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TECHNICAL
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NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1111

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FEBRUARY 1971
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GLOSSARY OF TERMS

ALTITUDE - Vertical distance from the vehicle to the Hough Ellipsoid at the time of exposure.

APOGEE - That point in an elliptical orbit of a satellite at which the distance is greatest between the orbiting body and the surface of the Hough Ellipsoid.

BINARY TIME WORD - Binary presentation of the accumulated system time.

DATE OF PHOTOGRAPHY - Day, month, and year (GMT) that the photography was acquired.

DISIC - Dual Improved Stellar Index Camera.

ECCENTRICITY - A measure of the deviation of an ellipse from a true circle; expressed by dividing the distance between the foci of the ellipse by the length of its major axis.

EXPOSURE TIME - Time during which a light-sensitive material is subjected to the influence of light; expressed in this text in fractions of a second. Formula:

$$\text{Exposure time (sec)} = \frac{\text{slit width (in)}}{\text{scan rate (radians per sec}}$$

FIDUCIAL MARK - A standard geometrical reference point imaged within the frame of a photograph. The intersection of the primary fiducial marks usually defines the intersection of the principal ray with the focal plane.

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.

FORMAT - The portion of the frame that contains imagery produced by the primary optical system of the camera.

FRAME* - A single exposure which contains the format and peripheral border information relevant to the format.

GENERATION - Number of reproductive steps by which a negative or positive photographic copy is separated from the original scene, ie., the original negative is generation one, a positive made from the original negative is generation two, etc.

GROUND RESOULUTION* - The minimum distance (expressed as bar plus space) between two adjacent linear features which can be detected by a photographic system, as determined from standard three bar resolution targets. A target is considered to be resolved when a grouping of three bars can be distinguished as three distinct lines.

HOUGH ELLIPSOID - A reference ellipsoid around the earth having a semi-major axis of 20,925,738.18 feet and a semiminor axis of 20,855,588.20 feet.

IMAGE MOTION COMPENSATION (IMC) - A correction made to compensate for relative image motion at the camera focal plane.

INCLINATION - The angle between the orbital and equatorial planes measured counterclockwise from the equatorial plane to the orbital plane with the ascending node as the vertex.

INTERPRETABILITY (PHOTOGRAPHIC) - Suitability of the imagery with respect to answering requirements on a given type of target. Various factors such as halation, uncompensated image motion, poor contrast, incorrect focus, improper film processing, atmospheric conditions (both natural and manmade), ground resolution, and insufficient natural or artificial lighting of the target affect interpretability. The 3 levels of interpretability are: Poor (P) - Unsuitable for adequately answering requirements on a given type of target. Fair (F) - Suitable for answering requirements on a given type of target but with only average detail. Good (G) - Suitable for answering requirements on a given type of target in considerable detail.

INDEX CAMERA - A framing camera used to record terrain imagery. The product is used for relative orientation and mapping purposes.

LOCAL SUN TIME - Time of day computed from the position of the sun relative to the imaged terrain.

MATERIAL CHANGE DETECTOR (MCD) - A pre-exposed pre-processed film strip (approximately three feet long) that is detected by telemetry when it passes through the panoramic camera. This strip is generally spliced between two different film types to signal the film change.

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.

PAN GEOMETRY DOTS - Images of the rail holes associated with the pan geometry calibration of the camera.

PANORAMIC CAMERA - Photographs a partial or complete panorama of the terrain in a transverse direction through a scanning motion of the lens system.

PASS - Photographic portion of an orbital revolution. A prefix "D" indicates the descending node, a prefix "A" indicates the ascending node, and a prefix "M" indicates a continuous camera operation from the ascending node through the descending node. An additional suffix "E" indicates that the associated photography was generated for engineering purposes.

PERIGEE - That point in an elliptical orbit of a satellite at which its distance is nearest the surface of the Hough Ellipsoid.

PERIOD - The time required for a satellite to complete one revolution about the earth.

PITCH - Rotation of the camera about its transverse axis. Positive pitch indicates nose up attitude.

PRINCIPAL RAY - That ray of light which emanates from a point in object space and passes undeviated through the centers of curvature of the lens surfaces. It is coincident with the optical axis of the lens.

RELATIVE ORIENTATION - The determining (analytically or in a photogrammetric instrument) of the position and attitude of one of a pair of overlapping photographs with respect to the other.

RESOLUTION - Measure, expressed in lines/nm, of the smallest array of point objects distinguishable as independent point images.

ROLL - Rotation of the camera about its longitudinal axis. Positive roll indicates left wing up attitude.

SOLAR ELEVATION - The angular distance to the sun measured from a plane tangent to the earth at the intersection of the principal ray of the camera and the earth.

STELLAR CAMERA - A framing camera which records stellar images. The product, in conjunction with the product of the Index camera, is used for attitude determination.

UNIVERSAL GRID - An X - Y coordinate system used to define image location on photographic formats.

VEHICLE GROUND TRACK AZIMUTH - Clockwise horizontal angle measured from the longitudinal meridian's intersection of the earth's surface to the vehicle's 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 top of the camera.

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* Defined differently than in the Glossary of NPIC Terminology.

SYNOPSIS

Mission 1111, a two-part satellite reconnaissance mission, was launched at 0125Z on 23 July 1970. The first capsule was recovered dry on rev 97, at 0200Z on 30 July 1970. The second capsule was recovered dry on rev 298 at 2128Z on 10 August 1970, terminating the mission.

The overall image quality of the fwd and aft records is good. Most imagery is crisp and retains sharpness at magnifications of 50X. The best imagery of the mission is good and received an MIP rating of 105. Film Type 3414 was employed throughout this mission.

Random intermittent plus density spots are present throughout Mission 1111-2 on all main camera material. These spots are similar to those noted on Mission 1110-2.

The aft camera lens stowed improperly on some passes; as a result, a dense fog pattern is present on the last frame of those passes.

The Dual Improved Stellar Index Cameras (DISIC) were operational throughout the mission. However, a series of continuous plus density lines, concentrated in a 0.8-inch-wide band near the format center, is present throughout the index record.

Approximately 30 percent of the mission is obscured by clouds.

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Fwd-Looking Panoramic Camera	325
Aft-Looking Panoramic Camera	324
DISIC Unit Number	2R

B. Launch and Recovery Dates

	1111-1	1111-2
Launch	23 Jul 70/0125Z	*
Recovery	30 Jul 70/0200Z	10 Aug 70/2128Z
Recovery Rev	112	301

C. Orbital Elements

Element	1111-1 (Rev 55)	1111-2 (Rev 212)	Photo Range
Period (min)	89.991	89.928	NA
Perigee (nm)	89.28	87.24	86.01(Pass A81)
Apogee (nm)	220.92	218.27	129.52 (Pass D298)
Eccentricity	0.01829	0.01820	NA
Inclination (deg)	60.00	60.00	NA
Perigee Latitude (Geod) (deg-min)	50-18N	46-50N	NA

NA - Not applicable.

D. Photographic Operations

1. Panoramic Cameras:

Type	1111-1 Revs	1111-1 Frames	1111-2 Revs	1111-2 Frames	Total Revs	Total Frames
Operational						
Fwd	45	2,847	62	2,884	107	5,731
Aft	45	2,846	62	2,877	107	5,723
Operational/Domestic						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0
Domestic						
Fwd	6	144	6	136	12	280
Aft	6	145	6	157	12	302
Engineering (no imagery)						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0
Totals						
Fwd	51	2,991	68	3,020	119	6,011
Aft	51	2,991	68	3,034	119	6,025

2. Secondary Cameras:

	Camera	Frames
1111-1	Stellar	2,405 Starboard
	Index	2,413 Port
		2,423
1111-2	Stellar	2,742 Starboard
	Index	2,737 Port
		2,683

E. Film Usage

Camera	Film Load (Total)	Pre-Flight Footage	Processed Footage**	Film Type
Fwd-Looking (1111-1)	16,300*	389	8,246	3414
Aft-Looking (1111-1)	16,300*	369	8,227	3414
Fwd-Looking (1111-2)	NA	NA	7,977	3414
Aft-Looking (1111-2)	NA	NA	8,010	3414
Stellar (1111-1)	2,000	38	723	3401
Stellar (1111-2)	NA	NA	760	3401
Index (1111-1)	2,200	48	1,063	3400
Index (1111-2)	NA	NA	1,123	3400

*Total load for both buckets.
**Values include pre-flight footages.
NA-Not applicable.

PART II. CAMERA OPERATION

All cameras operated satisfactorily throughout both segments of Mission 1111.

PART III. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: Generally medium throughout the mission.

2. Contrast: Generally medium throughout the mission.

3. Image Quality: Good overall. Mission 1111 produced the most consistently crisp imagery of any 1100 system flown. The 3414 film appears to have enhanced mission performance through reduction of both exposure time and mean image smear. Imagery acquired during the clear weather conditions maintains sharpness at 100X magnification. A slight variation in image quality exists across the format with the better quality recorded along the binary edge. The best fwd imagery of both Missions 1111-1 and 1111-2 received MIP ratings of 105.

4. Imaged Degradations:

a. Light Leaks:

(1) Very dense fog patterns are present on the third and fourth frames from the end of all camera operations. The fog on the third frame from the end is approximately four inches in length and covers the width of the format. The fog on the fourth frame from the end protrudes approximately one inch into the format from the binary edge and is approximately two inches in length. These fog patterns generally obscure imagery. They are apparently caused by light leaking through the fwd side of the fwd-looking camera drum/boot area (see Graphics 1 and 2, page 11).

(2) Minor fog patterns are present intermittently on the first four frames of some camera operations. These patterns appear as roller shadowgraphs. Degradation to the imagery is minor.

b. Static:

(1) Dendritic edge static traces are present on passes D102, D108, and D112. These traces are generally confined to the border area.

(2) Random intermittent plus density spots are present throughout Mission 1111-2 on all main camera materials. The sizes of the spots vary, the largest being approximately five ten-thousands of an inch. These spots are similar to those noted on Mission 1110-2 and generally appear on the last eight inches of the supply end of the frame. On fwd pass D113, these spots are heavily clustered in a pattern and appear as abrasion marks or smudges to the unaided eye. This pattern begins at the supply end and continues approximately nine inches into each frame of pass A113. The pattern appears as two parallel, longitudinal markings within the format, ultimately converging toward the center of the frame within the last three inches. The exact cause of these spots is presently unknown.

c. Other: None.

5. Physical Degradations:

a. Several longitudinal plus density lines are present intermittently throughout the fwd record. These lines continue through the horizon format and appear to be caused by the film rubbing against a transport component.

b. Rail scratches along both film edges are heavier than usual.

c. A longitudinal minus density streak is present along the center of frames 1 through 17 of pass A113. This streak is approximately 0.25 to 0.30 inch wide. The position and width of the marking correlate with the puck arm in the takeup assembly. No degradation to the imagery is apparent.

d. Frames 16 through 24 of pass D242 contain very fine plus density markings. These markings begin as fine longitudinal rake marks confined to the binary border area and progress to a more predominant high frequency raster-like mark by frame 21. On frames 23 and 24 this raster-like effect maintains an approximately 0.5mm amplitude with an estimated 200 cycles over a 2.00mm distance. These marks are oriented parallel to the major axis of the film. On frames 23 and 24 the raster-like patterns overlap each other and appear as a checkerboard pattern to the unaided eye. These patterns are generally confined to both borders; however, they also occur within the format. Degradation to the imagery is minor. Nothing associated with the camera system or film handling has been

identified at this time as the cause of these markings. A study of the entire system will be undertaken to establish any cause for these markings.

e. Manufacturer's Splices:

Pass	Frame
A091	72
A082	46
A162	45

B. Aft-Looking Panoramic Camera

1. Density: Generally medium throughout the mission.

2. Contrast: Generally medium throughout the mission.

3. Image Quality: Slightly less overall than that of the fwd. Most aft imagery retains its sharpness at magnifications up to 50X. A slight variation in image quality exists across the format with the better quality recorded along the camera number side.

4. Imaged Degradations:

a. Light Leaks:

(1) Minor fog patterns are present on the first two frames of many camera operations. These patterns appear as roller shadowgraphs and are minor in nature.

(2) A fog pattern is present near the supply end of the third frame of each camera operate. This pattern extends approximately one-half inch from the binary film edge into the format and causes minor degradation to the imagery. This fog appears to be caused by a light leak in the drum area of the fwd-looking camera (see Graphic 3, page 11).

(3) A very dense fog pattern due to improper lens stow is present near the supply end of the last frame of each camera operate on passes M69 to D86 and D148 to D298 (end of mission). This fog pattern is approximately six inches in length and

covers the width of the film web (see Graphic 4, page 11).

b. Static: Random intermittent plus density spots are present throughout Mission 1111-2 (see Part III, p. 6).

c. Other: None.

5. Physical Degradations - Manufacturer's Splices:

Pass	Frame
A010	19
A067	22/23
D126	26
D225	6

C. Stellar Camera

1. Density: Adequate to detect stellar images; however, the starboard stellar frames are dense.

2. Contrast: Adequate to detect stellar images.

3. Image Shape: Generally point-type.

4. Images Per Frame: Approximately 0 to 20 star images are recorded on starboard formats, and 20 to 30 star images are recorded on port formats.

5. Imaged Degradations:

a. Light Leaks - None noted.

b. Static - Dendritic and corona static traces are present intermittently throughout the stellar record on Mission 1111-2.

c. Other - An image of an eyelash is present on every port frame of Mission 1111-2, after pass 100. Some local, out-of-flat conditions occur in the vicinity of the eyelash.

6. Physical Degradations: None noted.

D. Index Camera

1. Density: Generally medium throughout.

2. Contrast: Generally medium throughout.

3. Image Quality: Good where not degraded by anomaly described in paragraph 5 below.

4. Imaged Degradations:

a. Light Leaks - None noted.

b. Static - Minor corona and dendritic static traces are present intermittently throughout the index record.

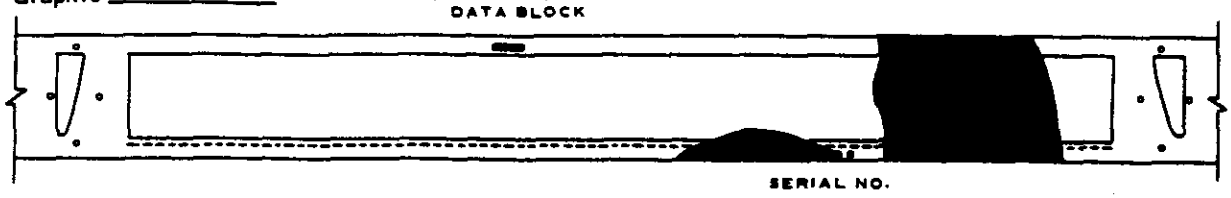
c. Other - None noted.

5. Physical Degradations: A series of continuous plus density lines are concentrated in a 0.8 inch wide band, 1.5 inches from the non-binary film edge. This pattern resembles that exhibited on Mission 1110-1, but in most cases it is less severe. This anomaly is apparently caused by the film remaining in contact with the reseau plate during film transport. Some degradation is apparent. However, practically all the imagery is good.

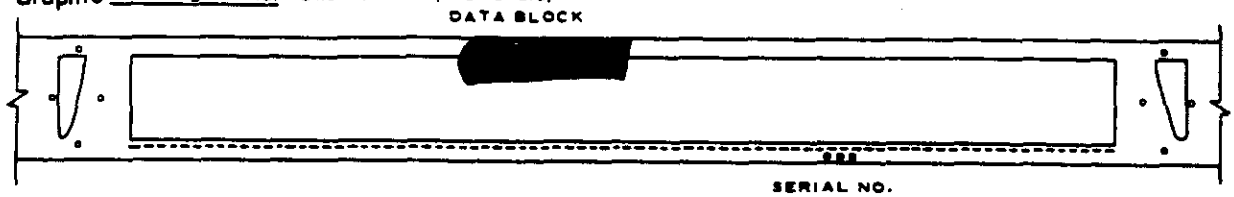
E. Graphic Display

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

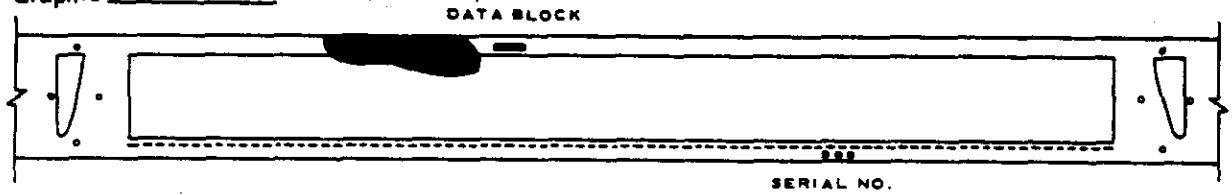
Graphic 1 3rd frame from end (fwd camera)



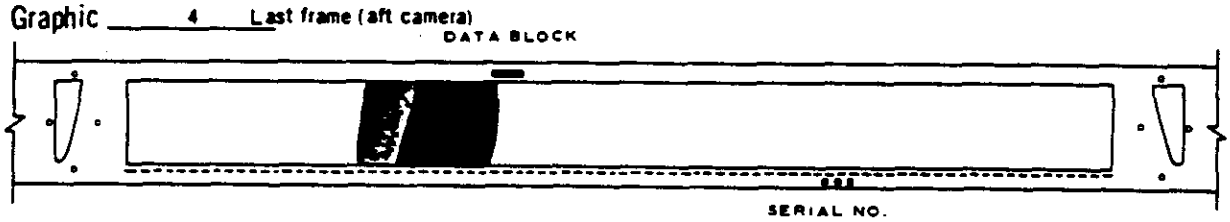
Graphic 2 4th frame from end (fwd camera)



Graphic 3 Third frame (aft camera)



Graphic 4 Last frame (aft camera)



PART IV. IMAGED AUXILIARY DATA

The auxiliary data for all cameras is imaged properly throughout the mission, with the exception of the aft-looking camera binary time word. After pass D214, all binary bits on the second frame from the end of each aft-looking camera operation are bloomed. This anomaly is associated with the improper lens stow problem described in Part III, p. 6).

PART V. MENSURATION QUALITY

Forty-six requests for mensuration support were filled during the initial readout of this mission. No mensuration problems were encountered, and the image quality is considered to be fair to good for mensuration.

PART VI. FILM PROCESSING

A. Processing Machines and Process Gamma

Camera	Machine/Process	Average Gamma	Film Type
Fwd (1111-1)	Yardleigh/Dual Gamma	2.11	3414
Aft (1111-1)	Yardleigh/Dual Gamma	2.05	3414
Fwd (1111-2)	Yardleigh/Dual Gamma	2.09	3414
Aft (1111-2)	Yardleigh/Dual Gamma	2.09	3414
Stellar (1111-1)	Trenton/Single Level	2.18	3401
Stellar (1111-2)	Trenton/Single Level	2.13	3401
Index (1111-1)	Yardleigh/Dual Gamma	1.51	3400
Index (1111-2)	Yardleigh/Dual Gamma	1.48	3400

B. Film Handling Summary

The processing site used three 8-hour shifts in an effort to reduce overtime expenditures during Mission 1111-2. The reduced number of men per shift delayed delivery of the domestic work prints to the breakdown team by approximately 2 hours. This in effect delayed the selection of the MIP by approximately 2 hours.

C. Timetable

Film	Recovered	Received at Processing Site	*Special Shipment at NPIC	Priority 1A at NPIC
Fwd (1111-1)	30 July 1970/ 0200Z	30 July 1970/ 2255Z	1 Aug 70/ 0146Z	1 Aug 70/ 1755Z
Aft (1111-1)	"	"	"	"
Stellar (1111-1)	"	"	None	"
Index (1111-1)	"	"	None	"
Fwd (1111-2)	10 Aug 70/ 2128Z	11 Aug 70/ 1940Z	13 Aug 70/ 0610Z	14 Aug 70/ 0608Z
Aft (1111-2)	"	"	"	"
Stellar (1111-2)	"	"	None	"
Index (1111-2)	"	"	None	"

*The following special shipment to be used to satisfy high-priority intelligence requirements was received at NPIC before priority 1A shipment

1111-1: 4 passes (D25, D41, D72, and D88) printed on 2430 and SO-369 dupe stock

1111-2: 8 passes (D104, D135, D151, D167, D214, D230, D246, and D293) printed on 2430 and SO-369 dupe stock.

PART VII. PI SUITABILITY

A. PI Statistics

1. Target Coverage:

	1111-1	1111-2	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	247	393	640

2. Photographic Interpretability Ratings:

Rating	Missiles	Nuclear Energy	Air Facilities	Ports	Ground Forces	Industry	Complex
Good	138	0	13	1	0	7	4
Fair	281	4	46	2	20	29	8
Poor	234	7	37	4	7	13	6
Totals*	653	11	96	7	27	49	18

3. Summary of Photographic Interpretability Ratings (percentage):

Good 163 or 18.9%
Fair 390 or 45.3%
Poor 308 or 35.8%

*A discrepancy can exist between the total number of targets covered. and the total PI reports because some targets are covered more than once.

B. PI Comments

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

a.	Clear	614 or 71.4%
b.	Scattered Clouds	138 or 15.9%
c.	Heavy Clouds	63 or 7.3%
d.	Haze	40 or 4.7%
e.	Cloud Shadow	6 or .7%

2. Product Interpretability: The PI suitability for this mission ranges from poor to good with a large portion in the fair to good category. This variability is generally attributed to variation in acquisition altitudes (88nm to 148nm) and adverse weather conditions. The PIs noted that the overall quality of the Middle East photography of Mission 1111-2 is not as good as that from Mission 1111-1. This difference in interpretation suitability was caused by the higher solar elevations and the resulting shorter target shadows on Mission 1111-2 as compared to Mission 1111-1.

PART VIII. RESOLUTION TARGET DATA, MISSION 1111

Target Designator	1		2	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	A10	A10	A10	A10
Frame	4	10	4	10
Date of Photography	23 Jul 70	23 Jul 70	23 Jul 70	23 Jul 70
Universal Grid Coordinates (x-y)	59.5 - 2.9	15.7 - 3.8	59.5 - 2.9	15.7 - 3.8
Geographic Coordinates of Format Center (deg-min)	34-20N 116-55W	35-15N 116-8W	34-20N 116-55W	35-15N 116-8W
Altitude (ft)	783,851	777,003	783,851	777,003
Camera				
Pitch (deg)	+15.4366	-15.0576	+15.4366	-15.0576
Roll (deg)	-00.0048	-00.0872	-00.0048	-00.0872
Yaw (deg)	+00.1540	+00.2890	+00.1540	+00.2890
Local Sun Time	0815	0820	0815	0820
Solar Elevation (deg-min)	37-5	38-32	37-15	38-32
Exposure (sec)	1/400	1/660	1/400	1/660
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	34-30	35-2	34-30	35-2
Filter (Wratten)	W25	W25	W25	W25
Target Type	B2	B2	B1	B1
Target Contrast	11:1	11:1	4:1	4:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

		1				2			
		Along Track		Across Track		Along Track		Across Track	
Observer		Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
1	ON	NR	8'11.6"	11'3.6"	10'1"	NR	10'1"	NR	NR
	DP	NR	NR	11'3.6"	10'1"	NR	NR	11'3.6"	NR
2	ON	NR	8'11.6"	11'3.6"	8'11.6"	NR	8'11.6"	11'3.6"	8'11.6"
	DP	NR	11'3.6"	11'3.6"	8'11.6"	NR	11'3.6"	11'3.6"	10'1"
3	ON	NR	8'11.6"	11'3.6"	8'11.6"	NR	10'1"	11'3.6"	11'3.6"
	DP	NR	8'11.6"	11'3.6"	10'1"	NR	10'1"	11'3.6"	NR

NR - No Bar Groups Readable

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PART VIII. (Continued)

Target Designator	3		4	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	A10	A10	A10	A10
Frame	4	10	5	11
Date of Photography	23 Jul 70	23 Jul 70	23 Jul 70	23 Jul 70
Universal Grid Coordinates (x-y)	59.5 - 2.9	15.7 - 3.8	34.2 - 2.7	41.2 - 3.7
Geographic Coordinates of Format Center (deg-min)	34-20N 116-55W	35-15N 116-8W	34-2N 117-12W	34-57N 116-24W
Altitude (ft)	783,851	777,003	782,713	775,896
Camera				
Pitch (deg)	+15.4366	-15.0576	+15.4318	-15.0572
Roll (deg)	-00.0048	-00.0872	+00.0037	-00.1055
Yaw (deg)	+00.1540	+00.2890	+00.1897	+00.3023
Local Sun Time	0815	0820	0815	0820
Solar Elevation (deg-min)	37-51	38-32	37-58	38-39
Exposure (sec)	1/400	1/660	1/400	1/660
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	34-30	35-2	34-35	35-7
Filter (Wratten)	W25	W25	W25	W25
Target Type	C	C	51-51 T-Bar	51-51 T-Bar
Target Contrast	6:1	6:1	5:1	5:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

	3				4				
	Along Track		Across Track			Along Track		Across Track	
Observer	Fwd	Aft	Fwd	Aft	Observer	Fwd	Aft	Fwd	Aft
1 ON	17'11.4"	AG	14'3"	14'3"	1 ON	8'6"	8'6"	9'6"	10'
DP	17'11.4"	AG	16'	14'3"	DP	8'6"	12'	9'6"	12'
2 ON	17'11.4"	AG	14'3"	AG	2 ON	8'6"	10'	8'6"	10'
DP	17'11.4"	AG	17'11.4	14'3"	DP	8'6"	12'	10'	12'
3 ON	17'11.4"	AG	AG	AG	3 ON	8'6"	7'1.4"	9'6"	10'
DP	17'11.4"	AG	14'3"	14'3"	DP	8'	8'6"	9'6"	10'

AG - All bar groups readable

PART VIII. (Continued)

	5		6
Target Designator	Fwd	Aft	Aft
Camera (looking)	A10	A10	A10
Pass	13	19	20
Frame	23 Jul 70	23 Jul 70	23 Jul 70
Date of Photography	34.8 - 1.3	40.9 - 5.3	40.6 - 0.4
Universal Grid Coordinates (x-y)			
Geographic Coordinates of Format Center (deg-min)	35-16N 116-10W	36-10N 115-22W	36-19N 115-14W
Altitude (ft)	773,607	766,971	765,877
Camera			
Pitch (deg)	+15.4301	-14.9859	-14.9844
Roll (deg)	-00.0713	-00.2191	-00.2215
Yaw (deg)	+00.3968	+00.3590	+00.3630
Local Sun Time	0820	0825	0825
Solar Elevation (deg-min)	38-52	39-31	39-38
Exposure (sec)	1/410	1/680	1/680
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	35-17	35-50	35-56
Filter (Wratten)	W25	W25	W25
Target Type	51-51 T-bar	51-51 T-bar	51-51 T-bar
Target Contrast	5:1	5:1	5:1
Weather Conditions	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

	5			6		
	Along Track		Across Track	Along Track		Across Track
Observer	Fwd	Aft	Fwd Aft	Observer	Aft	Aft
1 ON	8'	9'	10' 9'6"	1 ON	9'6"	9'
1 DP	9'6"	10'	12' 12'	1 DP	16'	12'
2 ON	8'6"	12'	10' 9'6"	2 ON	10'	9'6"
2 DP	16'	12'	12' 10'	2 DP	12'	12'
3 ON	8'	8'	12' 9'6"	3 ON	12'	9'6"
3 DP	12'	9'6"	12' 10'	3 DP	12'	12'

PART VIII. (Continued)

Target Designator	7		8	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	A10	A10	A10	A10
Frame	15	21	18	24
Date of Photography	23 Jul 70	23 Jul 70	23 Jul 70	23 Jul 70
Universal Grid Coordinates (x-y)	51.5 - 3.5	23.6 - 3.4	48.4 - 2.9	26.8 - 3.8
Geographic Coordinates of Format Center (deg-min)	35-34N 115-54W	36-27N 115-7W	36-1N 115-31W	36-53N 114-42W
Altitude (ft)	771,360	764,818	768,057	761,553
Camera				
Pitch (deg)	+15.4490	-14.9861	+15.4911	-15.0104
Roll (deg)	-00.1043	-00.2212	-00.1359	-00.2047
Yaw (deg)	+00.4295	+00.3702	+00.4658	+00.3818
Local Sun Time	0820	0825	0822	0829
Solar Elevation (deg-min)	39-05	39-44	39-25	40-01
Exposure (sec)	1/415	1/685	1/415	1/685
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	35-28	36-01	35-45	36-18
Filter (Wratten)	W25	W25	W25	W25
Target Type	C	C	C	C
Target Contrast	9:1	9:1	8.8:1	8.8:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

	7				8				
	Along Track		Across Track			Along Track		Across Track	
Observer	Fwd	Aft	Fwd	Aft	Observer	Fwd	Aft	Fwd	Aft
1 ON	8'7.3"	8'7.3"	9'8"	9'8"	1 ON	9'8"	10'10.3"	10'10.3"	10'10.3"
DP	7'8"	9'8"	8'7.3"	9'8"	DP	12'2.3"	12'2.3"	13'8"	10'10.3"
2 ON	8'7.3"	8'7.3"	9'8"	9'8"	2 ON	10'10.3"	10'10.3"	NR	10'10.3"
DP	8'7.3"	9'8"	8'7.3"	9'8"	DP	10'10.3"	12'2.3"	10'10.3"	10'10.3"
3 ON	9'8"	8'7.3"	12'2.3"	8'7.3"	3 ON	10'10.3"	10'10.3"	13'8"	10'10.3"
DP	8'7.3"	8'7.3"	8'7.3"	8'7.3"	DP	10'10.3"	10'10.3"	13'8"	10'10.3"

NR - No bar groups readable

PART VIII. (Continued)

Target Designator	9	10	
Camera (looking)	Fwd	Aft	Fwd
Pass	D45	D45	D45
Frame	5	12	6
Date of Photography	25 Jul 70	25 Jul 70	25 Jul 70
Universal Grid Coordinates	42.3 - 0.1	33.3 - 1.0	42.3 - 5.0
Geographic Coordinates of Format Center (deg-min)	43-30N 78-1W	42-48N 77-10W	43-24N 77-54W
Altitude (ft)	551,411	552,714	551,603
Camera			
Pitch (deg)	+15.5602	-14.7892	+15.5890
Roll (deg)	-00.0159	-00.1302	-00.0199
Yaw (deg)	-00.3194	-00.1968	-00.2882
Local Sun Time	1548	1552	1548
Solar Elevation (deg-min)	38-18	37-45	38-13
Exposure (sec)	1/315	1/550	1/315
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	138-27	139-7	138-33
Filter (Wratten)	W21	W21	W21
Target Type	51-51 T-bar	51-51 T-bar	51-51 T-bar
Target Contrast	5:1	5:1	5:1
Weather Conditions	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

	9				10		
	Along Track		Across Track		Along Track		Across Track
Observer	Fwd	Aft	Fwd	Aft	Fwd		Fwd
1 ON	8'	8'	8'	8'	7'1.5"		6'4.2"
1 DP	12'	12'	12'	12'	8'		8'
2 ON	7'1.5"	8'	8'	8'	7'1.5"		6'4.2"
2 DP	12'	8'	12'	8'	12		6'4.2"
3 ON	7'1.5"	8'	8'	8'	6'4.2"		6'4.2"
3 DP	12'	8'	12'	8'	7'1.5"		7'1.5"

PART VIII. (Continued)

Target Designator	11		12	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	D126	D126	D126	D126
Frame	6	12	22	28
Date of Photography	3 Aug 70	3 Aug 70	3 Aug 70	3 Aug 70
Universal Grid Coordinates (x-y)	41.0 - 4.7	35.0 - 1.8	44.2 - 4.9	31.7 - 1.3
Geographic Coordinates of Format Center (deg-min)	38-21N 121-57W	37-4N 121-20W	36-38N 120-21W	35-59N 119-46W
Altitude (ft)	547,350	548,660	550,975	552,510
Camera				
Pitch (deg)	+15.7100	-14.7817	+15.7290	-14.7380
Roll (deg)	-00.1087	-00.1305	+00.0660	+00.0179
Yaw (deg)	+00.0579	+00.0172	-00.0695	-00.1036
Local Sun Time	14:22	14:24	14:31	14:33
Solar Elevation (deg-min)	53-59	54-12	53-34	53-18
Exposure (sec)	1/560	1/915	1/560	1/915
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	142-27	142-53	143-36	144-1
Filter (Wratten)	W25	W25	W25	W25
Target Type	51-51 T-bar	51-51 T-bar	51-51 T-bar	51-51 T-bar
Target Contrast	5:1	5:1	5:1	5:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

		11				12			
		Along Track		Across Track		Along Track		Across Track	
Observer		Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
1	ON	5'0.5"	6'4.2"	5'7.9"	6'4.2"	5'7.9"	7'1.5"	7'	7'
	DP	6'4.2"	8'	6'4.2"	7'	7'1.5"	10'	8'	9'
2	ON	5'0.5"	6'4.2"	5'0.5"	6'4.2"	5'7.9"	6'4.2"	6'4.2"	7'
	DP	6'4.2"	7'	5'7.9"	7'	7'1.5"	8'	7'1.5"	8'
3	ON	5'7.9"	6'4.2"	5'7.9"	6'4.2"	5'7.9"	6'4.2"	6'4.2"	7'
	DP	6'4.2"	8'	6'4.2"	7'	7'1.5"	10'	8'	8'

//

PART VIII. (Continued)

Target Designator	13		14	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	D189	D189	D189	D189
Frame	6	12	6	12
Date of Photography	3 Aug 70	3 Aug 70	3 Aug 70	3 Aug 70
Universal Grid Coordinates (x-y)	24.6 - 2.8	51.2 - 2.7	24.0 - 3.0	51.2 - 3.4
Geographic Coordinates of Format Center (deg-min)	35-23N 117-43W	34-44N 117-10W	35-23N 117-43W	34-44N 117-10W
Altitude (ft)	545,934	547,723	545,934	547,723
Camera				
Pitch (deg)	+15.6857	-14.7847	+15.6857	-14.7847
Roll (deg)	-00.1323	-00.2055	-00.1323	-00.2055
Yaw (deg)	-00.1734	-00.0711	-00.1734	-00.0711
Local Sun Time	1313	1315	1313	1315
Solar Elevation (deg-min)	66-55	67-01	66-55	67-01
Exposure (sec)	1/580	1/915	1/580	1/915
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	144-34	144-57	144-34	144-57
Filter (Wratten)	W25	W25	W25	W25
Target Type	A8	A8	C	C
Target Contrast	11:1	11:1	6:1	6:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

		13				14			
		Along Track		Across Track		Along Track		Across Track	
Observer		Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
1	ON	5'5"	4'6"	5'5"	4'6"	12'8"	12'8"	12'8"	12'8"
	DP	5'5"	NR	NR	NR	12'8"	12'8"	12'8"	12'8"
2	ON	5'5"	4'6"	5'5"	5'5"	12'8"	12'8"	12'8"	12'8"
	DP	5'5"	NR	NR	NR	12'8"	12'8"	12'8"	12'8"
3	ON	5'5"	4'0"	5'5"	4'6"	12'8"	12'8"	12'8"	12'8"
	DP	5'5"	NR	NR	NR	12'8"	12'8"	12'8"	12'8"

NR - No bar groups readable

PART VIII. (Continued)

Target Designator	15		16	
Camera (looking)	Fwd	Aft	Fwd	Aft
Pass	D189	D189	D189	D189
Frame	6	12	6	12
Date of Photography	3 Aug 70	3 Aug 70	3 Aug 70	3 Aug 70
Universal Grid Coordinates (x-y)	24.0 - 3.0	51.2 - 3.4	24.0 - 3.0	51.2 - 3.4
Geographic Coordinates of Format (deg-min)	35-23N 117-43W	34-44N 117-10W	35-23N 117-43W	34-44N 117-10W
Altitude (ft)	545,934	547,723	545,934	547,723
Camera				
Pitch (deg)	+15.6857	-14.7847	+15.6857	-14.7847
Roll (deg)	-00.1323	-00.2055	-00.1323	-00.2055
Yaw (deg)	-00.1734	-00.0711	-00.1734	-00.0711
Local Sun Time	1313	1315	1313	1315
Solar Elevation (deg-min)	66-55	67-01	66-55	67-01
Exposure (sec)	1/580	1/915	1/580	1/915
Processing Level	Dual Gamma	Dual Gamma	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	144-34	144-57	144-34	144-57
Filter (Wratten)	W25	W25	W25	W25
Target Type	1B	1B	2B	2B
Target Contrast	4:1	4:1	11:1	11:1
Weather Conditions	Clear	Clear	Clear	Clear

GROUND RESOLUTION IN FEET AS DETERMINED FROM THE ORIGINAL NEGATIVE AND SECOND GENERATION DUPLICATE POSITIVE

	15				16			
	Along Track		Across Track		Along Track		Across Track	
Observer	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
1 ON	7'1.4"	7'1.4"	6'4.2"	7'1.4"	6'4.2"	6'4.2"	6'4.2"	6'4.2"
DP	7'1.4"	8'	6'4.2"	7'1.4"	6'4.2"	6'4.2"	7'1.4"	8'
2 ON	6'4.2"	6'4.2"	6'4.2"	6'4.2"	6'4.2"	6'4.2"	6'4.2"	6'4.2"
DP	7'1.4"	8'	6'4.2"	7'1.4"	7'1.4"	6'4.2"	7'1.4"	7'1.4"
3 ON	7'1.4"	6'4.2"	7'1.4"	6'4.2"	5'7.8"	5'7.8"	5'7.8"	6'4.2"
DP	7'1.4"	8'	6'4.2"	7'1.4"	6'4.2"	6'4.2"	6'4.2"	7'1.4"

PART IX. MISSION 1111 DATA

	Forward-Looking			Aft-Looking		Stellar		Index
	▲ Pan	Takeup Horizon	Supply Horizon	● Pan	Takeup Horizon	Supply Horizon	Port	Star-board	
Camera Number	3.25	*	*	.324	*	*	2R		2R
Reseau Number	*	*	*	*	*	*	5P	5	111
Lens Serial Number	I 213	40784	40794	I 184	23771	40777	5P	5	111
Slit Position/ Slit Widths (in) 1	0.131			0.081					
2	0.176	*	*	0.110	*	*	*		*
3	0.234			0.155					
4	0.287			0.197					
FS	0.189			0.135					
Aperture	*	F 8.0	F 6.3	*	F 6.3	F 8.0	F 2.8	F 2.8	F 6.3
Exposure Time (sec)	Variable	1/100	1/100	Variable	1/100	1/100	1.5	1.5	1/500
Filter (Wratten) Primary	W-25 Gel 4 mils	W-25	W-25	W-21 Gel 4 mils	W-25	W-25			W-12
Alternate	W-25 Gel 7 mils		*	W-21 Gel 7 mils	*	*	None	None	*
Focal Length (mm)	609.669	55.0*	55.0	609.689	55.0	55.0	76.20	76.20	76.20
Film Length (ft)	16,300	*	*	16,300	*	*	2,000		2,200
Splices	3	*	*	4	*	*	0		0
Emulsion	8-62-7-0	*	*	8-62-7-0	*	*	349-8-5-0		223-1-5-0
Film Type	3414	*	*	3414	*	*	3401		3400
Resolution Data (L/mm)	---	187R/166T	187R/166T	---	187R/187T	166R/166T	NA	NA	102R/102T
Static									
High Contrast	NA	NA	NA	NA	NA	NA	NA	NA	NA
Low Contrast	201	NA	NA	158	NA	NA	NA	NA	NA
Dynamic									
I High Contrast	285	NA	NA	253	NA	NA	NA	NA	NA
I Low Contrast	185	NA	NA	149	NA	NA	NA	NA	NA
P High Contrast	266	NA	NA	243	NA	NA	NA	NA	NA
P Low Contrast	192	NA	NA	120	NA	NA	NA	NA	NA

NA - Not available.
* - Not applicable.
R - Radial resolution on axis.
T - Tangential resolution on axis.
▲ - Resolution tested using a W-25 filter.
● - Resolution tested using a W-21 filter.

PART X. MISSION INFORMATION POTENTIAL (MIP) HISTORY, 1100 Series

Mission	MIP#	Pass	Frame	Universal Grid Coord	
1101	85	159D	2 Fwd	39.0	1.5
1102*	90	16D	22 Fwd	26.8	1.3
1103	90	79D	15 Fwd	41.8	3.8
1104*	115	16D	6 Fwd	33.1	4.1
1105*	95	16D	20 Aft	47.3	1.2
1106*	110	32D	8 Fwd	17.9	1.8
1107	95	122D	30 Aft	43.7	2.4
1108-1	105	30D	20 Fwd	28.8	0.5
1108-2	100	242D	20 Fwd	33.7	2.3
1109-1	110	16D	3 Fwd	25.8	3.2
1109-2	100	145D	6 Fwd	40.5	2.5
1110-1**	90	122D	55 Fwd	49.1	6.3
1110-2**	95	201D	112 Fwd	51.7	4.8
1111-1	105	A1C	1 Fwd	36.7	1.9
1111-2	105	A1C	14 Fwd	16.9	4.2

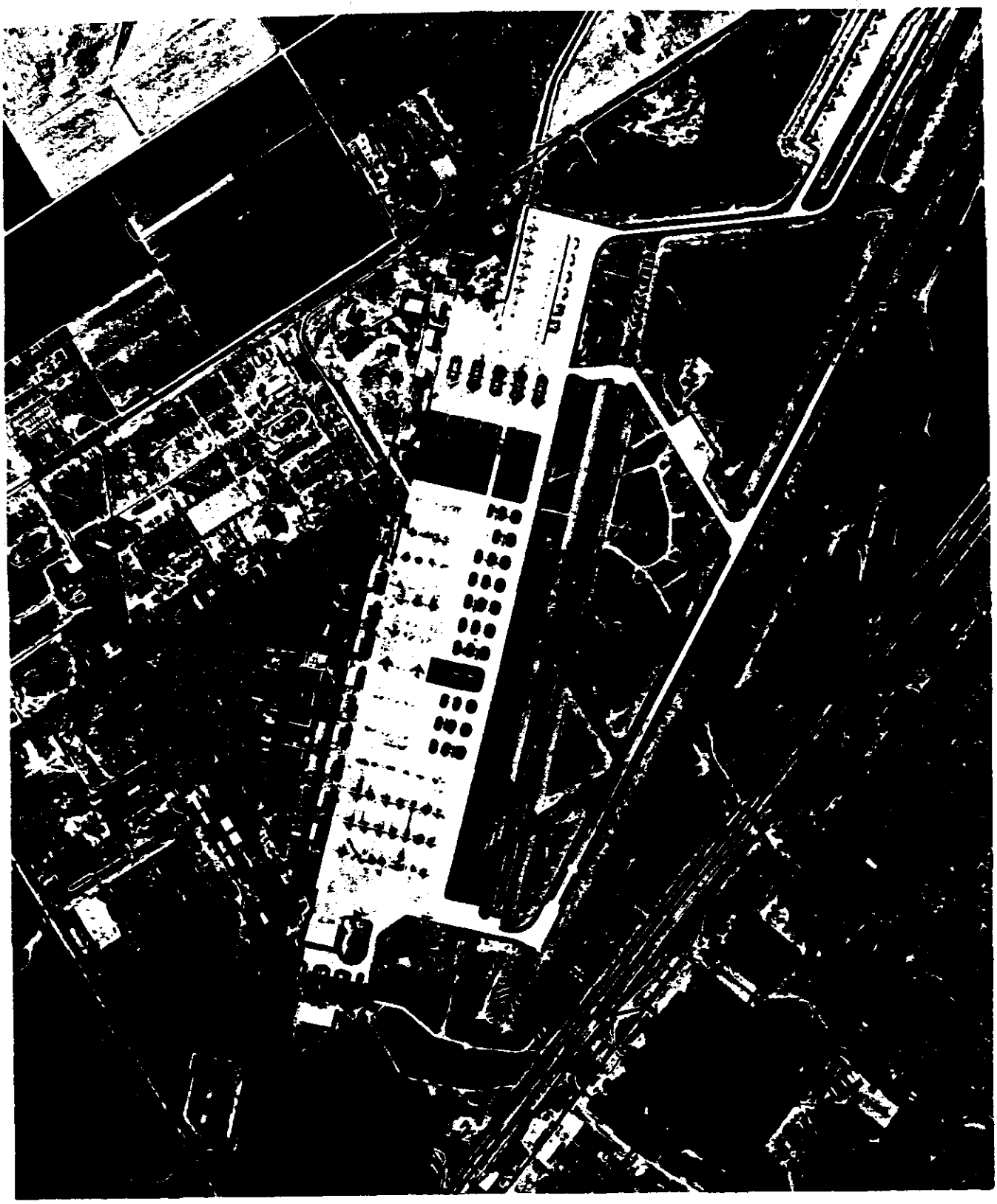
*Standards

FIGURE 1. BEST IMAGE QUALITY (MISSION 1111-1 MIP)

FIGURE 2. BEST IMAGE QUALITY (MISSION 1111-2 MIP)

	FIGURE 1	FIGURE 2
Camera	325	325
Pass	A10	D189
Frame	1 Fwd	14 Fwd
Date of Photography (GMT)	23 Jul 70	3 Aug 70
Universal Grid Coordinates (x-y)	36.7-1.9	16.9 4.2
Enlargement Factor	20X	20X
Geographic Coordinates (format center) (deg-min)	33-52N 117-18W	34-12N 116-41W
Altitude (ft)	787,645	547,897
Camera Attitude:		
Pitch (deg)	+15.4579	NA
Roll (deg)	-00.0545	NA
Yaw (deg)	+00.0323	NA
Local Sun Time	0815	1315
Solar Elevation (deg-min)	37-41	67-03
Exposure (sec)	1/390	1/577
Filter	W-25	W-25
Vehicle Ground Track Azimuth (deg-min)	34-15	145-04
Processing	Dual Gamma	Dual Gamma

[redacted]



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