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PHOTOGRAPHIC  
EVALUATION REPORT  
MISSION 1043

SPECIAL STUDY ON SCAN  
SPEED DEVIATION ANALYSIS  
OF THE FORWARD CAMERA



DECEMBER 1967

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# PHOTOGRAPHIC EVALUATION REPORT

## MISSION 1043

DECEMBER 1967

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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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.
COFY 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:  $\text{Exposure Time (sec)} = \frac{\text{Slit Width (in)}}{\text{Scan Rate (in per sec)}}$

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





STELLAR CAMERA	being at the center of the format. 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 than in the "Glossary of NPIC Terminology."



INDEX OF PHOTOGRAPHIC EVALUATION REPORTS AND SPECIAL STUDIES

<u>PER</u>	<u>DOCUMENT NUMBER</u>	<u>SPECIAL STUDY</u>
1033		None
1034		None
1036		None
1037		None
1038		None
1039		None
1040		None
1041		None
		Slant Range Computations Related to Universal Grid Coordinates for the KH-4 Camera System
1042		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

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

C. Orbit Elements

<u>Element</u>	<u>Planned</u>	<u>Actual</u> 1043-1	<u>Actual</u> 1043-2	<u>Photo Range</u>
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		Mission 1043-2		Total	
	Revs	Frames	Revs	Frames	Revs	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

<u>Camera</u>	<u>Frames</u>
Stellar (Mission 1043-1)	443
Index (Mission 1043-1)	443
Stellar (Mission 1043-2)	485
Index (Mission 1043-2)	485





E. Film Usage

	<u>Film Load (TOTAL)</u>	<u>Pre-Flight Footage</u>	<u>Processed Footage</u>
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.

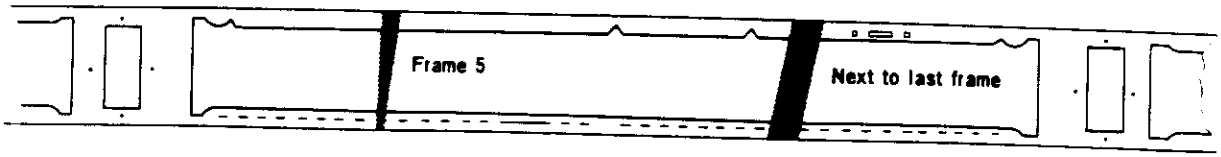
6. Product Quality: Good.



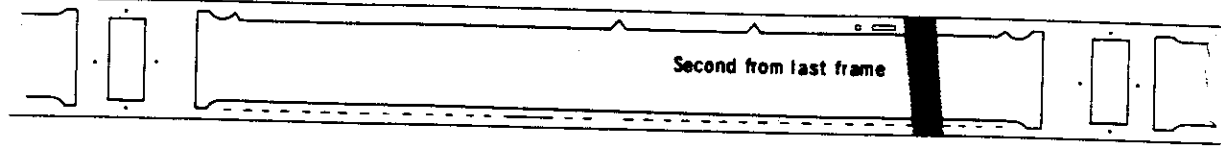
G. Graphic Display (Mission 1043)

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

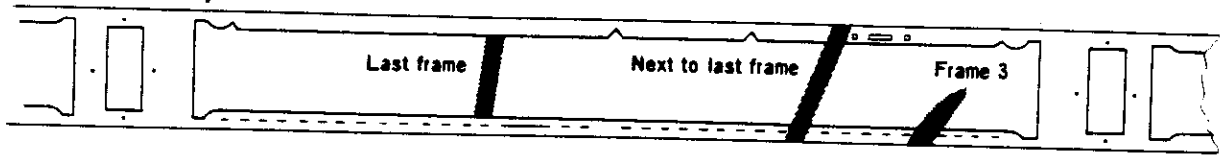
GRAPHIC 1



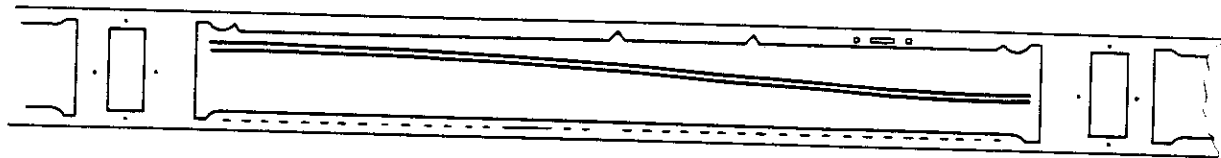
GRAPHIC 2



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 35. 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, 15, 30 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 1C 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.



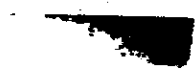
PART IV. MENSURATION QUALITY

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		Part: NA	
	Machine	Gamma	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	Processing				Changes
	Primary	Intermediate	Full	Transition	
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 LA 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)	"	"	None	"
Index (Mission 1043-2)	"	"	"	"

\*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

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

	<u>Mission 1043-1</u>	<u>Mission 1043-2</u>	<u>Totals</u>
Priority 1 Targets Programmed			
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

Target Designator	RESOLUTION TARGET DATA													
	A	B	AI	B	BI	C	CI	A	B	AI	B	BI	C	CI
Target Designator														
Altitude (ft)	33-35N 112-20W	33-35N 112-20W	33-14N 112-18W	33-35N 112-20W	33-14N 112-18W	36-30N 115-10W	36-25N 115-05W	33-35N 112-20W	33-35N 112-20W	33-14N 112-18W	33-35N 112-20W	33-14N 112-18W	36-30N 115-10W	36-25N 115-05W
Camera Number	635,506	635,506	637,304	635,506	637,304	635,356	636,817	635,506	635,506	637,304	635,506	637,304	635,356	636,817
Pitch (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Local Sun Time	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Solar Elevation (deg)	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1238	1238
Solar Azimuth (deg)	68.43	68.43	68.39	68.43	68.39	68.43	68.45	68.43	68.43	68.39	68.43	68.39	66.40	66.45
Exposure (fraction of second)	214	214	214	214	214	214	214	214	214	214	214	214	211	211
Processing Level	1/433	1/433	1/313	1/433	1/313	1/433	1/433	1/433	1/433	1/313	1/433	1/313	1/430	1/315
Vehicle Azimuth (deg)	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Filter (Wratten)	170.56	170.56	170.45	170.56	170.45	170.56	170.45	170.56	170.56	170.45	170.56	170.45	170.24	170.14
Target Type	21	21	23A	21	23A	21	23A	21	21	23A	21	23A	21	23A
Target Contrast	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	51/51 T-Bar	Milt Std 3-Bar	Milt Std 3-Bar
Weather Conditions	5:1	5:1	5:1	5:1	5:1	5:1	5:1	5:1	5:1	5:1	5:1	5:1	High	High
	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	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	Track	Along Track	Across Track	Track	Along Track	Across Track	Track
A	12	12	12	12	12	12	12	12	12
AI	16	16	16	16	16	16	16	16	16
B	16	16	16	16	16	16	16	16	16
BI	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--
CI	12	12	12	12	12	12	12	12	12

NA - Not Available.  
Blank - No Reading Possible.

	D		D1		E		E1		F		F1	
	Single	Aft	Single	Aft	Single	Aft	Single	Aft	Single	Aft	Single	Aft
Target Designator												
Altitude (ft)	34-37N 116-56W	628,593	34-35N 116-52W	629,676	38-06N 076-26W	626,195	38-12N 076-23W	627,255	33-58N 080-42W	625,394	33-58N 080-39W	625,213
Camera	201	NA	200	NA	201	NA	200	NA	201	NA	200	NA
Pitch (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yaw (deg)	NA	NA	NA	NA	NA	NA	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)	1/4.37		1/3.08		1/4.40		1/3.19		1/4.42		1/3.22	
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		
D1			16	16		
E						
E1						
F						
F1						

NA - Not Available.  
 Blank - No Reading Possible.

Target Designator	G		G1		H		H1		I		I1	
	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track
Printing Level	127D	15	127D	15	127D	15	127D	15	127D	15	127D	15
Camera (Looking)	15 Aug 67	24.8-13.7	15 Aug 67	24.8-13.7	15 Aug 67	24.8-13.7	15 Aug 67	24.8-13.7	15 Aug 67	24.5-14.0	15 Aug 67	24.5-14.0
Date of Photography	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-54N 116-56W	34-56N 117-00W	34-56N 117-00W	34-54N 116-56W	34-54N 116-56W
Universal Grid Coordinates	628,972	630,093	628,972	630,093	628,972	630,093	628,972	630,093	628,972	630,093	630,093	630,093
Geographic Coordinate of Format Center	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Altitude (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tilt (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Roll (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yaw (deg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Local Sun Time	1229	1229	1229	1229	1229	1229	1229	1229	1229	1229	1229	1229
Solar Elevation (deg)	68.17	68.19	68.17	68.19	68.17	68.19	68.17	68.19	68.17	68.17	68.19	68.19
Solar Azimuth (deg)	200	200	200	200	200	200	200	200	200	200	200	200
Exposure (fraction of second)	1/436	1/318	1/436	1/318	1/436	1/318	1/436	1/318	1/437	1/437	1/318	1/318
Processing Level	Intermediate	Full	Intermediate	Full	Intermediate	Full	Intermediate	Full	Intermediate	Intermediate	Full	Full
Vehicle Azimuth (deg)	170.42	170.32	170.42	170.32	170.42	170.32	170.42	170.32	170.42	170.42	170.32	170.32
Filter (Wratten)	21	23A	21	23A	21	23A	21	23A	21	21	23A	23A
Target Type	B2	B2	B1	B1	B1	B1	B1	B1	C	C	C	C
Target Contrast	High	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Weather Conditions	Haze	Haze	Cloud Covered	Haze	Cloud Covered	Haze	Cloud Covered	Haze	Haze	Haze	Haze	Haze
Observer Number 1	10	10	10	10	10	10	10	10	10	10	10	10
Observer Number 2	--	--	--	--	--	--	--	--	--	--	--	--
Observer Number 3	16	14	16	14	16	14	16	14	16	16	16	14

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE SECOND GENERATION POSITIVE

NA - Not Available.  
Blanks - No Reading Possible.

PART VII. MISSION DATA

Camera Number	Master Take-up Horizon	Slave Pan	Slave Take-up Horizon	Slave Supply Horizon	Mission 1043-1 Stellar	Mission 1043-2 Stellar
200	NA	201	NA	NA	D107/135/135	D112/143/139
NA	NA	NA	NA	NA	135	139
2092435	12841	2152435	12862	12837	11428	11717
.200	NA	.150	NA	NA	NA	823926
NA	f/6.3	NA	f/6.3	f/8.0	f/1.8	f/1.8
1/325 avg	1/100	1/400 avg	1/100	1/100	f/4.5	f/4.5
2.4	25	21	25	25	1/500	1/500
610,410	54,94	610,430	55,00	55,00	None	None
16,000	NA	16,000	NA	NA	85	85
4	NA	3	NA	NA	75	75
284-4-6-7	284-4-6-7	284-4-6-7	284-4-6-7	284-4-6-7	None	None
3404	3404	3404	3404	3404	183-4-10-6	183-4-10-6
247	*	241	*	*	3401	3401
127	*	127	*	*	*	*
201	*	206	*	*	71 AMAR	73 AMAR
123	*	125	*	*	*	*
177	*	183	*	*	*	*
122	*	121	*	*	*	*

Resolution Data (L/mm)	High Contrast	Low Contrast
Static	241	127
Dynamic	206	125
I High Contrast	183	121
I Low Contrast	*	*
P High Contrast	*	*
P Low Contrast	*	*

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.







~~Handle Via~~  
~~TALENT KEYHOLE~~  
Control System Only



~~Handle Via~~  
~~TALENT KEYHOLE~~  
Control System Only



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

Mission Number. . . . .	1043-1
Stellar Frame Numbers . . . . .	162,163,164
Correlates with	
Main Camera Number . . . . .	200
Pass . . . . .	39D
Frames . . . . .	36 fwd, 43 fwd, 50 fwd
Date of Photography (GMT) . . . . .	10 Aug 67
Enlargement Factor . . . . .	2.5
Exposure Time (sec) . . . . .	1

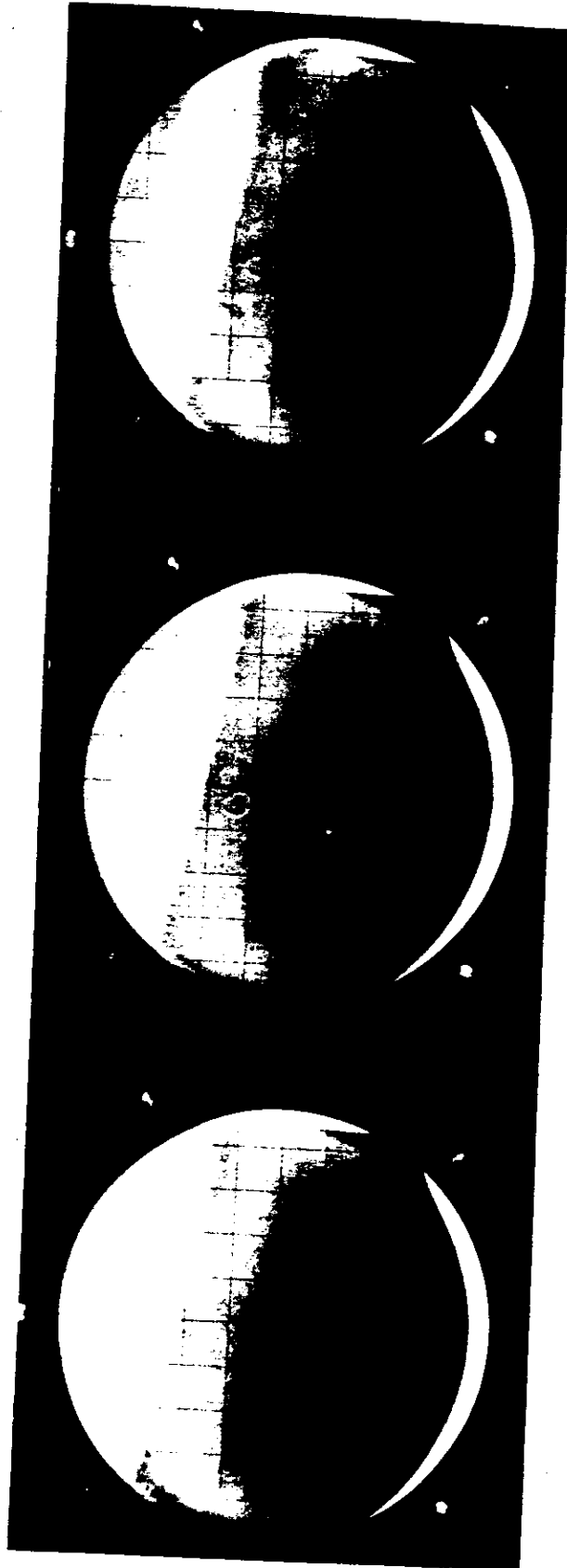
FIGURE 4

1043-2
161,162,163
200
152D
71 fwd, 78 fwd, 85 fwd
17 Aug 67
2.5
2



~~Handle With~~  
~~TALENT KEYHOLE~~  
Control System Only

~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~

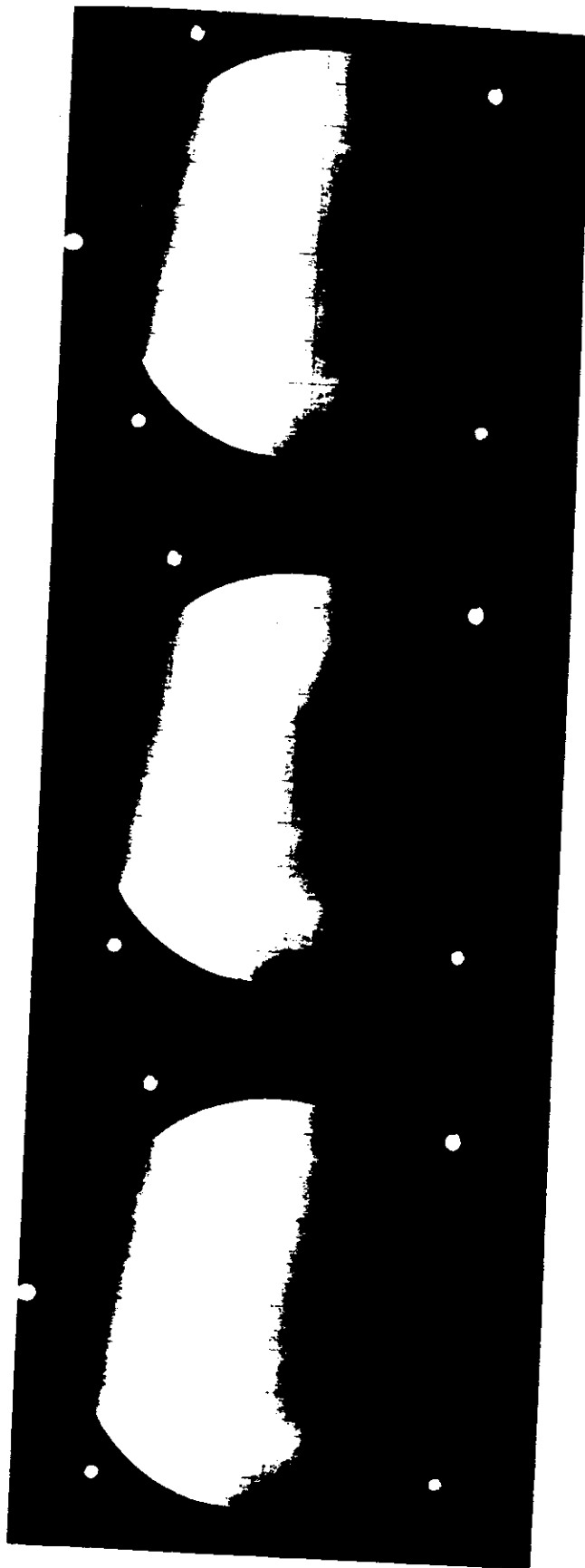


~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~

~~Handle With~~  
~~TALENT KEYHOLE~~  
Control System Only

~~Handle With~~  
~~TALENT-REMOVAL~~  
Control System Only

~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~



~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~

~~Handle With~~  
~~TALENT-REMOVAL~~  
Control System Only

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



FIGURE 5

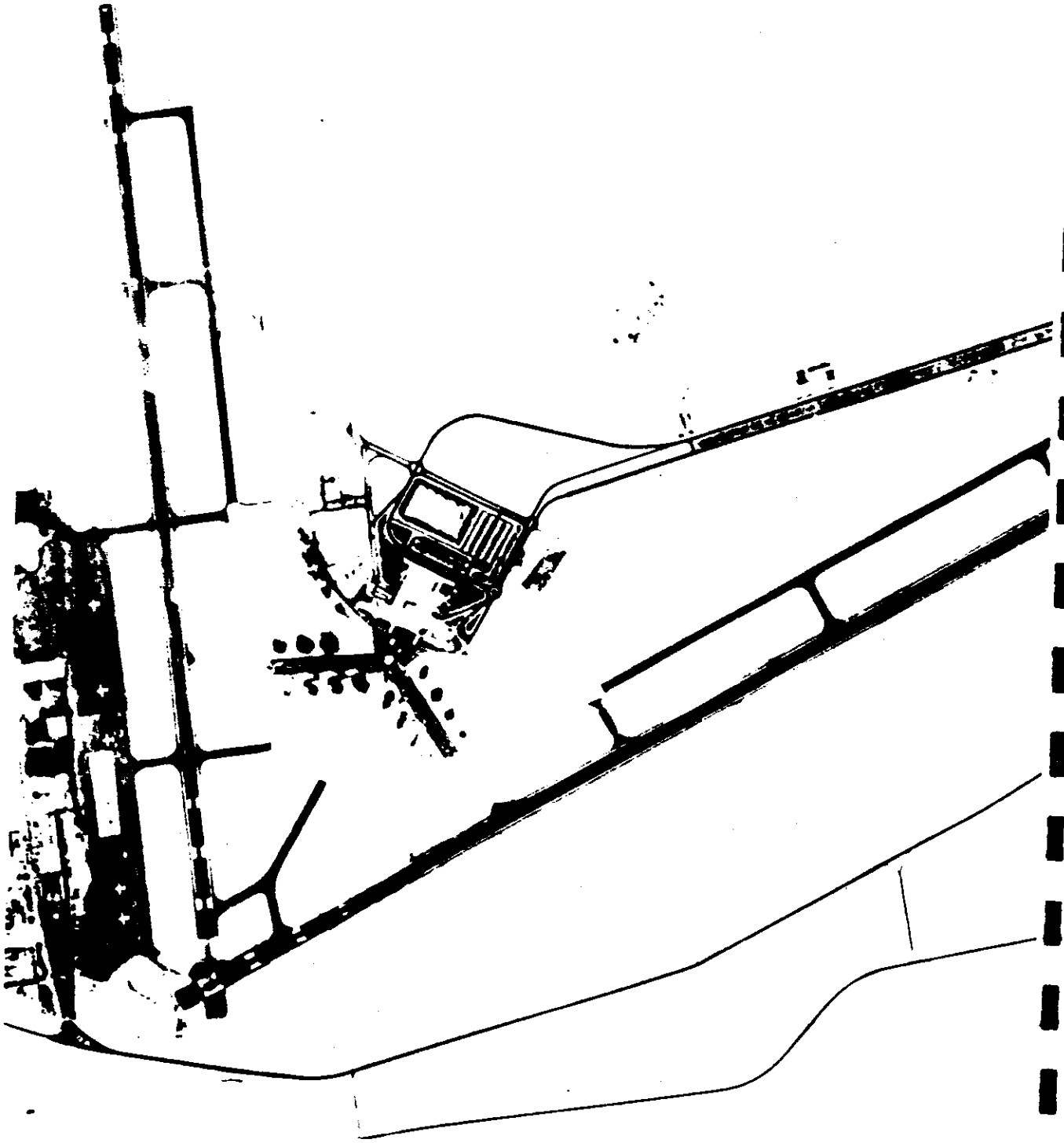
Mission. . . . . 1043-1  
Camera Number. . . . . 201  
Pass . . . . . 41D  
Frame. . . . . 83  
Date of Photography (GMT). . . . . 10 Aug 67  
Universal Grid Coordinates . . . . . 52.0-12.0  
Enlargement Factor . . . . . 20X  
Geographic Coordinates  
(Center of format) . . . . . 30-10N 031-36E  
Altitude (ft). . . . . 649,591  
Camera Attitude  
Pitch (deg). . . . . NA  
Roll (deg) . . . . . NA  
Yaw (deg). . . . . NA  
Local Sun Time . . . . . 1317  
Solar Elevation (deg). . . . . 67  
Solar Azimuth (deg). . . . . 123  
Exposure (sec) . . . . . 1/421  
Vehicle Azimuth (deg). . . . . 171  
Processing Level . . . . . Full

FIGURE 6

1043-2  
201  
216D  
13  
21 Aug 67  
48.5-14.2  
20X  
30-14N 031-28E  
628,663  
NA  
NA  
NA  
1128  
70  
155  
1/444  
171  
Intermediate

~~Handle Via~~  
~~TALENT-KEYHOLE~~  
Control System Only

~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~



~~TOP SECRET - RUFF~~  
~~NO FOREIGN DISSEM~~

~~Handle Via~~  
~~TALENT-KEYHOLE~~  
Control System Only