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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1047

[redacted]

JANUARY 1969

COPY [redacted]

40 PAGES

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MISSION 1047

JANUARY 1969

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

TABLE OF CONTENTS

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 altitude 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.

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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 test in fractions of a second. Formula: Exposure time (sec) = $\frac{\text{Split Width (in)}}{\text{Scan Rate (in per sec)}}$
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 when a grouping of 3 bars can be distinguished as 3 distinct lines. The lines need not have linear form.

[redacted]

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 than in the "Glossary of NPIC Terminology."

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PER	[redacted]	SPECIAL STUDY
1033		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-4A Camera System
1042		None
1043		Scan Speed Deviation Analysis of the Forward Camera, Mission 1043
1101		Slant Range Computations Related to Universal Grid Coordinates for the KH-4B Camera System
1044		Dual Gamma/Viscose Vs Conventional/Spray Processing Analysis (Mission 1044)
1102		None
1045		None
1046		S0230 Vs 3404 Evaluation
1103		None
1047		None

SYNOPSIS

Mission 1047, a two-part satellite reconnaissance mission, was launched on 20 June 1968 at 2146Z. Both buckets were recovered dry, the first on 29 June 1968/0033Z and the second on 5 July 1968/0001Z.

Both main cameras operated satisfactorily throughout the mission. However, an out-of-focus condition exists at the supply end of many frames of the fwd-looking and aft-looking cameras. A distorted main plate caused the film to track with a bias, resulting in a film buckle away from the plane of focus.

The head (core end) of the aft camera record (Camera No 219), second bucket, was crumpled and creased for approximately 30 to 40 feet. The reason for this anomaly is still unknown.

The image quality of the fwd-looking camera is fair to good with the image quality of the aft-looking camera noticeably better.

An MIP of 85 is assigned to the aft-looking camera. Approximately 30 percent of the mission is cloud covered.

The horizon cameras and the index cameras operated properly throughout both portions of the mission. The stellar camera for Mission 1047-1 contained two blank frames, and two frames were overexposed due to a hung shutter. The stellar camera for Mission 1047-2 developed a shutter malfunction from frame 79 to the end of the mission. However, these frames are suitable for attitude reduction.

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Forward-Looking Panoramic Camera	218
Aft-Looking Panoramic Camera	219
Stellar/Index Camera (Mission 1047-1)	D117/149/146
Stellar/Index Camera (Mission 1047-2)	D118/150/154

B. Launch and Recovery Dates

	Mission 1047-1	Mission 1047-2
Launch	20 Jun 68/2146Z	20 Jun 68/2146Z
Recovery Date	29 Jun 68	5 Jul 68
Time	0033Z	2322Z
Rev	129D	240D

C. Orbit Elements

Element	Planned	Actual (69D)	Actual (160D)	Photo Range
Period (min)	90.44	90.374	90.209	*
Perigee (nm)	100.0	100.300	101.870	99.7 nm, 58D
Apogee (nm)	220.7	221.990	219.120	141.8 nm, 156D
Eccentricity	0.0167	0.01689	0.01630	*
Inclination (deg)	85.0	84.999	84.999	*
Perigee Latitude	NA	34.460	56.896	*

*Not Applicable.

D. Photographic Operations

1. Panoramic Cameras

Type	Mission Revs	1047-1 Frames	Mission Revs	1047-2 Frames	Total Revs	Total Frames
Operational						
Fwd	42	2,891	45	3,026	97	5,917
Aft	42	2,886	45	2,982	97	5,868
Operational/Domestic						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0
Domestic						
Fwd	2	48	6	75	12	123
Aft	2	47	6	73	12	120
Engineering (no imagery)						
Fwd	1	12	1	4	2	16
Aft	1	11	1	4	2	15
Totals						
Fwd	48	2,951	52	3,105	100	6,056
Aft	48	2,946	52	3,059	100	6,005

2. Secondary Cameras

Camera	Frames
Stellar (Mission 1047-1)	450
Index (Mission 1047-1)	450
Stellar (Mission 1047-2)	479
Index (Mission 1047-2)	478

E. Film Usage

	Film Load (Total, ft)	Pre-Flight Footage	Processed Footage
Fwd-Looking (Mission 1047-1)	16,300*	261	8,011
Aft-Looking (Mission 1047-1)	16,300*	251	8,023
Fwd-Looking (Mission 1047-2)	NA	NA	8,192
Aft-Looking (Mission 1047-2)	NA	NA	8,072
Stellar (Mission 1047-1)	75	**	53
Stellar (Mission 1047-2)	75	**	59
Index (Mission 1047-1)	135	**	100
Index (Mission 1047-2)	135	**	121

*Total Load For Both Buckets.
**Not Available.
NA - Not Applicable.

PART II. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: Approximately 68 percent of the original negative is considered to be of medium density, 22 percent of thin density, and 10 percent of heavy density.

2. Contrast: The contrast of the original negative is generally medium. Approximately 27 percent of the film is of low contrast, 60 percent medium contrast, and thirteen percent high contrast.

3. Acuity: An out-of-focus area is present on most frames throughout the mission. This area is up to 6.0 inches long, extending from the supply end toward center format, and extends up to 1.0 inch into the format from the titled edge of the frame. A distorted main plate caused the film to track with a bias, resulting in a film buckle away from the focal plane. The sharpness of the imagery, which is not affected by this anomaly, is comparable to the average produced by this system.

4. Imaged Degradations:

a. Light Leaks: Light leak induced fog patterns are imaged on the fifth and sixth frame from the end of most camera operations. These fog patterns are minor, and their density varies with camera-off durations. The fog patterns are illustrated on Graphics 1 and 2, page 9.

b. Static: Minor dendritic fog patterns are present intermittently along the film edges throughout the second bucket. These fog patterns do not enter the active format area.

c. Other:

(1) A continuous minus density streak is present in the active format, approximately 0.1 inch from the time track edge of each frame throughout the mission. This anomaly is caused by a reflection from the pan geometry rail hole lamps. This reflection caused an alternate dark and light streak along the edge of the active format.

(2) Minor banding is present at the take-up end of most frames.

(3) The format edge, at the binary side, take-up end, becomes slightly ragged from approximately pass 150D to the end of the mission.

5. Physical Degradations:

a. Minor rail scratches are present throughout the mission.

b. Minor emulsion lifts are present throughout pass 129D.

6. Product Quality: The imaged and physical degradations noted above had only minor affects on the product quality. The quality of the forward camera record is considered to be good.

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 imagery obtained from the aft camera is noticeably better than that provided by the forward camera. However, the quality of this mission can only be compared to the average quality obtained with this system. The out-of-focus condition present on the forward camera record is also present on the aft camera record. However, the out-of-focus area is smaller and appears only intermittently throughout the mission.
4. Imaged Degradations:
   a. Light Leaks: Several minor fog patterns are present intermittently throughout the mission. These fog patterns do not seriously degrade the imagery. The fog patterns are illustrated on Graphics 3 and 4, page 9.
   b. Static: Minor dendritic fog patterns are present intermittently along both film edges throughout the material from the second bucket. The patterns are confined to the border areas.
   c. Other:
      (1) A minus density streak, generally aligned with the major axis of the film, is present intermittently on several frames through the mission. The minus density streak is attributed to a foreign particle in the scan head assembly.
      (2) Minor banding is present at the take-up end of most frames.
5. Physical Degradations:
   a. Crumpled film and multiple creases are present in the first 13 frames (120D, frames 121-127; A121E, frames 1-4; and 121D, frames 1-2) of the second bucket. During the de-filming of the second bucket, the following items were noted:
      (1) The full roll was quite normal in appearance, but as film was unwound the roll displayed an out-of-round condition that continued throughout the remainder of the operation.
      (2) Approximately the first 30 feet (core end) were severely creased and/or wrinkled, with the first 20-25 feet wound on the take-up spool in a direction opposite to normal spool rotation.
      (3) The film was jammed between the hub rollers with only a one foot long (instead of the usual 8 feet) free end of film wrapped into the first convolutions.

Inspection of the original negative revealed the following:

      (1) Three separate sets of pressure marks, caused by countersunk bolt holes in the hub assembly, are present.
      (2) The first few feet of film (core end) are crumpled and bent in an unrelatable pattern.
      (3) The remainder of the creases are perpendicular to the

major axis of the film and decrease in magnitude until they cease on frame 2, pass 121D. The creases and bends and their associated heavy-density marks severely degrade the imagery.

b. Emulsion scratches, oriented parallel to the major axis of the film, are present throughout the mission. The number, up to 16, position, and length, not restricted by frame boundaries, varies without an apparent pattern.

6. Product Quality: The imaged and physical degradations, with the exception of the damaged film, had only minor affects on the product quality.

C. Stellar Camera (Mission 1047-1)

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

2. Contrast: Adequate for the detection of stellar images. The stellar record was processed to a gamma of 2.14.

3. Image Shape: Most of the images are of a point type.

4. Images Per Frame: Approximately 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. Image Degradations:

a. Light Leaks: Minor fog patterns are present on two frames (frames 227 and 228) near the end of the mission. The density of this fog makes the detection of stellar images difficult.

b. Static: None noted.

c. Other: Frames 229 and 230 were not exposed due to a shutter failure. However, the fiducials were exposed.

7. Physical Degradations: None noted.

8. Product Quality: Good and comparable to that obtained on recent missions of this system.

D. Stellar Camera (Mission 1047-2)

1. Density: Suitable for the detection of stellar images on frames 1-78. The density of the remaining frames is heavy but stellar images are detectable.

2. Contrast: Adequate for the detection of stellar images. The stellar record was processed to a gamma of 2.20.

3. Image Shape: On frames 1 through 78, most stellar images are of a point type. The stellar images in the remaining frames are elongated due to the overexposure of these frames.

4. Images Per Frame: Approximately 20 stellar images are detectable in the first 78 frames. This number is reduced to 6 to 10 stellar images in the remaining frames due to heavy background density.

5. Flare Level: Flare affects approximately 50 percent of the format on the first 78 frames. Flare was not detected on the remaining frames due to their overexposed condition.

6. Image Degradations:

a. Light Leaks: None noted.

b. Static: None noted.

c. Other: Frames 79 to 479 (last frame) are overexposed due to a shutter failure. Frame 479 is an extra frame and does not have a corresponding index frame.

7. Physical Degradations: None noted.

8. Product Quality: The first 78 frames are good and comparable to that obtained on recent missions of this system. The remaining frames, although overexposed, are suitable for adequate attitude reduction.

E. Index Camera (Mission 1047-1)

1. Density: The density is generally medium.

2. Contrast: Medium. The index record was processed to a gamma of 1.11.

3. Acuity: No acutance measurements were made on this mission. However, the sharpness of the image 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: The product quality is good and comparable to recent missions of this system.

F. Index Camera (Mission 1047-2)

1. Density: The density is generally medium.

2. Contrast: Medium. The index record was processed to a gamma of 0.93.

3. Acuity: No acutance measurements were made on this mission. However, the sharpness of the image is good and comparable to recent missions of this system.

4. Imaged Degradations:

a. Light Leaks: None noted.

b. Static: None noted.

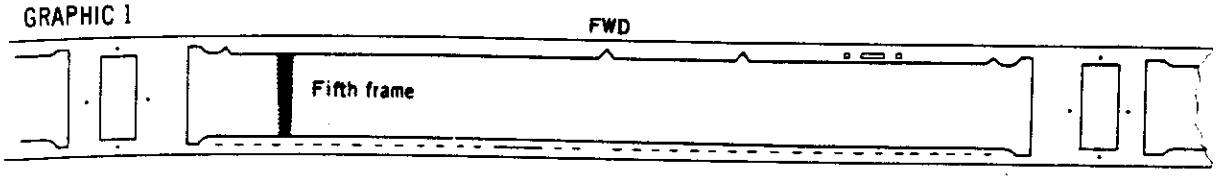
5. Physical Degradations: None noted.

6. Product Quality: The product quality is good and comparable to recent missions.

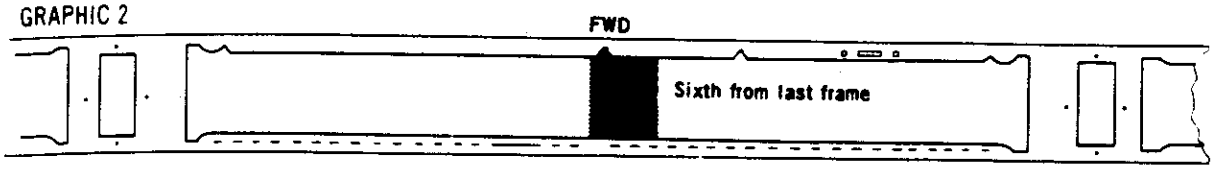
G. Graphic Display (Mission 1047)

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

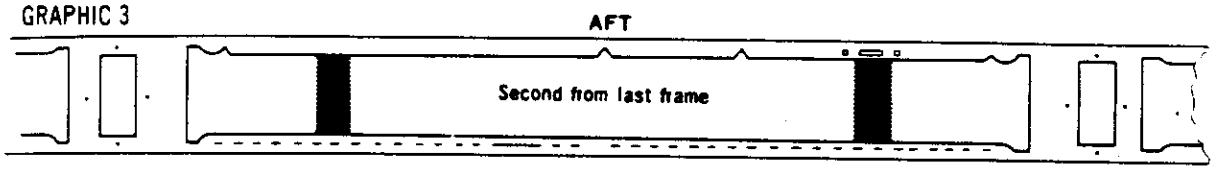
GRAPHIC 1



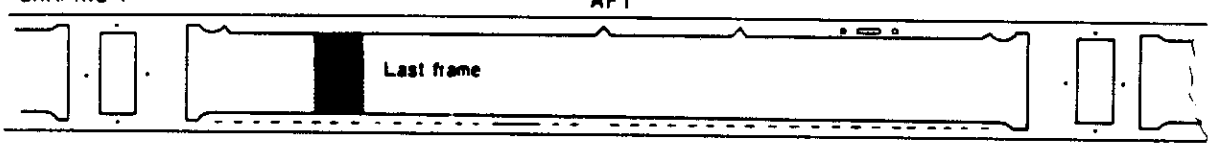
GRAPHIC 2



GRAPHIC 3



GRAPHIC 4



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PART III. IMAGED AUXILIARY DATA

A. Fwd-Looking Panoramic Camera

1. Horizon Cameras:
   a. Starboard-Looking
      (1) Imagery: Clear and distinct.
      (2) Fiducials: Sharp and well defined.
   b. Port-Looking
      (1) Imagery: Clear and distinct.
      (2) Fiducials: Sharp and well defined.

2. Frequency Marks: The frequency marks are erratic and/or missing for approximately 35 percent of the mission. In most instances, the streaked pulse initiated a start of the frequency marks. The density of the frequency marks decreases as the mission progressed. Approximately a quarter way through the mission, the density becomes thin enough to make detection of the frequency mark image difficult. The cause of this anomaly is related to the "dark effect" of the neon lamps. After periods of inactivity, especially in a low light environment, the threshold level required to fire the neon lamps is increased. In some cases, this level is marginal and requires an extended pulse, such as the streaked pulse to ionize the lamp. Once the lamp is on, the level required to sustain ignition is less.

3. Binary Time Word: Sharp and well defined. On several occasions, the number 16 light did not read properly in the automatic time word reader, due to a comet-like tail on the left index light. This resulted in a few passes being read entirely by hand. Pass 165D, frame 74 had a manufacturer's splice through the binary word.

4. Binary Index: Generally sharp and well defined. However, in a few instances it appeared comet-like in shape and caused the number 16 light not to read properly.

5. Camera Number: Readable.

6. Pan Geometry Dots: Not applicable.

7. Nodal Traces: Not applicable.

8. Nod Indicators: Not applicable.

B. Aft-Looking Panoramic Camera

1. Horizon Cameras:
   a. Starboard-Looking
      (1) Imagery: Clear and distinct.
      (2) Fiducials: Sharp and well defined.

2. Frequency Marks: The frequency marks are missing for up to 18 inches on the first frame of several camera operations. The reason for this anomaly is explained in Part III, A, 2.

3. Binary Time Word: Sharp and well defined on most passes. The binary block was not parallel to the edge of the film, and the left index light is comet-like in shape. Because of this, many of the passes near the end of the mission could not be read by the automatic time word reader and had to be read by hand. A special TI duplicate positive is used for reading the binary time word.

4. Binary Index: Sharp and well defined. However, in a few instances it appeared comet-like in shape, making the automatic reading of the binary word difficult.

5. Camera Number: Readable.
6. Pan Geometry Dots: Not applicable.
7. Nodal Traces: Not applicable.
8. Nod Indicators: Not applicable.

C. Stellar Camera (Mission 1047-1)

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

D. Stellar Camera (Mission 1047-2)

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

E. Index Camera (Mission 1047-1)

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 1047-2)

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

A total of 88 requests was received for mensuration on this mission. No problems were encountered. From a mensuration standpoint, the image quality is considered normal for this system.

B. Aft-Looking Panoramic Camera

Same as reported for the fwd-looking camera.

PART V. FILM PROCESSING

A. Processing Machines and Processing Gamma

Film	Processor	Entire Mission Gamma	
Fwd (Mission 1047-1)	Trenton	2.34	
Aft (Mission 1047-1)	Trenton	2.34	
Fwd (Mission 1047-2)	Trenton	2.20	
Aft (Mission 1047-2)	Trenton	2.20	
Stellar (Mission 1047-1)	Trenton	2.14	Single Level Process.
Stellar (Mission 1047-2)	Trenton	2.20	Single Level Process.
Index (Mission 1047-1)	Drape	1.11	Single Level Process.
Index (Mission 1047-2)	Drape	0.93	Single Level Process.

B. Processing Levels

1. Panoramic Cameras

Film	Primary	Intermediate	Full	Transition	Processing Changes
Fwd (Mission 1047-1)	2%	8%	81%	9%	24
Aft (Mission 1047-1)	1%	9%	82%	8%	18
Fwd (Mission 1047-2)	1%	3%	88%	8%	18
Aft (Mission 1047-2)	1%	3%	91%	5%	14

C. Film Handling Summary

1. Fwd-Looking Camera:
   - a. Capsule De-filming
     - (1) Mission 1047-1: No problems encountered.
     - (2) Mission 1047-2: No problems encountered.
   - b. Pre-Processing Inspection
     - (1) Mission 1047-1: No problems encountered.
     - (2) Mission 1047-2: No problems encountered.
   - c. Manufacturing Splices
     - (1) Mission 1047-1: Pass 88D, frame 72.
     - (2) Mission 1047-2: Pass 165D, frame 74.
   - d. Processing Splices
     - (1) Mission 1047-1: None other than normal.
     - (2) Mission 1047-2: None other than normal.
   - e. Manufacturing Defects
     - (1) Mission 1047-1: None noted.
     - (2) Mission 1047-2: None noted.
   - f. Processing Anomalies: None.
   - g. Breakdown: No problems encountered.

2. Aft-Looking Camera
   a. Capsule De-filming
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: As the film was unwound, it displayed an out-of-round condition that continued throughout the remainder of the de-filming operation. The first 20 to 25 feet (core end) of film was wound on the take-up spool in a direction opposite to normal spool rotation. The film was jammed between the hub rollers with only a one foot long (instead of the usual eight feet) free end of film wrapped into the first convolutions. This anomaly is explained in Part II, D-5.
   b. Pre-Processing Inspection
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: Approximately 30 to 40 feet of the head (core end) contains severe creases and/or wrinkles. This anomaly is explained in Part II, D-5.
   c. Manufacturing Splices
      (1) Mission 1047-1: Pass 87D, frame 100.
      (2) Mission 1047-2: Pass 165D, frame 80, Pass 212D, frame 137.
   d. Processing Splices
      (1) Mission 1047-1: None other than normal.
      (2) Mission 1047-2: None other than normal.
   e. Manufacturing Defects
      (1) Mission 1047-1: None noted.
      (2) Mission 1047-2: None noted.
   f. Processing Anomalies: None.
   g. Breakdown: No problems encountered.

3. Index Camera
   a. Capsule De-Filming
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: No problems encountered.
   b. Pre-Processing Inspection
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: No problems encountered.
   c. Manufacturing Splices
      (1) Mission 1047-1: None.
      (2) Mission 1047-2: None.
   d. Processing Splices
      (1) Mission 1047-1: None other than normal.
      (2) Mission 1047-2: None other than normal.
   e. Manufacturing Defects
      (1) Mission 1047-1: None noted.
      (2) Mission 1047-2: None noted.

f. Processing Anomalies: None.
g. Breakdown: No problems encountered.

4. Stellar Camera
   a. Capsule De-Filming
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: No problems encountered.
   b. Pre-Processing Inspection
      (1) Mission 1047-1: No problems encountered.
      (2) Mission 1047-2: No problems encountered.
   c. Manufacturing Splices
      (1) Mission 1047-1: None.
      (2) Mission 1047-2: None.
   d. Processing Splices
      (1) Mission 1047-1: None other than normal.
      (2) Mission 1047-2: None other than normal.
   e. Manufacturing Defects
      (1) Mission 1047-1: None noted.
      (2) Mission 1047-2: None noted.
   f. Processing Anomalies: None.
   g. Breakdown: No problems encountered.

[redacted]

D. <u>Timetable:</u>

Film	Recovered	Received at Processing Site	Special Shipment	Priority 1A Received at NPIC
Fwd (Mission 1047-1)	29 Jun 68/0033Z	NA	None	1 Jul 68/1136Z
Aft (Mission 1047-1)	"	"	"	"
Stellar (Mission 1047-1)	"	"	"	"
Index (Mission 1047-1)	"	"	"	"
Fwd (Mission 1047-2)	5 Jul 68/2322Z	"	"	10 Jul 68/1701Z
Aft (Mission 1047-2)	"	"	"	"
Stellar (Mission 1047-2)	"	"	"	"
Index (Mission 1047-2)	"	"	"	"

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 1047-1	Mission 1047-2	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	163	33	196

2. PI Quality Appraisal

Rating	Missiles	Nuclear Energy	Air Facilities	Ports	Elect Commo	Military Activity	Complex
Good	6	0	1	10	0	0	4
Fair	72	6	20	0	0	21	15
Poor	33	2	11	2	0	27	14
Totals*	111	8	32	12	0	48	33

3. Summary of PI Quality Ratings

Good 21 or 8.6%
Fair 134 or 54.9%
Poor 89 or 36.5%

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

C. PI Comments

1. Atmospheric Attenuation: The following is an analysis of the atmospheric conditions affecting the priority 1 targets as reported by the photo interpreters during the initial readout of the mission.

Weather	Number of Targets	
a. Clear	131	46.0 percent
b. Scattered Clouds	76	26.7 percent
c. Heavy Clouds	18	6.3 percent
d. Haze	42	14.7 percent
e. Cloud Shadow	18	6.3 percent

2. Terrain Conditions: The terrain conditions on this mission are normal for this time of year.

3. Product Interpretability: The interpretability of Mission 1047-1 and Mission 1047-2 is rated as fair and comparable to recent missions of this camera system. The aft-looking panoramic camera provided better image quality than the fwd-looking panoramic camera. The out-of-focus areas are a degrading factor in the interpretability of the material.

4. Resolution Target Analysis

RESOLUTION TARGET DATA

Target Designator	1		2	
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	95	95	95	95
Frame	5	4	7	6
Date of Photography	26 Jun 68	26 Jun 68	26 Jun 68	26 Jun 68
Universal Grid Coordinates	75.6-13.8	16.3-12.5	61.7-12.3	29.9-14.2
Geographic Coordinates of Format Center	36-35N 116-33W	36-39N 116-39W	36-17N 116-31W	36-20N 116-38W
Altitude (ft)	608,671	608,256	608,502	608,115
Camera				
Pitch (deg)	15°06'	-14°44'	15°05'	-14°44'
Roll (deg)	-0°02'	-0°05'	-0°04'	-0°06'
Yaw (deg)	-2°20'	-2°19'	-2°21'	-2°21'
Local Sun Time	1305	1305	1305	1305
Solar Elevation (deg)	70°09'	70°08'	70°18'	70°18'
Solar Azimuth (deg)	130°	130°	130°	130°
Exposure (sec)	1/445	1/514	1/445	1/514
Processing Level	Full	Full	Full	Full
Vehicle Azimuth (deg)	176°32'	176°38'	176°34'	176°40'
Filter (Wratten)	23A	21	23A	21
Target Type	Indian Springs Mil Std 3-Bar		Pahrump Mil Std 3-Bar	
Target Contrast	8.8-1	8.8-1	11:1	11:1
Weather Conditions	Clear	Clear	Clear	Clear

1

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	ON	NR	NR	NR	NR
	DP	NR	NR	NR	NR
Observer 2	ON	NR	NR	NR	NR
	DP	NR	NR	NR	NR
Observer 3	ON	NR	NR	NR	NR
	DP	NR	NR	NR	NR

NR - Not Resolved.

2

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	ON	13.7	10.9	12.2	13.7
	DP	NR	10.9	12.2	NR
Observer 2	ON	13.7	9.7	12.2	13.7
	DP	NR	10.9	12.2	NR
Observer 3	ON	13.7	9.7	12.2	13.7
	DP	NR	10.9	12.2	NR

Target Designator	3	
Camera (Looking)	Fwd	Aft
Pass	95	95
Frame	16	15
Date of Photography	26 Jun 68	28 Jun 68
Universal Grid Coordinates	12.3-12.9	19.7-13.3
Geographic Coordinates of Format Center	34-54N 116-26W	34-58N 116-32W
Altitude (ft)	607,894	607,645
Camera		
Pitch (deg)	15°04'	-14°44'
Roll (deg)	-0°08'	-0°03'
Yaw (deg)	-2°26'	-2°26'
Local Sun Time	1305	1305
Solar Elevation (deg)	70°58'	70°58'
Solar Azimuth (deg)	60°	60°
Exposure (sec)	1/445	1/514
Processing Level	Full	Full
Vehicle Azimuth (deg)	176°44'	176°49'
Filter (Wratten)	23A	21
Target Type	Edwards Low Range Type C	
Target Contrast	4:1	4:1
Weather Conditions	Clear	Clear

3

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	ON	NR	14.2	14.2	14.2
	DP	NR	14.2	14.2	16.0
Observer 2	ON	22.6	14.2	14.2	14.2
	DP	NR	14.2	18.0	16.0
Observer 3	ON	NR	14.2	14.2	14.2
	DP	NR	14.2	14.2	16.0

NR - Not Resolved.

Target Designator	4
Camera (Looking)	Aft
Pass	157
Frame	17
Date of Photography	30 Jun 68
Universal Grid Coordinates	79.0-11.4
Geographic Coordinates of Format Center	39-49N 82-53W
Altitude (ft)	606,315
Camera	
Pitch (deg)	-14°23'
Roll (deg)	-0°08'
Yaw (deg)	ND
Local Sun Time	1236
Solar Elevation (deg)	71°29'
Solar Azimuth (deg)	147°
Exposure (Sec)	1/507
Processing Level	Full
Vehicle Azimuth (deg)	176°15'
Filter (Wratten)	21
Target Type	Wright Pat AFB Type AB
Target Contrast	High
Weather Conditions	Scat Clouds

4

		Along Track Fwd	Along Track Aft	Across Track Fwd	Across Track Aft
Observer 1	DP	-	11.3	-	NR
	ON	-	NA	-	NR
Observer 2	DP	-	11.3	-	NR
	ON	-	8	-	NR
Observer 3	DP	-	11.3	-	NR
	ON	-	8	-	NR

NR - Not Resolved.
Forward Record is Cloud Covered.

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 camera.

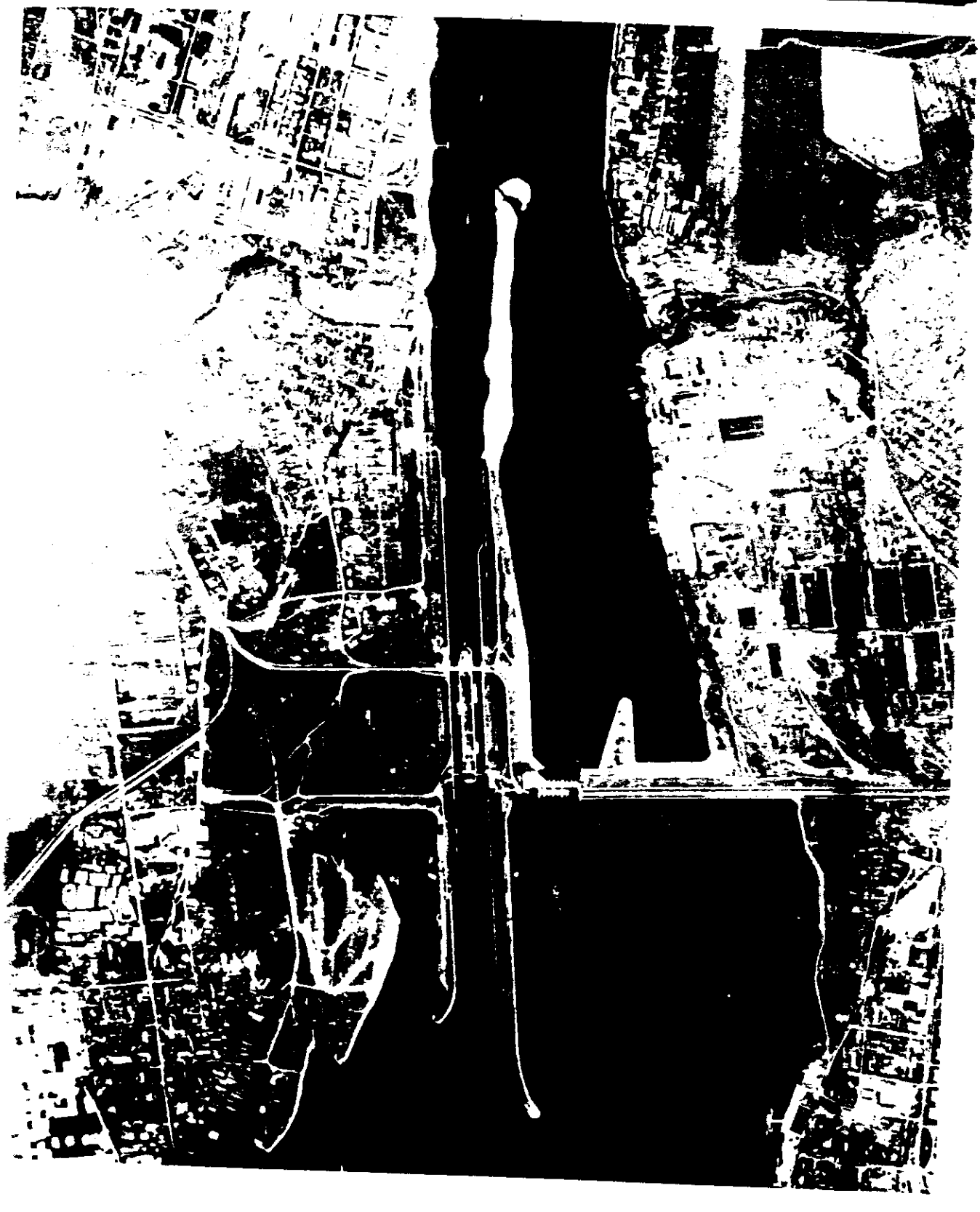
PART VII. MISSION DATA

	Fwd-Looking Pan	Fwd Take-up Horizon	Fwd Supply Horizon	Aft Pan	Aft Take-up Horizon	Aft Supply Horizon	Mission 1047-1 Stellar	Mission 1047-1 Index	Mission 1047-2 Stellar	Mission 1047-2 Index
Camera Number	218	*	*	219	*	*	D117/149/146		D118/150/154	
Reseau Number	NA	NA	NA	NA	NA	NA	146	149	154	150
Lens Serial Number	1460	12760	19102	1750	23760	12892	11642	825509	11399	825510
Slit Width	.150	NA	NA	.130	NA	NA	NA	NA	NA	NA
Aperture	3.5	8.0	6.3	3.5	6.3	8.0	1.8	4.5	1.8	4.5
Exposure Time (sec)	1/400 avg	1/100	1/100	1/460 avg	1/100	1/100	2.0	1/500	2.0	1/500
Filter (Wratten)	23A	25	25	21	25	25	None	21	None	21
Focal Length (mm)	609.628	54.950	55.000	609.628	54.750	55.000	85 nom	38.48	85 nom	38.56
Film Length (ft)	16,300	NA	NA	16,300	NA	NA	75	135	75	135
Splices	2	NA	NA	3	NA	NA	None	None	None	None
Emulsion	409-4-4-8	409-4-4-8	409-4-4-8	409-4-4-8	409-4-4-8	409-4-4-8	231-9-9-7	139-1-1-7	231-9-9-7	139-1-1-7
Film Type	3404	3404	3404	3404	3404	3404	3401	3400	3401	3400
Resolution Data (L/mm)										
Static										
High Contrast	0	*	*	0	*	*	*	85 (AWAR)		82 (AWAR)
Low Contrast	146	*	*	154	*	*	*	*	*	*
Dynamic										
I High Contrast	196	*	*	188	*	*	*	*	*	*
I Low Contrast	126	*	*	128	*	*	*	*	*	*
P High Contrast	191	*	*	205	*	*	*	*	*	*
P Low Contrast	131	*	*	127	*	*	*	*	*	*

*Not Available.

	FIGURE 1	FIGURE 2
Camera	219	218
Pass	231D	231D
Frame	14	14
Date of Photography (GMT)	5 Jul 68	5 Jul 68
Universal Grid Coordinates	50.5-10.5	41.1-11.9
Enlargement Factor	20X	20X
Geographic Coordinates	58-05N 38-50E	58-09N 38-53E
Altitude (ft)	613,153	612,496
Camera Attitude:		
Pitch (deg)	-15°1'	14°54'
Roll (deg)	-16'	-13'
Yaw (deg)	ND	ND
Local Sun Time	1305	1305
Solar Elevation (deg)	54°46'	54°42'
Solar Azimuth (deg)	157°	157°
Exposure (sec)	1/497	1/428
Vehicle Azimuth (deg)	172°32'	172°14'
Processing Level	Full	Full

[redacted]



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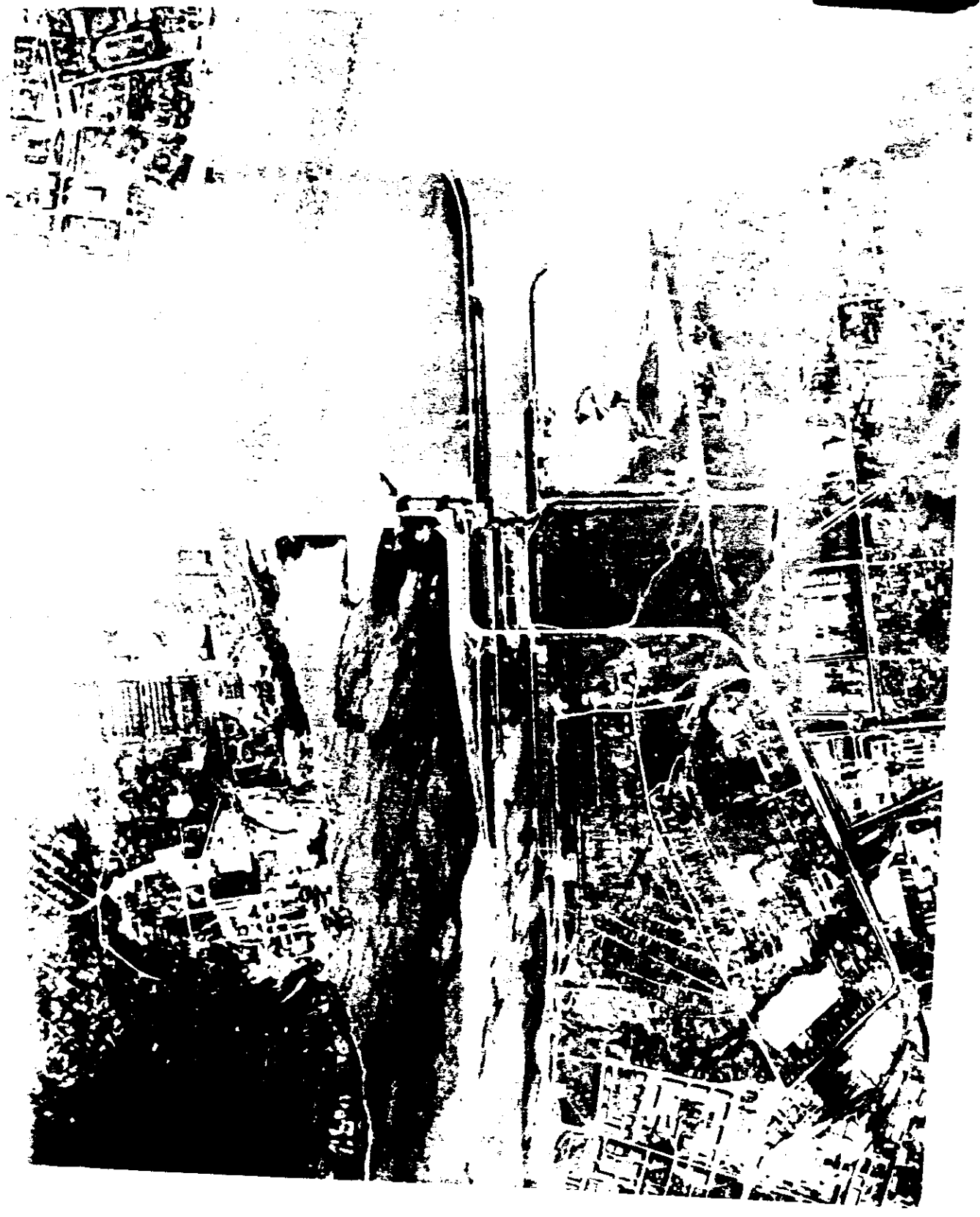


FIGURE 3. STELLAR FORMAT (MISSION 1047-1)

FIGURE 4. STELLAR FORMAT (MISSION 1047-2)

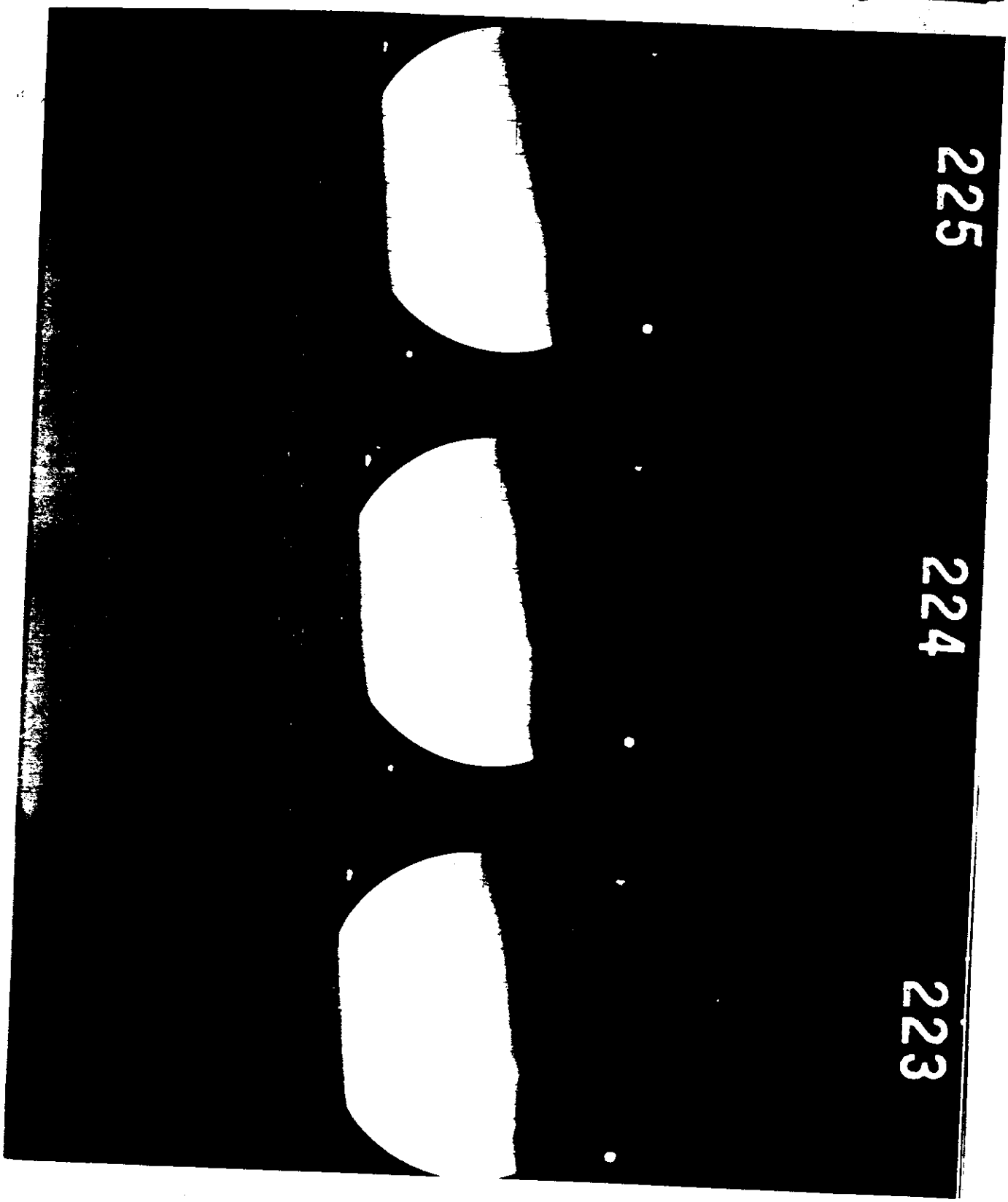
The following photographs exhibit the flare pattern prevalent throughout the mission. Figure 4 also shows the beginning of the shutter anomaly.

[redacted]

	FIGURE 3	FIGURE 4
Mission Number.	1047-1	1047-2
Stellar Frame Numbers	223, 224, 225	76, 77, 78
Correlates with:		
Main Camera Number	218	218
Pass.	84D	151D
Frames.	44, 51, 58	35, 42, 49
Date of Photography	26 Jun 68	30 Jun 68
Exposure Time (sec)	2.0	2.0

[redacted]

[redacted]



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