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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1024-1

22-27 SEPTEMBER 1965

MISSION 1024-2

27 SEPTEMBER - 2 OCTOBER 1965

[redacted]

-MARCH 1966

COPY [redacted]

77 PAGES

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT

MISSION 1024-1

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MISSION 1024-2

27 SEPTEMBER - 2 OCTOBER 1965

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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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SYNOPSIS

Mission 1024 is a 2-part satellite reconnaissance mission. The vehicle, containing 2 panoramic cameras, 4 horizon cameras, and 2 stellar index units, was launched into a prograde orbit on 22 September 1965. The recovery of the first capsule was accomplished in an air catch on pass 81D, 27 September 1965. The second capsule was retrieved in an air catch on pass 161D, 2 October 1965.

The imagery quality of the photography of the panoramic cameras is generally better than that of recent missions. This improvement is not reflected in the MIP rating of 85 assigned to this mission because the improvement is not of sufficient magnitude to raise the quality rating to the next higher increment, MIP 90. Approximately 40 percent of the mission is obscured or degraded by cloud cover.

The forward-looking (master) camera film of the second bucket (Mission 1024-2) was processed in the Yardleigh processor. The Yardleigh is a frame-by-frame processor having the ability to automatically and completely change the processing level from one frame to the next. All other panoramic camera photography of the mission was processed in the Trenton processor, providing a comparison for analysis.

The stellar and index cameras of both missions functioned well. However, the stellar film of Mission 1024-2 was seriously degraded in the processor when a processing splice separated. The accident destroyed approximately 25 percent of the film and, because of excessive stresses introduced throughout the take, the entire product was considered unuseable for attitude determination. Attitudes were therefore determined from horizon photography by the conjugate imagery method.

Eight resolution target arrays were photographed during this mission. The best ground resolution observed on the target displays was 7 feet. While there is little correlation in the resolution figures of the 2 cameras on any given target or from one pass to another on the same camera, there is also little correlation in the parameters controlling image quality. This report provides the resolution as measured on each target together with the factors that influence image quality. While an analysis of any one target complex leads the observer to conclude that one camera operated more efficiently than the other, analysis of the entire mission record shows little quality difference. However, the slave (aft) camera imagery is usually slightly better than that of the master (fwd) camera. The conclusion is that the system performed according to its design throughout the mission and the isolated quality differences are the result of atmospheric and relative solar position variations.

GENERAL FLIGHT DATA

1. Launch and Recovery Dates

Launch Date	22 September 1965
Recovery Date, Mission 1024-1	27 September 1965
Recovery Date, Mission 1024-2	2 Oct 1965

2. Orbital Parameters

	Mission 1024-1 (Rev 41)	Mission 1024-2 (Rev 100)
Period	90.078 min	89.944 min
Perigee	95.934 nm	96.657 nm
Apogee	205.320 nm	201.450 nm
Eccentricity	0.01522	0.01459
Inclination Angle	80.058°	80.057°
Perigee Latitude	18.438°N	31.517°N

3. Photographic Operations

	Mission 1024-1	Mission 1024-2
Operational Passes	29	28
Domestic Passes	6	5
Operational-Domestic Passes	1	0
Engineering Passes	1	3
Recovery Revolutions	81	161

PART I. CAMERA OPERATION

1. Master (Fwd) Panoramic Camera No 172

The master (fwd) panoramic camera was operational throughout the mission and recorded good quality, high-resolution imagery. Degradations caused by anomalies in the camera operation were minor. The following list describes the location, cause, and result of the camera operation anomalies:

a. Scratches

1. Scan Roller Scratches. There are small, longitudinal emulsion scratches just inside the format, at each edge, under the camera number and at the take-up end of most frames of the mission. The scratches are caused by the scan roller and are characteristic of the camera design. The manufacturer plans no remedial design changes.

2. Rail Scratches. There is a continuous, longitudinal emulsion scratch in the border, at both film edges, throughout the mission. These scratches are caused by the contact of the film emulsion with the film guide rails in the camera. Because of the camera design, these scratches will be present on all missions. The scratches, being outside of the format, have no direct bearing on the imagery. However, the emulsion flakes or dust they create are a potential hazard to the quality of the mission product. While the camera manufacturer is concerned with the problem, no solution is apparent and none is anticipated.

3. Intermittent Scratches. There is an emulsion scratch one inch from and parallel to the frequency-mark film edge intermittently throughout the mission. The scratch is very faint and occurs at unpredictable intervals. It is apparent in the panoramic as well as the horizon formats. Because of the subtlety of the scratch, it does not have a significant bearing on the image quality. The camera manufacturer agrees that the scratch was camera induced, but its cause has not been established.

b. Light Leaks

1. First and Last Frames of a Pass. Light entering the camera around the lens housing during camera-off periods caused the first and last frames of most passes to be partially fogged. The density

of the fog is commensurate with the duration of the camera-off period and the prevailing solar elevation. System design modifications to alleviate the problem are under study.

2. Other Recurring Fog Patterns. On the first frame of most passes, there is a 1.5-inch band of fog parallel to the minor axis of the film. On the fifth frame of most passes, there is a narrow band of fog, parallel to the minor axis of the film, near both ends of the format. On the next-to-last frame of most passes, there is a fogged area at the center of the frame. The density of all these areas of fog is commensurate with the duration of camera inactivity with which they are associated and with the solar elevation. The fog is believed to be caused by light entering the system in the ablative shield area and at the barrel interface or drum. To eliminate the fog, special light leak testing prior to launch is planned.

3. Mission Termination Procedure. The cut and wrap procedure, terminating Mission 1024-1, was accomplished smoothly. However, the film supply of both panoramic cameras was exhausted prior to the recovery of the second capsule. The trailing ends of the film became tangled in the bottom of the capsule, causing a delay in the defilming procedure. There was no significant film damage associated with this anomaly.

2. Slave (Aft) Panoramic Camera No 173

The slave (aft) panoramic camera was operational throughout the mission. Good quality, high acuity photography, approximately equal and possibly slightly better than that of the master camera, was recovered. Like the master camera, the degradations introduced by anomalies in the camera operation were of a minor nature. The following list denotes the degradations associated with camera operation and describes their location, cause, and severity.

a. Scratches

1. Scan Roller Scratches. There are longitudinal emulsion scratches just inside the format at both film edges, under the camera number, and on the same longitudinal axis at the take-up end of most frames of the mission. As in the master (fwd) camera photography, these scratches are caused by the scan roller and are inherent in the camera design.

2. Rail Scratches. Longitudinal emulsion scratches in both borders are continuous throughout the mission. Their cause and their influence on image quality is the same as on the master (fwd) camera photography. See Part I. A, (2).

[redacted]

B. Light Leaks

1. First and Last Frames of a Pass. Because light enters the camera system around the lens housing during camera-off periods, the first and last frames of most passes are partially fogged. This is the same type of fog that is present on the first and last frame of most passes of the master (fwd) panoramic camera photography.

2. Other Recurring Fog Patterns. There are areas of fog on the first 4 frames, the last 4 frames, and the sixth-from-last frame of most passes. All of these areas of fog are commensurate with the solar elevation and duration of camera inactivity with which they are associated. The light causing the fog is suspected to be leaking into the system at the ablative shield interface and at the barrel interface or drum. To eliminate the likelihood of light leaks, the camera and vehicle manufacturers intend to study the specific causes and initiate corrective measures.

3. Master (Fwd) Horizon Cameras

Both cameras were operational throughout the mission, recording good horizon images. Because of the processing accident that made the stellar film of Mission 1024-2 unuseable for attitude determination, the horizon images were the only source of attitude data available.

4. Slave (Aft) Horizon Cameras

The slave (aft) horizon cameras were operational throughout the mission. The imagery recorded by the port-looking (take-up) horizon camera is sharp and well defined throughout the mission. The starboard-looking (supply) horizon imagery is sharp and well defined through the first camera operational period of pass 5D. The horizon images exposed on pass 5D, part 2, through pass 18D are indistinct and appear to be out-of-focus at contact scale. However, under magnification the images are in focus. The apparent out-of-focus condition is an illusion introduced by a general, vague density/cast over the imagery. This phenomena has been experienced on previous missions and the cause is being studied. The veiled image condition is not apparent after pass 18D.

5. Stellar Camera No D-69/72/84 (Mission 1024-1)

The camera was operational throughout the mission, producing 401 frames.

a. Elongated Stellar Images. While the stellar images are well defined, they are not circular. At low magnification, the images appear to be smeared, but further study reveals -- an image, a smear, and another image. A frame, selected at random, was found to have stellar images as large as 24 X 57 microns (See illustration at the end of this section). This elongated imagery causes delays in the stellar reduction process because actual star centers must be determined before the data can be reduced. The probable cause of this anomaly is vehicle perturbation during exposure.

b. Flare. Earth albido caused approximately 10 percent flare in each frame. While the flare obscures the stellar images within the area it encompasses, it does not seriously affect the stellar reduction process.

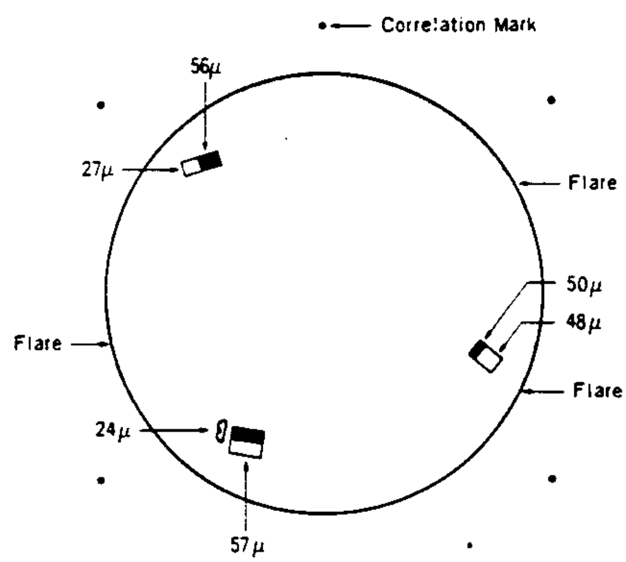
c. Plus Density Streaks. Heavy, distinct plus density streaks, parallel to the direction of flight, appear on most stellar frames exposed in the first 22 orbits (stellar frames 1 - 109). After pass 22D, the streaks appear only on frames 120, 137, and 172. While the images are thought to be of crystallized jettisoned fuel particles, investigation of the problem is continuing.

d. Static Induced Fog. There are intermittent traces of fog on the last 15 frames of the mission in association with film supply exhaustion. There are also traces of static fog at the edges of frames 9, 365, and 366. This fog was probably caused by a minor tracking problem in the camera during film manufacture or during processing. On most frames affected, the fog level was not of sufficient density to seriously impair the stellar reduction process. Only on frame 401 (the last frame of the mission) was fog of sufficient density to make the frame unuseable for the stellar reduction process.

IMAGE DIMENSIONS

Stellar Frame 49,

Mission 1024-1



6. Stellar Camera No D64/82/66 (Mission 1024-2)

The camera was operational throughout the mission and recorded 413 frames. The image quality and flare patterns are approximately the same as on the stellar photography of Mission 1024-1. However, a processing splice separated in the processor during processing. The film was damaged to such an extent that it was considered unuseable for attitude determination.

a. Plus Density Streaks. Plus density streaks, parallel to the line of flight, reported as being present on the stellar photography of Mission 1024-1, are not present on this photography.

b. Abrasions. The film contains abrasions and scratches associated with the aforementioned processing accident. Also, there is a heavy emulsion abrasion on frames 340-413 that is not considered to have been caused during processing. It is 0.2 inch from and parallel to the correlation lamp edge of the film. It does not intrude into the format and, therefore, does not degrade the imagery.

7. Index Camera No D-69/72/84 (Mission 1024-1)

The index camera operated normally throughout the mission. Four hundred eighteen good quality frames were produced. There are no film degradations caused by camera anomalies or malfunctions. However, the reseau grid was rotated 180 degrees from the position indicated in the calibration report, making it necessary to alter the prearranged interior matrix orientation.

8. Index Camera No D-64/82/66 (Mission 1024-2)

The camera was operational throughout the mission. Four hundred thirty-two frames were exposed. The photography is of good quality. However, minor image degradation is apparent intermittently in association with camera operation. The following paragraphs describe the location, severity, and cause of the degradations.

A. Edge Fog. Fog is minor and intermittent along both film edges throughout the mission. It was probably caused by a minor tracking problem in film manufacturing, in the camera, or during processing. The fog does not intrude into the format and is not a degrading factor.

b. Plus Density Streaks. On frame 158 and all subsequent frames there are groups of short, fine, comet-shaped plus density streaks parallel to the major axis of the film. Each group contains several streaks oriented along the major axis. They appear to be the result of a roller hesitation within the system. Because of the small scale of the imagery, the streaks are a degrading factor. Frames 200 and 257 are good examples of the resulting degradation.

c. Static Fog. Fog induced by dendritic static discharges is present on the last 20 frames of the mission in association with film supply exhaustion. The density of the fog is such that it presents a moderate degradation to the image quality.

b. Light Leaks. There is a streak of fog extending into the format from the camera number edge of the film on frame 2. Because the fog appears on only one frame, it is not a significant factor. The last 4 frames of the mission are fogged in varying degrees. This fog is apparently associated with film supply exhaustion.

[illegible]. Associated Equipment

This section is intended to describe problems in the procedures or equipment used in support of the mission.

a. Camera Operations Cable. The camera operation cable is compiled as the mission is in progress and is issued in one day increments. On Mission 1024-2, the orbiting vehicle was commanded to assume a "zombie" or inactive mode during the ascending portion of revolution 89. As a result of the command, 11 frames were generated in the panoramic cameras. Those frames were not indicated in the proper sequence on the cable. As a result, 6 unexplained, clear frames followed the photography of pass 88D on the slave (aft) camera photography and 5 clear frames followed the photography of pass 88D on the master (fwd) camera film. Because all frames must be titled, this omission caused delay during the initial breakdown procedure. To complicate the situation, the binary time word starts over, at random, when the cameras are reactivated. Therefore, the titling decision had to be made by comparing the binary time word of the clear frames with that of the previous pass. The procedure was effective and the frames were correctly titled pass 89AE.

b. Binary Word.

1. The binary index lamps were recorded faintly on the last frame of each camera operation. Because of their low intensity on the negative, they were further degraded in the printing process and subsequently were not of sufficient density to be useable in the automatic binary reading equipment. All of the affected index

lamp images had to be hand punched prior to reduction of the data. This problem was caused because the cameras electrical power was being shut down as the scan head crossed the center-of-format switch on the last frame of all operations. The solution of the problem is to adjust the cam commanding the index lamp so it is activated earlier in the cycle. This remedial action has been initiated by the contractor. The binary word was not recorded on the master (fwd) camera film of frame 54, pass 09D, and frame 49, pass 23D. The cause of the malfunction has not been determined. The binary word value is in error on the slave (aft) camera frame 53, pass 35D; frame 152, pass 40D; and frame 41, pass 57D. Binary lamp No 29 is very weak on slave (aft) camera passes 39D and 57D.

2. Automatic Binary Reader. The value of the binary words is automatically recorded by a binary reading machine. The density of the base fog is an input to the machine. The machine considers densities of a certain range above base fog to be lighted. Binary lamps and densities less than the given range are considered as unlit binary lamps. The base density adjustment is manually controlled by a rheostat. The master camera film of Mission 1024-2, having been processed in the Yardleigh, contains immediate and frequent base density changes. Because the binary reader was designed to be adjusted according to gradual base density changes, as is the case with film processed in the Trenton processor, a large portion of the master camera data blocks of Mission 1024-2 were not adaptable to machine reading and had to be reduced by hand. Anticipating that more film is to be processed in the Yardleigh, design modifications of the automatic binary reader are being considered.

PART II. FILM

1. Film Footage/Frame Totals

The total processed footage and the total frames generated by each camera was:

CAMERA	FOOTAGE	FRAMES
Master (Fwd) Panoramic No 174		
(1024-1)	8,057'	2,920
(1024-2)	7,987'	3,045
Slave (Aft) Panoramic No 175		
(1024-1)	8,096'	2,935
(1024-2)	7,922'	3,029
Stellar No D69/72/84 (1024-1)	44'	401
Stellar No D64/82/66 (1024-2)	44'	411
Index No D69/72/84 (1024-1)	93'	418
Index No D64/82/66 (1024-2)	91.5'	432

2. Film Processing

This section provides an evaluation of exposure, processing, and densities of the original negatives from the 10 cameras used in missions 1024-1 and 1024-2. An analysis of the film processed in the Yardleigh compared to that processed in the Trenton is also included in this section.

a. Panoramic Camera Exposure. The filter/slit width combination used on this mission provided less exposure then on any previous mission. Hence, the density readings on this mission are the lowest of any mission to date. In general the photo interpreters and the contractors have agreed that the film is not too thin. However, most of it was processed at the full development level. The processing contractor suggests that the exposure be selected to provide optimum density negatives at the intermediate level of development. He reasons that this provides more processing flexibility. The camera engineers want to keep the exposure time as low as possible to minimize the effects of vibration and IMC errors.

b. Index Cameras Exposure. The density of the index camera photography is commensurate with the solar elevation at which it was exposed. It was generally adequate throughout the mission.

c. Stellar Cameras Exposure. The stellar camera photography of missions 1024-1 and 1024-2 was adequately exposed.

d. Horizon Cameras Exposure. The exposure of the horizon cameras was also commensurate with the solar elevation, i.e., when the film of the panoramic cameras is of low density the horizons are also of low density.

e. Processing Equipment. The film from both panoramic cameras used on Mission 1024-1 was processed in Trenton processing machines. On Mission 1024-2, the film from the slave (aft) panoramic camera was processed in the Trenton and the film from the master (fwd) in the Yardleigh. Trenton processing is familiar to the community because it is the processing technique that has been used for several years. However, the Yardleigh processor is a new concept of film processing and was used operationally for the first time on the master (fwd) camera record of Mission 1024-2.

f. Yardleigh Processor. The Yardleigh is a frame-by-frame processor designed to accomplish immediate processing level changes without the need of a transitional period. Processing at the intermediate and full levels is accomplished by developer suspended in viscose. The primary level is a spray development system identical to that used in Trenton processing. After the primary stage of development, the minimum density of each frame is determined by an infrared scanning densitometer. That density then automatically dictates the proper developing level for that frame. The following section, devoted to the processing of the panoramic camera film of this mission, makes special note of the differences in Yardleigh and Trenton processing.

g. The percentage of film processed at each level of development was:

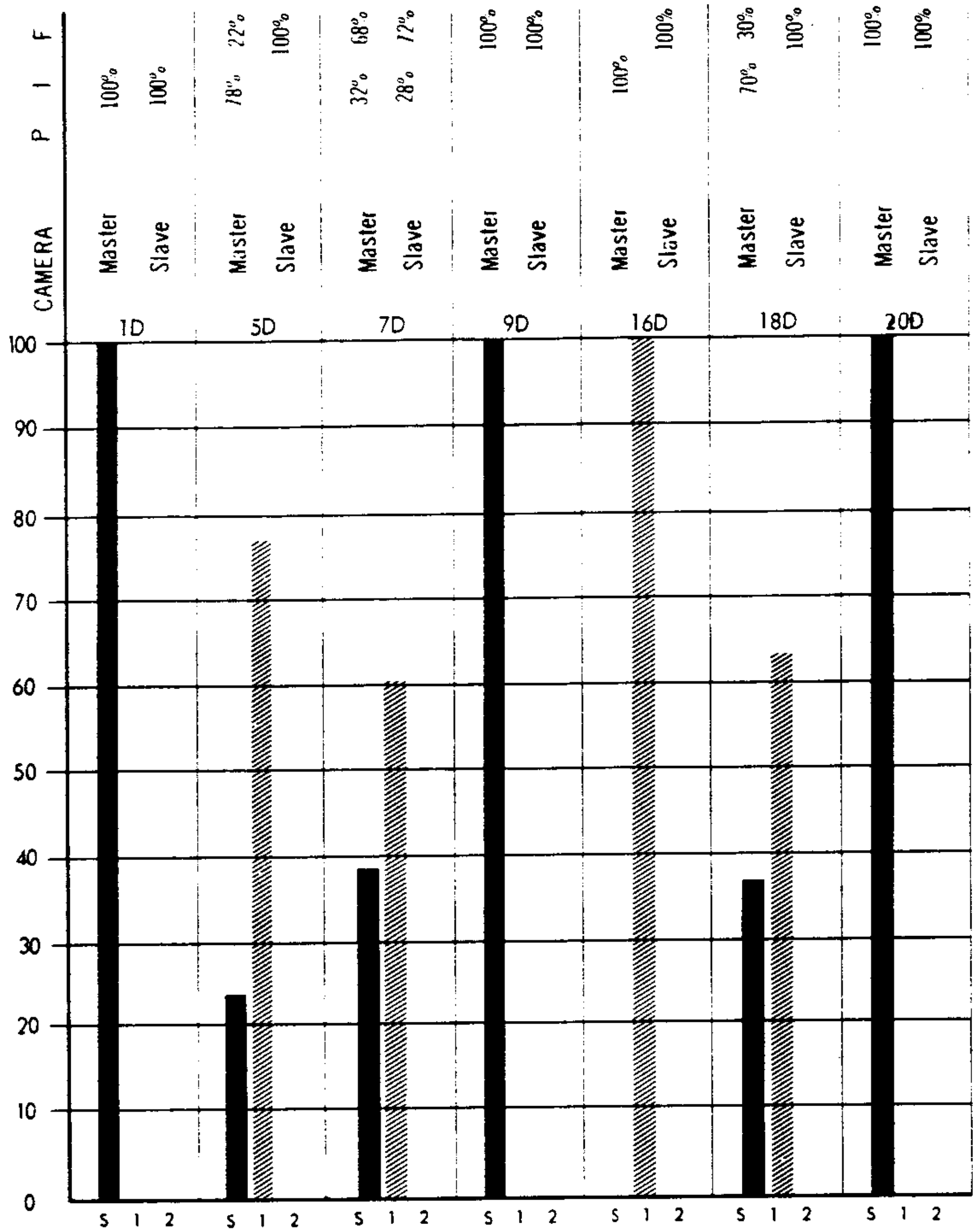
	1024-1		1024-2	
Development Level	Master	Slave	Master	Slave
Primary	0	0	15%	0.5%
Intermediate	57%	28%	16%	22.5%
Full	43%	72%	69%	77%

Processing Level Changes:

Master (Fwd) Camera, Mission 1024-1 - 37
Slave (Aft) Camera, Mission 1024-1 - 41
Master (Fwd) Camera, Mission 1024-2 - 355 (Yardleigh)
Slave (Aft) Camera, Mission 1024-2 - 30

3. Yardleigh/Trenton Processing Analysis

The reason for processing the master (fwd) camera photography of Mission 1024-2 in the Yardleigh and the slave (aft) camera photography of the same mission in the Trenton was to establish a comparison for analysis. Because there are differences in the relationship of the solar position and the principle ray (look angle) of the cameras, a comparison of the film from the 2 panoramic cameras on Mission 1024-2 must be considered relative to the differences in the 2 cameras on Mission 1024-1 (both processed in the Trenton). The following graphs show the differences in the processing of the 2 cameras on both halves of the mission. The chart indicates the percentage of film in each pass that was processed (S) at the same level of development. (1) one level of development difference (full-intermediate, primary-intermediate), and (2) 2 levels of development difference (primary-full). The percentage of film from each camera processed at each development level is indicated by pass. While the graphs suggest processing trends, they may be indicative of only this mission. Further statistical analysis is necessary to draw conclusions regarding the average operation of the processors. In the analysis of the graph, one should consider the process of the Yardleigh as ideal and deviations from it as excursions from optimum. This logic is based on the fact that the densitometry of the 2 processors is identical but the Yardleigh alters the process according to the density of each frame. The Trenton requires approximately 40 feet of film to be transported to accomplish an entire change in process levels. Therefore, the processing changes of the Trenton must be compromised by the average density of several frames.



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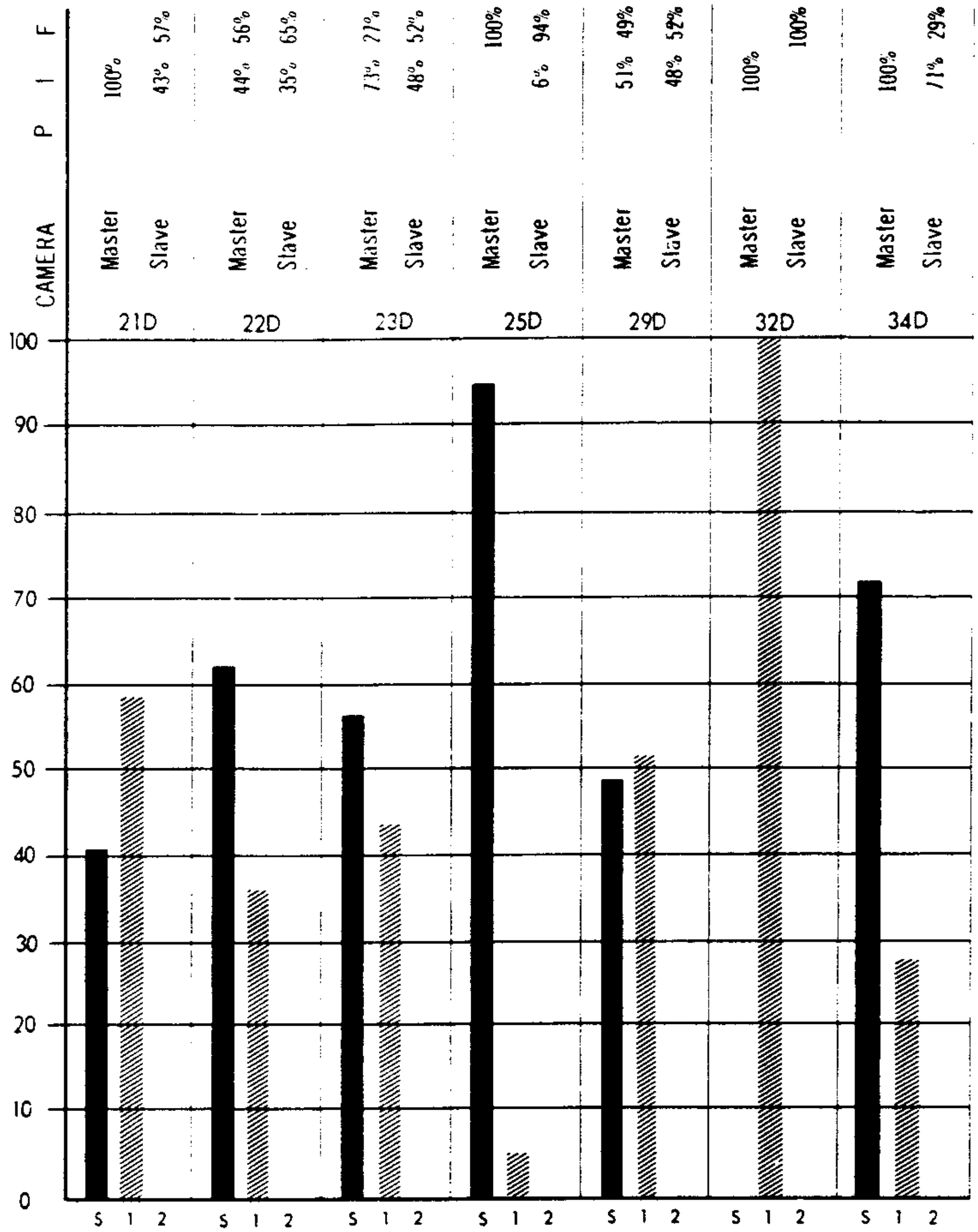

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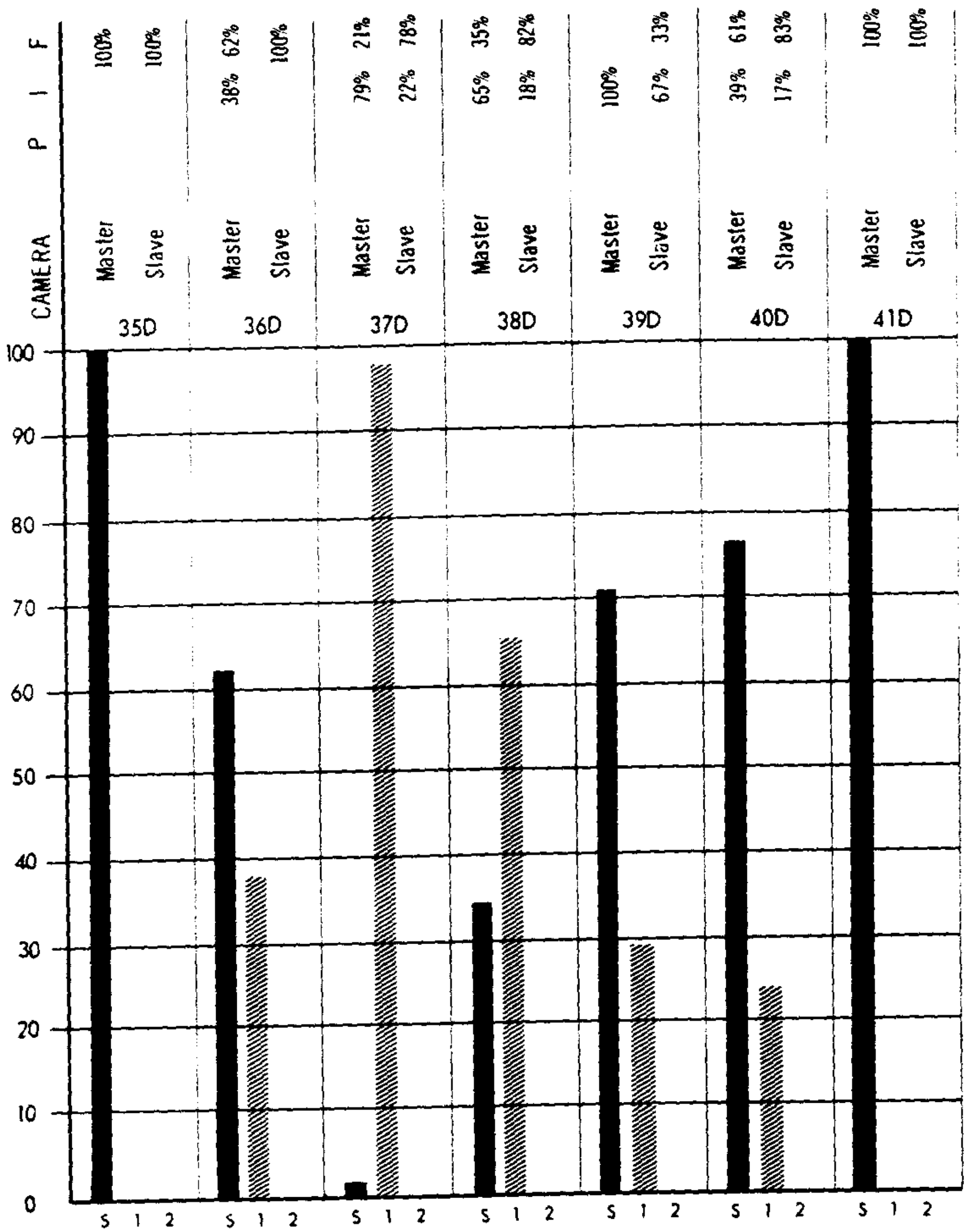

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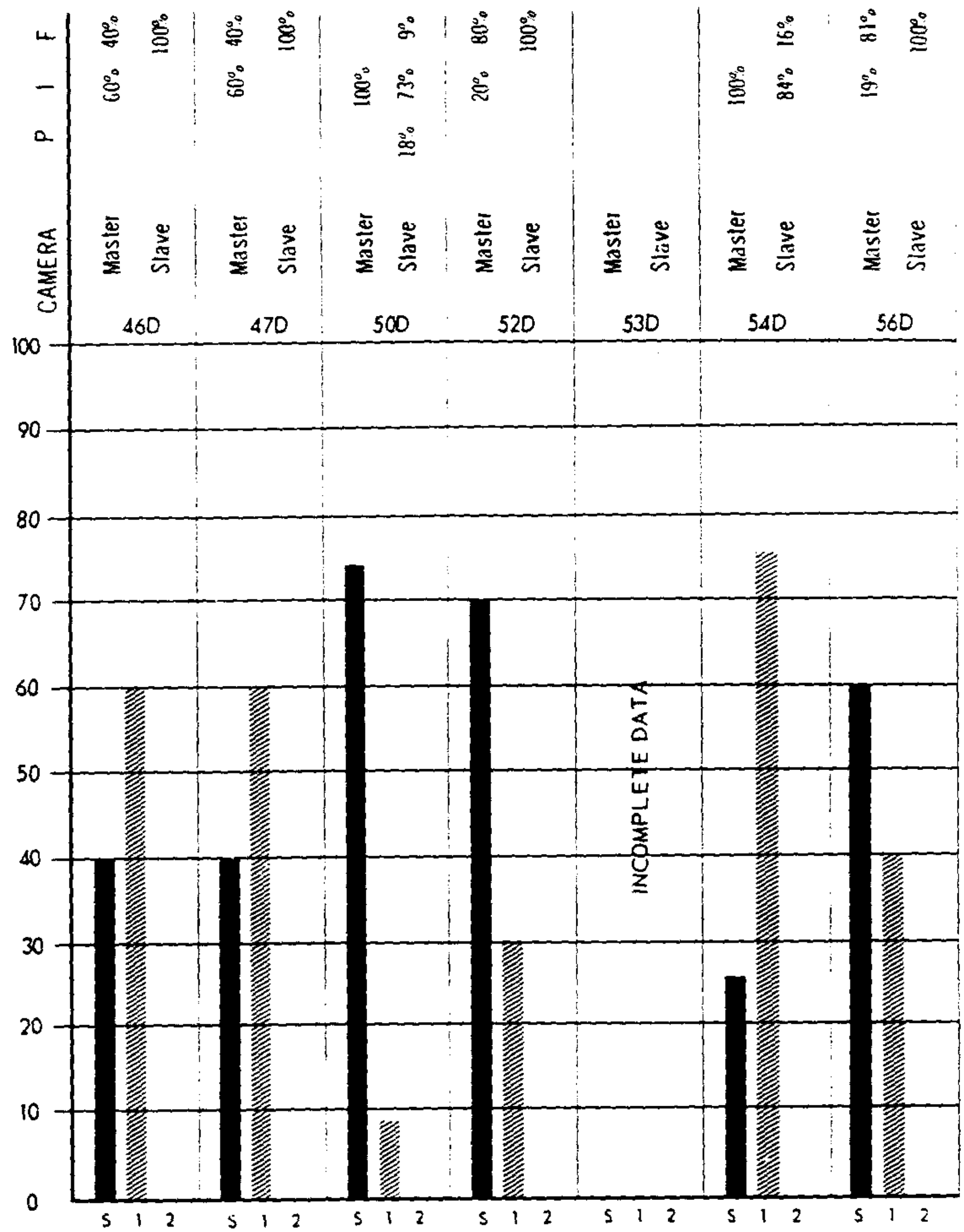

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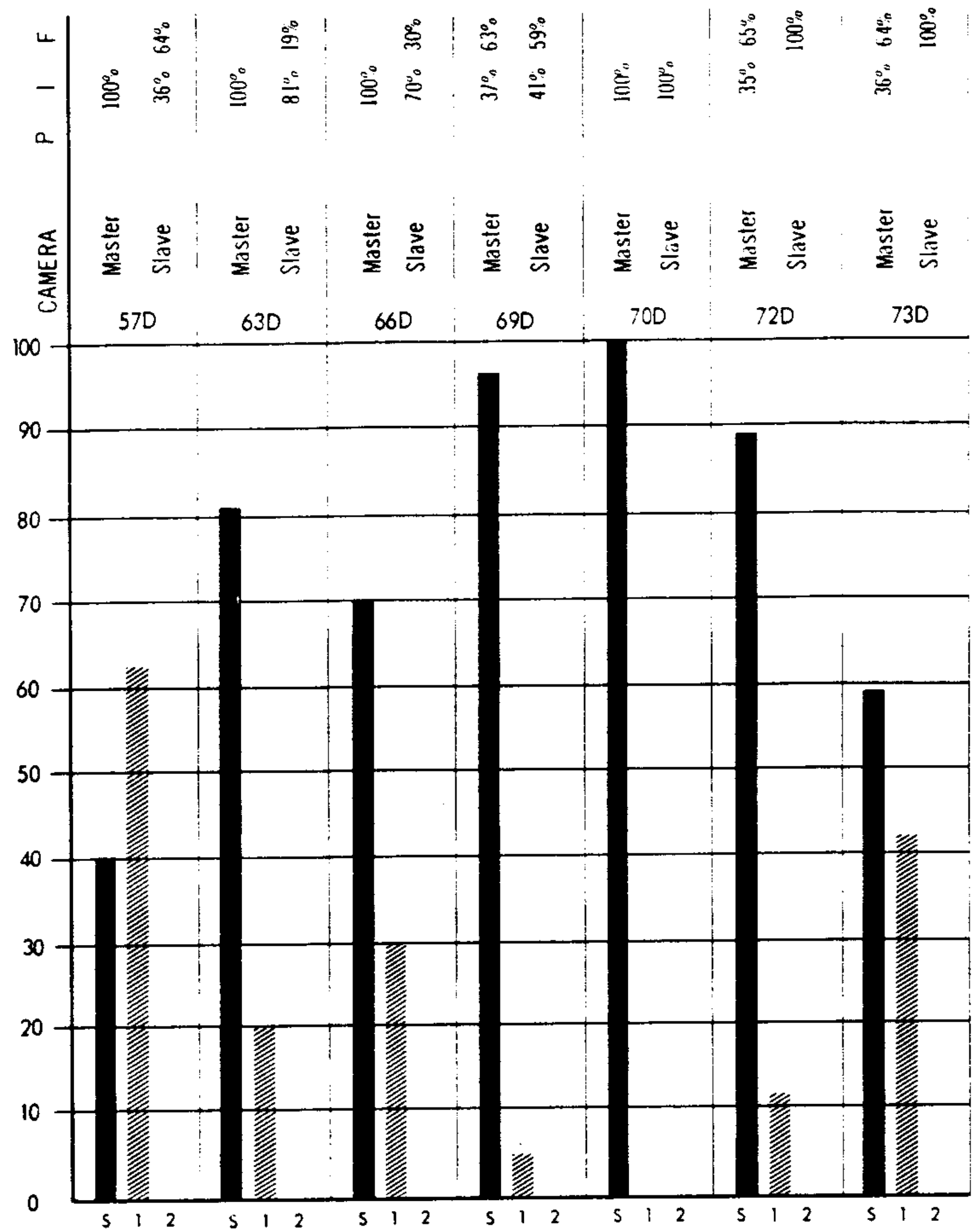

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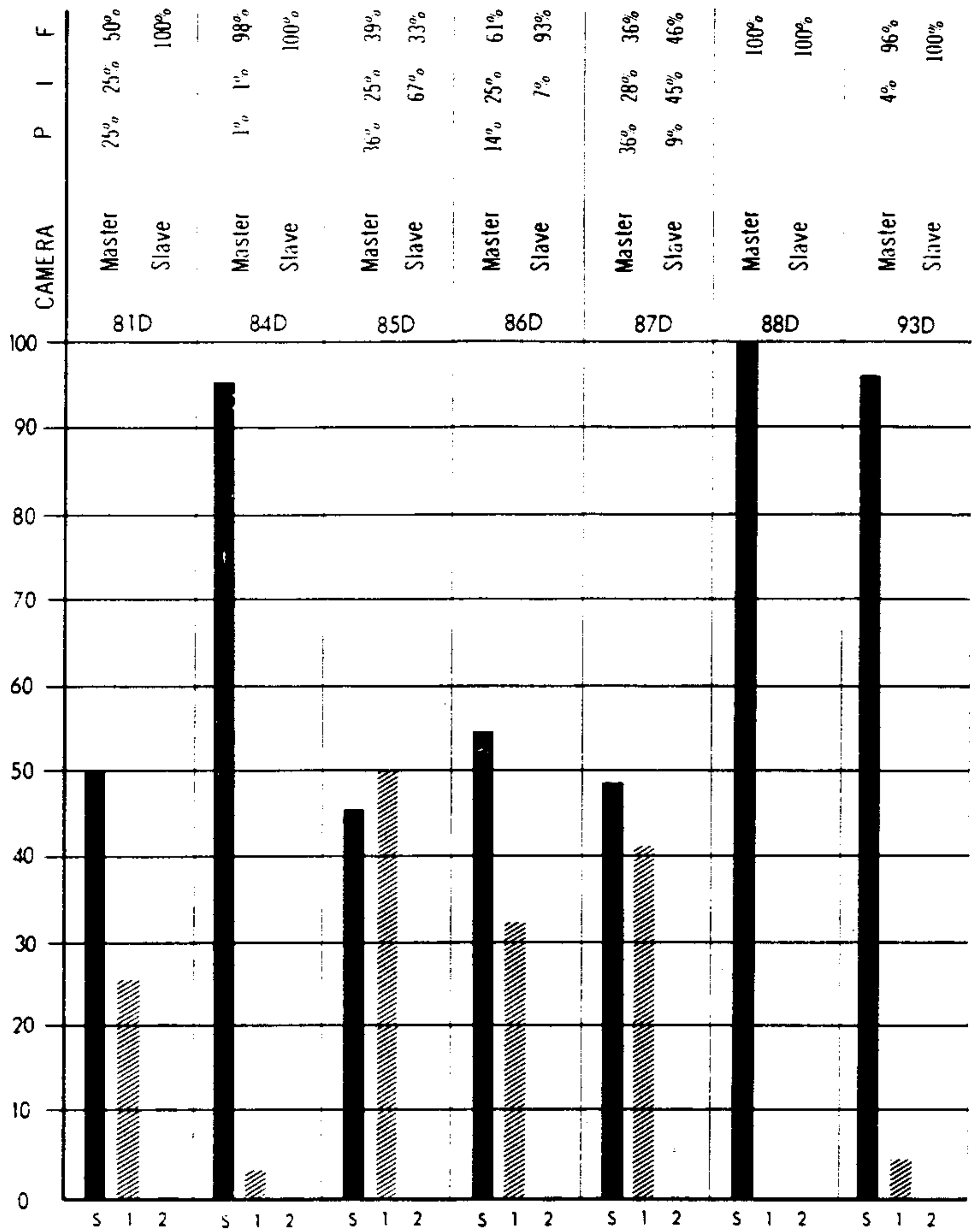
CAMERA
P I F
81D
84D
85D
86D
87D
88D
93D
Master
Slave
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90
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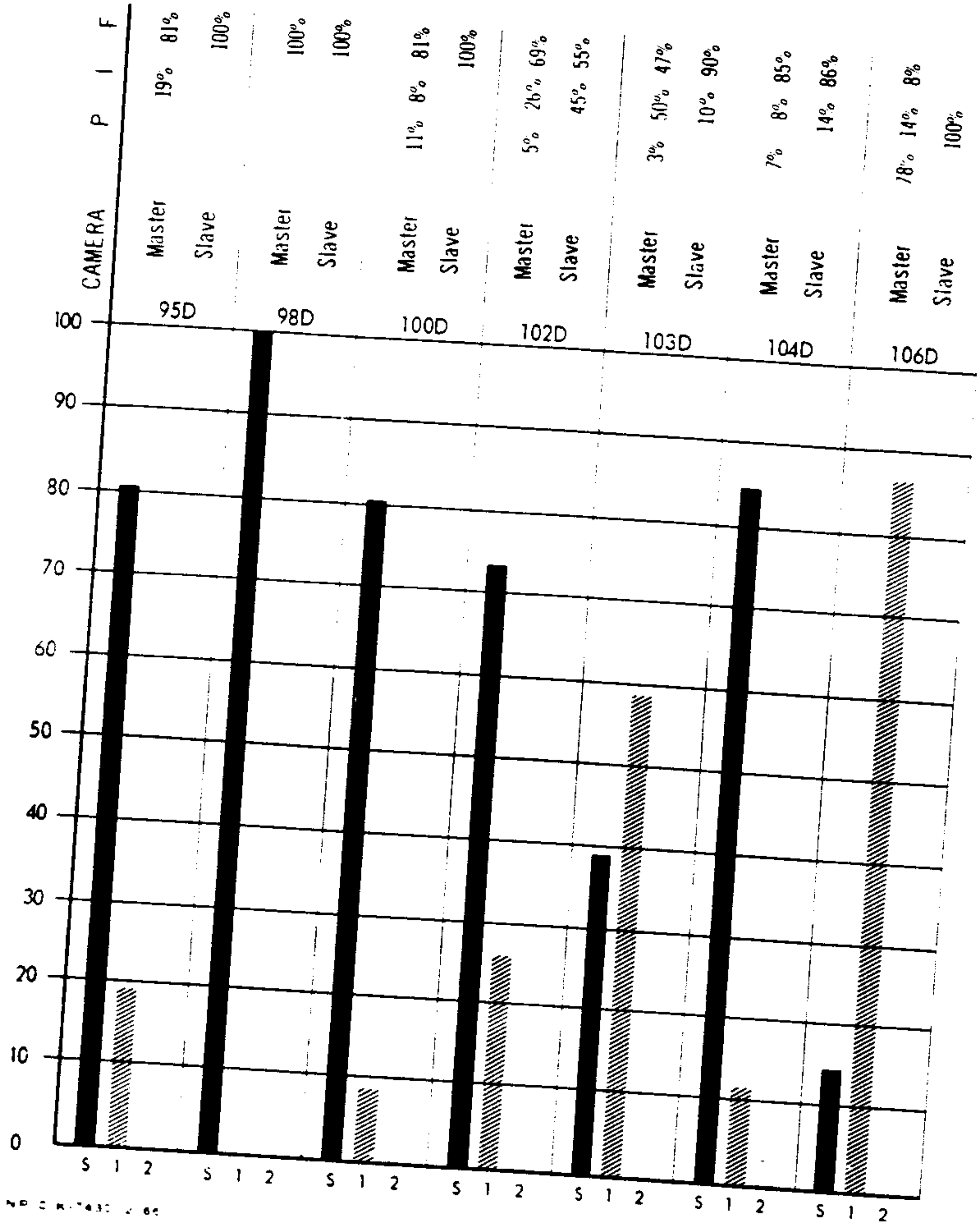
40
30
20
10
0


CAMERA
P I F
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95D Slave 100%
98D Master 100%
98D Slave 100%
100D Master 11% 8% 81%
100D Slave 100%
102D Master 5% 26% 69%
102D Slave 45% 55%
103D Master 3% 50% 47%
103D Slave 10% 90%
104D Master 7% 8% 85%
104D Slave 14% 86%
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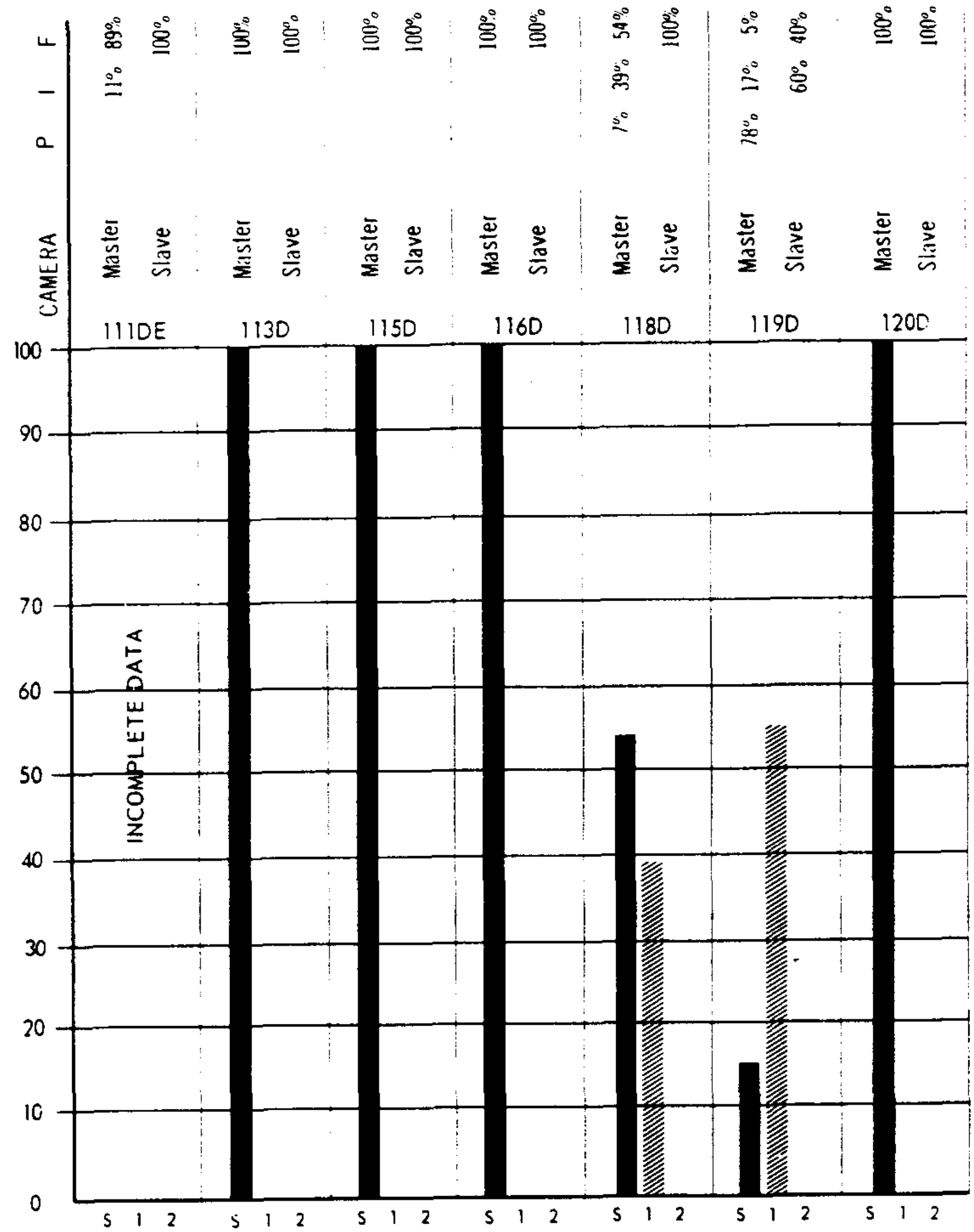
S 1 2


CAMERA
P I F
111DE Master 11% 89%
111DE Slave 100%
113D Master 100%
113D Slave 100%
115D Master 100%
115D Slave 100%
116D Master 100%
116D Slave 100%
118D Master 7% 39% 54%
118D Slave 100%
119D Master 78% 17% 5%
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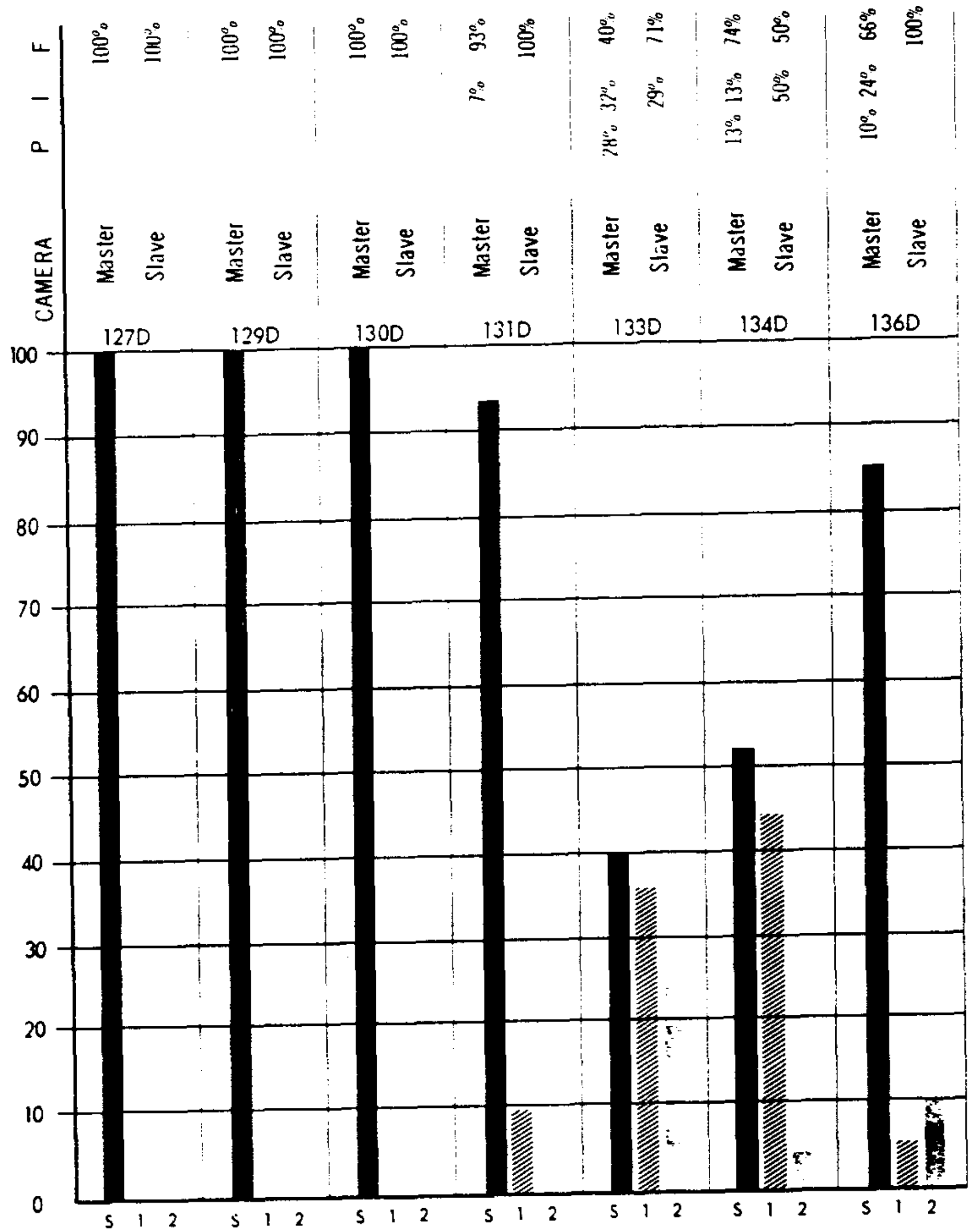
S 1 2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131D
Master
Slave
7% 93%
100%
133D
Master
Slave
28% 32% 40%
29% 71%
134D
Master
Slave
13% 13% 74%
50% 50%
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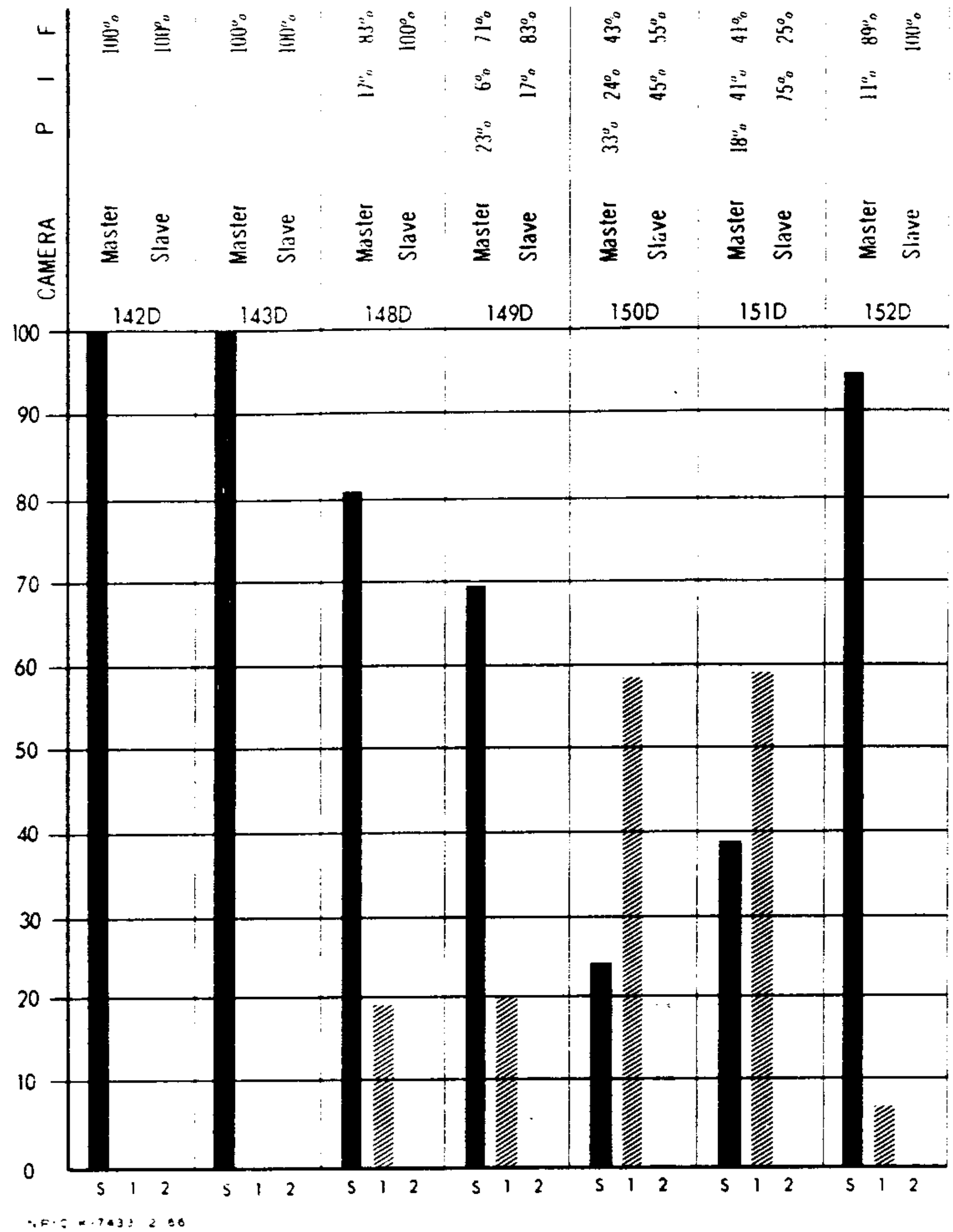
S 1 2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CAMERA
Master
Slave
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143D
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149D
150D
151D
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100
90
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70
60
50
40
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10
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S 1 2

a. Observations from the Graph.

1. On Mission 1024-1, the processing level of the master (fwd) camera photography and the slave (aft) camera photography was the same 58.3 percent of the processing time. It differed by one level of development 41.2 percent of the processing time and it was different by 2 levels of development during 0.5 percent of the process.

2. On Mission 1024-2, the film of the master camera (processed in the Yardleigh) was processed at the same level as that of the slave camera (processed in the Trenton) during 73.6 percent of the process. The process levels differed by one during 20.8 percent of the process and a difference of 2 levels of process existed during 5.6 percent of the processing time.

3. Although 2 different types of processors were used, the processing levels of the rolls of film were the same during 73.6 percent of Mission 1024-2. On Mission 1024-1, the processing levels were the same on only 58.3 percent of the mission. In order to determine the significance of these values, the same type of analysis should be conducted on a future mission.

4. The process level was identical on both rolls of film on 4 passes of Mission 1024-1. Three of these passes were processed at the full level and one at intermediate. On Mission 1024-2, the film of both cameras was processed continuously at the full level of development on 11 passes. While these figures alone tend to suggest that the Yardleigh does not change the process significantly, further analysis is necessary in order to establish the sigma limits of the values.

5. The following list denotes the orbits that would have a nearly identical track. The data is presented here to facilitate the readers analysis of processing.

ORBIT

1	2	3	4	5	6	7
[illegible]	[illegible]	[illegible]	20	21	22	23
[illegible]	34	35	36	37	38	39
[illegible]	[illegible]	[illegible]	52	53	54	55
[illegible]	[illegible]	[illegible]	68	69	70	71
[illegible]	82	83	84	85	86	87
[illegible]	[illegible]	[illegible]	100	101	102	103
[illegible]	114	115	116	117	118	119
[illegible]	130	131	132	133	134	135
[illegible]	[illegible]	147	148	149	150	151
[illegible]	[illegible]	[illegible]	164	165	166	167

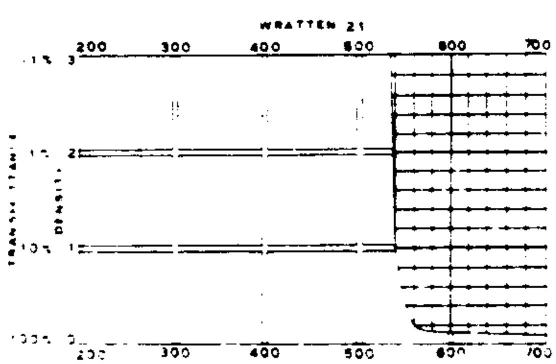
8	9	10	11	12	13	14
24	25	26	27	28	29	30
40	41	42	43	44	45	46
56	57	58	59	60	61	62
72	73	74	75	76	77	78
88	89	90	91	92	93	94
104	105	106	107	108	109	110
120	121	122	123	124	125	126
136	137	138	139	140	141	142
152	153	154	155	156	157	158
168	169	170	171	172	173	174

15
31
47
63
79
95
111
127
143
159
175

6. A further consideration involved in the evaluation of the processors is the filter differences in the 2 cameras. The following item describes the transmission of energy of each filter at various wavelengths within the electromagnetic spectrum.

4. Filter Transmission Data

Wavelength	Percent Transmittance Wratten 21	Percent Transmittance Wratten 25
540	2.5	
550	29.0	
560	65.0	
570	80.6	
580	85.4	
590	87.3	12.6
600	88.1	50.0
610	88.7	75.0
620	89.0	82.6
630	89.5	85.5
640	89.9	86.7
650	90.2	87.6
660	90.4	88.2
670	90.5	88.5
680	90.5	89.0
690	90.6	89.3
700	90.6	89.5
Dominant (A) Wavelength	593.7	617.2
Excitation (A) Purity	100.0	100.0
% Luminous Transmit (A)	57.4	22.5
Dominant (C) Wavelength	588.9	615.3
Excitation (C) Purity	99.9	100.0
% Luminous (C) Transmit	45.6	14.0



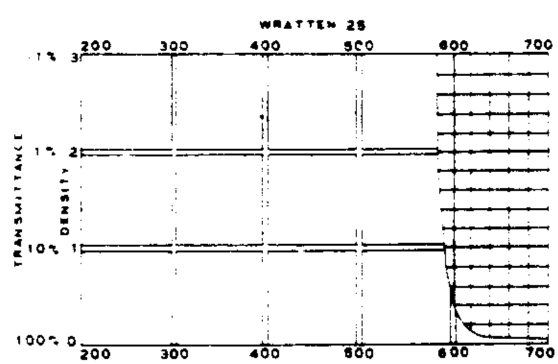


FIGURE 1. DESCRIPTION OF PHOTOGRAPHIC DATA

The data pertaining to photographs contained in this publication are defined as follows:

PASS: A pass is the operational portion of an orbital revolution. A suffix D indicates that the photography was acquired during the descending portion, a suffix A indicates that the photography was acquired during the ascending portion, and a suffix M indicates that the photography was acquired during a pass that includes both ascending and descending portions. An additional suffix E indicates that the pass was an engineering operation or that a portion of the pass has been edited.

DATE OF PHOTOGRAPHY: The date of photography indicates the day, month, and year (GMT) that the photography was acquired.

UNIVERSAL GRID COORDINATES: These coordinates are included to locate the illustrated photography within the panoramic format.

ENLARGEMENT FACTOR: The enlargement factor is included to indicate the number of diameters the original material has been enlarged in the photographic illustration.

GEOGRAPHIC COORDINATES: These coordinates are included to indicate the latitude and longitude of the panoramic format.

ALTITUDE: This measurement is the vertical distance from the vehicle to the Hough Ellipsoid at the time of the acquisition of the photography.

PITCH: Rotation of the camera about its transverse axis. Using appropriate aeronautical terminology, positive readings indicate nose-up attitude and negative readings indicate nose-down attitude.

ROLL: Rotation of the camera about its longitudinal axis. Using appropriate aeronautical terminology, positive readings indicate left wing-up attitude and negative readings indicate right wing-up attitude.

YAW: Rotation of the camera about its vertical axis. Positive readings indicate counterclockwise rotation when viewing the ground nadir from the vehicle-mounted camera in-flight.

LOCAL SUN TIME: This time is included to present to the viewer a realistic time of acquisition of the photography illustrated.

SOLAR ELEVATION: The solar elevation is the angular elevation of the sun above a plane tangent to the surface of the earth at the center of the panoramic format. A negative solar elevation indicates that the sun is below the plane.

SOLAR AZIMUTH: The solar azimuth is the angular measurement of the rays of the sun measured from true north in a clockwise direction.

EXPOSURE: The exposure is the duration of the photographic exposure expressed in a fraction of a second and is computed from the scan rate and slit width.

VEHICLE AZIMUTH: The vehicle azimuth is the angle of ground track with respect to geodetic coordinates.

PROCESSING LEVEL: The processing level is pertinent to the referenced frame and is extracted from the contractor's processing report.

FIGURE 2. SHADOW DETAIL RENDERED BY INTERMEDIATE/FULL PROCESSING LEVEL* -- TRENTON PROCESSOR NPIC K-6316 3 66

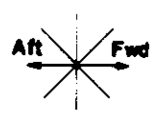
FIGURE 3. SHADOW DETAIL RENDERED BY FULL PROCESSING LEVEL -- YARDLEIGH PROCESSOR NPIC K-6317 (3/66

Note the obvious improvement in the shadow detail of Figure 3 compared to Figure 2.

*Processing level change (Intermediate Full) was initiated at frame [illegible]. This frame was probably processed during the transition period.

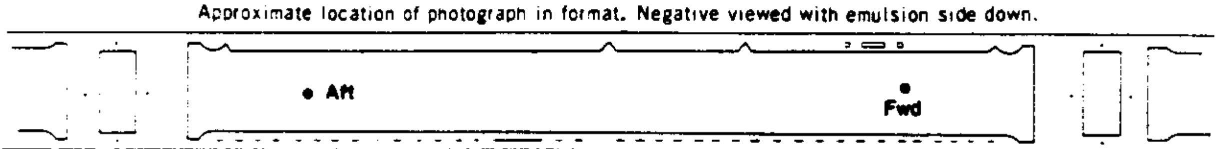
	FIGURE 2	FIGURE 3
Camera	173	172
Pass	103D	103D
Frame	18 Aft	12 Fwd
Date of Photography	29 Sept 65	29 Sept 65
Universal Grid Coordinates	20.5 - 12	70.5 - 13.5
Enlargement Factor	40X	40X
Geographic Coordinates	45-54N 61-54E	45-52N 61-58E
Altitude (feet)	610,693	612,684
Camera Attitude:		
Pitch	-00°08'	00°13'
Roll	00°00'	00°03'
Yaw	Not Determined	Not Determined
Local Sun Time	1225	1225
Solar Elevation	41°08'	41°11'
Solar Azimuth	187	187
Exposure	1/185 sec	1/123 sec
Vehicle Azimuth	168°12'	167°57'
Processing Level	Full	Full

Approximate flight direction on photograph



Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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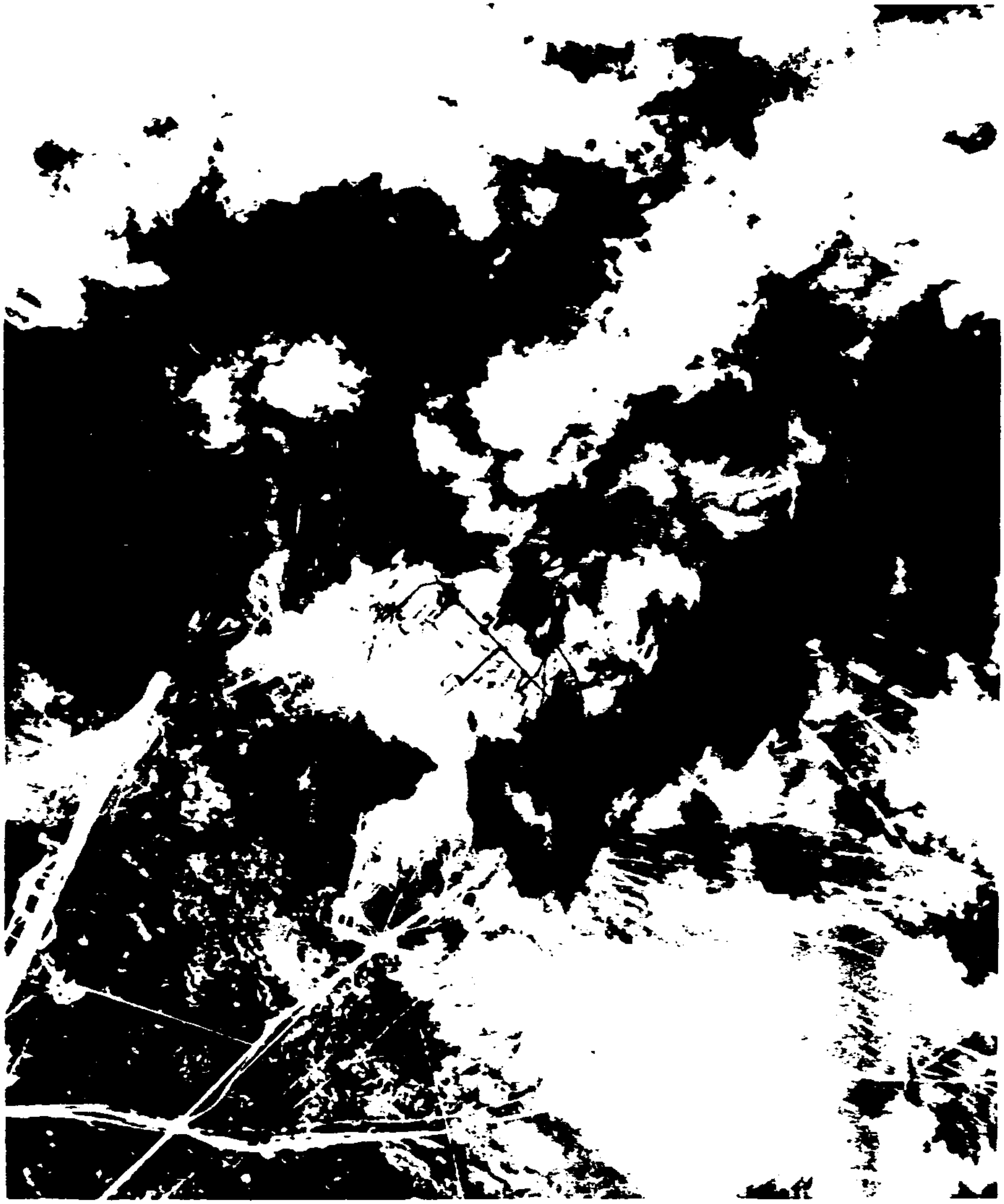

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FIGURE 4. SLAVE CAMERA IMAGERY -- PROCESSED AT THE FULL LEVEL OF DEVELOPMENT (TRENTON) NPIC K-6318 (3/66)

FIGURE 5. MASTER CAMERA IMAGERY -- PROCESSED AT THE FULL LEVEL OF DEVELOPMENT (YARDLEIGH) NPIC K-6319 (3/66)

Contrast differences in these 2 photographs reflect the contrast differences in the original negative.

[redacted]

	FIGURE 4	FIGURE 5
Camera	173	172
Pass	103D	103D
Frame.	60 Aft	54 Fwd
Date of Photography.	29 Sept 65	29 Sept 65
Universal Grid Coordinates	20.7 - 12.7	70.5 - 13.4
Enlargement Factor	20X	20X
Geographic Coordinates	39-35N 63-35E	39-33N 63-39E
Altitude (feet).	598,005	599,393
Camera Attitude:		
Pitch	00°38'	-00°43'
Roll.	-00°15'	00°14'
Yaw	Not Determined	Not Determined
Local Sun Time	1221	1220
Solar Elevation.	47°07'	47°08'
Solar Azimuth.	187°	187°
Exposure	1/187 sec	1/124 sec
Vehicle Azimuth.	169°50'	169°39'
Processing Level	Full	Full

Approximate flight direction on photograph

Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.

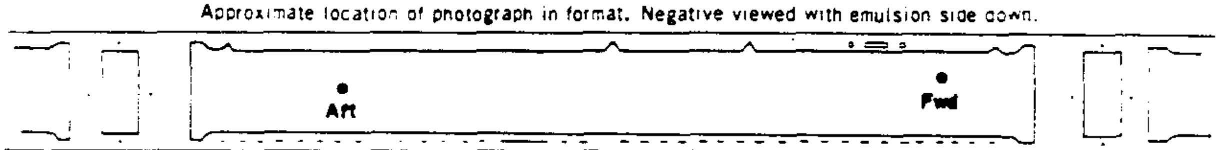

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FIGURE 6. IMAGERY PROCESSED AT THE FULL LEVEL OF DEVELOPMENT (TRENTON)

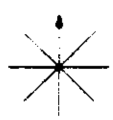
FIGURE 7. IMAGERY PROCESSED AT THE PRIMARY LEVEL OF DEVELOPMENT (YARDLEIGH)

Although there was a difference of 2 development levels in the processing of the original negatives that these prints were made from the densities are approximately the same.

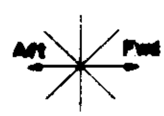
NPIC K-6320 (3/66)   NPIC K-6321 (3/66)

[redacted]

	FIGURE 6	FIGURE 7
Camera	173	174
Pass	103D	103D
Frame	48 Aft	42 Fwd
Date of Photography	29 Sept 65	29 Sept 65
Universal Grid Coordinates	19.5 - 11.9	72 - 14.2
Enlargement Factor	40X	40X
Geographic Coordinates	41-23N 63-09E	41-22N 63-13E
Altitude (feet)	601,212	602,771
Camera Attitude:		
Pitch	00°44'	-00°22'
Roll	-00°11'	00°06'
Yaw	Not Determined	Not Determined
Local Sun Time	1231	1231
Solar Elevation	45°25'	45°27'
Solar Azimuth	191°	191°
Exposure	1/186	1/123
Vehicle Azimuth	169°25'	169°13'
Processing Level	Full	Primary

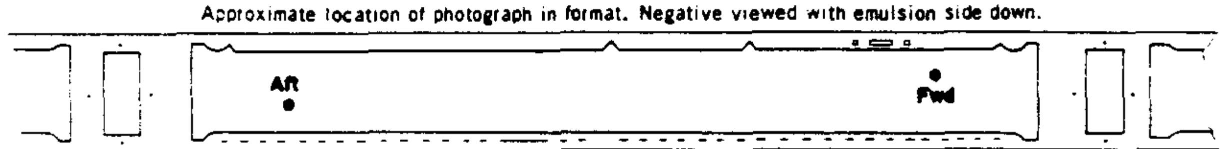


Approximate flight direction on photograph

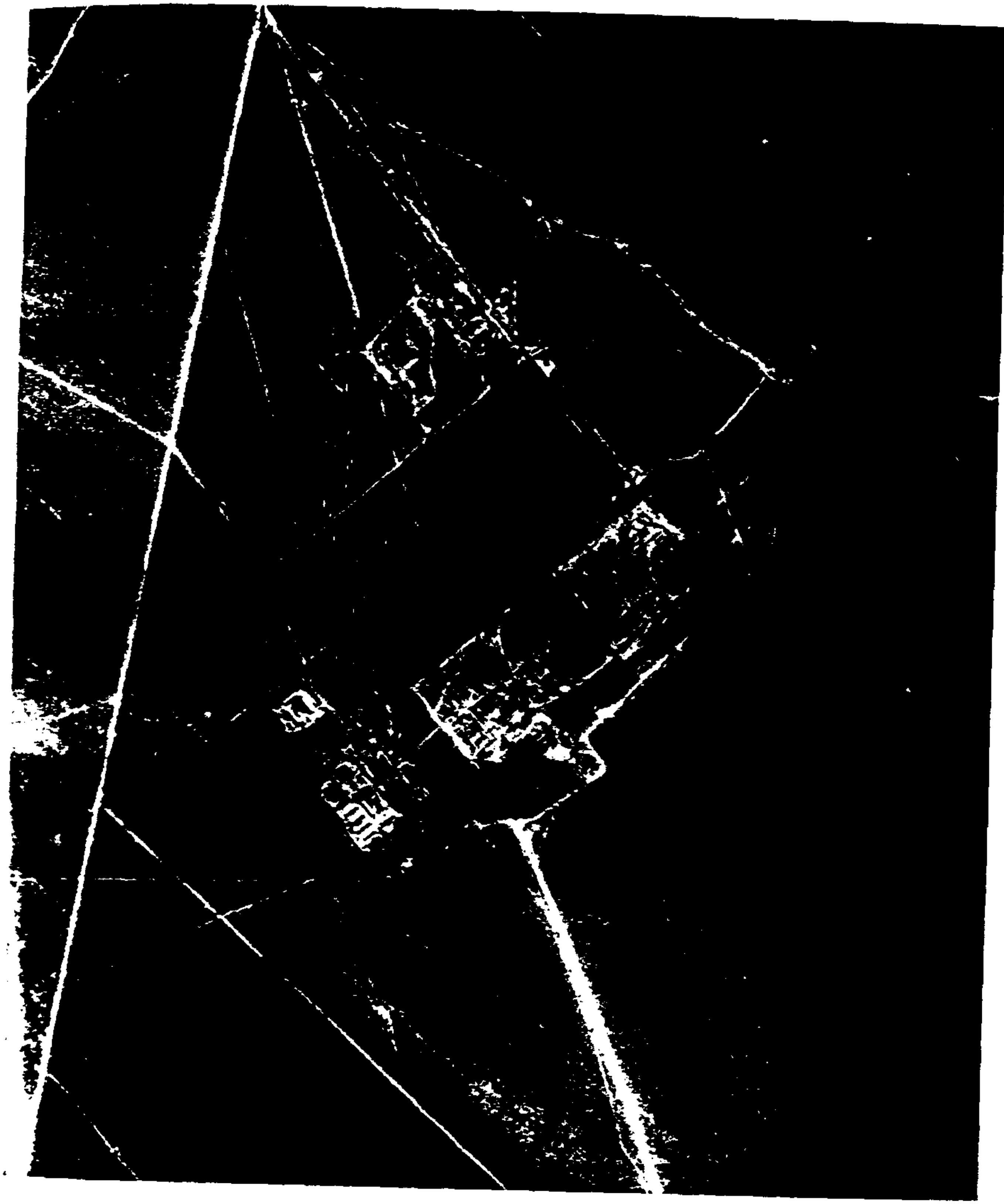


Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



[redacted]



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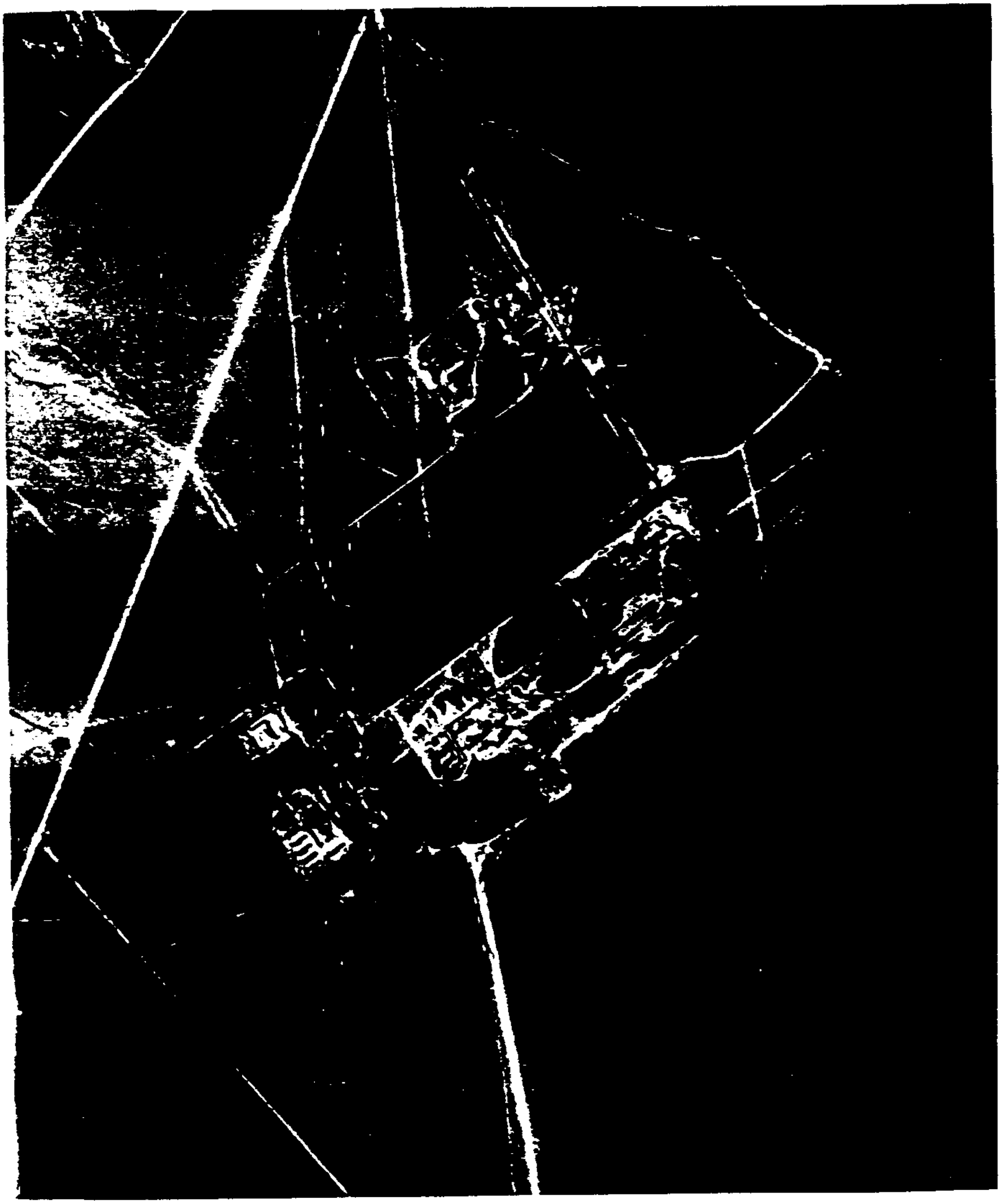

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5. <u>Physical Film Degradations</u>

This section provides data pertaining to physical film degradations of this mission that are not directly attributed to camera operation.

a. Panoramic Cameras. The light leaks, as described in the "Camera Operation Section" of this text, are not solely camera induced. Because the vehicle skin serves as the camera body, the light leaks must be considered as being a system anomaly as well as a camera-induced anomaly. Pinholes, abrasions, and handling marks are minor and intermittent throughout the mission. The slave camera photography of passes 9D through 37D contains a row of small plus density marks. The marks are approximately 0.9 inch from the binary edge of the film and appear each 2.35 inches along the major axis. The density of the marks is such that they can be detected only in low density, low contrast areas of the negative. The cause of the anomaly is unknown. The general physical condition of the film from both panoramic cameras is good.

b. Stellar/Index Unit D-69/72/84 (Mission 1024-1). The film recovered from both cameras of the stellar/index unit of Mission 1024-1 is in good physical condition (minor pinholes, abrasions, and handling marks excepted).

c. Stellar Camera D-64/82/66 (Mission 1024-2). The extreme physical destruction incurred during the process of the stellar camera film of Mission 1024-2 makes an evaluation of subtle system-induced physical degradation impossible.

d. Index Camera D-64/82/66 (Mission 1024-2). The general physical quality of the index camera film of Mission 1024-1 is good. However, there are random, comet-shaped minus density streaks on most frames after frame 158. All of the streaks are parallel to the major axis of the film but they follow no pattern of incidence. Their cause has not been determined.

PART III. IMAGE QUALITY

1. Definition of Photographic Interpretation (PI) Suitability

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: 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 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 degradations, 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 or highlight areas. Detection and identification of small objects are possible but accuracy of mensuration is limited by the fall-off in image quality and the less-than-optimum contrast.

Poor: Camera-induced degradations or weather limitations severely reduce the effectiveness of the photography. Definition of edges and corners are not well defined. 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.

2. PI Suitability, Missions 1024-1 and 1024-2

The PI suitability of this mission is good. The photo interpreters say the overall image quality is the best they have seen from this system in the past 12 months. Relatively good atmospheric conditions throughout the mission seem to be the influencing factor in the PI s quality appraisal.

While the MIP rating of 85 has been common among recent missions, it is a measure of only the best imagery of the mission. However, missions 1024-1 and 1024-2 have more imagery of approximately that same quality level.

The photo interpreters report contains some derogatory comments about the photography exposed at low solar elevations. However, the film footage exposed at these lower solar elevations is not excessive. The orbital parameters and the launch time are, by nature, a compromise and therefore will provide more favorable photographic conditions in some parts of the world than in others.

A detailed study of the imagery produced by both cameras reveals no consistent difference in image quality, although on most frames the slave (aft) camera photography is slightly better than that of the master (fwd) camera.

The Yardleigh processor processes each frame according to the minimum density of that frame. Because the maximum density of the frame is not considered in the processing level decision, the maximum density areas of the film processed in the Yardleigh tend to oscillate from one frame to the next. The positives that the photo interpreters view are printed according to the average density of the pass or part. As a result, the density difference between adjacent frames processed at different development levels is exaggerated. When the interpreter recognizes this as being the degrading fact, he asks for a special print of the area and the degrading factor is eliminated. The loss, then, is mainly in time.

The film processing contractor recognizes the loss of information incurred by printing film processed in the Yardleigh at an average level. To circumvent the problem, the processing contractor is developing a frame-by-frame printer. The problem was anticipated early in the Yardleigh development, and the printer is well on its way to becoming operational.

Except for the obvious changes in density level, the PI's said they could tell no difference in imagery processed in the Yardleigh compared to that processed in the Trenton. The comparison generated by this mission did not provide a good comparison for analysis. The difference in the relationship of the solar position and the principal ray encountered by the 2 cameras at any given geographic coordinate precludes a determination of the sole effects of processing.

The lack of useable stellar photography on the second part of the mission lowers the confidence level of the attitude data and thereby effects the mensural activities of Mission 1024-2. While the conjugate imagery method of attitude reduction is acceptable, it is not ideal.

Special prints or additional copies designed to minimize the density difference of the original negatives were made on 35 parts of this mission -- 15 on part 1 and 20 on part 2. These figures indicate only the parts which were recognized as being of excessive latitude prior to the initial printing. Several more parts were individually printed as the photo interpreters' demands required.

The micro-densitometry accomplished by the processing contractor produced the following average resolution figures:

Mission 1024-1:	91.6 l/mm
Mission 1024-2:	94.1 l/mm

The standard deviation of the samples traced on Mission 1024-1 was 19.4 l/mm and on 1024-2 was 18.2 l/mm.

3. Stellar Reduction Study

A. Mission 1024-1: Four hundred and one stellar frames were submitted for reduction. However, the last frame of the mission was fogged and was not used for attitude determination. Although flare degrades approximately 10 percent of each frame, it did not significantly affect the reduction process. The stellar images are large and the contrast is good. However, the images were not definite points but elongated smears (See Part I, section 5). A report is being compiled on the affect of indistinct stellar images relative to various comparator operators. Mission 1024 will be the basis for the report which will be made available to the intelligence community.

B. Mission 1024-2. The stellar film of Mission 1024-2 was not used for attitude determination (See Part I., section 6).

4. Resolution Targets

Eight resolution target complexes were photographed during Mission 1024. The following pages indicate the geographic location of each complex. The location of each target within the photography is listed together with the parameters influencing the image quality.

RESOLUTION TARGET DATA

Location	Lunken Airfield
Target:	
Type	Medium Contrast "T" Bar (portable)
Camera	172 (Master, Fwd)
Pass	46D (Mission 1024-1)
Frame	5
Universal Grid Coordinate	X57.8 - Y12.2
Date of Photography	25 Sept 65
Geographic Coordinate	39-00N - 84-52W
Vehicle Altitude (ft)	624,184
Vehicle Azimuth	$169^{\circ}47'$
Camera:	
Pitch	$00^{\circ}26'$
Roll	$-00^{\circ}07'$
Yaw	$00^{\circ}33'$
Local Sun Time	1312
Solar Elevation	$46^{\circ}55'$
Solar Azimuth	206°
Exposure	1/122 sec
Resolution - Original Negative:	
Flight Direction	12'0"
Scan Direction	(Not Resolved)
Resolution - Second Generation Positive:	
Flight Direction	12'0"
Scan Direction	(Not Resolved)

Location	Lunken Airfield
Target:	
Type	Portable Medium Contrast "T" Bar
Camera	173 (Slave-Aft)
Pass	46D (Mission 1024-1)
Frame	11
Universal Grid Coordinate	X32.7 - Y12.6
Date of Photography	25 Sept 65
Geographic Coordinate	39-02N 84-55W
Vehicle Attitude (ft)	621,599
Vehicle Azimuth	169°58'
Camera:	
Pitch	-00°19'
Roll	00°06'
Yaw	-00°26'
Local Sun Time	1312
Solar Elevation	46°24'
Solar Azimuth	206°
Exposure	1/120 sec
Resolution - Second Generation Positive:	
Flight Direction	16'
Scan Direction	12'

Location	Wright-Patterson AFB
Target:	
Type	Fixed Site
Camera	173 (Slave-Aft)
Pass	46D (Mission 1024-1)
Frame	7
Universal Grid Coordinate	X21.6 - Y13.3
Date of Photography	25 Sept 65
Geographic Coordinate	39-39N 85-03W
Vehicle Altitude (ft)	623,411
Vehicle Azimuth	169°51'
Camera:	
Pitch	00°23'
Roll	00°07'
Yaw	-00°32'
Local Sun Time	1305
Solar Elevation	85°03'
Solar Azimuth	203°
Exposure	1/181 sec
Resolution - Original Negative:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Note: Not covered by master (fwd) camera photography.

Location	Ganado Airfield
Target:	
Type	Portable. Medium Contrast "T" Bar (See illustration, Page 45)
Camera	174 (Master-Fwd)
Pass	63D (Mission 1024-1)
Frame	20
Universal Grid Coordinate	X44.8 - Y14.0
Date of Photography	26 Sept 65
Geographic Coordinate	35-39N 109-28W
Vehicle Altitude (ft)	606,743
Vehicle Azimuth	170°29'
Camera:	
Pitch	00°20'
Roll	-00°05'
Yaw	-00°06'
Local Sun Time	1300
Solar Elevation	50°06'
Solar Azimuth	203°
Exposure	1/121 sec
Resolution - Original Negative:	
Flight Direction	7'0"
Scan Direction	7'0"
Resolution - Second Generation Positive:	
Flight Direction	8'0"
Scan Direction	7'0"

Note: Not covered by slave (aft) camera photography.

Location	Indian Springs, Nevada
Target	
Type	Fixed Site
Camera	174 (Master-Fwd)
Pass	111D (Mission 1024-2)
Frame	2
Universal Grid Coordinate	X80.0 - Y13.2
Date of Photography	29 Sept 65
Geographic Coordinate	36-26N 116-45W
Vehicle Altitude (ft)	592,277
Vehicle Azimuth	170°20'
Camera:	
Pitch	-00°10'
Roll	00°09'
Yaw	Not Determined
Local Sun Time	1233
Solar Elevation	50°03'
Solar Azimuth	192°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	10'0"
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Location	Indian Springs, Nevada
Target:	
Type	Fixed Site
Camera	173 (Slave-Aft)
Pass	111D (Mission 1024-2)
Frame	12
Universal Grid Coordinate	X10.0 - Y11.2
Date of Photography	29 Sept 65
Geographic Coordinate	36-26N 116-48W
Vehicle Altitude (ft)	591,268
Vehicle Azimuth	$170^{\circ}30'$
Camera:	
Pitch	$00^{\circ}14'$
Roll	$-00^{\circ}06'$
Yaw	Not Determined
Local Sun Time	1232
Solar Elevation	$50^{\circ}03'$
Solar Azimuth	192°
Exposure	1/186 sec
Resolution - Original Negative:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Note: Target image is very near the bonus area of the frame.

Location	Pahrump, Nevada
Target:	
Type	Fixed Site
Camera	172 (Master-Fwd)
Pass	111D (Mission 1024-2)
Frame	8
Universal Grid Coordinate	X65.9 - Y13.9
Date of Photography	29 Sept 65
Geographic Coordinate	36-08N 116-41W
Vehicle Altitude(ft)	591,908
Vehicle Azimuth	170°23'
Camera:	
Pitch	-00°11'
Roll	00°05'
Yaw	Not Determined
Local Sun Time	1223
Solar Elevation	50°20'
Solar Azimuth	192°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	12.2"
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Location	Pahrump, Nevada
Target:	
Type	Fixed Site
Camera	173 (Slave-Aft)
Pass	111D (Mission 1024-2)
Frame	14
Universal Grid Coordinate	X24.8 - Y10.4
Date of Photography	29 Sept 65
Geographic Coordinate	36-08N 116-44W
Vehicle Altitude (ft)	590,930
Vehicle Azimuth	$170^\circ 33'$
Camera:	
Pitch	$00^\circ 17'$
Roll	$-00^\circ 08'$
Yaw	Not Determined
Local Sun Time	1232
Solar Elevation	$50^\circ 20'$
Solar Azimuth	192°
Exposure	1/186 sec
Resolution - Original Negative:	
Flight Direction	Not Resolved
Scan Direction	12'2"
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Location	Edwards, AFB
Target:	
Type	Portable, Medium Contrast "T" Bar (See illustration, Page 45)
Camera	172 (Master-Fwd)
Pass	127D (Mission 1024-2)
Frame	-
Universal Grid Coordinate	X63.5 - Y9.5
Date of Photography	30 Sept 65
Geographic Coordinate	34-47N 118-28W
Vehicle Altitude (ft)	588,087
Vehicle Azimuth	170°39'
Camera:	
Pitch	00°03'
Roll	00°13'
Yaw	00°08'
Local Sun Time	1222
Solar Elevation	51°27'
Solar Azimuth	191°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Note: Fixed sites also covered in the immediate vicinity.

Location	Edwards AFB
Target:	
Type	Portable, Medium Contrast Bar (See illustration, Page 45)
Camera	172 (Master-Fwd)
Pass	127D (Mission 1024-2)
Frame	8
Universal Grid Coordinate	X64.3 - Y14.7
Date of Photography	30 Sept 65
Geographic Coordinate	34-38N 118-26W
Vehicle Altitude (ft)	587,979
Vehicle Azimuth	170°41'
Camera:	
Pitch	00°03'
Roll	00°12'
Yaw	00°07'
Local Sun Time	1223
Solar Elevation	51°35'
Solar Azimuth	191°
Exposure	1/123 sec
Resolution - Original Negative	
Flight Direction	Not Resolved
Scan Direction	Not Resolved
Resolution - Second Generation Positive:	
Flight Direction	Not Resolved
Scan Direction	Not Resolved

Location	Edwards AFB
Target:	
Type	Portable. Medium Contrast "T" Bar (See illustration, Page 45)
Camera	173 (Slave-Aft)
Pass	127D (Mission 1024-2)
Frame	13
Universal Grid Coordinate	X26.5 - Y14.4
Date of Photography	30 Sept 65
Geographic Coordinate	34-46N 118-31W
Vehicle Altitude (ft)	587,512
Vehicle Azimuth	170°48'
Camera:	
Pitch	-00°05'
Roll	-00°06'
Yaw	-00°06'
Local Sun Time	1224
Solar Elevation	51°36'
Solar Azimuth	191°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	12'0"
Scan Direction	16'0"
Resolution - Second Generation Positive:	
Flight Direction	12'0"
Scan Direction	12'0"

Note: Better ground resolution on the positive in the scan direction.

Location	Philipsburgh, Kansas
Target:	
Type	Portable, Medium Contrast "T" Bar (See illustration, Page 45)
Camera	174 (Master-Fwd)
Pass	142D (Mission 1024-2)
Frame	7
Universal Grid Coordinate	X32.4-Y14.5
Date of Photography	1 Oct 65
Geographic Coordinate	39-45N 98-50W
Vehicle Altitude (ft)	590,058
Vehicle Azimuth	$169^\circ 36'$
Camera:	
Pitch	$00^\circ 09'$
Roll	$00^\circ 02'$
Yaw	$-00^\circ 14'$
Local Sun Time	1212
Solar Elevation	$46^\circ 34'$
Solar Azimuth	184°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	16'0"
Scan Direction	12'0"
Resolution - Second Generation Positive:	
Flight Direction	16'0"
Scan Direction	12'0"

Location	Philipsburgh, Kansas
Target:	
Type	Portable, Medium Contrast "T" Bar (See illustration, Page 45)
Camera	173 (Slave - Aft)
Pass	142D (Mission 1024-2)
Frame	12
Universal Grid Coordinate	X58.3 - Y14.7
Date of Photography	1 Oct 65
Geographic Coordinate	39-54N 98-55W
Vehicle Altitude (ft)	589,419
Vehicle Azimuth	$169^{\circ}46'$
Camera:	
Pitch	$-00^{\circ}05'$
Roll	$-00^{\circ}02'$
Yaw	$00^{\circ}21'$
Local Sun Time	1208
Solar Elevation	$46^{\circ}26'$
Solar Azimuth	184°
Exposure	1/123 sec
Resolution - Original Negative:	
Flight Direction	8'0"
Scan Direction	12'0"
Resolution - Second Generation Positive:	
Flight Direction	8'0"
Scan Direction	12'0"

MEDIUM CONTRAST "T" BAR TARGET
(Aspect Ratio 5:1)

The medium contrast "T" bar target consists of 2 legs each 327 feet long. Each leg is broken down into 8 separate panels for easy handling.

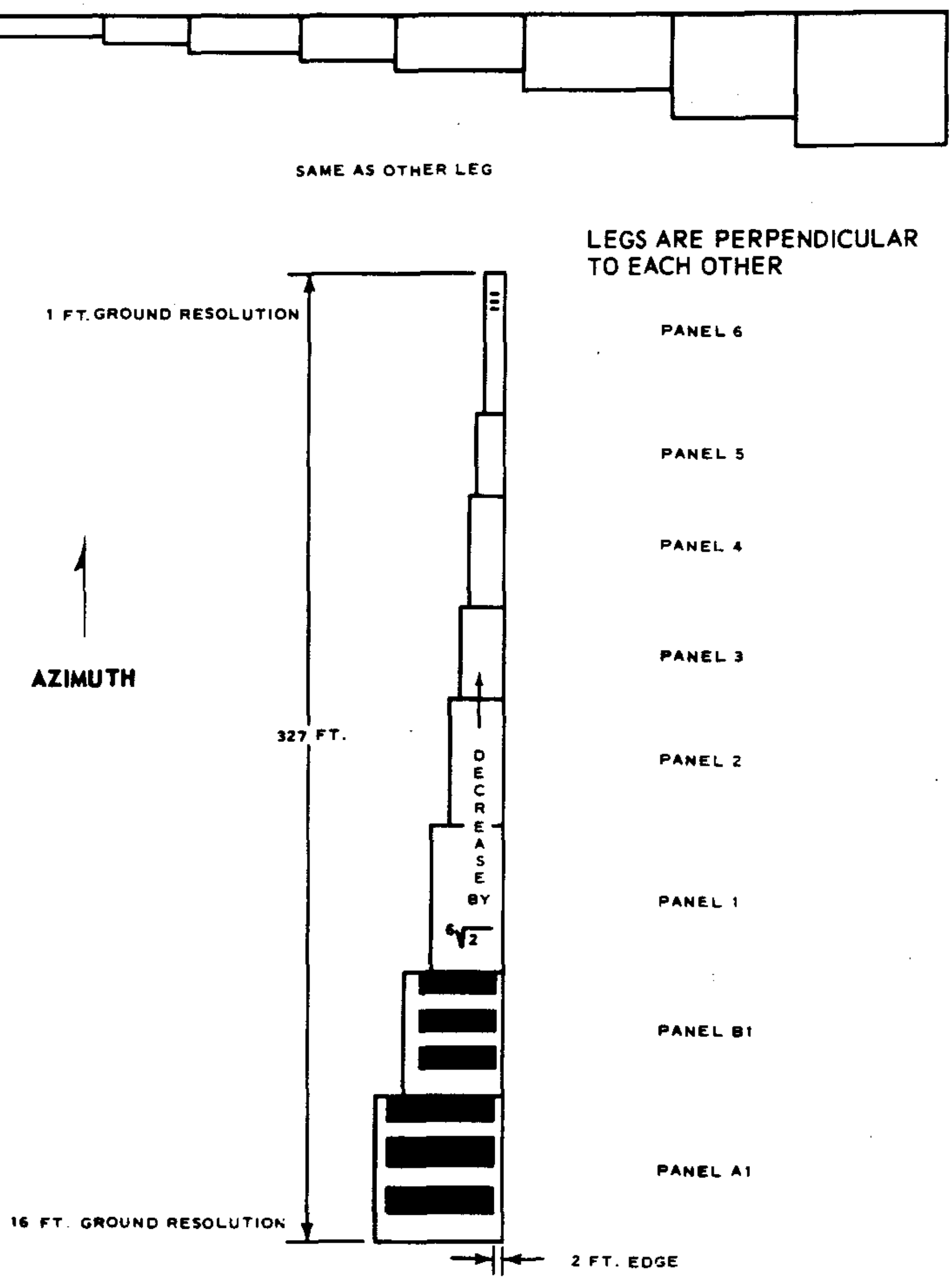
The pattern consists of 21 bar triplets ranging from an 8-foot bar group to a 6-inch bar group. The 2 largest bar groups are 8 feet and 6 feet respectively. The remaining bar groups range from 4 feet to 6 inches decreasing by the $(\sqrt[6]{2})$ sixth root of 2.

Each bar group consists of 3 black bars and 2 grey bars. Each grouping is separated by a grey patch equal to twice the width of the black bar element of the succeeding smaller grouping. Bar dimensions, length and width, conform to the aspect ratio as defined in Mil Std 150A. i.e., the length of the bar will equal 5 times the width of the bar.

The reflectance values of the black bars and grey background are 4 percent and 37 percent respectively. Each panel has a minimum of 2 feet of grey material as a border.

Two targets have been fabricated and are located at Dayton, Ohio (Air Mobile) and Tucson, Arizona (Ground Mobile). Instrumentation and operation will be carried out according to normal CORN operational procedures.

"T" BAR TARGET



NPIC K-6334 (2/66)

BAR DIMENSIONS - MEDIUM CONTRAST BAR TARGET

Bar Group No.		Width	Length
1	Panel A1	8 ft.	40 ft.
2	Panel B1	6 ft.	30 ft.
3	Panel 1	4 ft.	20 ft.
4		3 ft. 6.75 in.	17 ft. 9.750
5	Panel 2	3 ft. 2.125 in.	15 ft. 10.625
6		2 ft. 9.937 in.	14 ft. 1.6875
7	Panel 3	2 ft. 6.25 in.	12 ft. 7.250
8		2 ft. 2.937 in.	11 ft. 2.6875
9		2 ft.	10 ft.
10	Panel 4	1 ft. 9.375 in.	8 ft. 10.875
11		1 ft. 7.06 in.	7 ft. 11.3125
12		1 ft. 5 in.	7 ft. 1.000
13	Panel 5	1 ft. 3.125 in.	6 ft. 3.625
14		1 ft. 1.5 in.	5 ft. 7.500
15		1 ft.	5 ft.
16		10.687 in.	4 ft. 5.4375
17		9.5 in.	3 ft. 11.500
18	Panel 6	8.5 in.	3 ft. 6.500
19		7.562 in.	3 ft. 0.8125
20		6.75 in.	2 ft. 9.750
21		6.0 in.	2 ft. 6.000

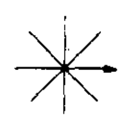
FIGURE 8. BEST RESOLUTION TARGET IMAGERY OF THIS MISSION

Note: Not covered by the slave (aft) camera.

NPIC K-6322 (3/66)

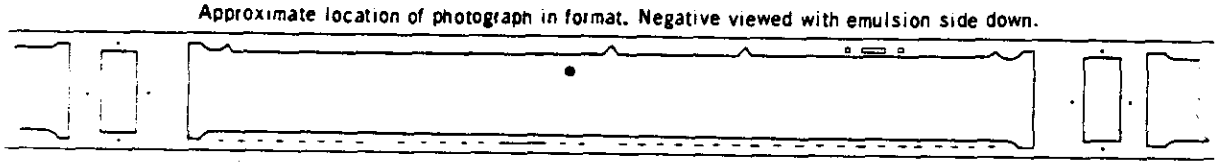
Camera	172
Pass	63D
Frame	20 Fwd
Date of Photography	26 Sept 65
Universal Grid Coordinates	44.8 - 14.0
Enlargement Factor	40X
Geographic Coordinates	35-39N 109-28W
Altitude (feet)	606,743
Camera Attitude:	
Pitch	$00^\circ20'$
Roll	$-0^\circ05'$
Yaw	$-0^\circ06'$
Local Sun Time	1300
Solar Elevation	$50^\circ05'$
Solar Azimuth	204°
Exposure	1/123 sec
Vehicle Azimuth	$170^\circ29'$
Processing Level	Intermediate

Approximate flight direction on photograph



Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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5. Definition of Mission Information Potential (MIP)

The MIP is an arbitrary number, not limited by terminal values, which is subjectively assigned to the panoramic photography of a mission and which compares it to the other missions. It is meant to be a measure of the camera's maximum capability for recording information, discounting adverse atmospheric conditions, minimum solar elevations, camera malfunctions, or other factors which reduce the quality of the photography.

The MIP is based on the best photography found in a mission, even though the photography may be limited to a few frames. Since these frames are considered to be the best in the mission, they do not indicate the overall success, average quality, or general interpretability of the photography.

Criteria for selection of the MIP frame:

a. Eliminate all portions of the mission affected by system malfunctions.

b. Select frames which are free of clouds or atmospheric attenuation.

c. Eliminate the first 10 frames and last frame of a pass because these may be affected by incorrect scan speed.

d. Select frames that are in a continuous strip of approximately 10 cloud-free frames because cloud shadows from weather fronts are cast for great distances.

e. Determine from the horizon cameras that the panoramic photography is not affected by apparent vehicle perturbations.

f. Select targets that are near the center of the format and on frames as close as possible to perigee for scale purposes and to eliminate obliquity.

g. Select frames having near optimum solar elevation.

h. Select a high-contrast target (preferably an airfield) and compare the target to a previous mission which has been given an MIP rating.

6. MIP, Mission 1024-1

The MIP rating of Mission 1024-1 is 85. The MIP frame of this mission, selected according to the criteria set forth in item 5 of this section, is frame 67, pass 9D aft. The quality of this frame is equal to the best of the mission and is approximately equal to the best of the last several missions. However, the quality of more photography of this mission is equal to the MIP frame than on most missions. The presence of more then normal high quality photography is attributed to the low percentage of cloud cover on this mission and the high percentage of film exposed in polar air masses. (It has been established that polar air masses offer less atmospheric attenuation).

7. MIP, Mission 1024-2

The image quality of Mission 1024-2 is approximately equal to that of Mission 1024-1. Hence, the MIP rating of this mission is also 85. The frame selected as the MIP frame is frame 15, pass 143D (aft). As in Mission 1024-1, the image quality of a large percentage of the mission is equal to the frame selected as the MIP.

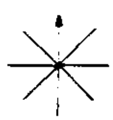
FIGURE 9. MIP FRAME, MISSION 1024-1 -- MIP RATING 85

The quality of this photography is equal to the best of the mission.

FIGURE 10. COMPARABLE COVERAGE FROM THE FORWARD-LOOKING (MASTER) CAMERA

NPIC K-6323 (3/66) NPIC K-6324 (3/66)

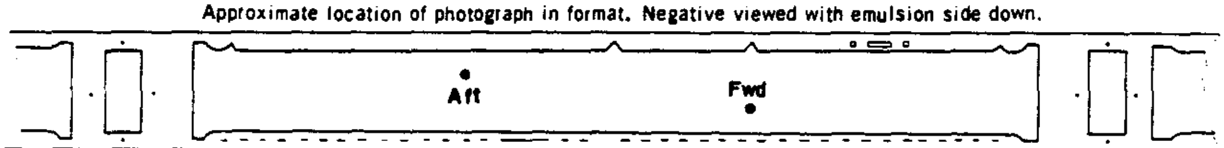
	FIGURE 9	FIGURE 10
Camera	173	172
Pass	9D	9D
Frame	67 Aft	61 Fwd
Date of Photography	23 Sept 65	23 Sept 65
Universal Grid Coordinates	59 - 10.6	31.6 - 14.1
Enlargement Factor	20X	20X
Geographic Coordinates	49-52N 31-05E	49-51N 31-09E
Altitude (feet)	693,372	698,027
Camera Attitude:		
Pitch	00°08'	-00°02'
Roll	-00°06'	00°06'
Yaw	-00°06'	00°29'
Local Sun Time	1309	1309
Solar Elevation	37°21'	37°22'
Solar Azimuth	203°	203°
Exposure	1/166 sec	1/111 sec
Vehicle Azimuth	166°55'	166°33'
Processing Level	Full	Full



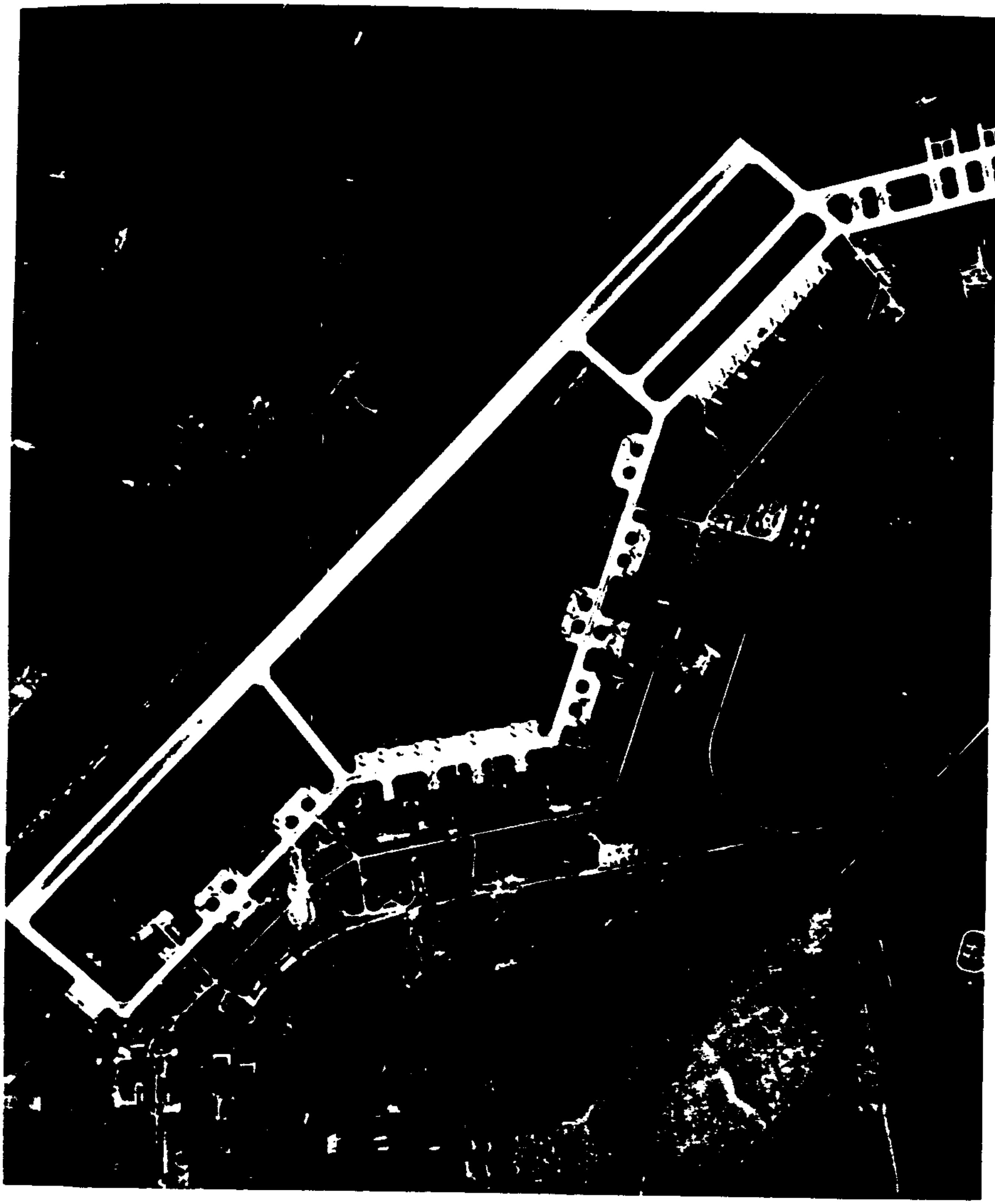
Approximate flight direction on photograph

Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



[redacted]



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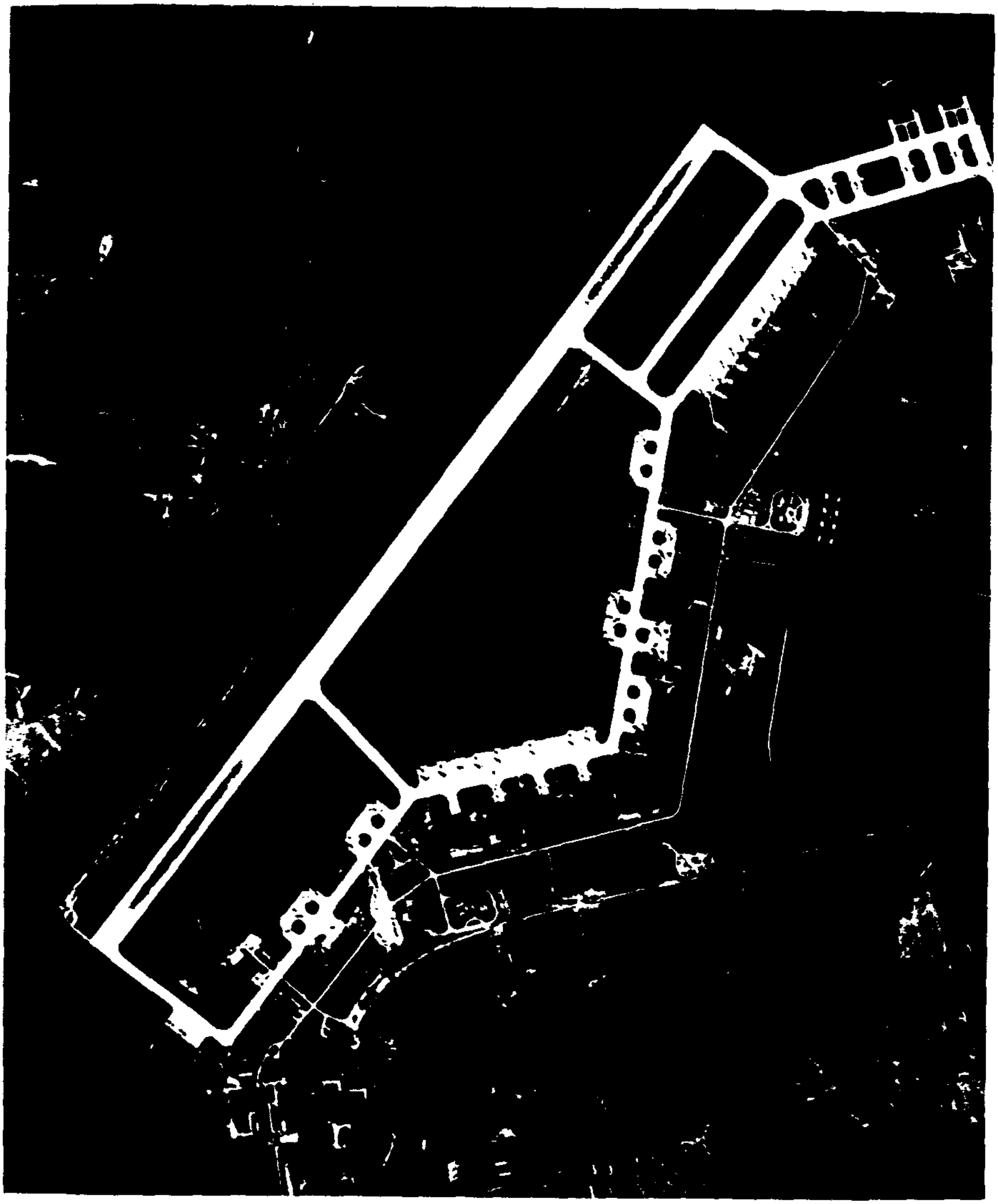


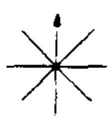
FIGURE 11. MIP FRAME, MISSION 1024-2 -- MIP RATING 85

The quality of this imagery is equal to the best of the mission.

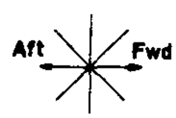
FIGURE 12. COMPARABLE COVERAGE FROM THE FORWARD-LOOKING (MASTER) CAMERA

NPIC K-6325 (3/66) NPIC K-6326 (3/66)

	FIGURE 11	FIGURE 12
Camera	173	172
Pass	D143	D143
Frame	15 Aft	9 Fwd
Date of Photography	1 Oct 65	1 Oct 65
Universal Grid Coordinates	34.6 - 14.2	55 - 9.5
Enlargement Factor	20X	20X
Geographic Coordinates	37-24N 120-59W	37-24N 120-55W
Altitude (feet)	587,864	588,401
Camera Attitude:		
Pitch	-00°08'	00°10'
Roll	-00°06'	00°09'
Yaw	00°00'	00°06'
Local Sun Time	1211	1211
Solar Elevation	48°53'	48°52'
Solar Azimuth	184°	184°
Vehicle Azimuth	1/186	1/123
Processing Level	Full	Full

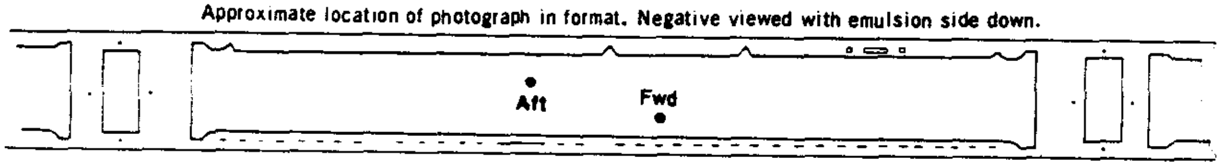


Approximate flight direction on photograph



Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



[redacted]

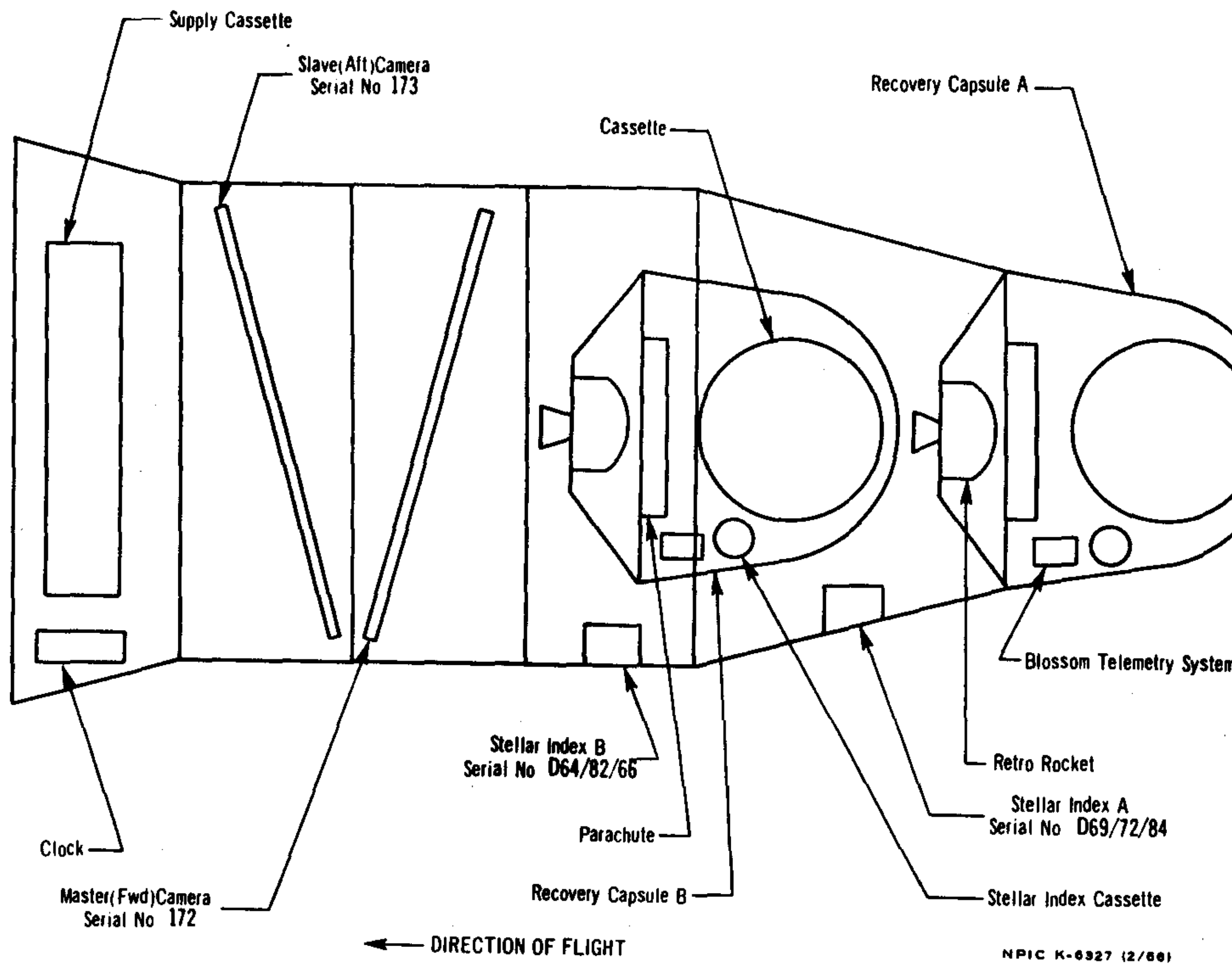
[redacted]

APPENDIX A. SYSTEM SPECIFICATIONS

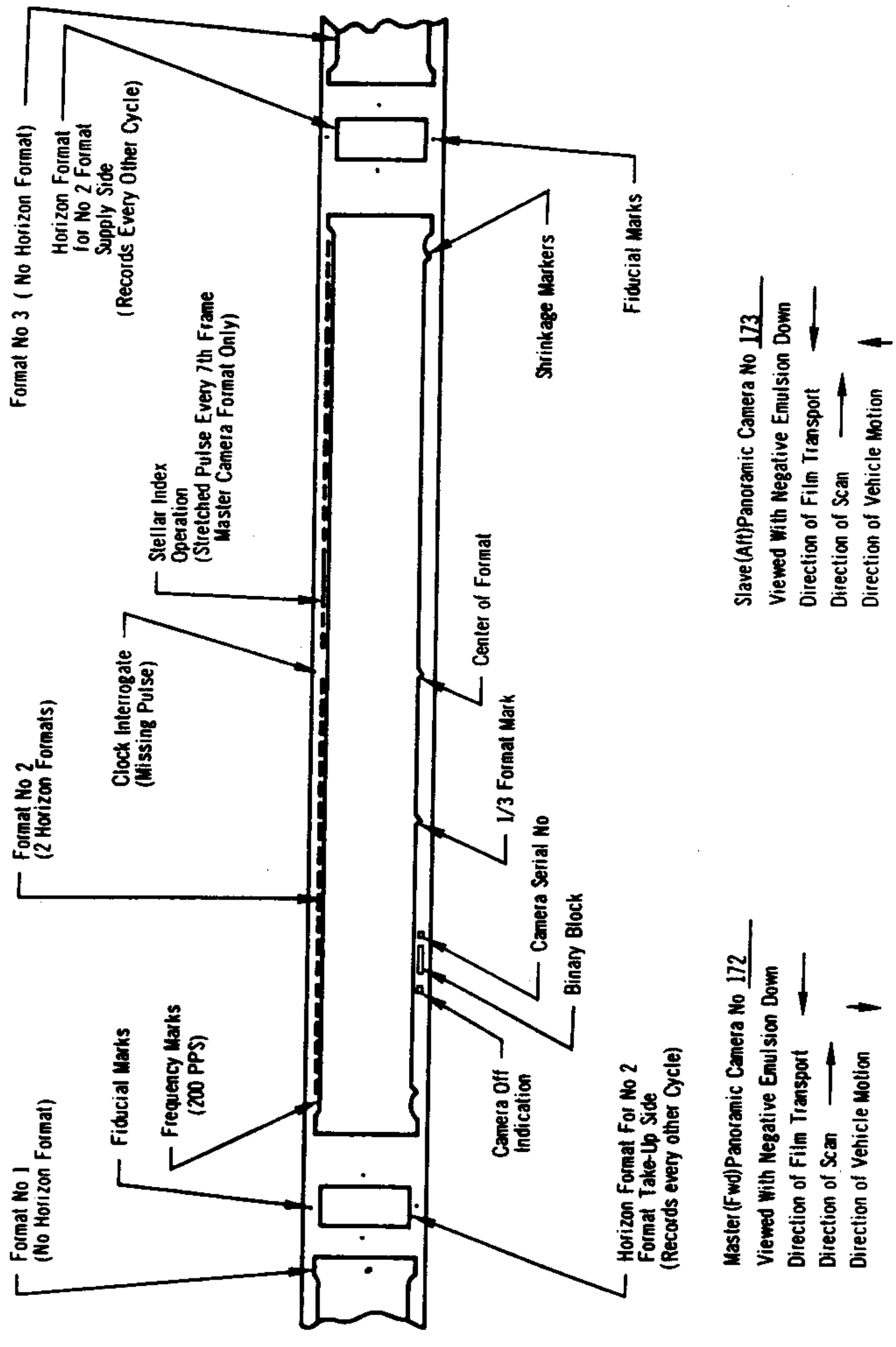
[illegible]	Master Pan	Master Take-Up Horizon	Master Supply Horizon	Slave Pan	Slave Take-Up Horizon	Slave Supply Horizon	Mission 1024-1		Mission 1024-2	
							Stellar	Index	Stellar	Index
[illegible]	[illegible]	N/A	N/A	173	N/A	N/A	D/60/72/[illegible]		D[illegible]/82/66	
[illegible]	N/A	N/A	N/A	N/A	N/A	N/A	84	72	66	82
[illegible] Serial No.	[illegible]35	81[illegible]	[illegible]12298	152235	[illegible]	813[illegible]	[illegible]	8177[illegible]	10578	817462
[illegible] Width	[illegible]"	N/A	N/A	0.150"	N/A	N/A	N/A	N/A	N/A	N/A
Aperture	N/A	f/[illegible]	f/6.8	N/A	f/6.8	f/8.0	f/1.8	f/4.5	f/1.8	f/4.5
[illegible] Time (sec)	Variable	1/1[illegible]	1/100	Variable	[illegible]	1/100	2.0	1/500	2.0	1/500
Filter (Wratten)	[illegible]	25	25	21	25	25	None	21	None	21
[illegible] Length (mm)	6[illegible].6[illegible]2	54.1[illegible]	55.40	609.628	[illegible]	54.70	*	38.57	*	38.377
Film Length (ft)	16,[illegible]00'	N/A	N/A	16,000'	N/A	N/A	44'	93'	44'	91.5'
Splices	5	N/A	N/A	5	N/A	N/A	0	0	0	0
Emulsion	213-5-6-5	213-5-6-5	213-5-6-5	213-5-6-5	213-5-6-5	213-5-6-5	124-35-8-5	104-14-6-5	124-35-8-5	104-14-6-5
Film Type	7-J-40	7-J-40	7-J-40	7-J-40	7-J-40	7-J-40	3-J-34	7-J-33	3-J-34	7-J-33
Static										
High Contrast	264	148	144	241	170	170	*	74(AWAR)	*	72(AWAR)
Low Contrast	141	N/A	N/A	138	N/A	N/A	*	*	*	*
Dynamic										
I High Contrast	198	N/A	N/A	201	N/A	N/A	*	*	*	*
I Low Contrast	131	N/A	N/A	129	N/A	N/A	*	*	*	*
P High Contrast	161	N/A	N/A	181	N/A	N/A	*	*	*	*
P Low Contrast	113	N/A	N/A	111	N/A	N/A	*	*	*	*

N/A Not applicable
* Not available

2. VEHICLE CONFIGURATION AND EQUIPMENT LAYOUT



3. PANORAMIC FORMAT CONFIGURATION



NPIC K-6328 (2/66)

1. Edge Spread Function

The spread function is obtained from microdensitometer edge traces to provide an objective measure of the image quality in mission photography. The spread function curve represents a summation of the separate elements of the photographic system. By taking the Fourier Transform of the spread function, the modulation transfer function of the system is obtained.

To satisfy the desire to express image quality in terms of a value, a single number is determined from the spread function curve by measuring its width at 50 percent amplitude. This width is expressed as a micron distance in image space and may be converted to a distance on the ground. On domestic passes, where 3-bar resolution targets have been available the ground distance determined from edge trace analysis and from the targets has been found to be comparable.

The microdensitometric analysis of edges in the image requires that the object edge fulfill the conditions of a unit step function, i.e., exist for an appreciable distance at a fixed brightness level and change abruptly to a new level which exists for an appreciable distance. This requirement is usually achieved by rooftops of buildings in large-scale photography and aircraft runways or taxiways in small-scale photography.

The mission is examined to determine the MIP frame (Mission Information Potential) which is a subjective selection of the best photography. Straight edges in this imagery meeting the criteria of a step function for a length of at least 120 microns are selected for scanning with the microdensitometer.

The microdensitometer used for the traces in this report is located at the SPPL facility. The location of the traces was directed by representatives from NPIC. The instrument is the Mann-Data Micro-Analyzer used with an effective slit of one micron by 80 microns. A scan speed of 0.05 mm/minute and a chart speed of 4 inches/minute was used for a recording to specimen expansion of 2032:1. One inch on the recording equals 12.5 microns on the specimen. The traces produced represent a plot of deflection versus distance. The deflection of the pen is essentially linear with density and the horizontal lines on the chart numbered 1 to 7 equal 0 to 3.0 density. At the same time the traces were made, the electronic output signals from the instrument were digitized as density values and recorded on paper tape for direct analysis by an IBM 1710 computer.

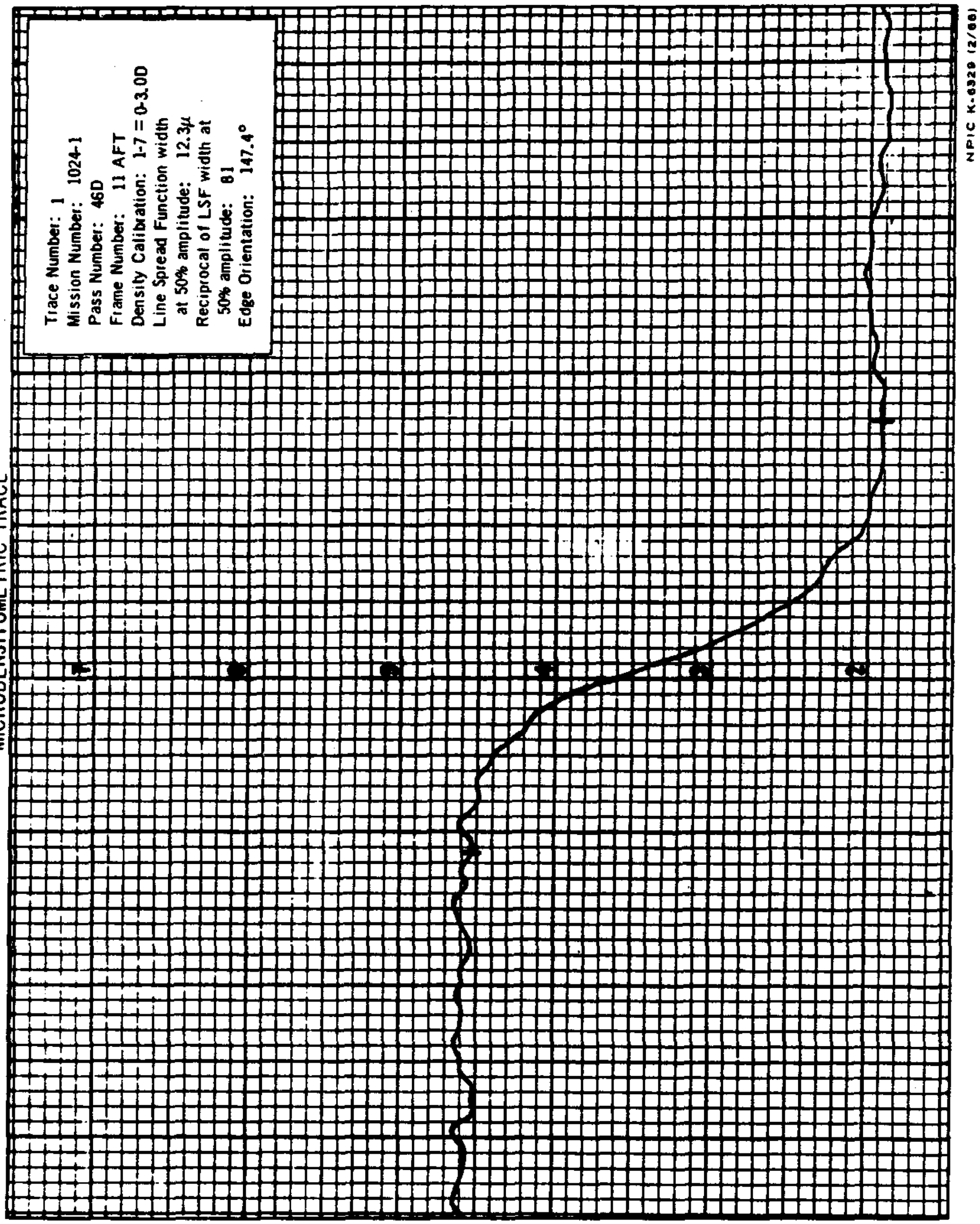
In the table on the next page the following computer outputs are listed for each edge traced: The 50 percent amplitude width of the Line Spread Function in microns, the reciprocal of the 50 percent width in millimeters, and the intersection point of the modulation transfer curve and the aerial image modulation curve. The procedure used in the derivation of these values is described in the SPPL Technical Report No. 101-31 (page 79-82). The edge orientation angle is determined in the microdensitometer and is 0° when the edge is parallel to the major axis of the film and 90° when the edge is perpendicular to the major axis of the film.

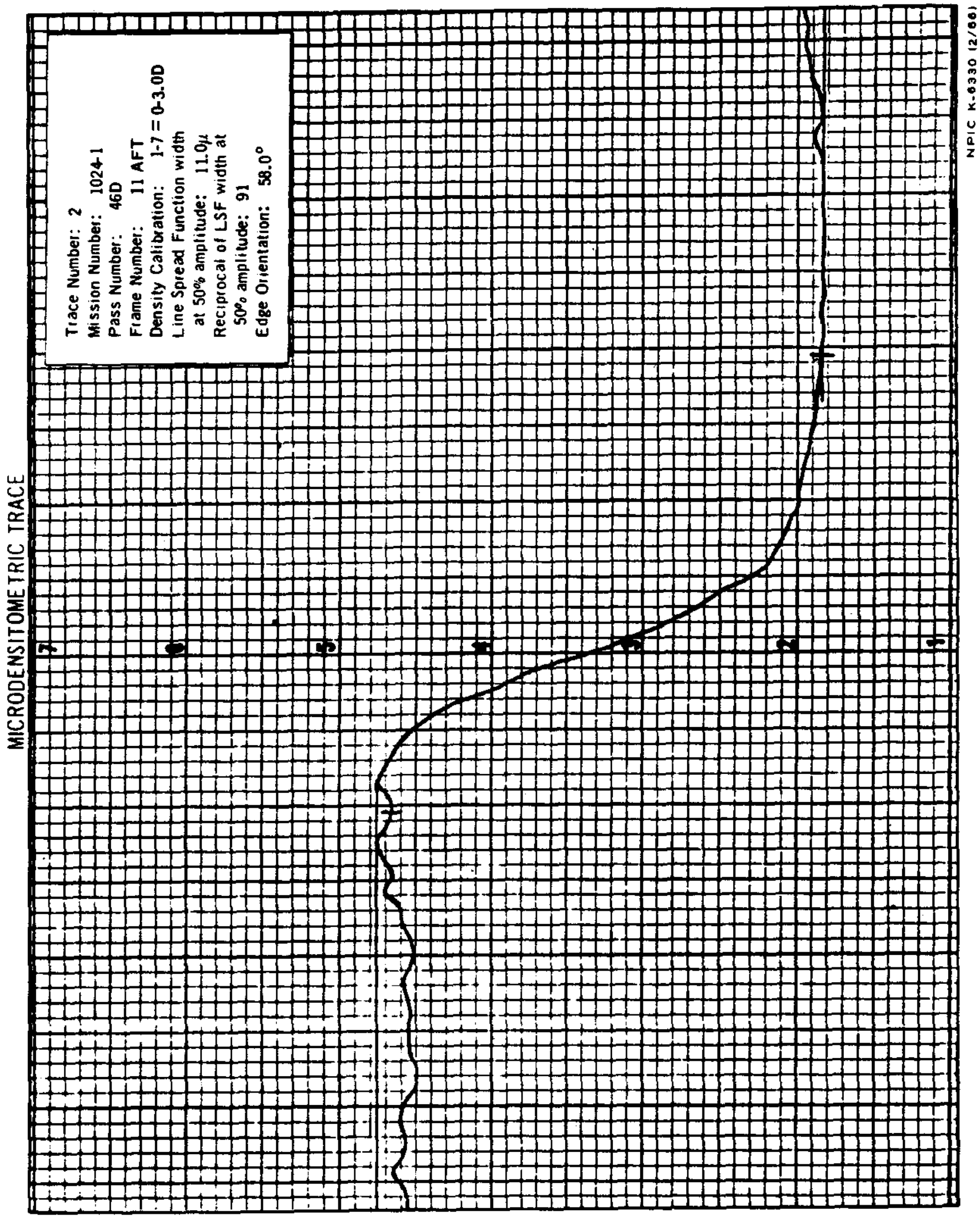
The edge traces were made on the original negative of this mission. The imagery traced is contained in the MIP frames of Missions 1024-1 and 1024-2.

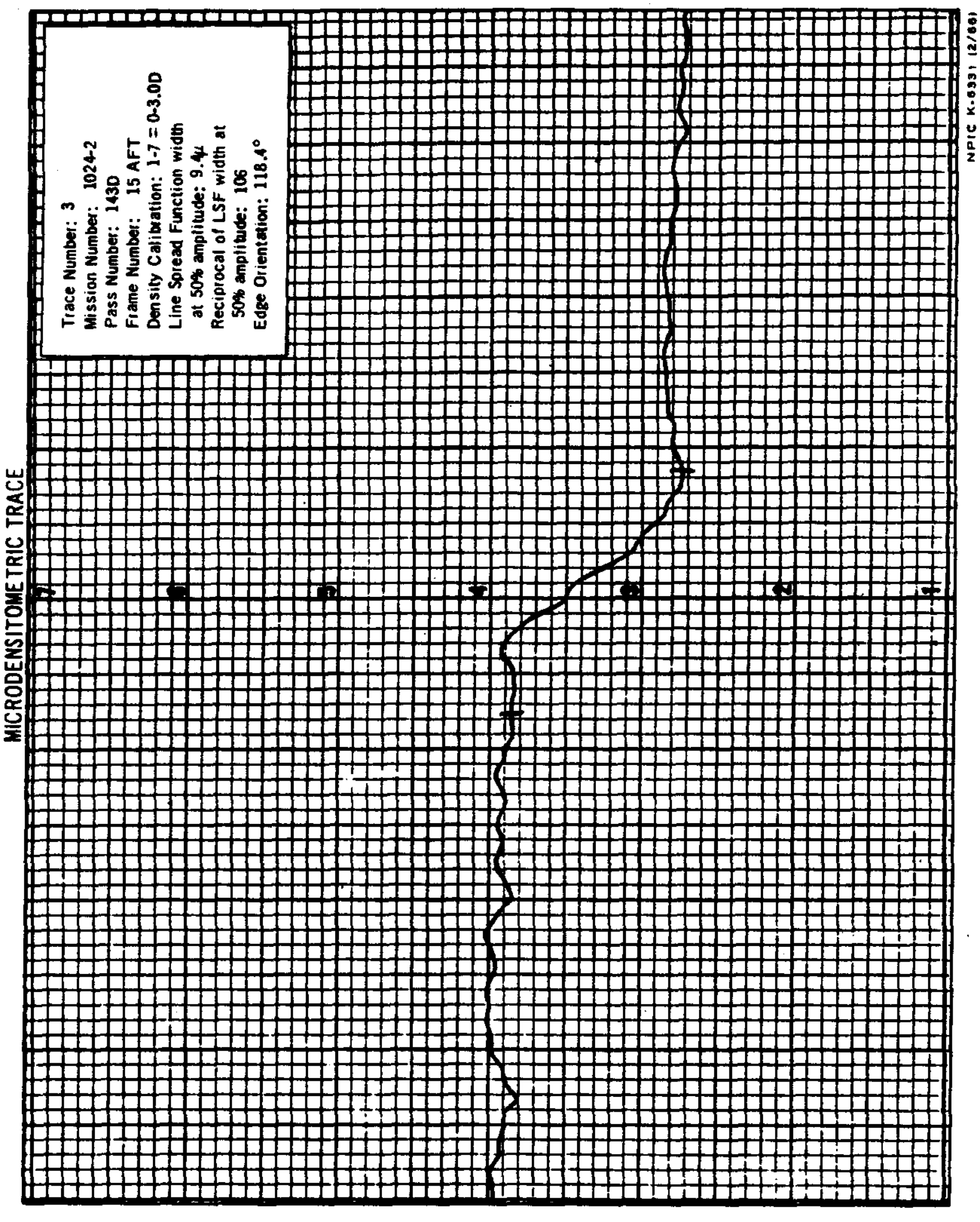
SUMMARY TABLE OF EDGE TRACES

Trace Number	Pass Frame	50% Width In Microns	1000/50% Width	MTF/AIM Intersect	Edge Orientation
1	46D/011 Aft	12.3	81	74	147.4°
2	46D/011 Aft	11.0	91	90	58.0°
3	143D/015 Aft	9.4	106	108	118.4°
4	143D/015 Aft	10.5	94	98	20.0°

MICRODENSITOMETRIC TRACE




MICRODENSITOMETRIC TRACE
Trace Number: 2
Mission Number: 1024-1
Pass Number: 46D
Frame Number: 11 AFT
Density Calibration: 1-7 = 0-3.0D
Line Spread Function width at 50% amplitude: 11.0μ
Reciprocal of LSF width at 50% amplitude: 91
Edge Orientation: 58.0°
7
6
5
4
3
2
1
NPIC K-6330 (2/66)


MICRODENSITOMETRIC TRACE
Trace Number: 3
Mission Number: 1024-2
Pass Number: 143D
Frame Number: 15 AFT
Density Calibration: 1-7 = 0-3.0D
Line Spread Function width
at 50% amplitude: 9.4μ
Reciprocal of LSF width at
50% amplitude: 106
Edge Orientation: 118.4°
7
6
5
4
3
2
1
NPIC K-5331 (2/66)

MICRODENSITOMETRIC TRACE

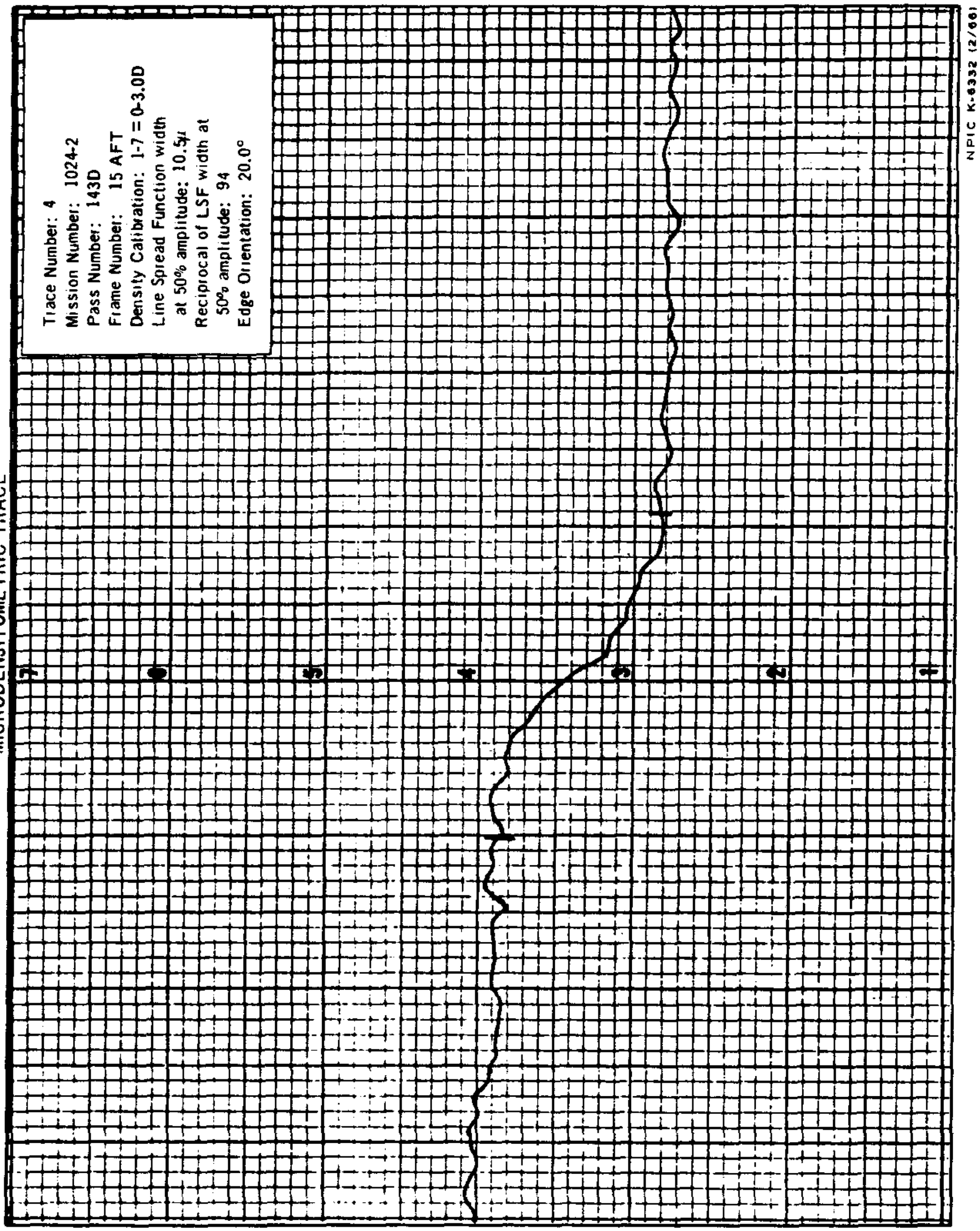


FIGURE 13. MICRODENSITOMETRY PANEL TRACED FOR EDGE ANALYSIS

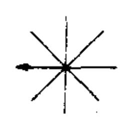
See microdensitometry data, APPENDIX B.

NPIC K-6333 (3/66)

FIGURE 13

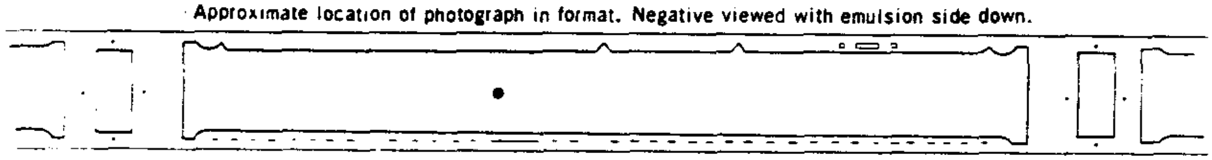
Camera	173
Pass	46D
Frame.	11 Aft
Date of Photography.	25 Sept 65
Universal Grid Coordinates	32.7 - 12.6
Enlargement Factor	40X
Geographic Coordinates	39-02N 84-55W
Altitude (feet).	621,599
Camera Attitude:	
Pitch	$-00^{\circ}19'$
Roll.	$00^{\circ}06'$
Yaw	$-00^{\circ}26'$
Local Sun Time	1306
Solar Elevation.	$46^{\circ}53'$
Solar Azimuth.	201°
Exposure	1/183
Vehicle Azimuth.	$169^{\circ}58'$
Processing Level	Full

Approximate flight direction on photograph



Approximate scan direction on photograph

Approximate location of photograph in format. Negative viewed with emulsion side down.



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~~NO FOREIGN DISSEM~~

APPENDIX C. DENSITY READINGS

The following density readings were measured on the stellar camera film of Mission 1024-1. They were made with a McBeth QuantaLog Densitometer, Model EP 1000, with an ET20 attachment and a 0.5 mm aperture. They are presented here in the interest of analysis. Because the stellar film of Mission 1024-2 is chemically fogged, density readings of it were not recorded.

STELLAR CAMERA MISSION 1104-1

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
1D	1	2.43	0.19	2.24	0.13
5D	2	0.74	0.14	0.60	0.13
	17	1.04	0.18	0.86	0.13
7D	18	1.00	0.18	0.82	0.13
	43	1.82	0.27	1.55	0.13
9AE	44	0.14	0.13	0.01	0.13
	45	0.14	0.13	0.01	0.13
9D	46	1.27	0.19	1.08	0.13
	59	1.11	0.20	0.91	0.14
16D	60	1.17	0.20	0.97	0.13
18D	61	1.31	0.20	1.11	0.14
	64	2.99	0.23	2.76	0.13
20D	65	0.97	0.18	0.79	0.13
	71	1.54	0.20	1.34	0.13
21D	72	1.17	0.18	0.99	0.13
	96	1.32	0.20	1.12	0.13
22D	97	1.30	0.18	1.12	0.13
	112	1.66	0.25	1.41	0.13
23D	113	1.25	0.20	1.05	0.13
	130	1.81	0.24	1.57	0.13
25D	131	1.30	0.20	1.10	0.13
	145	1.08	0.19	0.89	0.13
29D	146	1.72	0.29	1.43	0.14
	152	1.45	0.20	1.25	0.14
32D	153	1.62	0.26	1.36	0.15
34D	154	1.08	0.19	0.89	0.15
	159	1.22	0.19	1.03	0.15
35D	160	1.01	0.18	0.83	0.14
	167	1.18	0.18	1.00	0.15
36D	168	1.12	0.18	0.94	0.14
	187	1.22	0.19	1.03	0.14
37D	188	1.05	0.19	0.86	0.13
	202	1.10	0.21	0.89	0.14
38D	203	1.20	0.19	1.01	0.15
	220	1.75	0.23	1.52	0.15
39D	221	1.44	0.25	1.19	0.16
	235	1.67	0.25	1.42	0.13
40D	236	1.15	0.19	0.96	0.13
	259	1.43	0.22	1.21	0.13

Pass	Frame	Dmax	Dmin	Delta	Gross Fog
41D	260	1.24	0.20	1.04	0.14
	269	1.00	0.17	0.83	0.14
46D	270	1.55	0.25	1.30	0.15
	272	1.64	0.24	1.40	0.14
47D	273	1.65	0.24	1.41	0.15
	274	1.68	0.24	1.44	0.15
50D	275	0.97	0.19	0.78	0.14
	281	1.28	0.20	1.08	0.14
52D	282	1.22	0.19	1.03	0.13
	295	2.11	0.32	1.79	0.13
53D	296	1.40	0.19	1.21	0.13
	314	1.45	0.22	1.23	0.15
54D	315	1.18	0.19	0.99	0.13
	331	2.11	0.32	1.79	0.13
56D	332	1.64	0.22	1.42	0.13
	345	1.57	0.23	1.34	0.13
57D	346	0.77	0.15	0.62	0.14
	351	1.15	0.22	0.93	0.14
63D	352	1.97	0.32	1.65	0.15
	354	1.76	0.29	1.47	0.14
66D	355	1.34	0.21	1.13	0.14
	361	1.26	0.20	1.06	0.15
69D	362	1.49	0.20	1.29	0.13
	383	1.67	0.25	1.42	0.13
70D	384	1.03	0.19	0.84	0.13
	397	1.74	0.34	1.40	0.15
72D	398	1.28	0.29	0.99	0.19
	401	N/R	N/R	N/R	N/R

Dmax Range 0.14 - 2.99
Dmin Range 0.13 - 0.34
Gross Fog Range 0.13 - 0.19

Average Dmax 1.36
Average Dmin 0.21
Average Delta 1.15
Average Gross Fog 0.13

NR - Denotes No Reading Made

[redacted]

APPENDIX D. CLOUD COVER ANALYSIS

1. Introduction

This study represents a statistical analysis of the cloud cover on the photography of Mission 1024-2. The basis of this study is the cloud cover data for each quarter segment of every individual frame of photography. The data is obtained by analysts specifically trained in estimating cloud cover by designated categories.

Five cloud categories have been formulated for use in this photography (Reference, Table 1). These categories allow for the wide latitude of cloud cover conditions commonly found on a frame of this photography. Note in Table 1 that a mean cloud percentage value has been calculated for each category for use in determining a combined cloud cover percentage for all operational passes of the mission.

The occurrence of each cloud category within an operational pass is expressed as a percentage of 100 and appears in Table 2. Each percentage is a ratio of the number of occurrences of a given cloud cover category to the total number of cloud observations in a photo pass. For example: if the number of category 1 occurrences in a given pass is 200 out of a total of 1000 (250 frames x 4 quarters), all categories combined, then 20 percent of the pass would be classed as category 1.

Also a cloud cover percentage per pass is included in the last column of Table 2 under "Cloud Cover % Per Pass". This value is determined by the summation of the products of category percentage in each pass and the mean cloud percentage for that category as established in Table 1. For example: if it is determined that the following percentages exist in a given pass:

20% Category 1
15% Category 2
30% Category 3
25% Category 4
10% Category 5

Then, by using the mean cloud percentage established in Table 1 the following computations are made:

0.20 x 5.0	=	1.00%
0.15 x 17.5	=	2.63%
0.30 x 38.0	=	11.40%
0.25 x 75.0	=	18.75%
0.10 x 100.0	=	10.00%
		43.78%

Hence, 43.8 percent of this pass is cloud covered.

TABLE 1

CLOUD COVER CATEGORIES

Category Number	Percent of Cloud Cover	Description	Mean Cloud Percentage
1	Less than 10%	Clear	5%
2	10% - 25%	Small Scattered Clouds	17.5%
3	26% - 50%	Large Scattered Clouds	38%
4	51% - 99%	Broken or Connected Clouds	75%
5	100%	Complete Overcast	100%

2. Cloud Cover Data, Mission 1024

Mission 1024-1

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
05D	38.4	2.1	3.4	55.7	0.4	45.8
07D	34.1	9.3	11.9	41.6	3.1	42.1
09D	50.0	1.9	3.6	44.5	0.0	37.6
18D	8.3	11.1	20.9	58.3	1.4	55.4
20D	16.7	13.4	15.3	54.6	0.0	50.0
21D	39.4	2.7	4.6	41.4	11.9	47.1
22D	64.6	16.2	13.9	5.3	0.0	15.3
23D	16.1	11.3	14.3	58.3	0.0	52.0
25D	75.0	11.7	7.4	5.0	0.9	13.2
29D	65.8	17.5	9.2	7.5	0.0	15.5
34D	7.3	11.5	13.5	45.8	21.9	63.8
35D	7.8	14.3	15.2	58.2	4.5	56.8
36D	23.8	16.4	20.2	28.8	10.8	44.1
37D	14.8	25.5	17.4	42.3	0.0	43.6
38D	63.9	21.6	12.4	2.1	0.0	13.3
39D	48.1	19.1	10.9	20.2	1.7	26.7
40D	2.6	17.4	29.8	49.9	0.3	52.2
41D	87.2	9.2	2.6	1.0	0.0	7.7
50D	38.4	23.6	15.3	8.8	13.9	32.3
52D	19.6	8.5	8.7	48.8	14.4	56.8
53D	30.9	8.0	6.0	37.1	18.0	51.0
54D	42.3	9.5	29.9	16.7	1.6	29.3
56D	41.4	15.0	36.4	7.2	0.0	24.0
57D	50.5	0.4	3.8	45.3	0.0	38.0
66D	31.3	12.5	20.5	35.7	0.0	38.3
69D	53.9	11.5	14.6	14.8	5.2	26.5
70D	22.0	13.0	27.7	36.8	0.5	42.0
72D	34.9	7.9	29.6	26.4	1.2	35.3
73D	3.8	3.1	11.9	73.1	8.1	68.2
	36.9*	11.8*	15.0*	32.2*	4.1*	37.9**

*Average percentage by category for mission.
**Overall mission cloud cover percentage.

Mission 1024-2

Pass Number	1	2	3	4	5	Cloud Cover % Per Pass
85D	36.7	4.3	5.2	35.3	18.5	49.5
86D	43.2	6.9	10.1	31.5	8.3	39.1
87D	24.8	3.1	5.9	38.7	27.5	60.5
88D	86.5	0.7	12.8	0.0	0.0	9.3
93D	100.0	0.0	0.0	0.0	0.0	5.0
98D	77.2	1.6	4.9	16.3	0.0	18.2
100D	9.5	8.2	9.2	53.8	19.3	65.1
102D	16.8	12.0	27.8	41.1	2.3	46.6
103D	15.3	10.6	31.5	42.3	0.3	46.6
104D	54.7	13.6	11.2	16.4	4.1	25.7
106D	77.2	9.8	6.0	7.0	0.0	13.1
113D	0.0	5.3	58.3	32.6	3.8	51.3
115D	43.3	11.7	15.8	29.2	0.0	32.1
116D	69.1	10.3	16.5	4.1	0.0	14.6
118D	16.2	5.5	34.7	39.5	4.1	48.7
119D	0.0	2.6	6.3	39.6	51.5	84.0
120D	41.9	9.4	22.9	25.8	0.0	31.8
130D	93.7	5.3	1.0	0.0	0.0	6.0
131D	36.1	3.7	8.2	17.6	34.4	53.2
133D	2.8	4.6	47.4	30.4	14.8	56.6
134D	33.3	14.4	38.4	10.8	3.1	30.0
136D	29.2	13.5	27.2	26.3	3.8	37.7
148D	25.6	3.6	7.9	36.3	26.4	58.5
149D	1.2	4.4	14.0	55.7	24.7	72.6
150D	29.1	11.7	10.2	19.2	29.8	51.6
151D	39.7	1.4	7.5	43.8	7.6	45.5
152D	57.6	12.1	12.4	17.9	0.0	23.1
	36.6*	7.7*	16.9*	28.1*	10.7*	41.4**

*Average percentage by category for mission.
**Overall mission cloud cover percentage.

APPENDIX E. MISSION COVERAGE STATISTICS

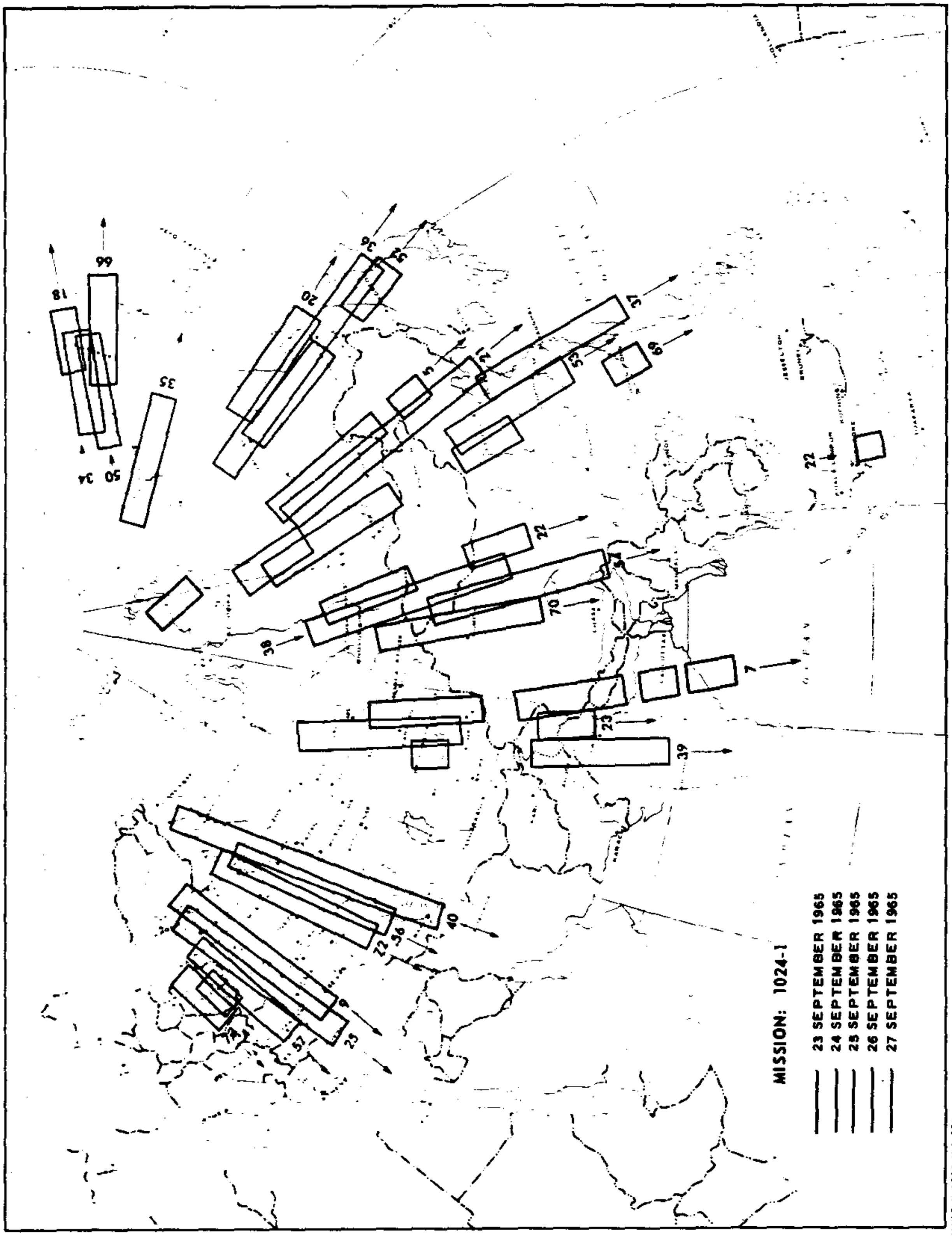
1. Summary of Plottable Photographic Coverage, Mission 1024

Mission 1024-1

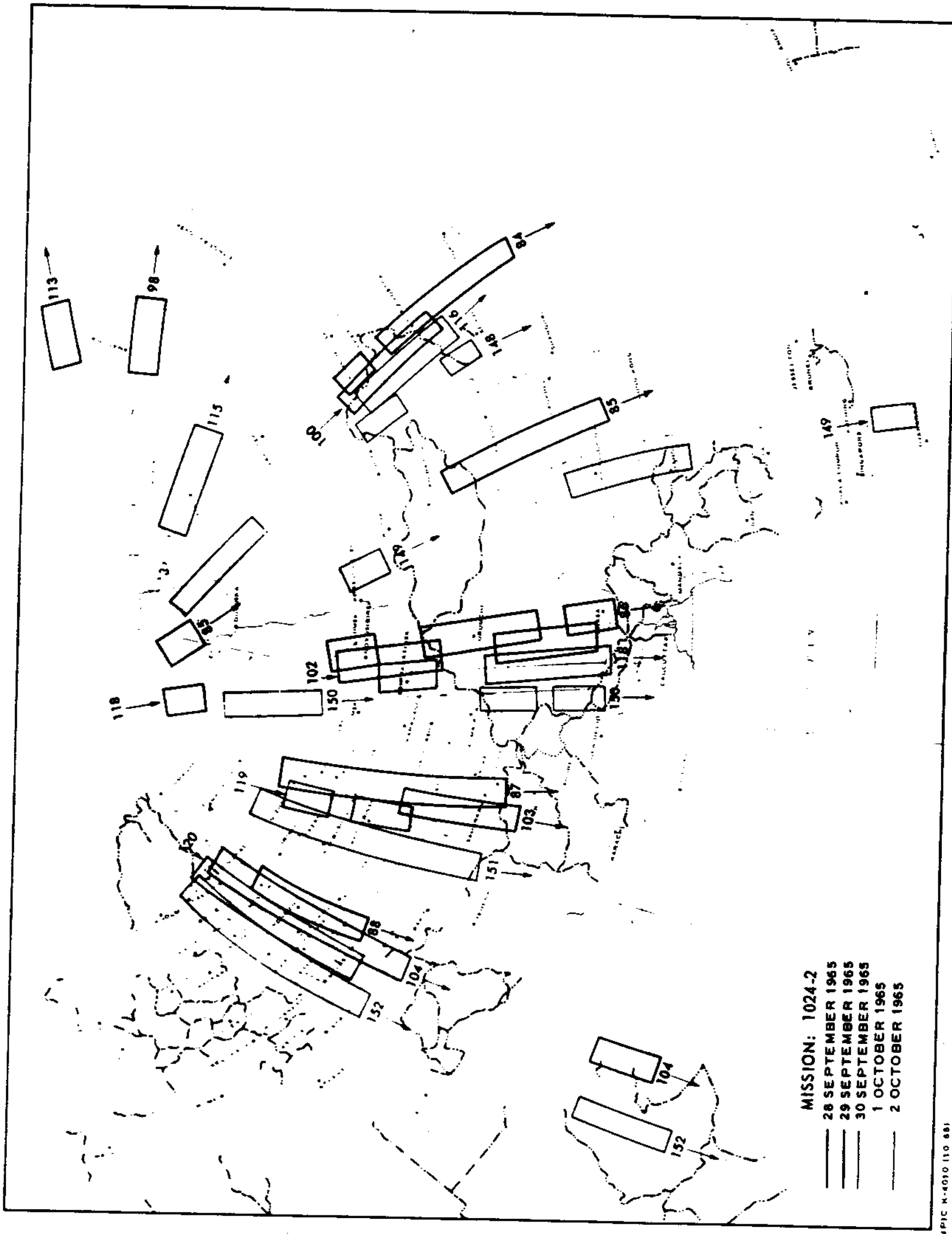
	FORWARD CAMERA		AFT CAMERA		TOTALS	
Country	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
USSR	14,651	2,350,864	14,929	2,371,222	29,580	4,722,086
China	5,106	760,360	5,144	773,592	10,250	1,533,952
India	1,132	158,618	1,061	148,990	2,193	307,608
Mongolia	836	131,850	807	127,084	1,643	258,934
Poland	726	113,794	689	108,096	1,415	221,890
Brazil	484	77,440	484	77,440	968	154,880
Taiwan	430	24,768	390	28,080	820	52,848
Rumania	307	49,536	233	37,672	540	87,208
Australia	260	39,000	260	35,100	520	74,100
Kashmir	211	30,806	211	30,806	422	61,612
Japan	226	16,040	143	9,268	369	25,308
Afghanistan	156	22,776	156	22,776	312	45,552
Indonesia	123	6,958	143	4,118	266	11,076
Nepal	61	8,784	61	8,784	122	17,568
Turkey	104	6,888			104	6,888
Finland			61	10,736	61	10,736
Czechoslovakia	16	2,464	14	2,156	30	4,620
Greenland			12	1,400	12	1,400
TOTAL	24,829	3,800,946	24,798	3,797,320	49,627	7,598,266
Continental US	534	80,124	534	78,600	1,068	158,724
GRAND TOTAL	25,363	3,881,070	25,332	3,875,920	50,695	7,756,990

Mission 1024-2

Country	FORWARD CAMERA		AFT CAMERA		TOTALS	
	Linear nm	Square nm	Linear nm	Square nm	Linear nm	Square nm
USSR	11,357	1,803,026	11,921	1,870,684	23,278	3,673,710
China	6,523	989,656	6,576	995,166	13,099	1,984,822
Nepal	140	20,784	27	3,942	942	140,976
Argentina	552	92,736	552	92,736	1,104	185,472
Saudi Arabia	480	72,000	517	77,550	997	149,550
Algeria	347	49,274	378	53,676	725	102,950
Mali	347	49,274	378	53,676	725	102,950
Ethiopia	311	43,540	311	43,540	622	87,080
North Vietnam	248	17,608	165	15,762	413	33,370
North Korea	245	25,788	177	20,580	422	46,368
Japan	185	25,050	185	25,050	370	50,100
Turkey	165	24,080	62	9,920	227	34,000
Mexico	130	11,096	112	9,782	242	20,878
Alaska (US)	111	3,692	67	2,108	178	5,800
Mongolia	66	10,032	201	30,552	267	40,584
Indonesia	62	876	62	876	124	1,752
Aden	53	7,950	57	8,550	110	16,500
Afghanistan	41	6,232	12	1,824	53	8,056
Upper Volta	30	4,200	15	2,100	45	6,300
Niger	20	2,800	10	1,400	30	4,200
Iran	8	1,216			8	1,216
Uruguay	6	1,008	6	1,008	12	2,016
Finland			8	1,376	8	1,376
TOTAL	21,427	3,261,918	21,799	3,321,858	43,226	6,583,776
Continental US	689	101,496	707	106,374	1,396	207,870
GRAND TOTAL	22,116	3,363,414	22,506	3,428,232	44,622	6,791,646

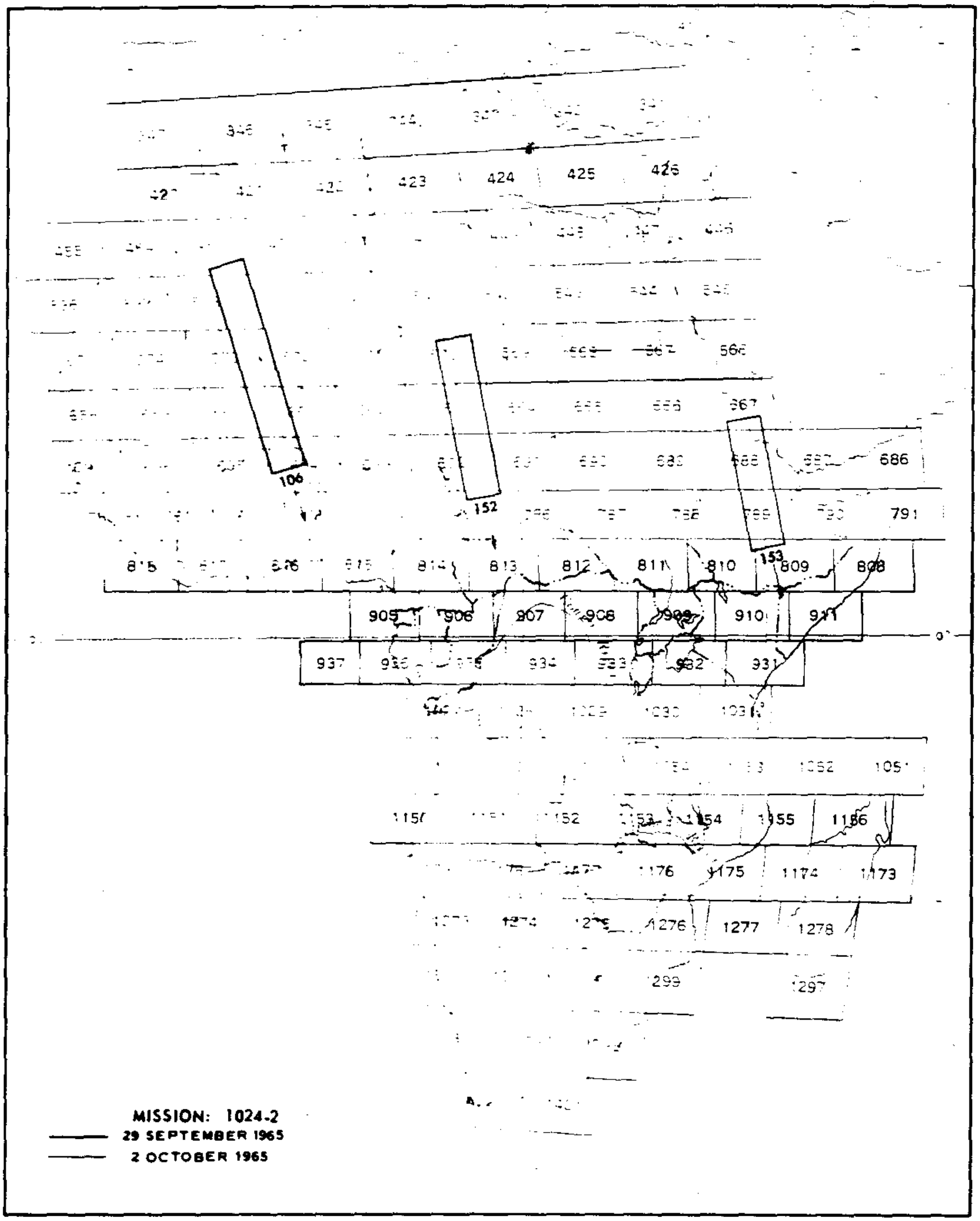


APPROXIMATE TRACK OF MISSION 1024-1, 23-27 SEPTEMBER 1965 OVER USSR, FAR AND MIDDLE EAST.



APPROXIMATE TRACK OF MISSION 1024-2, 28 SEPTEMBER - 2 OCTOBER 1965 OVER USSR, FAR AND MIDDLE EAST.

NPIC K-4010 (10 68)



APPROXIMATE TRACK OF MISSION 1024-2, 28 SEPTEMBER - 2 OCTOBER 1965 OVER AFRICA.

NPIC K-4011 (10/65)