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February 1965

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55 Pages

TECHNICAL REPORT

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1007

19-27 JUNE 1964

This document contains information referring to

Project Corona

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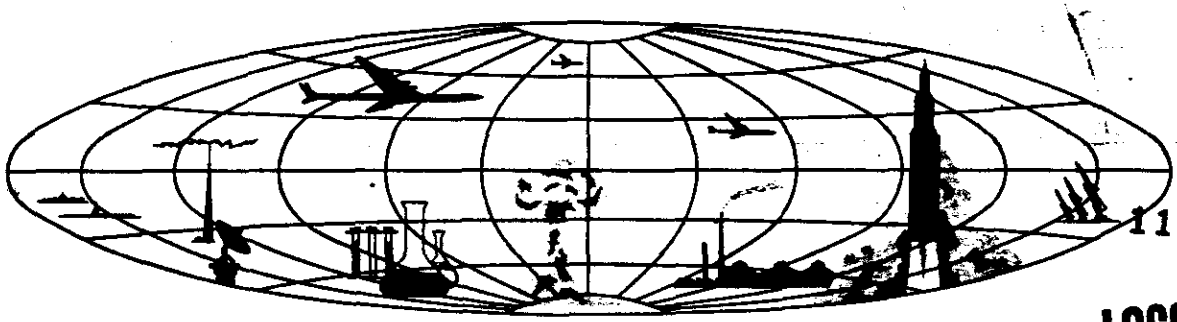

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TECHNICAL REPORT

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1007
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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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SYNOPSIS

Mission 1007 (J-07), the seventh in the J series of reconnaissance systems, was launched into orbit on 19 June 1964. The mission accomplished 49 operational photographic passes and 8 photographic engineering passes, the last photographic pass being pass 120.

The "A" bucket (designated 1007-1) was recovered on 24 June 1964 and the "B" bucket (designated 1007-2) on 28 June 1964. Both buckets were recovered dry. Mission 1007 consists of 15,870 feet of Master (FWD) panoramic film; 15,855 feet of Slave (AFT) panoramic film; 203 feet of Index film; and 114 feet of Stellar film.

The Master and Slave panoramic cameras operated satisfactorily throughout both phases of the mission. The photographic quality and interpretation suitability of the panoramic material are good and are similar to those results achieved in Mission 1004. The film is comparatively free of degradation, with the exception of small out-of-focus areas on most frames of the forward camera. This condition is present on the Master (FWD) panoramic camera photography of the first phase only (1007-1) and is similar to that found in Mission 1004. Despite slight vignetting of the format corners the horizon images are good and are usable for the determination of vehicle attitude in most operational passes. Vehicle attitude appears to have been normal throughout the mission.

The Stellar/Index (S/I) unit functioned satisfactorily throughout part one (1007-1). The index take is good and the stellar photography contains numerous stellar images. During the second phase (1007-2), S/I unit operation was erratic.

Clouds and/or haze obscured or degraded approximately 49 percent of the panoramic photography.

GENERAL FLIGHT DATA

Date of Launch: 19 June 1964

Orbital Parameters

	1007-1 Actual (revolution 32)	1007-2 Actual (revolution 96)
Period	90.96 min	90.88 min
Perigee	100.18 nm	101.58 nm
Apogee	258.44 nm	257.66 nm
Eccentricity	00.02188	0.02159
Inclination Angle	84°59.6' N	84°59.4' N
Perigee Latitude	48°56.0' N	64°27.6' N

Number of Frames Per Camera

Camera	Master	Slave	Stellar	Index
1007-1	2,737	2,714	392	392
1007-2	3,126	3,083	428	428
Total	5,863	5,797	820	820

The last six frames of terminal pass 57D (Mission 1007-1) were contained in the 1007-2 recovery package and are so listed.

PART 1. CAMERA OPERATION

1. Master Panoramic Camera No 144:

The camera was operational throughout the mission and the photography is of good quality. Diagonal light leak traces associated with camera off periods are present in the third frame of most camera operations. Although not severe, shadowgraphs of equipment appear at the start and end of most passes. Dendritic static traces occur at the frequency mark edge in pass 56D, and a few minor corona static fogged areas are present throughout the mission. Degradation by static discharges, however, is minor. In addition to continuous rail scratches, emulsion digs are present in the vicinity of the camera number approximately 0.1 inch into the format in every frame.

Areas of soft imagery which vary in size, shape, location, and degree of softness begin in pass 38D and terminate with pass 57D (last pass of 1007-1). Although these areas are confined within 3.0 inches of the supply end of the format area they should not be confused with the out-of-focus area or soft photography normally present in the "bonus" areas of the formats.

The shrinkage marker near the take-up end of the format and the adjacent frame edges are ragged from pass 24D to the end of the mission. Transverse banding, which results from an uneven scan speed, is apparent intermittently throughout the mission where density levels permit observation.

A Wratten 25 filter was used (in lieu of the normal Wratten 21 filter) on this unit.* The slit width was increased to provide the additional exposure required by the new filter; however, the compensation was not adequate and the film is slightly underexposed.

*Results of the filter experiment are contained in section 6, (Wratten 25 filter Experiment) of Part III.

The imagery of the photography obtained from the second phase of the mission (1007-2) displays the acuteness of that generally observed on the first phase (1007-1).

2. Slave Panoramic Camera No 145:

The camera was operational throughout the mission and the imagery is slightly superior to that of the master panoramic unit. A crescent-shaped light leak trace originating at the frequency mark edge is present within the first few frames of some passes. Equipment shadowgraphs usually occur within the first and last three frames of most camera operations. A few dendritic and corona static traces are noted throughout the mission; however, degradation is minor. A series of emulsion digs and scratches approximately 0.1 inch from the format edge under the camera number and a second series at the frequency mark edge of the format are present on each frame of the mission. Transverse banding caused by an uneven scan rate is noted intermittently throughout the mission where density levels permit observation.

3. Master Horizon Cameras:

A. The port horizon camera operated normally throughout the mission. Exposure varied from under to adequate. Image quality is good and the horizon arcs are unaffected by a slight vignetting at the camera number edge of the format. Small dendritic static traces are present in the formats at the frequency mark edge in numerous frames of the mission, but do not interfere with the horizon imagery.

B. The starboard horizon camera was operational throughout the mission and the exposure was adequate in most passes. Image quality is good and the horizon arcs are unaffected by a slight vignetting at the camera number edge of the format. Small dendritic

static traces are present in the formats at the frequency mark edge in numerous frames of the mission, but do not interfere with the horizon imagery.

4. Slave Horizon Cameras:

A. The starboard horizon camera was operational throughout the mission. Exposure was adequate in most passes and the image quality is good. The horizon arcs are unaffected by a slight vignetting at the camera number edge of the format.

B. The port horizon camera was operational throughout the mission. Exposure was under to adequate and the image quality is good. The horizon arcs are unaffected by a slight vignetting at the camera number edge of the format and are usable for determination of vehicle attitude.

5. Stellar Camera No D43 Reseau No 43:

This camera was used in the first phase of the mission (1007-1) and was operational throughout. The first four frames are affected by fog. Reflections from the baffle, lamp shield, and side curtain degrade all frames.

Sharply defined, extremely dense linear streaks are present intermittently within the formats. These are tentatively identified as traces of crystallized particles of jettisoned fuel.

Dendritic static traces are continuous along both edges of the film on the last 50 percent of the photography.

Numerous stellar images, including some of the sixth magnitude, are detectable on most frames. The reseau is visible in all 392 frames. The photography is affected by several areas of high gross fog of undetermined origin.

6. Index Camera No D43 Reseau No 43:

This camera was used in the first phase of the mission (1007-1) and operated satisfactorily. The photography consists of 392 frames, is considered good, and is comparatively free of degradation. Only slight edge fog at the camera number edge was noted.

The reseau is well defined in all frames. Exposure is adequate and low to medium contrast prevails, with a few examples of high contrast imagery.

7. Stellar Camera No D54 Reseau No 51:

This camera was used in the second phase of the mission (1007-2) and the photography is degraded by several anomalies. In some instances, the shutter remained open during film transport; in others, it failed to open or opened only partially. Multiple exposures occurred on 13 frames.*

The photography is affected by several areas of high gross fog and the presence of corona and dendritic static traces. Reflections from the baffle, lamp shield, and side curtain degrade all frames. The fiducial marks are bloomed throughout the second phase of the mission (1007-2). Emulsion cracks are present on approximately the last 10 feet of material, in addition to a plus density abrasion streak and associated emulsion cracking which occurred on about the last six feet of film.

Because of the many frames lost due to these anomalies, no stellar read-out was accomplished.

8. Index Camera No D54 Reseau No 56:

This camera was used in the second phase of the mission (1007-2). The photography consists of 428 frames and is considered good, although the imagery on all frames subsequent to frame 3 is distorted at the camera number edge of the format. This condition suggests that the film was not in the focal plane at the camera number edge during exposure. Slight edge fog is also present at this edge. Thirteen frames contain multiple exposures.*

Although the reseau is well defined, the grid is distorted at the camera number edge. The

*Corresponding frames of the stellar and index photography were multiple exposed. The unit correlation was normal throughout the mission.

correlation lamps were operational through the mission. Exposure ranges from slightly underexposed to adequate and low to medium contrast prevails, with a few examples of high contrast imagery. The titling is occasionally blocked up and/or double printed.

9. Associated Equipment:

A. Although imaged outside the format, the frequency marks on the master and slave materials are flared and reflect into the format area. They functioned properly on both the master and slave units throughout the mission.

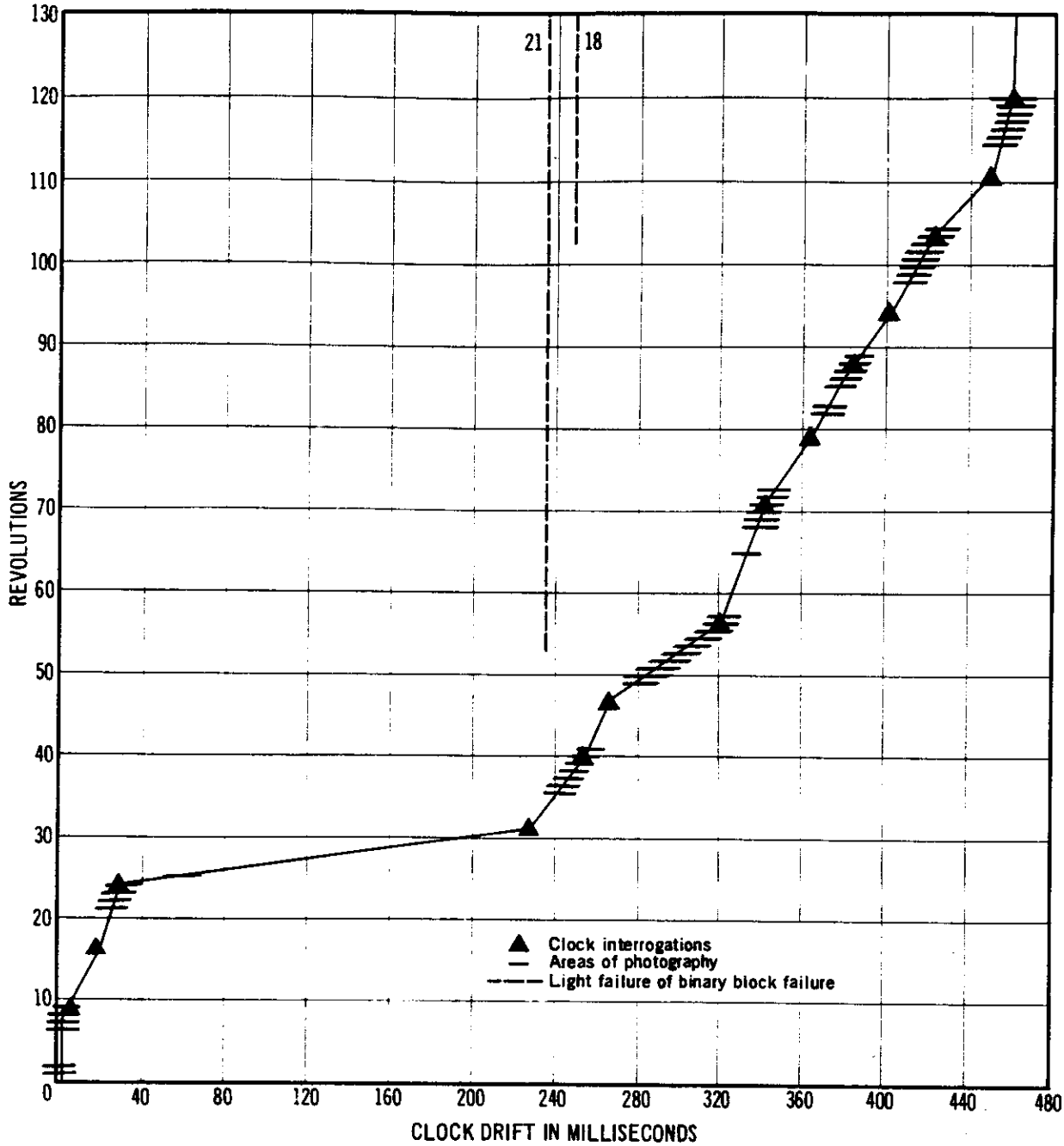
B. The binary records are good, although slightly bloomed on both the master and slave materials. Due to a slight shifting of the film, the top row of binary images are sometimes only two-thirds present. The binary clock experienced a total drift of 450 milliseconds during the mission, with the maximum drift for a single day being 199 milliseconds. Light number 18 did not function after pass 104D, frame 61, and light number 21 did not function after pass 52D, frame 52. Single binary records are imaged on each frame.

C. The horizon camera fiducials recorded properly throughout, with very little blooming noted.

D. The stellar and index camera correlation marks operated properly throughout the mission. Three of the four stellar fiducials were bloomed on the first phase of the mission (1007-1). One is bloomed to such an extent that it is not usable.

E. Camera off markers are present as required on the material from both panoramic cameras. They are imaged singly and in their proper position outside the format.

F. Camera numbers are slightly flared but legible on the panoramic material.



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PART II. FILM

1. Film Processing:

This section provides a descriptive evaluation of the exposure and processing, and comments on the exposure, the density, the processing, and the physical condition of the original negative.

Pertinent data were collected during various phases of the processing and more thoroughly during the evaluation of the negatives. This is a standard procedure. The community is informed by cable of any extensive defects in the photography which may affect the PI suitability of any mission.

Support organizations provided the processing center with pre-launch samples of the actual film used on this mission. These samples, along with fresh process control stock, were sensitometrically exposed and processed at controlled levels of development. A characteristic curve was prepared from these sensitometeric strips and is defined as the "Mission Material Processing Curve."

While the film was being prepared for processing, it was inspected for physical damage which could cause processing difficulties. During processing, data were recorded giving the processing conditions and film footage locations where processing changes occur. Changes in the normal course of processing which may affect the film quality were recorded and, after processing, the original negatives were examined frame by frame for defects and damage.

Most of the slave material on this mission received adequate exposure. Master photography was accomplished through a Wratten 25 filter (instead of the normal Wratten 21) and given only slightly more exposure. The increase of the slit width from 0.200 inches to 0.250 inches was inadequate to compensate for the Wratten 25 filter and the film is underexposed. The processing site reported that occasionally minimum density values of images on this material were on the toe of the sensitometric curve, even when processed at the full level of development. Approximate percentages of the panoramic film processed at each level are as follows:

Development Level	Percentage	
	Master	Slave
Primary	2	20
Intermediate	24	40
Full	74	40

The solar elevation varied from a low of 10°28' on operational pass 52D AFT to a high of 56°31' on pass 118D FWD. Acceptable photography was accomplished on all operational passes; however, photographs taken at lower latitudes where the sun angle was relatively high (30° - 50°) received optimum exposure.

The horizon cameras of each of the panoramic units received adequate exposure on all but the engineering passes. The extreme reflectance of a high amount of cloud cover caused many frames to be overexposed. Terrain exposure, however, is satisfactory.

The gross fog density readings of the panoramic film range from a minimum of 0.07 to a maximum of 0.19.

Stellar and index materials received adequate exposure.

2. Film Degradations:

This section lists some of the more notable film degradations and a few frames on which examples of each can be found.

[redacted]

A. Master Panoramic Camera:

Light Leaks	A diagonal band of plus density resulting from a light leak appears on the third frame in some passes. (Example: Pass 6D, frame 03).
Equipment Shadowgraphs	Shadowgraphs of equipment appear at the start and end of most camera operations. (Example: Pass 2D, frame 61; Pass 68D, frame 49).
Dendritic Static	Dendritic static traces occur at both edges intermittently throughout the mission. (Example: Pass 7D, frame 83; Pass 56D, frame 19).
Minus Density Streak	Minor, intermittently present throughout the mission. Pass 9D, frame 99 through 104; Pass 20D, frame 08 through 13; Pass 24D, frame 73.
Manufacturing Splices	Pass 37D, frame 133; Pass 69D, frame 82; Pass 103D, frame 41.
Emulsion Digs	A series of small emulsion digs are present near the camera number and just inside the format on each frame.
Transverse Banding	Apparent intermittently throughout the mission. (Example: Pass 57D, frames 40,42,43,44).
Emulsion Scratches	Rail scratches are severe and continous although outside of the format area.

B. Slave Panoramic Camera:

Light Leaks	A crescent-shaped patch of fog which appears intermittently throughout the mission is located approximately 9.0 inches from the supply end of the format. Pass 02D, frame 55; Pass 57D, frame 01.
Equipment Shadowgraphs	Shadowgraphs of equipment appear at the start of most camera operations. (Example: Pass 38D, frame 192; Pass 41D, frames 47 and 48).
Dendritic Static	Dendritic static traces occur at both edges intermittently throughout the mission. (Example: Pass 54D, frames 84 to 87; Pass 72D, frames 53 to 55).
Minus Density Streak	Intermittent, minor minus density streaks are present throughout the mission. (Example: Pass 22D, frames 42, 43 and 60).
Manufacturing Splices	Pass 2D, frame 02; Pass 38D, frame 66; Pass D70, frame 79; Pass 103D, frame 56.
Emulsion Digs	A series of small emulsion digs are near the camera number and just inside the format on each frame.
Transverse Banding	Apparent intermittently throughout the mission. (Example: Pass 55D, frames 69 to 84).
Emulsion Scratches	Continuous rail scratches are present outside the format area.

C. Stellar Camera No D43:

Dendritic Static	Continuous along both edges on the last 50 percent of the photography.
Reflections	Reflections from the baffle, lamp shield, and side curtain are present on every frame.

D. Index Camera No D43:

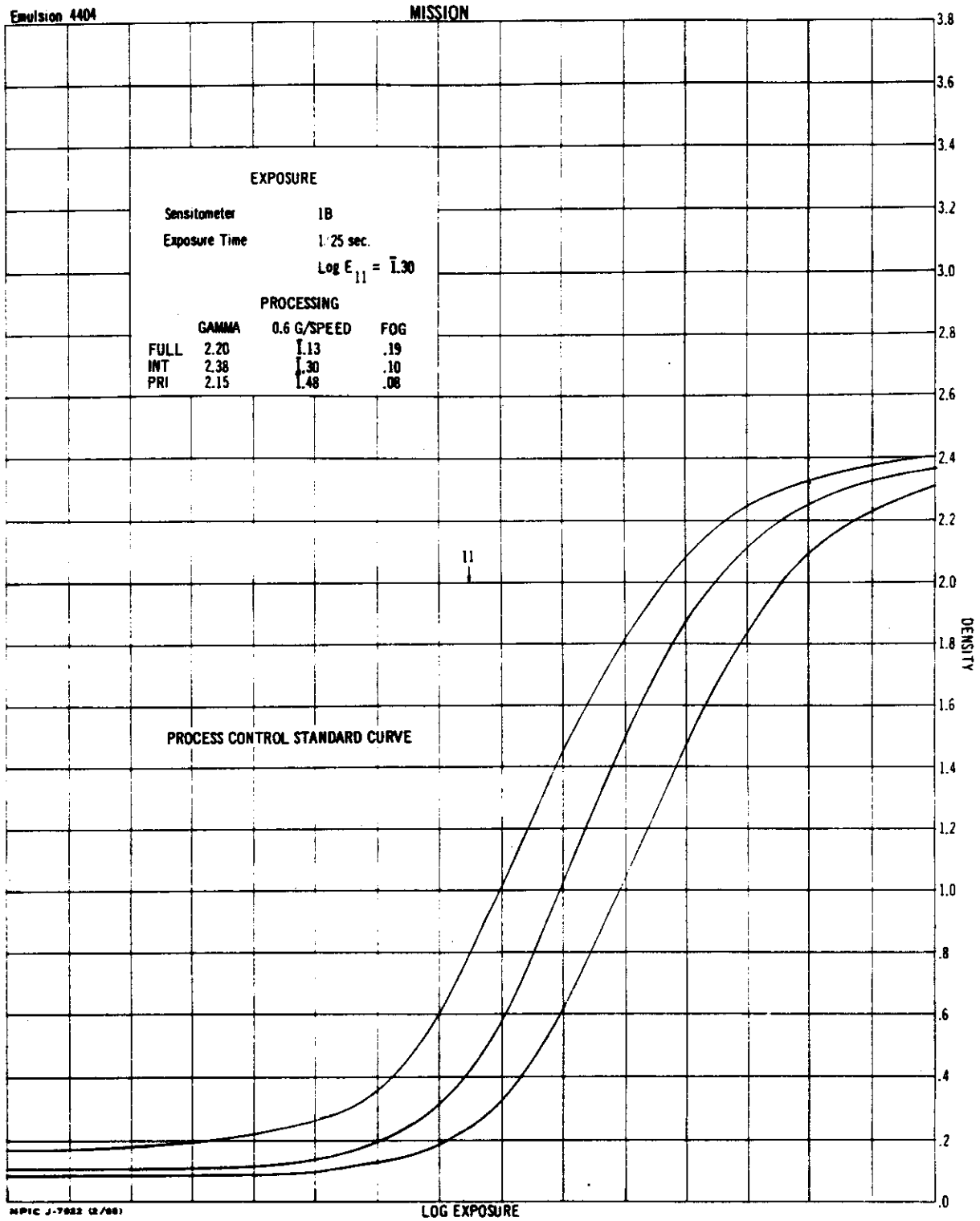
Edge Fog	Slight at camera number edge.
Broken Reseau Lines	Minor, but present throughout.

E. Stellar Camera No D54:

Dendritic Static	Intermittent throughout the material but concentrated at the titled edge through the first third of the material.
Reflections	Reflections from the baffle, lamp shield, and side curtain are present on every frame.
Emulsion Cracking	Present on the last 10 feet of the material.

F. Index Camera No D54:

Edge Fog	Slight at camera number edge.
Dendritic Static	Intermittent throughout the material at both edges. Camera number edge, frames 31 and 32; Titled edge, frames 105 to 111; Both edges, frames 174 and 175.


Emulsion 4404
MISSION
EXPOSURE
Sensitometer 1B
Exposure Time 1/25 sec.
Log E11 = 1.30
PROCESSING
GAMMA 0.6 G/SPEED FOG
FULL 2.20 1.13 .19
INT 2.38 1.30 .10
PRI 2.15 1.48 .08
11
PROCESS CONTROL STANDARD CURVE
DENSITY
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
1.8
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1.4
1.2
1.0
.8
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LOG EXPOSURE
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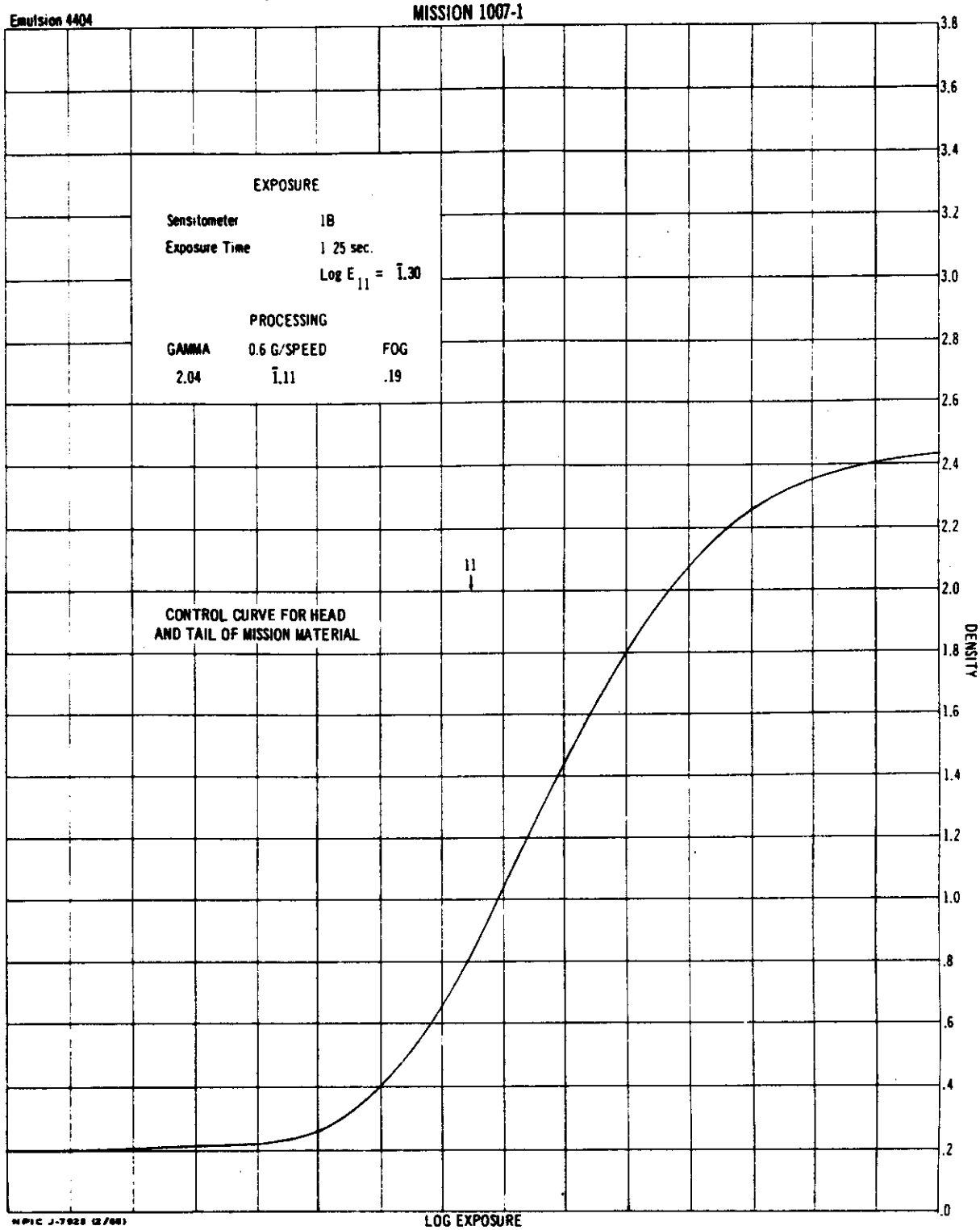
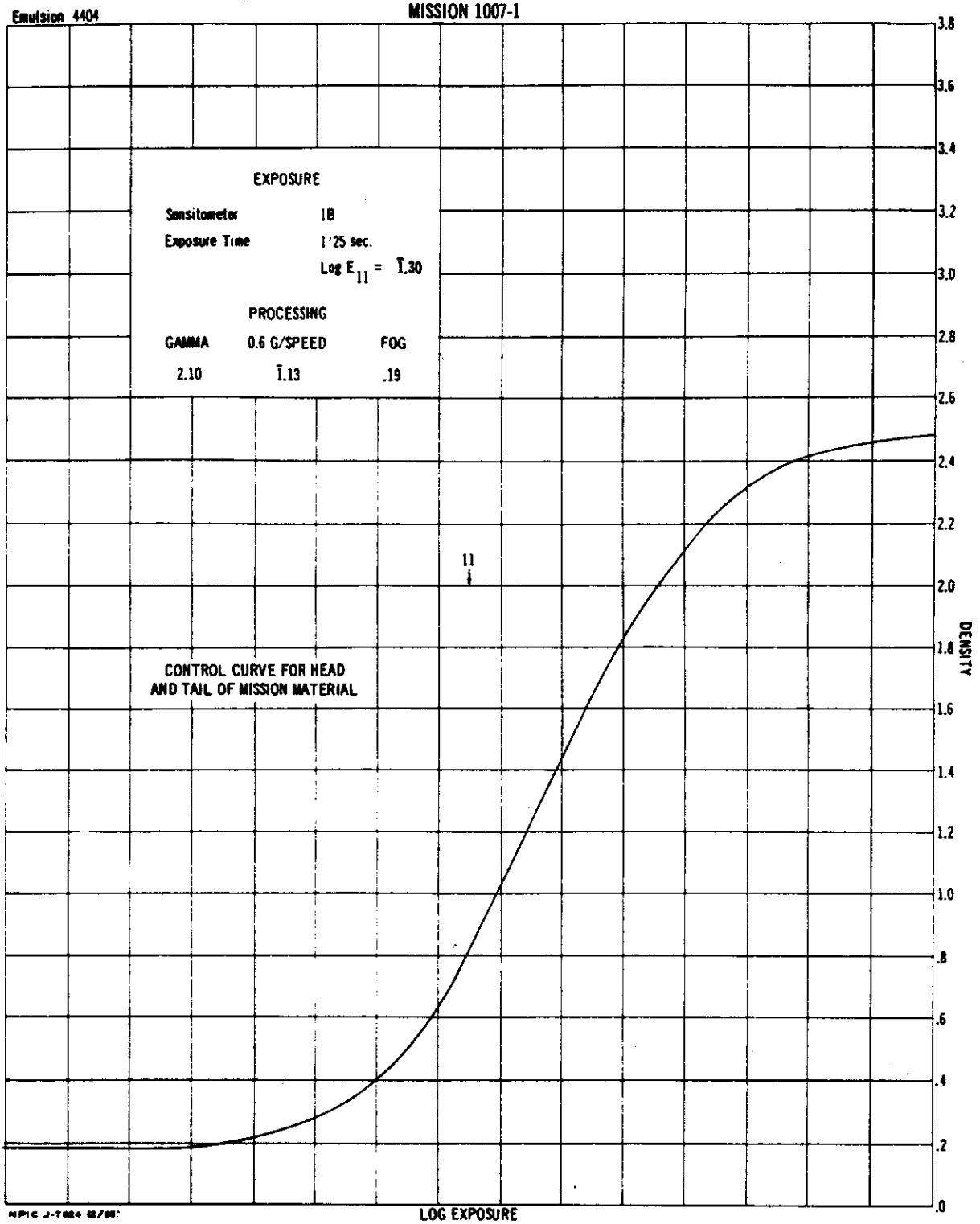
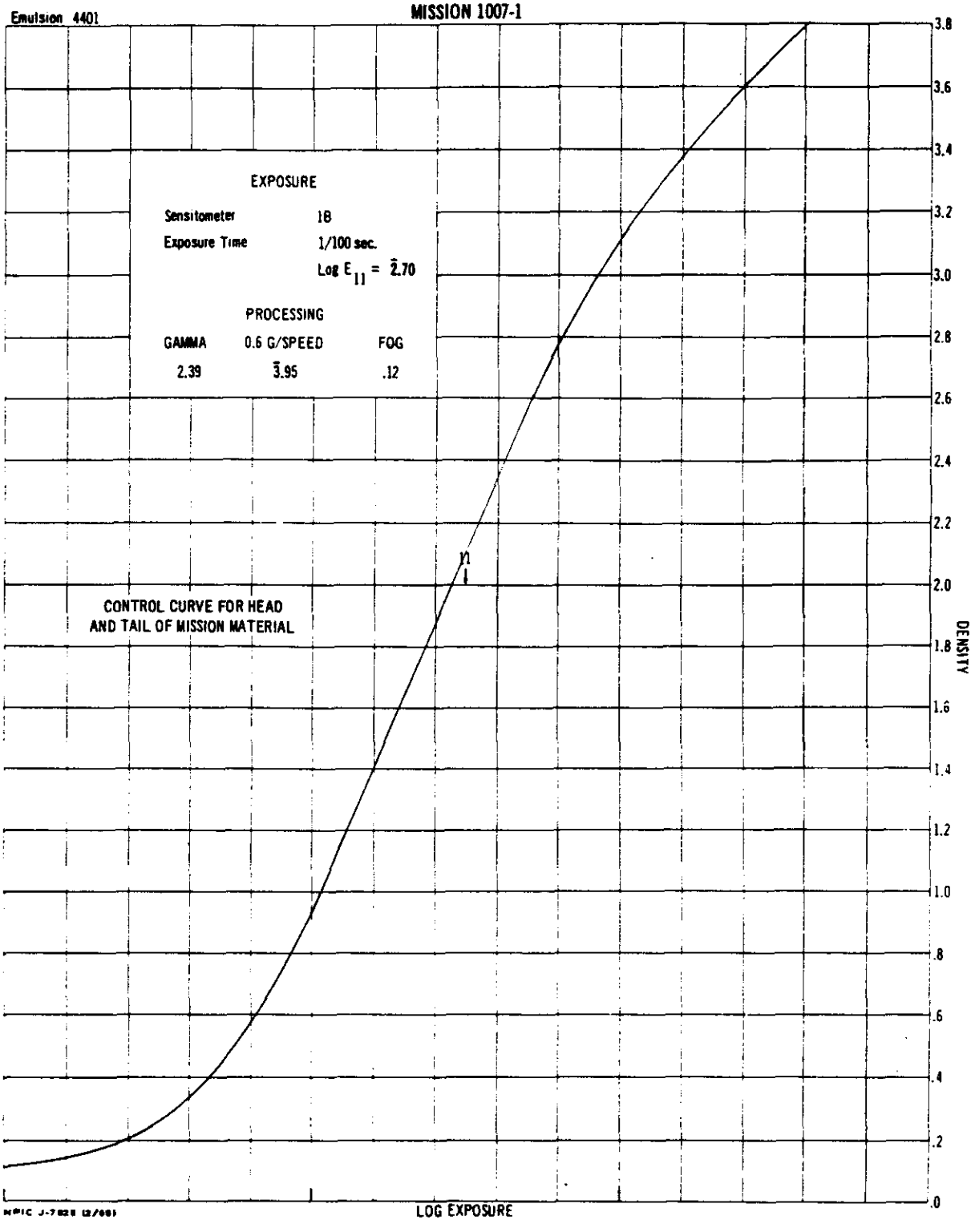
MASTER PANORAMIC CAMERA
MISSION 1007-1



SLAVE PANORAMIC CAMERA
MISSION 1007-1



STELLAR CAMERA
MISSION 1007-1



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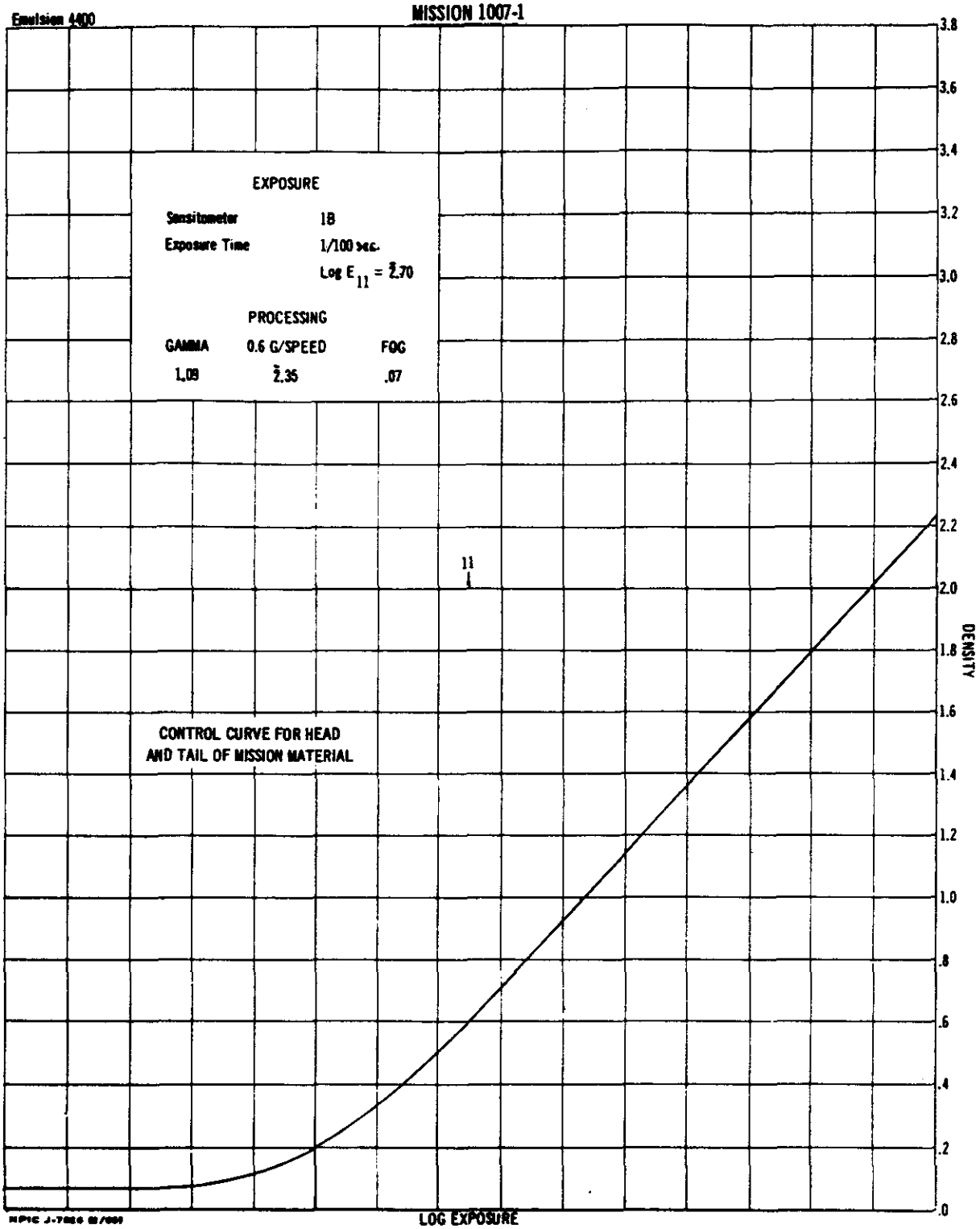
INDEX CAMERA
MISSION 1007-1



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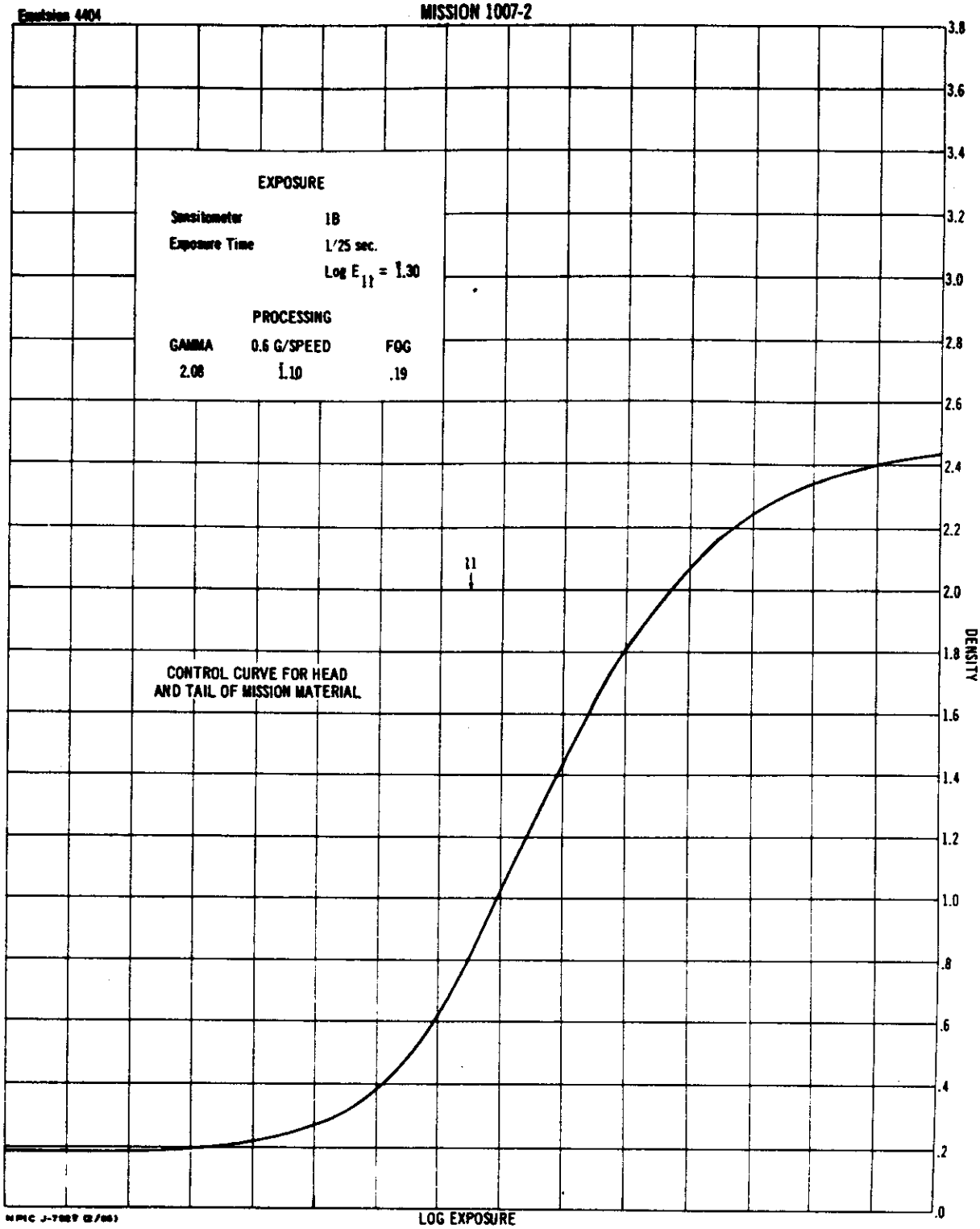
MASTER PANORAMIC CAMERA
MISSION 1007-2

Emulsion 4404



NPIC J-7087 (2/66)

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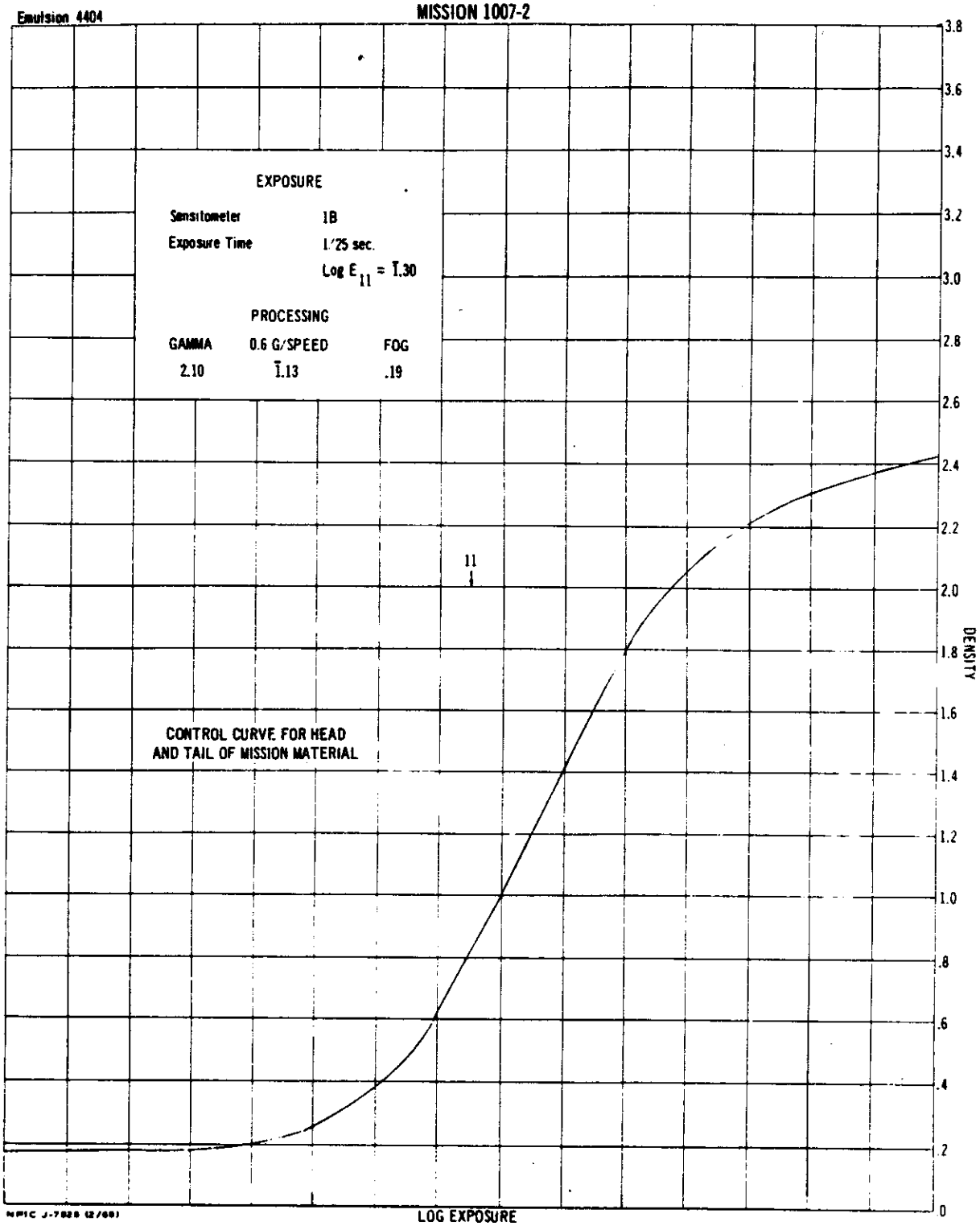
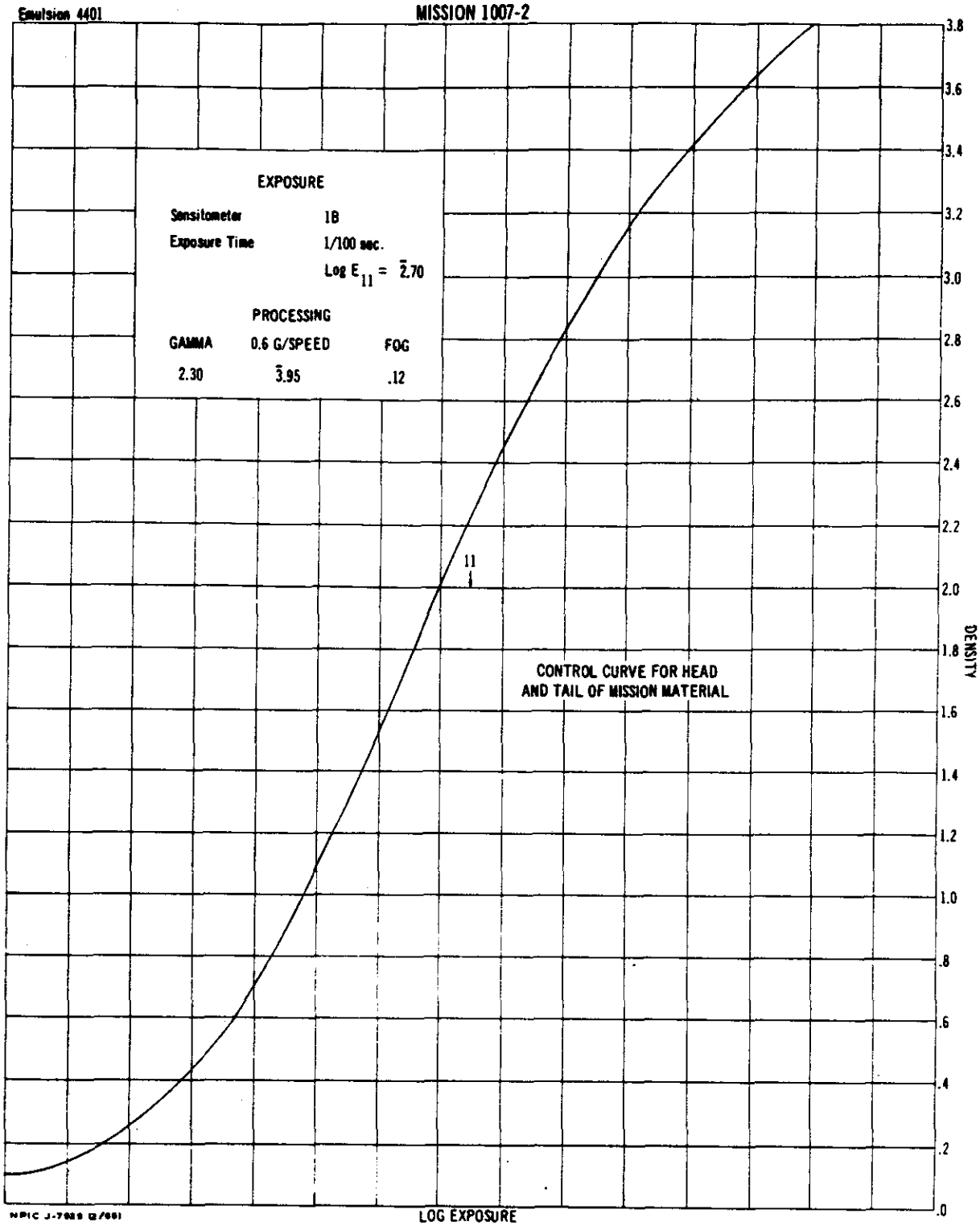
SLAVE PANORAMIC CAMERA
MISSION 1007-2



STELLAR CAMERA
MISSION 1007-2



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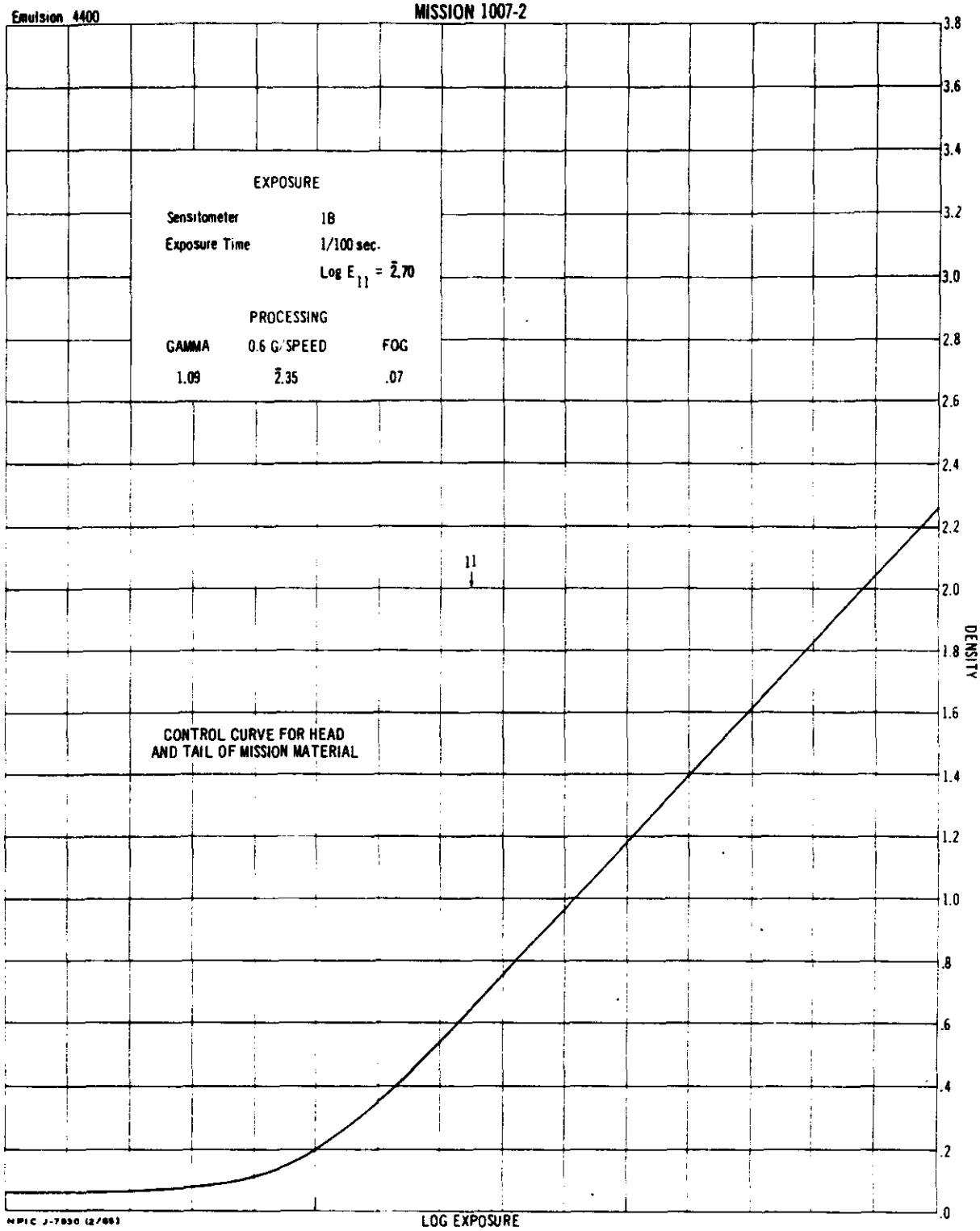
INDEX CAMERA
MISSION 1007-2



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PART III. IMAGE QUALITY

1. Photographic Interpretation (PI) Suitability:

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

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

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

Good: The photography is relatively free of degradation or limiting atmospheric conditions. Edges and corners 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 fall-off in image quality and 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 for Mission 1007

The PI suitability of the photography obtained in Mission 1007 is good. A total of 271 targets was observed and reported in the preliminary readout. Of these, only 22 were rated as being of poor quality due to cloud cover, haze conditions, or high obliquity. Highlights of the initial scan performed by the photo interpreters are reported as follows:

(1) Two new test facilities were identified.

(2) One new airfield was located.

(3) New missile sites were identified.

(4) Two new electronics and/or communications facilities were identified.

(5) 96 submarines were reported.

It should be noted that the preliminary report represents initial scan results only, accomplished in a short time and without the aid of the precise analytical and mensural instruments normally employed in photographic analysis.

More detailed study of the photography may develop additional information or may necessitate alteration of portions of the preliminary report.

Although the PI suitability of Mission 1007 is good, the film contains a variety of degradations, many of which are potentially capable of seriously affecting image quality. Those which directly affect the PI suitability are:

Light Leaks - A diagonal streak of plus density is present within the first three frames of most panoramic camera operations. Example: Pass 06D (FWD) frame 03. Shadowgraphs of equipment which occur at the beginning and end of most panormic camera operations are minor but do degrade the PI suitability. Example: Pass 52D (AFT) frame 190.

Scratches and Abrasions - A series of small emulsion digs and scratches are present near the camera number and just inside the format on each frame of the panoramic material. Because of their location at the format edge they constitute only a minor degradation. However, due to the amount of terrain area which is obscured, they would severely degrade the photography should they ever occur in a target area of the format.

Atmospherics - Approximately 49 percent of the photography is obscured by cloud and/or haze cover.

Image Motion - Characteristically, image motion is evident in the first few and last frames or each operation of the panoramic cameras. Image smear is not severe when the unit is operating within specifications. Even so, no targets are programmed to fall within these frames.

Image Softness - The Master (FWD) panoramic material contains areas of soft focus within 3.0 inches of the supply end of the format. These soft spots, although varying in size, shape, and degree of softness, generally intrude from the camera number edge. Beginning in Pass 39D (1007-1) they continue through 57D (last Pass 1007-1). Example: pass 56D (FWD) frame 120.

Minus Density Streaks - A few random minus density streaks are present intermittently throughout both the Master and Slave material. Although extensive streaking of this nature would seriously affect the PI suitability, their degrading effect on this mission was minor.

Transverse Banding - Where density levels are adequate to permit observations, transverse banding is apparent. This phenomenon, caused by an uneven scan rate, is present throughout the material from both the Master and Slave cameras.

Frequency Mark Reflection - Although the frequency marks are themselves imaged outside of the format, their reflections intrude into the image area. The result is a plus density veiling of the imagery along the format edge. Such reflections are present on all panoramic material in this mission and constitute a minor degradation.

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. No cases were noted in which the solar elevation was inadequate to produce good-quality photography. The solar elevation ranged from 10°28' to 56°31'.

Cloud streaking was noted throughout the mission.

[redacted]

3. Mission Information Potential:

The MIP rating is an arbitrary figure intended to indicate the quality of the best photography obtained in a particular mission. It is representative of the camera system's maximum capability for recording information. Therefore, photography containing adverse factors such as atmospherics, low solar elevation, and similar degradations is eliminated in the 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 MIP selection may constitute a portion of a frame, one frame, or several frames. In any case, the selected examples of best photography are not indicative of the success, quality, or PI suitability of the mission as a whole. The selections represent only the camera system's maximum capabilities. 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 obliquity and similar distortive factors.

c. No photography affected by system malfunctions can be considered for MIP selection. This eliminates the first few frames and the last frames of the passes since these may contain smeared images as a result of incorrect scan arm speed. In addition, the selected photography must be free of effects induced by vehicle pitch, roll, or yaw deviations.

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

e. Preferably, high contrast targets such as airfields are chosen for comparison with similar targets covered in previous missions which have been assigned MIP ratings.

4. MIP for Mission 1007

a. First Phase (1007-1)

Based on the foregoing, frame 109 (AFT) of Pass 56D is the MIP selection of 1007-1. The first phase of the mission is assigned an MIP rating of 85 and is considered comparable to Mission 1004.

The MIP frame (Pass 56D, frame 109 AFT) contains a large airfield and a missile site plus an industrial complex.

The airfield is located approximately mid-frame along both the major and minor axis and image quality is such that engine nacelles on the larger aircraft are readily discernible. The frame is cloud free and haze is minimal.

[redacted]

[redacted]

b. Second Phase (1007-2)

The quality of the imagery obtained from the second phase of the mission is generally equal to that obtained from the first phase. It is, therefore, assigned an MIP rating of 85 and is considered comparable to Mission 1004.

The retaining walls, breakwater, and bridges located in the MIP frame (Pass 103D, frame 155 AFT) display well defined edges and corners. They are approximately mid-frame along both the major and minor axis and no unusual distortions are present. Shadow detail, highlight detail, and contrast is optimal and small objects are readily discernible.

[redacted]

[redacted]

5. Wratten 25 Filter Experiment:

Slave panoramic photography was accomplished through a Wratten 21 filter. This filter is normally employed. The Master panoramic camera, however, utilized a Wratten 25 filter on this mission in an attempt to improve the image quality of the photography. It was hoped that the Wratten 25 would eliminate or at least minimize the inherent degradation of the Master material caused by the back-scattering of light into the lens.

The light transmittance of the Wratten 25 filter is significantly less than that of the Wratten 21 filter. To compensate for the decrease in exposure due to the new filter, the slit width was increased from 0.200 inches to 0.250 inches. This increase was not sufficient to afford full compensation; therefore, some material from the Master camera was underexposed. In an attempt to obtain increased density in the negative, 74 percent of the Master material was processed at the full level of development as opposed to only 44 percent processed at the full level for the slave film. Even so, some loss of detail in the shadow areas was noted. (Analysis of Dmin measurements made by AFSPPL indicate occasional instances of underprocessing).

Identical imagery on the master and slave negatives which received the same level of processing was compared. In general, the acuity of the Slave panoramic photography is better than that of the Master photography throughout the mission. However, in a comparison of that end of the frame looking toward the sub-solar point a few examples were observed where the forward camera image quality is better than that of the aft. No significant increase in image quality or haze penetration due to the use of the Wratten 25 filter is apparent.

Such a comparison is, however, inconclusive due to the difference in relative sun azimuth between the Master and slave photography. The difference in exposure between the cameras furthered hampered the evaluation. In future tests it is suggested that a single variable be altered in order that any resultant changes may then be directly attributed to that variable.

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APPENDIX A. SYSTEM SPECIFICATIONS

Panoramic Cameras

	Master (Fwd)	Slave (Aft)
Camera Number	144	145
Lens Serial Number	1212435	1172435
Slit Width	0.250"	0.200"
Aperture	f/3.5	f/3.5
Filter	Wratten 25	Wratten 21
Operational Focal Length	609.602 mm	609.602 mm
Film Type	4404 (SO-132)	4404 (SO-132)
Film Length	15800 ft	15800 ft
Splices	4	4
Emulsion	55/9/4/4	51/7/4/4
Static Bench Test		
High Contrast	241 l/mm	243 l/mm
Low Contrast	150 l/mm	152 l/mm
Dynamic Test		
ITEK High Contrast	165 l/mm	159 l/mm
ITEK Low Contrast	126 l/mm	123 l/mm
AP High Contrast	172 l/mm	187 l/mm
AP Low Contrast	105 l/mm	110 l/mm

Panoramic Camera Number 144 (Master)

Distortion - Positive (Pincushion)							
Angle Off Axis Degradation	3	2	1	0	359	358	357
Distortion Millimeters	.005	.004	.002	.000	.001	.002	.003

Panoramic Camera 145 (Slave)

Distortion - Positive (Pincushion)							
Angle Off Axis Degradation	3	2	1	0	359	358	357
Distortion Millimeters	.003	.002	.001	.000	.002	.003	.005

Stellar and Index Cameras A

	Stellar	Index
Camera No	D43	D43
Lens Serial No	10656	813060
Reseau Serial No	43	43
Filter	NONE	Wratten 21
Aperture	f/1.8	f/4.5
Exposure Time	2 sec	1/500 sec
Operational Focal Length	Not Available	38.12 mm
Film Type	4401 (SO 102)	4400 (SO 130)
Film Length	75 ft	135 ft
Splices	NONE	NONE
Emulsion	7-3-5-4	13-4-4-4
Perpendicularity of Reseau to Optical Axis	.0004	.0007
Location of Principal Point	Not Reported	Not Reported

[redacted]

Stellar and Index Cameras B

	Stellar	Index
Camera No	D54	D54
Lens Serial No	11296	813052
Reseau Serial No	51	56
Filter	NONE	Wratten 21
Aperture	f/1.8	f/4.5
Exposure Time	2 sec	1/500 sec
Operational Focal Length	Not Available	38.63 mm
Film Type	(4401) SO 102	(4400) SO 130
Film Length	75 ft	135 ft
Splices	NONE	NONE
Emulsion	7-3-5-4	13-4-4-4
Perpendicularity of Reseau to Optical Axis	.0009	.0004
Location of Principal Point	Not Reported	Not Reported

Horizon Cameras

	Starboard (Take-Up)	Port (Supply)	Starboard (Supply)	Port (Take-Up)
Camera Number	144	144	145	145
Lens Serial Number	812277	812281	812283	812287
Exposure Time	1/100 sec	1/100 sec	1/100 sec	1/100 sec
Aperture	f/6.0	f/6.8	f/8.0	f/6.8
Filter	Wratten 25	Wratten 25	Wratten 25	Wratten 25
Operation Focal Length	54.53 mm	54.40 mm	54.51 mm	54.33
Average Line/mm	116	117	123	118
Radial Distortion				
10° off axis	.001 mm	.007 mm	.006 mm	.004 mm
20° off axis	.001 mm	.019 mm	.017 mm	.005 mm
Tagential Distortion	.008 mm	.009 mm	.006 mm	.002 mm

Horizon Camera 144

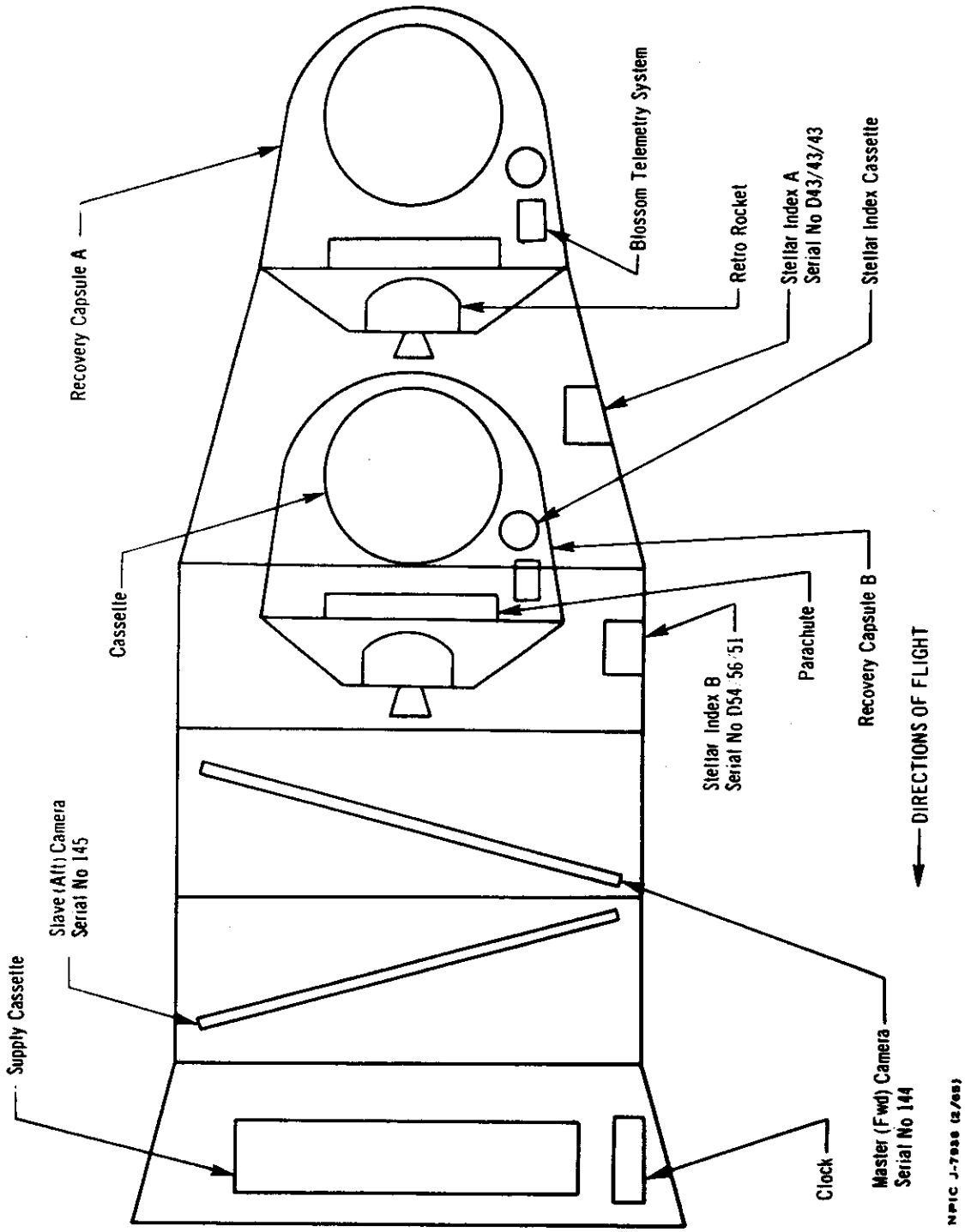
Resolution	Take-Up							Supply						
Angle Off Axis Deg	0	5	10	15	20	25	27.5	0	5	10	15	20	25	27.5
Radial Resolution	184	173	153	114	109	105	46	164	164	144	126	122	118	51
Tangential Resolution	164	145	134	106	91	60	41	164	145	134	108	91	57	46

Horizon Camera 145

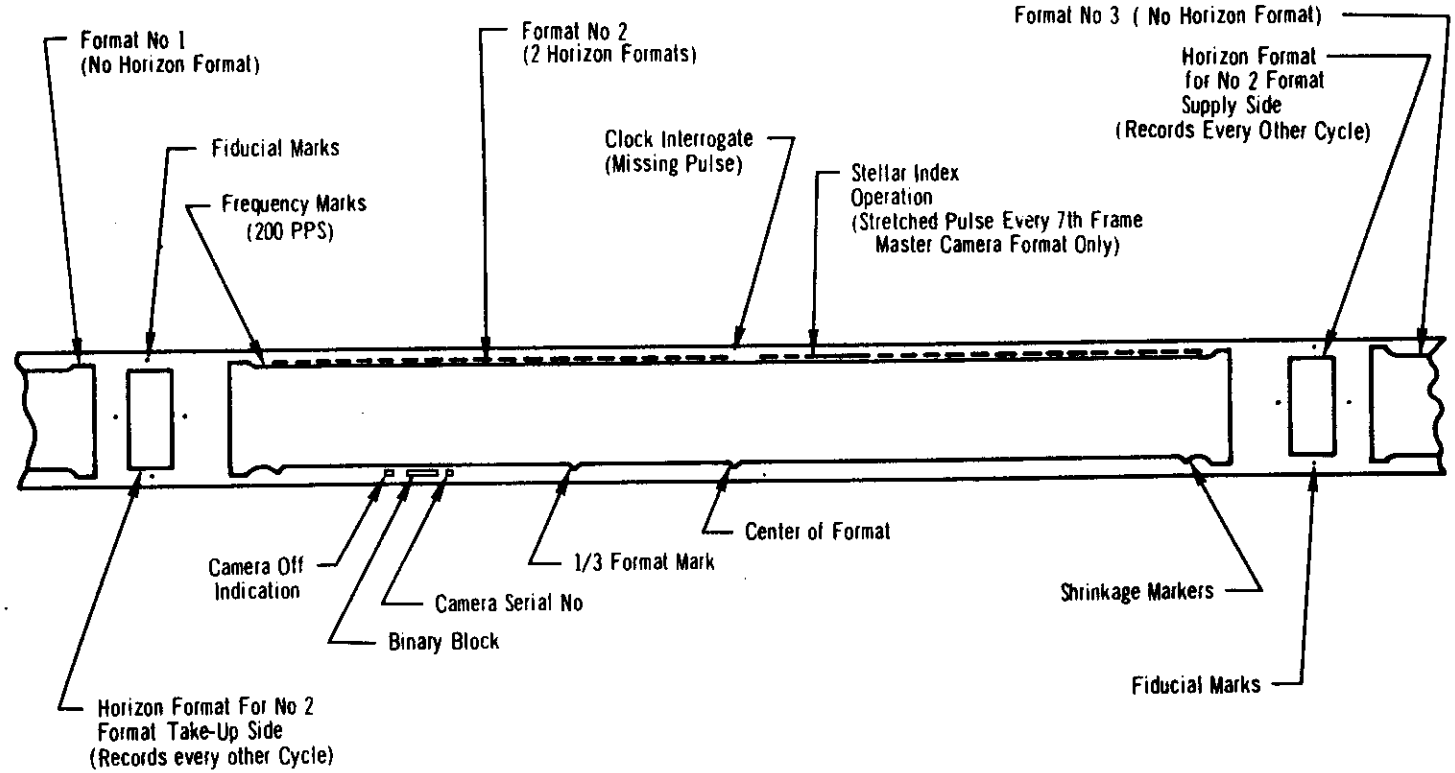
Resolution	Take-Up							Supply						
Angle Off Axis Deg	0	5	10	15	20	25	27.5	0	5	10	15	20	25	27.5
Radial Resolution	164	155	162	134	116	105	46	182	182	144	126	122	105	52
Tangential Resolution	164	145	142	115	91	67	46	182	162	142	115	97	60	46

[redacted]

VEHICLE LAYOUT



FILM SPECIFICATIONS
FORMAT LAYOUT



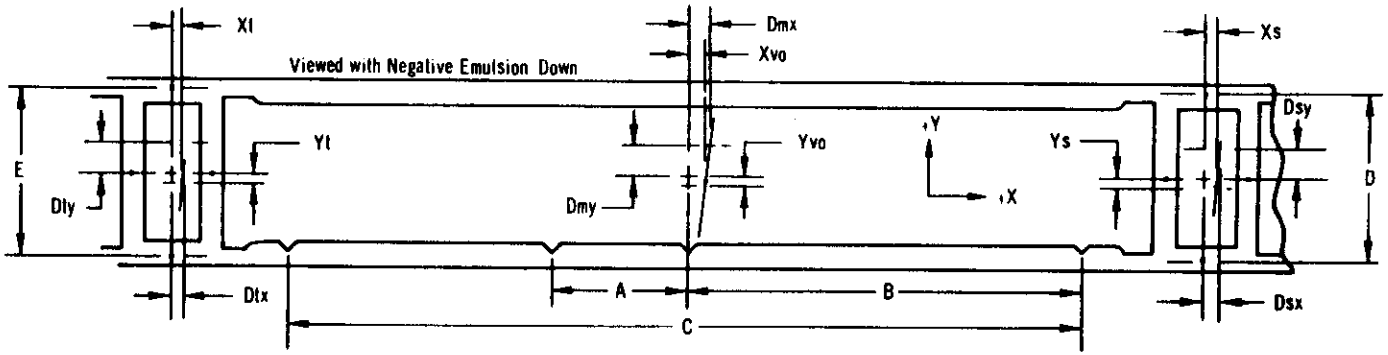
Master(Fwd)Panoramic Camera No 144
Viewed With Negative Emulsion Down
Direction of Film Transport ←
Direction of Scan →
Direction of Vehicle Motion ↓

Slave(Aft)Panoramic Camera No 145
Viewed With Negative Emulsion Down
Direction of Film Transport ←
Direction of Scan →
Direction of Vehicle Motion ↑

NPIC J-7830 (2/68)

TOP SECRET
CORONA
NO FOREIGN DISSEM

FILM SPECIFICATIONS
FORMAT SPECIFICATIONS



Master (Fwd) Camera		Vehicle Motion		Scan Direction	
A	76.4	Xt	+.247	Dtx	+ .239
B	355.3	Yt	−.072	Dty	+2.639
C	710.9	Xs	−.398	Dsx	− .397
D	56.511	Ys	+.173	Dsy	−1.727
E	56.529	Xvo	+.566	Dmx	+ .581
		Yvo	+.095	Dmy	+3.095

Format dimensions:

	Panoramic	Take-Up	Supply
Height	56.352	–	–
Width	754.9	–	–

Slave (Aft) Camera		Vehicle Motion		Scan Direction	
A	76.2	Xt	− .007	Dtx	− .012
B	355.8	Yt	− .062	Dty	+2.405
C	711.1	Xs	− .088	Dsx	− .088
D	56.551	Ys	− .076	Dsy	−1.864
E	56.547	Xvo	− .887	Dmx	− .866
		Yvo	+.321	Dmy	+3.321

Format dimensions:

	Panoramic	Take-Up	Supply
Height	56.050	–	–
Width	756.6	–	–

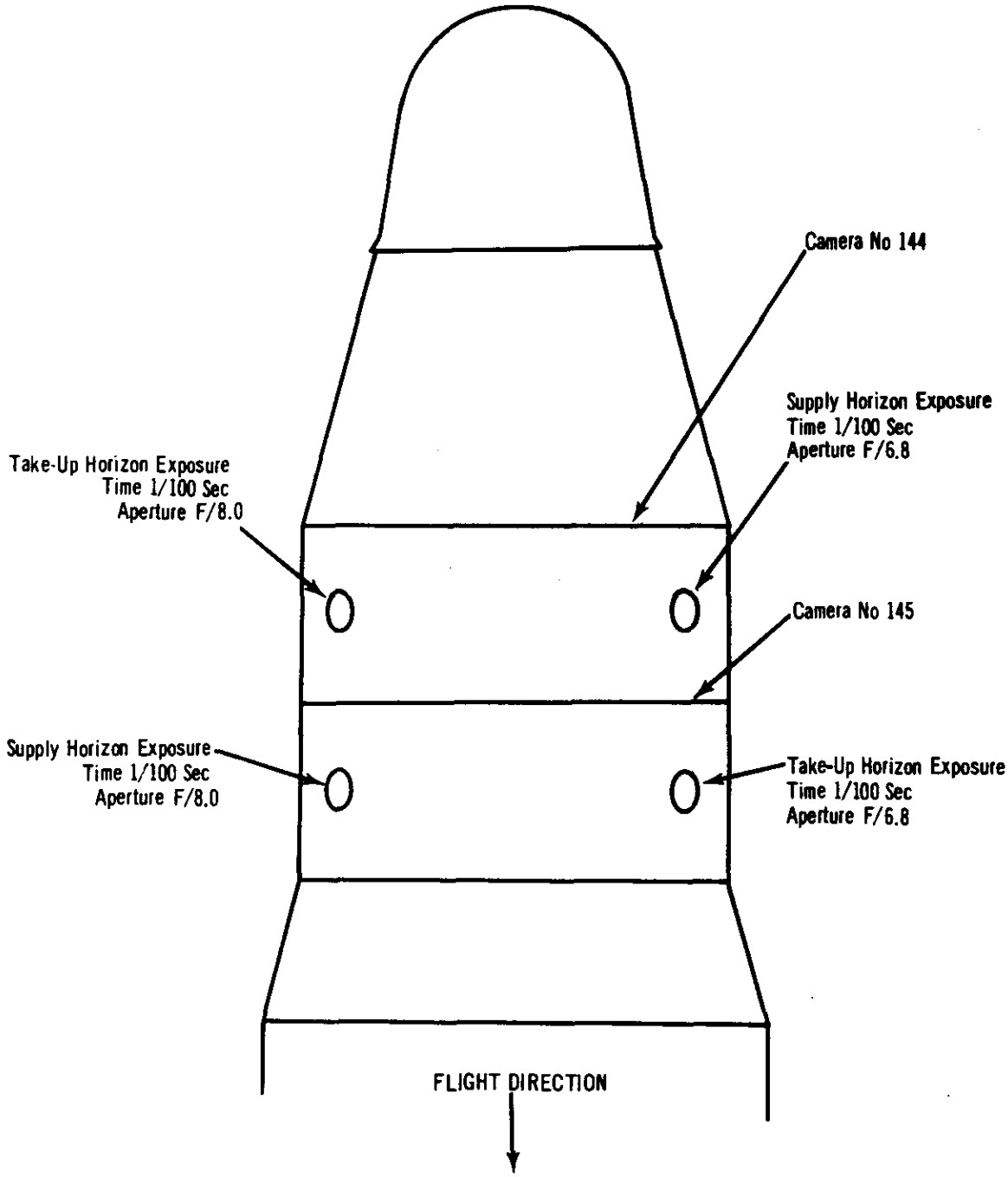
NOTE: 1. All dimensions are in millimeters and are average dimensions of three formats
2. Height of main format is taken at center of format
3. Dt, Dm, Ds, X and Y dimensions are taken 10 MM above point defining target center
4. Format Sign Convention

−X+Y	+X+Y
−X−Y	+X−Y

NPIC J-7940 (2/69)

TOP SECRET
CORONA
NO FOREIGN DISSEM

HORIZON LENS SETTINGS
(Viewed from top of vehicle inflight)



NPIC J-7941 (2/68)

[redacted]

6. Relative Orientation of Panoramic Camera to Stellar/Index Camera

The Stellar/Index Camera is not calibrated within the vehicle other than the eingineering alignment of the mounting brackets. For proper orientation of the S/I Package to the master panoramic frames, conjugate imagery from the index and panoramic frames were measured and by integrating these measurements into the orientation matrix for the S/I unit, a set of bias figures were produced for the relative orientation of the panoramic frame in reference to the S/I computations.

These orientation figures are shown with sign convention. For use of these figures, the figure given is added to or subtracted from the S/I values given to produce the proper orientation of the panoramic cameras.

All values produced for the final ephemeris have been converted using these bias values.

Mission 1007-1

Relative Orientation Forward

Pitch	Roll	Yaw
+15°09.3'	-0°30.0'	+0°16.2'

Relative Orientation Aft

Pitch	Roll	Yaw
-15°13.1'	-0°15.1'	-0°55.3'

Mission 1007-2

Because of the S/I camera malfunction, no relative orientation bias figures were produced.

APPENDIX B. TECHNICAL COMPENDIUM

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

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

The values of the numbers are:

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

In this report:

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

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

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

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

Density values all include gross fog.

[redacted]

Mission 1007 Forward

Pass	Frame	Overlap	Cloud Cat	Geographic Latitude	Geographic Longitude	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN Dmin	TERRAIN Dmax	TERRAIN Delta D	LIMITING Dmin	LIMITING Dmax	LIMITING Delta D	Gross Fog
D01	06	06	5444	51°00'N	145°10'W	15h47'	44°50'	260°	14°55'	-0°11'	102.7	1/257	NR	NR	NR	0.37	2.04	1.67	0.17
D01	11	04	3455	50 13 N	145 03 W	15 48	44 59	261	14 59	-0 10	102.4	1/262	NR	NR	NR	0.66	2.06	1.40	0.16
D02	09	04	4444	70 53 N	175 09 W	15 35	37 43	244	15 05	-0 08	114.7	1/221	NR	NR	NR	0.80	2.12	1.32	0.11
D02	52	06	1112	63 32 N	171 09 W	15 51	41 02	252	14 47	-0 14	109.3	1/240	0.63	2.08	1.45	0.26	2.12	1.86	0.14
D06	07	03	3344	53 49 N	100 02 E	15 02	44 29	246	14 44	0 03	108.4	1/251	0.41	1.07	0.66	0.31	2.18	1.87	0.16
D06	34	04	4212	49 35 N	100 44 E	15 06	45 26	251	14 23	-0 01	101.8	1/261	0.59	1.17	0.58	0.48	2.20	1.72	0.17
D06	50	05	2421	42 42 N	101 34 E	15 11	46 20	259	15 44	-0 18	99.9	1/263	0.63	1.14	0.51	0.28	2.15	1.87	0.12
D06	109	04	4422	33 41 N	102 18 E	15 16	46 11	270	14 11	-0 28	99.3	1/269	0.65	1.38	0.73	0.39	2.23	1.84	0.17
D07	07	07	1343	55 44 N	076 47 E	15 00	44 01	244	14 53	0 12	104.2	1/254	0.68	1.22	0.54	0.35	2.27	1.92	0.17
D07	70	07	2231	46 02 N	078 21 E	15 08	46 05	254	14 58	-0 10	100.7	1/268	0.62	1.52	0.90	0.50	2.19	1.69	0.17
D07	145	04	1111	34 39 N	079 23 E	15 16	46 22	268	15 13	-0 44	99.3	1/270	0.34	2.01	1.67	0.23	2.19	1.96	0.10
D07	160	06	1233	29 19 N	079 42 E	15 18	45 40	275	14 57	-0 45	99.8	1/269	0.36	1.13	0.77	0.28	2.19	1.91	0.10
D09	20	07	4343	58 45 N	030 21 E	14 55	43 08	241	14 59	-0 11	105.5	1/255	0.69	1.15	0.46	0.46	2.16	1.70	0.15
D09	53	07	1111	53 38 N	031 30 E	15 01	44 43	246	14 52	-0 02	103.1	1/262	0.42	1.22	0.80	0.39	1.70	1.31	0.17
D09	82	07	2111	49 12 N	032 13 E	15 05	45 44	252	14 37	0 05	101.5	1/267	0.36	1.60	1.24	0.36	2.02	1.66	0.17
D09	102	07	2111	46 09 N	032 37 E	15 07	46 13	255	14 37	-0 07	100.5	1/268	0.56	1.40	0.84	0.42	2.22	1.80	0.18
D20	13	04	1111	53 11 N	140 10 E	14 57	45 31	246	14 30	0 21	101.7	1/263	0.30	1.18	0.88	0.27	1.64	1.37	0.18
D20	44	06	1111	48 26 N	140 55 E	15 01	46 39	252	15 06	0 10	100.3	1/267	NR	NR	NR	0.23	1.95	1.72	0.17
D21	17	07	4244	51 35 N	117 36 E	14 58	46 00	248	15 22	-0 00	101.1	1/264	0.46	1.07	0.59	0.32	2.27	1.95	0.17
D21	60	07	4432	45 02 N	118 30 E	15 03	47 17	255	14 48	0 01	99.6	1/269	0.48	1.36	0.88	0.41	2.19	1.78	0.16
D21	86	07	4311	41 05 N	118 54 E	15 03	47 40	258	14 15	-0 05	99.2	1/269	0.40	1.40	1.00	0.37	2.22	1.85	0.17
D21	115	06	1111	36 41 N	119 16 E	15 06	47 45	264	14 42	-0 10	99.2	1/270	0.62	1.61	0.99	0.32	2.20	1.88	0.18
D21	119	06	1111	36 04 N	119 19 E	15 08	47 44	266	14 44	-0 08	99.1	1/269	0.48	1.51	1.03	0.32	2.15	1.83	0.17
D22	17	03	5534	56 24 N	093 49 E	14 52	44 38	242	14 27	0 11	102.8	1/262	NR	NR	NR	0.40	2.17	1.77	0.18
D22	67	05	3331	38 22 N	096 17 E	15 07	47 51	263	14 32	-0 22	99.1	1/269	0.80	2.22	1.42	0.50	2.24	1.74	0.17
D23	23	07	4444	55 30 N	071 10 E	14 54	44 59	240	14 34	0 05	102.3	1/263	0.64	1.10	0.46	0.44	2.24	1.80	0.14
D23	37	07	4443	53 21 N	071 35 E	14 55	45 39	246	14 42	-0 00	101.6	1/265	0.61	1.24	0.63	0.44	2.18	1.74	0.17
D23	59	07	4444	47 25 N	072 30 E	15 01	44 03	253	15 07	-0 09	100.0	1/267	1.06	1.48	0.42	0.70	2.24	1.54	0.16
D23	86	07	1111	43 00 N	073 01 E	15 04	47 41	258	15 25	-0 14	99.3	1/270	0.59	1.58	0.99	0.32	2.09	1.77	0.17
D23	133	06	4344	36 11 N	073 36 E	15 07	47 55	266	14 37	-0 17	99.3	1/270	0.35	2.09	1.74	0.30	2.22	1.92	0.12
D24	11	07	4344	64 57 N	045 27 E	14 39	41 16	231	14 59	-0 03	106.8	1/250	0.50	1.44	0.94	0.50	2.24	1.74	0.16
D24	64	08	1111	56 43 N	048 03 E	14 51	44 36	243	14 45	0 01	102.7	1/264	0.32	1.52	1.20	0.31	1.78	1.47	0.17
D24	80	07	1111	54 16 N	048 34 E	14 54	45 26	242	14 46	0 07	101.8	1/265	0.34	1.15	0.81	0.32	2.04	1.72	0.17
D24	141	07	1111	45 02 N	049 57 E	15 02	47 31	255	14 46	-0 32	99.6	1/269	0.48	1.68	1.20	0.22	1.97	1.75	0.14
D25	18	07	1111	53 06 N	025 56 E	14 55	45 50	246	14 37	-0 10	101.4	1/266	0.38	1.35	0.97	0.38	2.22	1.84	0.17
D36	13	06	1111	72 46 N	126 11 E	14 12	37 29	216	15 27	0 07	109.9	1/235	0.36	1.31	0.95	0.32	2.00	1.68	0.17
D36	52	05	5435	50 01 N	135 06 E	14 52	47 23	246	15 26	-0 10	100.2	1/263	0.45	0.96	0.51	0.40	2.23	1.83	0.18
D36	78	04	1244	45 59 N	135 38 E	14 55	48 16	250	15 14	0 06	99.6	1/265	0.58	1.15	0.57	0.30	2.24	1.94	0.18
D37	17	04	4444	51 18 N	112 03 E	14 50	47 06	246	15 02	-0 03	100.4	1/260	NR	NR	0.48	0.64	2.21	1.57	0.18
D37	92	04	4344	39 42 N	113 26 E	14 59	49 06	260	15 05	0 10	99.6	1/265	0.94	1.69	0.75	0.61	2.24	1.63	0.17
D37	124	05	4433	32 05 N	113 59 E	15 02	49 07	270	14 40	-0 12	100.2	1/264	1.10	1.58	0.48	0.52	2.21	1.69	0.18
D37	158	04	4412	29 25 N	114 08 E	15 04	48 36	273	14 57	-0 01	101.5	1/262	0.38	1.40	1.02	0.32	2.22	1.90	0.17
D38	09	04	4433	58 04 N	087 52 E	14 02	45 02	225	14 47	-0 12	102.3	1/254	0.55	1.10	0.55	0.48	2.27	1.79	0.16
D38	46	04	1111	48 29 N	089 38 E	14 13	47 53	247	15 26	-0 17	99.9	1/260	0.43	2.09	1.66	0.35	2.17	1.82	0.16
D38	150	03	4214	32 20 N	091 07 E	15 02	49 03	270	14 39	-0 39	100.8	1/262	0.54	1.60	1.06	0.27	2.19	1.92	0.10
D39	06	05	1344	58 02 N	065 00 E	14 42	44 55	238	15 21	-0 28	102.2	1/250	0.32	1.34	1.02	0.27	2.23	1.96	0.16
D39	29	06	2332	54 25 N	065 48 E	14 46	46 15	240	15 06	-0 10	101.1	1/259	0.66	1.23	0.57	0.37	2.26	1.89	0.17
D40	06	03	3233	59 02 N	041 53 E	14 01	44 33	225	14 56	-0 06	102.5	1/250	0.41	1.45	1.04	0.28	2.23	1.95	0.17
D40	70	06	1111	49 02 N	043 51 E	14 10	47 54	237	14 57	-0 09	100.0	1/263	0.39	1.62	1.23	0.36	1.75	1.39	0.17
D40	111	05	2333	42 42 N	044 37 E	14 15	49 04	243	15 04	-0 06	99.6	1/265	0.48	2.14	1.66	0.29	2.27	1.98	0.16
D41	10	05	4443	57 26 N	019 27 E	14 42	45 15	237	15 01	0 03	101.9	1/255	NR	NR	NR	0.62	2.27	1.65	0.17
D41	16	04	5444	56 29 N	019 40 E	14 43	45 37	238	14 56	0 07	101.6	1/258	NR	NR	NR	0.96	2.28	1.32	0.17

NOTE: NR denotes no reading. ND denotes no data.

Mission 1007 Forward

Pass	Frame	Overlap	Cloud Cat	Geographic Latitude	Geographic Longitude	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN			LIMITING			
													Dmin	Dmax	Delta D	Dmin	Dmax	Delta D	Gross Fog
D49	02	00	1111	61°25'N	164°24'W	14h39'	43°55'	235°	ND	ND	102.7	1/181	0.71	1.22	0.51	0.42	2.10	1.68	0.18
D52	06	04	4421	76 55 N	115 16 E	13 41	34 53	213	15°30'	-0°13'	110.3	1/230	NR	NR	NR	1.04	2.19	1.15	0.17
D52	30	05	1211	73 04 N	120 23 E	14 04	37 27	214	15 26	0 30	107.9	1/243	0.42	1.82	1.40	0.34	1.92	1.58	0.15
D52	62	03	4443	58 33 N	127 53 E	14 37	45 22	236	14 26	-0 20	101.6	1/256	NR	NR	NR	0.50	2.27	1.77	0.17
D52	116	05	1444	50 09 N	129 34 E	14 45	48 32	251	15 15	-0 13	100.1	1/264	0.68	1.34	0.66	0.34	2.23	1.89	0.17
D52	167	06	2344	42 17 N	130 32 E	14 50	50 19	255	15 14	0 02	100.0	1/264	0.47	1.22	0.75	0.30	2.11	1.81	0.17
D53	06	03	2211	53 42 N	106 07 E	14 41	47 24	240	14 56	-0 06	100.5	1/257	0.42	0.96	0.54	0.31	2.24	1.93	0.16
D53	28	05	1112	50 36 N	106 39 E	14 44	48 27	249	15 01	-0 06	100.1	1/262	0.34	1.56	1.22	0.27	2.20	1.93	0.16
D53	49	04	1113	41 53 N	107 43 E	14 50	50 27	256	14 16	-0 06	100.1	1/261	0.97	1.66	0.69	0.52	2.24	1.72	0.12
D53	98	05	3211	34 13 N	108 20 E	14 57	50 54	266	14 22	-0 04	101.4	1/261	1.02	1.64	0.62	0.57	2.18	1.61	0.16
D53	157	06	3444	24 49 N	108 51 E	14 59	49 44	278	14 53	-0 07	105.2	1/253	0.71	1.08	0.37	0.47	2.24	1.77	0.16
D54	12	05	4344	57 08 N	082 23 E	14 37	46 05	238	14 57	-0 15	101.2	1/258	0.52	0.84	0.32	0.46	2.26	1.78	0.17
D54	34	04	4444	53 42 N	083 17 E	14 41	47 27	240	14 29	-0 20	100.5	1/262	0.70	1.04	0.34	0.49	2.27	1.78	0.16
D54	53	05	4411	48 07 N	084 10 E	14 46	49 14	251	14 53	-0 18	100.0	1/263	0.91	1.77	0.86	0.46	2.25	1.79	0.17
D54	107	06	1222	39 44 N	085 05 E	14 51	50 47	258	15 17	-0 05	100.4	1/263	1.40	1.54	0.14	0.84	2.22	1.38	0.11
D54	155	02	2344	32 13 N	085 37 E	14 55	50 53	270	14 31	-0 18	102.3	1/260	1.37	1.63	0.26	0.32	2.19	1.87	0.10
D54	187	06	4345	26 58 N	085 55 E	14 58	50 17	275	14 36	-0 28	104.3	1/255	0.74	1.45	0.71	0.46	2.22	1.76	0.17
D55	30	06	5423	55 17 N	060 07 E	14 38	46 53	240	14 41	-0 04	100.8	1/260	0.56	1.38	0.82	0.44	2.27	1.83	0.16
D55	90	06	1112	46 00 N	061 36 E	14 47	49 50	240	14 56	-0 26	99.9	1/264	0.40	1.65	1.25	0.40	2.22	1.82	0.17
D56	14	06	1111	69 40 N	031 49 E	14 12	39 39	219	14 56	-0 10	105.6	1/247	0.41	2.03	1.62	0.25	2.03	1.78	0.17
D56	69	07	1111	61 00 N	035 49 E	14 25	44 23	230	15 19	-0 05	102.2	1/256	0.27	0.93	0.66	0.23	1.98	1.75	0.17
D56	104	06	1111	55 34 N	037 13 E	14 38	46 50	239	15 00	0 08	100.8	1/261	0.32	1.36	1.04	0.26	2.02	1.76	0.17
D56	175	06	1111	44 36 N	038 55 E	14 48	50 12	252	14 26	-0 20	100.0	1/265	0.29	1.19	0.09	0.28	2.10	1.82	0.17
D57	14	04	4344	53 51 N	014 44 E	13 59	47 33	228	15 11	-0 05	100.5	1/260	0.62	1.23	0.61	0.54	2.24	1.70	0.17
D57	40	05	2211	49 49 N	015 24 E	14 43	46 56	249	14 55	-0 13	100.1	1/262	0.27	1.18	0.91	0.27	2.17	1.90	0.16
D65	11	05	2222	21 06 N	165 04 W	14 56	49 34	265	ND	-0 08	109.2	1/239	NR	NR	NR	0.27	2.24	1.97	0.19
D68	37	07	2344	49 21 N	124 14 E	14 39	49 40	246	14 48	-0 15	100.1	1/262	NR	NR	NR	0.29	2.22	1.93	0.18
D69	79	05	5445	33 22 N	102 57 E	14 49	52 01	267	14 37	-0 31	103.4	1/256	0.52	0.94	0.42	0.38	2.17	1.79	0.13
D70	77	05	1111	34 40 N	080 02 E	14 48	52 08	264	15 35	-0 28	103.0	1/257	0.84	2.18	1.34	0.35	2.22	1.87	0.18
D71	60	06	1112	46 14 N	055 53 E	14 39	50 12	247	14 57	-0 18	100.3	1/263	0.74	1.65	0.91	0.43	2.25	1.82	0.17
D72	91	06	1111	47 47 N	033 06 E	14 38	50 23	247	15 17	-0 23	100.4	1/263	0.43	1.34	0.91	0.35	2.20	1.85	0.18
D83	19	04	4542	49 08 N	141 44 E	14 31	50 42	242	14 37	0 01	100.8	1/262	NR	NR	NR	0.54	2.22	1.68	0.15
D85	64	06	1121	40 30 N	097 03 E	14 36	52 59	254	14 56	-0 07	102.6	1/259	0.89	1.86	0.97	0.66	2.26	1.60	0.18
D86	123	06	1111	39 45 N	074 17 E	14 36	53 10	255	15 23	-0 22	103.0	1/258	0.38	1.83	1.45	0.30	2.14	1.84	0.12
D87	42	06	1223	54 24 N	049 31 E	14 26	48 53	236	15 01	-0 07	100.6	1/263	0.56	1.14	1.58	0.37	2.23	1.86	0.17
D88	07	04	1112	54 52 N	026 36 E	14 22	48 44	234	15 09	0 14	100.6	1/256	0.44	1.23	0.79	0.41	2.21	1.80	0.19
D88	47	07	4311	46 39 N	027 39 E	14 30	51 11	242	15 14	0 07	101.1	1/262	0.50	1.45	0.95	0.43	2.25	1.82	0.18
D98	21	05	3334	57 49 N	157 36 E	14 16	47 46	230	14 11	-0 05	100.9	1/261	0.46	1.14	0.68	0.37	2.04	1.67	0.16
D99	31	06	3344	48 10 N	136 35 E	14 25	52 03	242	14 57	-0 16	101.9	1/260	0.62	0.80	0.18	0.50	2.30	1.80	0.17
D99	64	06	1114	42 58 N	137 12 E	14 29	53 35	250	15 19	-0 07	103.3	1/258	NR	NR	NR	0.34	2.12	1.78	0.18
D101	22	06	5444	55 40 N	089 39 E	14 18	49 00	233	14 49	-0 10	101.0	1/263	0.48	1.14	0.66	0.44	2.26	1.82	0.17
D101	81	06	5444	43 00 N	091 33 E	14 28	53 44	249	15 12	-0 17	103.5	1/258	NR	NR	NR	1.06	2.22	1.16	0.17
D101	121	06	4444	36 36 N	092 06 E	14 31	54 46	256	15 25	-0 20	106.0	1/251	1.57	1.88	0.31	1.15	2.26	1.11	0.17
D101	166	07	4334	25 44 N	092 44 E	14 37	54 19	275	14 12	-0 06	112.4	1/237	0.45	1.22	0.77	0.34	2.29	1.95	0.17
D102	24	06	1111	76 31 N	050 14 E	13 05	34 16		14 32	0 02	105.0	1/250	NR	NR	NR	1.02	2.14	1.12	0.16
D102	98	07	4311	67 20 N	062 51 E	13 58	42 19	218	15 03	-0 07	101.7	1/260	0.49	0.88	0.39	0.30	2.18	1.88	0.17
D102	155	07	1122	58 37 N	066 08 E	14 14	47 31	232	14 51	-0 30	101.0	1/264	0.34	0.74	0.40	0.25	2.15	1.90	0.18
D102	176	07	5411	55 24 N	066 53 E	14 18	49 10	234	14 42	-0 17	101.1	1/265	0.39	1.03	0.64	0.34	2.10	1.76	0.18
D102	266	07	4312	41 22 N	066 53 E	14 29	54 11	252	14 58	-0 17	104.2	1/257	0.36	1.30	0.92	0.29	2.20	1.91	0.12
D103	56	07	4344	63 24 N	041 48 E	14 05	44 50	224	15 15	0 06	101.2	1/262	NR	NR	NR	0.40	2.16	1.78	0.16

NOTE: NR denotes no reading. ND denotes no data.

Mission 1007 Forward

Pass	Frame	Overlap	Cloud Cat	Geographic Latitude	Geographic Longitude	Sun Time	Solar Elev	Solar Azimuth	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN Dmin	TERRAIN Dmax	TERRAIN Delta D	LIMITING Dmin	LIMITING Dmax	LIMITING Delta D	Gross Fog
D103	96	07	4323	57°16'N	043°38'E	14h15'	48°17'	232°	15°40'	0°07'	101.0	1/264	0.38	1.42	1.04	0.33	2.18	1.85	0.16
D103	150	07	3237	46 55 N	045 11 E	14 24	52 02	242	14 27	-0 33	102.1	1/262	0.68	1.44	0.76	0.37	2.28	1.91	0.18
D103	178	07	1233	44 31 N	045 44 E	14 37	53 29	250	14 31	-0 35	103.2	1/259	1.03	1.88	0.85	0.47	2.24	1.77	0.11
D104	15	06	4223	56 40 N	020 57 E	14 15	48 38	230	15 15	-0 06	101.1	1/262	0.31	1.27	0.96	0.26	2.21	1.93	0.16
D104	28	07	1111	54 39 N	021 23 E	14 15	49 36	232	15 18	-0 06	101.3	1/262	0.31	1.35	1.04	0.26	2.05	1.77	0.16
D104	76	07	1214	47 11 N	022 35 E	14 23	52 43	242	14 58	0 01	102.6	1/259	0.47	1.52	1.05	0.33	2.22	1.89	0.15
D115	16	06	1431	75 52 N	116 30 E	13 20	36 29	201	14 35	0 04	103.1	1/254	NR	NR	NR	0.41	2.02	1.61	0.11
D115	67	06	3333	74 21 N	129 30 E	13 54	48 04	214	14 15	-0 12	102.7	1/260	0.38	1.02	0.64	0.29	2.20	1.91	0.16
D116	26	05	1111	50 57 N	106 10 E	14 16	51 56	236	14 27	-0 17	102.7	1/256	0.35	1.28	0.93	0.32	2.16	1.84	0.17
D116	53	06	3333	41 10 N	109 21 E	15 12	55 18	261	14 48	0 06	106.0	1/258	0.89	1.61	0.72	0.40	2.24	1.84	0.15
D117	22	07	1111	55 37 N	064 29 E	14 10	49 46	229	15 14	-0 15	101.9	1/260	0.32	0.94	0.62	0.30	2.17	1.87	0.18
D117	152	05	2112	31 51 N	067 14 E	14 27	56 27	266	15 01	-0 27	111.2	1/238	0.60	1.84	1.24	0.22	2.17	1.95	0.10
D118	13	05	3444	80 14 N	040 14 E	12 38	32 56	180	14 36	-0 02	104.3	1/251	NR	NR	NR	0.55	1.88	1.33	0.08
D118	141	07	3433	61 57 N	060 17 E	14 03	46 48	224	15 35	-0 07	101.4	1/262	0.42	1.13	0.71	0.36	2.23	1.87	0.17
D118	177	07	3333	55 23 N	061 42 E	14 10	49 56	231	15 04	-0 39	101.9	1/260	0.56	0.87	0.31	0.42	2.27	1.85	0.16
D118	239	07	1111	45 37 N	063 15 E	14 19	54 11	243	14 50	-0 47	104.5	1/255	0.45	1.58	1.13	0.34	2.28	1.94	0.12
D118	295	07	1111	35 59 N	064 06 E	14 25	56 20	256	15 35	-0 33	108.9	1/249	0.44	0.90	0.46	0.26	1.38	1.12	0.08
D119	61	06	4422	63 45 N	036 26 E	13 56	45 03	220	15 14	-0 06	101.4	1/261	0.28	1.07	0.79	0.28	2.10	1.82	0.15
D119	161	06	2122	44 59 N	040 30 E	14 19	54 26	245	14 23	-0 23	104.8	1/254	0.54	1.56	1.02	0.42	2.20	1.78	0.16
D119	222	07	1122	36 17 N	041 06 E	14 24	56 07	256	14 12	-0 17	107.8	1/245	0.35	1.36	1.01	0.28	2.16	1.90	0.12
D120	20	06	2224	53 07 N	016 30 E	14 12	51 11	233	ND	ND	102.5	1/256	0.68	1.30	0.62	0.61	2.20	1.59	0.17
D120	55	06	4122	47 33 N	017 22 E	14 16	53 37	239	ND	ND	104.0	1/254	0.60	1.58	0.98	0.45	2.22	1.77	0.16

NOTE: NR denotes no reading. ND denotes no data.

Mission 1007 Aft

Pass	Frame	Overlap	Cloud Cat	Geographic Longitude	Geographic Latitude	Sun Time	Solar Elev	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN Dmin	TERRAIN Dmax	TERRAIN Delta D	LIMITING Dmin	LIMITING Dmax	LIMITING Delta D	Gross Fog
D01	06	05	4435	51°53'N	145°22'W	15h07'	44°36'	-15°03'	-00°11'	102.7	1/319	NR	NR	NR	0.80	2.24	1.44	0.16
D01	12	06	4445	50 56 N	145 13 W	15 07	44 50	-14 59	-00 10	102.3	1/327	NR	NR	NR	0.42	2.18	1.76	0.14
D02	15	00	4334	70 48 N	175 09 W	14 33	37 45	-14 51	-00 06	113.8	1/281	NR	NR	NR	0.61	2.05	1.44	0.07
D02	58	05	1112	63 28 N	171 11 W	14 51	41 03	-15 11	-00 06	105.6	1/303	0.45	2.22	1.77	0.26	2.22	1.96	0.15
D06	12	03	3344	53 55 N	099 57 E	15 02	44 27	-15 20	00 03	103.1	1/316	0.55	1.20	0.65	0.37	2.31	1.94	0.17
D06	39	03	4212	49 39 N	100 40 E	15 16	45 26	-15 19	-00 06	101.5	1/325	0.38	1.04	0.66	0.38	2.27	1.89	0.11
D06	56	04	2421	42 38 N	101 31 E	15 11	46 20	-14 22	00 00	99.6	1/330	0.52	0.78	0.26	0.33	2.24	1.91	0.10
D06	114	04	4422	33 45 N	102 15 E	15 16	46 12	-15 37	-00 25	99.3	1/336	0.66	1.55	0.89	0.42	2.33	1.91	0.16
D07	13	05	1343	55 41 N	076 44 E	15 00	44 01	-15 09	00 07	103.6	1/320	0.78	1.42	0.64	0.45	2.34	1.89	0.15
D07	75	07	2231	46 04 N	078 17 E	15 08	46 05	-14 57	-00 10	100.4	1/333	0.47	1.22	0.75	0.37	2.26	1.89	0.11
D07	150	03	1111	34 36 N	079 20 E	15 15	46 22	-14 46	-00 46	99.3	1/337	0.59	2.20	1.61	0.30	2.32	2.02	0.10
D07	185	06	1233	29 19 N	079 39 E	15 18	45 40	-15 03	-00 46	99.9	1/337	0.33	1.12	0.79	0.33	2.28	1.95	0.10
D09	25	06	4343	58 51 N	030 16 E	14 55	43 07	-15 00	-00 13	105.1	1/318	0.50	1.30	0.80	0.50	2.18	1.68	0.12
D09	58	06	1111	53 40 N	031 26 E	15 01	44 42	-15 10	-00 04	102.7	1/326	0.50	1.50	1.00	0.50	1.88	1.33	0.15
D09	87	07	2111	49 11 N	032 10 E	15 06	45 44	-15 22	00 01	101.2	1/332	0.52	1.47	0.95	0.49	2.14	1.65	0.15
D09	107	06	2111	46 07 N	032 34 E	15 07	46 14	-15 19	-00 09	100.4	1/333	0.62	1.72	0.90	0.51	2.30	1.79	0.15
D20	07	06	1111	55 00 N	139 46 E	14 55	44 58	-15 36	00 11	102.0	1/319	NR	NR	NR	0.28	1.73	1.45	0.16
D20	34	07	1111	50 48 N	140 31 E	14 59	46 08	-15 01	00 17	100.7	1/331	0.34	0.90	0.56	0.28	1.79	1.51	0.18
D21	22	04	4244	51 40 N	117 32 E	14 58	45 59	-14 38	-00 05	100.9	1/329	0.62	1.06	0.44	0.44	2.34	1.90	0.15
D21	65	06	4432	45 04 N	118 26 E	15 03	47 17	-15 14	-00 02	99.5	1/334	0.94	1.65	0.71	0.54	2.31	1.77	0.15

Pass	Frame	Overlap	Cloud Cat.	Geographic Longitude	Geographic Latitude	Sun Time	Solar Elev	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN			LIMITING			Gross Fog
												Dmin	Dmax	Delta D	Dmin	Dmax	Delta D	
D21	91	06	4311	41°05'N	118°51'E	15h05'	47°40'	-15°40'	-00°11'	99.1	1/336	0.70	1.48	0.78	0.38	2.31	1.83	0.16
D21	120	06	1111	36 40 N	119 13 E	15 08	47 45	-15 13	-00 08	99.2	1/336	0.42	1.35	0.93	0.26	2.00	1.74	0.10
D21	124	06	1111	36 03 N	119 16 E	15 09	47 44	-15 09	-00 08	99.3	1/336	0.39	1.42	1.03	0.31	2.10	1.79	0.10
D22	21	03	5534	56 39 N	093 42 E	14 57	44 33	-15 25	00 09	102.5	1/324	NR	NR	NR	0.62	2.29	1.67	0.15
D22	72	08	3331	38 27 N	096 14 E	15 07	47 51	-15 36	-00 26	99.2	1/334	0.65	2.25	1.60	0.38	2.25	1.87	0.10
D23	28	06	4444	55 35 N	071 05 E	14 53	44 58	-15 18	00 02	102.0	1/327	0.89	1.60	0.71	0.70	2.34	1.64	0.15
D23	42	06	4443	53 25 N	071 31 E	14 55	45 38	-15 13	-00 05	101.3	1/329	0.45	0.93	0.48	0.28	2.27	1.99	0.10
D23	64	03	4444	47 30 N	072 26 E	15 01	47 02	-14 46	-00 06	99.8	1/333	0.83	1.32	0.49	0.49	2.29	1.80	0.10
D23	93	06	1111	43 04 N	072 57 E	15 04	47 40	-14 29	-00 18	99.3	1/335	0.36	1.29	0.93	0.25	1.78	1.53	0.09
D23	136	06	4344	36 13 N	073 33 E	15 07	47 55	-15 26	-00 18	99.3	1/336	0.42	2.20	1.78	0.42	2.27	1.85	0.09
D24	17	05	4344	64 54 N	045 24 E	14 39	41 18	-15 02	-00 07	106.2	1/313	0.82	1.17	0.35	0.67	2.35	1.68	0.15
D24	69	07	1111	56 44 N	047 59 E	14 51	44 36	-14 18	00 05	102.4	1/327	0.40	1.60	1.20	0.36	1.86	1.50	0.14
D24	85	07	1111	54 16 N	048 30 E	14 54	45 26	-15 13	00 07	101.5	1/330	0.40	1.52	1.12	0.35	1.74	1.39	0.15
D24	146	07	1111	44 57 N	049 54 E	15 02	47 31	-15 11	-00 31	99.5	1/336	NR	NR	NR	0.25	2.07	1.82	0.11
D25	24	06	1111	53 02 N	025 53 E	14 55	45 51	-15 14	-00 13	101.1	1/329	0.56	1.52	0.96	0.48	2.30	1.82	0.14
D36	19	05	1111	72 41 N	126 12 E	14 11	37 32	-14 27	00 06	109.0	1/295	0.28	1.05	0.77	0.22	2.03	1.81	0.10
D36	57	02	5435	50 05 N	135 02 E	14 52	47 22	-14 32	-00 11	100.4	1/323	0.54	0.84	0.30	0.38	2.29	1.91	0.10
D36	83	03	1244	46 00 N	135 35 E	14 55	48 15	-14 50	00 06	99.6	1/326	0.61	0.90	0.29	0.36	2.32	1.94	0.14
D37	22	NR	4444	51 22 N	111 59 E	14 50	47 05	-14 50	-00 04	100.3	1/321	NR	NR	NR	0.85	2.26	1.43	0.14
D37	96	04	4344	39 46 N	113 22 E	14 58	49 05	-14 59	00 11	99.6	1/326	0.62	1.52	0.90	0.53	2.26	1.73	0.10
D37	128	04	4433	34 46 N	113 46 E	15 01	49 08	-15 17	-00 13	100.3	1/325	0.83	1.42	0.59	0.37	2.21	1.84	0.09
D37	162	04	4421	29 24 N	114 05 E	15 04	48 36	-15 04	-00 01	101.8	1/323	NR	NR	NR	0.39	2.26	1.87	0.14
D38	14	02	4433	57 40 N	087 53 E	14 44	45 09	-15 15	-00 13	101.8	1/317	0.79	1.52	0.75	0.64	2.33	1.69	0.14
D38	50	01	1111	48 33 N	089 34 E	14 52	47 52	-14 27	-00 21	99.8	1/325	0.30	2.04	1.74	0.25	2.19	1.94	0.08
D38	154	03	4214	32 17 N	091 04 E	15 02	49 03	-15 18	-00 38	101.0	1/326	0.44	1.20	0.76	0.25	2.08	1.83	0.07
D39	11	03	1344	58 07 N	064 55 E	14 43	44 53	-14 37	-00 18	101.9	1/316	0.53	1.68	1.15	0.32	2.27	1.95	0.16
D39	34	04	2332	54 26 N	065 44 E	14 46	46 14	-14 55	-00 12	100.9	1/322	0.84	1.24	0.40	0.57	2.30	1.73	0.15
D40	12	03	3233	58 58 N	041 51 E	14 40	44 35	-15 04	-00 08	102.1	1/315	0.42	1.50	1.08	0.38	2.29	1.91	0.15
D40	75	04	1111	49 02 N	043 48 E	14 51	47 53	-14 52	-00 09	99.9	1/326	0.52	1.93	1.41	0.44	1.93	1.49	0.15
D40	116	03	2333	42 39 N	044 34 E	14 55	49 04	-14 51	-00 10	99.6	1/328	0.50	2.20	1.70	0.38	2.30	1.92	0.16
D41	15	03	4443	57 31 N	019 23 E	14 43	45 13	-15 00	-00 07	101.6	1/316	NR	NR	NR	0.60	2.25	1.65	0.10
D41	21	03	5444	56 33 N	019 36 E	14 43	45 35	-15 09	00 06	101.3	1/320	NR	NR	NR	0.70	2.16	1.48	0.10
D49	02	00	1111	62 20 N	164 46 W	14 32	43 55	ND	ND	102.7	1/229	0.49	1.02	0.53	0.40	2.12	1.72	0.10
D52	12	05	4421	76 51 N	115 19 E	13 41	35 33	-14 29	00 00	109.7	1/293	NR	NR	NR	0.61	1.95	1.34	0.07
D52	35	04	1211	73 09 N	120 14 E	14 02	37 59	-14 31	00 27	107.4	1/302	0.34	1.65	1.31	0.28	1.86	1.58	0.09
D52	66	03	4443	56 36 N	127 46 E	14 36	45 44	-15 29	-00 23	101.4	1/319	NR	NR	NR	0.60	2.25	1.65	0.08
D52	120	03	1444	50 10 N	129 30 E	14 45	46 47	-14 41	-00 13	100.0	1/326	0.83	1.74	0.91	0.46	2.28	1.82	0.15
D52	171	05	2344	42 14 N	130 29 E	14 51	50 27	-14 48	00 02	100.0	1/326	0.35	1.32	0.97	0.31	2.20	1.89	0.12
D53	13	03	2211	53 47 N	106 03 E	14 41	47 41	-15 01	-00 07	100.4	1/321	0.64	1.25	0.61	0.36	2.27	1.91	0.15
D53	33	06	1112	50 39 N	106 35 E	14 44	48 43	-14 56	-00 08	100.0	1/325	0.37	1.48	1.11	0.26	2.24	1.96	0.14
D53	54	05	1113	41 48 N	107 41 E	14 51	50 34	-15 51	-00 07	100.2	1/325	0.64	1.10	0.46	0.36	1.97	1.61	0.10
D53	102	05	3211	34 14 N	108 17 E	14 55	50 52	-15 32	-00 07	101.8	1/322	0.55	1.47	0.92	0.40	2.18	1.78	0.10
D53	161	06	3444	24 46 N	108 48 E	14 59	49 30	-15 01	-00 03	105.8	1/313	0.84	1.27	0.43	0.48	2.26	1.78	0.12
D54	18	04	4344	57 03 N	082 31 E	14 37	46 29	-15 10	-00 16	101.0	1/320	0.86	1.45	0.59	0.67	2.27	1.60	0.14
D54	39	03	4444	53 45 N	083 13 E	14 41	47 45	-15 34	-00 22	100.4	1/324	0.54	1.28	0.74	0.47	2.23	1.76	0.11
D54	58	05	4411	48 11 N	084 06 E	14 45	49 27	-15 00	-00 15	100.0	1/326	1.07	1.54	0.47	0.36	2.15	1.77	0.10
D54	112	04	1222	39 45 N	085 01 E	14 51	50 51	-14 49	-00 07	100.6	1/326	0.99	1.10	0.11	0.58	2.09	1.51	0.07
D54	160	02	2344	32 12 N	085 34 E	14 55	50 49	-15 24	-00 22	102.6	1/321	NR	NR	NR	0.28	2.07	1.79	0.06
D54	193	06	4345	26 55 N	085 51 E	14 57	50 04	-15 18	-00 26	104.8	1/316	NR	NR	NR	0.65	2.14	1.49	0.09
D55	35	04	5423	55 21 N	060 03 E	14 38	47 13	-15 15	-00 02	100.6	1/324	NR	NR	NR	0.45	2.24	1.79	0.09

NOTE: NR denotes no reading. ND denotes no data.

Pass	Frame	Overlap	Cloud Cat	Geographic Longitude	Geographic Latitude	Sun Time	Solar Elev	Pitch	Roll	Height in Nautical Miles	Exposure in Seconds	TERRAIN			LIMITING			Gross Fog
												Dmin	Dmax	Delta D	Dmin	Dmax	Delta D	
D55	95	05	1112	46°00'N	061°33'E	14h47'	49°35'	-15°00'	-00°29'	100.0	1/329	0.29	1.51	1.22	0.29	2.22	1.93	0.10
D56	19	04	1111	69 45 N	031 42 E	14 13	39 53	-15 02	-00 09	105.2	1/309	0.40	1.81	1.41	0.26	2.08	1.80	0.13
D56	74	04	1111	61 02 N	035 45 E	14 31	44 26	-14 40	-00 05	101.9	1/321	0.33	1.16	0.83	0.25	1.46	1.21	0.15
D56	109	04	1111	55 34 N	037 10 E	14 38	46 47	-15 00	-00 07	100.6	1/325	0.39	1.62	1.23	0.35	1.95	1.60	0.15
D56	180	05	1111	44 33 N	038 52 E	14 47	49 56	-15 32	-00 21	100.1	1/329	0.22	0.82	0.60	0.21	1.42	1.21	0.11
D57	19	02	4344	53 56 N	014 40 E	14 39	47 27	-14 50	00 06	100.4	1/324	0.57	1.19	0.62	0.54	2.24	1.70	0.10
D57	40	04	1112	50 39 N	015 14 E	14 42	48 32	-15 03	-00 13	100.1	1/326	0.36	1.32	0.94	0.30	2.26	1.96	0.14
D65	16	07	2222	21 03 N	165 07 W	14 56	49 32	ND	-00 07	109.9	1/299	NR	NR	NR	0.16	2.18	2.02	0.10
D68	42	04	2344	49 24 N	124 11 E	14 39	49 39	-15 05	-00 17	100.2	1/326	0.45	0.97	0.52	0.32	2.23	1.91	0.14
D69	65	NR	4445	33 05 N	102 55 E	14 49	52 01	-15 24	-00 37	103.9	1/316	NR	NR	NR	0.80	2.19	1.39	0.10
D70	82	03	1111	34 42 N	079 58 E	14 47	52 08	-14 25	-00 28	103.3	1/317	0.47	1.86	1.39	0.20	2.12	1.92	0.08
D71	65	03	1112	48 18 N	055 49 E	14 38	50 11	-14 57	-00 14	100.3	1/326	0.44	1.24	0.80	0.28	2.25	1.97	0.10
D72	95	04	1112	47 54 N	033 02 E	14 38	50 22	-14 40	00 21	100.4	1/326	0.57	1.18	0.61	0.42	2.28	1.86	0.14
D83	24	03	4542	49 12 N	141 40 E	14 31	50 40	-15 17	-00 06	100.8	1/323	NR	NR	NR	0.28	2.00	1.72	0.08
D85	68	04	1121	40 33 N	097 00 E	14 36	52 56	-14 59	00 01	102.9	1/318	0.60	1.84	1.24	0.46	2.28	1.82	0.09
D86	127	03	1111	39 49 N	074 14 E	14 36	53 10	-14 32	-00 26	103.2	1/319	0.34	1.72	1.38	0.34	2.19	1.85	0.09
D87	47	05	1223	54 26 N	049 26 E	14 26	48 52	-14 56	-00 07	100.6	1/325	0.56	1.54	0.96	0.42	2.35	1.83	0.14
D88	13	04	1112	54 47 N	026 34 E	14 24	48 46	-14 50	00 12	100.7	1/323	0.59	1.51	0.92	0.49	2.30	1.81	0.13
D88	52	04	4311	48 40 N	027 35 E	14 29	51 10	-14 44	00 08	101.2	1/323	0.62	1.66	0.84	0.72	2.34	1.62	0.15
D98	26	04	3334	57 53 N	157 34 E	14 16	47 44	-15 42	-00 05	100.9	1/324	NR	NR	NR	0.30	2.12	1.82	0.12
D99	36	03	3344	48 13 N	136 32 E	14 25	52 02	-14 57	-00 11	102.1	1/321	0.48	0.69	0.21	0.40	2.28	1.88	0.09
D99	69	04	1114	42 58 N	137 09 E	14 29	53 35	-14 36	-00 11	103.6	1/317	NR	NR	NR	0.16	2.08	1.90	0.09
D100	29	04	4444	50 24 N	113 23 E	14 23	51 17	-15 13	00 13	101.7	1/323	0.41	1.37	0.96	0.34	2.22	1.88	0.10
D100	108	06	4144	37 48 N	114 47 E	14 31	54 36	-15 16	-00 12	105.8	1/313	0.82	1.45	0.63	0.40	2.23	1.83	0.09
D100	168	06	4444	27 49 N	115 24 E	14 37	54 32	-16 09	-00 37	111.5	1/297	0.44	1.20	0.76	0.35	2.28	1.93	0.09
D100	207	04	4444	20 59 N	115 42 E	14 39	53 06	-15 25	00 00	116.6	1/283	NR	NR	NR	0.32	2.38	2.36	0.09
D102	29	04	1111	78 35 N	050 01 E	14 04	34 15	-15 26	00 03	104.7	1/312	NR	NR	NR	0.50	1.88	1.38	0.08
D102	103	04	4311	67 18 N	062 49 E	13 58	42 21	-14 57	-00 07	101.6	1/323	0.70	1.41	0.71	0.44	2.30	1.86	0.14
D102	159	05	1122	58 39 N	066 04 E	14 13	47 30	-15 06	-00 27	101.0	1/326	0.39	0.94	0.55	0.34	2.30	1.96	0.15
D102	180	05	5411	55 24 N	066 50 E	14 17	49 10	-15 18	-00 14	101.2	1/327	0.64	1.33	0.69	0.49	2.22	1.73	0.14
D102	269	06	4312	41 25 N	068 49 E	14 26	54 10	-14 57	-00 19	104.5	1/332	0.82	1.58	0.76	0.46	2.28	1.82	0.09
D103	61	04	4344	63 25 N	041 44 E	14 06	44 49	-14 43	00 03	101.1	1/326	0.32	0.84	0.52	0.30	2.22	1.92	0.10
D103	101	05	4323	57 14 N	043 35 E	14 14	48 17	-14 20	00 09	101.1	1/327	0.72	1.63	0.91	0.50	2.25	1.78	0.13
D103	155	06	3233	48 50 N	045 08 E	14 23	52 04	-15 33	-00 36	102.3	1/324	0.52	1.70	1.18	0.46	2.28	1.82	0.12
D103	183	06	1233	44 25 N	045 41 E	14 26	53 30	-15 22	-00 34	103.5	1/321	0.64	1.32	0.68	0.40	2.25	1.85	0.08
D104	20	04	4223	56 45 N	020 53 E	14 15	48 35	-14 40	-00 05	101.2	1/324	NR	NR	NR	0.18	2.24	2.06	0.10
D104	32	04	1111	54 52 N	021 17 E	14 17	49 31	-14 39	-00 09	101.3	1/324	0.44	1.37	0.93	0.32	2.18	1.86	0.14
D104	79	06	1214	47 29 N	022 29 E	14 23	52 37	-15 03	00 02	102.7	1/321	0.42	1.34	0.92	0.40	2.30	1.90	0.09
D115	21	04	1431	75 56 N	118 20 E	13 19	36 25	-15 09	00 06	103.0	1/315	NR	NR	NR	0.33	1.83	1.50	0.08
D115	72	04	3333	58 40 N	129 21 E	13 57	48 01	-15 38	-00 12	101.5	1/322	0.55	1.14	0.59	0.42	2.32	1.90	0.12
D116	31	04	1111	51 01 N	108 06 E	14 15	51 57	-15 24	-00 15	102.9	1/319	0.27	0.90	0.63	0.22	2.17	1.95	0.09
D116	59	06	3333	41 06 N	109 18 E	14 22	55 19	-15 04	00 10	106.4	1/306	0.70	1.51	0.81	0.29	2.24	1.95	0.09
D117	27	05	1111	55 42 N	084 24 E	14 11	49 43	-14 49	-00 13	102.0	1/321	0.34	1.17	0.83	0.31	2.14	1.83	0.13
D117	157	05	2112	31 53 N	087 10 E	14 27	56 27	-15 07	-00 24	111.9	1/296	0.58	1.53	0.95	0.19	2.12	1.93	0.08
D118	19	03	3444	80 10 N	040 23 E	12 39	32 59	-15 21	-00 02	104.0	1/312	NR	NR	NR	0.20	2.03	1.83	0.10
D118	146	05	3433	60 55 N	060 14 E	14 03	46 49	-14 23	-00 10	101.4	1/327	0.68	1.20	0.52	0.52	2.32	1.80	0.14
D118	182	06	3333	55 20 N	061 40 E	14 11	49 56	-15 04	-00 40	102.1	1/325	0.68	1.30	0.62	0.60	2.32	1.72	0.13
D118	244	06	1111	45 39 N	063 12 E	14 19	54 12	-15 03	-00 48	104.8	1/317	0.60	1.74	1.14	0.29	2.08	1.79	0.08
D118	302	05	1111	36 03 N	064 04 E	14 24	56 20	-14 30	-00 30	109.4	1/304	0.32	1.04	0.72	0.32	1.57	1.25	0.07
D119	66	05	4422	63 51 N	036 23 E	13 58	45 01	-14 43	-00 06	101.4	1/325	0.44	1.12	0.68	0.32	2.24	1.92	0.13
D119	123	05	3224	54 59 N	038 55 E	14 10	50 11	-14 35	-00 21	102.2	1/324	0.83	1.86	1.03	0.63	2.31	1.68	0.14
D119	186	06	2122	45 00 N	040 26 E	14 19	54 27	-15 39	-00 22	105.2	1/316	0.70	1.64	0.94	0.59	2.32	1.73	0.15
D119	227	05	1122	38 18 N	041 05 E	14 23	56 07	-15 17	-00 16	108.3	1/305	0.78	1.77	0.99	0.61	2.32	1.71	0.14
D120	26	04	2224	53 03 N	016 28 E	14 12	51 13	-15 05	-00 04	102.7	1/319	0.96	1.42	0.46	0.69	2.32	1.43	0.14
D120	77	05	1145	44 53 N	017 38 E	14 19	54 34	-14 56	-00 26	105.3	1/314	0.82	1.21	0.39	0.70	2.30	1.60	0.16

NOTE: NR denotes no reading. ND denotes no data.

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

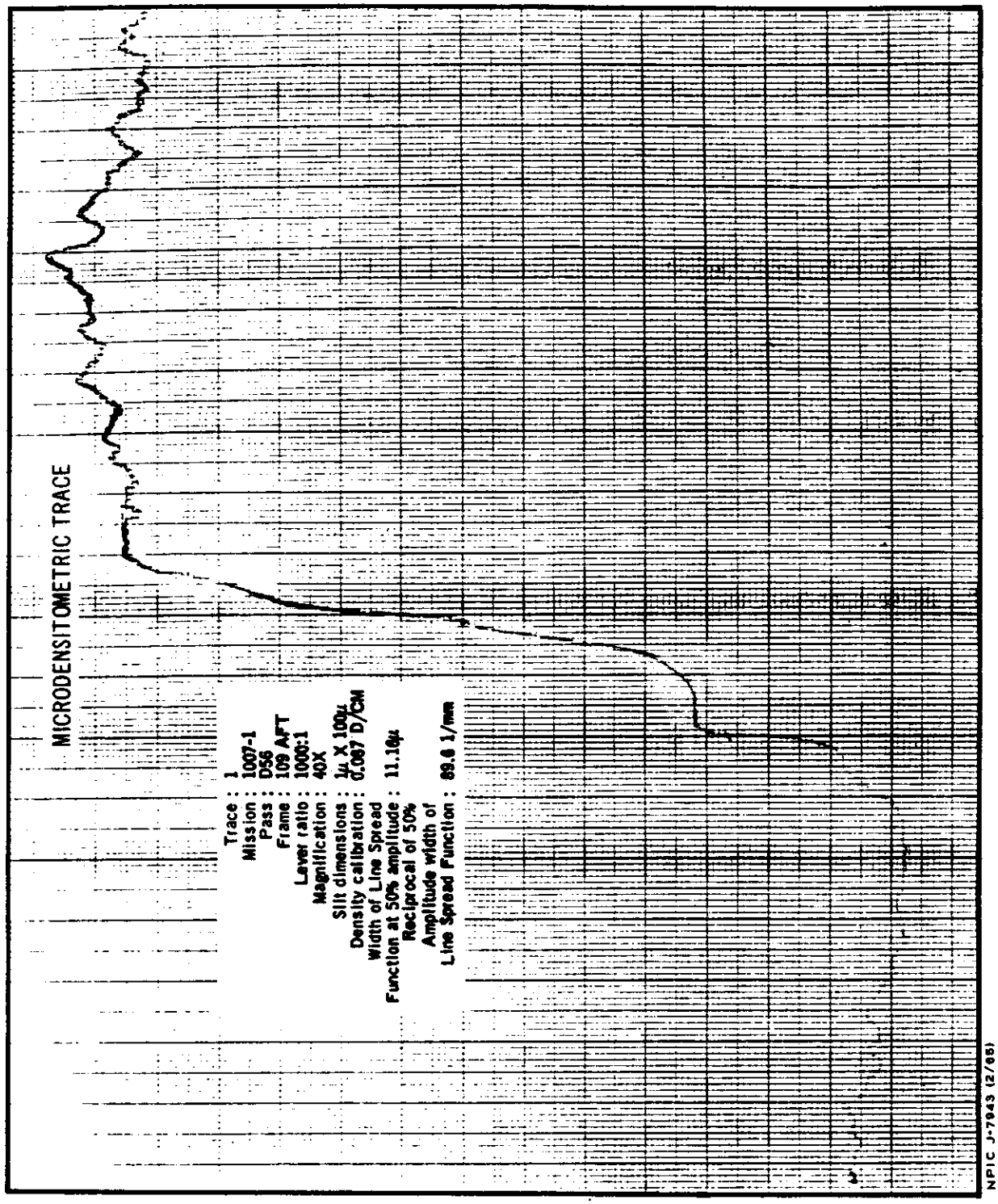
As a starting point the mission is examined to locate examples of best photography with edges long enough and straight enough for use in the microdensitometer, and having uniform density on each side of the edge to fulfill the conditions of a unit step function. This requirement is usually achieved by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

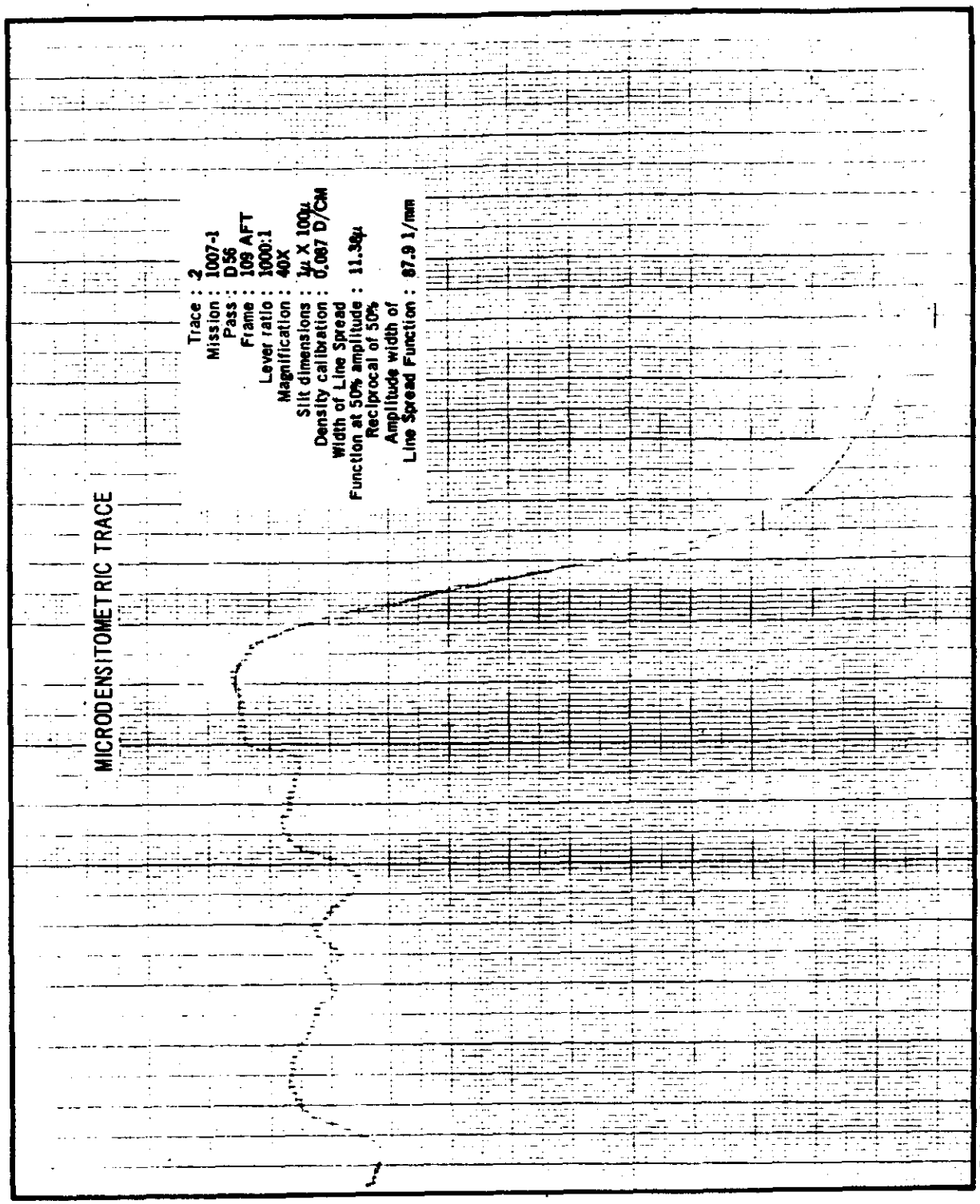
The microdensitometer used is a Joyce-Lobel Double Beam Model IIIC. It is used with an effective slit of 1 micron by 125 microns. The recording table and sample table are directly linked with a ratio arm of 1000:1. The speed of the scan is variable and is determined by the amount of pen deflection (as the pen is deflected the speed decreases giving the pen time to reach its maximum

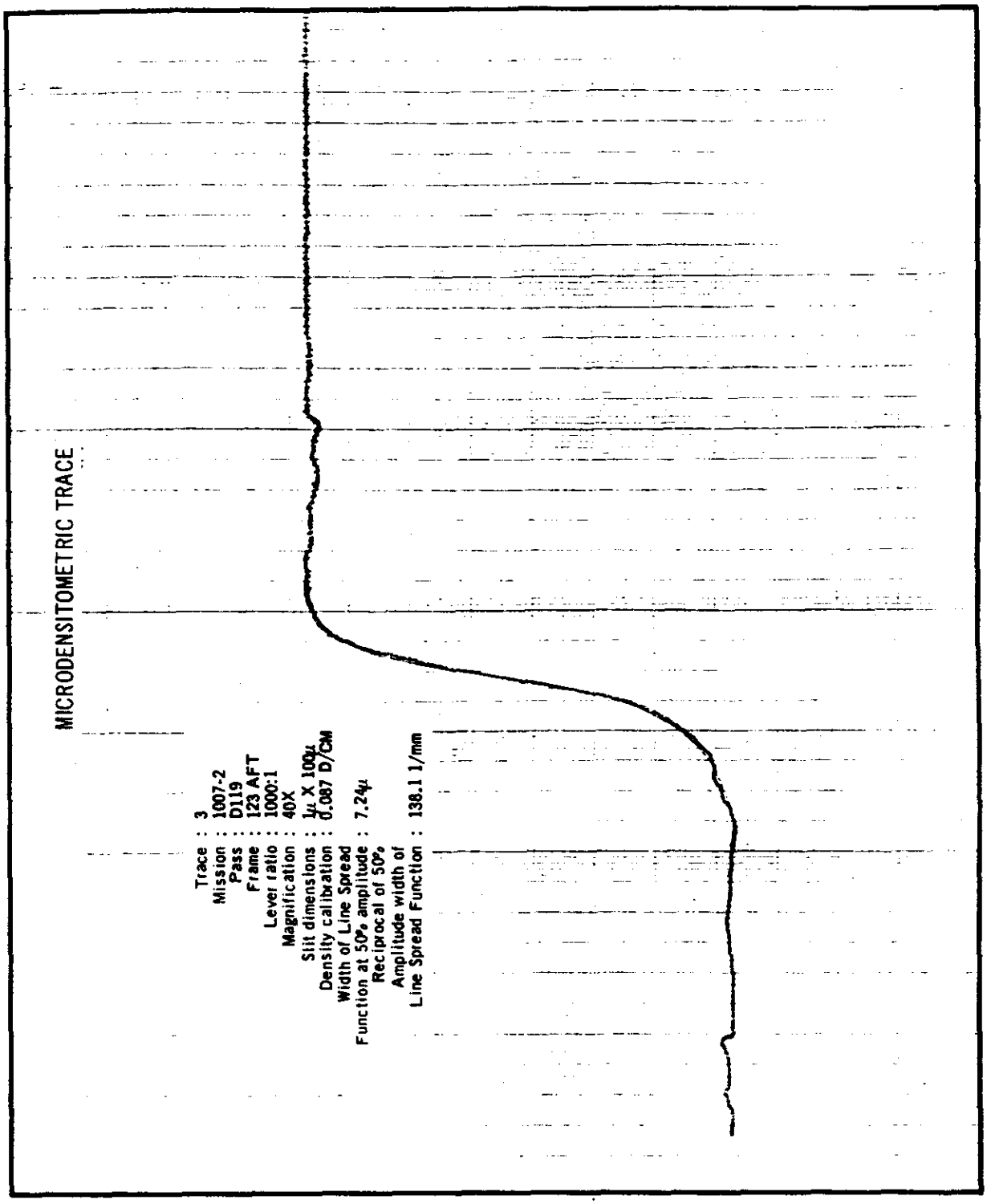
response). The chart thus produced represents a plot of chart displacement versus distance. This plot is manually smoothed by the analysts and is a judgment of what the edge would be if grain and other anomalies were absent.

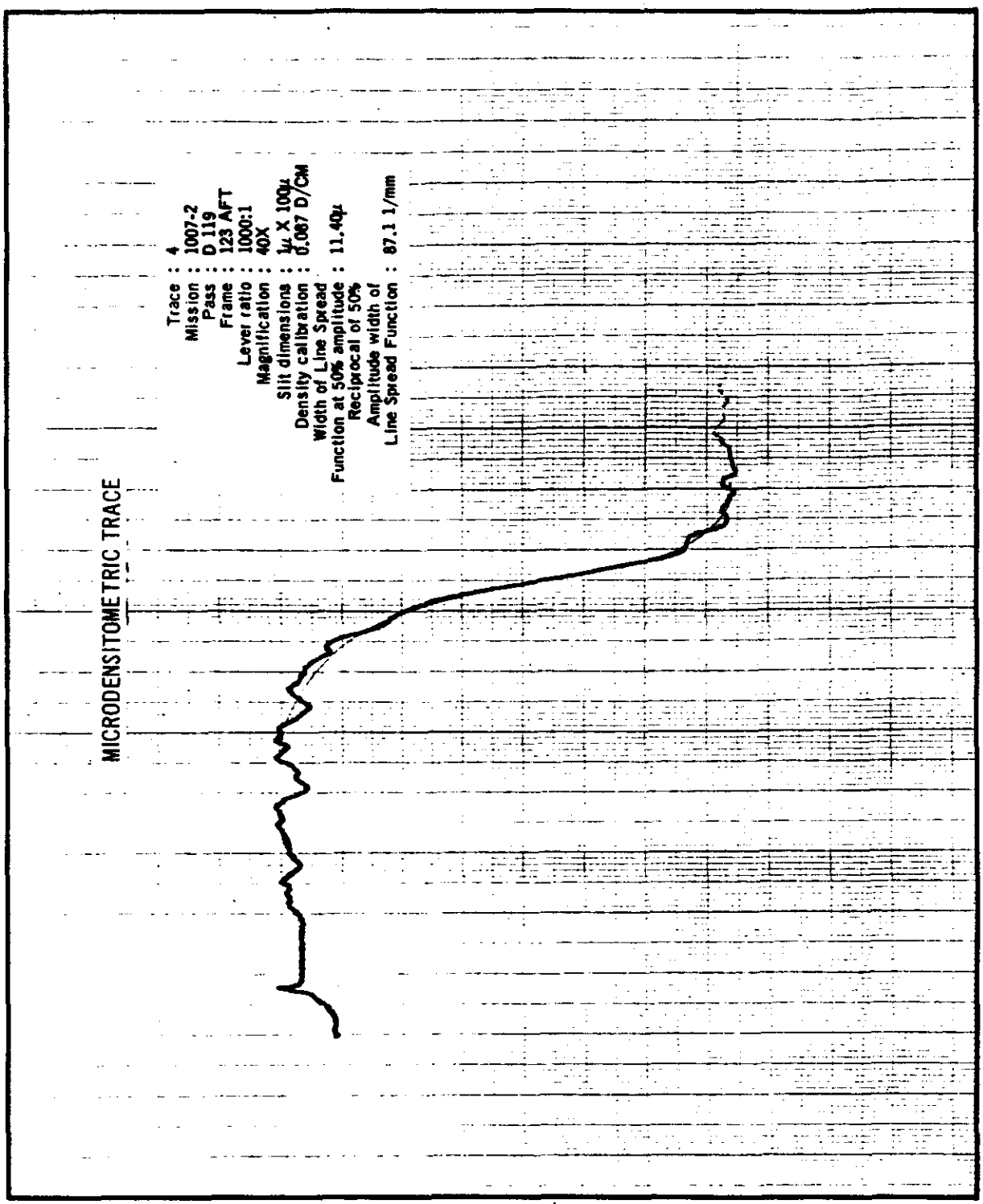
The data reduction is done manually at present, but the feasibility of using the UNIVAC 490 computer is being investigated. The linear slope of the calibrated step wedge in the microdensitometer is used to determine the densities at measured distance increments along the trace. The curve for the material 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.

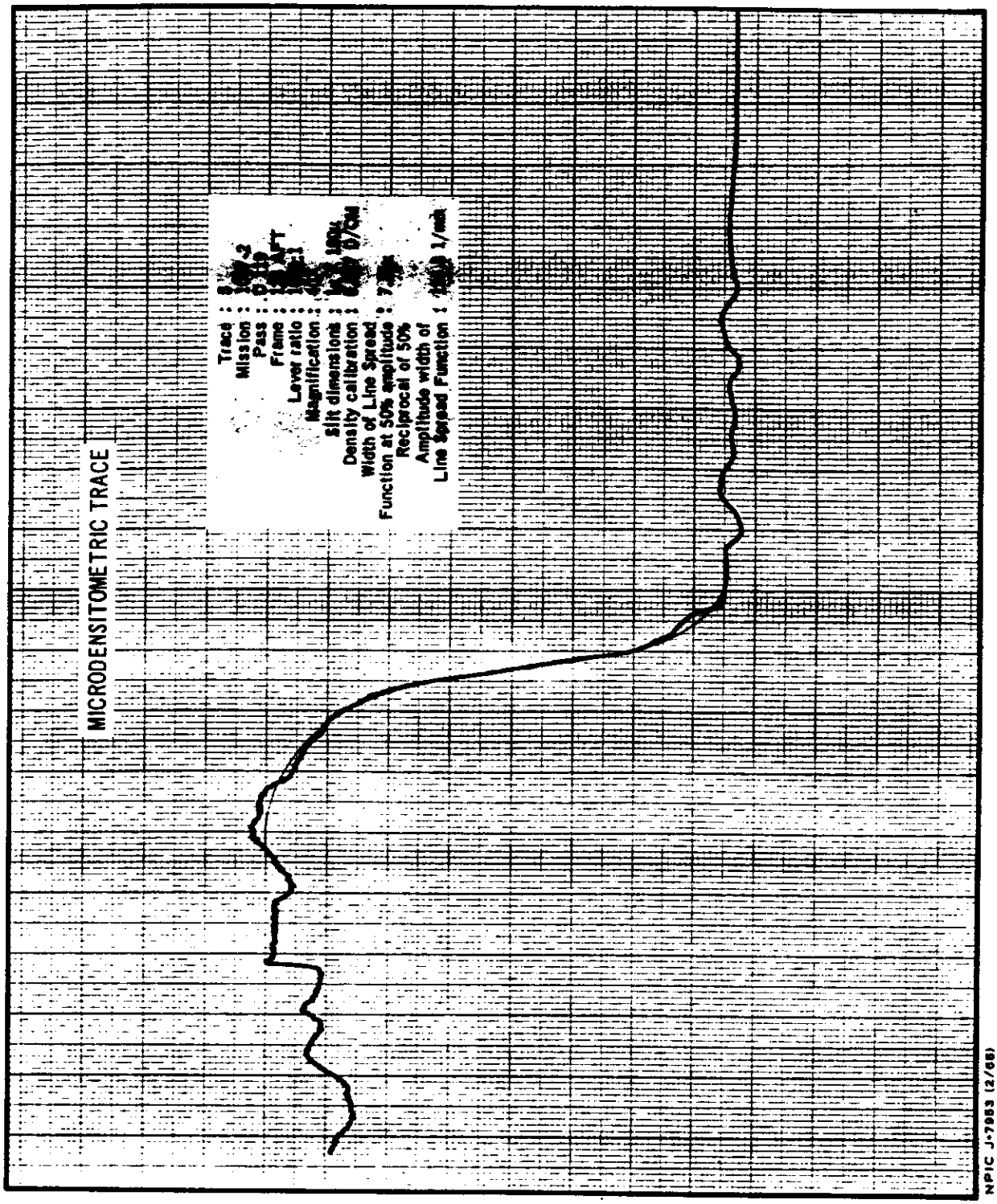
The 50 percent amplitude width value is shown on the enclosed original traces in terms of microns on the negative.


MICRODENSITOMETRIC TRACE
Trace : 1
Mission : 1007-1
Pass : D56
Frame : 109 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : 0.067 D/CM
Width of Line Spread Function at 50% amplitude : 11.1μ
Reciprocal of 50% Amplitude width of Line Spread Function : 89.8 1/mm
NPIC J-7943 (2/68)


MICRODENSITOMETRIC TRACE
Trace : 2
Mission : 1007-1
Pass : D56
Frame : 109 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : 0.087 D/CM
Width of Line Spread Function at 50% amplitude : 11.36μ
Reciprocal of 50% Amplitude width of Line Spread Function : 87.9 1/mm
NPIC J-7944 (2/68)


MICRODENSITOMETRIC TRACE
Trace : 3
Mission : 1007-2
Pass : D119
Frame : 123 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : 0.087 D/CM
Width of Line Spread Function at 50% amplitude : 7.24μ
Reciprocal of 50% Amplitude width of Line Spread Function : 138.1 1/mm
NPIC J-7851 (2/68)


MICRODENSITOMETRIC TRACE
Trace : 4
Mission : 1007-2
Pass : D 119
Frame : 123 AFT
Lever ratio : 1000:1
Magnification : 40X
Slit dimensions : 1μ X 100μ
Density calibration : 0.087 D/CM
Width of Line Spread Function at 50% amplitude : 11.40μ
Reciprocal of 50% Amplitude width of Line Spread Function : 87.1 1/mm
NPIC J-7982 (2/65)


MICRODENSITOMETRIC TRACE
Trace :
Mission :
Pass :
Frame :
Lever ratio :
Magnification :
Slit dimensions :
Density calibration :
Width of Line Spread Function at 50% amplitude :
Reciprocal of 50% Amplitude width of Line Spread Function :
NPIC J-7983 (2/68)

APPENDIX D. DENSITY READINGS

1. Stellar Camera No. D43:

Density readings were taken using a Macbeth QuantaLog Densitometer, Model EP 1000 and an ET 20 attachment with a 0.5 mm aperture. All readings include gross fog.

Stellar Camera No. D43

Pass	Frame	Dmax	Dmin	Delta	Gross Fog	Pass	Frame	Dmax	Dmin	Delta	Gross Fog
01D	1	2.12	0.82	1.30	0.77	36D	161	2.83	0.23	2.60	0.20
01D	2	2.22	0.80	1.42	0.78	37D	182	2.58	0.20	2.38	0.19
02D	3	1.98	0.75	1.23	0.70	37D	205	2.81	0.22	2.59	0.20
02D	11	2.12	0.21	1.91	0.18	38D	206	2.70	0.21	2.49	0.19
06D	12	1.93	0.20	1.73	0.17						
						38D	232	2.96	0.21	2.75	0.19
06D	29	2.61	0.22	2.39	0.17	39D	233	2.74	0.20	2.54	0.18
07D	30	2.12	0.20	1.92	0.18	39D	237	2.68	0.22	2.46	0.26
07D	55	2.63	0.26	2.37	0.25	40AE	238	0.22	0.22	0.00	0.22
08AE	56	0.27	0.25	0.02	0.24	40D	239	2.64	0.23	2.41	0.21
08AE	57	0.28	0.26	0.02	0.26						
						40D	255	2.76	0.52	2.24	0.47
09D	58	1.94	0.27	1.67	0.26	41D	256	2.43	0.34	2.09	0.24
09D	75	2.54	0.54	2.00	0.51	41D	262	2.52	0.21	2.31	0.20
20D	76	2.43	0.40	2.03	0.36	49D	263	2.72	0.22	2.50	0.21
20D	83	2.47	0.22	2.25	0.20	52D	264	2.58	0.28	2.30	0.24
21D	84	2.45	0.22	2.23	0.20						
						52D	290	2.85	0.22	2.63	0.19
21D	103	2.59	0.23	2.36	0.20	53D	291	2.74	0.22	2.52	0.20
22D	104	2.24	0.21	2.03	0.19	53D	314	2.72	0.21	2.51	0.19
22D	113	2.75	0.24	2.51	0.22	54D	315	2.80	0.24	2.56	0.20
23D	114	2.53	0.21	2.32	0.19	54D	342	2.94	0.22	2.72	0.19
23D	134	2.62	0.23	2.39	0.20						
						55D	343	2.74	0.20	2.54	0.19
24AE	135	0.22	0.21	0.01	0.20	55D	358	3.01	0.24	2.77	0.21
24D	136	2.12	0.20	1.92	0.19	56AE	359	0.28	0.21	0.07	0.20
24D	157	2.67	0.48	2.19	0.41	56D	360	2.82	0.24	2.58	0.22
25D	158	2.32	0.32	2.00	0.25	56D	385	2.78	0.30	2.58	0.25
25D	165	2.34	0.27	2.07	0.25						
						57D	386	2.69	0.24	2.45	0.21
36D	166	2.33	0.25	2.06	0.24	57D	392	2.75	0.21	2.54	0.19

2. Index Camera No. D43:

Terrain and limiting Dmin and Dmax values together with gross fog readings were made with a Macbeth QuantaLog Densitometer, Model EP 1000 and an ET 20 attachment with a 0.5 mm aperture. All readings include gross fog.

Index Camera No. D43

Pass	Frame	TERRAIN			LIMITING			Gross Fog
		Dmax	Dmin	Delta	Dmax	Dmin	Delta	
01D	1	NR	NR	NR	1.68	0.21	1.47	0.12
01D	2	NR	NR	NR	1.72	0.17	1.55	0.12
02D	3	NR	NR	NR	1.70	0.63	1.07	0.12
02D	11	1.45	0.49	0.96	1.45	0.14	1.31	0.10
06D	12	0.74	0.16	0.58	1.60	0.16	1.44	0.09
06D	29	0.84	0.22	0.62	1.98	0.22	1.76	0.10
07D	30	0.72	0.25	0.47	1.95	0.25	1.70	0.10
07D	55	1.17	0.27	0.90	2.04	0.22	1.82	0.10
08AE	56	NR	NR	NR	0.11	0.10	0.01	0.10
08AE	57	NR	NR	NR	0.11	0.10	0.01	0.10
09D	58	0.58	0.44	0.14	1.82	0.30	1.52	0.10
09D	75	0.75	0.40	0.35	1.79	0.20	1.59	0.10
20D	76	0.68	0.19	0.49	1.49	0.15	1.32	0.10
20D	83	0.82	0.15	0.67	1.34	0.15	1.19	0.10
21D	84	0.58	0.17	0.41	1.97	0.17	1.80	0.10
21D	103	1.07	0.24	0.83	2.10	0.11	1.99	0.09
22D	104	0.70	0.18	0.52	1.56	0.17	1.39	0.10
22D	113	1.88	0.29	1.59	1.92	0.25	1.67	0.10
23D	114	0.68	0.36	0.32	1.79	0.20	1.59	0.10
23D	134	1.82	0.23	1.59	2.07	0.21	1.86	0.06
24AE	135	NR	NR	NR	0.10	0.08	0.02	0.08
24D	136	0.58	0.31	0.27	2.05	0.17	1.88	0.08
24D	157	1.24	0.50	0.74	1.90	0.14	1.76	0.10
25D	158	0.80	0.22	0.58	2.06	0.22	1.84	0.11
25D	165	0.91	0.16	0.75	1.97	0.16	1.81	0.08
36D	166	1.55	0.17	1.38	1.60	0.13	1.47	0.08
36D	181	NR	NR	NR	1.76	0.11	1.65	0.06
37D	182	0.78	0.22	0.56	1.62	0.21	1.41	0.08
37D	205	0.58	0.22	0.36	1.87	0.20	1.67	0.08
38D	206	0.60	0.27	0.33	2.07	0.17	1.90	0.06
38D	232	0.84	0.22	0.62	1.90	0.21	1.69	0.06
39D	233	0.96	0.10	0.86	1.67	0.10	1.57	0.08
39D	237	0.66	0.15	0.51	1.93	0.15	1.78	0.08
40AE	238	NR	NR	NR	0.09	0.08	0.01	0.08
40D	239	0.64	0.15	0.49	1.77	0.15	1.62	0.08
40D	255	1.87	0.15	1.72	2.02	0.15	1.87	0.06
41D	256	NR	NR	NR	1.71	0.18	1.53	0.10
41D	262	1.02	0.35	0.67	1.78	0.33	1.45	0.09
49D	263	0.76	0.20	0.56	1.75	0.16	1.59	0.08
52D	264	1.42	0.60	0.82	1.70	0.37	1.33	0.08
52D	290	NR	NR	NR	1.64	0.13	1.51	0.08
53D	291	0.71	0.13	0.58	1.86	0.13	1.73	0.09
53D	314	0.90	0.23	0.67	2.06	0.23	1.83	0.08
54D	315	0.76	0.22	0.54	2.00	0.15	1.85	0.08
54D	342	0.72	0.44	0.28	1.77	0.26	1.51	0.08
55D	343	NR	NR	NR	1.72	0.81	0.91	0.08

Index Camera No D43 (Continued)

Pass	Frame	TERRAIN			LIMITING			Gross Fog
		Dmax	Dmin	Delta	Dmax	Dmin	Delta	
55D	358	1.17	0.50	0.67	1.91	0.13	1.78	0.08
56AE	359	NR	NR	NR	0.10	0.08	0.02	0.08
56D	360	1.56	0.12	1.44	1.72	0.12	1.60	0.08
56D	385	1.38	0.17	1.21	2.04	0.12	1.92	0.08
57D	386	0.68	0.45	0.23	1.86	0.17	1.69	0.08
57D	392	0.72	0.16	0.56	1.87	0.16	1.71	0.09

NOTE: NR denotes no reading.

3. Stellar Camera No. D54:

Density readings were taken using a Macbeth QuantaLog Densitometer, Model EP 1000 and an ET 20 attachment with a 0.5 mm aperture. All readings include gross fog.

Stellar Camera No. D54

Pass	Frame	Dmax	Dmin	Delta	Gross Fog	Pass	Frame	Dmax	Dmin	Delta	Gross Fog
65D	1	3.63	1.77	1.86	0.24	88D	132	3.87	2.45	1.42	0.32
65D	3	3.42	0.47	2.95	0.27	88D	139	3.59	0.87	2.72	0.34
68D	4	3.36	0.67	1.69	0.26						
68D	10	3.59	0.64	2.75	0.30	90D	140	3.38	0.85	2.53	0.35
69D	11	3.49	0.65	2.84	0.25	90D	148	3.82	2.03	1.79	0.26
						99D	149	3.82	1.07	2.75	0.29
69D	23	0.56	0.25	0.31	0.25	99D	160	3.56	0.72	2.84	0.26
70D	24	3.56	1.34	2.22	0.28	101D	161	3.53	0.80	2.73	0.28
70D	39	0.65	0.27	0.38	0.25						
71AE	40	0.44	0.32	0.12	0.32	101D	187	3.78	1.22	2.56	0.28
71AE	41	0.45	0.34	0.11	0.32	102D	188	3.64	1.02	2.62	0.28
						102D	230	3.41	0.72	2.69	0.24
71D	42	3.50	0.88	2.62	0.25	103AE	231	0.28	0.24	0.04	0.24
71D	52	3.52	0.88	2.64	0.33	103D	232	3.53	1.07	2.46	0.23
72D	53	3.58	0.94	2.64	0.27						
72D	70	0.65	0.33	0.32	0.32	103D	262	3.72	1.52	2.20	0.31
73D	71	3.63	1.23	2.40	0.42	104D	263	3.78	0.96	2.82	0.32
						104D	273	3.64	0.57	3.07	0.24
73D	77	3.81	2.19	1.62	0.29	115D	274	3.57	0.68	2.89	0.23
82D	78	3.87	3.81	0.06	0.77	115D	298	3.71	0.76	2.95	0.23
82D	83	3.78	1.21	2.57	0.29						
83D	84	3.52	0.80	2.72	0.28	116D	299	3.55	0.72	2.83	0.23
83D	86	3.54	0.78	2.76	0.26	116D	324	3.45	0.42	3.03	0.24
						117D	325	3.62	0.86	2.76	0.25
85D	89	3.67	1.36	2.31	0.35	117D	344	3.69	1.28	2.41	0.24
85D	100	0.82	0.34	0.48	0.33	118D	345	3.87	3.43	0.44	0.25
86D	101	3.51	0.70	2.81	0.27						
86D	122	3.72	1.42	2.30	0.28	118D	385	3.57	0.58	2.99	0.23
87AE	123	1.44	0.25	1.19	0.25	119AE	386	0.25	0.23	0.02	0.23
						119D	387	3.59	0.75	2.84	0.22
87AE	124	0.32	0.28	0.04	0.27	119D	413	3.45	0.55	2.90	0.23
87D	125	3.49	0.68	2.81	0.29	120D	414	3.46	0.49	2.97	0.22
87D	131	3.65	1.28	2.37	0.34	120D	428	3.49	0.53	2.96	0.23

4. Index Camera No. D54:

Terrain and limiting Dmin and Dmax values together with gross fog readings were made with a Macbeth QuantaLog Densitometer, Model EP 1000 and an ET 20 attachment with a 0.5 mm aperture. All readings include gross fog.

Index Camera No. D54

Pass	Frame	TERRAIN			LIMITING			Gross Fog
		Dmax	Dmin	Delta	Dmax	Dmin	Delta	
65D	1	NR	NR	NR	1.62	0.09	1.53	0.09
65D	3	NR	NR	NR	1.92	0.15	1.77	0.11
68D	4	0.72	0.36	0.36	1.94	0.21	1.73	0.10
68D	10	0.74	0.25	0.50	1.92	0.24	1.68	0.12
69D	11	0.57	0.32	0.25	1.93	0.22	1.71	0.14
69D	23	NR	NR	NR	1.80	0.26	1.54	0.10
70D	24	0.74	0.31	0.43	1.93	0.20	1.73	0.11
70D	39	1.77	0.32	1.45	1.99	0.16	1.83	0.09
71AE	40	NR	NR	NR	0.15	0.11	0.04	0.10
71AE	41	NR	NR	NR	0.11	0.10	0.01	0.10
71D	42	0.70	0.14	0.56	1.32	0.14	1.18	0.10
71D	52	1.22	0.31	0.91	1.84	0.27	1.57	0.10
72D	53	0.65	0.20	0.45	1.80	0.20	1.60	0.11
72D	70	0.47	0.22	0.25	2.42	0.12	2.30	0.10
73D	71	0.54	0.36	0.18	1.84	0.27	1.57	0.10
73D	77	0.81	0.27	0.54	1.82	0.23	1.59	0.12
82D	78	NR	NR	NR	1.73	0.35	1.38	0.10
82D	83	NR	NR	NR	1.75	0.49	1.26	0.09
83D	84	NR	NR	NR	1.88	0.51	1.37	0.11
83D	88	0.77	0.44	0.33	1.82	0.17	1.65	0.10
85D	89	0.52	0.36	0.16	1.87	0.21	1.66	0.11
85D	100	1.88	0.30	1.58	1.95	0.22	1.73	0.11
86D	101	0.64	0.18	0.46	1.92	0.16	1.76	0.10
86D	122	1.87	0.30	1.57	1.92	0.30	1.62	0.10
87AE	123	NR	NR	NR	0.11	0.10	0.01	0.10
87AE	124	NR	NR	NR	0.12	0.10	0.02	0.10
87D	125	0.75	0.14	0.61	1.48	0.14	1.34	0.10
87D	131	0.76	0.13	0.63	1.98	0.13	1.85	0.11
88D	132	0.69	0.21	0.48	1.46	0.21	1.25	0.10
88D	139	0.88	0.22	0.66	1.87	0.22	1.65	0.10
98D	140	0.72	0.18	0.54	1.72	0.12	1.60	0.10
98D	148	NR	NR	NR	1.80	0.21	1.59	0.10
99D	149	0.42	0.18	0.24	1.81	0.18	1.63	0.10
99D	160	NR	NR	NR	1.35	0.14	1.21	0.10
101D	161	0.64	0.22	0.42	1.85	0.22	1.63	0.10
101D	187	0.92	0.24	0.68	1.98	0.27	1.71	0.10
102D	188	NR	NR	NR	1.66	0.26	1.40	0.10
102D	230	1.74	0.21	1.53	1.74	0.21	1.53	0.09
103AE	231	NR	NR	NR	0.10	0.09	0.01	0.09
103D	232	NR	NR	NR	1.75	0.59	1.17	0.09

[redacted]

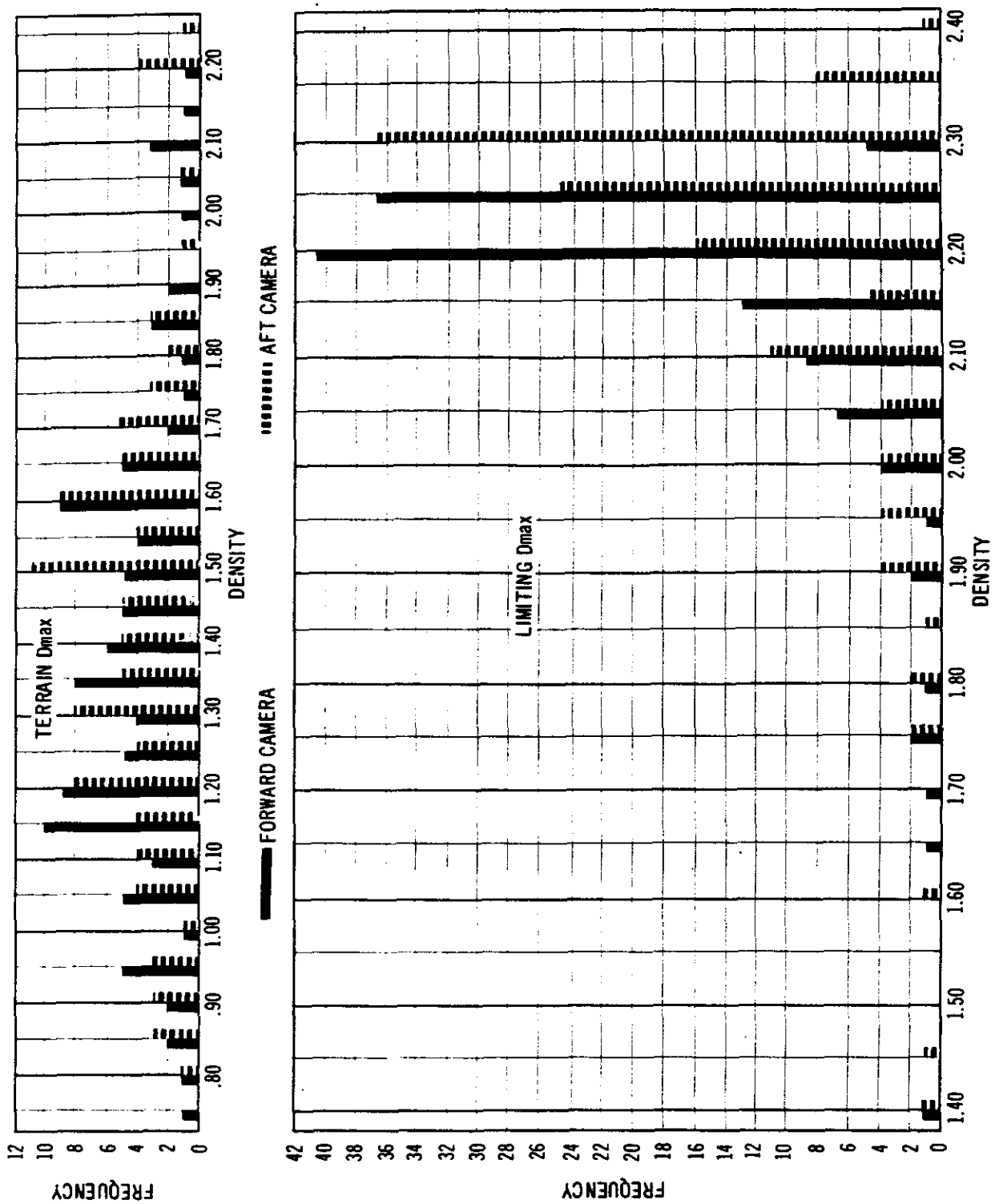
Index Camera No D54 (Continued)

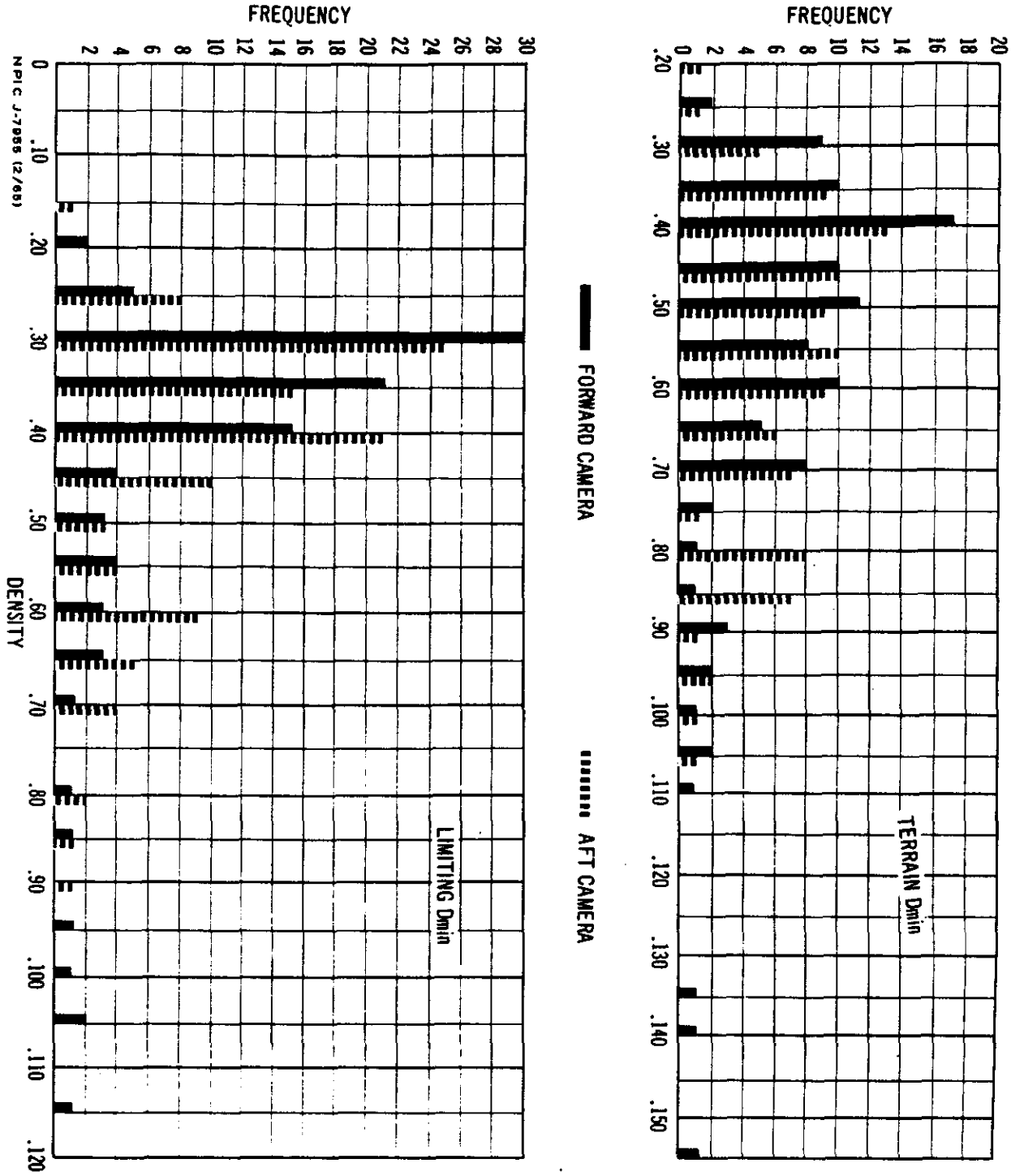
Pass	Frame	TERRAIN			LIMITING			Gross Fog
		Dmax	Dmin	Delta	Dmax	Dmin	Delta	
103D	262	DOUBLE EXPOSURE			2.19	0.51	1.68	0.10
104D	263	0.60	0.23	0.37	1.57	0.12	1.45	0.09
104D	273	0.92	0.21	0.71	1.97	0.15	1.82	0.09
115D	274	NR	NR	NR	1.66	0.27	1.39	0.10
115D	298	NR	NR	NR	1.82	0.12	1.70	0.09
116D	299	1.06	0.16	0.92	2.02	0.15	1.87	0.10
116D	324	0.74	0.17	0.57	1.46	0.11	1.35	0.08
117D	325	0.65	0.15	0.50	1.67	0.15	1.52	0.09
117D	344	1.12	0.35	0.77	1.92	0.32	1.60	0.09
118D	345	NR	NR	NR	1.62	0.38	1.24	0.09
118D	385	1.16	0.30	0.86	1.16	0.30	0.86	0.09
E119A	386	NR	NR	NR	0.10	0.09	0.01	0.09
119D	387	NR	NR	NR	1.47	0.18	1.29	0.09
119D	413	1.06	0.40	0.66	1.94	0.23	1.71	0.09
120D	414	0.80	0.14	0.66	1.47	0.14	1.33	0.09
120D	426	1.04	0.30	0.74	2.04	0.15	1.89	0.09

NOTE: NR denotes no reading.

[redacted]

APPENDIX E DENSITY CHARTS

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TERRAIN Dmin
FREQUENCY
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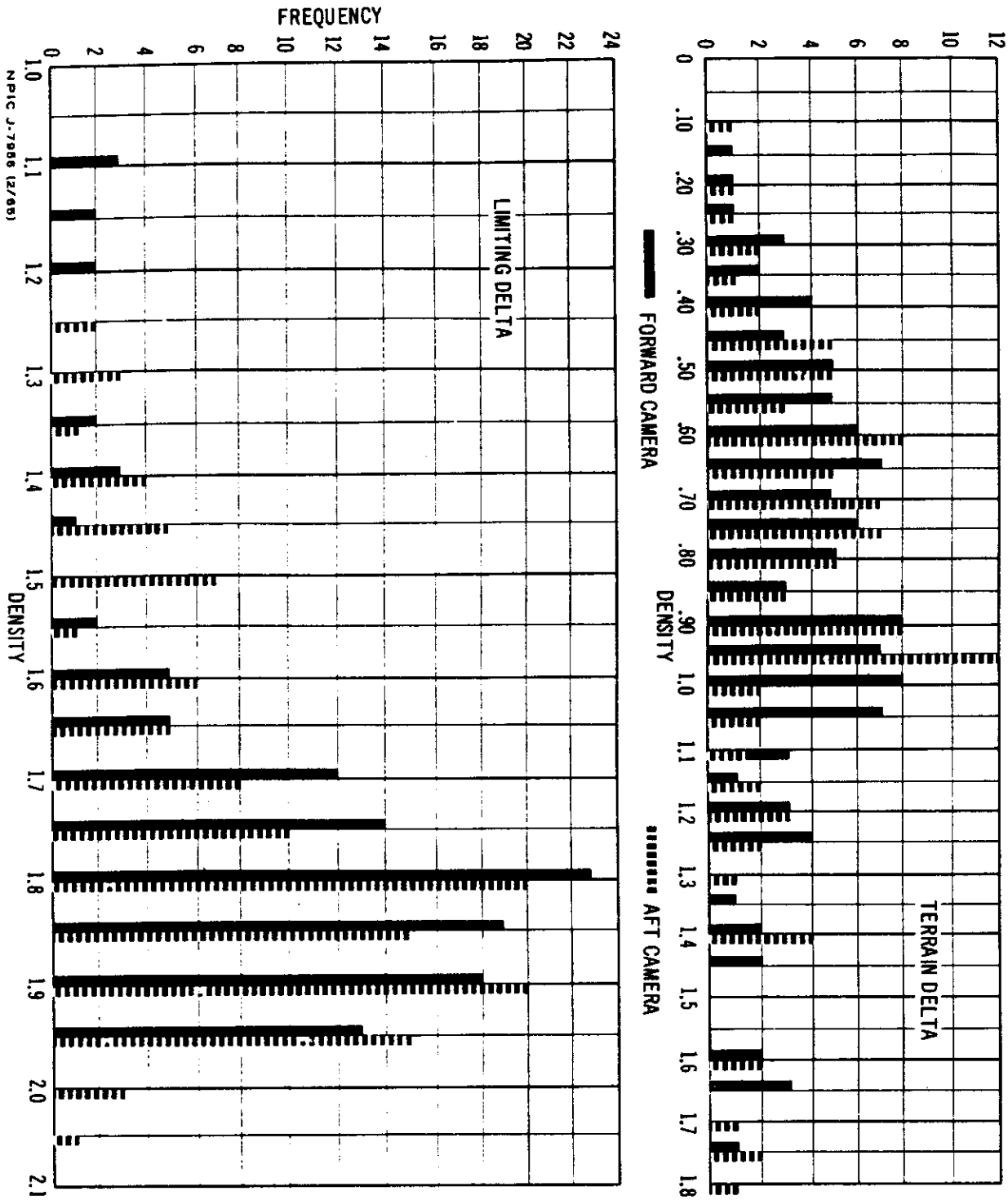
0 .10 .20 .30 .40 .50 .60 .70 .80 .90 .100 .110 .120
DENSITY
LIMITING Dmin
FORWARD CAMERA
AFT CAMERA
NPIC J-7955 (2/65)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DENSITY
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DENSITY
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