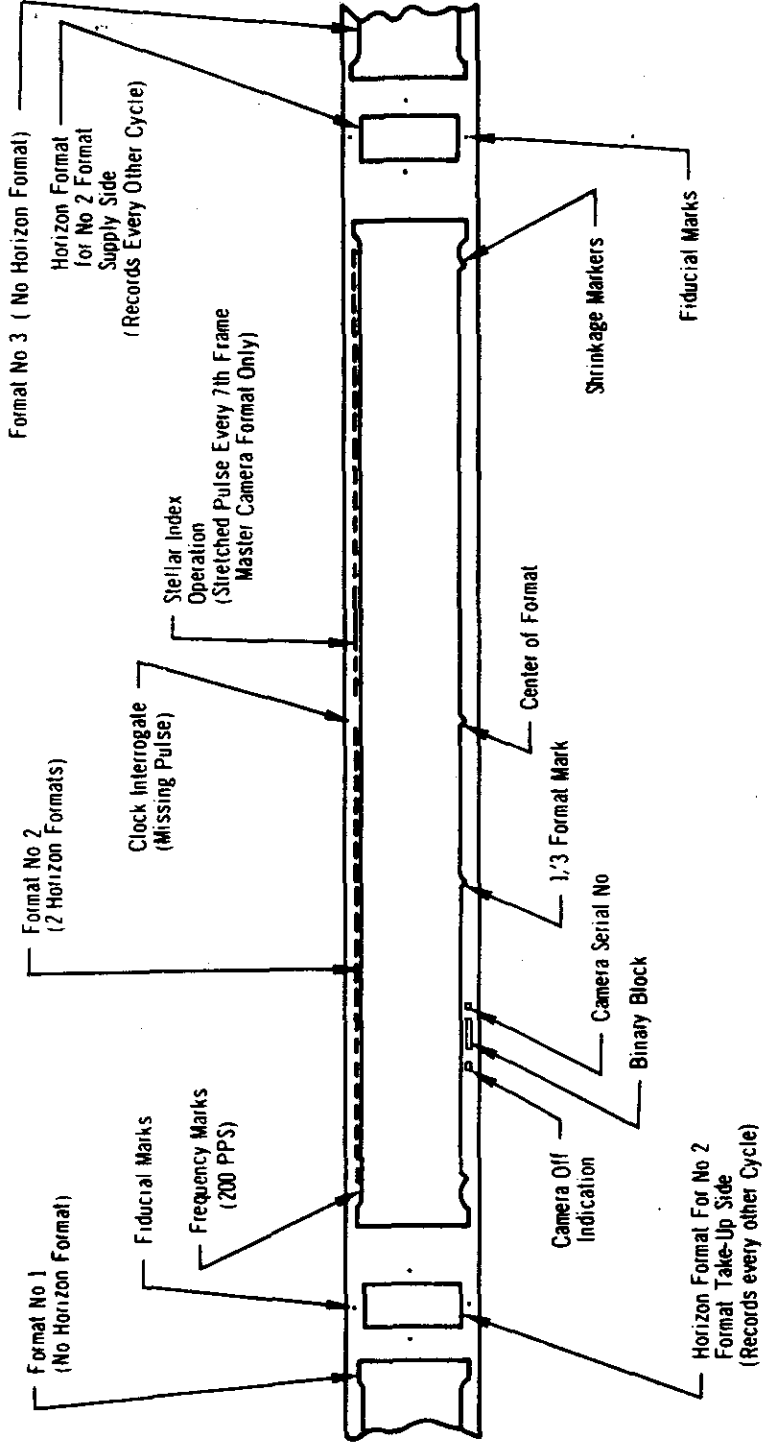
Resolution Data (1/mm):
 Static
 High Contrast
 Low Contrast
 Dynamic
 I High Contrast
 I Low Contrast
 P High Contrast
 P Low Contrast

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

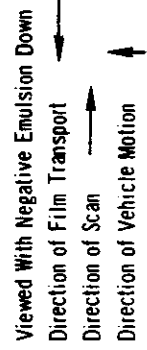
2. VEHICLE CONFIGURATION AND EQUIPMENT LAYOUT



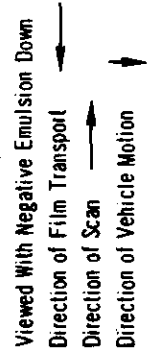
3. PANORAMIC FORMAT SPECIFICATIONS



Slave (Fwd Looking) Panoramic Camera No 167



Master (Aft Looking) Panoramic Camera No 166



NPIC K-8848 (11/2/65)



APPENDIX B. DENSITY READINGS

1. Density Readings from Stellar Material

The following is a compilation of the density values recorded from the stellar negatives. A Macbeth Quantalog Densitometer, Model EP 1000, with an ET 20 attachment and an 0.50 millimeter aperture was used in taking the values listed.

STELLAR DENSITY READINGS

Mission 1021-1

Pass	Frame	Dmax	Dmin	Delta	Gross Fog	Pass	Frame	Dmax	Dmin	Delta	Gross Fog
1D	1	1.55	0.33	1.22	0.19	25D	118	1.43	0.33	1.10	0.18
	2	1.50	0.31	1.19	0.19		130	1.85	0.38	1.47	0.18
2D	3	1.55	0.26	1.29	0.19	26D	131	1.67	0.29	1.38	0.18
	8	1.96	0.27	1.69	0.18		146	1.06	0.24	0.82	0.18
6D	9	1.64	0.40	1.24	0.18	27D	147	1.50	0.27	1.23	0.18
	10	1.77	0.38	1.39	0.18		149	1.48	0.26	1.22	0.18
9AE	11	NR	NR	NR	0.18	30D	150	1.27	0.27	1.00	0.18
	12	NR	NR	NR	0.18		155	1.33	0.32	1.01	0.18
9D	13	1.38	0.26	1.12	0.18	32D	156	1.73	0.33	1.40	0.18
	26	1.78	0.40	1.38	0.18		157	1.77	0.35	1.42	0.18
10D	27	1.86	0.40	1.46	0.18	34D	158	1.37	0.25	1.12	0.18
	33	1.41	0.31	1.10	0.18		165	1.60	0.29	1.31	0.18
11D	34	1.39	0.32	1.07	0.18	35D	166	1.60	0.29	1.31	0.18
	36	1.56	0.35	1.21	0.18		173	1.87	0.37	1.50	0.18
13D	37	1.27	0.27	1.00	0.18	37D	174	1.17	0.23	0.94	0.18
	45	1.62	0.32	1.30	0.18		185	1.10	0.25	0.85	0.18
16D	46	1.43	0.30	1.13	0.18	41D	186	1.34	0.31	1.03	0.18
	51	1.70	0.34	1.36	0.18		197	1.42	0.33	1.09	0.18
17D	52	1.18	0.22	0.96	0.18	42D	198	1.18	0.33	0.85	0.18
	55	1.36	0.24	1.12	0.18		215	1.00	0.30	0.70	0.18
18D	56	1.50	0.26	1.24	0.18	43D	216	1.39	0.27	1.12	0.18
	59	1.60	0.28	1.32	0.18		218	1.56	0.26	1.30	0.18
20D	60	1.80	0.37	1.43	0.18	45D	219	1.82	0.35	1.47	0.18
	65	1.65	0.30	1.35	0.18		226	0.95	0.28	0.67	0.18
21D	66	1.03	0.24	0.79	0.18	46D	227	1.30	0.28	1.02	0.18
	80	1.14	0.27	0.87	0.18		235	1.16	0.25	0.91	0.18
22D	81	1.23	0.26	0.97	0.18	48D	236	1.70	0.29	1.41	0.18
	93	1.75	0.33	1.42	0.18		237	1.72	0.35	1.37	0.18
23D	94	1.42	0.29	1.13	0.18	50D	238	1.60	0.30	1.30	0.18
	110	1.33	0.30	1.03	0.18		240	1.63	0.26	1.37	0.18
24D	111	1.37	0.32	1.05	0.18	51D	241	1.48	0.27	1.21	0.18
	115	1.37	0.27	1.10	0.18		245	1.68	0.34	1.34	0.18
25AE	116	0.68	0.19	0.49	0.18	55D	246	1.65	0.30	1.35	0.18
	117	0.72	0.22	0.50	0.18		255	1.20	0.25	0.95	0.18

Mission 021-1 (Continued)

Time	Frame	Dmax	Dmin	Delta	Gross Fog	Frame	Dmax	Dmin	Delta	Gross Fog
1:00	325	1.40	0.27	1.13	0.18	1:00	1.40	0.27	1.13	0.18
1:05	326	1.35	0.26	1.09	0.18	1:05	1.35	0.26	1.09	0.18
1:10	327	1.15	0.24	0.91	0.18	1:10	1.15	0.24	0.91	0.18
1:15	328	1.00	0.22	0.87	0.18	1:15	1.00	0.22	0.87	0.18
1:20	329	1.20	0.23	0.97	0.18	1:20	1.20	0.23	0.97	0.18
1:25	330	1.35	0.27	1.11	0.18	1:25	1.35	0.27	1.11	0.18
1:30	331	1.30	0.28	1.11	0.18	1:30	1.30	0.28	1.11	0.18
1:35	332	2.45	0.62	1.83	0.20	1:35	2.45	0.62	1.83	0.20
1:40	333	2.30	0.48	1.82	0.20	1:40	2.30	0.48	1.82	0.20
1:45	334	2.20	0.48	1.75	0.20	1:45	2.20	0.48	1.75	0.20
1:50	335	1.63	0.34	1.39	0.19	1:50	1.63	0.34	1.39	0.19
1:55	336	2.48	0.53	1.95	0.20	1:55	2.48	0.53	1.95	0.20
2:00	337	1.09	0.23	0.86	0.19	2:00	1.09	0.23	0.86	0.19
2:05	338	2.70	0.84	1.86	0.19	2:05	2.70	0.84	1.86	0.19
2:10	339	2.37	0.64	1.73	0.20	2:10	2.37	0.64	1.73	0.20

NR - Denotes No Readings Made.

Dmax Range 0.68-2.70 Average Dmax 1.50
Dmin Range 0.19-0.84 Average Dmin 0.31
Delta Range 0.49-1.86 Average Delta 1.19
Gross Fog Range 0.18-0.20 Average Gross Fog 0.18

STELLAR DENSITY READINGS

Mission 1021-2

Frame	Frame	Dmax	Dmin	Delta	Gross Fog	Frame	Frame	Dmax	Dmin	Delta	Gross Fog
95D	1	1.41	1.05	1.36	0.17	106D	186	1.80	0.54	1.26	0.17
96D	17	1.64	1.43	0.18	0.17	107D	190	2.24	0.63	1.61	0.17
97D	18	1.48	0.95	1.34	0.17	108D	194	1.52	0.38	1.14	0.17
98D	32	1.41	0.90	1.41	0.17	109D	204	1.73	0.35	1.38	0.17
99D	34	1.62	0.48	1.14	0.17	110E	205	1.90	0.57	1.33	0.17
100D	38	1.67	0.42	1.05	0.17	111D	206	1.74	0.47	1.27	0.17
101D	49	1.83	0.94	1.29	0.17	112D	209	1.59	0.48	1.11	0.18
102D	51	1.42	0.67	1.35	0.17	113D	210	2.22	0.71	1.51	0.18
103D	58	NR	NR	NR	0.18	114D	222	1.46	0.34	1.12	0.18
104D	59	NR	NR	NR	0.18	115D	223	1.68	0.51	1.17	0.18
105D	60	1.80	0.56	1.24	0.18	116D	231	1.62	0.47	1.15	0.18
106D	71	1.83	0.55	1.28	0.18	117D	232	NR	NR	NR	0.18
107D	72	1.84	0.53	1.31	0.17	118D	233	1.56	0.48	1.08	0.18
108D	82	1.68	0.48	1.20	0.17	119D	250	1.67	0.46	1.21	0.18
109D	83	1.63	0.50	1.13	0.17	120D	251	1.81	0.53	1.28	0.18
110D	100	1.52	0.38	1.14	0.17	121D	261	1.94	0.61	1.33	0.18
111D	101	2.08	0.68	1.40	0.17	122D	262	2.00	0.57	1.43	0.18
112D	104	1.93	0.60	1.33	0.17	123D	263	2.02	0.58	1.44	0.18
113D	105	1.74	0.50	1.24	0.17	124D	264	1.76	0.52	1.24	0.18
114D	108	1.93	0.56	1.47	0.17	125D	267	1.80	0.50	1.30	0.18
115D	109	1.85	0.53	1.32	0.17	126D	268	1.32	0.35	0.97	0.18
116D	115	1.92	0.52	1.40	0.17	127D	273	1.52	0.40	1.12	0.18
117D	116	1.52	0.37	1.15	0.17	128D	274	1.64	0.46	1.18	0.18
118D	118	1.54	0.37	1.17	0.17	129D	283	2.09	0.74	1.35	0.18
119D	119	1.68	0.61	1.07	0.17	130D	284	2.01	0.69	1.32	0.18
120D	132	2.22	0.76	1.46	0.17	131D	293	1.64	0.40	1.24	0.18
121D	133	1.37	0.38	0.99	0.17	132D	294	1.71	0.52	1.19	0.18
122D	151	1.62	0.45	1.17	0.17	133D	302	1.90	0.51	1.39	0.18
123D	152	1.74	0.54	1.20	0.17	134D	303	1.50	0.44	1.06	0.18
124D	162	1.57	0.42	1.15	0.17	135D	316	1.71	0.50	1.21	0.18
125D	163	NR	NR	NR	0.17	136D	317	NR	NR	NR	0.18
126D	164	1.78	0.53	1.25	0.17	137D	318	1.60	0.51	1.09	0.18
127D	179	1.72	0.46	1.26	0.17	138D	332	1.73	0.50	1.33	0.18

Mission 1021-2 (Continued)

F	Frang	Delta	Gross Fog	Delta	Gross Fog	Frang	Delta	Delta	Delta	Gross Fog
1	373	1.34	0.18	1.34	0.18	373	1.34	1.34	0.20	0.20
1	372	1.22	0.18	1.22	0.18	372	1.22	1.22	0.20	0.20
1	383	1.51	0.19	1.51	0.19	383	1.51	1.51	0.20	0.20
1	390	1.24	0.20	1.24	0.20	390	1.24	1.24	0.20	0.20
1	391	1.51	0.20	1.51	0.20	391	1.51	1.51	0.21	0.21
1	401	1.16	0.20	1.16	0.20	401	1.16	1.16	0.20	0.20
1	402	1.53	0.20	1.53	0.20	402	1.53	1.53	0.21	0.21
1	421	1.51	0.20	1.51	0.20	421	1.51	1.51	0.21	0.21
1	421	1.51	0.20	1.51	0.20	421	1.51	1.51	0.21	0.21

*Talent position numbers listed in averages are to Fog.

MR - Denotes No Readings Made.

Delta Range 1.32-2.25 Average Delta 1.72
 Delta Range 0.39-1.69 Average Delta 0.56
 Delta Range 0.18-1.61 Average Delta 1.18
 Gross Fog Range 0.17-0.21 Average Gross Fog 0.18

2. Index Material

The density and contrast of the index negatives from missions 1021-1 and 1021-2 are good. They compare favorably with the density and contrast of material from previous missions. There have been indications that recipients of this report do not require tabulated values of the densities of index negatives. If there is a requirement for this information the values will be furnished by the National Photographic Interpretation Center upon request.

APPENDIX C. MICRODENSITOMETRY

1. Edge Spread Function

The technique of obtaining the spread function from microdensitometer edge traces is used as 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 may be 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 (Mission Information Potential) frame, 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 SPPL facility. The location of the traces was decided by representatives from NPIC at SPPL. 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 inches/minute was used for a recording-to-specimen expansion of 2032:1. One inch on the recording equals 12.5 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 following table these computer outputs are listed for each edge traced: The 50 percent amplitude width of the Line Spread Function in microns, the reciprocal of the 50 percent width in millimeters, the computer determined reciprocal edge spread (Machine RES), 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 degrees when the edge is parallel to the major axis of the film and 90 degrees when the edge is perpendicular to the major axis of the film.

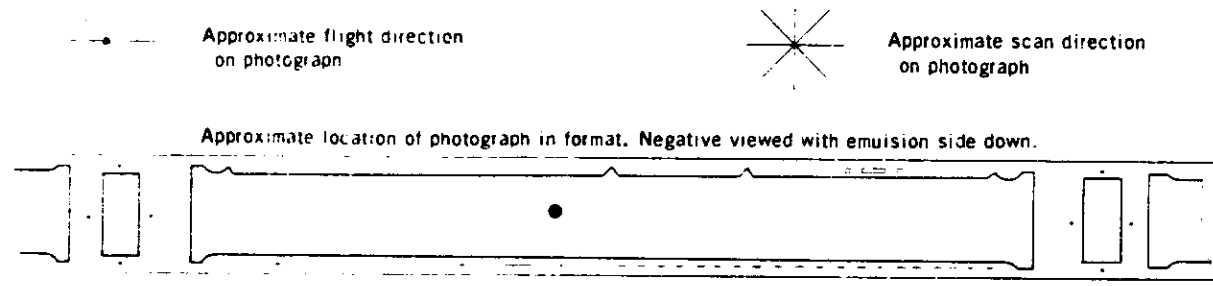
The edge traces were made on the original negative of this mission. The imagery traced is contained in the frames considered to be typical of the best in the mission.

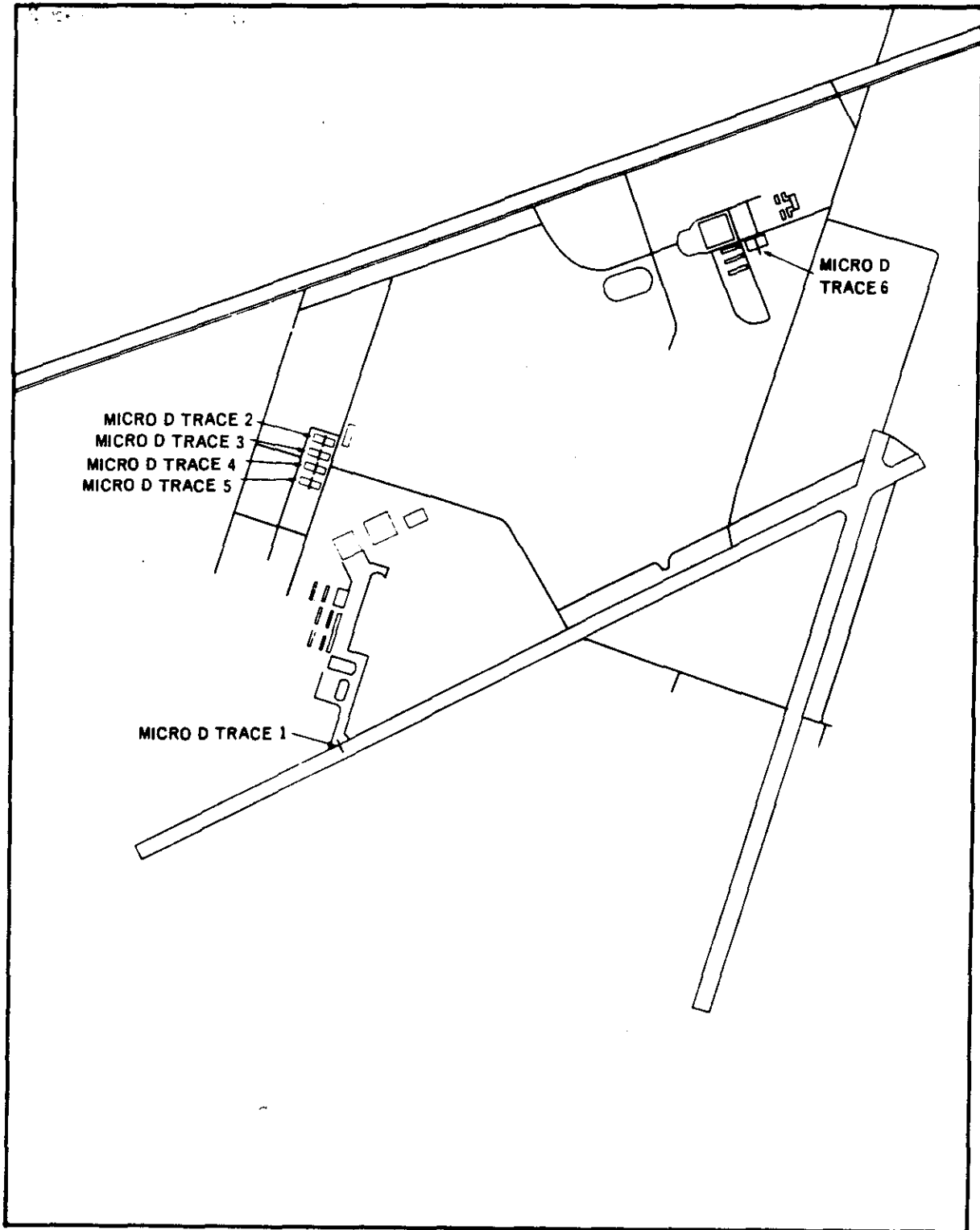
FIGURE 26. LOCATION OF EDGE TRACES 1-6, MISSION 1021-1

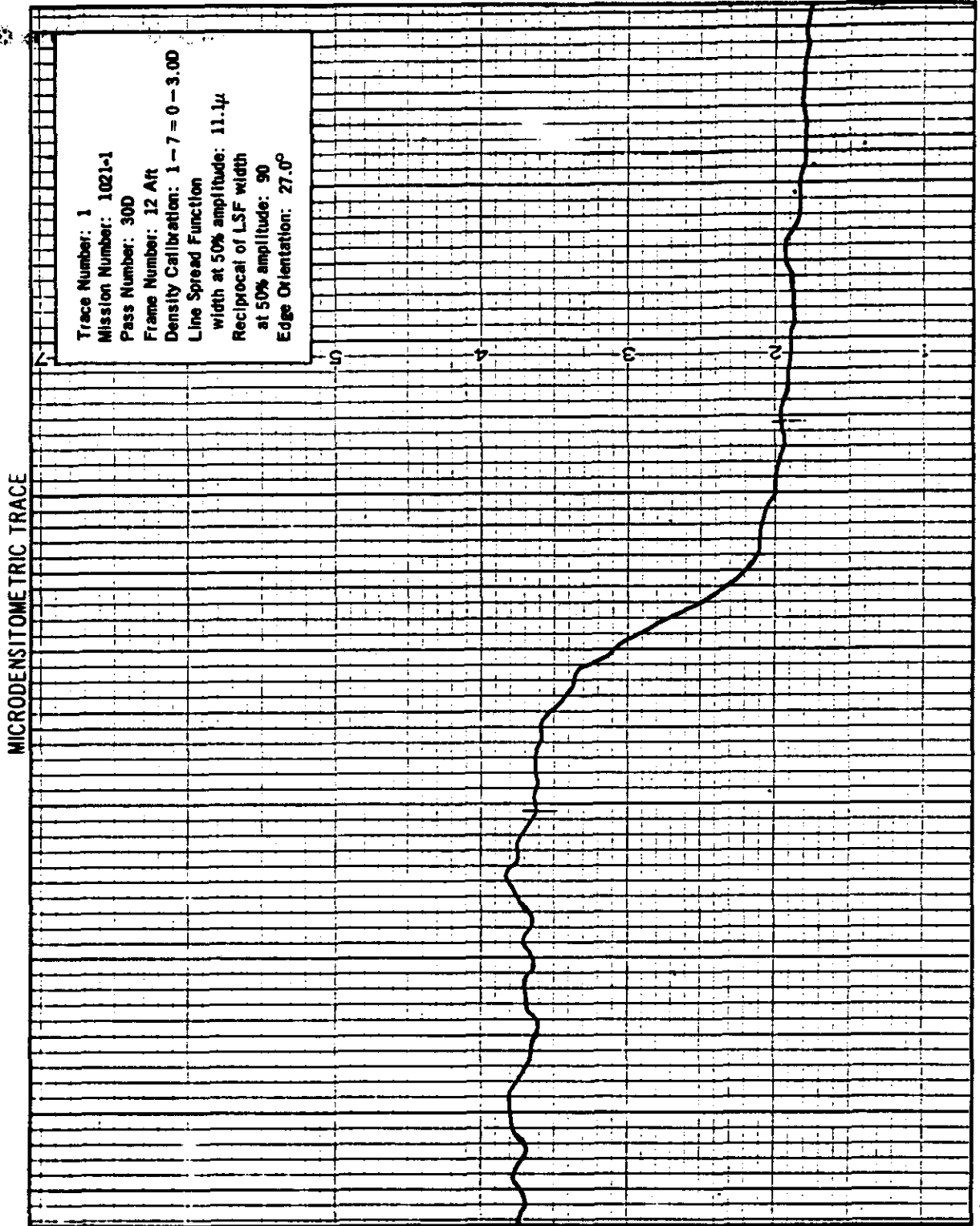
These traces were made on the MIP frame of Mission 1021-1

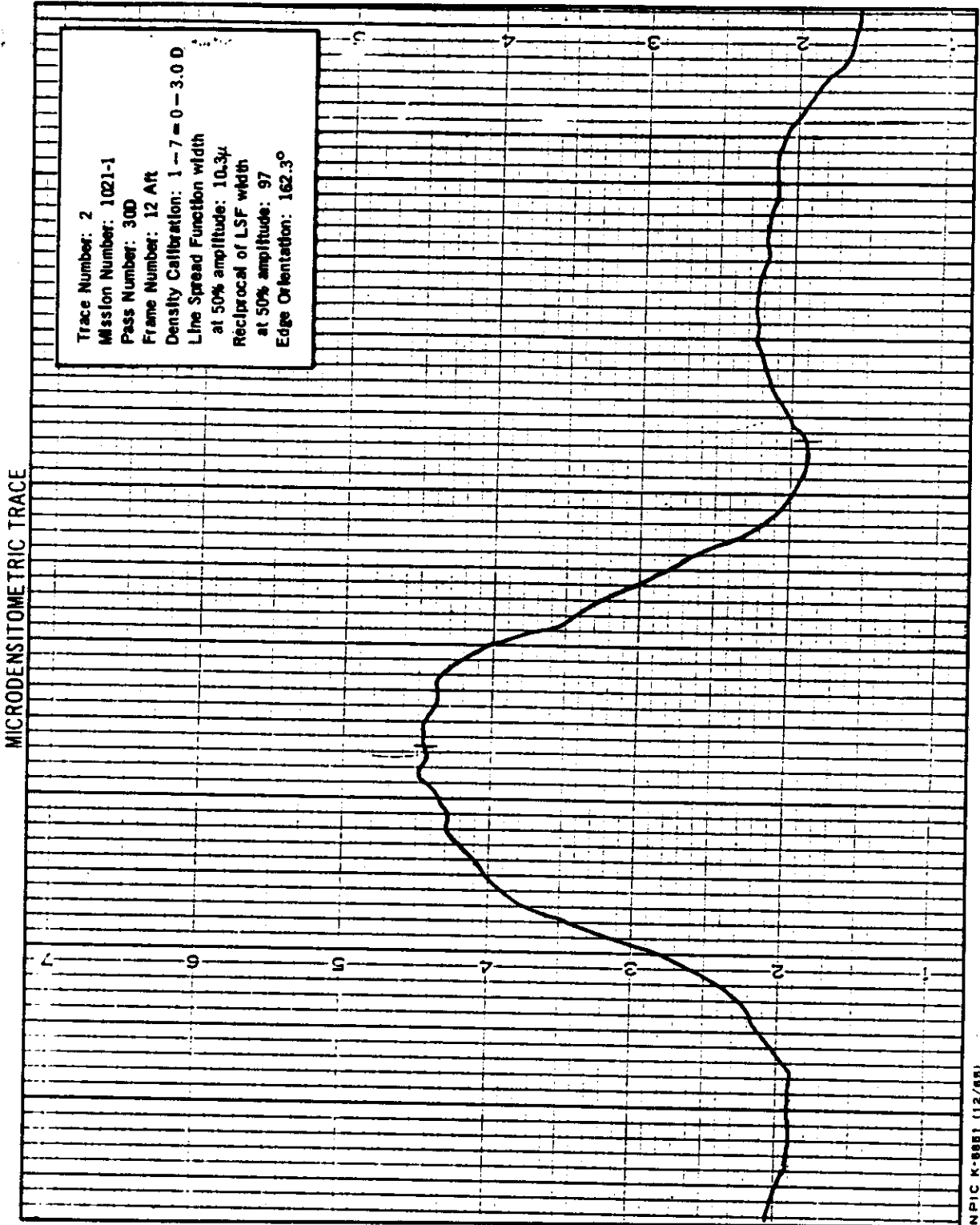
NPIC K-5849 (12/65)

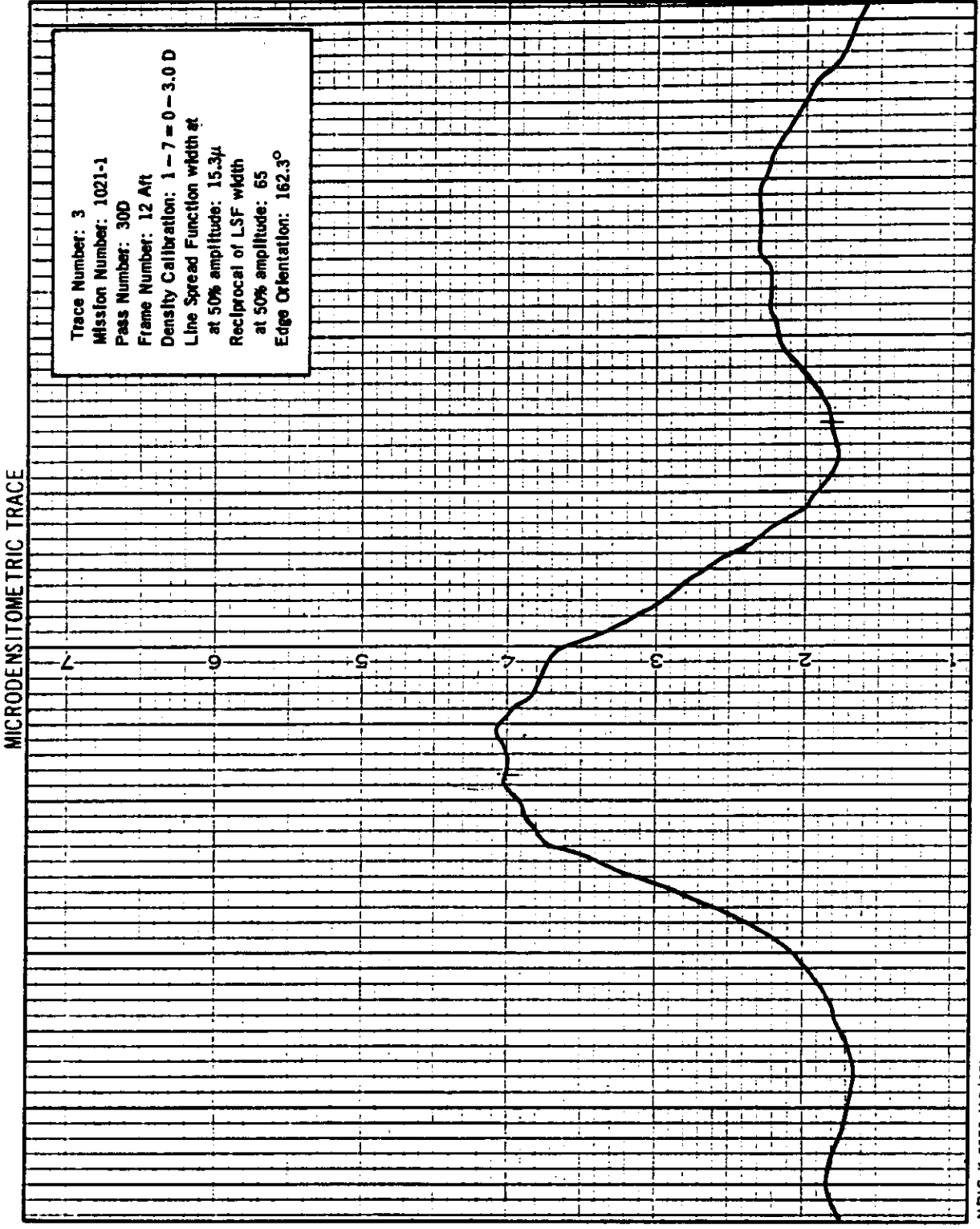
Camera	166
Pass	30D
Frame	12 aft
Date of Photography	20 May 65
Universal Grid Coordinates	40.7 - 12.7
Enlargement Factor	20X
Geographic Coordinates	33-08S 064-32W
Altitude (feet)	771,670
Camera:	
Pitch	-14°50'
Roll	0°11'
Yaw	-0°59'
Local Sun Time	1104
Solar Elevation	34°55'
Solar Azimuth	17°
Exposure (fractions of second)	1/304
Processing Level	Full
Vehicle Azimuth	164°49'



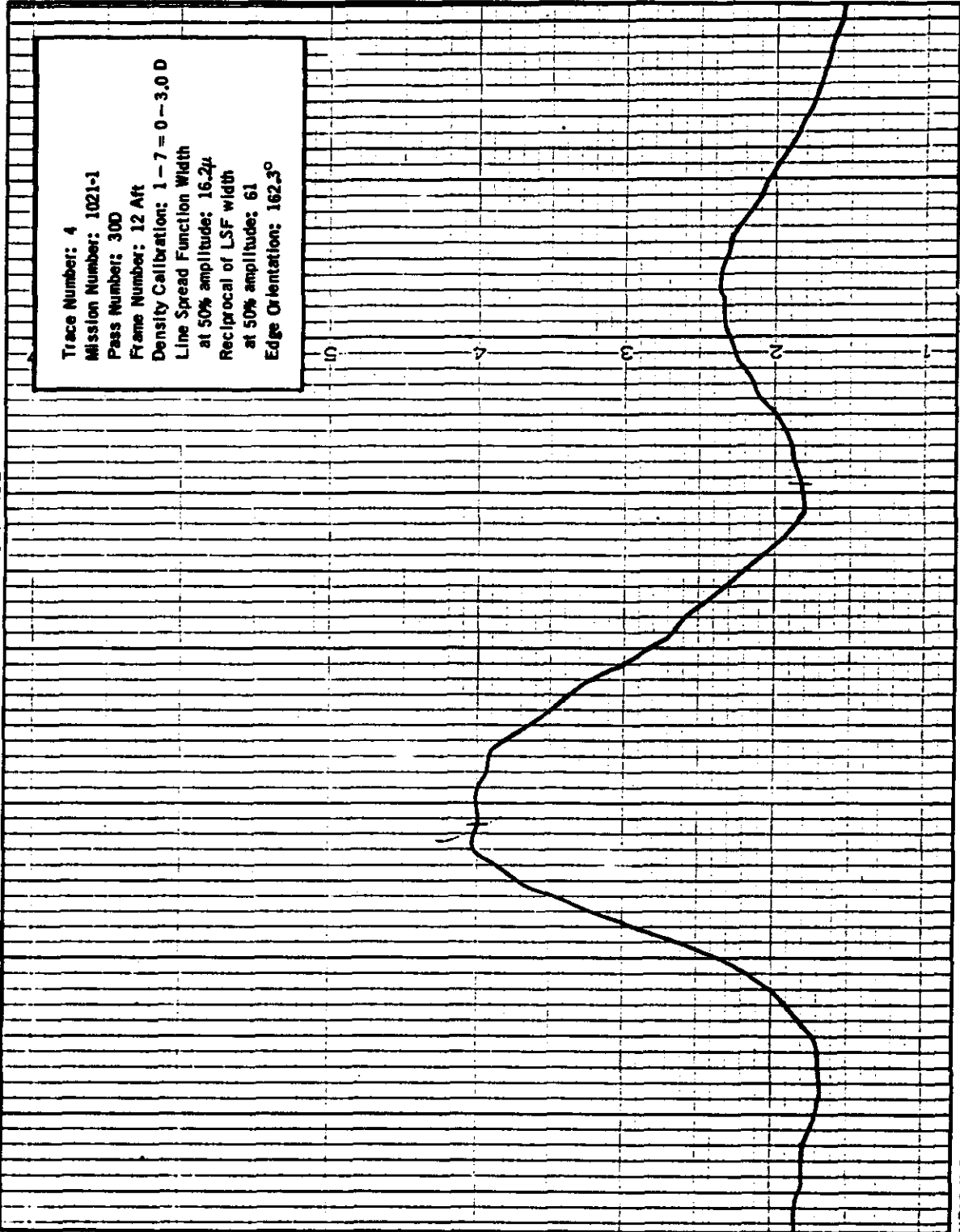




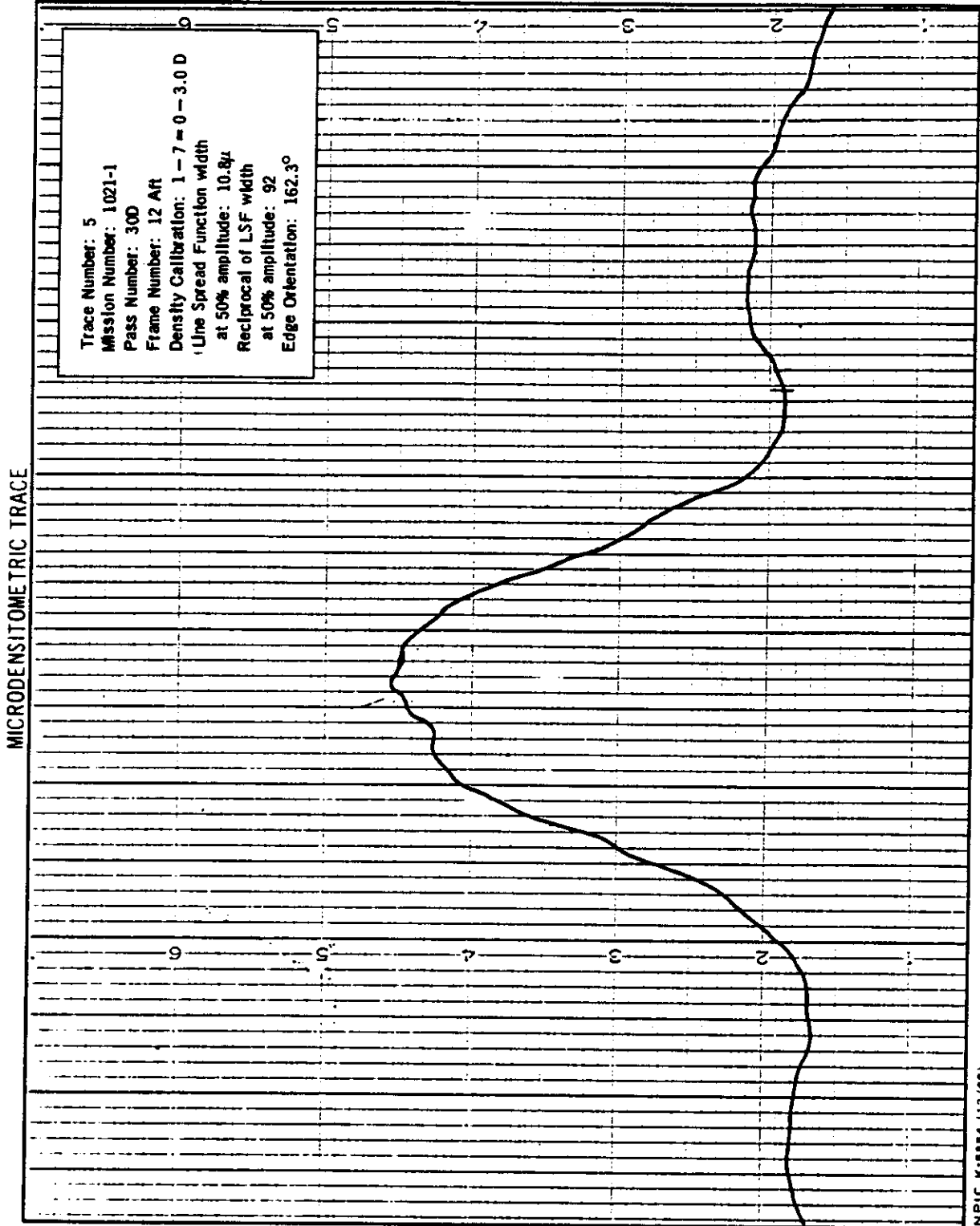




MICRODENSITOMETRIC TRACE



NPIC K-5885 (12/68)



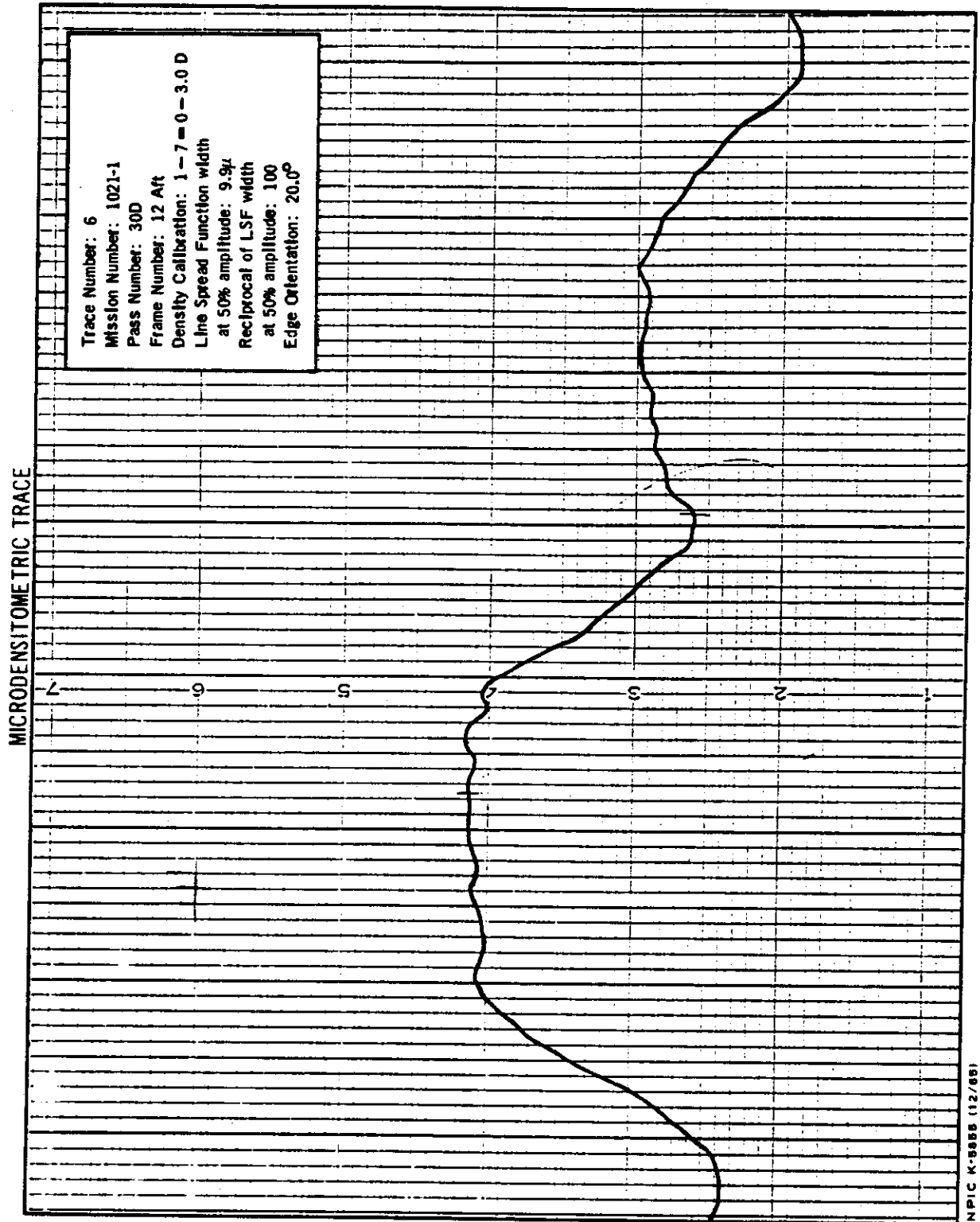




FIGURE 27. LOCATION OF EDGE TRACES 7-12, MISSION 1021-2

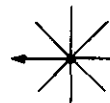
These traces were made on the MIP frame of Mission 1021-2.

NPIC K-5856 (12/65)

Camera	167
Pass	143D
Frame	14 fwd
Date of Photography	27 May 65
Universal Grid Coordinates	36.4 - 12.1
Enlargement Factor	20x
Geographic Coordinates	39-16N 121-04W
Altitude (feet)	672,673
Camera: Pitch	15°30'
Roll	-0°11'
Yaw	Not determined
Local Sun Time	803
Solar Elevation	36°26'
Solar Azimuth	92°
Exposure (fractions of second)	1/250
Processing Level	Full
Vehicle Azimuth	163°01'



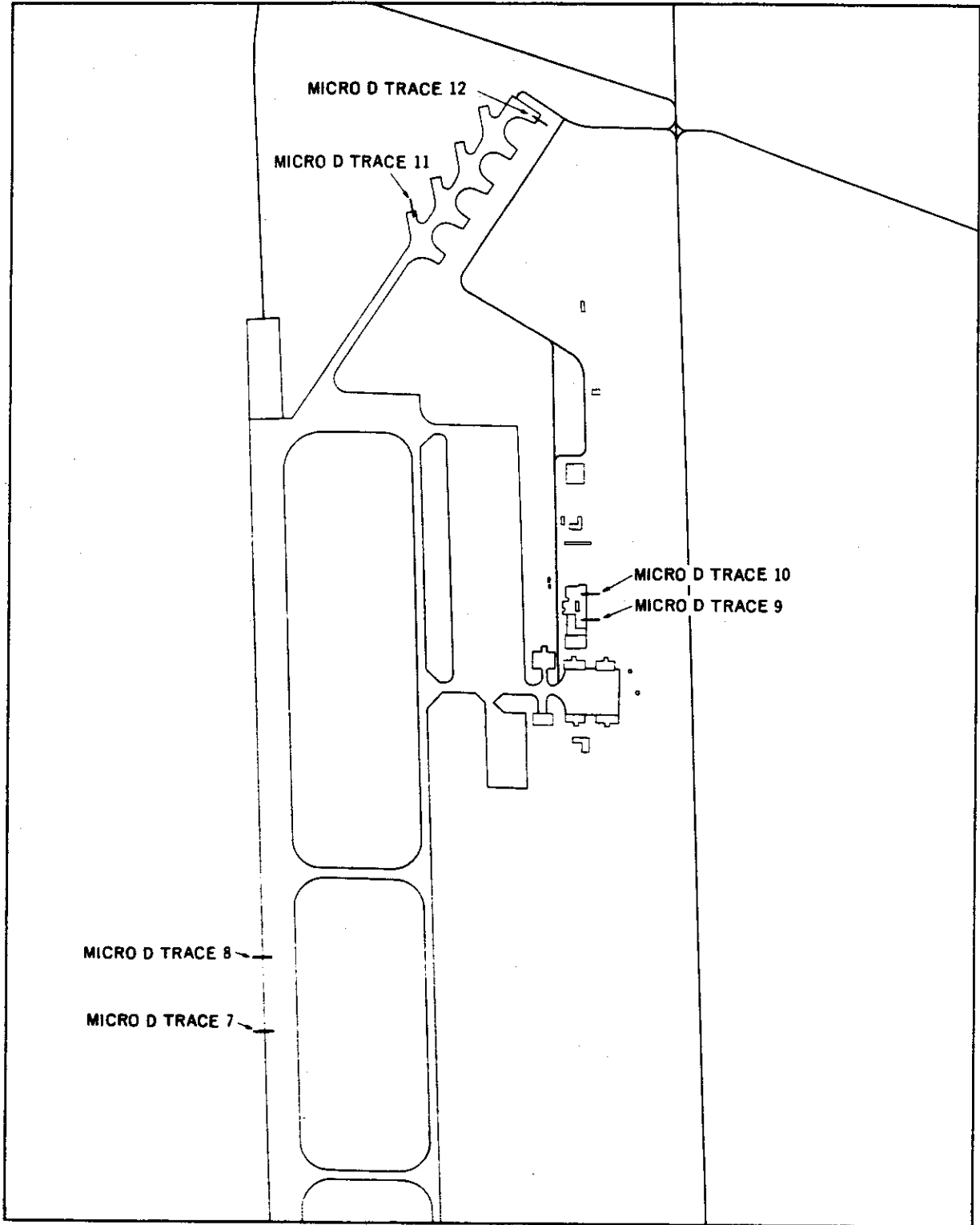
Approximate flight direction
on photograph

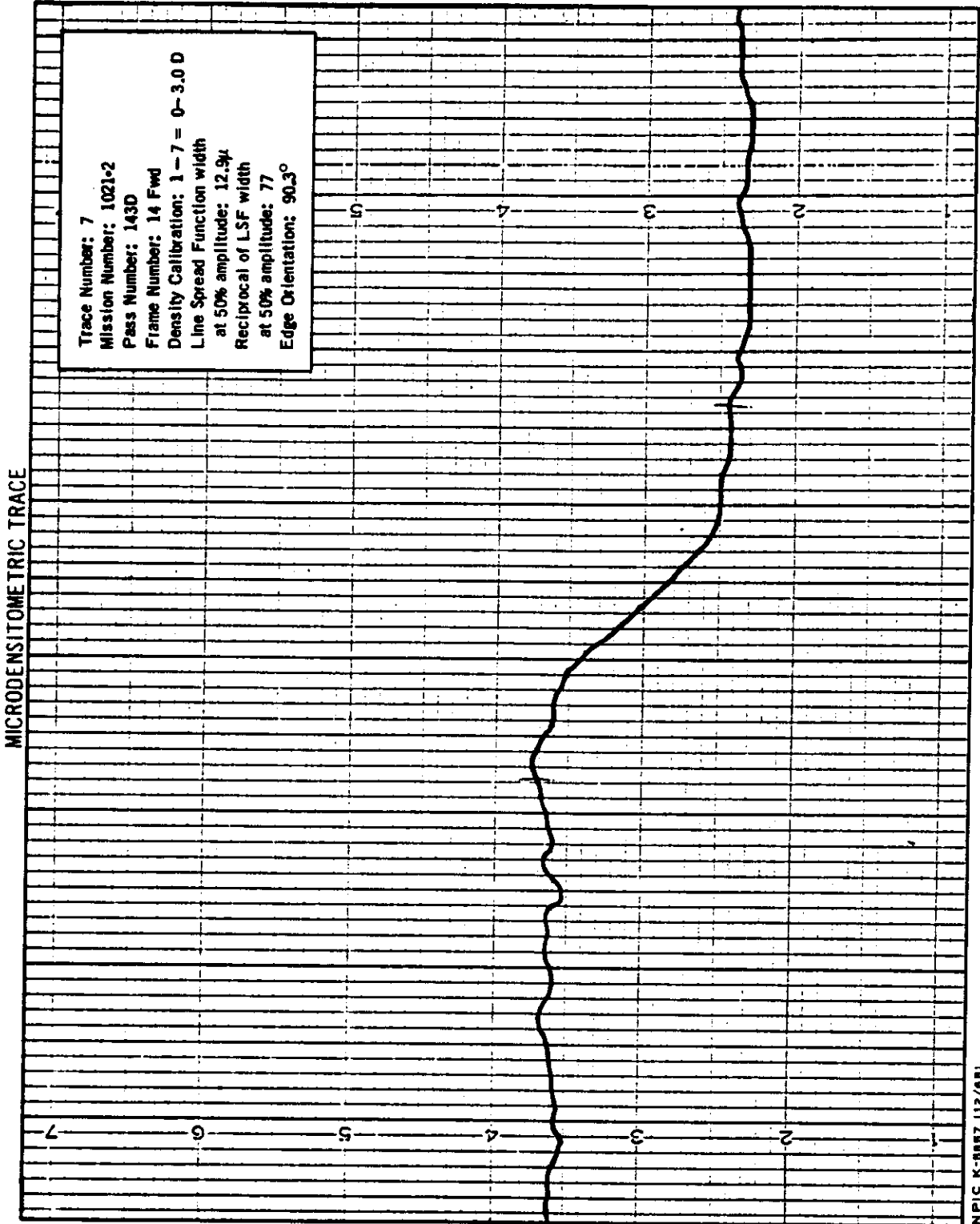


Approximate scan direction
on photograph

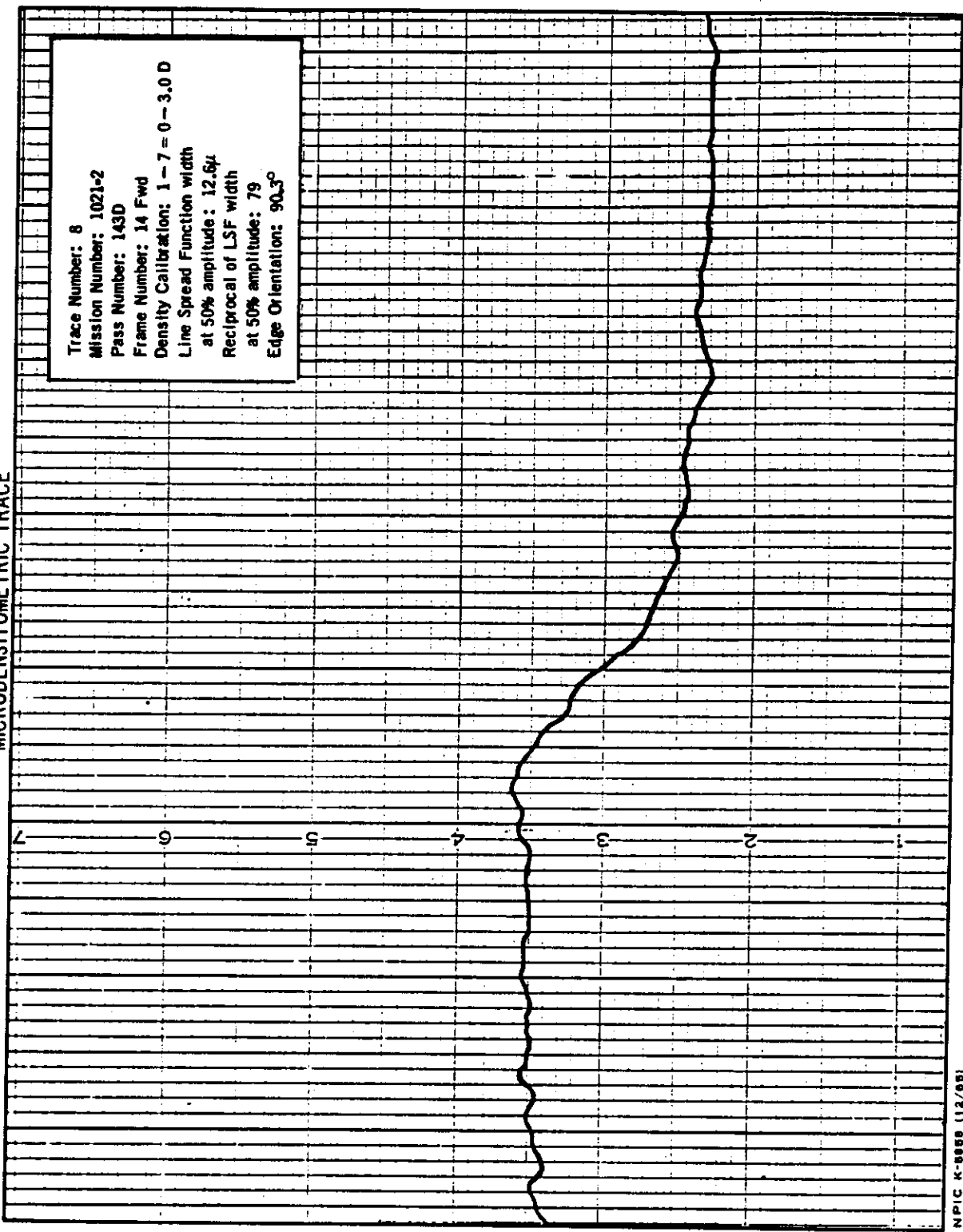
Approximate location of photograph in format. Negative viewed with emulsion side down.



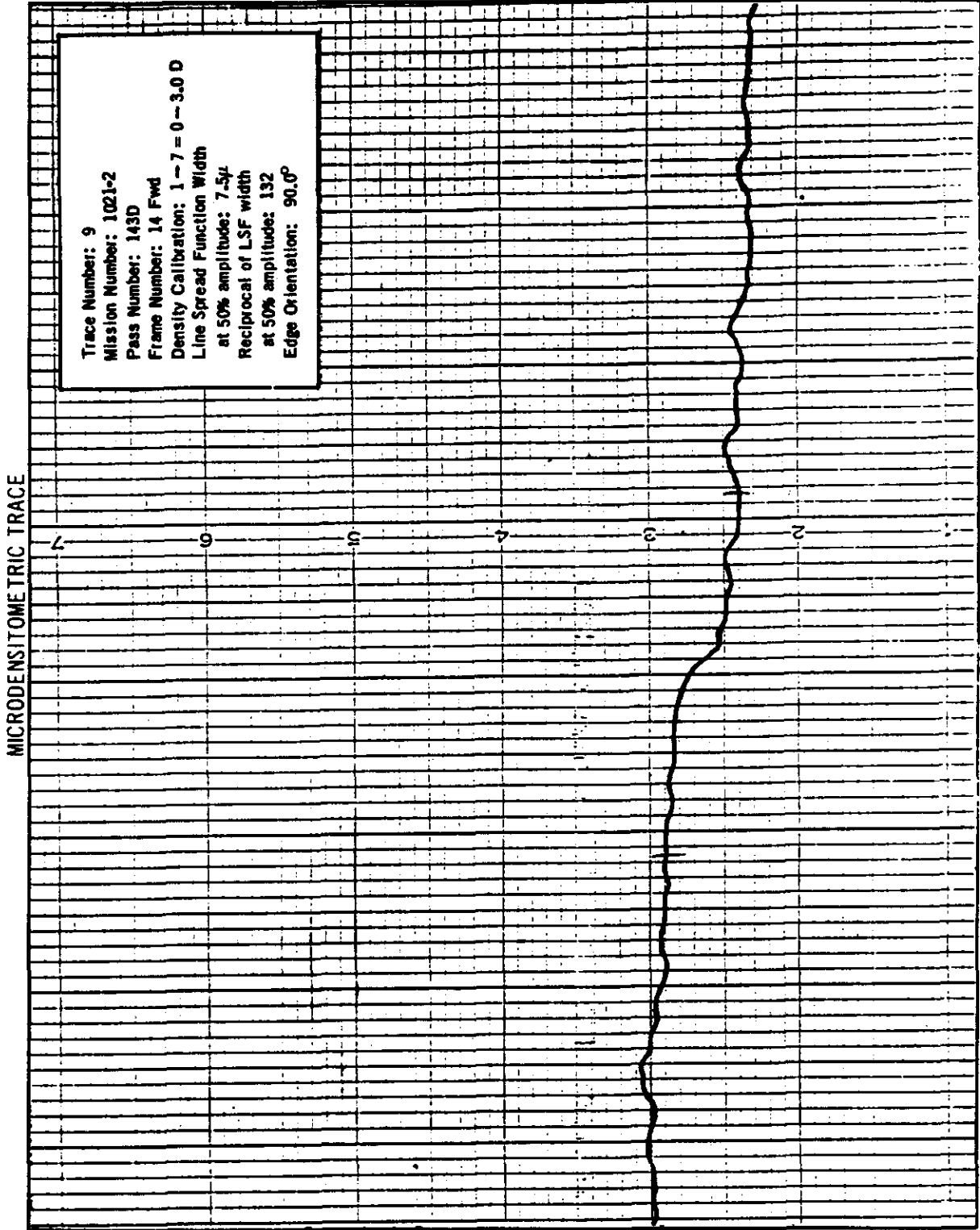


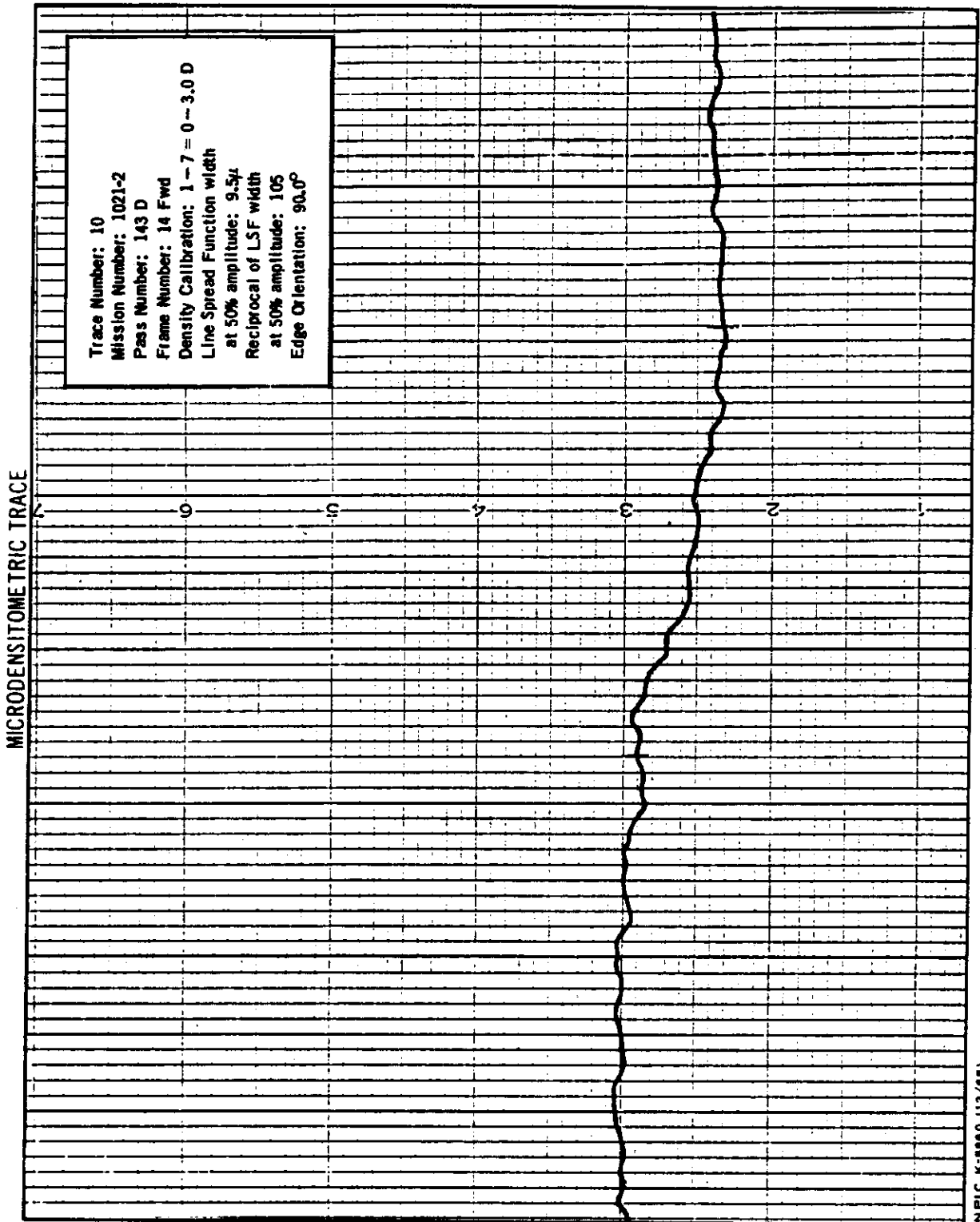


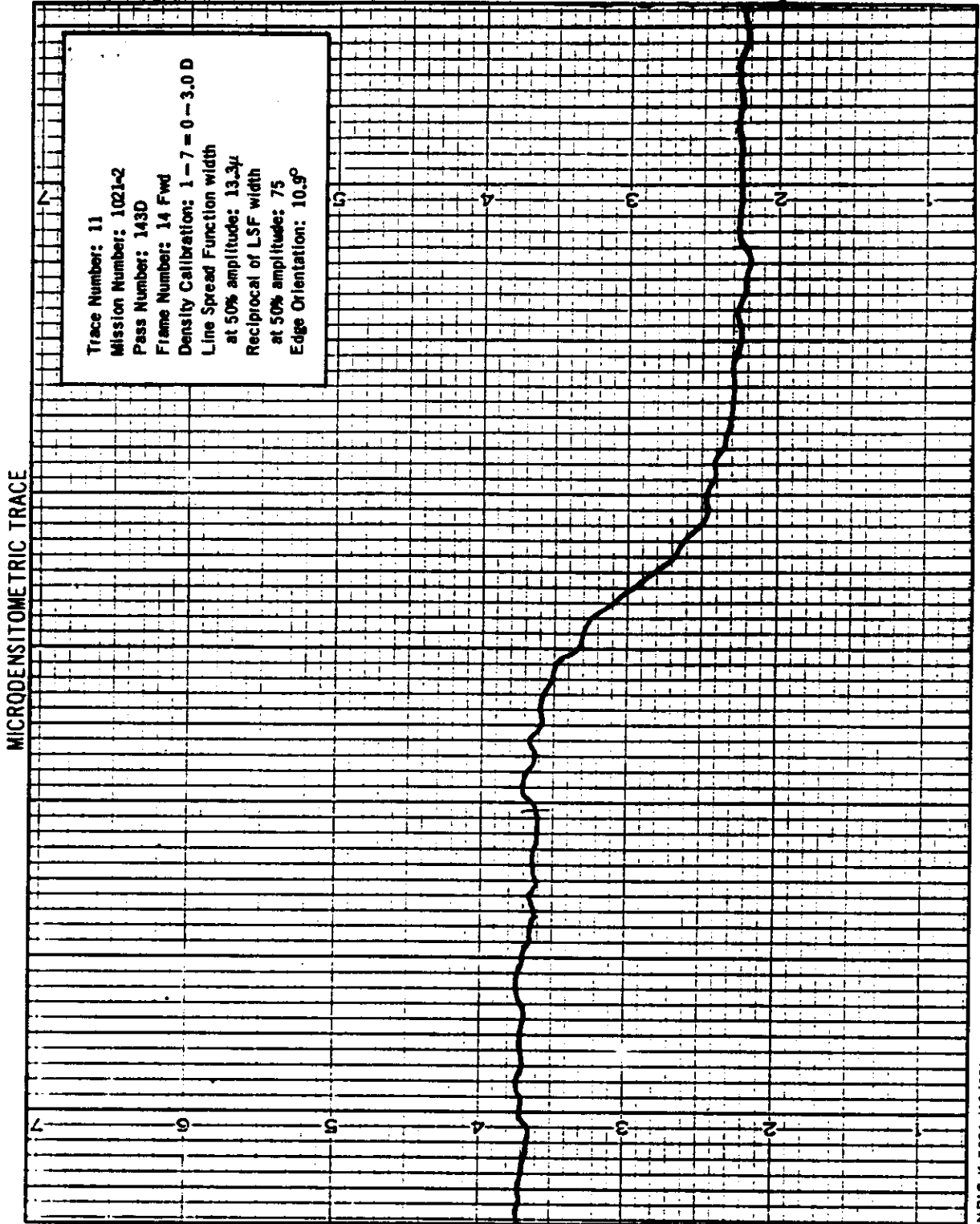
MICRODENSITOMETRIC TRACE

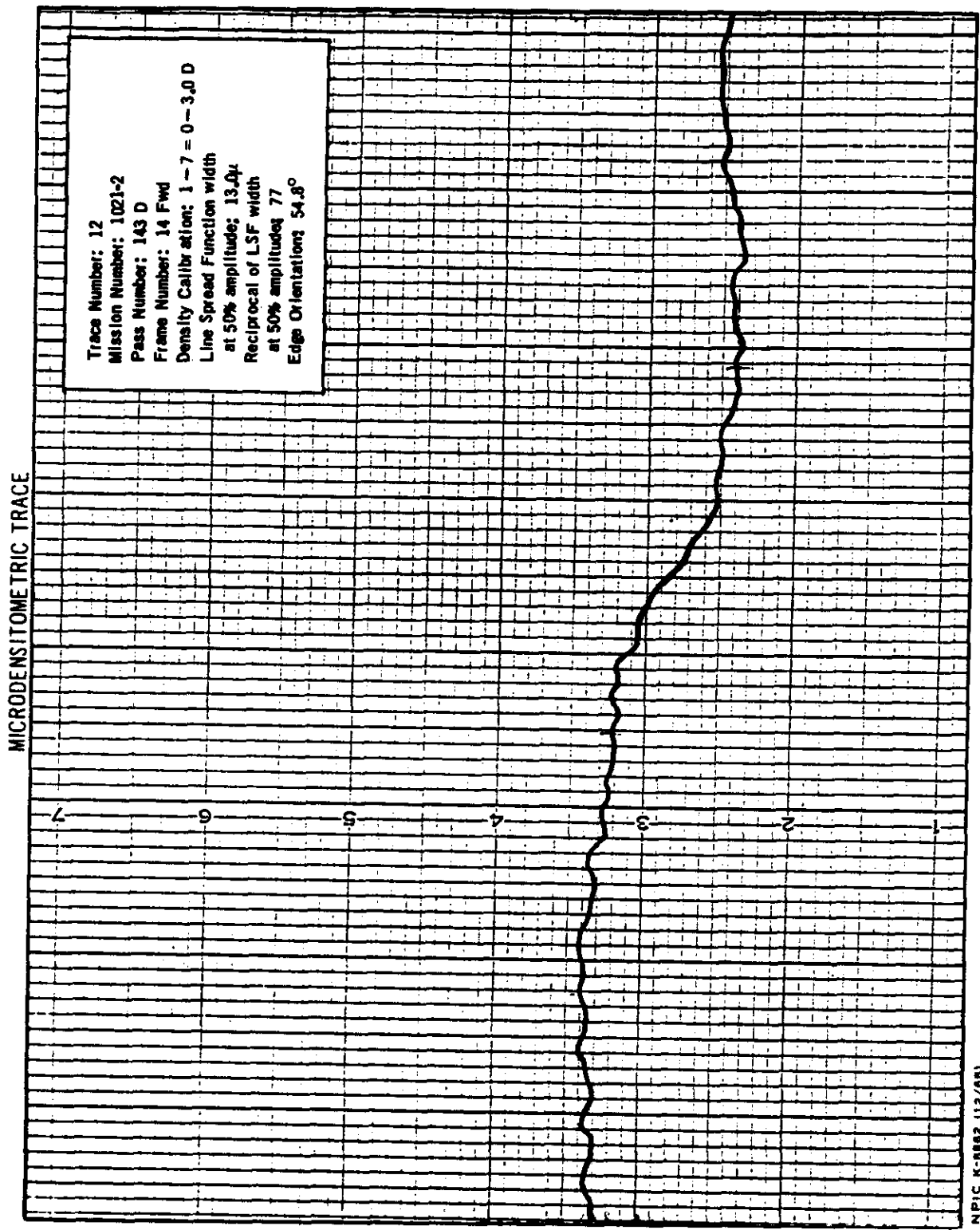


NPIC K-5888 (12/65)









APPENDIX D. CLOUD COVER ANALYSIS

1. Introduction

This study represents a statistical analysis of the cloud cover on the photography of Mission 1021. 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:

0.20 x 5.0	=	1.00%
0.15 x 17.5	=	2.63%
0.30 x 38.0	=	11.40%
0.25 x 75.0	=	18.75%
0.10 x 100.0	=	10.00%
		<u>43.78%</u>

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 Over-cast	100%



2. Cloud Cover Data, Mission 1021

Mission 1021-1

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
2D	48.0	5.4	9.3	37.3	0.0	34.8
6D	0.0	6.5	9.8	81.5	2.2	68.2
9D	73.8	6.3	2.1	17.8	0.0	18.9
10D	93.2	2.3	3.6	0.9	0.0	7.1
11D	100.0	0.0	0.0	0.0	0.0	5.0
13D	57.1	13.5	16.7	12.7	0.0	21.1
17D	45.2	12.1	8.9	15.3	18.5	37.8
18D	35.6	12.1	18.9	18.9	14.4	39.7
20D	5.0	5.0	17.8	62.2	10.0	64.5
21D	30.0	7.9	7.7	50.4	4.0	47.6
22D	24.6	7.3	9.9	58.0	0.2	50.0
23D	44.5	11.0	10.2	32.3	2.0	34.3
24D	73.8	9.1	10.4	6.7	0.0	14.3
25D	30.7	17.8	13.9	37.6	0.0	38.2
26D	52.3	12.2	7.2	27.9	0.4	28.9
27D	81.2	8.0	6.3	4.5	0.0	11.2
30D	33.8	5.9	10.8	47.5	2.0	44.4
34D	28.9	10.5	10.5	48.7	1.3	45.1
35D	18.8	8.2	4.6	62.5	5.8	56.9
37D	55.4	18.6	14.9	10.8	0.3	20.1
41D	14.9	23.8	37.6	23.7	0.0	37.0
42D	85.8	11.5	2.7	0.0	0.0	7.3
43D	83.0	3.6	8.9	4.5	0.0	11.5
46D	6.4	10.6	18.2	58.3	6.5	59.3
50D	30.8	15.4	23.1	29.8	1.0	36.3
51D	73.8	3.7	7.5	12.5	2.5	19.1
55D	60.4	10.8	19.8	6.2	2.8	19.9
56D	94.3	2.1	2.0	1.6	0.0	7.1
57D	69.1	9.9	11.8	9.2	0.0	16.6
58D	84.7	3.4	7.2	4.7	0.0	11.1
59D	72.1	5.3	18.5	4.1	0.0	14.6
65D	33.0	7.2	12.5	22.3	25.0	49.4
66D	37.8	8.7	11.8	20.5	21.2	44.4
67D	88.7	1.6	4.0	5.6	0.0	10.5
69D	56.6	9.6	18.4	12.1	3.3	23.9
70D	36.8	8.9	13.5	11.8	28.9	46.3
71D	55.8	15.4	26.5	2.3	0.0	17.3
72D	92.9	6.0	1.1	0.0	0.0	6.1
73D	84.8	3.0	9.4	2.8	0.0	10.4
74D	58.0	14.3	13.4	14.3	0.0	21.2
75D	41.1	10.4	24.0	24.0	0.5	31.5
	53.2*	9.7*	11.9*	22.1*	3.1*	28.5**

Mission 1021-2

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
85D	28.0	16.2	20.3	20.5	15.0	42.4
86D	42.1	14.4	10.6	28.6	4.3	34.4
87D	75.0	25.0	0.0	0.0	0.0	8.1
88D	94.3	2.7	1.5	1.5	0.0	6.9
89D	85.1	2.7	5.4	6.8	0.0	11.9
90D	93.6	6.1	0.3	0.0	0.0	5.9
93D	28.5	14.5	15.1	36.9	5.0	42.4
98D	49.1	13.2	13.2	23.6	0.9	28.4
102D	42.5	13.5	8.8	32.2	3.0	35.0
103D	73.3	7.2	7.1	7.4	5.0	18.2
104D	83.4	8.8	2.5	5.3	0.0	10.6
105D	78.7	12.1	7.8	1.4	0.0	10.1
106D	66.8	10.7	9.2	13.3	0.0	18.7
109D	28.1	11.5	9.9	50.5	0.0	45.1
114D	12.9	6.9	10.4	65.5	4.3	59.2
117D	49.7	13.8	9.5	15.5	11.5	31.6
119D	91.8	2.9	2.0	3.3	0.0	8.3
120D	79.6	12.9	5.1	2.4	0.0	10.0
121D	74.6	8.6	7.5	9.3	0.0	15.0
129D	56.0	1.8	7.7	22.0	12.5	35.1
132D	81.3	9.2	6.3	3.2	0.0	10.5
133D	61.7	11.8	15.9	10.6	0.0	19.1
134D	69.0	26.1	4.9	0.0	0.0	9.9
135D	78.0	1.6	0.0	5.9	14.5	23.1
136D	88.7	4.0	3.1	4.2	0.0	9.5
137D	60.9	5.5	16.5	13.3	3.8	24.1
145D	50.0	2.3	9.1	38.6	0.0	35.3
146D	51.2	7.5	17.5	23.8	0.0	28.3
148D	57.4	5.7	3.7	25.4	7.8	32.1
149D	55.8	9.4	2.2	30.8	1.8	30.2
150D	79.1	13.1	7.8	0.0	0.0	9.2
151D	9.5	8.3	13.8	49.0	19.4	63.3
152D	47.5	8.7	9.9	30.9	3.0	33.8
153D	89.3	9.3	1.4	0.0	0.0	6.6
154D	78.1	15.2	6.1	0.6	0.0	9.3
	61.5*	9.8*	8.3*	16.8*	3.6*	24.1**

*Average percentage by category for mission.

**Overall mission cloud cover percentage.



APPENDIX E. MISSION COVERAGE STATISTICS

1. Summary of Flottable Photographic Coverage Mission 1021-1

Country	FORWARD CAMERA		APT CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
USSR	4,867	769,626	4,908	772,269	9,775	1,541,895
Angola	2,111	339,560	2,273	383,926	4,384	723,486
India	2,062	327,154	2,050	325,246	4,112	541,168
Sudan	1,698	252,236	1,657	244,744	3,355	496,980
Saudi Arabia	1,698	219,535	1,626	222,082	3,324	441,617
Argentina	1,277	226,540	1,302	230,864	2,579	457,404
Australia	1,265	215,050	1,278	209,440	2,543	424,490
Ethiopia	1,131	165,882	1,045	144,985	2,176	310,867
Indonesia	807	82,706	787	81,066	1,594	163,772
Union Of						
South Africa	770	120,666	731	117,208	1,501	237,874
Canada	1,388	250,556	1,362	231,946	2,750	482,502
China	594	99,700	559	93,993	1,153	193,693
Egypt	455	72,345	600	91,376	1,055	163,721
Brazil	446	74,036	446	76,036	892	150,072
Congo	294	48,804	430	71,280	724	120,084
Sweden	414	53,044	381	61,054	795	114,098
Alaska US	351	26,950	362	27,994	713	54,944
Mauritania	387	61,533	288	45,792	675	107,325
Tanganyika	333	10,720	305	9,760	638	20,480
Norway	414	14,774	95	16,910	509	31,684
Guinea	246	34,102	246	34,102	492	68,204
Greenland	198	37,224	273	51,324	471	88,548
Spanish Sahara	213	33,867	243	38,637	456	72,504
Senegal	200	31,908	236	37,668	436	69,576
S W Africa	216	37,182	129	21,880	345	59,062
Rhodesia	186	30,876	135	22,410	321	53,286
Mongolia	62	10,291	145	24,092	207	34,383
Mali	92	14,628	92	14,628	184	29,256
Bechuanaland	93	16,110	69	12,138	162	28,248
Fiji Islands	74	3,740	74	3,740	148	7,480
Portuguese						
Guinea	72	11,520	72	11,520	144	23,040
Kenya	48	6,080	87	11,200	135	17,280
Panama	99	9,440	56	5,440	155	14,880
Sierra Leone	82	10,194	46	7,314	128	17,508

1. Summary of Plottable Photographic Coverage Mission 1021-1 (Cont'd)

Country	FORWARD CAMERA		AFT CAMERA		TOTALS	
	Linear run	Square run	Linear run	Square run	Linear run	Square run
Algeria	56	8,904	64	10,176	120	19,080
Zanzibar	48	800	44	640	92	1,440
Japan	62	3,230	21	340	83	3,570
Morocco	19	3,021	54	8,586	73	11,607
Gambia	36	5,760	36	5,760	72	11,520
Qatar	--	--	72	3,180	72	3,180
Mozambique	48	3,040	21	1,716	69	4,800
French						
Somaliiland	33	5,280	33	5,280	66	10,560
Iran	--	--	62	3,021	62	3,021
Panama Canal						
Zone	30	550	30	550	60	1,100
Nepal	15	2,385	41	6,519	56	8,904
Somali						
Republic	17	2,720	17	2,720	34	5,440
Jordan	--	--	21	3,339	21	3,339
Colombia	12	160	--	--	12	160
Sub-Total	25,019	3,754,429	24,904	3,805,935	49,923	7,560,364
Continental US	108	33,776	198	32,076	306	65,852
GRAND TOTAL	25,127	3,788,205	25,102	3,838,011	50,229	7,626,216

Summary of Available Photographic Coverage, Mission 1021-2

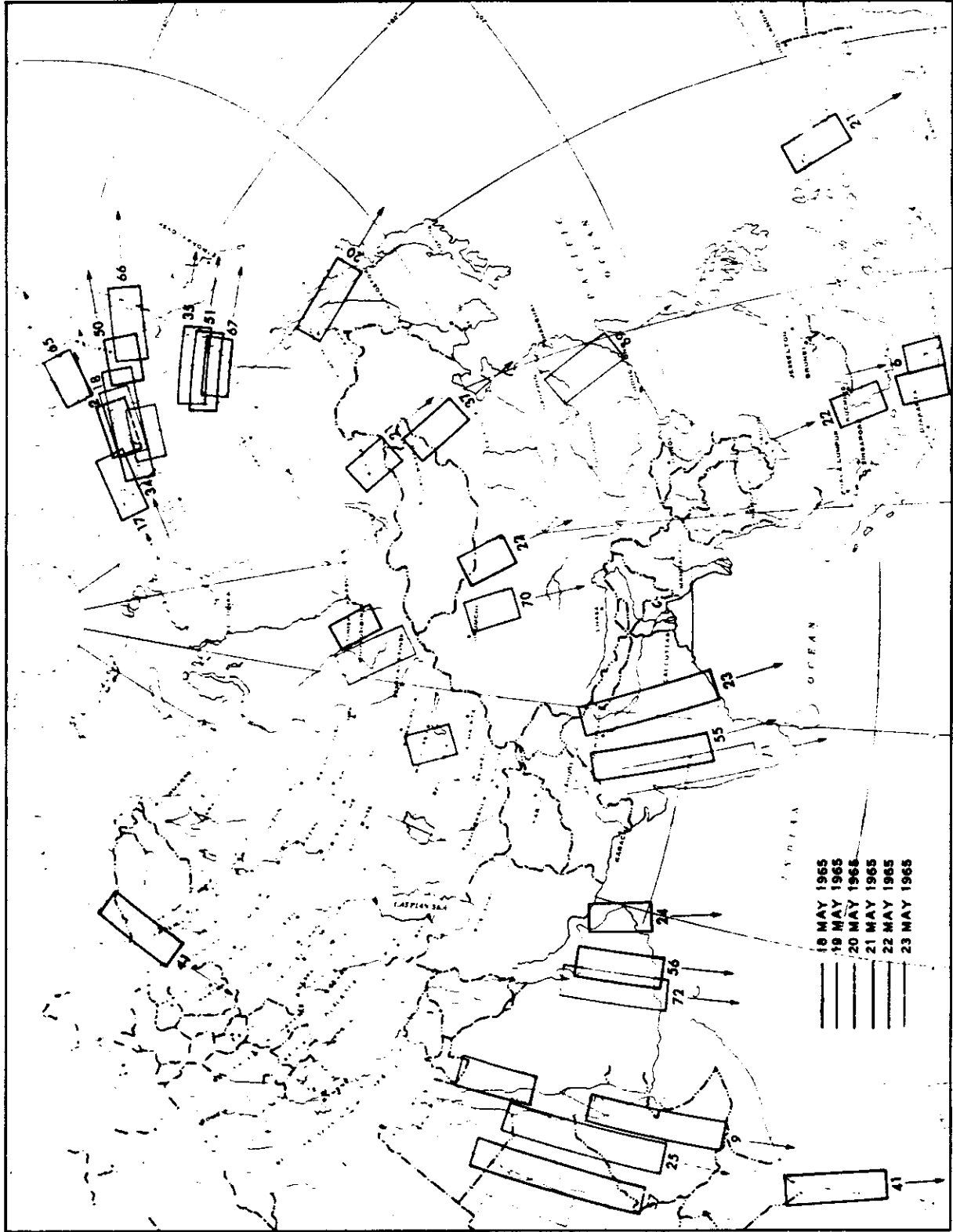
Country	FORWARD CAMERA		AFT CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
USSR	3,984	522,767	160	25,216	4,144	547,983
China	2,791	423,564	698	107,402	3,489	531,056
South Arat In	2,454	376,029	574	87,822	3,028	463,851
Sudan	1,938	298,820	670	104,104	2,608	402,924
Australia	1,612	227,997	310	41,912	1,922	269,909
Pakistan	1,344	199,111	353	54,362	1,697	253,473
India	1,244	169,313	314	48,307	1,558	217,620
Brazil	1,205	185,358	666	112,638	1,871	297,996
Afghanistan	897	138,070	290	44,660	1,187	182,730
Somali Republic	831	124,438	-	-	831	124,438
Mali	728	110,656	56	8,512	784	119,168
Chad	721	118,248	-	-	721	118,248
Algeria	661	100,472	335	50,920	996	151,392
Alaska	620	93,225	322	53,130	942	146,355
Canada	620	71,610	570	65,835	1,190	137,445
Rhodesia	598	101,557	-	-	598	101,557
Ethiopia	482	76,070	-	-	482	76,070
Indonesia	410	23,074	164	8,036	574	31,110
Congo	388	64,956	-	-	388	64,956
Burma	382	53,426	443	67,410	825	120,836
Paraguay	346	60,084	20	3,540	366	63,624
Niger	324	49,248	237	36,164	561	85,412
Iraq	256	39,424	-	-	256	39,424
Mexico	224	28,967	78	12,012	302	40,979
Morocco	211	32,494	-	-	211	32,494
Nepal	197	30,184	-	-	197	30,184
Finland	195	20,600	-	-	195	20,600
N Korea	183	24,231	-	-	183	24,231
W Germany	168	26,208	-	-	168	26,208
Syria	164	25,256	-	-	164	25,256
Mauritania	109	16,568	-	-	109	16,568
Uruguay	107	18,939	-	-	107	18,939
Turkey	82	12,628	-	-	82	12,628

1. Summary of Photable Photographic Coverage, Mission 1021-2 (Cont'd)

Country	FORWARD CAMERA		AFT CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
Iran	80	12,320	-	-	80	12,320
Argentina	74	12,594	20	3,540	94	16,134
Nigeria	63	9,576	17	2,618	80	12,194
Norway	62	10,540	-	-	62	10,540
Jordan	59	9,086	-	-	59	9,086
Bhutan	58	8,932	-	-	58	8,932
Bolivia	55	9,570	-	-	55	9,570
S Korea	55	3,388	-	-	55	3,388
Libya	39	5,928	-	-	39	5,928
Un Cen African Republic	31	4,874	-	-	31	4,874
Bechuanaland	25	4,350	-	-	25	4,350
E Germany	16	2,496	-	-	16	2,496
Netherlands	16	2,496	-	-	16	2,496
Egypt	5	760	74	11,396	79	12,156
France	4	624	-	-	4	624
Mongolia	2	312	-	-	2	312
Sub-Total	27,120	3,961,438	6,371	949,626	33,491	4,911,064
Continental US	1,026	153,076	442	68,068	1,468	221,144
GRAND TOTAL	28,146	4,114,514	6,813	1,017,694	34,959	5,132,208

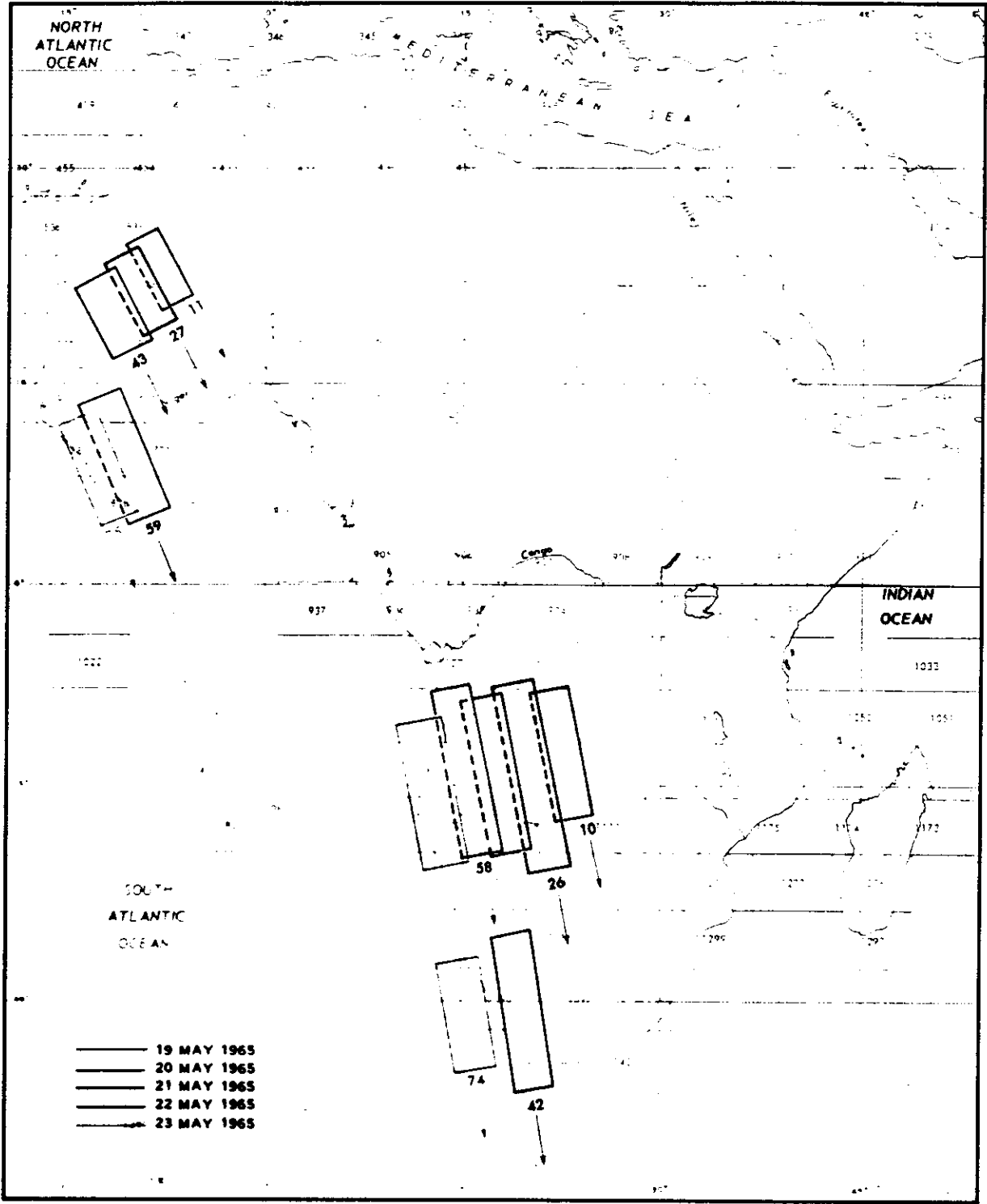
2. Mission Coverage Tracks Mission 1021

The Mission Coverage Tracks that are included in this report covered targets of intelligence value. The remaining tracks are not included because they did not cover targets of intelligence value and are not available at this time.



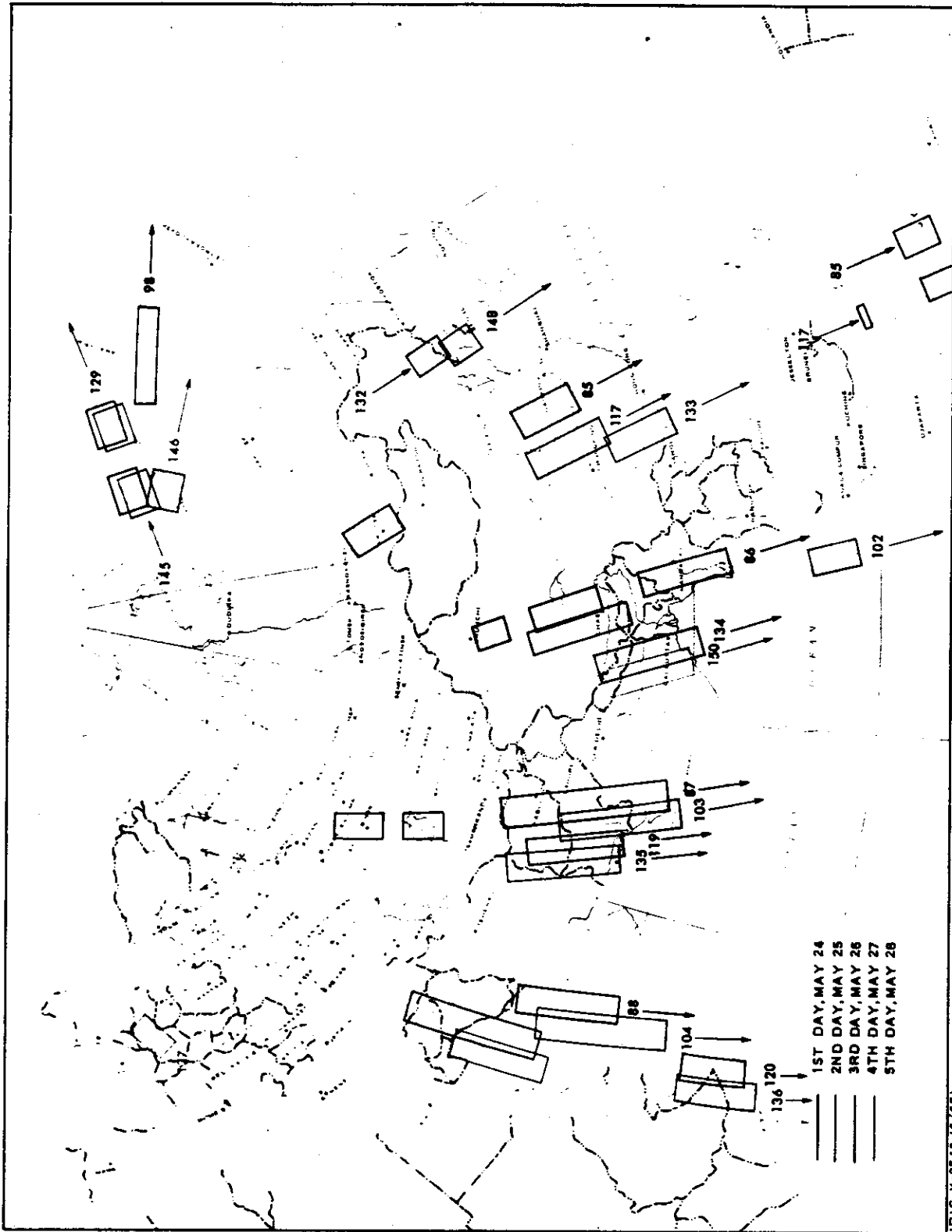
APPROXIMATE TRACK OF MISSION 1021-1, 18-23 MAY 1965 OVER USSR, FAR AND MIDDLE EAST.

NPIC K-0514 (5/65)



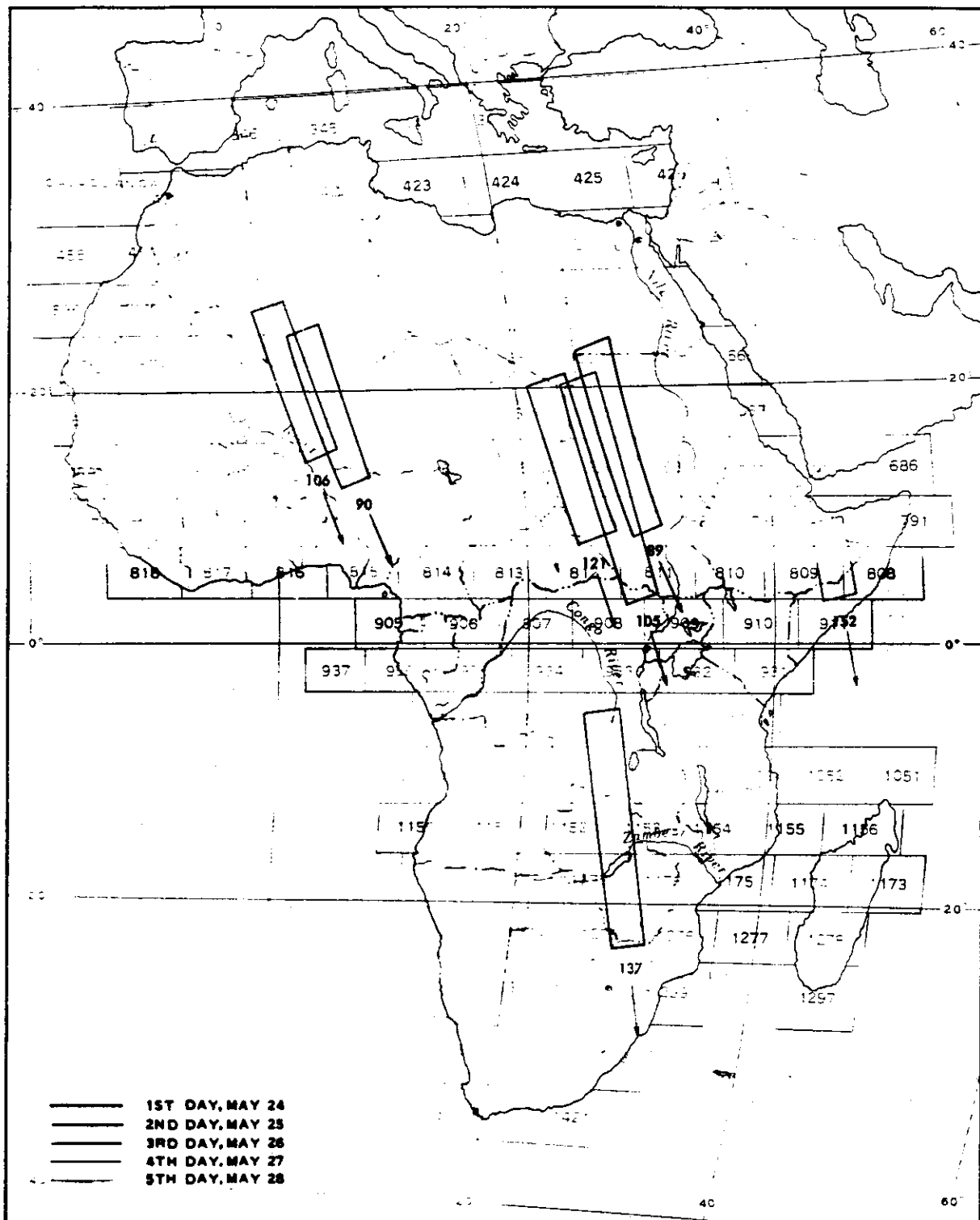
NPIC K-0515 (5/65)

APPROXIMATE TRACK OF MISSION 1021-1, 18-23 MAY 1965 OVER AFRICA.



APPROXIMATE TRACK OF MISSION 1021-2, 24-28 MAY 1965 OVER USSR, FAR AND MIDDLE EAST

NPIC K-0843 (8/68)



NPIC K-0842 (8/88)

APPROXIMATE TRACK OF MISSION 1021-2, 24-28 MAY 1965 OVER AFRICA