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March 1965

TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1008
11-17 JULY 1964

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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

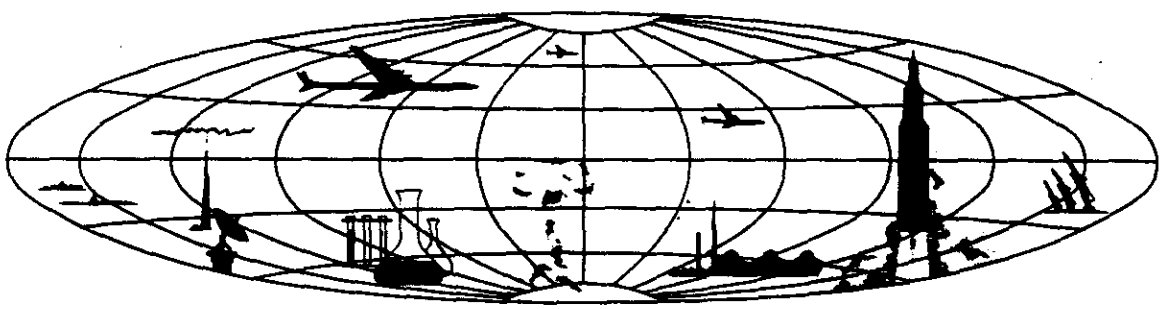

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TABLE OF CONTENTS

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TABLE OF CONTENTS (Continued)

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LIST OF ILLUSTRATIONS

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SYNOPSIS

Mission 1008 (J-10), the eighth in the J series reconnaisances system, was launched 10 July 1964 and consisted of two separate operational phases, designated Missions 1008-1 and 1008-2. Mission 1008-1 accomplished 22 photographic passes, two of which were programmed over the North American Continent, and 3 engineering (dark side) passes. The first payload was recovered and the second phase was activated on 14 July 1964. Mission 1008-2 made 24 photographic passes, including one pass containing domestic coverage, and 4 engineering passes. Recovery of the second payload on 18 July 1964 terminated the mission.

All cameras operated satisfactorily throughout the mission except the index unit in Mission 1008-2, which functioned properly only through frame 107. The shutter opened for exposure of frame 108 and remained open thereafter. This was the only major equipment malfunction.

Quality of the panoramic photography is good and is considered comparable with the results achieved in Mission 1004. The Slave (AFT) camera material contains an out-of-focus area along the fiducial edge at the supply ends of the formats. This condition is readily observed in passes 3D-31D, but diminishes appreciably in subsequent passes until it is no longer detectable. A similar degradation appeared in the photography obtained from Mission 1007. The horizon cameras associated with the panoramic instruments produced relatively good images. Slight vignetting of the format corners does not hamper use of the horizons for determination of vehicle attitude, which appears normal throughout the mission. A circuitry malfunction or random electrical eccentricity caused intermittent loss of the horizon fiducials, camera number, and binary record index lamps in both phases of the mission. This condition affected the Slave unit only.

The stellar/index camera functioned throughout Mission 1008-1 and produced good-quality imagery. As previously noted, only the stellar component sustained its performance in Mission 1008-2. At least 18 stellar images per frame are detectable, but approximately 35 percent of each format is affected by flares and/or reflections. In addition, the stellar footage exposed in Mission 1008-1 contains fogged areas which span 4-12 frames at each sequence coincident with programmed camera-off positions. Serious fogging occurs in Mission 1008-2.

Clouds and/or haze obscured approximately 42 percent of the panoramic photography in Mission 1008-1. The cloud cover increased somewhat in Mission 1008-2, degrading 47 percent of the photographic coverage.

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GENERAL FLIGHT DATA

Date of Launch: 10 July 1964

Orbital Parameters

	Planned		Actual (Average)	
	1008-1	1008-2	1008-1	1008-2
Period	91.05 min	91.05 min	90.98 min	90.93 min
Perigee	100.00 nm	100.00 nm	100.71 nm	100.67 nm
Apogee	259.00 nm	259.00 nm	258.89 nm	258.60 nm
Eccentricity	0.022	0.022	0.021986	0.0218
Inclination Angle	85.00°	85.00°	84.99°	84.98°

PART I. CAMERA OPERATION

1. Master (FWD) Panoramic Camera No 150: The camera was operational throughout the mission and the photography is comparatively free of degradation by light leaks and static discharges. Equipment shadowgraphs are present in the first, third, and last frames of approximately 50 percent of the passes. An exception is noted in pass 9D, where the last four frames are affected. The film edges contain continuous, fine rail scratches, which are not always readily detectable. There are two end-of-pass markers at each camera-off position, one generally displaced from the other by 15 to 20 inches. Occasionally, one of the markers is imprinted over the binary record. The shrinkage markers are ragged. The frequency marks, although flared, are recorded outside the formats and are readable in all cases. Random minus density streaks are minor and few, but a continuous, faint streak through the format centers (oriented to the long axis of the film) is detectable at some point in most passes and is presumed to be present throughout the film. The camera number is flared but readable. The adjacent binary index lamp is also flared.

2. Slave (AFT) Panoramic Camera No 151: The Slave instrument was operational throughout the mission and the photography is comparable to that obtained by the Master unit except for the out-of-focus area, which is present in most of the first-phase passes. The degradation is first detected in Pass 3D, frame 73. All subsequent passes, including 31D, are affected. The next operational pass (36D) still exhibits an out-of-focus condition, but to an appreciably lesser degree. From that point on, the degradation gradually diminishes until no longer detectable. The out-of-focus area is stabilized at the supply end of the fiducial edge. It extends approximately 1.50 inches into the photography and measures roughly 5.0 inches along the edge of the format. Length, width, and contour of the affected area vary, but the basic pattern remains the same. Mission 1004 exhibited

[redacted]

a similar degradation. Minor corona static discharges with associated fogged areas occur at random in a few passes, but image degradation is slight. Equipment shadowgraphs are more numerous than in the Master material and are present at the beginning and end of virtually all passes. In addition, minor light leak traces, commonly associated with camera on-off operations, are present in the second or third and fourth frames of most passes. These traces strike diagonally across the frequency mark edge in the second or third frames, but enter the format across the titled edge in the fourth frame. Somewhat heavier traces appear in the next-to-last frames, extending across the formats from edge to edge. Both edges contain fine rail scratches. The frequency marks are flared but are recorded outside the formats. Minor minus density streaks are present at random throughout the film, but not in excessive numbers. The shrinkage markers and the titled edges of the formats, on the take-up sides, are ragged. Two end-of-pass markers are recorded at most camera-off positions. The displacement between markers is similar to that noted in the master material. A circuitry malfunction or electrical eccentricity caused the camera number and binary record index lamps to fail intermittently from Pass 3D to the end of the mission. Initially, the camera number and binary index lamps failures span from 30 to 40 consecutive frames. However, as the mission progresses only one or two frames at a time are affected, with relatively long operational periods between malfunctions.

3. Master Horizon Cameras:

a. The port (supply) horizon camera was operational throughout the mission. The images are vignetted but the horizon curves are unaffected and remain usable for determination of vehicle attitude. Exposure was adequate and image quality is good.

b. The starboard (take-up) horizon camera was operational throughout the mission. Exposure was adequate and image quality is good. The image corners are vignetted, as in the portside photography, without affecting the usefulness of the horizon curves.

4. Slave Horizon Cameras:

a. The starboard (supply) horizon camera was operational throughout the mission. However, the fiducials were intermittently inoperative, coincident in most cases with the camera number and binary index lamps failures reported in preceding sections. Quality of the horizon images is inferior to the master horizon camera imagery. The photography appears soft, as if veiled or hazed. The source of this apparent degradation has not yet been ascertained with any degree of assurance. This condition is less noticeable in 1008-2, where the horizon images approach a more acceptable quality. The image corners are vignetted but the horizons curves are not injured.

[redacted]

b. The port (take-up) horizon camera was operational throughout the mission. Previous comments concerning the fiducials apply to this camera also. Similarly, the image corners are vignetted, but the horizon curves are unaffected. Image quality is slightly inferior to the master horizon camera photography but generally better than the starboard horizon imagery discussed in a. above.

5. Stellar Camera No 48 (Mission 1008-1): The stellar camera was operational throughout the mission. At least 18 stellar images per format are detectable despite degradation by flare and/or reflected light. Both film edges contain intermittent dendritic static discharges which become more intense and intrude into the formats in the last few frames. There are 5 areas of general fog which span from 4 to 12 consecutive frames. The overall effect is mildly degrading in the sense that the gross fog level is increased but detection of the stellar images is not impaired to an appreciable degree.

6. Index Camera No D45 (Mission 1008-1): The index camera was operational throughout the mission and produced good-quality photography. Degradations are few and consist primarily of a variety of static discharges which are confined to the last three frames only.

7. Stellar Camera No 33 (Mission 1008-2): The camera was operational but the film is seriously degraded by assorted light-induced degradations, including equipment shadowgraphs and areas of general fog. A severe light leak strikes across the edge adjacent to the camera number at each camera rest period. The intensity of the fogging in some areas is such that detection of stellar images in the affected frames is completely precluded. In other cases, degradation is slight. A light leak of unknown origin degrades the last 20 frames. In addition, the last half of the footage contains dendritic static discharges on both edges and associated fog patterns that degrade a number of formats. Transverse emulsion cracks are noted in approximately the last 10 percent of the stellar footage.

8. Index Camera No D28 (Mission 1008-2): The camera was operational through frame 107. In the following frame the shutter opened for the exposure but failed to close for the remainder of the mission. All terrain imagery subsequent to frame 107 is completely obliterated.

9. Associated Equipment:

a. The binary record was operational throughout the mission except in two cases (22D AFT, frame 164, and 38D AFT, frame 184) where it failed to appear.

b. The binary index lamps, camera number, and horizon camera fiducials failed intermittently in the slave camera, due to a malfunction or eccentricity in the common circuitry.

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c. The frequency marks are flared, with reflected images, but are recorded outside the formats and are readable in all cases. The marks appear slightly underexposed when compared with previous missions, but their readability is not impaired in any sense.

d. The camera number is slightly flared.

e. The center shrinkage markers are ragged.

f. Two end-of-pass markers are present at most camera-off positions. Occasionally, a marker is imprinted over the binary record.

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FIGURE 1. EXAMPLE OF HORIZON IMAGERY.

NPIC J-8178 (2/68)

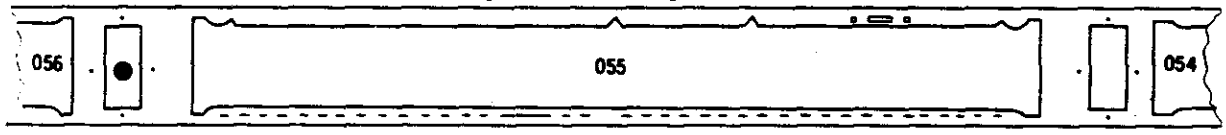
[redacted]

[redacted]

Pass . . . . . 3D AFT
Frame . . . . . 055 Starboard Horizon
Enlargements 3X

Note vignetting and slight veiling of the image.

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



NPIC J-8179 (3/65)

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FIGURE 2. LIGHT LEAK, STELLAR MATERIAL.

NPIC J-8180 (2/68)

[redacted]

[redacted]

Stellar Camera
Frames 315-317
Enlargement 2X

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FIGURE 3. LIGHT LEAK AND STATIC DISCHARGES, STELLAR MATERIAL.

NPIC J-8181 (2/65)

[redacted]

[redacted]

Stellar Camera
Frames 319-322
Enlargement 2X

[redacted]

[redacted]

[redacted]

FIGURE 4. EXAMPLE OF INDEX PHOTOGRAPHY.

NPIC J-8162 (2/68)

[redacted]

Index Camera
Frame 384
Enlargement 3X

[redacted]

PART II. FILM

1. Film Footage/Frame Totals:

	1008-1	1008-2
Master (FWD) Camera	7,860 ft/2,847 frames	7,991 ft/3,008 frames
Slave (AFT) Camera	7,795 ft/2,818 frames	8,044 ft/3,030 frames
Stellar Camera	64 ft/ 404 frames	60 ft/ 421 frames
Index Camera	108 ft/ 404 frames	102 ft/ 107 frames

Total Footage/Frames, Master Camera: 15,851 ft/5,855 frames
Total Footage/Frames, Slave Camera: 15,839 ft/5,848 frames
Total Footage/Frames, Panoramic Cameras: 31,690 ft/11,703 frames

The last seven master panoramic frames and the last six slave panoramic frames of the terminal pass in Mission 1008-1 (Pass 47DE) were recovered with the second payload. In every mission utilizing the two-phase concept, the last few frames of first-phase photography will be contained at the head of the second-phase payload. Attention is also called to the terminal pass in Mission 1008-2 (Pass 110D) which is monoscopic in this particular case and contains slave panoramic photography only. Monoscopic coverage, utilizing either panoramic camera, may be programmed into any part of a mission.

2. Film Processing: This section provides evaluations of processing, exposure, density, and physical condition of the original negatives. Processing data is abstracted from records maintained by the processing contractor. Evaluation of exposure and determination of the material's physical condition are accomplished by on-site inspection of the negatives as they are made available for breakdown and titling. Densitometric readouts and a final, more thorough examination of the negatives are conducted by photographic analysts at a later date.

The majority of the footage in Missions 1008-1 and 1008-2 received adequate exposure. However, low solar elevation and/or variations in terrain reflectivity caused some departures from the normal.

The following development levels were employed in processing the film:

	Mission 1008-1		Mission 1008-2	
	Master	Slave	Master	Slave
Primary	4%	4%	3%	3%
Intermediate	32%	27%	31%	30%
Full	64%	69%	66%	67%

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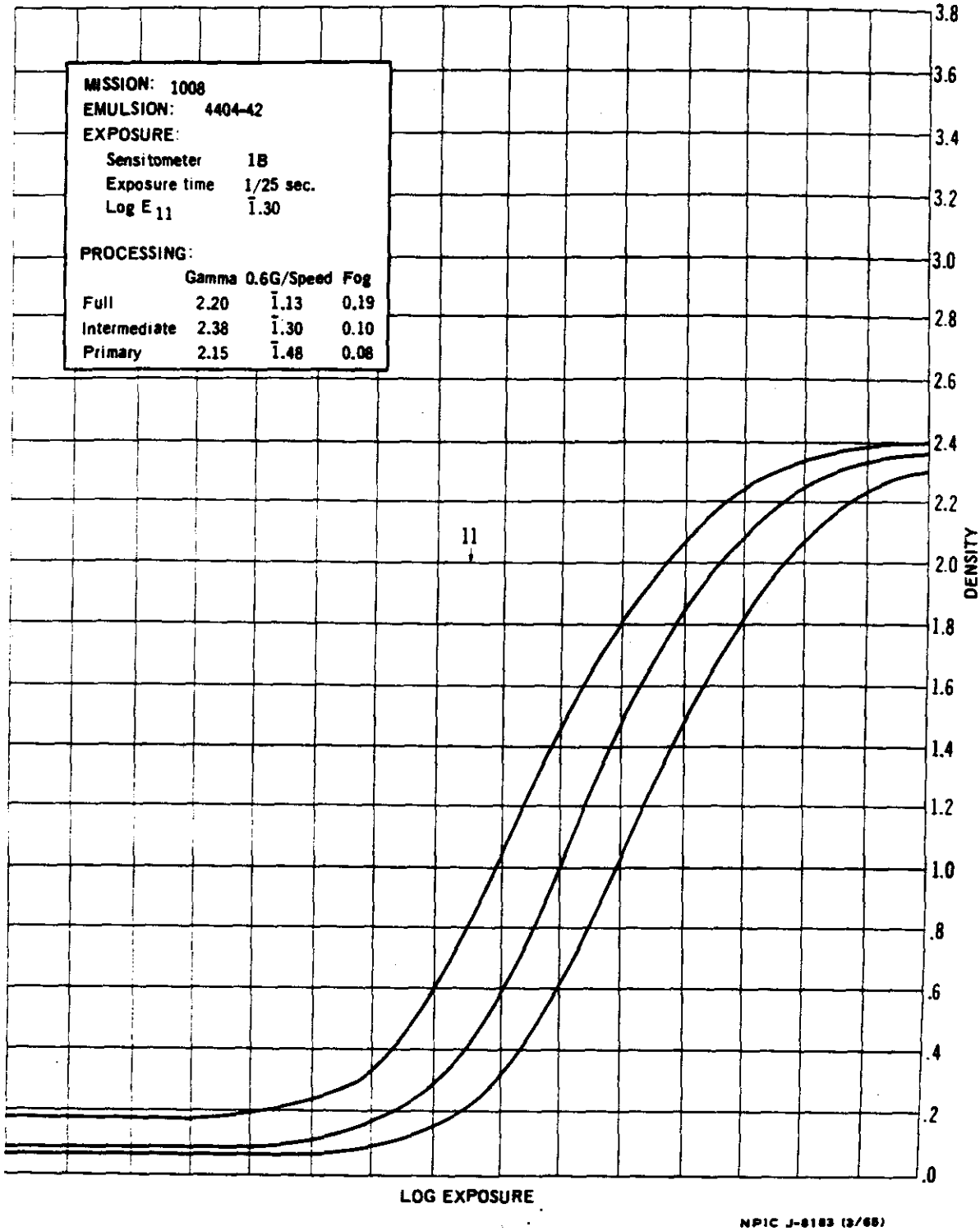
STANDARD SENSITOMETRIC CONTROL CURVES



NPIC J-8183 (3/68)

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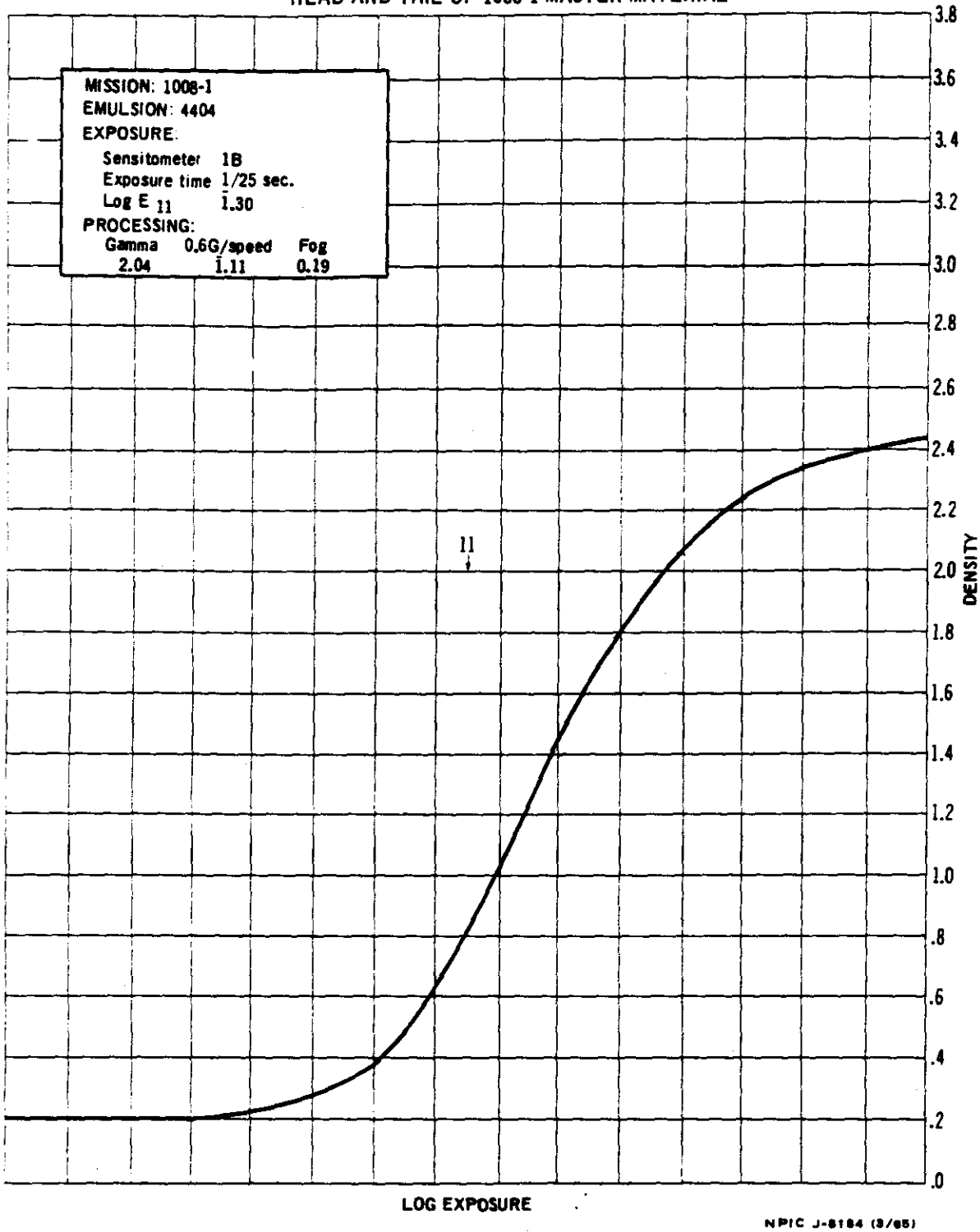
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-1 MASTER MATERIAL



NPIC J-8184 (3/65)

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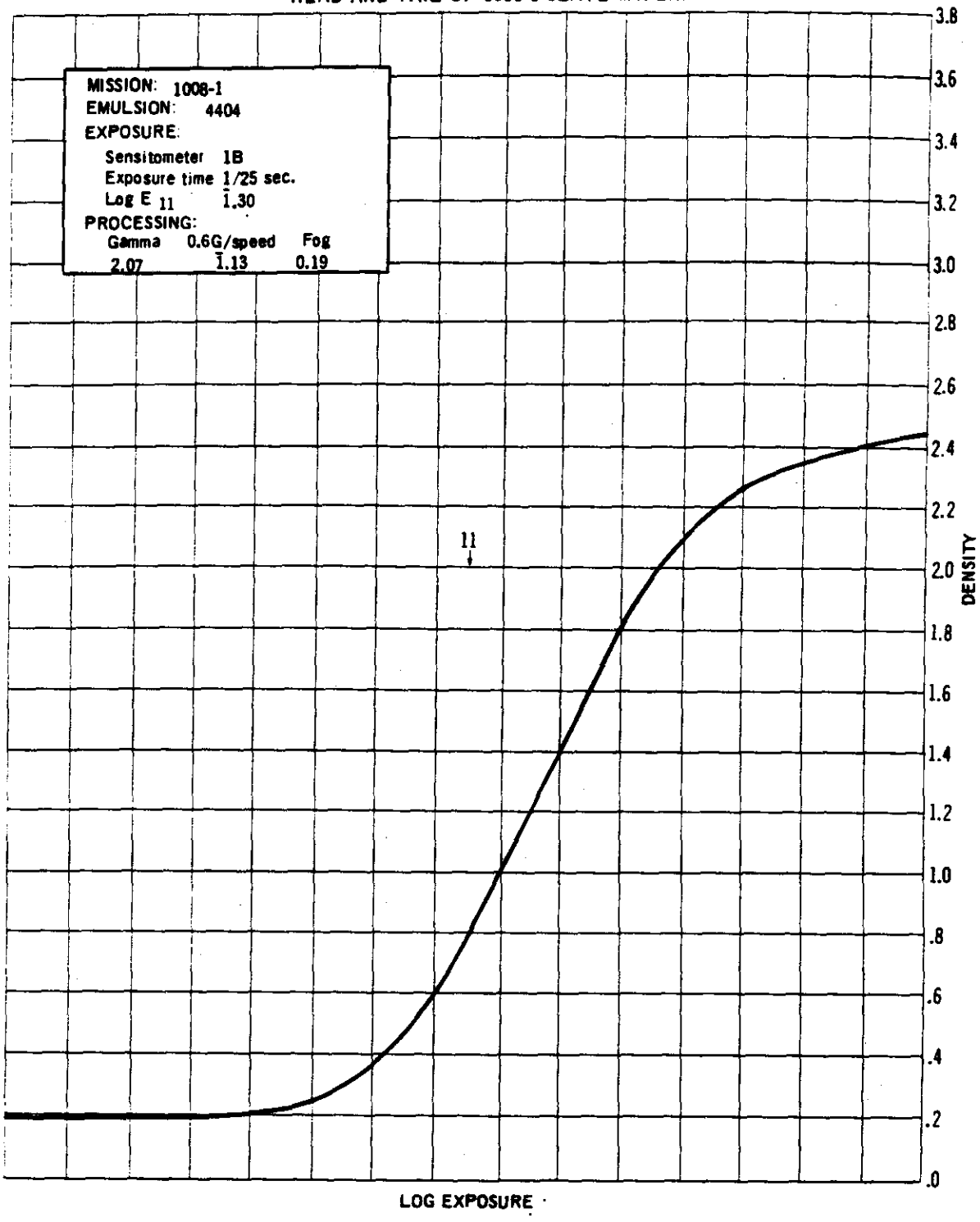
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-1 SLAVE MATERIAL



NPIC J-8185 (3/65)

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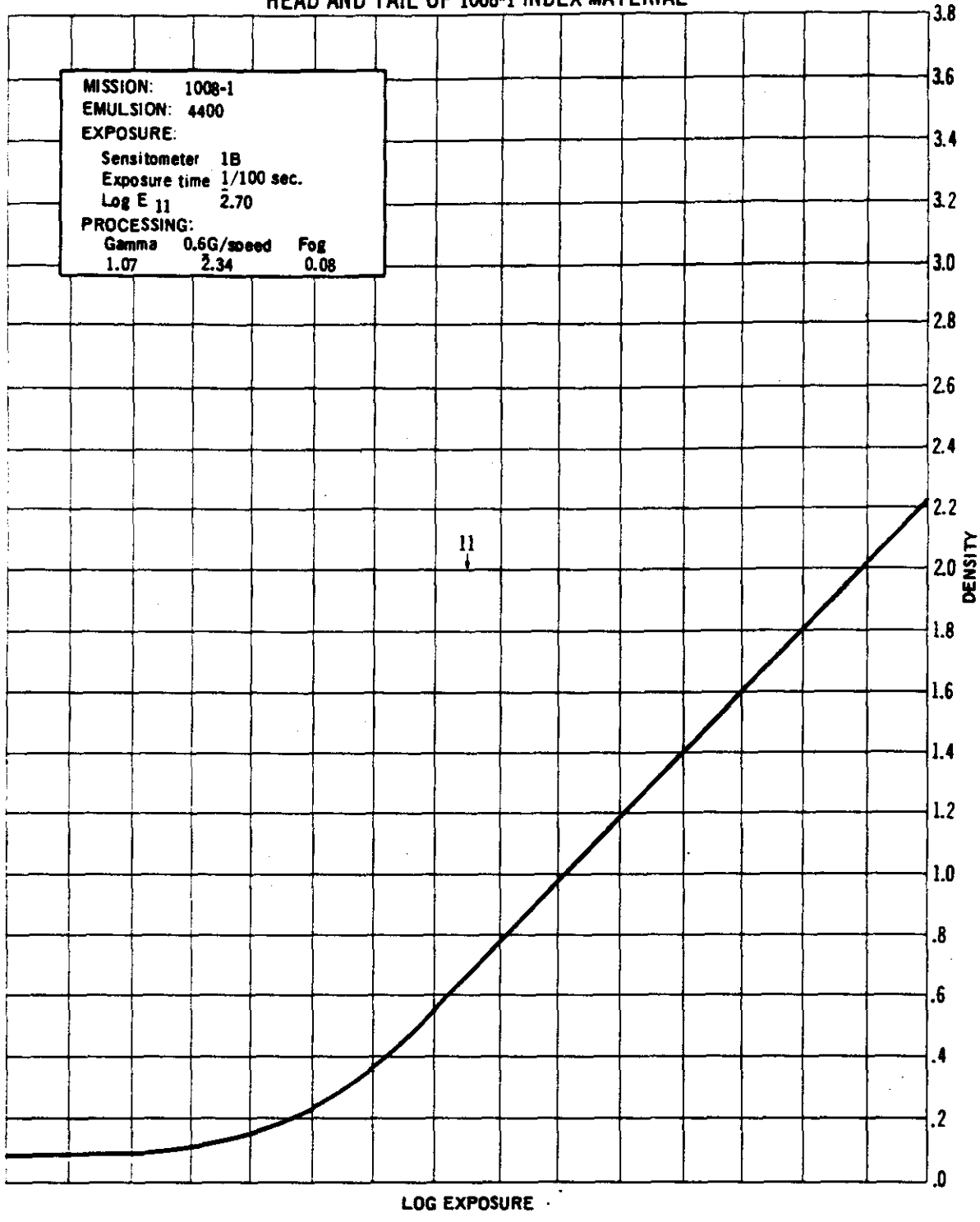
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-1 INDEX MATERIAL



NPIC J-8186 (3/65)

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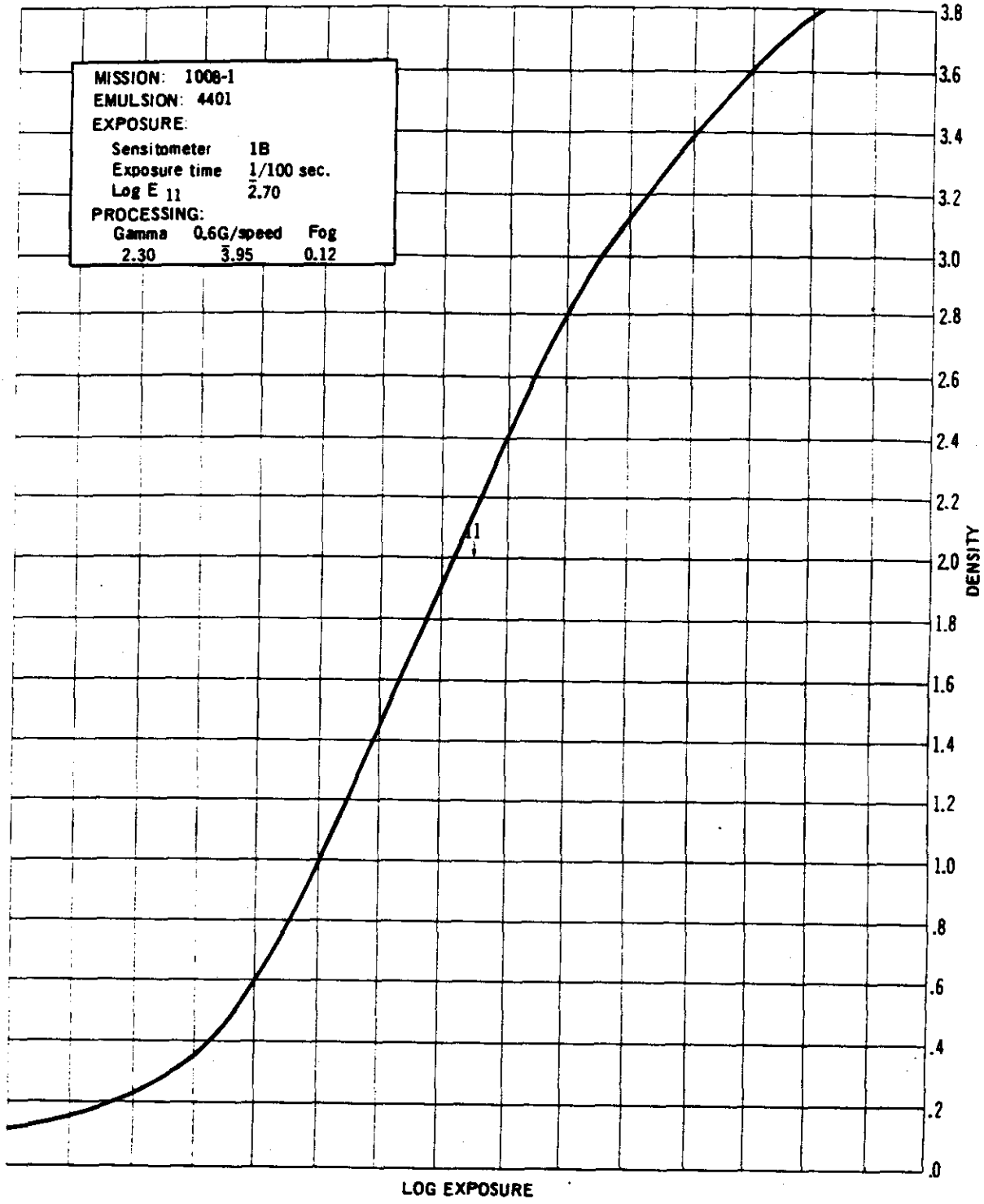
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-1 STELLAR MATERIAL



NPIC J-8187 (3/68)

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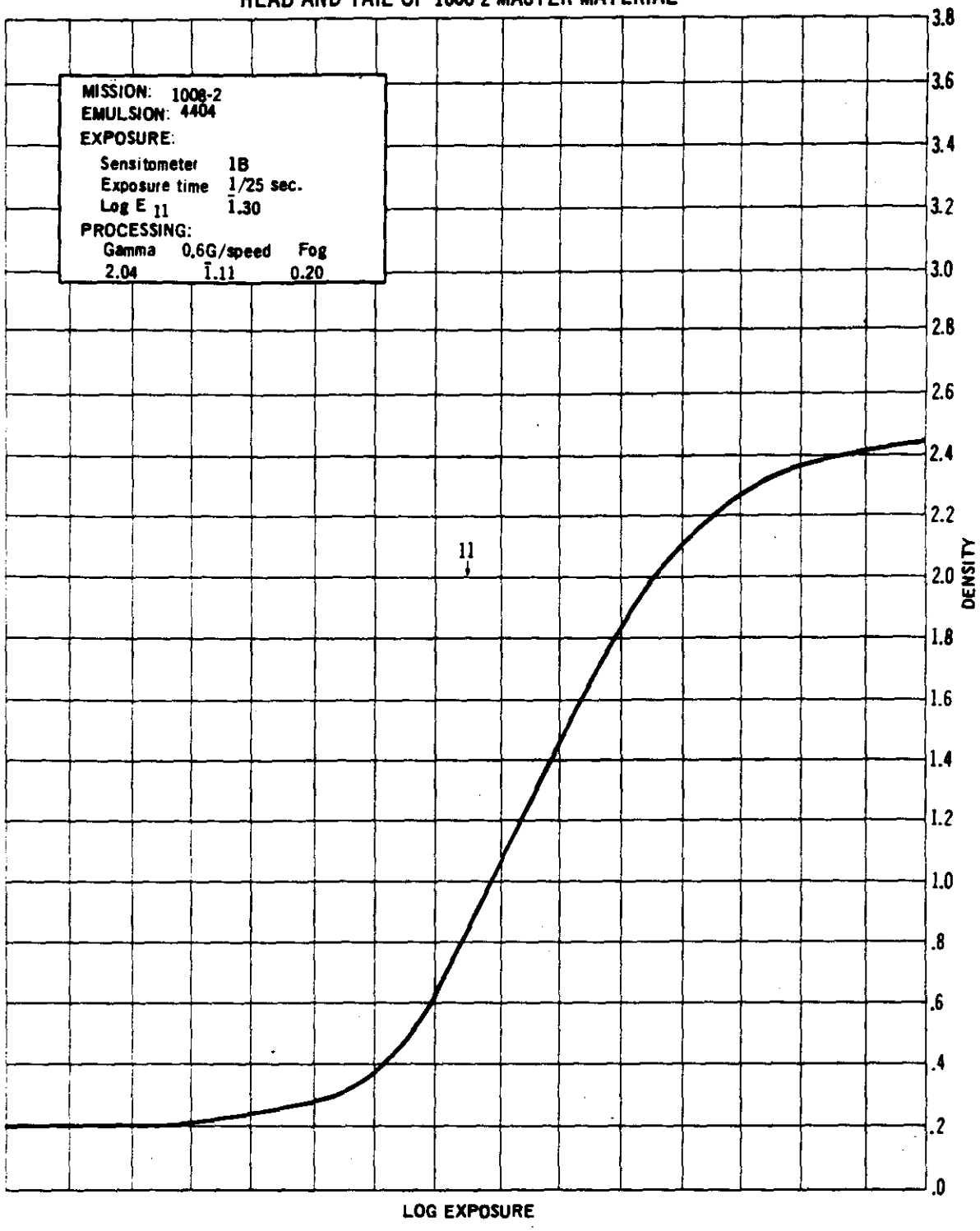
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-2 MASTER MATERIAL



NPIC J-8188 (9/68)

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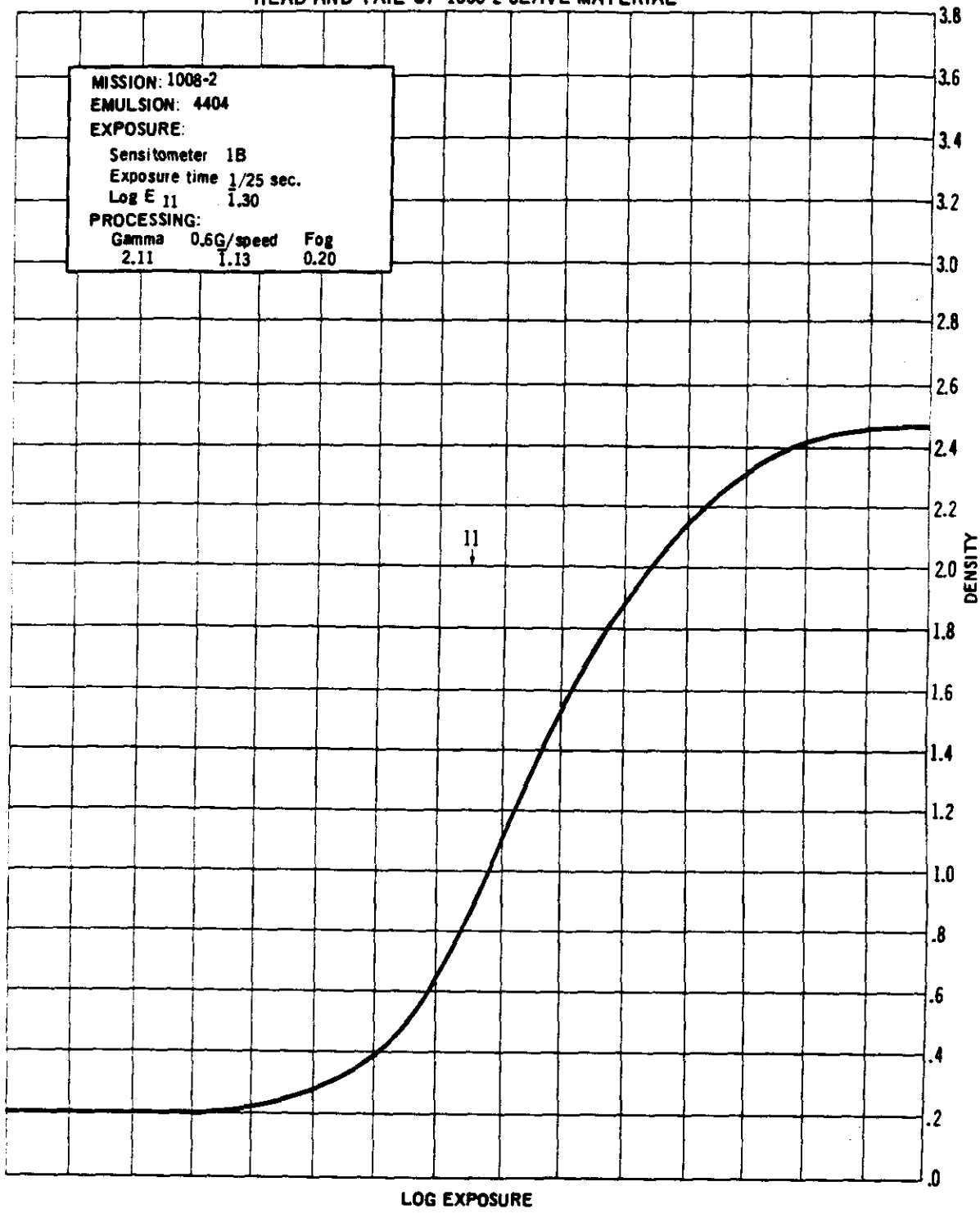
SENSITOMETRIC CURVE FROM HEAD AND TAIL OF 1008-2 SLAVE MATERIAL



NPIC J-8188 (3/68)

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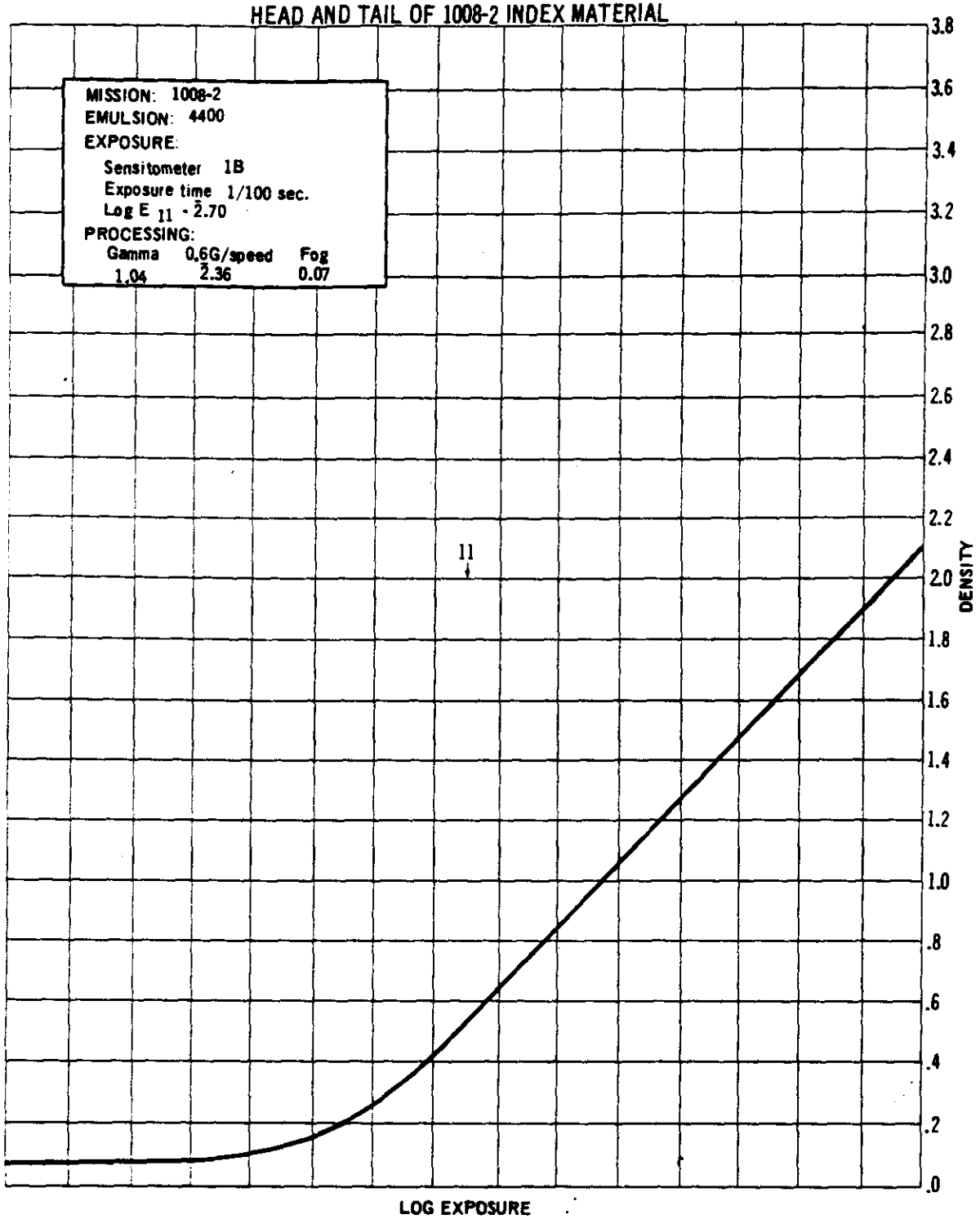
SENSITOMETRIC CURVE FROM
HEAD AND TAIL OF 1008-2 INDEX MATERIAL



NPIC J-8180 (3/68)

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Thirty-nine changes in development levels were employed in processing the Master Camera take and 35 changes in the Slave camera take of Mission 1008-1. Processing the Master camera material of Mission 1008-2 required 41 changes and 35 changes were executed in processing the Slave camera material.

3. Film Degradations: Examples of typical film degradations are noted in this section.

A. Master (FWD) Panoramic Camera No 150:

Light Leaks	Approximately 50 percent of the passes contain equipment shadowgraphs in the first, third, and last frames. Film transport indications are occasionally noted in the first and last frames of a number of passes.
Scratches and Abrasions	Both edges contain fine rail scratches which are not always readily detectable. Emulsion scratches occur intermittently, as in Pass 6D, frames 001-020, and in the last few frames of that pass. Additional examples are found in Pass 21D, frames 076-123, and Pass 22D, frames 003-008, 061-065, and 117-150. Very fine emulsion scratches are present in Pass 102D, frames 001-016 and 030. Abrasions are minor and few.
Emulsion Digs	Small digs are present at random throughout the film. Examples are Pass 3D, frames 086 and 096; Pass 6D, frames 140 and 199; Pass 52D, frames 036, 048, 056, 061 and 062.
Pinholes and Blisters	Intermittent and few. Examples: Pass 7D, frame 023; Pass 52D, frame 089. Small emulsion defects are also noted at random, as in Pass 24D, frame 059, and Pass 84D, frame 013.
Minus Density Streaks	A continuous, faint, minus density streak is observed to run through the format centers, roughly equidistant from and parallel to the film edges. Although not always detectable, it is probable that this streak is consistently present. Other minor minus density streaks are present at random throughout the film.

B. Slave (AFT) Panoramic Camera No 151:

Light Leaks	Film transport indications are present in the first and last frames of most passes. Equipment shadowgraphs are also present at the beginning and end of most passes, primarily in the second or third frames and

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	the last 3 frames. In addition, a narrow, diagonal light leak strikes across the frequency marks edge of the second or third frames. A similar trace enters the format across the fiducial edge of the fourth frame, and a more intense light leak extends from edge to edge in the next to last frame of most passes.
Corona Static	Small corona static discharges are present in a number of frames. Examples: Pass 40AE, frames 003, 004; Pass 56AE, frame 003; Pass 70D, frame 003. The discharges are not intense and are difficult to detect in frames containing normal imagery.
Scratches and Abrasions	Rail scratches are present on both edges. Emulsion scratches are noted intermittently throughout the film. Examples: Pass 8D, frames 162-164; Pass 22D, frames 041, 058, 059, 070, 060-068; and Pass 85D, frames 020, 022, 030, 042, 043. Abrasions are few, as in Pass 52D, frame 041, and Pass 53D, frame 037.
Emulsion Digs	Minor, random digs are present throughout the material. Examples: Pass 2D, frame 037; Pass 9D, frames 129-134; and Pass 24D, frames 076, 110, 111, 115, 117.
Pinholes and Blisters	Intermittent and few. Example: Pass 7D, frame 023. Minor emulsion defects are more numerous, as in Pass 6D, frame 092, and Pass 24D, frames 045, 047, but are not present in excessive numbers.
Minus Density Streaks	Minus density streaks are noted intermittently throughout the film. Example: Pass 9D, frames 129-134. The streaks are not numerous or particularly degrading.

PART III. IMAGE QUALITY

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

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PI suitability ratings are categorized as excellent, good, fair, poor, and unusable. These ratings refer to the overall interpretive value of the photography obtained from a particular reconnaissance mission. Individual targets may also be assigned PI suitability ratings if that is necessary or desirable. The standards that determine the various ratings are as follows.

Excellent: The photography is free of degradation by camera malfunctions or processing faults and weather conditions are favorable throughout. The imagery contains sharp, well defined edges and corners, with no unusual distortions. Contrast is 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 high quality of the photography.

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

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

Poor: Camera-induced degradations and/or weather limitations severely reduce the quality 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 the photography completely precludes detection, identification, and mensuration of cultural details.

2. PI Suitability, Missions 1008-1 and 1008-2: The PI suitability of the photography obtained in Missions 1008-1 and 1008-2 is good. A total of 225 targets were observed and reported in the preliminary PI reports (99 targets in Mission 1008-1 and 126 targets in Mission 1008-2) and the highlights of this initial scan are as follows:

(1) New identifications, including 7 fixed missile sites, 1 launch complex, and 1 possible reactor building.

(2) Observation of new construction and activity at a number of industrial and military sites.

[redacted]

(3) Confirmation of previous suspect activities, such as construction of new launch complexes, airfields, etc.

A total of 22 targets were reported as being covered by poor-quality photography, primarily due to cloud shadows, haze, solar elevation, and similar factors. In view of the relatively heavy cloud cover that prevailed, particularly in Mission 1008-2, this is not considered exorbitant. The poor-quality photography affected less than 10 percent of the total targets covered.

It should be noted that the preliminary report represents the initial scan results only, accomplished in a short time without the aid of the precise analytical and mensural instruments normally employed in photographic interpretation. More detailed study of the material may develop additional information or may require revision of information presented in the preliminary report.

Although the PI suitability of Mission 1008 is rated good, each of the degradations noted in Part II, item 3, is potentially capable of seriously affecting image quality, with a resultant decrease in PI suitability. Fortunately, Mission 1008 is relatively free of severe degradations. However, a brief discussion of the relationship between various degraditions and PI suitability, per se, is considered desirable.

Corona Static: This can be a major source of film degradation. Severe corona bursts act to obliterate imagery or degrade it to such an extent that even gross details are difficult to evaluate.

Light Leaks: Few camera systems are totally free of light leaks, which are among the most common degradations encountered. The degree of degradation is primarily dependent on the intensity and size of the light leak. Additional factors are frequency of occurrence and location of the light traces on the film. Severe light leaks are as damaging to imagery as major corona bursts.

Scratches and Abrasions: The effect of scratches and abrasions on imagery in any photographic reconnaissance system cannot be ignored. The potential degradation is intensified in this particular system, where the photographic scale is such that even a small scratch or abrasion may obliterate or degrade a target of significance.

Pinholes and Blisters: Serious degradations in this category are seldom encountered. Again, however, in view of the photographic scale inherent in this system, pinholes and blisters are capable of image destruction or obliteration to a significant degree.

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Plus or Minus Density Streaks: The severity of degradation is dependent on the density and extent of the streaks. In general, minus density streaks commonly derive from obstructions on the aperture slit and/or processing anomalies. Plus density streaks may also originate in processing or may be pressure-induced. An unusual form of plus-to-minus streaking is often observed with images of clouds and is primarily induced by alto-cumulus formations. When conditions permit (favorable background contrast, solar elevations, maximum cloud reflectivity) the streaking and its degrading effect on terrain detail are readily apparent. It is currently felt that this streaking originates in the high reflection content of cumulus clouds, which are known to reflect approximately 75 percent of the incident light. These reflections are then picked up by the camera chimney. Elimination of this condition by introducing a baffle system is under consideration.

Additional factors that affect PI suitability but have not been specifically noted under "Degradations" also merit consideration. Among these are:

Atmospheric Degradations: The effect of cloud cover on PI suitability is immediately apparent to even an uninitiated observer and need not be discussed here. The effects of haze are more subtle and are a prime source of degradation. Atmospheric haze and/or industrial haze veil terrain imagery and often impart an out-of-focus appearance to the photography. Thermal variations may also be present, particularly in areas of heavy industrial haze, and actual distortion of terrain images may be induced by those conditions. When such is the case, identification of small objects is difficult and accurate mensuration is not possible.

Image Motion: Exclusive of actual IMC error, image motion in this system is usually confined to the first and last frames of each camera operation sequence. Smeared imagery may also be detected in the second and third frames of a pass but generally the film must be viewed under considerable magnification to facilitate observation of the degradation.

Low Solar Elevation: This affects PI suitability to various degrees, depending on terrain reflectivity and sun azimuth with regard to the vehicle as well as the angular position of the sun over the horizon.

Manufacturer's Splices: These opague splices obviously degrade PI suitability when they are positioned within a format.

3. Mission Information Potential (MIP): The MIP rating assigned to a mission is an arbitrary number intended to indicate the quality of the best photography obtained in the mission. It is representative of the camera system's maximum capability for recording information as demonstrated by the instruments employed in each mission. In consideration of the information the MIP is intended to convey, photography containing adverse factors such

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as low solar elevation, poor atmospheric conditions, and similar degradations is eliminated in selection of the MIP example. The MIP rating assigned to a mission is indicative solely of the camera system's photographic capability, exclusive of degradations which are not camera-derived. The selected photography may constitute a portion of a frame containing a particular target, an entire frame, or several frames. In any case, the selections do not indicate the success, quality, or PI suitability of the mission as a whole but only the camera system's maximum effort. The criteria which govern selection of suitable MIP examples are as follows:

a. The photography must be comparatively free of cloud cover and/or atmospheric interference.

b. The selected targets should be at or near frame center in order to minimize the effects of obliquity and similar distortive factors.

c. No photography affected by systems malfunctions or inherent degradations can be considered for MIP selection. This eliminates the first few and last few frames of a pass, since these may contain smeared images, as mentioned in the preceding discussion. In addition, the photography must be free of effects induced by vehicle pitch, roll, or yaw deviations from normal.

d. Solar elevation must be near optimum. Overexposed or underexposed photography is not suitable for MIP selections.

e. Preferably, good contrast targets such as airfields are chosen for comparison with similar targets covered in previous missions.

4. MIP, Mission 1008-1 and 1008-2: Based on the foregoing criteria, frame 075 of Pass 24D, FWD, and frame 030 of Pass 72D, FWD, are selected as the MIP examples of Missions 1008-1 and 1008-2, respectively. Note that aircraft types are readily identifiable and accurate mensuration of runways is feasible. Both missions are assigned MIP ratings of 85. Mission 1008-1 is held comparable to Mission 1007 and Mission 1008-2 is of similar quality.

[redacted]

FIGURE 5. MIP SELECTION, MISSION 1008-1.

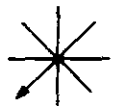
NPIC J-8191 (2/68)

[redacted]

[redacted]

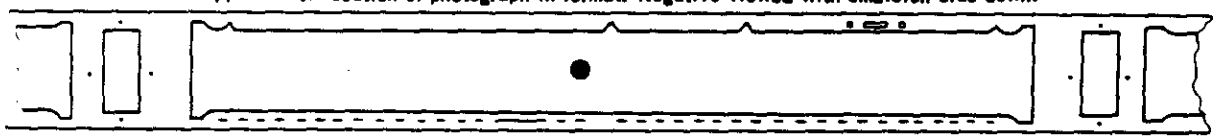
Pass	24D FWD
Frame	075
Index	41.10 - 13.80
Enlargement	20X
Solar Elevation	45° 14'
Solar Azimuth	119°
Altitude	102 nm
Densities	
Terrain Dmin	0.55
Limiting Dmin	0.44
Terrain Dmax	1.38
Limiting Dmax	1.97
Gross Fog	
Titled Edge	0.10
Non-Titled Edge	0.10
Center	0.11

Approximate flight direction on photograph



Approximate scan direction on photograph

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



NPIC J-6192 (3/68)

[redacted]

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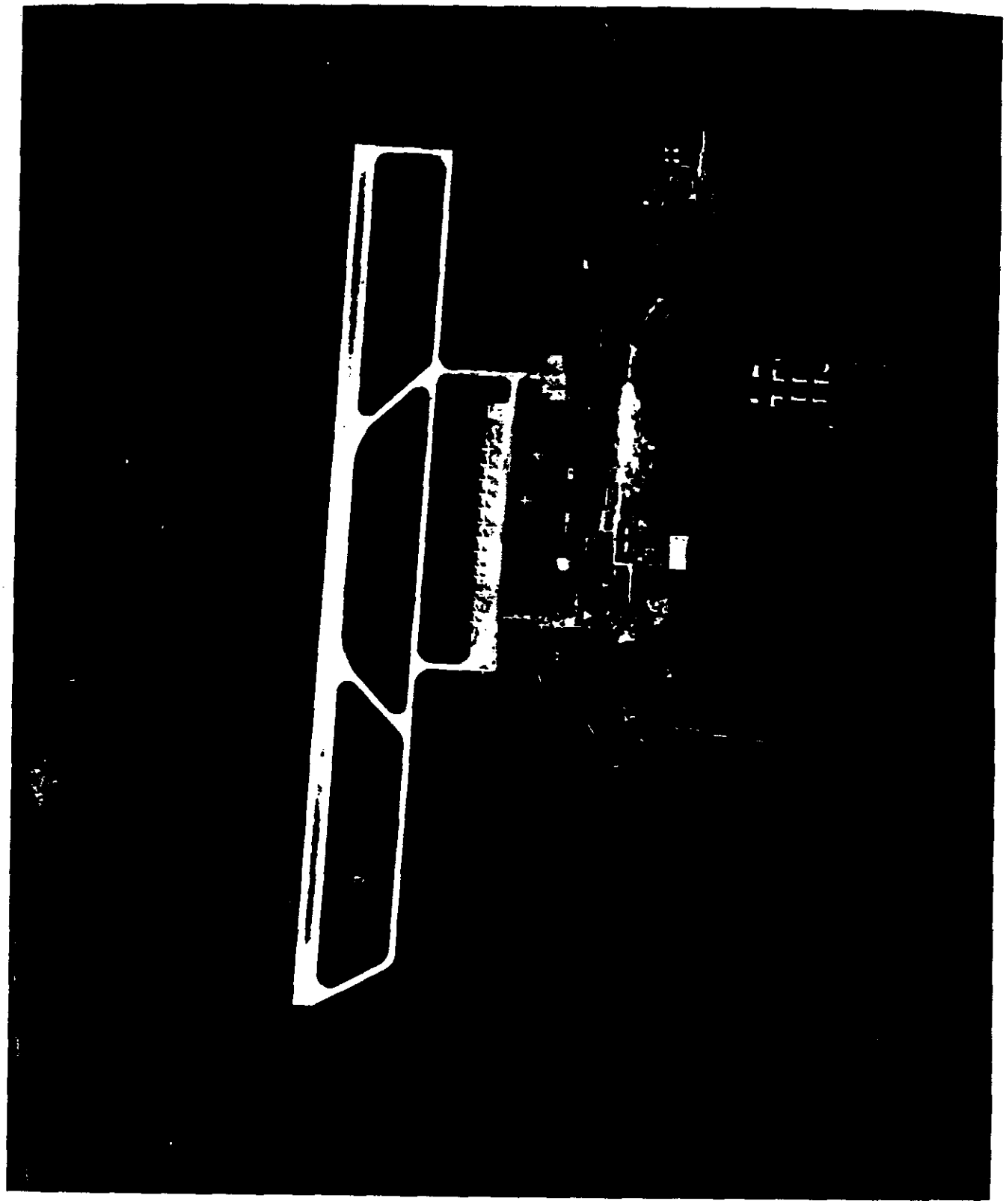
[redacted]



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[redacted]

[redacted]

FIGURE 6. MIP SELECTION, MISSION 1008-2.

NPIC J-8193 (2/68)

[redacted]

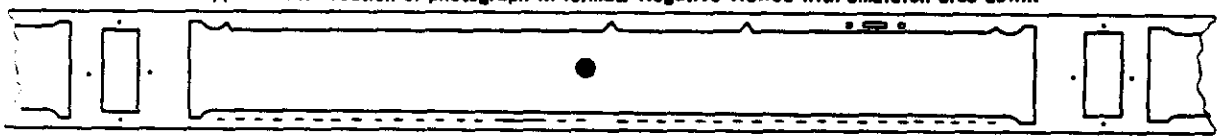
[redacted]

Pass	72D FWD
Frame	030
Index	44.20 - 13.20
Enlargement	20X
Solar Elevation	44° 43'
Solar Azimuth	134°
Altitude	101 nm
Densities	
Terrain Dmin	0.50
Limiting Dmin	0.50
Terrain Dmax	1.18
Limiting Dmax	2.09
Gross Fog	
Titled Edge	0.11
Non-Titled Edge	0.12
Center	0.12

Approximate flight direction on photograph

Approximate scan direction on photograph

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



NPIC J-8184 (3/66)

[redacted]

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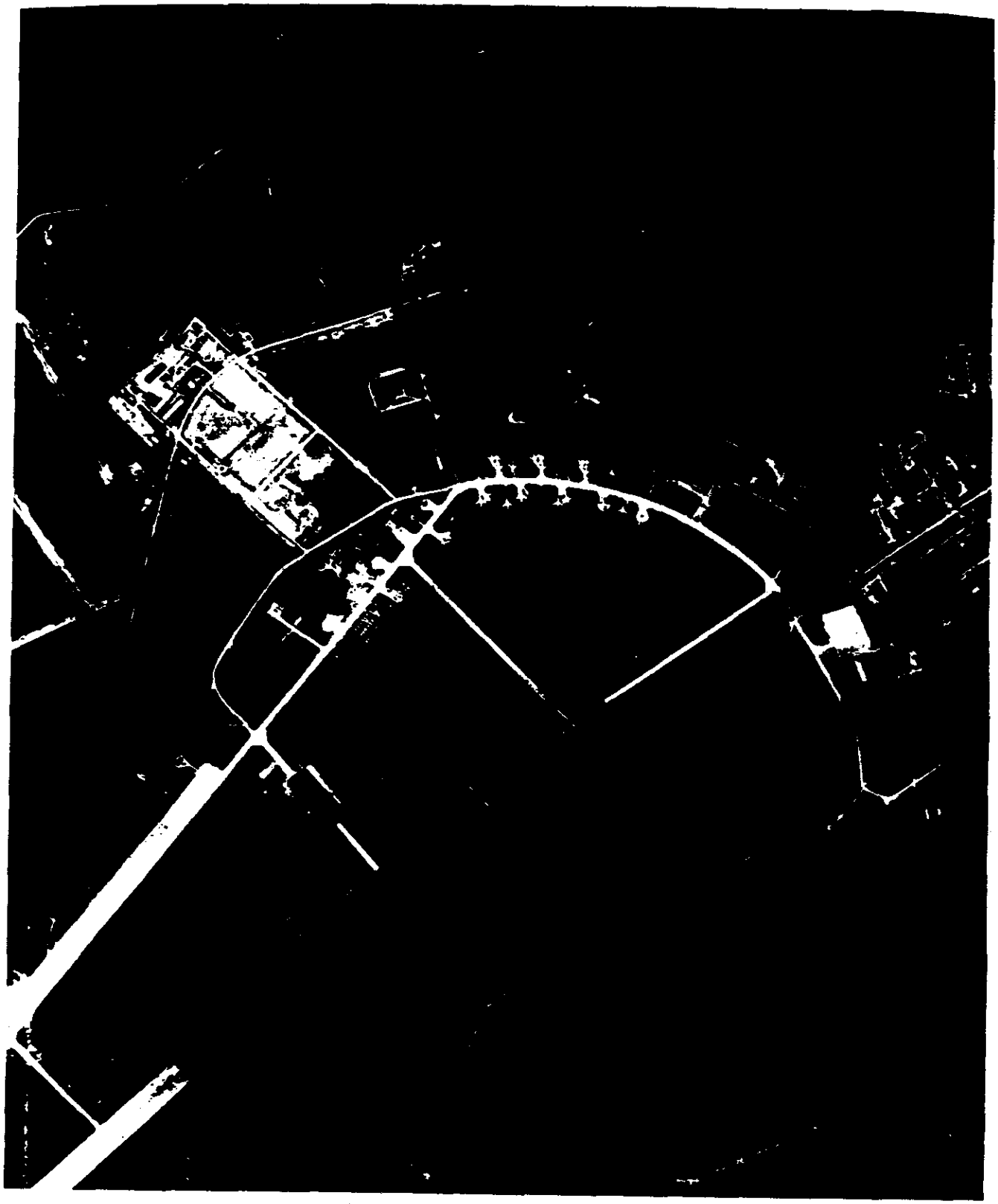
[redacted]



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[redacted]

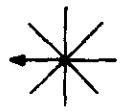
FIGURE 7. EXAMPLE OF GOOD PHOTOGRAPHY (TANK FARM).

NPIC J-6198 (2/66)

[redacted]

Pass	24D FWD
Frame	082
Index	39.70 - 10.00
Enlargement	20X
Solar Elevation	45° 37'
Solar Azimuth	116°
Altitude	102 nm
Densities	
Terrain Dmin	0.47
Limiting Dmin	0.47
Terrain Dmax	1.38
Limiting Dmax	1.60
Gross Fog	
Titled Edge	0.11
Non-Titled Edge	0.12
Center	0.12

Approximate flight direction on photograph



Approximate scan direction on photograph

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

NPIC J-6196 (8/68)

[redacted]

FIGURE 8. EXAMPLE OF GOOD PHOTOGRAPHY (CULTURE AREA).

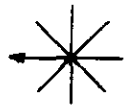
NPIC J-8197 (2/68)

[redacted]

Pass	36D FWD
Frame	222
Index	44.50 - 12.50
Enlargement	20X
Solar Elevation	47° 47'
Solar Azimuth	113°
Altitude	100 nm
Densities	
Terrain Dmin	0.40
Limiting Dmin	0.37
Terrain Dmax	1.18
Limiting Dmax	1.98
Gross Fog	
Titled Edge	0.12
Non-Titled Edge	0.12
Center	0.12

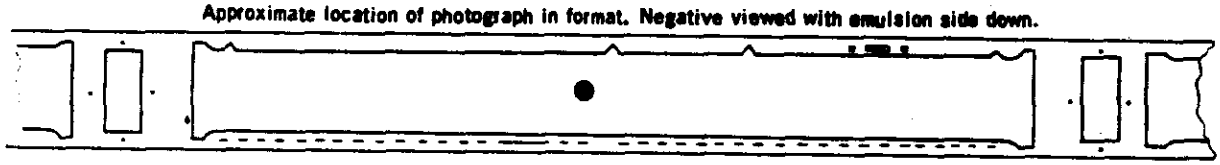
Note marshalling yard at center of photograph.

Approximate flight direction on photograph



Approximate scan direction on photograph

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



NPIC J-6198 (3/68)

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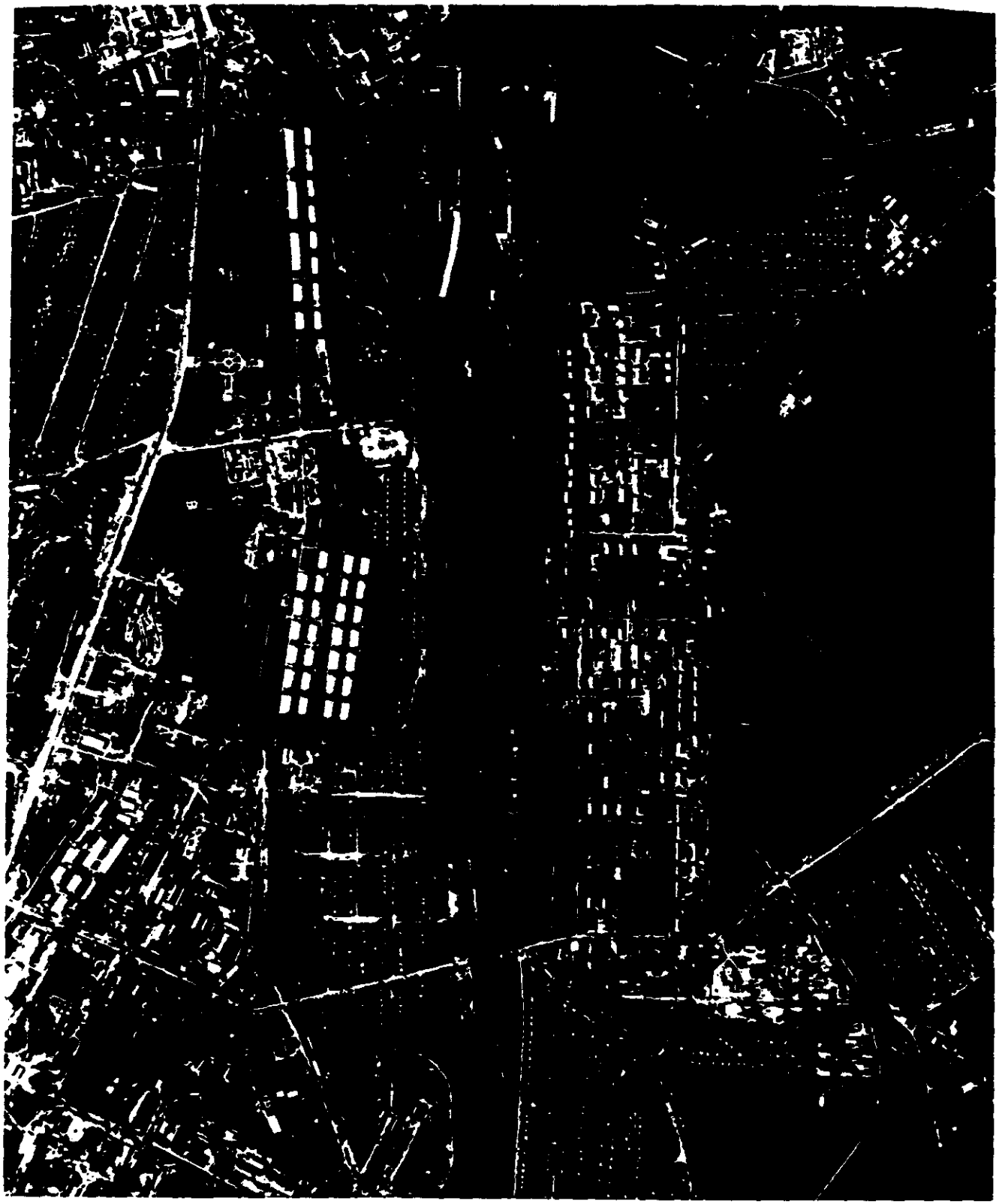
[redacted]



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[redacted]

FIGURE 9. EXAMPLE OF GOOD PHOTOGRAPHY (MISSILE COMPLEX).

NPIC ~~J-6199~~ (2/68)

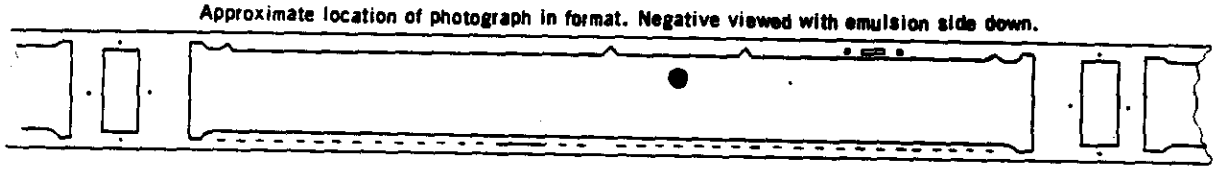
[redacted]

Pass	72D FWD
Frame	028
Index	52.80 - 14.40
Enlargement	20X
Solar Elevation	44° 33'
Solar Azimuth	133°
Altitude	101 nm
Densities	
Terrain Dmin	0.52
Limiting Dmin	0.42
Terrain Dmax	1.24
Limiting Dmax	1.74
Gross Fog	
Titled Edge	0.12
Non-Titled Edge	0.12
Center	0.12

Approximate flight direction on photograph

Approximate scan direction on photograph

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



NPIC J-6200 (3/68)

[redacted]

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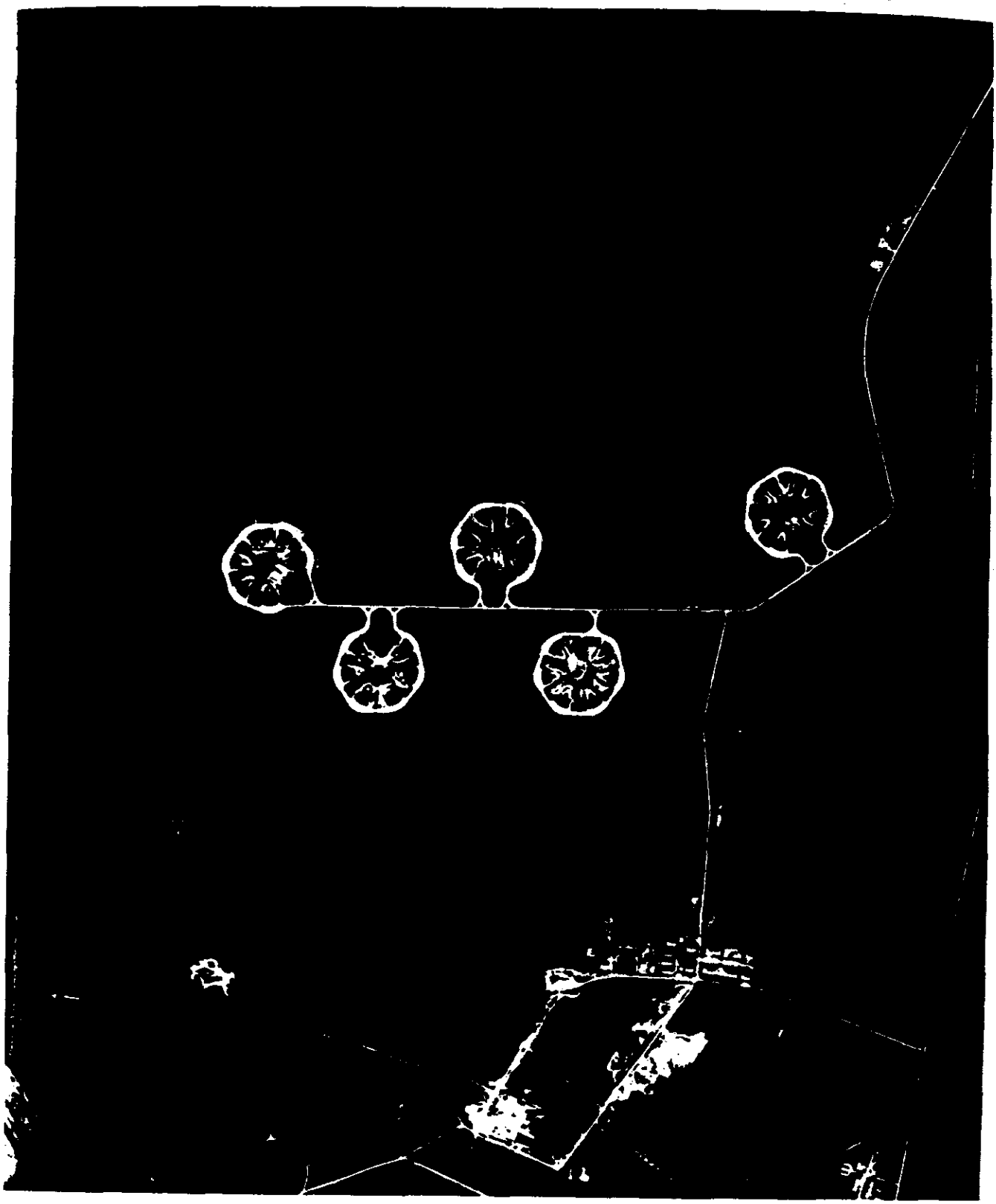
[redacted]



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[redacted]

[redacted]

FIGURE 10. EXAMPLE OF GOOD PHOTOGRAPHY (HARBOR AND SHIPPING).

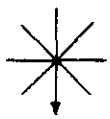
NPIC J-8201 (2/68)

[redacted]

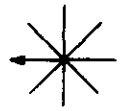
[redacted]

Pass	72D FWD
Frame	128
Index	54.70 - 11.40
Enlargement	20X
Solar Elevation	51° 09'
Solar Azimuth	116°
Altitude	100 nm
Densities	
Terrain Dmin	0.29
Limiting Dmin	0.16
Terrain Dmax	1.22
Limiting Dmax	2.02
Gross Fog	
Titled Edge	0.06
Non-Titled Edge	0.07
Center	0.06

Note that ship types are readily identifiable.

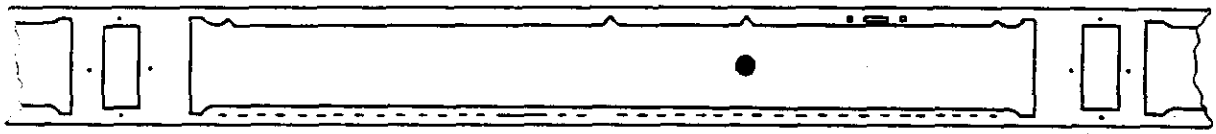


Approximate flight direction on photograph



Approximate scan direction on photograph

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



NPIC J-8202 (9/68)

[redacted]

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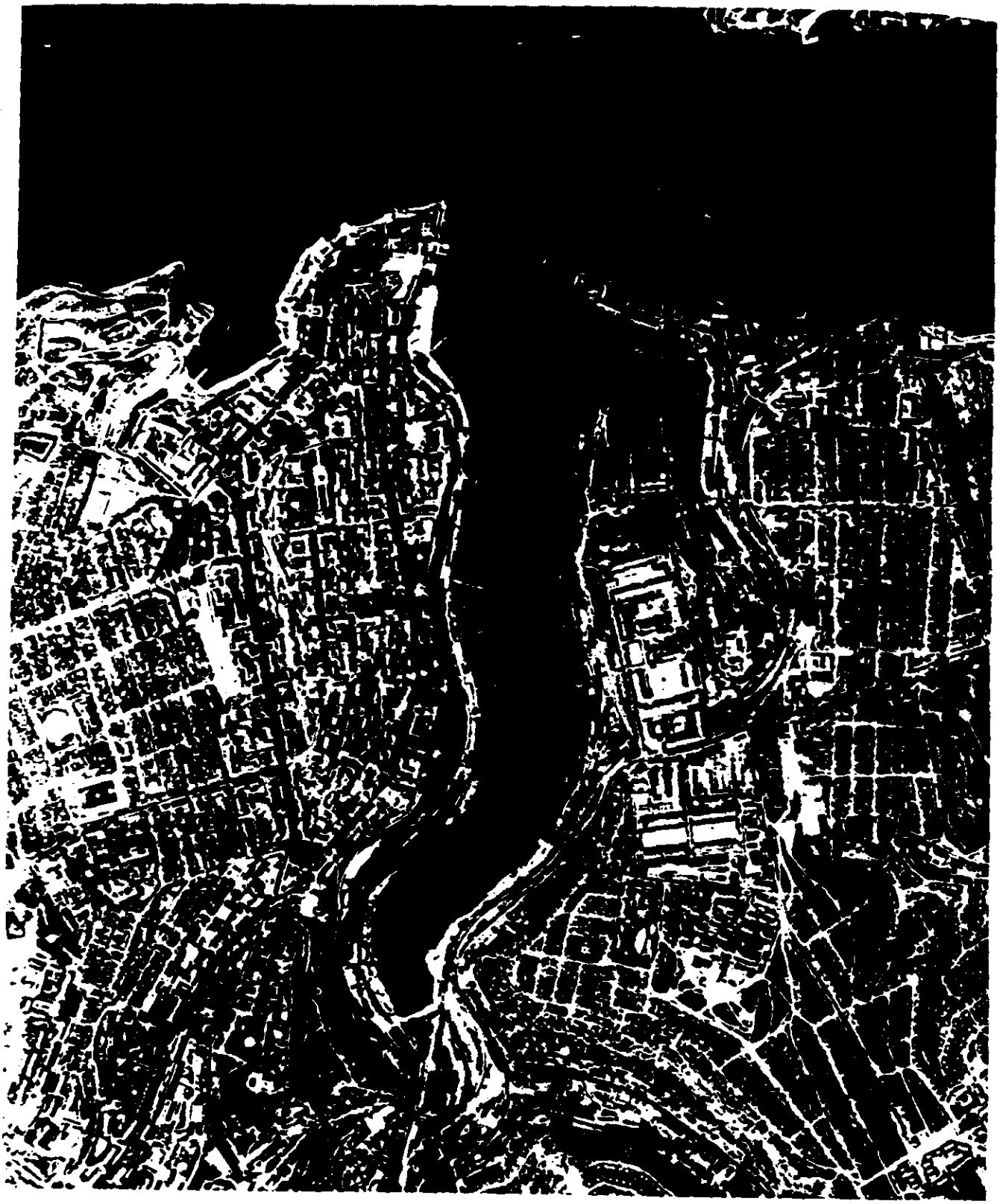
[redacted]



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[redacted]

FIGURE 11. EXAMPLE OF GOOD PHOTOGRAPHY (AIRFIELD).

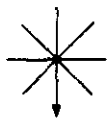
NPIC J-8203 (2/68)

[redacted]

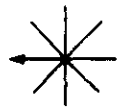
[redacted]

Pass	54D FWD
Frame	027
Index	43.40 - 13.20
Enlargement	20X
Solar Elevation	46° 20'
Solar Azimuth	127°
Altitude	101 nm
Densities	
Terrain Dmin	0.58
Limiting Dmin	0.58
Terrain Dmax	0.98
Limiting Dmax	0.98
Gross Fog	
Titled Edge	0.13
Non-Titled Edge	0.13
Center	0.14

The quality of this photography makes aircraft identification possible.

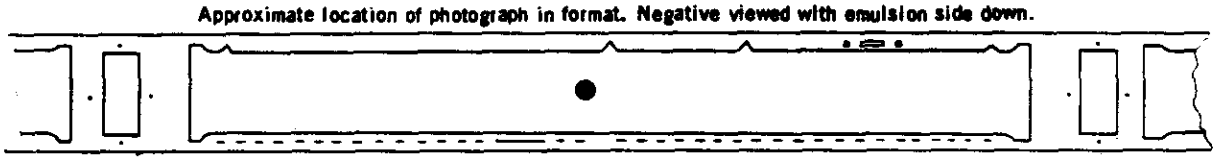


Approximate flight direction on photograph



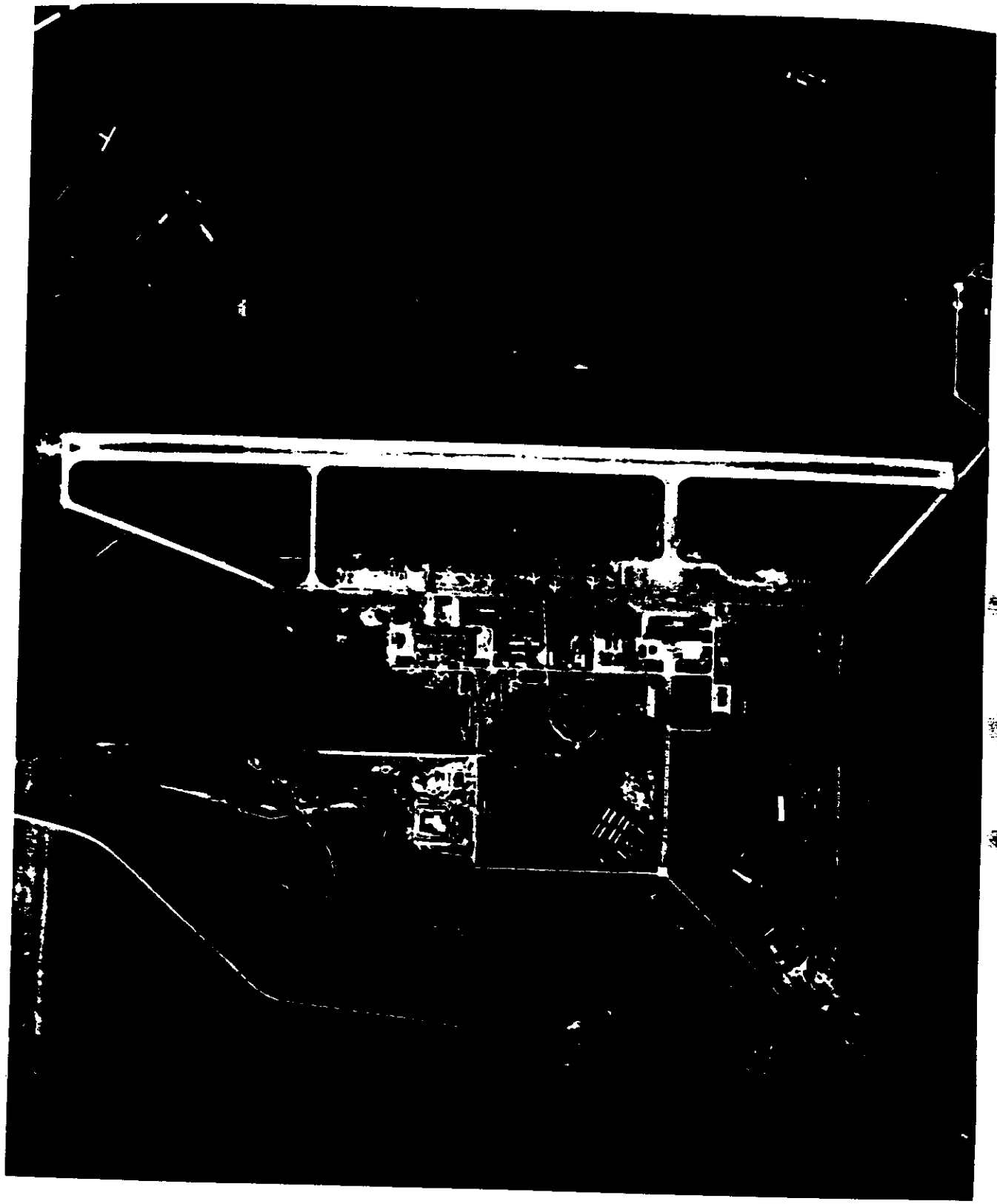
Approximate scan direction on photograph

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



NPIC J-8204 (3/65)

[redacted]



[redacted]

FIGURE 12. AIRFIELD, MODERATE HAZE.

NPIC J-8205 (2/68)

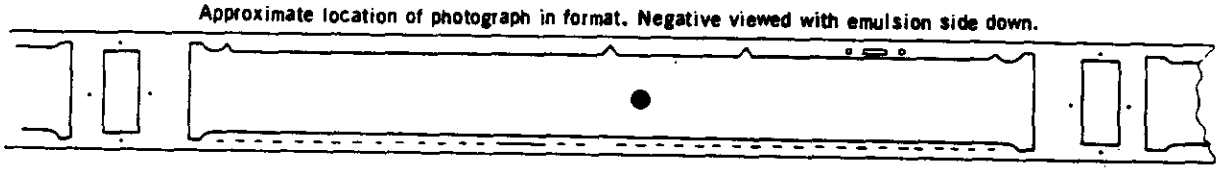
[redacted]

Pass	25D FWD
Frame	032
Index	50.60 - 12.80
Enlargement	20X
Solar Elevation	45° 42'
Solar Azimuth	118°
Altitude	102 nm
Densities	
Terrain Dmin	0.76
Limiting Dmin	0.76
Terrain Dmax	1.38
Limiting Dmax	2.11
Gross Fog	
Titled Edge	0.12
Non-Titled Edge	0.10
Center	0.12

Approximate flight direction on photograph

Approximate scan direction on photograph

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



NPIC J-6206 (3/68)

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[redacted]

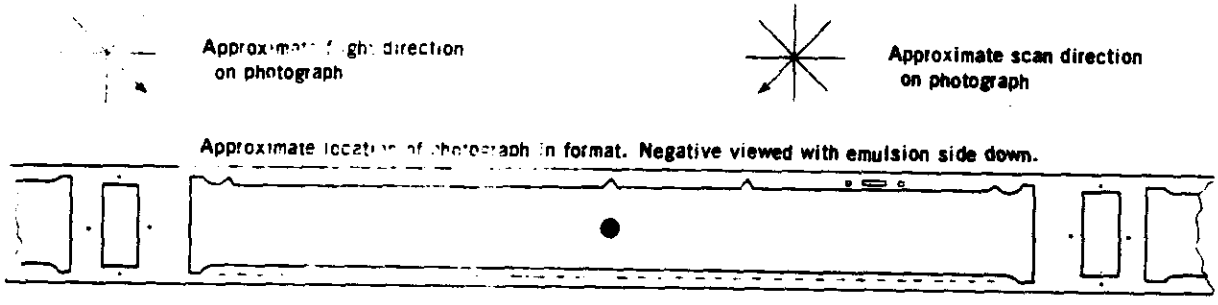
FIGURE 13. AIRFIELD, HEAVY HAZE, DEGRADATION MINIMIZED BY CORRECTIVE PRINTING.

NPIC J-8207 (2/68)

[redacted]

[redacted]

Pass	40D FWD
Frame	055
Index	46.70 - 12.40
Enlargement	20X
Solar Elevation	41° 46'
Solar Azimuth	136°
Altitude	105 nm
Densities	
Terrain Dmin	0.71
Limiting Dmin	0.71
Terrain Dmax	1.42
Limiting Dmax	2.06
Gross Fog	
Titled Edge	0.12
Non-Titled Edge	0.12
Center	0.13



NPIC J-6206 (3/65)

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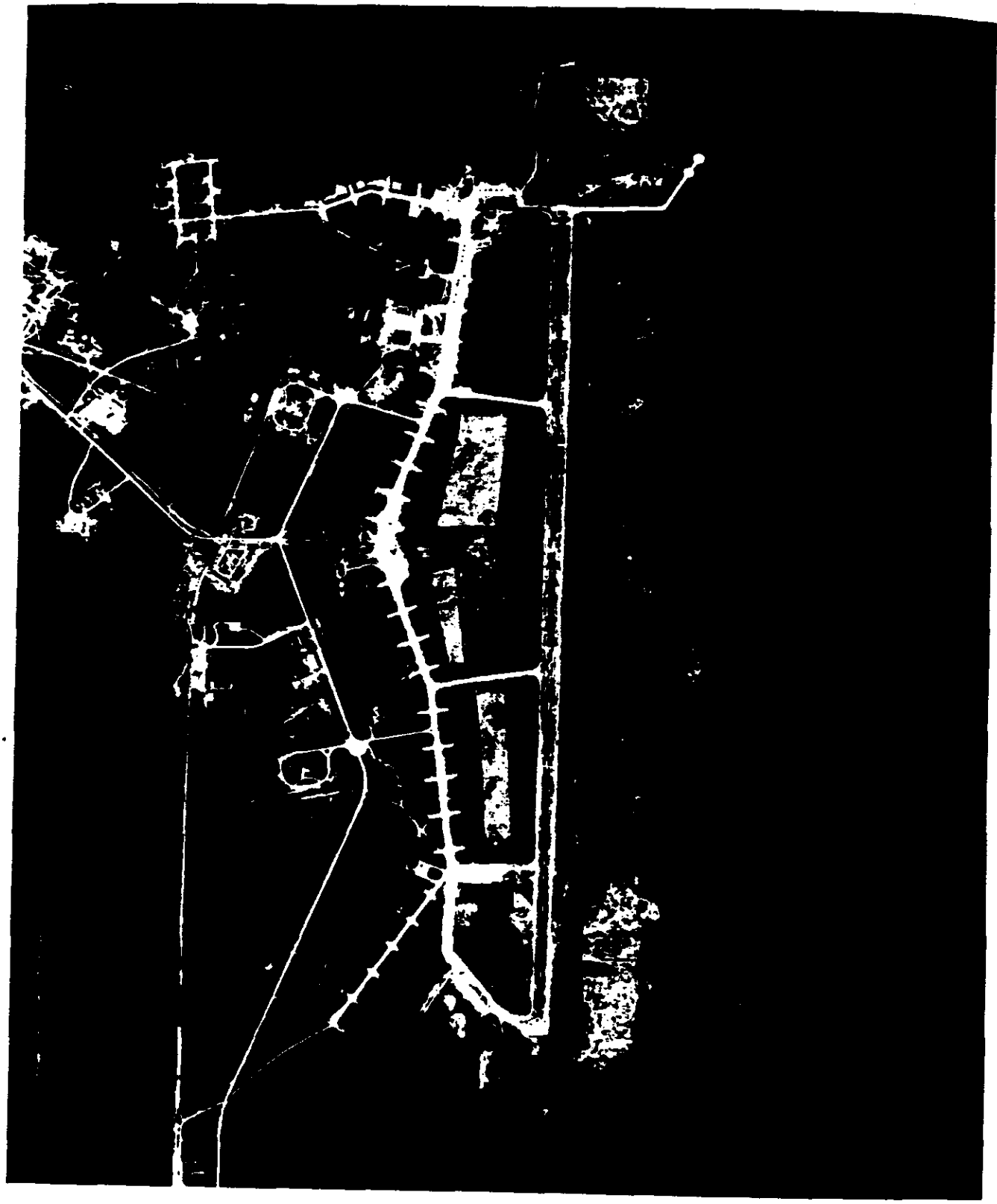
[redacted]



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[redacted]

FIGURE 14. IMAGE DEGRADATION (CLOUD SHADOW).

NPIC J-6209 (2/66)

Handle Via
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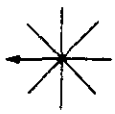
[redacted]

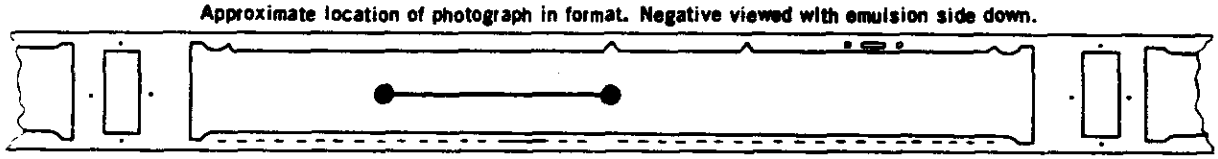
Pass	54D FWD
Frame	042
Index	25.00 - 46.00
Enlargement	Contact Print
Solar Elevation	47° 18'
Solar Azimuth	122°
Altitude	101 nm
Densities	
Terrain Dmin	0.64
Limiting Dmin	0.49
Terrain Dmax	1.31
Limiting Dmax	2.16
Gross Fog	
Titled Edge	0.11
Non-Titled Edge	0.12
Center	0.13



Approximate flight direction on photograph

Approximate scan direction on photograph

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



NPIC J-6210 (8/68)

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[redacted]

Handle Via
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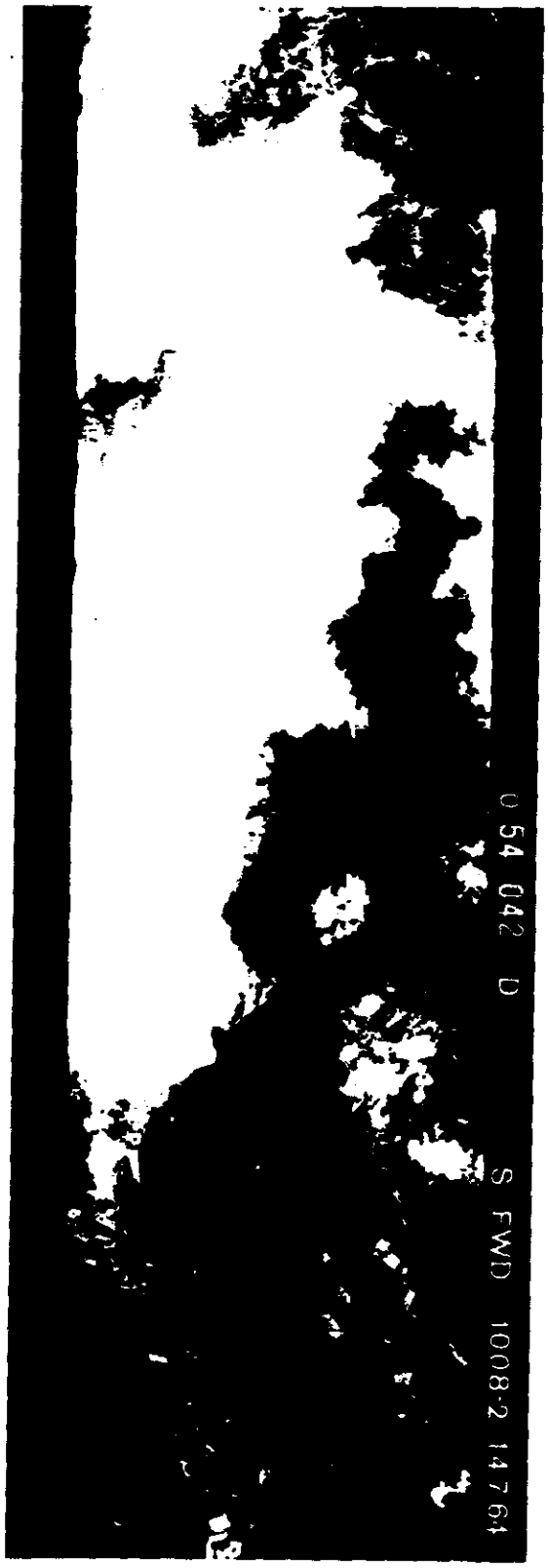

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[redacted]

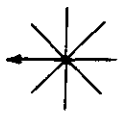
FIGURE 15. EXAMPLE OF CLOUD STREAKING.

NPIC J-6211 (2/68)

[redacted]

Pass	56D FWD
Frame	052
Index	36.00 - 54.00
Enlargement	Contact Print
Solar Elevation	44° 43'
Solar Azimuth	129°
Altitude	101 nm
Densities	
Terrain Dmin	0.70
Limiting Dmin	0.70
Terrain Dmax	1.66
Limiting Dmax	2.16
Gross Fog	
Titled Edge	0.11
Non-Titled Edge	0.12
Center	0.13

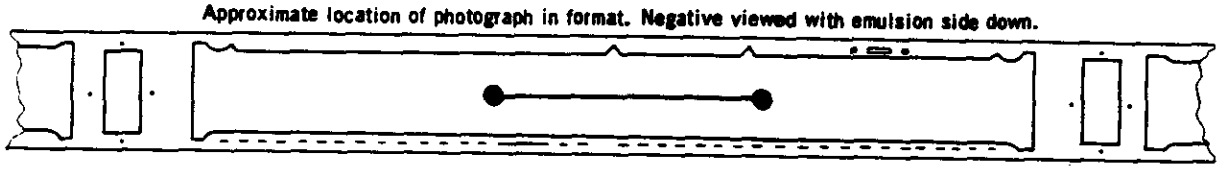
This photograph shows streaking from cloud-reflected flare.



Approximate flight direction on photograph

Approximate scan direction on photograph

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



NPIC J-8212 (3/65)

[redacted]

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[redacted]

Handle Via
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Control System Only

[redacted]

[redacted]

FIGURE 16. SCRATCH AND ABRASIONS.

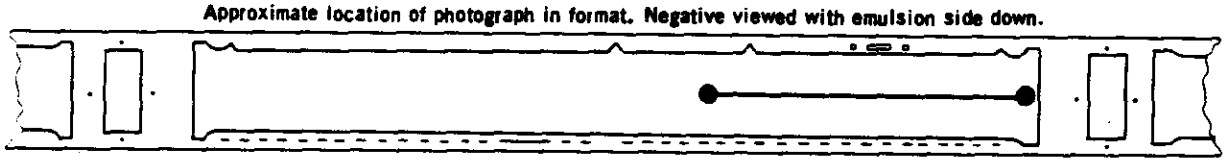
NPIC J-8213 (2/65)

[redacted]

[redacted]

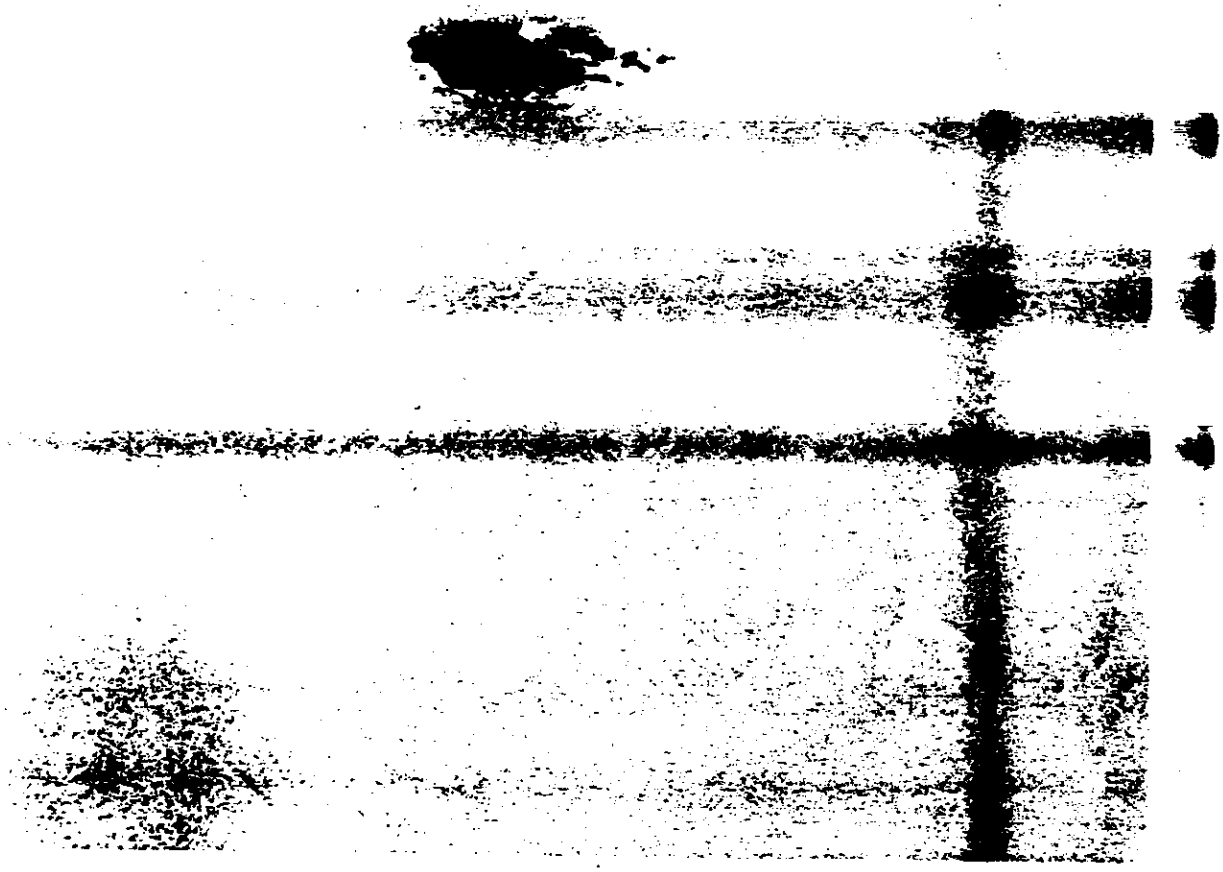
Pass . . . . . 22D AFT
Frame 190
Index . . . . . Take-Up End of Frame
Enlargement 20X

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



NPIC J-8214 (3/68)

[redacted]



[redacted]

FIGURE 17. EXAMPLE OF SCRATCH-DEGRADED IMAGERY.

NPIC J-6215 (2/68)

[redacted]

[redacted]

Pass . . . . . 9D FWD
Frame 086
Index . . . . . 22.30 - 13.40
Enlargement 40X

Example of potential degradation inherent in even a relatively small scratch, illustrated by comparison with aircraft adjacent to damaged area.

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

NPIC J-8216 (3/68)

[redacted]

Handle Via
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APPENDIX A. SYSTEM SPECIFICATIONS

1. Cameras:

PANORAMIC CAMERAS	MASTER (FWD)	SLAVE (AFT)
Camera Number	150	151
Lens Serial Number	1272435	1312435
Slit Width	0.200"	0.200"
Aperture	f/3.5	f/3.5
Filter	Wratten 21	Wratten 21
Operational F/L	609.551 mm	609.653 mm
Film Type	4404 (SO 132)	4404 (SO 132)
Film Length	15,753'	15,753'
Splices	4	4
Emulsion	62-3-6-4	62-3-6-4
Static Bench Test:		
High Contrast	235 L/mm	226 L/mm
Low Contrast	137 L/mm	135 L/mm
Dynamic Test:		
ITEK High Contrast	167 L/mm	163 L/mm
ITEK Low Contrast	131 L/mm	127 L/mm
AP High Contrast	178 L/mm	194 L/mm
AP Low Contrast	112 L/mm	113 L/mm

[redacted]

[redacted]

Stellar & Index Cameras	Stellar 1008-1	Stellar 1008-2	Index 1008-1	Index 1008-2
Camera Number	48	33	D45	D28
Lens Serial Number	11058	10293	813063	811898
Reseau Serial Number	48	33	45	28
Filter	None	None	Wratten 21	Wratten 21
Aperture	f/1.8	f/1.8	f/4.5	f/4.5
Exposure Time	2.0 sec	2.0 sec	1/500 sec	1/500 sec
Operational F/L	NR	NR	38.18 mm	NR
Film Type	4401	4401	4400	4400
Film Length	NR	NR	NR	NR
Splices	None	None	None	None
Emulsion	7-3-6-4	7-3-6-4	28-1-3-4	28-1-3-4
Perpendicularity of Reseau of Optical Axis	.0006/.937"	.0005/.937"	.0009/2.25"	.0003/2.25"
Location of Principal Point	NR	NR	NR	NR

Note: NR denotes Not Reported.

[redacted]

[redacted]

Horizon Cameras	Master Stbd (Take-Up)	Master Port (Supply)	Slave Stbd (Supply)	Slave Port (Take-Up)
Camera Number	150	150	151	151
Lens Serial Number	813546	812302	812307	812286
Exposure Time	1/100 sec	1/100 sec	1/100 sec	1/100 sec
Aperture	f/8.0	f/6.8	f/8.0	f/6.8
Filter	Wratten 25	Wratten 25	Wratten 25	Wratten 25
Operational F/L	54.71 mm	55.13 mm	55.29 mm	54.84 mm
Average L/mm	115.4 L/mm	133.4 L/mm	75.4 L/mm	Not Reported
Radial Distortion:				
10° Off-Axis	.002 mm	.041 mm	.006 mm	-.001 mm
20° Off-Axis	.000 mm	.088 mm	.014 mm	-.008 mm
Tangential Distortion	.002 mm	.002 mm	.003 mm	.005 mm

MASTER HORIZON CAMERAS

Resolution (L/mm)	Stbd (Take-Up)					Port (Supply)					
Angle Off-Axis	0°	10°	15°	20°	25°	0°	5°	10°	15°	20°	25°
Radial	170	132	108	101	98	206	182	172	149	116	12
Tangential	170	130	106	84	55	164	162	151	115	92	60

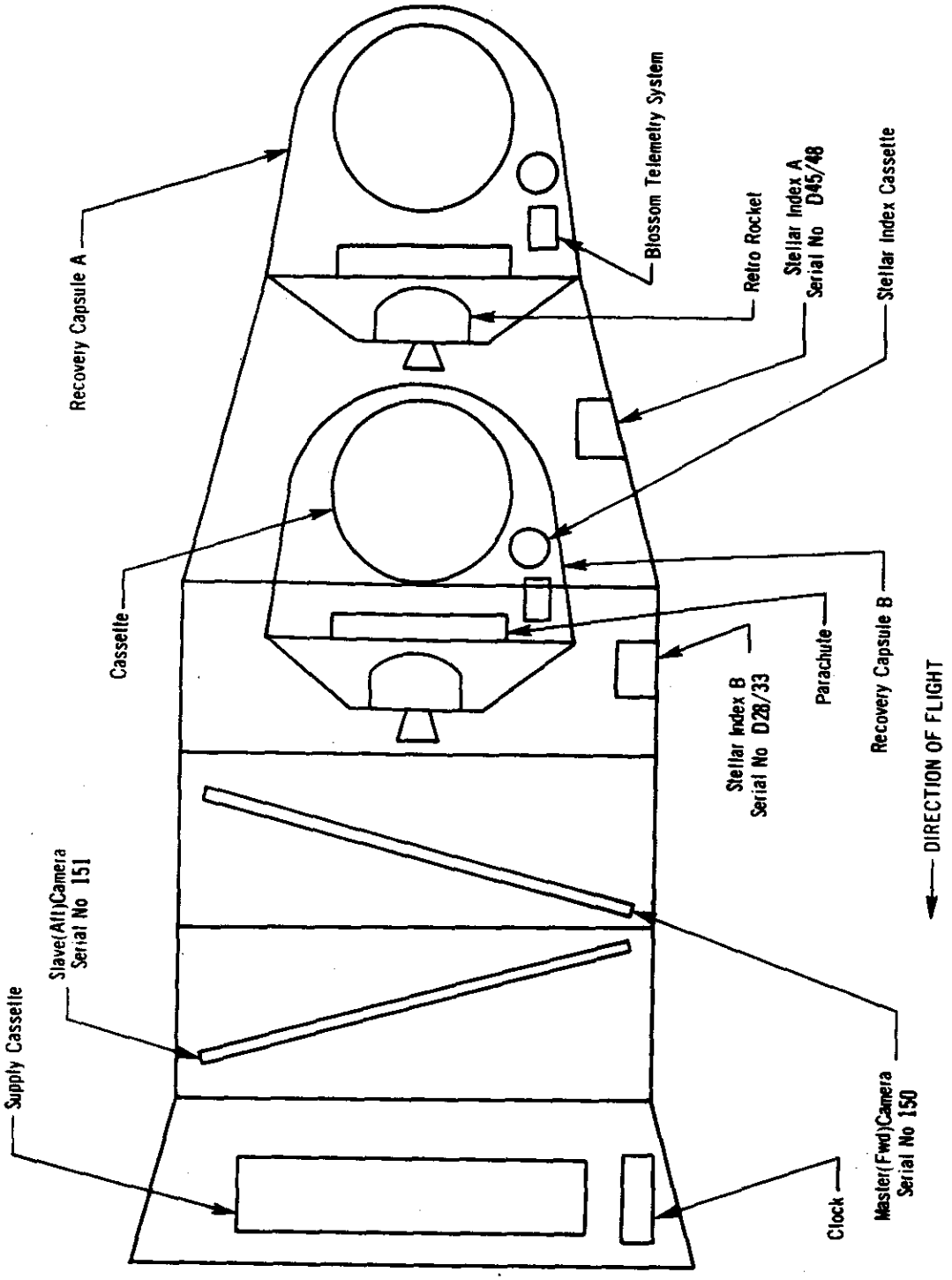
SLAVE HORIZON CAMERAS

Resolution (L/mm)	Stbd (Supply)						Port (Take-Up)
Angle Off-Axis	0°	5°	10°	15°	20°	25°	Not Reported
Radial	103	103	86	64	55	70	
Tangential	103	102	89	60	54	60	

[redacted]

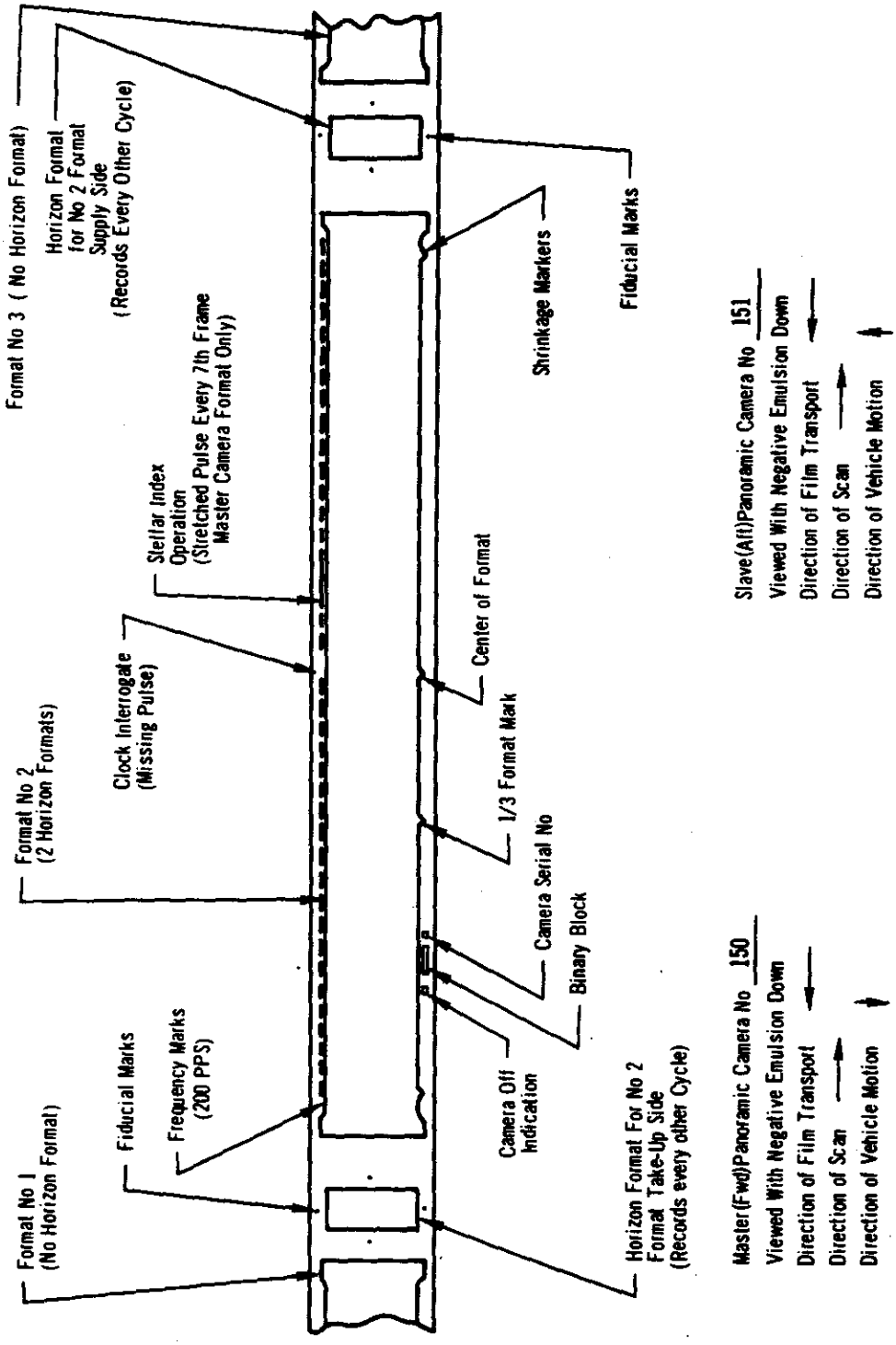
[redacted]

VEHICLE LAYOUT



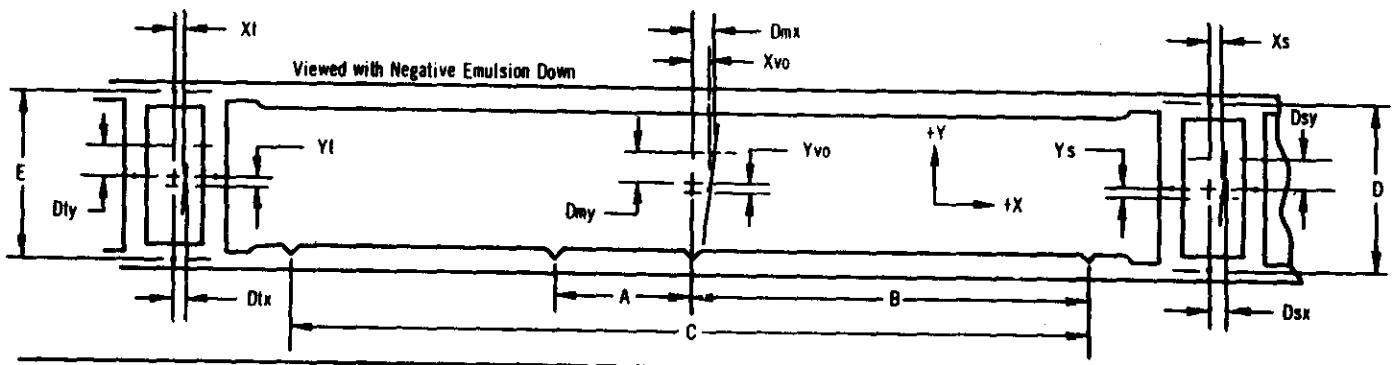
[redacted]

FILM SPECIFICATIONS
FORMAT LAYOUT



FILM SPECIFICATIONS

FORMAT SPECIFICATIONS



Master (Fwd) Camera		Vehicle Motion		Scan Direction	
A	76.3	Xt	+0.171	Dtx	+0.184
B	355.2	Yt	+0.055	Dty	-2.683
C	710.7	Xs	+0.051	Dsx	+0.052
D	56.564	Ys	-0.128	Dsy	+2.815
E	56.569	Xvo	+0.787	Dmx	+0.794
		Yvo	+0.495	Dmy	+3.495

Format dimensions:

	Panoramic	Take-Up	Supply
Height	55.868	NR	NR
Width	755.0	NR	NR

Slave (Aft) Camera		Vehicle Motion		Scan Direction	
A	76.2	Xt	-0.275	Dtx	-0.281
B	355.4	Yt	-0.261	Dty	+1.928
C	710.7	Xs	-0.631	Dsx	-0.647
D	56.563	Ys	-0.100	Dsy	-2.622
E	56.550	Xvo	-1.018	Dmx	-1.015
		Yvo	+0.800	Dmy	-3.800

Format dimensions:

	Panoramic	Take-Up	Supply
Height	56.231	NR	NR
Width	754.7	NR	NR

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

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

NR = Not Reported.

NPIC J-8219 (3/65)

[redacted]

DEFINITION OF PANORAMIC CAMERA FORMAT CALIBRATIONS

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

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

A. 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" 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 offset of Targets 2 and 3 from the indicated principal points of the supply and take-up horizon cameras respectively.

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

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

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

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

[redacted]

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

[redacted]

APPENDIX B. MICRODENSITOMETRY

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. Six 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 distribation is called the spread function of the photographic system.

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

[redacted]

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 in a Joyce-Lobel Double Beam Model IIIC. It is used with an effective slit of 1 micron by 75 or 100 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 antilog is obtained to yield the exposure (E) required to produce the determined densities. The difference between adjacent values of E is divided by the corresponding difference of the measured distance increments to produce the slope values (dE/dX) of the original scene reflectance distribution. Finally, 50 percent of the maximum slope is computed, and the distance between the 50 percent slope values is determined by interpolation. The value thus obtained represents the 50 percent amplitude width of the Line Spread Function of the original edge. The actual Line Spread Function Curve may also be plotted and the 50 percent amplitude width measured for verification of the computed value.

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

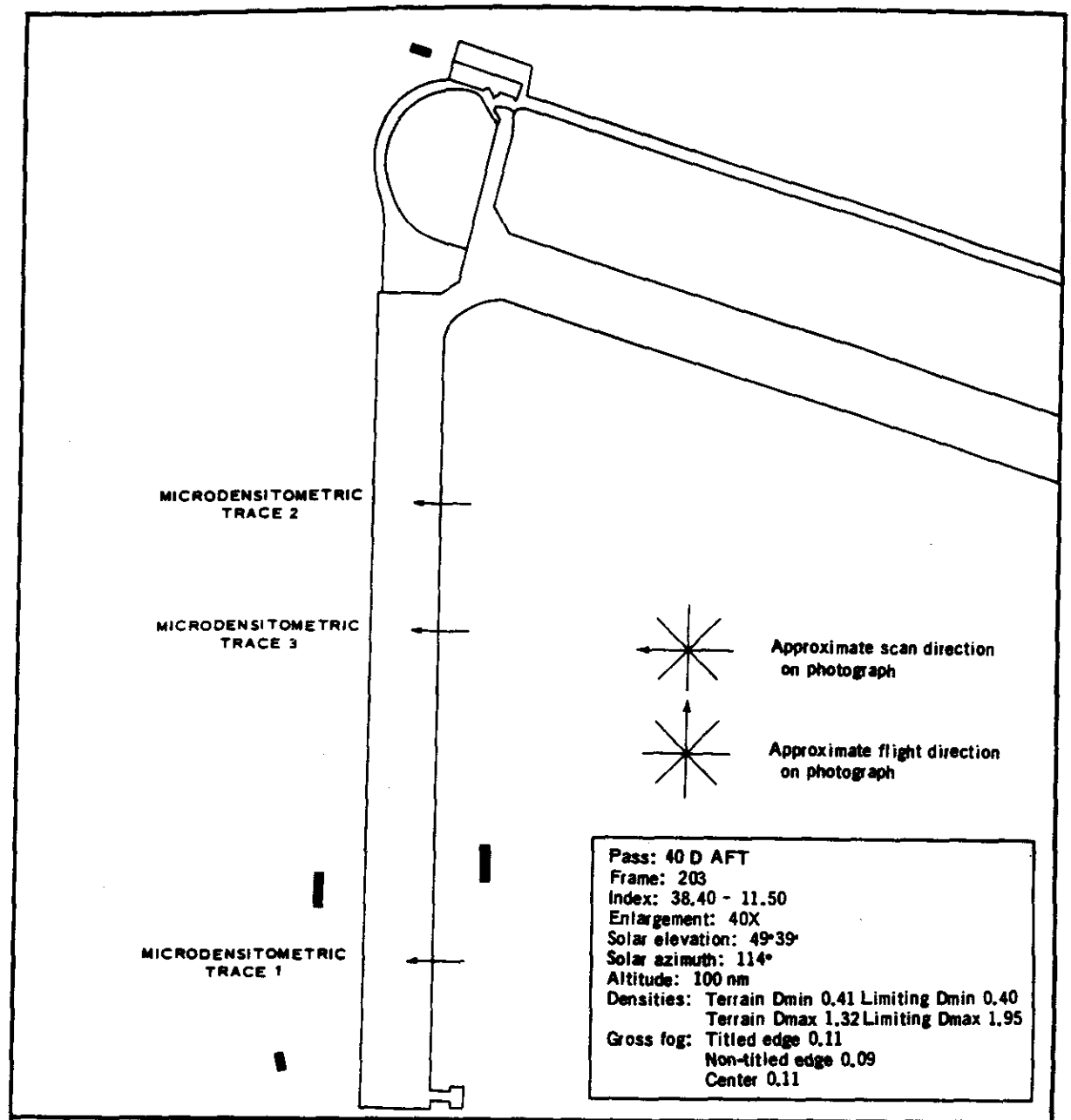
[redacted]

FIGURE 18. TARGET, MICRODENSITOMETRIC TRACES NO'S 1-3.

NPIC J-6220 (2/68)

[redacted]

[redacted]



[redacted]

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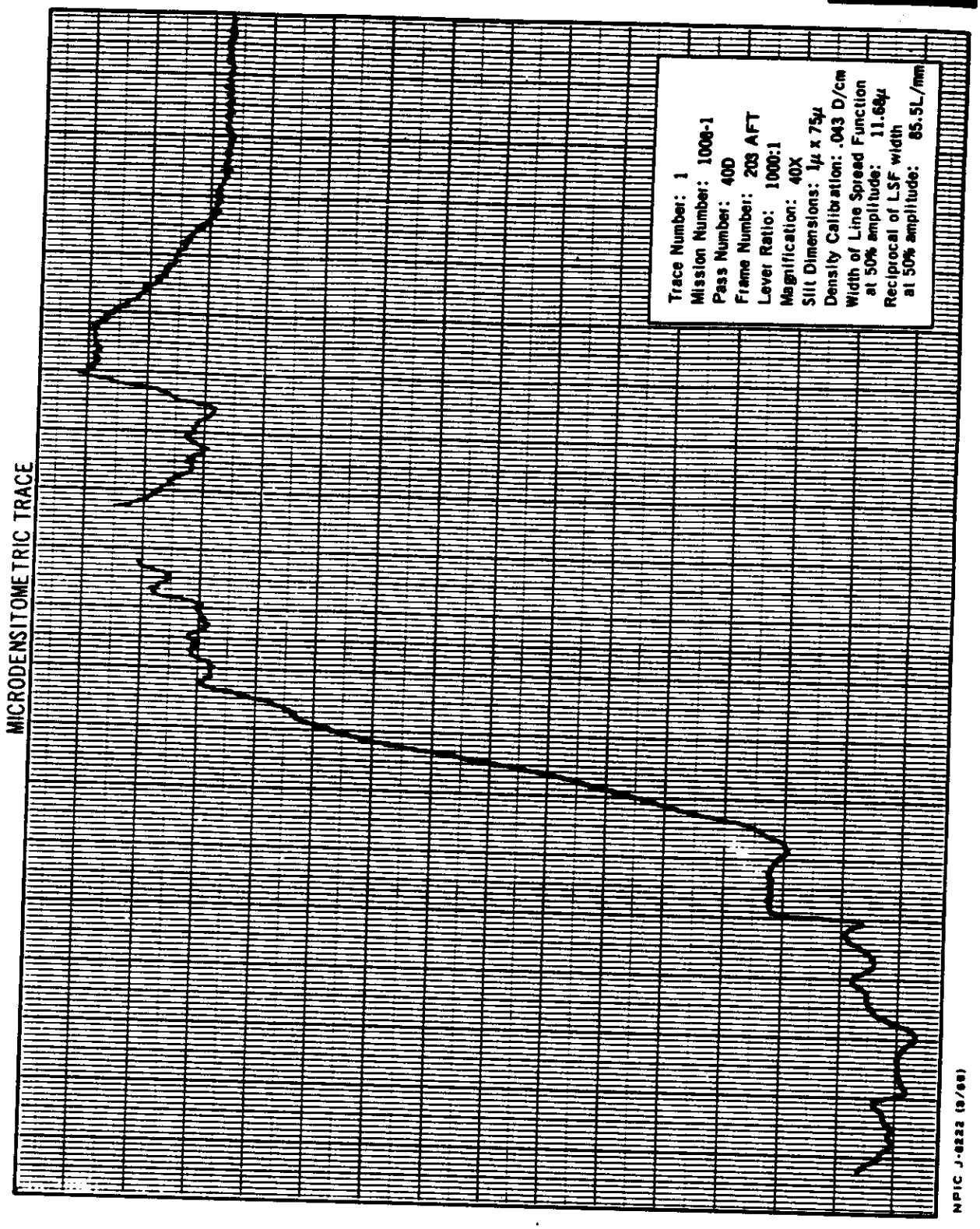
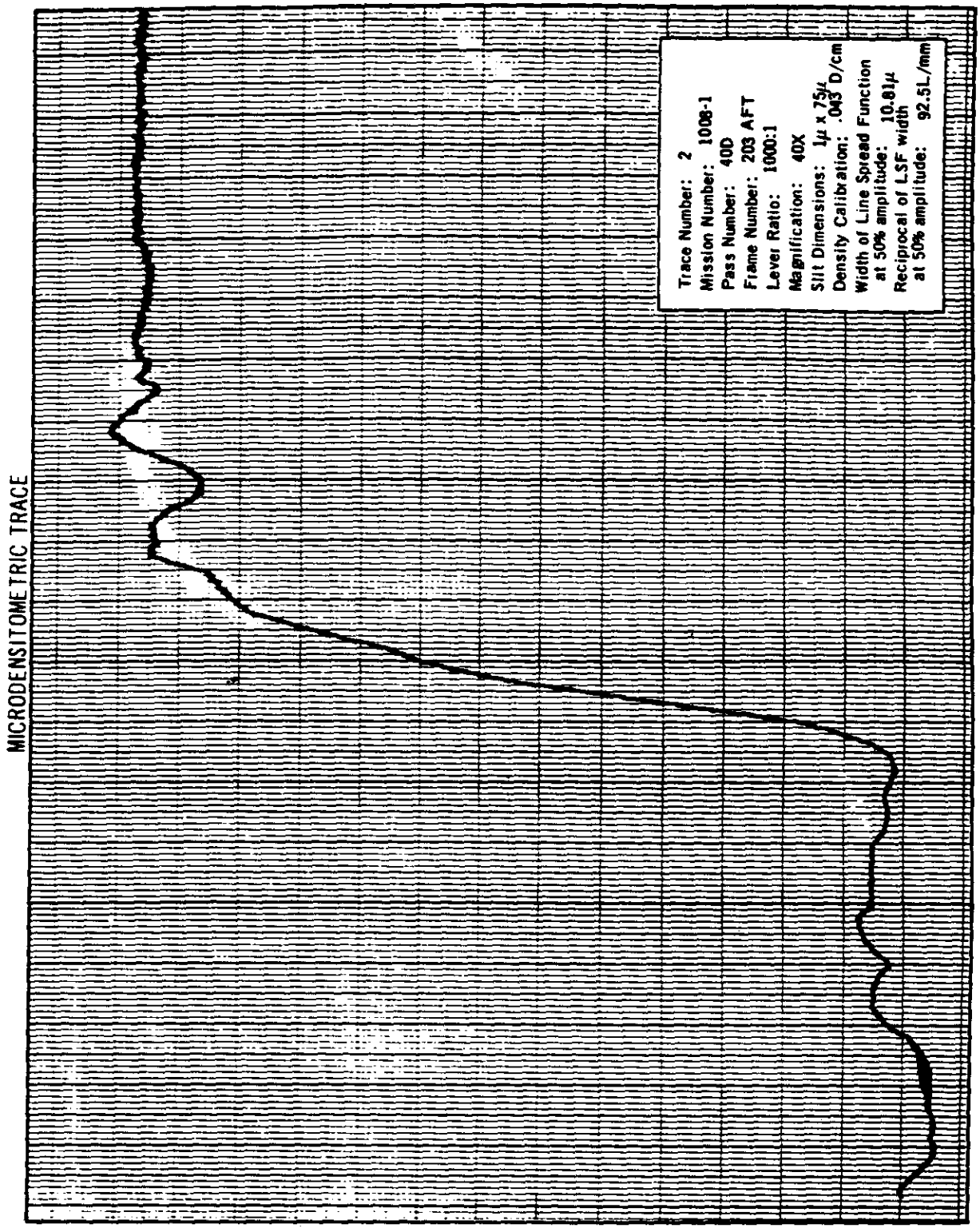
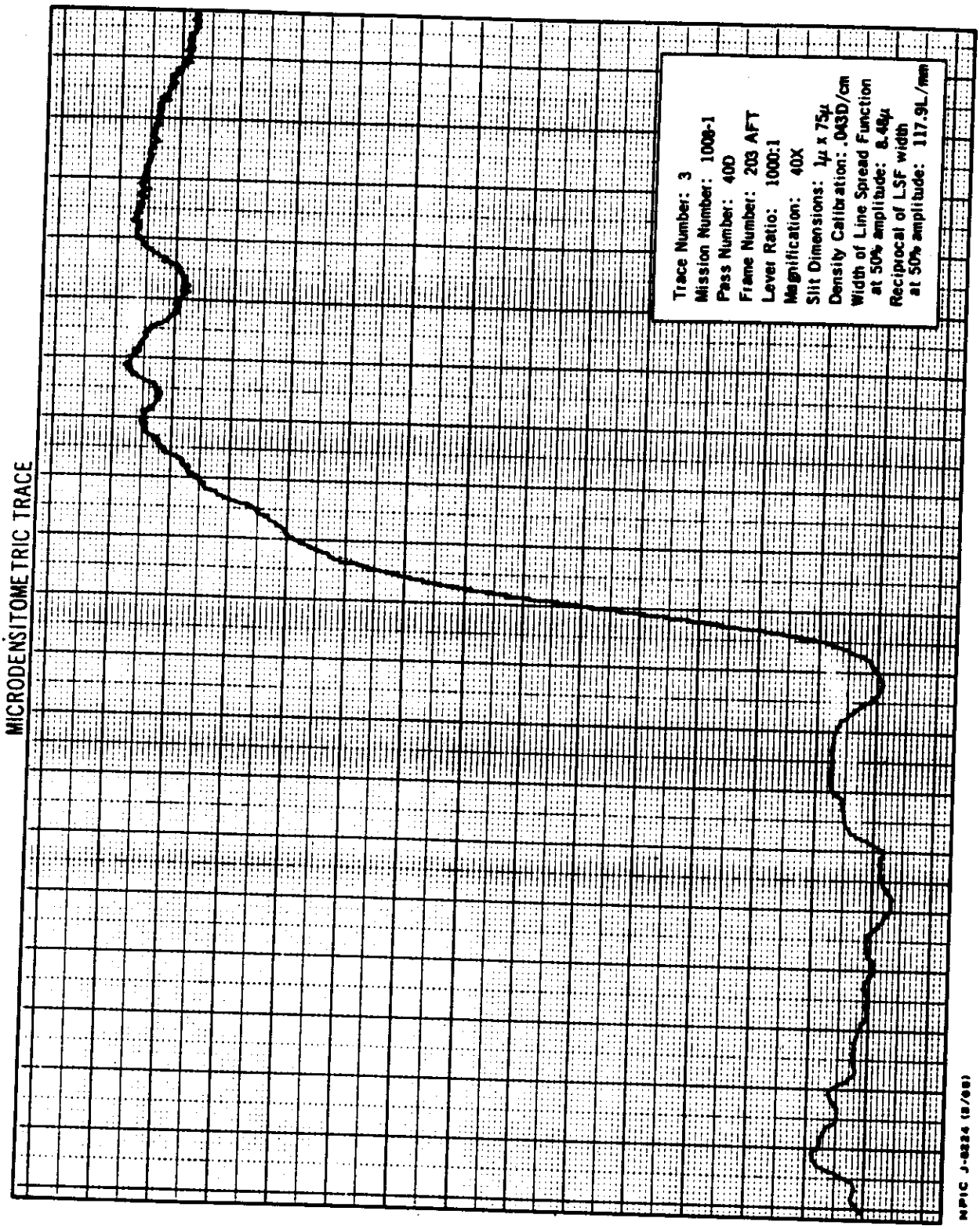

MICRODENSITOMETRIC TRACE
Trace Number: 1
Mission Number: 1008-1
Pass Number: 40D
Frame Number: 203 AFT
Lever Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .043 D/cm
Width of Line Spread Function at 50% amplitude: 11.68μ
Reciprocal of LSF width at 50% amplitude: 85.5L/mm
NPIC J-8222 (9/68)


MICRODENSITOMETRIC TRACE
Trace Number: 2
Mission Number: 1008-1
Pass Number: 40D
Frame Number: 203 AFT
Lever Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .043 D/cm
Width of Line Spread Function
at 50% amplitude: 10.81μ
Reciprocal of LSF width
at 50% amplitude: 92.5L/mm
NPIC J-8228 (8/68)

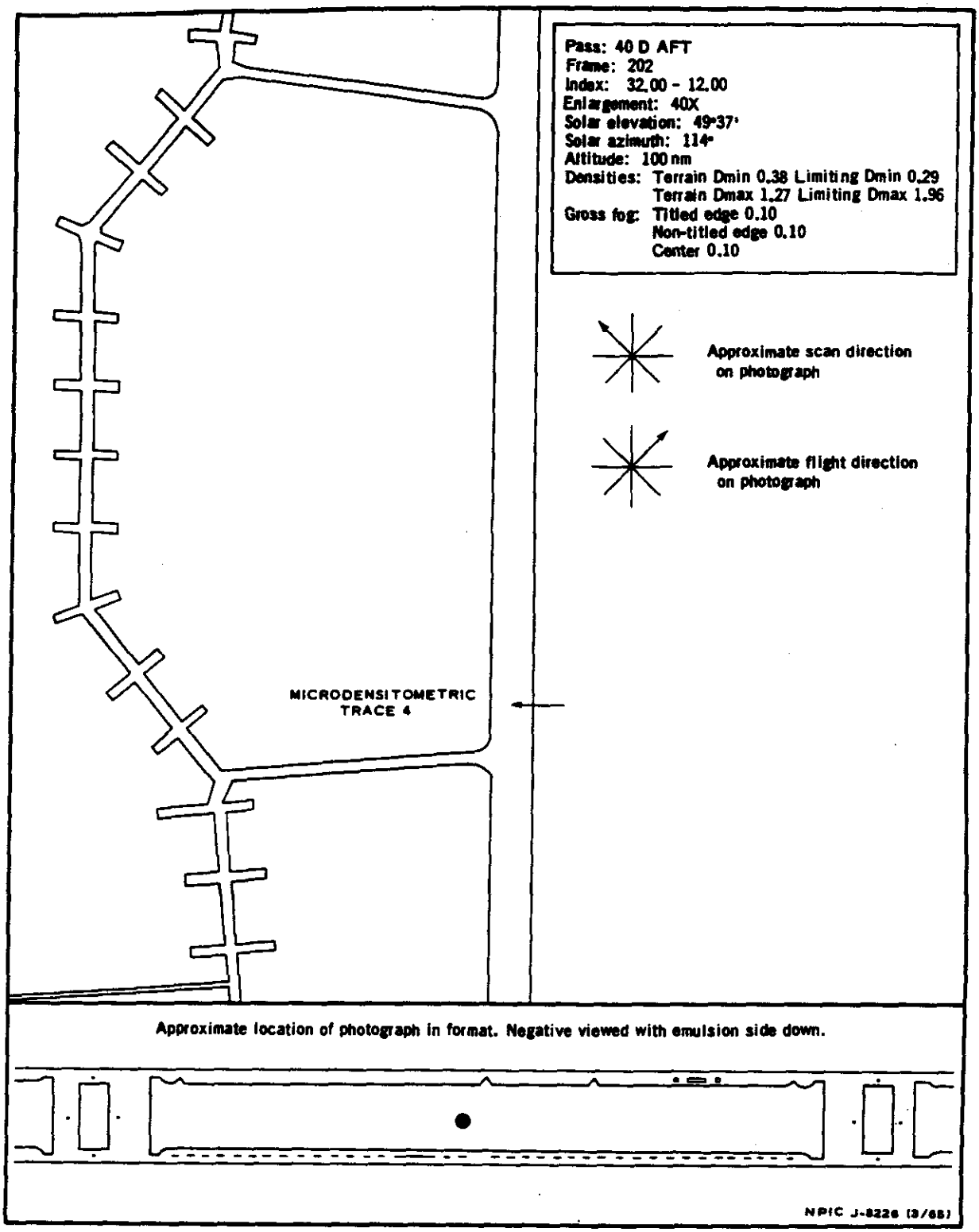

MICRODENSITOMETRIC TRACE
Trace Number: 3
Mission Number: 1008-1
Pass Number: 40D
Frame Number: 203 AFT
Level Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .043D/cm
Width of Line Spread Function at 50% amplitude: 8.48μ
Reciprocal of LSF width at 50% amplitude: 117.9L/mm
NPIC J-8334 (8/68)

[redacted]

FIGURE 19. TARGET, MICRODENSITOMETRIC TRACE NO 4.

NPIC J-8228 (2/68)

[redacted]


Pass: 40 D AFT
Frame: 202
Index: 32.00 - 12.00
Enlargement: 40X
Solar elevation: 49°37'
Solar azimuth: 114°
Altitude: 100 nm
Densities: Terrain Dmin 0.38 Limiting Dmin 0.29
Terrain Dmax 1.27 Limiting Dmax 1.96
Gross fog: Titled edge 0.10
Non-titled edge 0.10
Center 0.10
Approximate scan direction on photograph
Approximate flight direction on photograph
MICRODENSITOMETRIC TRACE 4
Approximate location of photograph in format. Negative viewed with emulsion side down.
NPIC J-8226 (3/65)

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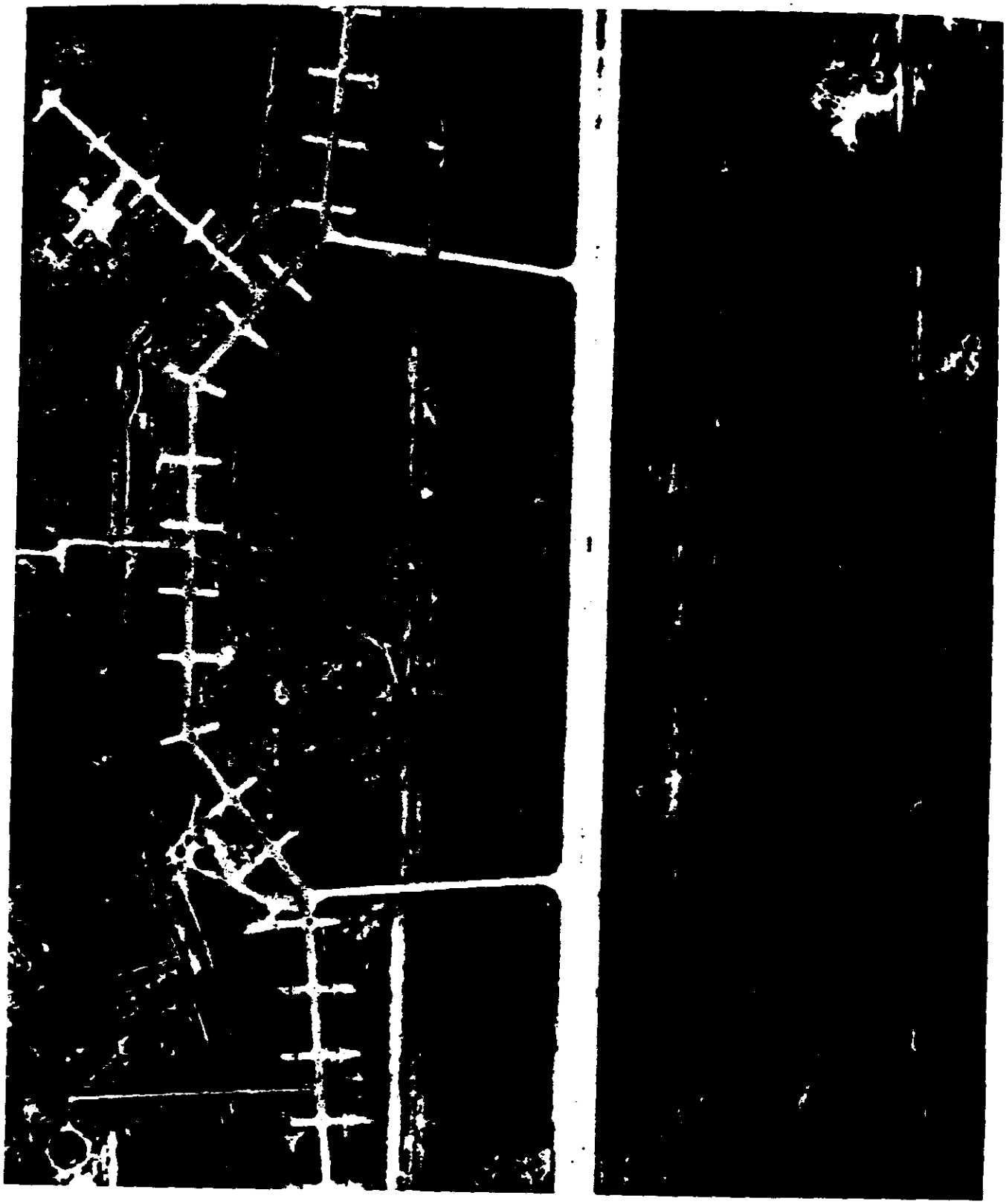

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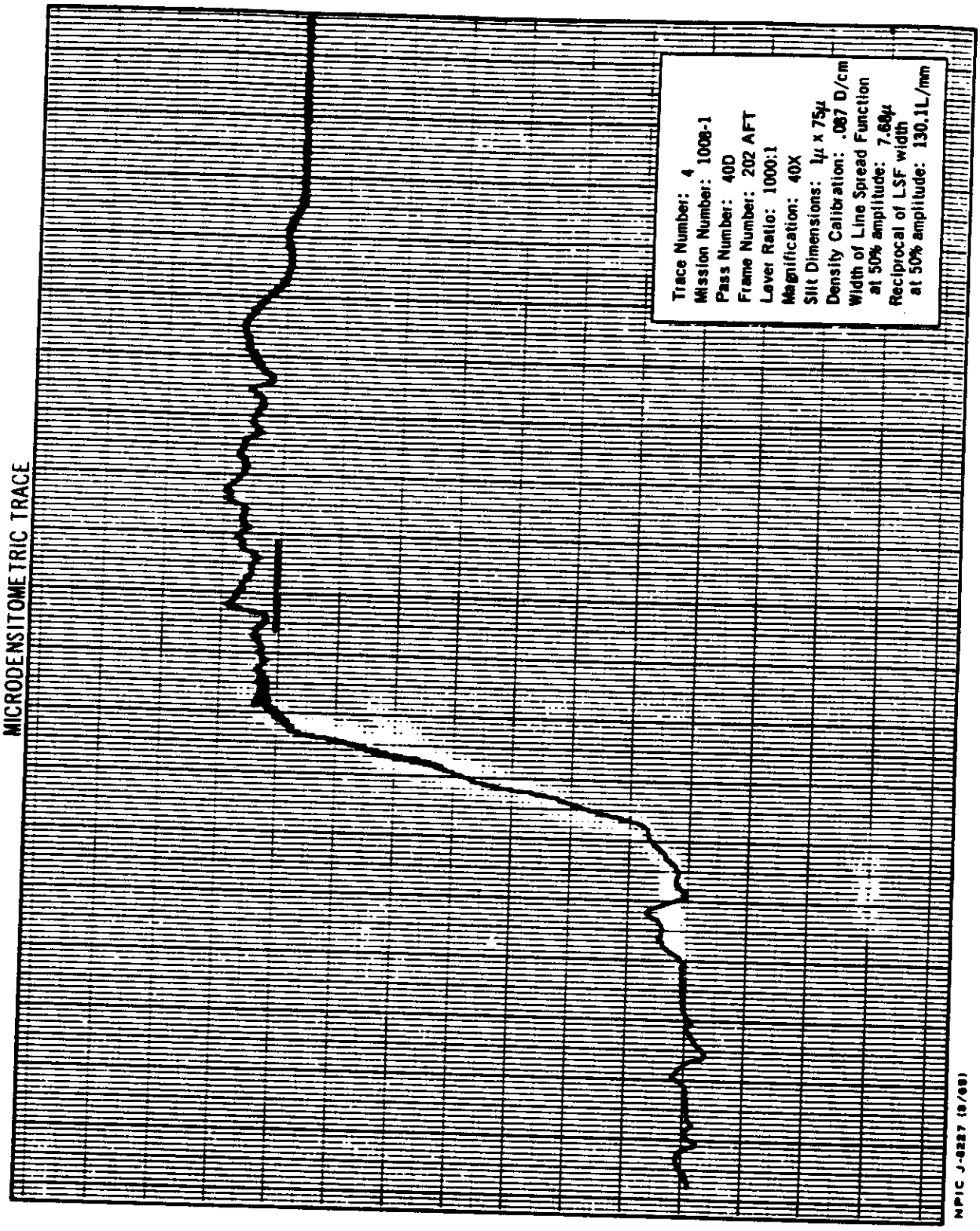
MICRODENSITOMETRIC TRACE
Trace Number: 4
Mission Number: 1008-1
Pass Number: 40D
Frame Number: 202 AFT
Lever Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .087 D/cm
Width of Line Spread Function
at 50% amplitude: 7.68μ
Reciprocal of LSF width
at 50% amplitude: 130.1L/mm
NPIC J-8227 (8/68)

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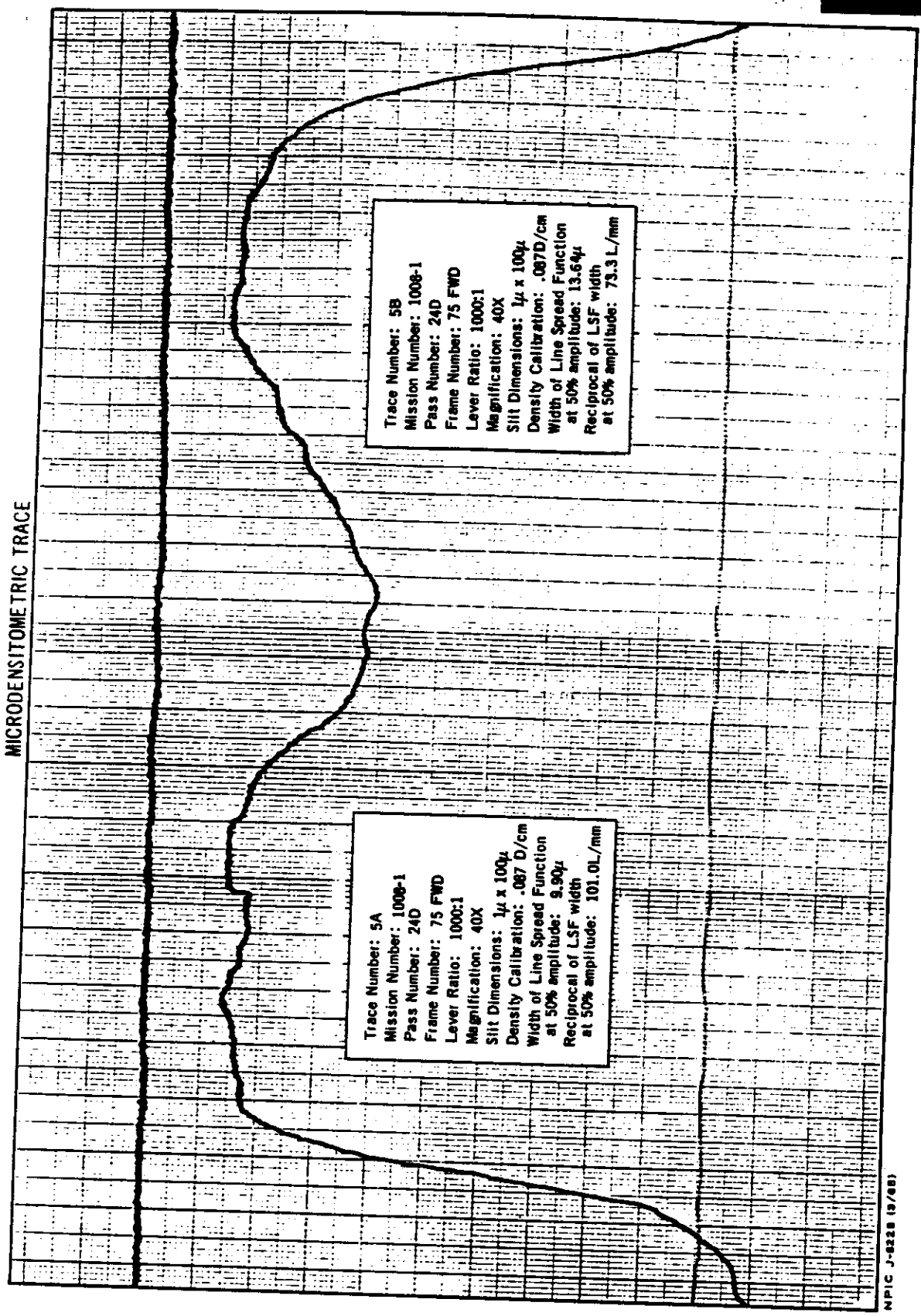

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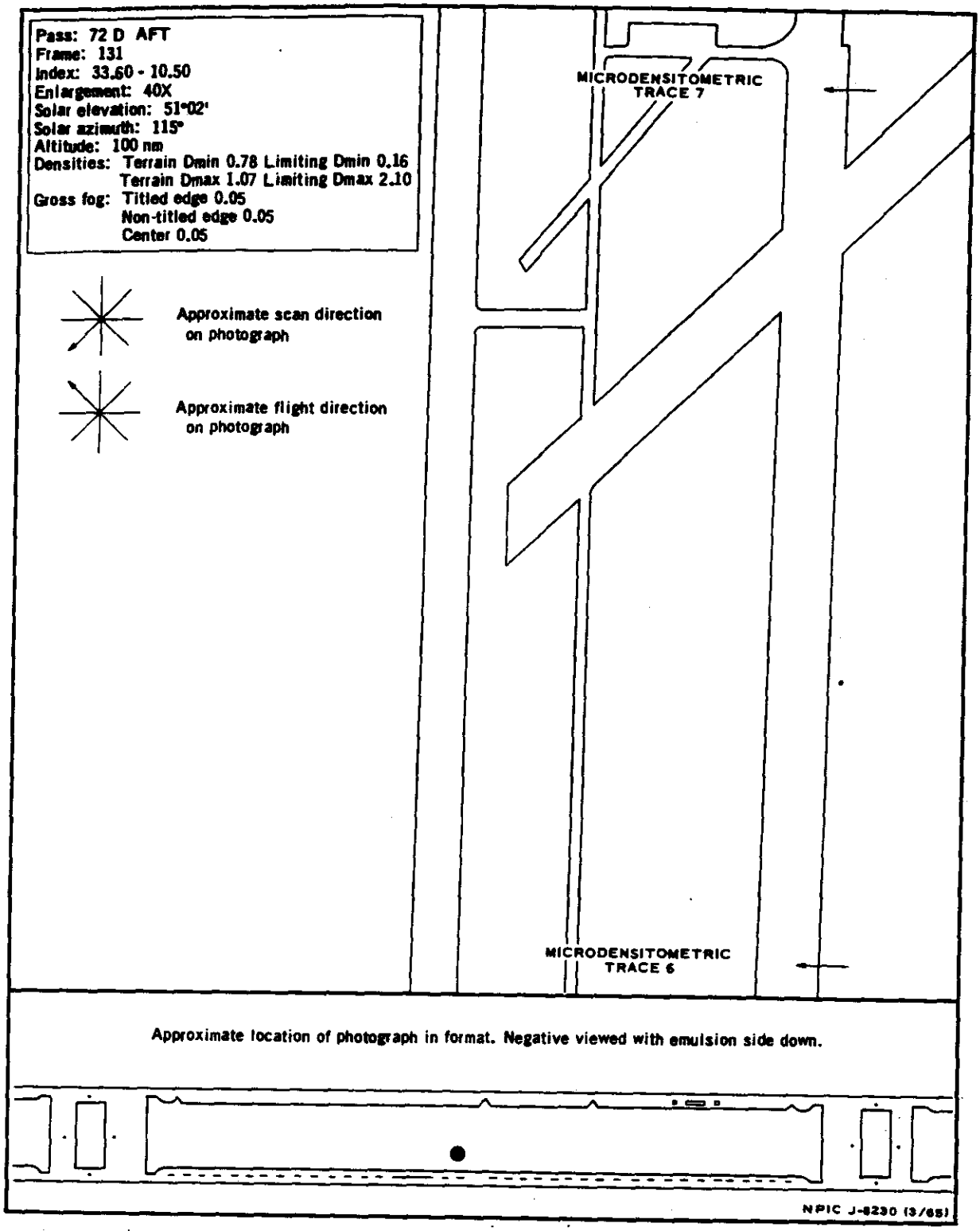
FIGURE 20. TARGET, MICRODENSITOMETRIC TRACES NO'S 6 AND 7.

NPIC J-8229 (2/68)

[redacted]

[redacted]



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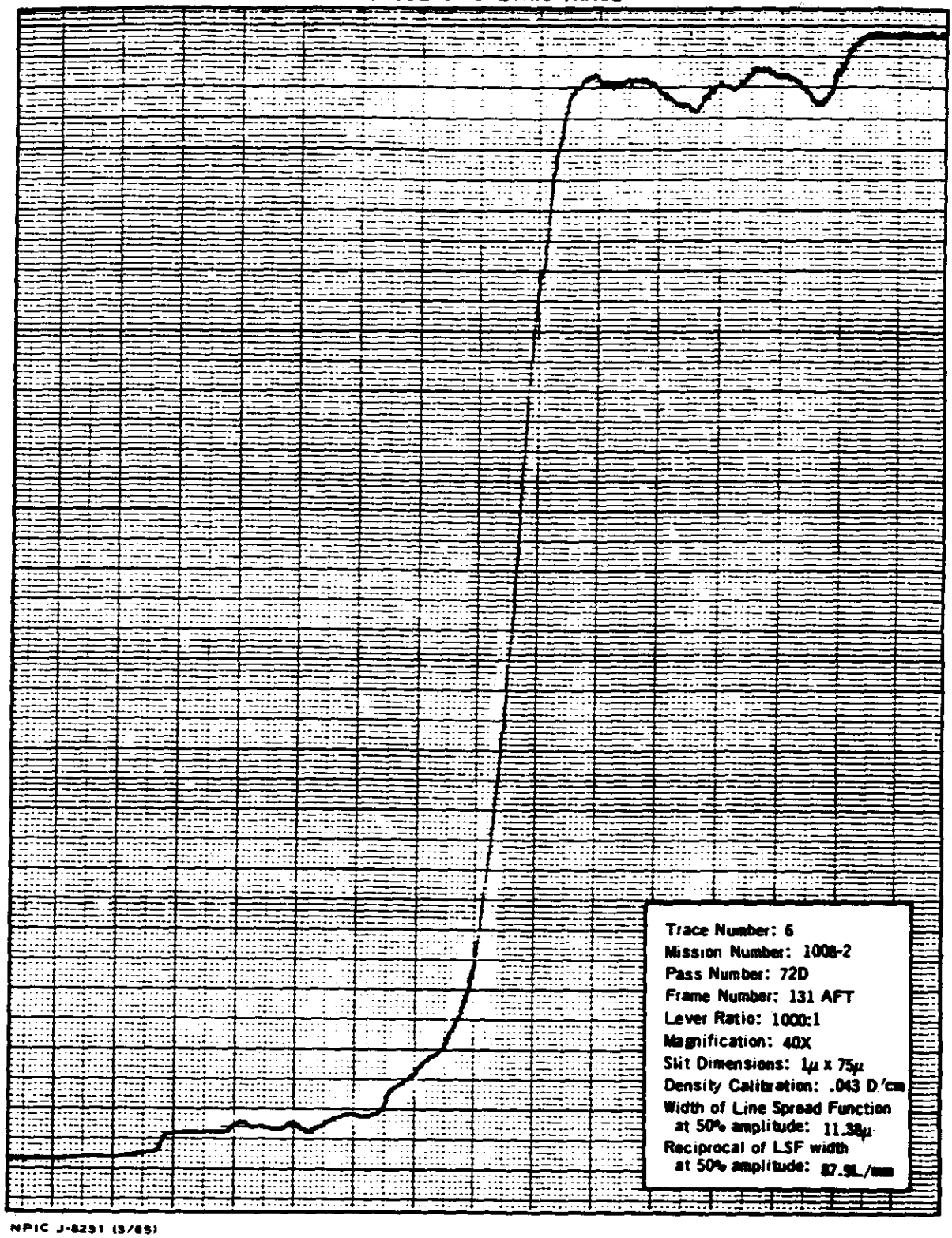
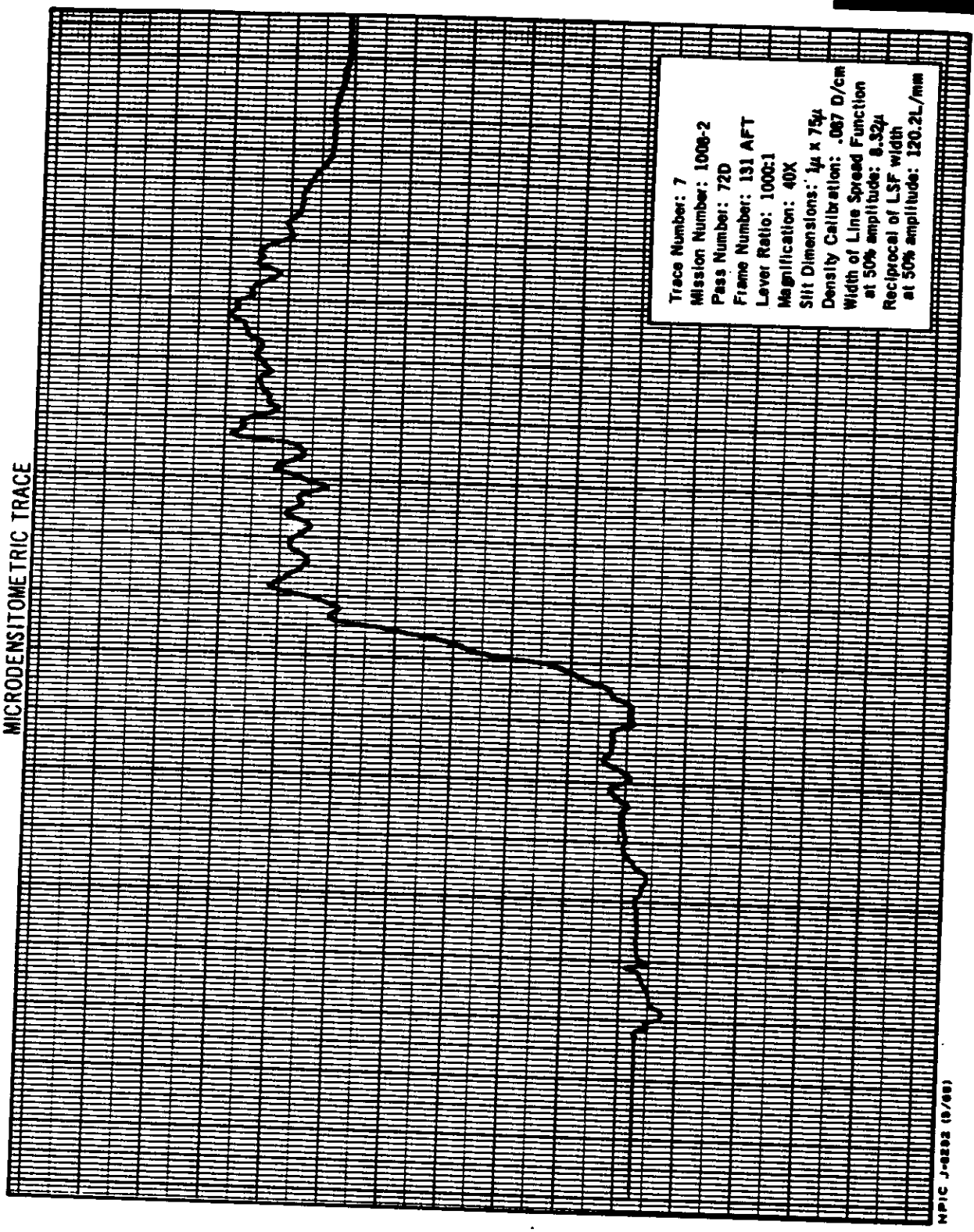
MICRODENSITOMETRIC TRACE



NPIC J-8291 (3/65)


MICRODENSITOMETRIC TRACE
Trace Number: 7
Mission Number: 1008-2
Pass Number: 72D
Frame Number: 131 AFT
Lever Ratio: 1000:1
Magnification: 40X
Slit Dimensions: 1μ x 75μ
Density Calibration: .087 D/cm
Width of Line Spread Function at 50% amplitude: 8.32μ
Reciprocal of LSF width at 50% amplitude: 120.2L/mm
NPIC J-8202 (5/68)

APPENDIX C. DENSITY READINGS

Mission 1008-1, 11-13 July 1964

S/I Frame	STELLAR				INDEX						
					Limiting			Terrain			
	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta	Dmax	Dmin	Delta	Gross Fog
1D/001	2.82	0.42	2.40	0.27	1.76	0.38	1.38	NR	NR	NR	0.08
1D/002	2.83	0.40	2.43	0.28	1.78	0.23	1.55	NR	NR	NR	0.08
2D/003	2.78	0.39	2.39	0.30	1.74	0.12	1.62	0.77	0.38	0.39	0.08
2D/009	2.80	0.54	2.26	0.42	1.68	0.20	1.48	NR	NR	NR	0.08
3D/010	2.81	0.72	2.09	0.64	1.74	0.32	1.42	NR	NR	NR	0.08
3D/022	2.85	0.33	2.52	0.19	1.72	0.27	1.45	NR	NR	NR	0.08
5D/023	2.84	0.30	2.54	0.19	1.96	0.21	1.75	0.53	0.28	0.25	0.08
5D/040	2.90	0.34	2.56	0.18	2.04	0.98	1.06	NR	NR	NR	0.08
6D/041	2.59	0.24	2.35	0.18	1.62	0.42	1.20	1.25	0.73	0.52	0.08
6D/077	2.66	0.26	2.40	0.18	2.12	0.21	1.91	0.94	0.30	0.64	0.08
7D/078	2.62	0.24	2.38	0.19	1.92	0.59	1.33	NR	NR	NR	0.08
8AE/101	0.20	0.20	0	0.20	0.08	0.08	0.00	NR	NR	NR	0.08
8AE/102	0.19	0.19	0	0.19	0.08	0.08	0.00	NR	NR	NR	0.08
8D/103	2.76	0.26	2.50	0.19	1.37	0.18	1.19	0.73	0.18	0.55	0.08
8D/125	2.62	0.28	2.34	0.20	1.84	0.31	1.53	1.35	0.42	0.93	0.08
9D/126	2.44	0.24	2.20	0.20	1.86	0.21	1.65	0.69	0.21	0.48	0.08
9D/145	2.88	0.90	1.98	0.85	1.20	0.12	1.08	0.57	0.35	0.22	0.08
19D/146	3.02	0.90	2.12	0.82	1.68	0.46	1.22	NR	NR	NR	0.08
19D/155	3.03	0.32	2.71	0.20	1.58	0.14	1.44	1.32	0.14	1.18	0.08
21D/156	2.90	0.27	2.63	0.20	1.51	0.16	1.35	0.73	0.20	0.53	0.08
21D/175	3.02	0.32	2.70	0.21	2.05	0.21	1.84	0.97	0.21	0.76	0.08
22D/176	2.89	0.26	2.63	0.20	1.56	0.65	0.91	1.42	0.65	0.77	0.08
22D/202	3.08	0.35	2.73	0.20	2.08	0.40	1.68	1.81	0.40	1.41	0.08
23D/203	2.75	0.28	2.47	0.20	1.95	0.24	1.71	0.64	0.28	0.36	0.08
23D/215	3.05	0.37	2.68	0.20	2.00	0.23	1.77	1.32	0.23	1.09	0.08
26AE/216	0.21	0.21	0	0.21	0.08	0.08	0.00	NR	NR	NR	0.08
26AE/217	2.50	0.20	2.30	0.20	0.08	0.08	0.00	NR	NR	NR	0.08
24D/218	2.92	0.27	2.65	0.20	1.83	0.18	1.65	0.88	0.25	0.63	0.08
24D/237	3.12	0.44	2.68	0.34	1.47	0.16	1.31	1.47	0.44	1.03	0.08
25D/238	2.96	0.49	2.47	0.40	1.47	0.14	1.33	0.65	0.23	0.42	0.09
25D/248	2.98	0.32	2.66	0.22	1.95	0.20	1.75	0.86	0.22	0.64	0.12
31D/249	2.96	0.38	2.58	0.21	2.03	0.28	1.75	1.13	0.44	0.69	0.14
31D/253	2.97	0.34	2.63	0.20	2.00	0.21	1.79	1.03	0.21	0.82	0.09
36D/254	2.85	0.28	2.47	0.24	1.54	0.53	1.01	1.42	0.72	0.70	0.08
36D/292	3.01	0.36	2.65	0.19	1.65	0.22	1.43	NR	NR	NR	0.08
37D/293	2.84	0.28	2.56	0.19	1.89	0.15	1.74	0.98	0.18	0.80	0.08
37D/298	2.84	0.32	2.52	0.20	1.96	0.23	1.73	0.97	0.25	0.73	0.08
38D/299	2.74	0.30	2.44	0.20	1.51	0.60	0.91	NR	NR	NR	0.08
38D/328	3.04	0.34	2.70	0.19	1.95	0.44	1.51	1.62	0.60	1.02	0.08
39D/329	2.80	0.26	2.54	0.20	1.06	0.14	0.92	0.58	0.14	0.44	0.08
39D/351	3.02	0.38	2.64	0.20	1.72	0.26	1.46	1.43	0.26	1.17	0.08
40AE/352	0.19	0.19	0	0.19	0.08	0.08	0.00	NR	NR	NR	0.08
40D/353	2.88	0.31	2.57	0.19	1.78	0.16	1.62	NR	NR	NR	0.08
40D/384	2.90	0.33	2.57	0.23	1.45	0.21	1.24	1.36	0.21	1.15	0.09
41D/385	2.81	0.35	2.46	0.27	1.97	0.14	1.83	0.59	0.19	0.40	0.09
41D/397	3.05	0.32	2.73	0.18	1.93	0.37	1.56	0.98	0.44	0.54	0.09
47DE/398	2.84	0.36	2.48	0.18	1.96	0.31	1.65	1.38	0.31	1.07	0.09
47DE/404	2.95	0.34	2.61	0.20	1.86	0.25	1.61	1.19	0.48	0.71	0.11

Mission 1008-2, 14-17 July 1964

S/I Frame	STELLAR				INDEX						
					Limiting			Terrain			
	Dmax	Dmin	Delta	Gross Fog	Dmax	Dmin	Delta	Dmax	Dmin	Delta	Gross Fog
49D/001	1.98	0.50	1.48	0.23	1.68	0.13	1.55	NR	NR	NR	0.08
49D/002	1.95	0.46	1.49	0.24	1.72	0.12	1.60	0.61	0.48	0.13	0.09
49D/003	1.96	0.49	1.47	0.23	1.82	0.14	1.68	0.62	0.36	0.26	0.09
52D/004	2.19	0.53	1.66	0.28	1.26	0.20	1.06	1.26	0.34	0.92	0.11
52D/031	2.54	0.72	1.82	0.30	1.42	0.20	1.22	NR	NR	NR	0.13
53D/032	2.21	0.60	1.61	0.41	1.88	0.21	1.67	0.41	0.21	0.20	0.09
53D/037	2.25	0.52	1.73	0.27	1.70	0.30	1.40	0.84	0.30	0.54	0.08
54D/038	2.20	0.60	1.60	0.29	1.24	0.15	0.09	0.58	0.15	0.43	0.10
54D/056	2.28	0.54	1.74	0.21	1.63	0.48	1.15	NR	NR	NR	0.09
55D/057	2.20	0.51	1.69	0.27	1.56	0.42	1.14	NR	NR	NR	0.10
55D/083	2.47	0.64	1.83	0.32	1.92	0.12	1.80	1.92	0.40	1.52	0.10
56AE/084	0.38	0.32	0.06	0.28	NR	NR	NR	NR	NR	NR	0.10
56AE/085	0.22	0.22	0.00	0.22	NR	NR	NR	NR	NR	NR	0.10
56D/086	2.21	0.54	1.67	0.28	1.41	0.16	1.25	NR	NR	NR	0.10
56D/107	2.10	0.58	1.52	0.42	1.85	0.45	1.40	NR	NR	NR	0.18
57D/108	2.37	0.80	1.57	0.44	NR	NR	NR	NR	NR	NR	2.56
57D/119	2.45	0.75	1.70	0.27							
68D/120	2.44	0.73	1.71	0.24							
68D/131	2.48	0.75	1.73	0.24							
69D/132	2.45	0.80	1.65	0.32	Remainder of film fogged by shutter malfunction						
69D/142	2.28	0.59	1.69	0.29							
70D/143	2.30	0.64	1.76	0.29							
70D/155	2.42	0.64	1.78	0.28							
71AE/156	0.28	0.28	0.00	0.28							
71D/157	2.28	0.63	1.65	0.22							
71D/182	2.42	0.61	1.81	0.24							
72D/183	2.14	0.52	1.62	0.32							
72D/206	2.47	0.58	1.89	0.24							
83D/207	2.26	0.61	1.65	0.32							
83D/220	2.89	0.65	2.24	0.25							
84D/221	2.75	0.74	2.01	0.24							
84D/226	2.48	0.65	1.83	0.24							
85D/227	2.42	0.74	1.68	0.27							
85D/239	2.52	0.77	1.75	0.27							
86D/240	2.30	0.64	1.66	0.26							
86D/273	2.53	0.70	1.83	0.27							
87AE/274	0.39	0.28	0.11	0.28							
87AE/275	1.69	0.26	1.43	0.26							
87D/276	2.22	0.62	1.60	0.26							
87D/294	2.38	0.62	1.76	0.25							
88D/295	2.02	0.51	1.51	0.25							
88D/322	2.08	0.59	1.49	0.31							
99D/323	2.15	0.71	1.44	0.24							
99D/351	2.34	0.72	1.62	0.26							

Mission 1008-2 (Continued)

S/I Frame	STELLAR Dmax	Dmin	Delta	Gross Fog	INDEX Limiting Dmax	Dmin	Delta	Terrain Dmax	Dmin	Delta	Gross Fog
100D/352	2.62	0.75	1.87	0.25							
100D/384	2.44	0.48	1.96	0.29							
102D/385	2.44	0.68	1.76	0.26							
102D/411	2.69	1.16	1.53	0.72							
103AE/412	3.10	0.88	2.22	0.88							
103D/413	3.28	1.64	1.64	0.89							
103D/420	2.40	1.64	0.76	1.60							
104D/421	2.55	1.87	0.68	1.06							

Special Note

In addition to the foregoing, gross fog densities were measured in areas equidistant from the film edges and between adjacent frames, exclusive of light-fogged and/or static-degraded sections. These readings reveal that the stellar material exposed in Mission 1008-1 has a fairly stable gross fog level, ranging from 0.19 - 0.23, with the exception of 5 distinct rises which occur in passes 3D, 9D, 25D, 36D, and 41D. In those passes the density values gradually rise to a peak, then rapidly revert to normal. The recorded peak values range from 0.28 (pass 41D) to 0.85 (pass 9D). In Mission 1008-2, however, the gross fog values are not stabilized at any level and accurate readings are complicated by the presence of light-fogged areas and equipment shadowgraphs. The possibility that radiation is the source of the fogging is currently under investigation.

APPENDIX D. CLOUD COVER ANALYSIS

INTRODUCTION

This study represents a statistical analysis of the cloud cover on the photography of Mission 1008. 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 KEYHOLE photography (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 percentage of each cloud category within an operational pass appears in Table 2. Each percentage is a ratio of the number of occurrences of a given cloud cover category to the total 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 1000 (250 frames by 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.

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 1008

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
2D	17.8	8.6	8.7	26.0	38.9	64.1
3D	16.4	10.1	14.7	39.7	19.1	57.1
5D	1.7	4.3	21.1	24.0	48.9	75.8
6D	33.0	17.6	20.0	19.1	10.3	37.0
7D	3.1	8.7	22.2	35.4	30.6	67.3
8D	68.4	17.1	12.7	1.8	0.0	12.6
9D	15.7	14.9	27.8	38.1	3.5	46.0
19D	12.5	5.0	11.6	47.8	23.1	64.9
21D	26.4	21.9	28.1	22.2	1.4	33.9
22D	32.8	16.9	15.4	29.1	5.8	38.0
23D	8.4	17.8	32.2	36.5	5.1	48.2
24D	47.0	16.2	14.9	18.6	3.3	28.1
25D	45.1	18.8	30.2	5.9	0.0	21.4
36D	25.5	10.9	18.1	23.9	21.6	49.6
37D	5.1	19.4	28.6	42.8	4.1	50.7
38D	19.1	17.3	19.5	38.9	5.2	45.7
39D	47.6	10.8	30.0	11.5	0.1	24.4
40D	32.8	28.7	24.2	13.5	0.8	26.7
41D	15.4	22.1	30.1	26.6	5.8	41.9
Average 1008-1	27.3	15.6	21.3	24.8	11.0	41.8

TABLE 2. (Continued)

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
52D	7.4	8.7	12.3	47.3	24.3	66.4
53D	4.7	11.0	28.5	55.2	0.6	55.0
54D	36.5	12.8	11.3	29.9	9.5	40.3
55D	21.9	10.2	21.6	27.5	18.8	50.6
56D	27.9	21.3	22.1	21.2	7.5	36.9
57D	45.4	13.4	20.7	18.3	2.2	28.3
68D	13.9	8.8	18.6	49.2	9.5	55.7
69D	8.9	16.1	27.6	42.5	4.9	50.5
70D	35.4	20.8	19.0	21.3	3.5	32.1
71D	23.1	18.2	26.7	18.3	13.7	41.9
72D	53.5	10.5	16.9	18.8	0.3	25.3
83D	8.9	12.0	23.2	45.9	10.0	55.8
84D	2.3	4.5	27.3	55.0	10.9	63.4
85D	15.6	15.8	27.0	40.8	0.8	45.2
86D	8.7	10.2	21.4	40.0	19.7	60.1
87D	51.0	13.3	12.7	20.0	3.0	27.7
88D	38.4	14.4	19.7	25.2	2.3	33.1
99D	18.4	8.1	12.2	29.0	32.3	61.0
100D	12.7	12.8	23.2	24.5	26.8	56.9
102D	27.4	16.6	22.5	26.1	7.4	39.8
103D	3.7	4.5	17.6	49.2	25.0	69.6
104D	36.1	17.3	21.0	21.3	4.3	33.1
Average 1008-2	23.9	12.9	19.9	30.5	12.8	46.7

APPENDIX E. MISSION COVERAGE STATISTICS

Summary of Plottable Photographic Coverage
Mission 1008-1

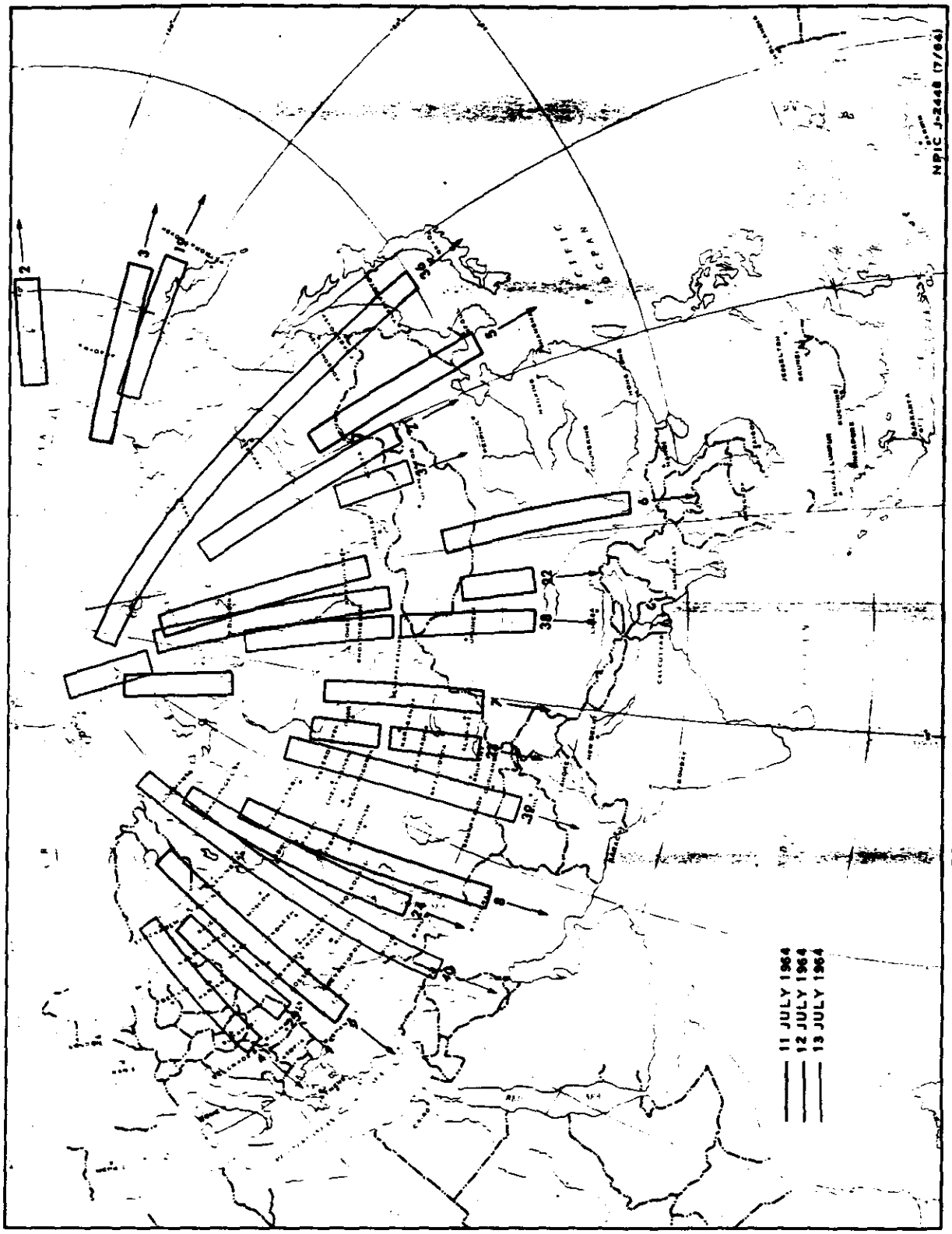
Country	Linear nm	Square nm
USSR	33,199	4,488,416
China	4,876	687,110
Finland	615	94,956
Mongolia	609	87,372
Poland	646	85,680
Iran	544	76,160
Mexico	644	58,236
Rumania	379	45,526
Afghanistan	268	37,254
Hungary	254	36,576
Turkey	254	35,560
Czechoslovakia	168	24,192
North Korea	132	18,480
Sweden	332	15,096
Yugoslavia	86	3,612
TOTAL	43,006	5,794,226
Continental US	1,133	143,622
GRAND TOTAL	44,139	5,937,848

[redacted]

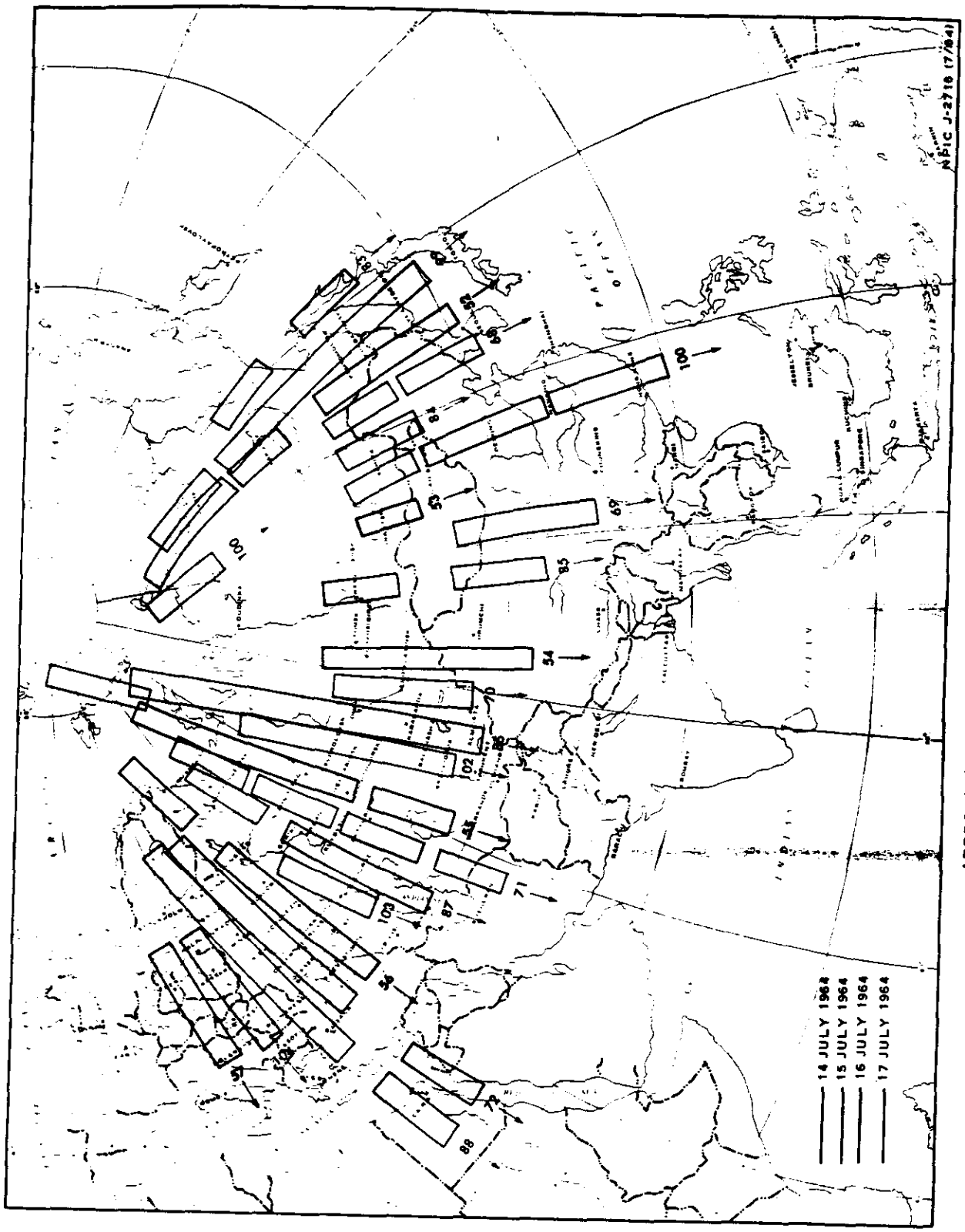
Summary of Plottable Photographic Coverage
Mission 1008-2

Country	Linear nm	Square nm
USSR	32,991	4,315,742
China	6,521	895,038
Finland	1,399	186,984
Mongolia	1,178	167,694
Poland	858	108,000
Egypt	692	80,592
Rumania	651	85,894
North Korea	452	34,860
Czechoslovakia	439	63,216
Bulgaria	303	21,460
Turkey	303	21,156
Austria	296	42,624
Hungary	279	40,176
Iran	274	38,360
Yugoslavia	267	34,790
East Germany	222	28,512
Norway	195	16,354
Israel	156	10,764
Sweden	111	10,508
Jordan	78	10,764
Saudi Arabia	78	8,556
Lebanon	78	2,208
Denmark	74	5,624
Hawaii	74	1,980
TOTAL	47,969	6,231,856
Continental US	167	23,380
GRAND TOTAL	48,136	6,255,236

[redacted]



APPROXIMATE TRACK OF MISSION 1008-1, 11-13 JULY 1964.



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