

MEMORANDUM FOR:

*A/DDI*

- The first practical collusion with OSP which we have performed in support of their Z effort.

*J. Krause*

16 Nov 70  
(DATE)

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MEMORANDUM FOR: Director, Office of Special Projects

SUBJECT : Comparison of Simulated Zama Imagery

1. We have completed the study you requested on comparison of simulated Zama imagery with the best quality KI-8 photography; the results are given in the attached report.

2. Should the recommendation regarding further study be acceptable to you, I should expect that any contractual support to that effort would be furnished, as it was in this initial situation, by OSP. In addition to that suggested different approach for a second study, thought should be given to a comparison of simulated Zama imagery against "average" KI-8 photography.

JOHN J. FICKS

Executive Director

National Photographic Interpretation Center

Attachment:

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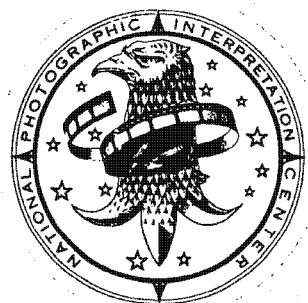
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# THE EXPLOITATION POTENTIAL OF ZAMAN IMAGERY COMPARED WITH KH-8 PHOTOGRAPHY

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NOVEMBER 1970

NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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I. INTRODUCTION

The psychophysical study reported herein was performed by the National Photographic Interpretation Center (NPIC), with the support of Human Factors Research, Inc., in response to a request levied by the Office of Special Projects, DDC&T. It was conducted to compare the best examples of domestic KH-8 coverage with various quality simulated Zaman (electro-optical) imagery. The simulated imagery consisted of combinations of different ground sample distances (GSD) and signal-to-noise ratios (SNR). The objective of the study was to determine what combinations of GSD and SNR constitute electro-optical images approximately equivalent for exploitation purposes to the "best quality" KH-8 photography.

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II. METHOD

It was not possible, because of time constraints and the few scenes available, to obtain objective measures of photo interpreter (PI) performance with the imagery. Consequently, the psychophysical technique of ranking was used. This technique had been shown in previous studies conducted at NPIC to be very reliable.<sup>1</sup> A major assumption in these previous studies as well as in the current investigation is that ranking of images by professional PIs reflects the exploitation potential of those images.

The Imagery

Three domestic scenes, a concrete pipe plant (Scene A), an engineering test center (Scene B), and an airfield (Scene C) were used in this experiment (see Attachment A). There were eight images of each of the three scenes: two "best quality" KI-8 and six simulated Zaman images. The six simulated images represented three values of GSD, [ ] 12"; and two values of SNR, 5:1 and 3:1. Thus, there was a simulated image representing each of the six cells illustrated by Table 1. It was assumed that the GSDs and SNRs describing the simulated Zaman imagery were accurate representations of those parameters.

Table 1. SIMULATED ZAMAN IMAGERY CHARACTERISTICS

	Ground Sample Distance		
			12"
Signal-to-	5:1		
Noise Ratio	3:1		

<sup>1</sup>Buckner, Harabedian, and Scott, The Judged Worth of Aerial Photography as a Function of Obliquity Angle with Scale Constant, Human Factors Research, Inc., Technical Report 723-4, April 1967.

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Two sets of the simulated images were used in the study. The characteristics of these images, applicable to all three scenes, are shown in Table 2. One set of positive transparencies was contact printed from the original simulated images (as produced by the Perkin-Elmer Line Scan Image Generator). The scale of these images increased directly as a function of decreasing GSD. The images representing a GSD



square and covered the same area on the ground. The images representing a GSD of 12" were approximately 4 1/2" square and also covered the same area on the ground (see Attachment C).

Table 2. Characteristics of the Simulated Imagery and NI-8 Photography

SET	Ground Sample Distance (Inches)	Signal-to-Noise Ratio	Approximate Scale	Approximate Format Size (Inches Square)	Ground Coverage (Ft. Square)	
ZAMAN 1	[Redacted]	5:1	1/330	9.0	[Redacted]	
ZAMAN 1		3:1	1/330	9.0		
ZAMAN 1		5:1	1/460	6.5		
ZAMAN 1		3:1	1/460	6.5		
ZAMAN 1	12	5:1	1/670	4.5		
ZAMAN 1	12	3:1	1/670	4.5		
ZAMAN 2	[Redacted]	5:1	1/5000	0.6		
ZAMAN 2		3:1	1/5000	0.6		
ZAMAN 2		5:1	1/5000	0.6		
ZAMAN 2		3:1	1/5000	0.6		
ZAMAN 2		12	5:1	1/5000		0.6
ZAMAN 2		12	3:1	1/5000		0.6
KH8 (2430)	N/A	N/A	1/35000	2.5		
KI8 (S0369)	N/A	N/A	1/35000	2.5		

\*Only the same [Redacted] covered by the Zaman imagery was used in the comparison.

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The second set of simulated images also consisted of positive transparencies, but each image had been reduced from the original simulated image to make the scales approximately equal. Each was approximately 0.6" square and covered the same square area on the ground.

The two KH-8 images of each scene were also positive transparencies which had been contact printed from the original negative. These negatives were previously selected by NPIC as representing "best quality" KH-8 photography (See Attachment D).

One of these transparencies was duplicated on Eastman Kodak Fine Grain Aerial Duplicating Film (2430), the standard duplicating material used for NPIC exploitation. The other transparency was duplicated on Eastman Kodak Recordak Print Film (SO-369), which is a higher contrast material than 2430 and is used in special exploitation situations at NPIC. The KH-8 images were contact scale and different from the scales of either of the two sets of simulated imagery, as is also shown in Table 2.

Two other types of stimulus materials were also furnished, but not used in this experiment. One was a third contact print of the KH-8 imagery printed on Eastman Kodak Recordak Minicard Film (6451), which is a very high contrast duplicating material. This material was not used because it was judged to be of too high contrast for the particular scenes being used.

The second type of material consisted of two groups of 7X enlargements of the three KH-8 scenes printed on Eastman Kodak Fine Grain Positive Film (7302). The two groups differed in that they had been produced on different enlarging equipment, one group on the Eastman Kodak Beacon Precision Enlarger (BPE) and the other on the Saltzman Enlarger. The rationale for producing these materials was to use them in the comparison tests with the reduced scale simulated material, tests in which both the KH-8 and simulated Zaman imagery would be of equal scale (both 1/5000).

The 7X enlargements from the BPE enlarger showed frequent minus density spots resulting from the matte particles of the original negative. Because of these spots, Eastman Kodak also sent 7X enlargements made on a Saltzman Enlarger. These enlargements did not contain the spots, but were not of optimum image quality. The NPIC photographic laboratory also attempted to reproduce the 7X enlargements on their BPE, but they were equally unsuccessful in eliminating the effect of the matte particles.

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Because of the potential bias introduced by the presence of the spots on the BPE enlargements and inadequate quality of the Saltzman enlargements, none of the 7X enlarged material was used in the experiment.

Although the KI-8 and simulated Zaman imagery covered the same ground areas, the scene content varied slightly because of the differing acquisition times. As a consequence, the length and orientation of the shadows in the KI-8 images were different from those in the simulated imagery and certain other features of each scene were also changed. For example in Scene A, cranes and trucks had been moved in the period between the two acquisition flights, but many of the features from which "worth for intelligence purposes" could be judged had not changed.

#### Experimental Design

The subjects were asked to rank the eight images of each scene in terms of their "worth for intelligence purposes." After they had ranked the eight images of one scene, they were asked to rank the images of a second scene, and finally the remaining scene.

In each case the subjects first ranked the six simulated images of one scene. Then they incorporated the KI-8 photography into the ranks they had assigned to the six simulated images of the scene.

All 26 subjects ranked all of the images of each scene. Half of the subjects ranked the reduced (1/5000) scale simulated images (Zaman Set 2) and the KI-8 images first, and then after a time interval of about a day, they ranked the contact scale simulated images (Zaman Set 1) and the KI-8 images. The other half of the subjects ranked the contact scale simulated images and the KI-8 images first and then after a similar interval ranked the reduced scale simulated images and the KI-8 images. In like manner, the scenes were presented systematically to the subject so that each scene appeared either first, second, or third equally often. These procedures were designed to reduce any order effects such as learning or fatigue.

#### The Subjects

Twenty-six employees of NPIC participated in the study. Twenty-one were professional photo interpreters working in the Imagery Exploitation Group (IEG). These 21 PIs represented both CIA and DIA. They had from two to 29 years of experience in photo interpretation, and at the time the study was conducted, all were active PIs. The other five subjects were

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technologists of the Applied Photo Science Division (APSD) of the Technical Services Group (TSG), and they had from two to 15 years of experience in evaluating photographic image quality.

### The Equipment

The subjects used a Richards 940 Split-Format Light Table and a Bausch and Lomb (B&L) zoom microscope to evaluate the imagery. The subjects did not use the microscope to evaluate the contact scale simulated imagery; however, they did use it to evaluate the reduced scale simulated imagery and the KH-8 photography. B&L 7X tube magnifiers were also used.

### The Procedure

The subjects were instructed informally how they should evaluate the imagery. First they were told:

"You have been asked to participate in a study designed to determine the relative worth or usefulness for intelligence purposes of two types of imagery. The study is being done for the Office of Special Projects in CIA.

"The results of the study may possibly have significant implications for the design of future reconnaissance systems. So, it is important that in making your comparisons of the different images you consider all of the relevant factors that make one image better than another for intelligence purposes.

"When I say 'worth or usefulness for intelligence purposes,' I mean the interpretability or informative value of the images in light of the requirements levied on you and the questions asked you by the intelligence analysts.

"We have two types of images of three scenes. One type you will recognize immediately as being KH-8 material. We have two KH-8 images of each of the three scenes. I will give you the six experimental images of one scene first. I want you first to look carefully at all of them, and then rank them from best to worst. After you have done that, I will give you two KH-8 images of the same scene, and I want you to rank them along with the six experimental images.

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"In making your evaluations look at those parts of the scene that you normally look at when you evaluate mission photography. Look, for example, [redacted]

and so on. In addition, use other features that you normally use.

"The original negatives from which the experimental and the KH-8 imagery was made were obtained at different times, [redacted]

[redacted] are different, as are the scales. Please try to ignore these differences and concentrate on the informative value of the imagery, its informative value in light of the requirements levied on you.

"I will give you the six experimental images of one scene first and after you have ranked them I'll give you the two KH-8 images of the same scene. After you complete that I'll give you the images of the second scene.

"Rank the scenes on this Response Sheet [see Attachment E] with the number-letter designation of the best image at the top, the worst at the bottom, and rest of them somewhere in between.

"Take your time; take breaks if you wish. And don't hesitate to ask questions. Do you have any questions now?

The subjects took about an hour and 15 minutes to evaluate the reduced scale simulated and KH-8 photography of all three scenes. They used the microscopes to evaluate both types of imagery.

They took about an hour to evaluate the contact scale simulated and KH-8 photography of all three scenes. Again, they used the microscopes to evaluate the KH-8 imagery, but in most instances could evaluate the large scale simulated imagery without using any magnification.

After the subjects had ranked the simulated and KH-8 images of all three scenes, they ranked the three KH-8 images printed on 2430 and the three KH-8 photographs printed on SO-369 to determine whether a significant image quality difference existed between the three KH-8 scenes. If such a difference existed, there is a possibility that it could produce variability from scene to scene in the position of the KH-8 imagery with respect to the Zaman simulated imagery rank.

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### III. RESULTS

The means and standard deviations of the ranks assigned the images by the five photographic scientists were compared with the means and standard deviations of the ranks assigned the images by the 21 PIs. There were no significant differences, so the data from the two groups were combined for presentation here.

The means and standard deviations of the rankings made by the 13 subjects who ranked the reduced scale simulated images first were compared with the means and standard deviations of the rankings made by the 13 subjects who ranked the reduced scale images second. The differences between the means and the standard deviations were not significant, so the data obtained from the two orders of presentation of the images were combined.

The rankings of the contact and reduced scale images in relation to the KH-8 images are presented separately, because in spite of the lack of statistically significant differences, there were differences in the mean ranks.

All of the data from which summary statistics were computed are shown in Attachment F, so that the reader may make comparisons and computations not presented.

Table 3 is a summary of the data. The means and standard deviations of the judgments of all subjects of the contact scale and reduced scale simulated imagery in relation to the two types of KH-8 imagery are shown.

Table 4 and Figures 1 and 2 (pages 12 to 29) below describe the data for each scene and both scales. The table shows the combined raw data. The numbers in the table indicate the frequencies of the rank assignments. Figure 1 shows the means and standard deviations of the data shown in Table 4. Figure 2 consists of a graph with number of observations plotted on the vertical axis and rank position plotted on the horizontal axis. The simulated Zaman imagery was first plotted in rank position, one through six, and represented by vertical bars. The height of the bars signifies the number of observers who ranked the [redacted]

[redacted] and so on. This would be the logical ranking of the simulated Zaman imagery if the technologist examined only the engineering parameters, ground sample distance and signal to noise ratio, assuming that the predominant differences among the six simulated image scenes are controlled by GSD rather than SNR. That is, in the simulated Zaman imagery provided, the

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TABLE 3

Means and Standard Deviations of Ranks of the  
 Three Scenes - Reduced and Contact Scale Simulated  
 Images.

REDUCED SCALE

Scene A	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		
Scene B	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		
Scene C	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		

CONTACT SCALE

Scene A	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		
Scene B	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		
Scene C	$\frac{I}{\bar{X}}$	12"/5:1	12"/3:1
	$\sigma$		

I = The image identification. The number to the left of the slant-line is the GSD in inches; the number to the right shows the SNR. The numbers, 2430 and 369 identify the two KH-8 images.

$\bar{X}$  = The mean of the ranks assigned the image.

$\sigma$  = The standard deviation of the ranks assigned the image.

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changes in ground sample distance contributed more to differences in image quality than did the changes in signal-to-noise ratio within one ground sample distance. This assumption is verified by the raw data (Attachment F) and is also illustrated in Figure 2. Some of the subjects did not rank the Zaman images in that order, and this accounts for the gap between the top of the bars and the total number of observations (26). The majority of ranking errors with the Zaman imagery resulted from the interchanging of signal-to-noise ratios within one ground sample distance value. For example:

1st		SNR 3:1	Interchanged
2nd		SNR 5:1	
3rd		SNR 5:1	
4th		SNR 3:1	
5th	GSD12"	SNR 5:1	
6th	GSD12"	SNR 3:1	

The bars in Figure 2 represent the mode of the distribution of ranks for each individual Zaman image. After the Zaman imagery had been separately plotted, the individual placements of the KH-8 photography relative to the Zaman imagery were entered. One "X" represents the placement of the KH-8 (SO-369) relative to the simulated Zaman imagery by one photo analyst. Similarly one "O" represents the placement of the KH-8 (2430) by one analyst.

Table 5 shows the relative rankings of the three KH-8 scenes for each film type. The cells in the table show the number of subjects who ranked the KH-8 photographs first, second and third when just the three scenes on SO-369 and the three scenes of 2430 were ranked.

TABLE 5 RANKS OF THE KH-8 PHOTOGRAPHY

	SO 369		
	SCENE		
	A	B	C
First	1	18	7
Second	7	5	14
Third	18	3	5
	2430		
	A	B	C
First	1	20	5
Second	5	5	16
Third	20	1	5

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The results show the order of preference as Scene B, Scene C, and Scene A and do not account for the apparent shifts in the placement of KH-8 photography in the simulated Zaman imagery ranking.

The data summary presented in Table 3 shows that the rankings of the KH-8 images in relation to the simulated images were more variable than the rankings of the simulated images alone. It shows that the [ ] 5:1 SNR image more frequently (100 of 156 possibilities) ranked better for intelligence purposes than the KH-8 images. It shows, but not unequivocally, that the KH-8 images were judged approximately equivalent to the [ ] 3:1 SNR and [ ] 5:1 SNR images and the [ ] 3:1 SNR is borderline in equaling the best KH-8 photography. Finally it shows that the 12" GSD images at either SNR were not as useful for intelligence purposes as the KH-8 images. It must be remembered that these generalized conclusions were derived from scene dependent results. For individual scene results one must refer to the data shown in Figures 1 and 2.

The mean ranks assigned the simulated images were in the same order regardless of scene or scale:

Rank 1.	GSD = [ ]	SNR = 5:1
Rank 2.	GSD = [ ]	SNR = 3:1
Rank 3.	GSD = [ ]	SNR = 5:1
Rank 4.	GSD = [ ]	SNR = 3:1
Rank 5.	GSD = 12"	SNR = 5:1
Rank 6.	GSD = 12"	SNR = 3:1

The data also showed that, in general, the differences among the simulated images due to differences in GSD were more discriminable than the differences due to SNR.

An alternate method of examining the resulting data is to determine the percent incidence of choosing each simulated Zaman image better than KH-8 photography, as shown in Figure 3 (page 30). For conciseness, both 2430 and SO-369 film types have been combined as representative of best KH-8 photography. Similarly, the reduced and contact scale were combined as representative of simulated Zaman imagery. An example of interpreting the graph is as follows: In Scene B, approximately 86% of the rankings by photo analysts indicated that the simulated Zaman image of [ ] 5:1 SNR was better for intelligence purposes than KH-8. Conversely, 14 percent of the rankings by photo analysts indicated that the KH-8 was better for intelligence purposes than the simulated Zaman image of [ ] 5:1 SNR. If an evaluation is to be based on percentage of photo analysts rating each Zaman image quality level better than KH-8, then this form of data presentation is most relevant. From this form of data presentation, one can see most vividly that the results are scene dependent, which was previously pointed out.

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TABLE 4A: COMBINED DATA, REDUCED SCALE IMAGES  
 SCENE A: CONCRETE PIPE PLANT

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
1	11	6	1				3	5
2	8	6	3				6	3
RANK 3	5	5	4	1			6	5
4	2	8	5	2			3	6
5		1	12	3	1		5	4
6			1	20		1	2	2
7					20	5		1
8				5	20	1		

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

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TABLE 4B: COMBINED DATA, REDUCED SCALE IMAGES  
 SCENE B: ENGINEERING TEST CENTER

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
1	18	5					2	1
2	5	14					5	2
R 3	2	3	7				8	6
A 4	1	4	3	7			4	7
N 5			7	11			3	5
K 6			8	8	3	1	3	3
7			1		11	11	1	2
8					12	14		

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE 4C: COMBINED DATA, REDUCED SCALE IMAGES  
 SCENE C: AIRFIELD

GSD					12"	12"	KH-8	KH-8	
	SNR	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
1	11	2						6	7
2	4	10						5	7
R 3	5	6	1					9	5
A N 4	5	8	3	4				3	3
K 5	1		12	7				3	3
6			9	13	3				1
7			1	2	16	7			
8					7	19			

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE 4D: COMBINED DATA, CONTACT SCALE IMAGES  
 SCENE A: CONCRETE PIPE PLANT

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
1	13	2					7	4
2	3	14		1			4	4
R 3	5	2	7	2			5	5
A 4	4	5	7	5			1	4
N 5		3	11	3	2		3	4
K 6	1		1	15	1	1	5	2
7					21	2	1	2
8					2	23		

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE 4E: COMBINED DATA, CONTACT SCALE IMAGES  
 SCENE B: ENGINEERING TEST CENTER

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
1	16	5					3	2
2	6	15					2	3
R 3	3	2	8	2			6	5
A 4	1	4	6	5			5	5
N 5			10	7		1	7	1
K 6			2	11	4		2	7
7					13	11		2
8				1	9	14	1	1

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly



Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE 4F: COMBINED DATA, CONTACT SCALE IMAGES  
 SCENE C: AIRFIELD

GSD	[Redacted]				12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
1	8	6					2	10
2	4	7					10	5
R 3	11	3	4	2			2	4
A 4	2	9	2	3			7	3
N 5	1	1	16	4	1		4	
K 6			4	17				4
7					14	12		
8					11	14	1	

Note: The number in each cell of the above table represents the number of subjects placing each image in the rank position.

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

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Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

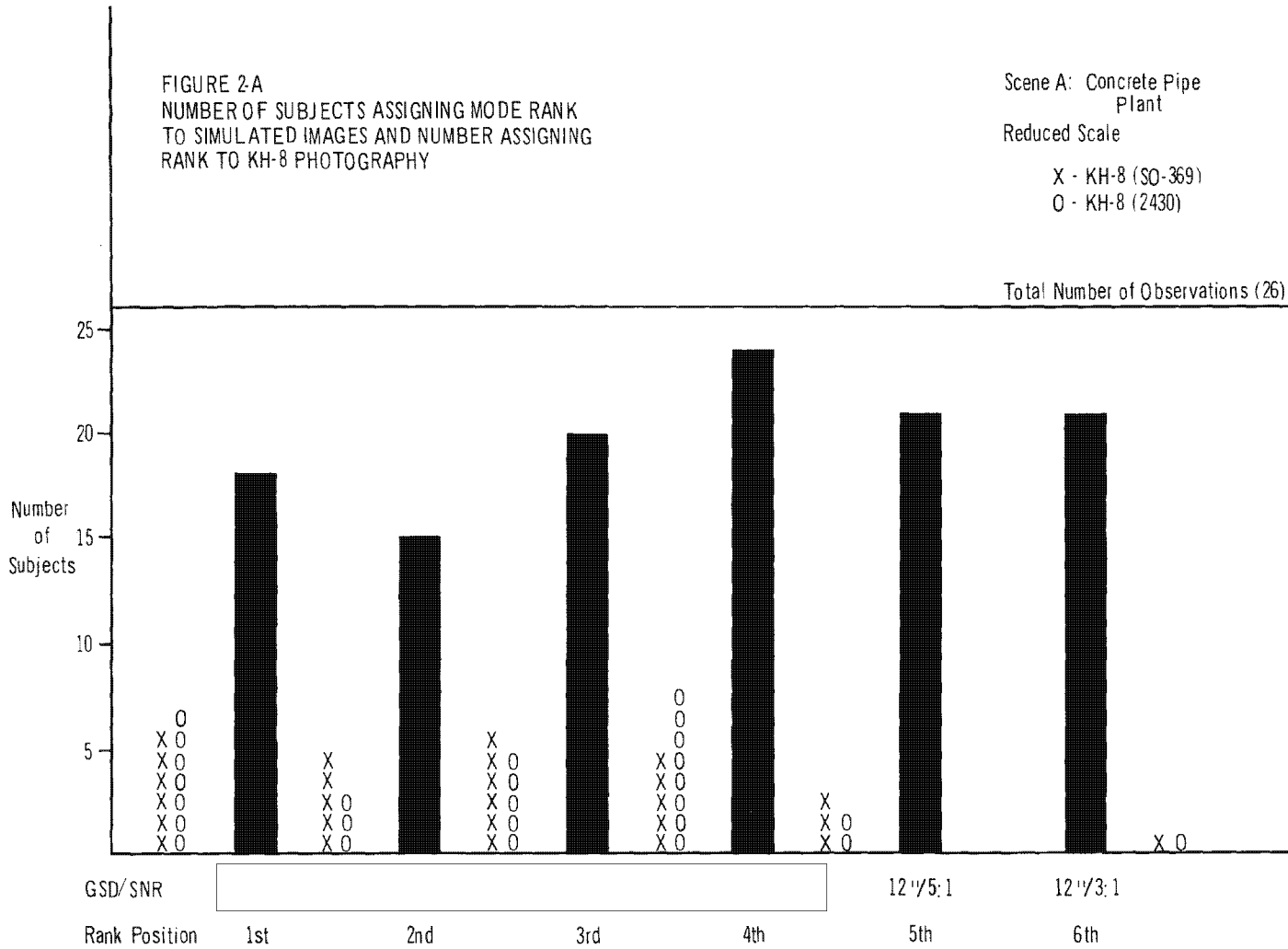
FIGURE 2-A  
NUMBER OF SUBJECTS ASSIGNING MODE RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

Scene A: Concrete Pipe  
Plant

Reduced Scale

X - KH-8 (SO-369)  
O - KH-8 (2430)

Total Number of Observations (26)



GSD/SNR

Rank Position

1st 2nd 3rd 4th 5th 6th

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0242

- 24 -

~~TOP SECRET RUFF ZAMAN~~

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

BYE-3173 0



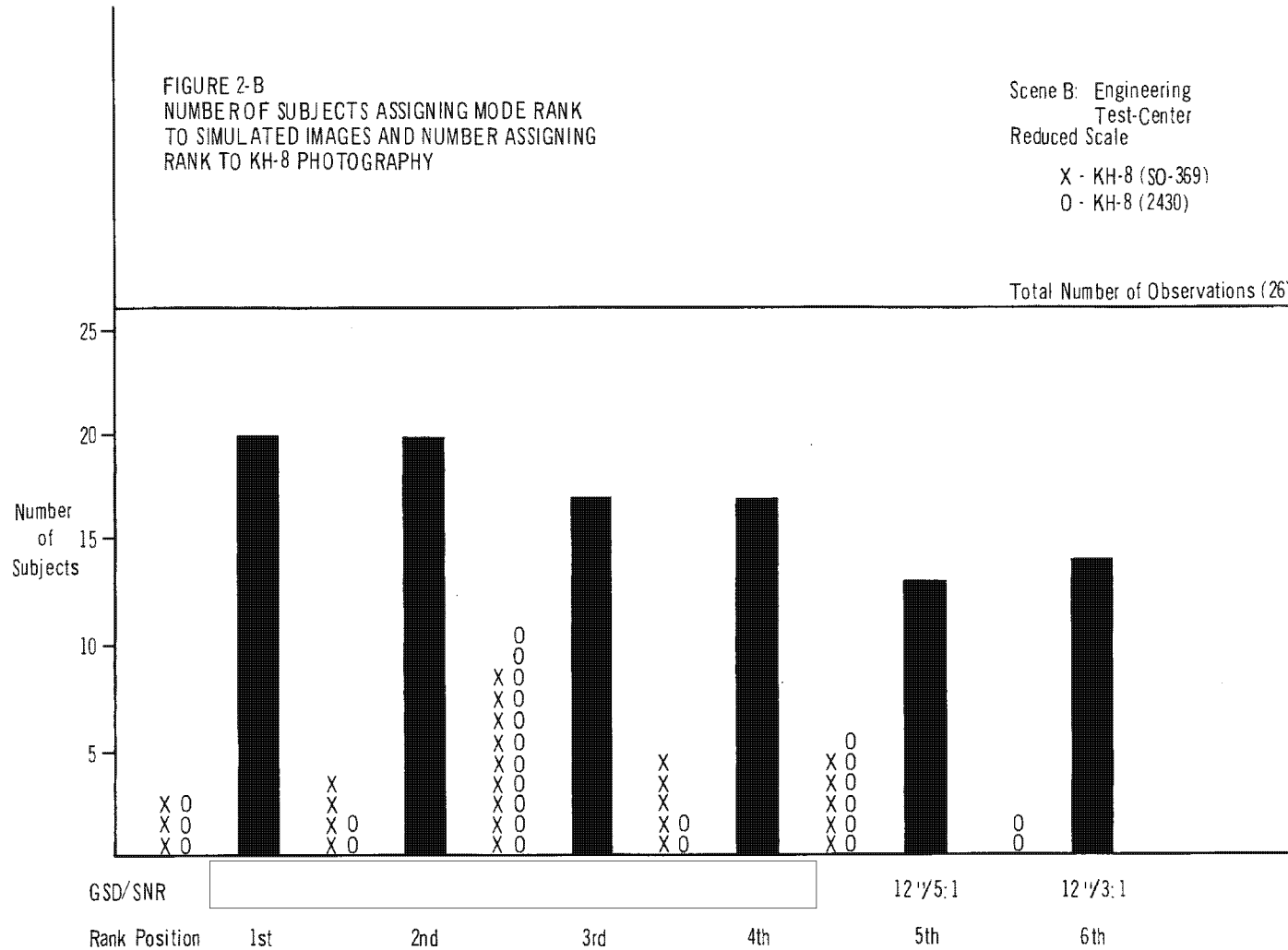
Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

FIGURE 2-B  
NUMBER OF SUBJECTS ASSIGNING MODE RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

Scene B: Engineering  
Test-Center  
Reduced Scale

X - KH-8 (SO-369)  
O - KH-8 (2430)

Total Number of Observations (26)



- 25 -

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 O

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0243

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

FIGURE 2-C  
NUMBER OF SUBJECTS ASSIGNING MODÉ RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

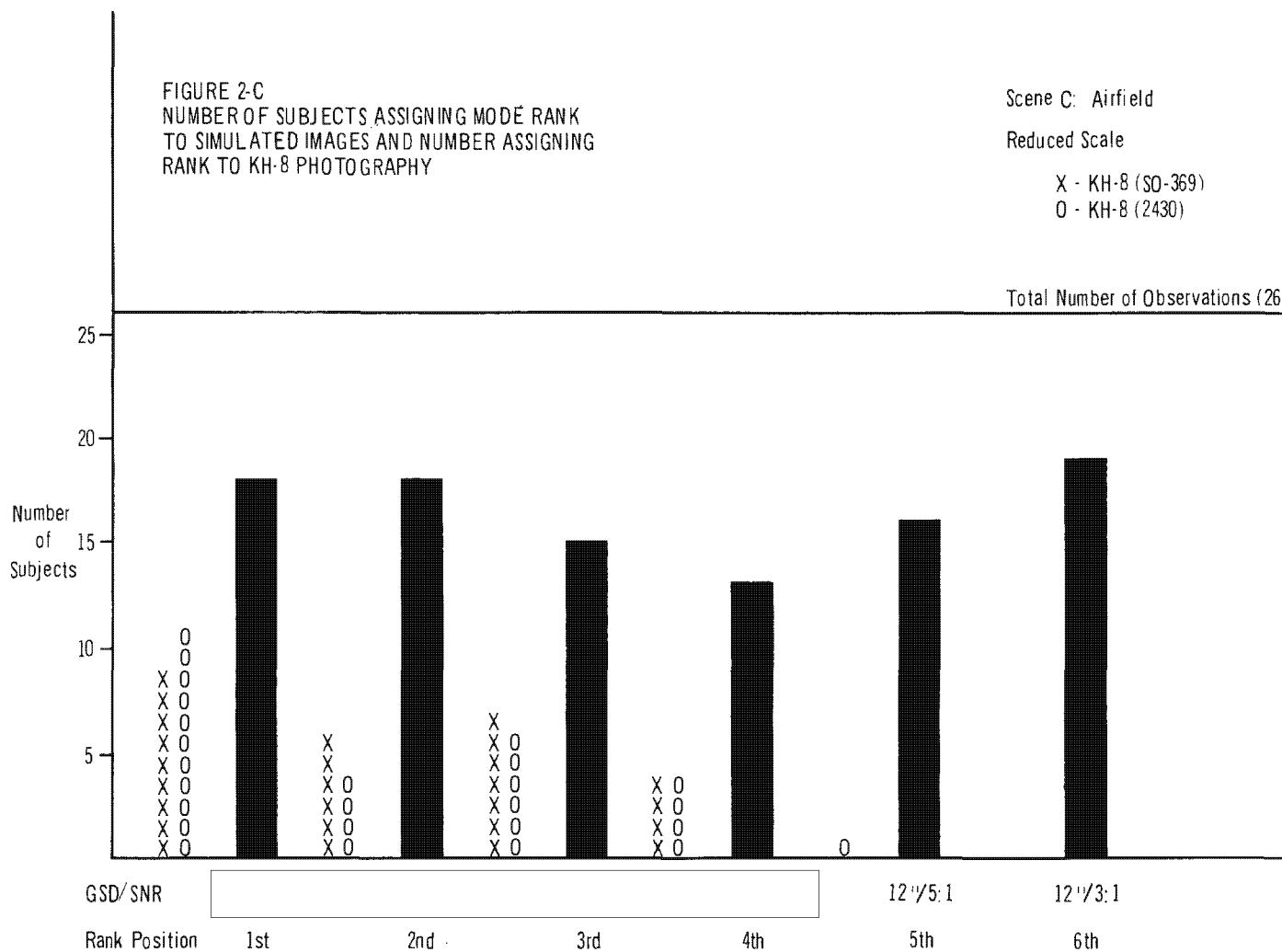
Scene C: Airfield

Reduced Scale

X - KH-8 (SO-369)

O - KH-8 (2430)

Total Number of Observations (26)



~~TOP SECRET RUFF ZAMAN~~

- 26 -

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0244

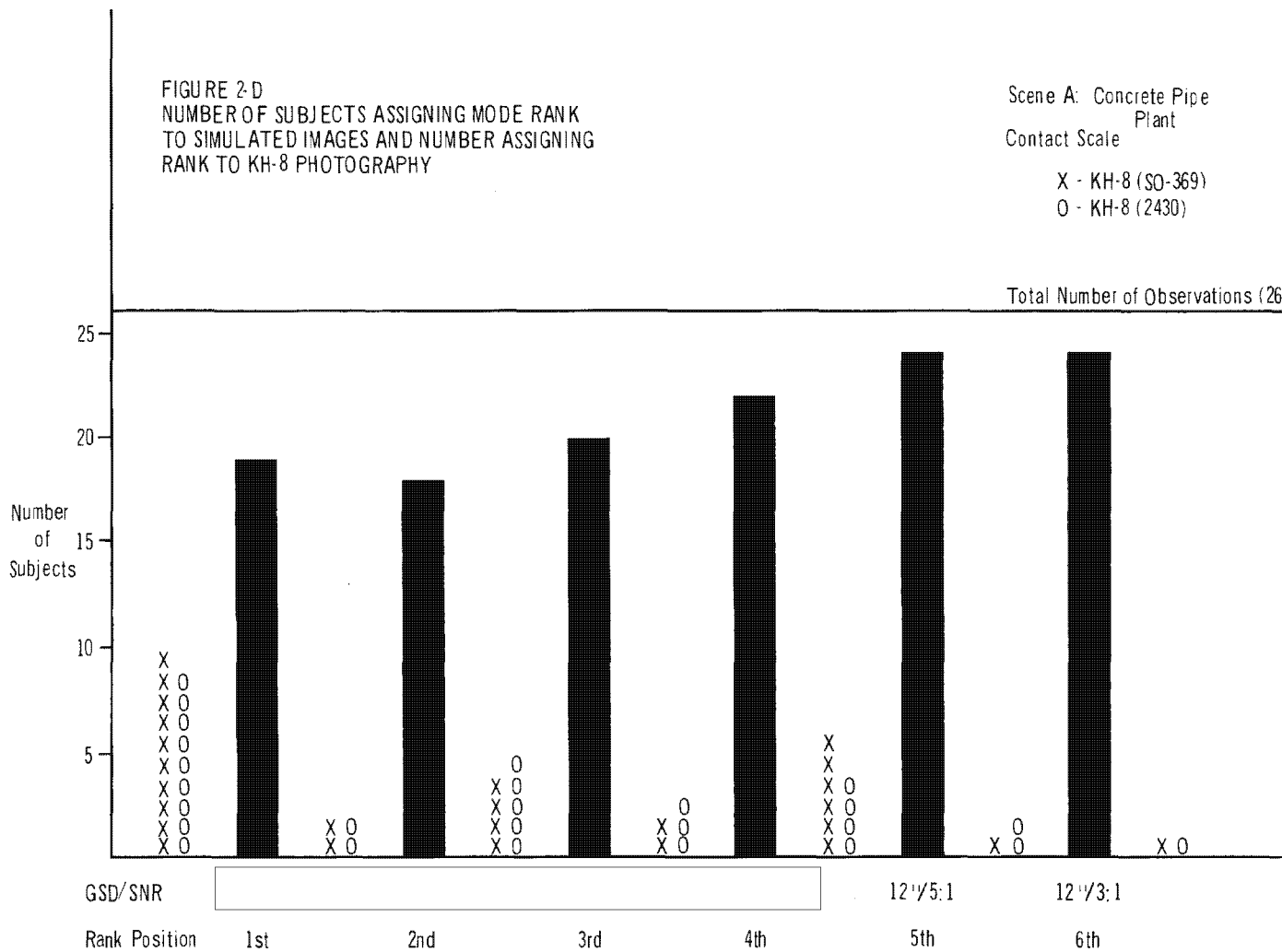
Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

FIGURE 2-D  
NUMBER OF SUBJECTS ASSIGNING MODE RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

Scene A: Concrete Pipe  
Plant  
Contact Scale

X - KH-8 (SQ-369)  
O - KH-8 (2430)

Total Number of Observations (26)



GSD/SNR

Rank Position

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0245

~~TOP SECRET RUFF ZAMAN~~

- 27 -

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

FIGURE 2-E  
NUMBER OF SUBJECTS ASSIGNING MODE RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

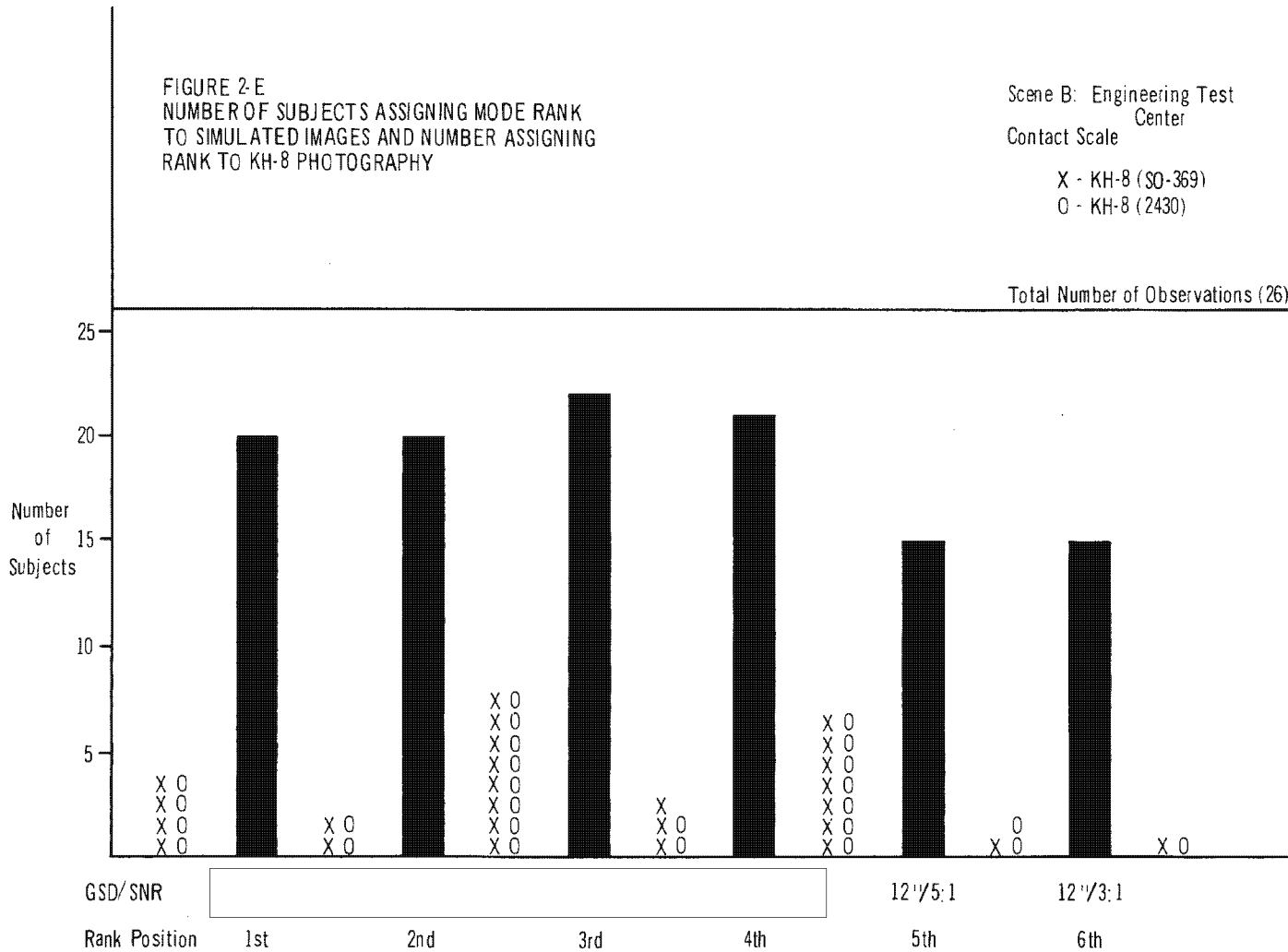
Scene B: Engineering Test  
Center

Contact Scale

X - KH-8 (SQ-369)

O - KH-8 (2430)

Total Number of Observations (26)



~~TOP SECRET RUFF ZAMAN~~

- 28 -

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

BYE-3173 0

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0246

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

FIGURE 2-F  
NUMBER OF SUBJECTS ASSIGNING MODE RANK  
TO SIMULATED IMAGES AND NUMBER ASSIGNING  
RANK TO KH-8 PHOTOGRAPHY

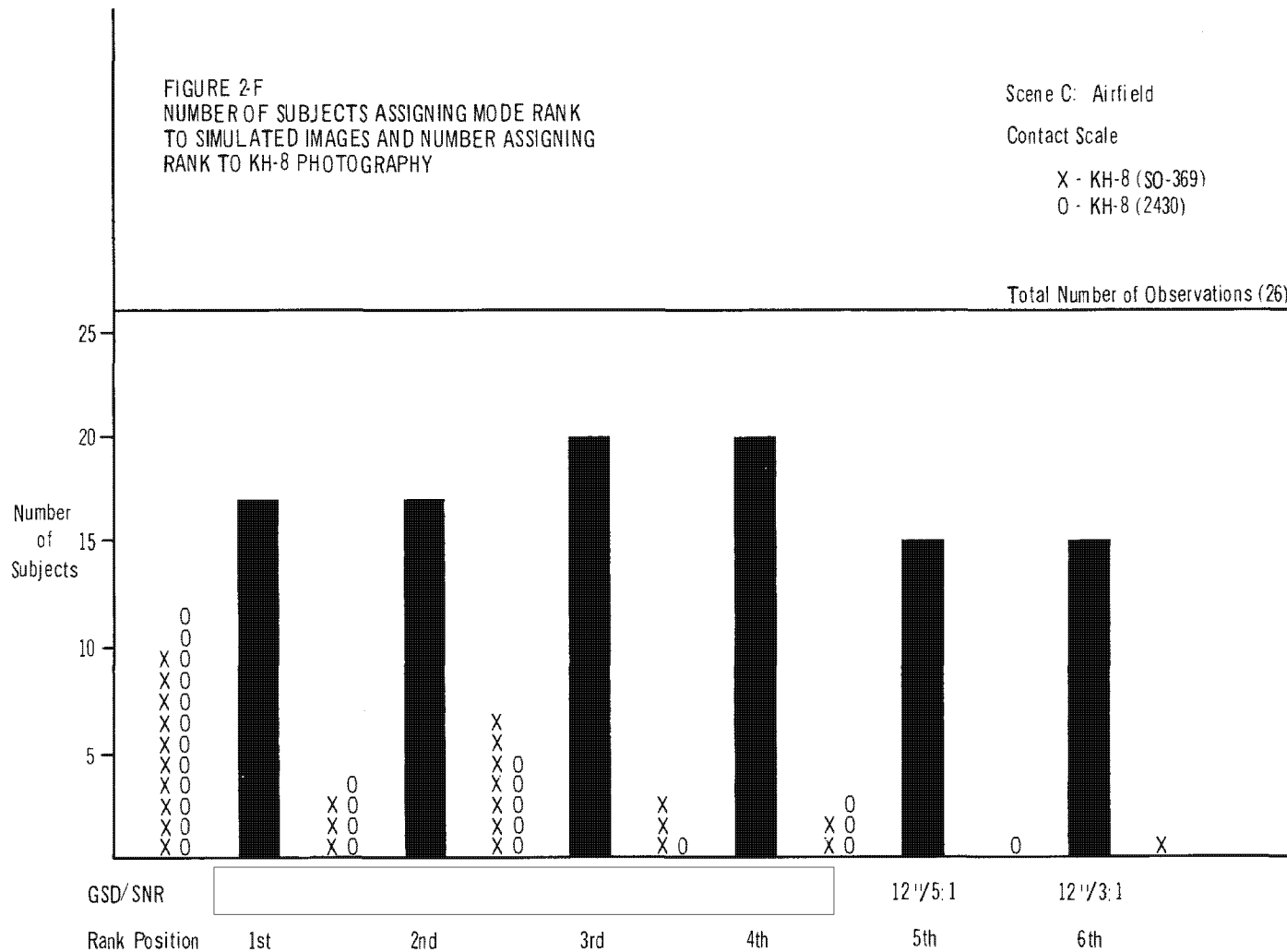
Scene C: Airfield

Contact Scale

X - KH-8 (SO-369)

O - KH-8 (2430)

Total Number of Observations (26)



~~TOP SECRET RUFF ZAMAN~~

- 29 -

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

BYE-3173 O

KH-8 Photography Placed Relative to Predominant Ranking of Simulated Zaman Imagery

NPIC P-0247

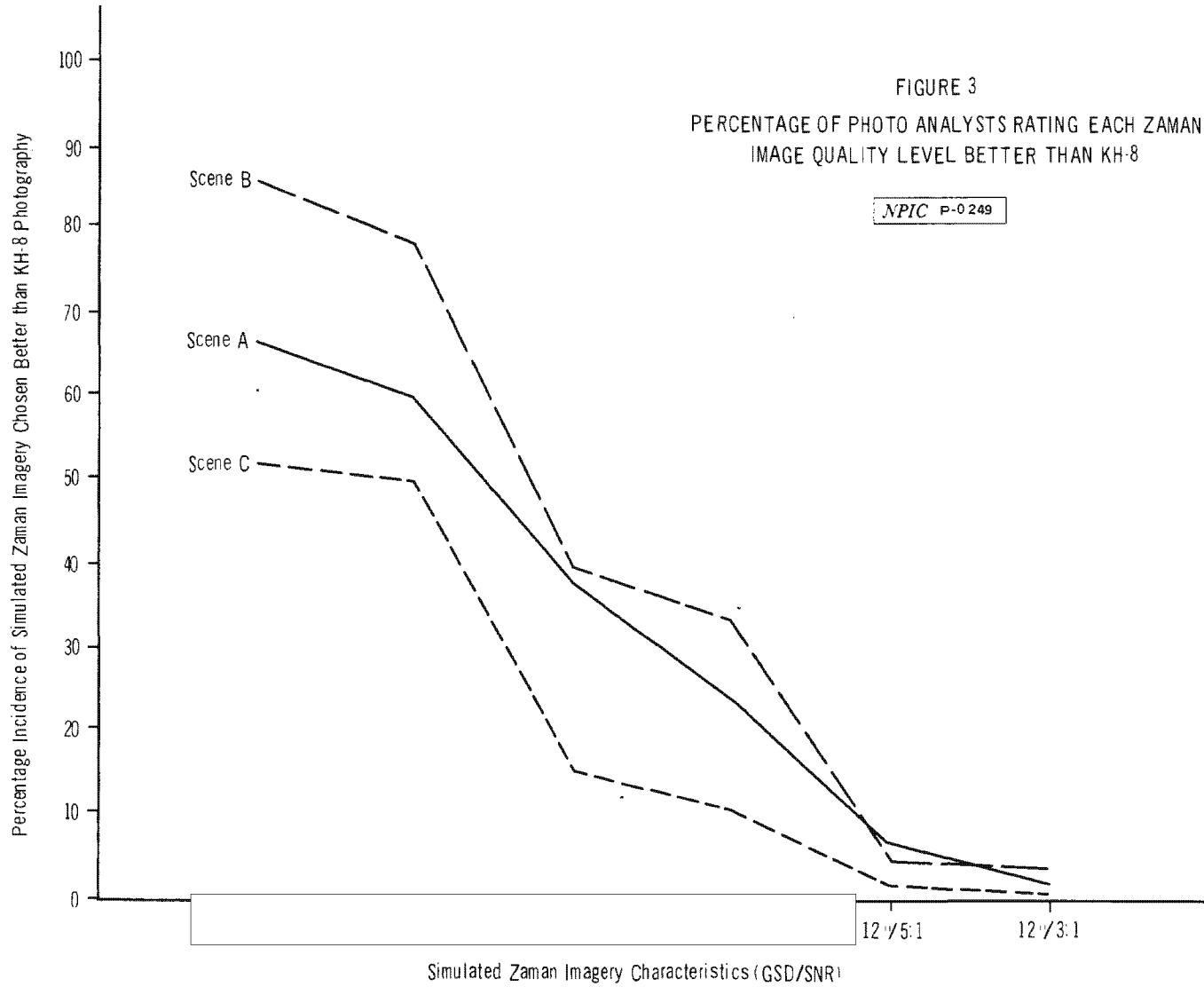
Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

EYE-3173 0

FIGURE 3  
PERCENTAGE OF PHOTO ANALYSTS RATING EACH ZAMAN  
IMAGE QUALITY LEVEL BETTER THAN KH-8

NPIC P-0249



- 30 -

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN TALENT-KEYHOLE  
Control Systems Jointly

Handle Via  
BYEMAN  
TALENT-KEYHOLE  
Control Systems Jointly

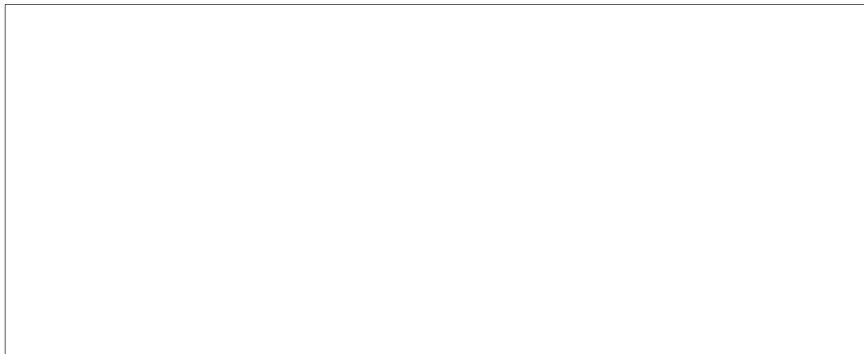
~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

#### IV. CONCLUSIONS

1. Based on the data available in this study, and utilizing any reasonable criteria, the 12 inch ground sample distance imagery with either of the considered signal-to-noise ratios could not duplicate best KH-8 quality.

2. Based on the criteria of the preference of at least 50 percent of the photo analysts, there are several conclusions which can be made from an analysis of the data presented. The most significant of these are:



#### V. RECOMMENDATION

This study attempted to evaluate systematically the simulated Zaman imagery and it was presumed at the outset that ranking of the images would approximately reflect exploitation potential. Although this study represents the best data currently available, the variability of the rankings clearly indicates the risk inherent in basing final system design decisions on the limited data derived solely from this study. For this reason, it is recommended that an exploitation performance study, that is, one in which PIs would respond to test questions on targets with known ground truth, be undertaken to complement this effort. The resulting rankings would then be based on absolute performance factors rather than subjective judgments. The results of such a study should produce more precise conclusions than the current subjective judgment study can provide.

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TALENT-KEYHOLE  
Control Systems Jointly

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BYEMAN  
TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

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Attachment E

S No. \_\_\_\_\_

RESPONSE SHEET

PROJECT 1718

<u>SCENE</u> <u>A</u>	<u>K8</u>	<u>SCENE</u> <u>B</u>	<u>K8</u>	<u>SCENE</u> <u>C</u>	<u>K8</u>
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	

A81	<input type="checkbox"/>	A82	<input type="checkbox"/>
D81	<input type="checkbox"/>	D82	<input type="checkbox"/>
F81	<input type="checkbox"/>	F82	<input type="checkbox"/>

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN  
TALENT-KEYHOLE  
Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F1: SCENE A  
 RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
S1	1✓	3	4✓	6	7✓	8	2✓	5
S2	2✓	1✓	4✓	6	8	7	3	5
S3	3	4	5	6	7✓	8	1✓	2✓
S4	1✓	2✓	5	6	7✓	8	3	4
S5	1✓	2✓	3✓	5	7✓	8	4	6
S6	1✓	2✓	5	6	7✓	8	4	3✓
S7	2✓	1✓	3✓	6	8	7	5	4
S8	2✓	4	5	6	7✓	8	3✓	1✓
S9	3	5	4✓	6	7	8	2✓	1✓
S10	2	4	5	6	7	8	1✓	3✓
S11	2	4	5	6	8	7	3	1✓
S12	2	1✓	4✓	6	7	8	3	5
S13	4	3	5	6	7	8	1✓	2✓
$\Sigma X$	26	36	57	77	94	101	35	42
$\Sigma X^2$	62	122	257	457	682	787	113	172
$\bar{X}$	2.00	2.77	4.38	5.92	7.23	7.77	2.69	3.23
$\sigma$	0.88	1.31	0.74	0.27	0.42	0.42	1.20	1.67

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly



Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F2: SCENE B  
 RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S1	2	1 ✓	3 ✓	5	8	7 ✓	4	6
S2	1 ✓	2 ✓	6	5	7 ✓	8	3 ✓	4
S3	1 ✓	4	5	6	7 ✓	8	2 ✓	3 ✓
S4	1 ✓	2 ✓	3 ✓	(5)	8	7 ✓	4	6
S5	2	1 ✓	6	4 ✓	8	7 ✓	(3)	5
S6	1 ✓	2 ✓	4 ✓	5 ✓	7 ✓	8	6	3 ✓
S7	2	1 ✓	6	4 ✓	8	7 ✓	5	3 ✓
S8	1 ✓	3	5 ✓	6	7 ✓	8	2 ✓	(4)
S9	1 ✓	4	5 ✓	6	8 ✓	7 ✓	2 ✓	3 ✓
S10	(1)	3	6	5 ✓	(8)	7 ✓	2 ✓	4 ✓
S11	1	(2)	6	4 ✓	8	(7)	3	5
S12	1	2	4 ✓	5 ✓	6 ✓	8	3	7
S13	4	3	(5)	6	8	7	1 ✓	2 ✓
$\Sigma X$	19	30	64	66	98	96	40	55
$\Sigma X^2$	37	82	330	342	744	712	146	259
$\bar{X}$	1.46	2.31	4.92	5.08	7.54	7.38	3.08	4.23
$\sigma$	0.84	0.99	1.07	0.73	0.63	0.48	1.33	1.42

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F3: SCENE C  
 RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S1	2 ✓	4	5	6	8	7 ✓	3	1
S2	1 ✓	4	5	6	7	8 ✓	3	2 ✓
S3	3	4	5 ✓	6	8	7 ✓	1 ✓	2 ✓
S4	3	2 ✓	5 ✓	6	7	8 ✓	4	1
S5	1 ✓	2 ✓	5 ✓	4 ✓	7	8	3	6
S6	2 ✓	1 ✓	6	4 ✓	7	8	5	3
S7	1 ✓	2 ✓	5 ✓	6	7 ✓	8	3	4
S8	2	4	5 ✓	6	7 ✓	8	3 ✓	1 ✓
S9	3	4	6	5 ✓	7 ✓	8	2 ✓	1 ✓
S10	4	2 ✓	6	5 ✓	7 ✓	8	3	1
S11	1 ✓	3 ✓	4 ✓	6	8	7 ✓	2 ✓	5
S12	5	3	6	4 ✓	7 ✓	8	1 ✓	2 ✓
S13	4	3	6	5 ✓	8	7 ✓	1 ✓	2 ✓
$\Sigma X$	32	38	69	69	95	100	34	31
$\Sigma X^2$	100	124	371	375	697	772	106	107
$\bar{X}$	2.46	2.92	5.31	5.31	7.31	7.69	2.61	2.39
$\sigma$	1.28	0.997	0.61	0.82	0.46	0.46	1.08	1.60

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F4: SCENE A  
 RAW DATA: RANKING OF CONTACT SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S14	1 ✓	2	4 ✓	5 ✓	7	8	6	3 ✓
S15	1 ✓	2	3 ✓	5 ✓	7	8	6	4 ✓
S16	1 ✓	2	5	6	7	8	3 ✓	4
S17	3	5	4	6	7	8	2 ✓	1 ✓
S18	1 ✓	2	5	6	7	8	3 ✓	4
S19	3	4	5	6	7	8	1 ✓	2 ✓
S20	4	2	5	6	7	8	1 ✓	3 ✓
S21	2	1 ✓	3 ✓	4 ✓	5 ✓	6	7	8
S22	1 ✓	2 ✓	4	6	7 ✓	8	3 ✓	5
S23	1 ✓	2 ✓	3 ✓	4 ✓	5 ✓	8	6	7
S24	1	2 ✓	3 ✓	4 ✓	6 ✓	8	5	7
S25	1	2 ✓	4	6	7 ✓	8	5	3 ✓
S26	1	2 ✓	3 ✓	4 ✓	7 ✓	8	6	5
$\Sigma X$	21	30	51	68	86	102	54	56
$\Sigma X^2$	47	82	209	366	576	804	276	292
$\bar{X}$	1.61	2.31	3.92	5.23	6.61	7.84	4.15	4.31
$\sigma$	1.00	0.99	0.83	0.89	0.74	0.53	1.99	1.98

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F5: SCENE B  
 RAW DATA: RANKING OF CONTACT SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S14	1 ✓	2 ✓	5	6	8	7 ✓	3 ✓	4
S15	1 ✓	2 ✓	3 ✓	5	7	8	6	4 ✓
S16	1 ✓	2 ✓	4	3 ✓	8	5 ✓	6	7
S17	3	4	5	6	8	7 ✓	2 ✓	1 ✓
S18	1 ✓	2 ✓	4	5 ✓	6 ✓	7 ✓	8	3 ✓
S19	1 ✓	2	5	6	7	8	3 ✓	4 ✓
S20	2	4	6	5 ✓	7	8	1 ✓	3 ✓
S21	2	1 ✓	3 ✓	4 ✓	6 ✓	7 ✓	5	8
S22	1 ✓	2	5	6	7	8	4	3 ✓
S23	1	2	3 ✓	4 ✓	7	8	5	6
S24	1	2	3 ✓	5	7	8	4 ✓	6
S25	1	2 ✓	4 ✓	5	7	8	3 ✓	6
S26	2	1 ✓	3 ✓	4 ✓	8	7 ✓	5	6
$\Sigma X$	18	28	53	64	93	96	55	61
$\Sigma X^2$	30	70	229	326	671	718	275	333
$\bar{X}$	1.38	2.15	4.08	4.92	7.15	7.38	4.23	4.69
$\sigma$	0.62	0.86	0.63	0.92	0.66	0.83	1.80	1.90

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F6: SCENE C  
 RAW DATA: RANKING OF CONTACT SAMPLED IMAGERY EVALUATED FIRST

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
S14	1	2	5	6	7	8	4	3
S15	2	1	4	6	7	8	5	3
S16	1	2	3	4	7	8	5	6
S17	3	4	5	6	7	8	2	1
S18	4	1	6	5	8	7	2	3
S19	3	4	5	6	7	8	2	1
S20	3	2	5	6	8	7	4	1
S21	1	2	5	6	8	7	3	4
S22	1	3	5	6	7	8	2	4
S23	3	4	5	6	8	7	1	2
S24	1	2	5	3	7	8	4	6
S25	1	3	5	6	8	7	4	2
S26	1	2	3	6	8	7	5	4
$\Sigma X$	25	32	61	72	97	98	43	40
$\Sigma X^2$	63	92	295	410	727	742	165	158
$\bar{X}$	1.92	2.46	4.69	5.54	7.46	7.54	3.31	3.08
$\sigma$	1.07	1.01	0.89	0.93	0.49	0.49	1.32	1.64

53  
~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F7: SCENE A  
 RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED SECOND

GSD					12"	12"	KI-8	KI-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S14	1	3	2	5	7	8	6	4
S15	1	4	2	6	7	8	5	3
S16	1	2	4	6	7	8	5	3
S17	3	4	5	6	7	8	2	1
S18	3	1	6	4	8	7	2	5
S19	3	4	5	6	7	8	2	1
S20	2	3	1	5	8	7	6	4
S21	1	2	3	4	5	6	8	7
S22	1	3	5	6	7	8	4	2
S23	1	2	3	6	7	8	5	4
S24	4	1	2	3	7	8	5	6
S25	1	4	5	6	7	8	2	3
S26	2	1	5	6	7	8	3	4
$\Sigma X$	24	34	48	69	91	100	55	47
$\Sigma X^2$	58	106	208	379	643	774	277	207
$\bar{X}$	1.85	2.61	3.69	5.30	7.00	7.69	4.23	3.61
$\sigma$	1.03	1.14	1.54	0.99	0.68	0.60	1.85	1.69

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~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
BYEMAN  
TALENT-KEYHOLE  
Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F8: SCENE B  
RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED SECOND

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
S14	1	2	3	4	7	8	6	5
S15	1	2	4	6	7	8	5	3
S16	1	2	5	6	7	8	3	4
S17	3	4	5	6	7	8	2	1
S18	2	1	3	4	8	6	7	5
S19	1	2	6	5	8	7	3	4
S20	1	2	3	4	6	8	5	7
S21	1	2	7	5	6	8	3	4
S22	1	2	5	6	7	8	4	3
S23	1	2	3	4	7	8	6	5
S24	1	2	3	5	8	7	4	6
S25	3	4	6	5	7	8	1	2
S26	2	1	6	5	8	7	3	4
$\Sigma X$	19	28	59	65	93	99	52	53
$\Sigma X^2$	35	70	293	333	671	759	244	247
$\bar{X}$	1.46	2.15	4.54	5.00	7.15	7.61	4.00	4.07
$\sigma$	0.74	0.86	1.39	0.78	0.66	0.62	1.66	1.54

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~~TOP SECRET RUFF ZAMAN~~

Handle Via  
BYEMAN  
TALENT-KEYHOLE  
Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F9: SCENE C  
 RAW DATA: RANKING OF REDUCED SAMPLED IMAGERY EVALUATED SECOND

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
S14	1	3	5	6	7	8	4	2
S15	1	2	4	6	7	8	5	3
S16	1	2	5	6	7	8	3	4
S17	3	4	5	6	8	7	1	2
S18	4	1	6	5	7	8	2	3
S19	4	3	6	5	7	8	1	2
S20	1	2	4	7	6	8	5	3
S21	1	2	3	7	6	8	4	5
S22	4	3	6	5	7	8	2	1
S23	3	4	5	6	7	8	2	1
S24	1	2	7	4	6	8	3	5
S25	2	4	5	6	8	7	1	3
S26	1	2	6	5	8	7	3	4
$\Sigma X$	27	34	67	74	91	101	36	38
$\Sigma X^2$	77	100	359	430	643	787	124	132
$\bar{X}$	2.08	2.61	5.15	5.69	7.00	7.76	2.77	2.92
$\sigma$	1.27	0.92	1.03	0.83	0.68	0.42	1.36	1.27

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly



Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F10: SCENE A  
 RAW DATA : RANKING OF CONTACT SAMPLED IMAGERY EVALUATED SECOND

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S3	2	4	5	6	7	8	1	3
S10	6	5	4	2	7	8	1	3
S7	1	2	4	3	7	8	6	5
S2	1	2	6	5	7	8	3	4
S1	1	3	4	6	7	8	2	5
S9	3	4	5	6	7	8	1	2
S8	4	2	5	6	7	8	3	1
S4	1	2	3	4	7	8	5	6
S5	2	1	5	3	7	8	4	6
S12	3	4	5	6	7	8	1	2
S11	4	5	3	6	8	7	2	1
S6	4	3	5	6	8	7	2	1
S13	3	4	5	6	7	8	1	2
$\Sigma X$	35	41	59	65	93	102	32	41
$\Sigma X^2$	123	149	277	351	667	802	112	171
$\bar{X}$	2.69	3.15	4.54	5.00	7.15	7.84	2.46	3.15
$\sigma$	1.49	1.23	0.84	1.41	0.36	0.36	1.60	1.79

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Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F11: SCENE B  
 RAW DATA : RANKING OF CONTACT SAMPLED IMAGERY EVALUATED SECOND

GSD					12''	12''	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	SO369	2430
S3	1	2	4	5	7	8	3	6
S10	1	3	5	6	7	8	4	2
S7	1	2	3	4	6	8	5	7
S2	2	1	4	3	7	8	5	6
S1	1	3	5	6	8	7	2	4
S9	1	2	3	6	8	7	4	5
S8	2	1	5	6	8	7	3	4
S4	1	2	3	4	7	8	5	6
S5	2	1	4	6	8	7	5	3
S12	3	4	5	8	6	7	1	2
S11	4	2	6	5	8	7	3	1
S6	1	2	5	6	7	8	4	3
S13	3	4	5	6	7	8	1	2
$\Sigma X$	23	29	57	71	94	98	45	51
$\Sigma X^2$	53	77	261	407	686	742	181	245
$\bar{X}$	1.77	2.23	4.38	5.46	7.23	7.54	3.46	3.92
$\sigma$	0.97	0.97	0.92	1.22	0.70	0.49	1.39	1.85

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Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET RUFF ZAMAN~~

BYE-3173 0

TABLE F12: SCENE C  
 RAW DATA : RANKING OF CONTACT SAMPLED IMAGERY EVALUATED SECOND

GSD					12"	12"	KH-8	KH-8
	5:1	3:1	5:1	3:1	5:1	3:1	S0369	2430
S3	3	4	5	6	7	8	1	2
S10	3	1	6	5	7	8	4	2
S7	2	1	3	4	5	7	8	6
S2	1	2	6	5	8	7	4	3
S1	2	4	5	6	7	8	3	1
S9	3	4	5	6	7	8	2	1
S8	3	4	5	6	7	8	2	1
S4	2	1	3	4	7	8	5	6
S5	3	1	5	6	7	8	4	2
S12	3	4	6	5	8	7	2	1
S11	5	6	4	3	8	7	2	1
S6	3	4	5	6	8	7	2	1
S13	4	3	5	6	8	7	2	1
$\Sigma X$	37	39	63	68	94	98	41	28
$\Sigma X^2$	117	149	317	368	688	742	171	100
$\bar{X}$	2.85	3.00	4.85	5.23	7.23	7.54	3.15	2.15
$\sigma$	0.95	1.57	0.95	0.97	0.80	0.50	1.79	1.75

~~TOP SECRET RUFF ZAMAN~~

Handle Via  
 BYEMAN  
 TALENT-KEYHOLE  
 Control Systems Jointly

~~TOP SECRET~~

~~TOP SECRET~~