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TECHNICAL PUBLICATION

[redacted]

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1105

WITH SPECIAL STUDIES
SO-121 EVALUATION
SO-180 SUPPLEMENT

[redacted]

APRIL 1969

COPY [redacted]

123 PAGES

[redacted]

re SO-180 supplement. Why are we working so hard to make black & white out of color? [redacted]

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1105

APRIL 1969

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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Control System Only

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LIST OF 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.

EXPOSURE*	Total quantity of light received per unit area on a sensitized plate or film.
EXPOSURE DURATION	Time during which a light-sensitive material is subjected to the influence of light. Expressed in this text in fractions of a second. Formula: Exposure Time (sec) = $\frac{\text{Slit Width (in)}}{\text{Scan Rate (in per sec)}}$
EXPOSURE STATION	Position occupied by the camera lens at the moment of exposure.
FIDUCIAL MARK	A standard geometrical reference point imaged at the margin of a photograph. The intersection of the primary fiducial marks usually defines the principal point.
FOCAL LENGTH: CALIBRATED	Adjusted value of the equivalent focal length. Computed to distribute the effect of lens distortion over the entire field.
FOCAL LENGTH: EQUIVALENT	Distance measured along the lens axis from the rear nodal point to the plane of best average definition over the entire field. Points other than the rear nodal point may be used but must be specified for correct interpretation of data.
FOCAL PLANE	Plane perpendicular to the lens axis, in which images of points in the object field of the lens are focused.
FRAME	One of a series of full-format photographs comprising a roll of film.
GROUND RESOLUTION*	Resolved ground distance as determined from standard bar target resolution targets. A target is considered to be resolved when a grouping of 3 bars can be distinguished as 3 distinct lines. The lines need not have linear form.

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."

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		S0230 Vs 3404 Evaluation
1047		None
1048		None
1101		Slant Range Computations Related to Universal Grid Coordinates for the KH4B Camera System
1102	[redacted]	None
1103		None
1104		S0-180 Evaluation Mission 1104
1105	[redacted]	S0-121 Evaluation Mission 1105 S0-180 Evaluation Supplement

SYNOPSIS

Mission 1105, a two-part satellite reconnaissance mission, was launched at 2131Z on 3 November 1968. The first capsule was recovered dry during rev 131D, at 2359Z on 11 November 1968. The mission was terminated by air catch of the second satellite re-entry vehicle on rev 292D, at 2215Z on 21 November 1968. One hundred and twenty-five photographic passes were accomplished by this nine-day mission. In general, the image quality of this mission is significantly poorer than that obtained from Mission 1104. The quality of the imagery is variable and displays areas of soft focus and image smearing. The variability in image quality is less on the second phase of the mission. However, the general image quality is still below the level of this system. The best imagery of the mission was assigned an MIP of 100, but this rating is not indicative of the overall mission quality.

Approximately 80 percent of the mission is cloud free photography.

No stellar/index unit (DISIC) was employed on this mission.

This was the first mission of this system to utilize a primary load of film type SO-380 (UTB). It is felt that the interaction of the UTB with the modified system (this system was modified to accommodate the UTB film) is the cause of the unsatisfactory image quality. This mission also carried a 500 foot tag end of film type SO-121 (aerial color film) on the aft camera supply. Detailed analysis of this color material is included in this report. It should be noted that the employment of UTB material provided approximately 7,700 feet of available film over the usual load of standard thin base material.

PART I. GENERAL SYSTEM INFORMATION

A. Camera Numbers

Forward-Looking Panoramic Camera	311
Aft-Looking Panoramic Camera	310
DISIC Camera	None

B. Launch and Recovery Dates

	Mission 1105-1	Mission 1105-2
Launch	3 November 68/2131Z	*
Recovery	11 November 68/2359Z	21 November 68/2215Z
Recovery Rev	131D	292D

C. Orbit Elements

Element	Planned	Actual 1105-1 Rev 5	Actual 1105-2 Rev 270	Photo Range
Period (min)	88.80	88.8	88.76	
Perigee (nm)	85.0	82.8	85.4	81.13, rev 32
Apogee (nm)	150.9	160.0	160.7	116.25, rev 252
Eccentricity	0.008981	0.01098	0.01058	
Inclination (deg)	82.0	82.12	82.13	
Perigee Latitude	35N	36.37N	51.38N	

NA - Not Available.
* - Not Applicable.

D. Photographic Operations

1. Panoramic Cameras

Type	Mission 1105-1 Rev	Mission 1105-1 Frames	Mission 1105-2 Rev	Mission 1105-2 Frames	Total Rev	Total Frames
Operational						
Fwd	50	4,219	55	4,105	105	8,324
Aft	50	4,220	53	3,928	103	8,148
Operational/ Domestic						
Fwd	0	0	0	0	0	0
Aft	0	0	0	0	0	0

Domestic						
Fwd	7	199	9	318	16	517
Aft	7	200	9	317	16	517
Engineering (no imagery)						
Fwd	3	33	1	11	4	44
Aft	3	33	1	11	4	44
Totals						
Fwd	60	4,451	65	4,434	125	8,385
Aft	60	4,453	63	4,356	123	8,709

2. Secondary Cameras

Camera - No stellar/index unit was employed on this mission.

E. Film Usage

	Film Load (Total, ft)	Pre-Flight Footage	Processed Footage
Fwd-Looking (Mission 1105-1)	*24,000	485	11,805
Aft-Looking (Mission 1105-1)	*23,550	485	11,804
Fwd-Looking (Mission 1105-2)	NA	NA	11,714
Aft-Looking (Mission 1105-2)	NA	NA	11,199
Stellar (Mission 1105-1)	NA	NA	NA
Stellar (Mission 1105-2)	NA	NA	NA
Index (Mission 1105-1)	NA	NA	NA
Index (Mission 1105-2)	NA	NA	NA

* - Total Load for Both Buckets.
NA - Not Applicable.

Aft-Looking Film Load consisted of:

(a) 23,000 ft of SO-380 (UTB).
(b) 50 ft of 3404.
(c) 3.5 ft material change detector strip (MCD).
(d) 500 ft of SO-121.

PART II. IMAGE ANALYSIS

A. Fwd-Looking Panoramic Camera

1. Density: The density of the forward-looking camera record is medium with a tendency toward heavy, due to the prevailing snow cover.

2. Contrast: The imagery obtained by the forward-looking camera is generally of medium to high contrast. The high contrast results from the high reflectance afforded by the snow covered areas in contrast to the low reflectance of the areas of wet, bare terrain.

3. Acuity: The imagery of the forward-looking camera record is degraded in varying degrees throughout the mission. The degradation is in the form of a variable out-of-focus condition compounded by image smear. The focus is generally poor and variable within a frame as well as between frames. Image sharpness varies significantly across the minor axis of the film as well as along the major axis, with the pattern variations between frames. The image smear is present for approximately six inches at the beginning and end of most frames, as well as randomly within a frame. The direction of smear varies from one area to the next. The smear is not confined to along and/or across track directions. The only consistent pattern seems to be that the supply end (half) of a frame is less degraded than the take-up end. It also appears that the better imagery usually occurs along the binary edge of the format, rather than the time track edge. This pattern is not consistent, however, since the reverse is sometimes true. The degree of image quality variability within a frame is such that one may expect to see engine nacelles on an aircraft at one location on a frame while he is unable to distinguish the outline of an aircraft at another location, within the same frame, in a similar format position. Image degradation is most severe at the beginning of the mission, and although the image smear at the ends of the frames and the overall focus problem persists through the second half (1105-2) there are fewer areas of severe degradation in the center two-thirds of most frames. Although the best imagery of the mission is present on the aft camera record during the first half of the mission (1105-1), the forward-looking camera record provided the best quality imagery on the second half (1105-2) of the mission.

4. Imaged Degradations

a. A minor light leak fog pattern is present within two inches of the take up end of the format on the first frame of a few passes. Occasionally, other frames within a pass were similarly affected. Degradation in all cases was extremely minor (Graphic 1, page 9).

b. Static: Dendritic type fog patterns are present intermittently throughout the forward-looking camera record. These patterns are found along both film edges and in most cases are confined to the border area.

c. Other: A wavering plus density streak is present intermittently throughout the material from the forward-looking record. This streak is approximately 0.2 to 0.3 inch wide (Graphic 4, page 9). The forward-looking camera record also contained an approximately 0.2 inch wide intermittent minus density streak (Graphic 2, page 9). These streaks are the result of strain marks which cause sensitization and desensitization in material. Such strain marks are induced by normal air twists in the camera film path which creates buckles in the film. These strain marks are characteristic of SO-380 film employed in this system.

Infrequent, random minus density spots, ranging in size from 0.025 to 0.050 inch, were observed on both the SO-380 and 3404 film. These spots contain no imagery and appear to be either desensitized or unprocessed areas.

A 0.1 inch wide plus density streak along the time-track edge of the film begins in forward frame 10, pass 197D and terminates at a manufacturer's splice in frame 73, pass 198D. This streak is outside the active format area and causes no degradation to the imagery.

A 0.10 inch wide minus density streak (rail reflection) is present along both the time-track and binary edges of all formats throughout the mission. Degradation is minor.

5. Physical Degradations: The forward-looking camera record contained two holes. The first is about 1.6 inches by 0.1 inch and is located 61 inches from the end of the material. The second hole is triangular, about 0.25 inch on a side, and is located 30.5 inches from the end of the material. A ten-inch-long crease, following the second hole, occurred during processing.

A faint base rub is present throughout the entire mission. It is located near the center of the 70mm web and appears to be continuous from head to tail. The faint plus density line resulting from this rub is visible only when the original negative is viewed by reflected light and thus offers no degradation to the imagery.

Minor rail scratches are present along both film edges throughout the mission.

6. Product Quality: The imaged degradations listed for the forward-looking camera record are generally of a minor nature and do not seriously affect the overall product quality.

B. Aft-Looking Panoramic Camera

1. Density: The density of the aft-looking camera record is generally medium with a tendency toward heavy, due to the prevailing snow cover.

2. Contrast: The imagery obtained by the aft-looking camera is generally of medium to high contrast. The high contrast results from the high reflectance afforded by the snow covered areas in contrast to the low reflectance of the areas of wet, bare terrain.

3. Acuity: The image quality of the aft-looking record is generally similar to that of the forward. The imagery displays a general out-of-focus condition and, like the forward camera photography, has areas of image smear. This smear is multi-directional and is most prevalent at the take up half of the format. As in the case of the forward-looking camera imagery, the most consistent and severe degradation exists within the last six inches at each end of a frame. In most instances, the image detail appears to be better in the forward-looking camera photography than in the aft for the first half of the mission. There are fewer instances of severe image degradation in the center two-thirds of most frames on the second half of the mission than on the first half. The quality of the aft-looking photography is better than that of the forward-looking on the second half (1105-2) of the mission. The fifth frame of each camera operation on 1105-1 contains a band of severely out-of-focus imagery approximately 0.5 inch wide along the binary edge of the frame. This band is continuous from the take up end of the frame to approximately the center of the format. On the second half of the mission (1105-2), this problem is non-existent.

4. Imaged Degradations

a. Light Leaks: A minor light leak induced fog pattern, within two inches of the take-up end of the format, is present on the first frame of a few passes. (Graphic 3, page 9).

b. Static: Dendritic static discharge traces are present along both edges of a few frames of the mission. In most cases, this static is confined to the border area and presents minor degradation to the imagery.

c. Other: A wavering plus density streak is present intermittently throughout the aft-looking record. This streak is approximately 0.2 to 0.3 inches wide and is the result of strain marks which cause sensitization in the material (Graphic 4, page 9). These marks are induced by the normal air twists in the camera film path which create buckles in the film. Such strain marks are characteristic of SO-380 film employed in this system.

Infrequent, random, minus density spots, ranging in size from 0.025 to 0.050 inch, were noted throughout the mission material. These spots contain no imagery and appear to be either desensitized or unprocessed areas.

5. Physical Degradations: The aft-looking camera record contained two holes. One hole is about 0.2 inch by 0.1 inch and is located approximately 23.8 inches from the end of the mission. This hole is present in the SO-121 color film. A second hole in frame 91, pass 273D is approximately 1.5 inches by 0.25 inch and was apparently caused by adhesion to a manufacturer's splice in frame 92.

An emulsion scratch approximately 1.5 inches from and parallel to the time-track edge of the film is present intermittently throughout the second half (1105-2) of the mission. This scratch is interrupted by numerous, small plus density dentritic static discharge traces. When these occur in a series, the discharge traces are spaced at intervals of 1.5 inches along the scratch. These discharge traces obscure an area with a diameter of about 0.05 inch.

Minor rail scratches are present along both film edges throughout the mission.

An emulsion scratch approximately 0.2 inch from and parallel to the time track edge is present on most frames of most passes on the first half of the mission. This scratch begins at the take-up end of the frame and continues approximately eight inches into the format.

An intermittent emulsion scratch 0.5 inch from and running parallel to the data block edge of the frame is present on passes 64D to 127D. This scratch is approximately 10 inches in length and is present in the take-up half of the frame.

6. Product Quality: The imaged degradations present on the aft-looking camera record are generally of a minor nature and do not seriously affect the overall product quality.

C. Stellar Camera

No stellar camera was employed on this mission. (See below)

D. Index Camera

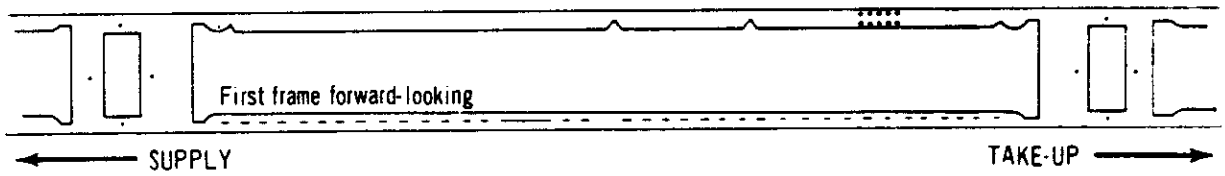
No index camera was employed on this mission. Required attitude for the photography of this mission was supplied on request, utilizing nominal and horizon reduced values.

[redacted]

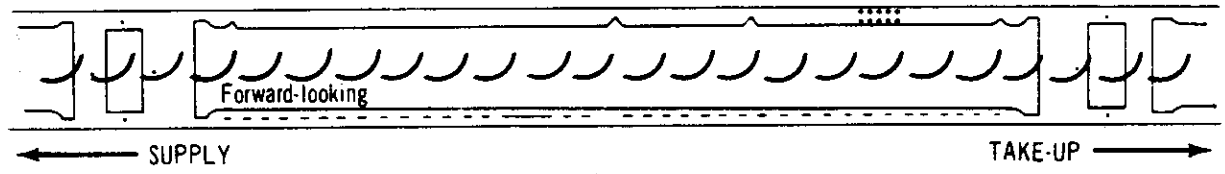
E. Graphic Display

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

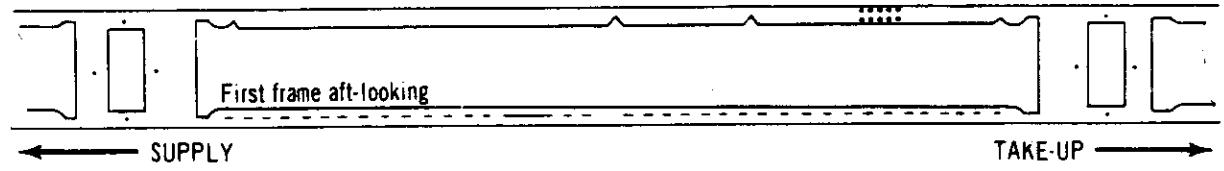
GRAPHIC 1



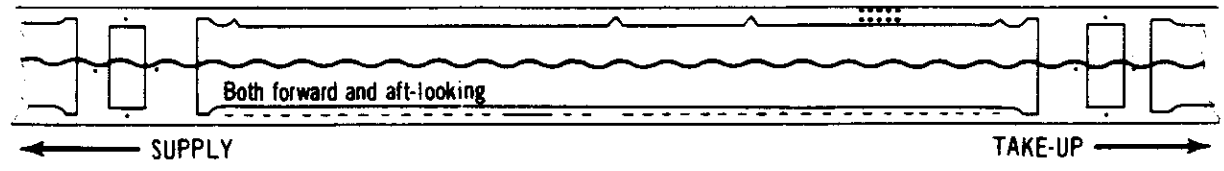
GRAPHIC 2



GRAPHIC 3



GRAPHIC 4



F. Explanation for Variable Image Quality

Both the forward-looking and aft-looking photographic records displayed imagery of a quality below that expected from this system. The contractor's explanation for the reduced quality of this mission follows: "Mission 1105 was the first system of this type to fly with a full load of SO-380 (Ultra Thin Base - UTB) film. The image quality variations are directly attributable to the interaction of the UTB with this system. Modifications were made to 1105 cameras to enable reliable handling of UTB. The major modification was a reduction in system film tensions. It would appear that this reduction in tension caused an in-flight variability in film lift and dynamics in the scan head area during exposure."

PART III. IMAGED AUXILIARY DATA

A. Forward-Looking Panoramic Camera

1. Horizon Cameras

a. Starboard-Looking

(1) Imagery: The arcs are sharp and distinct.
(2) Fiducials: Well defined.

b. Port-Looking

(1) Imagery: The imagery appears to become slightly veiled as the second half (1105-2) of the mission progresses. Under magnification, however, the horizon arcs prove to be sharp and distinct.

(2) Fiducials: Well defined.

NOTE: Due to system modifications necessary for utulization of SO-380, all horizon formats are overlapped approximately 0.4 inch by the panoramic imagery. This overlap did not affect the horizon arcs and thereby did not hinder horizon reduction.

2. Frequency Marks: Properly imaged throughout the mission.

3. Binary Time Word: The time word was operational, and the images are well defined throughout the mission. No difficulty was encountered during the automated readout.

4. Camera Number: Readable.

5. Rail Hole Images: All rail hole images were well defined throughout the mission.

6. Nodal Traces: Sharp and well defined throughout the mission.

7. Nod Indicators: Not applicable.

B. Aft-Looking Panoramic Camera

1. Horizon Camera

a. Starboard-Looking

(1) Imagery: The arcs are sharp and distinct throughout the mission.

(2) Fiducials: Well defined.

b. Port-Looking

(1) Imagery: The imagery appears to become slightly veiled as the second half (1105-2) of the mission progresses. Under magnification, however, the horizon arcs prove to be sharp and distinct.

(2) Fiducials: Well defined.

2. Frequency Marks: Properly imaged throughout the mission.

3. Binary Time Word: The time word was operational and the images well defined throughout the mission. No difficulty was encountered during the automated readout of the time word.

4. Camera Number: Readable throughout the mission.

5. Rail Hole Images: All rail hole images are well defined throughout the mission.

6. Nodal Trace: Sharp and well defined throughout the mission.

7. Nod Indicators: Not applicable.

C. Stellar Cameras

Not applicable.

D. Index Cameras

Not applicable.

PART IV. MENSURATION QUALITY

A. Forward-Looking Panoramic Camera

Seventy-eight individual 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 from a mensuration standpoint. The mensuration quality was found to be comparable to such other missions as 1103 and 1104.

B. Aft-Looking Panoramic Camera

See above.

PART V. FILM PROCESSING

A. Processing Machines and Processing Gamma

Record	Machine	Gamma	Film Type
Fwd (Mission 1105-1)	Yardleigh-5	1.850	SO-380
Aft (Mission 1105-1)	Yardleigh-5	1.845	SO-380
Fwd (Mission 1105-2)	Yardleigh-5	1.895	SO-380
Aft (Mission 1105-2)*	Yardleigh-5	1.955	SO-380
Stellar (Mission 1105-1)	None		
Stellar (Mission 1105-2)	None		
Index (Mission 1105-1)	None		
Index (Mission 1105-2)	None		

*The 500 feet of SO-121 was processed on the Grafton processor, using a modified 2607-A chemistry.

B. Processing Levels

1. Panoramic Cameras: Single level, dual gamma processing was employed on this mission.

2. Secondary Cameras: Not applicable.

C. Film Handling Summary

1. Fwd-Looking Camera

a. Capsule De-Filming

(1) Mission 1105-1: De-filmed on the West Coast and received at the processing site in suitcases.

(2) Mission 1105-2: Same as for Mission 1105-1.

b. Pre-Processing Inspection

(1) Mission 1105-1: No problems encountered.

(2) Mission 1105-2: A hole was noted through the material within the last six feet of the mission.

c. Manufacturing Splices

(1) Mission 1105-1: Pass 38D, frame 105; pass 58D, frame 86; pass 103D, frame 37; pass 118D, frame 52.

(2) Mission 1105-2: Pass 167D, frame 1; pass 198D, frame 73; pass 232D, frame 103.

d. Processing Splices

(1) Mission 1105-1: None other than normal.

(2) Mission 1105-2: In addition to the normal splices, a splice was required on frame 128 of pass 283D to prevent a hole in that frame from additional tearing.

e. Manufacturing Defects

(1) Mission 1105-1: None noted.

(2) Mission 1105-2: None noted.

f. Processing Anomalies

(1) Mission 1105-1: None.

(2) Mission 1105-2: None.

g. Breakdown

(1) Mission 1105-1: No problems.

(2) Mission 1105-2: No problems.

2. Aft-Looking Camera

a. Capsule De-Filming

(1) Mission 1105-1: De-filmed on the West Coast and received at the processing site in suitcases.

(2) Mission 1105-2: Same as for Mission 1105-1.

b. Pre-Processing Inspection

(1) Mission 1105-1: No problems encountered.

(2) Mission 1105-2: A 0.2 inch hole was noted in the color portion of the material, near the water seal cut. In frame 91, pass 273D, a 1.5 inches by 0.25 inch wide triangular piece of film was torn from the record by a splice in frame 92.

c. Manufacturing Splices

(1) Mission 1105-1: Pass 25D, frame 11; pass 54D, frame 234; pass 102D, frame 21.

(2) Mission 1105-2: Pass 135D, frame 77; pass 183D, frame 126; pass 273D, frame 17/18. The aft-camera material contained a pre-exposed, pre-processed indicator strip (3.5 feet long) to indicate the film type change from 3404 to SO-121. Part of frame 35, all of frame 36, and part of frame 37 of pass 273D were imaged on this non-sensitive strip and therefore not recorded.

d. Processing Splices

(1) Mission 1105-1: None other than normal.

(2) Mission 1105-2: In addition to the normal splices, a splice was required on frame 91, pass 273D to repair a hole in the material.

e. Manufacturing Defects

(1) Mission 1105-1: None noted.

(2) Mission 1105-2: None noted.

f. Processing Anomalies

(1) Mission 1105-1: No problems.

(2) Mission 1105-2: No problems.

3. Index Camera: No index camera was employed on this mission.

4. Stellar Cameras: No stellar cameras were employed on this mission.

D. Timetable

Film	Recovered	Received at Processing Site	Spec Ship at NPIC	Priority 1A at NPIC
Fwd (Mission 1105-1)	11 Nov 68/2359Z	12 Nov 68/1515	14 Nov 68/0857	15 Nov 68/1808
Aft (Mission 1105-1)	11 Nov 68/2359Z	12 Nov 68/1515	14 Nov 68/0857	15 Nov 68/1808
Stellar (Mission 1105-1)	NA	NA	NA	NA
Index (Mission 1105-1)	NA	NA	NA	NA
Fwd (Mission 1105-2)	21 Nov 68/2215Z	22 Nov 68/1425	23 Nov 68/2230	25 Nov 68/1657
Aft (Mission 1105-2)	21 Nov 68/2215Z	22 Nov 68/1425	23 Nov 68/2230	25 Nov 68/1657
Stellar (Mission 1105-2)	NA	NA	NA	NA
Index (Mission 1105-2)	NA	NA	NA	NA

NA - Not Applicable.

[redacted]

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 1105-1	Mission 1105-2	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	92	352	444

2. PI Quality Appraisal

Rating	Missiles	Nuclear Energy	Air Facilities	Naval Ports	Elect/ Commo	Ground Activity	Complex	Bio Chem Warfare	Other Activity
Good	67	2	7	22	1	19	6	0	9
Fair	76	6	38	14	7	102	43	3	3
Poor	35	3	25	18	2	41	15	0	0
Totals*	178	11	70	54	10	162	64	3	12

3. Summary of PI Quality Ratings (Percentage)

Good: 133 or 23 percent
Fair: 292 or 52 percent
Poor: 139 or 25 percent
Total: 564 or 100 percent

*A discrepancy exists between the total number of targets covered and the total on which the PI's report due to the fact that some targets are covered more than one time.

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C. PI Comments

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

Weather	Number of Targets
a. Clear	458 or 81 percent
b. Scattered clouds	46 or 8 percent
c. Heavy clouds	20 or 4 percent
d. Haze	27 or 5 percent
e. Scattered clouds/ cloud shadow	8 or 1 percent
f. Semi-darkness	5 or 1 percent

2. Terrain Condition: The terrain conditions were considered good for the interpretation of mission material. In most cases, the presence of snow cover aided the interpretation.

3. Product Interpretability: The imagery provided by Mission 1105 is generally soft and intermittently displays areas of image smear. The image degradation on this mission resulted in the interpretability being generally similar to that of a normal 1000 series mission. However, the best quality photography of Mission 1105 is better than the best of any 1000 series mission, while the more degraded imagery is worse than that of a normal 1000 series mission. The additional coverage provided by the use of film type SO-380 (UTB) is considered to be of an extreme advantage, and future use of this material is encouraged.

PART VII. RESOLUTION TARGET DATA

Target Designator	A		B	
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	16D	16D	16D	16D
Frame	7	13	7	13
Date of Photography	4 Nov 68	4 Nov 68	4 Nov 68	4 Nov 68
Universal Grid Coordinates	56.1 - 3.5	21.0 - 2.5	56.7 - 3.5	20.4 - 2.4
Geographic Coordinates of Format Center	34-47N 118-15W	35-30N 118-24W	34-47N 118-15W	34-47N 118-18W
Altitude (ft)	499,885	499,885	499,885	499,349
Camera				
Pitch (deg)	*	*	*	*
Roll (deg)	*	*	*	*
Yaw (deg)	*	*	*	*
Local Sun Time	1324	1324	1324	1324
Solar Elevation	33°56'	33°23'	33°56'	33°56'
Solar Azimuth	216°	216°	216°	216°
Exposure (sec)	1/272	1/460	1/272	1/460
Processing Level	NA	NA	NA	NA
Vehicle Azimuth	173°13'	173°13'	173°13'	173°19'
Filter (Wratten)	25	21	25	21
Target Type	B-1	B-1	B-2	B-2
Target Contrast	2:1	2:1	25:1	25:1
Weather Conditions	Clear	Clear	Clear	Clear

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

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	8'	8'	10'	9'
	Pos.	10'1"	11'4"	11'4"	+11'4"
Observer 2	Neg.	8'	9'	9'	9'
	Pos.	10'1"	9'	11'4"	10'1"
Observer 3	Neg.	8'	9'	9'	10'1"
	Pos.	10'1"	10'1"	11'4"	11'4"

*Not Available. + Greater Than.

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	9'	9'	9'	9'
	Pos.	9'	10'1"	9'	10'1"
Observer 2	Neg.	9'	9'	8'	9'
	Pos.	8'	9'	8'	9'11"
Observer 3	Neg.	9'	9'	9'	10'1"
	Pos.	8'	9'	8'	9'

Target Designator		C
Camera (Looking)	Fwd	Aft
Pass	16D	16D
Frame	13	19
Date of Photography	4 Nov 68	4 Nov 68
Universal Grid Coordinates	56.1 - 1.6	19.3 - 4.6
Geographic Coordinates of Format Center	34-3N 118-9W	34-3N 118-11W
Altitude (ft)	499,350	498,858
Camera		
Pitch (deg)	*	*
Roll (deg)	*	*
Yaw (deg)	*	*
Local Sun Time	1325	1325
Solar Elevation	34°29'	34°30'
Solar Azimuth	217°	217°
Exposure (sec)	1/272	1/460
Processing Level	NA	NA
Vehicle Azimuth	173°19'	173°26'
Filter (Wratten)	25	21
Target Type	51/51 T-Bar	51/51 T-Bar
Target Contrast	5:1	5:1
Weather Conditions	Hazy	Hazy

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

		C			
		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	12'	16'	+16'	12'
	Pos.	16'	16'	+16'	16'
Observer 2	Neg.	16'	12'	+16'	12'
	Pos.	16'	16'	+16'	16'
Observer 3	Neg.	16'	16'	+16'	12'
	Pos.	16'	16'	+16'	16'

*Not Available. + Greater Than.

Target Designator		D		E
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	32D	32D	32D	32D
Frame	3	9	5	11
Date of Photography	5 Nov 68	5 Nov 68	5 Nov 68	5 Nov 68
Universal Grid Coordinates	50.9 - 4.6	26.3 - 1.0	30.5 - 0.9	46.8 - 4.8
Geographic Coordinates of Format Center	36-38N 115-48W	36-37N 115-51W	36-23N 115-46W	36-23N 115-49W
Altitude (ft)	494,379	493,905	494,216	493,756
Camera				
Pitch (deg)	*	*	*	*
Roll (deg)	*	*	*	*
Yaw (deg)	*	*	*	*
Local Sun Time	1314	1314	1314	1314
Solar Elevation	33°5'	33°6'	33°17'	33°17'
Solar Azimuth	213°	213°	214°	214°
Exposure (sec)	1/269	1/459	1/271	1/458
Processing Level	NA	NA	NA	NA
Vehicle Azimuth	172°55'	173°2'	172°57'	173°4'
Filter (Wratten)	25	21	25	21
Target Type	C	C	C	C
Target Contrast	8.8:1	8.8:1	9.7:1	9.7:1
Weather Conditions	Clear	Clear	Clear	Clear

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

		D					E			
		Along Track		Across Track			Along Track		Across Track	
		Fwd	Aft	Fwd	Aft		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	8'7"	7'8"	+10'10"	8'7"	Observer 1	Neg. 8'7"	9'8"	8'7"	8'7"
	Pos.	8'7"	8'7"	+10'10"	10'10"		Pos. 8'7"	9'8"	9'8"	10'10"
Observer 2	Neg.	7'8"	7'8"	+10'10"	8'7"	Observer 2	Neg. 8'7"	9'8"	8'7"	8'7"
	Pos.	8'7"	7'8"	+10'10"	8'7"		Pos. 6'10"	7'8"	7'8"	8'7"
Observer 3	Neg.	7'8"	7'8"	+10'10"	8'7"	Observer 3	Neg. 8'7"	9'8"	7'8"	7'8"
	Pos.	7'8"	7'8"	+10'10"	8'7"		Pos. 6'10"	7'8"	8'7"	7'8"

* Not Available. + Greater Than.

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	F	
Target Designator		
Camera (Looking)	Fwd	Aft
Pass	32D	32D
Frame	13	19
Date of Photography	5 Nov 68	5 Nov 68
Universal Grid Coordinates	40.2 - 5.2	37.0 - 0.2
Geographic Coordinates of Format Center	35-25N 115-37W	35-24N 115-40W
Altitude (ft)	493,612	493,208
Camera		
Pitch (deg)	*	*
Roll (deg)	*	*
Yaw (deg)	*	*
Local Sun Time	1315	1315
Solar Elevation	34° 3'	34° 4'
Solar Azimuth	214°	214°
Exposure (sec)	1/272	1/459
Processing Level	NA	NA
Vehicle Azimuth	173° 7'	173° 14'
Filter (Wratten)	25	21
Target Type	51/51 T-Bar	51/51 T-Bar
Target Contrast	5:1	5:1
Weather Conditions	Clear	Clear

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

		F			
		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	8'	8'	7'2"	12'
	Pos.	12'	12'	12'	12'
Observer 2	Neg	8'	8'	7'2"	12'
	Pos.	12'	12'	12'	12'
Observer 3	Neg.	12'	8'	8'	8'
	Pos.	12'	8'	12'	12'

*Not Available. + Greater Than.

		G
Target Designator		
Camera (Looking)	Fwd	Aft
Pass	48D	48D
Frame	35	41
Date of Photography	6 Nov 68	6 Nov 68
Universal Grid Coordinates	56.5 - 4.4	21.9 - 1.1
Geographic Coordinates of Format Center	32-49N 112-31W	32-48N 112-33W
Altitude (ft)	505,340	504,981
Camera		
Pitch (deg)	*	*
Roll (deg)	*	*
Yaw (deg)	*	*
Local Sun Time	1309	1309
Solar Elevation	36°43'	36°44'
Solar Azimuth	212°	212°
Exposure (sec)	1/266	1/449
Processing Level	NA	NA
Vehicle Azimuth	173°30'	173°37'
Filter (Wratten)	25	21
Target Type	51/51 T-Bar	51/51 T-Bar
Target Contrast	5:1	5:1
Weather Conditions	Cloudy & Haze	Cloudy & Haze

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

		G			
		Along Track		Along Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	16'	12'	+16'	12'
	Pos.	16'	16'	+16'	12'
Observer 2	Neg.	16'	12'	+16'	12'
	Pos.	16'	16'	+16'	12'
Observer 3	Neg.	16'	12'	+16'	12'
	Pos.	16'	16'	+16'	12'

*Not Available. + Greater Than.

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Target Designator		
Camera (Looking)	Fwd	Aft
Pass	64D	64D
Frame	4	10
Date of Photography	7 Nov 68	7 Nov 68
Universal Grid Coordinates	19.6 - 0.7	57.8 - 5.8
Geographic Coordinates of Format Center	31-43N 109-45W	31-43N 109-48W
Altitude (ft)	508,629	508,289
Camera		
Pitch (deg)	*	*
Roll (deg)	*	*
Yaw (deg)	*	*
Local Sun Time	1301	1302
Solar Elevation	38°11'	38°11'
Solar Azimuth	210°	210°
Exposure (sec)	1/243	1/450
Processing Level	NA	NA
Vehicle Azimuth	173°39'	173°45'
Filter (Wratten)	25	21
Target Type	A Leg	A Leg
Target Contrast	11:1	11:1
Weather Conditions	Clear	Clear

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

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	12'7"	10'	14'1"	8'11"
	Pos.	12'7"	10'	15'10"	10'
Observer 2	Neg.	12'7"	8'11"	12'7"	8'11"
	Pos.	12'7"	8'11"	15'10"	11'2"
Observer 3	Neg.	12'7"	8'11"	12'7"	8'11"
	Pos.	12'7"	10'	15'10"	10'

*Not Available. + Greater Than.

Target Designator	I		J	
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	145	145	161D	161D
Frame	6	12	3	9
Date of Photography	12 Nov 68	12 Nov 68	13 Nov 68	13 Nov 68
Universal Grid Coordinates	25.8 - 4.9	51.3 - 0.9	7.7 - 1.6	70.3 - 4.1
Geographic Coordinates of Format Center	36-47N 119-18W	36-47N 119-21W	34-58N 116-47W	34-58N 116-49W
Altitude (ft)	509,227	508,777	511,207	510,855
Camera				
Pitch (deg)	*	*	*	*
Roll (deg)	*	*	*	*
Yaw (deg)	*	*	*	*
Local Sun Time	1213	1214	1206	1207
Solar Elevation	35°4'	35°4'	36°49'	36°49'
Solar Azimuth	195°	195°	193°	193°
Exposure (sec)	1/264	1/448	1/250	1/446
Processing Level	NA	NA	NA	NA
Vehicle Azimuth	172°54'	173°1'	173°11'	173°18'
Filter (Wratten)	25	21	23A	21
Target Type	51/51 T-Bar	51/51 T-Bar	B-1	B-1
Target Contrast	5:1	5:1	2:1	2:1
Weather Conditions	Clear	Clear	Clear	Clear

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

I

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	12'	12'	8'	12'
	Pos.	12'	12'	12'	12'
Observer 2	Neg.	12'	12'	12'	12'
	Pos.	12'	12'	12'	12'
Observer 3	Neg.	12'	12'	12'	12'
	Pos.	12'	12'	12'	12'

J

		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	+11'4"	9'	+11'4"	+11'4"
	Pos.	+11'4"	11'4"	+11'4"	+11'4"
Observer 2	Neg.	+11'4"	9'	+11'4"	+11'4"
	Pos.	+11'4"	10'1"	+11'4"	+11'4"
Observer 3	Neg.	+11'4"	10'1"	+11'4"	+11'4"
	Pos.	+11'4"	10'1"	+11'4"	+11'4"

*Not Available. + Greater Than.

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Target Designator	K		L	
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	161D	161D	161D	161D
Frame	3	9	3	9
Date of Photography	13 Nov 68	13 Nov 68	13 Nov 68	13 Nov 68
Universal Grid Coordinates	7.8 - 1.9	70.0 - 3.8	8.1 - 1.6	96.8 - 4.1
Geographic Coordinates of Format Center	34-58N 116-47W	34-58N 116-49W	34-58N 116-47W	34-58N 116-49W
Altitude (ft)	511,207	510,855	511,207	510,855
Camera				
Pitch (deg)	*	*	*	*
Roll (deg)	*	*	*	*
Yaw (deg)	*	*	*	*
Local Sun Time	1206	1207	1206	1207
Solar Elevation	36°49'	36°49'	36°49'	36°49'
Solar Azimuth	193°	193°	193°	193°
Exposure	1/250	1/446	1/250	1/446
Processing Level	NA	NA	NA	NA
Vehicle Azimuth	173°11'	173°18'	173°11'	173°18'
Filter (Wratten)	23A	21	23A	21
Target Type	B-2	B-2	C	C
Target Contrast	25:1	25:1	Unknown	Unknown
Weather Conditions	Clear	Clear	Clear	Clear

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

		K						L			
		Along Track		Across Track				Along Track		Across Track	
		Fwd	Aft	Fwd	Aft			Fwd	Aft	Fwd	Aft
Observer 1	Neg.	9'	10'1"	+11'4"	+11'4"	Observer 1	Neg.	12'8"	12'8"	22'7"	16'
	Pos.	10'1"	11'4"	+11'4"	+11'4"		Pos.	12'8"	12'8"	22'7"	14'3"
Observer 2	Neg.	11'4"	9'	+11'4"	+11'4"	Observer 2	Neg.	12'8"	12'8"	20'2"	14'3"
	Pos.	10'1"	11'4"	+11'4"	+11'4"		Pos.	12'8"	12'8"	22'7"	14'3"
Observer 3	Neg.	10'1"	11'4"	+11'4"	+11'4"	Observer 3	Neg.	12'8"	12'8"	22'7"	14'3"
	Pos.	10'1"	11'4"	+11'4"	+11'4"		Pos.	12'8"	12'8"	22'7"	14'3"

*Not Available. + Greater Than.

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Target Designator		M
Camera (Looking)	Fwd	Aft
Pass	161D	161D
Frame	12	18
Date of Photography	13 Nov 68	13 Nov 68
Universal Grid Coordinates	42.4 - 1.6	35.0 - 4.3
Geographic Coordinates of Format Center	33-51N 116-37W	33-51N 116-40W
Altitude (ft)	510,693	510,410
Camera		
Pitch (deg)	*	*
Roll (yaw)	*	*
Yaw (deg)	*	*
Local Sun Time	1207	1207
Solar Elevation	37°54'	37°54'
Solar Azimuth	193°	193°
Exposure (sec)	1/265	1/448
Processing Level	NA	NA
Vehicle Azimuth	173°22'	173°28'
Filter (Wratten)	23A	21
Target Type	51/51 T-Bar	51/51 T-Bar
Target Contrast	5:1	5:1
Weather Conditions	Haze	Haze

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

		M			
		Along Track		Across Track	
		Fwd	Aft	Fwd	Aft
Observer 1	Neg.	16'	8'	12'	12'
	Pos.	16'	12'	16'	12'
Observer 2	Neg.	16'	12'	12'	12'
	Pos.	12'	12'	12'	12'
Observer 3	Neg.	16'	12'	12'	12'
	Pos.	12'	12'	16'	12'

*Not Available. +Greater than.

Target Designator		N		O
Camera (Looking)	Fwd	Aft	Fwd	Aft
Pass	177D	177D	177D	177D
Frame	15	21	21	27
Date of Photography	14 Nov 68	14 Nov 68	14 Nov 68	14 Nov 68
Universal Grid Coordinates	4.8 - 4.9	72.2 - 1.2	19.4 - 3.1	58.1 - 3.0
Geographic Coordinates of Format Center	36-46N 114-22W	36-46N 114-25W	36-2N 114-15W	36-2N 114-18W
Altitude (ft)	505,613	505,318	505,317	505,062
Camera				
Pitch (deg)	*	*	*	*
Roll (deg)	*	*	*	*
Yaw (deg)	*	*	*	*
Local Sun Time	1155	1156	1155	1156
Solar Elevation	35°1'	35°1'	35°44'	35°44'
Solar Azimuth	190°	190°	190°	190°
Exposure (sec)	1/269	1/454	1/269	1/454
Processing Level	NA	NA	NA	NA
Vehicle Azimuth	172°54'	173°1'	173°1'	173°8'
Filter (Wratten)	25	21	25	21
Target Type	C	C	51/51 T-Bar	51/51 T-Bar
Target Contrast	8.8:1	8.8:1	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

		N					O				
		Along Track		Across Track				Along Track		Across Track	
		Fwd	Aft	Fwd	Aft			Fwd	Aft	Fwd	Aft
Observer 1	Neg.	+10'10"	+10'10"	+10'10"	+10'10"	Observer 1	Neg.	12'	12'	12'	12'
	Pos.	+10'10"	+10'10"	+10'10"	+10'10"		Pos.	12'	12'	16'	16'
Observer 2	Neg.	+10'10"	+10'10"	+10'10"	+10'10"	Observer 2	Neg.	12'	12'	12'	12'
	Pos.	+10'10"	+10'10"	+10'10"	+10'10"		Pos.	12'	12'	12'	16'
Observer 3	Neg.	+10'10"	+10'10"	+10'10"	+10'10"	Observer 3	Neg.	12'	12'	12'	12'
	Pos.	+10'10"	+10'10"	+10'10"	+10'10"		Pos.	12'	12'	12'	16'

*Not Available. + Greater Than.

[redacted]

PART VIII. MISSION DATA

	Fwd Pan	Fwd Take-up Horizon	Fwd Supply Horizon	Aft Pan	Aft Take-up Horizon	Aft Supply Horizon	Stellar Port	Stellar Starboard	Index
Camera Number	311	*	*	310	*	*	*	*	*
Reseau Number	*	*	*	*	*	*	*	*	*
Lens Serial Number	I-207	E23795	E23777	I-168	E23809	E23753	*	*	*
Slit Position/	1/0.180	*	*	1/0.138	*	*	*	*	*
Slit Width (in)	2/0.229	*	*	2/0.149	*	*	*	*	*
	3/0.310	*	*	3/0.192	*	*	*	*	*
	4/0.340	*	*	4/0.271	*	*	*	*	*
	FS/0.305	*	*	FS/0.198	*	*	*	*	*
Aperture	*	F/8.0	F/6.3	*	F/6.3	F/8.0	*	*	*
Exposure Time (sec)	Variable	1/100	1/100	Variable	1/100	1/100	*	*	*
Filter (Wratten) Primary	W/25	W/25	W/25	W/21	W/25	W/25	*	*	*
Alternate	W/23A	None	None	W/2E+CC2C+04N.D.	None	None	*	*	*
Focal Length (mm)	24.002	55	55	24.002	55	55	*	*	*
Splices	7	*	*	9	*	*	*	*	*
Film Type/	SO-380/	*	*	SO-380/	*	*	*	*	*
Film Length (ft)	24,000	*	*	23,000	*	*	*	*	*
		*	*	3404/50	*	*	*	*	*
		*	*	SO-121/500	*	*	*	*	*
Film Type/	SO-380/	*	*	SO-380/	*	*	*	*	*
Emulsion No	157-5-10-6-10-8	*	*	157-10-10-8	*	*	*	*	*
		*	*	3404/	*	*	*	*	*
		*	*	415-2-2	*	*	*	*	*
		*	*	SO-121/44.1	*	*	*	*	*
Resolution Data (L/mm)	NA	209R	166R	NA	209R	187R	*	*	*
	NA	187T	166T	NA	209T	187T	*	*	*
Static									
High Contrast	★293	NA	NA	▲257	NA	NA	*	*	*
Low Contrast	★182	NA	NA	▲150	NA	NA	*	*	*
Dynamic									
I High Contrast	★255	NA	NA	▲219	NA	NA	*	*	*
I Low Contrast	★173	NA	NA	▲132	NA	NA	*	*	*
P High Contrast	★279	NA	NA	▲265	NA	NA	*	*	*
P Low Contrast	★187	NA	NA	▲158	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.
FS - Fail Safe.

PART IX. ENGINEERING EXPERIMENTS

A. Mission 1105 Experiment

This mission carried a 500 foot tag end of film type SO-121 (aerial color film) on the aft camera supply. The experiment was limited in value by the reduced system film tension employed to accommodate the UTB material. This decrease in tension permitted the SO-121 to buckle out of the focal plane during exposure, providing imagery of variable quality.

B. Analysis of Experiment

A detailed analysis of the SO-121 experiment is included as a special study in this PER.

C. Schedule of Future Experiments

Tentative Experiments Mission 1106 & 1107	Polarizer through Focus	Winter, Proper Azimuths Stepped Glass Filter

FIGURE 1. MIP SELECTION, MISSION 1105-1 (Aft camera)
This is an example of the best image quality obtained on this mission.

FIGURE 2. CORRESPONDING COVERAGE OF MIP SELECTION, MISSION 1105-1
This is the corresponding coverage of the MIP area as imaged by the forward camera.

	FIGURE 1 MIP-1	FIGURE 2 Corresponding
Camera	310	311
Pass	16D	16D
Frame	20 aft	14 fwd
Date of Photography	4 Nov 68	4 Nov 68
Universal Grid Coordinates	47.3 - 1.2	29.3 - 5.0
Enlargement Factor	40X	40X
Geographic Coordinates	33-56N 118-10W	33-56N 118-8W
Altitude (ft)	498,781	499,265
Camera Attitude:		
Pitch (deg)	Not Available	Not Available
Roll (deg)	Not Available	Not Available
Yaw (deg)	Not Available	Not Available
Local Sun Time	1326	1326
Solar Elevation	34° 35'	34° 35'
Solar Azimuth	217°	217°
Exposure (sec)	1/380	1/262
Vehicle Azimuth	173° 27'	173° 20'
Processing Level	Dual Gamma	Dual Gamma

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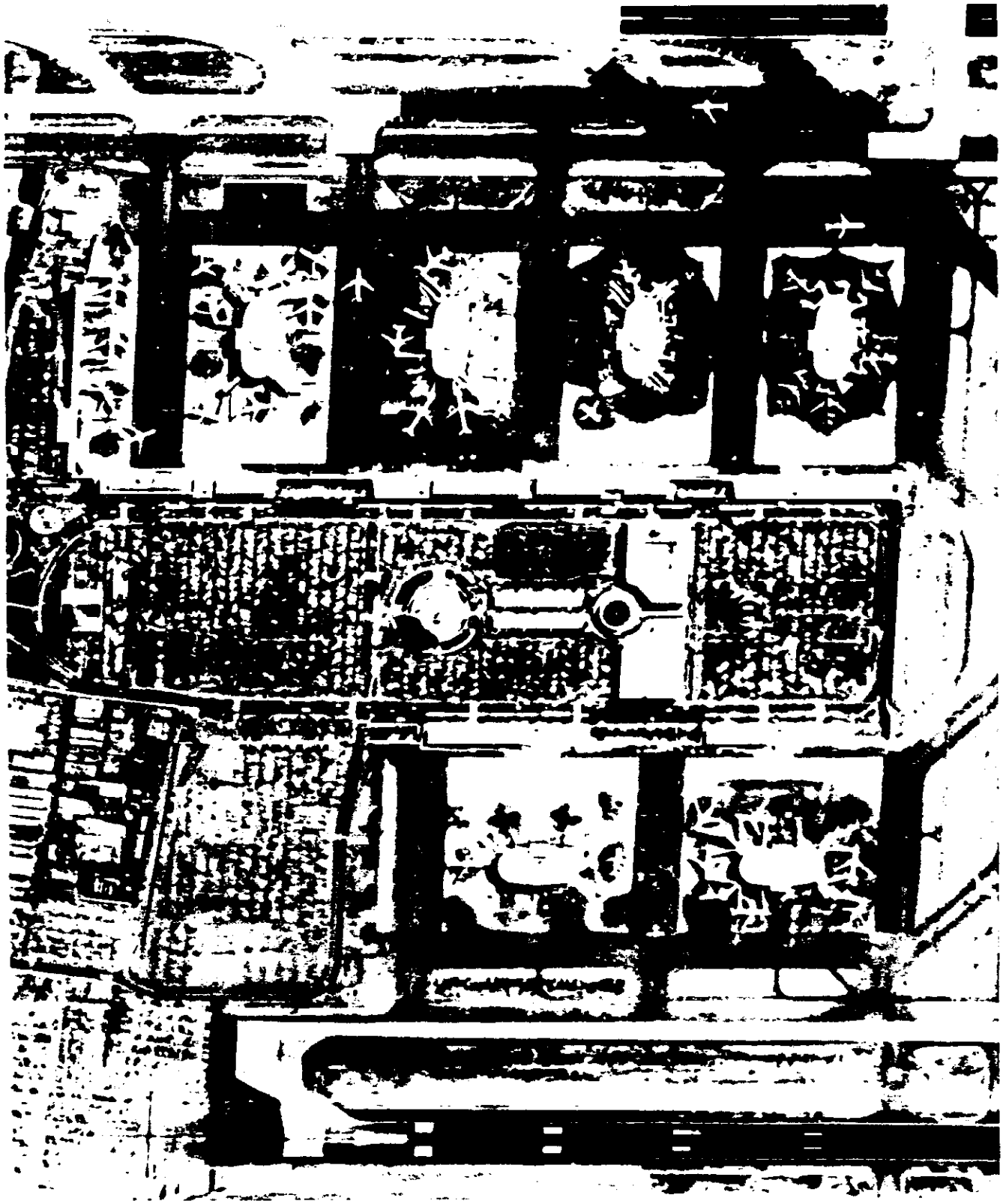
[redacted]



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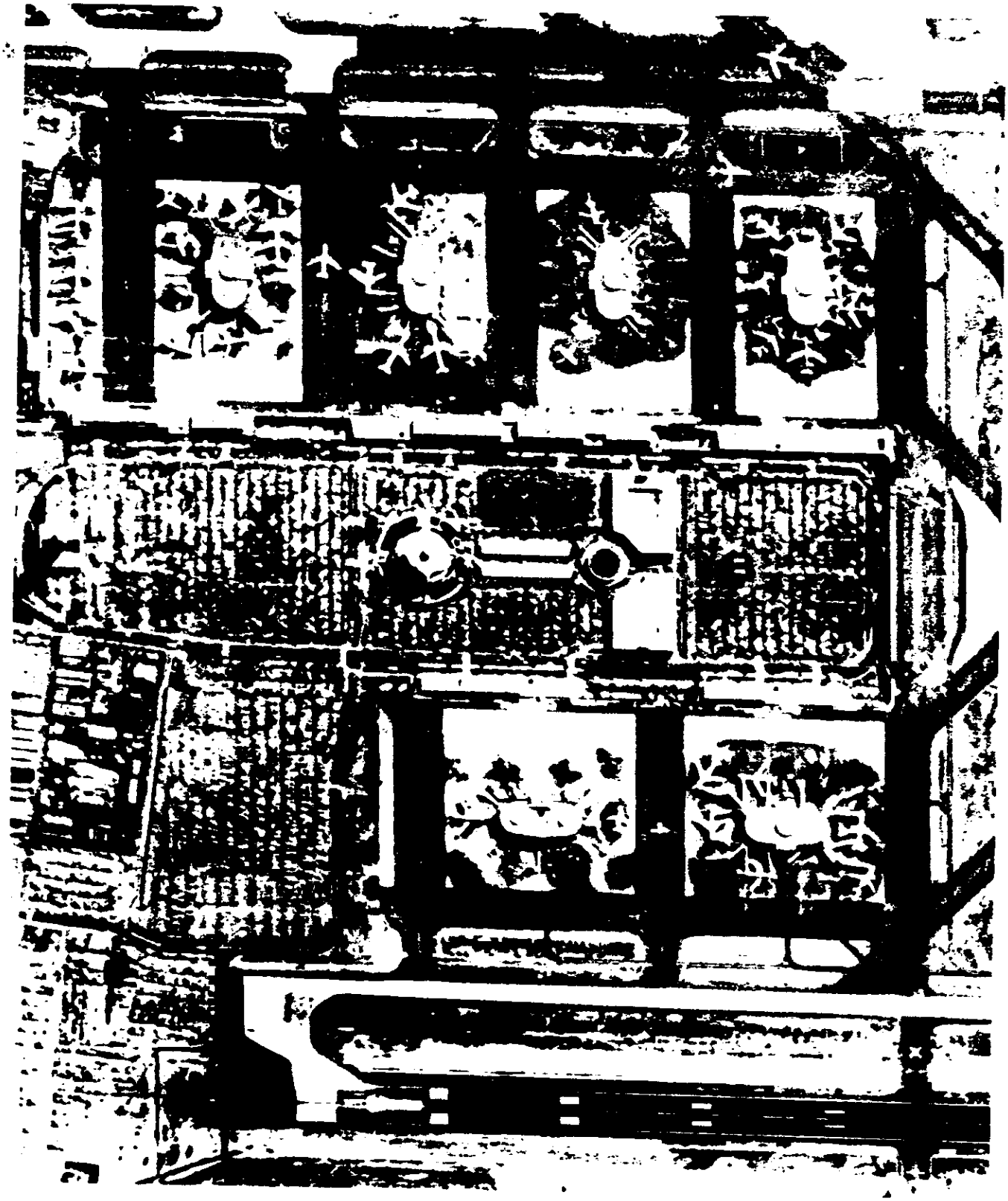

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FIGURE 3. MIP SELECTION, MISSION 1105-2 (Forward camera)
This is an example of the best image quality obtained on this mission.

FIGURE 4. CORRESPONDING COVERAGE OF MIP SELECTION, MISSION 1105-2
This is the corresponding coverage of the MIP target as imaged by the aft camera.

	FIGURE 3 MIP-2	FIGURE 4 Corresponding
Camera	311	310
Pass	170D	170D
Frame	28 fwd	34 aft
Date of Photography (GMT)	14 Nov 68	14 Nov 68
Universal Grid Coordinates	49.3 - 2.3	27.9 - 3.7
Enlargement Factor	40X	40X
Geographic Coordinates	55-47N 37-20E	55-01N 37-37E
Altitude (ft)	530,461	529,122
Camera Attitude:		
Pitch (deg)	Not Available	Not Available
Roll (deg)	Not Available	Not Available
Yaw (deg)	Not Available	Not Available
Local Sun Time	1135	1135
Solar Elevation	16°16'	16°16'
Solar Azimuth	192°	192°
Exposure (sec)	1/234	1/323
Vehicle Azimuth	167°44'	168°4'
Processing Level	Dual Gamma	Dual Gamma

[redacted]

[redacted]

[redacted]

FIGURE 5. EXAMPLE OF POOREST PHOTOGRAPHY OBTAINED ON MISSION 1105-1
This is an example of the out-of-focus imagery from Mission 1105-1.

FIGURE 5

Camera	310
Pass	41D
Frame	5 aft
Date of Photography (GMT)	6 Nov 68
Universal Grid Coordinates	46.0 - 5.2
Enlargement Factor	40X
Geographic Coordinates	52-19N 39-50E
Altitude	531,936
Camera Attitude:	
Pitch (deg)	Not Available
Roll (deg)	Not Available
Yaw (deg)	Not Available
Local Sun Time	1255
Solar Elevation	20°7'
Solar Azimuth	208°
Exposure (sec)	1/295
Vehicle Azimuth	169°21'
Processing Level	Dual Gamma

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SO-121 EVALUATION

MISSION 1105

LIST OF ILLUSTRATIONS

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[redacted]

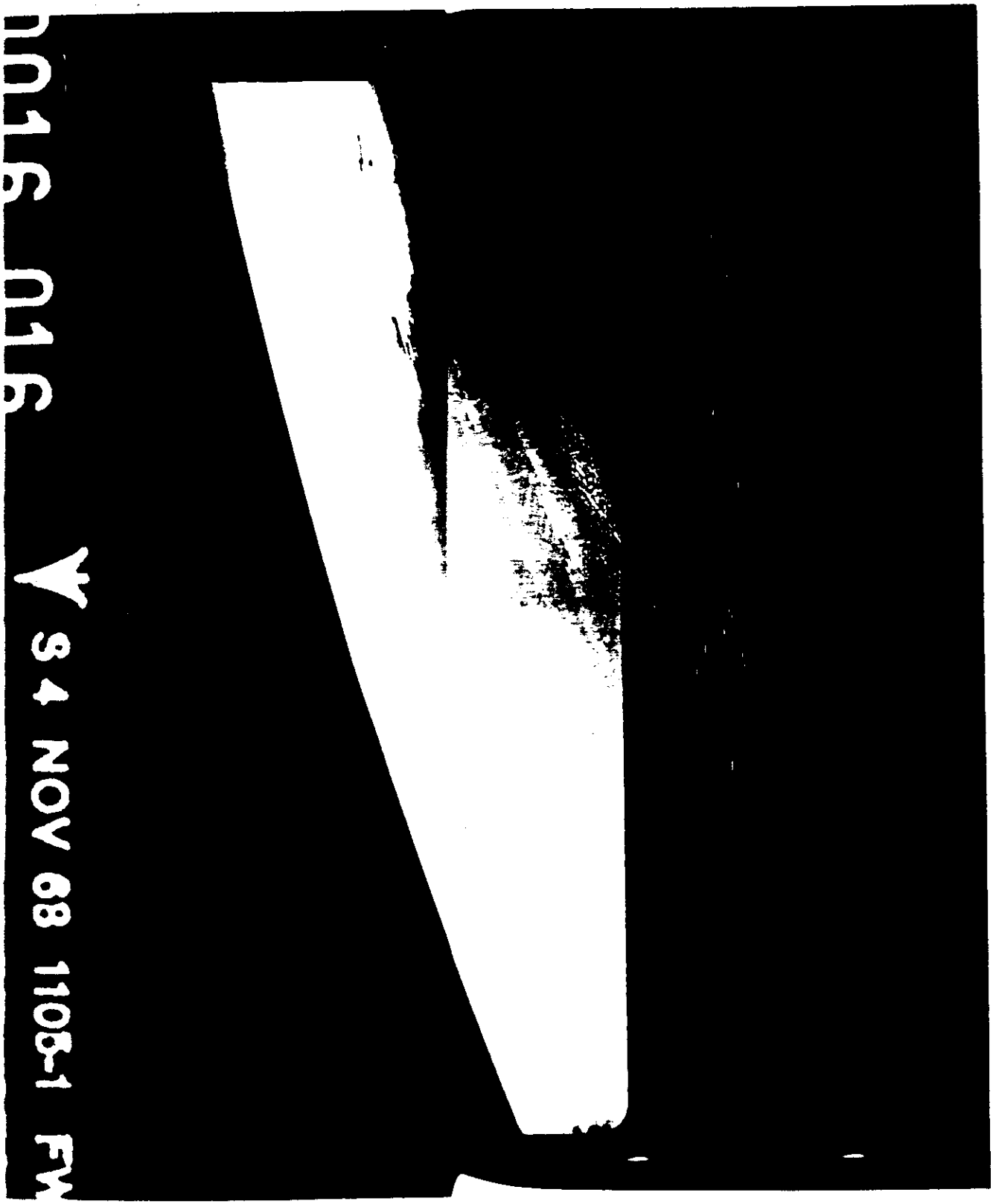

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FIGURE 8. EXAMPLE OF PANORAMIC AND HORIZON FORMAT OVERLAP

Due to modifications of this system which lengthened the panoramic formats, the horizon arcs on both main camera records are overlapped as illustrated by this example.

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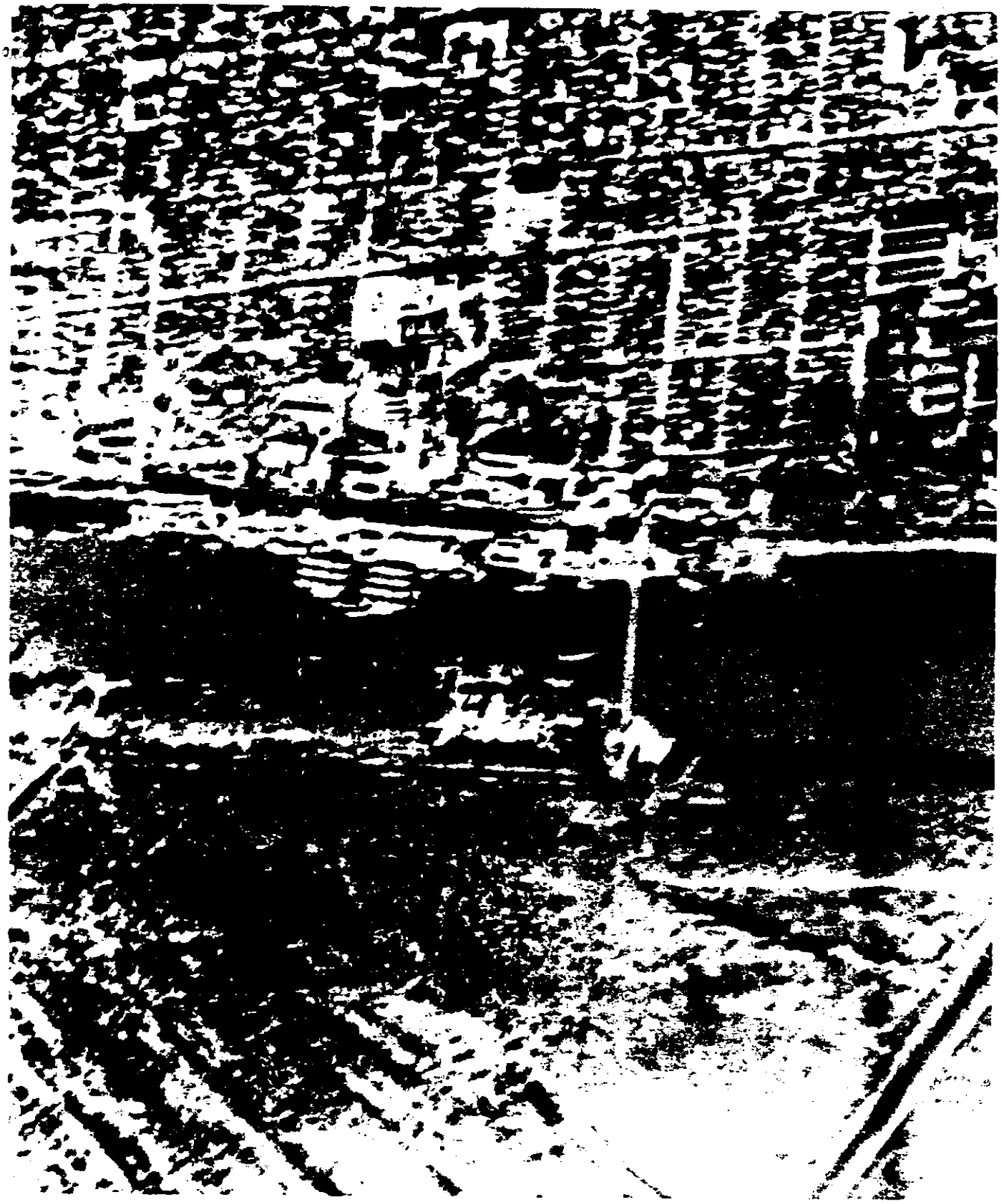
[redacted]



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[redacted]

FIGURE 7. EXAMPLE OF IMAGE SMEAR

An example of image smear on the forward-looking images from Mission 1105-1. Similar areas are found throughout the forward-looking material from this half of the mission.

FIGURE 7

Camera	310
Pass	25D
Frame	15 fwd
Date of Photography (GMT)	14 Dec 68
Universal Grid Coordinates	27.9 - 3.7
Enlargement Factor	40X
Geographic Coordinates	55-1N 37-37E
Altitude (ft)	529,122
Camera Attitude:	
Pitch (deg)	Not Available
Roll (deg)	Not Available
Yaw (deg)	Not Available
Local Sun Time	1154
Solar Elevation	23°3'
Solar Azimuth	197°
Exposure (sec)	1/323
Vehicle Azimuth	163°4'
Processing Level	Dual Gamma

[redacted]

FIGURE 6. EXAMPLE OF POOREST PHOTOGRAPHY OBTAINED ON MISSION 1105-2.

This is an example of the poorest quality imagery obtained on Mission 1105-2.

FIGURE 6

Camera	310
Pass	240D
Frame	5 aft
Date of Photography (GMT)	18 Nov 68
Universal Grid Coordinates	66.9 - 5.4
Enlargement Factor	40X
Geographic Coordinates	29-20N 80-15W
Altitude (ft)	497,095
Camera Attitude:	
Pitch (deg)	Not Available
Roll (deg)	Not Available
Yaw (deg)	Not Available
Local Sun Time	1130
Solar Elevation	41° 32'
Solar Azimuth	183°
Exposure (sec)	1/453
Vehicle Azimuth	174° 03'
Processing Level	Dual Gamma

SO-121 EVALUATION

MISSION 1105

I. INTRODUCTION

SO-121, a direct reversal color film, was used for the first time in this system in an engineering test. This report presents an analysis of the test with regard to the characteristics of the material, physical and imaged degradations, and image quality. The format of the report is similar to that used for the SO-180 evaluation on Mission 1104 (see the Photographic Evaluation Report on Mission 1104, [redacted] and enables the reader to compare the two films.

A. Test Description

Five hundred feet of SO-121 color film was attached to the end of the aft-looking camera black and white (SO-380) record. A total of 223 exposures were obtained during acquisitions 37 to 67 of pass 273D, all of passes 274D, 279D, 281D, and frames 1 through 71 of pass 283D, where the film supply was exhausted. Because of an increase in film thickness of SO-121 as compared to SO-380, photographic coverage of pass 280D and frames 72 through 130 of pass 283D was obtained by the forward camera only. SO-380 film has a thickness of 2.0 mils, while SO-121 is 3.5 mils thick. Fifty feet of type 3404 film, 3.0 mils thick, was spliced between the SO-380 and SO-121 to ease the transition from one film thickness to the next.

Prior to processing, the time track edge of the color material was flashed (partially exposed) with filtered light to decrease the density along the film edge. This allowed the standard edge titling technique to be employed while retaining auxiliary data. The color film was processed in the Grafton processor. Reproductions of the original were made on SO-271 duplicate color stock and disseminated to customers according to the standard requirement criteria.

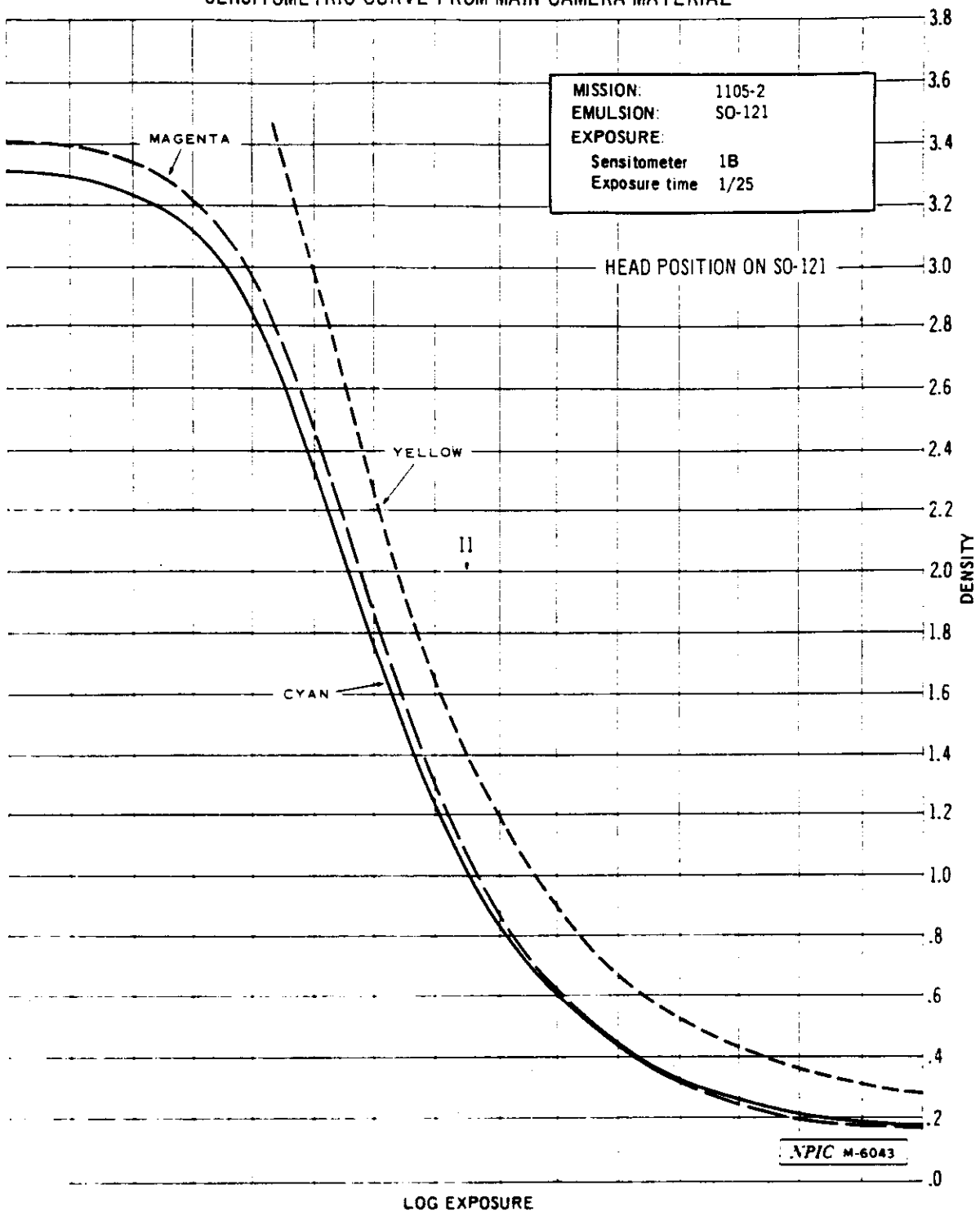
B. Characteristics of SO-121

SO-121 color film is a fine grain material with high definition characteristics, and is specifically designed for high altitude aerial reconnaissance. The film contains three emulsion layers with the green sensitive emulsion on top, the blue sensitive layer in the middle, and the red sensitive layer on the bottom. The emulsion layers are coated on a 2.5 mil estar polyester base with an anti-halation undercoat and a clear gel backing. The following is a cross-sectional design of the film:

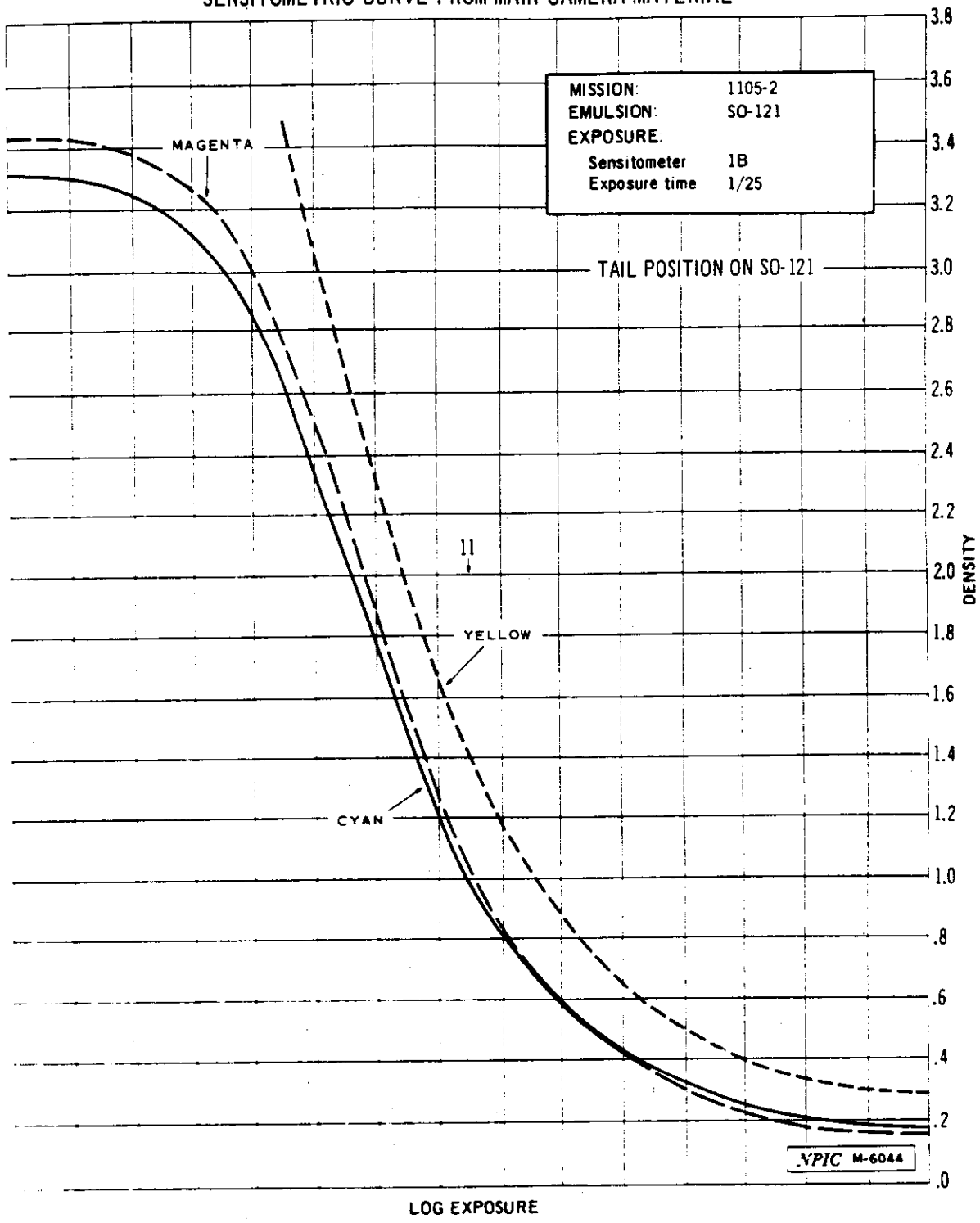
Green Sensitive Layer - Magenta Positive Image
Blue Sensitive Layer - Yellow Positive Image
Red Sensitive Layer - Cyan Positive Image
Base

The following curves, provided by the processing contractor, represent the sensitometric characteristics of the original (flight) film process as generated by a 1B sensitometer.

SENSITOMETRIC CURVE FROM MAIN CAMERA MATERIAL



SENSITOMETRIC CURVE FROM MAIN CAMERA MATERIAL



C. System/Film Compatibility

The overall quality of the SO-121 imagery is poor and does not represent the potential quality of the system/film combination. An out-of-focus condition was experienced throughout the mission. The film apparently curled away from the focal plane during exposure, resulting in very poor focus at the center of format with improvement toward each edge.

A second factor that should be considered with regard to image quality is that the spectral transmission of the lens is not optimized for the spectral sensitivity of the film. The sensitivity of the blue emulsion layer peaks far out on the spectral transmission curve for the lens and, therefore, provides poor resolution. The green sensitive layer peaks near the area of best transmission for the lens and provides the best image quality. The red sensitive layer peaks at the region of optimum transmission for the lens; however, the image created in the red sensitive emulsion layer is degraded by light scattering associated with the physical location of the layer.

II. FILM DEGRADATIONS

A. Physical Degradations

The overall physical condition of the film is good, although minor base and emulsion scratches are present intermittently throughout. Frames 70 and 71 of pass 283D are damaged by scratches and abrasions in association with film supply exhaustion.

B. Imaged Degradations

SO-121 has an aerial exposure index of 6.0 as compared to 1.6 for SO-380 and therefore is more susceptible to light leak induced fog. Fog patterns associated with camera off periods are present on a few frames near the end of some passes (example: frame 26 of pass 281D). Traces of dendritic edge static are present along both film edges intermittently throughout the color material. The degradation is generally minor; however, in some instances the traces extend into the format a distance of one inch (example: frame 7 of pass 281D).

III. IMAGE QUALITY

A. Resolution (Theoretical)

A dynamic system resolution of 132 L/mm was established by the camera contractor for the aft looking camera of Mission 1105, using SO-380 at 2:1 total overall contrast (TOC). This equates to a theoretical ground resolution of approximately 6.2 feet at 81 nautical miles (nm). The best ground resolution, as determined from the black and white (SO-380) coverage of an 8.8:1 type "C" resolution target covered by the aft camera, is approximately 7.7 feet along track and 8.3 feet across track (recorded at 81 nm). Unfortunately, no resolution targets were photographed with SO-121, nor was the system resolution reported using SO-121. Theoretical system resolution values using SO-121 were developed at this facility using the following computations.

Data and Calculations

1. System Resolution

Given:
a. Resolving power of SO-121 film at 2:1 TOC--78 L/mm
b. Resolving power of SO-380 film at 2:1 TOC--290 L/mm
c. Dynamic system resolution of the aft camera using SO-380 film at 2:1 TOC--132 L/mm

Formula: $\frac{1}{R_s} = \frac{1}{R_l} + \frac{1}{R_f}$ *

R_s = Resolving power of the system
R_l = Resolving power of the lens
R_f = Resolving power of the film

Using the given values and formula above, the system resolution of the aft camera using SO-121 film is computed to be approximately 59 L/mm at 2:1 TOC.

*These formulas do not take into account image motion parameters or atmospherics. A confidence limit of plus or minus three feet is a reasonable allowance for error.

**The formula $\left(\frac{1}{R_s}\right)^2 = \left(\frac{1}{R_l}\right)^2 + \left(\frac{1}{R_f}\right)^2$ has been suggested as a more accurate description of the system performances, but the difference is included in the confidence limit of plus or minus three feet.

2. Theoretical Ground Resolution

Formula: $S = \frac{H}{300\ FR}$ *

S = Ground resolution in feet
H = Altitude in feet
F = Focal length in feet
R = Resolving power of the system
300 = Conversion factor

Using the above scale formula, the theoretical ground resolution of SO-121 film in the aft camera is computed to be approximately 14 feet at an altitude of 82 nm.

Resolution Comparison (Approximate)

Film Resolving Power (cycles per millimeter)

TOC	SO-380	SO-121	3404	SO-180
1.6:1	195	63	190	30
1.7:1	205	73	196	35
2:1	280	78	260	42
6.4:1	482	130	465	67
1000:1	671	172	668	95

System Resolution (Approximations)

TOC	SO-380	SO-121
2:1	132 L/mm = 6.2 ft	59 L/mm = 14 ft

B. Resolution (Subjective)

The SO-121 imagery is generally out of focus and the expected resolution was not achieved. The best quality is restricted to a narrow band along the format edges where the ground resolution ranges from 15 to 25 feet. A very noticeable shift in quality (apparent at 5x magnification) occurs toward the format center where the best resolution is approximately 30 feet.

C. Color Quality

The color balance is good; however, there is a slight color shift from the beginning to the end of an operation and from one pass to another. The density and contrast are generally good.

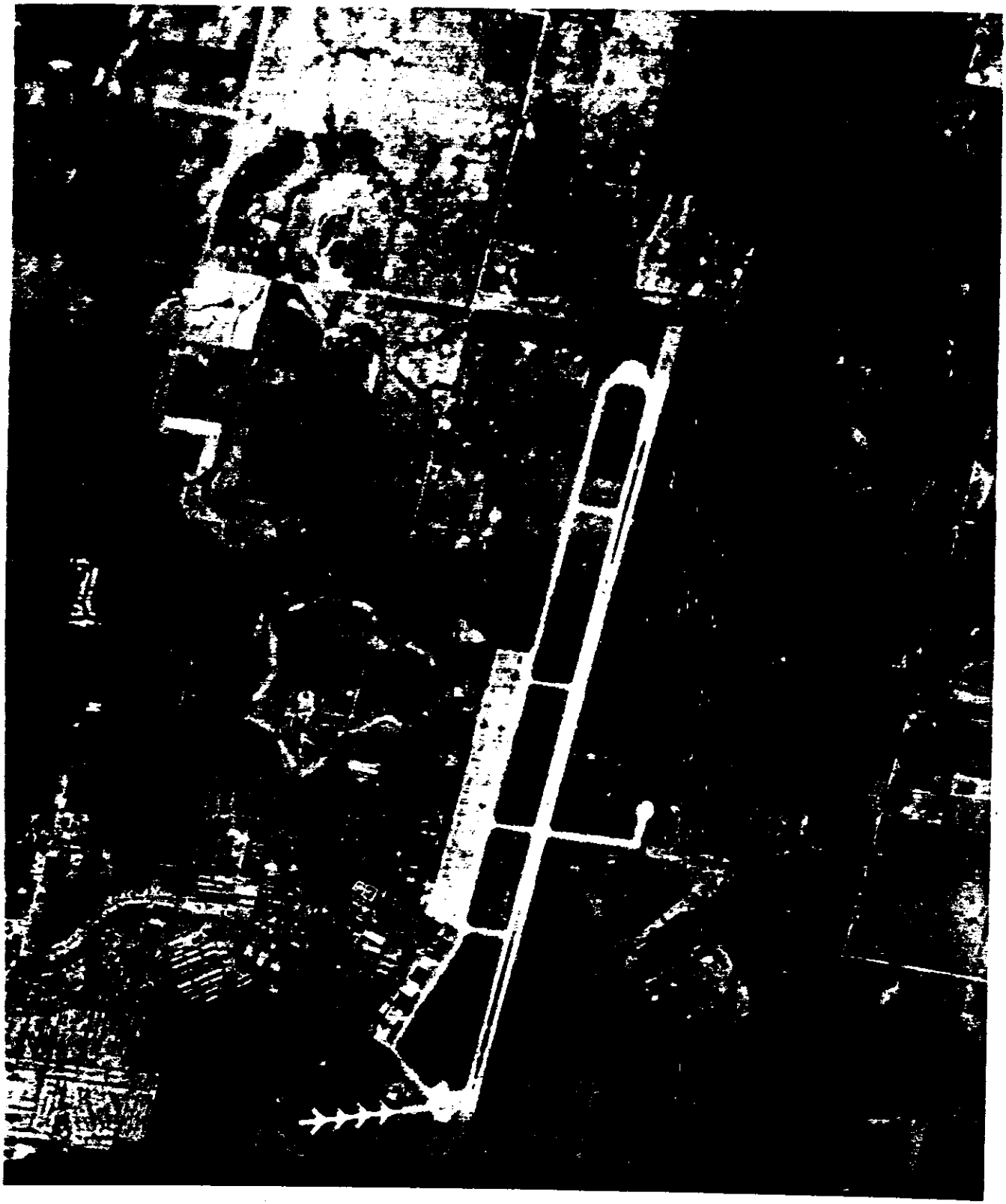
*See footnote (*) on page 41.

FIGURES 1a AND 2a. SO-121 AND SO-380 QUALITY COMPARISON

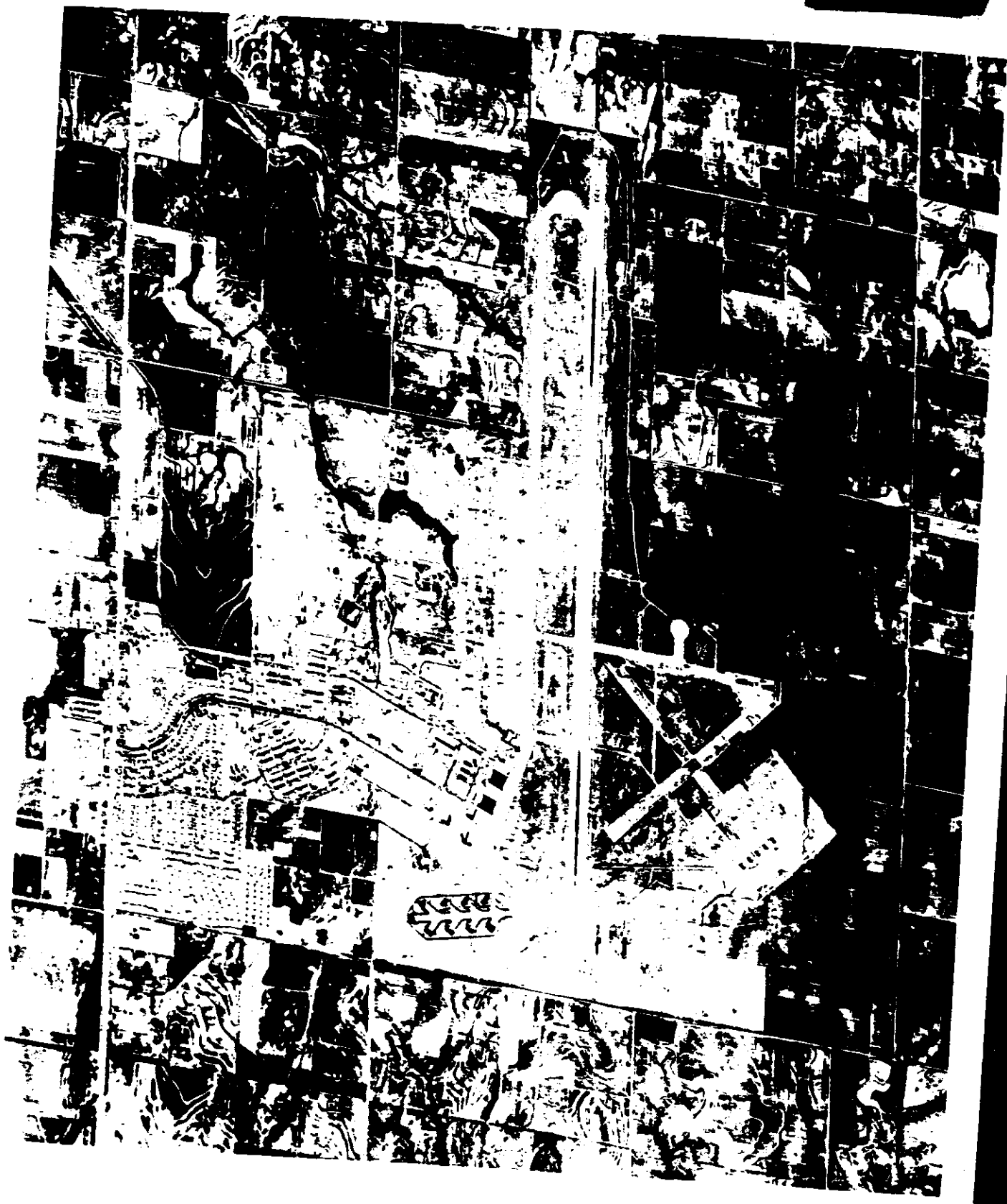
The following photographs are comparisons from SO-121 and SO-380 film. Both photographs are representative of the best quality that was obtained with the respective films. The SO-380 photograph contains fine detail, whereas the color provides additional tonal information.

	FIGURE 1a	FIGURE 2a
Camera	310	311
Pass	273D	273D
Frame	63 Aft	56 Fwd
Date of Photography (GMT)	20 Nov 1968	20 Nov 1968
Universal Grid Coordinates	67.8X	9.3X
	0.7Y	1.7Y
Enlargement Factor	10X	10X
Geographic Coordinates	35°01'N	35°53'N
	98°13'W	98°21'W
Altitude (ft)	512,755	512,960
Local Sun Time	1117	1117
Solar Elevation (deg)	34°28'	33°36'
Solar Azimuth (deg)	168°	168°
Exposure (sec)	1/436	1/270
Filter	W/2E+CC20C+0.4N.D.	W-25
Vehicle Azimuth (deg)	173°14'	173°06'

[redacted]



[redacted]



FIGURES 3a AND 4a. CHANGE IN IMAGE QUALITY WITHIN FORMAT

The following photographs display the shift in image quality as discussed in Part I. Note the relatively good imagery at the bottom of the prints, which portrays the edge of the format, and the poor quality that is readily apparent at the middle and top of the print.

Prints from SO-180 (infrared color film) of the same area as covered by Figure 3a are in the Photographic Evaluation Report for Mission 1104,

[redacted]

	FIGURE 3a	FIGURE 4a
Camera	310	310
Pass	274D	274D
Frame	17 Aft	20 Aft
Date of Photography (GMT)	20 Nov 1968	20 Nov 1968
Universal Grid Coordinates	40.6X	35.6X
	0.6Y	1.7Y
Enlargement Factor	10X	10X
Geographic Coordinates	34° 51'N	34° 29'N
	120° 33'W	120° 30'W
Altitude (ft)	512,766	512,719
Local Sun Time	1105	1105
Solar Elevation (deg)	34° 35'	34° 58'
Solar Azimuth (deg)	163°	163°
Exposure (sec)	1/437	1/438
Filter	W/2E+CC20C+0.4N.D.	W/2E+CC20C+0.4N.D.
Vehicle Azimuth (deg)	173° 15'	173° 19'

[redacted]

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[redacted]

IV. ACQUISITION PARAMETERS

The SO-121 was exposed through a Wratten 2E filter with a 0.20 cyan color correction filter and a 0.40 neutral density filter. There were five slit widths available: 0.138, 0.149, 0.192, and 0.271 inch and a fail-safe of 0.198 inch. Only the 0.192 and 0.271 slit widths were used during this experiment. The range of acquisition parameters experienced during exposure for the SO-121 is listed below. This data refers to the first and next to the last frame of each pass to avoid improper representation of exposure associated with camera slow down at the end of an operation.

RANGE OF ACQUISITION PARAMETERS

PASS/FRAME	LOCAL TIME	LATITUDE (DEGREE)	LONGITUDE (DEGREE)	ALTITUDE (FEET)	VEHICLE AZIMUTH (DEGREE)	SOLAR ELEVATION (DEGREE)	EXPOSURE TIME (SECONDS)
273/37	1111	38-34N	98-47W	513687	172-42	31-14	1/548
273/66	1114	35-01N	98-14W	512699	173-17	34-50	1/550
274/01	1111	37-11N	120-55W	513192	172-57	32-36	1/562
274/27	1114	34-01N	120-37W	512654	173-26	35-50	1/546
279/01	1105	41-05N	126-43E	512445	172-15	28-28	1/796
279/29	1108	37-39N	127-17E	511082	172-52	31-57	1/774
281/01	1050	52-17N	79-22E	521476	169-20	16-59	1/812
281/26	1055	49-12N	80-15E	517898	170-18	20-08	1/583
283/01	1043	56-37N	33-11E	526062	167-42	12-27	1/821
283/70	1055	48-07N	35-52E	515667	170-37	21-11	1/556

V. MENSURATION

There were no photo interpreter requests for mensuration support from the color portion of this mission. Therefore, no mensuration analysis has been accomplished.

VI. OBSERVATIONS AND CONCLUSIONS

1. Twenty-two targets were nominated for color coverage on this mission, but only one was actually covered. No additional intelligence information concerning this target was obtained from the color photography.

2. The image quality and interpretability are poor due to the out-of-focus condition experienced throughout the color acquisitions. This degraded condition precludes a detailed analysis of the potential of color photography in this system.

3. SO-121, approximately 1.5 mil thicker than SO-380 (UTB), results in a shorter film load capability and reduced area coverage.

4. The color balance is good and the exposure is adequate.

5. The use of the color imagery from this mission as a stereo partner with the high resolution black and white imagery, is limited by the out-of-focus condition of the color acquisitions.

6. The best ground resolution that can be expected from SO-121 in this system (approximately 15 feet) is not compatible with detailed target readout. Color oriented requirements should be directed against targets which do not require resolutions beyond the capability of the system. The requirement for color must be color resolution oriented rather than spatial resolution oriented.

SO-180 EVALUATION SUPPLEMENT

A special study on SO-180 film is incorporated in the Photographic Evaluation Report for Mission 1104. At the time of publication, the following prints were not available and are included herein to illustrate and substantiate the conclusions of the study. For the sake of convenience, the Appendix to the SO-180 Evaluation has been repeated in this report. For additional information, readers are referred to the study in its entirety (see [redacted].

LIST OF ILLUSTRATIONS

APPENDIX

It was previously stated that measurements made on tri-pack color films may be more accurate if obtained from a single emulsion layer rather than from the composite of all layers. Similarly, improvements may also be expected in the image quality of black and white reproductions made selectively from color film. It has been established that the quality of the imagery varies with filter/film combinations. Therefore, more information may be derived from one of the three layers than from either of the other two, and more than in all three viewed or printed as one. This phenomenon is more distinctly manifested in some areas than in others. Experiments were conducted on the corona fog-degraded areas (where the layer information differences are more pronounced) by making reproductions through red, green, and blue separation filters. The following combinations were used:

FILTER	FILM	PROCESS
W-92 (Red)	Dupont High Contrast Separation Film	Versamat A
W-99 (Green)	Dupont Medium Contrast Separation Film	Versamat B
W-98 (Blue)	Dupont Medium Contrast Separation Film	Versamat B

Reproductions from the fog-degraded* areas illustrate that the prints made through a W-92 (red) filter are unusable from an intelligence standpoint--practically all information is obscured with only gross terrain features detectable. The degree of information provided by the reproductions made through the W-99 (green) and W-98 (blue) filters is much superior, with the prints obtained through the green filter generally being the best. All reproductions are improved and more comparable with respect to each other as the fog from the corona static decreases. The value of this special printing technique as a salvage and enhancement operation is obvious.

*Corona Fog Imaged Red.

Since publication of the referenced Appendix, printing conditions have been modified to maximize information obtained from corona fog degraded areas. The previous procedure was to reproduce contract separation negatives from the original film, using Wratten filters 92, 99, and 98 (red, green, and blue respectively), and then make enlarged prints from the negatives. Upon investigation, it was determined that a large amount of degradation apparent in the prints is induced by the separation negatives rather than the original film. To more accurately portray the inherent quality of the original, enlarged separation negatives were made, and then contact prints were reproduced from these negatives. Wratten filters 29, 61, and 47B were used in this procedure because they are incorporated in the enlarger used in this experiment. The transmission characteristics of these filters are relatively similar to the W-92, 99, and 98 and are satisfactory for the objective.

In addition to the selectively filtered prints, reproductions were made from the same areas, using panchromatic and orthochromatic black and white film without any special filtration.

Comparison of all printing techniques employed indicates that the prints made through the red filter and also the prints made from the panchromatic film (without the use of selective filters) are very poor in quality. The remaining prints are fair in quality and appear comparable although those made through the green filter are slightly superior. Therefore, it is recommended that if high quality black and white reproductions are needed from the corona fog degraded areas of SO-180 film, a green filter be used to maximize the information.

FIGURE 1b. EFFECT OF CORONA STATIC ON SO-180

The following is a representative color sample of an area which is severely affected by corona static and portrays the original film as accurately as possible. The color print should be compared with the black and white prints which were made selectively from the same area. (FIGURES 2b thru 6b)

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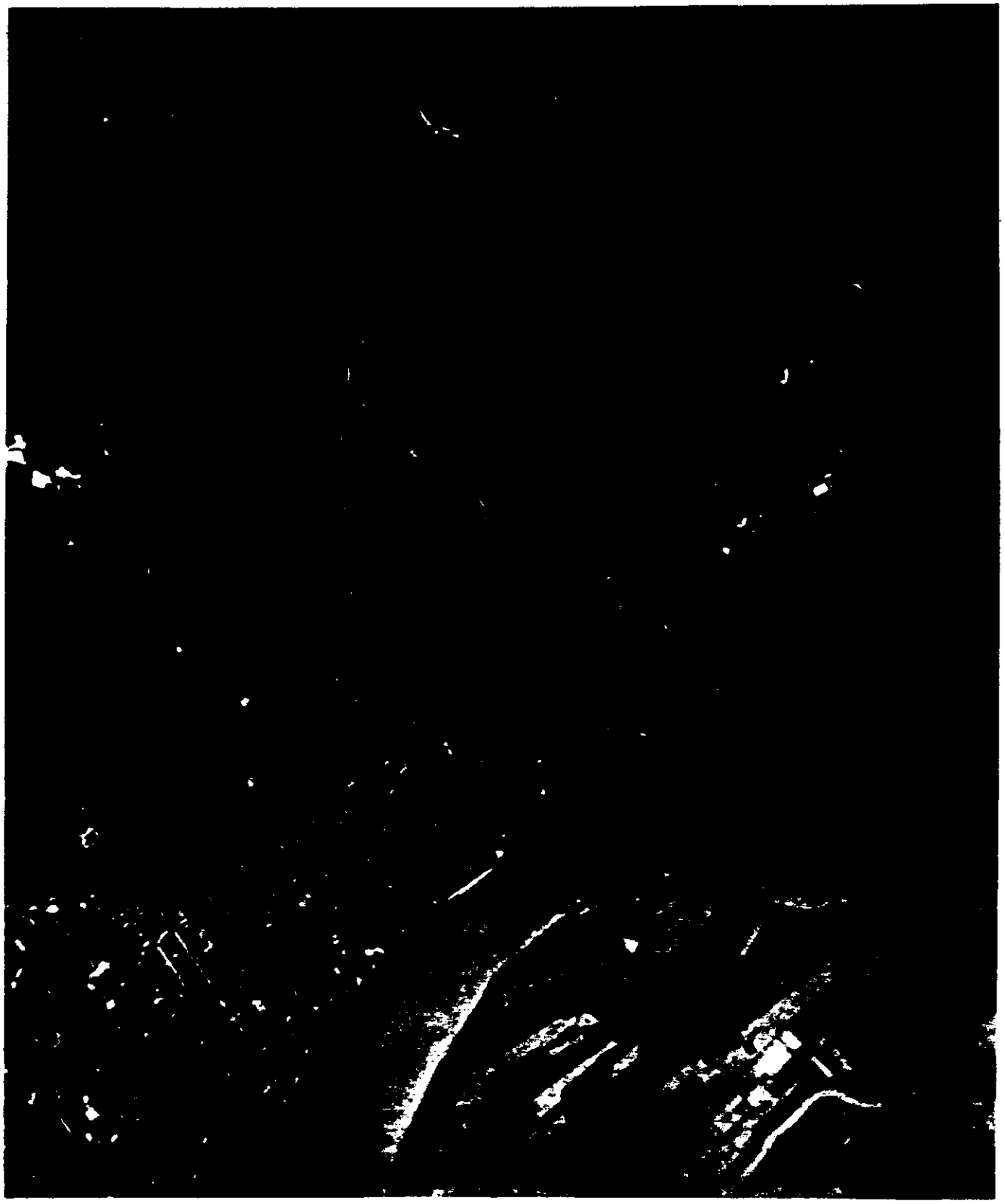

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FIGURE 2b. PANCHROMATIC BLACK AND WHITE PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with no filters and six seconds exposure f-8.

Processed in A Versamat at ten feet per minute.

Contact printed on Kodabromide paper.

[redacted]

FIGURE 3b. ORTHOCHROMATIC BLACK AND WHITE PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with no filters and two seconds exposure at f-8.

Processed in B Versamat at 12 feet per minute.

Contact printed on Kodabromide paper.

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[redacted]

FIGURE 4b. CYAN DYE LAYER (INFRARED INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with W-29 filter and 12 seconds exposure at f-8.

Processed in A Versamat at 15 feet per minute.

Contact printed on Kodabromide paper.

[redacted]

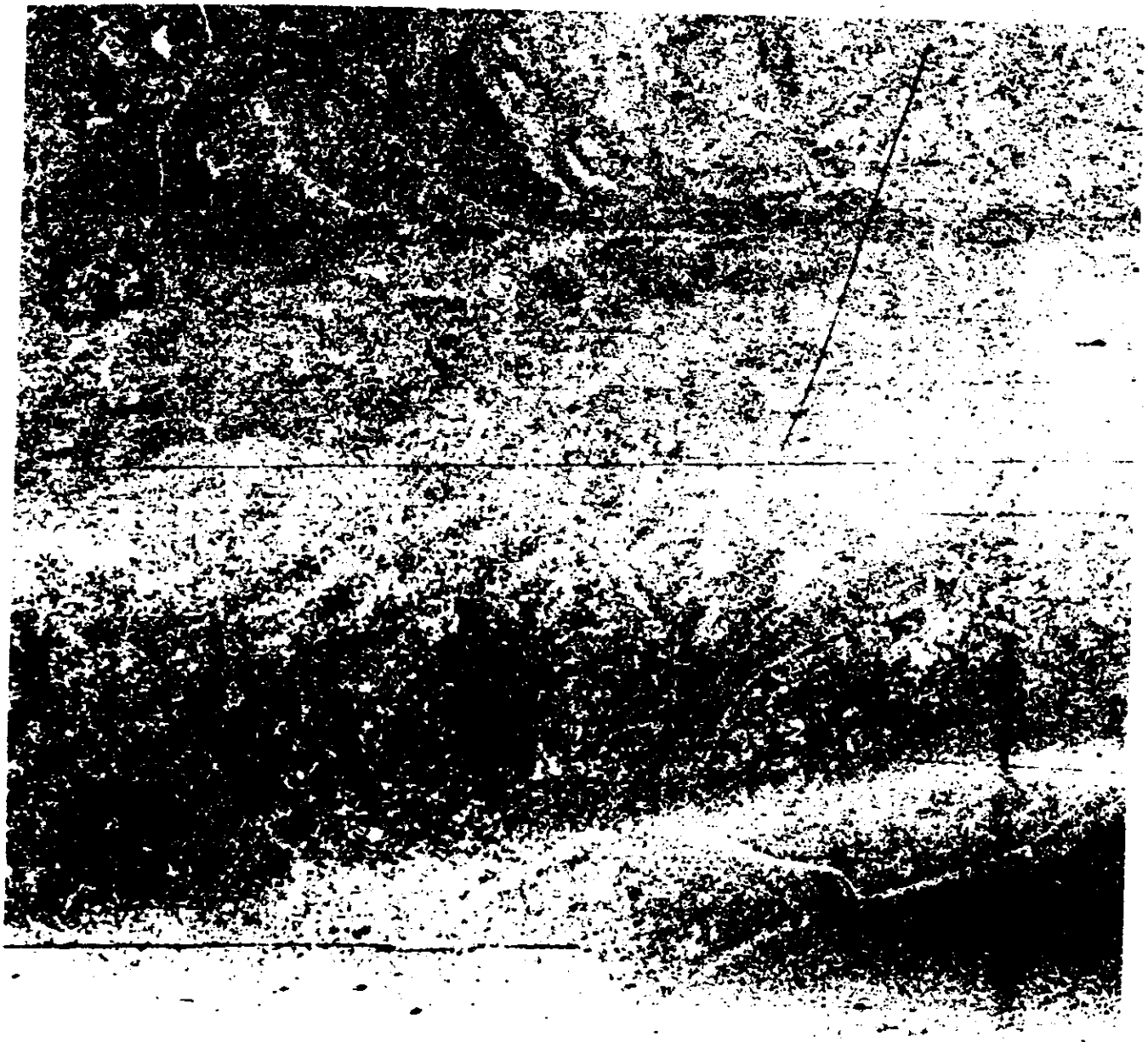


FIGURE 5b. MAGENTA DYE LAYER (RED INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with W-61 filter and eight seconds exposure at f-8.

Processed in B Versamat at 15 feet per minute.

Contact printed on Kodabromide paper.

[redacted]

FIGURE 6b. YELLOW DYE LAYER (GREEN INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with W-47B filter and 11 seconds exposure at f-8.

Processed in B Versamat at ten feet per minute.

Contact printed on Kodabromide paper.

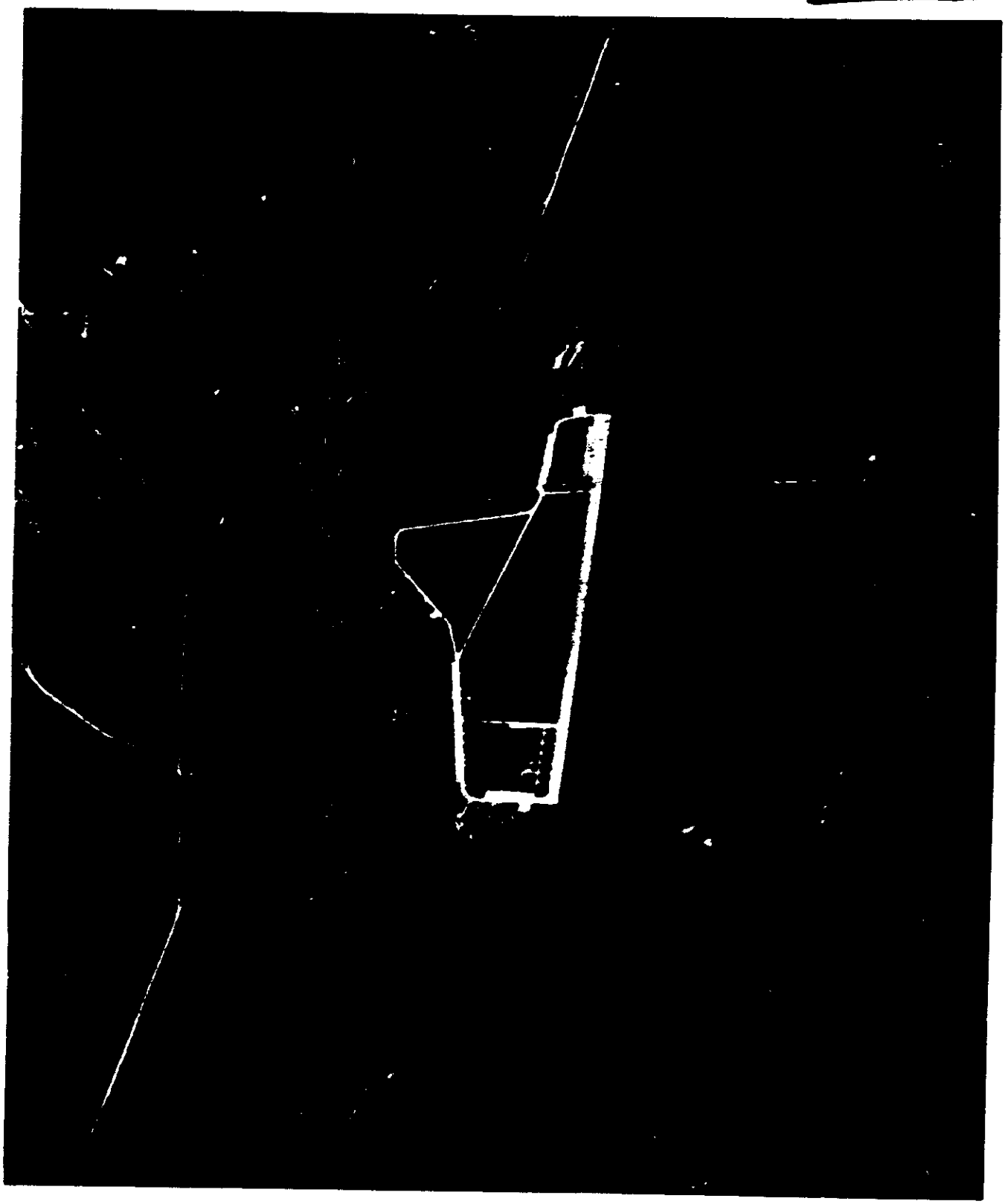
[redacted]

FIGURE 7b. EFFECT OF CORONA STATIC ON SO-180

The following is a representative sample of an area which is moderately affected by corona static. It should be compared with the black and white prints which were made selectively from the same area. (FIGURES 8b thru 12b)

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

[redacted]



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

FIGURE 8b. PANCHROMATIC BLACK AND WHITE PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with no filters and six seconds exposure at f-8.

Processed in B Versamat at ten feet per minute.

Contact printed on Kodabromide paper.

[redacted]

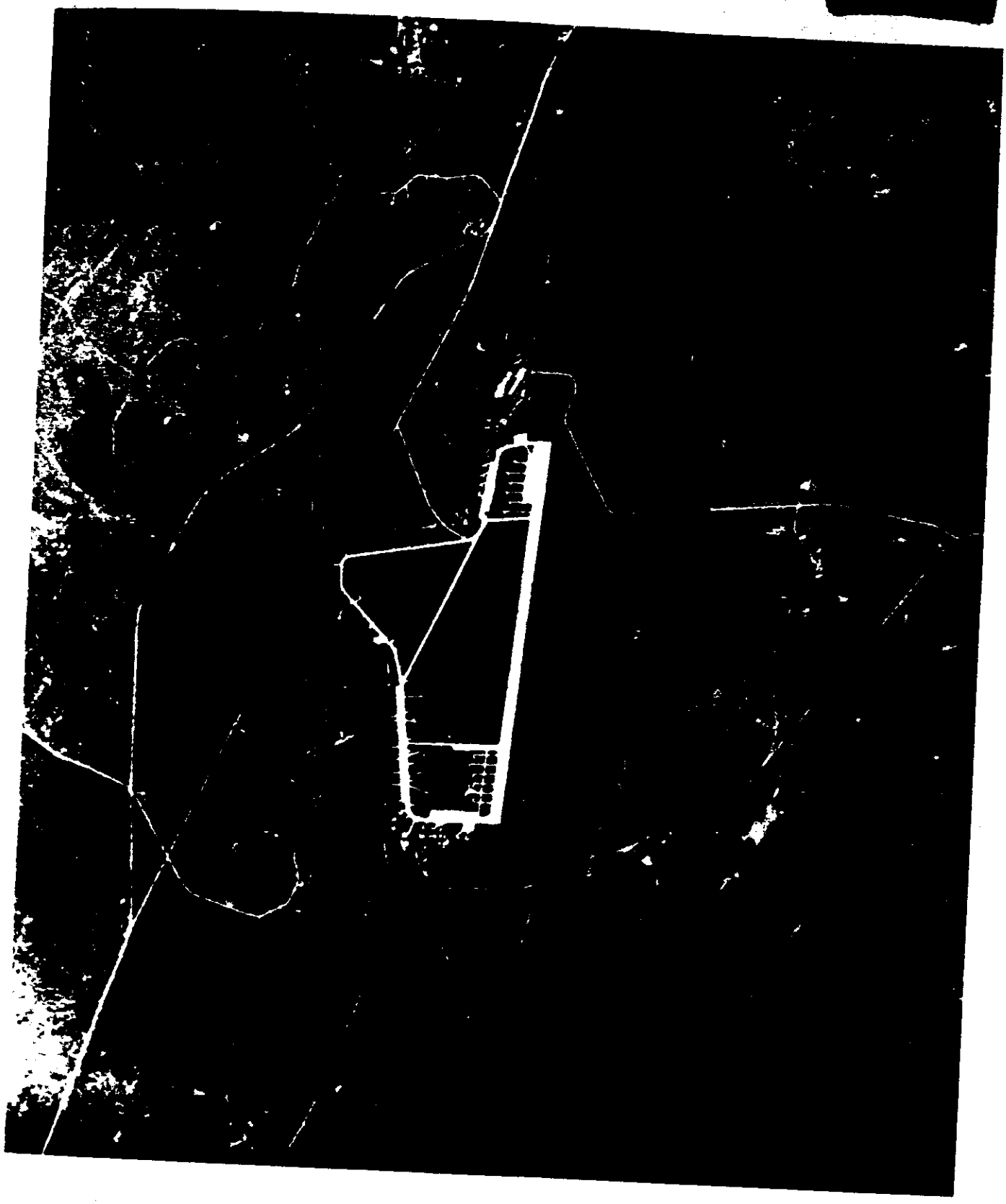


FIGURE 9b. ORTHOCHROMATIC BLACK AND WHITE PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with no filters and two seconds exposure at f-80

Processed in B Versamat at 12 feet per minute.

Contact printed on Kodabromide paper.

[redacted]

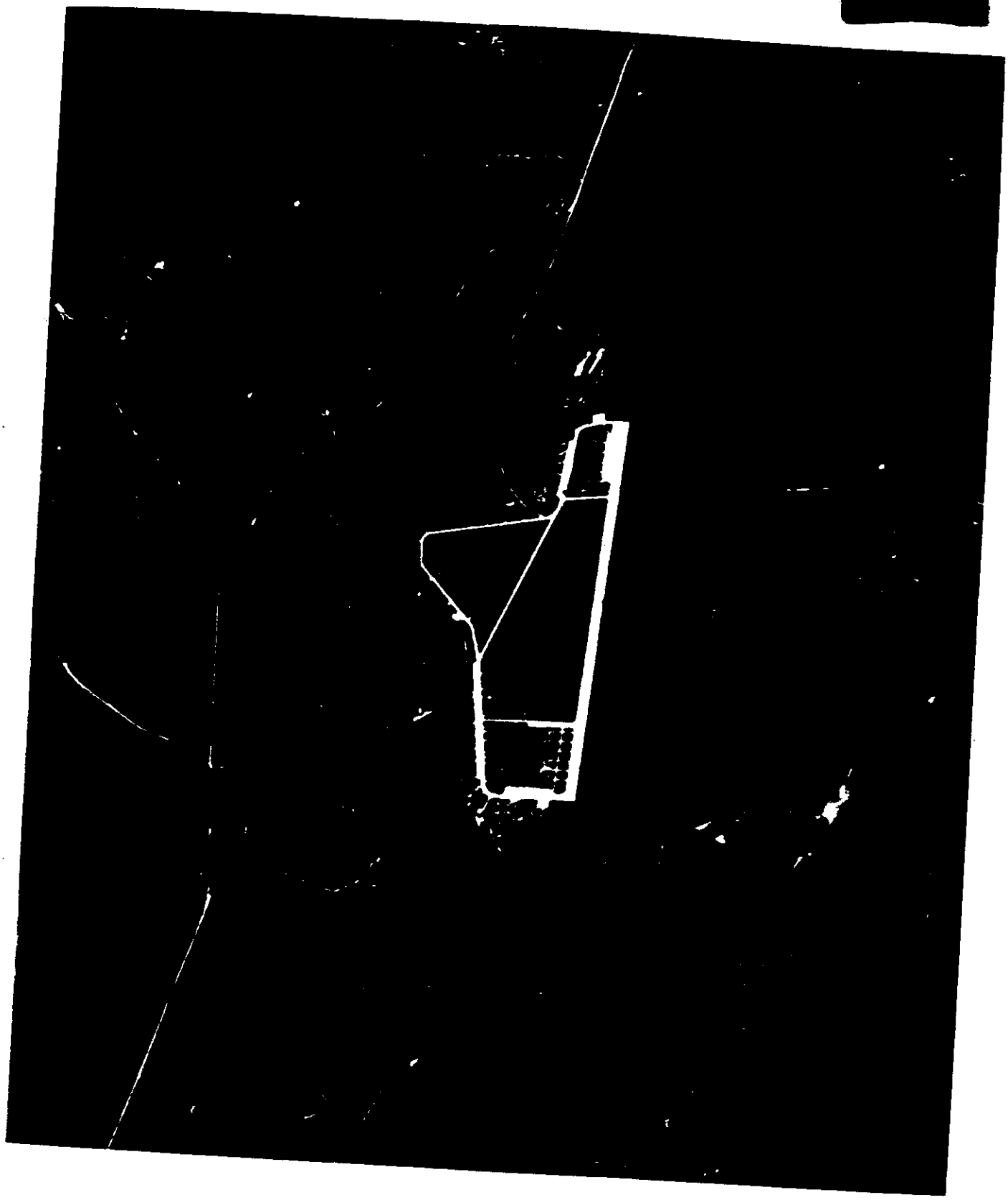


FIGURE 10b. CYAN DYE LAYER (INFRARED INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with
W-29 filter and eight seconds exposure at f-11.

Processed in A Versamat at 15 feet per minute.

Contact printed on Kodabromide paper.

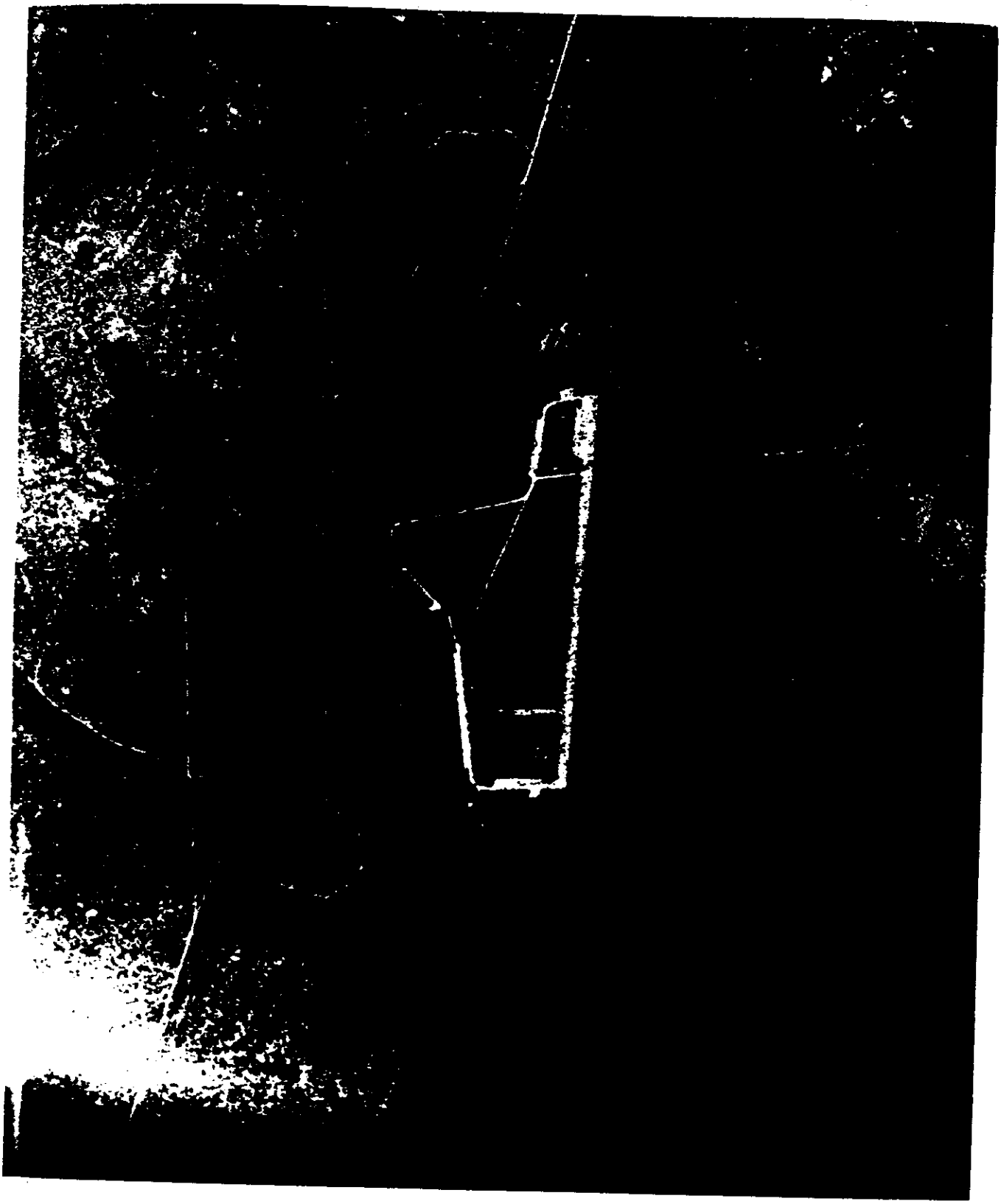


FIGURE 11b. MAGENTA DYE LAYER (RED INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with W-61 filter and eight seconds exposure at f-8.

Processed in B Versamat at 15 feet per minute.

Contact printed on Kodabromide paper.

[redacted]

FIGURE 12b. YELLOW DYE LAYER (GREEN INFORMATION) PRINT

Printing and processing conditions:

10X enlarged negative made on D-184 Durst Laborator Enlarger with W-47B filter and 11 seconds exposure at f-8.

Processed in B Versamat at ten feet per minute.

Contact printed on Kodabromide paper.