[redacted] "C" files

~~TOP SECRET~~
~~NO FOREIGN DISSEM~~

14 000382099D

[redacted]

TECHNICAL
PUBLICATION

NATIONAL PHOTOGRAPHIC
INTERPRETATION CENTER

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1110

Handle via
~~Talent-Keyhole~~
Channels Only

~~TOP SECRET~~
~~NO FOREIGN DISSEM~~

[redacted]

JANUARY 1971
COPY NO [redacted]
46 PAGES

[redacted]

GROUP 1 EXCLUDED FROM
AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

Declassified and Released by the NRO
In Accordance with E. O. 12958
on NOV 26 1997

[redacted]

TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1110

JANUARY 1971

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

CONTENTS

ILLUSTRATIONS

INDEX OF PHOTOGRAPHIC EVALUATION REPORTS AND SPECIAL STUDIES

PER	Document Number	Special Study
1033	[redacted]	None
1034		None
1036		None
1037		None
1038		None
1039		None
1040		None
1041		Slant Range Computations Related to Universal Grid Coordinates for the KH4A Camera System
1042	[redacted]	None
1043		Scan Speed Deviation Analysis of the Forward Camera, Mission 1043
1044	[redacted]	Dual Gamma/Viscose Vs Conventional/Spray Processing Analysis (Mission 1044)
1045	[redacted]	None
1046		SO-230 Vs 3404 Evaluation
1047		None
1048		None
1049		Image Quality Comparison Mission 1102--Original Negative Vs Duplicate Positive
1050	[redacted]	None
1051		None
1052		SO-239 Second Generation Vs Third Generation Negative
1101	[redacted]	Slant Range Computations Related to Universal Grid Coordinates for the KH4B Camera System
1102	[redacted]	None
1103		None
1104		Bicolor Evaluation Report SO-180 Evaluation, Mission 1104
1105		SO-121 Evaluation; SO-180 Supplement
1106	[redacted]	None
1107		MIP 1100 Series; Effects of Conjugate Imagery Loss, Mission 1107
1108	[redacted]	SO-242 Evaluation, Mission 1108
1109		None
1110		None

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, i.e., the original negative is generation one, a positive made from the original negative is generation two, etc.
GROUND RESOLUTION*	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 semi-minor 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.

*Defined differently than in the Glossary of NPIC Terminology.

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/mm, 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.

SYNOPSIS

Mission 1110, a two-part satellite reconnaissance mission, was launched at 2135Z on 20 May 1970. The first capsule was recovered dry via air catch during rev 179 at 2230Z on 31 May 1970. The second capsule was recovered dry via air catch during rev 309 at 2230Z on 8 June 1970. A total of 105 photographic passes was acquired during the 20-day mission.

The overall image quality is less than that provided by recent missions. Most objects appear sharp and clearly defined at 25X magnification, but these same objects have an out-of-focus appearance at 50X. Even though the best imagery was obtained by the fwd-looking camera, the aft-looking camera imagery is generally comparable. MIP ratings of 90 and 95 have been assigned to Missions 1110-1 and 1110-2, respectively. Approximately 2,000 feet of SO-349* was spliced into the regular film load for each camera. Preliminary examination indicates no apparent image quality difference between the SO-349 and the 3404 materials. (A special study of the two film types is underway and will be published as a supplement to a photographic evaluation report in the near future.)

Approximately 75-80 percent of the mission contains cloud-free photography. The Dual Improved Stellar Index Cameras (DISIC) operated throughout the mission. However, the index camera material is degraded by a band of plus density lines located near the center of the format throughout the mission. Intense static fogging is also present intermittently throughout the mission. The static fogging obliterates up to 80 percent of some frames.

*The new film designation for SO-349 is 3414.

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Fwd-Looking Panoramic Camera	323
Aft-Looking Panoramic Camera	322
DISIC Unit Number	10

B. Launch and Recovery Dates

	1110-1	1110-2
Launch	20 May 70/2135Z	NA
Recovery	31 May 70/2230Z	8 June 70/2230Z
Recovery Rev	179D	309D

C. Orbit Elements

Element	Actual 1110-1 (Rev 1)	Actual 1110-2 (Rev 234)	Photo Range
Period (min)	88.62	88.44	NA
Perigee (nm)	89.01	92.31	87.0 (Pass 40D)
Apogee (nm)	145.33	137.86	119.5 (Pass 213D)
Eccentricity	0.00750	0.00602	NA
Inclination (deg)	83.00	83.00	NA
Perigee Latitude (Geod) (deg-min)	23-54 N	37-29 N	NA

NA - Not applicable.

D. Photographic Operations

1. Panoramic Cameras:

Type	1110-1 Revs	1110-1 Frames	1110-2 Revs	1110-2 Frames	Total Revs	Total Frames
Operational						
Fwd	47	2,825	42	3,014	89	5,839
Aft	47	2,818	42	3,027	89	5,845
Operational/Domestic						
Fwd	0	0	1	33	1	33
Aft	0	0	1	33	1	33
Domestic						
Fwd	7	161	5	140	12	301
Aft	7	161	5	140	12	301
Engineering (no imagery)						
Fwd	1	10	2	17	3	27
Aft	1	10	2	17	3	27
TOTALS						
Fwd	55	2,996	50	3,204	105	6,200
Aft	55	2,989	50	3,217	105	6,206

2. Secondary Cameras:

Camera	Frames
Stellar (1110-1)	2,285 Starboard 2,281 Port
Index (1110-1)	2,303
Stellar (1110-2)	2,910 Starboard 2,909 Port
Index (1110-2)	2,749

E. Film Usage

Camera	Film Load (Total)	Pre-Flight Footage	Processed Footage**	Film Type
Fwd-Looking (1110-1)	16,300*	437	8,233	3404
Aft-Looking (1110-1)	16,300*	363	8,234	3404
Fwd-Looking (1110-2)	NA	NA	4,830	3404
			1,969	SO-349
			1,150	3404
Aft-Looking (1110-2)	NA	NA	3,818	3404
			1,996	SO-349
			2,162	3404
Stellar (1110-1)	2,000*	43	660	3401
Stellar (1110-2)	NA	NA	831	3401
Index (1110-1)	2,200*	52	1,020	3400
Index (1110-2)	NA	NA	1,155	3400

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

[redacted]

PART II. CAMERA OPERATION

All cameras operated satisfactorily throughout both buckets of this mission.

PART III. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: Varies from thin to heavy. Parts of some operations are underexposed; others, overexposed. This condition occurred where operational requirements for SO-349 and 3404 film types necessitated a restriction in slit selection. Since one slit was slaved specifically to SO-349, only three slits were available for use with 3404. Consequently, optimum exposure could not be achieved on all operations.

2. Contrast: Ranges from low to high.

3. Image Quality: Less overall than that provided by recent missions. Most objects appear sharp and well defined at a magnification of 25X; but when these same objects are viewed at 50X, they exhibit an out-of-focus appearance. The image quality of 1110-2 is more variable than 1110-1. The Performance Evaluation Team (PET) emphasized that all the following factors contributed to the poor performance of this mission:

a. Small Scale - Again, this mission was flown at a higher altitude than some earlier missions to obtain additional coverage.

b. Low Lens Resolution - Lens resolution test performance was the poorest since Mission 1102.

c. Out-Of-Focus Appearance - The cameras were designed and calibrated for operation at on-orbit temperatures of approximately 70°F. Actual on-orbit temperatures ranged around 60°F. The decrease in temperature caused a shift in focus and thus an out-of-focus condition in the resulting imagery.

d. Filter - An alternate filter (W-25) in the fwd-looking camera, used on several domestic passes, provided better ground resolution than the primary W-23A filter, which was used for all operational photography. As a result the PET recommended that the W-25 be used on the fwd camera of all future flights.

This mission utilized 2,000 feet of film type SO-349 in each main camera. An analysis of SO-349 as compared to 3404 will be presented in a special study in a later photographic evaluation report. Preliminary evaluation by NPIC and PET personnel revealed no apparent difference in image quality between the two materials. Considering the slight increase

in speed of SO-349 and hence the ability to decrease slit widths, thus decreasing image smear components, the PET recommends SO-349 (3414) be used on future flights.

An MIP rating of 90 has been assigned to frame 55 fwd, pass 122D of Mission 1110-1; and an MIP of 95 has been assigned to frame 112 fwd, pass 201D of Mission 1110-2. MIP ratings are given to the nearest increment of five because of the lack of confidence that can be placed in the ability of observers to discriminate between two images in finer increments. By using the established rating procedures, a five-man team ranked the 1110-1 imagery and arrived at a rating of 92.0. Thus by normal rounding-off procedures, Mission 1110-1 was given an MIP rating of 90. A four-man team ranked the 1110-2 imagery and arrived at a rating of 92.6; thus Mission 1110-2 was given an MIP rating of 95. The actual difference between the two rankings is 0.6. Hence, the image quality between the two MIP frames is not indicative of the difference of 5 in the MIP ratings. Overall image quality of Missions 1110-1 and 1110-2 is comparable.

4. Imaged Degradations:

a. Light Leaks - A minor characteristic splash-like fog pattern (see Graphic 1, page 12) is present on the first frame of most camera operations of Mission 1110-1. This fog pattern was not imaged on the material from Mission 1110-2.

b. Static - A few instances of minor dendritic edge static traces were noted.

c. Other:

(1) Characteristic out-of-focus bands are present on frames three and four of most passes. These areas are associated with film path rollers, and the severity of degradation is dependent upon the length of camera-off time between operates.

(2) Random, intermittent, plus density spots are present throughout Mission 1110-2. They are present on both the fwd and aft camera records as well as both 3404 and SO-349 emulsions. The size of the spots varies with the largest being approximately 0.0005 inch in diameter. Analysis, by the processing contractor, determined that the spots are composed of silver and have a fuzzy, unsharp boundary. They occur both in and out of the format area with significantly higher frequency in the last few inches at the supply end of the frame. The source of sensitization which resulted in these spots could not be established, but it is suspected to have occurred in flight.

5. Physical Degradations:

a. An intermittent, eight-inch long, longitudinal emulsion scratch originates approximately three inches from the supply end of the frame and extends through the horizon block into the take-up of the adjacent frame. The scratch is located one inch from the binary film edge. The severity of the scratch decreases as the mission progresses. Similar scratching was noted by camera contractors during system ground tests. The source of the scratching was isolated on the input side of, and immediately prior to entering, the horizon platen area. Equipment in this area was partially disassembled and inspected, but the direct cause was not determined. During flight readiness tests, the scratching was still noted but less severe, and further disassembly and inspection were considered unwarranted.

b. A band of diagonal marks (rope-like appearance), 0.1 inch wide and 0.3 inch from the binary film edge, runs continuously from frames 23-38 and 43-92 of pass 263D fwd. These marks do not appear on the last frame of pass 263D. Degradation to the imagery is minor. No cause could be established.

c. Manufacturer's splices are located on the following:

Pass	Frame
022D	142
070D	34
154D	12
218D	32
236D	07
266D	28
260D	30

B. Aft-Looking Panoramic Camera

1. Density: Varies from thin to heavy.

2. Contrast: Ranges from low to high.

3. Image Quality: Less overall than that provided by recent missions (see Part III, paragraph A-3, for detailed explanation of the image quality). The best aft camera imagery is slightly less than the corresponding fwd camera imagery, and the aft image quality is more variable than that of the fwd.

4. Imaged Degradations:

a. Light Leaks - A minor characteristic splash-like fog pattern (see Graphic 2, page 12) is present on the first frame of most passes. An equipment shadowgraph (see Graphic 3, page 12) is present on the fourth and sixth frame from the end of some passes.

b. Static - A few instances of minor dendritic edge static were noted.

c. Other:

(1) Characteristic out-of-focus bands are present on frames four and five of most passes. These areas are associated with film path rollers, and the degradation severity is dependent upon the length of camera-off time between operates.

(2) Random, intermittent, plus density spots are present throughout 1110-2 (see Part III, paragraph A-4c(2), for a detailed description of this anomaly).

5. Physical Degradations:

a. Several minus density defects are present intermittently throughout the SO-349 portion of the aft camera record. Analysis indicates a foreign liquid substance formed a drop on the film. As the drop was transported through the input metering roller assembly of the camera or processor roller, the substance was squeegeed. This squeegeed pattern was repeated four to five times at a frequency of 6 3/8 inches. The substance either desensitized the emulsion or prevented penetration of the viscous developer, thereby resulting in a minus density spot. Analysis concluded this anomaly is not a film defect; however, the exact cause could not be determined.

b. Three nicks (small tears) in the edge of the film and a diagonal crease in frames 25 and 26 of pass 187D were caused when the film tracked over a flange of a guide roller during the processing contractor's presplice operation. This anomaly occurred when a manufacturer's splice, in frame 26, 189D, left the camera take-up spool and slack suddenly formed, causing the film to track over the flange of a guide roller on the presplice table. The slack resulted from an out-of-round condition of the film on the camera take-up spool.

c. Rail scratches along the data block edge of the film appear heavier than usual.

d. Manufacturer's splices are located on the following:

Pass	Frame
039D	27
118D	36
187D	26
232D	24
234D	112
263D	45
268D	133

C. Stellar Cameras

1. Density: Varies from thin to heavy; however, the overall density of the starboard imagery is slightly greater than that of the port.

2. Contrast: Adequate for detection of stellar images.

3. Image Shape: Point-type.

4. Images Per Frame: Approximately 8-15 stellar images are detectable on both starboard and port frames.

5. Imaged Degradations:

a. Light Leaks - None noted.

b. Static - Multiple corona and dendritic static discharge traces are present intermittently throughout the mission. Additional static marks, induced by the reseau grid plate, are present in the port frames and, to a greater degree, in the starboard frames. These discharge traces are more prominent on Mission 1110-2 than 1110-1.

6. Physical Degradations: None noted.

D. Index Camera

1. Density: Ranges from medium to heavy.

2. Contrast: Generally medium.

3. Image Quality: Generally good where not degraded by static fogging.

4. Imaged Degradations:

a. Light Leaks - None noted.

b. Static/Other - Several, continuous, very fine emulsion rubs located near format center are present throughout the mission. These lines are coincident with the reseau grid lines and are believed to be a result of inadequate film clearance which permitted the film to rub during transport. The rub lines are generally confined to a 0.7-inch band near center of format. Intense static fogging associated with these lines severly degrades the imagery within the surrounding area. The fogging (corona and dendritic) increases as the mission progresses and becomes so severe that up to 80 percent of some frames are obliterated.

The reseau plate for this unit was unique in that small sections of grid lines were missing. The reseau plate was accepted out of specifications with the condition that it must retain enough line junctions to act as a 5mm grid rather than the normal 2.5mm grid. This decision was concurred with by the prime user.

An early vacuum chamber test by the manufacturer showed a static marking condition similar to that on the mission material. At that time the marking was successfully eliminated by cleaning the grid plate. During a later test the film transport unit jammed and the platten pad received a small tear in one corner. A film sample from the camera was tested and it was determined that the film was still flat and within calibration limits. In retrospect, this jam might have loosened the platten pad.

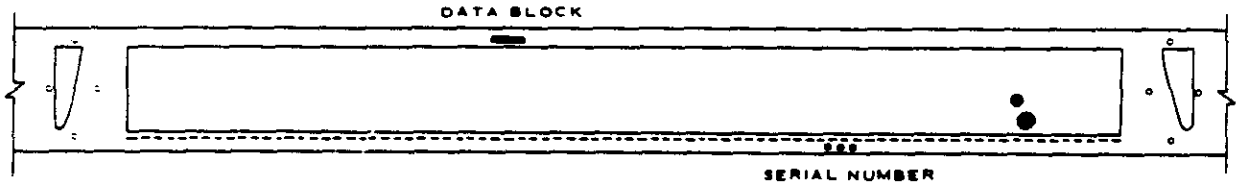
Tentative conclusions may be drawn from the above evidence. The broken reseau grid, which is normally grounded, had many small metallic segments which individually acted as small charge collectors. Emulsion dust would tend to gather at these points, causing a gradual build-up as the mission progressed. A partially loosened pad and/or close tolerance in the platen film path would aggravate the situation. As the emulsion built up, the charge condition would increase, which is what evidently occurred during the mission.

5. Physical Degradations: See paragraph 4 above.

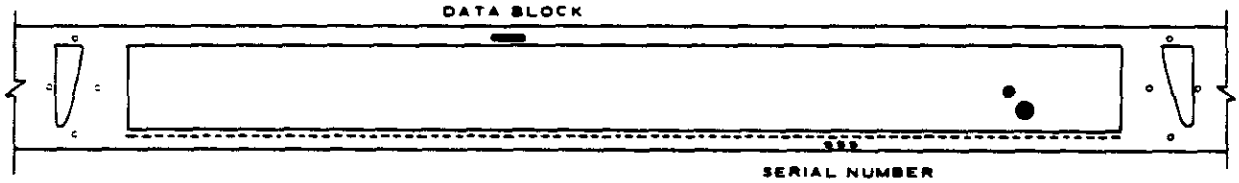
E. Graphic Display

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

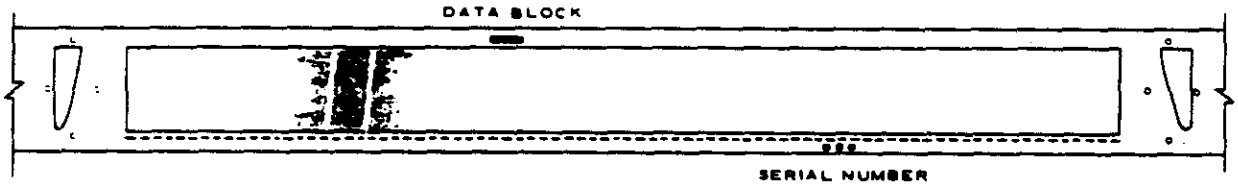
GRAPHIC 1. First frame of 1110-1 only (fwd camera)



GRAPHIC 2. First frame of most passes (aft camera)



GRAPHIC 3. Fourth and sixth frame from end of most passes (aft camera)



PART IV. IMAGED AUXILIARY DATA

The auxiliary data for all cameras are imaged properly throughout the mission except as noted below.

1. The fwd camera number was imaged several times on the last frame of most operations. Also, the next to last frame of some fwd operates of Mission 1110-2 contains an extra binary time word. These conditions resulted when the electrical inhibit pulse was of insufficient duration to prevent multiple firing during the slow creep mode of the last frame of some operations.

2. Five frames of the DISIC material do not have the binary time word imaged. The cause is probably due to a missed data request pulse.

PART V. MENSURATION QUALITY

Eighty requests for mensuration support were fulfilled during the initial readout of this mission. No mensuration problems were encountered and the image quality is considered to be good for mensuration.

PART VI. FILM PROCESSING

A. Processing Data

Camera	Mission	Machine/ Process	Developer	Film	Average Gamma	Speed Value AEI	Speed Value AFS
Fwd	1110-1	Yardleigh/ Dual Gamma	NA	3404	1.94	3.5	9.7
	1110-2	Yardleigh/ Dual Gamma	NA	3404	1.99	3.6	10.4
	1110-2	Yardleigh/ Dual Gamma	NA*	SO-349	2.11	4.7	14.0
Aft	1110-1	Yardleigh/ Dual Gamma	NA	3404	1.98	3.6	9.9
	1110-2	Yardleigh/ Dual Gamma	NA	3404	2.02	3.6	9.9
	1110-2	Yardleigh/ Dual Gamma	NA*	SO-349	2.11	4.7	14.0
Stellar	1110-1	Trenton/ Single Level	NA	3401	2.12	65.9	222.0
	1110-2	Trenton/ Single Level	NA	3401	2.13	60.1	227.0
Index	1110-1	Yardleigh/ Dual Gamma	NA**	3400	1.41	32.3	75.2
	1110-2	Yardleigh/ Dual Gamma	NA**	3400	1.62	32.3	76.9

NA - Not available.
*Film type SO-349 was processed in a different Dual Gamma developer than 3404.
**Film type 3400 was processed in a different Dual Gamma developer than 3404 and SO-349.

B. Film Handling Summary: No film handling or initial breakdown problems were encountered except as noted below.

1. Three nicks and a crease occurred during the Mission 1110-1 aft defilming operation (see Part III, paragraph B-5b, for an explanation of this anomaly).

2. Breakdown of Mission 1110-2 was delayed four hours due to the split film load. The 3404 portion of the fwd and aft record was processed first. The Yardleigh processor was then shut down four hours for cleaning/certification before processing the SO-349 portion of the mission. Since SO-349

and 3404 require different chemistries, and only one dual gamma Yardleigh processor is available, complete certification/cleaning of the processor between emulsions is necessary.

3. Before the index record of Mission 1110-2 could be processed the Yardleigh was again shutdown for cleaning/certification. This procedure required nine hours, and as a result a substantial delay was encountered in the breakdown team's correlation of the stellar and index material.

C. Timetable

Mission	Recovered	Received at Processing Site	Priority 1A at NPIC
1110-1	31 May 70/ 2230Z	1 Jun 70/ 1900Z	4 Jun 70/ 0551Z
1110-2	8 Jun 70/ 2230Z	9 Jun 70/ 2020Z	12 Jun 70/ 0458Z

No special prepriority 1A shipment at NPIC.

PART VII. PI SUITABILITY

A. PI Statistics

1. Target Coverage:

	1110-1	1110-2	Total
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	63	87	150

2. Photographic Interpretability Ratings:

Rating	Missiles	Nuclear Energy	Air Facilities	Ports	Elect Commo	Military Activity	Complex
Good	3	0	2	0	0	1	1
Fair	53	1	14	4	1	4	7
Poor	42	0	9	18	0	3	10
TOTALS*	98	1	25	22	1	8	18

3. Summary of Photographic Interpretability Ratings (percentage):

Good	7	or	4.2%
Fair	84	or	48.5%
Poor	82	or	47.3%

*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	78	or	45.0%
b.	Scattered Clouds	66	or	38.2%
c.	Heavy Clouds	23	or	13.3%
d.	Haze	6	or	3.5%
e.	Cloud Shadow	--	or	--

2. Product Interpretability: The photo interpretability of Mission 1110 is fair to poor. The effectiveness of this mission was reduced by the higher than normal acquisition altitudes and the out-of-focus appearance of the imagery.

PART VIII. RESOLUTION TARGET DATA

A. Mission 1110-1

Camera (looking)	Fwd	Aft
Pass	129D	129D
Frame	10	16
Date of Photography	28 May 70	28 May 70
Universal Grid Coordinates	30.7-3.0	44.9-3.2
Geographic Coordinates of Format Center (deg-min)	41-44N 115-41W	40-51N 115-33W
Altitude (ft)	612,870	611,854
Camera		
Pitch (deg)	+15.0056	-15.0171
Roll (deg)	-00.0749	-00.0523
Yaw (deg)	+00.2806	+00.3230
Local Sun Time	1226	1227
Solar Elevation (deg-min)	68-51	69-38
Exposure (sec)	1/490	1/665
Processing	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	173-18	173-28
Filter (Wratten)	W-23A	W-21
Target Type	51/51 T-Bar/ Vernier T-Bar	51/51 T-Bar/ Vernier T-Bar
Target Contrast	5:1/5:1	5:1/5:1
Weather Conditions	Scattered Clouds	Scattered Clouds

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

	51/51 T-Bar					Vernier T-Bar			
	Along Track		Across Track			Along Track		Across Track	
Observer	Fwd	Aft	Fwd	Aft	Observer	Fwd	Aft	Fwd	Aft
1 ON	12	8	16	12	1 ON	9	7	10	*
DP	12	12	12	12	DP	NR	10	10	*
2 ON	12	12	16	12	2 ON	9	7	NR	*
DP	16	12	16	12	DP	NR	9.5	NR	*
3 ON	12	12	16	12	3 ON	10	8.5	NR	*
DP	16	12	16	12	DP	NR	10	NR	*

NR - Not resolved.
*- In cloud shadow.

B. Mission 1110-1

Camera (looking)	Fwd	Aft
Pass	48D	48D
Frame	3	9
Date of Photography	23 May 70	23 May 70
Universal Grid Coordinates	26.3-2.1	49.1-3.9
Geographic Coordinates of Format Center (deg-min)	31-84N 109-56W	30-47N 109-49W
Altitude (ft)	592,755	592,076
Camera		
Pitch (deg)	+15.3108	-15.3566
Roll (deg)	-00.1164	-00.0878
Yaw (deg)	+00.2876	+00.4827
Local Sun Time	1315	1315
Solar Elevation (deg-min)	69-18	69-34
Exposure (sec)	1/504	1/684
Processing	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	174-41	174-48
Filter (Wratten)	W-23A	W-21
Target Type	Ft. Huachuca	Ft. Huachuca
Target Contrast	Leg A - 10:1 Leg B - 17:1	Leg A - 10:1 Leg B - 17:1
Weather Conditions	Clear	Clear

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

Leg A

Observer		Along Track Fwd	Along Track Aft	Across Track Fwd	Across Track Aft
1	ON	8.6	6.25	11.2	8.6
	DP	13.2	10.6	20.6	8.6
2	ON	8.6	6.8	11.2	6.8
	DP	16.3	13.2	25.6	8.6
3	ON	10.6	12.5	13.2	11.2
	DP	16.3	13.2	25.6	16.3

Leg C

Observer		Along Track Fwd	Along Track Aft	Across Track Fwd	Across Track Aft
1	ON	6.25	6.8	8.6	8.6
	DP	5.3	6.8	6.8	6.8
2	ON	6.25	6.8	8.6	8.6
	DP	6.8	6.8	6.8	8.6
3	ON	6.8	8.6	8.6	6.8
	DP	5.3	8.6	10.5	8.6

C. Mission 1110-2

Camera (looking)	Fwd	Aft
Pass	210D	210D
Frame	55	61
Date of Photography	2 Jun 70	2 Jun 70
Universal Grid Coordinates	26.2 -3.8	49.2-2.6
Geographic Coordinates of Format Center (deg-min)	40-24N 120-07W	39-34N 120-02W
Altitude (ft)	572,521	572,250
Camera		
Pitch (deg)	+15.7349	-15.7663
Roll (deg)	-00.0515	-00.0577
Yaw (deg)	+00.4061	+00.4050
Local Sun Time	1137	1137
Solar Elevation (deg-min)	71-36	72-27
Exposure (sec)	1/520	1/705
Processing	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	173-23	173-32
Filter (Wratten)	W-23A	W-21
Target Type	51/51 T-Bar/ Vernier T-Bar	51/51 T-Bar/ Vernier T-Bar
Target Contrast	5:1/5:1	5:1/5:1
Weather Conditions	Clear	Clear

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

	51/51 T-Bar					Vernier T-Bar				
		Along Track		Across Track			Along Track		Across Track	
Observer		Fwd	Aft	Fwd	Aft	Observer	Fwd	Aft	Fwd	Aft
1	ON	12	7.1	12	8	1 ON	8	7	9	8
	DP	12	12	12	12	DP	8	8.5	8	8.5
2	ON	12	8	12	8	2 ON	8	8	9.5	8
	DP	12	12	12	12	DP	9.5	9.5	9.5	8.5
3	ON	12	7.1	12	7.1	3 ON	8.5	8	9	8
	DP	12	12	12	12	DP	10	9	9.5	8.5

D. Mission 1110-2

Camera (looking)	Fwd	Aft
Pass	226D	226D
Frame	11	17
Date of Photography	3 Jun 70	3 Jun 70
Universal Grid Coordinates	32.0-4.6	43.2-1.1
Geographic Coordinates of Format Center (deg-min)	40-52N 116-40W	39-46N 116-32W
Altitude (ft)	566,332	566,147
Camera		
Pitch (deg)	+15.6187	-15.7104
Roll (deg)	-00.0813	-00.1115
Yaw (deg)	+00.4826	+00.5443
Local Sun Time	1137	1137
Solar Elevation (deg-min)	71-13	72-03
Exposure (sec)	1/523	1/709
Processing	Dual Gamma	Dual Gamma
Vehicle Ground Track Azimuth (deg-min)	173-21	173-37
Filter (Wratten)	W-23A	W-21
Target Type	51/51 T-Bar/ Vernier T-Bar	51/51 T-Bar Vernier T-Bar
Target Contrast	5:1/5:1	5:1/5:1
Weather Conditions	Clear	Clear

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

51/51 T-Bar

Observer		Along Track Fwd	Along Track Aft	Across Track Fwd	Across Track Aft
1	ON	12	12	12	12
	DP	12	12	12	12
2	ON	12	12	12	12
	DP	12	12	12	12
3	ON	12	12	12	12
	DP	12	12	12	12

Vernier T-Bar

Observer		Along Track Fwd	Along Track Aft	Across Track Fwd	Across Track Aft
1	ON	10	7	9.5	7
	DP	9.5	9.5	9.5	8.5
2	ON	9.5	8.5	9.5	8
	DP	10	9.5	9.5	9
3	ON	9.5	8.5	9.5	8.5
	DP	10	12	12	8.5

	Fwd-Looking			Aft-Looking			DISIC (Unit 10)		
	Panoramic	Take-up Horizon	Supply Horizon	Panoramic	Take-up Horizon	Supply Horizon	Stellar Port	Stellar Starboard	Index
Camera Number	323	*	*	322	*	*			
Reseau Number	*	*	*	*	*	*	9P	12	114
Lens Serial Number	I-210	E-23768	E-23810	I-193	E-40772	E-40783	9P	12	114
Slit Position/ Slit Widths (in) Pos 1	0.141	*	*	0.104	*	*	*	*	*
2	0.167	*	*	0.132	*	*	*	*	*
3	0.203	*	*	0.160	*	*	*	*	*
4	0.108	*	*	0.080	*	*	*	*	*
Failsafe	0.153	*	*	0.118	*	*	*	*	*
Aperture	*	f8.0	f6.3	*	f6.3	f8.0	f2.8	f2.8	f6.3
Exposure Time (sec)		1/100	1/100		1/100	1/100	1.5	1.5	1/500
Filter (Wratten) Primary	23A	25	25	21	25	25			W-12
Alternate	25	*	*	23A	*	*	None	None	*
Focal Length	24.0012 in	55mm	55mm	24.0048 in	55mm	55mm	3 in	3 in	3 in
Film Length (ft)	16,300	*	*	16,300	*	*	2,000		2,200
Splices	7	*	*		*	*	0		0
Emulsion	3404-449-5/ SO-349-4-2-3-0	*	*	3404-449-5/ SO-349-4-2-3-0	*	*	327-4-8-9		211-2-12-9
Film Type	3404/SO-349/ 3404	*	*	3404/SO-349/ 3404	*	*	3401		3400
Resolution Data (1/mm)		209R/187T	187R/187T		187R/166T	187R/148T	NA	NA	102R/102T ($\frac{3400}{W-21}$)
Static									
High Contrast	268 (W-21)	NA	NA	243 (W-21)	NA	NA			
Low Contrast	159 (W-21)	NA	NA	160 (W-21)	NA	NA			
Dynamic									
I High Contrast	259 (W-25)	NA	NA	229 (W-21)	NA	NA			
I Low Contrast	170 (W-25)	NA	NA	138 (W-21)	NA	NA			
P High Contrast	243 (W-23A)	NA	NA	206 (W-21)	NA	NA			
P Low Contrast	166 (W-23A)	NA	NA	120 (W-21)	NA	NA			

NA - Not available.
* - Not applicable.
R - Radial resolution on axis.
T - Tangential resolution on axis.

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

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

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

*Standards.
**See comments in Part III, paragraph A-3.

FIGURE 1. MIP SELECTION, MISSION 1110-1 (FWD CAMERA)

Example of the best image quality obtained on this mission.

FIGURE 1

Camera	323
Pass	122D
Frame	55 Fwd
Date of Photography (GMT)	28 Jun 70
Universal Grid Coordinates	49.1-3.6
Enlargement Factor	40X
Geographic Coordinates (format center) (deg-min)	56-45N 36-34E
Altitude (ft)	578,574
Camera Attitude:	
Pitch (deg)	+15.1375
Roll (deg)	-00.2095
Yaw (deg)	+00.1303
Local Sun Time	1244
Solar Elevation (deg-min)	54-33
Exposure (sec)	1/525
Filter	W-23A
Vehicle Ground Track Azimuth (deg-min)	169-15
Processing	Dual Gamma

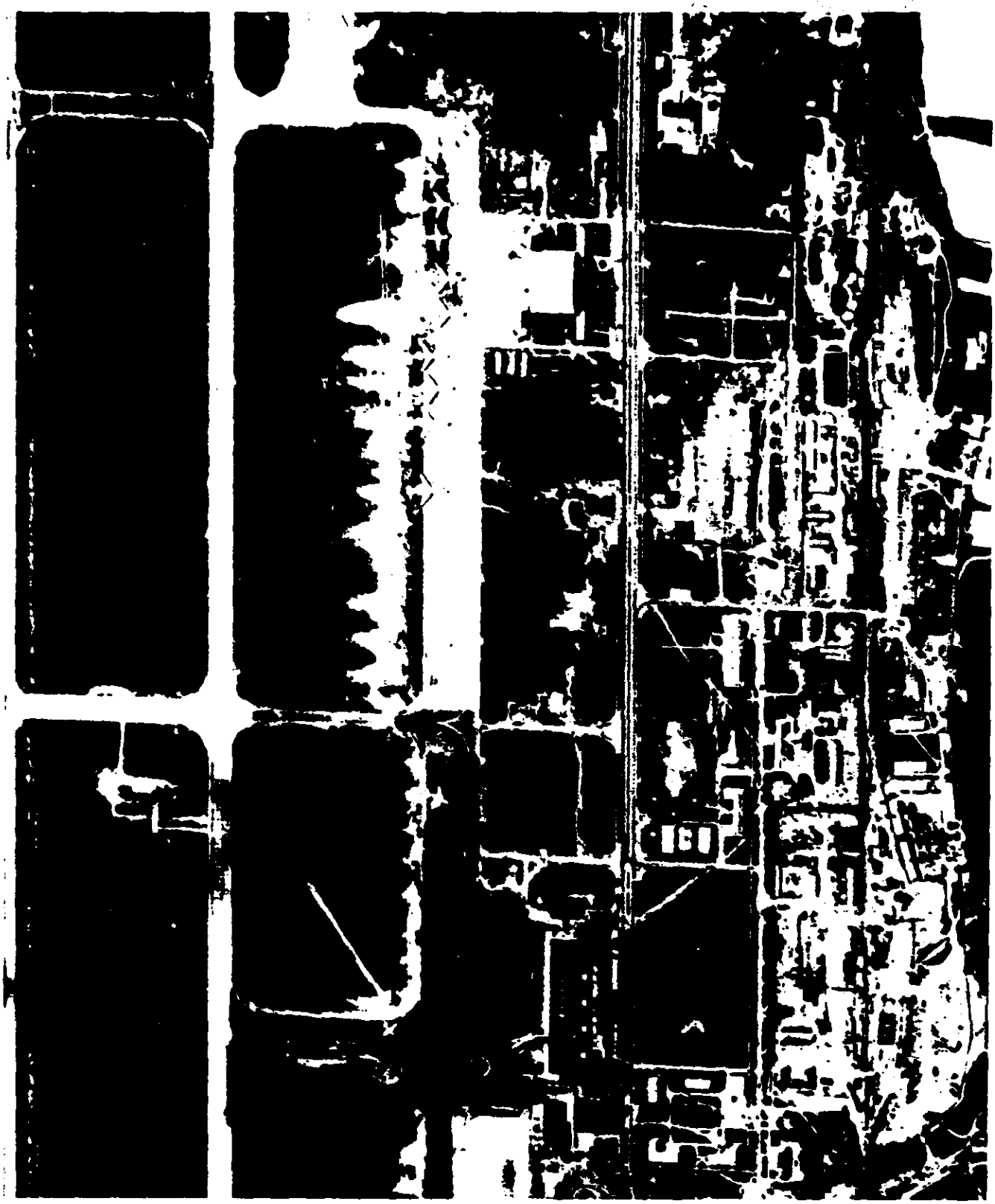


FIGURE 2. MIP SELECTION, MISSION 1110-2 (FWD CAMERA)

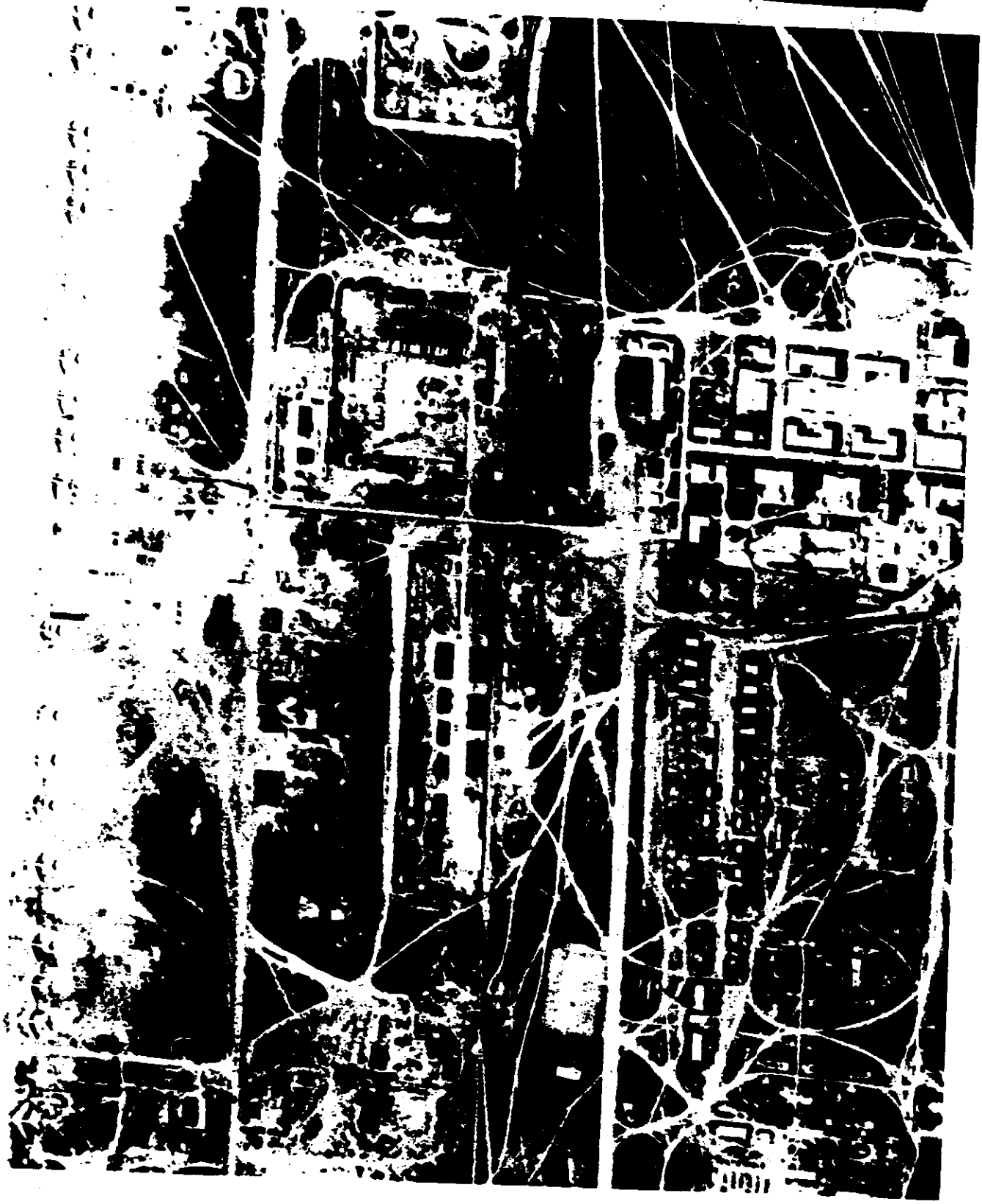
Example of the best image quality obtained on this mission.

FIGURE 2

Camera	323
Pass	201D
Frame	112 Fwd
Date of Photography (GMT)	2 Jun 70
Universal Grid Coordinates	51.7-4.8
Enlargement Factor	40X
Geographic Coordinates (format center) (deg-min)	36-26N 78-38E
Altitude (ft)	582,701
Camera Attitude:	
Pitch (deg)	+15.5858
Roll (deg)	-00.1271
Yaw (deg)	+00.5529
Local Sun Time	1139
Solar Elevation (deg-min)	61-43
Exposure (sec)	1/431
Filter	W-23A
Vehicle Ground Track Azimuth (deg-min)	171-05
Processing	Dual Gamma

~~Talent KEYHOLE~~
Control System Only

[redacted]



~~TOP SECRET RUFF~~
NO FOREIGN DISSEM

Handle Via
~~Talent KEYHOLE~~
Control System Only

[redacted]

FIGURE 3. ANOMALY - PLUS DENSITY SPOTS

Example of the plus density spots on the 3404 and SO-349 film types from both cameras of Mission 1110-2.

FIGURE 3

Pass.....	248D
Frame.....	48 Aft
Enlargement Factor.....	40X

[redacted]

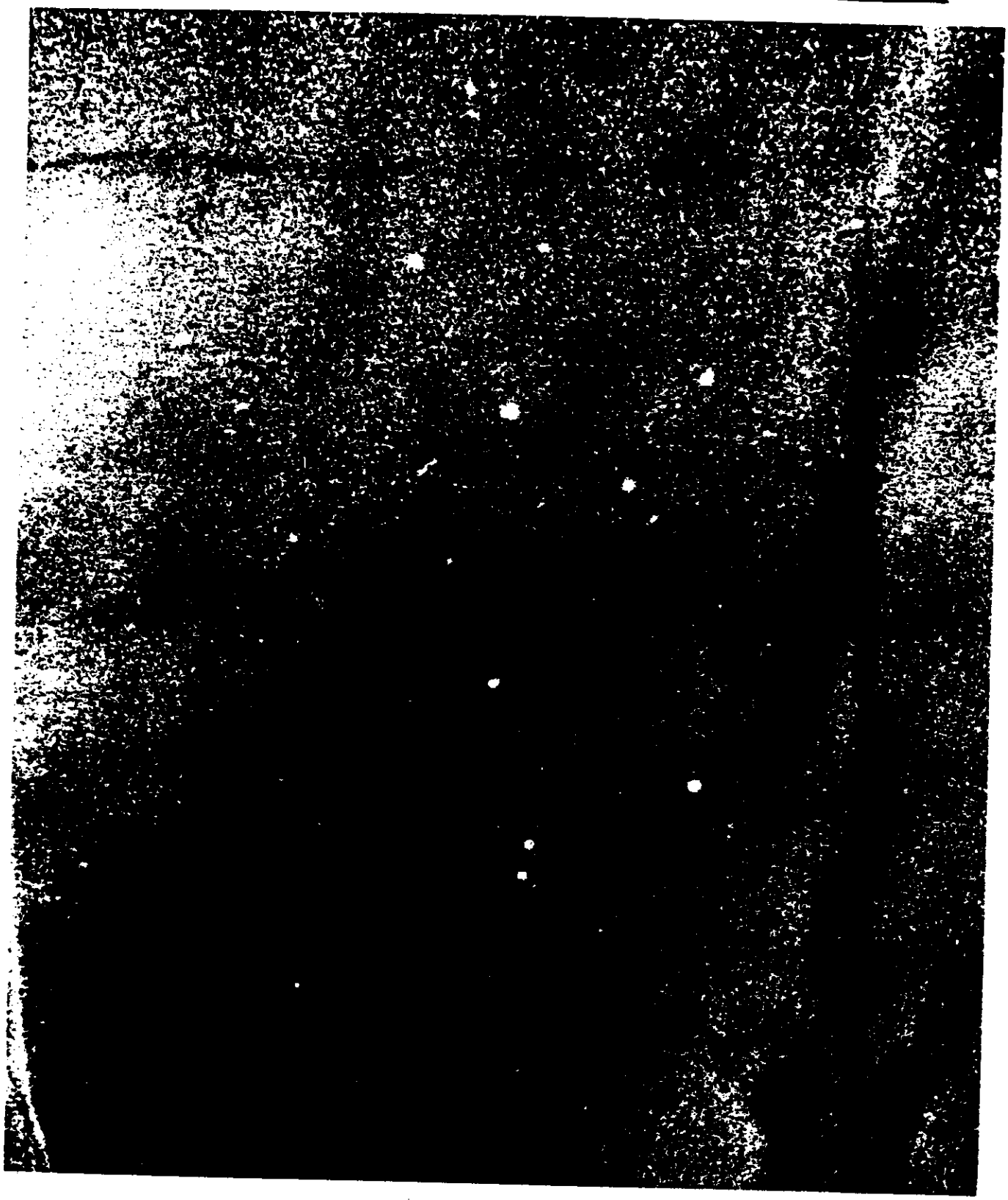


FIGURE 4. INDEX - STATIC FOGGING AND MARKINGS

Example of the severity of the plus density markings and static fogging patterns on the index material from Missions 1110-1 and 1110-2.

FIGURE 4

Pass.....	249
Frame.....	4
Date of Photography (GMT).....	5 Jun 70
Enlargement Factor.....	1.0X
Exposure (sec).....	1/500