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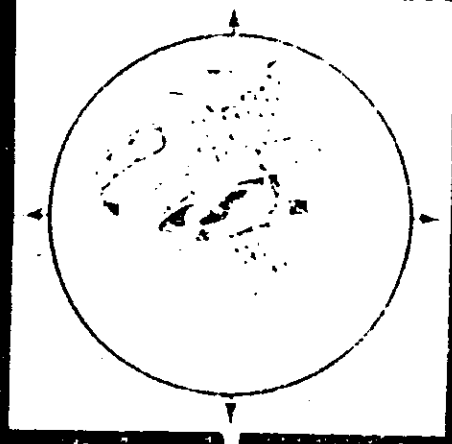

PHOTOGRAPHIC EVALUATION REPORT MISSION 1017-1 25 FEBRUARY - 2 MARCH 1965 MISSION 1017-2 2 - 6 MARCH 1965

AUGUST 1965
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112 PAGES

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 1017-1
25 FEBRUARY - 2 MARCH 1965
MISSION 1017-2
2 - 6 MARCH 1965

AUGUST 1965

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

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LIST OF ILLUSTRATIONS

SYNOPSIS

Mission 1017 (J-14) was launched 25 February 1965. The initial phase, designated Mission 1017-1, accomplished 39 photographic revolutions, including 3 domestic and 2 engineering passes. The payload was recovered in an air catch on 2 March 1965 and second-phase operations were initiated with no intervening deactivation period. Mission 1017-2 accomplished 33 photographic revolutions, including 3 domestic and 3 engineering passes. Recovery of the second payload in an air catch on 6 March 1965 terminated the mission.

The panoramic cameras were operational throughout the mission, but a capping shutter malfunction degraded the slave (AFT) camera photography in the last 5 passes (133D - 137D). The stellar/index cameras performed satisfactorily throughout Mission 1017-1. A possible solenoid malfunction in the second-phase S/I unit caused a film metering failure. Only 45 stellar formats and 29 index [illegible] recorded. Of these, approximately 70 percent of the stellar formats and most of the index formats contain multiple exposures.

The photography in Mission 1017 was acquired at solar elevations ranging between 0 and 79 degrees. Geographic latitudes ranged between 9 degrees south and 74 degrees north. Clouds obscured 20 percent of the panoramic photography in Mission 1017-1 and 30 percent in Mission 1017-2.

[redacted]

GENERAL FLIGHT DATA

Mission 1017-1

Launch Date	25 February 1965
Recovery Date	2 March 1965

Mission 1017-2

Starting Date	2 March 1965
Recovery Date	6 March 1965

Orbital Parameters

	Mission 1017-1 (Rev 40)	Mission 1017-2 (Rev 109)
Period	89.99 min	89.86 min
Perigee	92.29 nm	98.45 nm
Apogee	201.90 nm	198.32 nm
Eccentricity	0.0145	0.0139
Inclination Angle	75.07°	75.07°

Photographic Operations

	Mission 1017-1	Mission 1017-2
Operational Passes	34	27
Domestic Passes	3	3
Engineering Passes	2	3
Recovery Revolutions	81	145

PART I. CAMERA OPERATION

1. Master (FWD) Panoramic Camera No 140: The instrument was operational throughout the mission. Camera-induced degradations consist primarily of minor scratches, random minus-density streaks, light leak patterns at or near the at-rest positions, and a number of dendritic static discharges. The latter appear intermittently on both film edges in pass 94D and on the time track edge in passes 94D and 97D. Although some of the discharges intrude on the formats, degradation is minor. The major light-struck areas at or near the camera-rest positions contain the following patterns:

Mission 101-1: The 6th frame from the end of most passes is degraded by an edge-to-edge rectangle of uniform fog, approximately 0.7 inches wide, located in the take-up section of the frame. The last frame of some passes contains an equipment shadowgraph at the supply end of the format.

Mission 101-2: The 5th frame from the end of most passes contains a small light trace in the take-up end of the format. A similar pattern is present in the next-to-last frame. The last frame contains an equipment shadowgraph.

The degree of degradation in the frames affected by the uniform fog, light traces, and equipment shadowgraphs is dependent on the extent of time that the camera was at rest and on the solar elevation during the camera-off period. Degradation is not severe in the majority of cases in Mission 101-1 and is even less in Mission 101-2.

Faint banding is noted at the start of the scan in the thin-density areas, such as water imagery. Examples are found in passes 93D and 120D. Frames 57-61 of pass 137D (the terminal photographic revolution) are severely degraded by smeared images and intermittent fogging due to impending film exhaustion. In addition, static discharges and abrasions are present on both edges of the film.

2. Slave (AFT) Panoramic Camera No 165: The camera operated without malfunction until pass 133D, frame 24, when the capping shutter failed to close. It stayed open throughout the remainder of the mission. The horizon images and the extreme ends of the panoramic formats suffered the most degradation. The degree of degradation varied with solar elevation. Most of the affected horizon images were later salvaged by special printing of the duplicate positives. Similarly, special printing restored a significant amount of the degraded imagery in the panoramic format end sections. Dendritic static discharges are present intermittently on the fiducial edge of pass 55D and on the frequency marks edge of passes 83D-86D. A number of the discharges intrude on the formats, but image degradation is minor. Banding is detectable in thin-density areas at the scan start. Several passes contain intermittent minus-density streaks. As in the master (FWD) panoramic material, certain fog patterns and light traces appear recurrently at or near camera-off positions. Brief descriptions of these follow:

Mission 1017-1: The first frame of most passes contains a bar-type light trace, approximately 0.75 inches wide, extending from edge to edge within the format near frame-center. The 7th frame from the end is degraded by an edge-to-edge rectangle of uniform fog, approximately 6.5 inches wide, positioned in the take-up section of the frame. The third frame from the end of most passes contains an equipment shadowgraph at the take-up end. A small, irregular fog pattern is present in the next-to-last frame but is not readily detectable in all cases.

Mission 1017-2: The first frame of most passes contains the same bar-type light trace noted in Mission 1017-1. An equipment shadowgraph is present in the third frame from the end and a faint light trace is detectable in the last frame of some passes.

3. Master (FWD) Horizon Cameras: The port (supply) horizon camera was operational throughout the mission. The starboard (take-up) horizon camera shutter malfunctioned (failed to close) in pass 5D, frames 120 and 121, causing the loss of 2 horizon exposures and degrading the panoramic photography in those frames. The overall horizon image quality is good.

4. Slave (AFT) Horizon Cameras: The port (take-up) and starboard (supply) horizon cameras were operational throughout the mission. Image quality is good. However, the Panoramic camera capping shutter malfunction noted in Item 2 degraded all the horizon images from pass 133D, frame 24 to the end of the mission in Pass 137D. Special printing was required to restore the affected images to a useable condition.

5. Stellar Camera No 21 (Mission 1017-1): The instrument was operational throughout the mission. Approximately 30 percent of each format is degraded by flare. All frames contain a minimum of 10 readily identifiable stars which provide better-than-average geometry. However, numerous examples of distorted stellar images are also detectable in most frames. In general, mensuration and reduction of attitude values were enhanced by the above-average contrast and better-than-average geometry, but limited by the prevelance of distorted images. Some difficulty was encountered in resolving the reseau cross in the fiducial marks which were overexposed. The film is free of all but minor degradations.

6. Stellar Camera No 60 (Mission 1017-2): A possible solenoid malfunction is tentatively identified as the cause of a film metering failure, with consequent multiple exposures. The camera generated only 45 stellar formats, of which approximately 70 percent contain evidence of multiple exposures ranging from 2 to 5 exposures per format. The remaining, unaffected frames contain fair-to-good stellar images. The flare is noticeably less intense than in the film exposed during Mission 1017-1, and a considerable number of stellar images are detectable in the flared areas.

7. Index Camera No D21 (Mission 1017-1): The instrument performed without malfunction and produced good-quality terrestrial imagery.

8. Index Camera No D68 (Mission 1017-2): The possible stellar/index solenoid malfunction noted in Item 6 limited the acquired photography to 29 frames, most of which contain multiple exposures that have little or no information content value.

9. Associated Equipment: The old-type binary data block was employed in the master (FWD) panoramic camera and the lamp images are bloomed and distorted. Some read-out problems were encountered in the Slave (AFT) camera material. Specifically, the dimness of Lamp No 17 in passes 20D and 41D and Lamp No 29, in many passes, caused difficulties. In pass 136D, the top row of lamp images tracked

too close to the edge of the film and the time had to be hand-read. The frequency marks are flared, with reflected images, but are recorded outside the formats. The marks appear underexposed in the slave (AFT) camera material of Mission 1017-2 but are readable in all cases.

10. Special Note: Yaw Steering Experiments: Vehicle yaw was programmed in passes 9D-85D. The yaw increments ranged from 0.75 to 1.50 degrees, depending on the system lattitude. This is one of a continuing series of experiments intended to investigate the practical value of controlled yaw as compensation for possible image smear induced by the earth's rotational velocity. Approximately 0.5 degrees of residual (uncompensated) yaw angle remained after implementation of the yaw steering control. Identical terrain photography, acquired with and without yaw steering, was examined for comparison of image quality. The participants in the evaluation were unable to detect a difference between the samples.

[redacted]

FIGURE 1. DEFINITION OF PHOTOGRAPHIC DATA.

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

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

Date of Photography: The date of photography indicates the day, month, and year (GMT) that the photography was acquired.

Universal Grid Coordinates: These coordinates are included to locate the illustrated photography within the panoramic format.

Enlargement Factor: The enlargement factor is included to indicate the latitude and longitude of the panoramic format.

Geographic Coordinates: These coordinates are included to indicate the latitude and longitude of the panoramic format.

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

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

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

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

Local Sun Time: This time is included to present to the viewer a realistic time of the acquisition of the photography illustrated.

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

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

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

[redacted]

FIGURE 2. EXAMPLE OF HORIZON CAMERA PHOTOGRAPHY.

NPIC K-2002 (8/68)

Camera	FWD
Pass	30D
Frame	8
Date of Photography	27 February 1965
Universal Grid Coordinates	Port Horizon
Enlargement Factor	3x
Geographic Coordinates	40°00'N, 83°57'W
Altitude (feet)	622,831
Pan Camera Attitude:	
Pitch	15°21'
Roll	00°18'
Yaw	02°02'
Local Sun Time	1258 Hrs
Solar Elevation	40°
Solar Azimuth	199°
Horizon Camera Exposure	1/100 sec

Approximate flight direction on photograph

Approximate scan direction on photograph

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

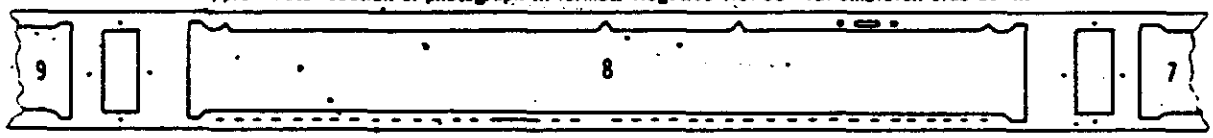

FIGURE 3. EXAMPLE OF STELLAR CAMERA PHOTOGRAPHY

[redacted]

Stellar Frame Number	66
Correlates with FWD Camera:	
Pass	60
Frame	144
Date of Photography	26 February 1965
Enlargement Factor	5x
Pan Camera Attitude:	
Pitch	15°21'
Roll	00°20'
Yaw	-00°18'
Stellar Camera Exposure Time	2 sec

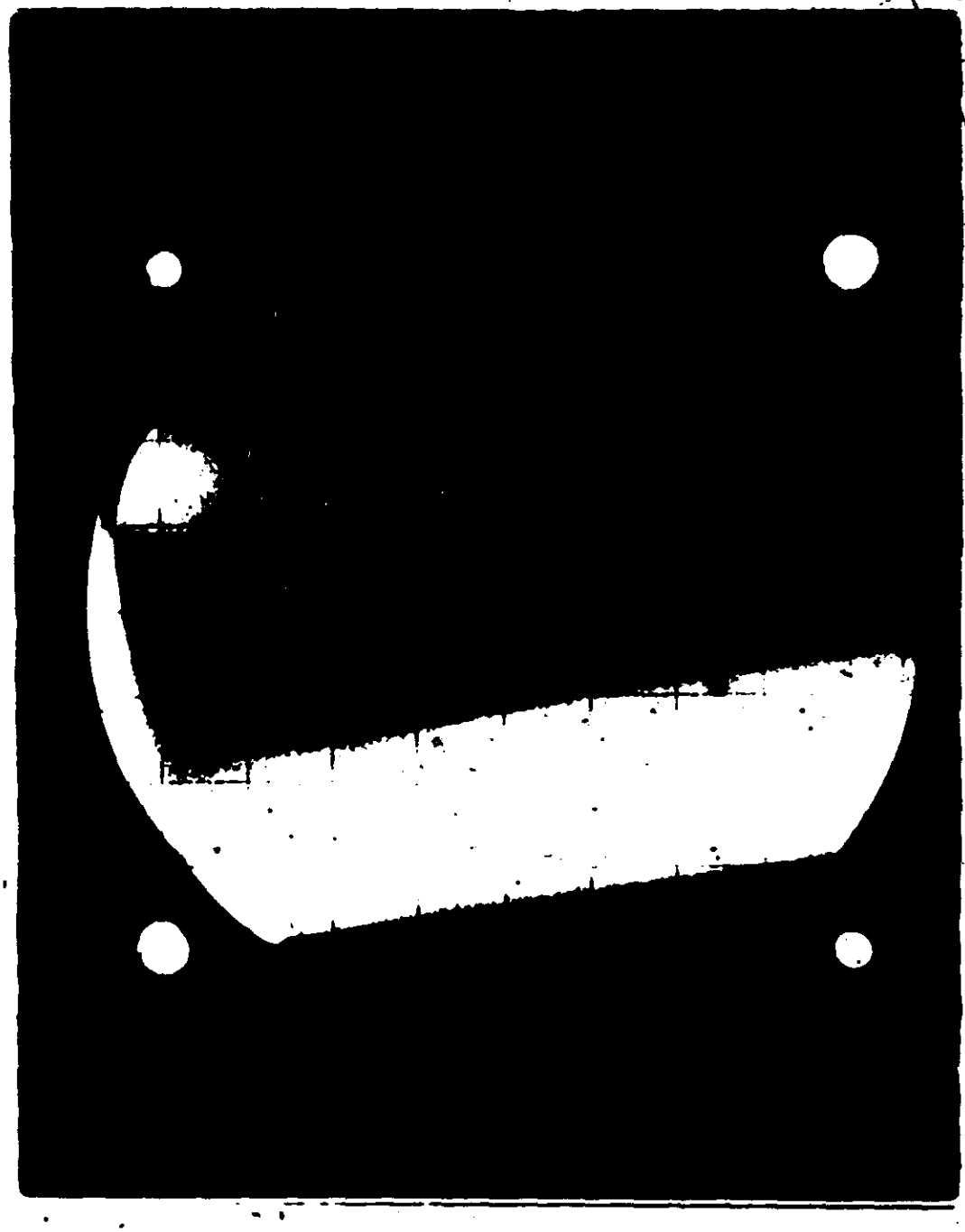

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FIGURE 4. EXAMPLE OF INDEX CAMERA PHOTOGRAPHY.

NPIC K-2684 (8/65)

[redacted]

Index Frame Number	23
Correlates with FWD Camera:	
Pass	4D
Frame	53
Date of Photography	26 February 1965
Enlargement Factor	2x
Pan Camera Attitude:	
Pitch	14°43'
Roll	00°11'
Yaw	-00°29'
Index Camera Exposure	1/500 sec


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1017-1 26 FEB 65
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PART II. FILM

1. Film Footage/Frame Totals:

	1017-1	1017-2
Master (FWD) Camera	8,252 ft/2,936 frames	7,725 ft/2,914 frames
Slave (AFT) Camera	8,214 ft/2,940 frames	7,672 ft/2,908 frames
Stellar Camera	66 ft/ 420 frames	5 ft/ 45 frames
Index Camera	94 ft/ 420 frames	6 ft/ 29 frames

Total Footage/Frames, Master (FWD) Camera: 15,977 ft/ 5,850 frames
Total Footage/Frames, Slave (AFT) Camera: 15,886 ft/ 5,848 frames
Total Footage/Frames, FWD & AFT Cameras: 31,863 ft/11,698 frames

The last 6 master panoramic frames and the last 7 slave panoramic frames of the terminal pass in Mission 1017-1 (pass 81D) were recovered with the second payload. In every mission employing the 2-phase concept, the last few frames of first-phase photography will be contained at the head of the second-phase payload. Monoscopic coverage, employing either panoramic camera, may be programmed into any part of a mission.

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

Most of the footage in this mission received adequate exposure. However, variations in terrain reflectivity and/or low solar elevations caused some departures from normal exposure results. In order to strike an acceptable minimum/maximum densities mean, infrared densitometry was utilized by the processing contractor to determine the optimum development levels required for the various portions of the panoramic records.

The following development levels were employed in processing the film:

	1017-1		1017-2	
	Master	Slave	Master	Slave
Primary	13%	24%	5%	18%
Intermediate	63%	58%	63%	62%
Full	24%	18%	32%	20%

Sixty-two processing level changes were required on the master record and 47 on the slave record on Mission 1017-1. On Mission 1017-2, 51 processing level changes were required on the master record and 46 changes on the slave material. As a whole, density of the mission record is good. Most of the density levels are in the medium category.

3. Physical Film Degradations: No major degradations are present on the panoramic film. Most of the degradations consist of intermittent and minor scratches, digs, pinholes, etc., except for the dendritic static discharges previously mentioned. The only other exceptions worth noting are an uncommonly high number of kinks in the material recovered from Mission 1017-1 and numerous fine, longitudinal emulsion scratches near the take-up end of many frames in the second-phase material. The stellar/index film records are also free of all but minor physical defects.

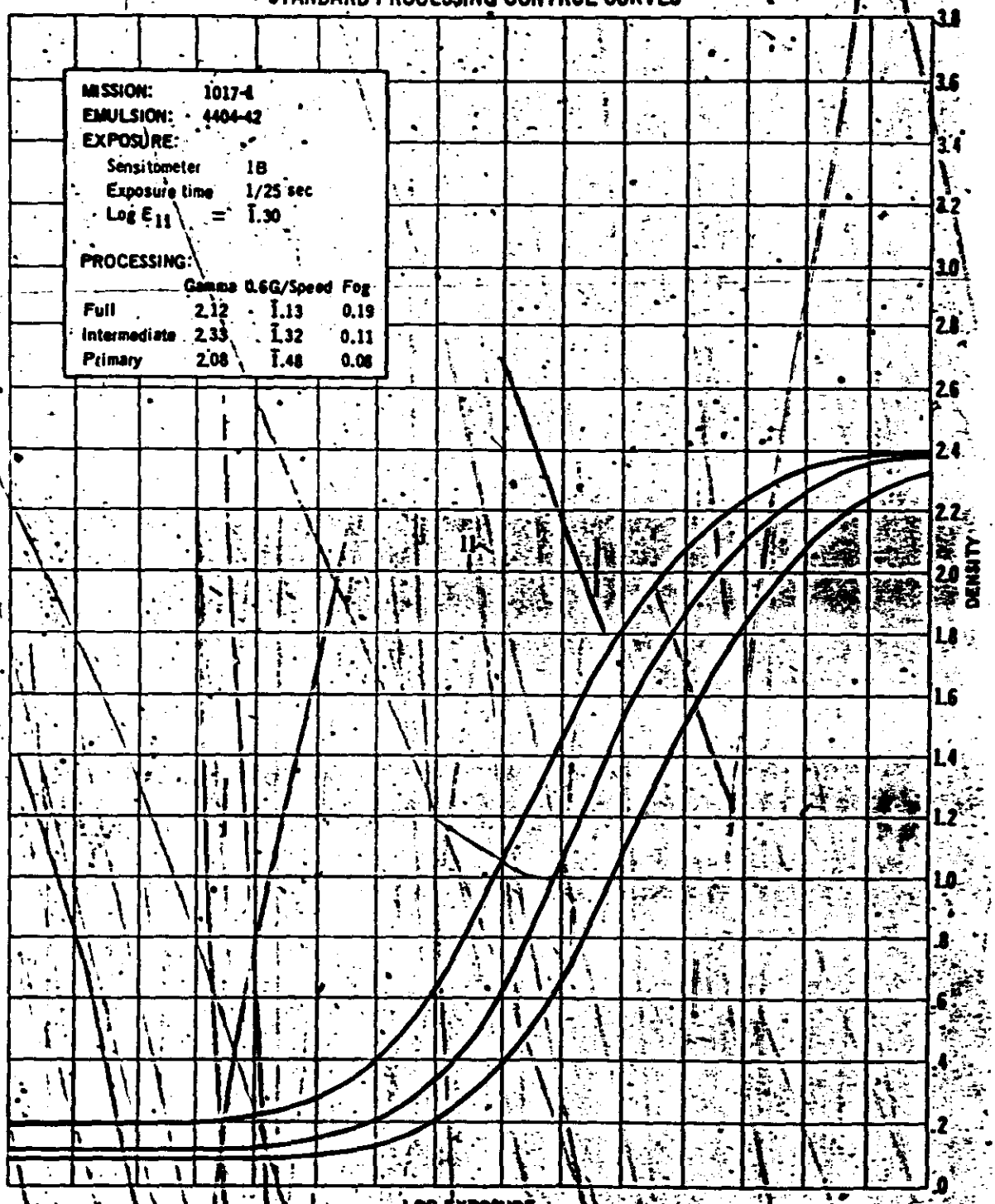
4. Film Processing Curves: The following pages contain reproductions of the film processing curves for Missions 1017-1 and 1017-2.

STANDARD PROCESSING CONTROL CURVES

MISSION: 1017-4
EMULSION: 4404-42
EXPOSURE:
Sensitometer 1B
Exposure time 1/25 sec
Log E_{11} = 1.30

PROCESSING:

	Gamma	0.6G/Speed	Fog
Full	2.12	1.13	0.19
Intermediate	2.33	1.32	0.11
Primary	2.08	1.48	0.08



NPIC [illegible]

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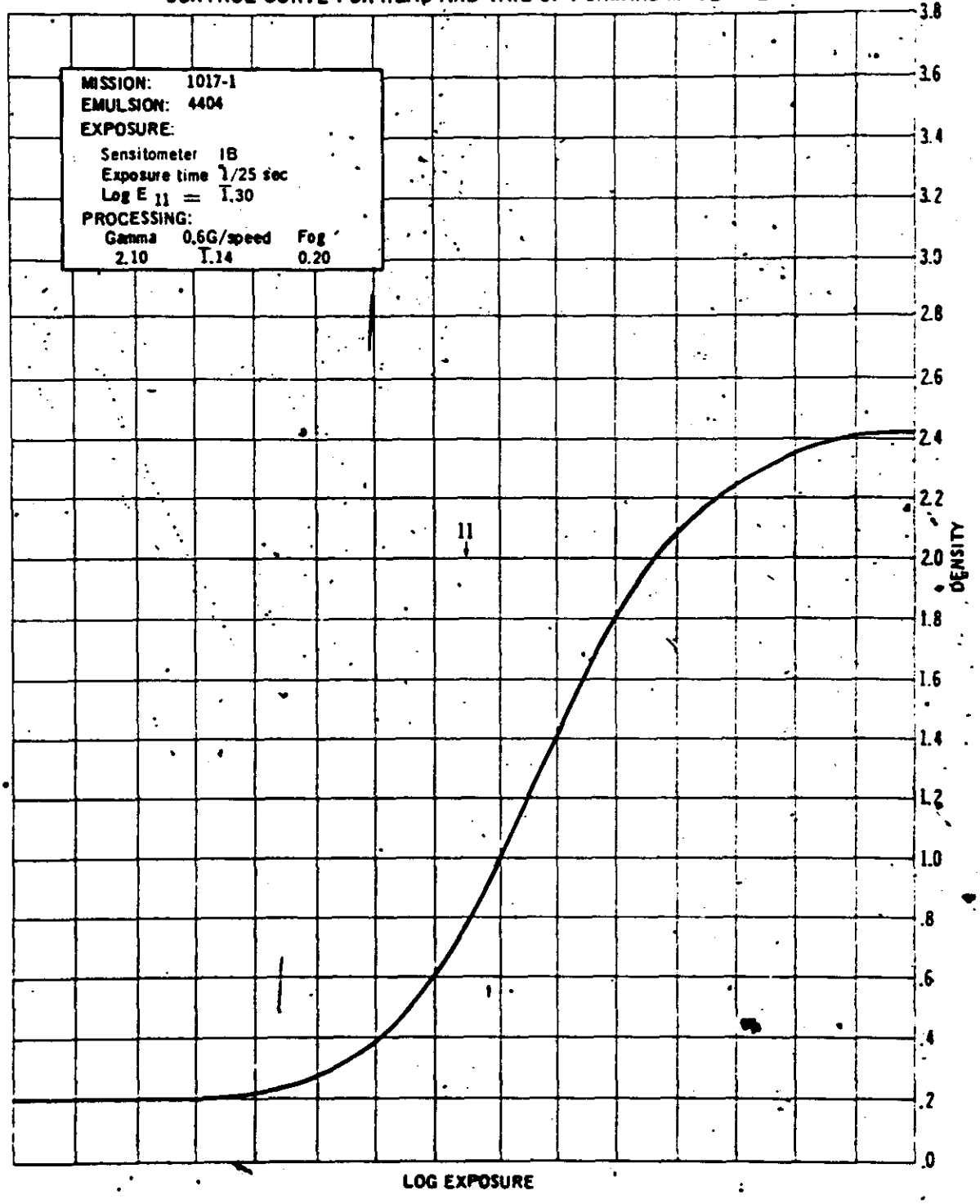
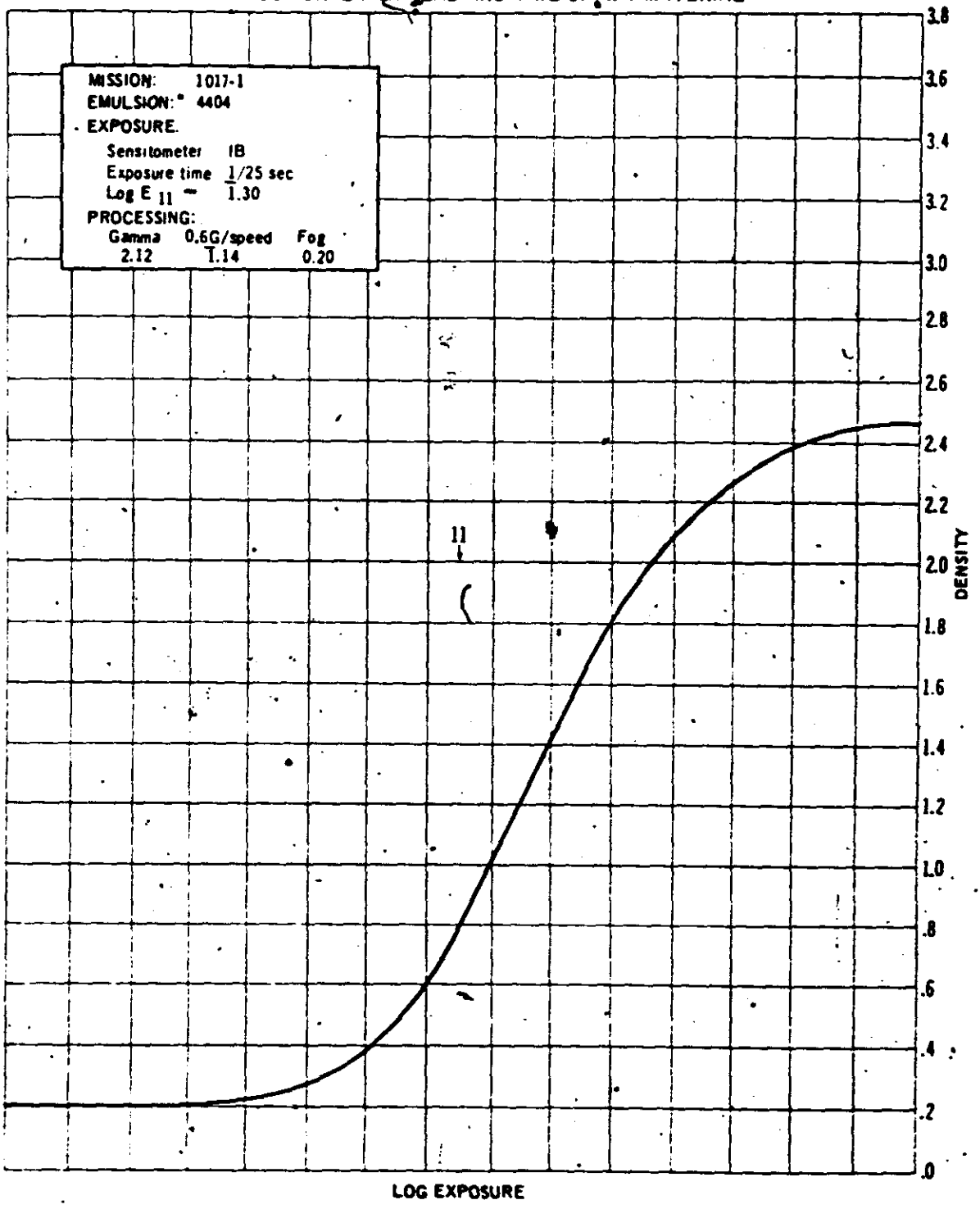
CONTROL CURVE FOR HEAD AND TAIL OF FORWARD MATERIAL



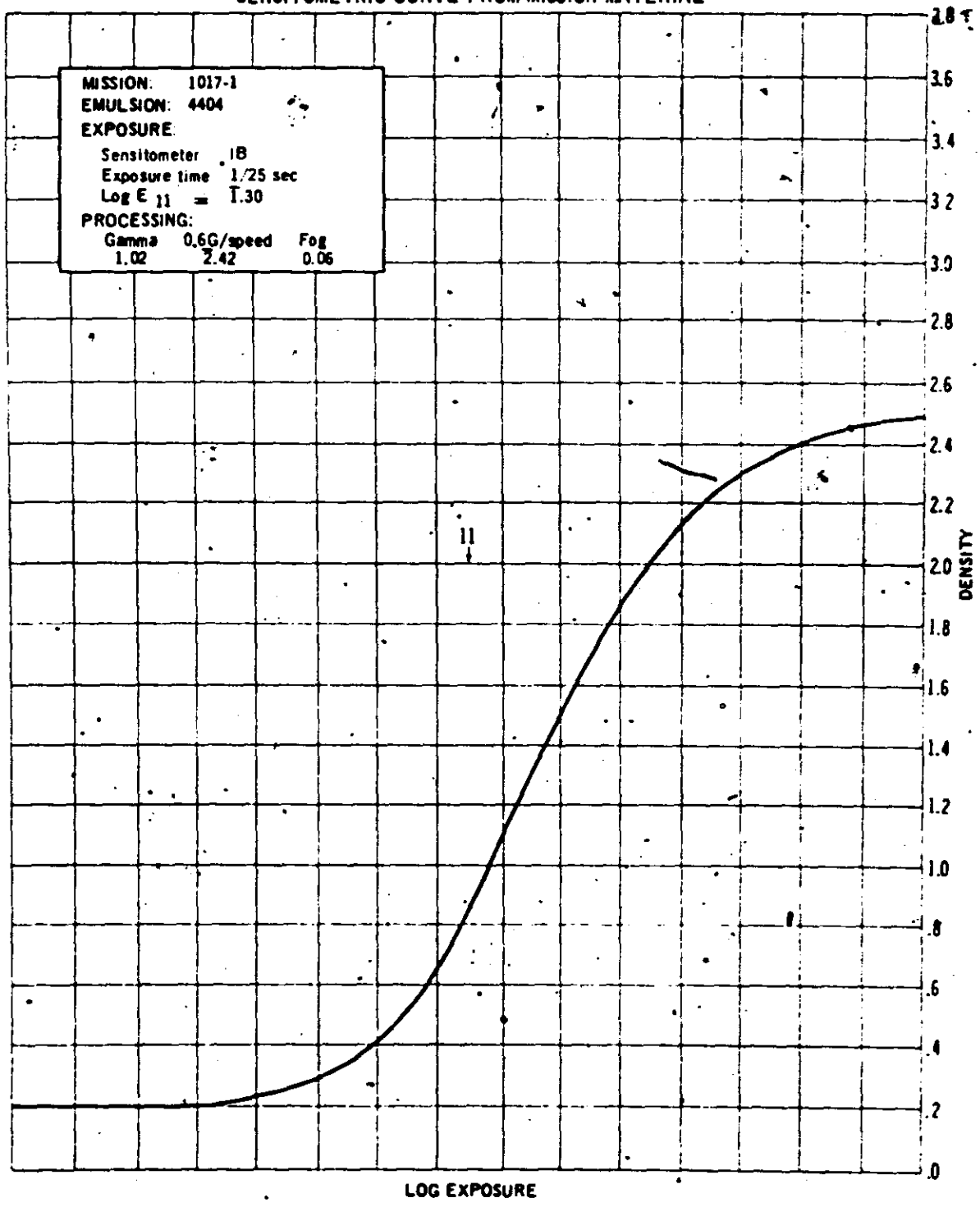
NPIC K-2890 (7/68)

CONTROL CURVE FOR HEAD AND TAIL OF AFT MATERIAL



NPIC K-2091 (7/85)

SENSITOMETRIC CURVE FROM MISSION MATERIAL



NPIC K-2002 (7/68)

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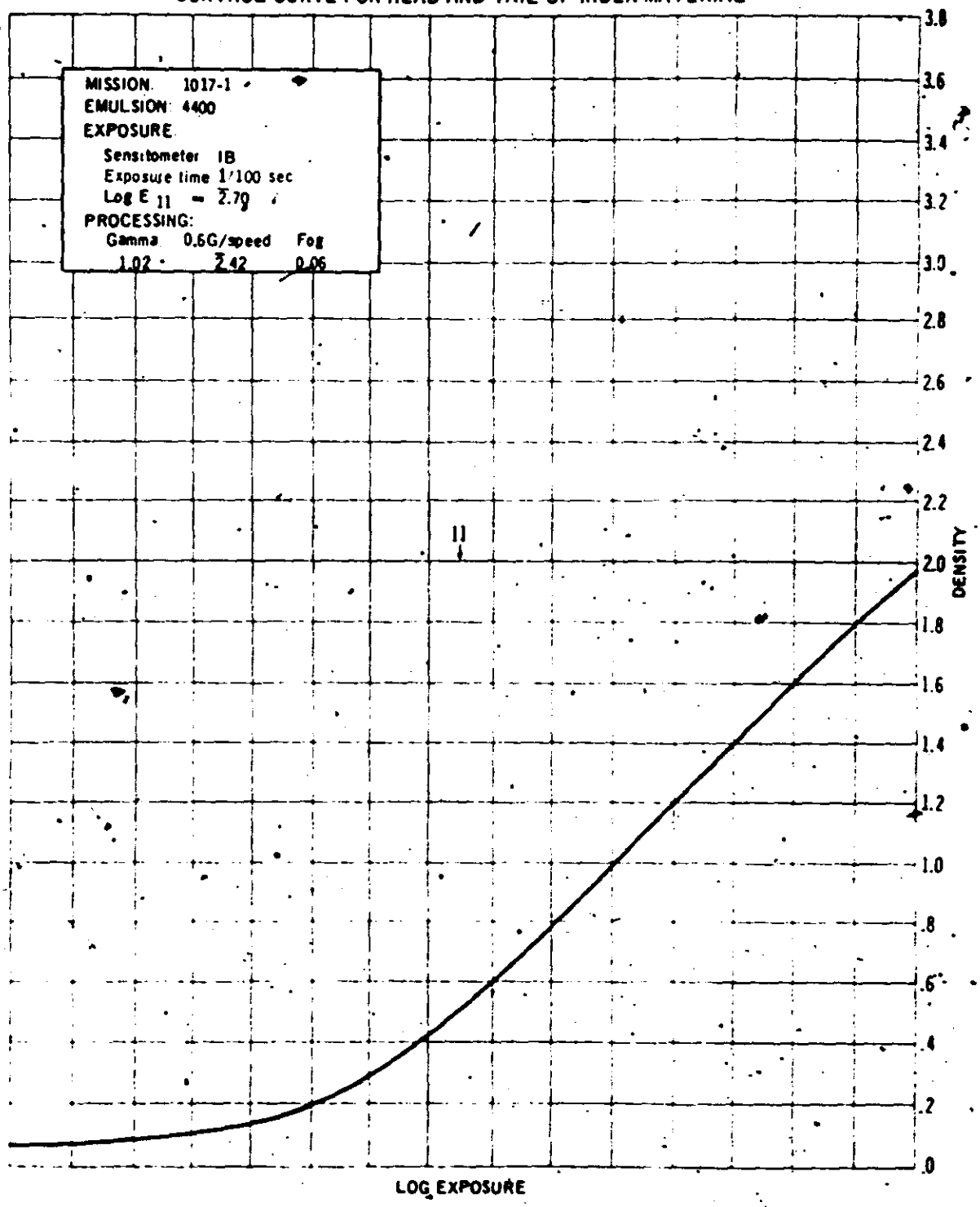

NPIC K-2003 (7 69)

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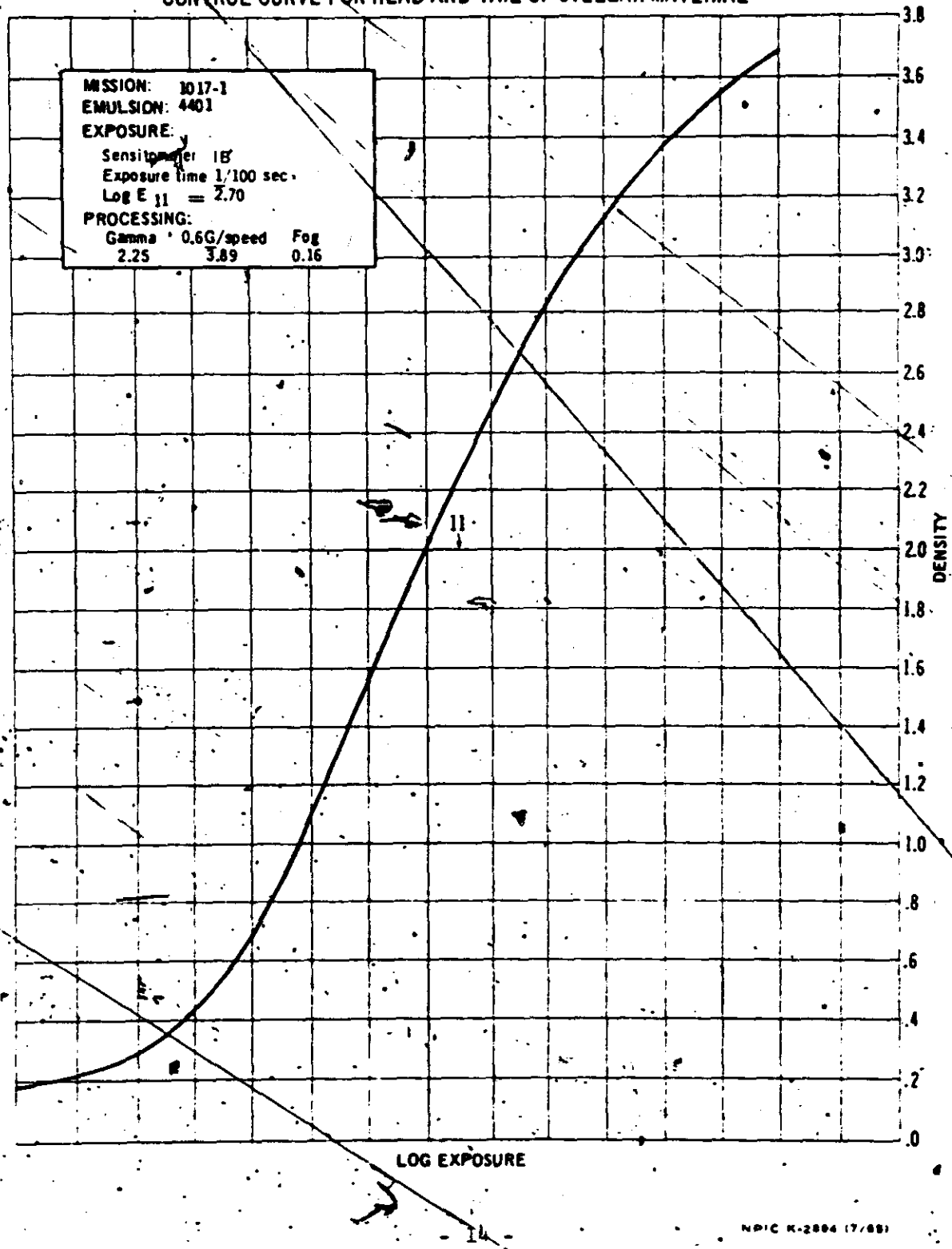

NPIC K-2804 (7/68)

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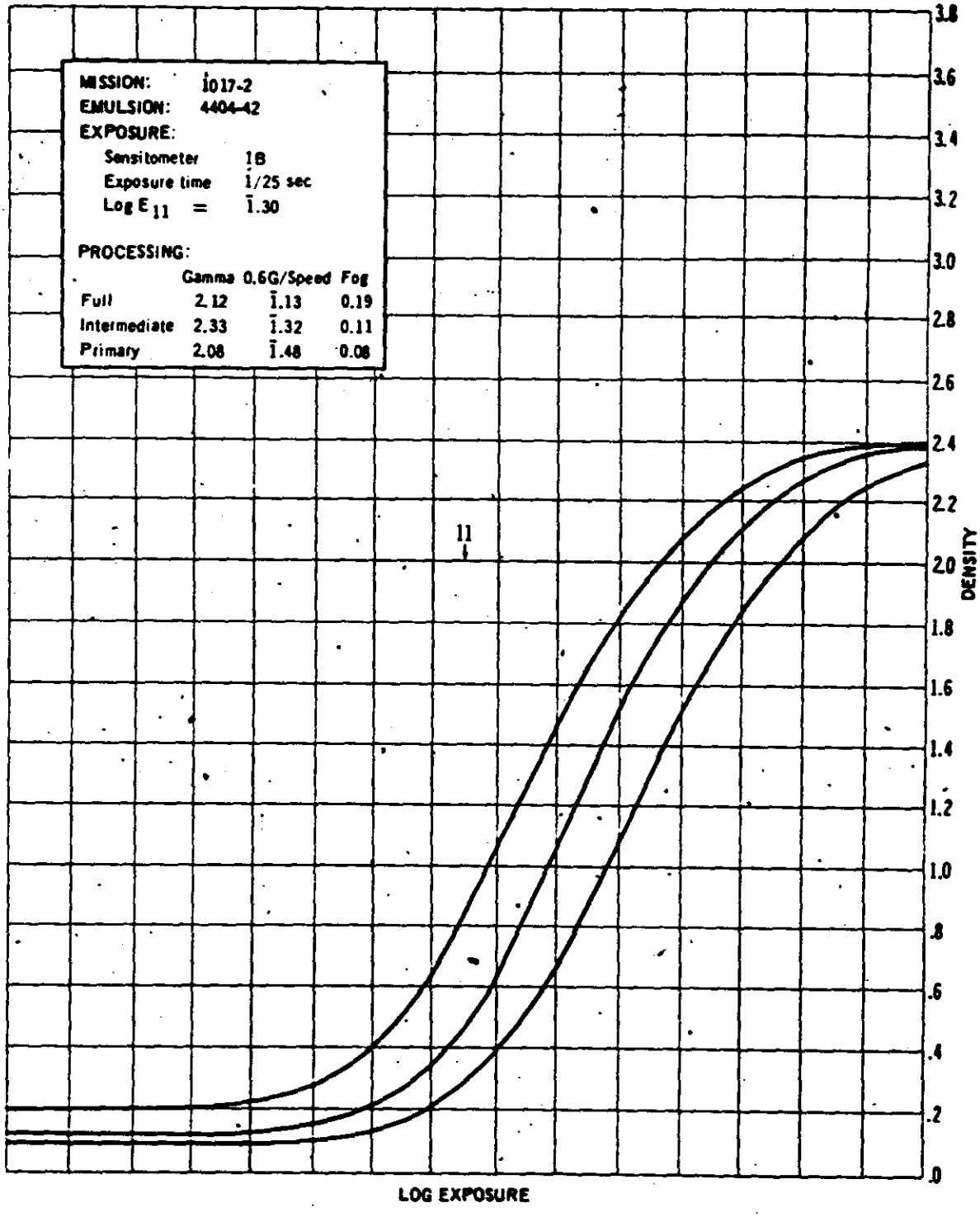
STANDARD PROCESSING CONTROL CURVES



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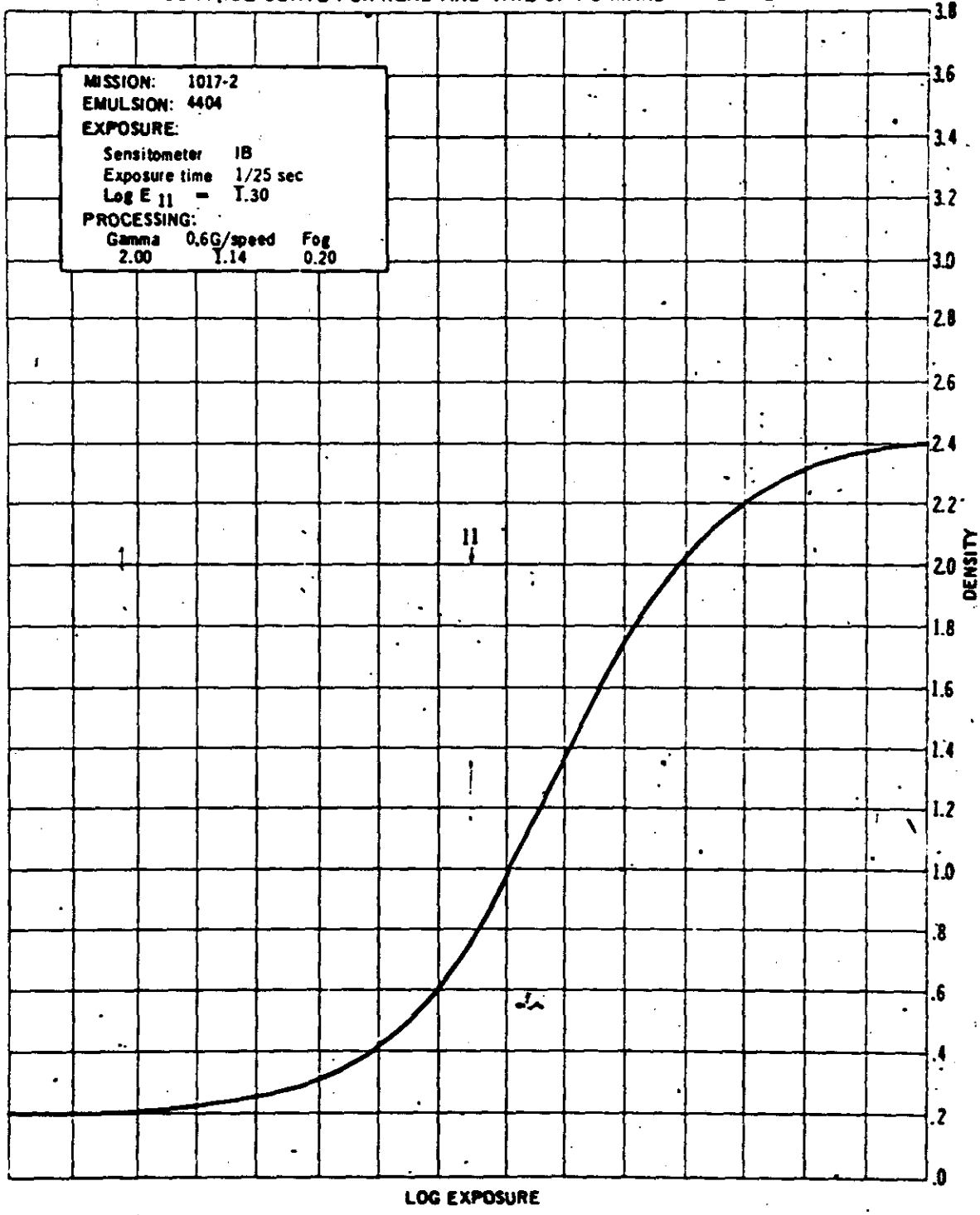

NPIC R-2800 (7/69)

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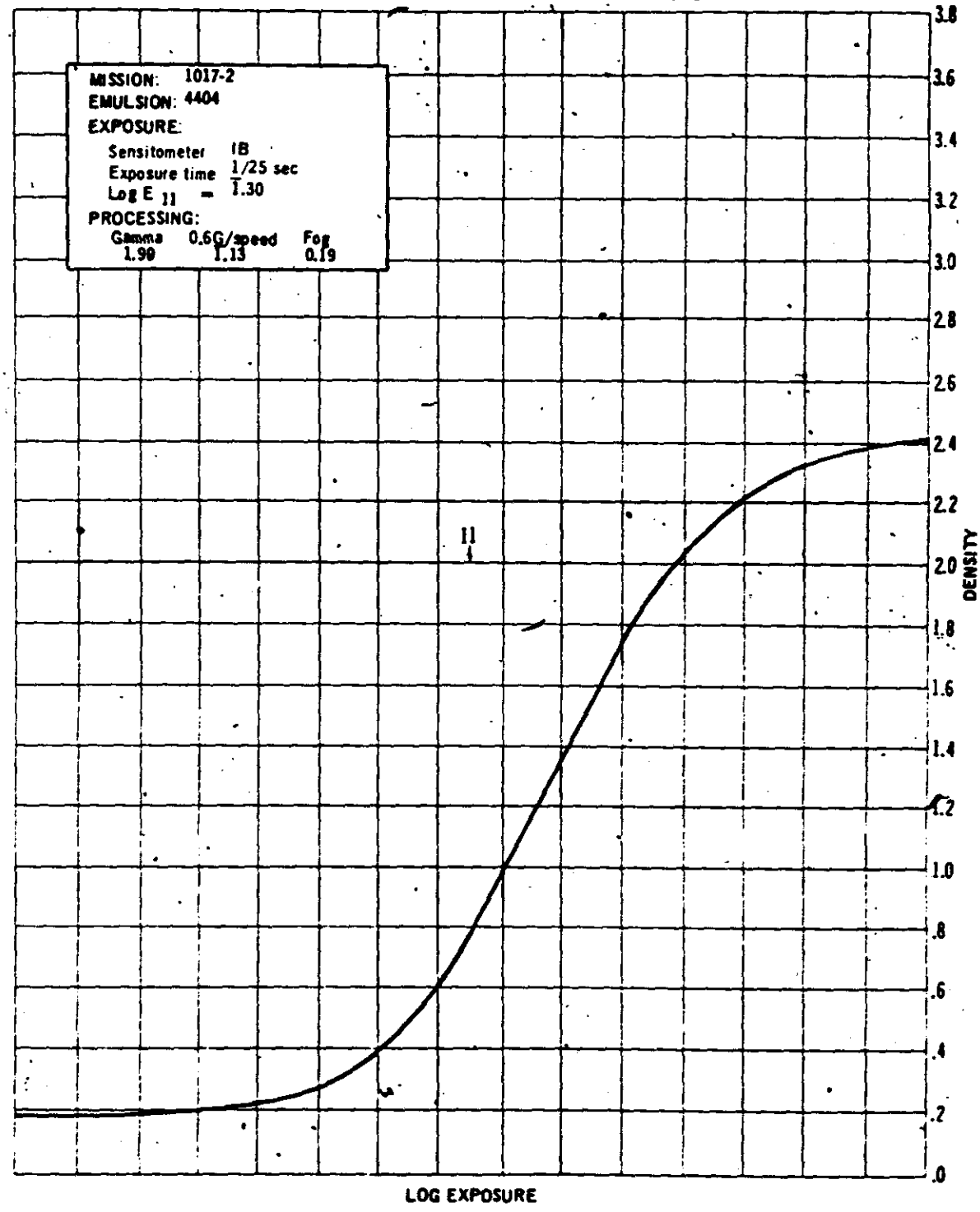

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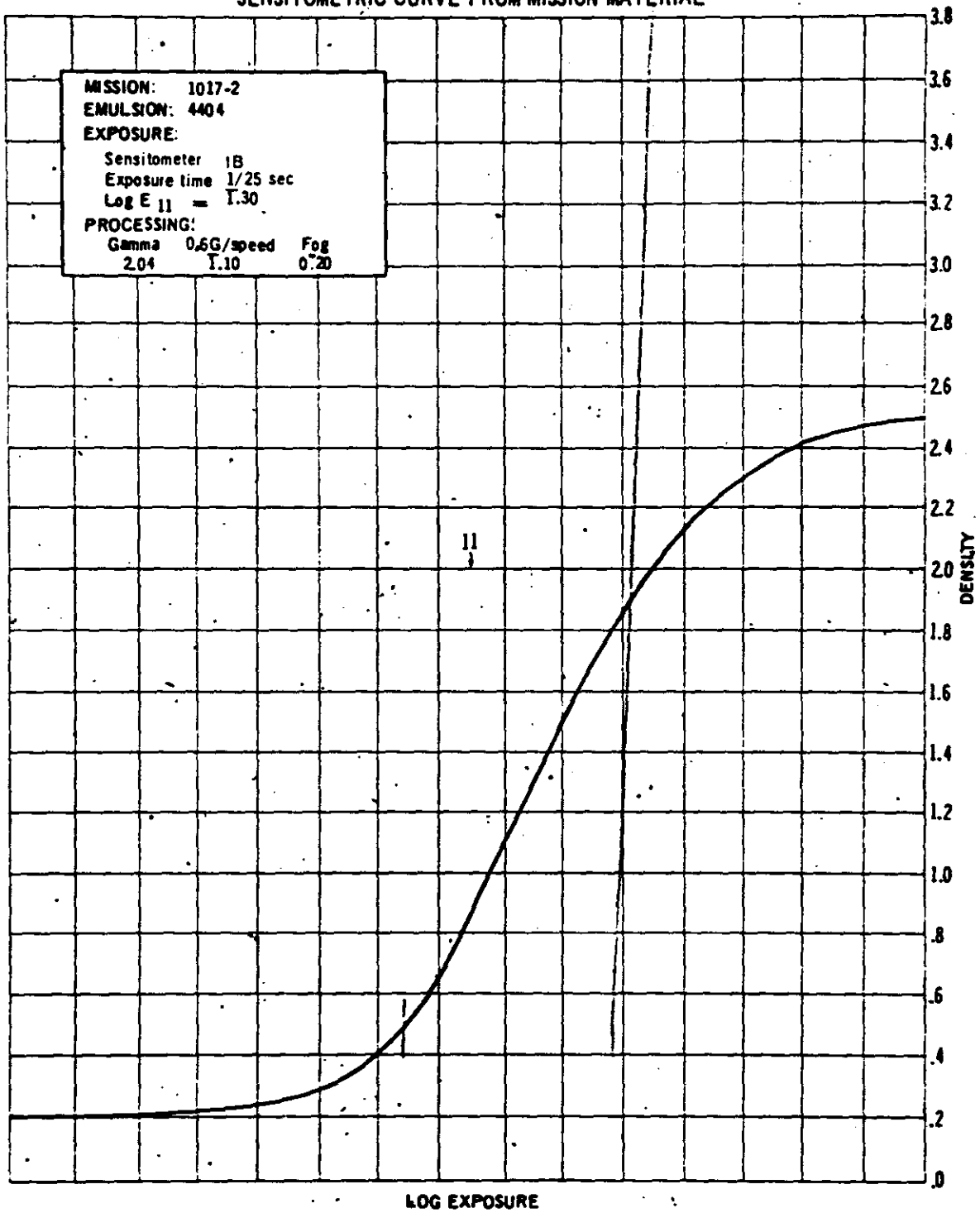

NPIC K-2898 (7/85)

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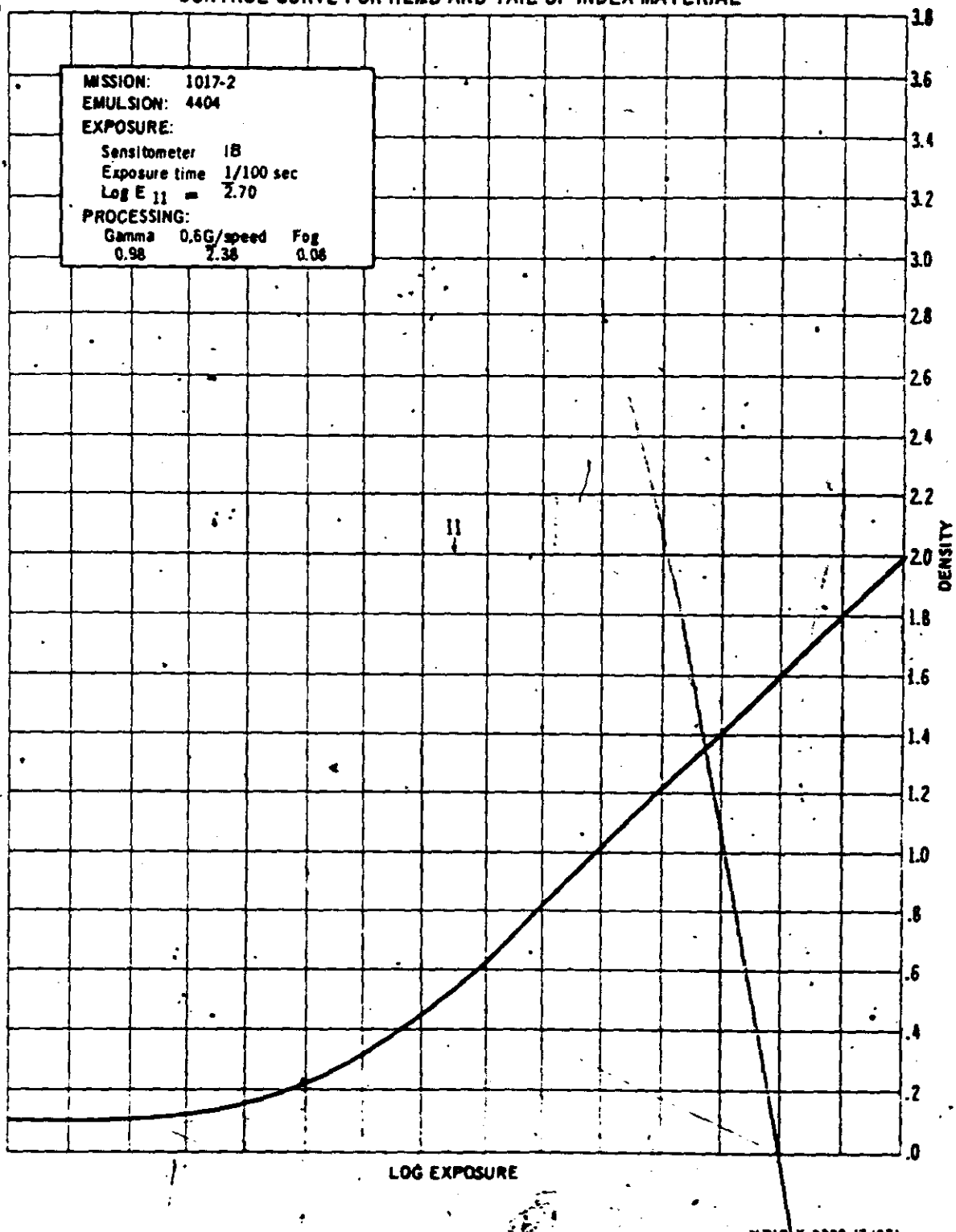

NPIC K-2999 (7/69)

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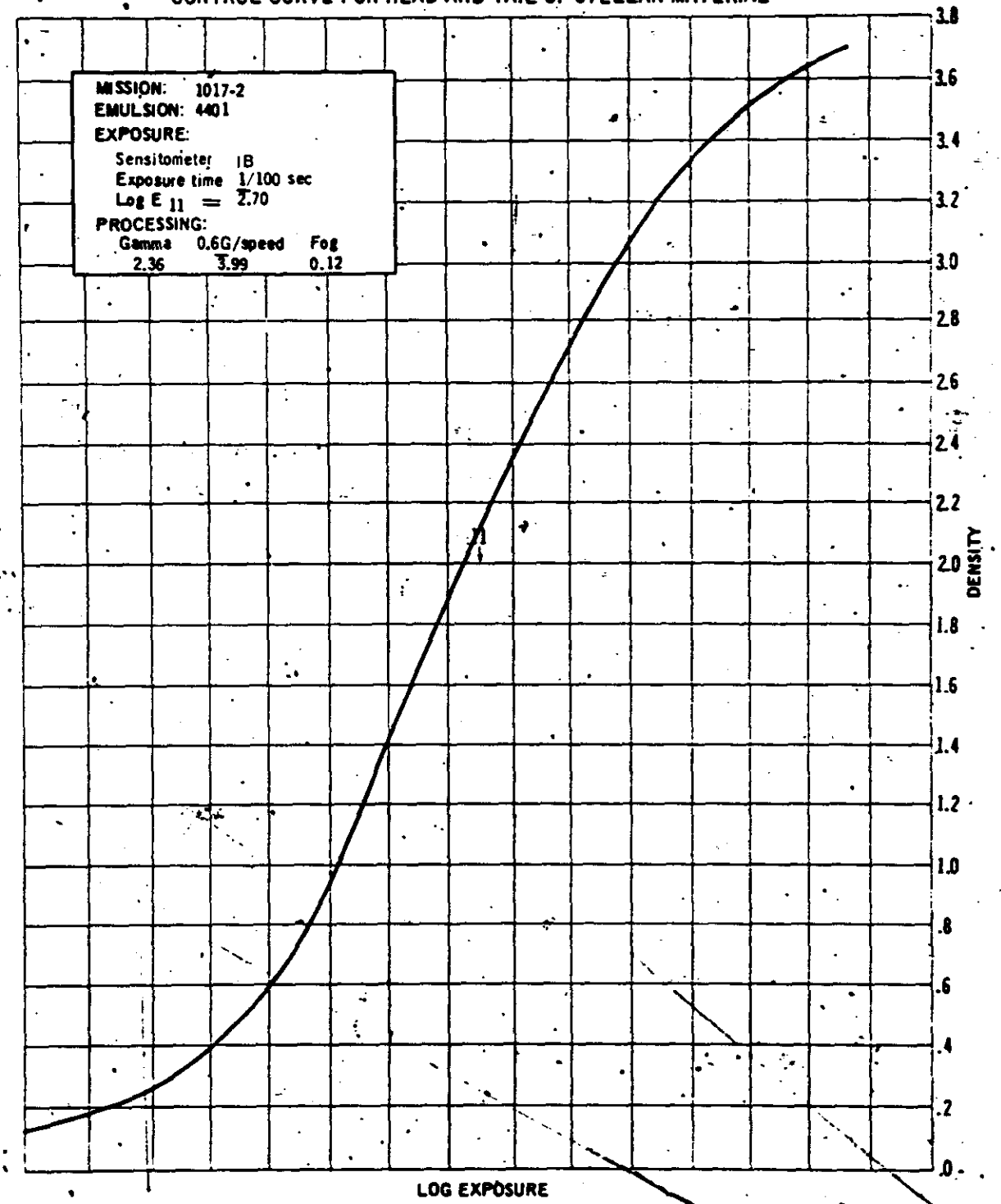

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