C00864

~~TOP SECRET - GAMBIT~~

SYSTEM

PERFORMANCE EVALUATION TEAM

(FLIGHT MISSION CHARACTERISTICS)

MISSION 4010/64

~~TOP SECRET - GAMBIT~~

~~TOP SECRET - GAMBIT~~

BCS 24571-64

SPR 4-072

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SYSTEM

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(FLIGHT MISSION CHARACTERISTICS)

MISSION 4010/64

Aug '64

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FOREWORD

THIS REPORT PREPARED FOR AND BY DIRECTION OF
THE DIRECTOR OF SPECIAL PROJECTS
OFFICE OF
THE SECRETARY OF THE AIR FORCE

Preparing Unit:
Performance Evaluation Team
Los Angeles AF Station
Los Angeles 45, California

PERFORMANCE EVALUATION TEAM
REPORT NO. 4010/64

PUBLICATION REVIEW

This report has been reviewed and is approved.

VICTOR M. GENEZ
Colonel, USAF
Team Manager

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4010/64

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BCS 24571-64

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SECTION I

RESUME OF MISSION 4010

Mission 4010, consisting of the GAMBIT Camera, the Stellar/Index Camera Unit (SIC), and the Orbit Control Vehicle System (OCV), was launched into orbit from Point Arguello Launch Complex, Pad 4, at 2200:14Z on 14 August 1964.

The satellite vehicle was boosted into orbit by a Standard Atlas/Standard Agena combination with nominal ascent and injection. The satellite vehicle achieved the following orbital parameters:

	Nominal (sec)	Actual (sec)
Inclination (degrees)	95.3	95.5
Period (minutes)	89.1	89.18
Apogee (nautical miles)	171.27	176.5
Perigee (nautical miles)	84.24	84.45
Eccentricity		.0129

The operational objectives of Mission 4010 were to conduct a five-day photographic mission to obtain high resolution photography of selected target areas as defined by the (S) NRO Staff. Orbit adjust maneuvers were scheduled to be executed to lower perigee to 75NM on Rev 12 and to shift ground trace as required to maximize target score. Following separation and recovery of the payload capsule, an orbit adjust maneuver was to be executed to de-orbit the OCV.

These mission objectives were only partially realized due to a malfunction of the command programmer which prevented loading of commands subsequent to Rev 19. Only one and one-half days of operational photography, and no R&D photography, was obtained. Due to misalignment of the slit, the photography obtained was degraded with ground resolution on the order of five to ten feet. Recovery of the capsule was initiated by BUSS on Rev 50 after recovery attempt on Rev 34 was unsuccessful because of a faulty transmitter component. The payload capsule was recovered by air snatch on 18 August 1964. Due to lack of command capability, no de-boost of the OCV was effected, thus through spiral decay the OCV re-entered the earth's atmosphere on Rev 133 at approximately 0144Z on 22 August 1964.

The following subjective evaluation was submitted by the National Photographic Interpretation Center (NPIC): The quality of the photography does not compare favorably with the known capability of the system. Enlargements up to 40 diameters are being used by the photo interpreters, but a combination of inferior resolution and possible overexposure somewhat degrades the imagery. The absence of the time track, coupled with a defective yaw slit and extremely limited Stellar/Index photography, makes it extremely difficult to effectively utilize the photography to its fullest extent. The programmed stereo coverage achieved is very good and enhances the photo interpretation of those areas. Some image streaking along the major axis of the film was noticed on the high oblique photography.

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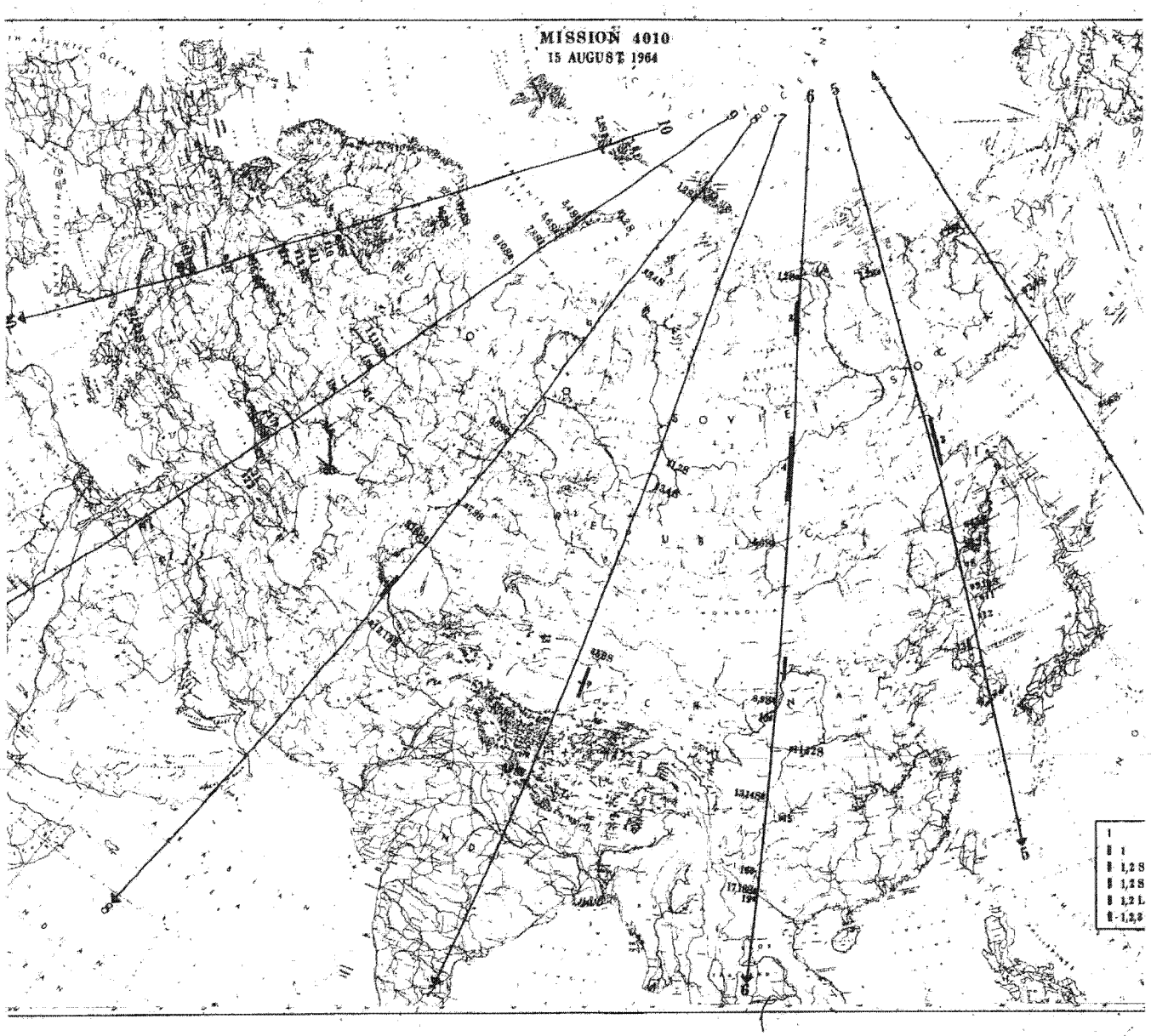
AM



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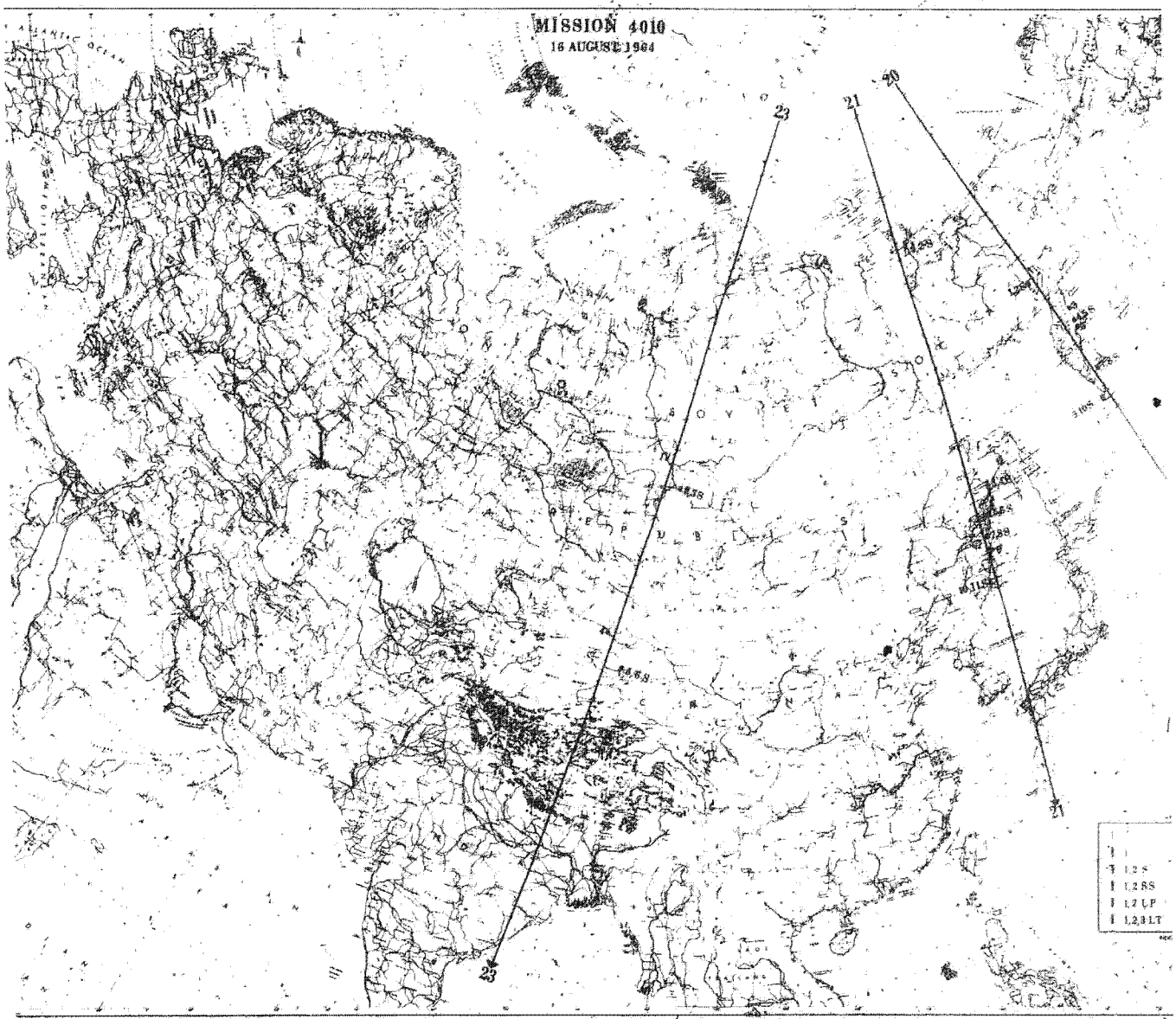

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SECTION II

FLIGHT PROGRAM

A. Performance of the Command System

1. Due to the system anomaly experienced with the command program decoder, primary payload commands were generated and loaded only for Revs D04 through D10 and Revs D19 through D23. Payload commands for Revs D19 and D22 were not executed because the satellite vehicle departed the station in the stored programmer mode. Payload commands for Revs D24 through D27, Revs D35 through D44, and Revs D51 through D59 were generated but not loaded because of the previously mentioned vehicle programmer malfunctions. A total of 39 stereo pairs and 53 strip frames of photography was programmed by those commands successfully loaded and executed. Of these, clouds obscured approximately 50% of the photographic frames obtained.

a. Command message 103 was loaded on Rev 04 at Pogo Tracking Station (PTS) for payload operations on Revs D04 and D05 to obtain seven stereo pairs and five strip frames.

b. Command message 105 was loaded on Rev 06 at New Hampshire Tracking Station (NHS) to obtain nine stereo pairs and 10 strip frames on Revs D06 and D07.

c. Command message 106 was loaded on Rev 08 at Vandenberg Tracking Station (VTS) to obtain 16 stereo pairs and 23 strip frames on Revs D08, D09, and D10.

d. Command message 113 was loaded on Rev 18 for payload operations on Revs D19 through D23, but subsequent attempts to update this command message resulted in loss of photography on Revs D19 and D22. The resultant photography of message 113 consisted of seven stereo pairs and 15 strip frames.

2. Due to failure of the Stellar/Index Camera (SIC) System, no SIC photography was commanded after Rev 10.

B. Geopositioning

1. The photographic map match effort was conducted using the technique of identifying photo bench marks on the photography and correlating these positions with bench marks located on the best available Series 200 Target Charts or Operational Navigational Charts (see Photo-Map Positioning Sheets, Appendix A, for map accuracy).

2. A total of 133 photographic frames was plotted on the Mission Coverage Index. However, only 131 frames were available for map match (see paragraph A5, Section IV, for explanation). Eighty-one frames contained adequate imagery to permit map match. Three of these frames did not have sufficient common detail between the map and photography to perform the map match. Because the timing marks were not exposed on the film, the map match miss distances could be measured only in terms of the cross-track distances with any degree of precision. The computer program for making the skew correction

scale corrections, and miss distance averages was not used. The skew and scale corrections were applied manually when the cross-track measurements were made. The center line of the actual photography plots to the west of the predicted center line location in all but four frames of the photography. For the areas of good chart coverage and reliable bench marks, this bias is of the order of one nautical mile. This will be investigated to see if the Mission Correlation Data, or some other element in the commanding system, contributes to this bias.

3. A determination of the location of the target position on the film format was made. This was accomplished by a correlation between cultural features on the charts and corresponding photography. Displacement from the center line was computed by measuring the distance from the fiducial line to target position and subtracting this distance from one-half the film width. The following table shows the displacement of the target location from the center line of the format:

Inches	No. of Observations
0 - 0.5	13
0.5 - 1.0	12
1.0 - 1.5	15
1.5 - 2.0	5
2.0 - 2.5	8
2.5 - 3.0	2
3.0 - 4.0	2
Off Film	1

Where several targets are framed by an exceptionally long burst, the targets are displaced from center line of photography due to the earth's rotation for which no roll corrections are made. This was noticed on Rev D10, Frame 014. The only observed instance where the target location did not appear occurred on Rev D21, Frame 011. Rev D21, Frames 010 and 011 were programmed for stereo photography of two targets. The location of the second target does not appear on Frame 011.

4. To determine the commanding accuracy in the in-track direction, measurements were taken from the beginning and the end of the format. The accuracy of the GAMBIT photographic system is shown by the fact that no target location appeared closer than 5.6" from the beginning of the exposure, nor 5.7" from the termination of the exposure.

SECTION III

PHOTOGRAPHIC CHARACTERISTIC EVALUATION SUMMARY

(SPPL Report No. 101-1-29)

The following observations result from an analysis of original negatives from Reconnaissance Satellite Mission 4010:

A. Minus-density streaks, located 1" and 3" from the non-titled edge, occurred on Revs D04, D05, D06, D08, and D09. Revs D10, D20, D21, and D23 contained only the minus-density streak 3" from the edge.

B. The mission was exceptionally clean and free of scratches, lint, or other degradations.

SECTION IV

CAMERA SYSTEM OPERATIONS

A. Primary Camera

1. Film Transport: No malfunctions were observed. The start-up transient was shorter than usual, ending in less than one second but with two small ripples extending slightly more than one second. With no data track present, film velocity measurements could not be taken. However, the evenness of the tone did not indicate any film velocity variation modulation. The stopping transient was very short, usually consuming only one-half inch of record travel. The take-up motor actuations during strip lengths, which overrun the take-up looper, were minimal as far as their result on film velocity was concerned. Tracking appeared to be constantly good.

2. Slit: The No. 2 slit used appeared to be clean. However, in the MAB when the slit was moved into place, a human error occurred. The slit was not properly aligned with the platen. It was skewed to the Z axis by .020" to .040" at its end. Further, it was not centered on the apex of the crown of the round platen but was translated to one side by about .140". This had several serious effects. The primary effect was the image falling to one side of the crown creating an out of focus condition estimated as .004" to .005" from the plane of the best focus. Depth of field of this system is estimated as $\pm$ 1.5 thousandths of an inch. Double imagery resulted in the loss of considerable resolution in the X direction (along flight line). Further, the larger of the double yaw slits on the title side was obscured. On the time track side, this also resulted in a constant X displacement due to the built-in crab condition.

3. Double Yaw Slit: The larger slit of the title side pair was obscured. See paragraph 2 above.

4. Time Track: The time tracks did not appear anywhere in the record. Due to the skewing of the slit aperture plate, the two small holes in the plate through which the data track bulbs peer were misaligned and completely cut off any bulb light. On orbit, the output of CPL-19 on TLM indicated both tracks were operable.

5. Footage Utilization: The film supply was loaded with 2,938 feet of Type 4404 emulsion. At lift-off, 198 feet was in the take-up. Prior to each pass, seven feet of blank film was transported to remove film "set". At the end of each pass, five feet was transported to signal end-of-pass and provide the processor with sufficient footage to change processing state, if necessary. A health check was made on Rev 02, using 47.7 feet. The between-pass blanks amounted to 120 feet. The operational take was approximately 330 feet. Due to the commanding anomaly, three photos were lost when the cutter/sealer was actuated for the recovery sequence. The bucket returned approximately 700 feet of record.

6. Exposure: Densities were generally heavy. The No. 2 slit (.0166") was selected to expose targets between 45°N and 60°N when the perigee was at 75NM. Due to the commanding anomaly, the orbit

adjust was not performed to lower perigee from 84NM to 75NM. This resulted in lower film velocities and longer exposures, providing heavy densities.

7. Tone Analysis: Tone traces will be taken on five frames as part of a continuing tone study using microdensitometer traces. Results to date indicate the most probable tone in sun angles from 60° to 90° is 800 ft lamberts with a lower one sigma variation about 600 ft lamberts. Dmin values taken by a half-millimeter aperture with a densitometer agree very closely with Dmin values obtained by a 5.8μ aperture tone trace taken by a microdensitometer. Dmin values taken from snow scenes where the values are taken from the tones of areas cleared of snow are considerably higher than normal as densitometer values had previously indicated. This is probably due to the increased scattered light from the highly reflective snow cover.

B. Resolution

Due to the double imagery prevalent throughout the take, the photos were generally soft. Usually, where 40X to 60X magnification is used to view the microdetail, 20X, and occasionally 30X, had to be used. The double images were always displaced in the line of flight. Estimated limiting resolution was of the order of five to ten feet.

C. Stellar-Index Camera

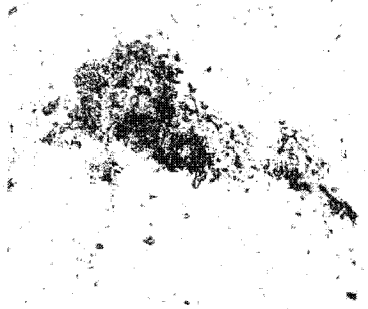
1. Stellar Analysis: Approximately 75 ft. of 35mm, Type 4401 emulsion was loaded in the supply. Due to the early stoppage of the S/I (Rev + 1.8), only 64 1/2" were recovered. No explanation for the stoppage is available at this time. No correlation lamps appeared, but it was known prior to lift-o that these lamps had malfunctioned. The fiducial lamps were trimmed too high and bloomed into spots 3/16" in diameter. There are 32 frames of ground test and seven orbital frames before the cutter/sealer cut. It is estimated that 16 more frames were taken but remained on orbit in the film chute and camera. The first orbital stellar frame was taken seconds after the IR horizon scanner was turned off, and shows streaked stars. The length of the streaks indicate an attitude change of 0.35°/second. The remaining six stellar shots show stars but no streaks. The S/I operated for 23 or 24 orbital frames.

2. Index Analysis: Approximately 135 ft. of 70mm, Type 4400 emulsion was loaded in the supply. Only 108" were recovered. Twelve index frames are visible before the cutter/sealer cut. There are 11 frames left on orbit in the film chute and camera. These frames show the approach to the South Pole and passage into the dark side of the Earth. The title edge format corners are pulled out as though the platen had not come completely down on the film. There is an obscuration on the non-title side in the reseau number block. No correlation lamp shows. There are 64" of blank film where checkout frames were taken with the hatch in place. No shutter or film transport malfunction was observed. The index material is numbered in the wrong direction. The frames show an 80% overlap. This is due to the fixed 15 second cycle of operation, and the altitude over the South Pole of 130 to 140NM.

D. Experimental Operations

Due to extensive cloud cover, no R&D operations were programmed the first day. Due to the command anomaly, no R&D operations could be loaded for any other day. No CORN target support was exercised for these reasons.

PHOTOGRAPH 1



Example of Double Image from Title Edge of Format

Rev D08, Frame 001

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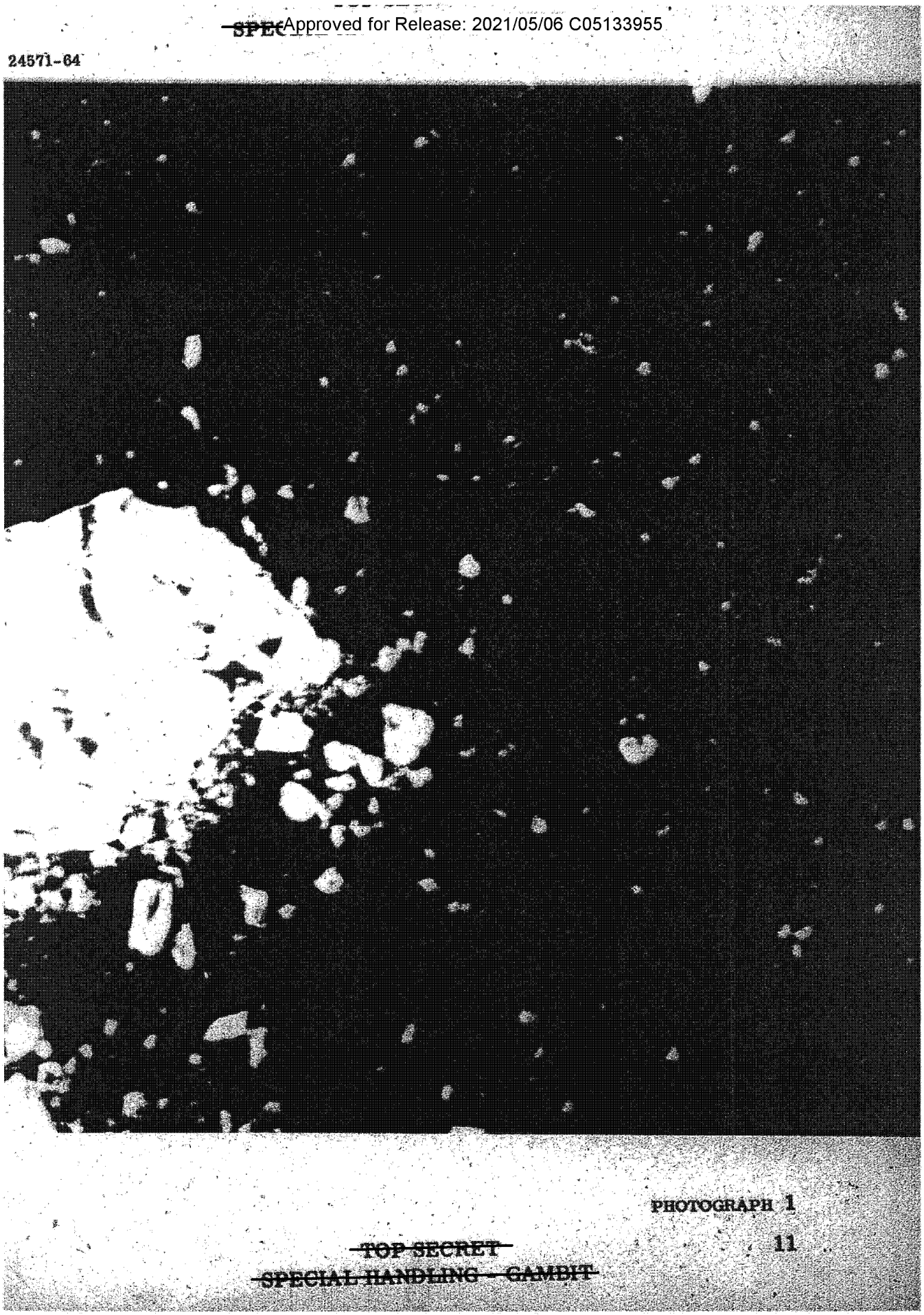


PHOTOGRAPH 1

PHOTOGRAPH 2

Example of Double Image from Center of Format.

Rev D08, Frame 001

CS 24571-64

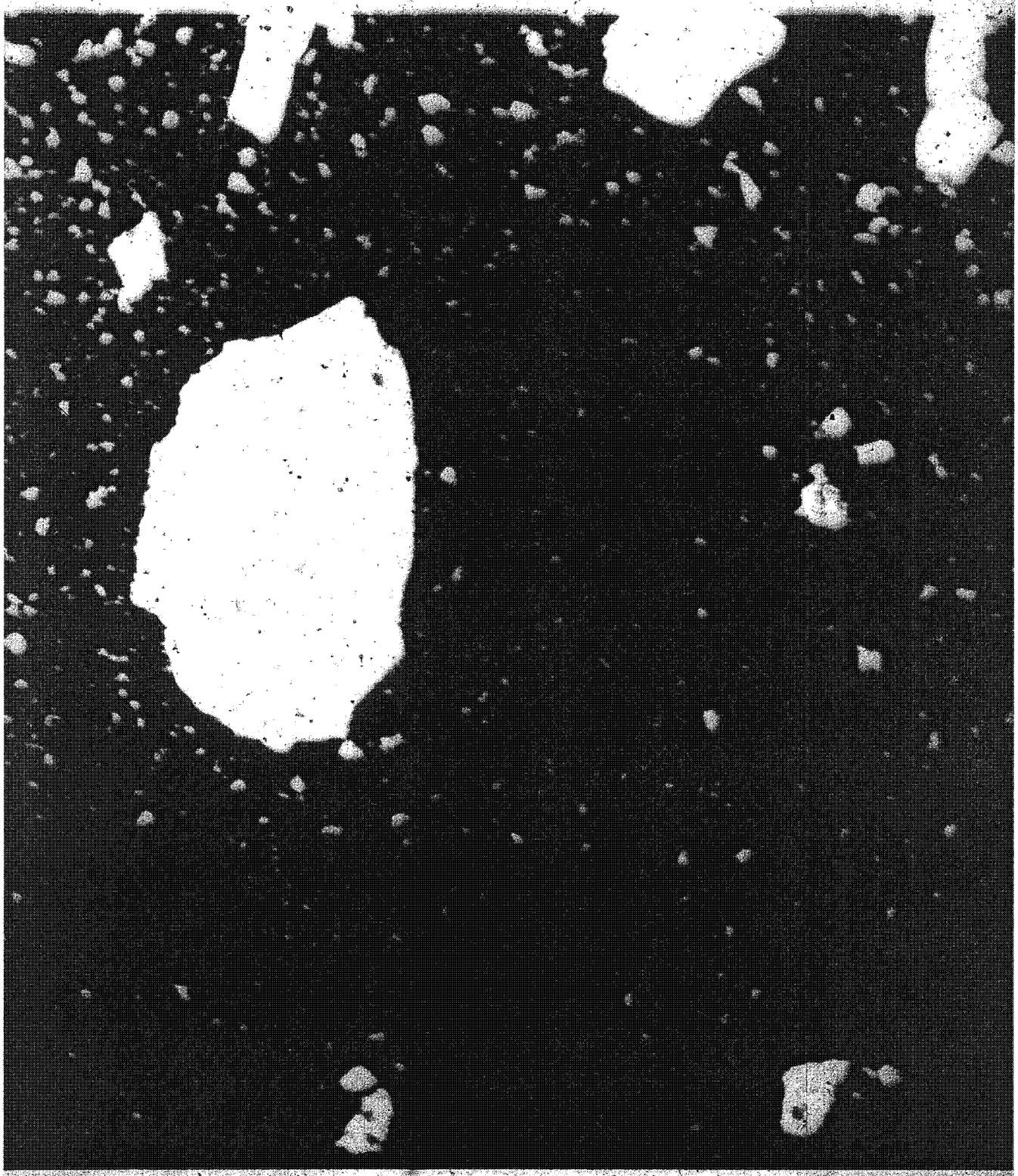
PHOTOGRAPH 2

PHOTOGRAPH 3

Example of Double Image from Time Track Edge of Format

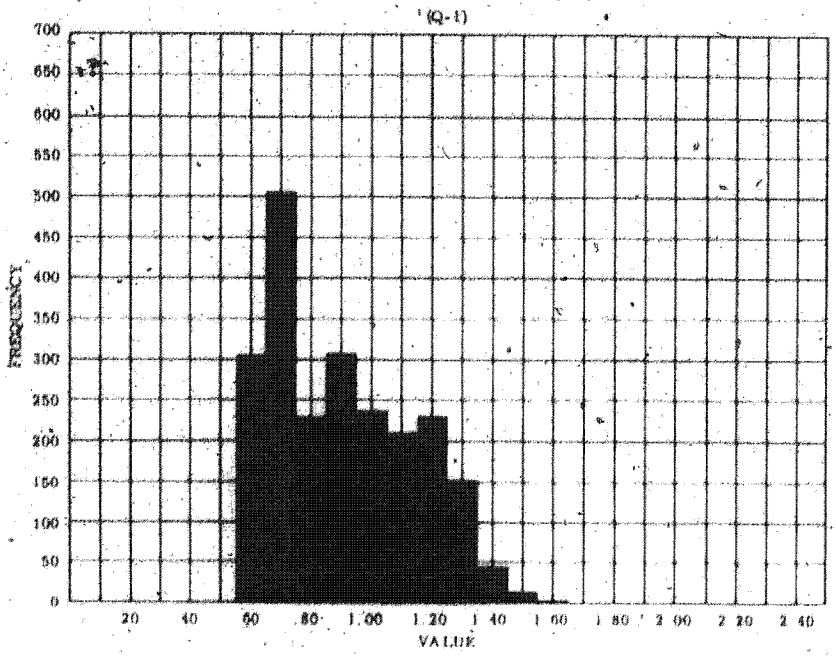
Rev D08, Frame 001

S 24571-64

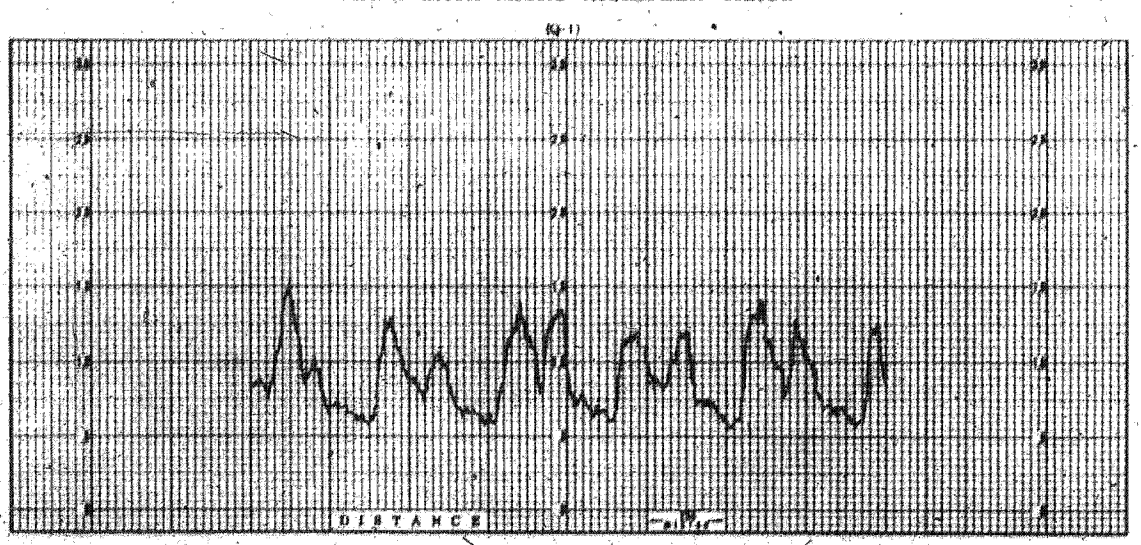


PHOTOGRAPH 3

FREQUENCY DISTRIBUTION



MANN-DATA MICRO-ANALYZER TRACE



PASS 006 FRAME 005 CAMERA POSITION

MA SCAN SPEED 1 mm/mia CHART SPEED 6"/mia SPOT SIZE 1.5μ

ILLUSTRATION 3

BCS 24571-64
PERFORMANCE EVALUATION TEAM
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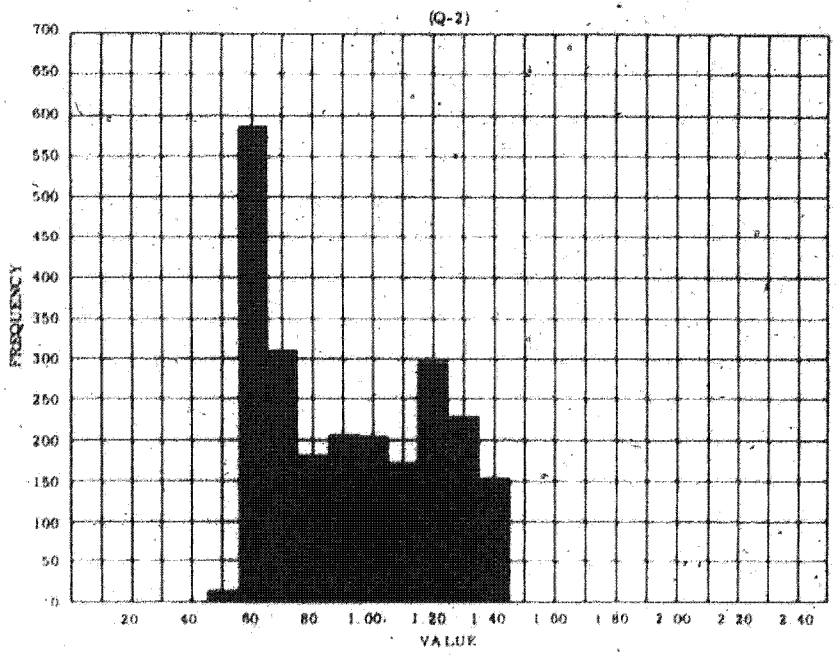
FREQUENCY DISTRIBUTION



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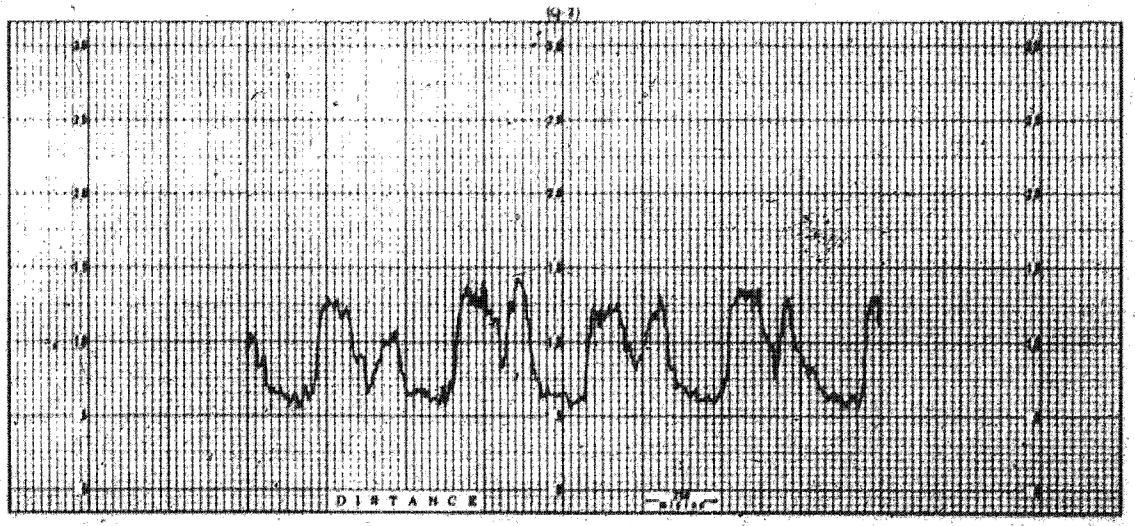


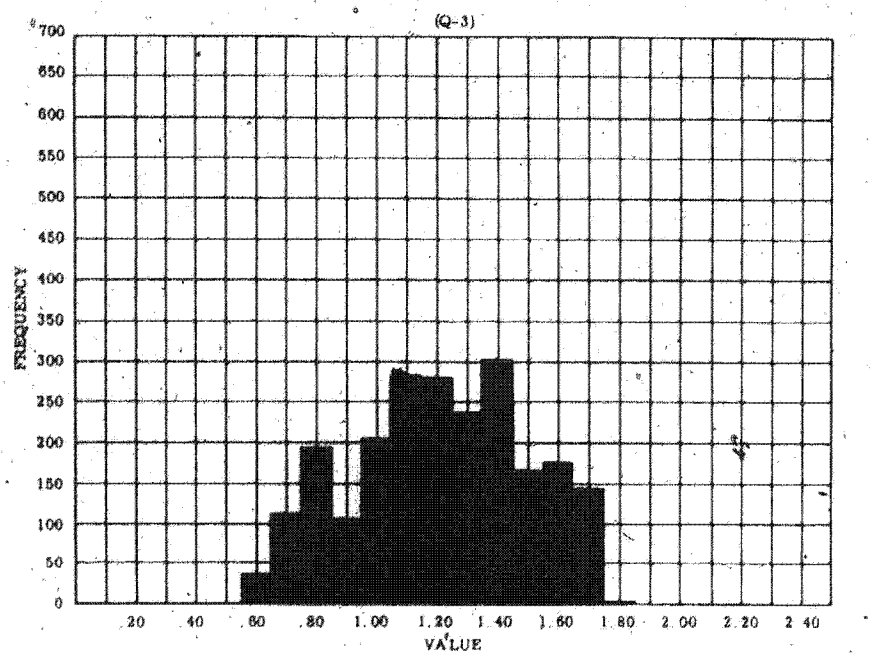
PASS 006 FRAME 008 CAMERA POSITION

MA SCAN SPEED 1 mm/min CHART SPEED 6"/min SPOT SIZE 5 μ

ILLUSTRATION 4

BCS 24571-64
PERFORMANCE EVALUATION TEAM
REPORT NO. 4010/64

FREQUENCY DISTRIBUTION



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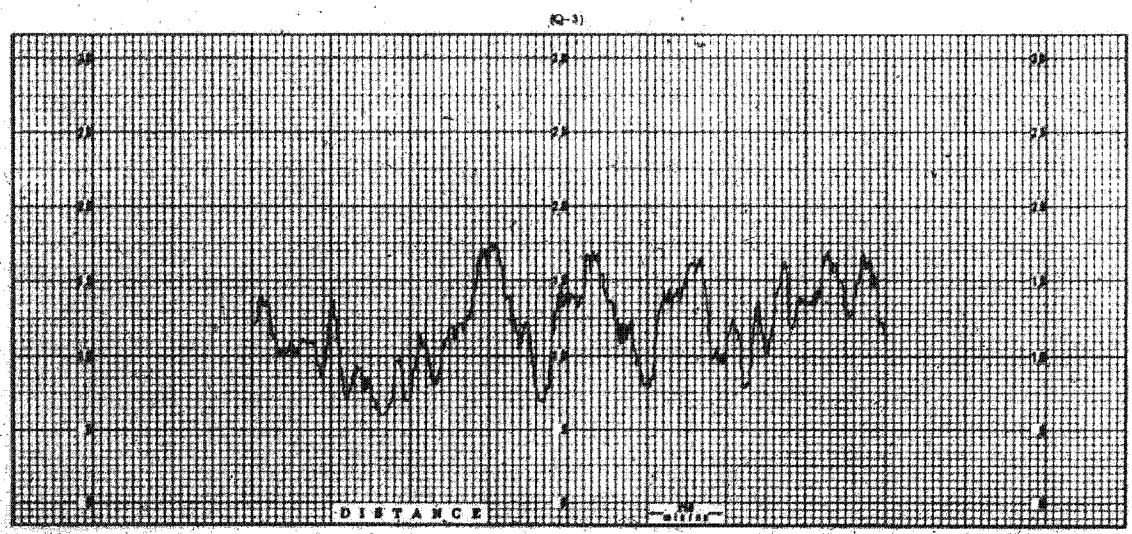

PASS 006 FRAME 016 CAMERA POSITION _____

MA SCAN SPEED 1 mm/min CHART SPEED 6"/min SPOT SIZE 5.8μ

ILLUSTRATION 5

BCS 24571-64
PERFORMANCE EVALUATION TEAM
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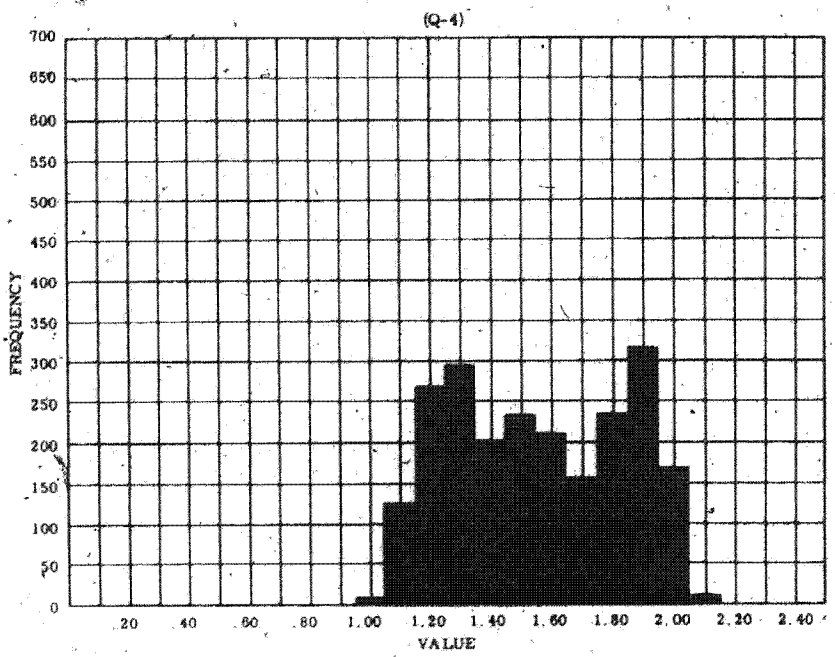
FREQUENCY DISTRIBUTION



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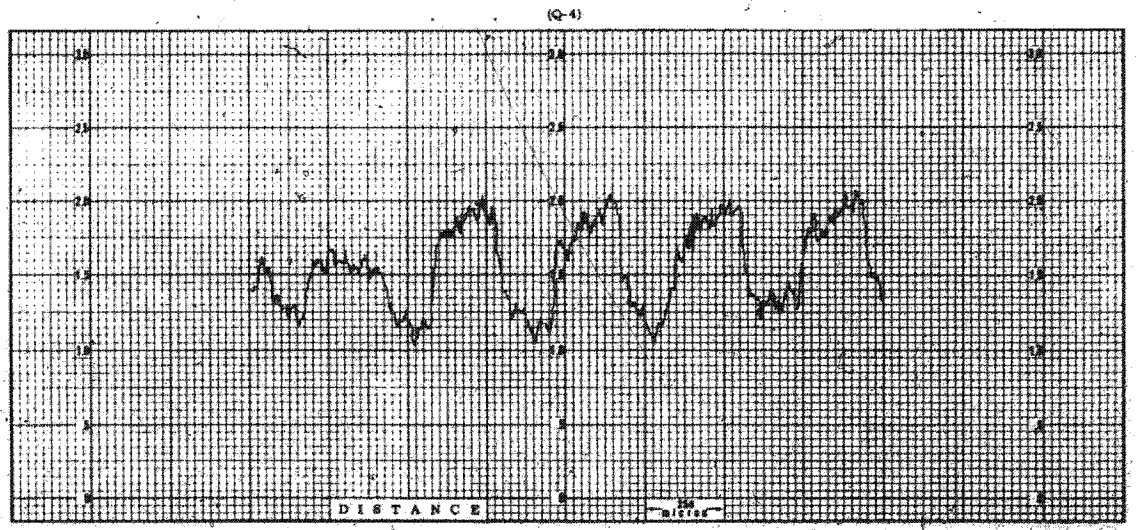


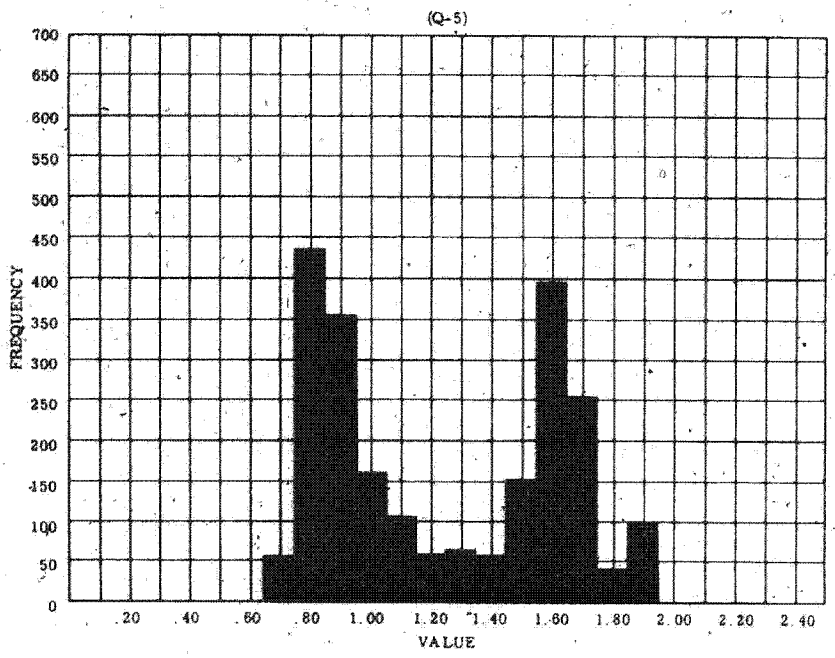
PASS D09 FRAME 009 CAMERA POSITION

MA SCAN SPEED 1 mm/min CHART SPEED 4"/min SPOT SIZE 5.8μ

ILLUSTRATION 6

BCS 24571-64
PERFORMANCE EVALUATION TEAM
REPORT NO. 4010/64

FREQUENCY DISTRIBUTION



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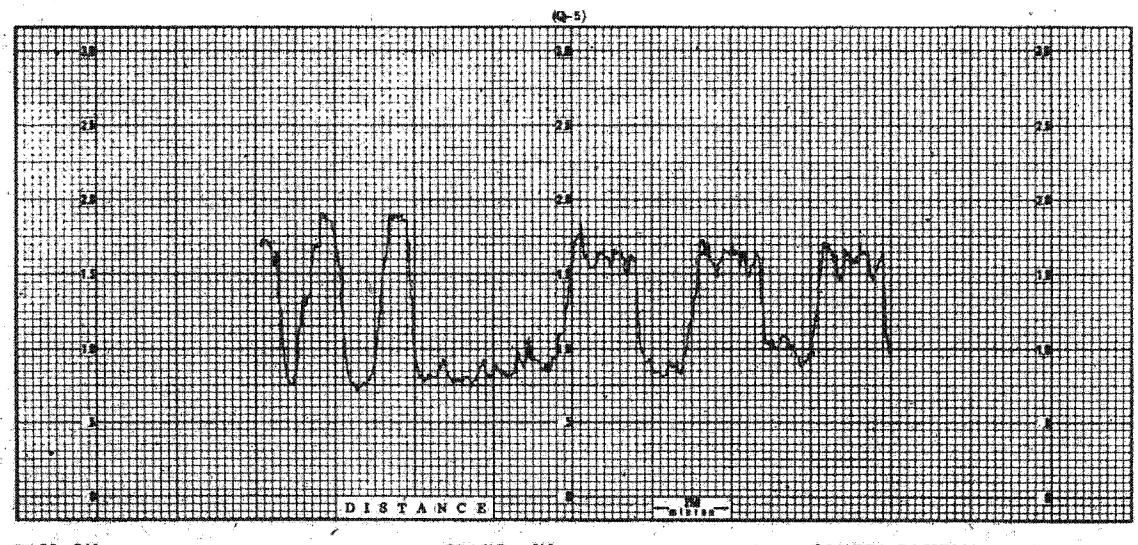

PASS D10 FRAME 010 CAMERA POSITION

MA SCAN SPEED 1 mm/min CHART SPEED 4"/min SPOT SIZE 5.8μ

ILLUSTRATION 7

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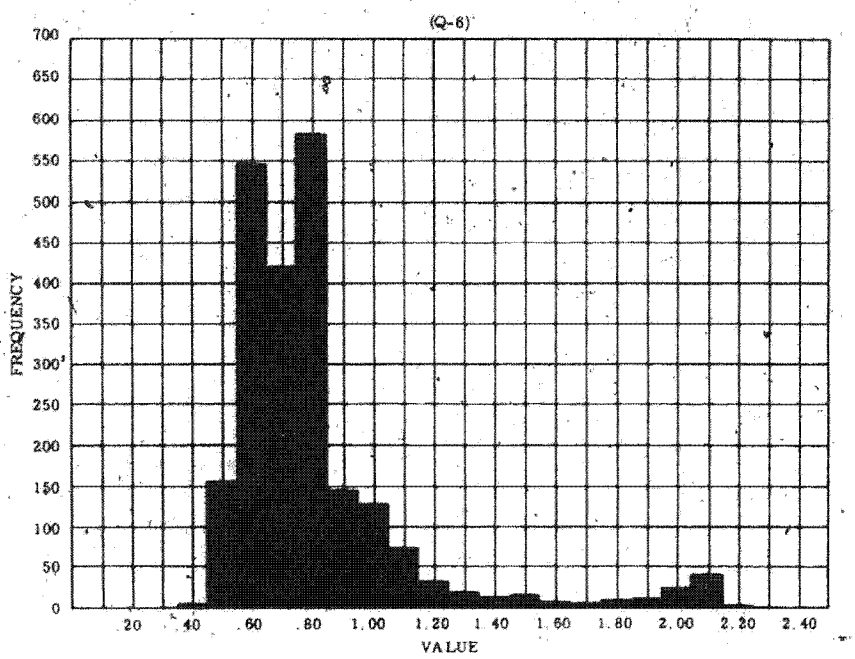
PERFORMANCE EVALUATION TEAM
REPORT NO. 4010/64

FREQUENCY DISTRIBUTION



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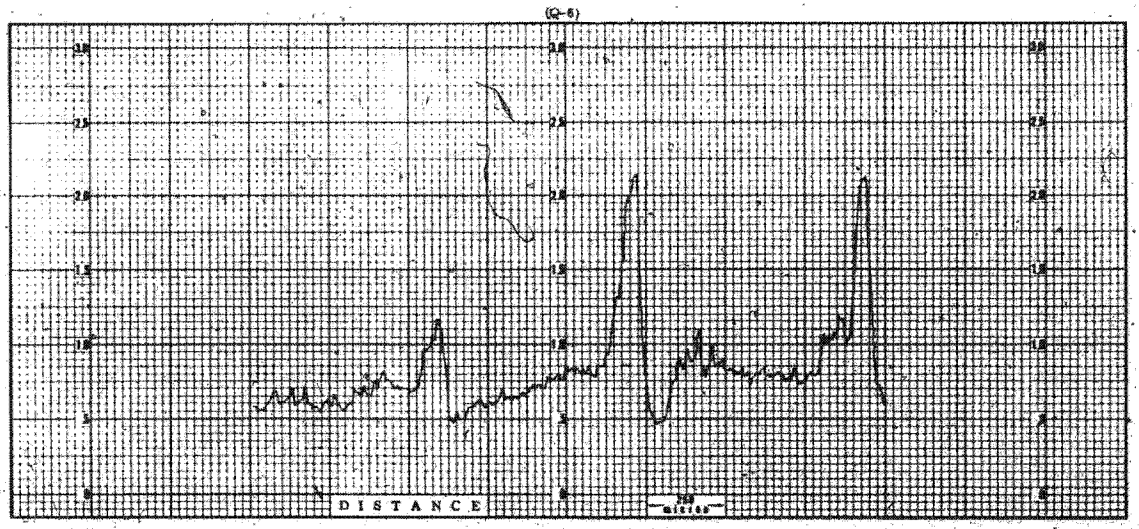

PASS D21 FRAME 001 CAMERA POSITION

MA SCAN SPEED 1 mm/min CHART SPEED 4"/min SPOT SIZE 5.5μ

ILLUSTRATION 8

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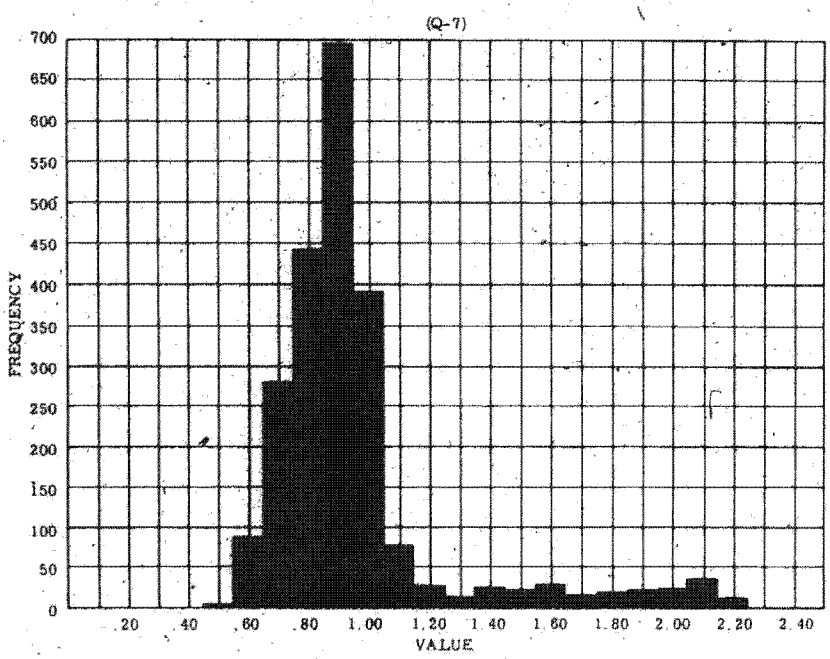
REPORT NO. 4010/64

FREQUENCY DISTRIBUTION



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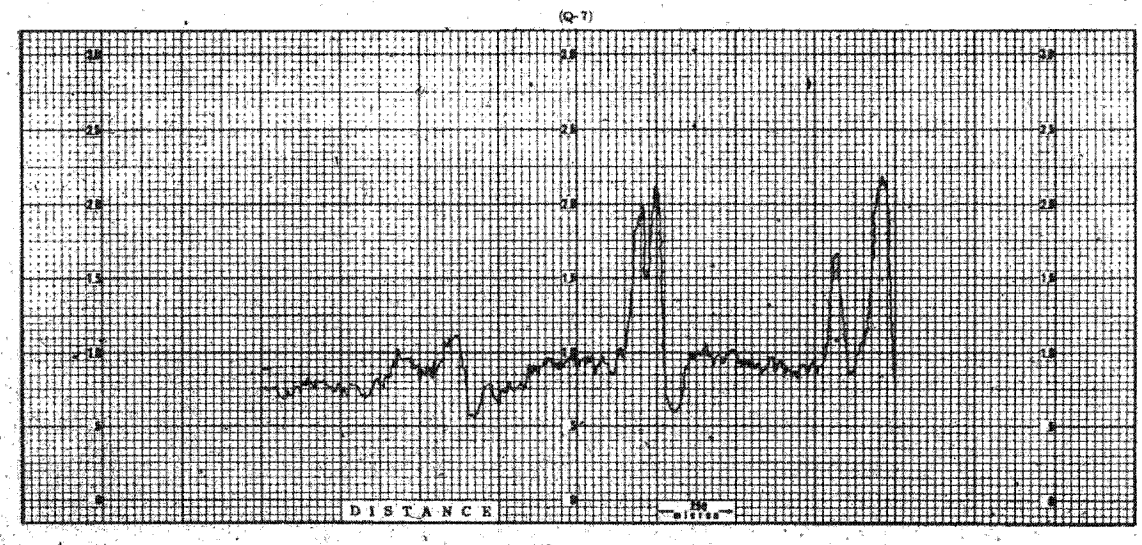

PASS 1021 FRAME 002 CAMERA POSITION

MA SCAN SPEED 1 mm/min CHART SPEED 4"/min SPOT SIZE 5.8μ

ILLUSTRATION 9

~~TOP SECRET - GAMBIT~~

APPENDIX A

COMMAND INFORMATION

Rev D04

Acc. No.	System Time Sec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Best Ephemeris Min	Deg	Min	Film Velocity in. sec. Command	Actual
001	13985.6	5.5	69	55N	163	50E	69	55.4N	163	50.2E	2.8449	
002	13998.6	5.5					69	4.0N	163	5.2E	2.8733	
003	14094.1	6.9	62	42N	158	52E	62	42.3N	158	52.0E	2.7888	
004	14106.4	6.9					61	52.7N	158	26.5E	2.7888	
005	14258.4	6.2	51	35N	154	24E	51	35.2N	154	24.4E	2.7888	
006	14272.1	6.2					50	39.3N	154	7.2E	2.7888	

COMMAND INFORMATION

em ıe	Burst Time	Command Position Lat		Long		Best Ephemeris				Film Velocity in. /sec.		Mir- ror	Crab
	Sec	Deg	Min	Deg	Min	Deg	Min	Deg	Min	Command	Actual	Pos.	Deg.
2.6	60.1	58	04N	134	25E	58	4.0N	134	25.4E	3.6122		0	2.0
1.6	6.2	47	56N	131	02E	47	6.3N	131	2.5E	3.1114		F	2.5
3.2	6.2					47	8.8N	130	49.5E	3.1114		A	2.5

COMMAND INFORMATION

ystem Time Sec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity in. sec. Command	Actual	M re Po
633.0	6.2	73	20N	122	56E	73	18.4N	122	54.9E	3.0806		
644.6	6.2					72	33.5N	121	59.0E	3.1114		
670.3	40.1	70	54N	120	11E	70	53.0N	120	9.6E	3.3692		
828.8	80.1	60	21N	113	07E	60	19.6N	113	6.2E	3.6122		
945.6	6.0	60	21N	113	07E	52	24.8N	110	4.5E	2.7888		
960.7	6.0	51	24N	109	45E	51	23.2N	109	45.0E	2.7888		
094.5	30.1	42	16N	107	17E	42	14.7N	107	17.2E	3.7589		
140.5	5.5	39	07N	106	34E	39	5.5N	106	33.9E	3.5060		
151.4	5.5					38	20.6N	106	24.0E	3.5060		
167.7	5.3	37	15N	106	10E	37	13.4N	106	9.6E	3.4029		
290.8	5.6	28	47N	104	29E	28	45.5N	104	28.9E	3.0501		
343.5	5.4	25	09N	103	49E	25	7.7N	103	49.3E	3.1739		
360.1	5.5	24	00N	103	37E	23	59.1N	103	37.1E	3.5060		
371.0	5.5					23	14.0N	103	29.2E	3.5410		
379.9	5.3	22	39N	103	23E	22	20.7N	103	20.0E	3.5410		

[redacted]

COMMAND INFORMATION

Item me ec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity in. sec. Command	Actual	Mir-ror Pos.	Crab Deg.	Ro An
92.1	6.9	59	25N	90	24E	59	24.5N	90	23.5E	2.7888		F	2.0	3
04.4	6.9					58	34.6N	90	2.1E	2.7888		A	2.0	3
26.2	7.6	57	07N	89	26E	57	6.2N	89	26.2E	3.0199		F	2.0	2
37.1	7.6					56	21.9N	89	9.2E	3.0199		A	2.0	2
14.6	6.9					30	32.4N	82	31.0E	2.8733		A	2.0	-3

[redacted]

COMMAND INFORMATION

008

System Time Sec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Flight Velocity in sec. Command	Actual
35222.8	7.6	80	03N	93	18E	80	3.0N	93	20.0E	2.9604	
35233.7	7.6					79	25.4N	91	2.1E	2.9900	
35316.9	5.5	74	17N	79	41E	74	18.0N	79	41.0E	2.9604	
35329.9	5.5					73	27.9N	78	31.4E	2.9900	
35566.4	7.6	57	44N	67	24E	57	44.5N	67	23.6E	2.8449	
35579.4	7.6					56	51.7N	67	2.7E	2.9020	
35729.9	6.2	46	37N	63	47E	46	37.1N	63	47.1E	3.2701	
35741.5	6.2					45	49.5N	63	34.8E	3.3358	
35794.5	40.1	42	11N	62	41E	42	11.9N	62	40.6E	3.7589	
35849.8	5.5	38	24N	61	49E	38	24.3N	61	49.0E	3.4369	
35860.7	5.5					37	39.4N	61	39.3E	3.4369	

COMMAND INFORMATION

stem ime ec	Burst Time Sec	Command Position Lat Deg.	Lat Min	Long Deg.	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity-in./sec. Command	Actual	Mir-ror Pos.	Crab Deg.	Roll Angl
04.3	5.5	78	09N	64	57E	78	10.0N	64	57.7E	2.7888		F	1.0	31.
19.4	5.5					77	14.8N	62	43.0E	2.7888		A	1.0	31.
49.2	5.5	75	23N	59	05E	75	23.2N	59	5.5E	2.9311		F	.5	-17.
62.2	5.5					74	33.7N	57	46.2E	2.9604		A	.5	-17.
00.1	7.6	72	07N	54	34E	72	7.2N	54	34.5E	2.9900		F	1.0	-17.
11.0	7.6					71	24.6N	53	48.0E	3.0199		A	1.0	-17.
01.7	7.8	45	05N	41	05E	45	5.3N	41	5.1E	3.1425		F	2.0	-27.
13.3	7.8	44	17N	40	53E	44	17.7N	40	53.1E	3.1739		A	2.0	-27.
32.9	5.3	42	56N	40	34E	42	57.2N	40	33.4E	3.5410		A	2.5	- 2.
53.4	5.4	41	32N	40	14E	41	32.9N	40	13.4E	2.8167		A	2.0	34.
63.1	5.3	40	52N	40	04E	40	53.0N	40	4.2E	2.7888		A	1.5	36.

COMMAND INFORMATION

D10

System Time Sec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity in. sec. Command	Actual
46100.4	5.5	68	46N	29	03E	68	46.8N	29	3.8E	2.8449	
46113.4	5.5			"		67	55.2N	28	22.9E	2.8449	
46230.1	6.9	60	06N	23	49E	60	6.6N	23	48.6E	3.2377	
46240.3	6.9					59	25.3N	23	30.1E	3.2377	
46256.0	5.5	58	21N	23	03E	58	21.7N	23	2.9E	2.9900	
46268.5	5.3	57	30N	22	42E	57	31.0N	22	42.3E	3.0199	
46280.1	6.9	56	43N	22	24E	56	43.8N	22	23.8E	3.0501	
46292.4	6.9					55	53.8N	22	4.9E	3.0501	
46305.9	12.5	54	58N	21	45E	54	58.9N	21	44.9E	3.3358	
46370.3	5.3	50	35N	20	19E	50	36.1N	20	18.9E	3.2701	
46409.5	5.5	47	56N	19	33E	47	55.7N	19	32.6E	3.4369	
46420.4	5.5					47	11.0N	19	20.3E	3.4369	
46431.8	5.4	46	23N	19	08E	46	24.3N	19	7.8E	3.5060	
46490.8	6.5	42	21N	18	07E	42	22.0N	18	7.2E	2.7888	
46505.9	8.5	41	19N	17	53E	41	20.0N	17	52.6E	2.7888	

COMMAND INFORMATION

stem me ec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity in. /sec. Command	Actual	Mir-ror Pos.	Crab Deg.	R A
12.3	5.9	53	31N	158	19E	53	31.7N	158	17.8E	3.4369		F	2.0	
23.2	5.9	52	47N	158	04E	52	47.2N	158	3.1E	3.4369		A	2.0	
46.3	6.7	51	12N	157	34E	51	12.8N	157	33.2E	2.9900		F	1.5	-
57.2	7.4	50	28N	157	21E	50	28.3N	157	19.6E	3.0501		A	1.5	-

COMMAND INFORMATION

Rev D21

Acc. No.	System Time Sec	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Best Ephemeris Min	Best Ephemeris Deg	Best Ephemeris Min	Film Velocity in. /se Command	Film Velocity in. /se Actua
001	18491.6	6.9	71	29N	146	21E	71	29.1N	146	20.5E	2.8733	
002	18503.9	6.9					70	40.8N	145	31.4E	2.8733	
010	18901.1	8.4	43	51N	133	16E	43	52.3N	133	14.7E	3.0806	
011	18912.7	6.4	43	04N	133	04E	43	4.6N	133	3.1E	3.1114	

[redacted]

COMMAND INFORMATION

em ıe :	Burst Time Sec	Command Position Lat Deg	Lat Min	Long Deg	Long Min	Best Ephemeris Deg	Min	Deg	Min	Film Velocity in. / sec. Command	Actual	Mir- ror Pos.	Crab Deg.
5.2	5.3	43	50N	88	41E	43	52.6N	88	41.4E	3.3692		O	2.0
7.9	7.6	41	36N	88	09E	41	38.2N	88	9.2E	2.7888		F	2.0

[redacted]

PHOTO-MAP POSITIONING

Rev D04

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
001A			1.9W					7,100
B			1.6W					7,100
002A			1.6W					7,100
B			1.2W					7,100
003A			.6W					7,000
B			.6W					7,000
004A			1.1W					7,000
B			1.1W					7,000
005A			.5W					400
B			.1W					400
006A			.5W					400
B			.1W					400

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PHOTO-MAP POSITIONING

Rev D05

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
003A			1.2W					---
B			.9W					---
006A			1.2W					350
B			1.2W					315
007A			1.3W					350
B			1.3W					315

PHOTO-MAP POSITIONING

Rev D06

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
001A			2.1W					5,300
B			1.6W					5,300
002A			1.7W					5,300
B			1.2W					5,300
003A			1.0W					---
B			1.0W					---
C			1.5W					---
D			1.0W					---
E			1.0W					---
F			1.0W					---
G			1.0W					---
004A			.8W					4,000
B			.8W					4,000
C			.8W					4,000
D			.8W					4,000
E			.3W					4,000
F			.1W					4,000
G			.6E					4,000
* H			.7W					4,000
I			0					4,000

* Questionable Benchmark

PHOTO-MAP POSITIONING

Rev D06 (Cont'd)

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
004J			0					3,000
K			.4W					3,000
L			1.0W					---
M			0					---
*005A			2.7W					1,400
B			1.9W					1,400
C			1.6W					1,400
006A			1.7W					1,400
B			.8W					1,400
C			.7W					1,400
*007A			---					---
* B			---					---
*008A			.2E					15,100
B			---					---
009A			.3E					15,100
B			---					---
*010A			1.5W					18,240
015A			.9W					1,000
B			1.5W					1,000

*Questionable Bench Mark

PHOTO-MAP POSITIONING

Rev D06 (Cont'd)

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
016A			1.3W					1,900
B			1.2W					1,900
017A			.7W					2,000
B			.8W					2,000
018A			.7W					2,000
B			.8W					2,000
019A			1.2W					3,000
B			1.1W					3,000

PHOTO-MAP POSITIONING

Rev D07

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
001A			0					5,000
B			0					5,000
002A			0					5,000
B			0					5,000
003A			1.4W					1,000
C			1.4W					1,000
004A			1.9W					1,000
B			1.9W					1,000
*009A			1.0E					15,000
B			.5E					15,000

*Questionable Bench Mark

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PERFORMANCE EVALUATION TEAM
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PHOTO MAP POSITIONING

Rev D08

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
001A			1.6W					8,200
002A			1.2W					8,200
B			1.2W					8,200
003A			.4W					400
B			.4W					400
C			.4W					6,000
004A			.6W					400
B			.6W					400
005A			1.6W					2,600
B			1.6W					2,600
006A			.6W					2,600
B			.6W					2,600
009A			1.7W					1,200
B			1.5W					1,200
010A			1.1W					1,200
B			.9W					1,200
011A			.4E					1,000
B			.3E					1,000
012A			.5W					1,000
B			.5W					1,000

PHOTO-MAP POSITIONING

Rev D08 (Cont'd)

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
013A			2W					1,000
B			4W					1,000

PHOTO-MAP POSITIONING

Rev D09

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity	Attitude Error (deg)			Map Accuracy
		In-Track (NM)	Cross Track (NM)	Error (%)	P	R	Y	(± ft)
001A			1.5W					1,900
* B			2.4W					1,900
002A			2.2W					1,900
* B			2.8W					1,900
003A			.6W					4,400
004A			0					4,400
007A			.8W					8,100
008A			0					8,100
*018A			.5W					500
B			1.2W					600
*019A			.7E					500
B			0					600
020A			.1W					700
021A			.6W					350
B			.6W					900
022A			1.1W					900

*Questionable Bench Mark

PHOTO-MAP POSITIONING

Rev D10

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity	Attitude Error (deg)			Map Accuracy
		In-Track (NM)	Cross Track (NM)	Error (%)	P	R	Y	(± ft)
006A			.8W					400
007A			.9W					400
008A			1.1W					400
B			.9W					400
C			.9W					400
009A			.9W					400
B			.8W					400
C			.8W					400
010A			.5W					400
B			.5W					400
C			.5W					600
011A			.8W					500
B			.8W					500
C			.8W					500
012A			.5W					400
B			.6W					400
013A			.9W					400
B			.8W					400
014A			.7W					400
B			.7W					400

PHOTO-MAP POSITIONING

Rev D10 (Cont'd)

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error In-Track (NM)	Positioning Error Cross Track (NM)	Film Velocity Error (%)	Attitude Error (deg) P	Attitude Error (deg) R	Attitude Error (deg) Y	Map Accuracy (± ft)
017A			.5W					400
* B			1.7W					400
C			.6W					400
018A			0					400
B			0					600
C			0					400
019A			.2W					400
B			.1W					600
C			.1W					400
020A			.3W					700
B			.3W					700
C			.3W					700
021A			.3W					400
B			.2W					400
022A			.9W					400
B			.6W					400

*Questionable Bench Mark

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PHOTO-MAP POSITIONING

Rev D20

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
007A			.7W					1,000
B			.7W					1,000
C			.6W					1,000
008A			.8W					1,000
C			.8W					1,000
009A			.1W					400
B			0					400
C			.1W					400
010A			0					400
B			0					400
C			0					400

PHOTO-MAP POSITIONING

Rev D21

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
*001A			.7W					7,000
B			0					7,000
C			0					7,000
002A			.5W					7,000
B			.5W					7,000
C			.5W					7,000
010A			.2W					900
B			.1W					400
C			.2W					400
011A			.5W					900
B			.5W					400
C			.5W					400

*Questionable Bench Mark

PHOTO-MAP POSITIONING

Rev D23

Acc/ PBM No.	Azimuth of Photo ℄ (deg)	Positioning Error		Film Velocity Error (%)	Attitude Error (deg)			Map Accuracy (± ft)
		In-Track (NM)	Cross Track (NM)		P	R	Y	
004A			1.1W					15,200
B			.9W					15,200
005A			.2W					15,000

END

DATE FILMED

FEB 18 1976