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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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Notice of Missing Page(s)

Pages 68 and 70 of the original document were blank.

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PHOTOGRAPHIC EVALUATION REPORT
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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).

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.

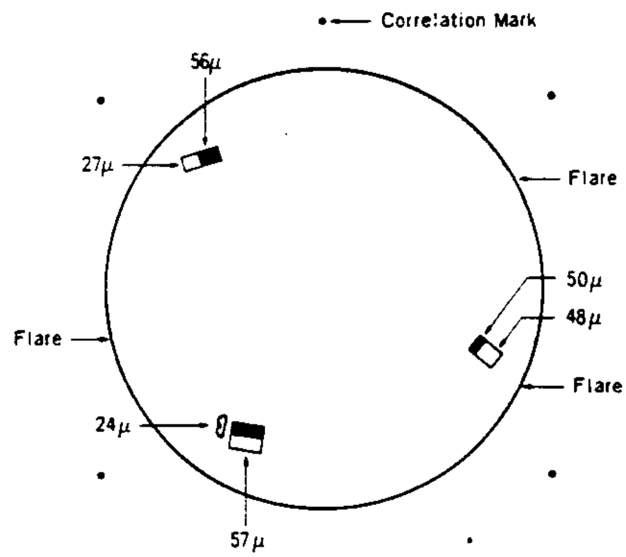
c. Plus Density Streaks. Heavy, distinct plus density streaks, parallel to the direction of flight, appear on most stellar frames exposed in the first 22 orbits (stellar frames 1 - 109). After pass 22D, the streaks appear only on frames 120, 137, and 172. While the images are thought to be of crystallized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

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.

4. 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:

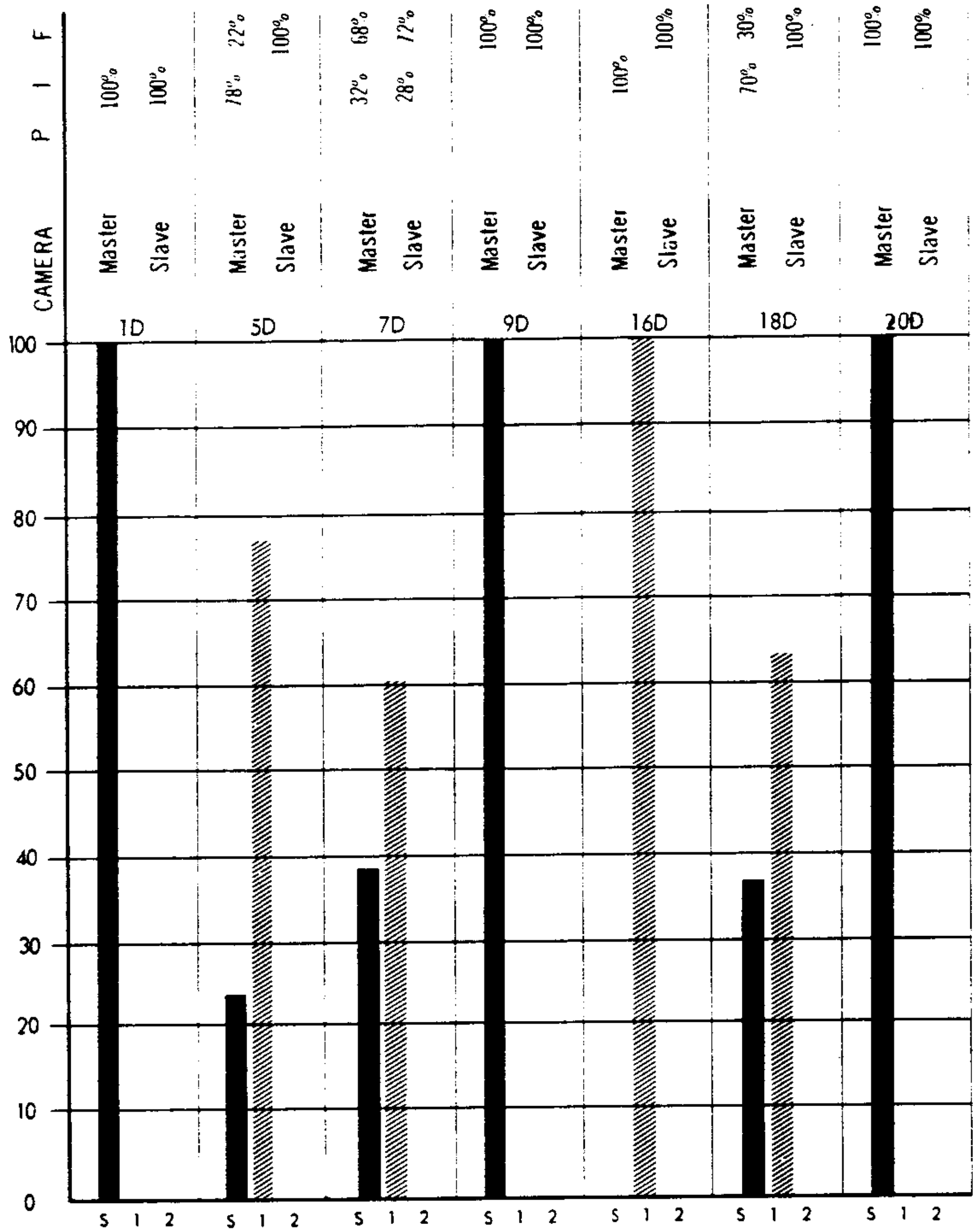
	1024-1		1024-2	
Development Level	Master	Slave	Master	Slave
Primary	0	0	15%	0.5%
Intermediate	57%	28%	16%	22.5%
Full	43%	72%	69%	77%

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.


P I F
CAMERA
Master 100%
Slave 100%
Master 78% 22%
Slave 100%
Master 32% 68%
Slave 28% 72%
Master 100%
Slave 100%
Master 100%
Slave 100%
Master 70% 30%
Slave 100%
Master 100%
Slave 100%
1D
5D
7D
9D
16D
18D
20D
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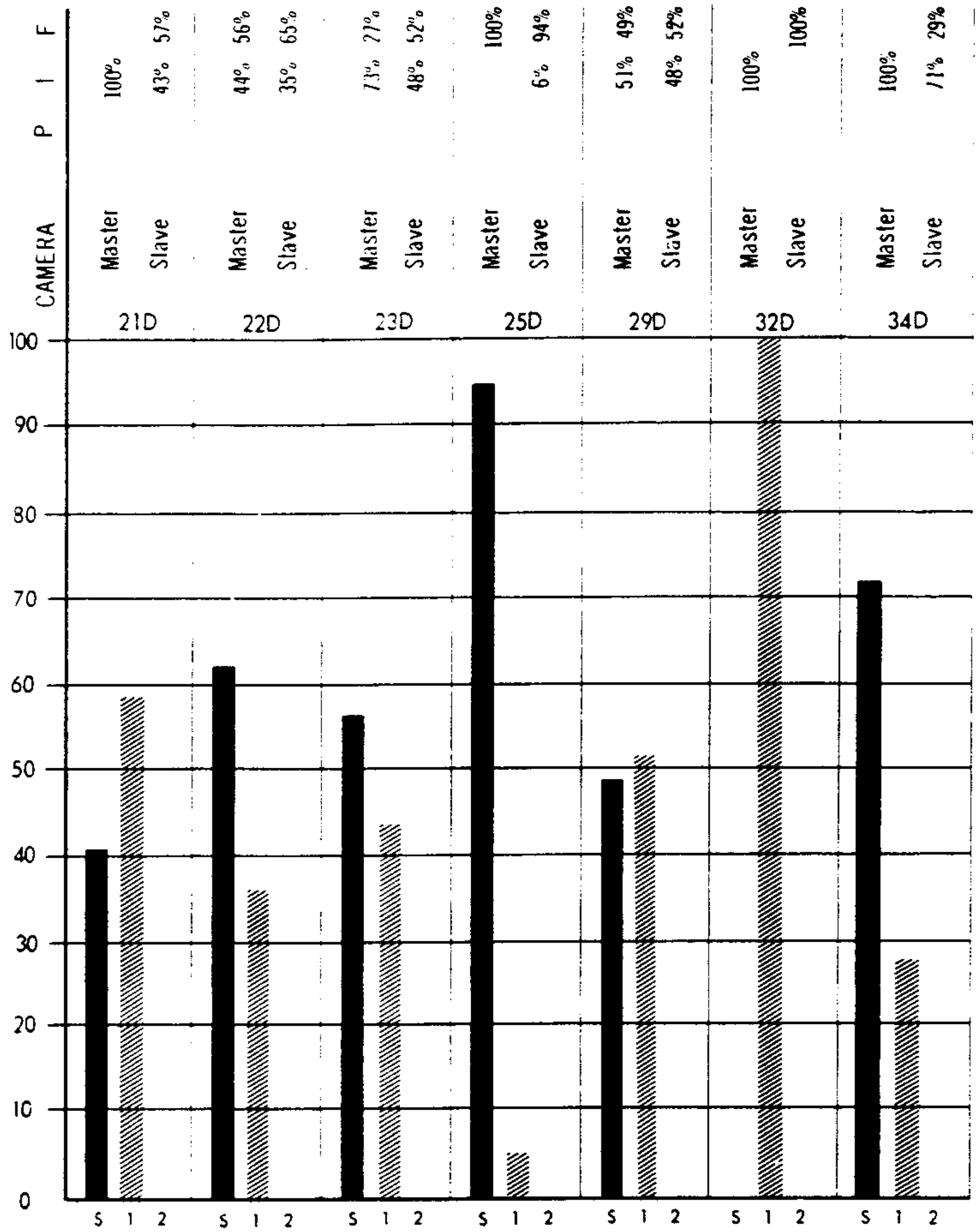
80
70
60
50
40
30
20
10
0
S 1 2



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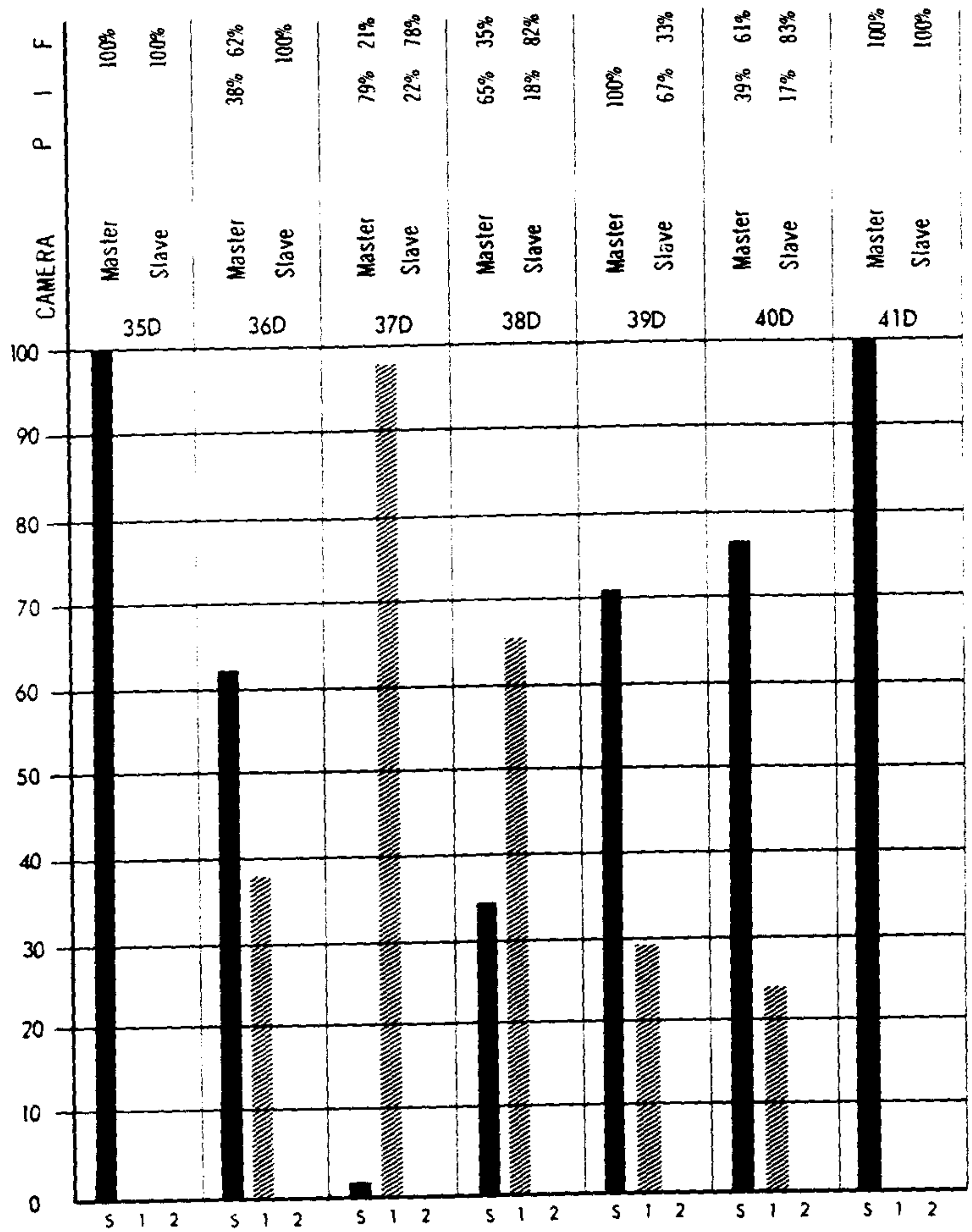

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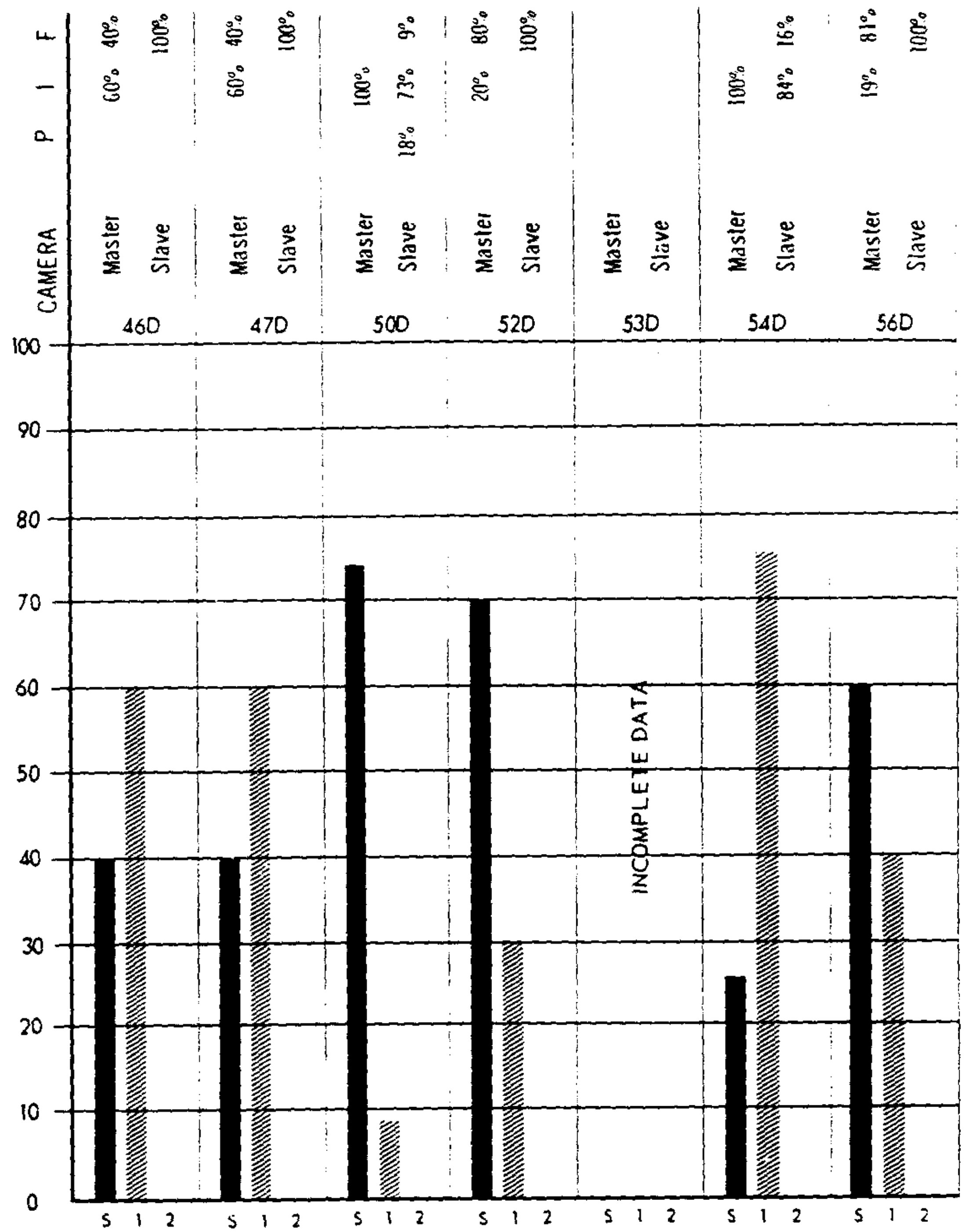

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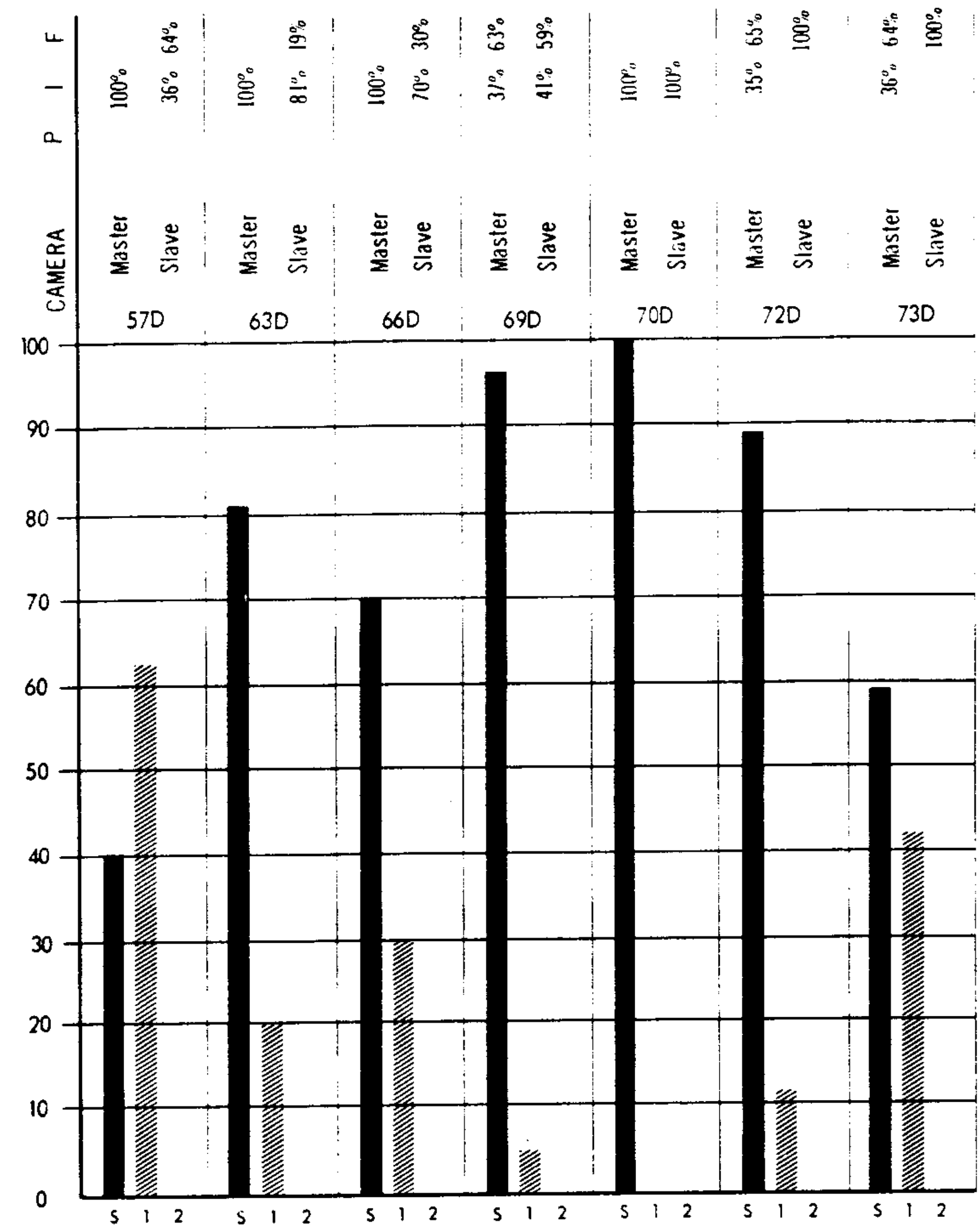
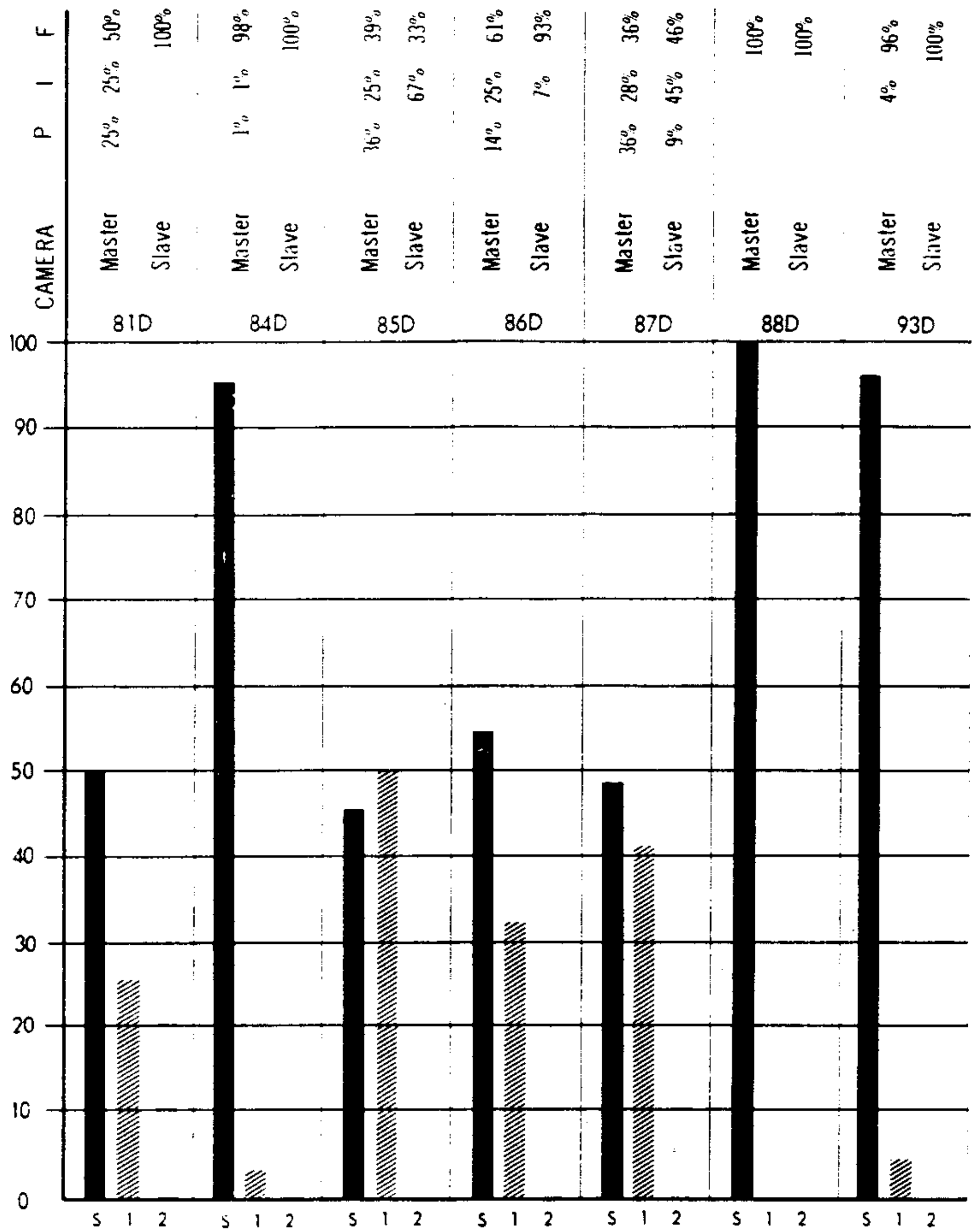


NPIC K-7420 2/66


CAMERA
P I F
81D
84D
85D
86D
87D
88D
93D
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Slave
100
90
80
70
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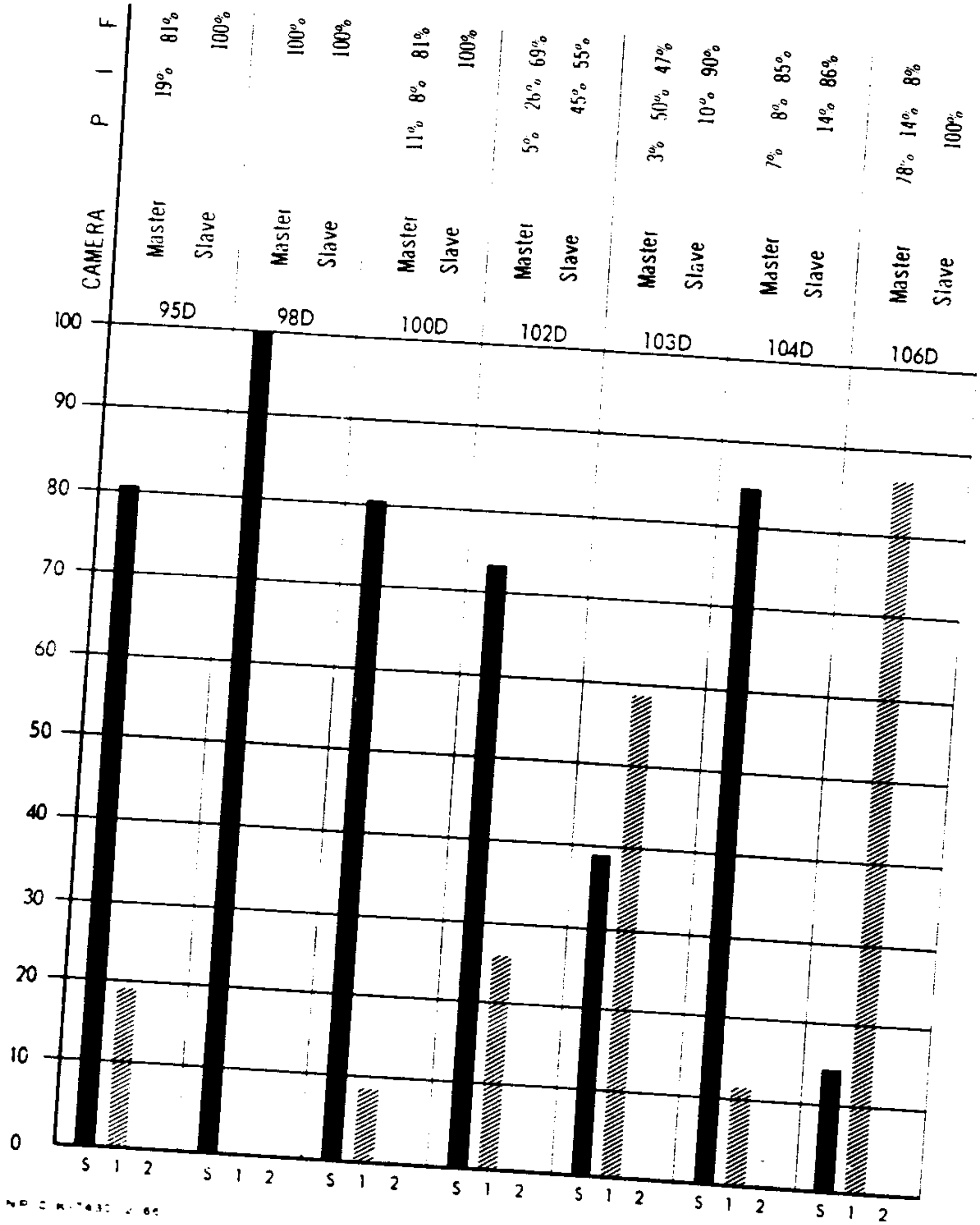
30
20
10
0
S 1 2


CAMERA
P I F
95D
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Slave 100%
98D
Master 100%
Slave 100%
100D
Master 11% 8% 81%
Slave 100%
102D
Master 5% 26% 69%
Slave 45% 55%
103D
Master 3% 50% 47%
Slave 10% 90%
104D
Master 7% 8% 85%
Slave 14% 86%
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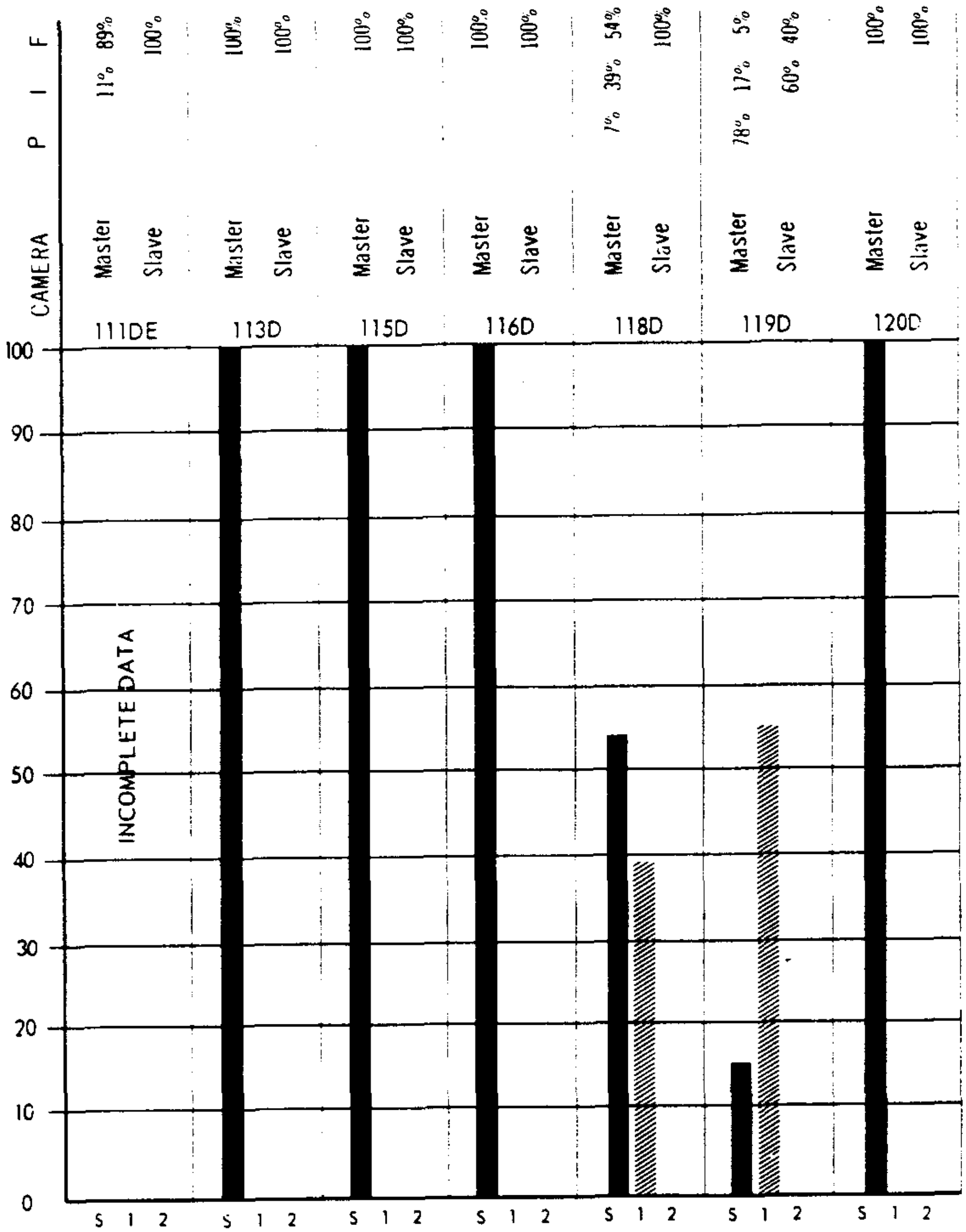
30
20
10
0
S 1 2


CAMERA
P I F
111DE Master 11% 89%
Slave 100%
113D Master 100%
Slave 100%
115D Master 100%
Slave 100%
116D Master 100%
Slave 100%
118D Master 7% 39% 54%
Slave 100%
119D Master 78% 17% 5%
Slave 60% 40%
120D Master 100%
Slave 100%
INCOMPLETE DATA
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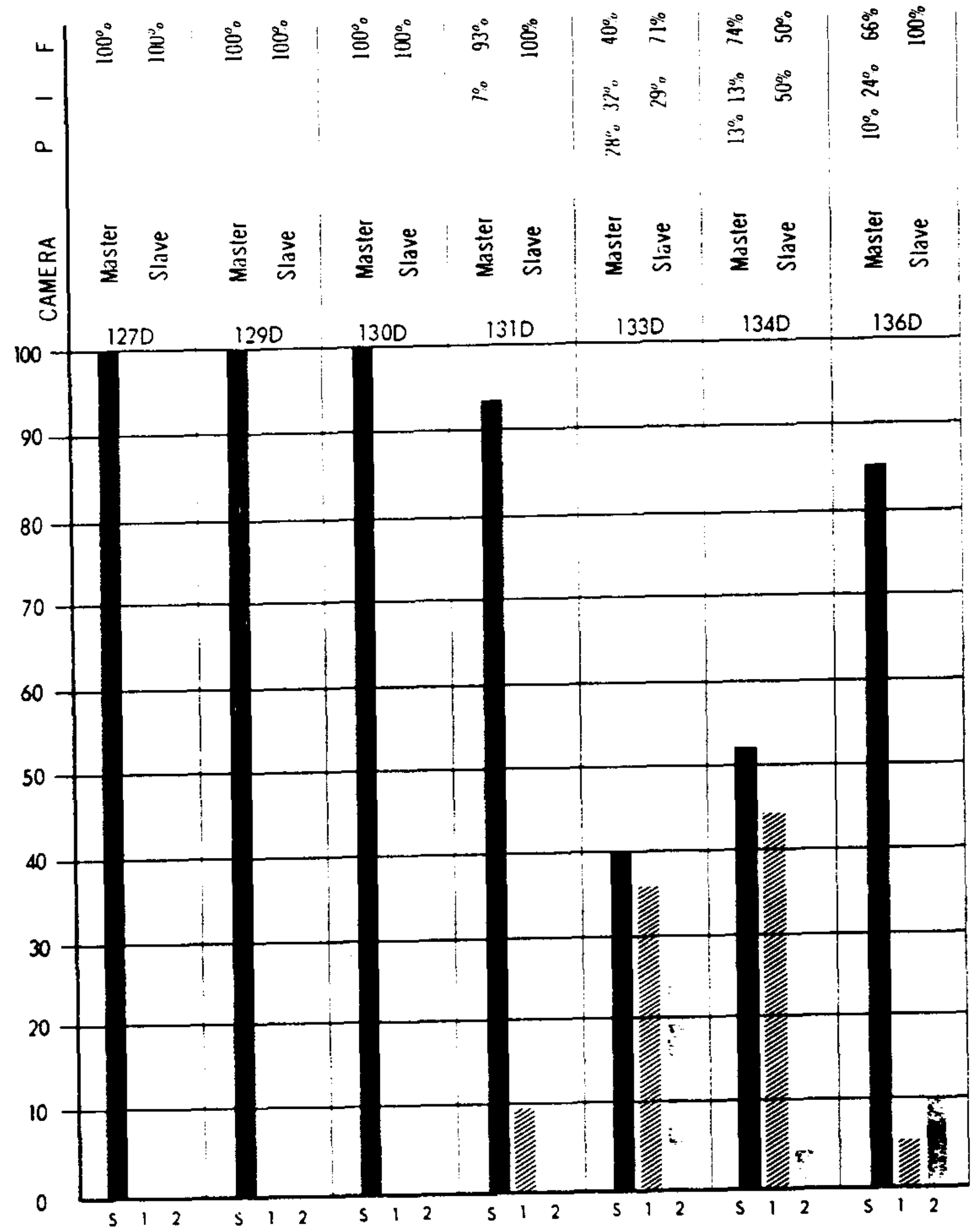
90
80
70
60
50
40
30
20
10
0
S 1 2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CAMERA
Master
Slave
127D
129D
130D
131D
133D
134D
136D
100%
93%
7%
40%
32%
28%
71%
29%
74%
13%
13%
50%
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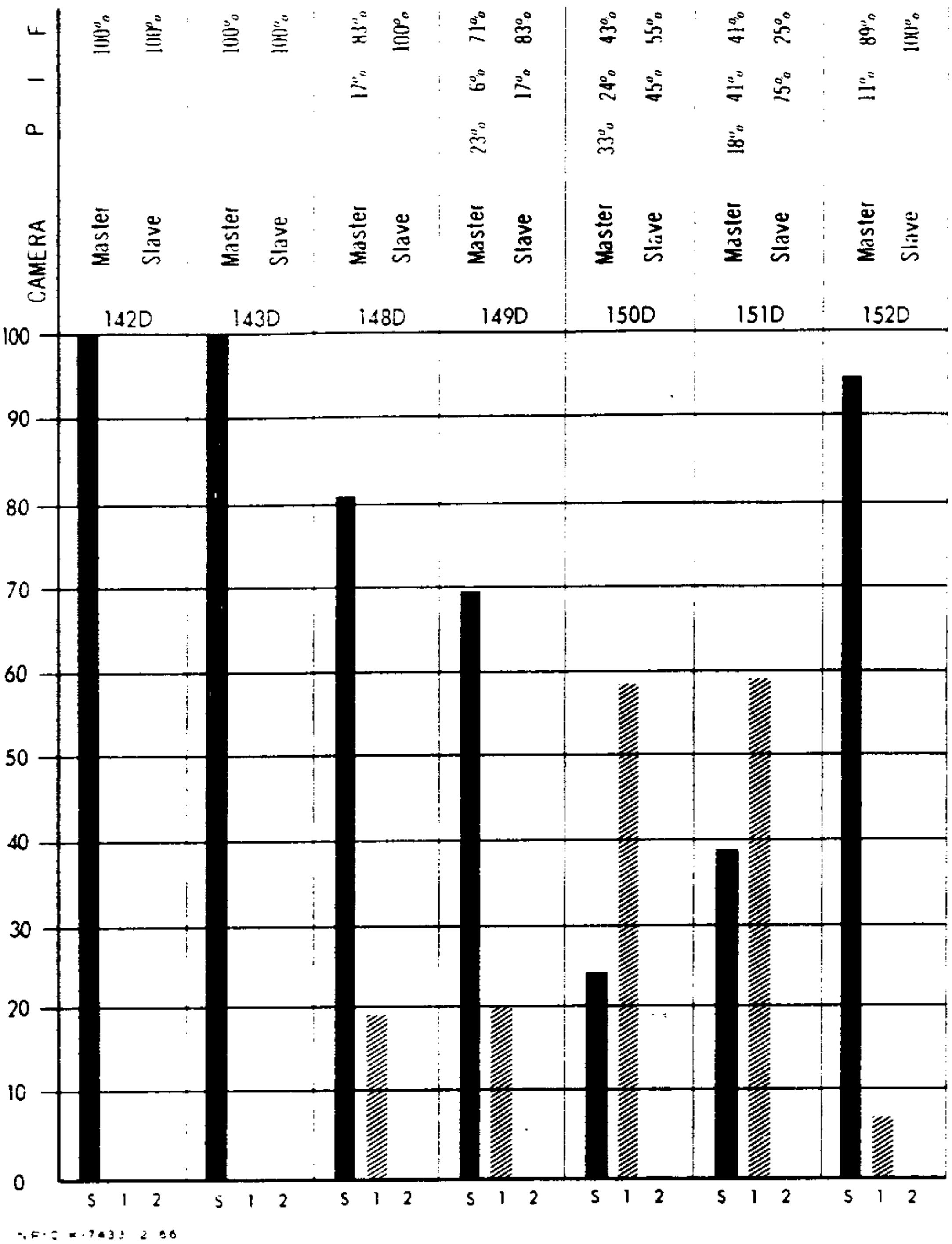
S 1 2


P I F
CAMERA
142D
Master 100%
Slave 100%
143D
Master 100%
Slave 100%
148D
Master 17% 83%
Slave 100%
149D
Master 23% 6% 71%
Slave 17% 83%
150D
Master 33% 24% 43%
Slave 45% 55%
151D
Master 18% 41% 41%
Slave 75% 25%
152D
Master 11% 89%
Slave 100%
100
90
80
70
60
50
40
30
20
10
0
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

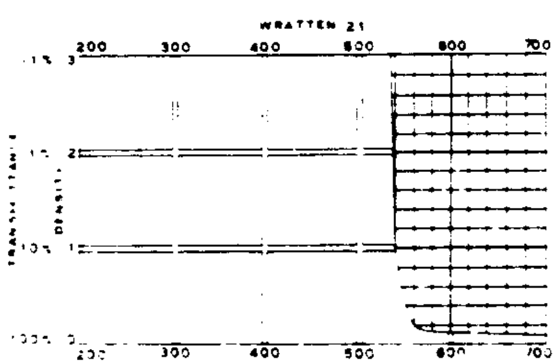
8	9	10	11	12	13	14
24	25	26	27	28	29	30
40	41	42	43	44	45	46
56	57	58	59	60	61	62
72	73	74	75	76	77	78
88	89	90	91	92	93	94
104	105	106	107	108	109	110
120	121	122	123	124	125	126
136	137	138	139	140	141	142
152	153	154	155	156	157	158
168	169	170	171	172	173	174

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



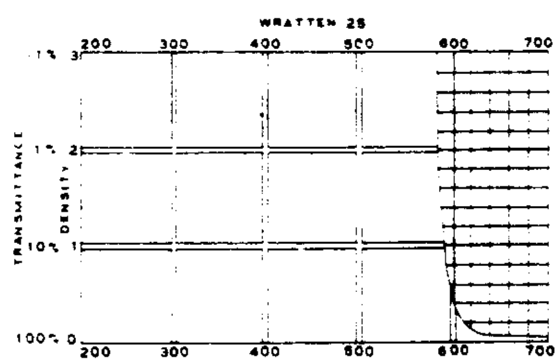


FIGURE 1. DESCRIPTION OF PHOTOGRAPHIC DATA

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

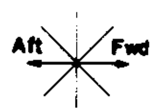
FIGURE 3. SHADOW DETAIL RENDERED BY FULL PROCESSING LEVEL -- YARDLEIGH PROCESSOR NPIC K-6317 (3/66

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.

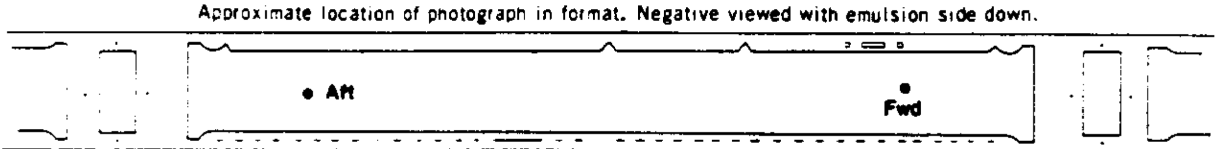
	FIGURE 2	FIGURE 3
Camera	173	172
Pass	103D	103D
Frame	18 Aft	12 Fwd
Date of Photography	29 Sept 65	29 Sept 65
Universal Grid Coordinates	20.5 - 12	70.5 - 13.5
Enlargement Factor	40X	40X
Geographic Coordinates	45-54N 61-54E	45-52N 61-58E
Altitude (feet)	610,693	612,684
Camera Attitude:		
Pitch	-00°08'	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.



[redacted]

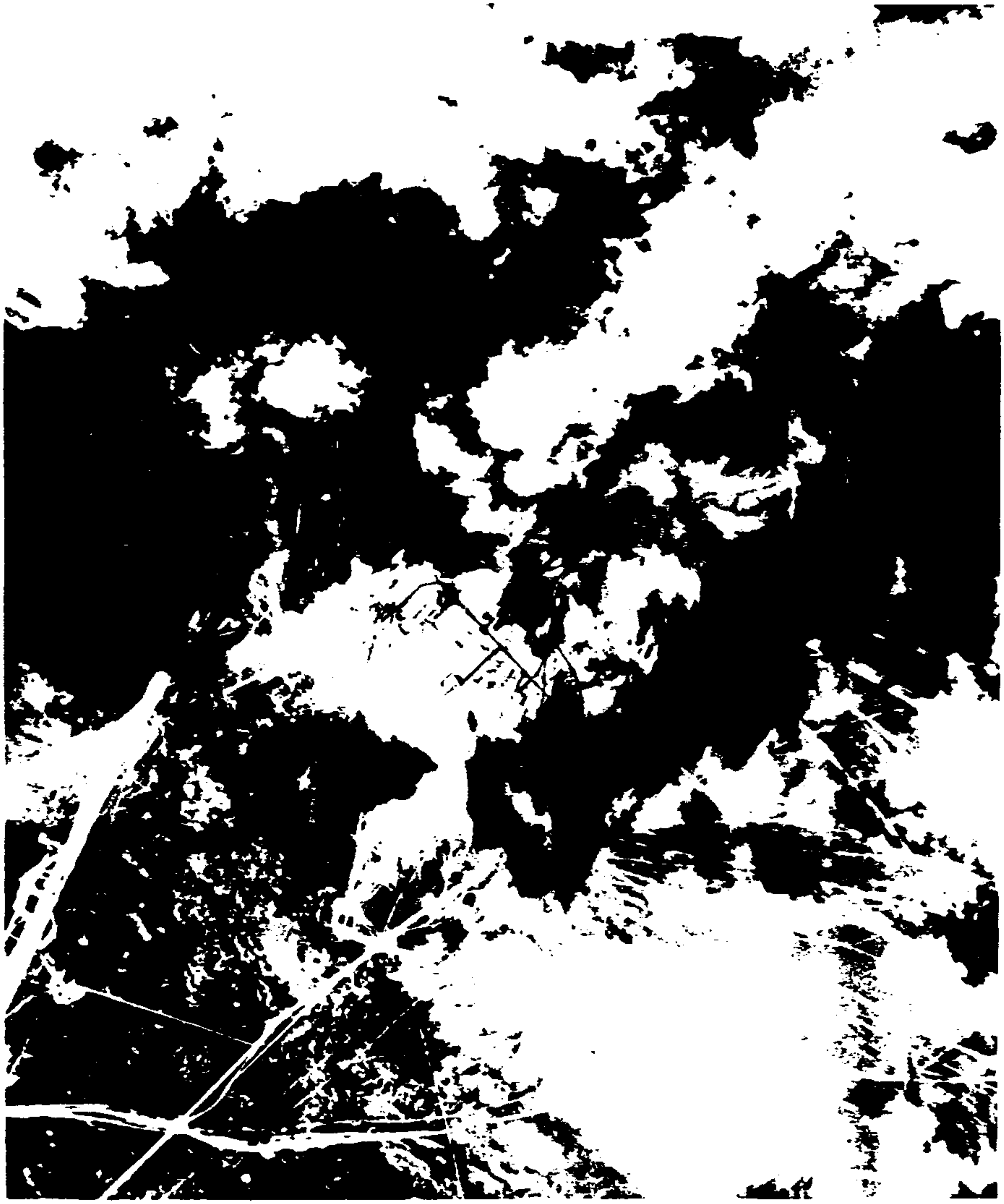


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FIGURE 4. SLAVE CAMERA IMAGERY -- PROCESSED AT THE FULL LEVEL OF DEVELOPMENT (TRENTON) NPIC K-6318 (3/66)

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

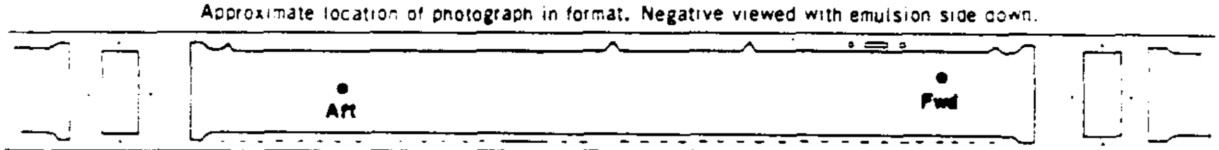
Contrast differences in these 2 photographs reflect the contrast differences in the original negative.

	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°35'
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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