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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT MISSION 1043

SPECIAL STUDY ON SCAN SPEED DEVIATION ANALYSIS OF THE FORWARD CAMERA

[redacted]

DECEMBER 1967

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66 PAGES

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PHOTOGRAPHIC EVALUATION REPORT

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DECEMBER 1967

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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LIST OF ILLUSTRATIONS

GLOSSARY OF TERMS

ABSOLUTE HEIGHT	Vertical distance from the vehicle to the mean ground level of the area being photographed.
ACUITY	Sharpness - Edge definition.
ACUTANCE	Measure of the ability of a lens to reproduce sharp images.
AIR BASE	Ground distance between 2 exposure stations.
ALTITUDE	Vertical distance from the vehicle to the Hough Ellipsoid at the time of exposure.
AZIMUTH OF THE PRINCIPAL RAY	Horizontal clockwise angle, measured from true north to the camera principal ray.
BASE HEIGHT RATIO	Ratio between the air base and the absolute attitude of a stereoscopic pair of photographs.
CAMERA NADIR	Geodetic latitude and longitude of a point vertically beneath the perspective center of the camera lens on the Hough Ellipsoid.
CONE ANGLE	Angle between the principal ray and the vehicle nadir.
COPY GENERATION	Number of reproductive steps by which a negative or positive photographic copy is separated from the original, i.e. the original negative is copy 1, a positive made from the original negative is copy 2, etc.
DATE OF PHOTOGRAPHY	Indicates the day, month, and year (GMT) that the photography was acquired.

EXPOSURE*	Total quantity of light received per unit area on a sensitized plate or film.
EXPOSURE DURATION	Time during which a light-sensitive material is subjected to the influence of light. Expressed in this test in fractions of a second. Formula: Exposure Time (sec) = $\frac{\text{Slit Width (in)}}{\text{Scan Rate (in per sec)}}$
EXPOSURE STATION	Position occupied by the camera lens at the moment of exposure.
FIDUCIAL MARK	A standard geometrical reference point imaged at the margin of a photograph. The intersection of the primary fiducial marks usually defines the principal point.
FOCAL LENGTH: CALIBRATED	Adjusted value of the equivalent focal length. Computed to distribute the effect of lens distortion over the entire field.
FOCAL LENGTH: EQUIVALENT	Distance measured along the lens axis from the rear nodal point to the plane of best average definition over the entire field. Points other than the rear nodal point may be used but must be specified for correct interpretation of data.
FOCAL PLANE	Plane perpendicular to the lens axis, in which images of points in the object field of the lens are focused.
FRAME	One of a series of full-format photographs comprising a roll of film.
GROUND RESOLUTION*	Resolved ground distance as determined from standard bar target resolution targets. A target is considered to be resolved when a grouping of 3 bars can be distinguished as 3 distinct lines. The lines need not have linear form.

HOLEY RAIL DOTS	Images of the rail holes associated with the pan geometry calibration of the camera.
IMC (Image Motion Compensation)	Correction for the forward motion of the vehicle while photographing the terrain.
ISODENSITOMETER	An instrument which is basically a microdensitometer with the capability of repeatedly scanning an image at pre-set intervals. Its output is in the form of a plot representing distance along 2 axes and density differences as code changes within each scan line.
LOCAL SUN TIME	Time of day computed from the position of the sun relative to the imaged terrain.
MICRODENSITOMETER	An instrument which measures the optical density of very small areas in an image. Its output is in the form of a continuous plot of density versus distance across an image. The microdensitometer used in NPIC can accurately measure distances as small as 1 micron and densities up to 5.0+.
NOD INDICATORS	A series of marks imaged in the border area of each frame for the purpose of defining the relative orientation of the optical axis and the ground scene.
NODAL TRACE	A continuous line imaged along the major axis of each frame to define the optical axis of the lens relative to any given instant of exposure.
PANORAMIC CAMERA	Photographs a partial or complete panorama of the terrain in a transverse direction through a scanning motion of the lens system.

PARALLAX	Apparent displacement of the position of an object in relation to a reference point, caused by a change in the point of observation.
PASS	Operational portion of an orbital revolution. A suffix D indicates the descending node and a suffix A indicates the ascending node. An additional suffix E indicates that the associated photography was generated for engineering purposes.
PITCH	Rotation of the camera about its transverse axis. Positive pitch indicates nose-up attitude.
PROCESSING LEVEL	Degree of development. Three levels of processing are currently employed: Primary, intermediate, and full.
PRINCIPAL RAY	That ray of light which emanates from a point in object space and passes undeviated through the lens to become imaged at the principal point of the camera system. It is co-incident with the optical axis of the lens.
RESOLUTION	Measure of the smallest array of point objects distinguishable as independent point images, expressed in lines/mm.
ROLL	Rotation of the camera about its longitudinal axis. Positive roll indicates left wing up attitude.
SHADOW FACTOR	A constant for each frame, used to calculate heights from shadow lengths.
SHRINKAGE MARKERS	Calibrated reference points used to calculate deformations of the photographic material.
SOLAR ELEVATION	Vertical angle measured from a plane (tangent to the surface of the earth at the point of intersection of the principal ray) to the sun, the vertex

	being at the center of the format.
STELLAR CAMERA	Used simultaneously with the index camera to photograph stars in order to determine vehicle attitude.
SYSTEM TIME LABEL	Binary presentation of the accumulative system time.
UNIVERSAL GRID	X, Y coordinate system used to locate images on photographic formats.
VEHICLE AZIMUTH	Clockwise horizontal angle measured from true north to the vehicle ground track.
VIGNETTING	Gradual reduction in density of parts of a photographic image due to the stopping of some of the rays entering the lens.
YAW	Rotation of the camera about its vertical axis. Positive yaw represents nose-left attitude, as viewed from the top of the camera.

*Defined differently that in the "Glossary of NPIC Terminology."

INDEX OF PHOTOGRAPHIC EVALUATION REPORTS AND SPECIAL STUDIES

PER	DOCUMENT NUMBER	SPECIAL STUDY
1033	[redacted]	None
1034		None
1036		None
1037		None
1038		None
1039		None
1040		None
1041		Slant Range Computations Related to Universal Grid Coordinates for the KH-4 Camera System
1042	[redacted]	None
1043		Scan Speed Deviation Analysis of the Forward Camera, Mission 1043

SYNOPSIS

Mission 1043, a 2-part satellite reconnaissance mission, was launched on 7 August 1967 at 2144Z. The first capsule was recovered dry on revolution 113, 14 August 1967. The mission was terminated by air catch of the second satellite re-entry vehicle on revolution 240, 22 August 1967. A total of 125 photographic passes was accomplished by the 15-day mission.

The aft-looking panoramic camera operated satisfactorily throughout the mission. The operation of the fwd-looking panoramic camera was also satisfactory up to pass 46D. At that time, a scan rate perturbation became apparent. By pass 68D, the timing blips were visually closer together at the end of the scan cycle than at the beginning.

On pass 228, frame 120 of the fwd-looking camera, the film came out of the rails and on pass 230, frame 13 the forward camera operation was prematurely terminated. Approximately 1,458 feet of film was not recovered.

The image quality of the aft-looking panoramic camera record is good throughout the mission. The quality of the fwd-looking camera record is good up to pass 68D. However, the retarded scan rate degrades the imagery on the last third of all succeeding frames of the mission.

An MIP of 85 is assigned to this mission. Frame 10 aft, rev 79 is the MIP frame and frame 10 fwd, rev 79 has imagery corresponding to the MIP frame. Approximately 65 percent of the mission contains cloud-free photography.

The horizon cameras and the stellar-index unit functioned properly throughout the mission. No major degradations were noted. The fiducial marks were properly exposed and clearly readable throughout.

There was an orbit adjust on rev 2. On rev 120, the H/timer was reset to meet operational requirements. As a result, the V/H ramp start punch was missed and the panoramic cameras operated at the slowest cycle rate. This slow cycle rate caused poor imagery and lapse in ground coverage.

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Forward-Looking Panoramic Camera 200
Aft-Looking Panoramic Camera 201
Stellar/Index Camera (Mission 1043-1) D107/135/135
Stellar/Index Camera (Mission 1043-2) D112/143/139

B. Launch and Recovery Dates

	Mission 1043-1	Mission 1043-2
Launch	2144Z/7 Aug 67	*
Recovery	2343Z/14 Aug 67	2115Z/22 Aug 67

C. Orbit Elements

Element	Planned	Actual 1043-1	Actual 1043-2	Photo Range
Period (min)	NA	90.011	89.823	*
Perigee (nm)	NA	102.085	103.365	99.92, rev 6
Apogee (nm)	NA	195.060	192.070	182.83, rev 9
Eccentricity	NA	0.01295	0.01237	*
Inclination (deg)	NA	79.971	79.971	*
Perigee Latitude	NA	16.321N	41.524N	*

NA - Not Available.
* - Not Applicable.

D. Photographic Operations

1. Panoramic Cameras

Type	Mission 1043-1 Revs	Mission 1043-1 Frames	Mission 1043-2 Revs	Mission 1043-2 Frames	Total Revs	Total Frames
Operational						
Fwd	52	2,681	49	2,299	101	4,980
Aft	52	2,730	53	2,765	105	5,495
Operational/Domestic						
Fwd	1	78	0	0	1	78
Aft	1	80	0	0	1	80
Domestic						
Fwd	4	74	12	233	16	307
Aft	4	74	12	240	16	314
Engineering (no imagery)						
Fwd	2	15	1	11	3	26
Aft	2	15	1	11	3	26
Totals						
Fwd	59	2,848	62	2,543	121	5,391
Aft	59	2,899	66	3,016	125	5,915

2. Secondary Cameras

Camera	Frames
Stellar (Mission 1043-1)	443
Index (Mission 1043-1)	443
Stellar (Mission 1043-2)	485
Index (Mission 1043-2)	485

E. Film Usage

	Film Load (TOTAL)	Pre-Flight Footage	Processed Footage
Fwd-Looking (Mission 1043-1)	16,000*	331	7,805
Aft-Looking (Mission 1043-1)	16,000*	339	7,948
Fwd-Looking (Mission 1043-2)	NA	NA	6,737
Aft-Looking (Mission 1043-2)	NA	NA	7,999
Stellar (Mission 1043-1)	75	11.1	54
Stellar (Mission 1043-2)	75	5.2	55
Index (Mission 1043-1)	135	5.25	111
Index (Mission 1043-2)	135	9.33	107

*Total load for both buckets.
NA - Not Applicable.

PART II. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: A major part of the fwd-looking camera record is of medium density. Any high density is attributed to snow and cloud covered areas.

2. Contrast: The imagery obtained by the fwd-looking camera is generally of medium contrast with some areas of low contrast attributed to atmospherics.

3. Acuity: The edge sharpness of the imagery on the fwd-looking camera record is generally good, up to the system malfunction on pass 68. The product is generally considered to be comparable to recent missions. However, finer detail can be observed in the imagery obtained from the aft-looking camera record. After pass 68D, the fwd-looking camera suffered a loss in image quality in the last third of the frame due to the erratic scan rate.

4. Image Degradations:

a. Light Leaks: Light leak induced fog patterns are present in frame 5 and in the next-to-last frame of most camera operations (Graphic 1, page 10). These fog patterns are minor, and their density varies with camera-off durations. The patterns are similar to those observed on the last several missions. From pass 68D to the termination of the fwd record, on pass 230D, frame 13, an erratic scan rate caused the imagery in the last third of the frame, at the supply end of the format, to be smeared. The particulars of this anomaly are discussed in the attached Special Study.

b. Static: None noted.

c. Other: A plus density streak is present on the inboard time track edge throughout the mission. This streak severely degrades approximately 0.025 inch of the format edge and is apparently due to an inflight distortion of the filter, causing it to act as a cylindrical lens, thereby inducing overexposure and distortion.

5. Physical Degradation: Rail scratches are present throughout the mission. Minor scan head scratches are present near the inboard time track edge throughout the mission. Heavy film creases, emulsion scratches, and gouges are present after pass 228D, frame 119 in association with the film coming out of the rails.

6. Product Quality: After rev 68, the fwd camera record suffered a loss in image quality in the last third of each frame due to the erratic scan rate. This loss in image quality is assumed to be associated with the complete film pull out of the rails on rev 338, frame 119. The quality of most imagery generated during the first half of the mission, Mission 1043-1, up to pass 68D, is considered to be good when atmospheric conditions are favorable and is not adversely affected by the imaged and physical degradations noted above.

B. Aft-Looking Panoramic Camera

1. Density: Same as reported for the fwd-looking camera.

2. Contrast: Same as reported for the fwd-looking camera.

3. Acuity: The edge sharpness of the imagery is generally good. Finer detail can be observed in the imagery obtained from the aft-looking camera than from the forward camera. The aforementioned erratic scan rates added to the reduced image sharpness of the forward record.

4. Imaged Degradations:

a. Light Leaks: Light leak induced fog patterns are present on the second-from-last frame of most passes, (Graphic 2, page 10), and the third, next-to-last, and last frame on some passes (Graphic 3, Page 10).

b. Static: Minor dendritic fog patterns resulting from static discharges are present on revs 89D, 165D, and 168D, along the film edge of some frames.

c. Other: A minus density streak is present intermittently throughout the mission on some frames of the aft-looking camera record. This streak is approximately one-eighth to one-quarter inch wide and follows the path of the field flattener, along the scan direction. An example of this streak can be seen on frames 1, 4, and 6 of rev 57D (Graphic 4, page 10). A foreign particle was apparently trapped in the lens stove between the number 5 element and the field flattener. This particle became attached to the underside of the field flattener and moved with it during photographic scan. Minus density spots appear 1.17 inches from the binary edge on frame 4 of pass 7D. These spots are periodic at a three and one-eighth inch interval and disappear before frame 9, pass 7D. These spots appear to be associated with film metering.

5. Physical Degradations: Numerous emulsion scratches are present. A film crease is present on pass 157D between frames 3 and 4. This crease is approximately 1.5 inches from the time track edge of the film.

6. Product Quality: The imaged and physical degradations listed for the aft-looking camera record are generally of a minor nature and do not affect the overall product quality.

C. Stellar Camera (Mission 1043-1)

1. Density: Adequate for the detection of stellar images.

2. Contrast: Adequate for the detection of stellar images.

3. Image Shape: The stellar images appear to be slightly elongated.

4. Images Per Frame: Approximately 15 to 20 stellar images are detectable in each stellar frame.

5. Flare Level: Flare affects approximately 50 percent of each stellar frame. However, stellar images are detectable in the flare areas.

6. Imaged Degradations:

a. Light Leaks: None noted.

b. Static: None noted.

c. Other: None noted.

7. Physical Degradations: None noted.

8. Product Quality: The product quality is considered good. No problems were encountered in the reduction process.

D. Stellar Camera (Mission 1043-2)

1. Density: Adequate for the detection of stellar images.

2. Contrast: Adequate for the detection of stellar images.

3. Image Shape: The stellar images appear slightly elongated.

4. Images Per Frame: Approximately 20 to 25 stellar images are detectable in each stellar frame.

5. Flare Level: Flare affects approximately 30 percent of each stellar frame. However, stellar images are detectable in the flare areas.

6. Image Degradations:

a. Light Leaks: None noted.

b. Static: Minor static induced fog patterns are present on the last 20 frames in association with film supply depletion.

c. Other: A small minus density spot, which appears to be caused by a foreign particle on the reseau plate, is imaged in the same location on every frame throughout the mission.

7. Physical Degradations: The last 20 frames are degraded by emulsion scratches and gouges associated with film supply depletion.

8. Product Quality: The product quality is considered to be good. No problems were encountered in the reduction process.

E. Index Camera (Mission 1043-1)

1. Density: Generally low to medium.

2. Contrast: Generally low to medium.

3. Acuity: The image quality is good and comparable to recent missions of this system.

4. Imaged Degradations:

a. Light Leaks: None noted.

b. Static: None noted.

c. Other: None noted.

5. Physical Degradations: None noted.

6. Product Quality: Good.

F. Index Camera (Mission 1043-2)

1. Density: Generally low to medium.

2. Contrast: Generally low to medium.

3. Acuity: The image quality of the index record is good and comparable to recent missions of this system.

4. Imaged Degradations:

a. Light Leaks: The first 2 frames are degraded by heavy fog patterns which extend into the formats from both edges of the film.

b. Static: Minor static-induced edge fog appears intermittently throughout the mission.

c. Other: Numerous minus density spots, which appear to be the result of foreign particles on the reseau plate, are present in the same location on every frame.

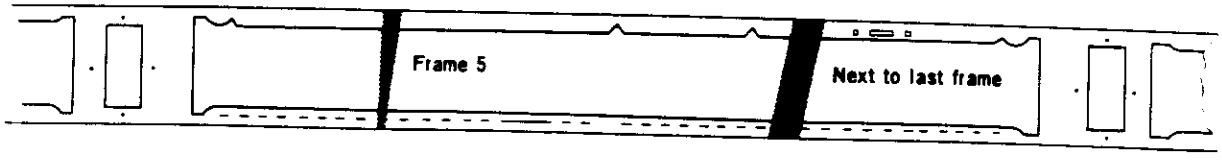
5. Physical Degradations: None noted.

6. Product Quality: Good.

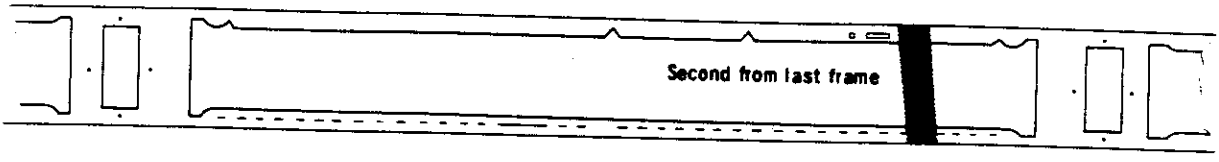
G. Graphic Display (Mission 1043)

The patterns illustrated below are referenced in the text of this report.

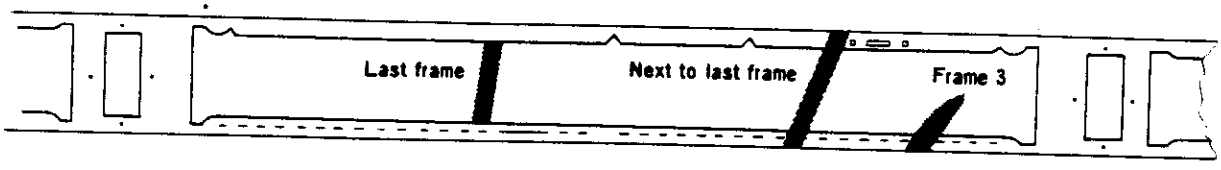
GRAPHIC 1



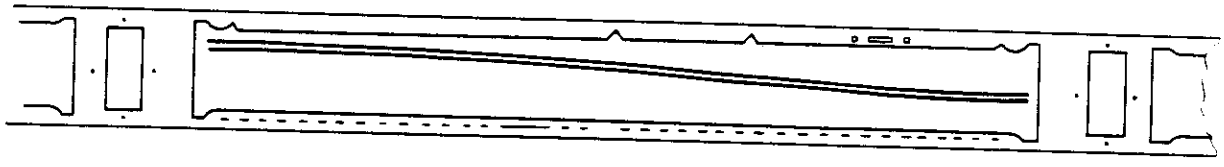
GRAPHIC 2



GRAPHIC 3



GRAPHIC 4



NPIC M-0525

PART III. IMAGED AUXILIARY DATA

A. Fwd-Looking Panoramic Camera

1. Horizon Cameras

a. Starboard-Looking

(1) Imagery: Clear and distinct.

(2) Fiducials: Well defined.

b. Port-Looking

(1) Imagery: Clear and distinct up to pass 228D, frame 119. At that time, the port horizon photography was smeared due to the rail pullout condition. The film which was out of the rails created a chord between the horizon camera clamps and the film was pulled through the port horizon during exposure as the scan head moved through the scan phase.

(2) Fiducials: Well defined up to the abovementioned malfunction on pass 228D, frame 120.

2. Frequency Marks: The frequency marks are missing for the first 1 to 3 inches of the first frame of a few passes and are totally obliterated by the rail pullout after pass 228D, frame 119. The frequency marks are clear and distinct when imaged.

3. Binary Time Word: Well defined.

4. Binary Index: Well defined.

5. Camera Number: The camera number is sharp. However, it, plus the serial number index, is displaced toward the active format area a distance of 0.015 inch. As a result, the binary readout could not be accomplished automatically on every frame, and many cards had to be punched manually.

6. Pan Geometry Dots: The pan geometry rail hole images are generally weak and difficult to distinguish. Counting from the take-up end of each frame, the following images are not detectable on frame 1, pass 1D: Camera number edges 7, 13, and 16 and time track edges 15, 30, and 36. On pass 228D, frame 10 the following dots are not detectable: Camera number edges 1 through 16 and 59 and time track edges 1 through 5, 13, 34 through 36, and 72.

7. Nodal Traces: The nodal traces are present on some of the domestic material only. Nodal traces were not active in operational photo passes. When present they are clear and distinct.

8. Nod Indicators: Not applicable.

B. Aft-Looking Panoramic Camera:

1. Horizon Camera

a. Starboard-Looking

(1) Imagery: Clear and distinct.

(2) Fiducials: Well defined.

b. Port-Looking

(1) Imagery: Clear and distinct.

(2) Fiducials: Well defined.

2. Frequency Marks: Sharp and well defined in most passes. However, on the frames that received primary development, the frequency marks are weak but still detectable.

3. Binary Time Word: Well defined.

4. Binary Index: Well defined.

5. Camera Number: Same as the forward camera.

6. Pan Geometry Dots: The pan geometry rail hole images are generally weak and quite difficult to distinguish. Counting from the take-up end of the frame, the following images are not detectable on pass 1D, frame 1: Camera number edges 1, 3, 8, 10, 15, 17, 48, 51, and 57 and time track edge 14.

On pass 228D, frame 10 only 2 images are detectable on the camera number edge. On the time track edge, only 3 images are detectable.

7. Nodal Traces: The nodal traces are present on some of the domestic material only. Nodal traces were not active in operational photo passes. When present they are clear and distinct.

8. Nod Indicators: Not applicable.

C. Stellar Camera (Mission 1043-1)

1. Grid Image Quality: Sharp and well defined.

2. Correlation Lamp Image Quality: Sharp and well defined.

D. Stellar Camera (Mission 1043-2)

1. Grid Image Quality: Sharp and well defined.

2. Correlation Lamp Image Quality: Sharp and well defined.

E. Index Camera (Mission 1043-1)

1. Grid Image Quality: Sharp and well defined.

2. Correlation Lamp Image Quality: Sharp and well defined.

3. Camera Number Legibility: Good.

F. Index Camera (Mission 1043-2)

1. Grid Image Quality: Sharp and well defined.

2. Correlation Lamp Image Quality: Sharp and well defined.

3. Camera Number Legibility: Good.

PART IV. MENSURATION QUALITY

A. Fwd-Looking Panoramic Camera

There were 80 requests for mensuration on this mission. No problems were encountered. The image quality is considered to be fair to good for mensuration purposes.

B. Aft-Looking Panoramic Camera

Same as above.

PART V. FILM PROCESSING

A. Processing Machines and Process Gamma

Film	Part: Entire Mission Machine	Gamma	Part: NA Machine	Gamma
Fwd (Mission 1043-1)	Trenton	2.30	NA	NA
Aft (Mission 1043-1)	Trenton	2.27	"	"
Fwd (Mission 1043-2)	Trenton	2.26	"	"
Aft (Mission 1043-2)	Trenton	2.27	"	"
Stellar (Mission 1043-1)	Trenton	2.27	"	"
Stellar (Mission 1043-2)	Trenton	2.38	"	"
Index (Mission 1043-1)	Drape	0.94	"	"
Index (Mission 1043-2)	Drape	0.89	"	"

NA -- Not Applicable.

B. Processing Levels

1. Panoramic Cameras

Film	Primary	Intermediate	Full	Transition	Processing Changes
Fwd (Mission 1043-1)	6%	14%	68%	12%	29
Aft (Mission 1043-1)	6%	8%	74%	12%	28
Fwd (Mission 1043-2)	2%	11%	73%	14%	30
Aft (Mission 1043-2)	5%	16%	63%	16%	42

2. Secondary Cameras

a. Stellar Cameras: The stellar camera records were processed with a Trenton processor at a single level of development.

b. Index Cameras: The index camera records were processed with a Drape processor at a single level of development.

C. Film Handling Summary

1. Fwd-Looking Camera

a. Capsule De-Filming

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

b. Pre-Processing Inspection:

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered. However, the forward camera record was approximately 1,300 feet shorter than the aft record.

c. Manufacturing Splices:

(1) Mission 1043-1: Frame 13, pass 29D.

(2) Mission 1043-2: Frame 9, pass 149D and frame 1, pass 228D.

d. Processing Splices

(1) Mission 1043-1: None other than normal.

(2) Mission 1043-2: None other than normal.

e. Manufacturing Defects:

(1) Mission 1043-1: None noted.

(2) Mission 1043-2: None noted.

f. Processing Anomalies: None.

g. Breakdown: No problems encountered.

2. Aft-Looking Camera

a. Capsule De-Filming

(1) Mission 1043-1: The back tension, which is normally present when the spools of the panoramic camera records are defilmed, was absent when the aft camera spool was defilmed. This spool was free to rotate without restraint in either direction. Also, when it was rotated, an internal grinding noise could be heard. No problems or delays were encountered because of this anomaly.

(2) Mission 1043-2: No problems encountered.

b. Pre-Processing Inspection

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

c. Manufacturing Splices

(1) Mission 1043-1: Frame 126, pass 41D and frame 31, pass 72D.

(2) Mission 1043-2: Frame 27, pass 152D.

d. Processing Splices

(1) Mission 1043-1: None other than normal.

(2) Mission 1043-2: None other than normal.

e. Manufacturing Defects

(1) Mission 1043-1: None noted.

(2) Mission 1043-2: None noted.

f. Processing Anomalies: None.

g. Breakdown: No problems encountered.

3. Index Camera

a. Capsule De-Filming

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

b. Pre-Processing Inspection

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

c. Manufacturing Splices

(1) Mission 1043-1: None.

(2) Mission 1043-2: None.

d. Processing Splices

(1) Mission 1043-1: None other than normal.

(2) Mission 1043-2: Rev 127, between frames 75 and 76.

e. Manufacturing Defects

(1) Mission 1043-1: None.

(2) Mission 1043-2: None.

f. Processing Anomalies: None.

g. Breakdown: No problems encountered.

4. Stellar Camera

a. Capsule De-Filming

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

b. Pre-Processing Inspection

(1) Mission 1043-1: No problems encountered.

(2) Mission 1043-2: No problems encountered.

c. Manufacturing Splices

(1) Mission 1043-1: None.

(2) Mission 1043-2: None.

d. Processing Splices

(1) Mission 1043-1: None other than normal.

(2) Mission 1043-2: None other than normal.

e. Manufacturing Defects

(1) Mission 1043-1: None.

(2) Mission 1043-2: None.

f. Processing Anomalies: None.

g. Breakdown: No problems encountered.

D. Timetable

Film	Recovered	Received at Processing Site	*Spec Ship at NPIC Recd	Priority 1A at NPIC Recd
Fwd (Mission 1043-1)	2343Z/14 Aug 67	15 Aug 67/1255 EDT	None	18 Aug 67/0025 EDT
Aft (Mission 1043-1)	"	"	"	"
Stellar (Mission 1043-1)	"	"	"	"
Index (Mission 1043-1)	"	"	"	"
Fwd (Mission 1043-2)	2115Z/22 Aug 67	23 Aug 67/1055 EDT	24 Aug 67/1400 EDT	26 Aug 67/0130 EDT
Aft (Mission 1043-2)	"	"	"	"
Stellar (Mission 1043-2)	"	"	"	"
Index (Mission 1043-2)	"	"	None	"
			"	"

*The following passes were dispatched to NPIC on a priority basis to satisfy the highest priority requirements.

1043-2	149D, fwd and aft	duplicate positive.
"	165D, fwd and aft	" "
"	181D, fwd and aft	" "
"	197D, fwd and aft	" "

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PART VI. PI SUITABILITY

A. Definition of Photographic Interpretation (PI) Suitability

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

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

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

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

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

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

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

B. PI Statistics

1. Target Coverage

	Mission 1043-1	Mission 1043-2	Totals
Priority 1 Targets Programmed	No specific priority 1 targets were programmed on this mission although specific areas were selected for initial readout.		
Priority 1 Targets Covered	353	232	585

2. PI Quality Appraisal

Rating	Missiles	Nuclear Energy	Air Facilities	Ports	Elect/ Commo	Military Activity	Complex	Bio/Chem Warfare
Good	29	0	10	0	1	0	10	0
Fair	158	12	138	16	2	62	14	18
Poor	123	10	78	36	2	34	8	2
Totals*	310	22	226	52	5	96	32	20

3. Summary of PI Quality Ratings

Good 50 or 6.6%
Fair 420 or 55.0%
Poor 293 or 38.4%

*A discrepancy may exist between the total number of targets covered and the total PI reports because some targets are covered repeatedly.

C. PI Comments

1. Atmospheric Attenuation: Listed below is the photo interpreters report of weather conditions for the priority 1 targets covered on this mission.

a. Clear: 528 or 69.2%
b. Scattered Clouds: 98 or 12.8%
c. Heavy Clouds: 50 or 6.6%
d. Haze: 73 or 9.6%
e. Cloud Shadow: 14 or 1.8%

2. Terrain Conditions: The terrain conditions on this mission are normal for the time of year. Blowing sand is apparent in certain heavily targeted areas of Mission 1043-1. Frame 83 aft, pass 41D illustrates this condition.

3. Product Interpretability: The photointerpretability of Mission 1043 ranges from poor to good. The quality of most imagery generated during the first half of the mission, Mission 1043-1, is considered to be good when atmospheric conditions are favorable. However, there was a prevalence of adverse atmospheric conditions. The PI suitability of Mission 1043-2 is poorer than that of Mission 1043-1.

4. Resolution Target Analysis

RESOLUTION TARGET DATA

Target Designator	A	A1	B	B1	C	C1
Printing Level	Dual Printed Dark		Dual Printed Light		Single	Single
Camera (Looking)	Aft	Fwd	Aft	Fwd	Aft	Fwd
Pass	95D	95D	95D	95D	111D	111D
Frame	24	23	24	23	11	11
Date of Photography	13 Aug 67	13 Aug 67	13 Aug 67	13 Aug 67	14 Aug 67	14 Aug 67
Universal Grid Coordinates	29.5-9.2	52.5-11.8	29.5-9.2	52.5-11.8	69.5-13.5	22.8-12.9
Geographic Coordinate of Format Center	33-35N 112-20W	33-41N 112-18W	33-35N 112-20W	33-14N 112-18W	36-30N 115-10W	36-25N 115-05W
Altitude (ft)	635,506	637,304	635,506	637,304	635,356	636,817
Camera Number	201	200	201	200	201	200
Pitch (deg)	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA
Yaw (deg)	NA	NA	NA	NA	NA	NA
Local Sun Time	1252	1252	1252	1252	1238	1238
Solar Elevation (deg)	68.43	68.39	68.43	68.39	66.40	66.45
Solar Azimuth (deg)	214	214	214	214	211	211
Exposure (fraction of second)	1/433	1/313	1/433	1/313	1/430	1/315
Processing Level	Full	Full	Full	Full	Full	Full
Vehicle Azimuth (deg)	170.56	170.45	170.56	170.45	170.24	170.14
Filter (Wratten)	21	23A	21	23A	21	23A
Target Type	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	Milt Std 3-Bar	Milt Std 3-Bar
Target Contrast	5:1	5:1	5:1	5:1	High	High
Weather Conditions	Clear	Clear	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE SECOND GENERATION POSITIVE

Target Designator	Observer Number 1		Observer Number 2		Observer Number 3	
	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track
A	12	12	12	12	12	12
A1	16	12	16	12	16	12
B	16	12	16	12	16	12
B1	--	12	--	12	--	12
C	--	--	--	--	--	--
C1	12	--	12	--	--	--

NA - Not Available.
Blank - No Reading Possible.

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Target Designator	D	D1	E	E1	F	F1
Printing Level	Single	Single	Single	Single	Single	Single
Camera (Looking)	Aft	Fwd	Aft	Fwd	Aft	Fwd
Focus	127D	127D	157D	157D	205D	205D
Frame	17	17	20	19	9	9
Date of Photography	15 Aug 67	15 Aug 67	17 Aug 67	17 Aug 67	20 Aug 67	20 Aug 67
Universal Grid Coordinates	55.0-13.2	37.2-11.8	46.5-11.5	45.5-10.6	39.5-12.0	52.5-12.0
Geographic Coordinate of Format Center	34-37N 116-56W	34-35N 116-52W	38-06N 076-26W	38-12N 076-23W	33-58N 080-42W	33-58N 080-39W
Altitude (ft)	628,593	629,676	626,195	627,255	625,394	625,213
Camera	201	200	201	200	201	200
Pitch (deg)	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA
Yaw (deg)	NA	NA	NA	NA	NA	NA
Local Sun Time	1229	1229	1209	1209	1145	1145
Solar Elevation (deg)	68.34	68.37	64.54	64.48	67.09	67.09
Solar Azimuth (deg)	200	200	180	180	171	171
Exposure (fraction of second)	1/437	1/308	1/440	1/319	1/442	1/322
Processing Level	Intermediate	Full	Full	Full	Full	Full
Vehicle Azimuth (deg)	170.45	170.35	170.04	169.51	170.52	170.42
Filter (Wratten)	21	23A	21	23A	21	23A
Target Type	51/51 T-Bar	51/51 T-Bar	A	A	A	A
Target Contrast	5:1	5:1	High	High	Med	Med
Weather Conditions	Clear	Clear	Clear	Clear	Haze	Haze

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE SECOND GENERATION POSITIVE

Target Designator	Observer Number 1		Observer Number 2		Observer Number 3	
	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track
D	16	12	12	12	--	16
D1	--	16	16	16	--	16
E	--	--	--	--	--	--
E1	--	--	--	--	--	--
F	--	--	--	--	--	--
F1	--	--	--	--	--	--

NA - Not Available.
Blank - No Reading Possible.

Target Designator	G	G1	H	H1	I	I1
Printing Level	Dual Printed Light		Dual Printed Dark		Single	Single
Camera (Looking)	Aft	Fwd	Aft	Fwd	Aft	Fwd
Pass	127D	127D	127D	127D	127D	127D
Frame	15	15	15	15	15	15
Date of Photography	15 Aug 67	15 Aug 67	15 Aug 67	15 Aug 67	15 Aug 67	15 Aug 67
Universal Grid Coordinates	67.1-11.4	24.8-13.7	67.1-11.4	24.8-13.7	24.5-14.0	67.2-11.2
Geographic Coordinate of Format Center	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-54N 116-56W
Altitude (ft)	628,972	630,093	628,972	630,093	628,972	630,093
Camera	201	200	201	200	201	200
Pitch (deg)	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA
Yaw (deg)	NA	NA	NA	NA	NA	NA
Local Sun Time	1229	1229	1229	1229	1229	1229
Solar Elevation (deg)	68.17	68.19	68.17	68.19	68.17	68.19
Solar Azimuth (deg)	200	200	200	200	200	200
Exposure (fraction of second)	1/436	1/318	1/436	1/318	1/437	1/318
Processing Level	Intermediate	Full	Intermediate	Full	Intermediate	Full
Vehicle Azimuth (deg)	170.42	170.32	170.42	110.32	170.42	170.32
Filter (Wratten)	21	23A	21	23A	21	23A
Target Type	B2	B2	B1	B1	C	C
Target Contrast	High	High	Low	Low	Low	Low
Weather Conditions	Haze	Haze	Cloud Covered	Haze	Haze	Haze

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE SECOND GENERATION POSITIVE

Target Designator	Observer Number 1		Observer Number 2		Observer Number 3	
	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track
G	10	10	10	10	10	10
G1	--	--	--	--	--	--
H	--	--	--	--	--	--
H1	--	10	--	--	--	--
I	16	16	16	16	16	16
I1	14	14	16	14	16	14

NA - Not Available.
Blanks - No Reading Possible.

PART VII. MISSION DATA

	Master Pan	Master Take-up Horizon	Master Supply Horizon	Slave Pan	Slave Take-up Horizon	Slave Supply Horizon	Mission 1043-1 Stellar	Mission 1043-1 Index	Mission 1043-2 Stellar	Mission 1043-2 Index
Camera Number	200	NA	NA	201	NA	NA	D107/135/135		D112/143/139	
Reseau Number	NA	NA	NA	NA	NA	NA	135	135	139	143
Lens Serial Number	2092435	12870	12841	2152435	12862	12837	11428	821945	11717	823926
Slit Width	.200	NA	NA	.150	NA	NA	NA	NA	NA	NA
Aperture	NA	f/8.0	f/6.3	NA	f/6.3	f/8.0	f/1.8	f/4.5	f/1.8	f/4.5
Exposure Time (sec)	1/325 avg	1/100	1/100	1/400 avg	1/100	1/100	1.0	1/500	2.0	1/500
Filter (Wratten)	23A	25	25	21	25	25	None	21	None	21
Focal Length (mm)	610.410	54.90	54.94	610.430	55.00	55.00	85	38.43	85	38.55
Film Length (ft)	16,000	NA	NA	16,000	NA	NA	75	135	75	135
Splices	4	NA	NA	3	NA	NA	None	None	None	None
Emulsion	284-4-6-7	284-4-6-7	284-4-6-7	284-4-6-7	284-4-6-7	284-4-6-7	183-4-10-6	139-1-1-7	183-4-10-6	139-1-1-7
Film Type	3404	3404	3404	3404	3404	3404	3401	3400	3401	3400
Resolution Data (L/mm)										
Static										
High Contrast	247	*	*	241	*	*	*	71 AWAR	*	73 AWAR
Low Contrast	127	*	*	127	*	*	*	*	*	*
Dynamic										
I High Contrast	201	*	*	206	*	*	*	*	*	*
I Low Contrast	123	*	*	125	*	*	*	*	*	*
P High Contrast	177	*	*	183	*	*	*	*	*	*
P Low Contrast	122	*	*	121	*	*	*	*	*	*

NA - Not Applicable.
* - Not Available.

FIGURE 1. BEST IMAGE QUALITY

Image quality comparable to the best of this mission.

FIGURE 2. CORRESPONDING COVERAGE

Corresponding coverage as imaged by the fwd-looking camera.

NPIC L-4534 NPIC L-4535

	FIGURE 1	FIGURE 2
Camera	201	200
Pass	79D	79D
Frame	10	10
Date of Photography (GMT)	12 Aug 67	12 Aug 67
Universal Grid Coordinates	55.5-12.5	36.5-13.3
Enlargement Factor	20X	20X
Geographic Coordinates (Center of format)	40-51N 111-34W	40-47N 111-30W
Altitude (ft)	658,618	661,068
Camera Attitude:		
Pitch (deg)	NA	NA
Roll (deg)	NA	NA
Yaw (deg)	NA	NA
Local Sun Time	1243	1243
Solar Elevation	62°15'	62°18'
Solar Azimuth	158°	158°
Exposure (sec)	1/415	1/302
Vehicle Azimuth	169°28'	169°15'
Processing Level	Full	Full

NA - Not Available.

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FIGURE 3. STELLAR FORMAT (MISSION 1043-1)

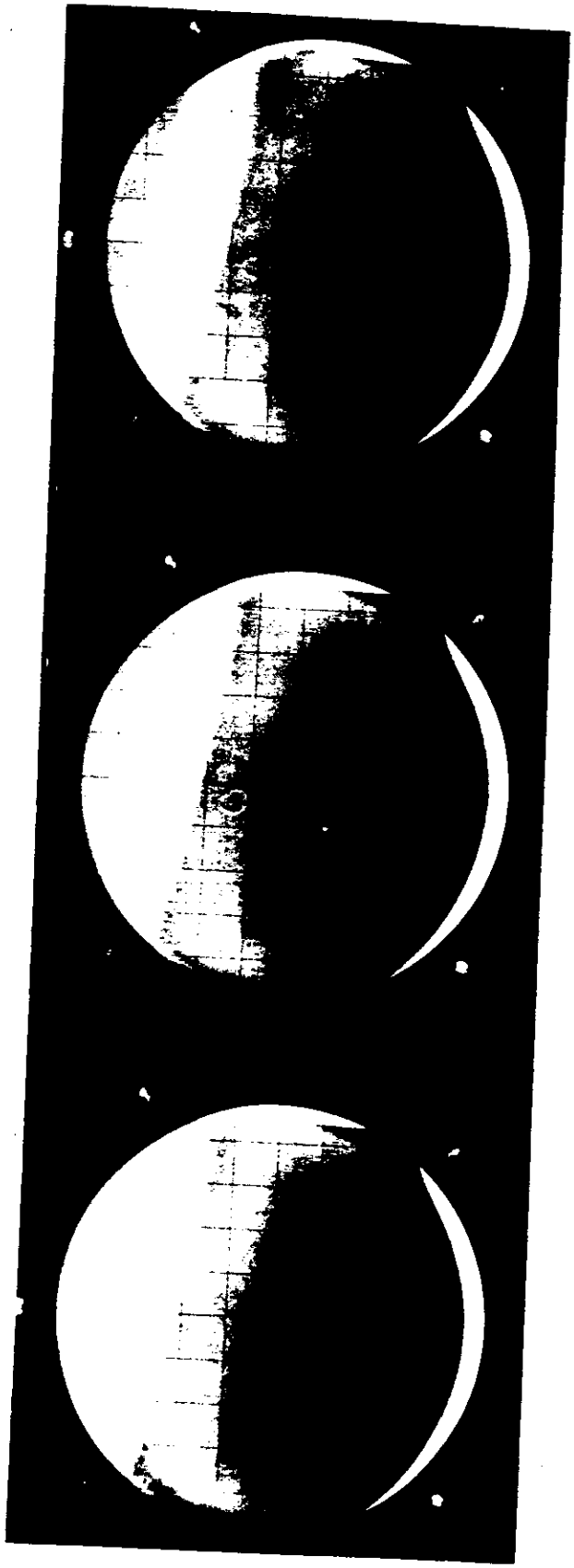
FIGURE 4. STELLAR FORMAT (MISSION 1043-2)

The following photographs exhibit the flare pattern prevalent throughout the mission.

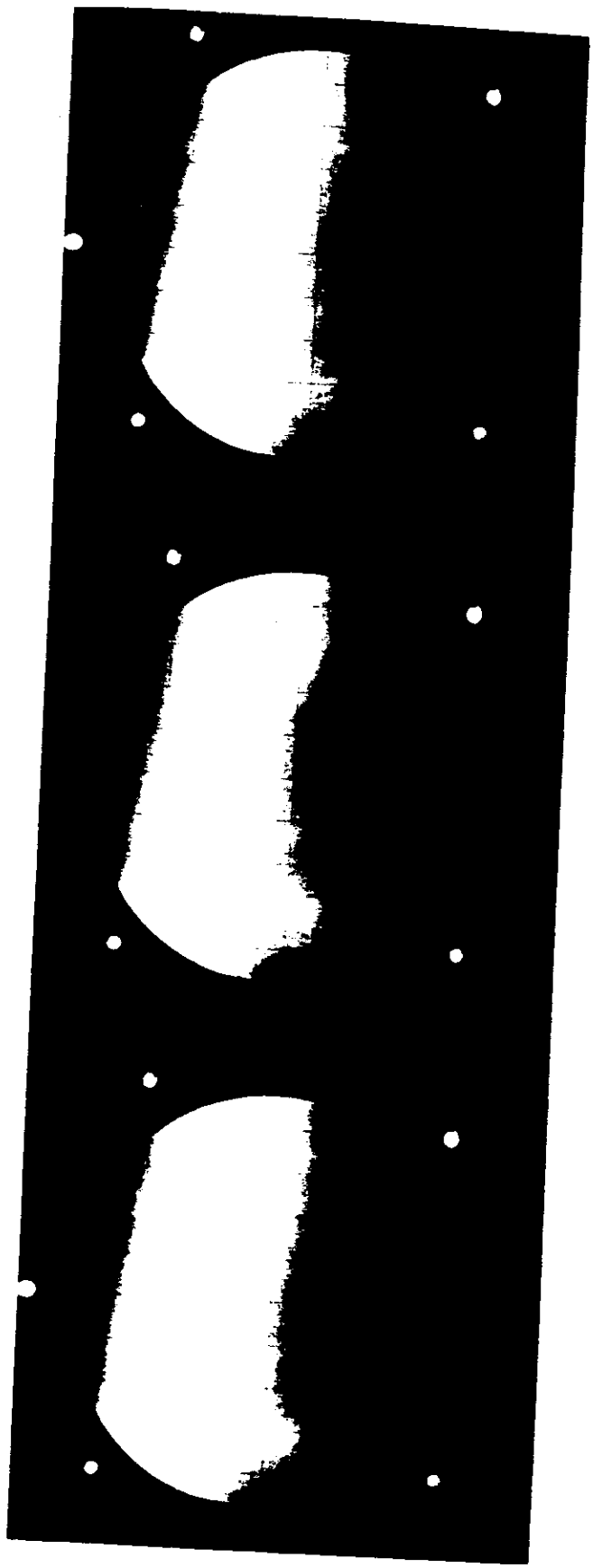
NPIC L-4536 NPIC L-4537

	FIGURE 3	FIGURE 4
Mission Number	1043-1	1043-2
Stellar Frame Numbers	162,163,164	161,162,163
Correlates with		
Main Camera Number	200	200
Pass	39D	152D
Frames	36 fwd, 43 fwd, 50 fwd	71 fwd, 78 fwd, 85 fwd
Date of Photography (GMT)	10 Aug 67	17 Aug 67
Enlargement Factor	2.5	2.5
Exposure Time (sec)	1	2

[redacted]



[redacted]



FIGURES 5 & 6. COMPARISON OF IDENTICAL TARGETS

Figures 5 and 6 show a comparison of the identical target as recorded on 2 different days of Mission 1043.

Figure 5 represents imagery degraded by blowing sand. The imagery displayed in Figure 6 is relatively free of the degradation. The imagery in Figure 5 has been significantly improved through the photographic printing. However, degradation is still apparent.

NPIC L-4538 NPIC L-4539

[redacted]

	FIGURE 5	FIGURE 6
Mission	1043-1	1043-2
Camera Number	201	201
Pass	41D	216D
Frame	83	13
Date of Photography (GMT)	10 Aug 67	21 Aug 67
Universal Grid Coordinates	52.0-12.0	48.5-14.2
Enlargement Factor	20X	20X
Geographic Coordinates (Center of format)	30-10N 031-36E	30-14N 031-28E
Altitude (ft)	649,591	628,663
Camera Attitude		
Pitch (deg)	NA	NA
Roll (deg)	NA	NA
Yaw (deg)	NA	NA
Local Sun Time	1317	1128
Solar Elevation (deg)	67	70
Solar Azimuth (deg)	123	155
Exposure (sec)	1/421	1/444
Vehicle Azimuth (deg)	171	171
Processing Level	Full	Intermediate

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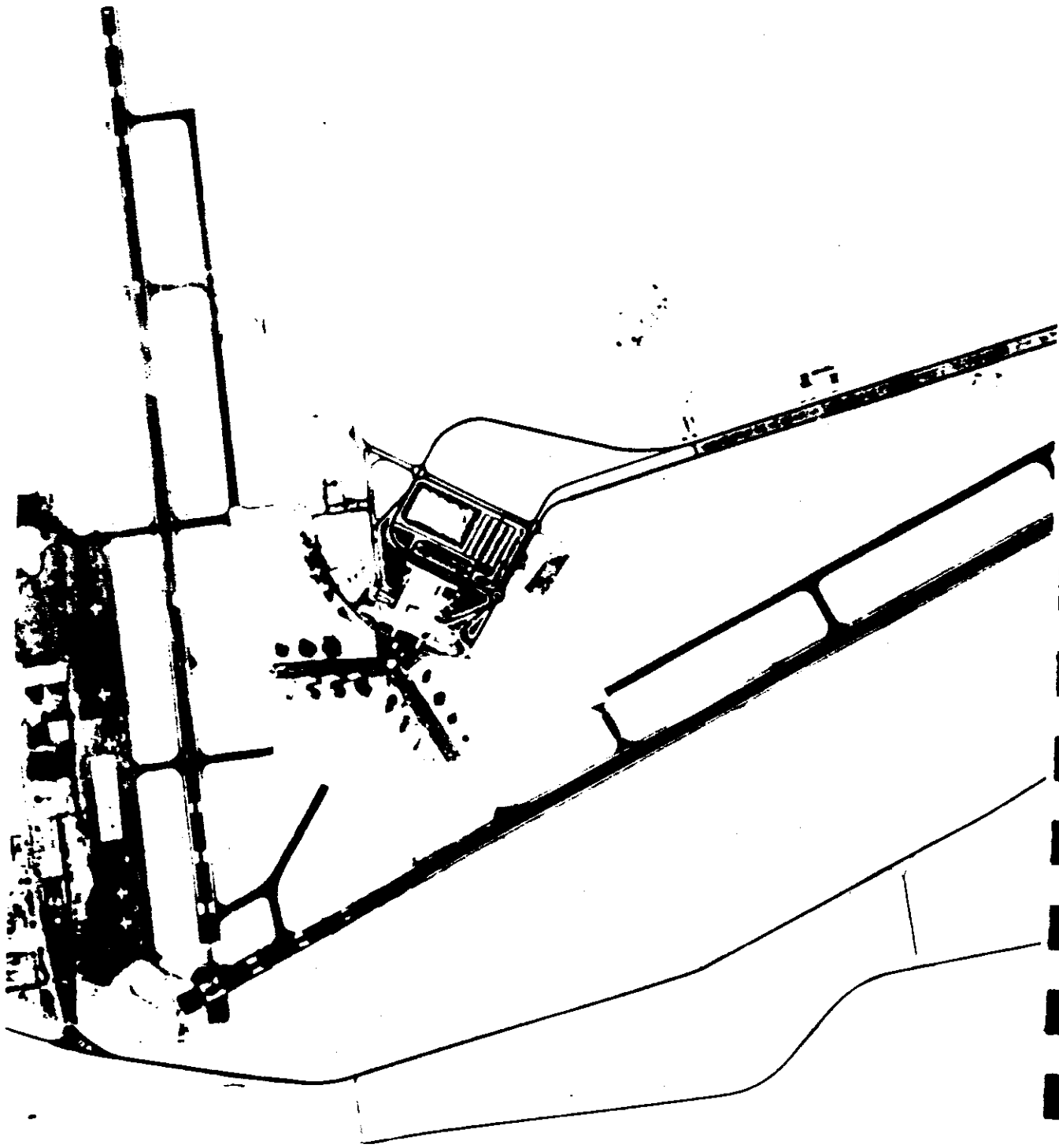

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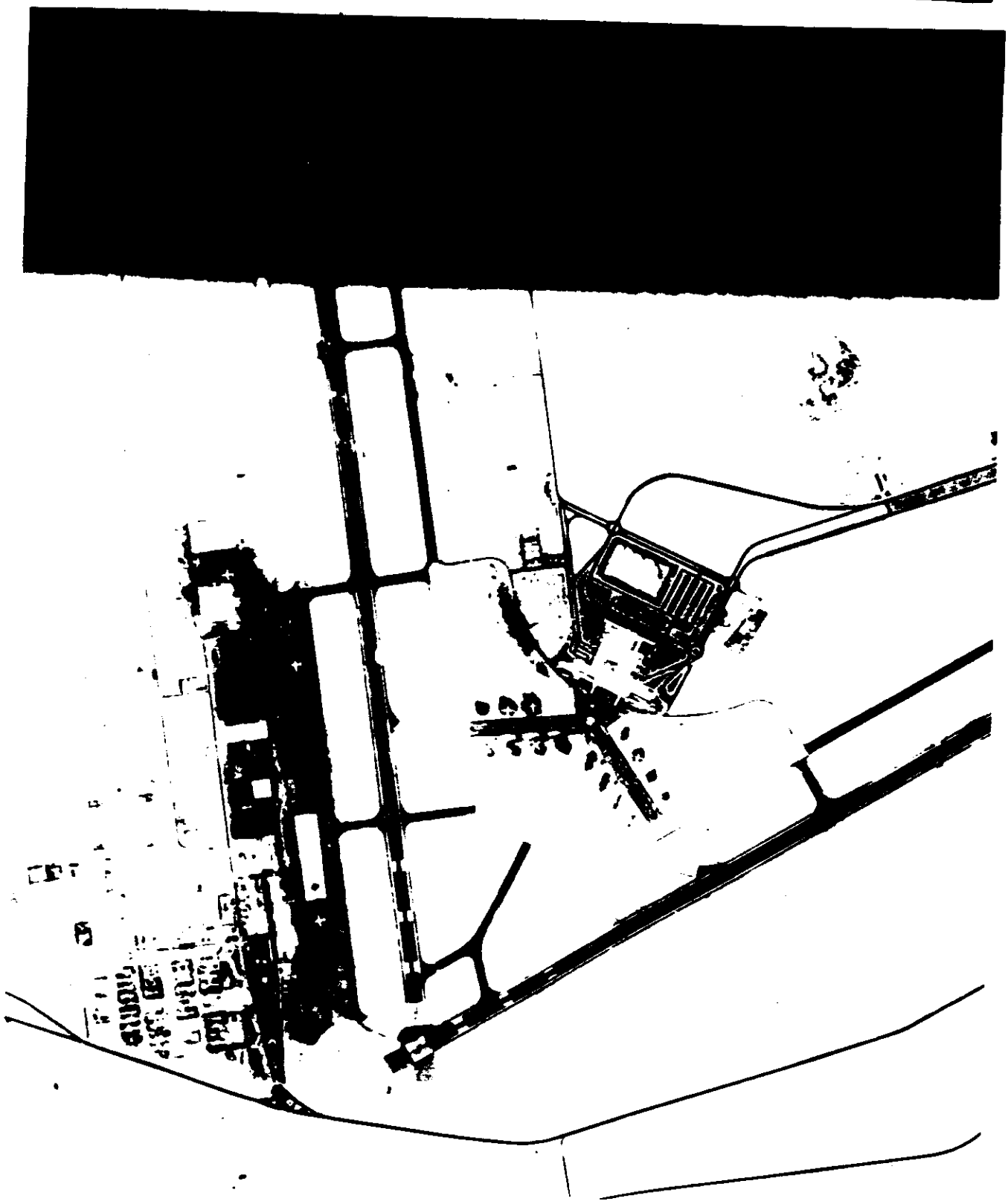
[redacted]



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Special Study: Scan Speed Deviation Analysis of the Forward Camera, Mission 1043

I. Introduction

A. The following Special Study graphically describes the nature and magnitude of the scan speed deviations on the fwd camera photography of Mission 1043. The film of the fwd (master) camera came out of the guide rails on pass 228, causing the remainder of the fwd camera film to be of little or no intelligence value. It is believed that there is a connection between the scan rate anomaly and the pulling of the film from the rails. A scan rate perturbation was first noted on pass 68D during a routine, subjective analysis of the time track. It was observed that the scan rate was slower toward the end of the scan than at the beginning or center of the scan.

B. The object of this analysis is to provide support for the overall evaluation of the mission and background data for future related analysis.

C. It should be noted that the V/H mismatch on pass 120D, which caused extensive image degradation and holidays in the coverage of both panoramic cameras, is not connected with the subject of this study. That anomaly resulted from a programming error rather than a hardware malfunction.

II. Procedure

A. The film was viewed in order to subjectively establish the beginning of the scan rate perturbation. It was determined that the first visible effect was at the supply end of the time track of pass 68D.

B. The time tracks were then measured to objectively determine the beginning and progression of the anomaly. This was accomplished by measuring the distance between each frequency mark in the 200 cycle-per-second (CPS) time track on the frames selected for analysis. The distance from the center of one dot to the center of the next (representing a period of 5 milliseconds, 5/1,000 sec) was then plotted to graphically illustrate the scan rate. A Nistri stereocomparator, Model RIC 1, was used as the measuring device. The Nistri has a measuring accuracy of $\pm$ 1 micron.

C. All measurements on the graphs in this report were made from the center of one dot to the center of the next, beginning at the first dot at the take-up end of the frame. The distance between each dot is recorded in microns through the end of the frame (beginning of scan).

Missing pulses and streaked pulses, indicating S/I camera operation, were given the average distance of the pulses on either side.

D. The graphs are oriented with the X direction representing time in milliseconds, and the Y direction representing the distance between pulses in microns. The beginning of scan starts at the left of the graph. The original curves were smoothed out by hand for presentation herein. The base line of each graph is a plotted line labeled "normal," representing the programmed scan rate as computed from the programmed cycle period. The 5 percent deviation from normal is indicated by lines labeled ± 5 percent.

E. In order to establish the exact beginning of the scan rate retardation, selected frames were measured on passes prior to 68D. The time tracks of several other frames were measured to establish the magnitude and consistency of the anomaly.

III. Analysis

A. Approximately 20 traces were made in association with the analysis. Only the 10 most significant traces were choosen for presentation. The mission, pass, frame, and reason for analysis are as follows for each graph:

Graph 1: Mission 1042-2, pass 183D, frame 23 fwd -- a typical scan rate plot from an earlier mission.

Graph 2: Mission 1043-1, pass 36D, frame 22 fwd -- a typical scan rate, prior to the anomaly, for Mission 1043.

Graph 3: Mission 1043-1, pass 56D, frame 20 fwd -- beginning of the scan rate retardation.

Graph 4: Mission 1043-1, pass 61D, frame 20 fwd -- the scan rate deviation is more pronounced. The maximum scan speed excursion is approximately 19 percent less than the programmed rate.

Graph 5: Mission 1043-1, pass 68D, frame 7 fwd -- continuation of the anomaly. This is the point at which the anomaly was first noted subjectively.

Graph 6: Mission 1043-1, pass 102D, frame 96 fwd -- a frame just prior to the cut and wrap between Missions 1043-1 and 1043-2.

Graph 7: Mission 1043-2, pass 104D, frame 22 fwd -- frame from the first operational pass of Mission 1043-2.

Graph 8: Mission 1043-2, pass 228D, frame 95 fwd -- frame from the pass where the film pulled from the rails. Film came out of the rails at frame 120.

Graph 9: A simulated KH-4B frame with 1 percent deviation line. The graph is included to provide a comparison between the 2 systems.

B. The following table lists 3 expressions of scan speed for each frame in the analysis. The Programmed Scan Rate is interpreted from the flight data information provided in the Camera Performance Estimate. The Ephemeris Scan Rate is computed from the binary time data. The Measured Scan Rate is computed from the time track measurements.

Pass	Frame	Programmed Scan Rate	Ephemeris Scan Rate	Measured Scan Rate
Mission 1042-2		Radius Per Sec	Radius Per Sec	Radius Per Sec
183D	23 fwd	2.791	2.825	2.8705
Mission 1043				
25D*	10 fwd	2.335	2.272	2.518
36D	22 fwd	2.045	2.077	2.201
46D*	18 fwd	2.673	2.685	2.943
56D	20 fwd	2.311	2.277	2.305
57D*	8 fwd	2.635	2.608	2.745
61D	20 fwd	2.594	2.623	2.655
68D	7 fwd	2.159	2.144	2.143
102D	96 fwd	2.600	2.618	2.627
104D	22 fwd	2.500	2.554	2.545
228D	95 fwd	2.652	2.721	2.627

*No graphic illustrations.

C. Frames analyzed in detail but not illustrated graphically in this report include:

1. Traces prior to pass 36D, showing a curve very similar to that of pass 36D, frame 22.

2. Traces on several frames between passes 36D and 56D, showing little or no change.

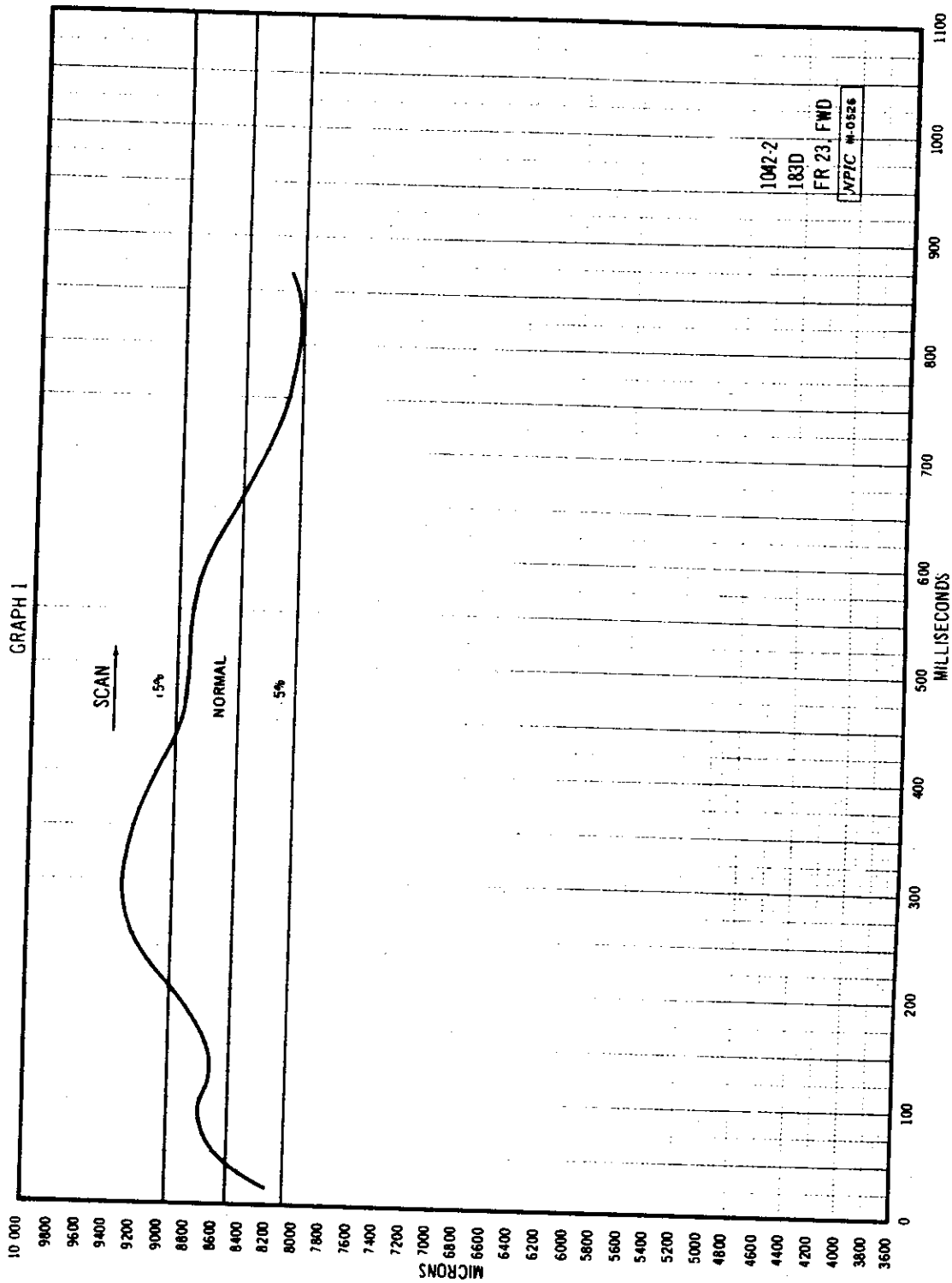
3. Traces of frames between pass 56D and 61D, showing a gradual increase in the magnitude of the scan rate retardation.

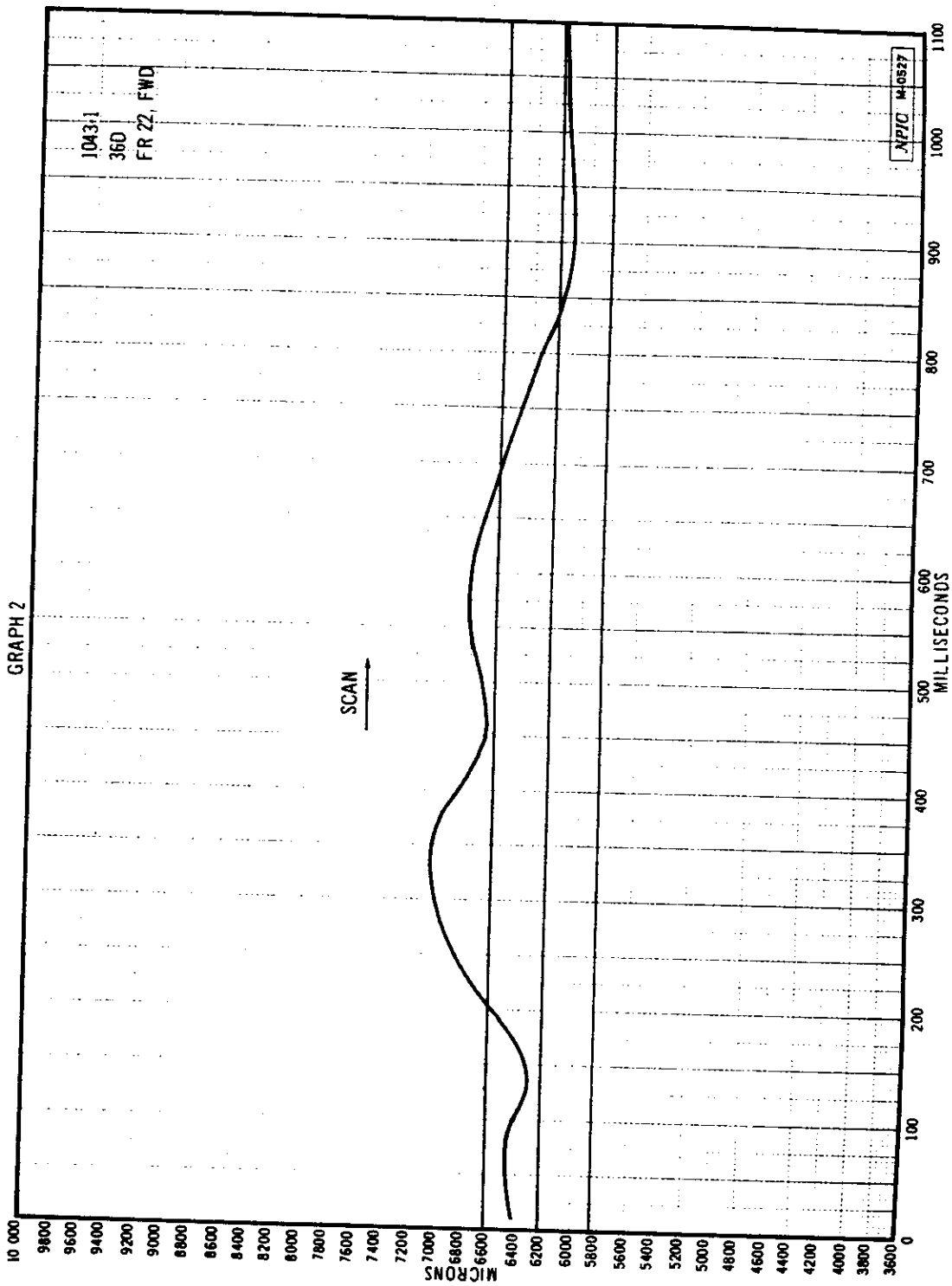
4. Traces generated from frames between passes 61D and 68D. These also show a gradual increase in magnitude of the anomaly.

5. Traces of frames between pass 68D and pass 102D, indicating that the degree of scan rate retardation remained unchanged during that period of the mission.

6. Traces on frames of passes between 104D and 228D, indicating an unchanged continuation of the anomaly.

D. Scan Rate Plots:




GRAPH 2
1043i
360
FR 22, FWD
NPIC M-0527
SCAN
MILLISECONDS
MICRONS
0
100
200
300
400
500
600
700
800
900
1000
1100
10 000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
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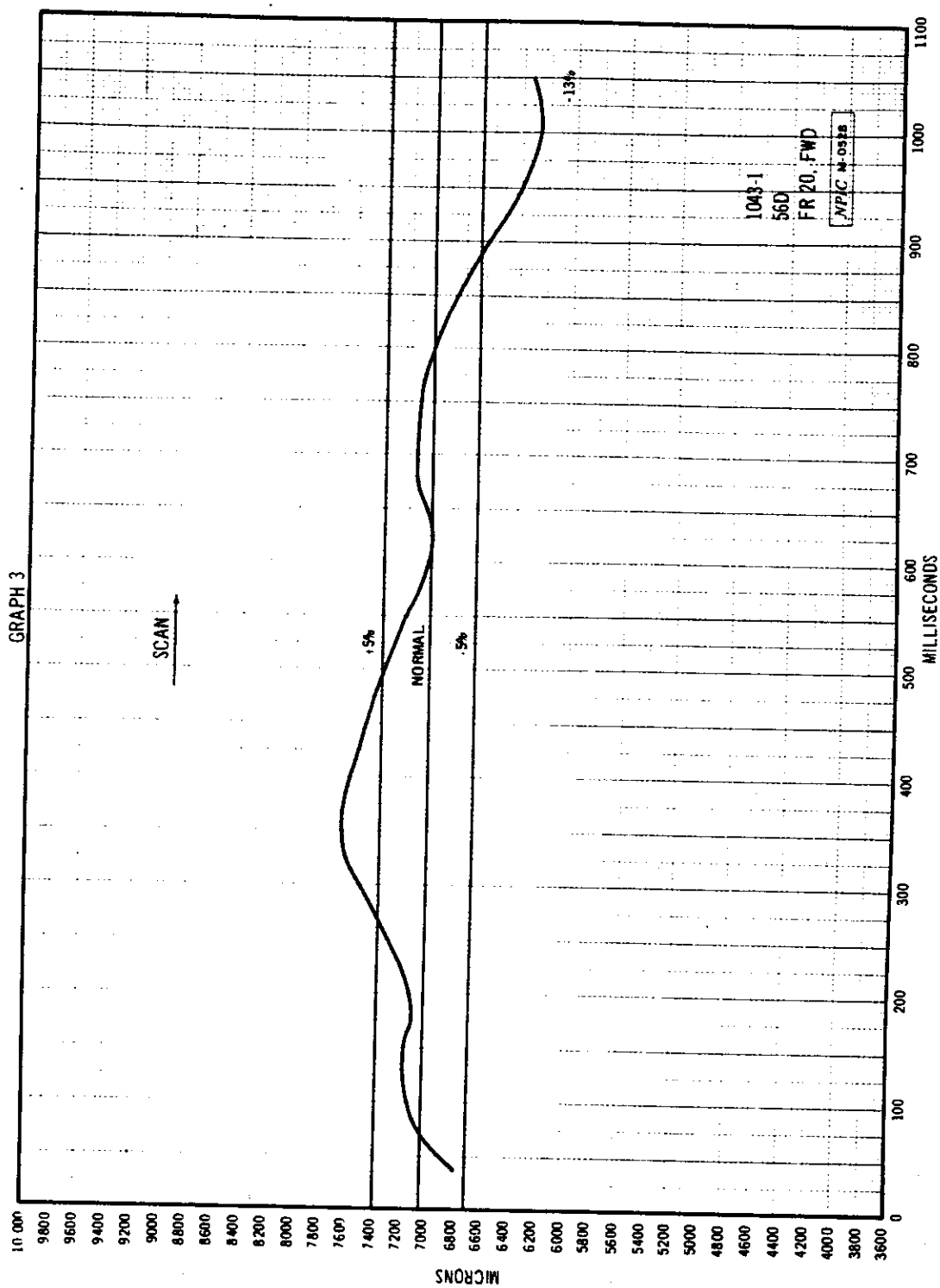
5000
4800
4600
4400
4200
4000
3800
3600


GRAPH 3
SCAN
.5%
NORMAL
.5%
-13%
1043-1
56D
FR 20, FWD
NPIC M-0818
MILLISECONDS
0
100
200
300
400
500
600
700
800
900
1000
1100
MICRONS
10,000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400
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6000
5800
5600
5400
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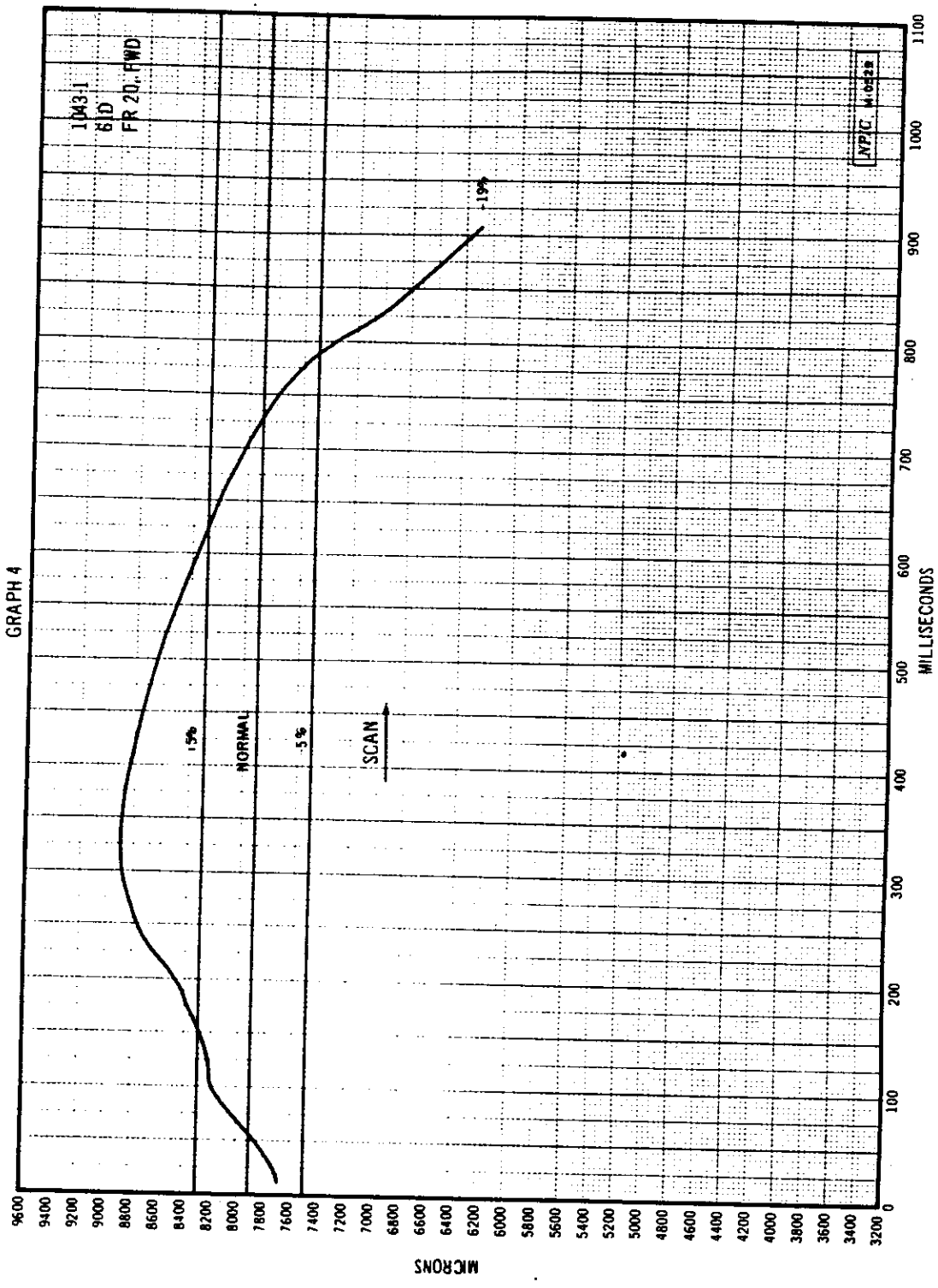
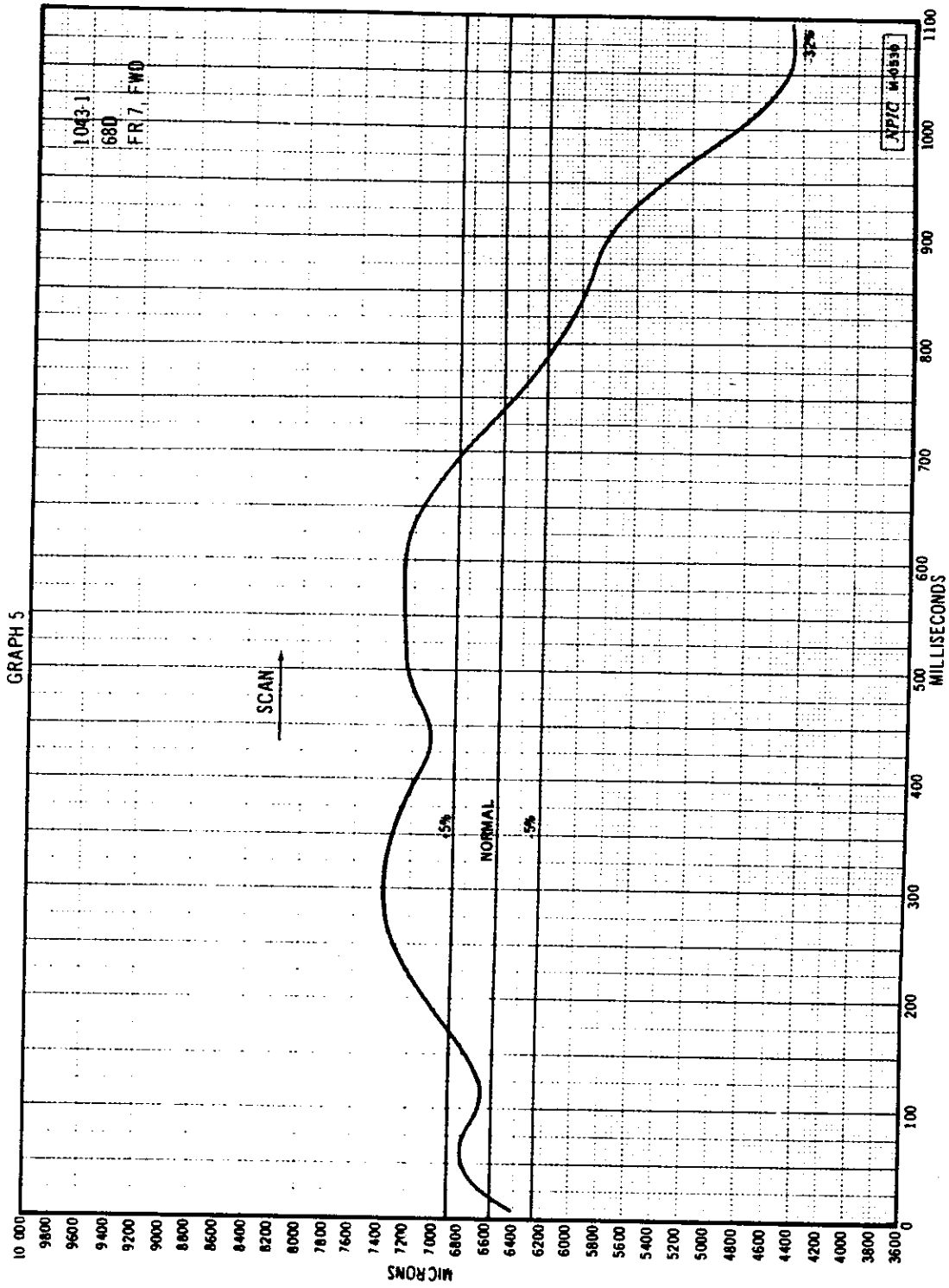
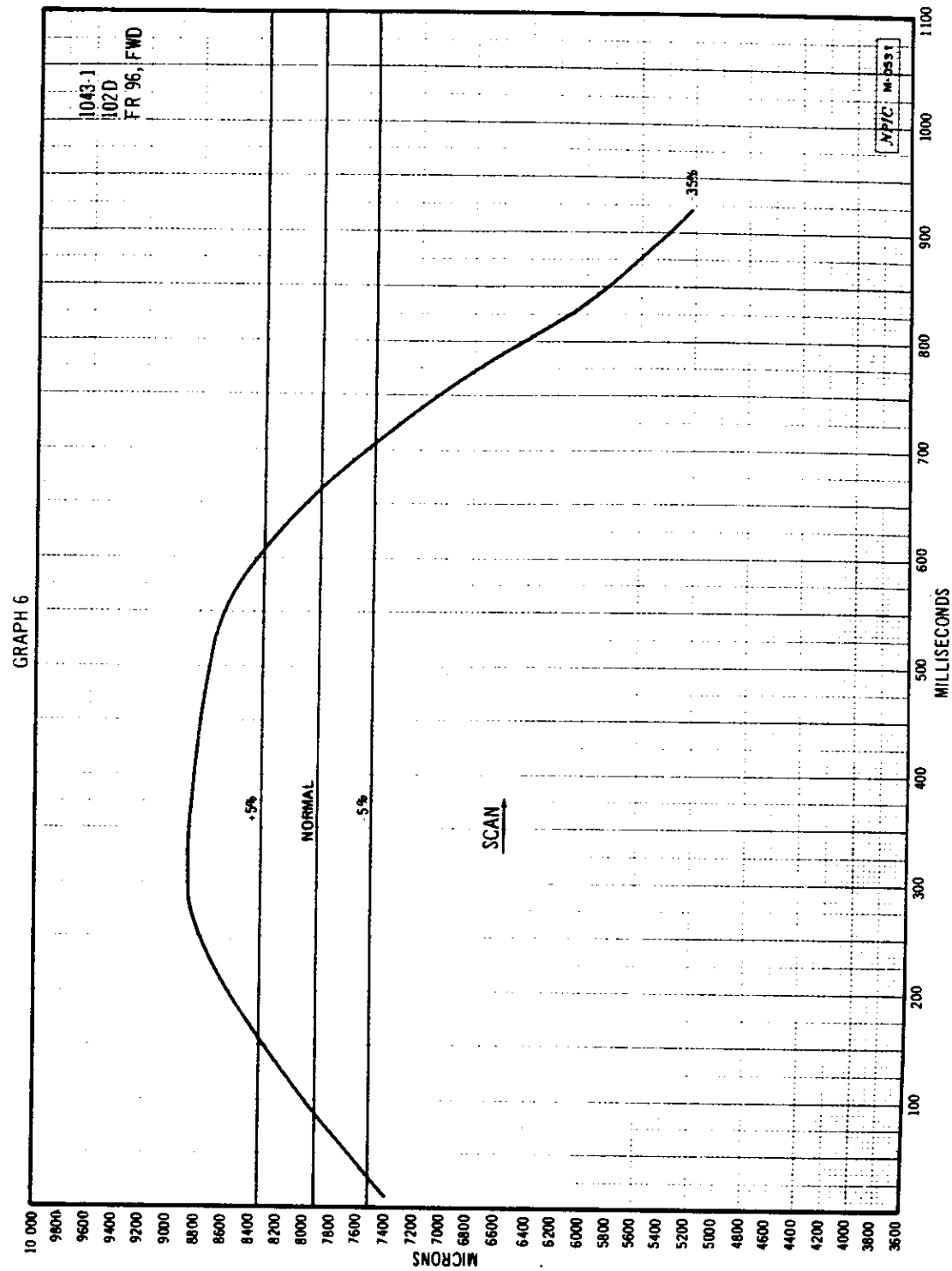
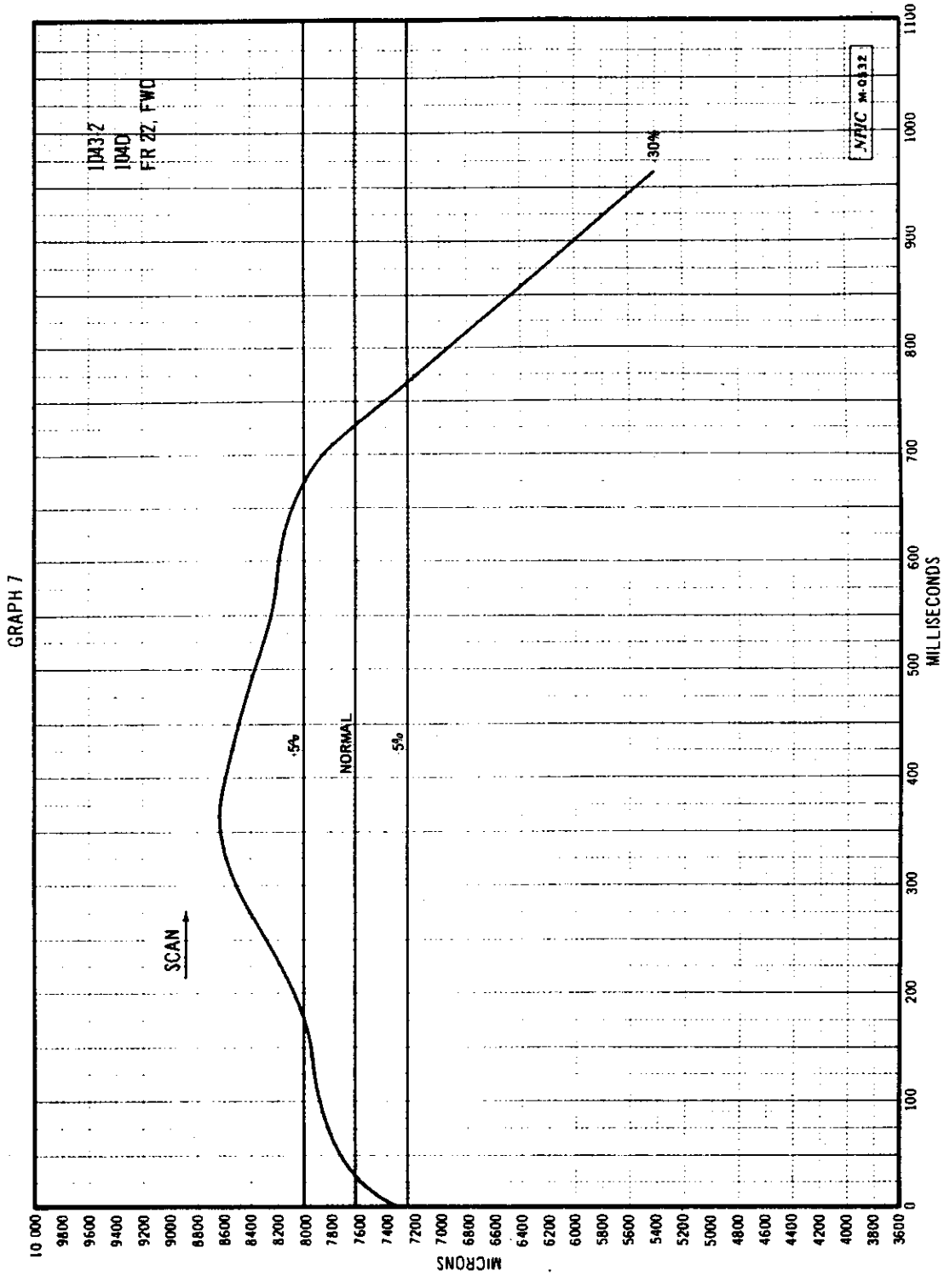
5000
4800
4600
4400
4200
4000
3800
3600


GRAPH 4
1043:1
6 ID
FR 20, FWD
19%
15%
NORMAL
5%
SCAN
MILLISECONDS
MICRONS
0
100
200
300
400
500
600
700
800
900
1000
1100
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400
6200
6000
5800
5600
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
3400
3200


GRAPH 5
1043-1
680
FR 7, FWD
SCAN
5%
NORMAL
5%
MICRONS
MILLISECONDS
10 000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400
6200
6000
5800
5600
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
0
100
200
300
400
500
600
700
800
900
1000
1100


GRAPH 6
1043-1
102D
FR 96, FWD
NPIC M-0551
35%
+5%
NORMAL
-5%
SCAN
MICRONS
MILLISECONDS
10 000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
6600
6400
6200
6000
5800
5600
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
100
200
300
400
500
600
700
800
900
1000
1100


GRAPH 7
1043.2
1040
F/R 22, FWD
VAIC M-0332
30%
5%
NORMAL
5%
SCAN
MILLISECONDS
MICRONS
0
100
200
300
400
500
600
700
800
900
1000
1100
10 000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
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5400
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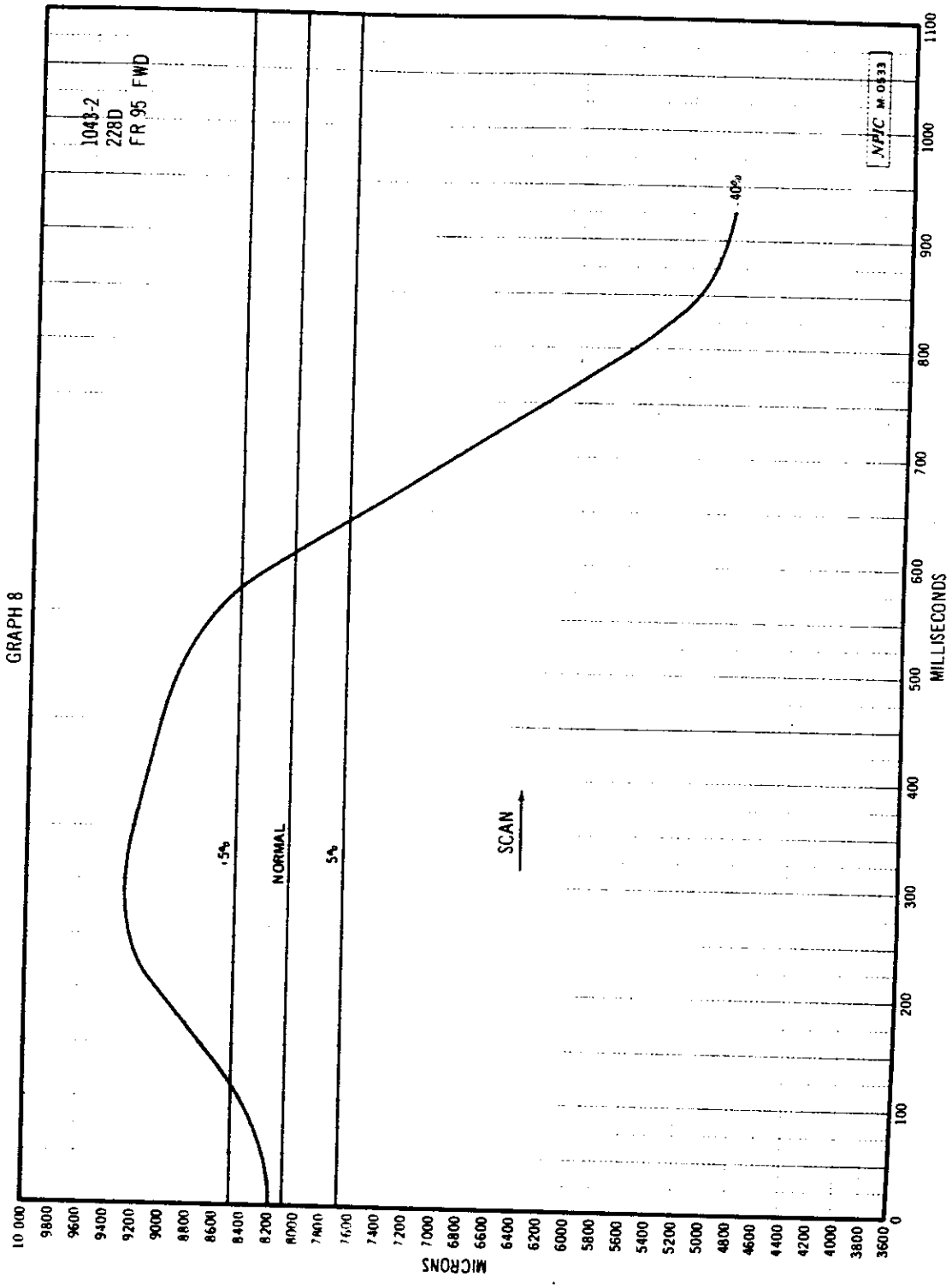
5000
4800
4600
4400
4200
4000
3800
3600


GRAPH 8
1043-2
228D
FR 95 FWD
NPIC M 0833
40%
.5%
NORMAL
5%
SCAN
MILLISECONDS
MICRONS
0
100
200
300
400
500
600
700
800
900
1000
1100
10 000
9800
9600
9400
9200
9000
8800
8600
8400
8200
8000
7800
7600
7400
7200
7000
6800
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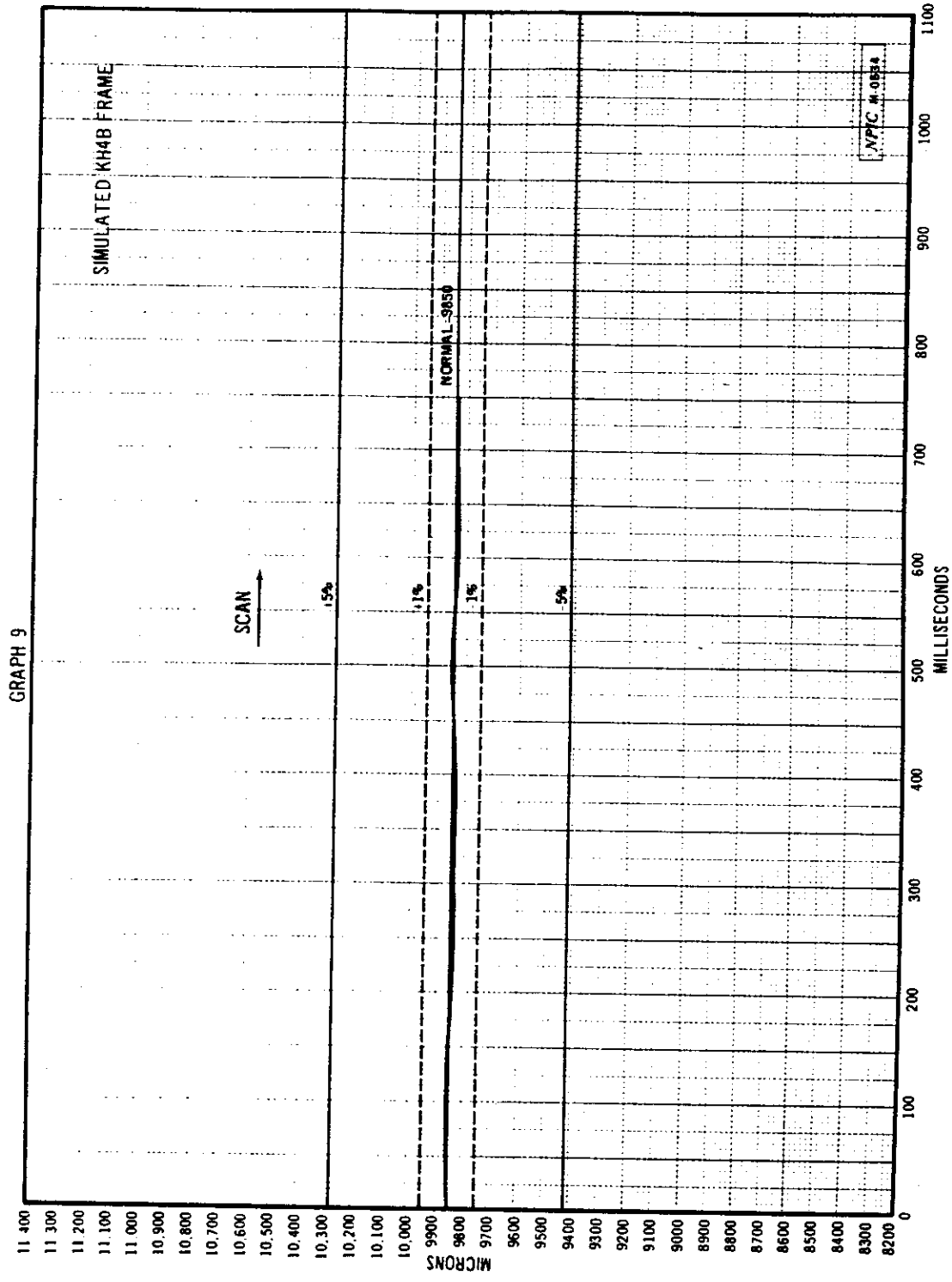
GRAPH 9
SIMULATED KH4B FRAME
SCAN
.5%
.1%
NORMAL-9850
1%
5%
NPIC M-0854
MILLISECONDS
MICRONS
11 400
11 300
11 200
11 100
11 000
10,900
10,800
10,700
10,600
10,500
10,400
10,300
10,200
10,100
10,000
9900
9800
9700
9600
9500
9400
9300
9200
9100
9000
8900
8800
8700
8600
8500
8400
8300
8200
0
100
200
300
400
500
600
700
800
900
1000
1100

IV. Summary

A. The following observations can be made through analysis of the data presented in this study:

1. The scan speed was apparently normal through the first 55 orbital revolutions.

2. The first scan rate retardation of a measurable magnitude is on pass 56D. The maximum error observed on that pass is 10 percent.

3. The magnitude of the scan rate retardation became progressively more pronounced from pass 56D through approximately pass 68D.

4. The variation in scan speed can first be detected subjectively on pass 68D. The magnitude of the error at that point is 32 percent.

5. The magnitude of the scan rate perturbation is about 35 to 45 percent less than the normal scan rate and remains fairly consistent throughout the mission after pass 68D.

6. The degree of scan rate retardation is not changed in association with the cut and wrap between mission segments.