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March 1965

TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT MISSION 1009-1 6-9 AUGUST 1964 AND MISSION 1009-2 9-13 AUGUST 1964

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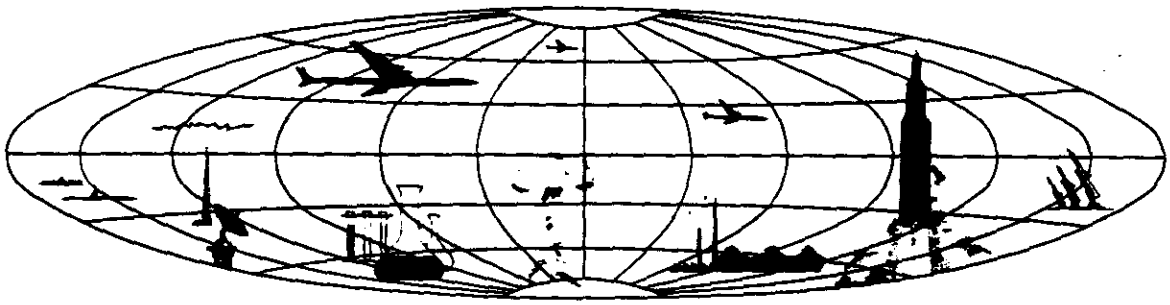

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[redacted]

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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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SYNOPSIS

Mission 1009 (System J-12) was a two-part satellite photographic reconnaissance mission. A normal orbit was achieved and photographic coverage was accomplished between 6 and 13 August 1964. Clouds covered approximately 48 percent of the mission. The cameras and associated photographic equipment functioned properly and more than 11 million square nautical miles (nm) of plottable photographic coverage was acquired.

The recovery capsule from Mission 1009-1 was retrieved by an air catch during revolution 49. The cameras were reactivated during the same revolution and continued to function properly throughout Mission 1009-2. The second recovery capsule was retrieved by an air catch during revolution 128.

There is no significant difference in image quality of the panoramic material between missions 1009-1 and 1009-2.

The mission was assigned an MIP rating of 85.

GENERAL FLIGHT DATA

Date of Launch: 5 August 1964

Actual Orbital Parameters

	Revolution 25	Revolution 112
Period:	90.7 minutes	90.6 minutes
Perigee:	101 nm	102 nm
Perigee Latitude:	44.6°N	63.3°N
Apogee:	243 nm	242 nm
Eccentricity:	0.0198	0.0194
Inclination Angle:	79.99°	80.0°

Recovery:
Mission 1009-1: 8 August 1964
Mission 1009-2: 13 August 1964

PART I. CAMERA OPERATIONS

1. Master (FWD) Panoramic Camera No 154

The Master Panoramic Camera functioned properly on this mission. The major detriment to the photographic record is the slight loss of resolution

[redacted]

[redacted]

at the supply end of the format adjacent to the non-timing track edge. This area varies in size and recurs sporadically. On occasion it extends as far as 2.3 inches into the format along the non-timing track edge, but does not extend more than 0.6 inch along the timing track edge. The area is most prevalent in the first three passes and appears intermittently throughout the first part of the mission (1009-1). It is not detected throughout the second part (1009-2). Other degradations, which are considered minor, include:

a. There are three, and sometimes four, short scratches, approximately 0.4 inch apart within the format adjacent to the camera number and parallel to the major axis of the negatives. These scratches continue throughout both parts of the mission and appear to be associated with the field flattener.

b. Continuous scratches parallel to the edges of the negatives are evident throughout both parts of the mission. These scratches are attributed to the rails which support the film during film transport.

c. Non-image forming light caused fogged areas and shadowgraphs of equipment on the last two frames of all passes and a diagonal fog streak is evident on the second or third frame after a camera on. The density of these fogged areas is commensurate with the duration of the camera-off period.

2. Slave (AFT) Panoramic Camera No 155

The Slave Panoramic Camera functioned properly on this mission. There is no major detriment to the photographic record from this camera. Minor degradations attributed to the camera include:

a. A continuous fine minus density streak 0.8 inch from and parallel to the non-timing track edge.

b. Recurring minus density streaks, approximately 0.05 inch wide, parallel to the major axis and variable in intensity, quantity, and location. These streaks are presumed to be caused by foreign matter close to the slit aperture.

c. Non-image-forming light caused fog areas and shadowgraphs of equipment in the third and in the last or second to last frame of most passes.

[redacted]

[redacted]

3. Master (FWD) Horizon Cameras

a. The port (supply) horizon camera was operational throughout the mission. The exposure is commensurate with the solar elevation. The negatives in pass 1D contain images of material associated with the vehicle. What appears to be a piece of tape can be readily identified in successive frames and unidentifiable objects can also be detected.

b. The starboard (take-up) horizon camera was operational throughout the mission. The exposure is commensurate with the solar elevation. The imagery in the early passes and at extreme northern latitudes in later passes has the appearance of being recorded through a cloud of vapor. This veiling degrades the imagery, but the horizons are definable and useful for the determination of vehicle attitude.

4. Slave (AFT) Horizon Cameras

a. The port (take-up) horizon camera was operational throughout the mission. The exposure is commensurate with the solar elevation. The negatives in pass 1D contain images of material similar to those described for the Master Port Horizon Camera.

b. The starboard (supply) horizon camera shutter failed to open in passes 46D, frames 6 and 12; 47DE, frame 6; 52D, frames 125 through 145; 69D, frame 3; 70D, frames 7 and 15; 85D, frames 13 and 188; 99D, frame 3; 116D, frame 20; and 118D, frame 47. The exposure is commensurate with the solar elevation. The imagery in the early passes and at extreme northern latitudes in the later passes has the same appearance as that described for the Master Starboard Horizon Camera.

5. Stellar Camera No 56 (Mission 1009-1)

This stellar camera functioned properly, recording 338 frames. Stars to the 7th magnitude were identified and as many as 56 stars can be detected in some frames. The first frame contains a double exposure.

Flare affects approximately 20 percent of each frame. A certain amount of flare may be advantageous for hypersensitizing the emulsion. Stellar images can be detected in the flared area.

Multidirectional streaks are present on 10 percent of the frames. These streaks may be caused by particles of fuel used to control the vehicle attitude. The streaks were noted in the following frames: 1, 3, 4, 5, 6, 7, 12, 16, 17, 18, 21, 24, 25, 27, 28, 29, 31, 46, 47, 53, 57, 58, 59, 64, 69, 91, 100, 103, 104, 106, 139, 174, 197, 247, 270, 304, 325 and 326.

[redacted]

[redacted]

Edge static and emulsion cracking along the minor axis is noted throughout the material. The similarity of the two degradations causes difficulty in differentiation between them. In some instances the emulsion cracking extends from edge to edge (example frame 330).

6. Stellar Camera No 34 (Mission 1009-2)

This stellar camera functioned properly, recording 412 frames. Stars to the 7th magnitude were identified and as many as 50 stars can be detected in some frames.

Flare affects approximately 35 percent of each frame. There were six fewer stars detectable in Mission 1009-2 than in 1009-1. This loss may be attributed to the excessive flare.

There are small plus density areas and associated markings that appear as emulsion cracks. These areas are located 0.3 inch and 0.6 inch from the edge opposite the camera number and appear randomly throughout the material. There is evidence of continuous dendritic static discharges or emulsion cracks along the edge opposite the camera number and similar markings intermittently along the camera number edge. These marks extend from edge to edge more frequently as the mission progresses. The last seven feet contain continuous edge-to-edge markings. The format is slightly degraded by non-image-forming light that produces a plus density streak entering the format from the camera number edge and extending 0.5 inch into the format. The following frames are affected: 25, 62, 110, 145, 165, 172, 174, 205, 227, 244, 266, 293, 312, 325, 331, 344, 362, 376, 382, 384, 388 and 402. A plus density streak, approximately 0.1 inch wide and of undetermined origin, is noted between the camera number and the format in the last 17 frames of the mission.

[redacted]

[redacted]

FIGURE 1. DEFINITION 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 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: The pitch is the rotation of the vehicle about the transverse axis. Positive readings indicate nose-up attitude, negative readings indicate nose-down attitude.

ROLL: The roll is the rotation of the vehicle about the longitudinal axis. Positive readings indicate left wing-up attitude. Negative readings indicate right wing-up attitude.

YAW: The yaw is the rotation of the vehicle about the vertical axis. Positive readings indicate counterclockwise rotation when viewing the ground nadir from the vehicle.

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

[redacted]

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.

[redacted]

FIGURE 2. STELLAR FRAME NO 1 (MISSION 1009-1).

NPIC J-8554 (3/65)

This is the first frame recorded by the stellar camera (No 56) on this mission. It depicts the typical streaks that are usually observed in stellar photography during the early portion of a mission. The vertical lines of the reseau are double imaged in this frame; however, no other double exposures were detected in the stellar material of this mission.

[redacted]

[redacted]

Stellar Frame Number	1 (1009-1)
Correlates with FWD Camera:	
Pass	1D
Frame	4
Date of Photography	6 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	-01° 03.5'
Roll	00° 32.6'
Yaw	00° 13.5'
Exposure Time	2 seconds

[redacted]

[redacted]

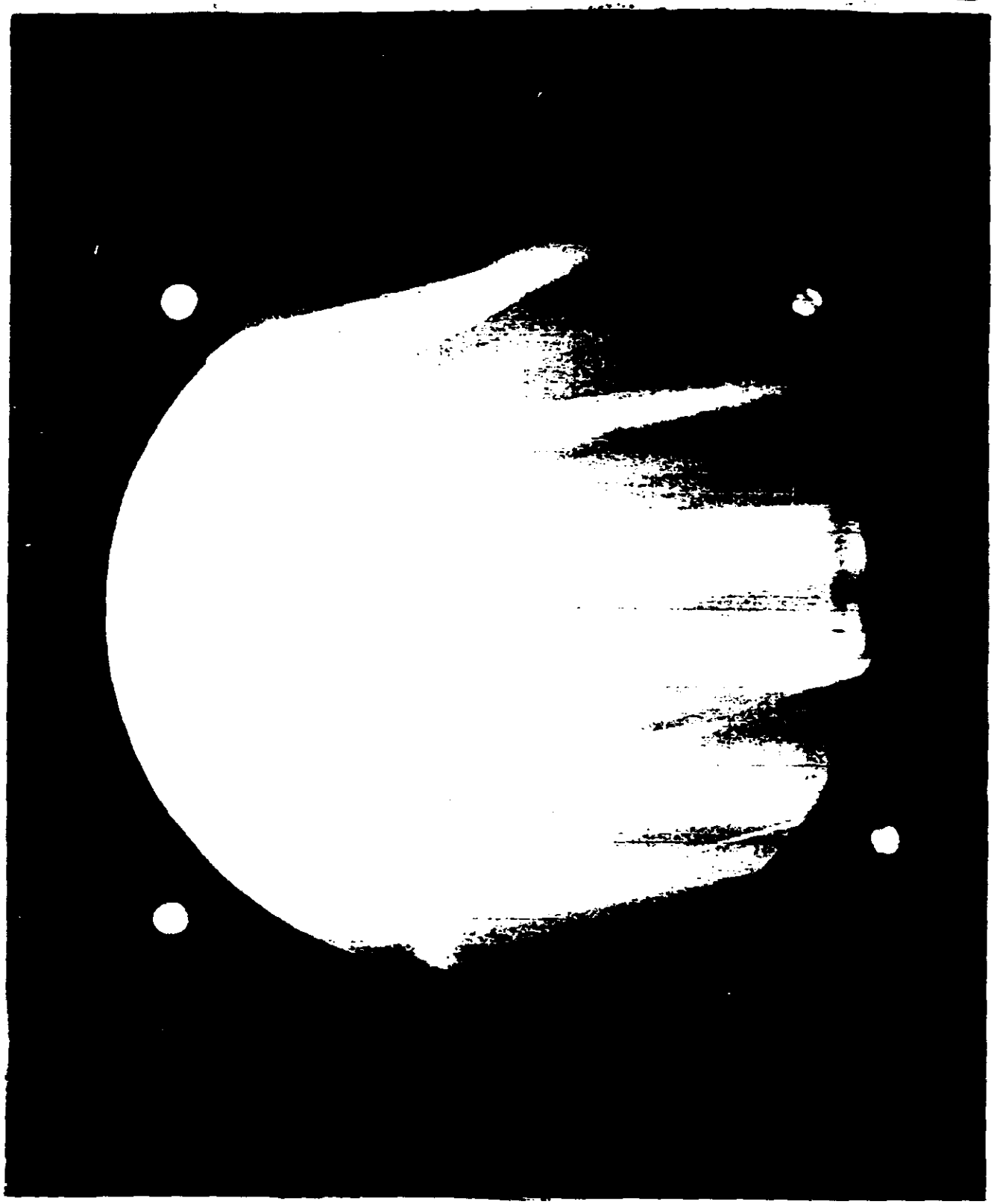

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FIGURE 3. STELLAR FRAME NO 3 (MISSION 1009-1).

NPIC J-8585 (3/68)

This frame was recorded 7 hours and 30 minutes after stellar frame 1. Similar streaks can still be observed, but the quantity has diminished considerably. The streaks shown in this photograph have the appearance of flat objects rotating as they pass through the angle of view of the stellar camera.

[redacted]

[redacted]

Stellar Frame Number	3 (1009-1)
Correlates with FWD Camera:	
Pass	6D
Frame	10
Date of Photography	6 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	-01°03.5'
Roll	00°32.0'
Yaw	00°18.6'
Exposure Time	2 seconds

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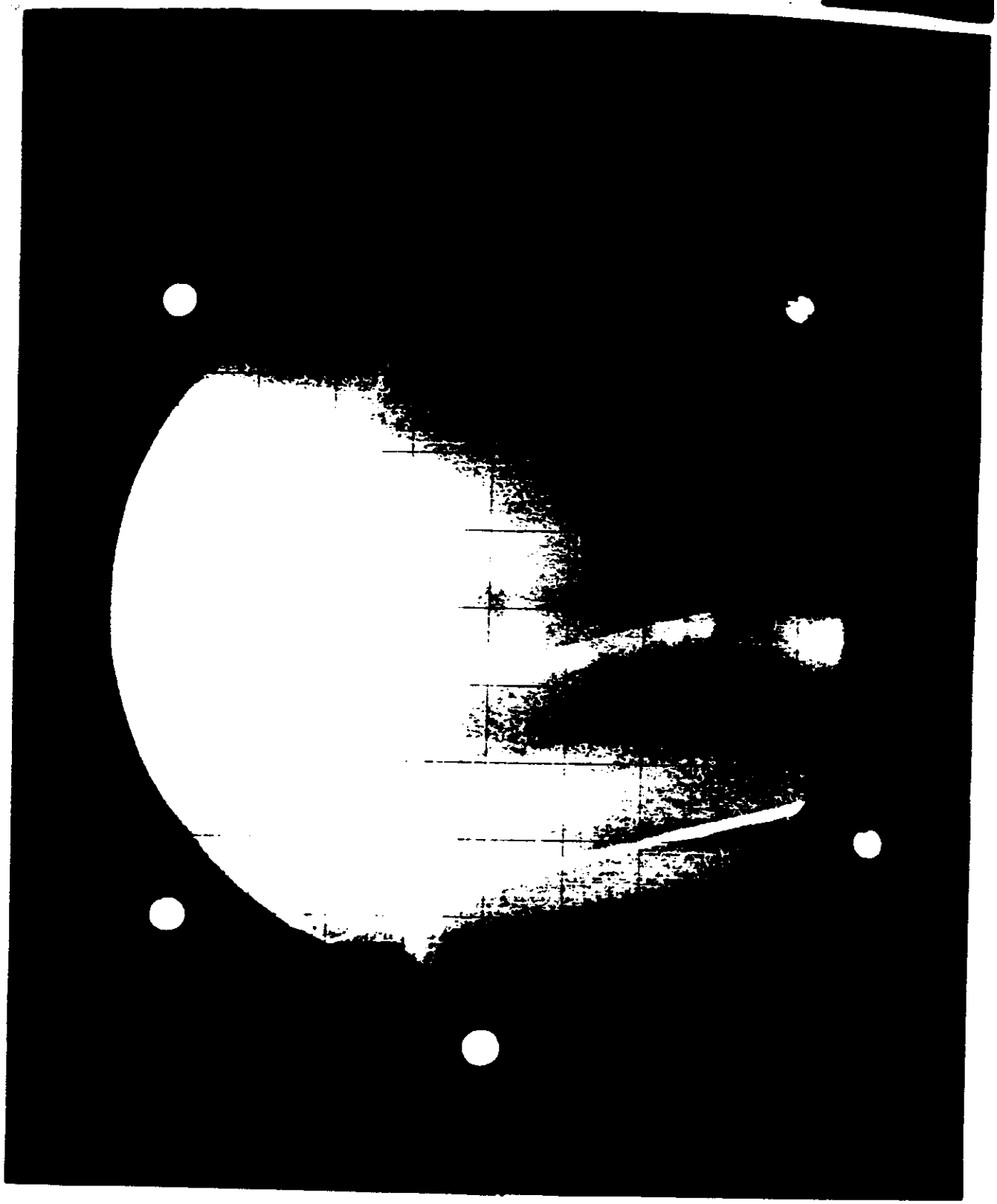

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FIGURE 4. STELLAR FRAME NO 4 (MISSION 1009-1).

NPIC J-8556 (3/68)

This photograph is included to show the pattern of one of the larger streaks observed in the stellar photography in Mission 1009-1.

[redacted]

[redacted]

Stellar Frame Number	4 (1009-1)
Correlates with FWD Camera:	
Pass	6D
Frame	17
Date of Photography	6 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	-01°05.5'
Roll	00°32.2'
Yaw	00°25.3'
Exposure Time	2 seconds

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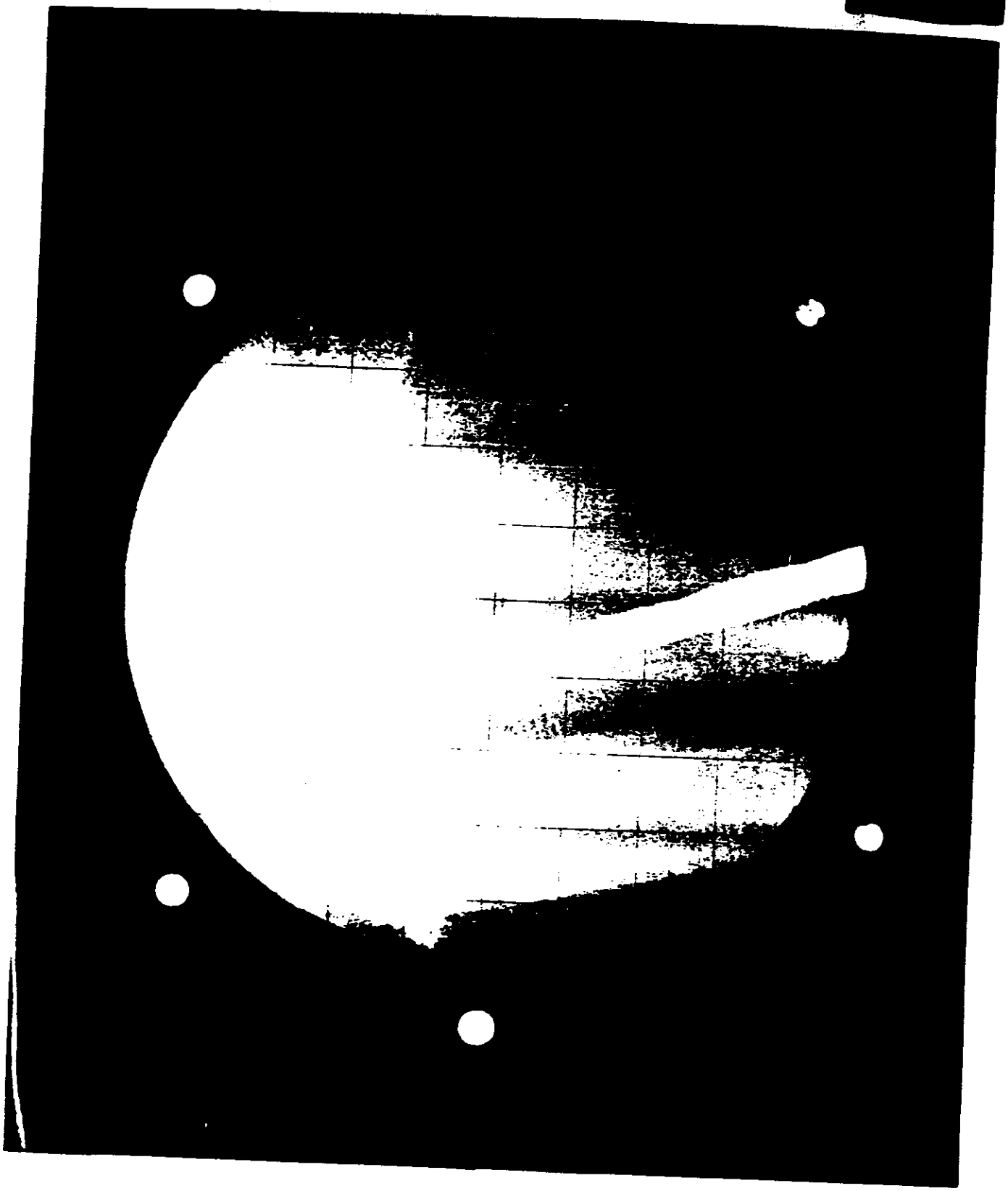

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FIGURE 5. STELLAR FRAME NO 24 (MISSION 1009-1).

NPIC J-8867 (3/68)

This photograph shows an average stellar frame from Mission 1009-1.

[redacted]

[redacted]

Stellar Frame Number	24 (1009-1)
Correlates with FWD Camera:	
Pass	6D
Frame	157
Date of Photography	6 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	-00° 44.1'
Roll	00° 27.5'
Yaw	-00° 05.8'
Exposure Time	2 seconds

[redacted]

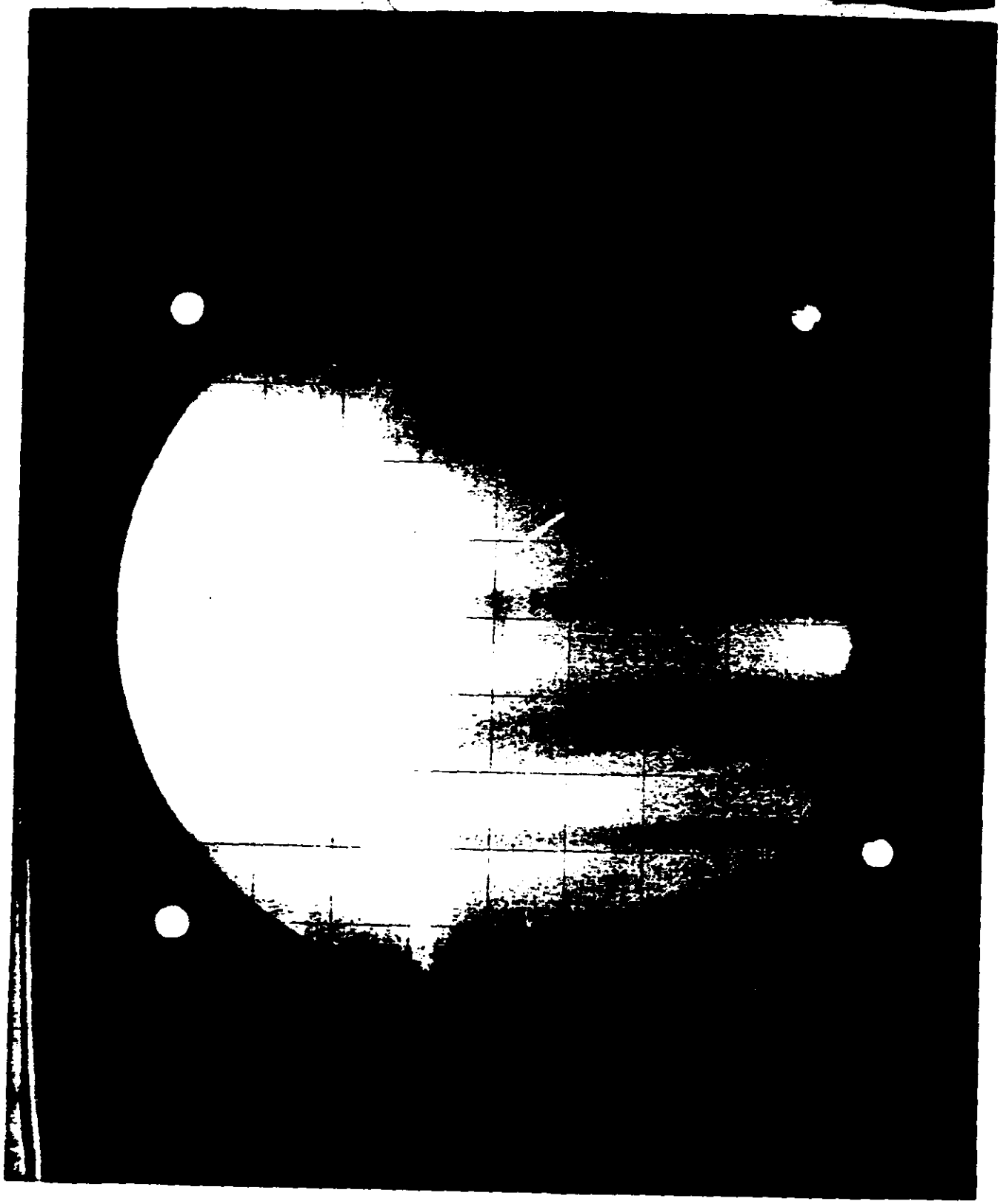

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FIGURE 6. STELLAR FRAME NO 139 (MISSION 1009-1).

NPIC J-8588 (3/65)

This photograph is included to show the pattern of a streak that was recorded during the middle portion of Mission 1009-1.

[redacted]

[redacted]

Stellar Frame Number	139 (1009-1)
Correlates with FWD Camera:	
Pass	21D
Frame	137
Date of Photography	7 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	00° 10.3'
Roll	00° 01.9'
Yaw	00° 40.8'
Exposure Time	2 seconds

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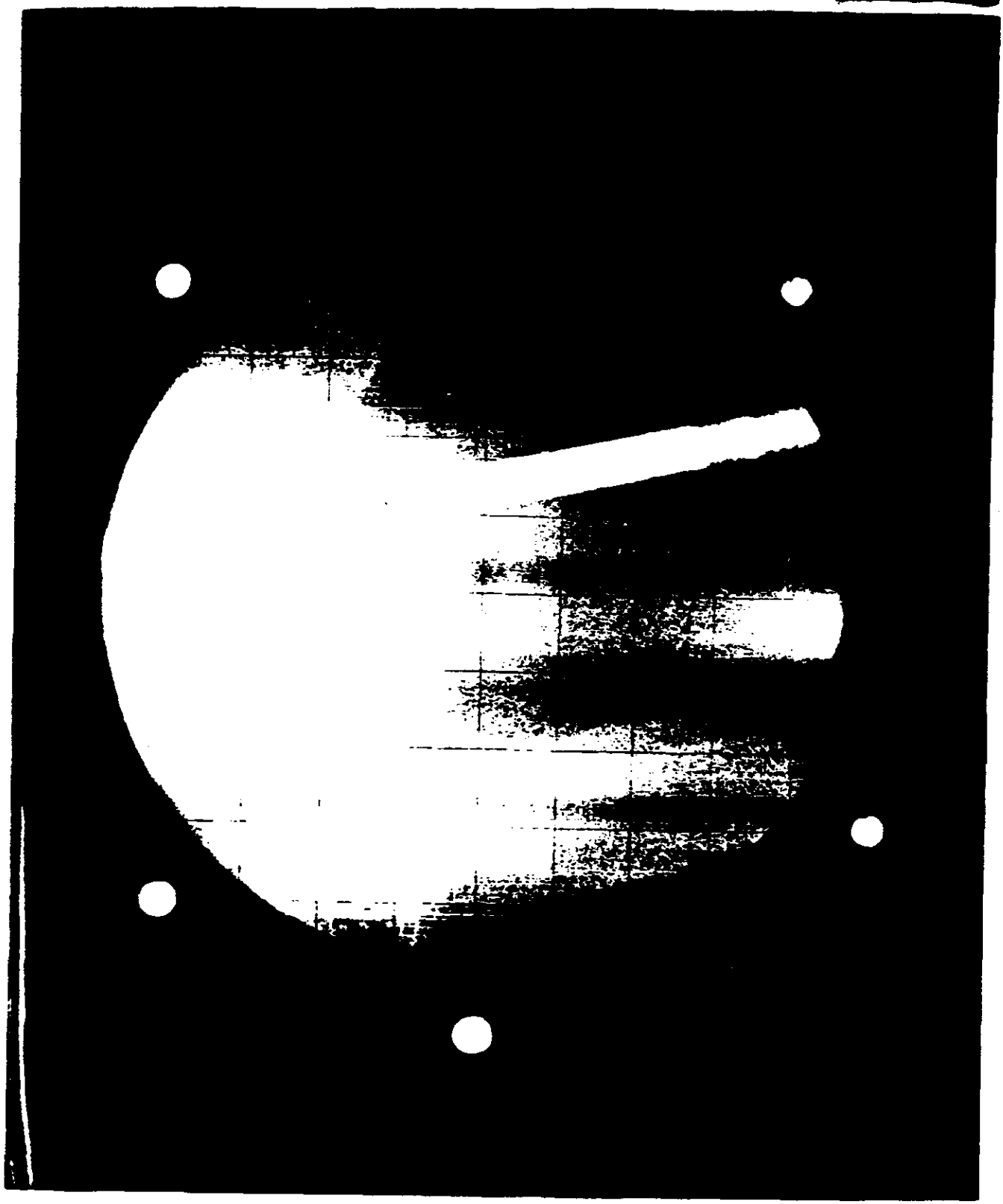

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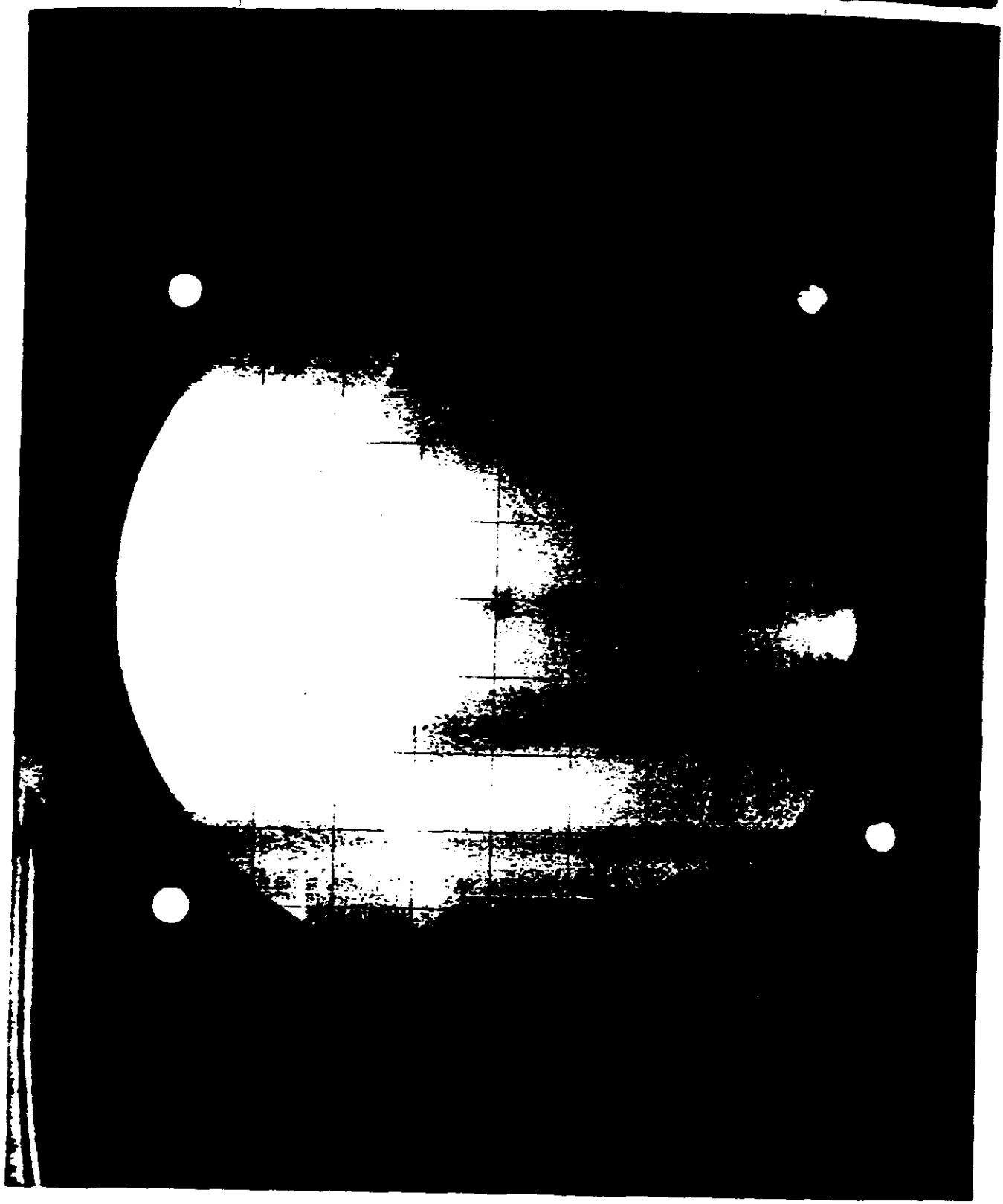
FIGURE 7. STELLAR FRAME NO 303 (MISSION 1009-1).

NPIC J-8858 (3/69)

This photograph shows stellar images that are detectable in the flared area of the format in Mission 1009-1.

[redacted]

Stellar Frame Number	303 (1009-1)
Correlates with FWD Camera:	
Pass	40D
Frame	88
Date of Photography	8 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	01°47.7'
Roll	00°34.9'
Yaw	-00°04.2'
Exposure Time	2 seconds



[redacted]

FIGURE 8. STELLAR FRAME NO 28 (MISSION 1009-2).

NPIC J-8560 (3/68)

This photograph shows the difference in contrast between the stellar photography from Camera No 56 (Mission 1009-1) and Camera No 34 (Mission 1009-2). Emulsion cracking or the results of electric discharges can be detected two places within the format.

[redacted]

[redacted]

Stellar Frame Number	28 (1009-2)
Correlates with FWD Camera:	
Pass	52D
Frame	176
Date of Photography	9 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	00°03.3'
Roll	00°48.1'
Yaw	00°02.9'
Exposure Time	2 seconds

[redacted]

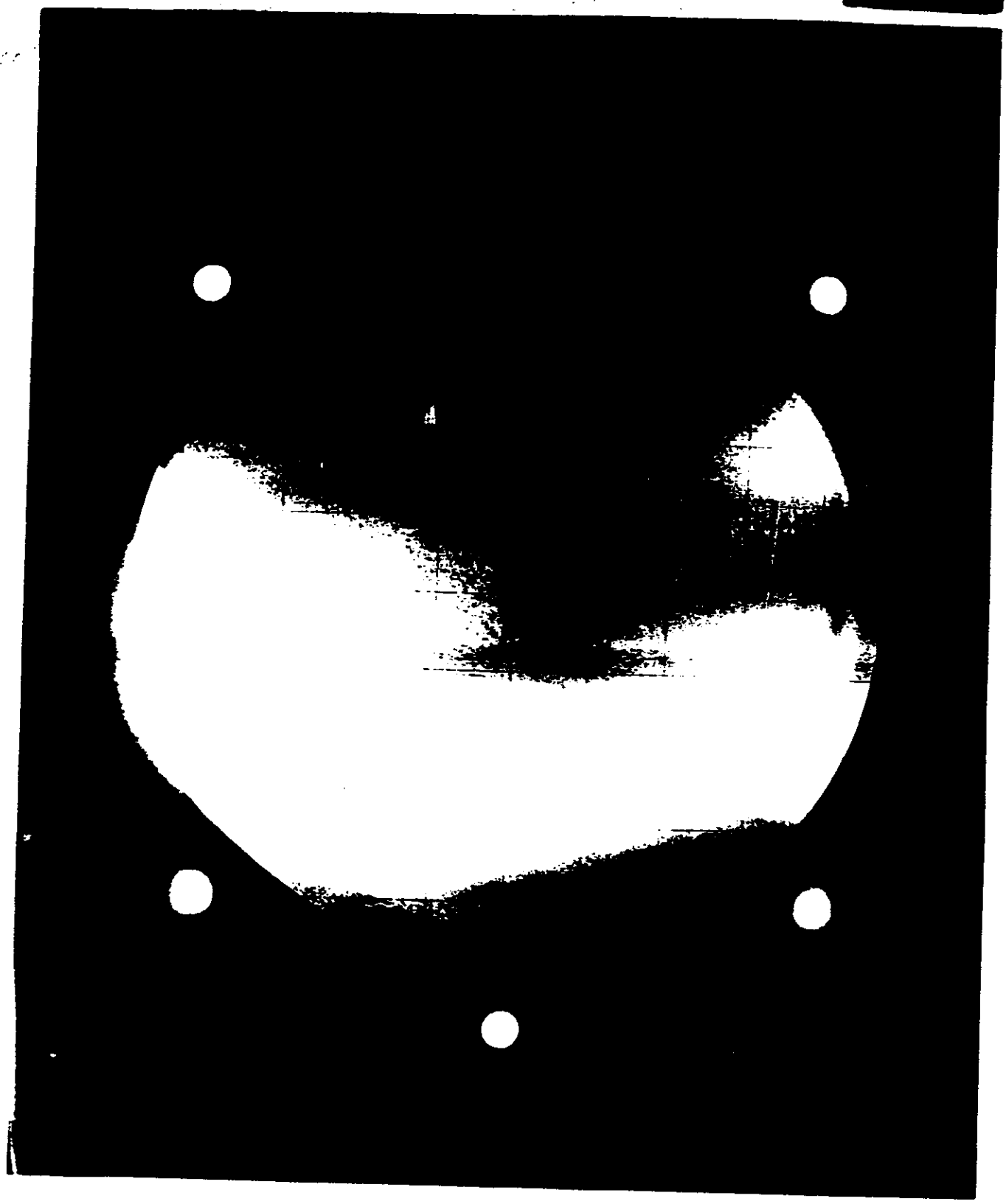


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FIGURE 9. STELLAR FRAME NO 95 (MISSION 1009-2).

NPIC J-9961 (3/68)

This photograph is included to show the pattern of the flared area in the stellar format of Camera No 34 of Mission 1009-2.

[redacted]

[redacted]

Stellar Frame Number	95 (1009-2)
Correlates with FWD Camera:	
Pass	54D
Frame	185
Date of Photography	9 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	00°04.9'
Roll	00°03.8'
Yaw	00°56.1'
Exposure Time	2 seconds

[redacted]

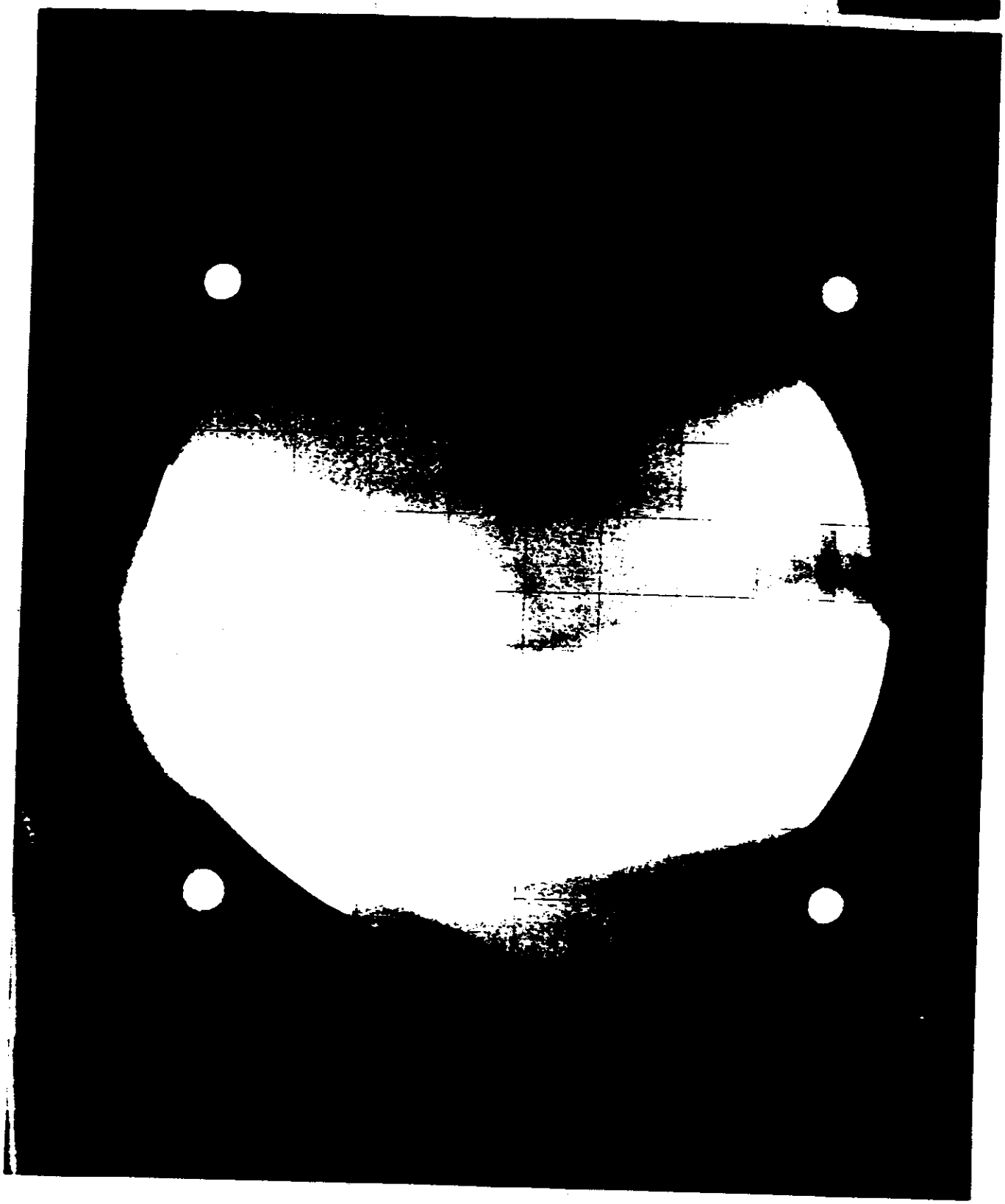

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FIGURE 10. STELLAR FRAME NO 392 (MISSION 1009-2).

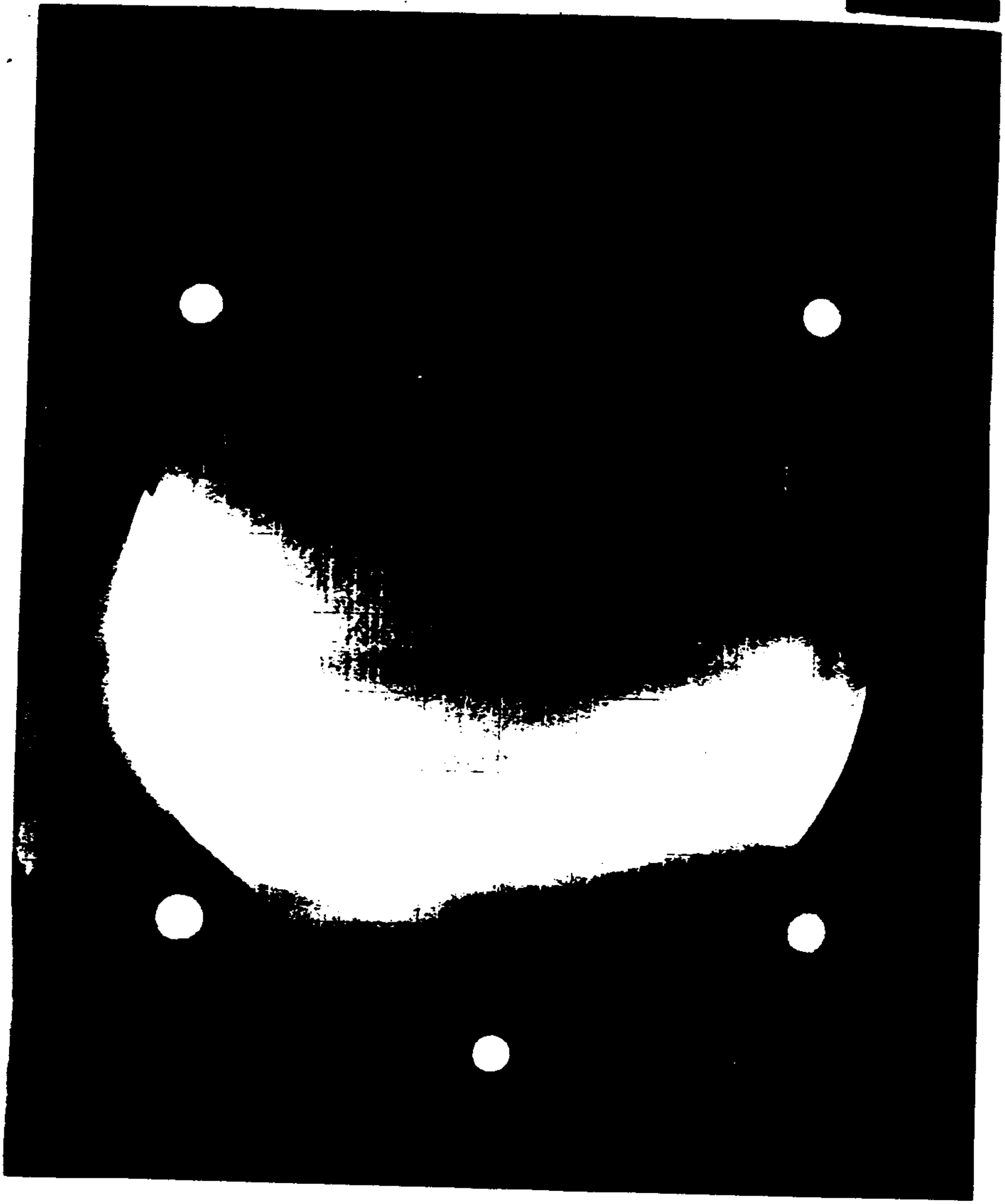
NPIC J-8862 (3/68)

This photograph shows the most severe emulsion cracking observed in the stellar photography from Camera No 3⁴ of Mission 1009-2.

[redacted]

Stellar Frame Number	392 (1009-2)
Correlates with FWD Camera:	
Pass	112D
Frame	6
Date of Photography	13 August 1964
Enlargement Factor	5X
Vehicle:	
Pitch	-00°09.7'
Roll	00°13.7'
Yaw	00°43.4'
Exposure Time	2 seconds

[redacted]



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7. Index Camera No 54 (Mission 1009-1)

The first frame is double exposed. The results of a light leak are noted in the format adjacent to the camera number in frame 96. No other degradations are noted in the index material of this mission.

8. Index Camera No 38 (Mission 1009-2)

A light leak of undetermined origin degrades each frame to a minor degree. The light leak causes a plus density streak to project 0.3 inch into the format 0.35 inch on the supply side of the camera number block. The density of the streak is commensurate with the duration between operations and is most severe in the following frames: 5, 28, 65, 113, 148, 150, 175, 177, 198, 208, 230, 232, 247, 269, 282, 288, 296, 315, 317, 328, 334, 347, 365, 372, 379, 385, 387, 391, 405, 426 and 434. This light leak is not associated with the camera, but rather occurs in the transport path because the plus density occurs even on frames that were exposed on the dark side of the orbit.

9. Associated Equipment

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

With the exception of the binary word the equipment associated with the master and slave panoramic cameras functioned properly throughout the missions. The horizon camera fiducials are clearly defined. The 200 cycles per second timing pips are legible and recorded properly outside the format. The camera number, index marks and binary word are of optimum density. The binary word that is recorded on the negatives and the serial output recorded in the clock interrogations exhibit an error after pass 8D frame 157. Bit 15 of the binary word remained lighted for extended intervals, producing erroneous time data throughout the balance of Mission 1009-1 and throughout all of Mission 1009-2. These errors are accumulative and occur in passes 8D, 40D, 99D and 100D. Two additional errors occur in the clock correlation figures; however, no photographic record is available during these occurences. The binary word errors are being hand corrected for ephemeris data. There are two camera-off markers at most camera-off positions in the material from both the master and slave panoramic cameras.

[redacted]

[redacted]

FIGURE 11. INDEX FRAME NO 279 (MISSION 1009-1).

NPIC J-6883 (3/68)

This photograph is included to show the density fall-off in the corners of the format of the index photography from Mission 1009-1.

[redacted]

[redacted]

Index Frame Number	279 (1009-1)
Correlates with FWD Camera:	
Pass	39D
Frame	63
Date of Photography	8 August 1964
Enlargement Factor	3X
Vehicle:	
Pitch	00° 12.7'
Roll	00° 28.9'
Yaw	00° 29.7'
Exposure	1/500 second

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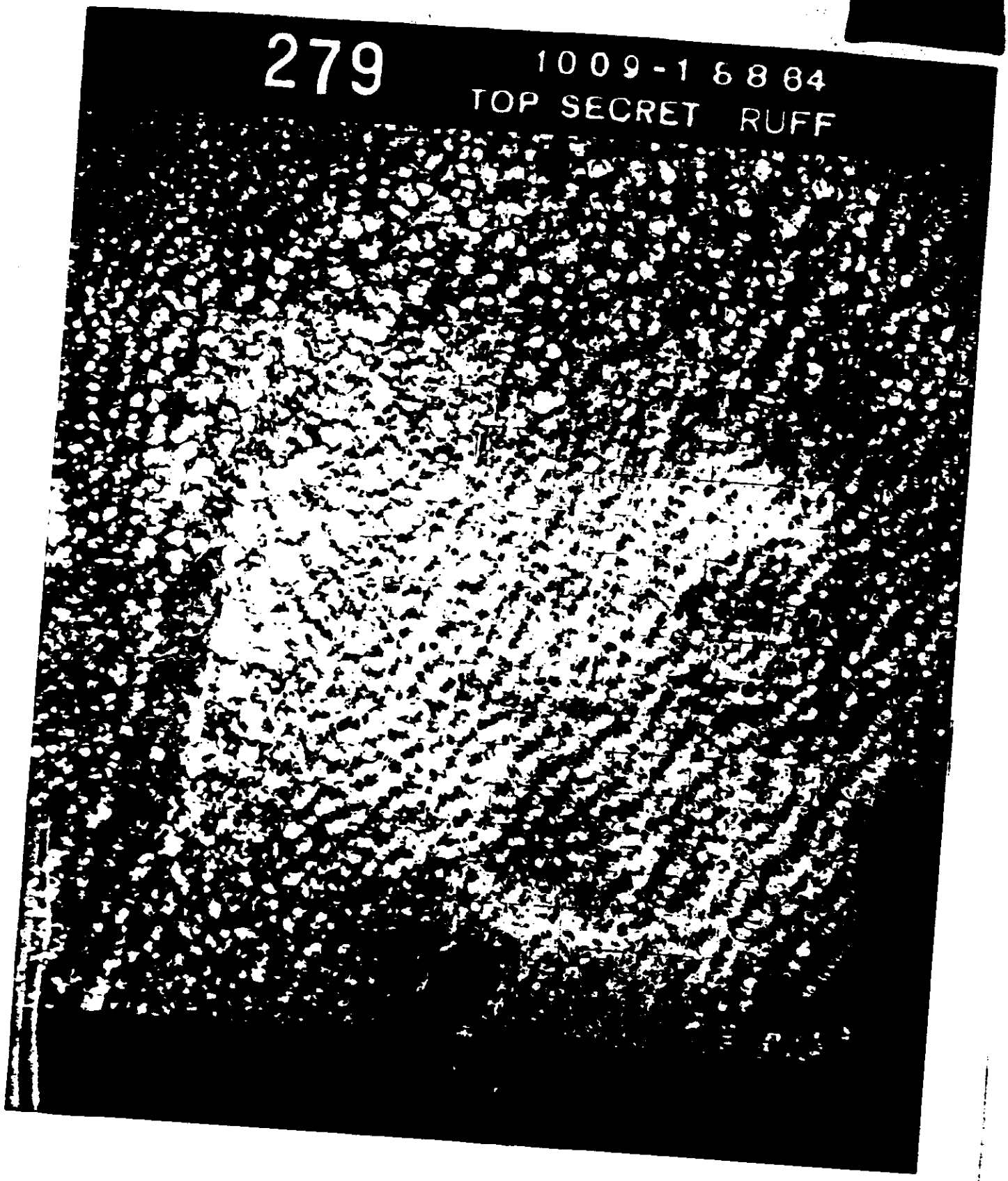

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FIGURE 12. INDEX FRAME NO 319 (MISSION 1009-1).

NPIC J-6864 (3/68)

The following photograph shows a cloud-free frame of photography from Mission 1009-1.

[redacted]

Index Frame Number	319 (1009-1)
Correlates with FWD Camera:	
Pass	46D
Frame	17
Date of Photography	8 August 1964
Enlargement Factor	3X
Vehicle:	
Pitch	01°57.3'
Roll	00°18.4'
Yaw	00°31.9'
Exposure	1/500 second

[redacted]

[redacted]

[redacted]

FIGURE 13. INDEX FRAME NO 247 (MISSION 1009-2).

NPIC J-8868 (3/68)

The following photograph is an example of the fogged area caused by a non-image forming light leak in the index camera used in Mission 1009-2.

[redacted]

[redacted]

Index Frame Number	247 (1009-2)
Correlates with FWD Camera:	
Pass	72D
Frame	78
Date of Photography	10 August 1964
Enlargement Factor	3X
Vehicle:	
Pitch	00° 15.7'
Roll	00° 19.6'
Yaw	00° 12.1'
Exposure	1/500 second

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[redacted]

[redacted]

[redacted]

PART II. FILM

1. Film Footage

The film footage and the frames processed from each of the cameras employed in Missions 1009-1 and 1009-2 are as follows:

CAMERA	FOOTAGE	FRAMES
Master Panoramic Camera No 154, Mission 1009-1	6,628	2,377
Mission 1009-2	8,293	3,125
Slave Panoramic Camera No 155, Mission 1009-1	6,558	2,360
Mission 1009-2	8,248	3,120
Stellar Camera No 56 Mission 1009-1	47	338
Stellar Camera No 34 Mission 1009-2	42	412
Index Camera No 54 Mission 1009-1	90	338
Index Camera No 38 Mission 1009-2	90	436

2. Film Processing

This section provides an evaluation of exposure, processing, and densities of the original negatives from the 10 cameras used in Missions 1009-1 and 1009-2.

a. The exposure was good throughout the mission.

b. Infra-red detection densitometry was employed to determine the optimum levels of development for the various portions of the missions. Sixty-six changes in the level of development were required for optimum development of the material from the Master Camera and 77 changes were required for the slave material. The percentages processed at the various levels are as follows:

[redacted]

Level of Development	Mission 1009-1 Master	Mission 1009-1 Slave	Mission 1009-2 Master	Mission 1009-2 Slave
Primary	1%	0%	3%	4%
Intermediate	26%	40%	21%	47%
Full	73%	60%	76%	49%

c. The density of the negatives is considered good and compares favorably with negatives from previous missions. The photography on this mission was taken in the mid-afternoon between 1415 and 1530 sun time. The combination of elevation and azimuth caused a variance in the negative densities and contrast across the format of most frames. The principal ray of the forward camera was facing the sun on the starboard side and facing across the rays of the sun of the port side. The principal ray of the aft camera was facing across the rays of the sun on the starboard side and facing with the sun on the port side. This variance in density and contrast necessitated "special" printing on 33 parts of the mission in the reproduction of the duplicate positives.

3. Physical Film Degradations

There are no major film degradations on the material from the panoramic cameras used in missions 1009-1 and 1009-2. Static electrical discharges of undetermined origin caused minor dendritic-type fogging along the non-timing-track edge of the negatives from the master camera throughout Mission 1009-1. The fog is contained within the borders and does not affect the format. Starting with pass 52D, evidence of static electrical discharges is also present along the timing-track edge and becomes progressively more intense throughout Mission 1009-2. The negatives from the slave camera contain the results of static electrical discharges along the timing-track edge in passes 25AE, 25D, 30D, 46D, 99D and 112D. The negatives from the master camera contain manufacturing splices in passes 37D, frame 71; 54D, frame 197; and 85D, frame 197; and 85D, frame 185. The slave material contains manufacturing splices in passes 21D, frame 21; 46D, frame 29; and 69D, frame 39. Emulsion digs, scratches, pinholes and handling marks are considered normal.

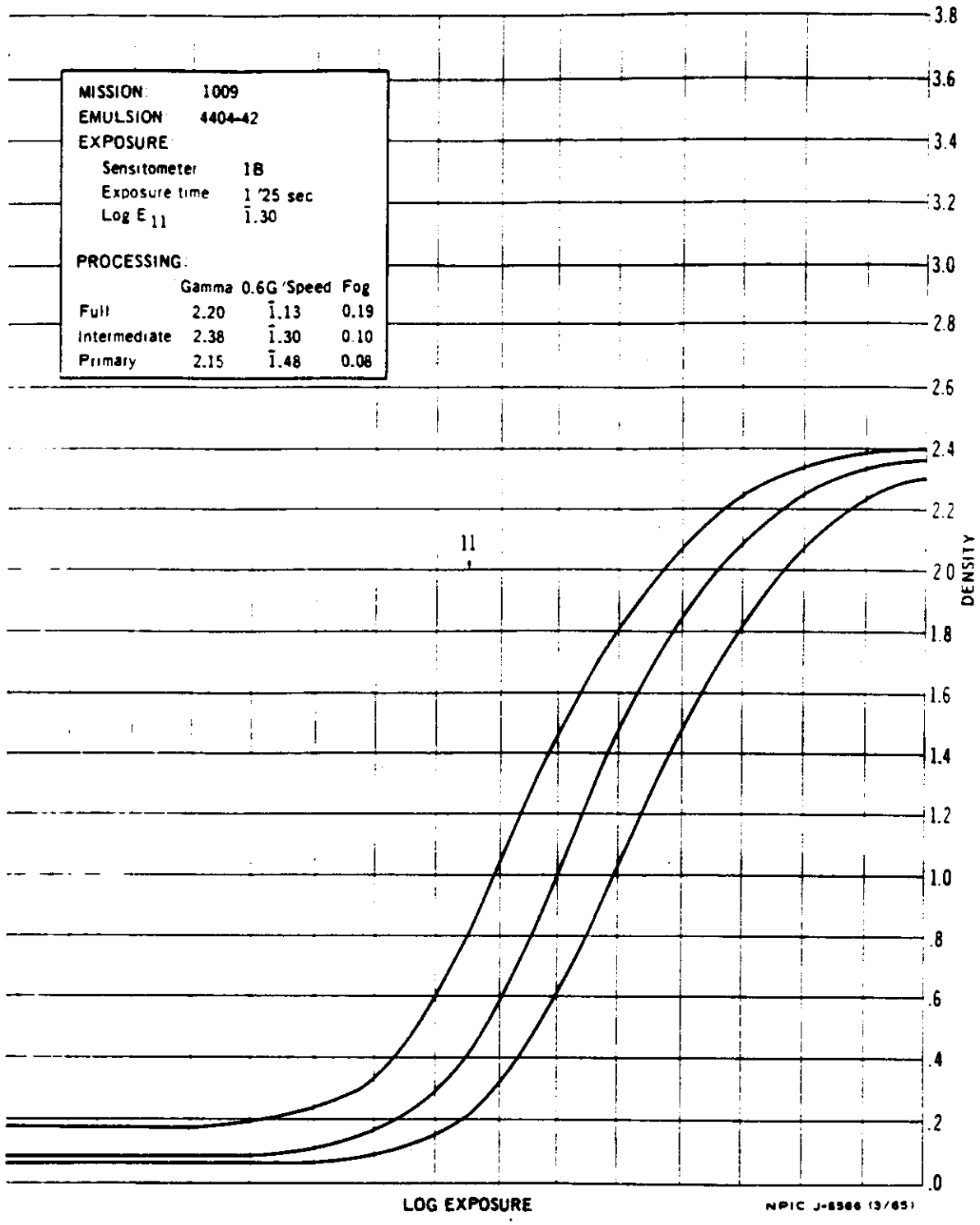
4. Film Processing Curves

The following processing curves are a product of the processing contractor:

[redacted]

[redacted]

STANDARD SENSITOMETRIC CONTROL CURVES



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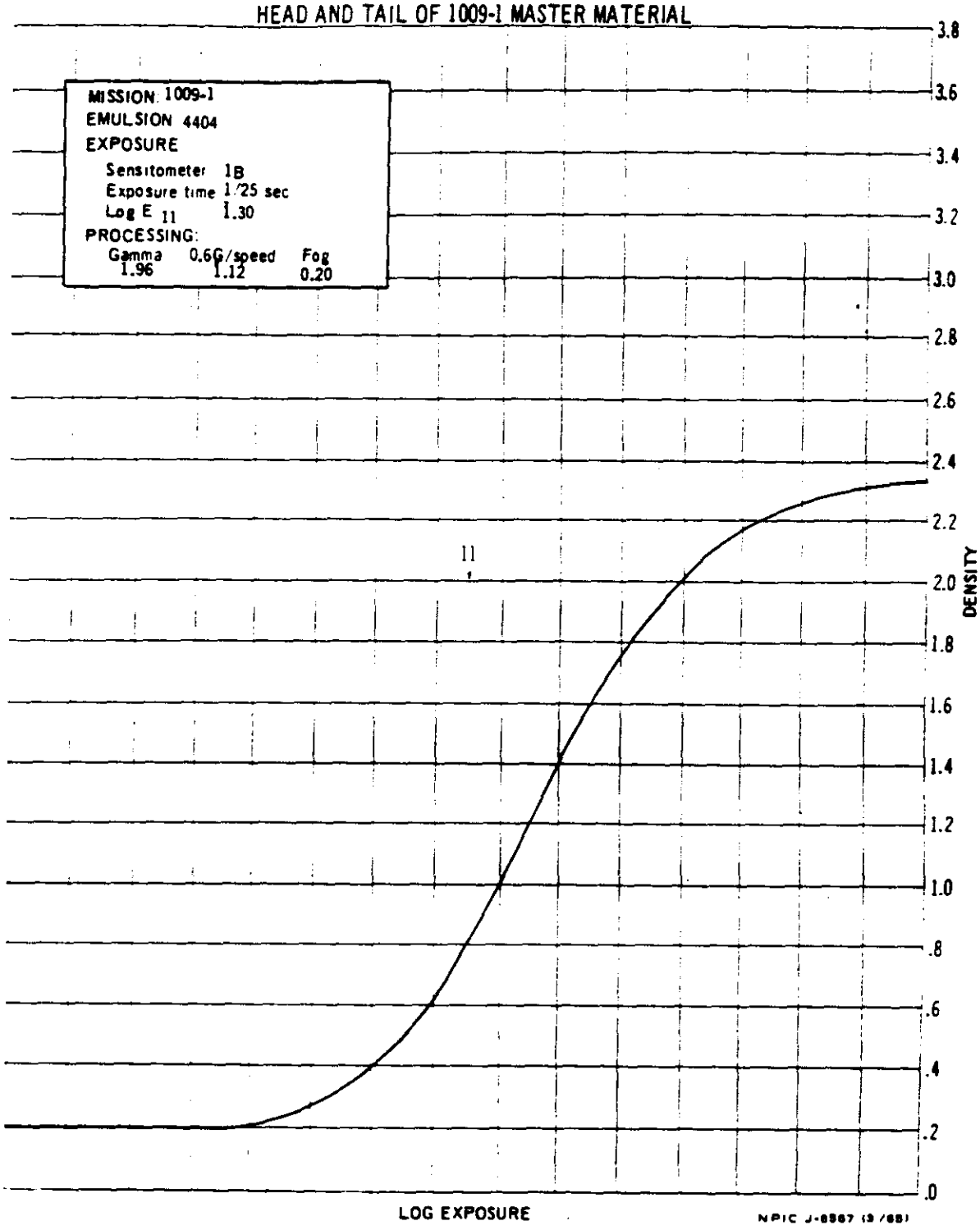
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-1 MASTER MATERIAL



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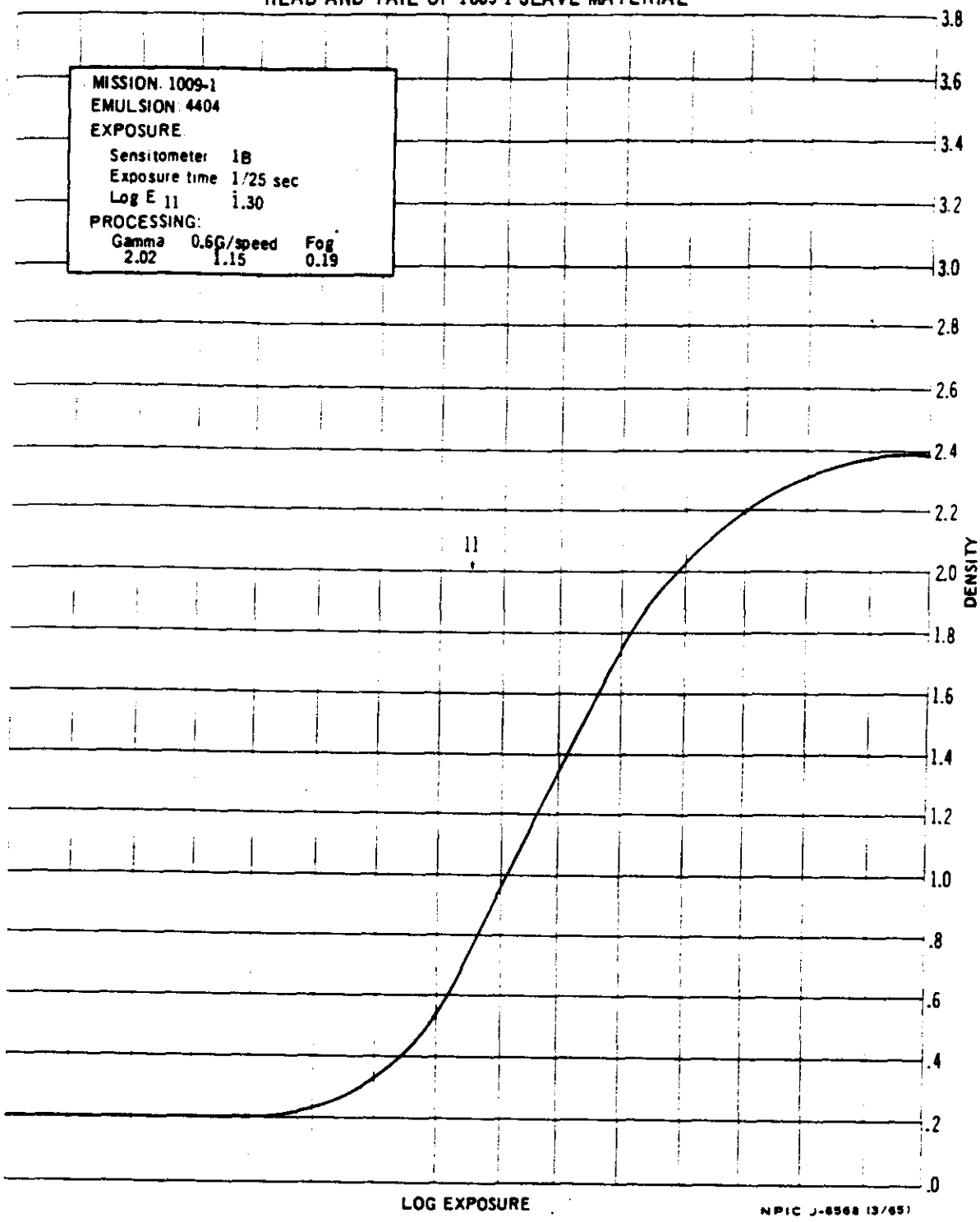
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-1 SLAVE MATERIAL



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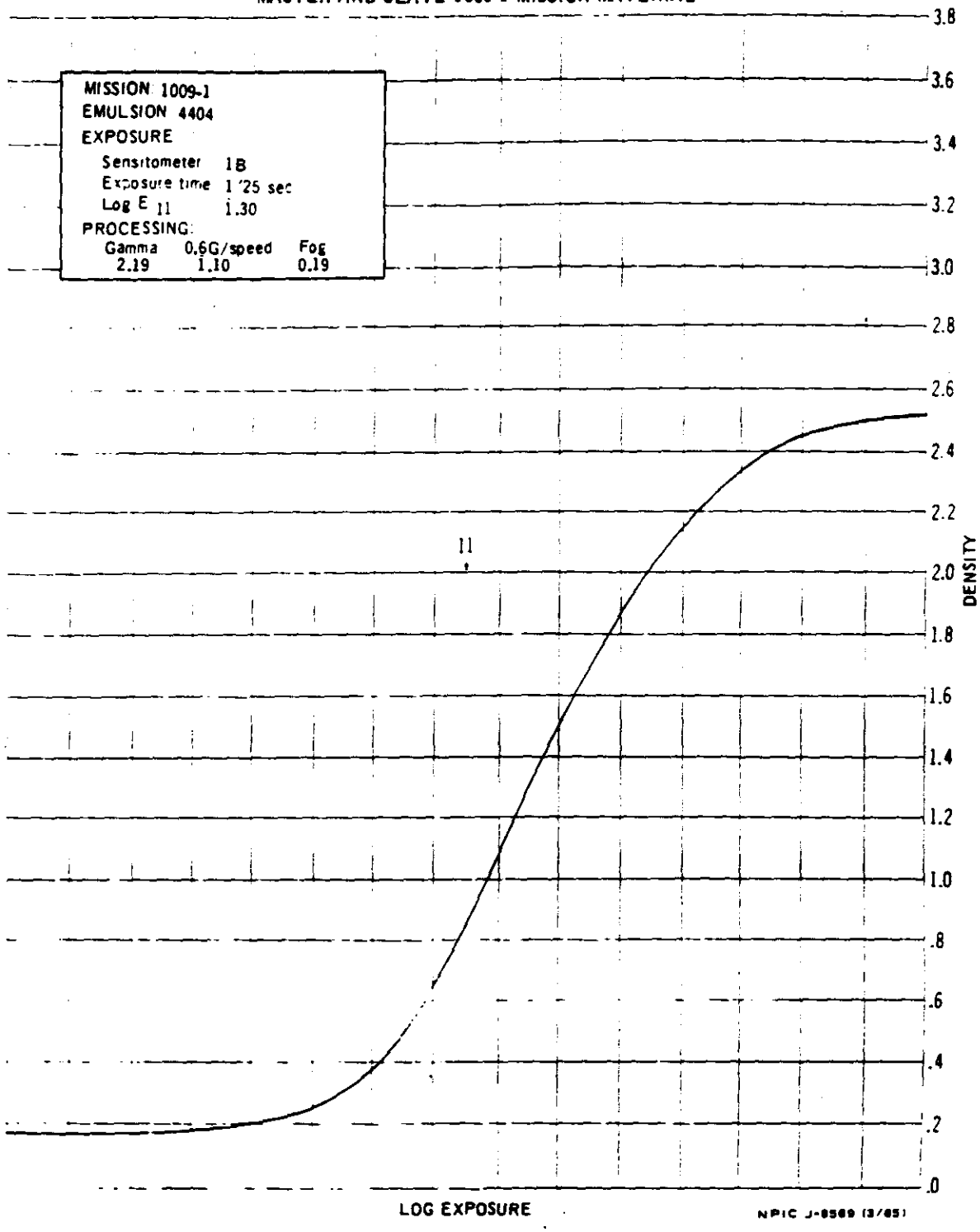
SENSITOMETRIC CURVE FROM MASTER AND SLAVE 1009-1 MISSION MATERIAL



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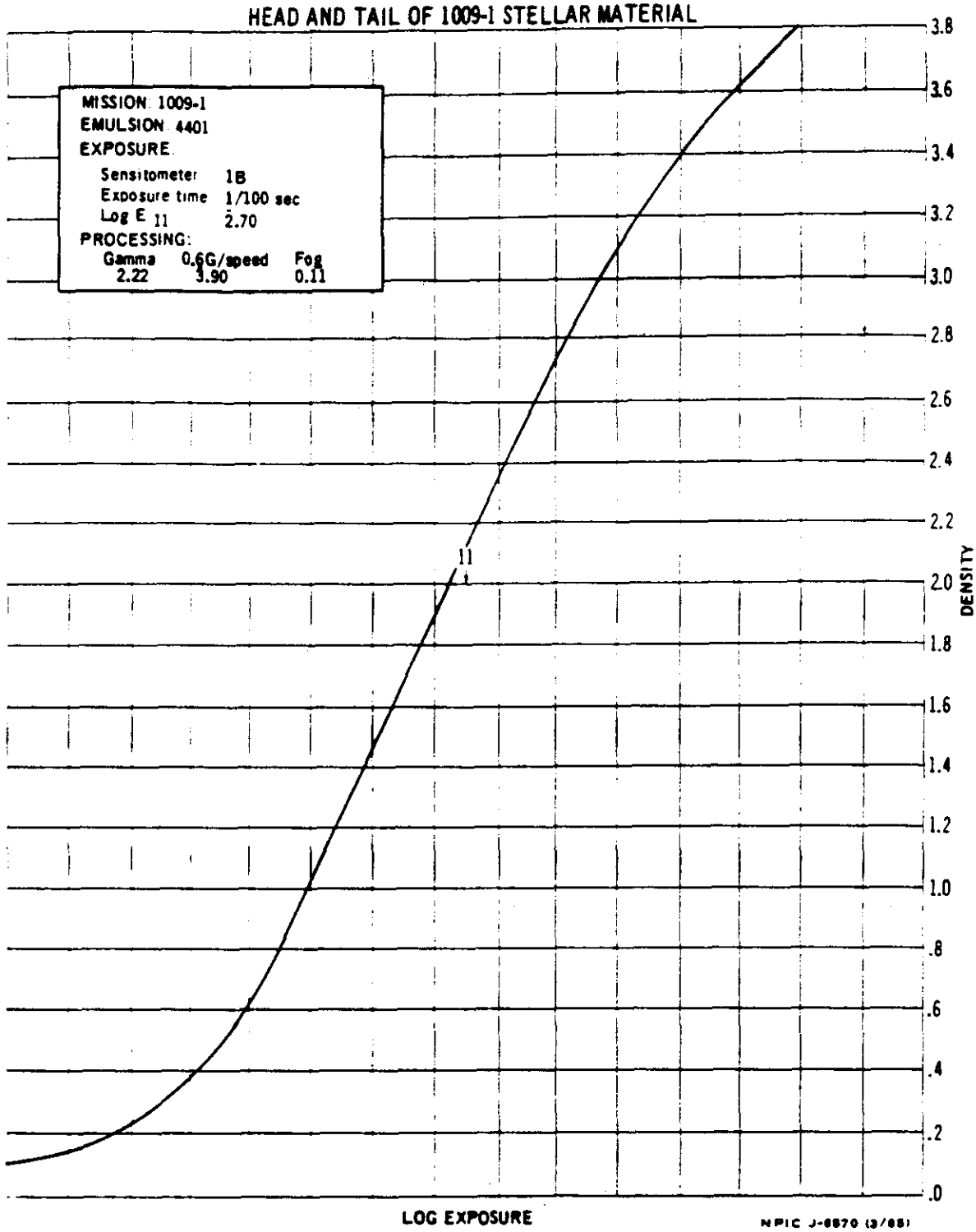
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-1 STELLAR MATERIAL



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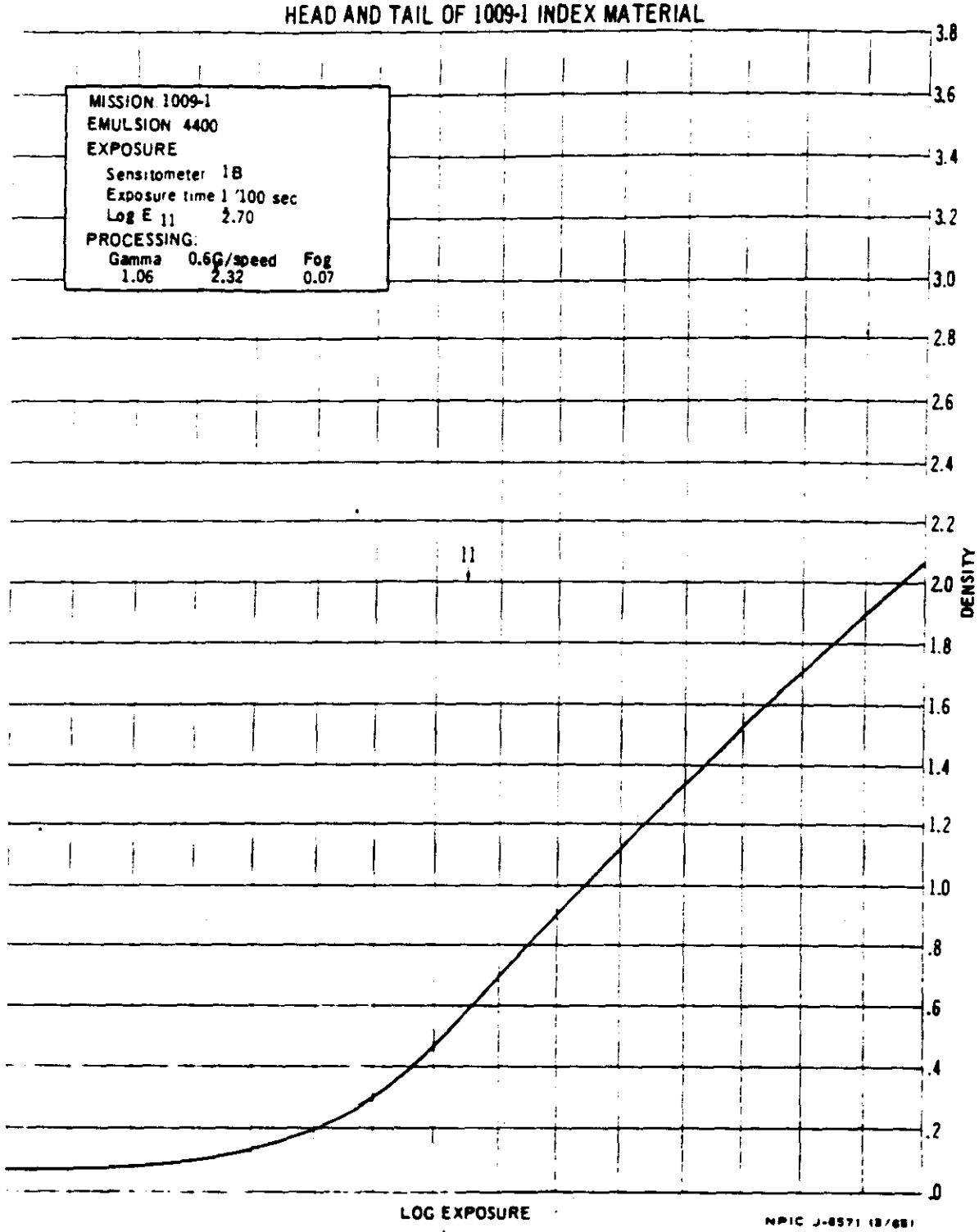
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-1 INDEX MATERIAL



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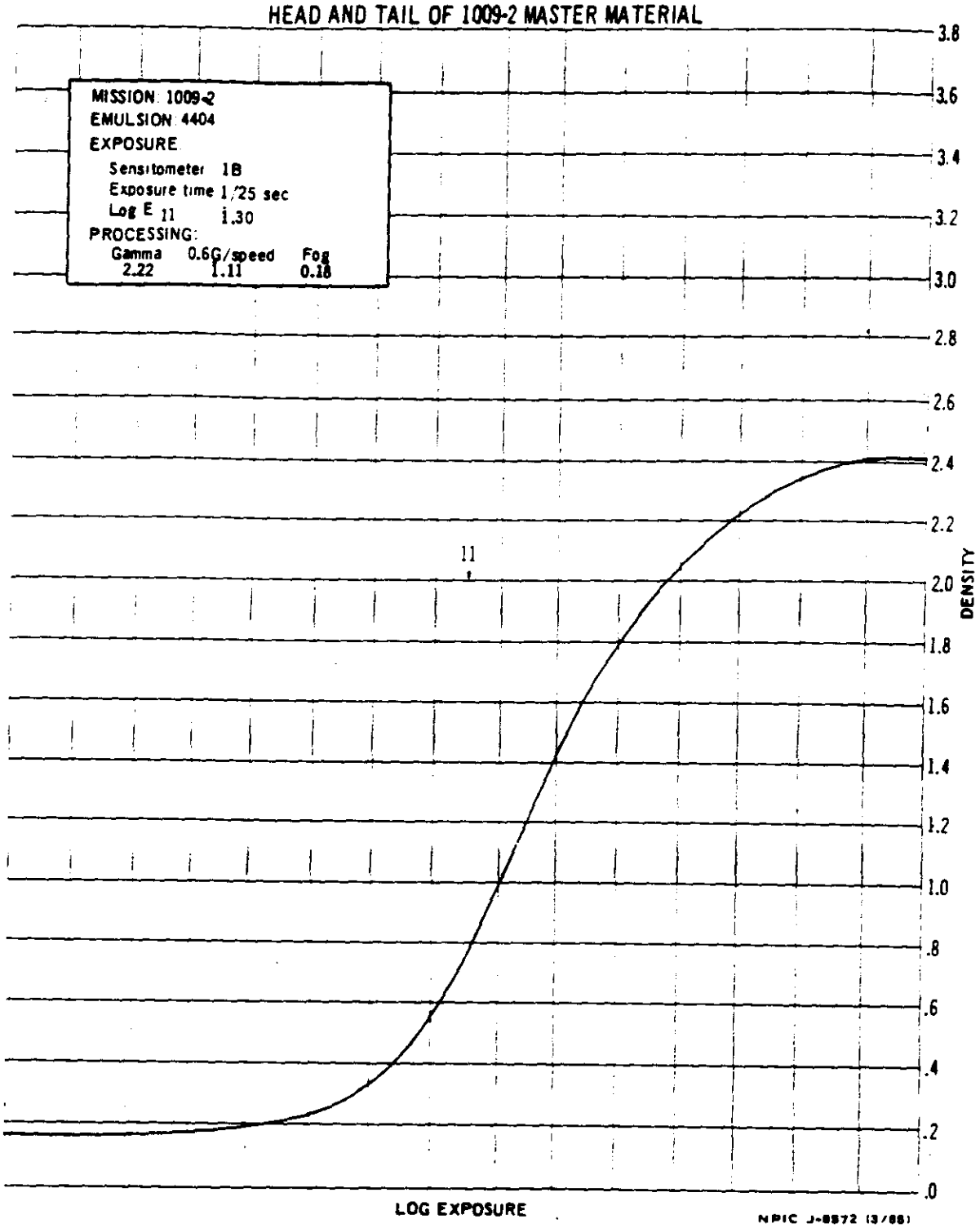
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-2 MASTER MATERIAL



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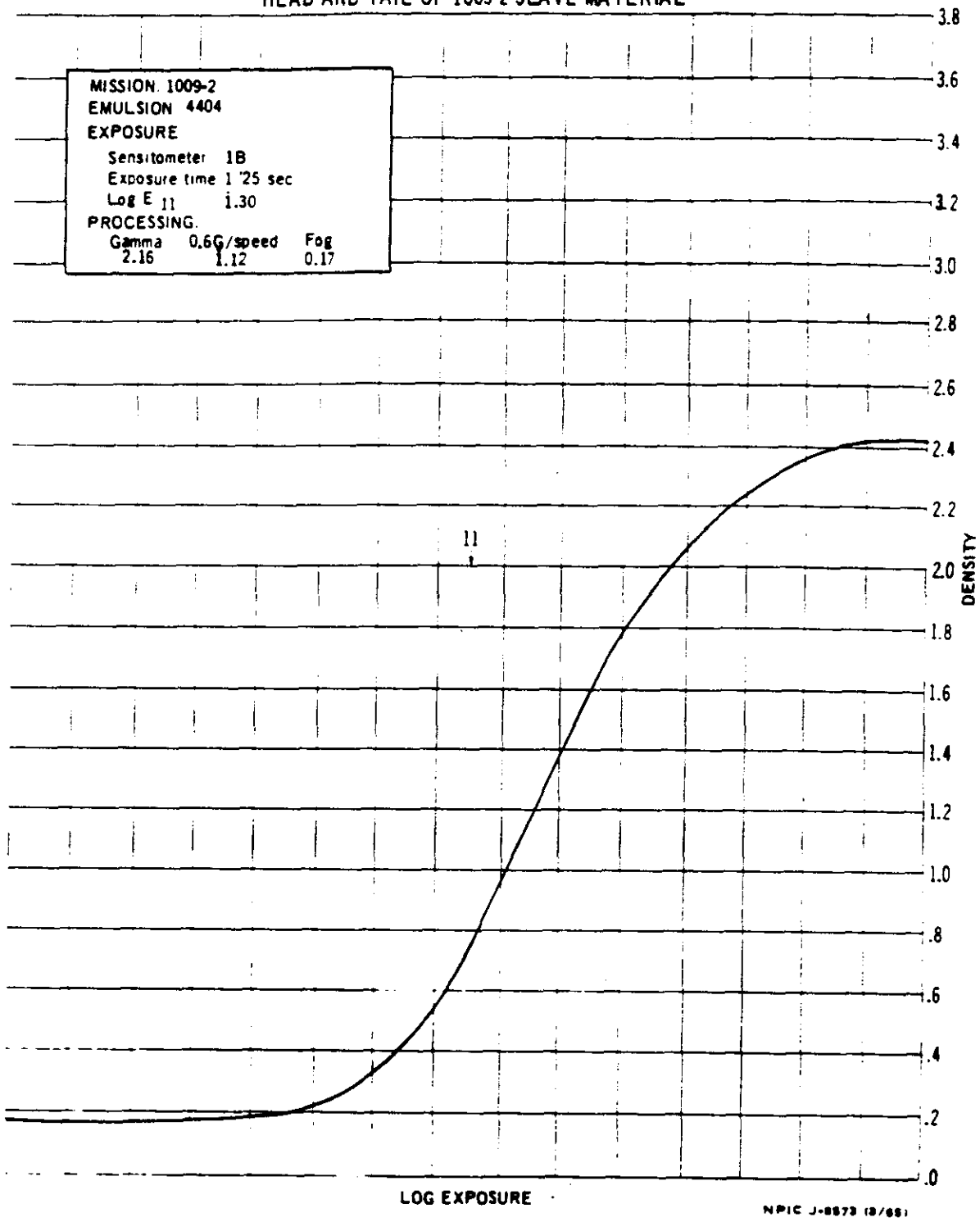
SENSITOMETRIC CURVE FROM
HEAD AND TAIL OF 1009-2 SLAVE MATERIAL



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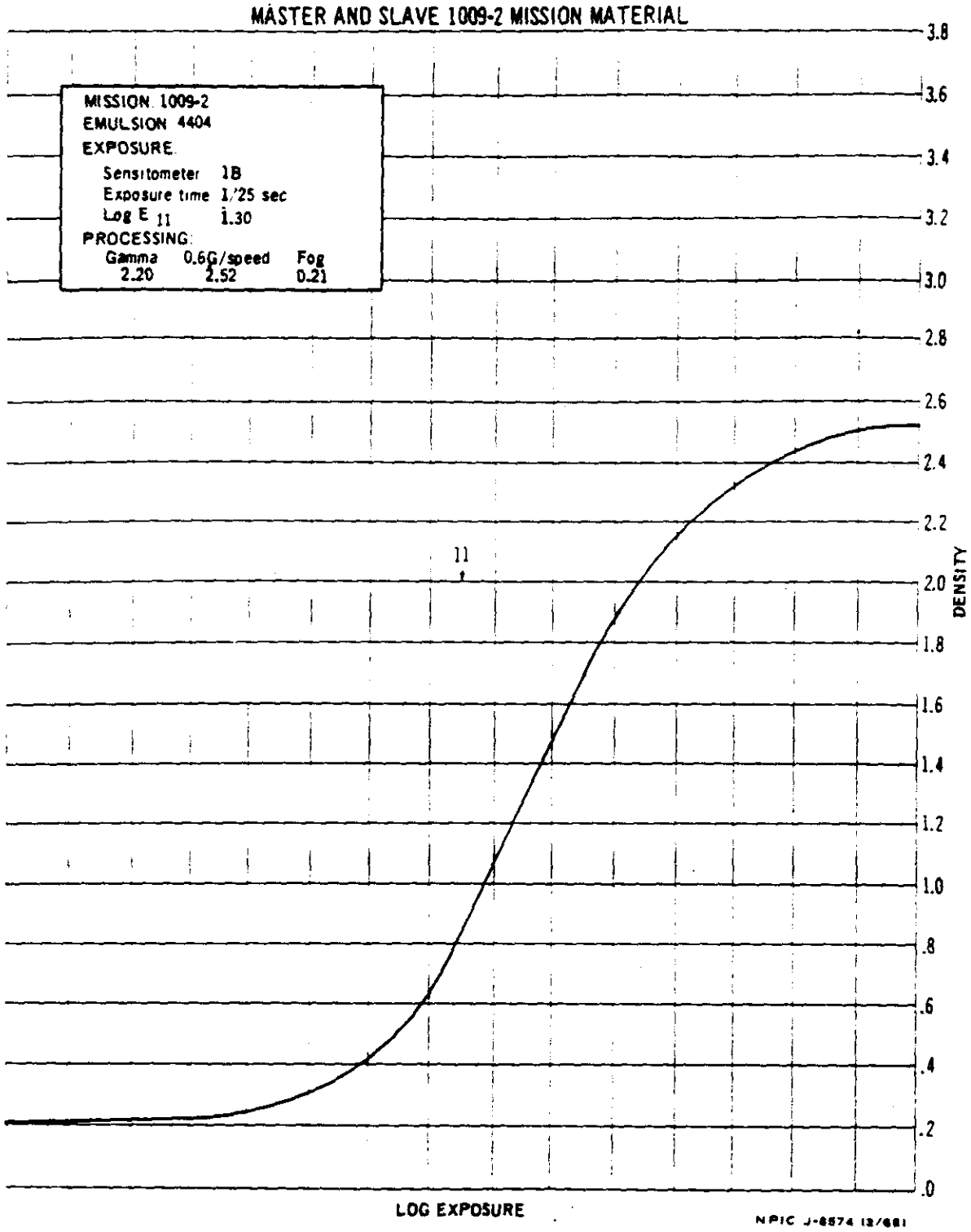
SENSITOMETRIC CURVE FROM MASTER AND SLAVE 1009-2 MISSION MATERIAL



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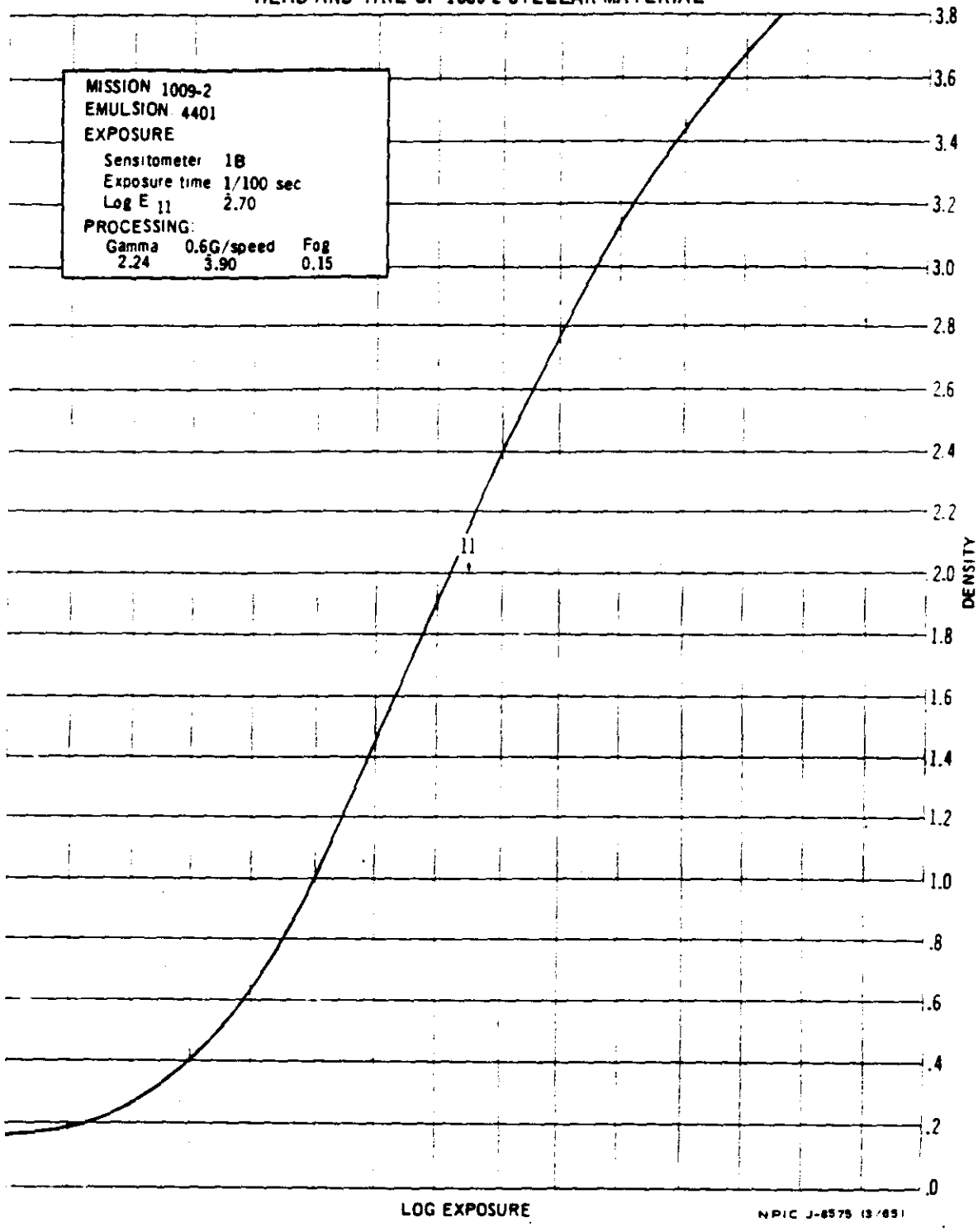
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-2 STELLAR MATERIAL



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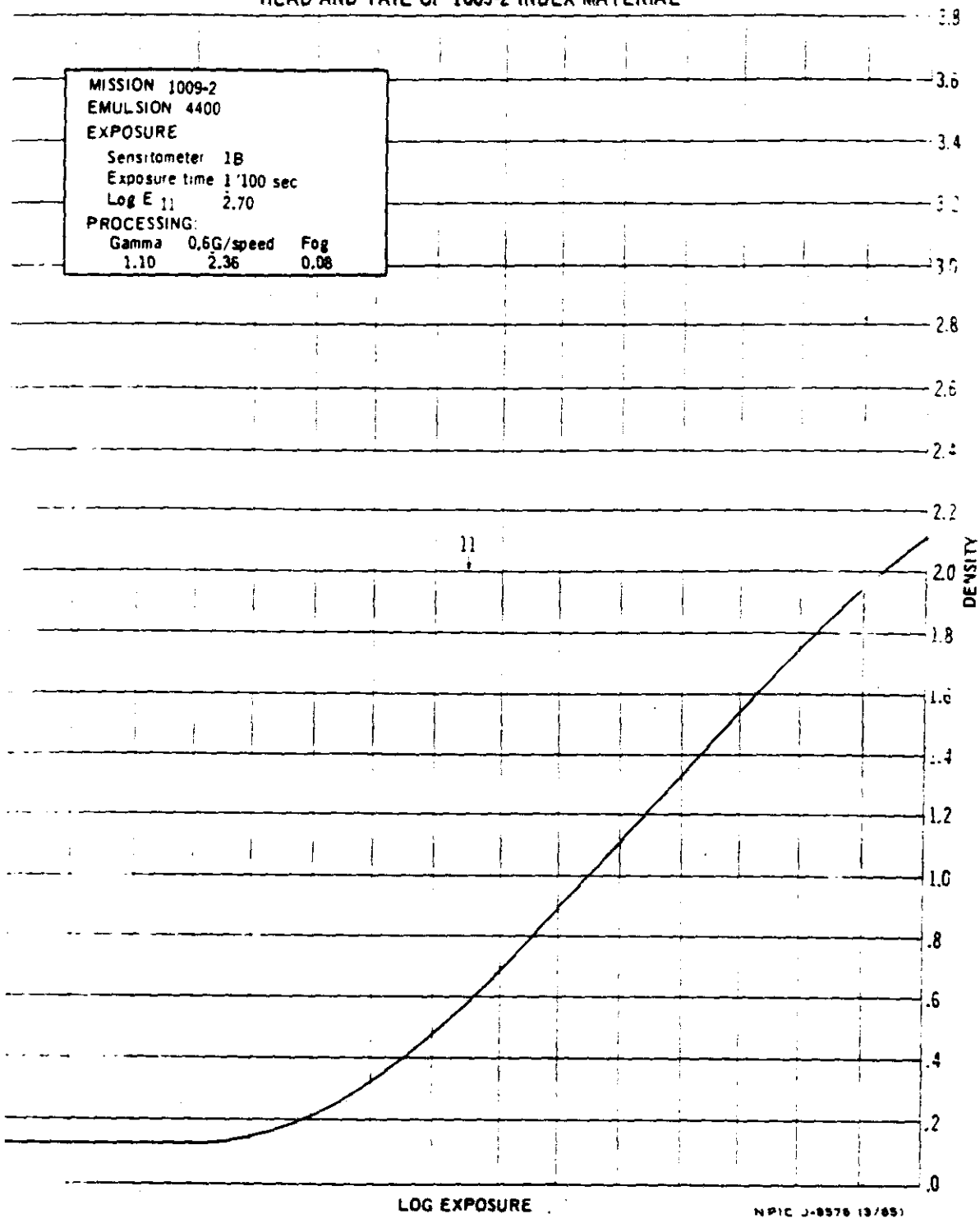
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1009-2 INDEX MATERIAL



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PART III. IMAGE QUALITY

1. Photographic Interpretation (PI) Suitability

The 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 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 and/or highlight areas. Detection and identification of small objects are possible, but accuracy of mensuration is reduced by the fall-off in image quality and the less-than-optimum contrast that prevails.

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

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

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2. PI Suitability for Missions 1009-1 and 1009-2

The PI suitability is good for both parts of the mission. Photographic interpreters reported on 88 targets in the preliminary readout of Mission 1009-1. No poor-quality ratings were assigned. Three of the 92 targets reported on in the preliminary readout of Mission 1009-2 were assigned a poor-quality rating.

It should be noted that the preliminary report represents the initial scan results only, accomplished in a short time. More detailed study of the photography may develop additional information or may necessitate alteration of portions of the preliminary report.

The time of the launch and the inclination angle of the orbit were selected to produce optimum photographic coverage of targets of interest. Since the majority of the targets of interest are between 40 and 60 North latitude, the combination of launch time and inclination angle located the sun on the Western (starboard) side and slightly forward of the beam of the vehicle at this time of day at these latitudes. Generally this caused a variance in illumination across the format of most frames. The forward-looking camera starts taking the photograph of the terrain on the starboard side with the principal ray facing the light source. When it completes the scan the rays of the sun are at right angles to the principal ray. The aft-looking camera starts taking the picture of the terrain on the port side with the principal ray facing away from and approximately parallel with the rays of the sun. When it completes the scan the rays of the sun are at right angles to the principal ray. This causes targets that are to be viewed in stereo to have radically different lighting, which may be beneficial for viewing some targets and detrimental for others. "Special" printing of 33 parts of the mission minimized the difference in contrast and density in the reproduction of the duplicate positives and no major complaints were voiced by the interpreters.

HIGHLIGHTS OF THE MISSION

(a) Eighty-eight targets were observed in the material from Mission 1009-1 and 92 targets in the material from Mission 1009-2.

(b) A newly identified launch facility was observed.

(c) A launch site was confirmed.

(d) Fifteen submarines were observed and identified. Another was observed but could not be identified.

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(e) A gaseous diffusion power plant was observed emitting smoke for the first time.

(f) A nuclear research institute was observed and identified for the first time.

(g) A newly identified probable electronic tracking site was observed.

(h) A higher than usual level of activity was noted at one of the major missile test centers. Two new launch sites were identified in the same area.

(i) A nuclear storage facility was located.

(j) A new large combatant hull was observed under construction on building ways.

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FIGURE 14. PHOTOGRAPH SHOWING PI SUITABILITY.
NPIC J-8577 (3/65)

FIGURE 15. PHOTOGRAPH SHOWING PI SUITABILITY.
NPIC J-8578 (3/65)

These two photographs show the affects of solar azimuth on PI suitability. In Figure 14 the rays of the sun are at right angles to the principal ray of the photograph. This side lighting increases the apparent contrast in the scene. This additional contrast can be beneficial with certain type targets and detrimental with others.

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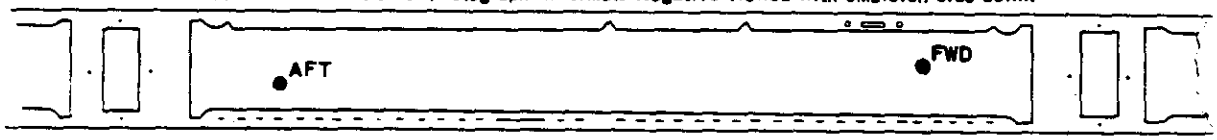
	Figure 14	Figure 15
Pass	40D	40D
Frame	62 Fwd	67 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	74.3-12.2	17.1-11.2
Enlargement Factor	20X	20X
Geographic Coordinates	44-30N 043-10E	44-30N 043-10E
Altitude (feet)	601,813	601,813
Vehicle:		
Pitch	15° 29'	-14° 36'
Roll	00° 04'	00° 29'
Yaw	-00° 28'	-00° 22'
Local Sun Time	1445	1445
Solar Elevation	42.5°	42.5°
Solar Azimuth	248°	248°

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



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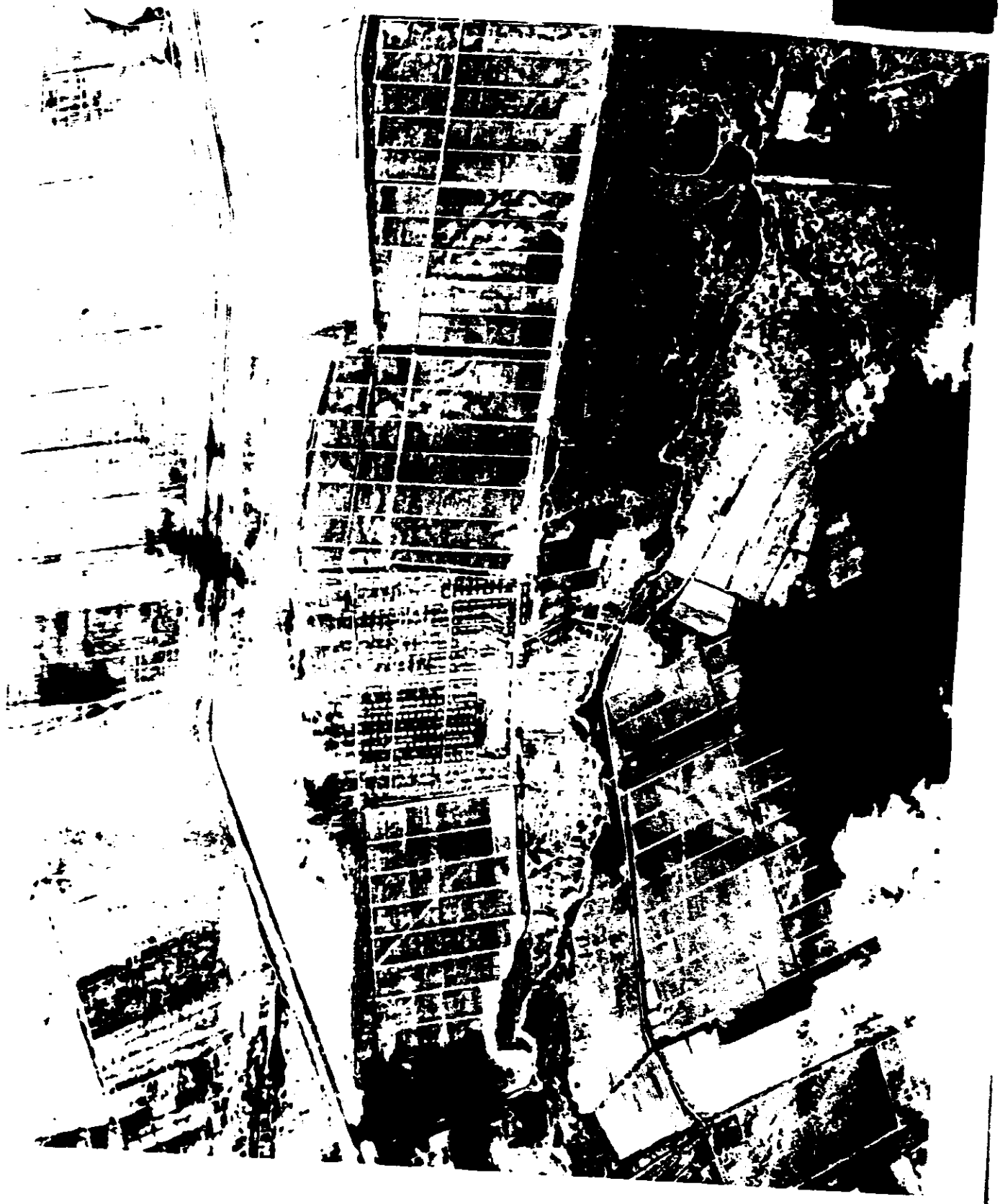

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FIGURE 16. PHOTOGRAPH SHOWING PI SUITABILITY.

NPIC J-8579 (3/65)

FIGURE 17. PHOTOGRAPH SHOWING PI SUITABILITY.

NPIC J-8580 (3/65)

These two photographs show the affects of solar azimuth on PI suitability. These photographs are sections from the same frame as the two preceding photographs (figures 14 and 15) and are included to show a comparison between similar type targets on the port (east) and starboard (west) sides of the vehicle.

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	Figure 16	Figure 17
Pass	40D	40D
Frame	62 Fwd	67 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	19.7-10.5	71.8-12.4
Enlargement Factor	20X	20X
Geographic Coordinates	44-30N 043-10E	44-30N 043-10E
Altitude (feet)	601,813	601,813
Vehicle:		
Pitch	15° 29'	-14° 36'
Roll	00° 04'	00° 29'
Yaw	-00° 28'	-00° 22'
Local Sun Time	1445	1445
Solar Elevation	42.5°	42.5°
Solar Azimuth	248°	248°

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

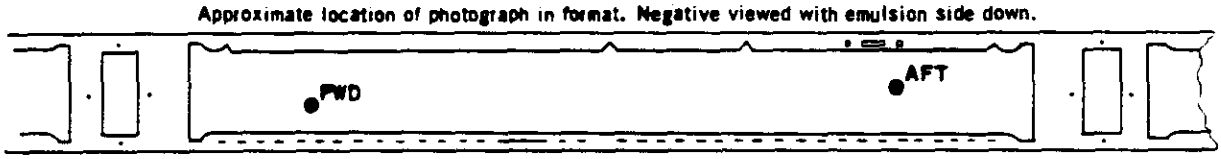

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FIGURE 18. PHOTOGRAPH SHOWING AVERAGE QUALITY OF NEAR VERTICAL COVERAGE, MASTER (FWD) CAMERA.

NPIC J-8581 (3/65)

FIGURE 19. PHOTOGRAPH SHOWING AVERAGE QUALITY OF NEAR VERTICAL COVERAGE, SLAVE (AFT) CAMERA.

NPIC J-8582 (3/65)

These two photographs depict the average quality of the photography in Mission 1009 when the targets are near the center of the format. The solar bearing is nearly identical in both photographs because of the time of day the photographs were taken. The sun is on the starboard beam of the vehicle and produces the same effect as long as the targets are near the center of format.

The photographs are printed in proper perspective relative to the principal ray during acquisition.

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	Figure 18	Figure 19
Pass	37D	37D
Frame	126 Fwd	131 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	45.7-13.2	44.5-09.5
Enlargement Factor	20X	20X
Geographic Coordinates	35-05N 114-30E	35-05N
Altitude (feet)	605,712	605,712
Vehicle:		
Pitch	15°21'	-14°50'
Roll	00°11'	00°21'
Yaw	00°24'	00°16'
Local Sun Time	1449	1449
Solar Elevation	44°	44°
Solar Azimuth	257°	257°

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

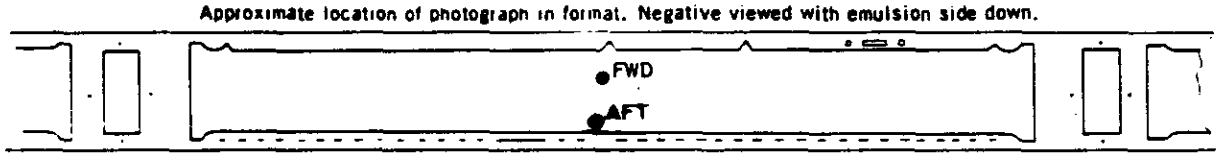

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FIGURE 20. PHOTOGRAPH SHOWING AVERAGE QUALITY OF LEFT OBLIQUE COVERAGE, MASTER (FWD) CAMERA.

NPIC J-8583 (3/65)

FIGURE 21. PHOTOGRAPH SHOWING AVERAGE QUALITY OF LEFT OBLIQUE COVERAGE, SLAVE (AFT) CAMERA.

NPIC J-8584 (3/65)

These two photographs depict the average quality of the photography in Mission 1009 when looking east (port) with the sun at a declination of 16.5°N in mid-afternoon. The difference in quality between the FWD and AFT material is a function of the solar bearing (sub-solar point) relative to the principal ray during acquisition. In Figure 20, from the FWD camera, the rays of the sun cross the principal ray at a right angle. This side-lighting causes higher contrast and a slight loss of detail in highlight (dense) areas. Figure 21 contains slightly less contrast than Figure 20. More detail can be discerned in the highlight areas of the AFT material. In this photograph the rays of the sun are more nearly parallel to the principal ray. Figures 20 and 21 both reflect the comparative contrast in the original negatives from which they were made.

The photographs are printed in proper perspective relative to the principal ray during acquisition.

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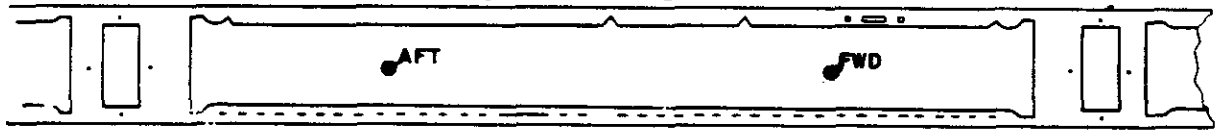
	Figure 20	Figure 21
Pass	21D	21D
Frame	25 Fwd	31 Aft
Date of Photography	7 August 1964	7 August 1964
Universal Grid Coordinates	65.4-11.5	25.0-11.0
Enlargement Factor	20X	20X
Geographic Coordinates	50-40N 115-10E	50-40N 115-10E
Altitude (feet)	618,000	618,000
Vehicle:		
Pitch	15°17'	-14°27'
Roll	-00°23'	00°05'
Yaw	01°19'	-00°09'
Local Sun Time	1438	1438
Solar Elevation	43°	43°
Solar Azimuth	238°	138°

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



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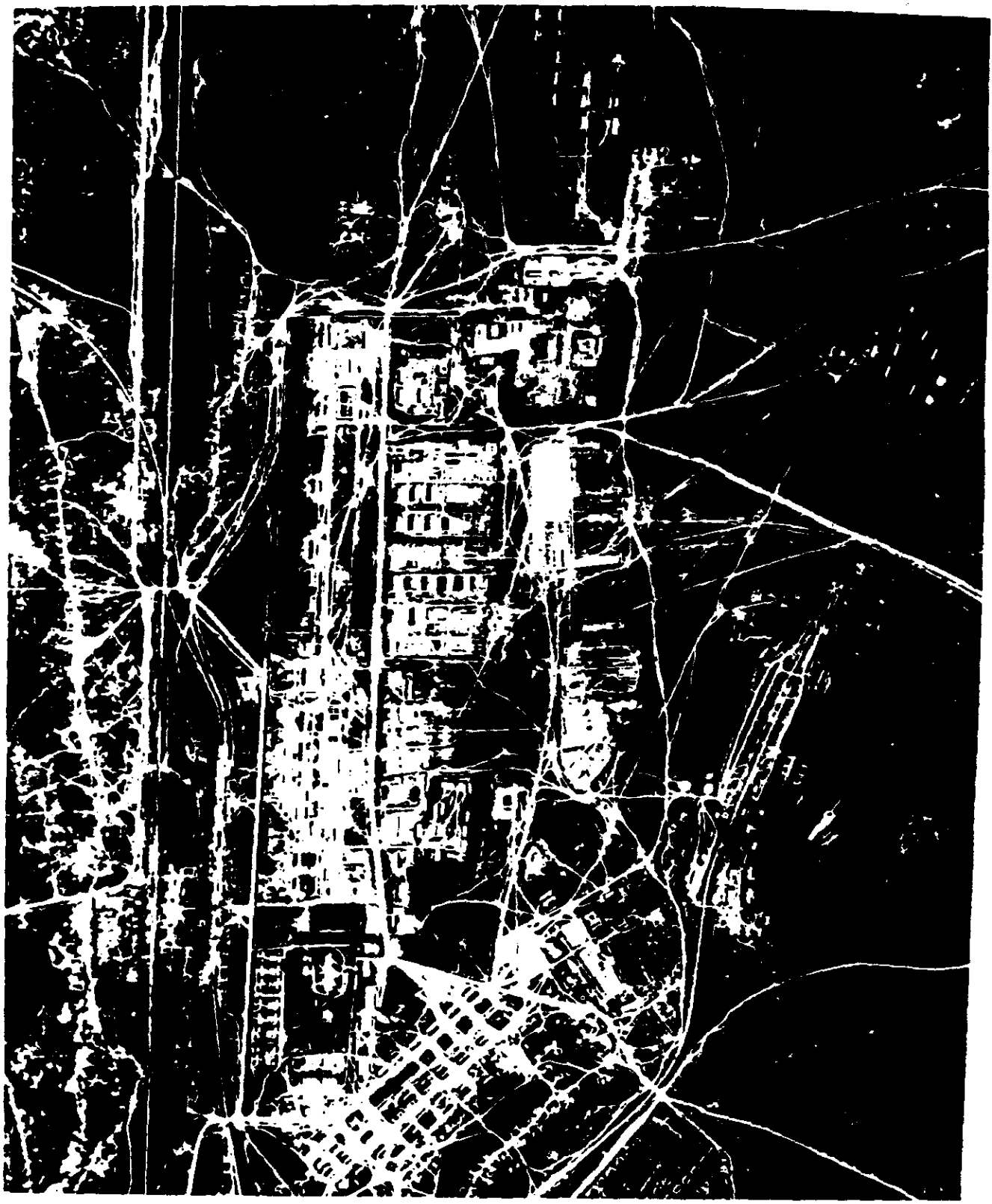

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FIGURE 22. PHOTOGRAPH SHOWING AVERAGE QUALITY OF RIGHT OBLIQUE COVERAGE, MASTER (FWD) CAMERA.

NPIC J-8565 (3/65)

FIGURE 23. PHOTOGRAPH SHOWING AVERAGE QUALITY OF RIGHT OBLIQUE COVERAGE, SLAVE (AFT) CAMERA.

NPIC J-8566 (3/65)

These two photographs depict the average quality of the photography in Mission 1009 when looking west (starboard) in mid-afternoon with the sun at a declination of 16.5°N and the target at 55°N latitude. The difference in quality between FWD and AFT material is the negligible when the photography is acquired under these conditions.

The photographs are printed in proper perspective relative to the principal ray during acquistion.

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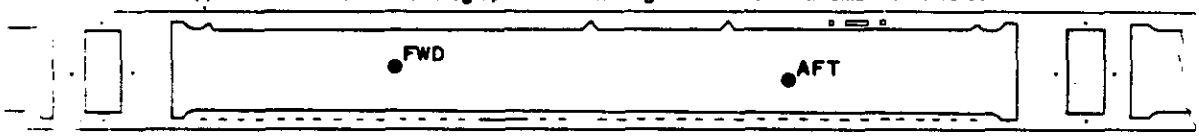
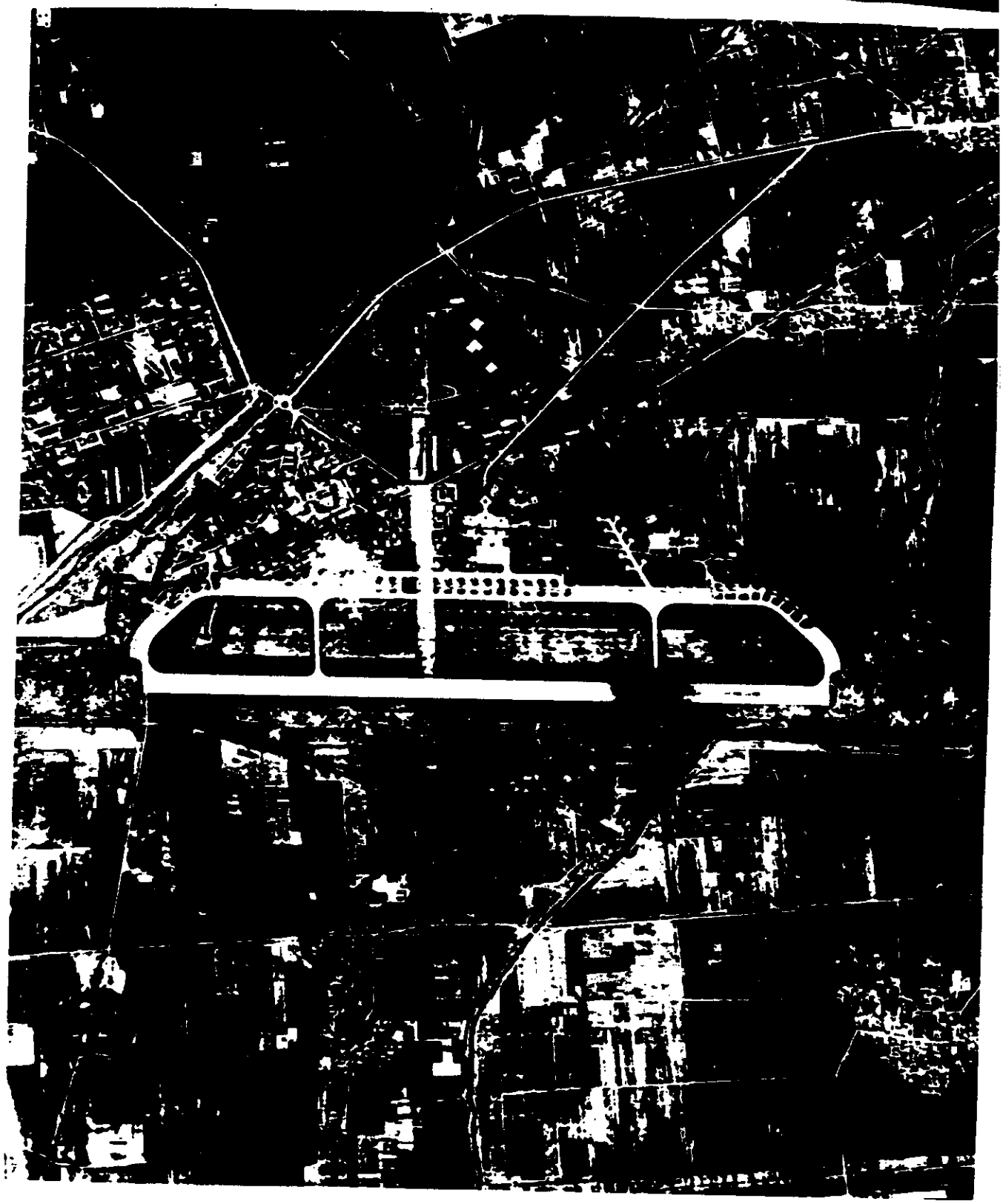
	Figure 22	Figure 23
Pass	37D	37D
Frame	125 Fwd	130 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	28.5-12.3	61.7-10.5
Enlargement Factor	20X	20X
Geographic Coordinates	35-10N 114-20E	35-10N 114-20E
Altitude (feet)	602,043	602,043
Vehicle:		
Pitch	15° 20'	-14° 50'
Roll	00° 11'	00° 21'
Yaw	00° 24'	00° 16'
Local Sun Time	1449	1449
Solar Elevation	44°	44°
Solar Azimuth	257°	257°

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





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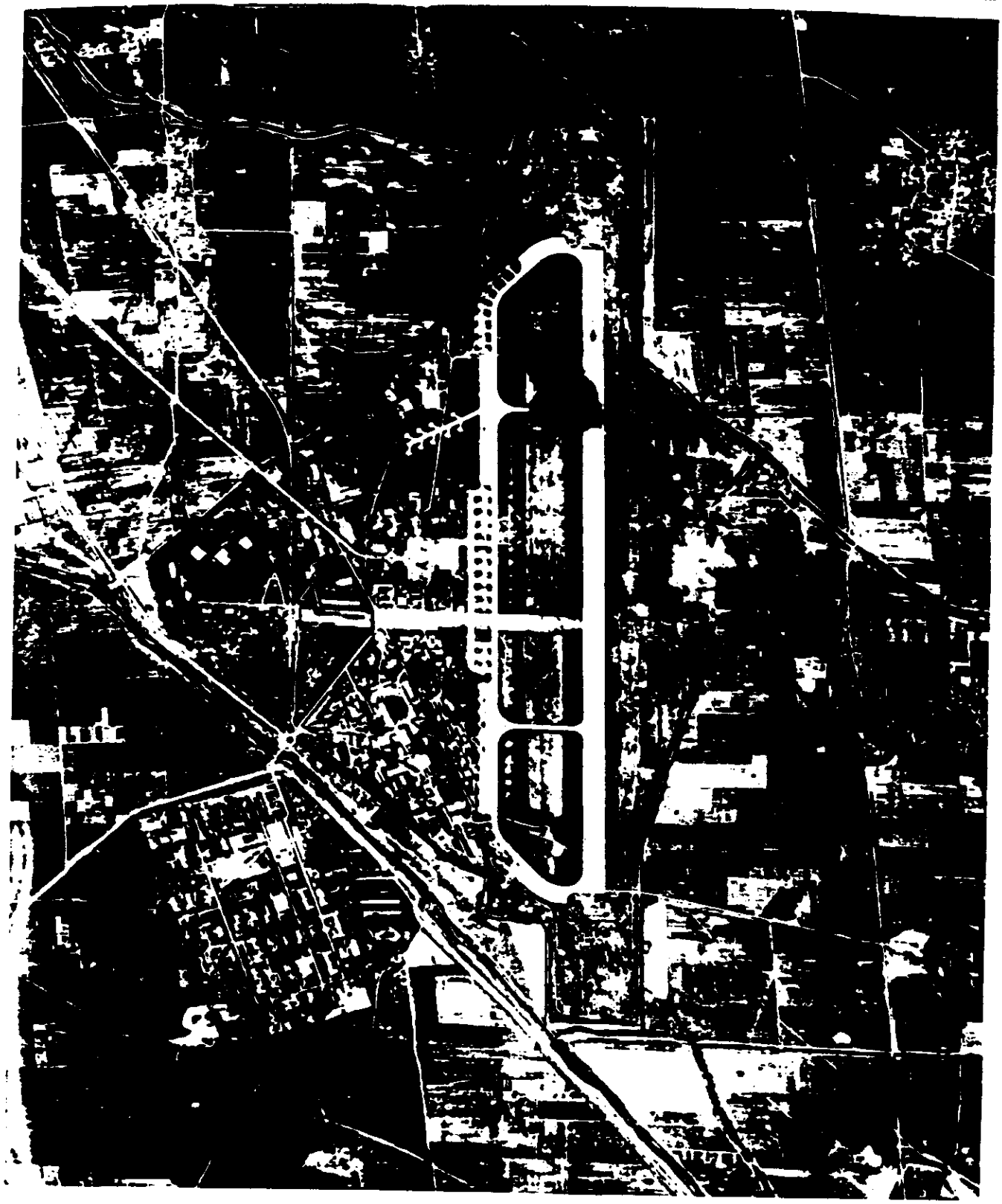

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FIGURE 24. PHOTOGRAPH SHOWING EFFECTS OF SOLAR AZIMUTH.

NPIC J-8567 (3/65)

FIGURE 25. PHOTOGRAPH SHOWING EFFECTS OF SOLAR AZIMUTH.

NPIC J-8568 (3/65)

These two photographs show how the solar azimuth affects the PI suitability in Mission 1009. The FWD camera was facing almost directly into the rays of the sun during acquisition. This back-lighting caused a glare from all reflective surfaces and increased densities to a point where a halation-like appearance degrades fine detail. In Figure 25, taken by the AFT camera, the rays of the sun are striking the target from the left, presenting a more natural side-lighting effect. The fine detail in this photograph enhances the PI suitability.

The photographs are printed in proper perspective relative to the principal ray during acquisition.

[redacted]

[redacted]

	Figure 24	Figure 25
Pass	21D	21D
Frame	6 Fwd	12 Aft
Date of Photography	7 August 1964	7 August 1964
Universal Grid Coordinates	18.8-13.1	71.5-10.0
Enlargement Factor	20X	20X
Geographic Coordinates	53-15N 114-00E	53-15N 114-00E
Altitude (feet)	625.289	625.289
Vehicle:		
Pitch	15° 25'	-14° 48'
Roll	-00°06'	-00° 10'
Yaw	01°05'	Not Available
Local Sun Time	1431	1431
Solar Elevation	42°	42°
Solar Azimuth	232°	232°

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

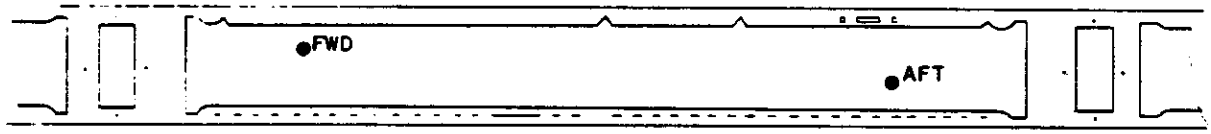

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FIGURE 26. PHOTOGRAPH SHOWING EFFECTS OF SOLAR AZIMUTH.
NPIC J-8589 (3/65)

FIGURE 27. PHOTOGRAPH SHOWING EFFECTS OF SOLAR AZIMUTH.
NPIC J-8590 (3/65)

These figures show how geographic latitude affects the PI suitability in Mission 1009. The preceding photographs (Figures 24 and 25) were taken at 53°N and the AFT camera photography contains more detail than the FWD. The following photographs were taken at 37°N and the FWD camera photography contains more detail than the AFT. The targets are on the west (starboard) side of the vehicle and are of the same approximate obliquity. The bearing of the solar azimuth relative to the principal ray during acquisition is the major cause of the shift in quality from one camera to the other. This bearing is a factor of the latitude.

The photographs are printed in the proper perspective relative to the principal ray during acquisition.

[redacted]

	Figure 26	Figure 27
Pass	6D	6D
Frame	173 Fwd	177 Aft
Date of Photography	6 August 1964	6 August 1964
Universal Grid Coordinates	23.6-12.2	67.5-14.5
Enlargement Factor	20X	20X
Geographic Coordinates	37-00N 101-45E	37-00N 101-45E
Altitude (feet)	607,053	607,053
Vehicle:		
Pitch	15°15'	-14°59'
Roll	-00°04'	00°07'
Yaw	00°06'	00°12'
Local Sun Time	1505	1505
Solar Elevation	45°	45°
Solar Azimuth	255°	255°

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

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FIGURE 28. EXTREME OBLIQUE PHOTOGRAPH, MASTER (FWD) CAMERA.

NPIC J-8691 (3/65)

FIGURE 29. EXTREME OBLIQUE PHOTOGRAPH, SLAVE (AFT) CAMERA.

NPIC J-8692 (3/65)

These two photographs of a launch site show the affect of the solar azimuth under conditions of extreme obliquity with this camera system. The sub-solar point is slightly forward of the starboard beam of the vehicle. The principal ray of the FWD camera was almost directly facing the sub-solar point during the acquisition of the target. The principal ray of the AFT camera was facing at an approximate right angle from the sub-solar point. The difference in the quality of the two photographs can be readily distinguished. Both photographs are oriented in the proper viewing perspective.

[redacted]

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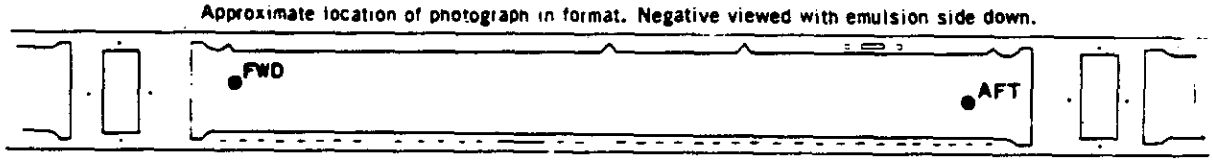
	Figure 28	Figure 29
Pass	37D	37D
Frame	91 Fwd	96 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	13.2-12.5	78.0-11.8
Enlargement Factor	20X	20X
Geographic Coordinates	52-45N 108-50E	52-45N 108-50E
Altitude (feet)	617,700	617,700
Vehicle:		
Pitch	15°05'	-15°06'
Roll	00°21'	00°35'
Yaw	-00°01'	-00°11'
Local Sun Time	1421	1421
Solar Elevation	42°	42°
Solar Azimuth	240°	24°

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



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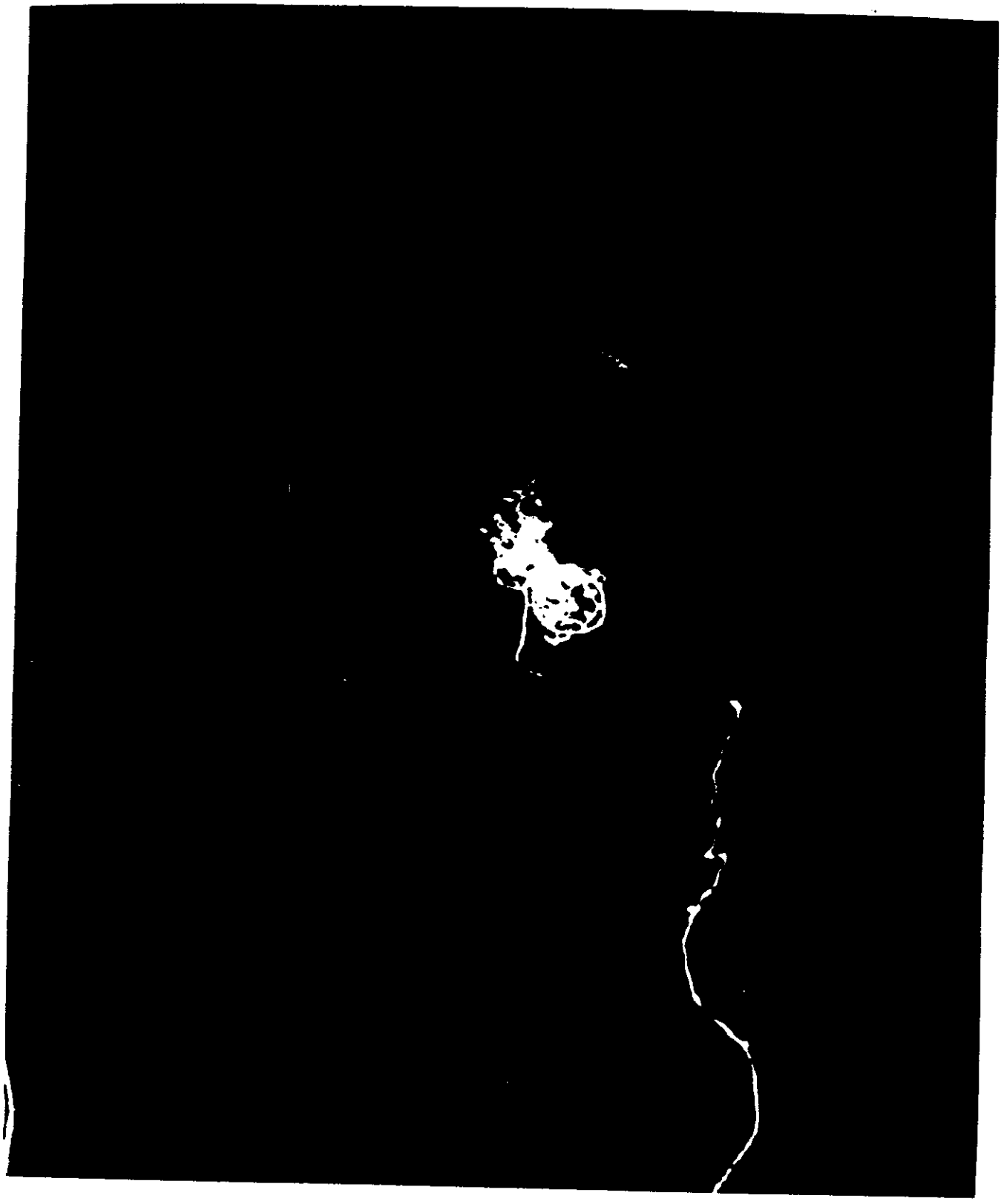

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FIGURE 30. AVERAGE OBLIQUE PHOTOGRAPH, MASTER (FWD) CAMERA.

NPIC J-8593 (3/65)

FIGURE 31. AVERAGE OBLIQUE PHOTOGRAPH, SLAVE (AFT) CAMERA.

NPIC J-8594 (3/65)

These two photographs show the average quality of the photography in Mission 1009 looking east (port).

[redacted]

[redacted]

	Figure 30	Figure 31
Pass	41D	41D
Frame	55 Fwd	60 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	65.8-11.8	25.1-14.3
Enlargement Factor	20X	20X
Geographic Coordinates	48-25N 19-15E	48-25N 019-15E
Altitude (feet)	601,545	601,545
Vehicle:		
Pitch	14°43'	-15°28'
Roll	00°19'	00°20'
Yaw	-00°12'	-00°23'
Local Sun Time	1430	1430
Solar Elevation	45°	45°
Solar Azimuth	237°	237°

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

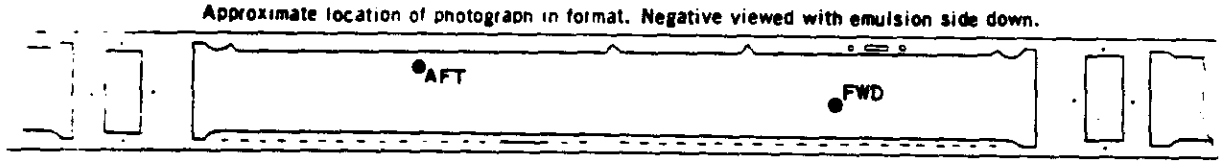

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FIGURE 32. EXTREME OBLIQUE PHOTOGRAPH, MASTER (FWD) CAMERA.

NPIC J-8595 (3/65)

FIGURE 33. EXTREME OBLIQUE PHOTOGRAPH, SLAVE (AFT) CAMERA.

NPIC J-8596 (3/65)

These two photographs show the average quality of the photography in Mission 1009 taken at extreme obliquity on the east (port) side of the vehicle. The photographs are printed in the proper perspective relative to the principal ray during acquisition.

[redacted]

[redacted]

	Figure 32	Figure 33
Pass	61D	61D
Frame	7 Fwd	13 Aft
Date of Photography	9 August 1964	9 August 1964
Universal Grid Coordinates	73.5-09.9	17.2-13.0
Enlargement Factor	20X	20X
Geographic Coordinates	42-40N 074-10W	42-40N 74-10W
Altitude (feet)	612,351	612,351
Vehicle:		
Pitch	15°05'	-14°56'
Roll	00°21'	00°39'
Yaw	00°51'	00°43'
Local Sun Time	1438	1438
Solar Elevation	47°	47°
Solar Azimuth	245°	245°

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

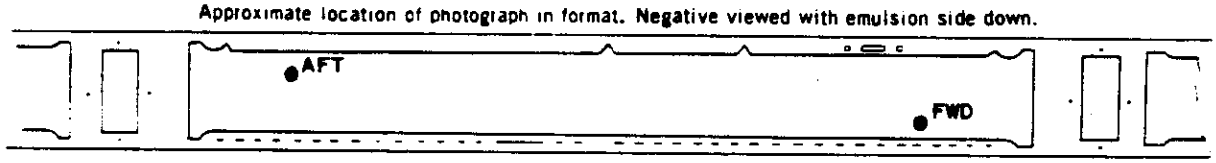

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FIGURE 34. PHOTOGRAPH OF AN AIRCRAFT IN FLIGHT, MASTER (FWD) CAMERA.

NPIC J-8597 (3/65)

FIGURE 35. PHOTOGRAPH OF AN AIRCRAFT IN FLIGHT, SLAVE (AFT) CAMERA.

NPIC J-8596 (3/65)

These two photographs show a jet aircraft in flight and a vapor trail which makes the aircraft more easily detectable. Photographs of this type can be used to estimate the speed and altitude of vehicles in flight.

The photographs are printed in the proper perspective relative to the principal ray during acquisition.

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	Figure 34	Figure 35
Pass	6D	6D
Frame	116 Fwd	121 Aft
Date of Photography	6 August 1964	6 August 1964
Universal Grid Coordinates	51.5-13.3	38.9-10.4
Enlargement Factor	20X	20X
Geographic Coordinates	55-30N 096-30E	55-30N 096-30E
Altitude (feet)	635,610	635,610
Vehicle:		
Pitch	14°40'	-15°31'
Roll	-00°10'	00°00'
Yaw	00°26'	00°33'
Local Sun Time	1440	1440
Solar Elevation	40°	40°
Solar Azimuth	234°	234°

Approximate [illegible] format. Negative viewed with emulsion side down.

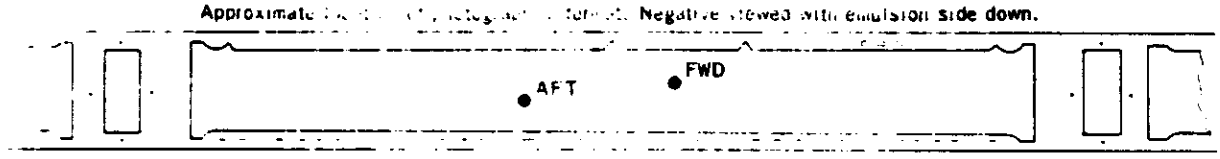

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FIGURE 36. PHOTOGRAPH SHOWING AVERAGE QUALITY OF MASTER (FWD) CAMERA LOOKING WESTWARD.

NPIC J-8599 (3/65)

FIGURE 37. PHOTOGRAPH SHOWING AVERAGE QUALITY OF SLAVE (AFT) CAMERA LOOKING WESTWARD.

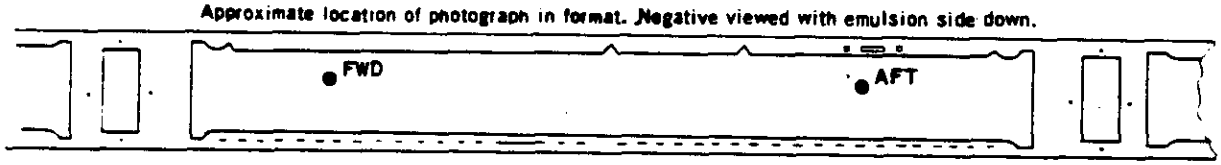
NPIC J-8600 (3/65)

These two photographs show the average quality of the photography in Mission 1009 looking west (starboard) toward the sub-solar point.

[redacted]

	Figure 36	Figure 37
Pass	41D	41D
Frame	55 Fwd	60 Aft
Date of Photography	8 August 1964	8 August 1964
Universal Grid Coordinates	21.5-13.2	69.5-12.7
Enlargement Factor	20X	20X
Geographic Coordinates	48-25N 019-15E	48-25N 019-15E
Altitude (feet)	601,545	601,545
Vehicle:		
Pitch	14°43'	-15°28'
Roll	00°19'	00°21'
Yaw	-00°12'	-00°23'
Local Sun Time	1430	1430
Solar Elevation	45°	45°
Solar Azimuth	237°	237°

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



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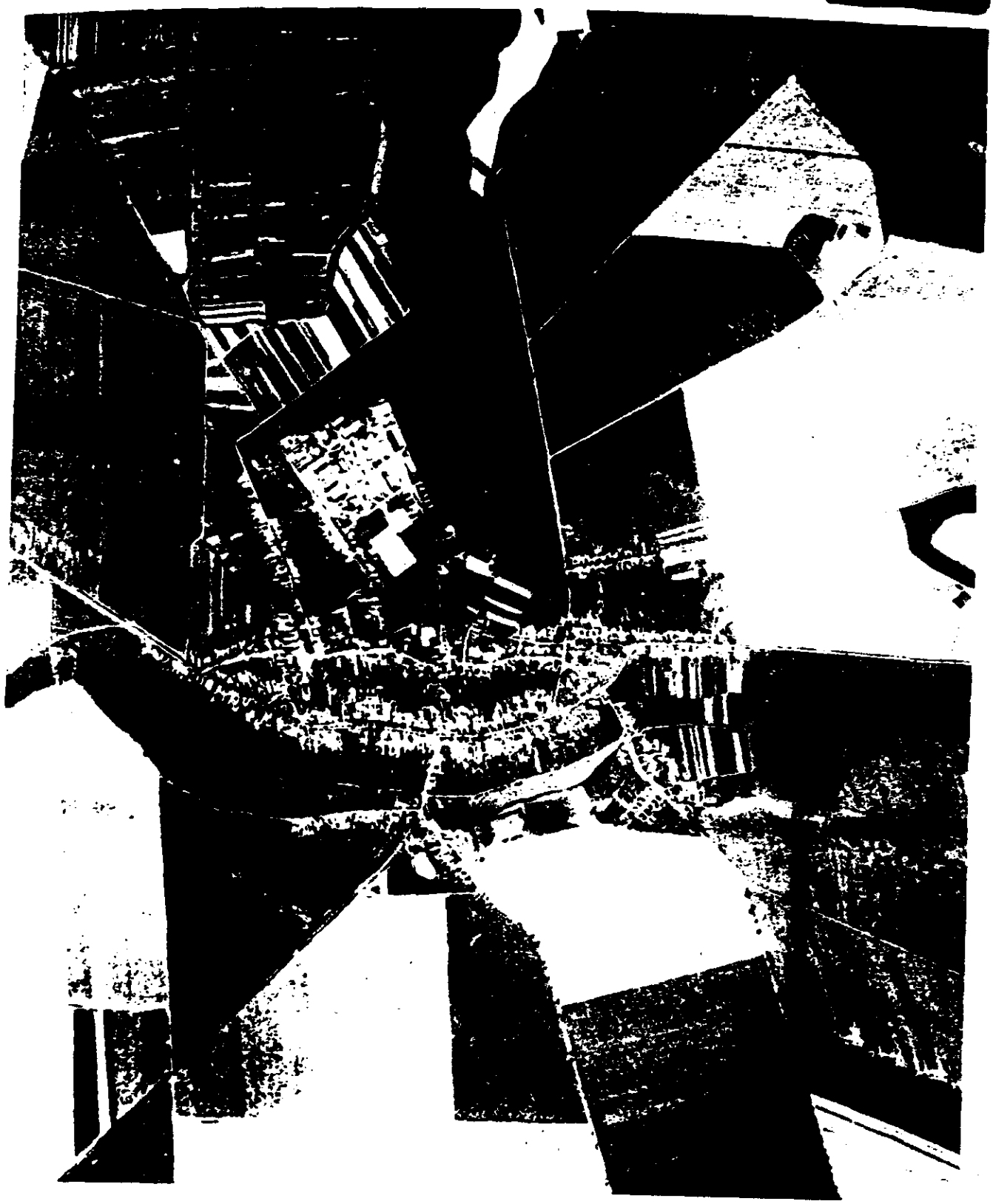

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FIGURE 38. PHOTOGRAPH OF NEW YORK WORLD'S FAIR AREA, MASTER (FWD) CAMERA.

NPIC J-8601 (3/65)

FIGURE 39. PHOTOGRAPH OF NEW YORK WORLD'S FAIR AREA, SLAVE (AFT) CAMERA.

NPIC J-8602 (3/65)

These two photographs of the New York World's Fair Area show the average quality of the photography in Mission 1009 taken at average obliquity on the east (port) side of the vehicle. The slight difference in contrast can be attributed to the bearing of the solar azimuth relative to the principal ray during the acquisition of the target.

The photographs are printed in the proper perspective relative to the principal ray during acquisition.

[redacted]

[redacted]

	Figure 38	Figure 39
Pass	61D	61D
Frame	9 Fwd	15 Aft
Date of Photography	9 August 1964	9 August 1964
Universal Grid Coordinates	69.1-10.9	21.8-12.0
Enlargement Factor	20X	20X
Geographic Coordinates	42-00N 074-00W	42-00N 074-00W
Altitude (feet)	612,500	612,500
Vehicle:		
Pitch	15° 07'	-14° 54'
Roll	00°22'	00° 39'
Yaw	00° 51'	00° 43'
Local Sun Time	1437	1437
Solar Elevation	47°	47°
Solar Azimuth	245°	245°

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

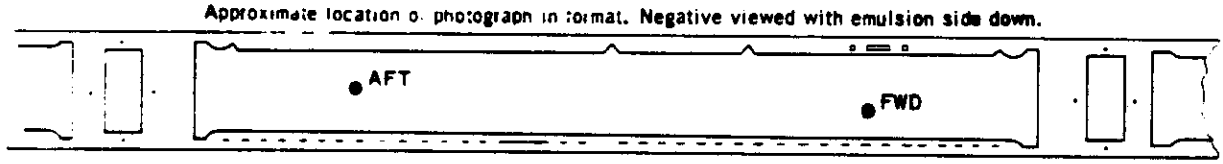

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FIGURE 40. PHOTOGRAPH SHOWING AVERAGE QUALITY OF MASTER (FWD) CAMERA LOOKING WESTWARD.

NPIC J-8603 (3/66)

FIGURE 41. PHOTOGRAPH SHOWING AVERAGE QUALITY OF SLAVE (AFT) CAMERA LOOKING WESTWARD.

NPIC J-8604 (3/66)

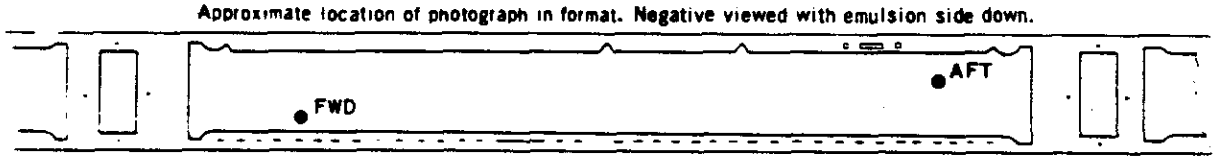
These two photographs of a tank farm show the average quality of the photography in Mission 1009 taken at extreme obliquity on the west (starboard) side of the vehicle.

[redacted]

[redacted]

	Figure 40	Figure 41
Pass	61D	61D
Frame	14 Fwd	20 Aft
Date of Photography	9 August 1964	9 August 1964
Universal Grid Coordinates	18.1-09.7	73.2-12.8
Enlargement Factor	20X	20X
Geographic Coordinates	41-40N 073-30W	41-40N 073-30W
Altitude (feet)	623,482	623,482
Vehicle:		
Pitch	15° 11'	-14° 52'
Roll	00° 28'	00° 40'
Yaw	00° 54'	00° 43'
Local Sun Time	1437	1437
Solar Elevation	47°	47°
Solar Azimuth	245°	245°

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



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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 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.

[redacted]

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4. MIP Rating for Mission 1009

Pass 61D, frame 13 FWD, has been selected as the MIP frame for Mission 1009. 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 AFT camera (frame 19 AFT) is almost identical to the MIP frame.

[redacted]

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FIGURE 42. PHOTOGRAPH FROM THE MIP FRAME.

NPIC J-8606 (3/68)

This photograph has been selected from the MIP frame from Mission 1009. It is printed in the proper perspective relative to the principal ray during acquisition.

FIGURE 43. PHOTOGRAPH OF THE SAME AREA AS THE MIP FRAME, FROM THE SLAVE (AFT) MATERIAL.

NPIC J-8606 (3/68)

This photograph is included to show a comparison between a target from the MIP Frame (Figure 42) and the same target taken with the AFT camera. The increase in contrast is attributed to the slight variation in the bearing of the solar azimuth relative to the principal ray. Both negatives received the same exposure and were processed at the same level (full development).

[redacted]

[redacted]

	Figure 42	Figure 43
Pass	61D	61D
Frame	13 Fwd	19 Aft
Date of Photography	9 August 1964	9 August 1964
Universal Grid Coordinates	46.2-12.2	44.3-10.1
Enlargement Factor	20X	20X
Geographic Coordinates	41-45N 073-45W	41-45N 073-45W
Altitude (feet)	620,884	620,884
Vehicle:		
Pitch	15° 10'	-14°53'
Roll	00°27'	00°40'
Yaw	00°54'	00°43'
Local Sun Time	1438	1438
Solar Elevation	47°	47°
Solar Azimuth	245°	245°

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

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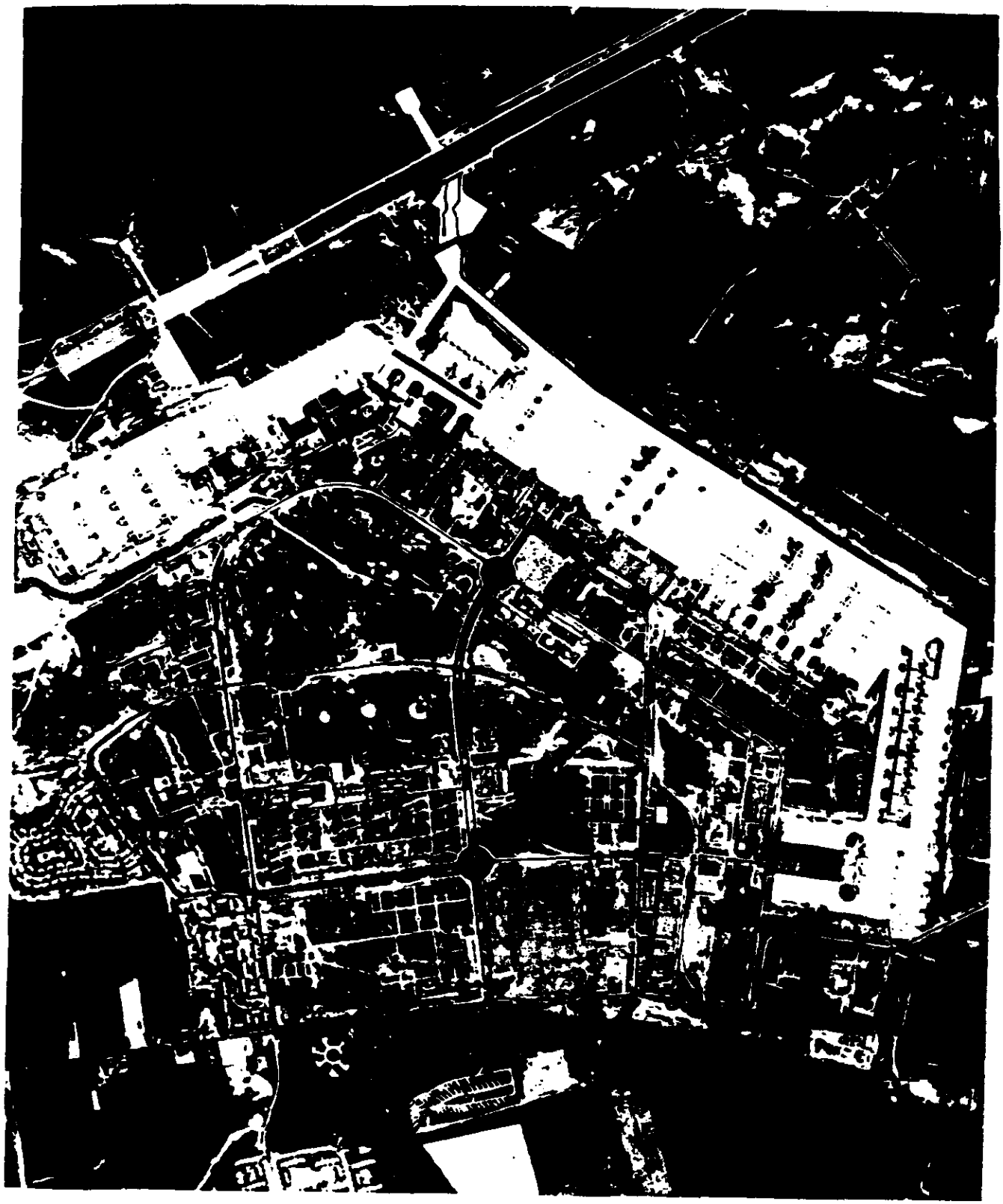

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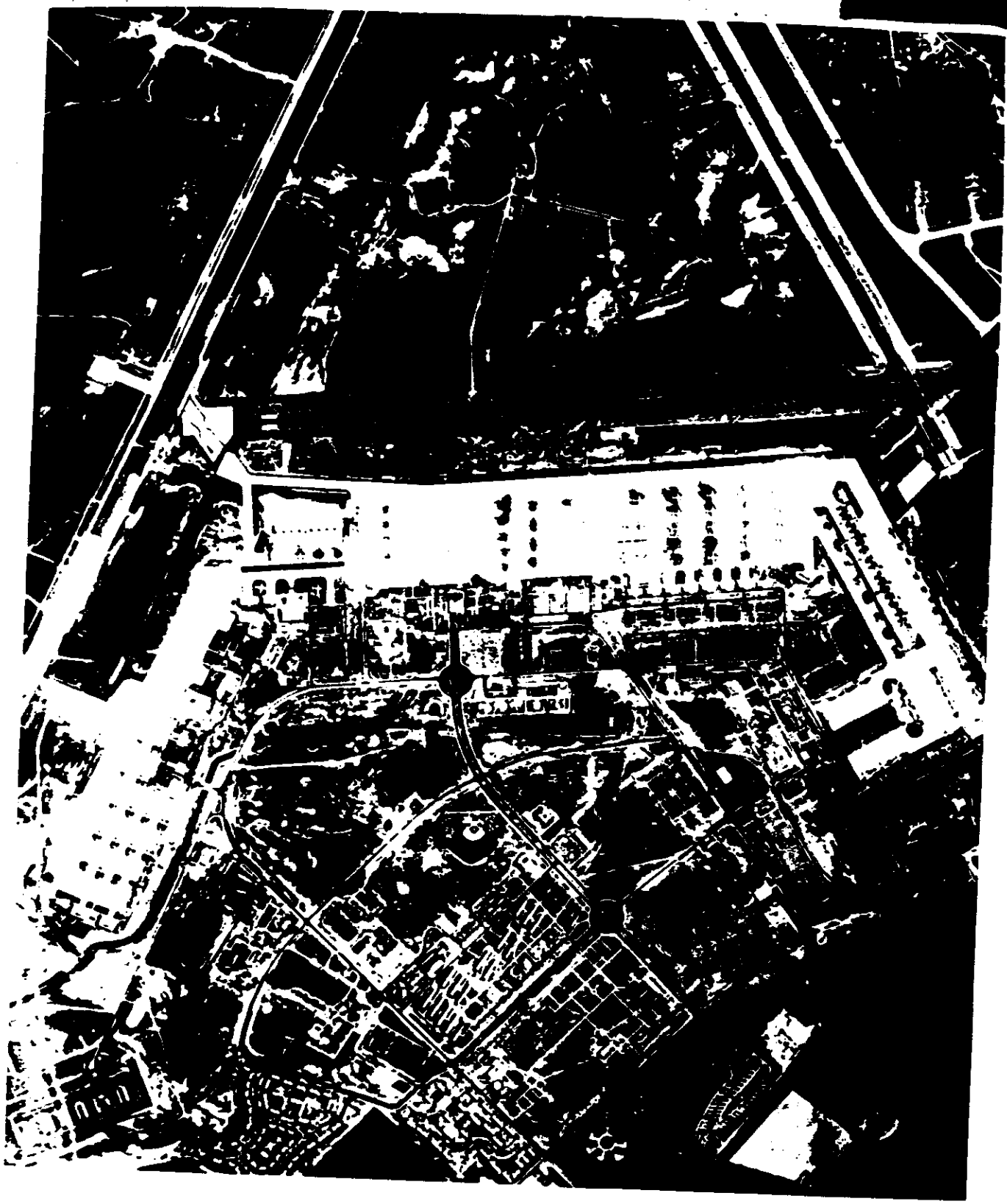


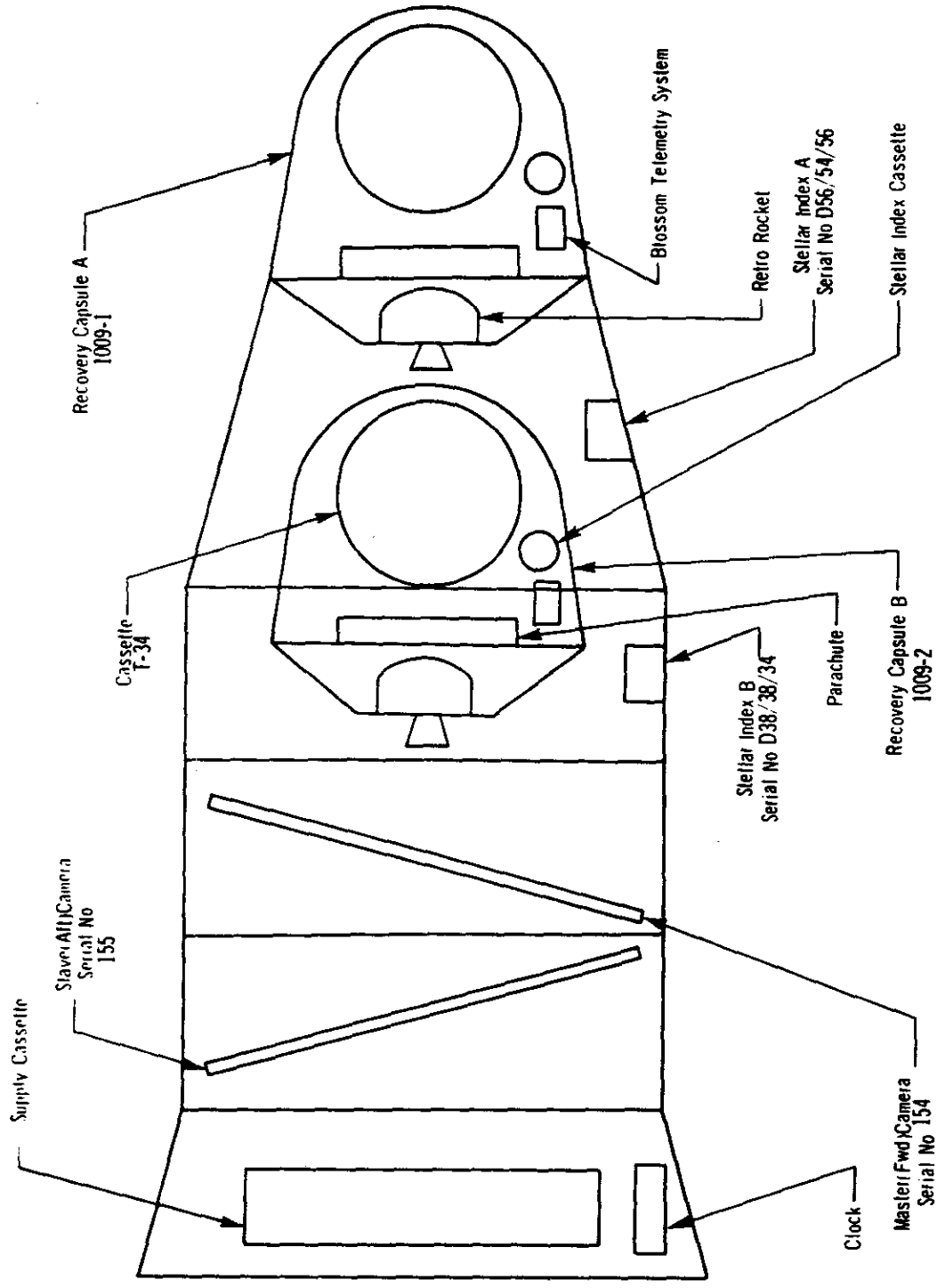
APPENDIX A. SYSTEM SPECIFICATIONS

1. Cameras

	Master Panoramic	Master Port Horizon	Master Stbd Horizon	Slave Panoramic	Slave Port Horizon	Slave Stbd Horizon	Mission 1009-1 Stellar Camera	Mission 1009-1 Index Camera	Mission 1009-2 Stellar Camera	Mission 1009-2 Index Camera
Camera No	154	*	*	155	*	*	56	54	34	38
Lens Serial No	1292435	812290	814010	1322435	813519	813517	10781	813271	10466	813047
Slit Width	0.200	NA	NA	0.200	NA	NA	NA	NA	NA	NA
Aperture	f3.5	f6.8	f8.0	f3.5	f6.8	f8.0	f1.8	f4.5	f1.8	f4.5
Exposure		1/100	1/100		1/100	1/100	2.0 sec.	1/500	2.0 sec.	1/500
Filter	Wratten 21	Wratten 25	Wratten 25	Wratten 21	Wratten 25	Wratten 25	none	Wratten 21	none	Wratten 21
Focal Length (mm)	609.602	55.03	55.01	609.617	54.77	54.97	83.96	38.25	84.12	38.08
Film Length	15,800'	NA	NA	15,800'	NA	NA	47'	90'	42'	90'
Splices	4	NA	NA	4	NA	NA	none	none	none	none
Emulsion	59-2-4-3-5-4	NA	NA	59-4-5-4	NA	NA	7-3-6-4	28-1-3-4	7-3-6-4	28-1-3-4
Film Type	4404	4404	4404	4404	4404	4404	4401	4400	4401	4400
RESOLUTION DATA (lines per millimeter)										
Static:										
High Contrast	253	*	94.3(A)	200	84.6(A)	79.4(A)	*	76.7(A)	*	78.8(A)
Low Contrast	157	NA	NA	151	NA	NA	*	*	*	*
Dynamic:										
I. High Contrast	163	NA	NA	194	NA	NA	*	*	*	*
I. Low Contrast	131	NA	NA	137	NA	NA	*	*	*	*
P. High Contrast	171	NA	NA	194.5	NA	NA	*	*	*	*
P. Low Contrast	102.5	NA	NA	110	NA	NA	*	*	*	*

NA - Not Applicable
* - Not Available
(A) - AWAR

VEHICLE LAYOUT



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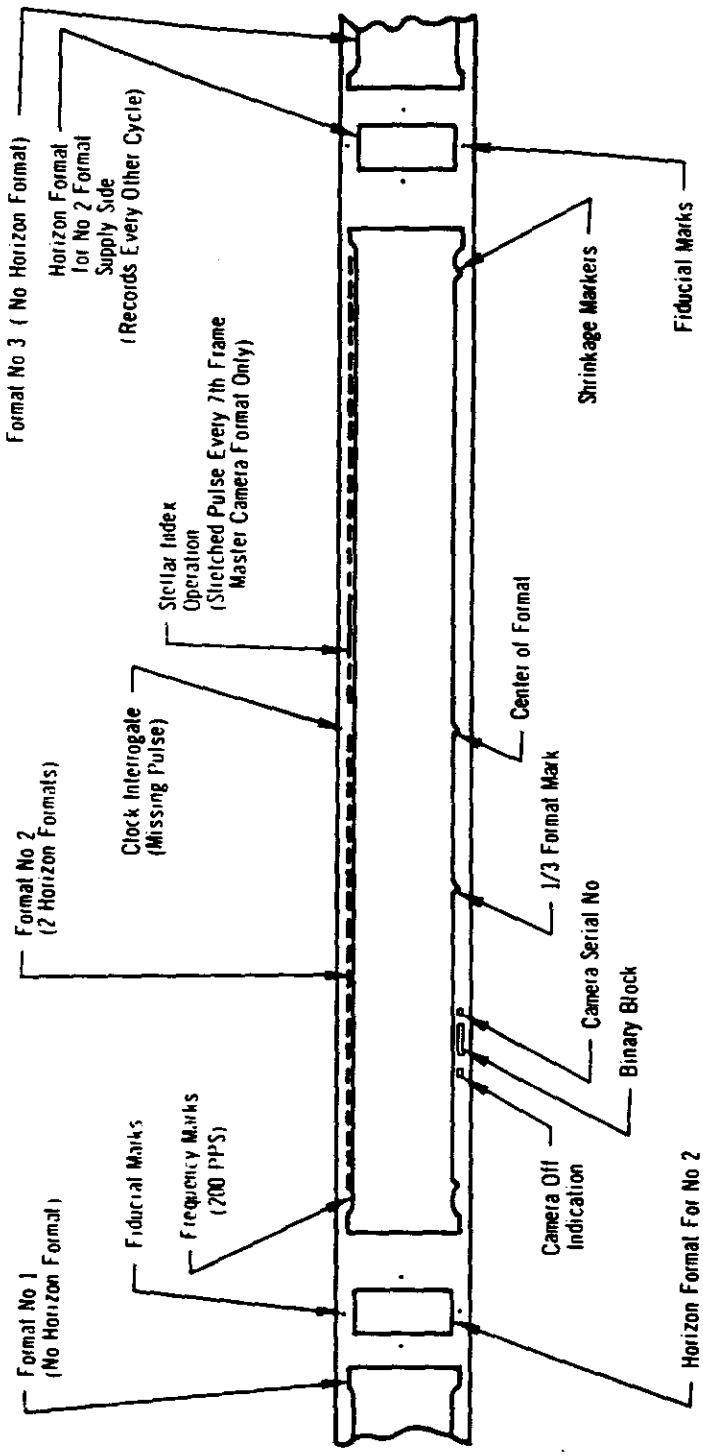
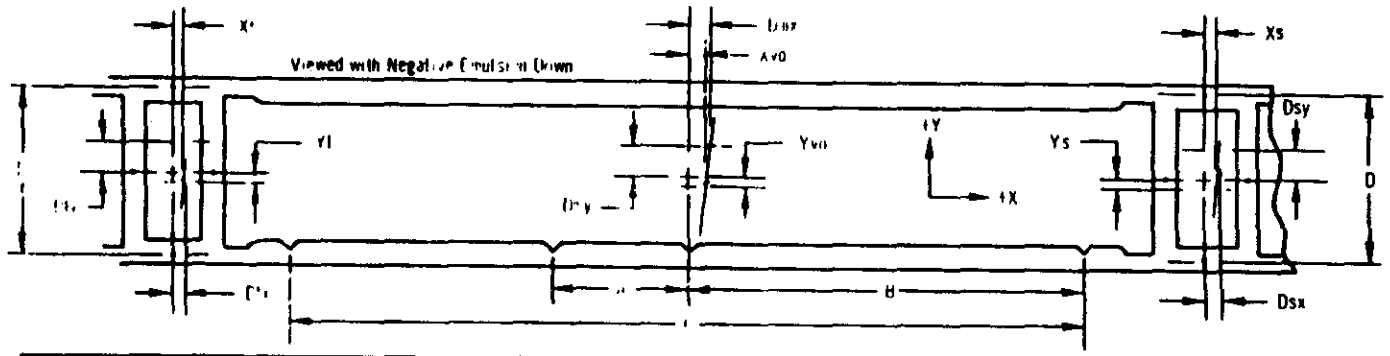
FILM SPECIFICATIONS
FORMAT LAYOUT



NPIC J-6608 (3/68)



Master(Fwd)Camera NO. 154		Vehicle Motion		Scan Direction	
A	76.2	Xt	+0.063	Dtx	+0.076
B	355.6	Yt	+0.264	Dty	-2.622
C	711.0	Xs	+0.085	Dsx	+0.088
D	56.540	Ys	+0.083	Dsy	+2.764
E	56.564	Xvo	+1.010	Dmx	+1.021
		Yvo	+0.612	Dmy	-2.388

Format dimensions:

Panoramic	
Height	55.947
Width	755.8

Slave(Aft)Camera NO. 155		Vehicle Motion		Scan Direction	
A	76.1	Xt	+0.087	Dtx	+0.088
B	355.6	Yt	-0.177	Dty	+2.146
C	711.1	Xs	-0.374	Dsx	-0.385
D	56.573	Ys	-0.141	Dsy	-2.077
E	56.559	Xvo	-0.708	Dmx	-0.732
		Yvo	+0.243	Dmy	-2.738

Format dimensions:

Panoramic	
Height	55.824
Width	755.3

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

-X+Y	+X+Y
-X-Y	+X-Y

NPIC J-8609 (3/68)

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Definition of Panoramic Format Calibrations

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

Two sets, of 3 targets each, are aligned to be coplanar within ±5 seconds of arc so positioned to form an angle of -15.00° ±5 seconds to the mechanical interface for master camera calibrations and an angle of +15.00° ±5 seconds to the mechanical interface for slave camera calibrations.

A -- One target, Target 1, of each set is imaged on the Terrain Format.

B -- The second and third targets of each set are at angles of 75.00° ±5 seconds from Target 1 and are imaged on the horizon formats.

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

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

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

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

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

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

[redacted]

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

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

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

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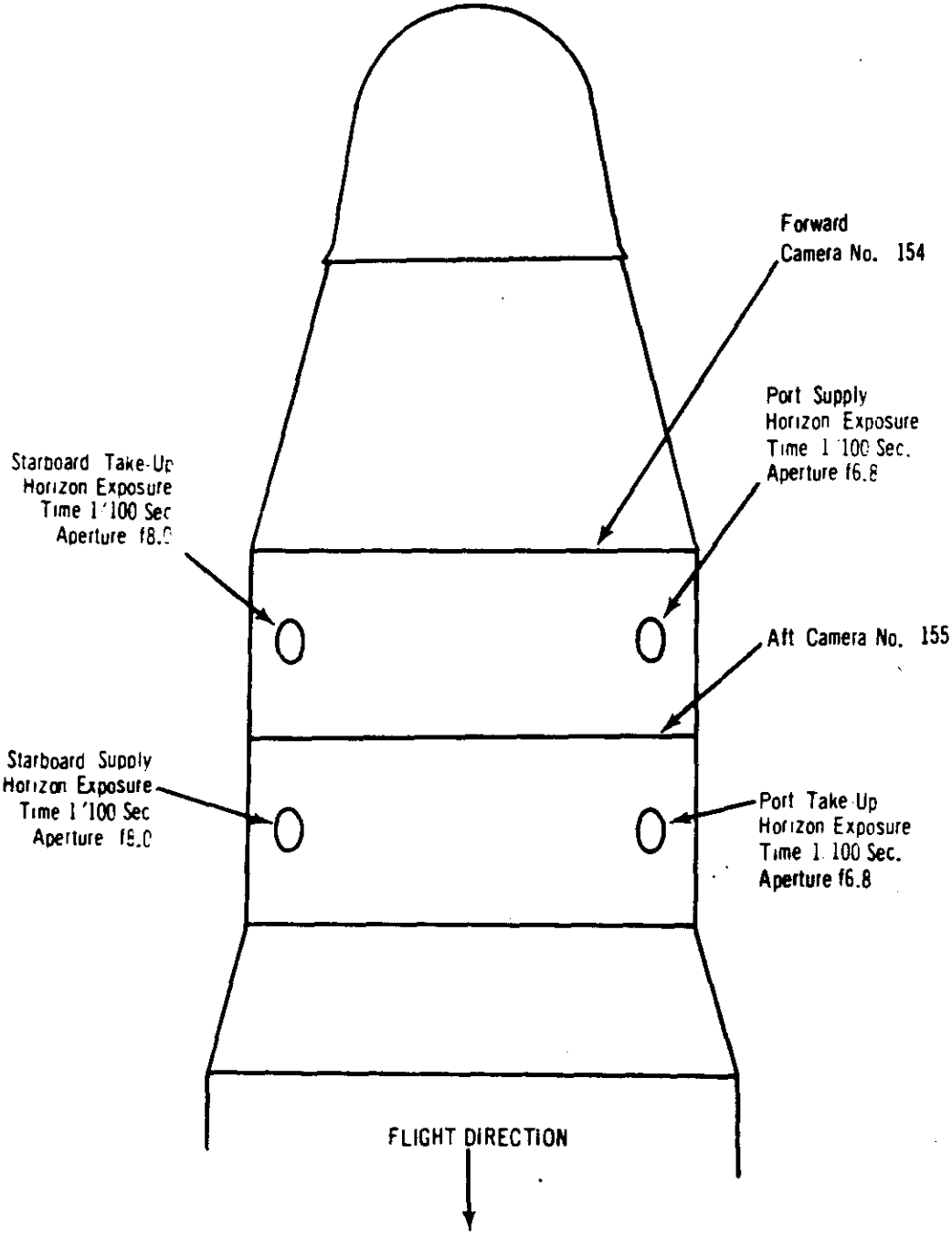
HORIZON LENS SETTINGS
(Viewed from top of vehicle in flight)



NPIC J-6610 (3/68)

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APPENDIX B. DENSITY READINGS

Mission 1009-1

		STELLAR CAMERA				INDEX CAMERA						
						LIMITING				TERRAIN		
Pass	Frame	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta
1D	1	3.14	0.82	2.32	0.18	1.94	0.30	1.64	0.08	NR	NR	NR
6D	2	2.69	0.54	2.15	0.18	1.43	0.14	1.29	0.08	0.82	0.14	0.68
	31	2.81	0.56	2.25	0.18	1.95	0.14	1.81	0.08	0.50	0.14	0.36
7D	32	2.52	0.40	2.12	0.18	2.02	0.16	1.86	0.08	0.60	0.22	0.38
	49	2.84	0.62	2.22	0.19	1.64	0.18	1.46	0.08	1.10	0.21	0.89
8D	50	2.35	0.35	2.00	0.19	1.58	0.27	1.31	0.08	NR	NR	NR
	77	2.51	0.39	2.12	0.20	1.77	0.36	1.41	0.08	1.12	0.36	0.76
9AE	78	0.23	0.20	0.03	0.20	0.08	0.08	0.00	0.08	NR	NR	NR
	79	0.25	0.20	0.05	0.20	0.09	0.08	0.01	0.08	NR	NR	NR
9D	80	2.77	0.48	2.29	0.20	1.87	0.15	1.72	0.08	0.42	0.15	0.27
	95	2.42	0.44	1.98	0.26	1.36	0.13	1.23	0.08	0.77	0.24	0.53
10D	96	2.43	0.41	2.02	0.26	1.06	0.20	0.86	0.08	0.64	0.20	0.44
	100	2.28	0.38	1.90	0.26	1.26	0.17	1.09	0.08	0.50	0.31	0.19
17D	101	2.25	0.34	1.91	0.27	1.77	0.09	1.68	0.07	NR	NR	NR
	107	1.94	0.30	1.64	0.26	1.22	0.10	1.12	0.07	NR	NR	NR
20D	108	2.54	0.46	2.08	0.28	1.67	0.21	1.46	0.07	0.96	0.30	0.66
	119	2.35	0.36	1.99	0.19	1.60	0.10	1.50	0.07	0.54	0.12	0.42
21D	120	2.60	0.45	2.15	0.18	1.64	0.11	1.53	0.07	0.54	0.11	0.43
	146	2.97	0.65	2.32	0.18	1.84	0.12	1.72	0.07	0.52	0.38	0.14
22D	147	2.65	0.46	2.19	0.18	1.53	0.17	1.36	0.07	0.43	0.22	0.21
	164	2.61	0.39	2.22	0.18	1.85	0.13	1.72	0.07	0.73	0.38	0.35
23D	165	2.48	0.42	2.06	0.20	1.34	0.17	1.17	0.07	0.79	0.35	0.44
	183	2.58	0.43	2.15	0.18	1.78	0.10	1.58	0.07	1.10	0.14	0.96
24D	184	2.38	0.36	2.02	0.18	1.56	0.13	1.43	0.07	0.47	0.29	0.18
	208	2.67	0.50	2.17	0.27	1.61	0.11	1.50	0.07	1.10	0.22	0.88
25AE	209	0.43	0.33	0.10	0.32	0.07	0.07	0.00	0.07	NR	NR	NR
25D	210	2.62	0.54	2.08	0.31	1.70	0.14	1.56	0.07	0.61	0.34	0.27
	216	2.84	0.53	2.31	0.21	1.84	0.21	1.63	0.07	0.61	0.28	0.33
30D	217	2.53	0.48	2.05	0.21	1.89	0.18	1.71	0.07	0.70	0.18	0.52
	222	2.66	0.41	2.25	0.20	1.91	0.10	1.81	0.07	NR	NR	NR
37D	223	2.79	0.50	2.29	0.19	1.62	0.15	1.47	0.07	NR	NR	NR
	252	2.90	0.54	2.36	0.19	1.77	0.67	1.10	0.07	NR	NR	NR
38D	253	2.41	0.38	2.03	0.18	0.71	0.10	0.61	0.07	0.62	0.10	0.52
	270	2.82	0.50	2.32	0.18	1.98	0.21	1.77	0.07	1.85	0.29	1.56
39D	271	2.71	0.44	2.27	0.18	2.09	0.16	1.93	0.07	0.72	0.16	0.56
	288	2.73	0.43	2.30	0.18	1.34	0.18	1.16	0.07	1.34	0.18	1.16
40AE	289	0.29	0.18	0.11	0.18	0.08	0.07	0.01	0.07	NR	NR	NR
	290	0.25	0.18	0.07	0.18	0.08	0.07	0.01	0.07	NR	NR	NR
40D	291	2.52	0.42	2.10	0.18	1.90	0.19	1.71	0.07	0.61	0.19	0.42
	304	2.47	0.36	2.11	0.20	1.96	0.12	1.84	0.07	1.79	0.23	1.56
41D	305	2.72	0.44	2.28	0.20	1.62	0.13	1.49	0.07	0.77	0.13	0.64
	316	2.48	0.39	2.09	0.18	2.07	0.14	1.93	0.08	0.91	0.14	0.77
46D	317	2.41	0.38	2.03	0.18	0.70	0.13	0.57	0.07	0.70	0.13	0.57
	321	2.85	0.49	2.36	0.19	1.55	0.12	1.43	0.07	0.75	0.12	0.63
47D	322	2.70	0.48	2.22	0.19	2.02	0.20	1.82	0.07	1.49	0.28	1.21
	327	2.87	0.54	2.33	0.20	2.11	0.10	2.01	0.07	1.34	0.29	1.05
48A	328	2.08	0.25	1.83	0.18	1.18	0.10	1.08	0.07	NR	NR	NR
	333	2.42	0.32	2.10	0.18	1.30	0.16	1.14	0.07	NR	NR	NR
49D	334	2.46	0.41	2.05	0.18	1.50	0.09	1.41	0.07	1.05	0.16	0.89
	338	2.44	0.39	2.05	0.19	1.73	0.10	1.63	0.07	0.72	0.39	0.33
Average		2.35	0.42	1.93	0.19	1.45	0.15	1.33	0.07	0.84	0.22	0.62
Range		0.23 to 3.14	0.20 to 0.65	0.03 to 2.36	0.18 to 0.32	0.07 to 2.09	0.07 to 0.67	0.00 to 2.01	0.07 to 0.08	0.42 to 1.85	0.10 to 0.39	0.14 to 1.56

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Mission 1009-2

		STELLAR CAMERA				INDEX CAMERA LIMITING				INDEX CAMERA TERRAIN		
Pass	Frame	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta
49D	1	3.63	0.41	3.22	0.23	1.94	0.11	1.83	0.08	0.67	0.30	0.37
	2	3.63	0.41	3.22	0.23	1.89	0.11	1.78	0.08	0.46	0.18	0.28
52D	3	3.62	0.44	3.18	0.24	1.43	0.23	1.20	0.08	NR	NR	NR
	32	3.68	0.44	3.24	0.33	1.78	0.20	1.58	0.11	NR	NR	NR
53D	33	3.68	0.41	3.27	0.24	1.64	0.49	1.15	0.08	NR	NR	NR
	68	3.72	0.46	3.26	0.25	1.90	0.19	1.71	0.09	0.48	0.19	0.29
54D	69	3.67	0.44	3.23	0.26	1.32	0.34	0.98	0.09	NR	NR	NR
	116	3.64	0.43	3.21	0.26	2.06	0.22	1.84	0.08	0.93	0.21	0.72
55D	117	3.64	0.38	3.26	0.24	1.56	0.13	1.43	0.08	NR	NR	NR
	152	3.68	0.42	3.26	0.25	1.23	0.34	0.89	0.09	1.23	0.34	0.89
56AD	153	0.31	0.27	0.04	0.27	0.10	0.08	0.02	0.08	NR	NR	NR
56D	154	3.67	0.48	3.19	0.25	1.38	0.16	1.22	0.09	0.54	0.16	0.38
	172	3.69	0.60	3.09	0.42	1.62	0.11	1.51	0.08	0.73	0.21	0.52
61D	173	3.69	0.59	3.10	0.34	1.91	0.10	1.81	0.08	0.76	0.12	0.64
	178	3.65	0.40	3.25	0.27	1.48	0.11	1.37	0.08	NR	NR	NR
65D	179	3.66	0.42	3.24	0.25	1.84	0.22	1.62	0.08	NR	NR	NR
	180	3.64	0.38	3.26	0.24	1.87	0.10	1.77	0.08	NR	NR	NR
69D	181	3.66	0.43	3.23	0.26	1.66	0.21	1.45	0.08	NR	NR	NR
	211	3.72	0.52	3.20	0.26	1.98	0.17	1.81	0.08	0.87	0.18	0.69
70D	212	3.66	0.42	3.24	0.26	1.72	0.10	1.62	0.08	0.54	0.10	0.44
	234	3.73	0.48	3.25	0.26	1.97	0.21	1.76	0.08	1.71	0.21	1.50
72AD	235	0.30	0.27	0.03	0.27	0.09	0.08	0.01	0.08	NR	NR	NR
72D	236	3.71	0.48	3.23	0.27	1.71	0.22	1.49	0.08	0.67	0.22	0.45
	250	3.66	0.42	3.46	0.28	1.26	0.13	1.15	0.08	0.51	0.16	0.35
82D	251	3.69	0.49	3.20	0.27	1.43	0.14	1.29	0.08	0.62	0.24	0.38
	270	3.69	0.42	3.27	0.26	0.80	0.12	0.68	0.08	NR	NR	NR
85D	273	3.71	0.44	3.27	0.26	1.53	0.17	1.36	0.08	0.55	0.17	0.38
	299	3.75	0.57	3.18	0.27	1.82	0.20	1.62	0.08	0.64	0.24	0.40
86D	300	3.66	0.44	3.22	0.26	1.52	0.14	1.38	0.08	0.48	0.25	0.23
	318	3.71	0.50	3.21	0.26	1.61	0.17	1.44	0.08	1.34	0.17	1.17
88AD	319	0.32	0.29	0.03	0.29	0.09	0.08	0.01	0.08	NR	NR	NR
	320	0.30	0.29	0.01	0.29	0.09	0.08	0.01	0.08	NR	NR	NR
88D	321	3.73	0.57	3.16	0.30	1.64	0.19	1.45	0.08	0.44	0.27	0.17
	331	3.73	0.48	3.25	0.28	1.78	0.33	1.45	0.08	0.85	0.33	0.52
96D	332	3.62	0.33	3.29	0.26	1.59	0.10	1.49	0.08	NR	NR	NR
	337	3.66	0.38	3.28	0.27	1.80	0.13	1.67	0.08	NR	NR	NR
99D	338	3.68	0.44	3.22	0.27	1.81	0.12	1.69	0.08	0.58	0.12	0.46
	350	3.72	0.49	3.23	0.28	1.79	0.23	1.56	0.08	NR	NR	NR
100D	351	3.67	0.42	3.25	0.26	1.56	0.37	1.19	0.08	0.62	0.37	0.25
	368	3.72	0.51	3.21	0.27	1.85	0.29	1.56	0.08	NR	NR	NR
102D	369	3.65	0.44	3.21	0.26	1.22	0.17	1.05	0.08	0.77	0.17	0.60
	382	3.72	0.55	3.17	0.32	1.85	0.36	1.49	0.08	1.31	0.45	0.86
102D	383	3.73	0.57	3.16	0.32	1.82	0.36	1.46	0.08	NR	NR	NR
	389	3.68	0.50	3.18	0.28	1.88	0.27	1.61	0.08	0.70	0.27	0.43
103AD	390	0.32	0.29	0.03	0.27	0.09	0.08	0.01	0.08	NR	NR	NR
	391	0.30	0.27	0.03	0.27	0.09	0.08	0.01	0.08	NR	NR	NR
112D	392	3.61	0.32	3.28	0.28	1.75	0.14	1.61	0.08	0.48	0.37	0.11
	394	3.57	0.33	3.24	0.28	1.66	0.10	1.56	0.08	NR	NR	NR
115D	395	3.64	0.38	3.26	0.27	1.84	0.17	1.67	0.08	0.49	0.17	0.32
	408	3.67	0.62	3.05	0.35	1.58	0.16	1.42	0.08	NR	NR	NR
116D	409	3.65	0.64	3.01	0.34	1.82	0.13	1.69	0.08	0.57	0.13	0.44
	412	3.69	0.55	3.14	0.33	NR	NR	NR	NR	NR	NR	NR
117D	429	Stellar Film Expended				2.68	0.18	2.50	0.08	0.94	0.18	0.76
	430					1.82	0.23	1.59	0.08	0.45	0.30	0.15
	436					1.74	0.20	1.54	0.09	1.30	0.20	1.10
average		3.35	0.45	0.91	0.28	1.51	0.18	1.33	0.08	0.75	0.23	0.52
range		0.30 to 3.75	0.27 to 0.64	0.01 to 3.46	0.23 to 1.42	0.09 to 2.68	0.08 to 0.49	0.01 to 2.50	0.08 to 0.11	0.27 to 1.71	0.12 to 0.45	0.15 to 1.50

NR = reading too low

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APPENDIX C. MICRODENSITOMETRY

1. Edge Spread Function

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

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

Edges meeting the criteria described below have been found on domestic passes of missions in the same frame as resolution targets and have been scanned. The ground distance in feet, thus determined, has been approximately that determined from the resolution target. Although the techniques used are not refined and are considered to be still in the development stage, the potential of this type of objective analysis should be realized. The 6 examples of edge scans and their respective spread functions are included.

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

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

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by differentiating the signal output curve point by point; i.e., measuring the rate of change or signal with time or distance, and plotting signal amplitude versus time or distance.

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

The microdensitometer used is a Joyce-Lobel Double Beam Model IIIC. It is used with an effective slit of 1 micron by 75 microns. The recording table and sample table are directly linked with a ratio arm of 1000:1. The speed of the scan is variable and is determined by the amount of pen deflection (as the pen is deflected the speed decreases giving the pen time to reach its maximum response). The chart thus produced represents a plot of chart displacement versus distance. This plot is manually smoothed by the analyst and is a judgment of what the edge would be if grain and other anomalies were absent.

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

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

[redacted]

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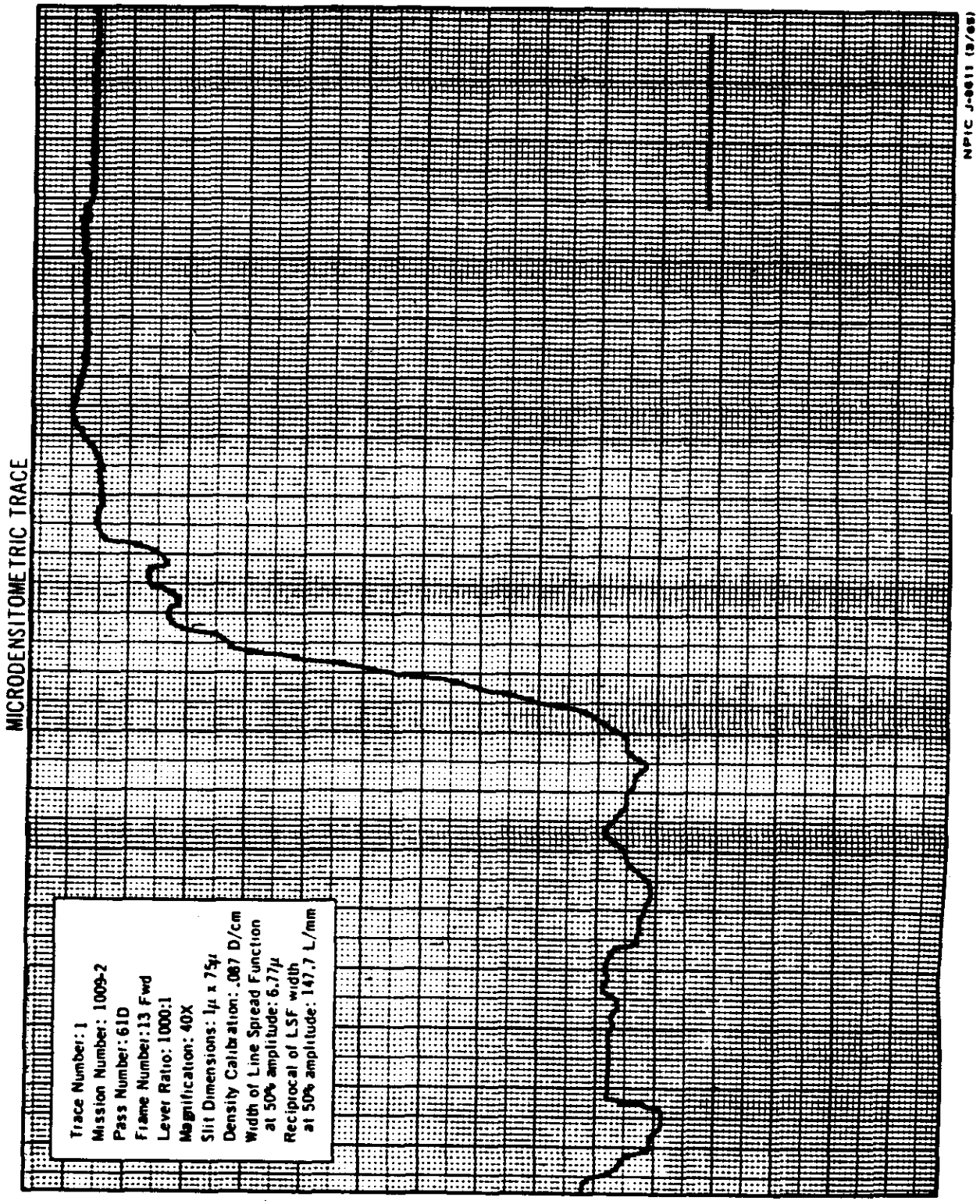

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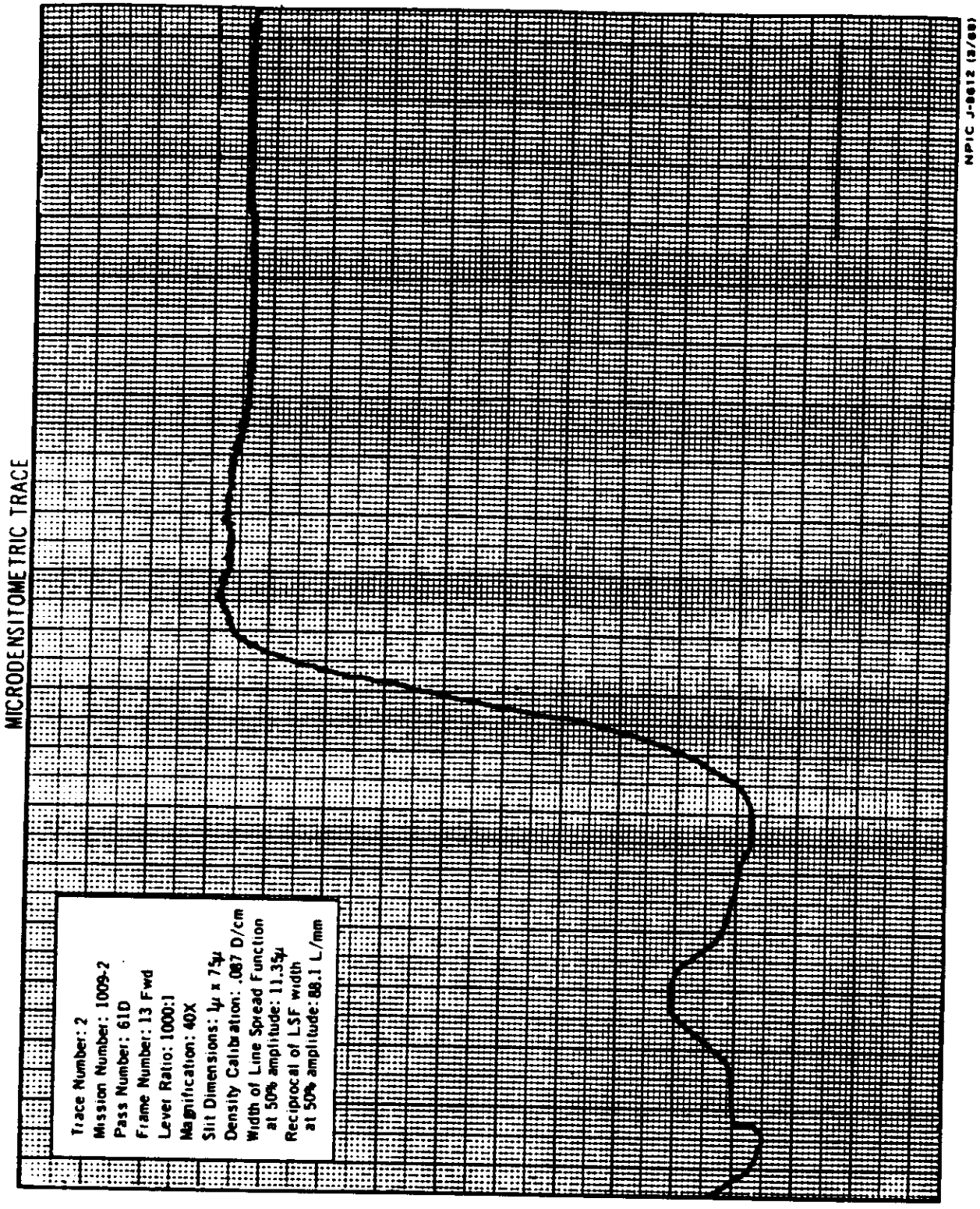
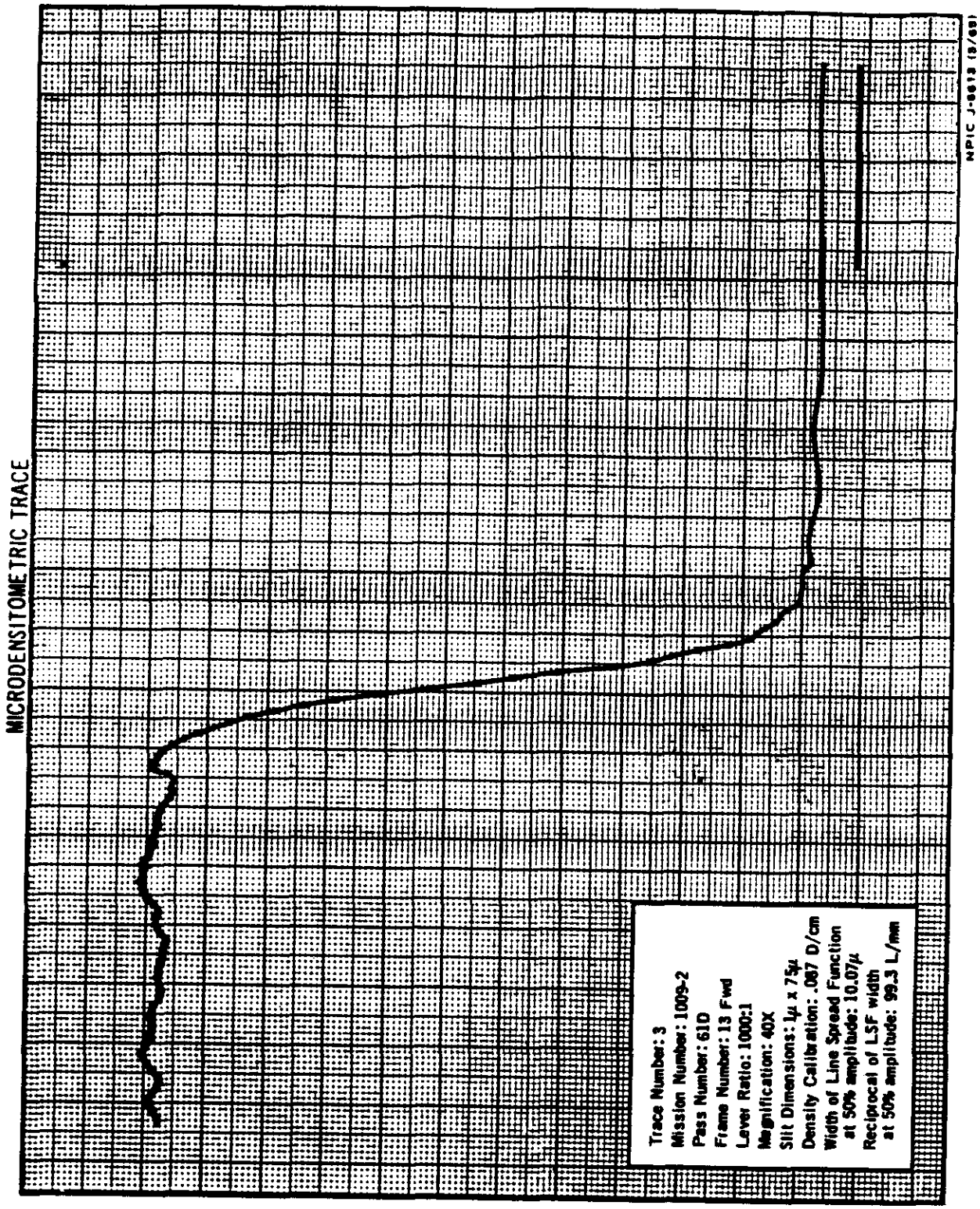


NPIC J-9612 (3/68)

[redacted]

[redacted]



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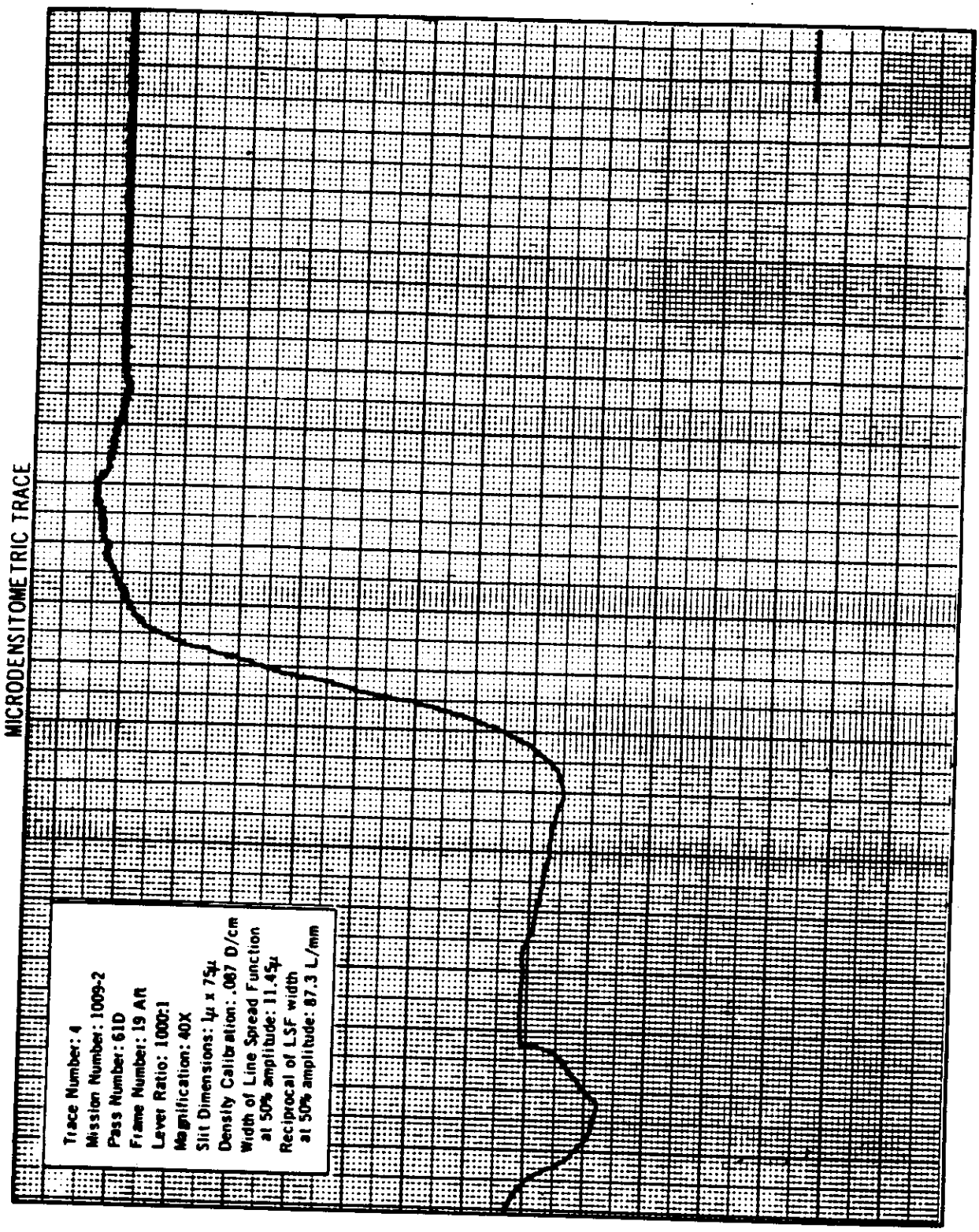

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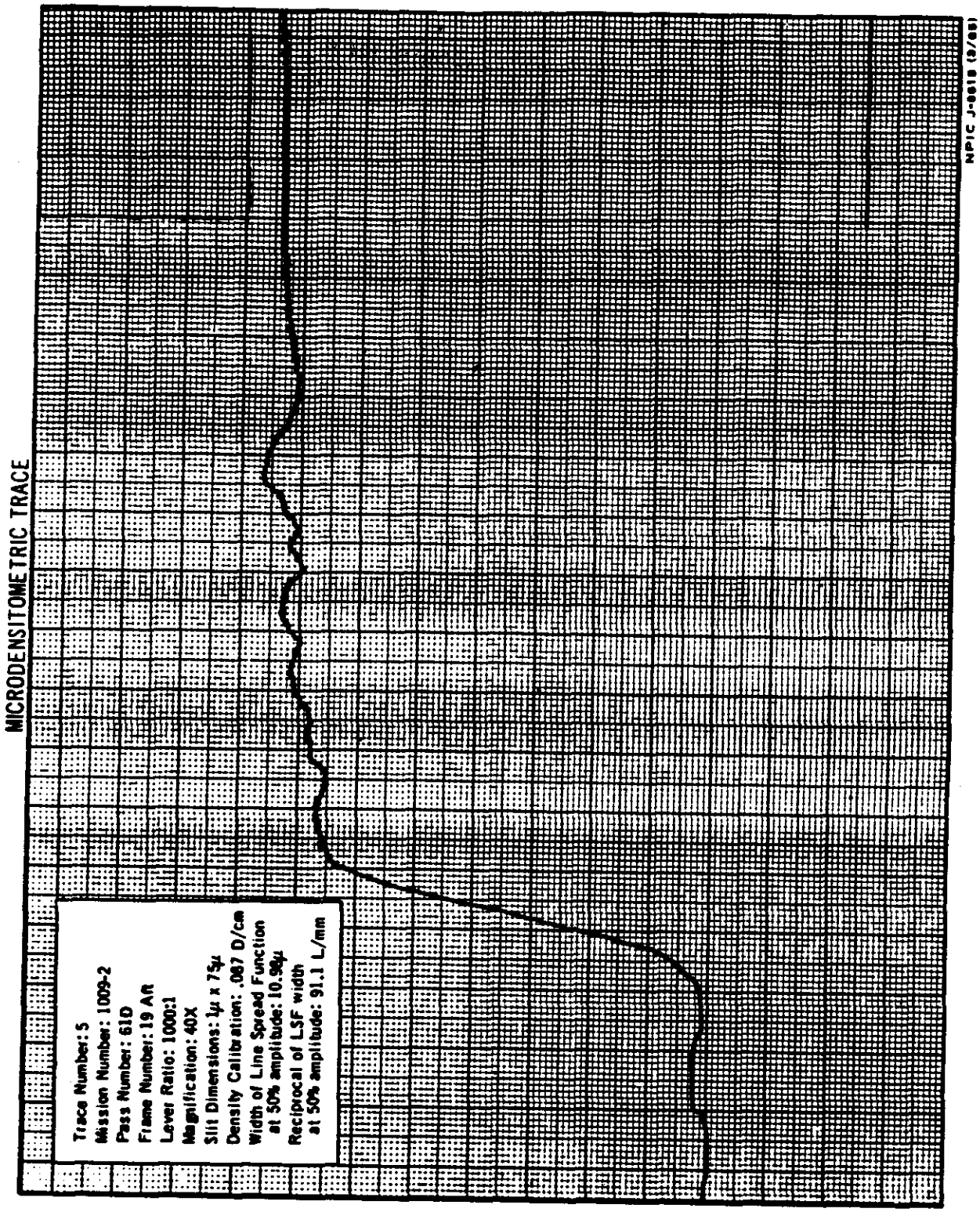

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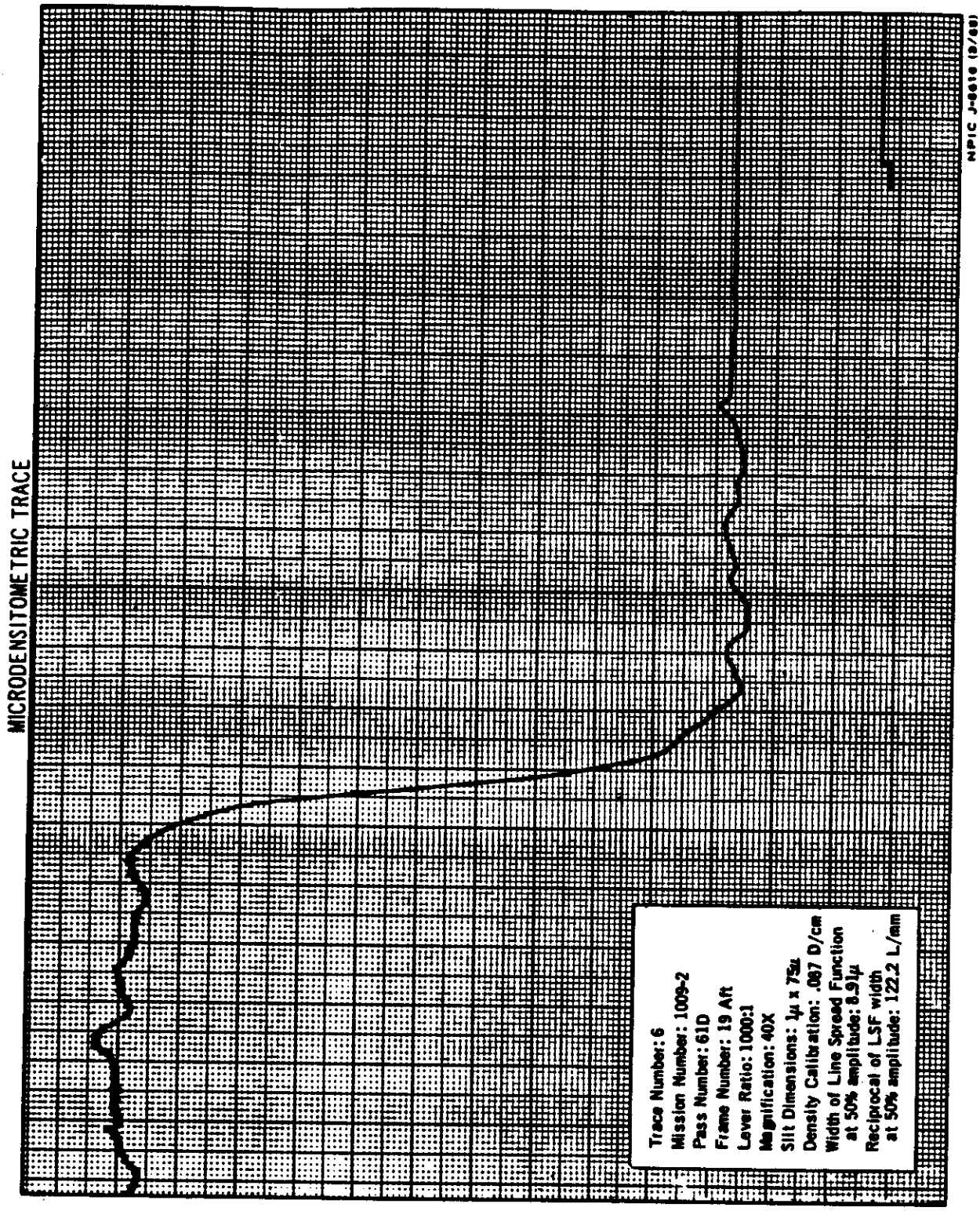
MICRODENSITOMETRIC TRACE
Trace Number: 6
Mission Number: 1009-2
Pass Number: 61D
Frame Number: 19 Aft
Laver Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .067 D/cm
Width of Line Spread Function
at 50% amplitude: 8.9μ
Reciprocal of LSF width
at 50% amplitude: 122.2 L/mm
NPIC J-6610 (8/68)

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APPENDIX D. CLOUD COVER ANALYSIS

1. INTRODUCTION

This study represents a statistical analysis of the cloud cover on the photography of Mission 1009. 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 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 photographic pass. For example: if the number of category 1 occurrences in a given pass is 200 out of a total of 1000 (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%
		43.78%

Hence, 43.8 percent of this pass is cloud covered.

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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%

TABLE 2
PERCENTAGE OF CLOUD COVER
CATEGORIES BY PASSES
MISSION 1009-1

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
6D	45.6	7.7	13.6	31.6	1.5	34.0
7D	6.7	19.6	36.8	36.7	0.2	45.5
8D	17.5	10.9	16.1	43.6	11.9	53.5
9D	19.3	3.6	11.1	52.1	13.9	58.8
10D	67.1	19.1	7.2	6.6	0.0	14.4
17D	0.9	29.5	24.1	43.3	2.2	49.1
20D	8.9	2.6	6.1	32.7	49.7	77.5
21D	21.0	28.8	17.4	23.4	9.4	39.7
22D	16.2	19.5	20.6	35.6	8.1	46.8
23D	19.6	24.1	27.9	20.6	7.8	39.1
24D	11.5	9.3	20.4	49.9	8.9	56.3

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Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
25D	6.4	7.3	18.6	60.0	7.7	61.4
37D	33.9	13.4	11.3	21.4	20.0	44.4
38D	31.0	12.5	22.9	30.2	3.4	38.5
39D	40.4	3.8	12.0	38.4	5.4	41.4
40D	13.1	15.0	15.4	43.1	13.4	54.8
41D	30.8	23.9	28.1	16.1	1.1	29.6
48A	0.0	0.0	1.1	79.6	19.3	79.4
49D	61.8	9.2	7.9	17.8	3.3	24.3
	23.7*	14.0*	17.6*	34.6*	10.1*	46.4**

MISSION 1009-2

52D	37.1	5.2	10.5	34.0	13.2	45.5
53D	3.7	11.5	26.9	37.2	20.7	61.0
54D	32.7	7.7	9.9	36.7	13.0	47.3
55D	60.7	6.4	18.5	13.1	1.3	22.3
56D	14.2	12.1	19.8	40.8	13.1	54.0
65D	0.0	17.1	51.3	30.3	1.3	46.5
69D	25.5	4.6	13.3	45.3	11.3	52.4
70D	42.3	7.0	14.0	33.0	3.7	37.1
72D	15.3	23.8	40.5	15.3	5.1	36.9
82D	28.0	4.0	6.9	31.1	30.0	58.1
85D	13.0	5.6	27.9	49.4	4.1	53.4
86D	28.2	7.7	24.8	38.4	0.9	41.9
88D	4.9	9.9	18.2	63.3	3.7	60.1
96D	13.8	29.3	37.2	19.2	0.5	34.9
99D	22.5	19.5	20.3	29.5	8.2	42.5
100D	2.0	4.3	18.7	49.3	25.7	70.6
101D	19.9	18.1	27.3	30.3	4.4	41.7
102D	0.0	3.7	15.3	50.5	30.5	74.8
112D	0.0	5.5	39.0	55.5	0.0	57.4
115D	4.0	9.6	7.9	42.1	36.4	72.8
116D	9.7	15.6	25.3	34.4	15.0	53.6
117D	30.3	27.5	6.6	21.3	14.3	39.1
118D	48.0	4.4	34.1	13.1	0.4	26.3
	22.4*	9.7*	19.3*	36.1*	12.5*	49.7**

* Average Percentage by Category for Mission.
** Overall Mission Cloud Cover Percentage.

[redacted]

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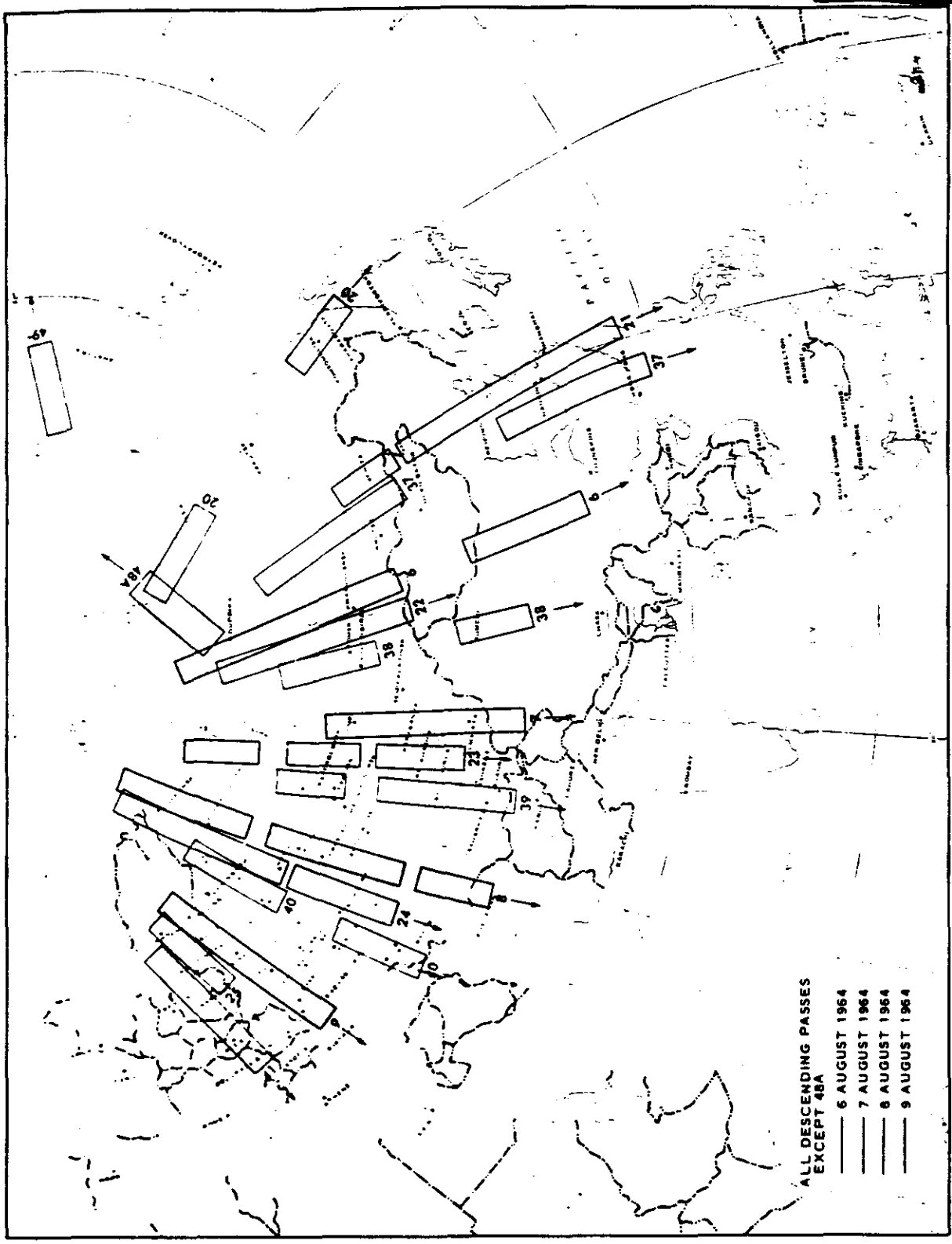
APPENDIX E. MISSION COVERAGE STATISTICS

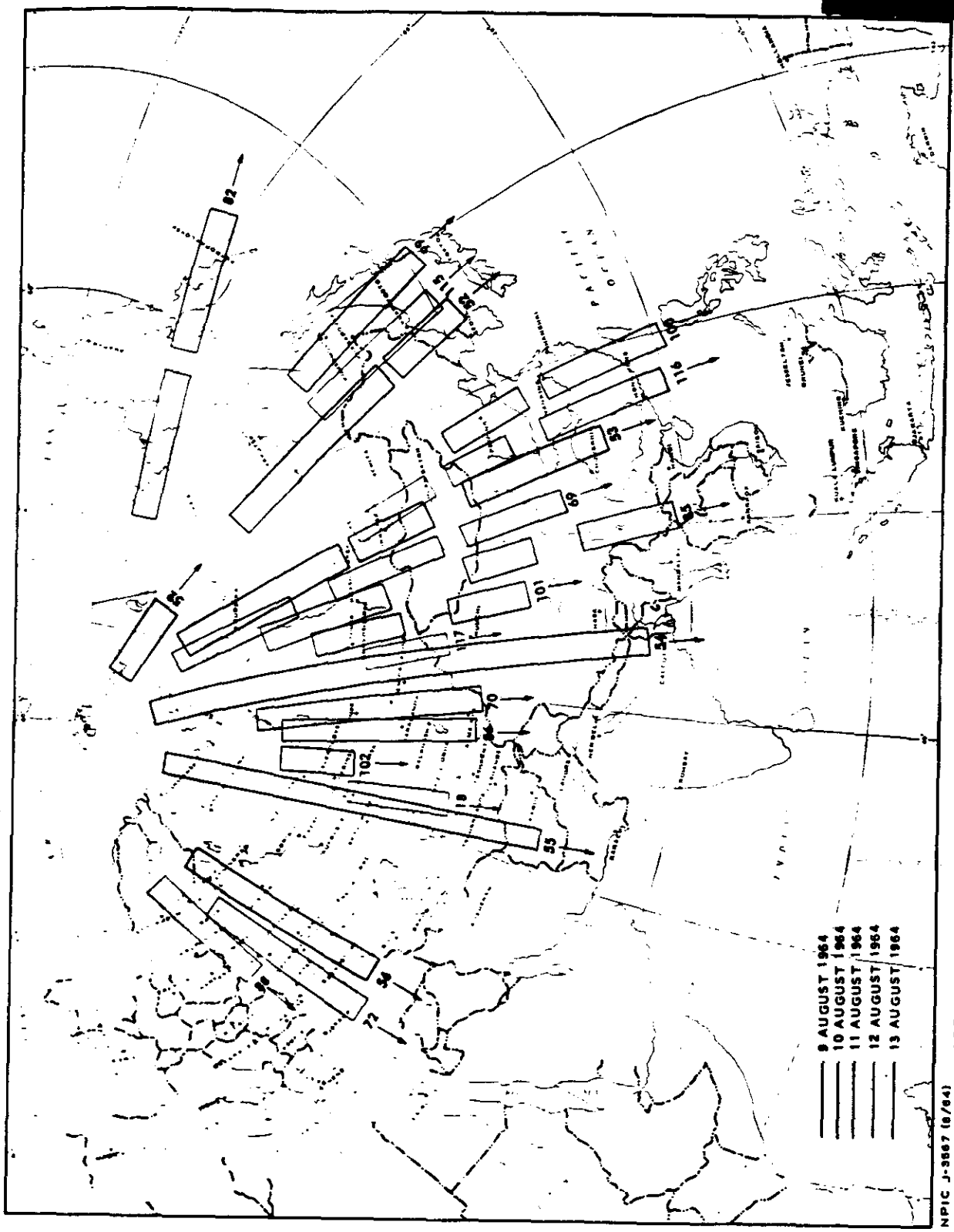
Summary of Plottable Photographic Coverage Mission 1009

6-13 August 1964

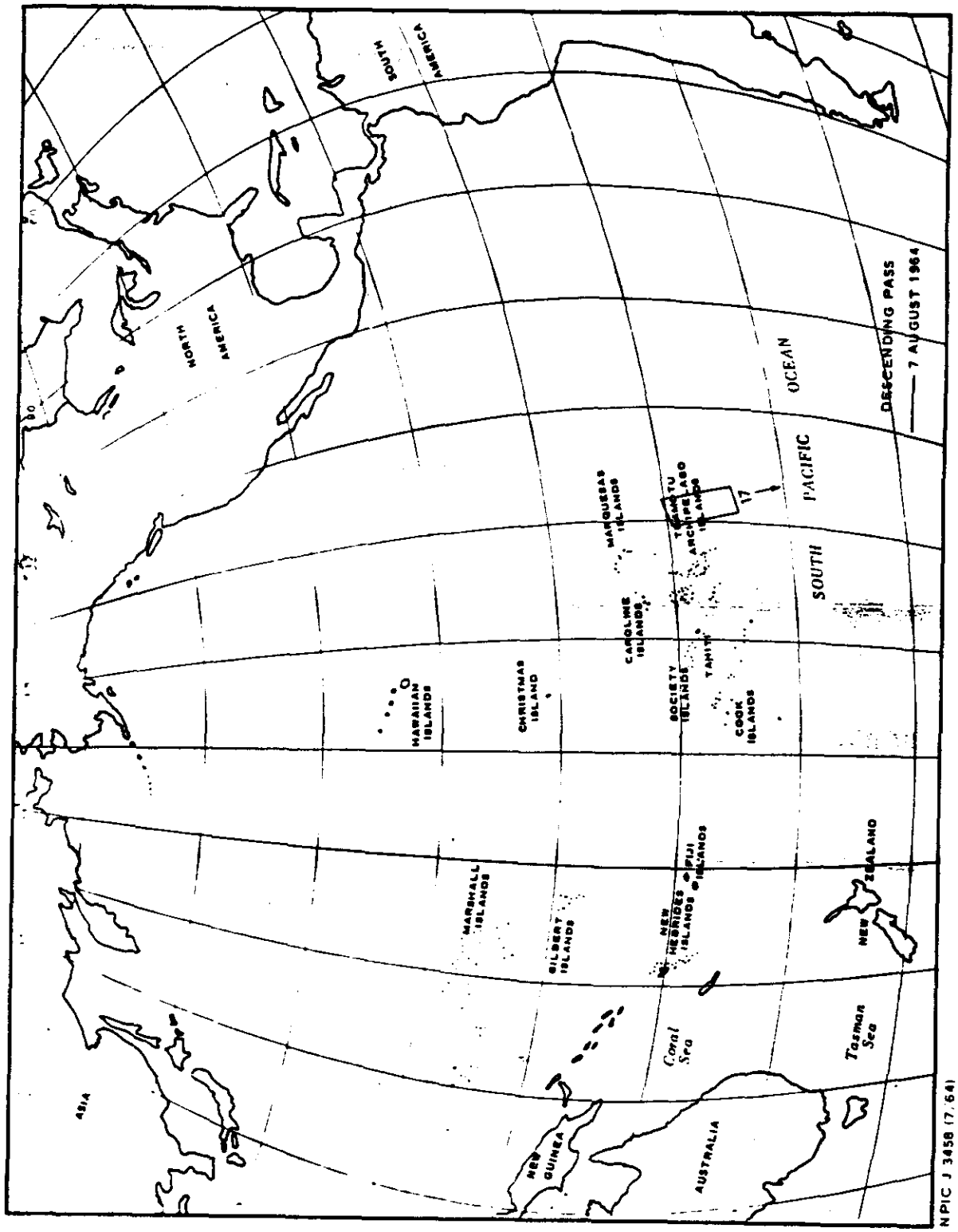
COUNTRY	Mission 1009-1				Mission 1009-2				TOTALS	
	FORWARD CAMERA		AFT CAMERA		FORWARD CAMERA		AFT CAMERA			
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
Afghanistan	86	12,384	37	5,328	123	17,712	82	11,808	328	47,232
Angola	62	8,928	31	4,464	none	none	none	none	93	13,392
China	2,912	392,112	3,002	405,068	5,516	786,096	5,383	766,944	16,813	2,350,220
Czechoslovakia	86	12,384	117	16,848	none	none	none	none	203	29,232
Finland	112	10,656	179	15,408	139	7,056	197	13,392	627	46,512
Formosa	144	14,688	144	14,688	none	none	none	none	288	29,376
Hawaii	none	none	none	none	90	1,296	138	2,016	228	3,312
Hungary	129	18,576	117	16,848	none	none	none	none	246	35,424
Hong Kong	none	none	none	none	12	292	12	292	24	584
India	none	none	none	none	61	8,784	19	2,736	80	11,520
Iran	117	16,839	53	7,632	none	none	none	none	170	24,471
Laos	none	none	none	none	4	576	none	none	4	576
Mexico	81	7,056	36	4,176	none	none	none	none	117	11,232
Mongolia	168	24,192	111	15,984	672	96,768	607	87,408	1,558	224,352
Nepal	none	none	none	none	12	1,728	43	6,192	55	7,920
North Korea	none	none	none	none	62	4,464	74	5,328	136	9,792
Norway	132	5,760	102	4,464	none	none	none	none	234	10,224
Pakistan	none	none	none	none	50	7,200	none	none	50	7,200
Poland	322	41,040	455	57,312	27	3,888	20	2,880	824	105,120
Republic of the Congo	185	26,640	154	22,176	none	none	none	none	339	48,816
Rumania	43	6,192	39	5,616	none	none	none	none	82	11,808
Sweden	176	3,600	234	8,784	none	none	none	none	410	12,384
Tuamotu Archipelago	19	288	19	288	267	3,744	267	3,744	572	8,064
Turkey	29	4,176	24	3,456	none	none	none	none	53	7,632
Union of Central African Republics	62	8,928	123	17,712	none	none	none	none	185	26,640
Continental US	967	133,056	1,066	149,616	262	22,608	314	27,072	2,609	332,352
USSR	13,071	1,832,800	13,186	1,780,980	16,271	2,182,752	16,347	2,032,344	58,875	7,828,876
Yugoslavia	129	18,576	39	5,616	none	none	none	none	168	24,192
TOTALS	19,032	2,598,871	19,268	2,562,464	23,568	3,144,964	23,503	2,962,156	85,371	11,268,455



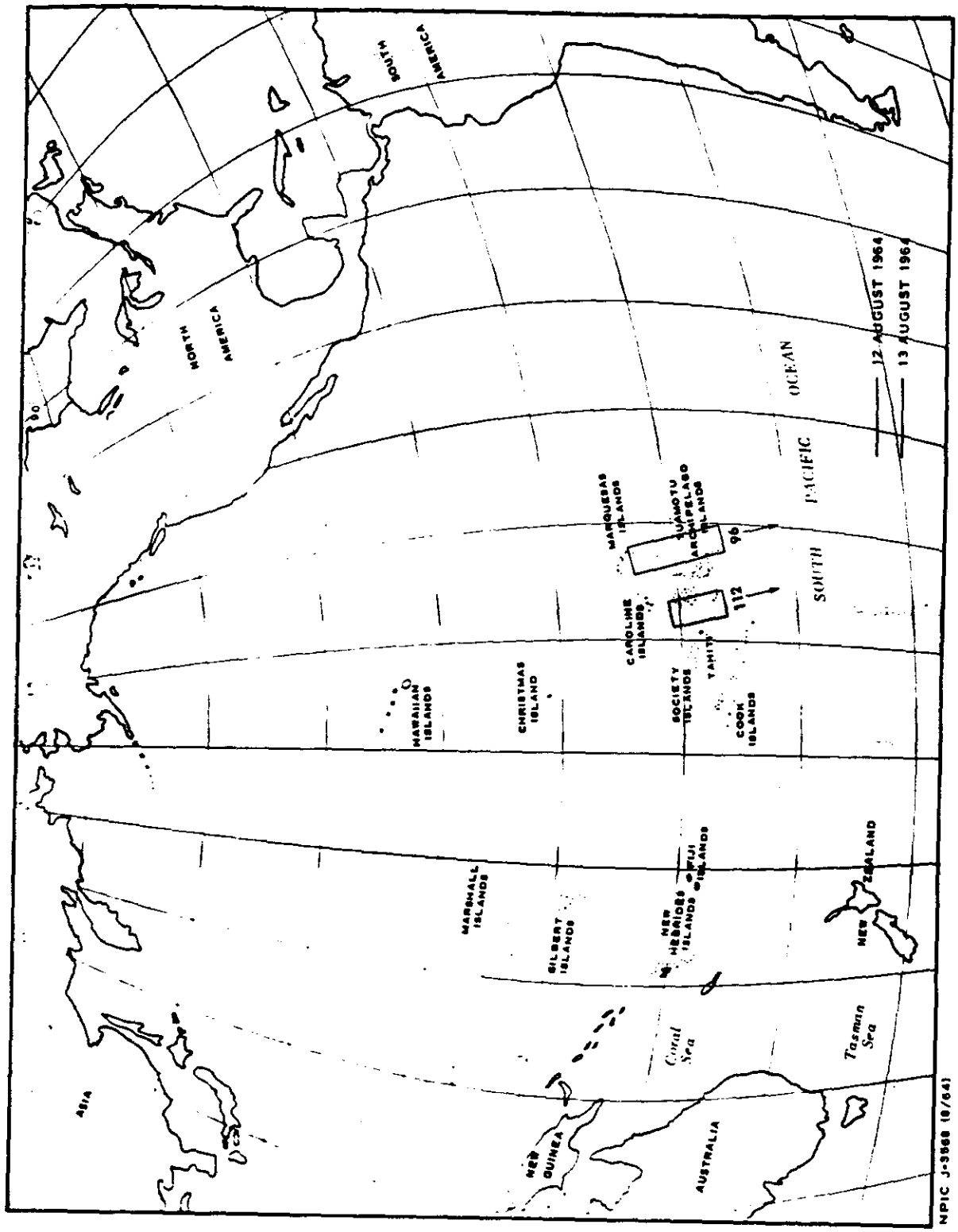
APPROXIMATE TRACK OF MISSION 1009-1, 6-9 AUGUST 1964 OVER USSR, FAR AND MIDDLE EAST.



APPROXIMATE TRACK OF MISSION 1009-2, 9-13 AUGUST 1964 OVER USSR, FAR AND MIDDLE EAST.

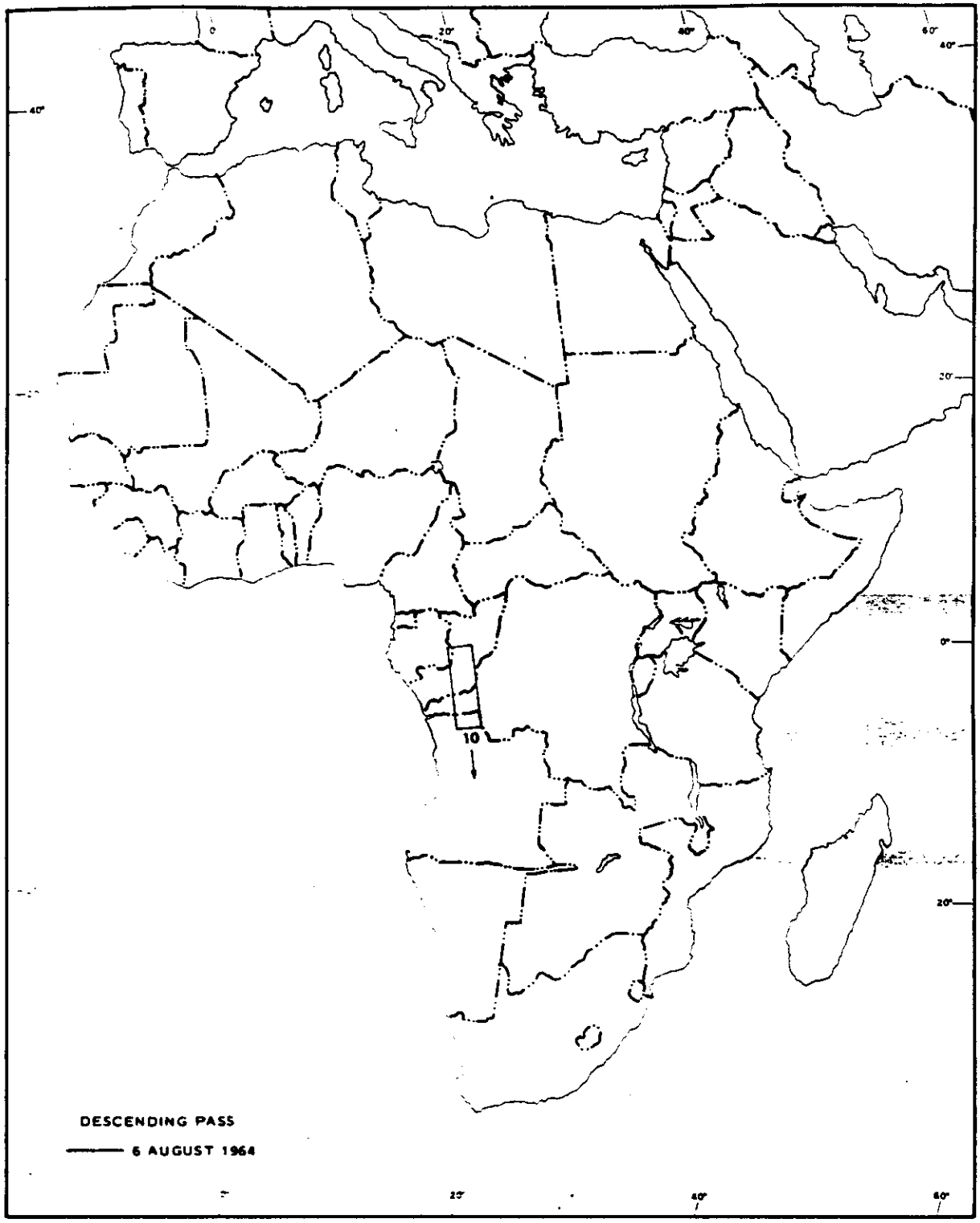


APPROXIMATE TRACK OF MISSION 1009-1, 6-9 AUGUST 1964 OVER SOUTH PACIFIC.



APPROXIMATE TRACK OF MISSION 1009-2, 9-13 AUGUST 1964 OVER SOUTH PACIFIC.

[redacted]



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APPROXIMATE TRACK OF MISSION 1009-1, 6-9 AUGUST 1964 OVER AFRICA.

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