TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1033

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1033

SEPTEMBER 1967

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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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 text 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.

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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.
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.

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.

[redacted]

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 than in the "Glossary of NPIC Terminology."

[redacted]

INDEX OF PHOTOGRAPHIC EVALUATION REPORTS AND SPECIAL STUDIES

PER	DOCUMENT NUMBER	SPECIAL STUDY
1033	[redacted]	None
1037		None
1038		None
1039		None
1040		None
1041		Slant Range Computations Related to Universal Grid Coordinates for the KH-4 Camera System

SYNOPSIS

Mission 1033, a 2-part photographic satellite reconnaissance mission, was launched into a prograde, 1-day synchronous orbit on 24 May 1966/0200Z. The first payload (Mission 1033-1) was recovered on 29 May 1966/0410Z. The second part (Mission 1033-2) was recovered on 4 June 1966/0217Z. Photography was obtained during 104 orbital revolutions.

All cameras operated satisfactorily throughout the mission except the stellar of the second mission. The shutter of the stellar camera of Mission 1033-2 remained open longer than the programmed exposure duration on approximately 300 frames.

The 1-day synchronous orbit was intended to obtain daily coverage over a large number of high priority targets. The orbit achieved was near circular with an inclination angle of 66°. Photographic perigee was achieved on the ascending portion of the orbit. Both ascending and descending coverage of target areas was accomplished at varied scales, look angles, and lighting conditions.

The image quality of the main cameras is considered to be fair to good. An MIP of 85 is assigned to both segments of the mission. The main degrading factor is the heavy cloud cover for both missions, 45 percent for Mission 1033-1 and 50 percent for Mission 1033-2.

[redacted]

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Forward-Looking Panoramic Camera 194
Aft-Looking Panoramic Camera 195
Stellar/Index Camera (Mission 1033-1) D91/109/105
Stellar/Index Camera (Mission 1033-2) D84/75/102

B. Launch and Recovery Dates

	Mission 1033-1	Mission 1033-2
Launch	24 May 66/0200Z	N/A
Recovery	29 May 66/0410Z	4 Jun 66/0217Z

C. Orbit Elements

	Planned	Actual Rev 42	Actual Rev 130	Actual Photo Range
Period (min)	*	88.928	88.826	N/A
Perigee (nm)	*	101.83	100.45	97.03 (Rev 164A)
Apogee (nm)	*	154.55	151.46	118.91 (Rev 54D)
Eccentricity	*	0.00739	0.00717	N/A
Inclination Angle (deg)	*	66.032	66.032	N/A
Perigee Latitude	*	60.748°N	63.744°N	N/A

* - Not Available.
N/A - Not Applicable.

D. Photographic Operations

1. Panoramic Cameras

Type	Mission 1033-1 Revs	Mission 1033-1 Frames	Mission 1033-2 Revs	Mission 1033-2 Frames	Total Revs	Total Frames
Operational						
Fwd	45	2,914	47	2,835	92	5,749
Aft	44	2,892	47	2,851	91	5,743
Operational/Domestic						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0
Domestic						
Fwd	5	85	7	104	12	189
Aft	5	86	7	104	12	190
Engineering (no imagery)						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0
Totals						
Fwd	50	2,999	54	2,939	104	5,938
Aft	49	2,978	54	2,955	103	5,933

2. Secondary Cameras

Camera	Frames
Stellar (Mission 1033-1)	430
Index (Mission 1033-1)	430
Stellar (Mission 1033-2)	401
Index (Mission 1033-2)	412

E. Film Usage

	Film Load (Total)	Pre-Flight Footage	Processed Footage
Fwd-Looking (Mission 1033-1)	*16,000	308	8,229
Aft-Looking (Mission 1033-1)	*16,000	307	8,200
Fwd-Looking (Mission 1033-2)	NA	NA	7,787
Aft-Looking (Mission 1033-2)	NA	NA	7,810
Stellar (Mission 1033-1)	75	1.39	50
Stellar (Mission 1033-2)	75	2.77	45
Index (Mission 1033-1)	135	**	110
Index (Mission 1033-2)	135	10	93

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

PART II. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: The fwd camera's original negative is considered to be 70 percent medium density, 25 percent thin, and 5 percent heavy. The thin density is attributed to low solar elevations.

2. Contrast: Seventy-five percent of the mission is estimated to be of medium contrast, 20 percent low, and 5 percent high.

3. Acuity: The edge sharpness of the fwd camera film is good. The quality of the fwd camera is comparable on the ascending passes to that of the aft. The aft camera photography is better than the fwd on the descending passes. This change in quality from fwd to aft was observed throughout the mission.

4. Image Degradations

a. Light Leaks

(1) Areas of fog resulting from system light leaks caused minor degradations on the film. The fog density is proportionate to the camera off periods. The fogged areas are located as follows:

(a) Present on the first frame of most passes. (Graphic No 1, page 10).

(b) Present on the fifth frame of a few passes. (Graphic No 2, page 10).

(c) Present on the next-to-last frame of most passes. (Graphic No 3, page 10).

(d) Present on the last frame of most passes. (Graphic No 4, page 10).

b. Static: Minor edge static and some dendritic static was noted on several passes of Mission 1033-2, but was generally associated with manufacturing splices.

5. Physical Degradation: A series of short, fine emulsion scratches is present under the camera number. They are oriented parallel to the major axis of the film and are present throughout the entire width of the format. A tiny metal chip was discovered imbeded in the first frame of pass 82D. It caused small holes and indentations throughout this pass, the cut and wrap pass. The pitch of these holes and dimples corresponds to the diameter of the "B-Bucket" take-up spool core. It was thus determined that the metal chip was introduced through the film during the cut-and-wrap operation.

6. Product Quality: The effect of the imaged and physical degradations on quality is minor. The overall quality of the fwd photography is good. However, imagery along the entire frequency mark edge of the format appears to be slightly out of focus. This condition affects less than 0.5 inch of the format area along the edge. A gradual, rather than an abrupt, shift in focus is present across this 0.5 inch area. This condition prevails throughout the entire mission.

B. Aft-Looking Panoramic Camera

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

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

3. Acuity: The edge sharpness of the aft camera is good. The quality of the aft descending photography is better than the aft ascending photography. It is comparable to the fwd ascending photography. Since perigee was programmed on the ascending portion of the orbit, the larger scale is present on the ascending photography.

4. Imaged Degradations

a. Light Leaks: Degradation caused by the light leaks is considered minor, and the density is commensurate with the duration of the camera off periods. The approximate location of the fog patterns is as follows:

(1) First frame of a few passes. (Graphic No 5, page 10).

(2) Third frame from the end of most passes. (Graphic No 6, page 10).

(3) Second frame from the end of most passes. (Graphic No 7, page 10).

b. Static: Same as reported for the fwd-looking camera.

5. Physical Degradation: Fine emulsion scratches are present under the camera number, just inside the format area, and at the take-up end of each frame throughout the mission. These scratches are oriented parallel to the major axis of the film.

6. Product Quality: The effect of the imaged and physical degradation on quality is minor. Imagery along the camera number edge of the format appears to be slightly out of focus. This condition is similar to that displayed by the forward camera imagery. It affects less than 0.5 inch of the format area along the camera number edge of the format. Like the forward camera imagery, the shift in focus is gradual rather than abrupt with no definite line of demarcation between the good and poor focus.

C. Stellar Camera (Mission 1033-1)

1. Density: Adequate to determine the presence of stellar images.

2. Contrast: Adequate to determine the presence of stellar images.

3. Image Shapes: Some image streaking is evident throughout the mission. In addition, there are streaked images of what is thought to be jettisoned, crystallized fuel particles on the first 20 frames.

4. Image Per Frame: There are 20 or more images on most frames.

5. Flare Level: The density of the flare is moderate and affects about one-third of the format area.

6. Image Degradations

a. Light Leaks: None noted.

b. Static: A series of static traces occurs outside the format area, randomly throughout the mission.

c. Others: A plus density pressure mark, between the correlation mark and the stellar format, begins about halfway through the material and continues throughout the remainder of the mission. Fine emulsion cracking is present on the last 3 feet of the film.

7. Product Quality: The stellar field provided good geometry, and the images were easy to identify.

D. Stellar Camera (Mission 1033-2)

1. Density: The shutter of this stellar camera remained in the open position intermittently throughout the mission. It was open during a portion of or throughout the film transport cycle of approximately 200 frames. The shutter remained open during the platten raise cycle on an additional 100 frames. The effected frames show an increase in density, but not to the point of being unuseable.

2. Contrast: The shutter malfunction lowered the contrast on the effected frames, but stellar images are visible.

3. Image Shape: The majority of stellar images are double, elongated, or "L"-shaped.

4. Images Per Frame: Twenty or more images are visible on each frame.

5. Flare Level: Flare level was high, in association with the shutter malfunction. The flare obscures the stellar images on 13 frames.

6. Image Degradations:

a. Light Leaks: The last foot of the material is fogged. Several stellar images are obscured.

b. Static: None noted.

c. Other: None noted.

7. Physical Degradation: None noted.

8. Product Quality: Stellar reduction was difficult because of the poor image quality.

E. Index Camera (Mission 1033-1)

1. Density: The density of the index film is medium throughout.

2. Contrast: The contrast is medium.

3. Acuity: The image sharpness is good.

4. Imaged Degradations:

a. Light Leaks: None.

b. Static: None.

c. Other: Newton rings are apparent in areas of low contrast and low density.

5. Physical Degradations: None.

6. Product Quality: The image quality is good.

F. Index Camera (Mission 1033-2)

1. Density: The density is generally medium throughout.

2. Contrast: The contrast is medium.

3. Acuity: The image sharpness is good.

4. Imaged Degradations:

a. Light Leaks: The last 12 inches of the film are fogged, obscuring the associated frames.

b. Static: None noted.

c. Other: None noted.

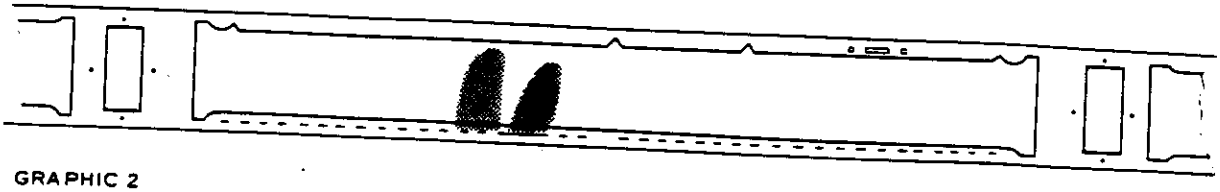
5. Physical Degradations: None.

6. Product Quality: The quality is good throughout, except for the fog noted in item 4a.

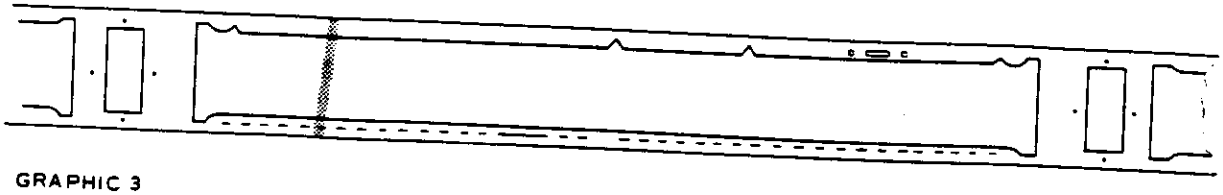
G. Graphic Display (Mission 1033)

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

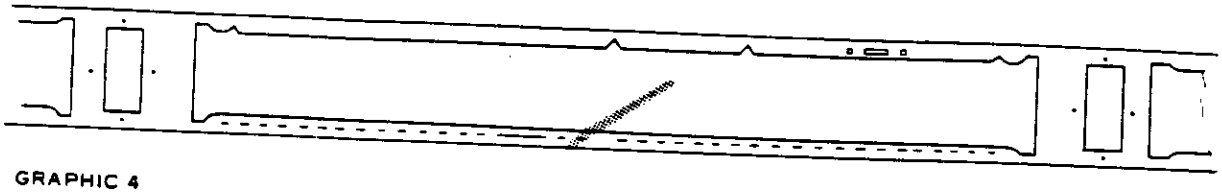
GRAPHIC 1



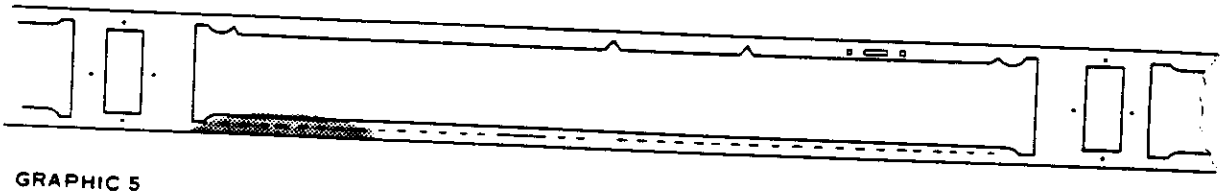
GRAPHIC 2



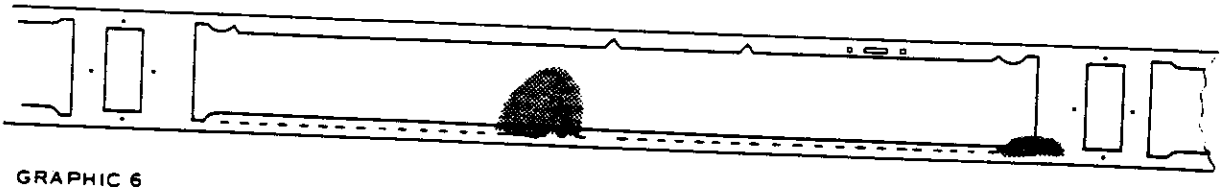
GRAPHIC 3



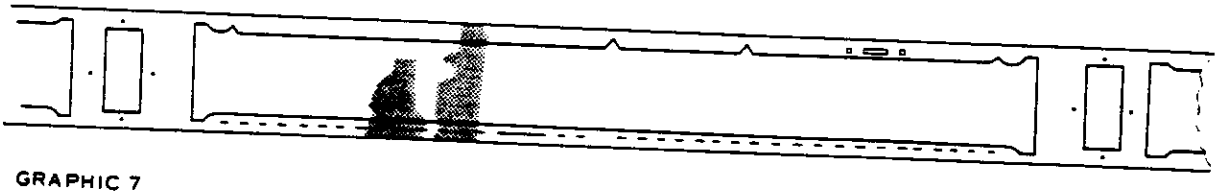
GRAPHIC 4



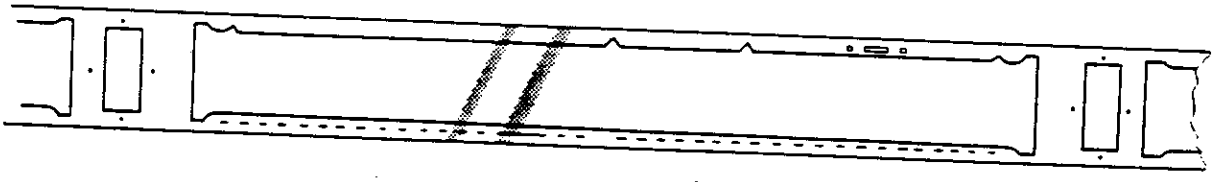
GRAPHIC 5



GRAPHIC 6



GRAPHIC 7



PART III. IMAGED AUXILIARY DATA

A. Fwd-Looking Panoramic Camera

1. Horizon Cameras

a. Starboard-Looking

(1) Imagery: The starboard horizon has a veiled appearance at the beginning of the mission. The veiling gradually lessens and the imagery appears normal by pass 114A and remains clear during the remainder of the mission.

(2) Fiducials: The fiducials are sharp and well defined.

b. Port-Looking

(1) Imagery: The imagery is good, and the earth's curvature is sharp and well defined.

(2) Fiducials: The fiducials are sharp and well defined.

2. Frequency Marks: On several occasions during the mission, the lamp was not completely out between pulses. On these occasions, the frequency mark track is imaged as a continuous line with the individual marks barely distinguishable. Several examples are: frame 13, pass 22D to frame 67, pass 24D and frames 92 and 103, pass 55D.

3. Binary Time Word: No data block images are missing on the first half of the mission, but on part 2 the data block image is missing on frame 57, pass 88D and frame 14, pass 151D. The number 6 light operation was erratic from frame 32, pass 47D. It failed frequently in the positive or "on" position toward the end of the mission. All other lights are of good quality.

4. Binary Index: Good quality and readable.

5. Camera Number: Readable.

6. End of Pass Marker: Operational throughout.

7. Pan-Geometry Dots: Not applicable.

8. Nodal Traces: Not applicable.

9. Nod Indicators: Not applicable.

B. Aft-Looking Panoramic Camera

1. Horizon Cameras

a. Starboard-Looking

(1) Imagery: The imagery of this camera displays a veiled condition throughout the mission. The starboard horizon imagery was not suitable for attitude determination.

(2) Fiducials: Sharp and well defined.

b. Port Horizon

(1) Imagery: The imagery is good, and the earth's curvature is sharp and well defined.

(2) Fiducials: Sharp and well defined.

2. Frequency Marks: Operational throughout the mission.

3. Binary Time Word: The binary image is of good quality throughout except on frame 22, pass 51A where it is missing.

4. Binary Index: The leading index light is fuzzy on frames 76 to 125, pass 152D, and frames 1 to 125, pass 168D.

5. Camera Number: Readable.

6. End of Pass Marks: Did not record after pass 80A.

7. Pan-Geometry Dots: Not applicable.

8. Nodal Traces: Not applicable.

9. Nod Indicators: Not applicable.

C. Stellar Camera (Mission 1033-1)

1. Grid Image Quality: The grid is sharp and well defined.

2. Correlation Lamp Image Quality: Good.

D. Stellar Camera (Mission 1033-2)

1. Grid Image Quality: The grid quality is adversely effected by the heavier density of the frames exposed during the shutter malfunction.

2. Correlation Lamp Image Quality: Good.

E. Index Camera (Mission 1033-1)

1. Grid Image Quality: The grid is sharp and well defined.

2. Correlation Lamp Image Quality: Good.

3. Camera Number Legibility: Readable.

F. Index Camera (Mission 1033-2)

1. Grid Image Quality: The grid is sharp and well defined.

2. Correlation Lamp Image Quality: Good.

3. Camera Number Legibility: Readable.

PART IV. MENSURATION QUALITY

A. Fwd-Looking Panoramic Camera

The mensuration quality of Mission 1033 is considered to be fair for products from this camera system. There were 9 requests for mensuration during the mission. Because of the veiled starboard horizon, a nominal attitude was used for mensuration during the first half of the mission. Two requests required the determination of various dimensions and azimuths at missile complexes. No ground track azimuth was available in the time span required; therefore, vehicle azimuth was used for mensuration purposes.

B. Aft-Looking Panoramic Camera

The mensuration quality of the aft camera product is comparable to that of the fwd camera.

PART V. FILM PROCESSING

A. Processing Machines and Process Gamma

Film	Part: Entire Mission Machine	Gamma	Part: Machine	N/A Gamma
Fwd (Mission 1033-1)	Trenton	2.15		N/A
Aft (Mission 1033-1)	Trenton	2.17		N/A
Fwd (Mission 1033-2)	Trenton	2.39		N/A
Aft (Mission 1033-2)	Trenton	2.23		N/A
Stellar (Mission 1033-1)	*	2.28		N/A
Stellar (Mission 1033-2)	*	2.21		N/A
Index (Mission 1033-1)	*	1.24		N/A
Index (Mission 1033-2)	*	1.26		N/A

B. Processing Levels

1. Panoramic Cameras

Film	Primary	Intermediate	Full	Transition	Processing Changes
Fwd (Mission 1033-1)	0%	3.0%	97.0%	*	8
Aft (Mission 1033-1)	2.5%	8.0%	89.5%	*	25
Fwd (Mission 1033-2)	1.3%	3.9%	94.8%	*	14
Aft (Mission 1033-2)	0.3%	4.7%	95.0%	*	18

* - Not Available.
N/A - Not Applicable.

2. Secondary Cameras

a. Stellar Cameras: No interruption in processing.

b. Index Cameras: No interruption in processing.

Film	Primary	Intermediate	Full	Transition	Processing Changes
Index (Mission 1033-1)					
Index (Mission 1033-2)			Not applicable.		

[redacted]

C. Film Handling Summary

1. Fwd-Looking Camera

a. Capsule De-Filming

(1) Mission 1033-1: Capsule received without the usual harness attachment, resulting in some handling difficulty.

(2) Mission 1033-2: No problems encountered.

b. Pre-Processing Inspection

(1) Mission 1033-1: No problems encountered.

(2) Mission 1033-2: No problems encountered.

c. Manufacturing Splices

(1) Mission 1033-1: Pass 23D, Frame 21; Pass 67A, Frame 1.

(2) Mission 1033-2: Pass 100A, Frame 31; Pass 144A, Frame 8; Pass 150D, Frame 25.

d. Processing Splices

(1) Mission 1033-1: Pass 6D, between Frames 1 and 2.

(2) Mission 1033-2: Only those normal to mission processing.

e. Manufacturing Defects

(1) Mission 1033-1: Only minor defects noted.

(2) Mission 1033-2: Only minor defects noted.

f. Processing Anomalies

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

g. Breakdown

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

[redacted]

2. Aft-Looking Camera

a. Capsule De-Filming

(1) Mission 1033-1: Same as fwd.

(2) Mission 1033-2: No problems encountered.

b. Pre-Processing Inspection

(1) Mission 1033-1: No problems encountered.

(2) Mission 1033-2: No problems encountered.

c. Manufacturing Splices

(1) Mission 1033-1: Pass 35A, Frame 72; Pass 72D, Frame 56.

(2) Mission 1033-2: Pass 104D, Frame 100; Pass 152D, Frame 104.

d. Processing Splices

(1) Mission 1033-1: None other than normal.

(2) Mission 1033-2: Pass 99A, between Frames 29 and 30; Pass 112A, between Frames 3 and 4.

e. Manufacturing Defects

(1) Mission 1033-1: Only minor defects noted.

(2) Mission 1033-2: Only minor defects noted.

f. Processing Anomalies

(1) Mission 1033-1: No major problems encountered.

(2) Mission 1033-2: No major problems encountered.

g. Breakdown

(1) Mission 1033-1: No major problems encountered.

(2) Mission 1033-2: No end-of-pass marks recorded.

3. Index Camera

a. Capsule De-Filming

(1) Mission 1033-1: No problems encountered.

(2) Mission 1033-2: No problems encountered.

b. Pre-Spooling

(1) Mission 1033-1: No static reported.

(2) Mission 1033-2: No static reported.

c. Manufacturing Splices

(1) Mission 1033-1: None.

(2) Mission 1033-2: None.

d. Processing Splices

(1) Mission 1033-1: Head and tail only.

(2) Mission 1033-2: Head and tail only.

e. Manufacturing Defects

(1) Mission 1033-1: None noted.

(2) Mission 1033-2: None noted.

f. Processing Anomalies

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

g. Breakdown

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

4. Stellar Camera

a. Capsule De-Filming

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

b. Pre-Spooling

(1) Mission 1033-1: No static reported.

(2) Mission 1033-2: No static reported.

c. Manufacturing Splices

(1) Mission 1033-1: None.

(2) Mission 1033-2: None.

d. Processing Splices

(1) Mission 1033-1: Head and tail only.

(2) Mission 1033-2: Head and tail only.

e. Manufacturing Defects

(1) Mission 1033-1: None noted.

(2) Mission 1033-2: None noted.

f. Processing Anomalies

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

g. Breakdown

(1) Mission 1033-1: No major problems.

(2) Mission 1033-2: No major problems.

D. Timetable

Film	Recovered	Received at Processing Site	**Spec Ship at NPIC Recd	Priority 1A at NPIC Recd
Fwd (Mission 1033-1)	29 May 66/0410Z	*	None	31 May 66/2253 EDT
Aft (Mission 1033-1)	"	*	"	"
Stellar (Mission 1033-1)	"	*	"	"
Index (Mission 1033-1)	"	*	"	"
Fwd (Mission 1033-2)	4 Jun 66/0217Z	*	"	6 Jun 66/0420 EDT
Aft (Mission 1033-2)	"	*	"	"
Stellar (Mission 1033-2)	"	*	"	"
Index (Mission 1033-2)	"	*	"	"

* - Not available.
**Special Shipment Explanation: There was no special handling associated with this mission.

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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 1033-1	Mission 1033-2	Totals
Priority 1 Targets Programmed	*	*	*
Priority 1 Targets Covered	537	509	1,046

2. PI Quality Appraisal

Rating	Missiles	Nuclear Energy	Air Facilities	Ports	Elect Commo	Military Activity	Complex
Good	506	1	40	1	6	0	13
Fair	1,360	14	56	10	55	0	21
Poor	1,532	28	40	12	41	12	32
Totals	3,398	43	136	23	102	12	66

3. Summary of PI Quality Ratings (Percentage)

Good 567 or 15.0%
Fair 1516 or 40.2%
Poor 1697 or 44.8%
3780

* - Not Available.

C. PI Comments

1. Atmospheric Attenuation

An analysis of atmospheric conditions affecting the priority targets as reported by the photo interpreters during the initial scan of the mission is as follows:

Weather	Number of Targets
Heavy Clouds	258
Scattered Clouds	1,008
Haze	832
Clear	1,682
	3,780

The cloud cover for Mission 1033-1 was 45 percent and for Mission 1033-2 50 percent. The heavy cloud cover has an adverse effect on the PI suitability of many targets.

2. Terrain Conditions: Snow cover on this mission is at a minimum due to the low inclination angle. At this time of the year, there is also an increase in the amount of green vegetation.

3. Product Interpretability: The PI suitability of both portions of Mission 1033 is considered to be from fair to good. An MIP rating of 85 was assigned to both portions of Mission 1033. The 1-day synchronous orbit, in conjunction with the 65° inclination angle, provided multiple coverage over many priority targets on both ascending and descending passes. The near circular orbit provided near equal scale on the ascending and descending passes. The orbit made it possible to obtain photography under various solar conditions.

	Fwd-Looking Camera	Fwd Take-up Horizon	Fwd Supply Horizon	Aft-Looking Camera	Aft Take-up Horizon	Aft Supply Horizon	Mission 1033-1 Stellar	Mission 1033-1 Index	Mission 1033-2 Stellar	Mission 1033-2 Index
Camera Number	194	*	*	195	*	*	D91	D91	D84	D84
Reseau Number	N/A	N/A	N/A	N/A	N/A	N/A	109	105	75	102
Lens Serial Number	2002435	12895	12836	1962435	12874	12849	11359	819190	10727	819957
Slit Width (in)	0.200	N/A	N/A	0.200	N/A	N/A	N/A	N/A	N/A	N/A
Aperture	f/3.5	f/8.0	f/6.3	f/3.5	f/6.3	f/8.0	f/1.8	f/4.5	f/1.8	f/4.5
Exposure Time (sec)	N/A	1/100	1/100	N/A	1/100	1/100	2.0	1/500	2.0	1/500
Filter (Wratten)	21	25	25	21	25	25	None	21	None	21
Focal Length (mm)	609.602	55.00	55.00	609.602	54.90	55.00	84 nom	38.45	84 nom	38.37
Film Length (ft)	16,000	N/A	N/A	16,000	N/A	N/A	75	135	75	135
Splices	5	N/A	N/A	4	N/A	N/A	None	None	None	None
Emulsion	244-3-4-6	244-3-4-6	244-3-4-6	244-3-4-6	244-3-4-6	244-3-4-6	151-48-3-6	113-2-3-6	151-48-3-6	113-2-3-6
Film Type	3404	3404	3404	3404	3404	3404	3401	3400	3401	3400
Resolution Data (L/mm)										
Static										
High Contrast	262	*	*	250	*	*	*	*	*	*
Low Contrast	152	*	*	152	*	*	*	*	*	*
Dynamic										
I High Contrast	187	*	*	192	*	*	*	74 (A)	*	73 (A)
I Low Contrast	119	*	*	119	*	*	*	*	*	*
P High Contrast	182	*	*	169	*	*	*	*	*	*
P Low Contrast	116	*	*	116	*	*	*	*	*	*

N/A - Not Applicable.
* - Not Available.
(A) - AWAR.

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4. Resolution Target Analysis

RESOLUTION TARGET DATA

Target Designator
Camera (Looking)
Pass
Frame
Date of Photography
Universal Grid Coordinates
Geographic Coordinate of Format Center
Altitude (ft)
Camera
  Pitch (deg)
  Roll (deg)
  Yaw (deg)
Local Sun Time
Solar Elevation (deg)
Solar Azimuth (deg)
Exposure (fraction of second)
Processing Level
Vehicle Azimuth (deg)
Filter (Wratten)
Target Type
Target Contrast
Weather Conditions

No resolution targets photographed.

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE

Target Designator	Observer Number 1		Observer Number 2		Observer Number 3	
	Along Track	Across Track	Along Track	Across Track	Along Track	Across Track