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DIRECTORATE OF SPECIAL PROJECTS
OFFICE OF THE SECRETARY OF THE AIR FORCE

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SYSTEM
PERFORMANCE EVALUATION TEAM
(FLIGHT MISSION CHARACTERISTICS)
MISSION 4022/65

This report consists of 142 pages.

Cy 5 of 5 copies
BCS 39739-65
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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

FOREWORD

THIS REPORT PREPARED FOR AND BY DIRECTION OF

THE DIRECTOR OF SPECIAL PROJECTS

OFFICE OF

THE SECRETARY OF THE AIR FORCE

Preparing Unit:

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PUBLICATION REVIEW

This report has been reviewed and is approved.

VICTOR M. GENEZ
Colonel, USAF
Team Manager

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SECTION I

RESUME OF MISSION 4022

A. INTRODUCTION

Mission 4022, consisting of the GAMBIT Camera system and the Orbital Control Vehicle (OCV), was launched into orbit from Point Arguello Launch Complex, Pad 3, at 1223:38Z on 30 September 1965.

B. OBJECTIVES

The operational objectives of this mission were to conduct:

1. A four-day reconnaissance mission to obtain high resolution photography of specific targets selected by the NRO staff.

2. R&D experiments to obtain exposure and filter data using special test filter configurations in Slit position A.

3. Continuing R&D experiments to evaluate focus sensor mechanism, film set data, exposure tests, inner shield operations, thermal control, OCV power supply, capability of augmented tracking stations to support orbital operations, and BUSS capabilities.

4. Fifth day OCV solo operations to demonstrate vehicle attitude control and full system capability over a five day period.

C. MISSION INFORMATION

1. Powered Flight and Orbital Parameters

The Standard Atlas/Agena combination which boosted the satellite into orbit had the following powered flight ascent parameters:

	NOMINAL (SEC)	ACTUAL (SEC)
BOOSTER ENGINE CUT-OFF	T -/ 132.40	T -/ 130.14
BOOSTER ENGINE JETTISON	T -/ 135.40	T -/ 133.35
SUSTAINER ENGINE CUT-OFF	T -/ 273.92	T -/ 280.05
VERNIER ENGINE CUT-OFF	T -/ 293.60	T -/ 298.71
BOOSTER SEPARATION	T -/ 296.10	T -/ 301.21
AGENA IGNITION	T -/ 331.17	T -/ 337.14
AGENA CUT-OFF	T -/ 566.89	T -/ 575.04

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The satellite (OCV) achieved a near-nominal orbit with the following elements:

	NOMINAL	ACTUAL
INCLINATION (DEGREES)	95.5	95.56
PERIOD (MINUTES)	88.85	88.91
PERIGEE (NM)	85.9	85.05
APOGEE (NM)	157.11	160.8
ECCENTRICITY	.0095	.0098
ARGUMENT OF PERIGEE (DEGREES)	137.44	141.67

2. Recovery

The capsule was de-orbited on 4 October 1965 on Rev 67 and was recovered by air catch. The OCV solo exercise was terminated four revs early due to power depletion. The OCV was de-boosted on 5 October on Rev 77 with impact predicted in the South Atlantic at 16° 22'N 32° 25' W.

D. RESULTS

The operational objectives of Mission 4022 were satisfactorily accomplished despite the fact that high stabilization control gas consumption required budgeting on Day 4 and resulted in the elimination of some low priority primary targets as well as several R&D operations. This mission resulted in a total of 198 stereo pairs, 95 framed stereo pairs, 9 lateral pairs and 206 strip frames utilizing 2699 feet of film in the primary camera. The GRAVY program indicates that a total of 963 COMOR targets were available, of which 543 were photographed in cloud free areas. (See NPIC comments below.)

E. ANOMALIES

Only one serious anomaly was noted:

An apparent high consumption rate of stabilization control gas required the reduction of roll maneuvers on Day 4. The unscheduled depletion was apparently caused by a high rate of usage by this vehicle for orbit stabilization maintenance as well as the increase in numbers of a new target category type. This problem is under study by the contractor for development of specific procedures which will prevent a recurrence of unscheduled depletion. Completion of the study is scheduled prior to the next mission.

F. OVERALL EVALUATION

The following subjective evaluation of Mission 4022 is submitted by the National Photographic Interpretation Center (NPIC).

1. The intelligence content of the Mission is one of the highest to date with 543 targets covered in cloud-free or partially cloud-free areas. Most of the important targets were covered with stereo photographs. This target coverage was equivalent with the best previous missions that were of four day

duration, but not numerically equivalent to a five day mission.

2. The photo interpretation of this mission was the best to date of many of the prime targets that must be covered for intelligence purposes. Most of the prime targets were covered with stereo photographs and proved to be the best photography of the target areas gained to date. The target portion of the readout has been separated into two separate readouts and since the second readout is incomplete at this time the number of targets quoted is subject to change.

3. The acquisition of targets was exceptionally high with no misses due to attitude or coordinates. The only limiting factor to a higher acquisition was the 50% cloud cover experienced in the target areas.

4. The mensuration of imagery on this mission was the best to date and was enhanced by the fact that the stellar/index package worked throughout the mission and adequate stars existed on 1304 frames of the 1767 exposures programmed. Stellar reduction was possible on all of the frames with adequate stars. The mensuration of imagery with known dimensions with accurate camera attitude was within 1/4 of 1 percent on all dimensions long enough to minimize pointing errors and resolution limitations.

5. The film speed variations on this mission were higher than on some previous missions but were generally within the 1% area of the programmed speed. Some excursions beyond the 1% lines do occur but do not seem to degrade the imagery when viewed through high magnification. The excursions of the film speeds from nominal or programmed values was generally within plus or minus 1/2 of 1 percent of the programmed value. The settling times at the start of the frames were approximately .4 seconds with a significant change at about 1.2 seconds after the start of the frame. The rest of the speeds were within the limits stated above. The looper actions were normal to the previous missions with no variations outside the plus or minus 5% lines except at the very start of the looper area. The looper area extended through about 3.8 to 4 seconds in most cases and did not appear to be as violent as it has been on some previous missions.

6. The imagery on this mission was the best achieved to date and was consistent throughout the mission. There was a slight fall off in resolution before the two focus adjustments but the imagery was relatively consistent from pass to pass. Comparison of the same images from Missions 4016, 4017, and 4018 shows that this mission was slightly better than the previous best missions. The best resolution for this mission was about 1.8 feet with the average ground resolution being about 2.0 feet. Mensuration techniques for producing ground resolution show some areas where the resolution reaches 1.8 feet but the resolution decreases in a normal fashion when high obliquity angles occur or with the higher altitudes in some portions of the mission. CORN Target readings were consistent with the mensuration figures above.

7. The time track operated continually throughout the mission and provided the accurate mensuration base necessary in this type system. The yaw slits operated throughout the mission and

provided some yaw checks against the stellar reduced yaw.

8. Stellar/Index Camera

a. The Stellar/Index camera operated throughout the mission in both the dependent mode (with the main camera) and the independent mode for mapping purposes with no master camera operations.

b. There were 1771 programmed frames of which 1767 were acquired. Both the stellar and index acquired the same number of frames and were correlated by both time and pass number. There were 408 frames taken with the vehicle in a positive roll position and the stellar had no chance to acquire stellar fields; of the remaining 1359 exposures 1304 had adequate stars for stellar reduction. This is the best operation of the stellar/index package to date and the stellar field generally contained 10 or more stars. High amounts of background light limited the stellar exposures to small areas near the edge of the frame in many cases and these do not contain the best geometry for reduction but can be reduced in a two star solution. The flared portion of the format was the smallest to date and the overexposure areas were smaller than on previous missions. There are 25 frames with streaked stars due to the vehicle rolling during exposure. These have all been correlated to programmed roll conditions and were caused by a lack of time between exposure cycles to complete the stellar exposure before the vehicle motion was to occur. No double exposures were found in this camera. There were four commanded stellar index firings which did not occur.

c. Time correlations were accomplished by both the M.C.D. and the Telemetry times and they both agreed except for the four commanded frames which did not occur.

d. The final analysis of the stellar fields in the vertical mode and the rolled position of -6.5 degrees from the vertical have not been completed but it appears that the stellar field recorded is slightly better in the -6.5 degree roll position.

e. The index camera provided excellent coverage of some unmapped areas of the world and should prove invaluable to the mapping community.

9. A final analysis of the mission shows the following facts:

a. The number of targets covered were comparable to any other four day mission.

b. The resolution was the best of any mission to date.

c. The stellar/index operation was the best to date.

d. The time correlation was the most accurate to date.

e. The intelligence content was higher than any previous mission due to the higher resolution.

f. The resolution was consistent and relatively constant throughout the mission.

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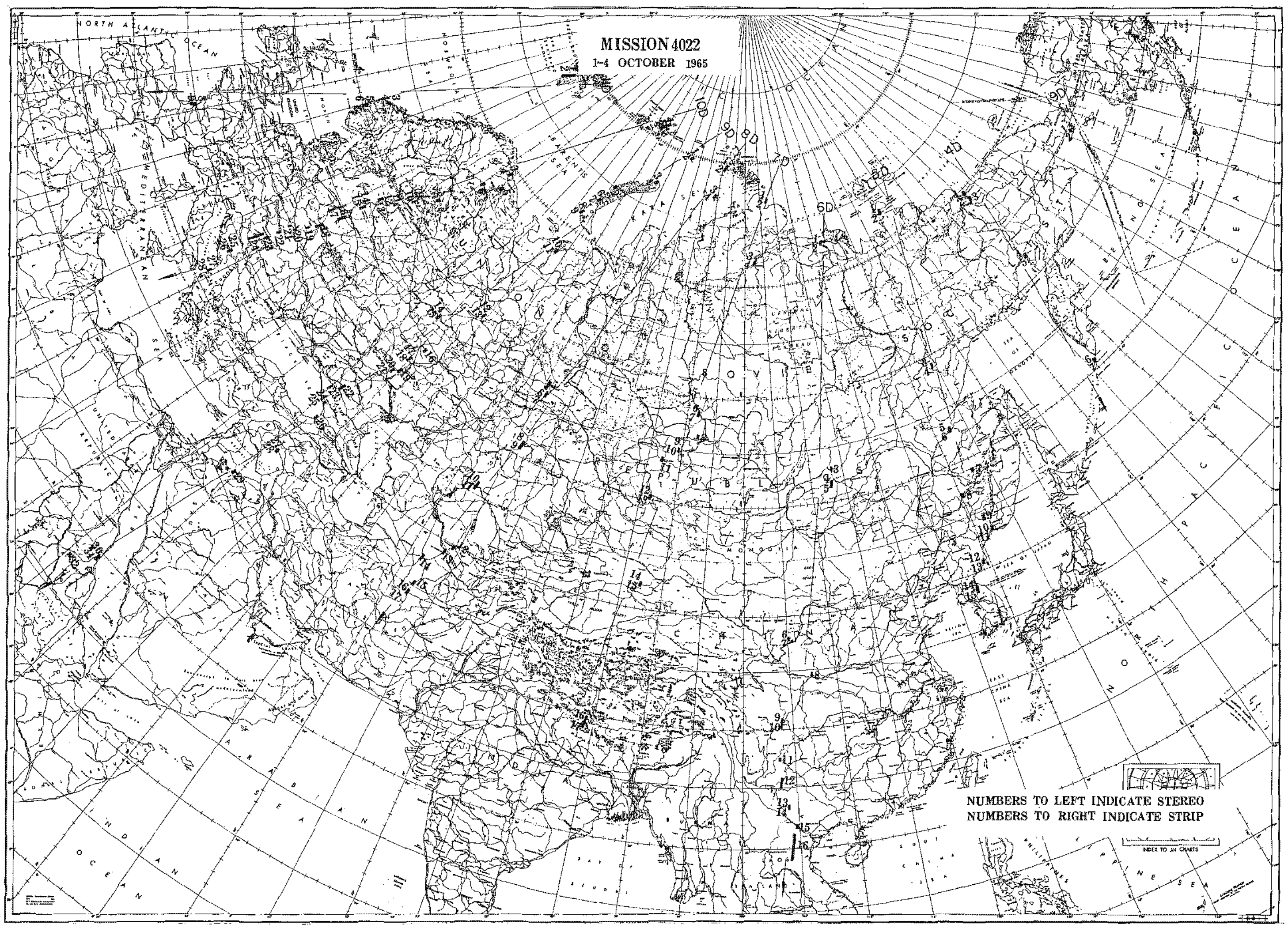

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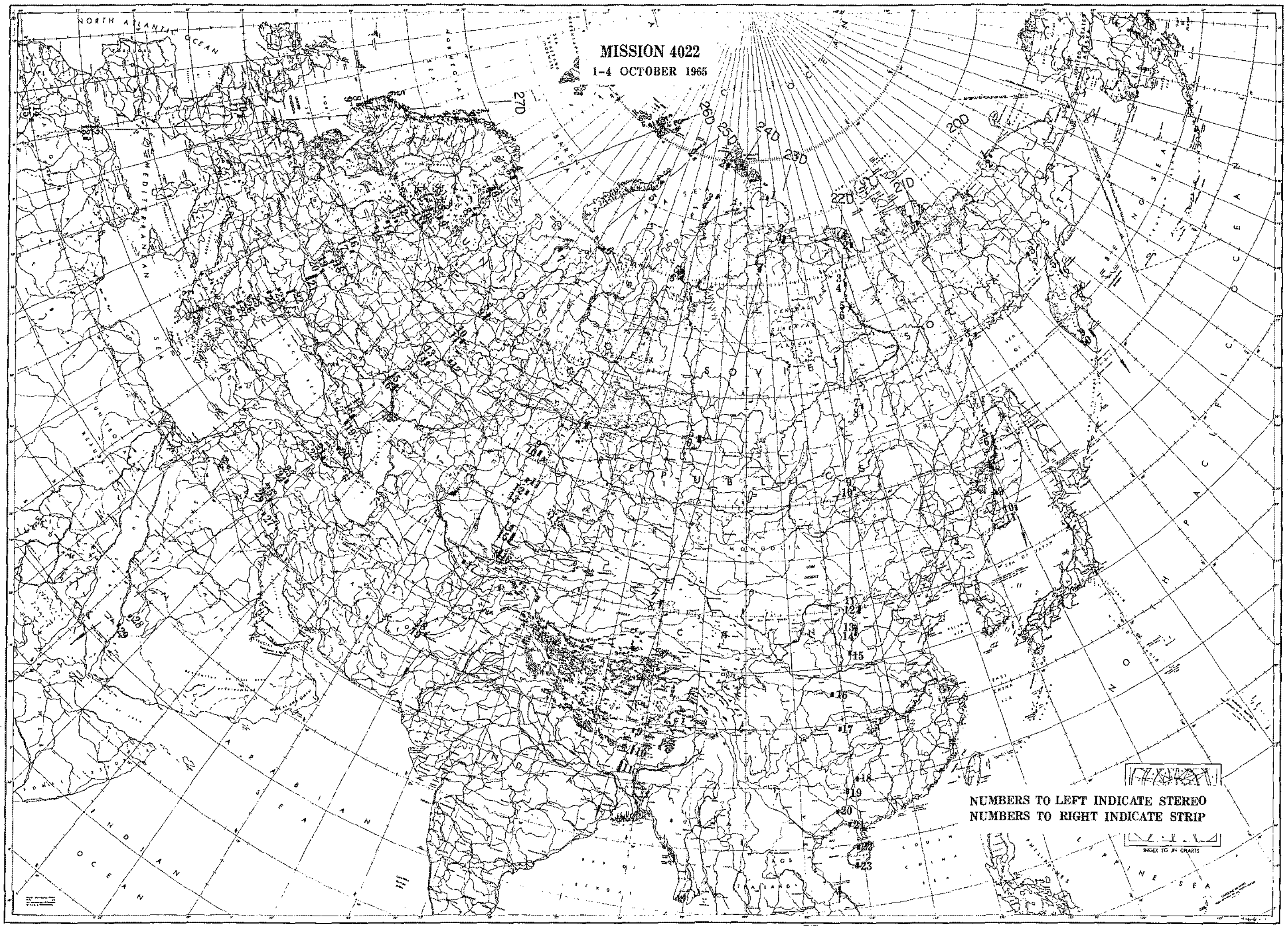

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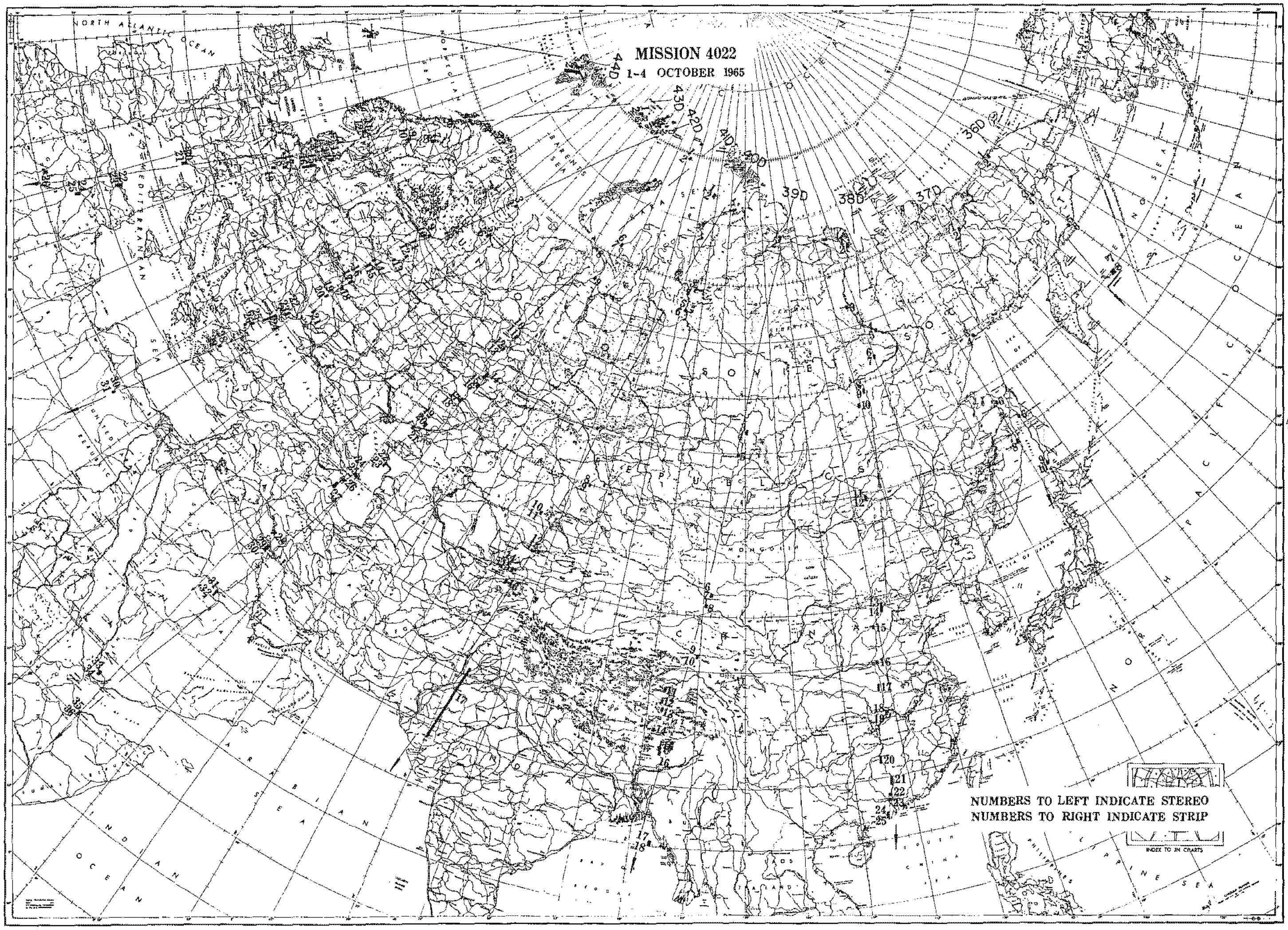

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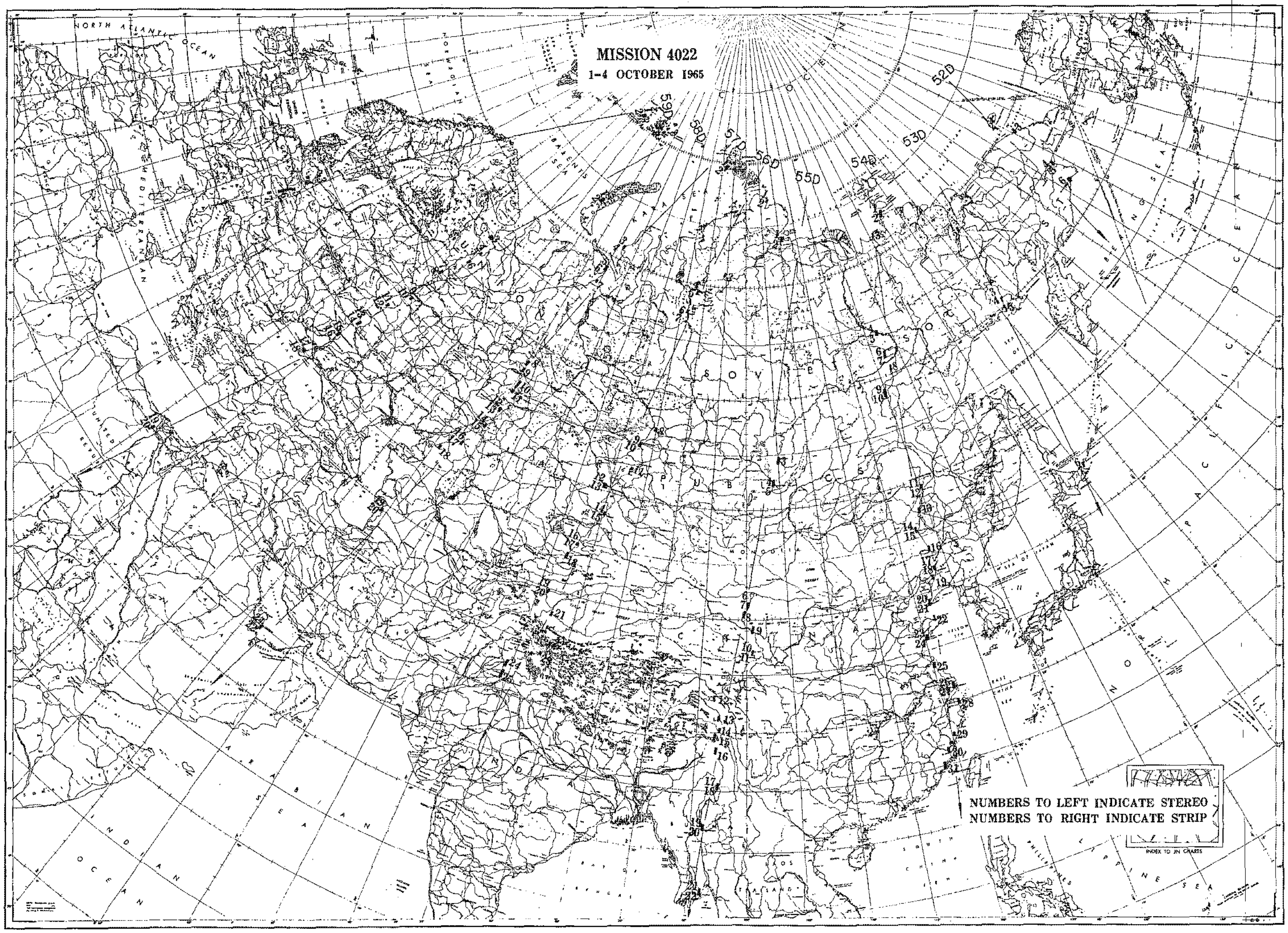

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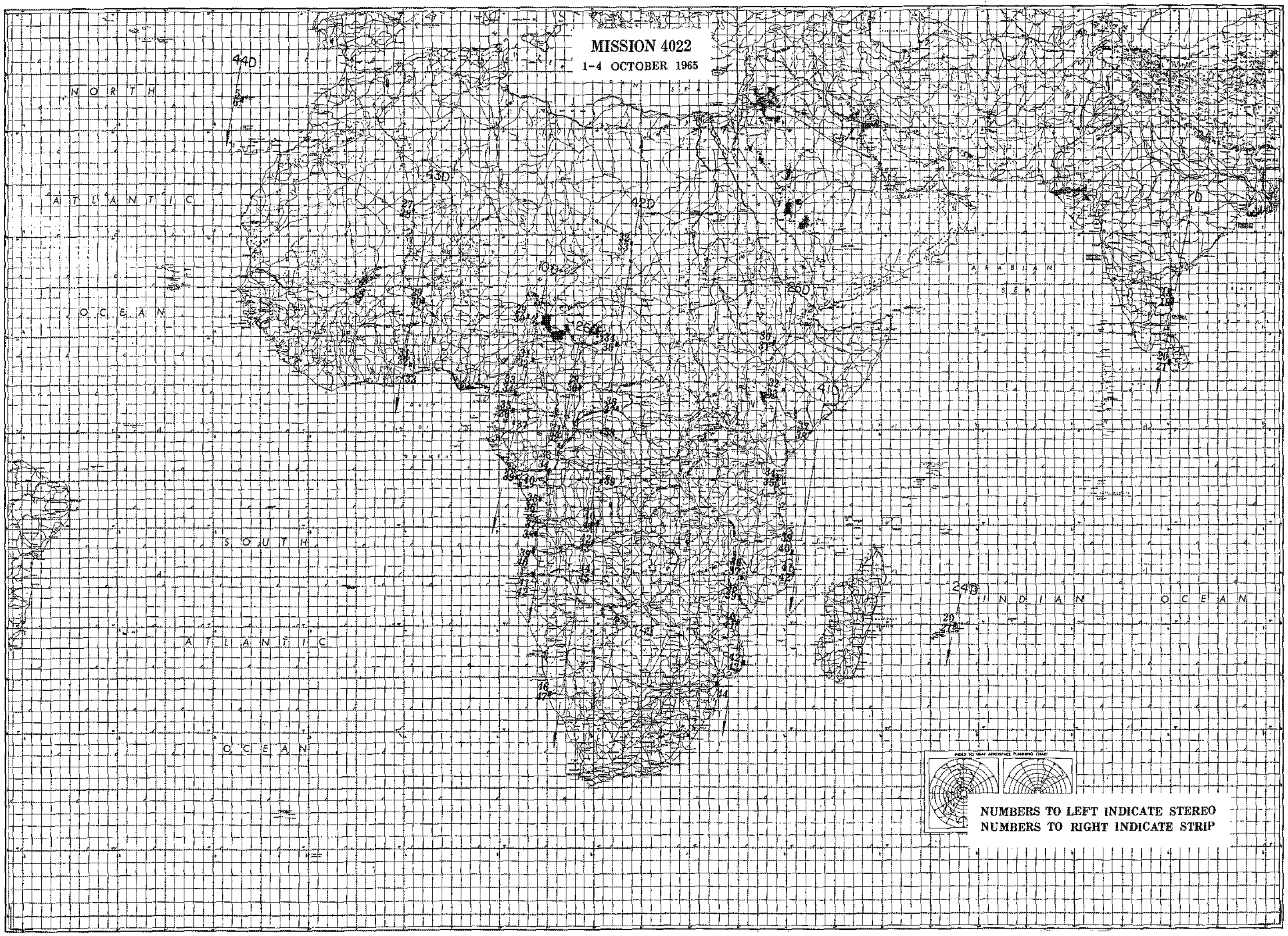

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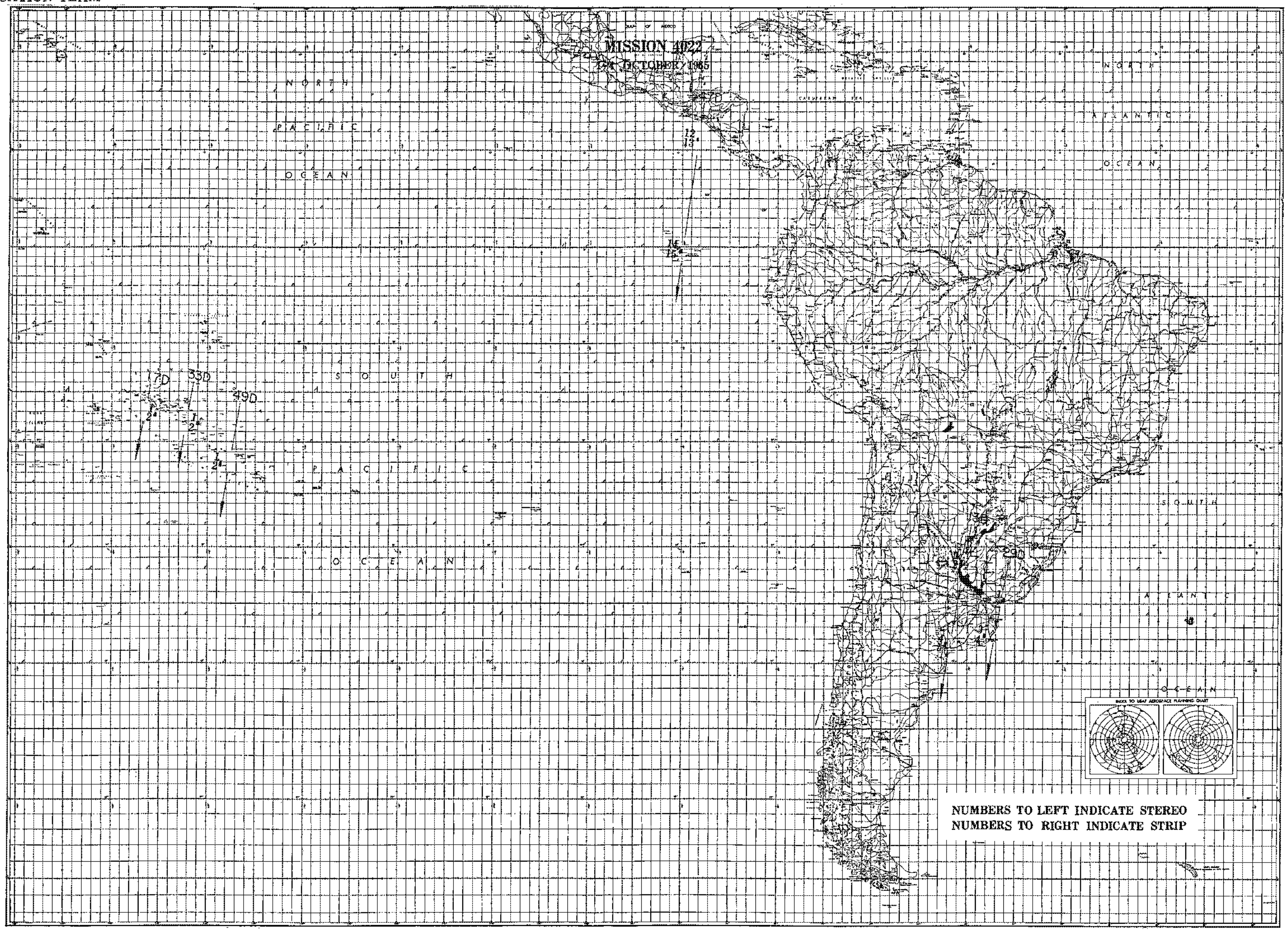

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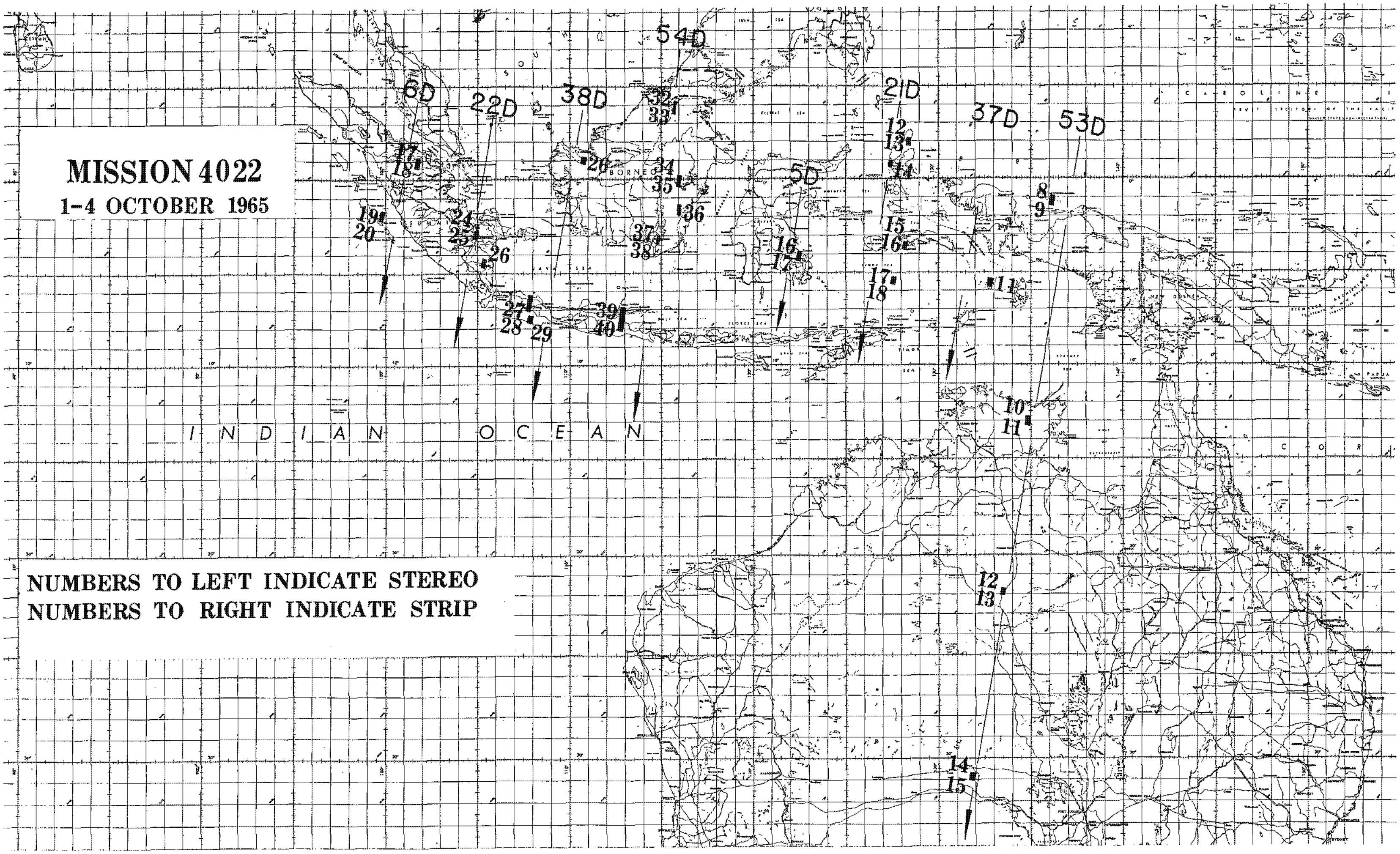

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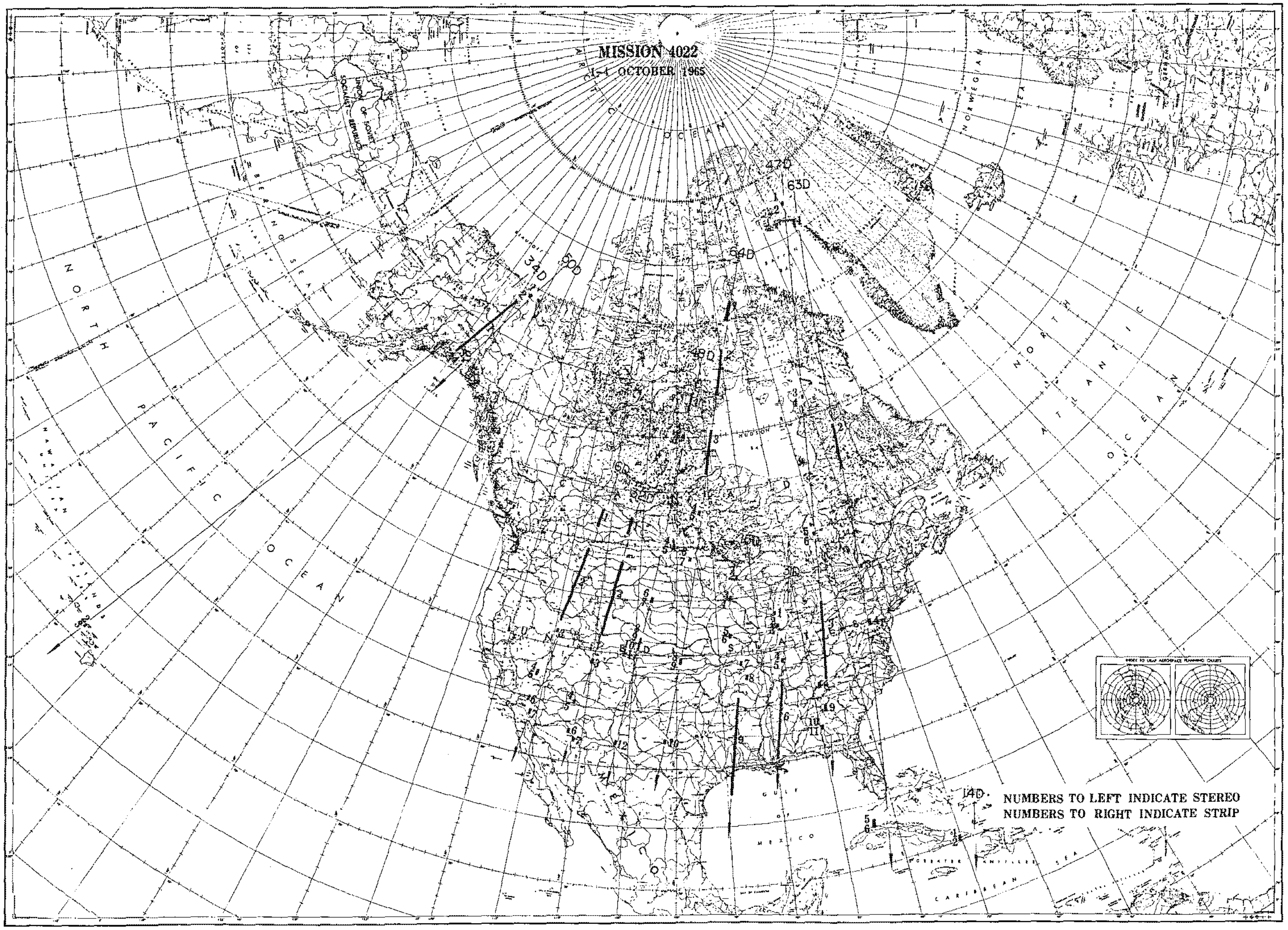

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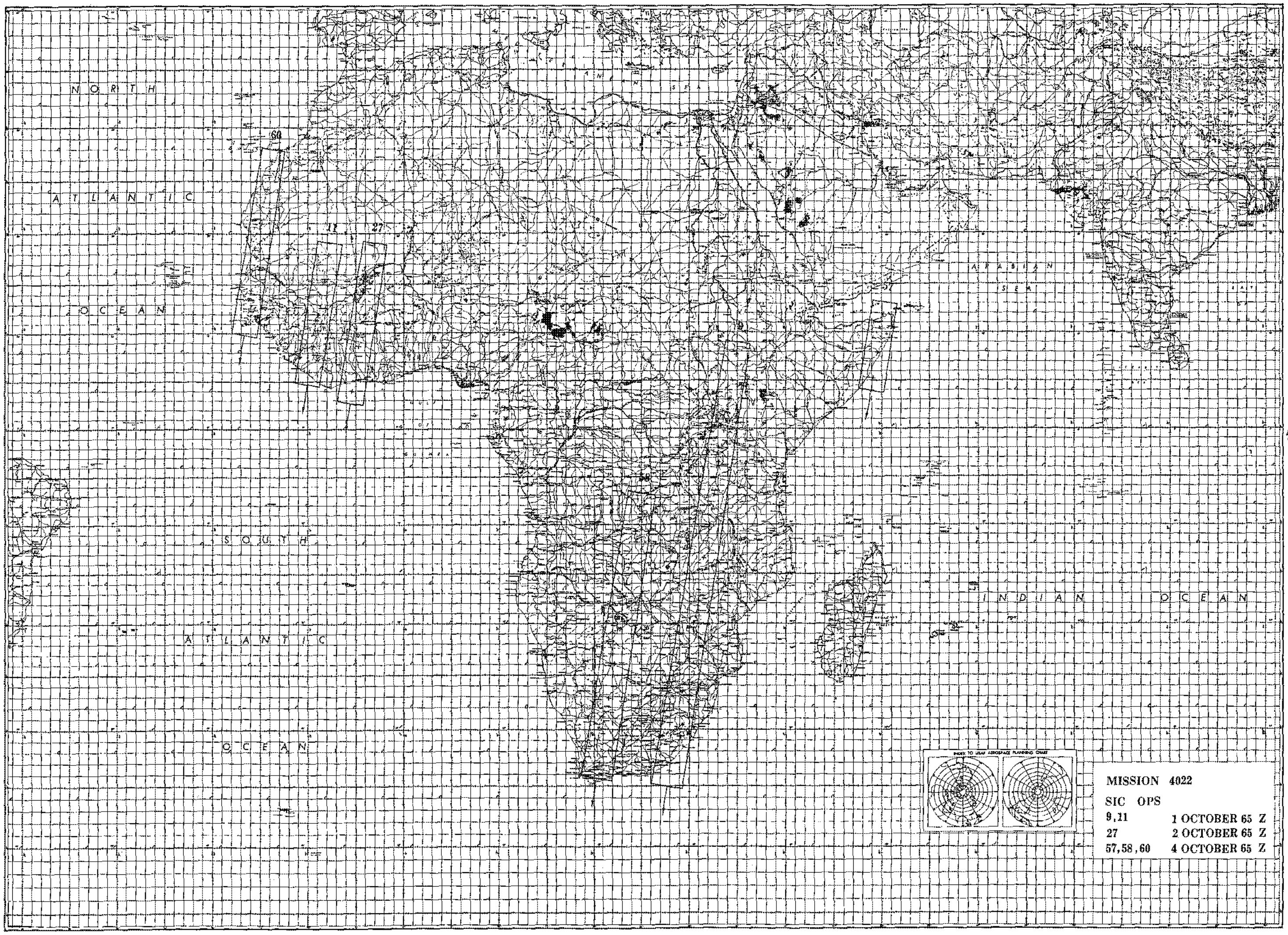

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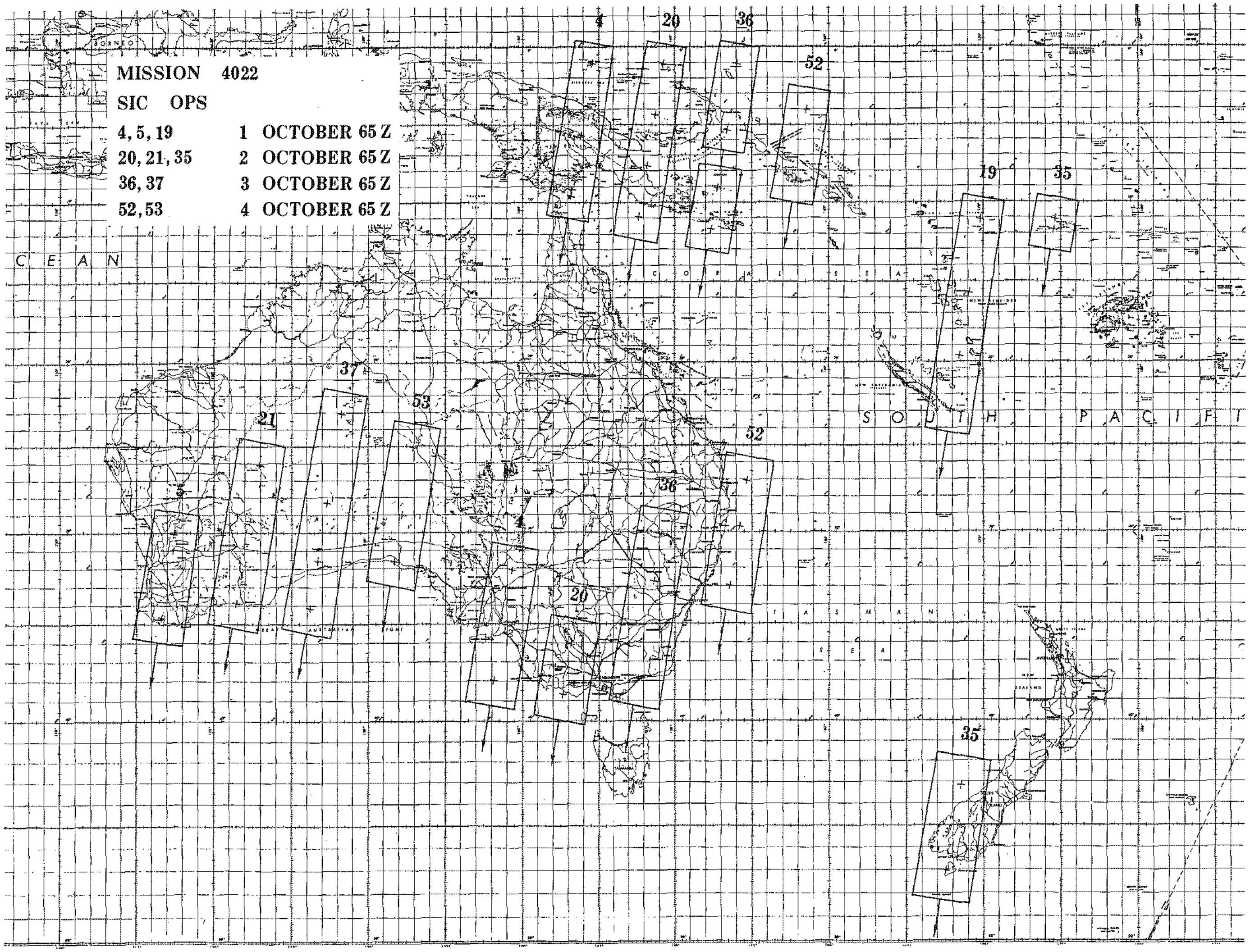

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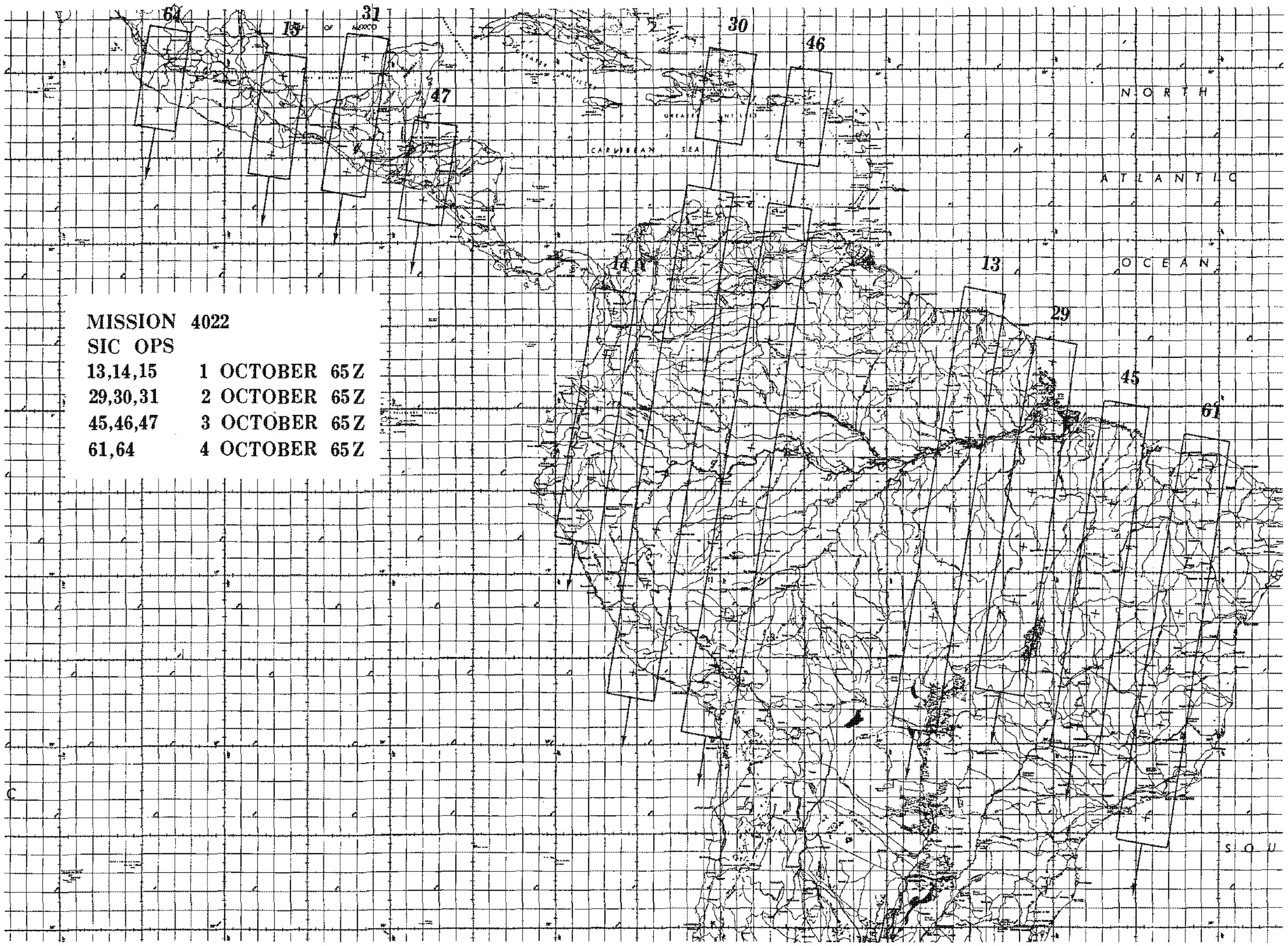

ILLUSTRATION 11

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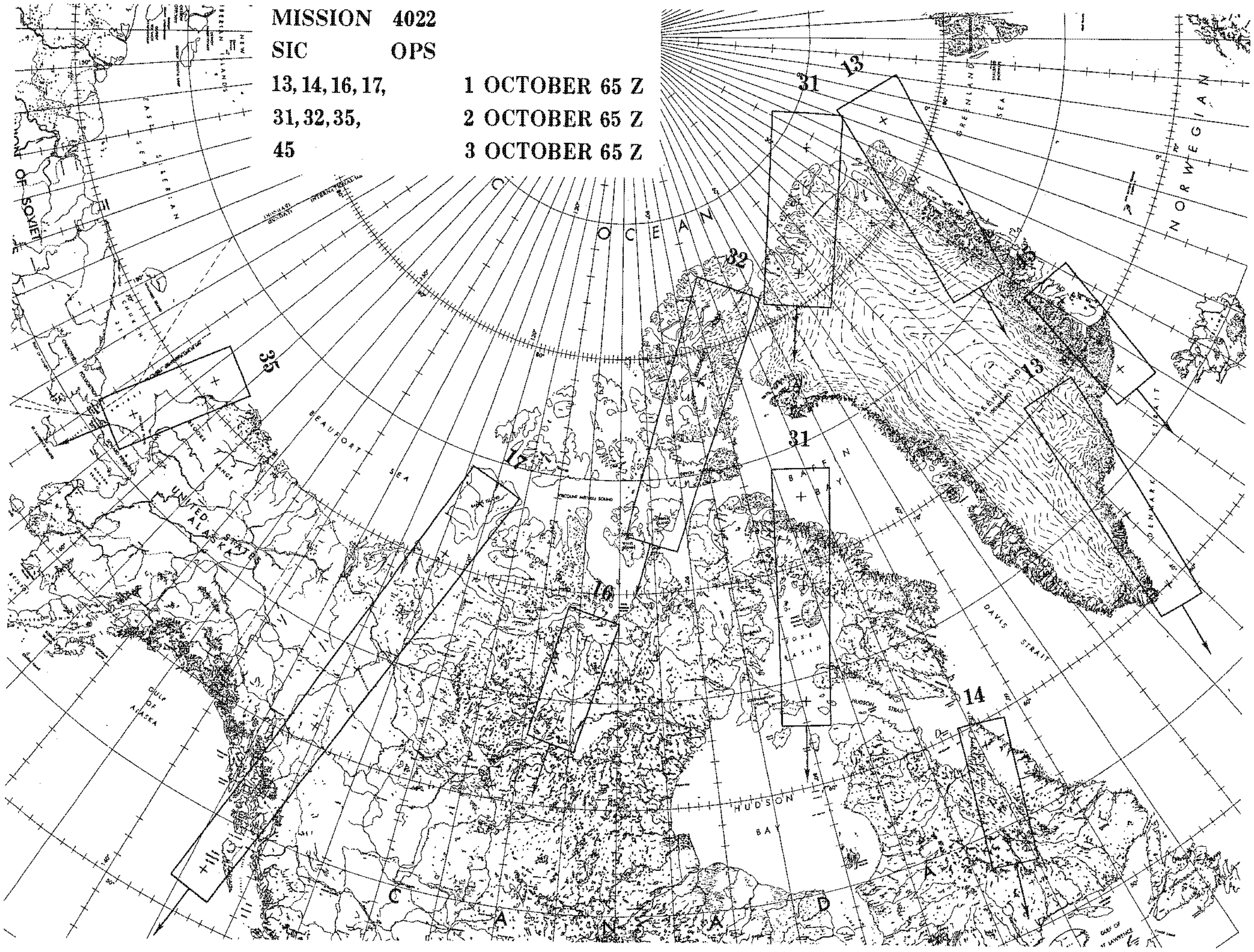

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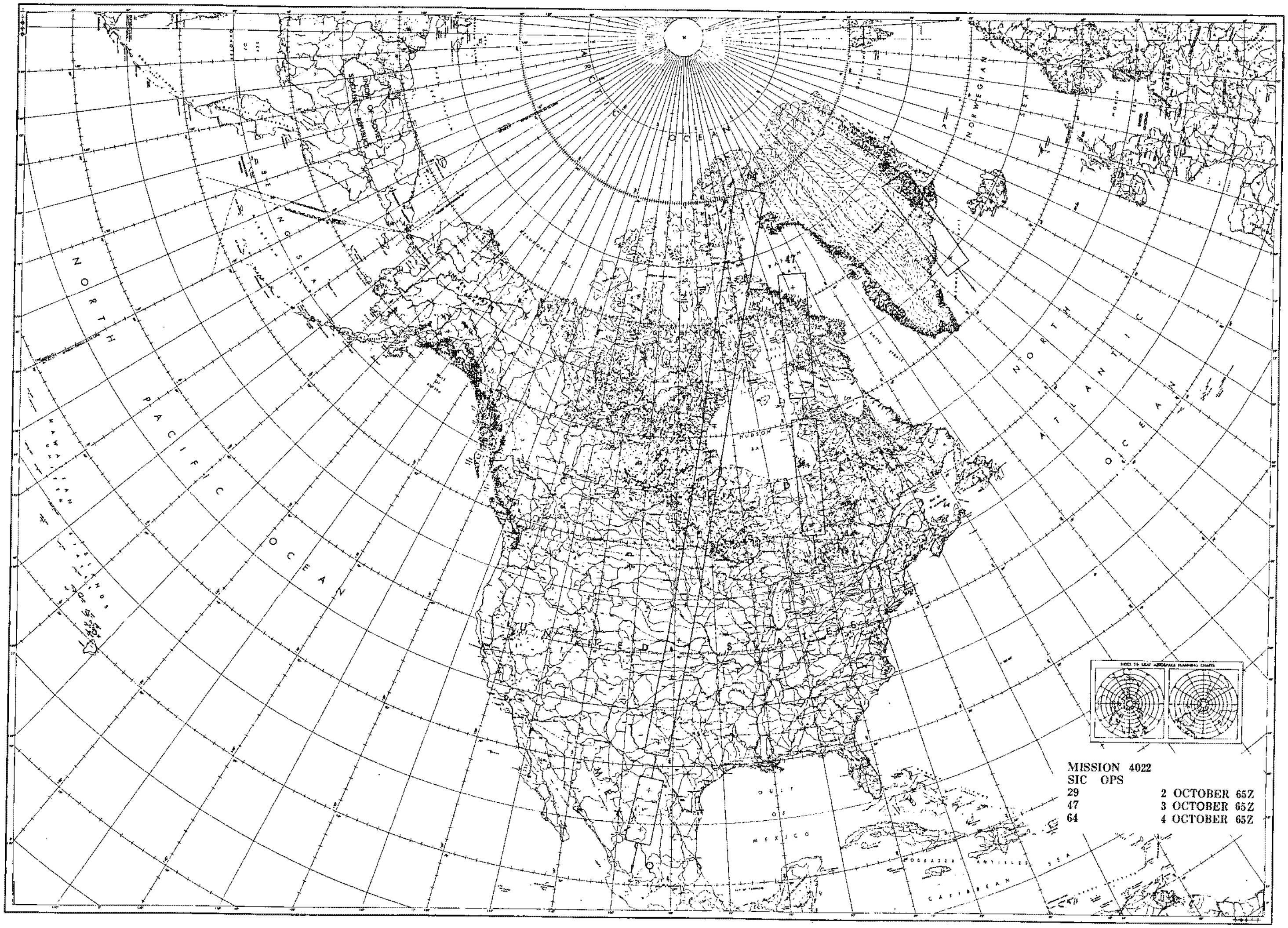

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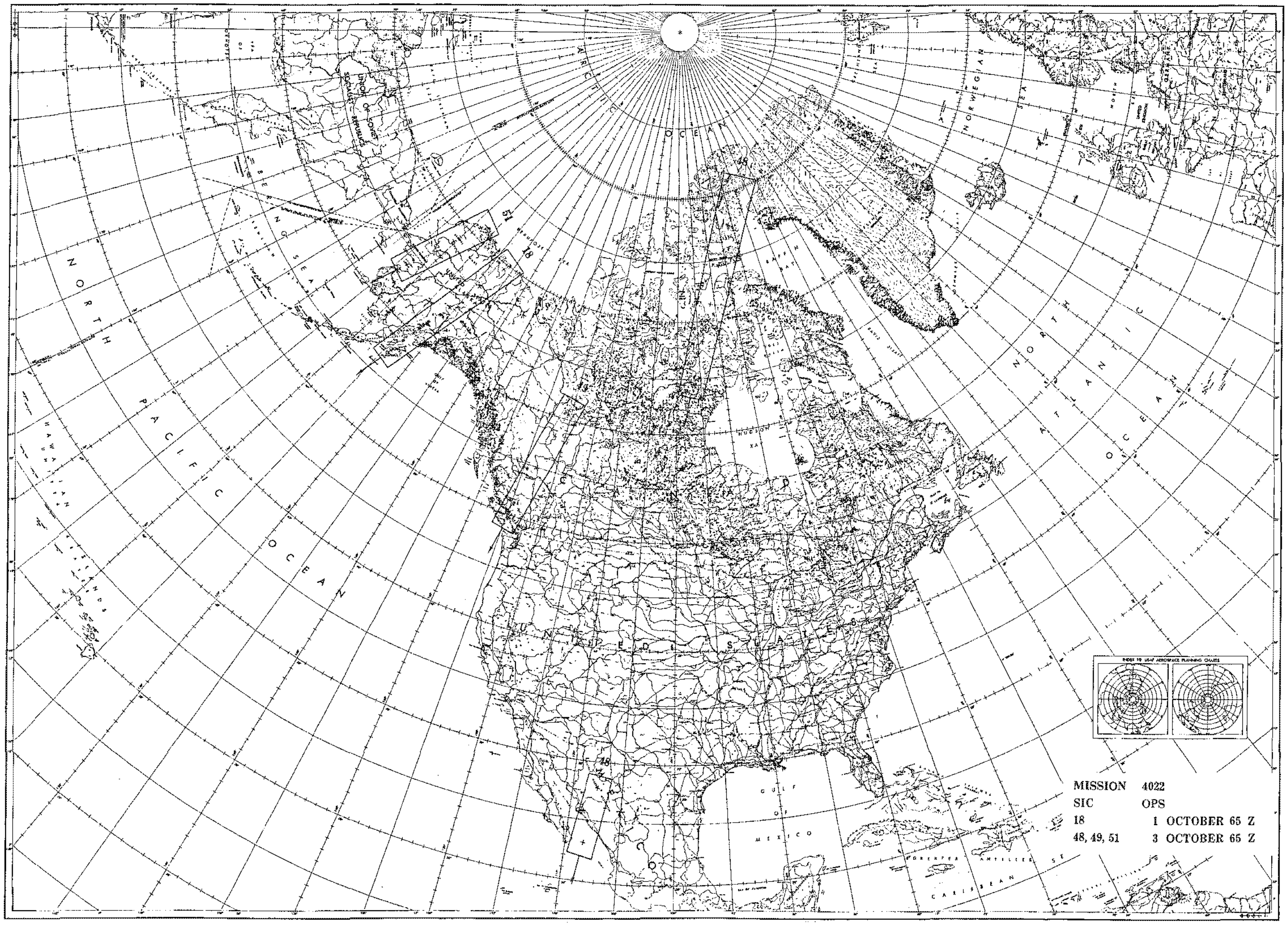

ILLUSTRATION 14

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SECTION II

FLIGHT PROGRAM

Performance of the Command System

1. For Mission 4022 all commands, except for those in conjunction with R&D experiments, for camera payload operations were generated by the Mission Profile Generation Program (TMPGP) and programmed through the GMINT and GCOMMAND modules. The following table summarizes the command messages loaded, the rev and tracking station for loading, the operating rev (s) and the results.

COMMAND LOAD SUMMARY

MESSAGES	LOAD REV & STATION	OPERATING REV(S)	STEREO PAIRS	STRIPS	FRAMED STEREO PAIRS	LATERAL PAIRS
103	4/POGO	4	3	1		
		5	3	3	4	
105	6/BOSS	6	4	6	2	1
		7	6	3	3	
108	8/COOK	8	3	5	2	1
		9	6	8	6	
109	10/HULA	10	10	12	4	
		11	3	1	1	
		13	2	1		
110	14/POGO	14	1			
		15	3	3		
112	16/POGO	16		4	1	
		17	1			
113	19/POGO	19	1			
		20	3	2	1	
		21	4	4	3	
114	22/BOSS	22	5	10	3	
		23	1	5	2	
		24	5	3	3	1
116	25/KODI	25	11	10	6	
		26	7	14	7	
		27	7	1		
		29	2			
117	30/POGO	31	1	2	1	
		32	1	4		
118	33/POGO	33	1			
		34		1	1	

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MESSAGES	LOAD REV & STATION	OPERATING REV(S)	STEREO PAIRS	STRIPS	FRAMED STEREO PAIRS	LATERAL PAIRS
121	36/POGO	36	3			1
		37	2	3	2	
122	38/POGO	38	4	11	5	
		39	4	8	1	
		40	5	3	2	
123	41/KODI	41	9	8	7	1
		42	12	11	6	
		43	11	5	2	1
		44	1		2	
125	46/POGO	47	5	3	1	
		48	3	3	1	
126	49/POGO	49	1			
		50	2			
127	52/POGO	52	2	1		1
		53	7	1		
128	54/BOSS	54	8	12	6	
		55	4	8	3	
		56	5	9	3	
		57	4	6	2	2
129	58/HULA	58	9	2		
130	59/HULA	59	1	2		
132	63/POGO	63		4	1	
		64	2	3	1	

2. Stellar/Index Camera (GSIC) operations independent of the primary camera were programed for mapping purposes. A total of 27 command messages were manually programed for independent GSIC operations on 59 revs to obtain 979 photographic frames in the mapping mode. A total of 792 GSIC photographic frames were obtained during primary camera payload operations. For evaluation, see NPIC comments in Section I.

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SECTION III

PHOTOGRAPHIC CHARACTERISTICS EVALUATION SUMMARY

(SPPL Report No. 101-1-58)

The following observations result from analysis of the original negatives from Reconnaissance Satellite Mission 4022.

A. Physical Degradations

1. Imaged

a. Two fine-lined, continuous minus-density streaks were visible paralleling the major axis, approximately 1 1/2" from the titled edge, throughout this Mission.

b. Dendritic fogging (static discharges) was observed intermittently along the titled edge of the following Revs: D06, D07, D13-D15, and D52-D56.

2. Superficial

a. A thin, continuous base scratch occurred, approximately 2 3/4" from the non-titled edge on all frames and revs throughout the Mission.

b. Two emulsion digs, approximately 1/8" in length, were found on Frame 003 of Rev D05.

c. A pre-processing splice (sonic) was noted 4" from the head of Frame 006, Rev D09.

d. Numerous pinholes were visible on Frame 014, Rev D08 and throughout all frames of Rev D07.

e. A 1/16" wide base scratch was observed extending the entire length at the center of Frame 004, Rev D16.

f. A few minor abrasions, scratches and pinholes were noted throughout this Mission.

B. Film Format Characteristics

The titling, time tracks, and fiducial lines appeared clear and distinguishable throughout Mission 4022.

C. Density

There were 648 density measurements accomplished on Mission 4022. The results are portrayed by range, average, and standard deviation (σ) in the following table:

	Range	Average	Standard Deviation (σ)
Dmin	0.22 - 1.30	0.48	0.17
Dmax	0.34 - 2.66	1.35	0.42
$\bar{D}$	0.30 - 1.56	0.92	0.24
ΔD	0.06 - 2.26	0.88	0.42

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SECTION IV

CAMERA SYSTEM OPERATIONS

A. Primary Camera

1. Film Transport

Velocity plots by NPIC showed that this transport system was not as smooth as others. Although there are many deviations from the ±1% film velocity error permitted by specification, the 3σ value lies well within the specified limits. The looper empty and start of refill did not result in velocity variations as violent as experienced previously due to excellent damping. The start up and stopping transients were nominal.

2. Yaw Slits

Slits were clean and produced usable imagery for image motion analysis.

3. At liftoff, 2683 feet were available for on orbit use. The load in the supply prior to going to the launch pad was 2955 feet. The film was consumed as follows:

Pad Checkout	272 feet
Orbital Health Check	35 feet
Operational Footage	1223 feet
R&D/ CORN	376 feet
Runout	649 feet
Processing Blanks	400 feet
Total	2955 feet

4. Processing

Approximate percentages of the use of the three processing levels:

Full	72%
Intermediate	20%
Primary	8%

Due to misidentification of looper marks for frame lines, some frames received two levels of processing. FM-23 will have interframe marks on the film and will eliminate this difficulty. Only one frame could be identified as underprocessed.

5. Exposure

Optimum exposure occurs about 0.50 density level for Dmin for this mission. Many frames have Dmin values below this level but are still within the half photographic stop below D = 0.50 deemed as acceptable exposure. About 12% of the frames were below this minimum acceptable level. This is due in a large part to the low sun angles encountered this time of year and the terrain still covered with dark green vegetation. This filter-lens combination has poor green transmission.

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6. Resolution

Resolution was the best achieved to date. CORN target readouts indicated levels of about 1.8 feet. These readings still must be adjusted for their position in the field of the lens and the higher than 2:1 contrast of the CORN target as it appears at the aperture of the orbiting lens. This resolution was totally unexpected if judgement is based on the tri-bar readings of resolution obtained during acceptance testing and MAB validation testing. These levels were about 125 lpm at 2:1 contrast. Besides this consideration, the lens was more astigmatic than any other flight model accepted. One theory is based in the lack of adequate stiffness in the substrate as compared to later stiffer mirrors and the relieving of stress in the zero-G environment. Focus sensor operations indicated BPF as being removed from the preflight setting by about .002". Platen movements on orbit were accomplished moving the platen in two separate movements of about .001" each. No real improvement in resolution as a result of these movements is apparent in the preliminary subjective visual analysis nor the CORN target readings. Edge Trace data has not yet been compiled at this writing. See NPIC comments on resolution.

B. Stellar/Index Camera

S/I No. 18 was flown. No shutter or transport anomalies due to mechanical operation were noted. However, four programmed frames about the middle of the mission did not occur. No explanation can be offered at this time. A new stellar baffle installed for this mission aided in obtaininga greater stellar count than on any other mission. See the NPIC comments on the results of the S/I performance and the resulting utility for mensuration.

C. Experimental Operations

The following Secondary Flight Objectives were accomplished:

1. SFO 120: Remote Focus Record - with the door open, no film transport, the focus sensor is turned on. Resultant readings were obtained on nineteen revs. These resulted in the platen being moved about .001" on Rev 22 and the same amount on Rev 35. The evaluation of the resulting image acuity has not been completed but did not result in a degradation as a result of the platen movements.

2. SFO 109: Thermal Pulse Degradation of Optics - with the door open for varying periods of 180 seconds to 800 seconds, strips are photographed at the termination of these door open periods. Edge Trace evaluations have not been completed. Subjective judgements indicate little noticeable difference in image quality even at the end of the longest period.

3. SFO 137: Film Set Elimination Experiment - two 1.9 seconds of film transport operation separated by 23 minutes before the processing blank were programmed on four revs. Film velocity plots of these frames have not yet been completed.

4. SFO 138: Slit Change Within Stereo Pair - this was accomplished on Rev 34 between 002 and 003. Subjective evaluations will be completed by the payload contractor. These evaluations should indicate to some extent the tradeoffs between reducing smear at the expense of low light detail rendition.

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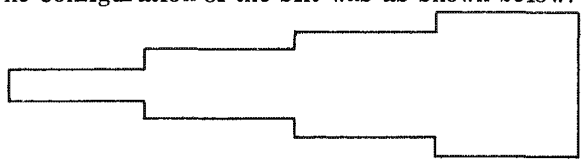
5. SFO 139: Move Platen .002" Between Frames - this was accomplished on Rev 63. Platen was moved out on frame 003 and back to BPF on 004. Edge trace data is undergoing processing. Slit No. 3 with the glass blocks either side of the center of the slit was used. Subjective evaluation shows little change of image quality even though the BPF is increased about .002" by these glass blocks.

6. SFO 141: Test Slit Spectral Filtration - the test slit Position A on the slit aperture plate had four filters across its aperture. This slit was used on six revs. Tone traces were taken from good imagery on four revs. Edge traces were taken where well-defined images existed. This data will be reduced at a later date. The configuration of the slit was as shown below:

Time Track Side



Title Side

Wratten Filter	2E	4	12	Polaroid
50% Trans.	430 mμ	475 mμ	520 mμ	All λ
Slit Width	.0069"	.0078"	.0085"	.0204"

CORN Targets were obtained on:

Rev 15,	Frame 007	Booneville, Missouri
Rev 16	Frame 003	Wells, Nevada
Rev 31	Frame 004/005	Olney, Illinois
Rev 31	Frame 006	Mathison, Mississippi
Rev 32	Frame 003	Green River, Utah
Rev 32	Frame 006	Eloy, Arizona
Rev 47	Frame 009	Norcross, Georgia
Rev 63	Frame 004	Mechanicsburg, Pennsylvania
Rev 64	Frame 008/009	Hill City, Kansas
Rev 64	Frame 010	Big Springs, Texas

Blackbird aircraft was flown on 1, 3, and 4 October. The coverage obtained on 1 October was useful for comparison with Rev 15, frame 007, at Booneville, Missouri. On 3 October there was a camera mount and camera malfunction. On 4 October the coverage was two miles west of the CORN targets. Blackbird used KA-2, 12" focal length, and T-11, 6" focal length cameras at 16,500 feet and 8,000 feet altitudes. Bluebird aircraft was flown on 2 October. Comparison cover with Rev 32, frame 006, was obtained. Bluebird used a 12 inch focal length, KA-53 camera at 18,500 feet altitude.

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

FILM VELOCITY VS TIME
REV D10 FRAME 029

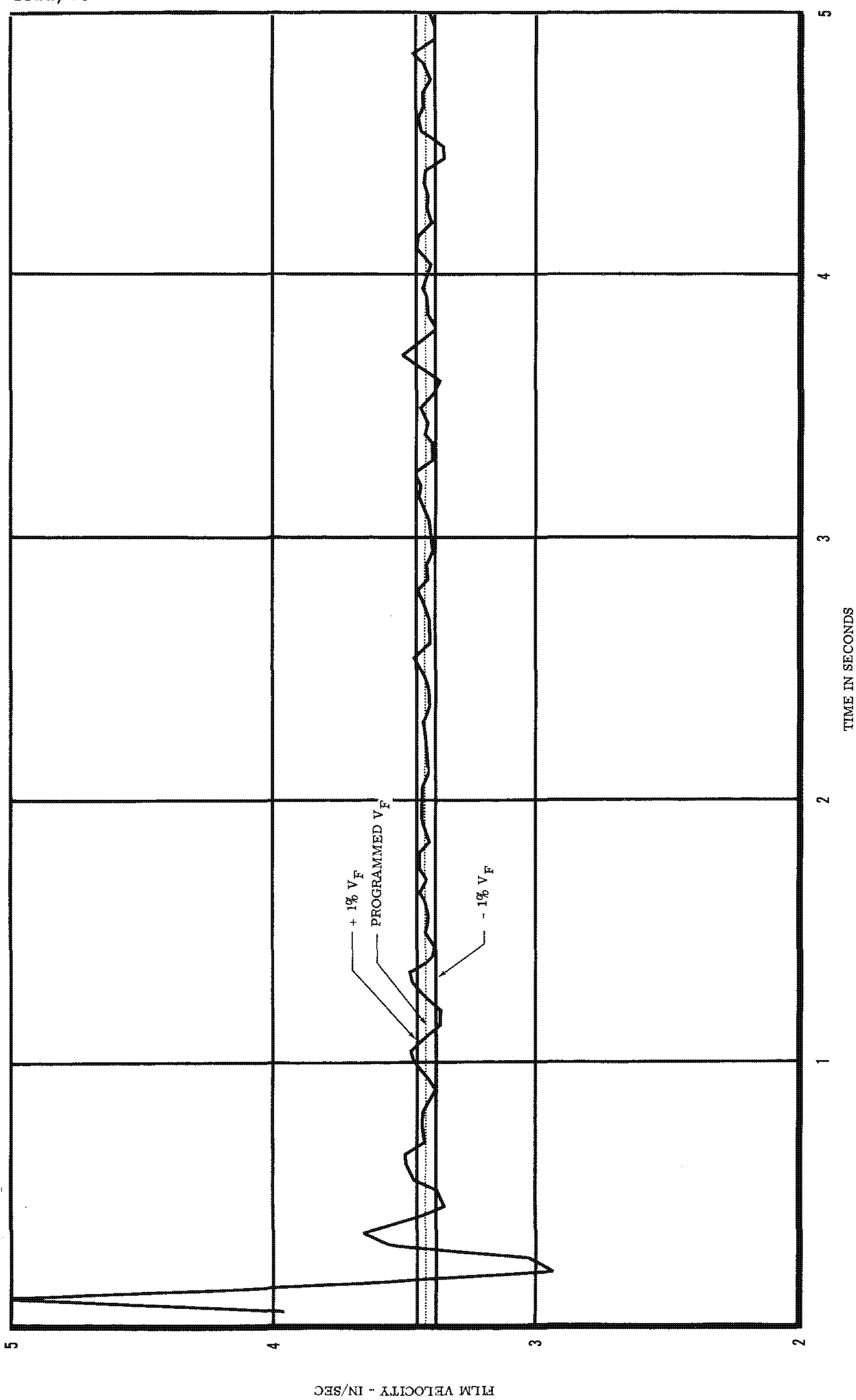

ILLUSTRATION 15

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FILM VELOCITY VS TIME
REV 15 FRAME 007

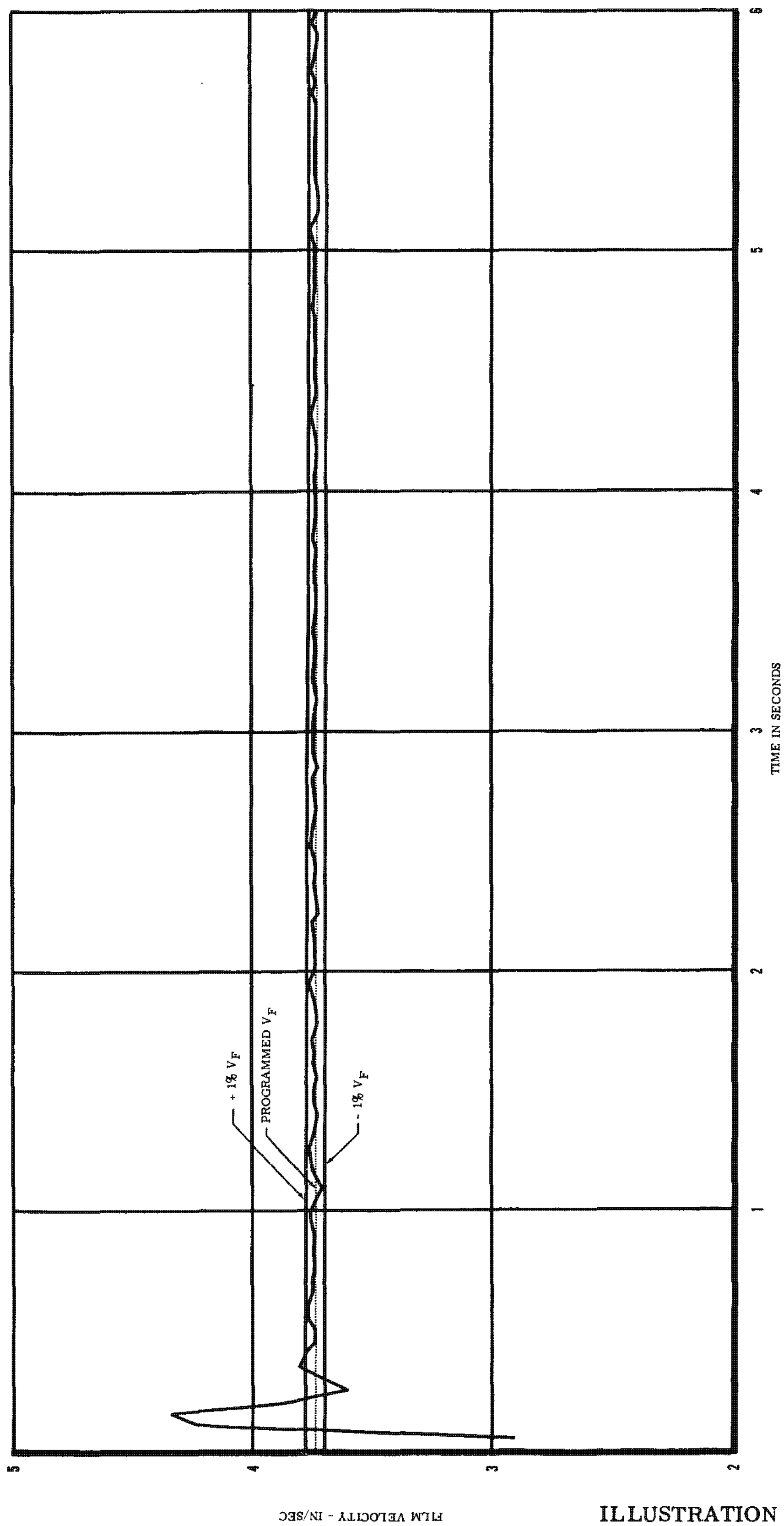

ILLUSTRATION 16

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FILM VELOCITY VS TIME
REV D52 PROCESSING BLANK

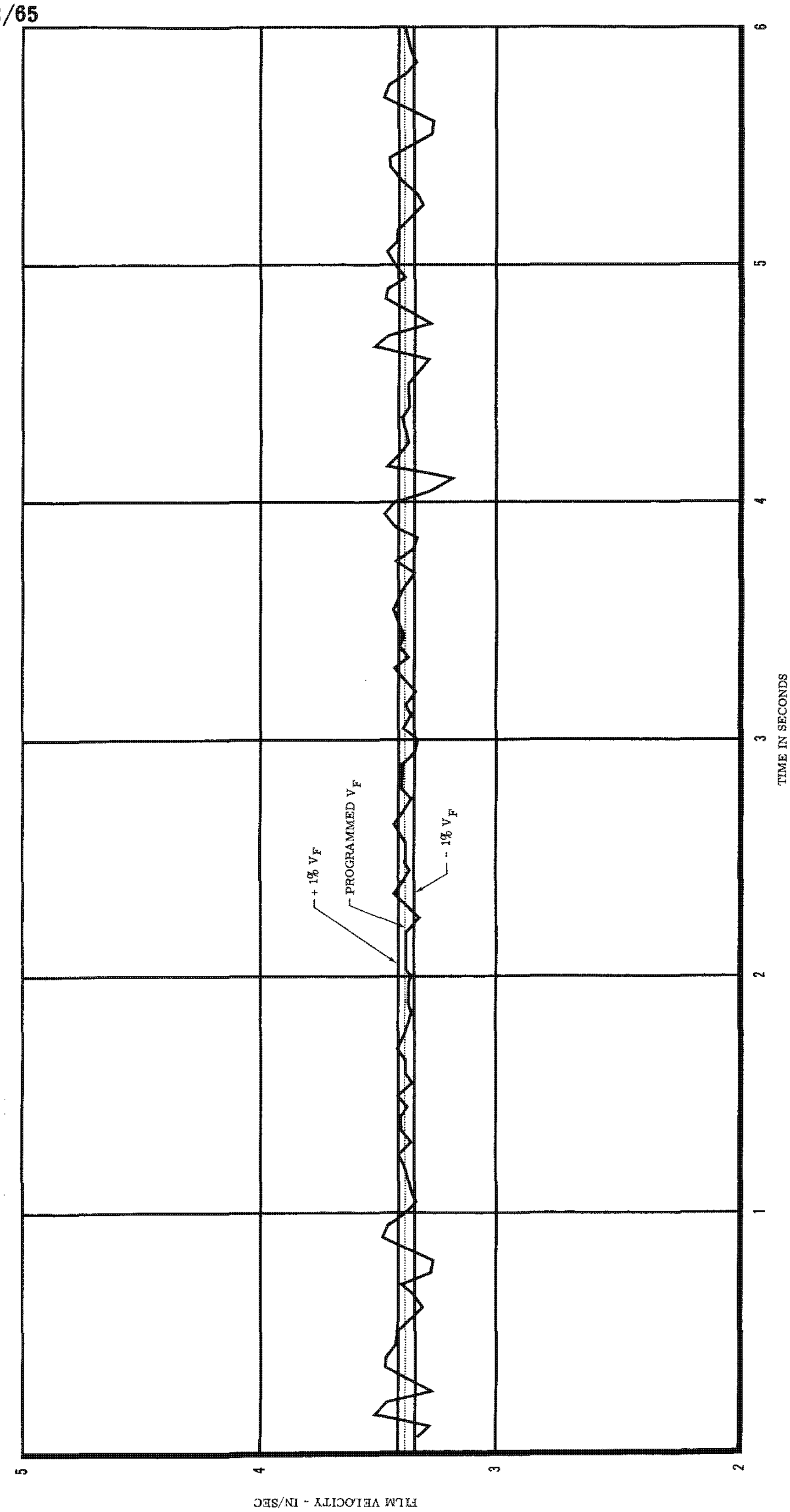

ILLUSTRATION 17

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPH NO. 1
SFO 109-1

CORN Target at Wells, Nevada
Door open 301 seconds, focus power on

Rev D16 Frame 003

Altitude: 85.7 NM Obliquity: -12.3°
Scale: 1:83,200 Strip

40X

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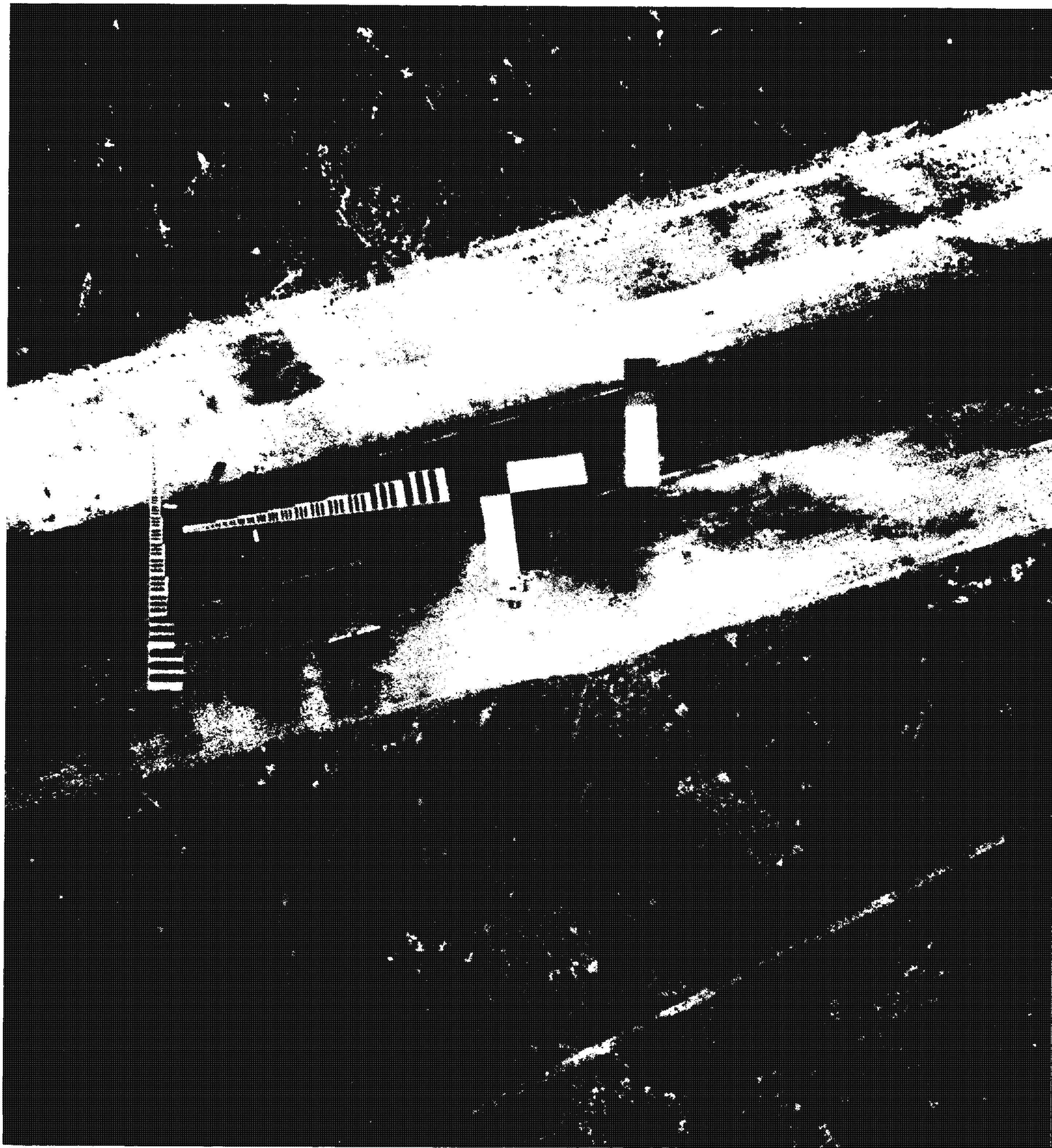

PHOTOGRAPH 1

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPH NO. 2
SFO 109-2

CORN Target at Green River, Utah
Door open 500 seconds, focus power on

Rev D32 Frame 003

Altitude: 84.8 NM
Scale: 1:80,500

Obliquity: + 0.4°
Strip

40X

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PHOTOGRAPH 2

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PHOTOGRAPHS NO. 3 & NO. 4

CORN Target at Eloy, Arizona

PHOTOGRAPH NO. 3

Obtained by Bluebird aircraft
using a KA-53, 12" focal length
camera from 18, 500 feet

20X

PHOTOGRAPH NO. 4

SFO 109-3

Door open 592 seconds, focus
power on

Rev D32 Frame 006

Altitude: 84.4 NM
Scale: 1:80,000

Obliquity: -1.9°
Strip

40X

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PHOTOGRAPH 3

SECRET

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PHOTOGRAPH 4

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPH NO. 5
SFO 109-4

CORN Target at Lowry AFB, Colorado
Door open 701 seconds, focus power on

Rev D48 Frame 011

Altitude:	84.4 NM	Obliquity:	+ 6.0°
Scale:	1:80,500	Strip	

40X

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPH 5

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPHS NO. 6 & NO. 7

CORN Target at Booneville, Missouri

PHOTOGRAPH NO. 6

Blackbird photography obtained by KA-2/
12" focal length camera from altitude of
16, 500 feet.

PHOTOGRAPH NO. 7

Rev D15 Frame 007

Altitude: 85.4 NM Obliquity: -1.1°
Scale: 1 :81,000 Strip

40X

PHOTOGRAPH 6

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PHOTOGRAPH 7

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPH NO. 8

CORN Target at Olney, Illinois

Rev D31 Frame 005

Altitude:	84. 8 NM	Obliquity:	+ 0. 2°
Scale:	1:83, 200	Stereo	

40X

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PHOTOGRAPH 8

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPH NO. 9

CORN Target at Mathison, Mississippi

Rev D31 Frame 006

Altitude: 84.4 NM Obliquity: + 0.9°
Scale: 1:80,000 Strip

40X

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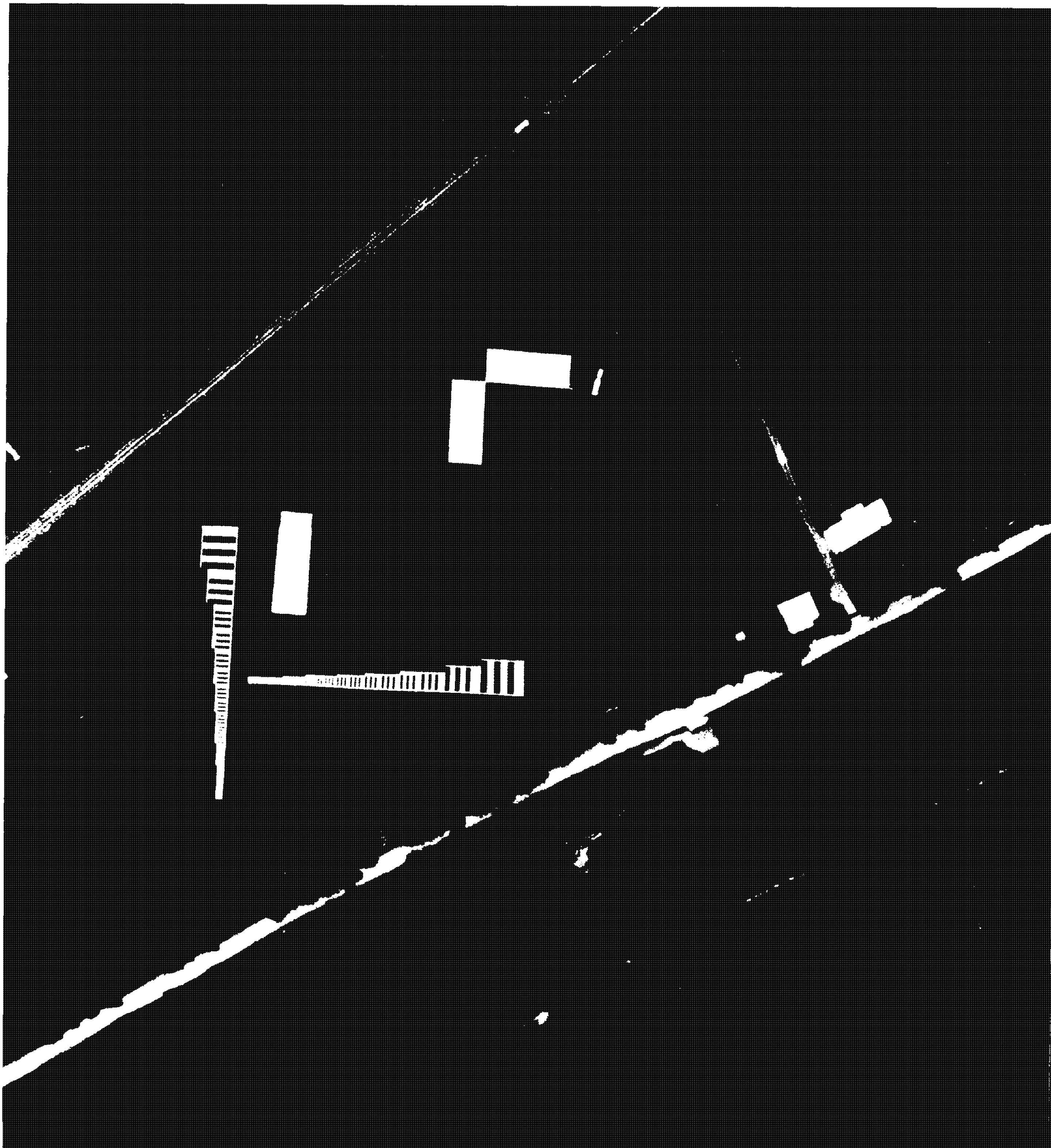

PHOTOGRAPH 9

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPH NO. 10

CORN Target at Norcross, Georgia

Rev D47 Frame 009

Altitude:	84.1 NM	Obliquity:	-2.6°
Scale:	1:79,800	Strip	

40X

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PHOTOGRAPH 10

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PHOTOGRAPH NO. 11

CORN Target at Hill City, Kansas

This CORN target was located in the center of the format using the glass blocks test slit. Focal plane is at best plane of focus (BPF).

Rev D64 Frame 008

Altitude: 84.1 NM
Scale: 1:83,000

Obliquity: +5.8°
Stereo

40X

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PHOTOGRAPH 11

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPH NO. 12

CORN Target at Hill City, Kansas

This CORN target was located in glass block adjacent to center block (time track side) using glass blocks test slit. Focal plane is at BPF + .0025 in.

Rev D64 Frame 009

Altitude:	84.0 NM	Obliquity:	+5.8°
Scale:	1:82,900	Stereo	

40X

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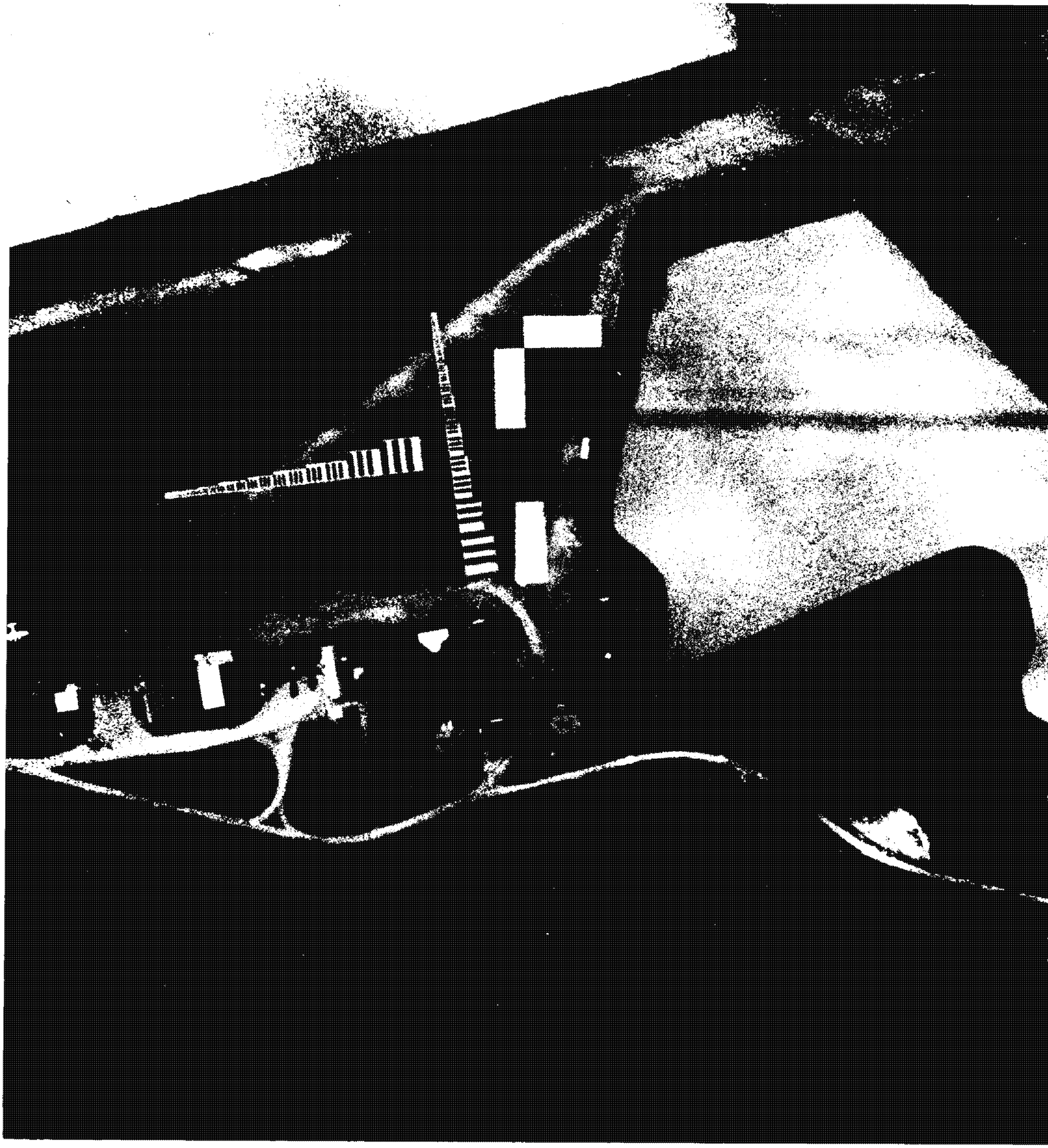
PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65



PHOTOGRAPH 12
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TOP SECRET - GAMBIT

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PHOTOGRAPH NO. 13

CORN Target near Big Springs, Texas

This CORN Target was located two glass blocks from center block (time track side) using glass blocks test slit. Focal plane is at BPF + .002 in.

Rev D64 Frame 010

Altitude: 84.0 NM Obliquity: +5.8°
Scale: 1:80,000 Strip

40X

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PHOTOGRAPH 13

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SECTION V

VEHICLE POSITIONING

1. Ephemerides

a. Generation of Best Fit Ephemeris

The Best Fit Ephemeris was generated by reprocessing the tracking data in approximately one-day spans. Resulting range residuals were generally well under 1000 feet.

The following chart shows the fit spans selected for each primary BFE. Included in the chart are the weighted R.M.S. residual of the fit (a measure of quality), and the derived drag factor ($C_DA/2m$). Nodal crossing time comparisons are also shown for revs common to two fits, to indicate the degree of consistency between ephemerides.

CHARACTERISTICS OF BEST FIT EPHEMERIDES

FIT SPAN	PAYLOAD REVS*	RMS RESIDUAL	DRAG FACTOR (FT^2/SLUG)	NODAL CROSSING TIME COMPARISON
1-18	4-17	1.22	.1628	
17-29	18-27	1.03	.1769	.048 sec @ Rev 18
26-34	28-33	0.83	.1984	.034 sec @ Rev 28
32-49	34-49	1.20	.2003	.030 sec @ Rev 34
54-64	56-64	1.17	.1889	.013 sec @ Rev 56

*Revs used for payload analysis runs in TDATA and TEAR routines. BFE was broken into shorter fit spans due to unusually high magnetic storm activity.

2. Map Match

Forty-nine revs of photography, composed of 813 frames, were available for analysis. To improve the reliability of the results and reduce the map error contribution to the overall system error, no bench marks were selected on maps with positional error greater than 2000 feet on the World Geodetic System. This criteria of selecting photography in areas of less than 8/10 cloud cover provided 1711 bench marks on 305 frames of photography. After editing, 1658 bench marks were used for making final analysis. This photography was located on 39 of the 49 revs taken.

3. Position and Attitude Determination

a. The TEAR Program was used for the Mission 4022 evaluation. The TEAR program utilizes data derived from comparing ground bench mark positions common to the map and the photography, as well as vehicle (exposure station) positions from either the operational command or best fit ephemeris to determine in-track and cross-track miss distances. This is accomplished by using the satellite position and tracing the ray corresponding to the photo bench mark (PBM) position on the film through the camera system to the ground. The difference between the ground coordinates of the traced ray and the PBM map

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coordinates is then resolved into in-track and cross-track miss distances. Thus the miss distances can be written

$$\sigma = f\,(A,\ E,\ C,\ M)$$

where A, E, C and M respectively refer to attitude, ephemeris, camera and map quantities. Therefore, using the programmed attitude and camera orientation, the command or best fit satellite position along with the PBM position on the film and the map, the miss distances can be calculated. These miss distances (σ_x and σ_y) are determined for each PBM in the frame and represent the total system error, the components of which are attitude, ephemeris, camera sub-system and map errors. Using TEAR with the vehicle position derived from the command ephemeris, the ephemeris error will contain a contribution due to predicting the ephemeris beyond the orbit determination (tracking data) fit span.

While the miss distances are computed for each PBM, the ultimate goal is to determine the errors which caused these miss distances. Knowing the functional relation $\sigma = f\,(\ )$ the difference equations

$$\Delta\sigma = \frac{\partial\sigma}{\partial A}\Delta A + \frac{\partial\sigma}{\partial E}\Delta E + \frac{\partial\sigma}{\partial C}\Delta C + \frac{\partial\sigma}{\partial M}\Delta M = \sigma$$

can be formed where the Δ quantities represent the errors (actual value-programmed value) which are to be determined and the coefficients of these errors can be explicitly derived. Obviously $\Delta\sigma = \sigma$ since the programmed miss distance is zero.

In a simplified form to explicitly show the attitude and instrument errors the equations for the down range and cross range miss distances can be expressed as follows

$$\sigma_x = \sigma_{xo} + \psi \tan \Omega + \theta \left(1 + \frac{\tan^2 \Sigma}{\cos^2 \Omega}\right) + \varphi \frac{\tan \Sigma \sin \Omega}{\cos^2 \Omega} + \Delta\Sigma \frac{1}{\cos^2 \Sigma \quad \cos \Omega} \qquad (1)$$

$$\sigma_y = \sigma_{yo} + \psi \frac{\tan \Sigma}{\cos \Omega} - \theta \frac{\tan \Sigma \sin \Omega}{\cos^2 \Omega} - \varphi \frac{1}{\cos^2 \Omega} \qquad (2)$$

where

h = Altitude above horizontal plane passing through the bench mark.

σ_x = In-track miss distance divided by h.

σ_y = Cross-track miss distance divided by h.

σ_{xo} = Mapping, timing and ephemeris error contribution to σ_x divided by h.

σ_{yo} = Mapping, timing and ephemeris error contribution to σ_y divided by h.

ψ = Vehicle yaw.

θ = Vehicle pitch.

Ω = Vehicle obliquity angle = vehicle roll angle + mirror crab angle.

φ = Vehicle roll error.

Σ = Calibrated mirror stereo angle.

$\Delta\Sigma$ = Difference between actual and calibrated mirror stereo angle.

These equations have been derived for an ordered body orientation of yaw, pitch then roll and small angle approximations have been used. In particular, the errors have been regarded as small so that for example

$$F(\Omega \pm \varphi) = F(\Omega)$$

$$F(\Sigma \pm \Delta\Sigma) = F(\Sigma)$$

Where F ( ) represent the trig functions. Also the mapping error includes errors in measuring the location of the PBM on both the map and the film.

Since the vehicle yaw and pitch are always programmed to be zero, ψ and θ are the yaw and pitch errors. Also $\Delta\Sigma$ is the mirror stereo position error since Σ is the calibrated mirror position. The error in the mirror crab position has been included in the roll error as a first approximation. Thus the computed miss distances σ_x and σ_y along with the programmed obliquity angle Ω, and the calibrated mirror stereo angle Σ are known. For the purpose of this analysis the bench mark height will be considered as known when computing σ_x and σ_y and will be allowed as an error included in σ_{xo} and σ_{yo}. The task then is to determine the unknown errors σ_{xo}, σ_{yo}, $\Delta\Sigma$, φ, θ and ψ which cause the miss distances σ_x and σ_y.

b. Single Frame Case

Due to the nature of the GAMBIT system the program was formulated so that the programmed knowns do not vary over the length of the frame. Also the unknown errors are constant for each frame. In reality only the camera orientation errors are likely to be constant over a frame. Since the attitude and ephemeris errors are slowly varying during a typical short frame the assumption that these errors are constant is reasonable. However, while the error in the map itself may be nearly constant over a short frame the errors in measuring the PBM position on both the film and the map may vary considerably. Hopefully, these measurement errors are somewhat random with a bias nearly equal to the probable map error. Since the film and map measurement errors are included in the map error the assumption that the map error is constant during the time of a frame is likely to be poor depending upon the randomness of the measurements. Since the map errors are not truly constant during the time of the frame, the miss distances calculated from the functional relation $\sigma = f(\,)$ will not be the same for each bench mark in the frame.

Regarding map and ephemeris errors as a single error, equations 1 and 2 are two equations in six unknowns. Since this is an undetermined and consequently unsolvable set of equations valid for each bench mark in the frame, choice of several bench marks allows the set to be expanded. Choosing three or more bench marks per frame one would expect the resulting set of equations to be exactly or overdetermined and solvable by the least squares technique. Since the coefficients of the unknowns as well as the unknowns are considered constant for each bench mark in a frame, equations 1 and 2 may be written

$$\sigma_{xi} = \sigma_{xo} + \psi A + \theta B + \varphi C + \Delta \Sigma D \qquad (1a)$$

$$\sigma_{yi} = \sigma_{yo} + \psi E + \theta F + \varphi G \qquad (2a)$$

where the subscript i refers to the i th bench mark in a frame and the trig coefficients have been replaced for simplicity. The above equations are 2i equations in six unknowns. However, the right-hand side of the 2 i equations is constant for all bench marks (all values of i) so that it is not possible to uniquely determine the six unknown errors. Thus choosing any two uncorrelated errors and assuming the other errors are zero, a solution is possible. However, neglecting four of the six errors will result, in general, in erroneous values for the two determined errors. It should be noted that choosing two uncorrelated errors and applying the least squares technique to the 2 i ($i > 1$) equations the technique simply averages over all the bench marks.

Again any two uncorrelated errors may be determined; however, the determined errors will, in general, be erroneous. By picking three sets of two uncorrelated errors and making three runs with the program all six errors may be determined. However, all six will be erroneous since they were taken two at a time. Nevertheless since only two errors can be determined at a time, the TEAR program has been used to determine each set of errors independently of the other sets in order to determine approximate values for the errors.

Since the ephemeris error is slowly varying, neglecting this error and solving for attitude error will result in a near constant attitude error bias from frame to frame. Also for the same mirror position the error is generally the same so that mirror position error will also introduce a bias into the attitude error determination. However, in this case the bias will depend upon the position of the stereo mirror. Therefore, if the map error is also constant from frame to frame, neglecting all but the attitude errors will only bias the results and the relative attitude time history will be meaningful. The map error is considered constant over a frame even though this may be an erroneous assumption. Thus the program is used, on a frame basis, to determine two attitude errors ignoring map, ephemeris and camera errors. In other words, in the current usage of the program to determine attitude errors on a frame basis, $\Delta \Sigma$, σ_{xo} and σ_{yo} have been regarded as being equal to zero. The results then, at best, will be an average and only the relative attitude errors from frame to frame will be meaningful. Realizing the above limitations, then consistent with the method of using the TEAR program namely neglecting mirror, map and ephemeris errors, equations 1 and 2 may be written

$$\sigma_x = \psi \tan \Omega + \theta \left(1 + \frac{\tan^2 \Sigma}{\cos^2 \Omega}\right) + \varphi \frac{\tan \Sigma \sin \Omega}{\cos^2 \Omega} \qquad (3)$$

$$\sigma_y = \Psi \frac{\tan \Sigma}{\cos \Omega} - \theta \frac{\tan \Sigma \ \sin \Omega}{\cos^2 \Omega} - \varphi \frac{1}{\cos^2 \Omega} \quad (4)$$

to show the attitude error dependence.

Examination of equations 3 and 4 show the three attitude errors of which only two can be determined on a frame basis. Proceeding blindly and solving for the three errors, two at a time will give erroneous results since each solution ignores one of the errors. However, there are certain special combinations of the mirror and obliquity angles which allow an accurate solution for at least one of the unknown errors. Therefore, certain special cases will be examined where when solving for two of the errors, the resulting solution for at least one of the two errors will be accurate. Of course, while equations 3 and 4 may be used to determine an accurate solution for one or more of the unknowns the accuracy of the determination is still subject to the assumption that $\Delta\Sigma = \sigma_o = 0$.

Case A Strip Vertical ($\Sigma = \Delta\Sigma = \sigma_o = 0$)

Considering first the case where $\Sigma = 0$, equations 3 and 4 reduce to

$$\sigma_x = \Psi \tan \Omega + \theta \quad (5)$$

$$\sigma_y = -\varphi \frac{1}{\cos^2 \Omega} \quad (6)$$

Thus the roll error may be determined.

Case B Zero Obliquity ($\Omega = \Delta\Sigma = \sigma_o = 0$)

For $\Sigma \neq 0$ and at zero obliquity angle, equations 3 and 4 reduce to

$$\sigma_x = \theta \ (1 + \tan^2 \Sigma) \quad (7)$$

$$\sigma_y = \Psi \tan \Sigma - \varphi \quad (8)$$

Thus the pitch error can be determined.

Case C Nadir ($\Sigma = \Omega = \Delta\Sigma = \sigma_o = 0$)

At zero obliquity and stereo angles, the equations become

$$\sigma_x = \theta \quad (9)$$

$$\sigma_y = -\varphi \quad (10)$$

so that both the roll and pitch errors can be determined.

c. Multiple Frame Case

Since the program formulation assumes the unknown errors to be constant over any solution interval, equations 1a and 2a may be written

$$\sigma^j_{xi} = \sigma^j_{xo} + \Psi A^j + \theta B^j + \varphi C^j + \Delta\Sigma D^j \quad (1b)$$

$$\sigma^j_{yi} = \sigma^j_{yo} + \Psi E^j + \theta F^j + \varphi G^j \quad (2b)$$

where the superscript j refers to the j th frame in the interval of frames where the errors are to be determined. In general, the coefficients A^j - - - G^j will be different for each frame since the programmed knowns generally change from frame to frame. The assumption that the ephemeris and mirror errors are constant is reasonable over a few frames since the ephemeris error is slowly varying and the mirror is a mechanical system for which the error in position is approximately the same each time the mirror is in the same position. While it is likely that the map errors over several frames will vary even more than previously discussed, there is some probability that the measurement errors are somewhat random with a bias equal to the probable map error. Most critical is the assumption of constant attitude errors since an accurate time history (frame to frame) of these errors is desired. The assumption of constant attitude errors is poor due to attitude changes caused by the attitude control system instability, the vehicle roll maneuvers, changes in the mirror position and other mechanical devices. Considering these attitude errors constant over several frames results in the program determining an average error and the detailed time history is lost.

Equations 1b and 2b are 2 i x j equations in six unknowns and solution via the least squares technique is indicated. Since for a particular frame (j constant) and for various values of i the equations are the same as section b with respect to the averaging property only i constant and various values of j will be considered in this section. In particular for $j \geq 3$ the set of equations is exactly or overdetermined and solution is accomplished by the least squares technique. Two factors influence the solution for $j \geq 3$. First the solution may be ill conditioned due to the way the coefficients of equations 1 and 2 vary from frame to frame and due to correlation between the unknowns. Secondly, since the program formulation assumes the errors to be constant over the $j \geq 3$ frames, any error which can be determined will be an average error over the $j \geq 3$ frames.

To examine the correlation between the various unknown errors would require explicit expressions for the three map, two film measurement, three ephemeris, mirror stereo, mirror crab, three attitude and time errors. Thus including all the errors the correlation would be determined by examination of the determinent of a 14 x 14 matrix. Even ignoring all errors except the attitude errors the examination of the 3 x 3 matrix would involve at least the coefficients of equations 3 and 4 for two frames ($j = 2$). This is an extremely difficult task and, in general, is best handled by using the program with several test cases. Also it should be noted that the program had not been used for $j \geq 2$ and the only multiple frame case which had been used is the rather special case of stereo pairs.

The one case that can be examined in detail where only mirror stereo position and attitude errors are considered is the special case of stereo pairs. For stereo pairs the parameters corresponding to the first frame of the pair will be denoted with a plus superscript and the parameters corresponding to the second frame with a minus superscript. Letting Σ_c^+ and Σ_c^- be the calibrated stereo mirror angles, then consider Σ to be an average value defined by

$$\Sigma = 1/2 \, (\Sigma_c^+ - \Sigma_c^-)$$

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Since the calibrated value is not the true mirror stereo position, the true values are then given by

$$\Sigma^+ = \Sigma + \Delta\Sigma^+$$

$$\Sigma^- = -\Sigma + \Delta\Sigma^-$$

Assuming that $\Delta\Sigma^+$ and $\Delta\Sigma^-$ are small so that

$$\tan \Sigma^+ = \tan \Sigma$$

$$\tan \Sigma^- = -\tan \Sigma$$

$$\cos^2 \Sigma^+ = \cos^2 \Sigma$$

$$\cos^2 \Sigma^- = \cos^2 \Sigma$$

and Ψ, θ , φ and Ω are constant and equal for both frames of a stereo pair, then equations 1 and 2 for a stereo pair with $\sigma_{xo} = \sigma_{yo} = 0$ may be written as

$$\frac{\sigma_x^+ + \sigma_x^-}{2} = \Psi \tan \Omega + \theta \left(1 + \frac{\tan^2 \Sigma}{\cos^2 \Omega}\right) + \frac{\Delta\Sigma^+ + \Delta\Sigma^-}{2} \frac{1}{\cos^2 \Sigma \cos \Omega} \quad (11)$$

$$\frac{\sigma_y^+ - \sigma_y^-}{2} = \Psi \frac{\tan \Sigma}{\cos \Omega} - \theta \frac{\tan \Sigma \sin \Omega}{\cos^2 \Omega} \quad (12)$$

$$\frac{\sigma_x^+ - \sigma_x^-}{2} = \varphi \frac{\tan \Sigma \sin \Omega}{\cos^2 \Omega} + \frac{\Delta\Sigma^+ - \Delta\Sigma^-}{2} \frac{1}{\cos^2 \Sigma \cos \Omega} \quad (13)$$

$$\frac{\sigma_y^+ + \sigma_y^-}{2} = -\varphi \frac{1}{\cos^2 \Omega} \quad (14)$$

where the σ's refer to the same bench mark in each frame. In this analysis the equations for each frame were combined to represent a stereo pair. The TEAR program, for stereo pairs, combines the two sets of 2 equations per bench mark per frame into a single set which is twice as large. While this analysis differs from the program formulation, conclusions regarding permissible solutions due to the correlation of variables will be the same.

Examination of equations 11 - 14 shows four equations in five unknowns so that it is not possible to determine a unique solution for the unknown errors. However, if $\Delta\Sigma^+$ and $\Delta\Sigma^-$ are known or are zero then examination of the determinent of the 3 x 3 coefficient matrix shows that a unique solution can be determined. It should be noted that in the method of using the TEAR program it is assumed that $\Delta\Sigma^+ = \Delta\Sigma^- = 0$ so that a unique solution, which is erroneous can be determined. The solution is erroneous since the effect of mirror stereo position is ignored whereas this error makes an important contribution to equations 11 and 13. Of course, neglecting σ_{xo} in equations 11 and σ_{yo} in equation 14 also

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decreases the validity of the solution.

For zero obliquity the above equations reduce further to

$$\sigma_x^+ + \sigma_x^- = 2\,\theta\,(1 + \tan^2 \Sigma) + \left(\Delta\Sigma^+ + \Delta\Sigma^-\right)\frac{1}{\cos^2 \Sigma} \qquad (15)$$

$$\sigma_y^+ - \sigma_y^- = 2\,\psi \tan \Sigma \qquad (16)$$

$$\sigma_x^+ - \sigma_x^- = (\Delta\Sigma^+ - \Delta\Sigma^-)\frac{1}{\cos^2 \Sigma} \qquad (17)$$

$$\sigma_y^+ + \sigma_y^- = -2\,\varphi \qquad (18)$$

Therefore, if $\Delta\Sigma^+$ and $\Delta\Sigma^-$ are known, as before, a unique solution can be determined. Furthermore, even if the mirror stereo position errors are not known the yaw and roll errors can still be accurately determined. Again in the use of the program $\Delta\Sigma^+$ and $\Delta\Sigma^-$ are not known and closely coupled with the yaw, pitch and roll errors. The coefficient multiplying these terms is large and ignoring these terms (i.e., the error in the calibrated mirror position) will generally result in an erroneous determination of the attitude errors except yaw and roll at zero obliquity.

In summary the error in the calibrated mirror stereo position introduces two variables which are highly correlated with the attitude errors. Due to this correlation, when using the program, the mirror stereo error is ignored and the determined attitude errors are erroneous, especially for non-zero obliquity angles. For $\Omega = 0$ the yaw and roll error determination is not affected by the mirror errors. However, at larger roll angles even the yaw and roll error determination is further degraded.

d. Correlation - Multi-Frame Case

Considering only attitude errors (i.e., $\sigma_{xo} = \sigma_{yo} = \Delta\Sigma = 0$) equations 3 and 4 may be written in matrix notation for the j th frame

$$A^j \delta = \sigma^j$$

where

$$A^j = \begin{bmatrix} A_{11}^j & A_{12}^j & A_{13}^j \\ A_{21}^j & A_{22}^j & A_{23}^j \end{bmatrix}$$

$$\delta = \begin{bmatrix} \psi \\ \theta \\ \varphi \end{bmatrix}$$

$$\sigma^j = \begin{bmatrix} \sigma^j_x \\ \sigma^j_y \end{bmatrix}$$

and the i subscript referring to the i th PBM in the j th frame has been dropped for convenience.

For two frames j and k equations 3 and 4 may be written

$$\begin{bmatrix} [A^j] \\ [A^k] \end{bmatrix} \delta = \begin{bmatrix} [\sigma^j] \\ [\sigma^k] \end{bmatrix}$$

where the total matrices have been partitioned. Therefore, the normal equations in the least squares process have the coefficient matrix

$$[B] = [A^j]^T [A^j] + [A^R]^T [A^k]$$

with elements

$$b_{mn} = \sum_j \sum_r a^j_{r\,m} \; a^j_{r\,n} \qquad m, n = 1, 2, 3$$

where j is the frame and r is the rows of $[A]$. Only the triangular matrix is given since $B^T = B$ (i.e., B is symmetric). Therefore, explicitly the elements are as follows

$$b_{11} = \sum_j \left[\tan^2 \Omega_j + \frac{\tan^2 \Sigma_j}{\cos^2 \Sigma_j} \right]$$

$$b_{12} = \sum_j \tan \Omega_j$$

$$b_{13} = \sum_j \left[\frac{\tan \Sigma_j}{\cos \Omega_j} \right]$$

$$b_{22} = \sum_j \left[(1 + \frac{\tan^2 \Sigma_j}{\cos^2 \Omega_j})^2 + \frac{\tan^2 \Sigma_j \tan^2 \Omega_j}{\cos^2 \Omega_j} \right]$$

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$$b_{23} = \sum_j \left[\frac{\tan \Sigma_j \tan \Omega_j}{\cos \Omega_j} \left(1 + \frac{1}{\cos^2 \Omega_j} + \frac{\tan^2 \Sigma_j}{\cos^2 \Omega_j}\right) \right]$$

$$b_{33} = \sum_j \left[\frac{\tan^2 \Sigma_j \tan \Omega_j}{\cos^2 \Omega_j} + \frac{1}{\cos^4 \Omega_j} \right]$$

where the subscript j on the mirror stereo and obliquity angles refer to the j th frame.

The variance/covariance matrix is given by $C = B^{-1}$ so that the correlation is given by

$$\rho_{pq} = \frac{C_{pq}}{\sqrt{C_{pp} \, C_{qq}}} = \frac{\Delta_{pq}}{\sqrt{\Delta_{pp} \, \Delta_{qq}}}$$

where Δ_{pq} is the co-factor of b_{pq}. Explicitly

$$\rho_{\Psi,\theta} = \frac{b_{23} b_{13} - b_{12} b_{33}}{\sqrt{(b_{22} b_{33} - b_{23}^2)(b_{11} b_{33} - b_{13}^2)}}$$

$$\rho_{\Psi,\varphi} = \frac{b_{12} b_{23} - b_{22} b_{13}}{\sqrt{(b_{22} b_{33} - b_{23}^2)(b_{11} b_{22} - b_{12}^2)}}$$

$$\rho_{\theta,\varphi} = \frac{b_{12} b_{13} - b_{11} b_{23}}{\sqrt{(b_{11} b_{33} - b_{13}^2)(b_{11} b_{22} - b_{12}^2)}}$$

so that in general it is difficult to derive an analytical expression for the correlation.

While the correlation is a complex function of the mirror stereo and obliquity angles, results can be obtained for multiple frames of the previously discussed special cases.

Case IA $\Sigma = 0, \quad \Omega \neq 0$

For multiple frames of $\Sigma = 0$ photography, the correlation is given by

$$\rho_{\theta,\varphi} = \rho_{\Psi,\varphi} = 0$$

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$$-\rho_{\psi,\theta} = \left[\frac{\sum_j \tan^2 \Omega_j}{\sum_j j} \right]^{1/2}$$

Case IB $\Sigma \neq 0$, $\Omega = 0$

Since stereo pairs will be considered separately then the only non zero values of Σ_j and Σ_k will be $\Sigma_j = \Sigma_k$. However, the obliquity for this case is zero and for two frames with the same obliquity and mirror stereo angle $[A^j] = [A^k]$. Therefore, the multiple frames case is exactly the same as the single frame case with multiple bench marks.

Case IC $\Sigma = 0$, $\Sigma = 0$

It is obvious (Case IB) that multiple frames of nadir photography are exactly the same as the single frame case with multiple bench marks.

Case ID Stereo Pairs

For a single stereo pair, the correlation is given by

$$\rho_{\theta,\varphi} = \rho_{\psi,\varphi} = 0$$

$$\rho_{\psi,\theta} = \frac{-\sin\Omega \quad \cos^2\Omega}{[\tan^2\Sigma \ (1 + \tan^2\Sigma\ )^2 + \sin^2\Omega \ \cos^4\Omega]^{1/2}}$$

Therefore, allowing a correlation of about $\rho_{\psi,\theta} = .2$ the solution for the yaw and pitch errors will be reasonable for $-3.5° \geq \Omega \geq 3.5°$. The yaw-pitch correlation is plotted in Figure 1.

Case IE $\Sigma_1 = \Sigma_2$, $\Omega_1 = -\Omega_2$

For equal mirror stereo angles along with equal and opposite obliquity angles, the correlation is given by

$$\rho_{\psi,\theta} = \rho_{\theta,\varphi} = 0$$

$$\rho_{\psi,\varphi} = \frac{-\tan\Sigma}{\sqrt{b_1 \ b_3}}$$

where

$$b_1 = \tan^2\Omega + \frac{\tan^2\Sigma}{\cos^2\Omega}$$

$$b_3 = \tan^2\Sigma \ \tan^2\Omega + \frac{1}{\cos^2\Omega}$$

From the yaw-roll correlation plotted in Illustration 19, the correlation is small ($\rho_{\psi,\varphi} \geq .2$) for $\Omega \geq 40°$.

Results can also be derived for various combinations of the above cases.

Case IIA $\Sigma = 0$, $\Omega \neq 0$ plus $\Sigma = 0$, $\Omega = 0$

$$\rho_{\theta,\varphi} = \rho_{\varphi,\psi} = 0$$

$$\rho_{\psi,\theta} = \frac{-1}{\sqrt{2}}$$

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Case IIB $\Sigma = 0, \Omega = 0$ plus $\Omega = 0, \ \Sigma \neq 0$

$$\rho_{\theta,\varphi} = \rho_{\psi,\theta} = 0$$

$$\rho_{\psi,\varphi} = \frac{1}{\sqrt{2}}$$

Case IIC $\Sigma \neq 0, \Omega = 0$ plus $\Sigma = 0, \Omega \neq 0$

$$\rho_{\psi,\theta} = \frac{-P \tan \Omega}{\sqrt{AC}}$$

$$\rho_{\psi,\varphi} = \frac{(1 + Q^2) \tan \Sigma}{\sqrt{BC}}$$

$$\rho_{\theta,\varphi} = \frac{-\tan \Sigma \tan \Omega}{\sqrt{AB}}$$

where

$$P = 1 + \frac{1}{\cos^4 \Omega}$$

$$Q = (1 + \tan^2 \Sigma)$$

$$A = P \tan^2 \Omega + \frac{\tan^2 \Sigma}{\cos^4 \Omega}$$

$$B = Q^2 (\tan \Sigma + \tan^2 \Omega) + \tan^2 \Sigma$$

$$C = (1 + Q^2) P$$

Case IID $\Sigma = 0, \Omega = 0$ plus $\Sigma \neq 0$ plus $\Sigma = 0, \Omega \neq 0$

For the combination of the three special cases, the correlations are given by the same formulas as Case IIC where

$$P' = P + 1$$

$$Q' = Q + 1$$

Plots of the correlations are presented in Illustration 20 for Case IID. Case IIC will have the same general shape with slightly larger correlations. Note that it is not possible to choose an obliquity angle or range of angles for which all three correlations are small.

Consideration of other combinations of frames is very algebraically complex. However, a sufficient but not necessary condition for the correlation to be zero is that the co-factor $\Delta_{pq} = 0$. Several results can be presented utilizing the above condition.

Case IIIA Multiple Stereo Pairs

$$\rho_{\psi,\varphi} = \rho_{\theta,\varphi} = 0$$

$$\Delta_{\psi,\theta} = 0 \text{ if } \sum_j \tan \Omega_j = 0$$

Case IIIB Stereo Pairs Plus All Other Combinations

The one exception not included in this case is $\pm\Sigma_j = \Sigma_k, \Omega_j \neq \Omega_k$ and non-zero. For

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$$\sum_j \tan \Omega_j = 0$$

the correlations are given by

$$\rho_{\psi,\theta} = 0$$

$$\rho_{\theta,\varphi} = 0$$

$$\rho_{\psi,\varphi} = \frac{\tan \Sigma}{\sqrt{b_{11}\, b_{33}}}$$

where

$$b_{11} = 3 \tan^2 \Omega + 2 \frac{\tan^2 \Sigma}{\cos^2 \Omega} + \tan^2 \Sigma$$

$$b_{33} = 2 \frac{\tan^2 \Sigma \tan^2 \Omega}{\cos^2 \Omega} + \frac{3}{\cos^4 \Omega} + 2$$

It can be seen from the plot of $\rho_{\psi,\varphi}$ in Illustration 21 that the roll-yaw correlation is small ($\rho_{\psi,\varphi} \lesssim .2$) for $\Omega \gtrsim 10°$

While including all combinations is too algebraically complex for analytical analysis, it is interesting to investigate what combinations are permissible when requiring zero correlation. Since b_{11} b_{22} and b_{33} cannot be zero except for b_{11} which is zero for the trivial case of $\Sigma = \Omega = 0$ then for zero correlation it is necessary that $b_{12} = b_{13} = b_{23} = 0$ or

$$\sum_j \tan \Omega_j = 0$$

$$\sum_j \frac{\tan \Sigma_j}{\cos \Omega_j} = 0$$

$$\sum_j \frac{\tan \Sigma_j \tan \Omega_j}{\cos \Omega_j} \left[1 + \frac{\tan^2 \Sigma_j}{\cos^2 \Omega_j} + \frac{1}{\cos^2 \Omega_j}\right] = 0$$

It does not appear likely that for several randomly chosen frames that the above three conditions would be satisfied. Also for several frames of photography the number of variables Ω_j and Σ_j greatly exceeds the number of constraining equations. However, from the following table

	b_{12}	b_{13}	b_{23}
$\Sigma = 0\ \Omega = 0$	0	0	0
$\Sigma = 0\ \Omega \neq 0$	$\tan \Omega$	0	0
$\Sigma \neq 0\ \Omega = 0$	0	$\tan \Sigma$	0
$\Sigma_1 = -\Sigma_2, \Omega_1 = \Omega_2$	$2 \tan \Omega$	0	0
$\Sigma_1 = \Sigma_2, \Omega_1 = -\Omega_2$	0	$2 \frac{\tan \Sigma}{\cos \Omega}$	$2 \frac{\tan \Sigma \tan \Omega}{\cos \Omega} \left[1 + \frac{\tan^2 \Sigma}{\cos^2 \Omega} + \frac{1}{\cos^2 \Omega}\right]$

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it is obvious that considering multiple frames of stereo and $\Sigma = 0$ photography such that $\Sigma \tan \Omega_j = 0$ then all correlations will be zero.

e. Effect of Non-Zero Mirror, Map and Ephemeris Errors

The effect of an error in the calibrated mirror stereo position is shown in the following chart where the indicated attitude errors are coupled to the mirror stereo position error.

Error	$\Sigma = 0$		$\Sigma \neq 0$		Pairs	
	$\Omega \neq 0$	$\Omega = 0$	$\Omega \neq 0$	$\Omega = 0$	$\Omega \neq 0$	$\Omega = 0$
ψ	$\Delta\Sigma$	*	$\Delta\Sigma$	none	$\Delta\Sigma^+ + \Delta\Sigma^-$	none
θ	$\Delta\Sigma$	$\Delta\Sigma$	$\Delta\Sigma$	$\Delta\Sigma$	$\Delta\Sigma^+ + \Delta\Sigma^-$	$\Delta\Sigma^+ + \Delta\Sigma^-$
φ	none	none	$\Delta\Sigma$	none	$\Delta\Sigma^+ - \Delta\Sigma^-$	none

Therefore, some errors are not affected by a mirror stereo position error for different combinations of Σ and Ω.

The effect of non-zero map and ephemeris errors can be determined by replacing σ by $\sigma - \sigma_O$. Examination of equations 5 - 10 shows the coupling between the attitude and ephemeris errors. The components which are coupled depend upon the obliquity angle as shown by the following chart.

Error	$\Sigma = 0$		$\Sigma \neq 0$		Pairs	
	$\Omega \neq 0$	$\Omega = 0$	$\Omega \neq 0$	$\Omega = 0$	$\Omega \neq 0$	$\Omega = 0$
ψ	σ_{xo}	*	both	σ_{yo}	both	none
θ	σ_{xo}	σ_{xo}	both	σ_{xo}	both	σ_{xo}
φ	σ_{yo}	σ_{yo}	both	σ_{yo}	both	σ_{yo}

For stereo pairs it has been assumed that $\sigma_o^+ = \sigma_o^-$ and of course the bench mark is common to both frames. Note from the chart that using stereo pairs at zero obliquity the yaw error can be determined even for non-zero map and ephemeris errors. However, in actuality $\sigma_o^+ \neq \sigma_o^-$ and even the yaw error determination will be degraded.

f. Test Case Results

Prior to the appropriate equations being available for analysis, several test cases were designed to help determine how to use the program. Initially, these test cases were designed with zero ephemeris error and such that for each bench mark $\sigma_x = \sigma_y = 0$. Then inputting attitude errors the question was whether or not the solution for attitude errors would be identical to the errors that were input. Without exception the results of the previous analysis were confirmed by the test cases.

* Yaw cannot be determined.

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Since the actual data is carefully edited to remove obvious errors, data noise (random map reading error) was simulated by introducing a small error such that on an individual frame and bench mark basis σ_x and σ_y were not zero while the average σ_x and σ_y per frame were zero. The addition of the data noise did not seriously affect the determination of the attitude errors.

The effect of non-zero values for σ_{xo} and σ_{yo} was simulated by introducing a data bias, i.e., for each bench mark σ_x and σ_y on a frame basis are non-zero and equal. The test case results, as anticipated, showed that generally the effect of ephemeris and/or map errors degraded the determination of the attitude errors. In fact these errors combined to either increase or decrease the attitude errors depending upon the sign of the data bias, i.e., σ_{xo} and σ_{yo} and the magnitude of the obliquity angle. In particular, the correlations between σ_{xo} and θ along with σ_{yo} and φ were very high.

g. Summary

(1) The TEAR program can be used post flight, prior to the availability of stellar photography, to attempt to determine gross sub-system malfunctions. Any attempt to utilize the program without inputs from the stellar reduction to detect small, nominal, within spec subsystem errors may be misleading. In particular, the program should be used first to determine the in-track and cross-track ephemeris errors independent of attitude errors. Secondly, the attitude errors should be determined independent of ephemeris errors. When solving for the attitude errors on a frame basis, the special cases should be used to determine the errors. The attitude errors should only be used to examine the relative behavior between adjacent frames or pairs. However, even this use of the program may be misleading due to the possible compensating effect of the various errors.

(2) The following table indicates what combinations are permissible when solving for attitude errors in the presence of other system errors and when the other system errors are not so large so as to be overriding.

	$\Omega = 0$			$\Omega \neq 0$		
	Y	P	R	Y	P	R
$\Sigma =$	No	Yes	Yes	No	Yes*	Yes
$\Sigma \neq$	No	Yes	No	No	Yes*	No
Pairs	Yes	Yes	Yes	No	Yes*	Yes

The asterisk indicates serious degradation of accuracy at large obliquity angles.

(3) An error in the calibrated stereo mirror position (i.e., true position not equal to calibrated position) will add an additional unknown $\Delta\Sigma$ term to the σ_x equation for $\Sigma = 0$ and $\Sigma \neq 0$. For stereo pairs an additional unknown term involving $\Delta\Sigma^+$ and $\Delta\Sigma^-$ will be added to the two equations in σ_x^+ and σ_x^-. The necessity of neglecting these terms due to the usage of the program will degrade any attitude

error determination resulting from a σ_x equation depending upon the obliquity angle.

(4) Since σ_{xo} should appear in the σ_x equation and σ_{yo} in the σ_y equation, all results except ψ from stereo pairs with $\Omega = 0$ will be seriously degraded by the necessity of neglecting these terms. The degree that the results will be degraded is dependent upon the value of the obliquity angle.

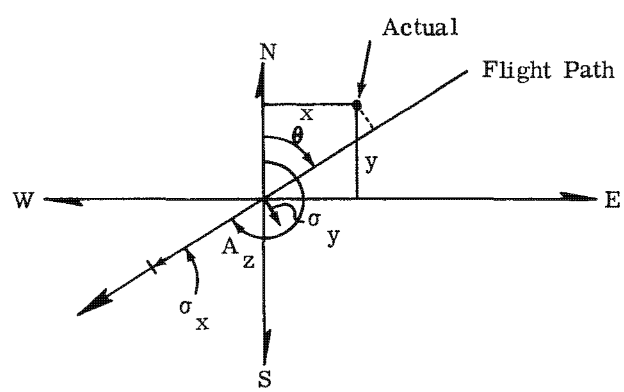
(5) Since pitch and roll error are so closely correlated with mirror position error (crab and stereo) solving for attitude error while neglecting mirror position error will also indicate gross malfunctions in the mirror and/or attitude control system. One way of deciding which system is malfunctioning is to observe some pattern which shows the mirror malfunction in a particular position.

(6) Utilizing the attitude orientation information obtained from the reduction of stellar photography, the TEAR program can be used to attempt to determine the ephemeris errors both in the best fit and command ephemerides. Since the BFE errors are slowly varying over a payload operating span, a very limited amount of attitude orientation data derived from the stellar photography will serve to determine the ephemeris errors. Inputting the ephemeris errors will then allow for solution of the attitude errors on a per frame and/or stereo pair basis with the same limitations as discussed in the analysis. Possible problems may occur due to map and instrument errors along with the correlation between the radial, cross-track and in-track ephemeris errors.

4. Accuracy

The accuracy of the miss distance calculation is largely dependent upon the accuracy of the photo map match, i.e., the accuracy of determining the map coordinates of the PBM. In order to determine the influence of map errors and human errors in reading the map, the following analysis was conducted.

Denoting the map coordinates of the intersection of the traced ray with the earth as the computed position and the map coordinates of the PBM as the actual position, the coordinate system as shown below can be established with the origin at the computed position.



Thus x is the longitude of the actual point relative (actual-computed) to the computed point and y is the latitude of the actual point relative to the computed point. A_z is the azimuth given by

$$A_z = \sin^{-1}\left[\frac{\cos i}{\cos\varphi}\right]$$

where i is the orbit inclination and φ is the geocentric latitude of the computed point. Also, for convenience

$$\theta = A_z - 180°$$

Therefore the latitude and longitude of the actual point are related to σ_x and σ_y by

$$\begin{bmatrix} -y \\ x \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} \sigma_x \\ \sigma_y \end{bmatrix}$$

so that

$$\begin{bmatrix} \sigma_x \\ \sigma_y \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} -y \\ x \end{bmatrix}$$

Therefore, an error in the map or in measuring x and y will be reflected in σ_x and σ_y according to

$$\begin{bmatrix} \delta\sigma_x \\ \delta\sigma_y \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} -\delta y \\ \delta x \end{bmatrix}$$

which shows the dependence upon the azimuth and consequently the inclination of the orbit and the latitude of the computed point.

For polar orbits, and north to south camera operation

$$\delta\sigma_x = -\delta y = -.15 \text{ NM}$$

$$\delta\sigma_y = \delta x = .15 \text{ NM}$$

for typical map and measurement errors of .15 NM. For an orbit inclination of 105° and at approximately 60° north latitude, $\theta \cong 26.8°$ so that

$$\delta\sigma_x \cong -.2 \text{ NM}$$

$$\delta\sigma_y \cong .07 \text{ NM}$$

which shows that for this particular orbit and latitude the error in the σ_x and/or σ_y determination can be larger or smaller than the error in the latitude and/or longitude measurement.

5. Method of Making TEAR Runs

For the PBM's that were chosen the corresponding latitude, longitude, time and film measurement along with the appropriate satellite vehicle positions were input to the TEAR Computer Program.

a. Using the BFE satellite position, the σ_x and σ_y for each individual PBM was determined and then edited by comparison with the average σ_x and σ_y for the entire frame. A comparison was also made of the σ_x and σ_y of neighboring PBM's. All PBM's whose σ_x and σ_y were not in close agreement were identified and rechecks of all the PBM parameters were then made. A second computer run was then made with the corrected PBM's to check for agreement with surrounding points. At this point all bench marks that did not agree within $\pm$ 0.3 nautical miles with surrounding points were eliminated from further analysis. Also, all frames with only one bench mark per frame were excluded from further consideration.

b. The miss distances (σ_x and σ_y) shown on Geo-Positioning Data Sheets, Appendix A, were computed for each individual bench mark using the BFE satellite position, and then averaged for the entire photographic frame. Regarding the PBM map position coordinates as the actual position and the coordinates of the traced ray as the predicted position, then σ_x is positive if the actual position is south of the predicted position and σ_y is positive if the actual position is east of the computed position. The Mean Error (ME) shown is also computed for each frame.

c. Due to limitations posed by the correlation between the yaw, pitch and roll error sub-components the following procedure was used when determining the attitude errors:

(1) For photography where $\Sigma = 0$ and the roll angle is zero, the total system error was considered to be due to attitude error and the attitude error was resolved into pitch and roll components without any loss of accuracy even in the presence of yaw. The accuracy of the determined pitch error is degraded at greater roll angles.

(2) For frames where $\Sigma \neq 0$, and for zero roll angle again the total system error was considered to be caused by attitude error. However, only the pitch component of the attitude error could be determined with reasonable accuracy. The pitch error determination is even less accurate for greater roll angles.

(3) For stereo pairs, again the total system error was considered to be caused by attitude error and the attitude error was resolved into pitch and roll components. For zero roll angle the yaw pitch and roll errors are accurate. The accuracy of the yaw and pitch error determination is degraded for greater roll angles.

d. In Case I the vehicle attitude errors were computed using the BFE satellite position. The results of this run are shown on the Data Sheets. In this case the system error is considered to be due entirely to attitude errors and is determined as outlined in Section 4.c.

e. In Case II the BFE errors were computed using the BFE satellite position. Errors shown on the Geo-Positioning Data Sheets under BFE Ephemeris Error columns are the in-track and cross-track errors that would result if all of the system error was caused entirely by the BFE errors.

f. In Case III the command ephemeris errors were computed using the command ephemeris satellite position. The errors in the command ephemeris are shown on the Geo-Positioning Data Sheets in terms of in-track and cross-track errors. This TEAR run used the commanded satellite vehicle position for comparison with the bench mark positions. The results shown here give the error that would result if all the system error was caused entirely by command ephemeris errors. Also shown is the difference between the command and best fit ephemerides where the sign convention of section g was utilized to show which difference is larger in absolute value.

g. The command and best fit ephemeris errors along with the mean error were averaged over each payload operating span on each rev and are displayed on the summation chart (page 87). This chart shows the in-track and cross-track error history for each ephemeris. In theory, the errors in the BFE should be less than the errors in the command ephemeris since no extrapolation is involved, the length of the fit span (tracking data interval) is longer, and the orbit determination is accomplished post flight in a more precise manner. These BFE and command ephemeris in-track and cross-track errors, along with the mean error, were differenced on the same summary chart. Since both the BFE and command ephemeris error determination used the same BM's and the same values for attitude, then the differences in the errors must be a slowly varying function. Examination of the differences show the trend to be the expected slowly varying function with some dispersion about this trend. This dispersion or noise is due to inaccuracy in the σ_x and σ_y, the in-track and the cross-track error determination. In other words, the difference between the true best fit and command ephemeris errors is a slowly varying function and an error in the determined ephemeris errors will result in the observed noise. The sign following the error number in the difference columns shows which ephemeris had the bigger error in accordance with the following sign convention.

$$- \Xi \quad \left|\epsilon_{CMD}\right| > \left|\epsilon_{BFE}\right|$$
$$+ \Xi \quad \left|\epsilon_{BFE}\right| > \left|\epsilon_{CMD}\right|$$

h. The last several GAMBIT missions indicated in some instances that the miss distances and consequently the ephemeris errors were, in magnitude, larger for the best fit than the command ephemeris. It has previously been pointed out that the ephemeris errors for either the command or best fit ephemeris result from resolving the total miss distances into only ephemeris errors. Also the attitude errors result from resolving the BFE total miss distances into only attitude errors. Thus, neither the attitude or ephemeris errors are correct. The following example will show that due to this method of using the TEAR program, it is not possible to determine which ephemeris has the larger errors. Consider the BFE to be absolutely correct (i.e., no ephemeris errors) and no map errors so that the miss distances are due to attitude or mirror position errors. More specifically assume the vehicle to have only a pitch error corresponding to a finite σ_x and a negligible σ_y. Now the TEAR program normally is used to determine the ephemeris error due to σ_x, resulting in an in-track ρ approximately equal to σ_x even though the BFE was not in error. Now consider the command ephemeris position to be behind the BFE position by a distance $-\rho$. Then solving for the command in-track ephemeris error would give a $\sigma_x = 0$ and a zero ephemeris error. Thus, the TEAR results would show the BFE to be in error by ρ and the command ephemeris to have zero error. Also if the command ephemeris were ahead of the BFE by a distance ρ

then solving for the command in-track ephemeris error would give $2\sigma_x$ and 2 ρ ephemeris error. Due to the method of producing the BFE and since the command ephemeris is predicted, the conclusion may be drawn that the BFE errors must be smaller than the command ephemeris errors. Also the ephemeris errors as well as the difference between the command and best fit ephemeris errors is a slowly varying function. Thus, if the TEAR produced results show the BFE ephemeris errors to be larger than the command ephemeris errors, the true error must be an attitude, mirror or map error which, in fact, compensated for part of the command ephemeris error. Since accurate maps are used the contribution due to map errors should be small. Also, since the BFE is more accurate, then true attitude errors will tend to increase σ_x and σ_y when using the BFE satellite position. Conversely, since the command ephemeris is less accurate, then the attitude errors will tend to be more compensating, thus sometimes reducing the σ_x and σ_y when using the commanded vehicle position. Therefore, if the vehicle has attitude errors it is not surprising the BFE ephemeris errors will sometimes appear to be larger than the command ephemeris errors.

i. As mentioned previously for stereo pairs with the absolute value of obliquity less than about 3.5 deg the yaw, pitch and roll errors may be accurately determined.

Rev	Frames	Yaw	Pitch	Roll
7	18 & 19	.636	.599	-.069
10	11 & 12	.540	.395	-.410
21	5 & 6	.721	.486	.071
26	10 & 11	.047	.042	-.343
26	16 & 17	.369	.244	-.149
31	4 & 5	-.138	.325	-.153
42	28 & 29	.612	.194	-.307
48	8 & 9	.516	.105	-.569
54	20 & 21	.046	.025	-.460
58	4 & 5	.356	.382	-.102

j. For certain revs the various correlations between the attitude subcomponent errors were small so that the yaw pitch and roll errors could be determined on a rev basis as shown below.

Rev	Yaw	Pitch	Roll
5	.400	.294	-.272
24	.497	.143	-.356
27	.086	-.244	-.387
32	.720	-.009	-.344
37	.499	.403	-.236
58	-.042	.387	-.368

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k. Based on the data for the entire flight the average errors were

σ_x = .302 NM

σ_y = -.710 NM

Yaw = .286 deg

Pitch = .193 deg

Roll = -.364 deg

5. Statistical Analysis

The in-track and cross-track miss distances were analyzed on a statistical basis. The procedure used was to make the usual frequency of occurrence plots, calculate the probability and plot the results on "probability paper" (Illustrations 22-27). Referring to Illustrations 22-27 the probability that the error σ will be greater than σ_0 can be found by first determining the intersection of $\bar{\sigma} - \sigma_0$ and $\bar{\sigma} + \sigma_0$, where $\bar{\sigma}$ is the mean error, with the plotted line. Secondly the probability P_L (in percent) corresponding to $\bar{\sigma} \pm \sigma_0$ to the left of $\bar{\sigma}$ is read off the left hand scale. The corresponding probability P_R to the right of $\bar{\sigma}$ is read off the right hand scale. The desired probability is then the positive difference of P_L and P_R.

Since the data bias and distribution is a function of the mirror stereo position and the vehicle roll angle the analysis was conducted using several combinations of Σ and roll. The analysis of the cross-track errors was accomplished for $\Sigma = 0$ (Illustration 22) and $\Sigma \neq 0$ (Illustration 23). For the in-track errors the break down was the same ($\Sigma = 0$, Illustration 24); however, it was necessary to consider sub cases for $\Sigma \neq 0$. Illustration 25 shows $\pm \Sigma \neq 0$ for roll angles between $\pm$ 15 degrees. Illustration 26 is the same except the roll angle varies between 15 and 45 degrees. Illustration 27 shows the probability plot for the roll angle between -15 and -45 degrees. The results (mean and standard deviation) are summarized below where the units are NM.

For σ_y

	$\Sigma = 0$	$\Sigma \neq 0$
Mean	-.6	-.7
SD	.4	.45

For σ_x

	$\Sigma = 0$	$\Sigma \neq 0$					
		-15° → 15°		15° → 45°		-15° → -45°	
		$+\Sigma$	$-\Sigma$	$+\Sigma$	$-\Sigma$	$+\Sigma$	$-\Sigma$
Mean	.12	.2	.45	-.03	.37	.4	1.0
SD	.49	.6	.6	.5	.6	.8	.9

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6. Conclusions

a. The pitch (and stereo mirror position) error is closely correlated with the in-track ephemeris error and consequently σ_x. Therefore, the pitch error determined independently from ephemeris errors is not the actual pitch error but is highly biased by the presence of an actual in-track ephemeris error. In other words, while σ_x is caused principally by an in-track ephemeris error, then solving for pitch independently results in a pitch error equivalent to σ_x and consequently equivalent to the in-track ephemeris error. However, over a payload operating span the in-track ephemeris error is a slowly varying function so that the difference between the determined pitch error on succeeding frames is a meaningful number within the accuracy bounds of the σ_x and σ_y determination. The principle inaccuracy in the σ_x and σ_y determination is due to map errors.

The pitch error difference between succeeding frames is caused by either a pitch attitude error, an error in the stereo mirror position, or latitude errors in reading the maps. Without use of attitude data from the stellar camera it is not possible to determine whether this pitch difference is caused by the vehicle attitude control system, the map or the position of the stereo mirror. For this mission the vehicle telemetry indicated that the attitude control system (pitch) did not experience any large variations. Examining the difference between the determined pitch error on succeeding frames tends to confirm a relatively quiet attitude control system. The following exhibited unusual pitch behavior when compared to adjacent frames.

Rev	Frame	Stereo	Crab	Roll
8	12	V	2.0	39.70
9	22	F	2.0	-24.82
11	8	F	2.5	36.87
24	17	V	2.0	-40.41
40	14	F	2.0	-26.94
41	31	F	3.0	-21.27
43	20	F	2.5	-8.51

b. Since the orbit plane is usually accurately determined, the major contribution to σ_y, at least for $\Sigma = 0$ photography, is due to roll and/or crab errors. For $\Sigma \neq 0$, the major contribution to σ_y is due to roll and/or crab errors. Since the best independent estimate of the BFE cross-track ephemeris error is about 300 feet, any σ_y in excess of 300 feet must be due to roll and/or crab errors. Therefore, the TEAR results (roll and/or crab errors) for $\Sigma = 0$ photography give an accurate indication of these errors. For $\Sigma \neq 0$, the accuracy of the errors is slightly degraded. However, it is not possible to determine which sub-component is in error without additional inputs. Nevertheless, since the cross-track error is small and it is, again, a slowly varying function of time, the relative change of σ_y between succeeding frames gives an indication of the roll (or crab) and yaw errors. While it is very difficult to separate σ_y into a yaw and roll component, a large symmetrical change in σ_y between two adjacent frames is indicative of a predominant yaw error.

c. Comparing the in-track and cross-track miss distances on adjacent frames showed that the change was very large on the following frames:

$\Delta\sigma_x$ Rev	$\Delta\sigma_x$ Frame	$\Delta\sigma_y$ Rev	$\Delta\sigma_y$ Frame
5	11	8	10
6	5	8	11
9	21	27	14
11	4	27	15
11	7		
24	17		
41	30		
43	18		

Note that all the above frames where $\Delta\sigma_x$ is very large are the second frame of a stereo pair.

d. The in-track and cross-track miss distances for each Bench Mark on the long (100 sec) frames were examined in detail. Several plots of σ_x and or σ_y versus latitude appear as Illustrations 28 and 29. Since the mirror system remains fixed, the ephemeris errors are slowly varying and high accuracy maps were used, therefore, the miss distances reflect variations in the vehicle attitude during the frame. Illustration 28 shows a change in pitch near the center of the frame. Illustration 28 shows the effect of calculating the crab correction at the frame center. Illustration 29 shows a change in the vehicle roll attitude during the frame.

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CASE I D

Stereo Pairs

Yaw - Pitch

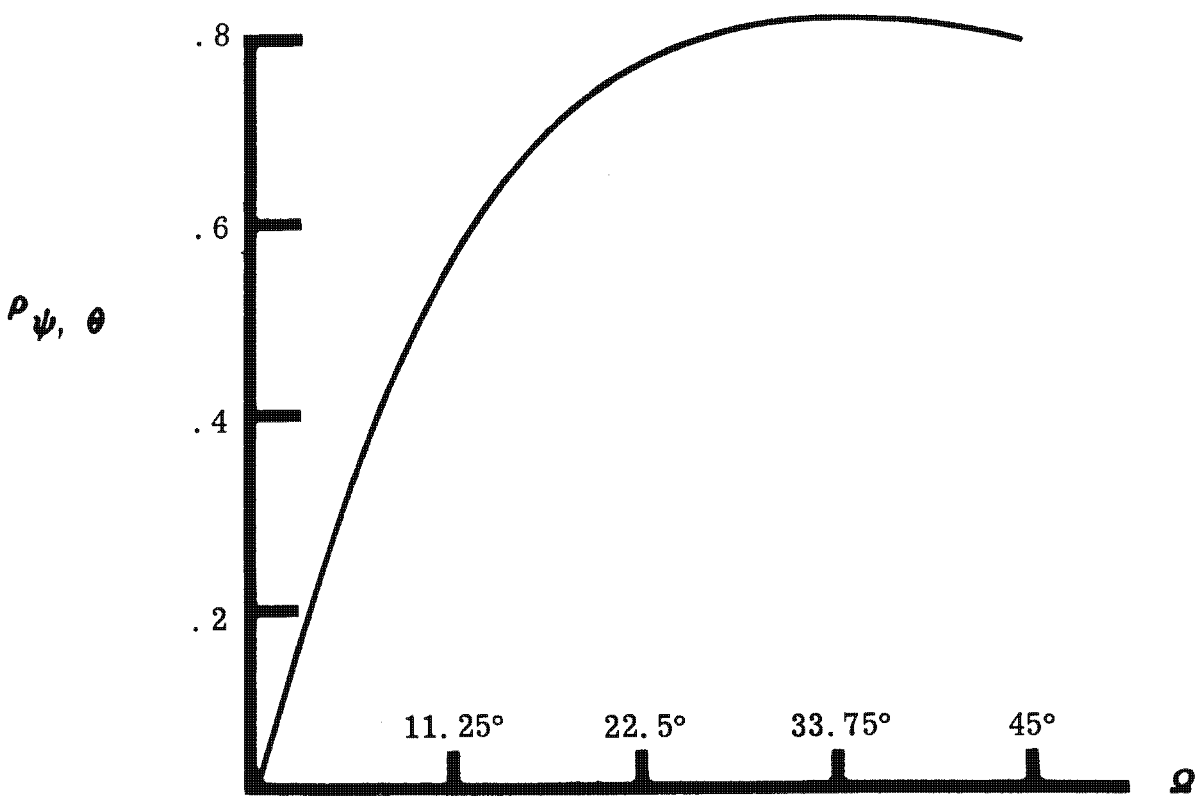

ILLUSTRATION 18

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CASE IE

$\Sigma_1 = \Sigma_2, \Omega_1 = -\Omega_2$

Yaw - Roll

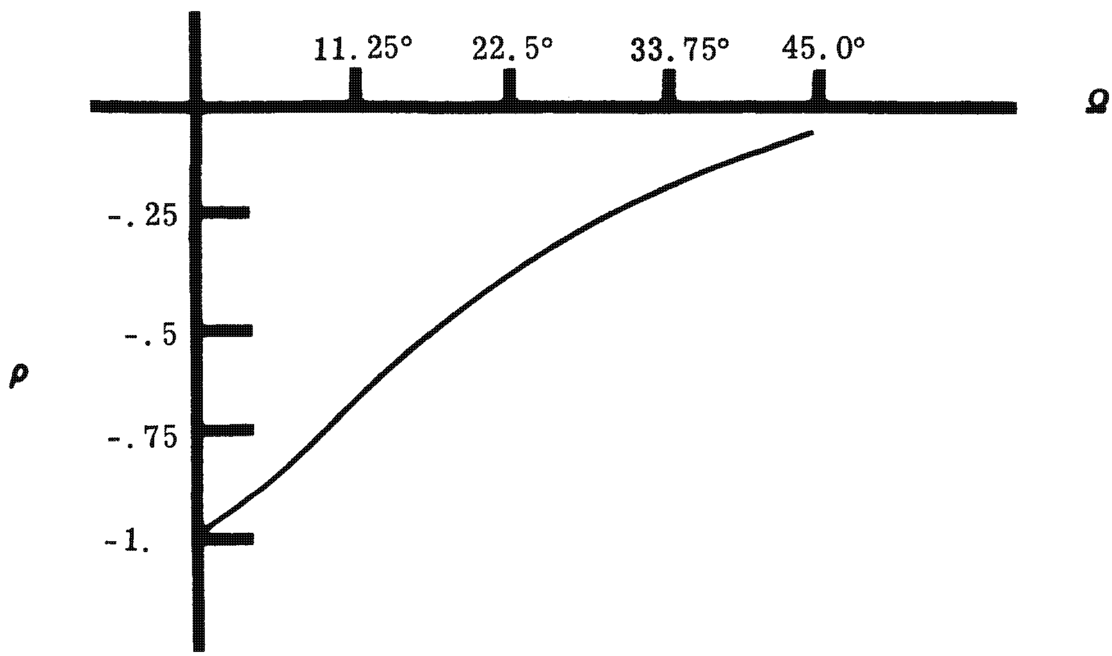

ILLUSTRATION 19

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CASE II D

$\Sigma = 0, \quad \Omega = 0$
$\Sigma = 0, \quad \Omega \neq 0$
$\Sigma \neq 0, \quad \Omega = 0$
Yaw - Pitch
Yaw - Roll
Pitch - Roll

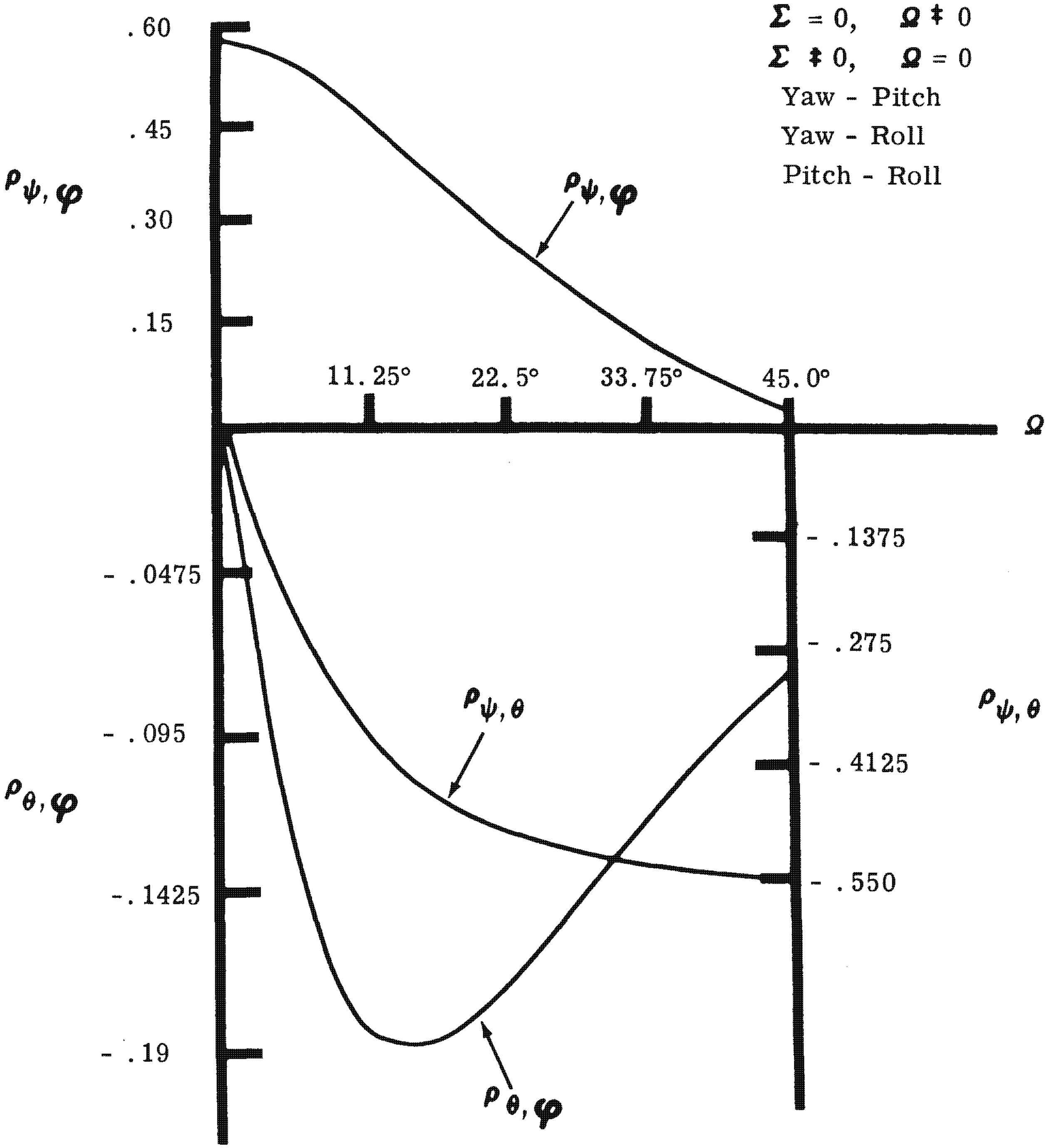

ILLUSTRATION 20

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CASE III B

Stereo Pairs

$\Sigma = 0, \quad \Omega = 0$

$\Sigma \neq 0, \quad \Omega = 0$

$\Sigma = 0, \quad \Omega \neq 0$

Yaw - Roll

$\sum_j \Omega_j = 0$

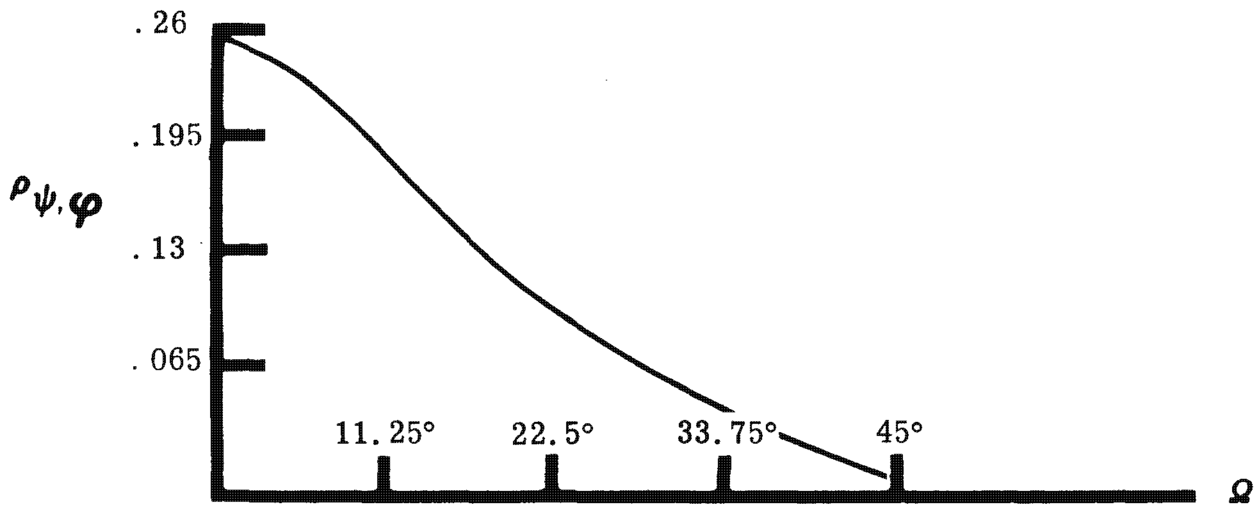

ILLUSTRATION 21

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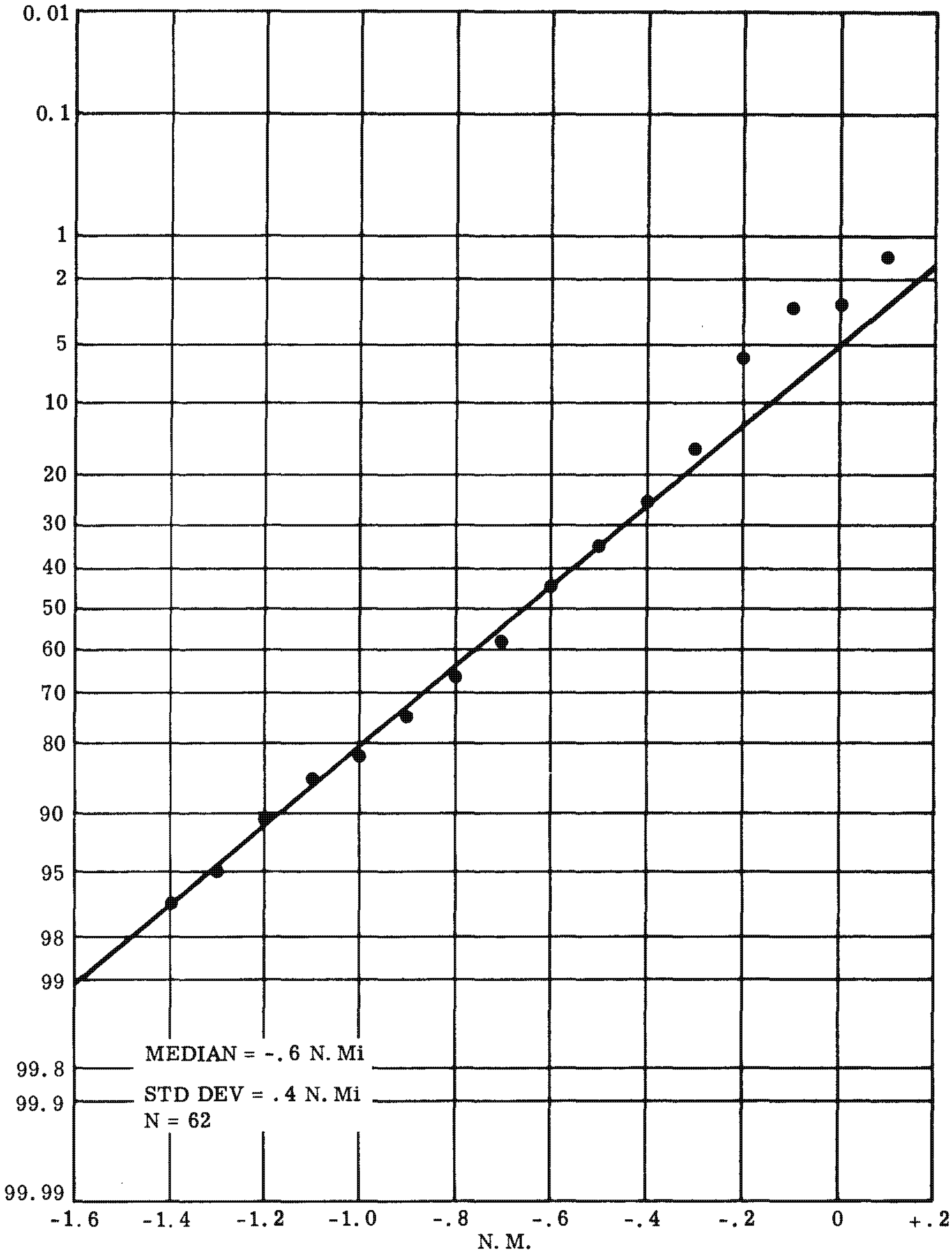

$\sigma_y\left(\Sigma = \bullet\right)$

ILLUSTRATION 22

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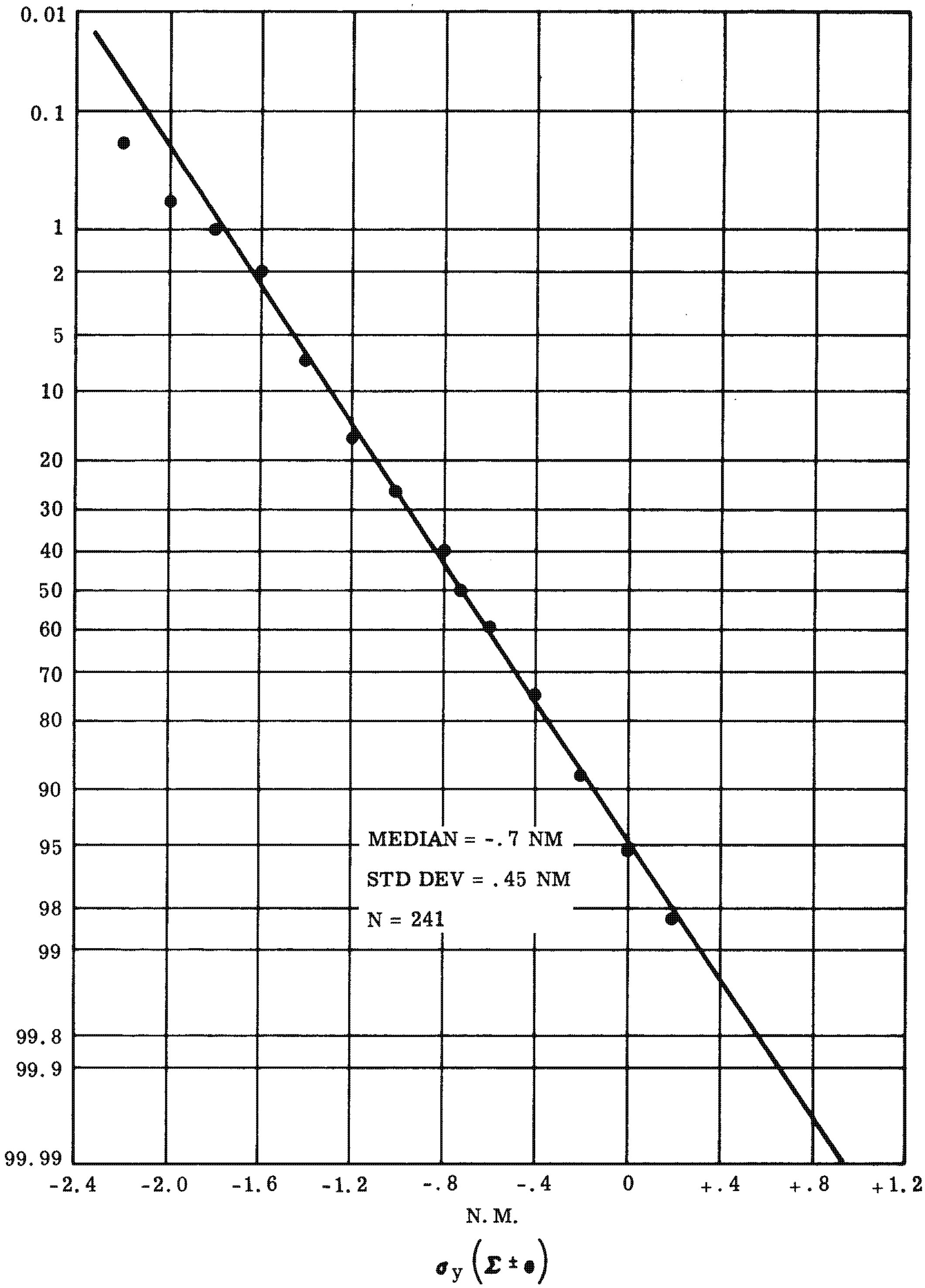

ILLUSTRATION 23

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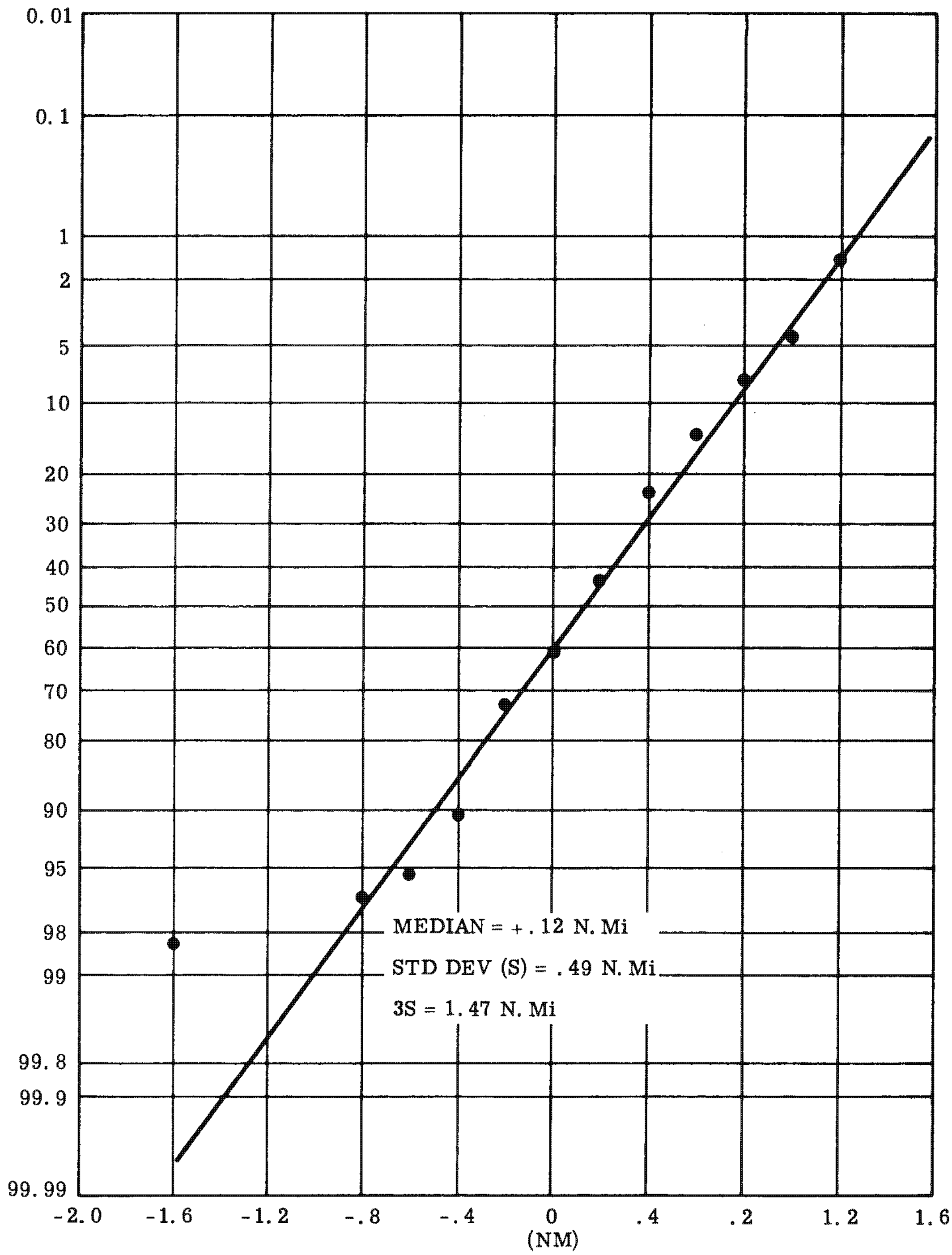

σ_X ($\Sigma = 0$)

ILLUSTRATION 24

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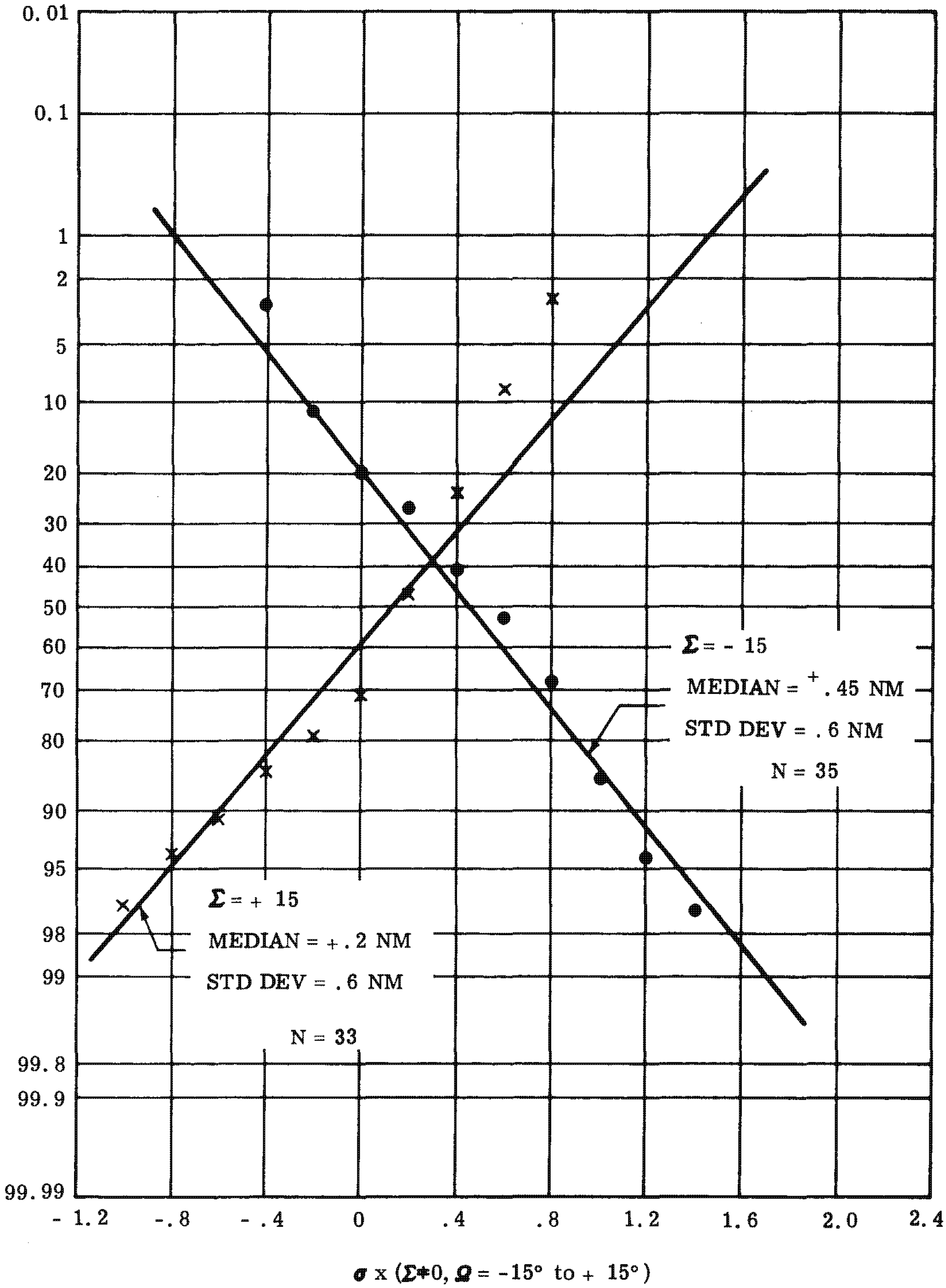

ILLUSTRATION 25

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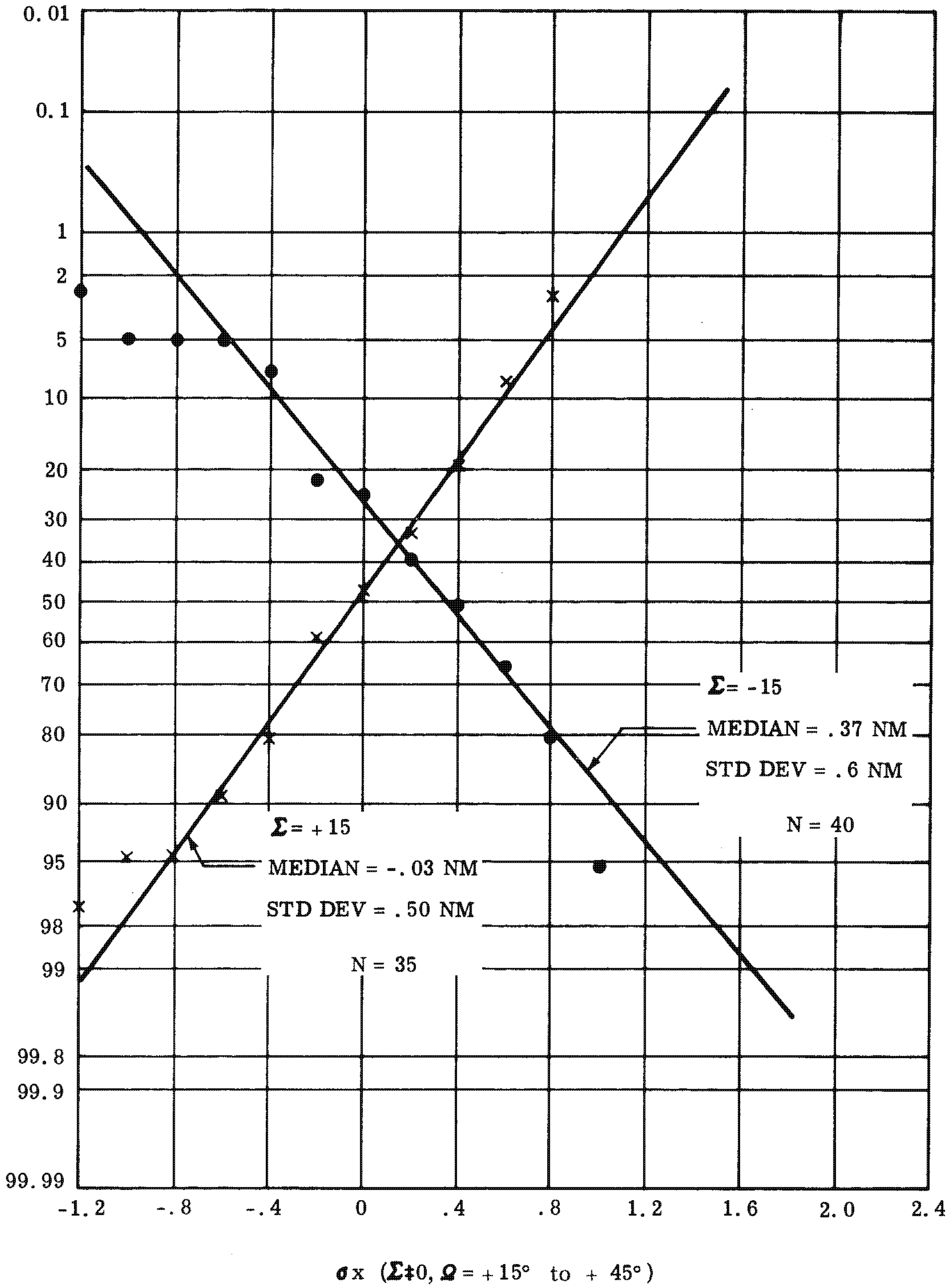

ILLUSTRATION 26

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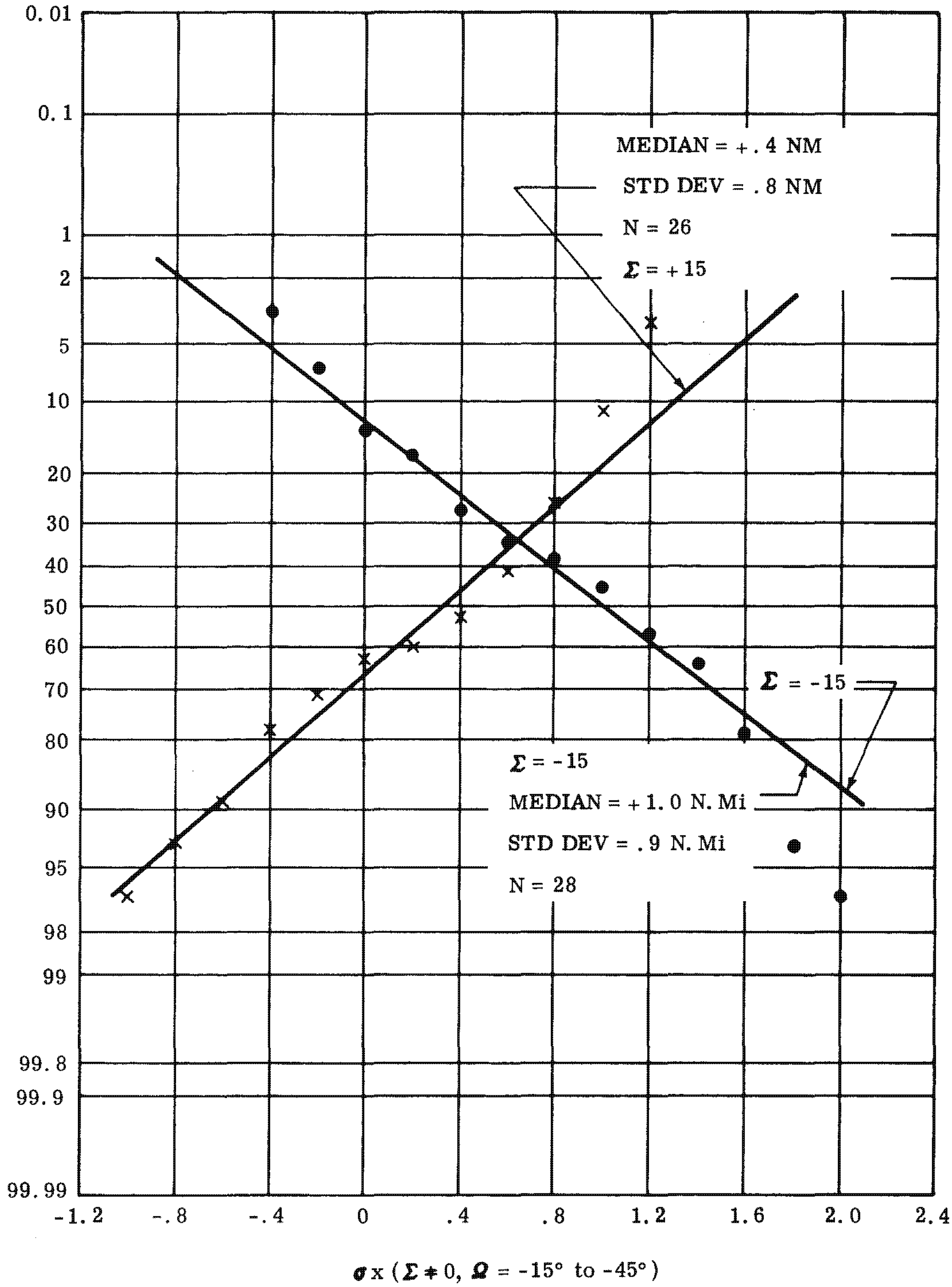

ILLUSTRATION 27

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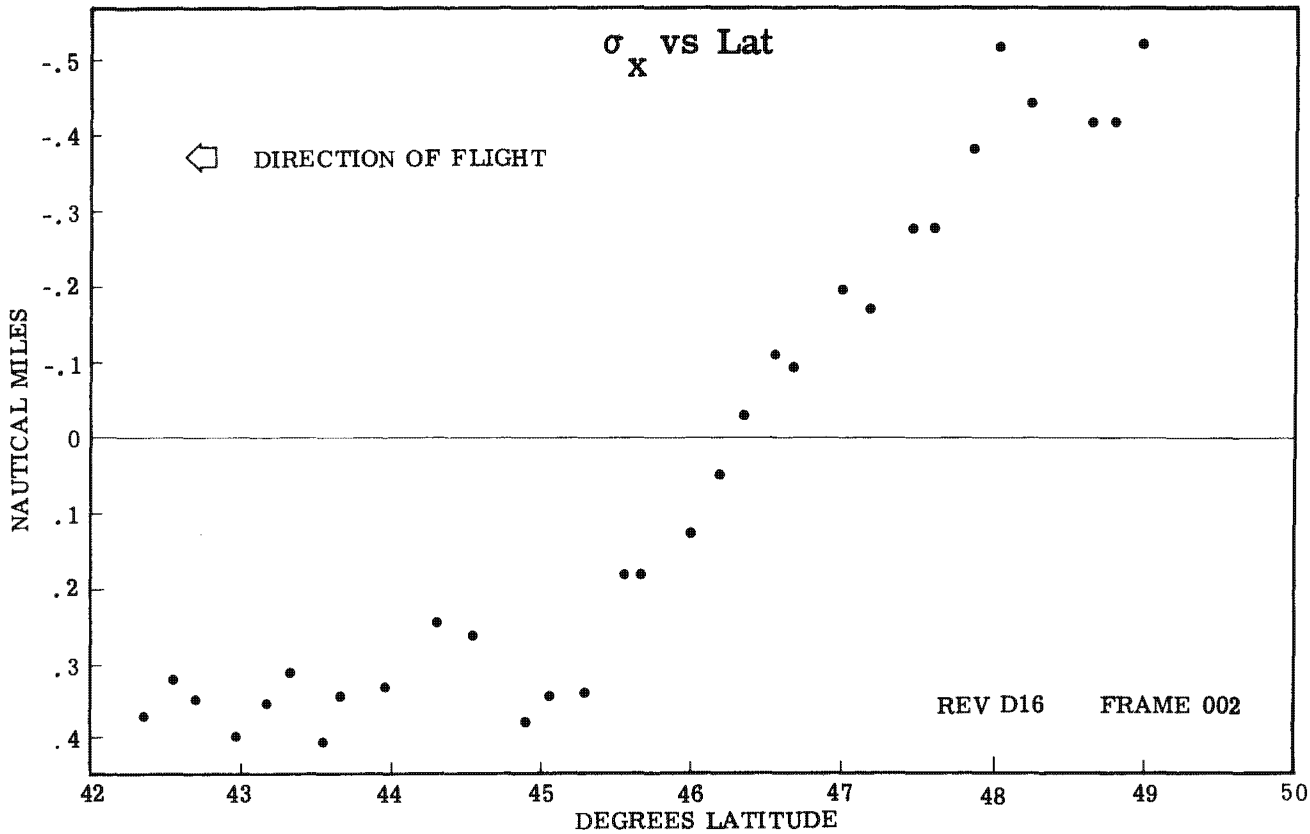

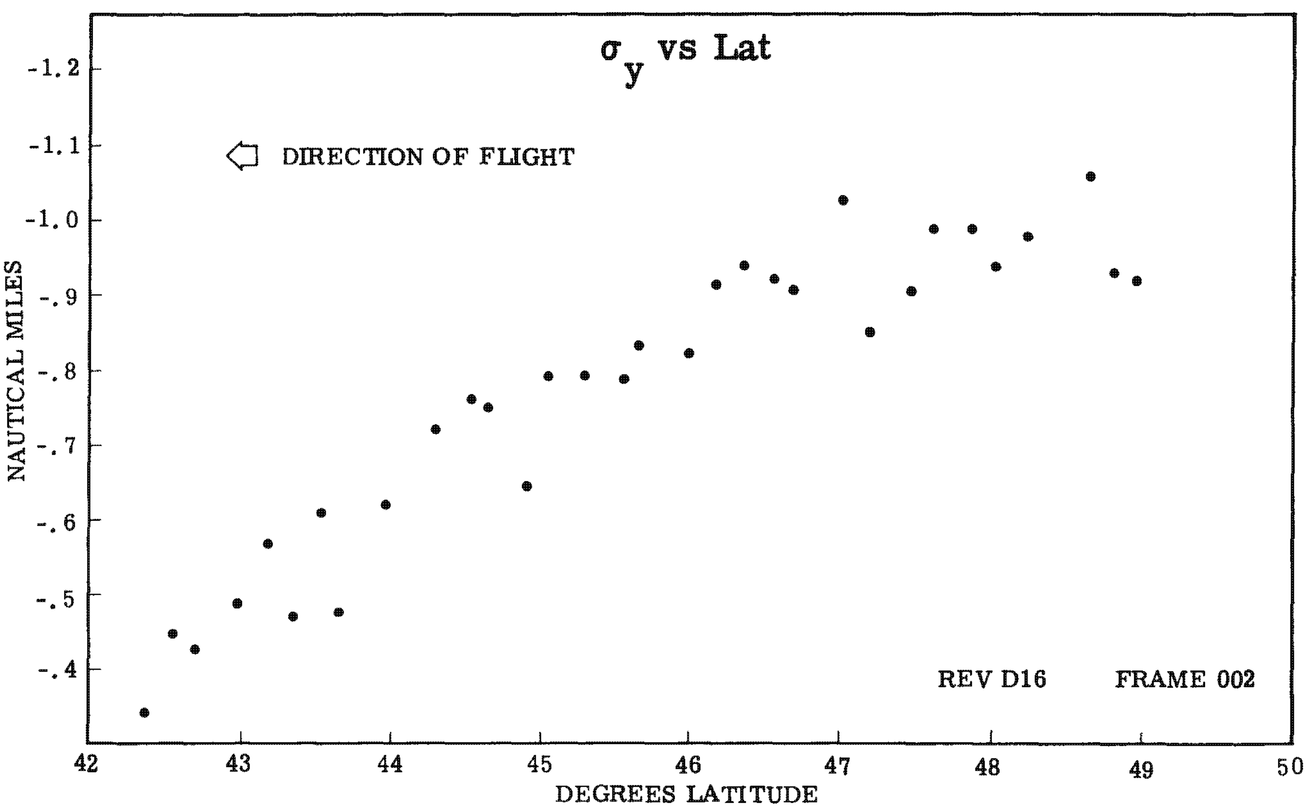

ILLUSTRATION 28

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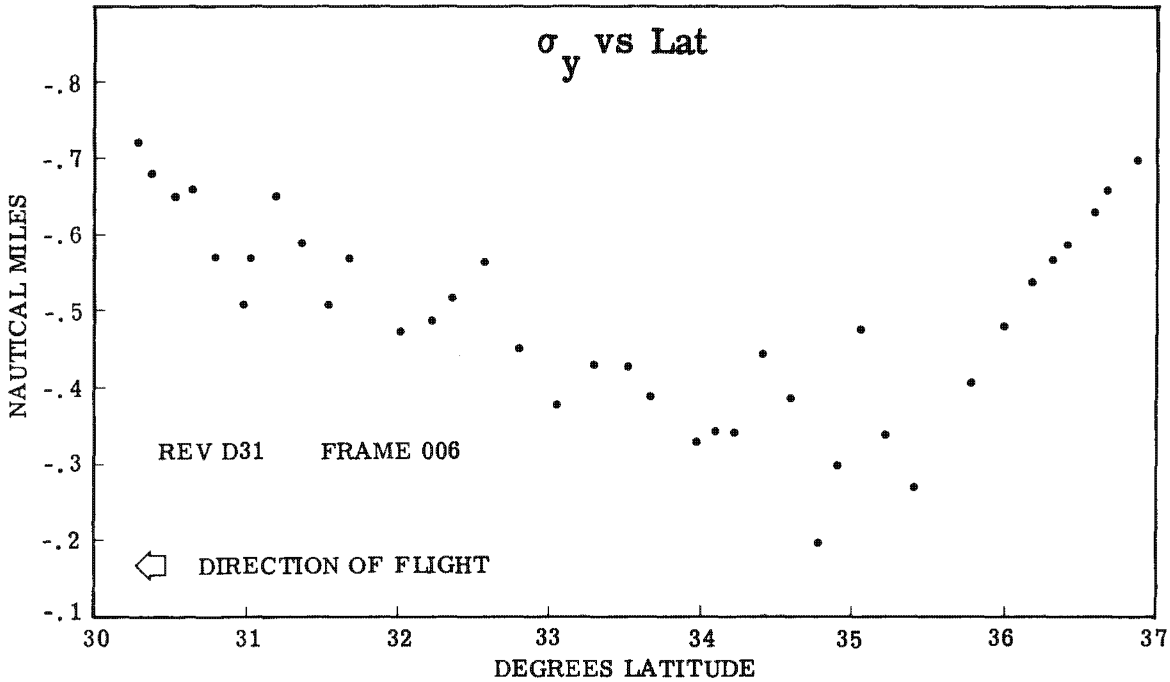

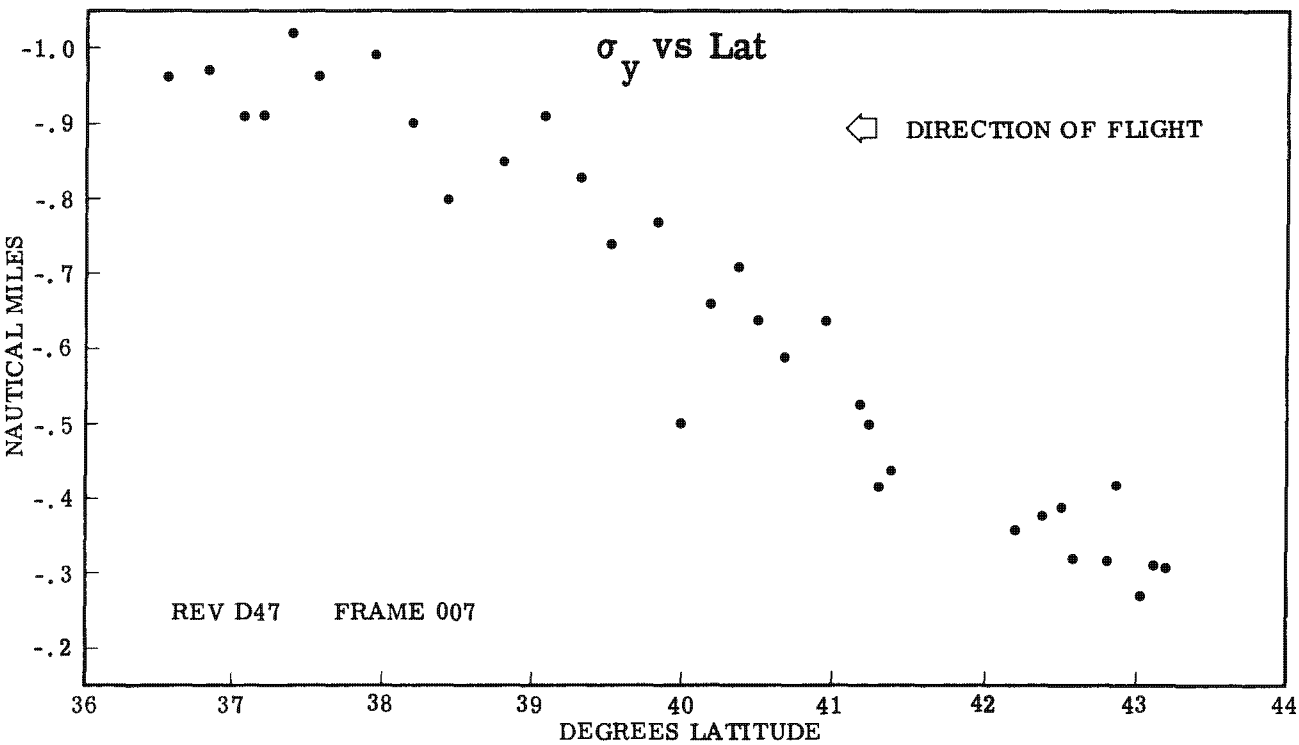

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E P H E M E R I S   C O M P A R I S O N

S U M M A R Y   B Y   R E V S

MSG NR.	FIT SPAN	EPOCH REV	LOAD REV	OPS REV	BEST FIT EPHEMERIS IN-TRACK	BEST FIT EPHEMERIS X-TRACK	BEST FIT EPHEMERIS ME	COMMAND EPHEMERIS IN-TRACK	COMMAND EPHEMERIS X-TRACK	EPHEMERIS ERROR (COMMAND - BFE) IN-TRACK	EPHEMERIS ERROR (COMMAND - BFE) X-TRACK	EPHEMERIS ERROR (COMMAND - BFE) ME
103	01-02	02	04	05	.462	-.662	.712	.038	-.632	-.424+	.030+	-.095
105	01-04	04	06	06	1.155	-1.051	1.189	.265	-.974	-.890+	.077+	-.357
				07	1.295	-.058	.928	-.030	-.059	-1.325+	-.001-	-.658
108	01-06	06	08	08	.735	-.900	.947	.056	-.825	-.679+	.075+	-.173
				09	.458	-.889	.846	-.459	-.804	-.917-	.085+	-.045
109	01-08	08	10	10	.538	-.622	.728	.252	-.599	-.286+	.023+	-.089
				11	.865	-.985	1.108	.535	-.869	-.330+	.116+	-.159
110	01-10	10	14	14	-1.097	-1.378	1.218	-1.506	-1.377	-.409-	.001+	.192
				15	-.137	-.532	.597	-.529	-.521	-.392-	.011+	.091
112	01-14	14	16	16	.276	-.739	.637	.399	-.831	.123-	-.092-	.079
113	06-17	17	19	20	.164	-.752	.577	.418	-.809	.254-	-.057-	.088
				21	.599	-.481	.686	1.127	-.533	.528-	-.052-	.282
114	09-20	20	22	22	.445	-.870	.802	1.145	-.863	.700-	.007+	.279
				23	.003	-.987	.686	1.071	-.985	1.068-	.002+	.321
				24	.218	-.744	.875	1.735	-.729	1.517-	.015+	.596
116	13-23	23	25	25	-.058	-.576	.455	.225	-.538	.283-	.038+	-.001
				26	.272	-.499	.523	.685	-.462	.413-	.037+	.143
				27	-.428	-.782	.770	.114	-.740	.542+	.042+	-.076
117	15-26	26	30	31	.139	-.462	.451	1.331	-.470	1.192-	-.008-	.570
				32	-.014	-.505	.509	1.926	-.506	1.940-	-.001-	.914
118	21-32	32	33	34	-.289	-.692	.539	.444	-.721	.733-	-.029-	.065
121	23-34	34	36	37	.637	-.511	.751	1.313	-.544	.676-	-.033-	.350
122	25-36	36	38	38	.423	-.963	.835	.671	-.995	.248-	-.032-	.091
				39	.355	-.865	.715	.666	-.910	.311-	-.045-	.122
				40	.769	-.873	.955	1.160	-.893	.391-	-.020-	.180
123	29-39	39	41	41	-.059	-.834	.784	-.773	-.856	-.714-	-.022-	.175
				42	.329	-.624	.660	-.609	-.651	-.938-	-.027-	.102
				43	.505	-.993	1.058	-.698	-1.002	-1.203-	-.009-	.048
125	32-42	42	46	47	-.067	-.695	.524	.169	-.714	.236-	-.019-	.022
				48	.036	-.699	.585	.305	-.725	.269-	-.026-	.050
127	39-50	50	52	53	.592	-1.114	.890	.293	-1.073	-.299+	.041+	-.099
128	41-52	52	54	54	.113	-.838	.741	.062	-.833	-.051+	.005+	-.010
				55	-.064	-.608	.539	-.144	-.617	-.080-	-.009-	.014
				56	.474	-1.535	1.233	.075	-1.587	-.399+	-.052-	-.009
				57	.717	-.585	.673	.058	-.652	-.659+	-.067-	-.179
129	46-55	55	58	58	.643	-.581	.676	.109	-.618	-.534+	-.037-	-.146
130	46-55	55	59	59	.642	-.628	.701	-.154	-.682	-.796+	-.054-	-.118
132	48-59	59	63	63	-.005	-.959	.744	-1.609	-.987	-1.604-	-.028-	.603
				64	-.146	-.745	.685	-2.153	-.768	-2.007-	-.023-	.956

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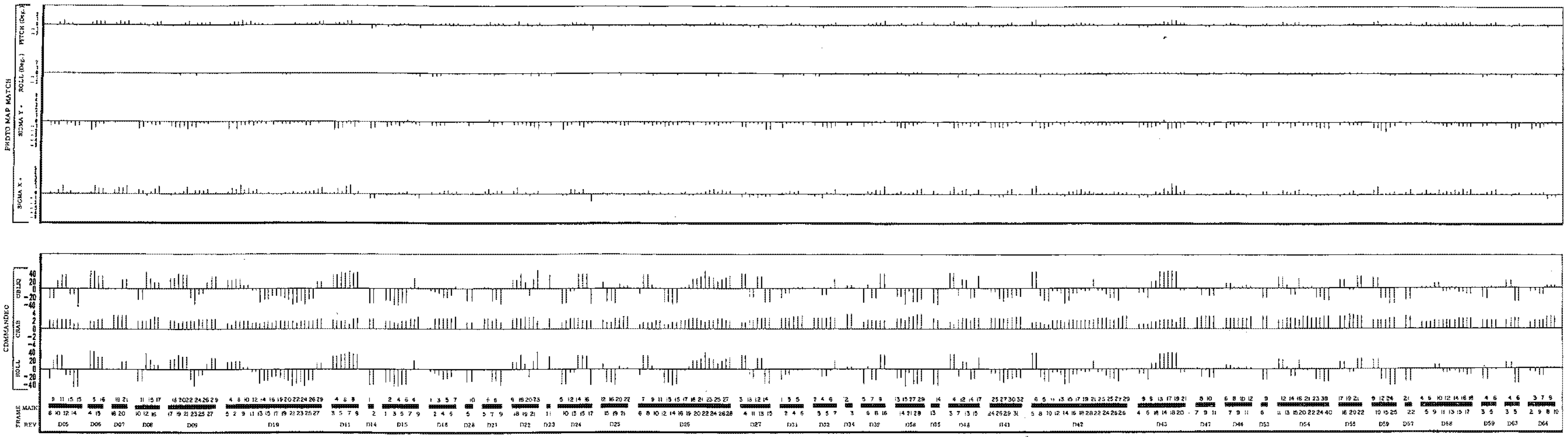
COMPUTED VEHICLE ATTITUDE



S Y S T E M   T I M E

Group	System time
D05	18161.49; 18174.38; 10211.09; 10225.38; 10251.45; 10281.99; 10288.18; 10294.29
D06	15411.83; 15422.99; 15868.09; 15872.59
D07	21306.24; 21318.36; 21356.78; 21408.84
D08	26158.18; 26171.66; 26253.58; 26278.08; 26329.08; 26338.58
D09	31498.44; 31472.18; 31427.78; 31443.24; 31455.18; 31494.38; 31514.86; 31538.96; 31541.46; 31569.96; 31815.46; 31827.56
D18	36463.28; 36425.66; 36561.46; 36573.98; 36552.98; 36604.28; 36617.48; 36529.18; 36646.28; 36658.08; 36626.58; 36688.98; 36781.08; 36727.08; 36744.44; 36762.58; 36774.74; 39763.98; 38800.08; 38812.88; 36847.08; 36858.34; 36882.58; 36883.08
D11	41894.98; 41909.48; 41924.98; 41938.68; 41954.98; 42156.86; 42165.56
D14	58904.37; 58517.67
D15	63446.67; 63459.57; 63472.37; 53446.47; 63522.37; 63535.47; 63564.67; 63581.57; 63612.42
D16	66691.67; 68249.47; 68851.27; 68812.87; 68923.37; 68954.97; 46969.97
D29	3532.22; 3604.77
D21	6951.97; 6662.47; 6989.97; 5043.57; 5838.87
D22	14275.82; 14285.97; 14654.87; 14673.27; 14890.97; 14714.52; 14755.67
D23	19894.67
D24	24626.19; 24541.06; 24033.56; 24554.56; 25049.46; 25063.76; 25672.79; 25111.49
D25	30213.96; 38287.98; 38308.46; 38382.46; 30485.90; 30425.48; 30436.36
D26	35345.88; 35374.59; 35388.28; 35425.98; 35439.18; 35449.68; 35478.78; 35464.48; 35496.46; 35505.89; 35542.46; 35552.98; 35523.66; 35587.56
D26	35599.56; 35612.02; 35641.46; 35664.76; 35677.18; 35695.46; 35704.86; 35717.06; 35232.59
D27	40657.46; 40671.56; 40041.25; 40952.56; 41145.18; 41158.86; 41211.56; 41224.18
D31	62334.15; 62344.75; 62355.65; 62399.95; 62481.05; 62424.55
D32	62582.75; 97717.15; 67766.85; 67777.55; 67609.35; 67926.55
D34	78629.25; 96838.35
D37	7735.84; 7765.84; 7288.84; 7799.84; 7838.44; 7843.74
D39	13246.94; 13252.44; 13281.24; 13471.74; 13921.54; 13936.14; 13951.34
D35	19696.74; 18227.14
D48	23458.34; 23484.44; 23675.94; 23853.94; 23862.44; 23886.44; 23853.14; 24432.74
D41	28210.24; 29221.84; 29234.94; 29247.54; 29354.44; 29385.24; 29439.34; 25456.04
D45	34107.44; 34182.74; 84224.54; 34235.04; 34252.34; 34226.24; 34285.84; 34391.54; 34324.04; 34348.54; 34359.24; 34378.14; 24385.54; 34356.04; 24406.54; 34628.34; 34452.44; 34492.94; 34474.74; 34509.54; 24511.64; 34522.24; 34554.24; 34564.34
D43	39438.43; 38449.23; 39491.93; 39528.13; 39531.43; 38622.53; 35636.63; 35685.13; 38639.83; 28714.32; 39818.83; 39828.93
D47	61118.63; 61227.83; 61251.23; 61290.43; 61288.33
D45	88447.43; 65417.53; 66468.93; 66471.03; 66489.57; 68489.13; 86602.23
D53	7299.17; 7382.02
D54	11875.32; 11887.42; 11912.12; 11923.72; 11940.22; 11964.72; 12825.52; 12009.62; 12853.92; 12878.22; 12081.52; 12695.52; 12713.22
D55	17545.62; 17556.13; 12590.42; 17606.52; 17666.92; 17681.02
D76	22432.21; 22444.31; 22581.21; 22513.01; 22770.41; 22785.21
D57	28199.31; 28211.41
D59	32961.51; 32972.41; 32985.21; 33069.11; 33099.41; 33100.31; 33119.81; 33143.51; 33153.81; 33175.21; 31185.71; 33225.31; 33236.21
D59	38415.11; 58455.51; 34455.41; 34465.41
D63	59627.38; 59800.28; 60147.78; 60159.58
D64	94518.38; 64934.78; 65095.98; 65106.88; 65238.58; 95248.68; 65339.48

ILLUSTRATION 30

43A

COPY 5

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APPENDIX A

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Handle via Byeman Controls Only

TOP SECRET - GAMBIT

GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMAND		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 5	8	-24.81	2.0	2F	1600.	.296	-.878	.658	.116		.293	-.903	-.189	-.841	-.482+	.062+
D 5	9	19.85	2.5	2F	1500.	.098	-.622	.454	.104		.107	-.636	-.367	-.690	-.474-	-.054-
D 5	10	36.15	2.5	2F	1280.	.864	-.677	.780	.602		.899	-.678	.412	-.792	-.487+	-.114-
D 5	11	36.15	2.5	2A	1280.	1.710	-.002	1.210	1.050		1.752	.031	1.381	-.091	-.371+	-.122-
D 5	10-11	STEREO PAIR			1280.	1.287	-.339	1.018	.671	-.148	1.325	-.324	.896	-.442	-.429+	-.118-
D 5	12	-15.59	2.5	2F	1300.	.195	-.769	.563	.085		.195	-.791	-.267	-.749	-.462-	.042+
D 5	13	-15.59	2.5	2A	1300.	.602	-.425	.524	.389		.614	-.439	.247	-.399	-.367+	.040+
D 5	12-13	STEREO PAIR			1300.	.398	-.597	.544	.248	-.364	.405	-.615	-.010	-.574	-.415+	.041+
D 5	14	-43.95	1.5	2F	1200.	-.165	-.909	.66D	-.216		-.187	-.931	-.642	-.763	-.455-	.168+
D 5	15	-43.95	1.5	2A	1200.	.160	-.845	.613	.184		.149	-.869	-.182	-.701	-.331-	.168+
D 5	14-15	STEREO PAIR			1200.	.025	-.872	.633	.015	-.289	.009	-.895	-.373	-.727	-.382-	.168+
D 6	4	45.37	2.0	2F	900.	.368	-1.758	1.276	.462		.442	-1.779	-.415	-1.619	-.857+	.160+
0 6	5	45.37	2.0	2A	900.	1.698	-1.347	1.536	.886		1.791	-1.313	.860	-1.157	-.931+	.156+
D 6	4- 5	STEREO PAIR			900.	1.033	-1.553	1.412	.470	-.444	1.116	-1.547	.222	-1.389	-.894+	.158+
D 6	15	31.90	2.5	2V	1300.	1.162	-.462	.887	.787	-.207	1.194	-.468	.297	-.470	-.897+	-.002-
0 6	16	31.90	2.5	2V	1120.	1.159	-.612	.938	.787	-.274	1.191	-.623	.316	-.633	-.875+	-.010-
0 7	18	.00	3.5	2F	900.	.796	-.328	.610	.501		.816	-.339	-.553	-.306	-1.369+	.033+
0 7	19	.00	3.5	2A	900.	1.251	.116	.890	.785		1.282	.120	-.026	.150	-1.308+	.030-
D 7	18-19	STEREO PAIR			900.	1.023	-.106	.763	.637	-.071	1.049	-.108	-.289	-.076	-1.338+	.032+
D 7	20	20.56	3.5	1F	900.	1.329	.013	.941	.815		1.363	.015	.003	-.015	-1.360+	-.030+
0 7	21	20.56	3.5	1A	900.	1.666	-.046	1.179	1.022		1.709	-.045	.448	-.079	-1.261+	-.034-
D 7	20-21	STEREO PAIR			900.	1.482	-.014	1.056	.884	-.023	1.520	-.013	.205	-.044	-1.315+	-.031-
0 8	10	-29.06	2.0	2F	1375.	.918	-1.551	1.276	.432		.920	-1.601	.310	-1.599	-.610+	.002+
D 8	11	-29.06	2.0	2A	1380.	.607	-1.293	1.013	.455		.605	-1.333	-.076	-1.329	-.681+	.004+
0 8	10-11	STEREO PAIR			1378.	.745	-1.408	1.137	.448	-.750	.745	-1.452	.095	-1.449	-.650+	.003+
D 8	12	39.70	2.0	2V	600.	-.471	-.217	.377	-.310	-.086	-.479	-.232	-1.156	-.079	-.677-	.153+
0 8	13	22.68	2.5	2A	1900.	.508	-.602	.559	.279		.526	-.613	-.195	-.504	-.721+	.109+
D 8	16	11.34	3.0	1F	1100.	.998	-.812	.910	.667		1.026	-.831	.383	-.742	-.643+	.089+
D 8	17	11.34	3.0	1A	1100.	1.507	-.790	1.203	.920		1.548	-.803	.813	-.711	-.735+	.092+
0 8	16-17	STEREO PAIR			1100.	1.229	-.802	1.053	.772	-.510	1.263	-.818	.578	-.728	-.685+	.090+
D 9	17	24.81	2.0	1F	880.	-.470	-.917	.730	-.208		-.467	-.944	-1.326	-.836	-.859-	.108+
0 9	18	24.81	2.0	1A	840.	.344	-1.189	.877	.132		.373	-1.210	-.553	-1.098	-.926-	.112+
D 9	17-18	STEREO PAIR			860.	-.063	-1.053	.807	-.020	-.561	-.047	-1.077	-.939	-.967	-.892-	.110+
0 9	19	36.86	1.5	2V	780.	.172	-1.231	.881	.131	-.476	.208	-1.254	-.689	-1.108	-.897-	.146+
D 9	20	32.61	2.0	2F	680.	.437	-1.112	.853	.379		.471	-1.128	-.401	-.995	-.872+	.133+
D 9	21	32.61	2.0	2A	667.	1.426	-1.570	1.504	.738		1.495	-1.577	.547	-1.440	-.948+	.137+
D 9	20-21	STEREO PAIR			673.	.976	-1.362	1.251	.572	-.589	1.029	-1.373	.116	-1.238	-.913+	.135+
0 9	22	-24.81	2.0	2F	783.	-.009	-1.128	.804	-.086		-.022	-1.156	-.900	-1.146	-.878-	.010+
D 9	23	-41.83	2.0	2V	700.	.784	-1.264	1.054	.496	-.476	.776	-1.313	-.159	-1.352	-.935+	-.039-
D 9	24	-14.88	2.5	2F	900.	.680	-.522	.612	.400		.695	-.539	-.207	-.504	-.902+	.035+
0 9	25	-14.88	2.5	2A	900.	.681	-.519	.610	.439		.696	-.535	-.252	-.501	-.948+	.034+
0 9	24-25	STEREO PAIR			900.	.681	-.520	.611	.417	-.330	.695	-.537	-.229	-.502	-.924+	.035+
D 9	26	14.18	2.5	2A	1300.	.975	-.562	.804	.580		1.003	-.570	.047	-.476	-.956+	.094+
D 9	27	28.36	2.5	1F	700.	-.010	.040	.039	-.010		-.011	.041	-.923	.165	-.912-	.124-
D 9	28	28.36	2.5	1A	700.	.274	-.206	.244	.155		.283	-.208	-.707	-.082	-.990-	.126+
D 9	27-28	STEREO PAIR			700.	.132	-.083	.174	.091	-.049	.136	-.084	-.815	.041	-.951-	.125+

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GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMANO		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 10	3	19.14	1.5	2F	760.	.447	-1.533	1.130	.359		.506	-1.533	.298	-1.467	-.208+	.066+
D 10	4	19.14	1.0	2A	760.	1.224	-.620	.972	.663		1.274	-.590	1.017	-.523	-.257+	.067+
D 10	3- 4	STEREO PAIR			760.	.835	-1.077	1.054	.446	-.557	.890	-1.063	.657	-.997	-.233+	.066+
D 10	7	21.27	2.0	1F	800.	1.045	-1.506	1.298	.713		1.109	-1.501	.881	-1.425	-.228+	.076+
D 10	8	21.27	2.0	1A	800.	1.842	-.781	1.417	1.027		1.909	-.749	1.641	-.671	-.268+	.078+
D 10	7- 8	STEREO PAIR			800.	1.444	-1.144	1.359	.796	-.583	1.509	-1.126	1.261	-1.049	-.248+	.077+
D 10	9	5.67	2.0	1F	700.	.816	-.811	.815	.490		.842	-.819	.601	-.770	-.241+	.049+
D 10	10	5.67	2.0	1A	700.	1.231	-.628	.978	.708		1.267	-.632	.985	-.582	-.282+	.050+
D 10	9-10	STEREO PAIR			700.	1.023	-.720	.900	.594	-.441	1.054	-.726	.793	-.676	-.261+	.050+
D 10	11	-5.67	1.5	1F	600.	.430	-.897	.705	.239		.438	-.913	.219	-.879	-.219+	.034+
D 10	12	-5.67	1.5	1A	600.	.814	-.428	.655	.481		.834	-.439	.541	-.404	-.293+	.035+
D 10	11-12	STEREO PAIR			600.	.622	-.663	.680	.364	-.412	.636	-.677	.380	-.642	-.256+	.035+
D 10	13	-36.15	1.5	2A	700.	.127	-.492	.362	.110		.115	-.506	-.175	-.527	-.290-	-.021-
D 10	14	-29.06	1.5	2F	620.	.024	-.647	.460	-.043		.010	-.659	-.251	-.665	-.261-	-.006-
D 10	15	-29.06	2.0	2A	620.	.260	-.061	.209	.158		.265	-.068	-.033	-.072	-.298+	-.004-
D 10	14-15	STEREO PAIR			620.	.142	-.354	.357	.099	-.165	.138	-.365	-.142	-.369	-.280-	-.004-
D 10	16	-19.14	1.5	2F	600.	-.217	-.729	.542	-.169		-.231	-.741	-.492	-.725	-.261-	.016+
D 10	17	-19.14	2.0	2A	525.	.006	-.149	.115	.010		.005	-.152	-.302	-.136	-.307-	.016+
D 10	16-17	STEREO PAIR			554.	-.080	-.372	.348	-.032	-.208	-.086	-.379	-.375	-.363	-.289-	.016+
D 10	18	-21.27	2.0	2V	600.	-.202	-.619	.463	-.135	-.357	-.215	-.630	-.502	-.615	-.287-	.015+
D 10	19	-24.10	2.0	2V	700.	.038	-.646	.460	.019	-.357	.030	-.662	-.256	-.652	-.286-	.010+
D 10	20	-29.77	2.0	2V	700.	.129	-.673	.492	.076	-.340	.121	-.691	-.161	-.692	-.282-	-.001-
D 10	21	-42.54	2.0	2A	600.	.596	-.474	.542	.403		.599	-.501	.262	-.530	-.337+	-.029-
D 10	22	-36.86	1.5	2V	700.	.301	-.384	.352	.191	-.169	.301	-.400	.001	-.414	-.300+	-.014-
D 10	23	-33.32	2.0	2V	660.	.072	-.382	.280	.043	-.179	.068	-.393	-.232	-.400	-.300-	-.007-
D 10	24	-42.54	2.0	2A	822.	.435	-.912	.727	.350		.425	-.945	.085	-.972	-.340+	-.027-
D 10	25	-29.06	2.0	1F	800.	.476	-.827	.677	.220		.477	-.855	.184	-.852	-.293+	.003+
D 10	26	-29.06	2.0	1A	800.	.649	.001	.461	.402		.665	-.008	.324	-.003	-.341+	.005+
D 10	25-26	STEREO PAIR			800.	.562	-.413	.579	.365	-.207	.571	-.431	.254	-.428	-.317+	.003+
D 10	27	14.88	2.5	1F	600.	.983	-.510	.785	.636		1.011	-.516	.729	-.438	-.282+	.078+
D 10	28	14.88	2.5	1A	600.	1.266	-.035	.897	.786		1.298	-.026	.946	.053	-.352+	.079-
D 10	27-28	STEREO PAIR			600.	1.111	-.294	.838	.669	-.180	1.141	-.293	.828	-.215	-.313+	.078+
D 11	3	32.61	2.0	1F	900.	.197	-1.733	1.239	.302		.267	-1.747	-.003	-1.648	-.270+	.099+
D 11	4	32.61	2.0	1A	900.	1.099	-1.573	1.360	.528		1.188	-1.557	.848	-1.454	-.340+	.103+
D 11	3- 4	STEREO PAIR			900.	.648	-1.653	1.301	.360	-.672	.727	-1.653	.422	-1.552	-.305+	.101+
D 11	5	36.86	2.0	1F	700.	.533	-1.275	.979	.461		.599	-1.271	.323	-1.157	-.276+	.114+
D 11	6	36.86	2.0	1A	700.	1.611	-.501	1.194	.900		1.672	-.444	1.330	-.329	-.342+	.115+
D 11	5- 6	STEREO PAIR			700.	1.072	-.888	1.092	.512	-.326	1.136	-.859	.826	-.745	-.310+	.114+
D 11	7	43.24	1.0	2A	1100.	1.838	-.660	1.382	1.016		1.915	-.583	1.559	-.450	-.356+	.133+
D 11	8	36.86	2.5	1F	1000.	-.295	-1.138	.832	-.041		-.277	-1.172	-.601	-1.048	-.324-	.124+
D 11	9	36.86	2.5	1A	1000.	.450	-.145	.345	.263		.465	-.138	.063	-.013	-.402+	.125+
D 11	8- 9	STEREO PAIR			1000.	.119	-.586	.611	-.011	-.233	.135	-.598	-.232	-.473	-.367-	.125+
D 14	1	-39.70	2.5	1F	500.	-1.104	-1.470	1.301	-.848		-1.142	-1.512	-1.532	-1.511	-.390-	.001+
D 14	2	-39.70	2.5	1A	500.	-1.019	-1.225	1.129	-.522		-1.052	-1.247	-1.481	-1.245	-.429-	.002+
D 14	1- 2	STEREO PAIR			500.	-1.061	-1.347	1.218	-.598	-.554	-1.097	-1.378	-1.506	-1.377	-.409-	.001+
D 15	1	-32.61	2.0	1F	700.	-.377	-1.200	.891	-.341		-.406	-1.222	-.769	-1.223	-.363-	-.001-
D 15	2	-32.61	2.0	1A	700.	-.249	-.772	.576	-.099		-.267	-.787	-.649	-.787	-.382-	.000+
D 15	1- 2	STEREO PAIR			700.	-.313	-.986	.750	-.176	-.474	-.337	-1.005	-.709	-1.005	-.372-	.000+
D 15	3	-43.24	1.5	1F	500.	-.114	-.676	.486	-.156		-.134	-.690	-.488	-.719	-.354-	-.029-
D 15	4	-43.24	1.5	1A	500.	.270	-.992	.728	.262		.254	-1.023	-.167	-1.049	-.421+	-.026-
D 15	3- 4	STEREO PAIR			500.	.078	-.834	.619	-.001	-.271	.060	-.856	-.328	-.884	-.388-	-.028-
D 15	5	-38.99	2.0	1F	760.	.151	-.421	.320	.045		.147	-.435	-.221	-.448	-.368-	-.013-
D 15	6	-38.99	2.0	1A	760.	.502	.336	.428	.282		.520	.336	.099	.324	-.421+	-.012+
D 15	5- 6	STEREO PAIR			760.	.327	-.043	.378	.233	-.008	.334	-.049	-.061	-.062	-.395+	-.013-
D 15	7	-1.41	2.5	2V	400.	-.244	-.306	.282	-.164	-.206	-.249	-.315	-.649	-.268	-.400-	.047+
D 15	8	22.68	2.5	2V	500.	-.253	-.502	.400	-.166	-.272	-.254	-.518	-.652	-.435	-.398-	.083+
D 15	9	-.70	3.0	2V	400.	-.940	-.788	.887	-.635	-.532	-.962	-.812	-1.366	-.761	-.404-	.051+
D 16	1	-6.38	.0	2V	400.	.445	-.806	.692	.289	-.520	.454	-.825	.592	-.911	.138-	-.086-
D 16	2	-11.34	2.5	2V	400.	.055	-.864	.665	.033	-.563	.053	-.885	.181	-.976	.128-	-.091-
D 16	3	-14.88	2.5	2V	600.	.286	-.754	.572	.191	-.484	.289	-.775	.398	-.871	.109-	-.096-
D 16	4	-24.81	2.5	2F	600.	.703	-.952	.842	.377		.713	-.984	.847	-1.088	.134-	-.104-
D 16	5	-25.52	2.5	2A	600.	.849	-.200	.620	.550		.869	-.211	.974	-.314	.105-	-.103-
D 16	4- 5	STEREO PAIR			600.	.768	-.618	.752	.490	-.350	.782	-.640	.904	-.744	.122-	-.104-
D 16	6	-19.85	2.5	2V	400.	.311	-.177	.287	.210	-.111	.318	-.184	.416	-.284	.098-	-.100-
D 16	7	-.70	3.0	2V	400.	.475	-.355	.420	.322	-.240	.487	-.365	.591	-.450	.104-	-.085-
D 20	9	-31.90	1.5	2F	1850.	.021	-.932	.666	-.072		.004	-.951	.280	-1.009	.276-	-.058-
D 20	10	-31.90	1.5	2A	1933.	.376	-.467	.432	.259		.377	-.484	.602	-.542	.225-	-.058-
D 20	9-10	STEREO PAIR			1886.	.173	-.732	.577	.102	-.347	.164	-.752	.418	-.809	.254-	-.057-

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GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMAND		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
0 21	5	-1.41	2.5	2F	1800.	.510	-.176	.398	.311		.523	-.180	1.069	-.201	.546-	-.021-
0 21	6	-1.41	2.5	2A	1800.	1.068	.390	.823	.656		1.094	.400	1.599	.379	.505-	-.021+
D 21	5- 6	STEREO PAIR			1800.	.829	.147	.675	.505	.096	.849	.151	1.372	.130	.523-	-.021+
0 21	7	-33.32	2.0	2V	1800.	.252	-1.0D3	.737	.154	-.486	.240	-1.031	.765	-1.092	.525-	-.061-
D 21	8	-29.77	2.5	2A	1800.	.742	-.311	.579	.477		.756	-.330	1.251	-.386	.495-	-.056-
D 21	9	-41.12	1.5	2F	1900.	.687	-.627	.670	.341		.689	-.658	1.242	-.738	.553-	-.D80-
D 22	9	17.72	2.5	1F	1100.	.654	-.772	.718	.448		.679	-.781	1.395	-.762	.716-	.019+
D 22	10	17.72	2.5	1A	1100.	1.413	-.707	1.119	.831		1.456	-.707	2.153	-.688	.697-	.019+
D 22	9-10	STEREO PAIR			1100.	1.033	-.740	.940	.623	-.437	1.068	-.744	1.774	-.725	.706-	.019+
0 22	18	35.45	2.5	2V	800.	.036	-.509	.362	.028	-.207	.042	-.524	.736	-.524	.694-	.D00+
D 22	19	12.76	3.0	2A	900.	.385	-.636	.530	.217		.396	-.652	1.081	-.646	.685-	.006+
D 22	20	-20.56	3.0	2V	800.	-.403	-.8D9	.641	-.275	-.489	-.416	-.831	.287	-.817	.7D3+	.014+
D 22	21	20.56	3.0	2A	1640.	.276	-1.067	.784	.1D4		.288	-1.094	.988	-1.093	.7D0-	.001+
0 22	23	43.24	2.0	2V	100D.	.642	-1.468	1.139	.437	-.449	.672	-1.509	1.373	-1.521	.7D1-	-.D12-
D 23	11	31.19	2.5	2V	1450.	-.DD5	-.958	.686	.003	-.434	.D03	-.987	1.071	-.985	1.068-	.002+
D 24	9	-38.99	1.5	2F	1100.	-.273	-1.552	1.116	-.342		-.318	-1.579	1.218	-1.567	1.536-	.D12+
D 24	10	-39.70	2.D	2A	11D0.	-.216	-.807	.596	-.066		-.240	-.821	1.278	-.8D8	1.518-	.013+
D 24	9-10	STEREO PAIR			11D0.	-.249	-1.233	.930	-.129	-.499	-.284	-1.255	1.244	-1.242	1.528-	.013+
D 24	12	-9.21	2.5	1F	110D.	.944	-.582	.787	.57D		.966	-.599	2.486	-.584	1.520-	.D15+
D 24	13	-9.21	2.5	1A	110D.	.996	-.054	.709	.619		1.021	-.059	2.518	-.044	1.497-	.015+
D 24	12-13	STEREO PAIR			1100.	.970	-.318	.749	.603	-.208	.993	-.329	2.502	-.314	1.509-	.015+
0 24	14	32.61	2.5	2F	1700.	.374	-.842	.654	.318		.397	-.857	1.916	-.843	1.519-	.D14+
0 24	15	33.32	2.0	2A	1600.	.852	-1.236	1.070	.424		.893	-1.253	2.409	-1.239	1.516-	.014+
D 24	14-15	STEREO PAIR			1642.	.653	-1.072	.920	.386	-.466	.687	-1.088	2.203	-1.074	1.516-	.014+
D 24	16	32.61	2.0	2V	1350.	.096	-.519	.377	.069	-.231	.106	-.531	1.626	-.518	1.52D-	.013+
D 24	17	-40.41	2.D	2V	1400.	-1.620	-.215	1.157	-1.090	-.084	-1.663	-.196	-.152	-.181	1.511+	.015+
D 25	12	12.76	2.0	2F	900.	.255	-.420	.351	.174		.266	-.426	.548	-.386	.282-	.04D+
D 25	15	-33.32	1.5	2F	1000.	-.316	-.447	.393	-.238		-.332	-.452	-.028	-.427	.3D4+	.025+
0 25	16	-33.32	1.5	2A	1000.	.163	-.269	.228	.120		.162	-.278	.442	-.253	.28D-	.025+
0 25	15-16	STEREO PAIR			1000.	-.037	-.343	.308	-.014	-.142	-.044	-.350	.246	-.326	.290-	.024+
D 25	19	-40.41	2.5	2A	980.	.053	-.573	.410	.086		.044	-.589	.321	-.562	.277-	.027+
D 25	20	7.09	2.5	2V	1400.	-.090	-.699	.512	-.058	-.454	-.089	-.718	.200	-.665	.289-	.053+
0 25	21	1.41	3.D	1F	980.	-.360	-.857	.658	-.214		-.367	-.881	-.086	-.829	.281+	.052+
D 25	22	1.41	3.0	1A	98D.	-.056	-.763	.542	-.047		-.D55	-.783	.214	-.73D	.269-	.053+
D 25	21-22	STEREO PAIR			980.	-.208	-.810	.602	-.133	-.546	-.211	-.832	.064	-.780	.275+	.052+
D 26	6	-16.3D	1.0	2V	800.	-.272	-.186	.248	-.170	-.104	-.282	-.184	.146	-.173	.428+	.011+
D 26	7	32.61	1.5	1F	600.	.227	-.600	.460	.200		.259	-.596	.688	-.563	.429-	.D33+
D 26	8	32.61	1.5	1A	6D0.	.681	-.250	.518	.381		.709	-.224	1.132	-.189	.423-	.035+
D 26	7- 8	STEREO PAIR			600.	.454	-.425	.490	.228	-.170	.484	-.411	.910	-.377	.426-	.034+
D 26	9	5.67	1.5	2V	600.	-.342	-.758	.594	-.213	-.473	-.346	-.772	.078	-.746	.424+	.026+
0 26	10	-1.41	2.0	1F	600.	-.177	-.550	.412	-.104		-.182	-.558	.250	-.534	.432-	.024+
D 26	11	-1.41	2.0	1A	600.	.324	-.532	.444	.192		.333	-.542	.759	-.516	.426-	.026+
D 26	10-11	STEREO PAIR			600.	.074	-.541	.428	.043	-.344	.076	-.550	.504	-.525	.428-	.025+
D 26	12	-35.45	1.0	2F	960.	-.311	-.989	.736	-.293		-.350	-.996	.071	-.984	.421+	.012+
D 26	13	-35.45	1.0	2A	960.	.132	-.768	.554	.135		.113	-.788	.530	-.776	.417-	.012+
D 26	12-13	STEREO PAIR			960.	-.089	-.879	.651	-.055	-.349	-.118	-.892	.301	-.88D	.419-	.012+
D 26	14	-41.83	1.5	2A	680.	.158	-.671	.489	.150		.138	-.691	.548	-.681	.410-	.010+
D 26	15	-38.99	1.5	2V	1100.	-.001	-.649	.467	-.013	-.259	-.D21	-.661	.391	-.648	.412-	.013+
D 26	16	-4.25	2.0	2F	700.	.310	-.387	.355	.185		.317	-.395	.740	-.362	.423-	.033+
D 26	17	-4.25	2.0	2A	700.	.472	-.076	.343	.288		.483	-.078	.888	-.D45	.4D5-	.033+
D 26	16-17	STEREO PAIR			700.	.383	-.245	.350	.233	-.159	.392	-.251	.807	-.218	.415-	.033+
D 26	18	5.67	2.5	2F	700.	-.387	-.580	.495	-.222		-.394	-.594	.018	-.555	.412+	.D39+
0 26	19	21.27	2.5	2F	700.	-.242	-.514	.405	-.109		-.241	-.529	.183	-.482	.424+	.047+
D 26	20	21.27	2.5	2A	700.	.134	-.086	.120	.077		.139	-.086	.527	-.039	.388-	.047+
D 26	19-20	STEREO PAIR			700.	-.054	-.300	.298	-.046	-.173	-.D51	-.3D8	.355	-.260	.406-	.048+
D 26	21	26.23	2.0	2A	700.	.357	-.215	.318	.2D5		.369	-.214	.764	-.163	.395-	.051+
D 26	22	41.12	1.5	2V	90D.	.488	-.679	.594	.332	-.230	.518	-.682	.931	-.619	.413-	.063+
0 26	23	26.94	2.D	2A	70D.	1.D47	-.566	.845	.611		1.082	-.565	1.478	-.51D	.396-	.D55+
0 26	24	23.39	2.0	2A	960.	1.054	-.560	.844	.620		1.087	-.56D	1.497	-.506	.410-	.D54+
0 26	25	13.47	2.5	2V	1200.	.414	-.849	.697	.281	-.523	.43D	-.868	.852	-.816	.422-	.052+
D 26	26	18.43	2.5	2A	1100.	.812	-.373	.635	.487		.836	-.375	1.242	-.320	.406-	.055+
0 26	27	24.10	2.0	2A	1160.	.505	-.339	.441	.293		.521	-.342	.919	-.283	.398-	.059+
D 26	28	27.65	2.D	2A	1033.	.648	-.445	.564	.373		.670	-.447	1.061	-.386	.391-	.061+

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GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMAND		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 27	3	33.32	1.5	1F	1000.	-.748	-1.031	.904	-.298		-.714	-1.076	-.134	-1.048	.580+	.028+
D 27	4	33.32	1.5	1A	1000.	.369	-1.088	.813	.145		.432	-1.083	.982	-1.054	.550-	.029+
D 27	3- 4	STEREO PAIR			1000.	-.190	-1.059	.860	-.071	-.446	-.141	-1.080	.424	-1.051	.565-	.029+
D 27	10	-24.81	2.0	1F	880.	-.540	-.268	.430	-.350		-.557	-.267	-.004	-.237	.553+	.030+
D 27	11	-24.81	2.0	1A	880.	-.248	-.081	.194	-.149		-.255	-.080	.280	-.050	.535-	.030+
D 27	10-11	STEREO PAIR			880.	-.394	-.174	.334	-.232	-.087	-.406	-.174	.138	-.144	.544+	.030+
D 27	12	26.23	2.5	1F	1500.	-.977	-.534	.788	-.571		-.996	-.559	-.459	-.492	.537+	.067+
D 27	13	26.23	2.5	1A	1500.	-.257	-.398	.338	-.194		-.259	-.411	.261	-.344	.520-	.067+
D 27	12-13	STEREO PAIR			1500.	-.617	-.466	.606	-.380	-.267	-.628	-.485	-.099	-.418	.529+	.067+
D 27	14	-37.57	2.5	1F	2000.	-.605	-1.477	1.136	-.542		-.636	-1.516	-.114	-1.473	.522+	.043+
D 27	15	-37.57	2.5	1A	2000.	-.464	-1.526	1.137	-.154		-.491	-1.560	.037	-1.517	.528+	.043+
D 27	14-15	STEREO PAIR			2000.	-.535	-1.501	1.137	-.332	-.637	-.564	-1.538	-.039	-1.495	.525+	.043+
D 31	1	-26.94	2.5	2V	700.	.274	-1.115	.815	.175	-.613	.268	-1.147	1.482	-1.197	1.214-	-.050-
D 31	2	-15.59	2.5	1F	700.	.158	-.301	.248	.086		.161	-.310	1.406	-.336	1.245-	-.026-
D 31	3	-15.59	2.5	1A	700.	.684	-.337	.545	.441		.700	-.349	1.868	-.372	1.168-	-.023-
D 31	2- 3	STEREO PAIR			700.	.433	-.320	.429	.267	-.193	.442	-.330	1.647	-.355	1.205-	-.025-
D 31	4	-2.83	3.0	2F	400.	.329	-.176	.269	.206		.337	-.181	1.559	-.181	1.222-	.000+
D 31	5	-2.83	3.0	2A	400.	.709	-.277	.539	.448		.726	-.284	1.905	-.284	1.179-	.000+
D 31	4- 5	STEREO PAIR			400.	.519	-.227	.426	.326	-.153	.532	-.233	1.732	-.232	1.200-	.001+
D 31	6	-2.12	3.0	2V	400.	-.160	-.499	.400	-.109	-.338	-.164	-.513	1.014	-.506	1.178-	.007+
D 32	2	-.70	2.5	2V	400.	-.033	-.284	.247	-.023	-.191	-.033	-.291	1.928	-.291	1.961-	.000+
D 32	3	-2.12	2.5	2V	400.	-.179	-.954	.688	-.122	-.649	-.183	-.979	1.746	-.979	1.929-	.000+
D 32	4	-20.56	2.5	1F	400.	-.754	-1.005	.891	-.543		-.778	-1.029	1.163	-1.059	1.941-	-.030-
D 32	5	-20.56	2.5	1A	400.	-.207	-1.175	.847	-.075		-.219	-1.204	1.669	-1.231	1.888-	-.027-
D 32	4- 5	STEREO PAIR			400.	-.480	-1.090	.869	-.316	-.648	-.498	-1.117	1.416	-1.145	1.914-	-.028-
D 32	6	-4.96	3.0	2V	400.	.291	-.266	.286	.198	-.181	.298	-.273	2.205	-.270	1.907-	.003+
D 32	7	19.85	2.5	2A	400.	.915	-.405	.710	.557		.940	-.410	2.833	-.367	1.893-	.043+
D 34	2	2.12	3.5	2F	1500.	-.498	-.725	.622	-.304		-.510	-.749	.221	-.778	.731+	-.029-
D 34	3	2.12	3.5	2A	1500.	-.068	-.619	.441	-.053		-.069	-.635	.667	-.664	.736-	-.029-
D 34	2- 3	STEREO PAIR			1500.	-.283	-.672	.539	-.180	-.454	-.289	-.692	.444	-.721	.733-	-.029-
D 37	5	-39.70	1.5	2V	1680.	-.354	-1.050	.788	-.250	-.409	-.392	-1.062	.291	-1.117	.683+	-.055-
D 37	6	4.25	2.0	2V	1500.	.557	-.439	.503	.370	-.286	.572	-.447	1.257	-.475	.685-	-.028-
D 37	7	-29.06	2.0	2F	1600.	.375	-.958	.731	.148		.369	-.985	1.036	-1.035	.667-	-.050-
D 37	8	-29.06	2.0	2A	1600.	.872	-.261	.647	.558		.890	-.280	1.565	-.329	.675-	-.049-
D 37	7- 8	STEREO PAIR			1600.	.623	-.609	.690	.393	-.303	.630	-.633	1.301	-.682	.671-	-.049-
D 37	9	34.03	2.0	2F	1400.	.787	-.370	.618	.525		.813	-.364	1.503	-.373	.690-	-.009-
D 37	10	34.03	2.0	2A	1400.	1.529	.046	1.084	.956		1.566	.078	2.225	.070	.659-	-.008+
D 37	9-10	STEREO PAIR			1400.	1.158	-.162	.882	.633	-.080	1.190	-.143	1.864	-.151	.674-	-.008-
D 38	13	-24.10	2.5	2F	1740.	.228	-1.177	.853	.065		.224	-1.211	.489	-1.250	.265-	-.039-
D 38	14	-24.10	2.5	2A	1600.	.583	-1.349	1.042	.443		.586	-1.388	.832	-1.427	.246-	-.039-
D 38	13-14	STEREO PAIR			1654.	.446	-1.283	.974	.280	-.742	.447	-1.320	.700	-1.359	.253-	-.039-
D 38	15	-44.66	2.0	2V	700.	-.266	-1.367	.989	-.195	-.477	-.297	-1.399	-.037	-1.448	.260+	-.049-
D 38	21	-11.34	3.0	2V	1460.	.045	-.635	.466	.030	-.422	.045	-.654	.291	-.688	.246-	-.034-
D 38	27	-38.28	3.0	2F	1700.	.297	-1.023	.755	.077		.308	-1.055	.544	-1.078	.236-	-.023-
D 38	28	-38.99	3.5	2A	1700.	.754	-.560	.665	.476		.777	-.565	1.022	-.587	.245-	-.022-
D 38	27-28	STEREO PAIR			1700.	.526	-.792	.712	.299	-.297	.542	-.805	.783	-.828	.241-	-.023-
D 38	29	-31.90	3.5	2A	1800.	1.144	-.305	.839	.668		1.177	-.306	1.419	-.329	.242-	-.023-
D 39	13	-38.99	2.5	2V	1600.	.652	-.482	.583	.450	-.220	.662	-.503	.976	-.546	.314-	-.043-
D 39	14	-44.66	2.0	2V	1400.	.120	-1.122	.805	.073	-.401	.108	-1.155	.418	-1.201	.310-	-.046-
D 40	3	36.15	1.5	2F	1600.	.603	-.360	.505	.388		.639	-.327	1.064	-.326	.425-	.001+
D 40	4	36.86	1.0	2A	1600.	1.525	-1.380	1.457	.802		1.645	-1.303	2.041	-1.301	.396-	.002+
D 40	3- 4	STEREO PAIR			1600.	1.141	-.955	1.160	.667	-.336	1.226	-.894	1.634	-.893	.408-	.001+
D 40	7	-19.14	2.0	2V	900.	.297	-1.443	1.044	.183	-.855	.286	-1.475	.674	-1.510	.388-	-.035-
D 40	12	17.72	2.5	1F	2000.	.756	-.800	.788	.526		.781	-.814	1.177	-.837	.396-	-.023-
D 40	13	17.72	2.5	1A	2000.	1.070	-.330	.801	.659		1.100	-.329	1.479	-.352	.379-	-.023-
D 40	12-13	STEREO PAIR			2000.	.913	-.565	.795	.553	-.335	.940	-.571	1.328	-.594	.388-	-.023-
D 40	14	-26.94	2.0	2F	1025.	-.313	-.969	.732	-.273		-.331	-.991	.072	-1.032	.403+	-.041-
D 40	15	-26.94	2.5	2A	800.	.049	-.333	.241	.052		.047	-.342	.415	-.382	.368-	-.040-
D 40	14-15	STEREO PAIR			929.	-.158	-.696	.576	-.086	-.375	-.169	-.713	.219	-.753	.388-	-.040-
D 40	17	26.94	2.5	2V	1375.	1.002	-.883	.968	.683	-.446	1.033	-.902	1.408	-.926	.375-	-.024-

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TOP SECRET - GAMBIT

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GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMAND		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 41	24	-12.05	2.5	1F	1000.	-.504	-1.265	.969	-.360		-.521	-1.297	-1.222	-1.319	-.701-	-.022-
D 41	25	-12.05	2.5	1A	1000.	-.281	-1.066	.787	-.149		-.292	-1.093	-1.005	-1.114	-.713-	-.021-
D 41	24-25		STEREO PAIR		1000.	-.382	-1.157	.874	-.239	-.751	-.396	-1.185	-1.103	-1.207	-.707-	-.022-
D 41	26	-27.65	2.5	2A	900.	-.622	-1.153	.928	-.316		-.649	-1.176	-1.379	-1.205	-.730-	-.029-
D 41	27	-34.74	2.5	2A	1000.	-.586	-1.202	.949	-.271		-.615	-1.226	-1.333	-1.258	-.718-	-.032-
D 41	29	-25.52	2.5	2F	1500.	.838	-.964	.905	.461		.853	-.999	.151	-1.019	-.702+	-.020-
D 41	30	-25.52	3.0	2A	1500.	1.075	-.373	.805	.705		1.100	-.390	.388	-.409	-.712+	-.019-
D 41	29-30		STEREO PAIR		1500.	.957	-.669	.856	.607	-.376	.976	-.693	.269	-.713	-.707+	-.020-
D 41	31	-21.27	3.0	3F	2000.	-.306	-.027	.224	-.195		-.313	-.027	-1.027	-.041	-.714-	-.014-
D 41	32	-24.10	3.0	3A	2000.	.016	-.395	.286	.033		.015	-.406	-.709	-.420	-.724-	-.014-
D 41	31-32		STEREO PAIR		2000.	-.145	-.211	.257	-.101	-.117	-.149	-.217	-.868	-.232	-.719-	-.015-
D 42	5	38.99	1.5	2F	700.	1.161	-.953	1.065	.799		1.238	-.904	.337	-.880	-.901+	.024+
D 42	6	38.99	1.5	2A	725.	1.721	.318	1.239	1.043		1.746	.412	.806	.435	-.940+	.023-
D 42	5- 6		STEREO PAIR		711.	1.410	-.388	1.146	.644	-.131	1.463	-.322	.545	-.299	-.918+	.023+
D 42	8	-20.56	1.5	2V	600.	-.216	-1.360	.975	-.154	-.774	-.245	-1.378	-1.169	-1.419	-.924-	-.041-
D 42	9	-34.03	1.0	1F	600.	-.059	-1.343	.952	-.174		-.100	-1.362	-1.002	-1.416	-.902-	-.054-
D 42	10	-34.03	1.0	1A	600.	.238	-1.174	.849	.222		.210	-1.203	-.727	-1.256	-.937-	-.053-
D 42	9-10		STEREO PAIR		600.	.073	-1.268	.907	.015	-.564	.038	-1.292	-.880	-1.345	-.918-	-.053-
D 42	11	-9.92	2.0	2F	600.	.020	-.665	.473	-.007		.016	-.676	-.884	-.706	-.900-	-.030-
D 42	12	-9.92	2.0	2A	600.	.319	-.273	.301	.199		.325	-.280	-.619	-.309	-.944-	-.029-
D 42	11-12		STEREO PAIR		600.	.169	-.469	.396	.104	-.295	.171	-.479	-.751	-.508	-.922-	-.029-
D 42	13	-14.88	2.0	2V	700.	-.375	-.530	.460	-.248	-.326	-.389	-.536	-1.319	-.569	-.930-	-.033-
D 42	14	-41.12	1.5	2V	660.	-.559	-.795	.691	-.380	-.293	-.598	-.793	-1.542	-.852	-.944-	-.059-
D 42	15	-35.45	2.0	2A	700.	.563	-.237	.437	.363		.571	-.256	-.381	-.307	-.952+	-.051-
D 42	16	-15.59	2.0	2F	600.	.586	-.503	.549	.339		.597	-.518	-.326	-.548	-.923+	-.030-
D 42	17	-15.59	2.0	2A	600.	.859	.055	.609	.530		.881	.050	-.065	.020	-.946+	-.030+
D 42	16-17		STEREO PAIR		600.	.708	-.255	.576	.440	-.154	.723	-.266	-.210	-.296	-.933+	-.030-
D 42	18	-6.38	2.0	2A	600.	1.053	-.368	.795	.655		1.078	-.378	.135	-.401	-.943+	-.023-
D 42	19	-7.79	2.0	2F	600.	.442	-.754	.623	.259		.451	-.772	-.481	-.797	-.932-	-.025-
D 42	20	-7.79	2.0	2A	600.	.684	-.569	.635	.433		.700	-.584	-.246	-.607	-.946+	-.023-
D 42	19-20		STEREO PAIR		600.	.563	-.661	.629	.348	-.434	.575	-.678	-.364	-.702	-.939+	-.024-
D 42	21	19.85	2.0	2V	660.	.411	-.428	.427	.277	-.244	.426	-.433	-.505	-.439	-.931-	-.006-
D 42	22	-8.50	2.5	2F	600.	-.188	-.760	.555	-.134		-.195	-.777	-1.143	-.800	-.948-	-.023-
D 42	23	-8.50	2.5	2A	600.	.286	-.607	.476	.188		.292	-.623	-.665	-.645	-.957-	-.022-
D 42	22-23		STEREO PAIR		600.	.049	-.683	.517	.029	-.449	.048	-.700	-.904	-.723	-.952-	-.023-
D 42	24	-19.85	2.5	2V	700.	.003	-.749	.547	-.002	-.460	-.003	-.768	-.954	-.796	-.951-	-.028-
D 42	25	-26.94	2.0	1F	1000.	.030	-.746	.530	-.041		.022	-.765	-.903	-.798	-.925-	-.033-
D 42	26	-26.94	2.0	1A	1000.	.563	-.418	.498	.380		.572	-.434	-.391	-.466	-.963+	-.032-
D 42	25-26		STEREO PAIR		1000.	.296	-.582	.514	.186	-.301	.297	-.600	-.647	-.632	-.944-	-.032-
D 42	27	-34.03	2.5	2A	800.	.520	-.588	.560	.375		.525	-.611	-.435	-.647	-.960+	-.036-
D 42	28	-4.25	3.0	1F	600.	.120	-.697	.502	.071		.123	-.716	-.824	-.733	-.947-	-.017-
D 42	29	-4.25	3.0	1A	600.	.442	-.219	.351	.281		.453	-.225	-.509	-.241	-.962-	-.016-
D 42	28-29		STEREO PAIR		600.	.281	-.458	.433	.178	-.309	.288	-.470	-.666	-.487	-.954-	-.017-
D 43	4	-13.47	1.0	1F	740.	-.745	-1.233	1.020	-.487		-.783	-1.234	-1.951	-1.272	-1.168-	-.038-
D 43	5	-13.47	1.0	1A	740.	-.214	-.706	.524	-.109		-.231	-.712	-1.419	-.750	-1.188-	-.038-
D 43	4- 5		STEREO PAIR		740.	-.480	-.969	.810	-.280	-.563	-.507	-.974	-1.685	-1.012	-1.178-	-.038-
D 43	6	-26.94	1.0	2F	900.	-.769	-1.162	.986	-.549		-.825	-1.151	-2.007	-1.204	-1.182-	-.053-
D 43	9	13.47	1.5	1F	1920.	-.366	-1.132	.843	-.162		-.359	-1.152	-1.526	-1.162	-1.167-	-.010-
D 43	10	13.47	1.5	1A	1933.	.477	-1.088	.844	.248		.506	-1.098	-.715	-1.108	-1.221-	-.010-
D 43	9-10		STEREO PAIR		1927.	.094	-1.108	.843	.057	-.671	.113	-1.123	-1.083	-1.133	-1.196-	-.010-
D 43	13	36.86	2.0	1F	420.	.321	-.630	.502	.268		.348	-.630	-.848	-.616	-1.196-	.014+
D 43	14	36.86	2.0	1A	420.	1.166	.261	.849	.731		1.186	.303	-.039	.317	-1.225+	.014-
D 43	13-14		STEREO PAIR		420.	.743	-.184	.697	.346	-.086	.767	-.165	-.443	-.151	-1.210+	.014+
D 43	17	39.70	2.0	2F	600.	.671	-1.497	1.161	.603		.734	-1.505	-.437	-1.486	-1.171+	.019+
D 43	18	39.70	2.0	2A	600.	2.185	-1.482	1.868	1.205		2.285	-1.445	1.052	-1.426	-1.233+	.019+
D 43	17-18		STEREO PAIR		600.	1.428	-1.490	1.555	.761	-.520	1.510	-1.475	.307	-1.457	-1.203+	.018+
D 43	19	39.70	1.5	2A	700.	1.800	-1.411	1.620	.982		1.884	-1.391	.665	-1.377	-1.219+	.014+
D 43	20	-8.50	2.5	1F	1000.	.483	-1.239	.942	.281		.492	-1.271	-.729	-1.292	-1.221-	-.021-
D 43	21	-8.50	2.5	1A	1000.	.797	-.586	.701	.509		.815	-.602	-.418	-.623	-1.233+	-.021-
D 43	20-21		STEREO PAIR		1000.	.640	-.912	.830	.404	-.607	.654	-.937	-.574	-.958	-1.228+	-.021-
D 47	7	-.70	2.5	2V	927.	.022	-.646	.491	.015	-.437	.023	-.663	.255	-.686	.232-	-.023-
D 47	8	-20.56	3.0	2A	900.	.054	-.658	.470	.066		.052	-.676	.294	-.689	.242-	-.013-
D 47	9	-5.67	3.0	2V	900.	-.321	-.360	.347	-.219	-.245	-.329	-.370	-.088	-.391	.241+	-.021-
D 47	10	-22.68	3.0	2F	900.	-.394	-.925	.715	-.308		-.409	-.951	-.180	-.962	.229+	-.011-
D 47	11	-22.68	3.0	2A	900.	.053	-.703	.503	.070		.050	-.722	.302	-.733	.252-	-.011-
D 47	10-11		STEREO PAIR		900.	-.171	-.814	.618	-.106	-.474	-.179	-.836	.061	-.847	.240+	-.011-

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GEO-POSITIONING DATA

PHOTO I.D.		COMMANDED POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUDE ERRORS DEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMAND		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 48	6	7.79	2.5	2F	1000.	.208	-1.104	.795	.170		.218	-1.130	.482	-1.158	.264-	-.028-
D 48	7	7.79	2.5	2A	1000.	.658	-.646	.654	.397		.678	-.659	.954	-.688	.276-	-.029-
D 48	6- 7	STEREO PAIR			1000.	.433	-.875	.728	.266	-.573	.448	-.894	.718	-.923	.270-	-.029-
D 48	8	-1.41	2.5	1F	1000.	.094	-1.032	.733	.061		.097	-1.059	.353	-1.083	.256-	-.024-
D 48	9	-1.41	2.5	1A	1000.	.256	-.637	.488	.162		.263	-.653	.533	-.677	.270-	-.024-
D 48	8- 9	STEREO PAIR			1000.	.175	-.834	.623	.110	-.571	.180	-.856	.443	-.880	.263-	-.024-
D 48	10	1.41	2.5	2A	1000.	-.117	-.315	.248	-.077		-.120	-.323	.156	-.348	.276-	-.025-
D 48	11	3.54	2.5	2V	1000.	-.643	-.568	.608	-.440	-.385	-.658	-.584	-.384	-.610	.274+	-.026-
D 48	12	.70	3.0	2V	1000.	-.143	-.434	.328	-.098	-.296	-.146	-.446	.125	-.470	.271+	-.024-
D 53	8	-29.06	3.0	1F	1600.	.524	-1.313	1.002	.216		.538	-1.356	.218	-1.315	-.320+	.041+
D 53	9	-29.06	3.0	1A	1600.	.628	-.865	.762	.422		.646	-.879	.368	-.838	-.278+	.041+
D 53	8- 9	STEREO PAIR			1600.	.576	-1.089	.890	.341	-.541	.592	-1.114	.293	-1.073	-.299+	.041+
D 54	11	24.10	2.0	1F	1200.	-.031	-.763	.548	.042		-.021	-.780	-.076	-.777	-.055-	.003+
D 54	12	24.10	2.0	1A	1200.	.888	-.391	.689	.532		.915	-.387	.850	-.385	-.065+	.002+
D 54	11-12	STEREO PAIR			1200.	.470	-.560	.629	.270	-.323	.489	-.566	.429	-.564	-.060+	.002+
D 54	13	4.25	2.5	2V	1020.	.603	-.440	.529	.407	-.293	.619	-.449	.550	-.447	-.069+	.002+
D 54	14	-19.85	2.5	2F	1200.	.359	-1.249	.923	.158		.358	-1.282	.299	-1.278	-.059+	.004+
D 54	15	-19.85	2.5	2A	1200.	.678	-.849	.774	.464		.688	-.875	.627	-.871	-.061+	.004+
D 54	14-15	STEREO PAIR			1200.	.501	-1.072	.860	.309	-.653	.505	-1.101	.445	-1.098	-.060+	.003+
D 54	16	20.56	2.0	2V	1300.	.908	.087	.645	.614	.056	.929	.098	.863	.098	-.066+	.000+
D 54	20	-3.54	3.0	1F	1500.	-.159	-.690	.506	-.102		-.163	-.708	-.213	-.707	-.050-	.001+
D 54	21	-3.54	3.0	1A	1467.	.208	-.663	.498	.131		.213	-.681	.160	-.679	-.053+	.002+
D 54	20-21	STEREO PAIR			1482.	.041	-.675	.501	.025	-.459	.042	-.693	-.009	-.692	-.051+	.001+
D 54	22	-.70	2.5	2V	900.	-.335	-.702	.556	-.228	-.479	-.343	-.722	-.395	-.721	-.052-	.001+
D 54	23	-26.23	2.5	2F	880.	-.528	-1.121	.878	-.417		-.550	-1.149	-.617	-1.142	-.067-	.007+
D 54	24	-26.23	2.5	2A	880.	-.297	-1.305	.947	-.113		-.314	-1.337	-.367	-1.331	-.053-	.006+
D 54	23-24	STEREO PAIR			880.	-.413	-1.213	.913	-.273	-.685	-.432	-1.243	-.492	-1.237	-.060-	.006+
D 54	39	-34.03	3.0	2F	1900.	-.423	-1.306	.974	-.338		-.432	-1.349	-.466	-1.331	-.034-	.018+
D 54	40	-34.03	3.0	2A	1900.	-.227	-1.227	.886	-.037		-.231	-1.242	-.229	-1.226	.002+	.016+
D 54	39-40	STEREO PAIR			1900.	-.325	-1.266	.931	-.175	-.557	-.332	-1.294	-.348	-1.278	-.016-	.016+
D 55	17	17.01	3.0	1F	1467.	-.455	-.627	.557	-.248		-.464	-.650	-.552	-.658	-.088-	-.008-
D 55	18	17.01	3.0	1A	1520.	-.104	-.035	.114	-.068		-.106	-.036	-.184	-.045	-.078-	-.009-
D 55	17-18	STEREO PAIR			1491.	-.296	-.358	.418	-.199	-.219	-.301	-.369	-.384	-.378	-.083-	-.009-
D 55	19	-8.50	3.5	1F	1300.	.258	-.735	.552	.152		.264	-.760	.175	-.760	-.089+	.000+
D 55	20	-8.50	3.5	1A	1300.	.665	-.669	.668	.428		.681	-.687	.616	-.687	-.065+	.000+
D 55	19-20	STEREO PAIR			1300.	.462	-.702	.613	.291	-.467	.473	-.723	.396	-.723	-.077+	.000+
D 55	21	24.81	3.0	2F	957.	-.475	-.663	.582	-.239		-.484	-.689	-.572	-.706	-.088-	-.017-
D 55	22	24.81	3.0	2A	940.	-.030	-.771	.551	-.078		-.027	-.791	-.095	-.809	-.068-	-.018-
D 55	21-22	STEREO PAIR			950.	-.290	-.708	.569	-.157	-.367	-.294	-.732	-.373	-.749	-.079-	-.017-
D 56	9	23.39	2.0	2F	700.	.832	-1.287	1.085	.620		.877	-1.294	.540	-1.267	-.337+	.027+
D 56	10	23.39	2.0	2A	700.	1.597	-1.362	1.485	.905		1.661	-1.361	1.258	-1.333	-.403+	.028+
D 56	9-10	STEREO PAIR			700.	1.215	-1.324	1.301	.741	-.705	1.269	-1.328	.899	-1.300	-.370+	.028+
D 56	12	-27.65	2.0	2F	1333.	-.171	-1.977	1.407	-.272		-.205	-2.016	-.559	-2.093	-.354-	-.077-
D 56	13	-27.65	2.0	2A	1340.	-.013	-2.139	1.516	.126		-.045	-2.187	-.458	-2.263	-.413-	-.076-
D 56	12-13	STEREO PAIR			1336.	-.099	-2.050	1.458	-.103	-1.087	-.133	-2.094	-.513	-2.171	-.380-	-.077-
D 56	24	-42.54	2.5	2V	1200.	.246	-1.246	.904	.155	-.472	.235	-1.284	-.209	-1.391	-.444+	-.107-
D 56	25	-41.83	2.5	2V	1300.	.458	-.933	.740	.302	-.375	.457	-.965	.008	-1.065	-.449+	-.100-
D 57	21	-31.19	3.0	1F	1100.	.470	-.729	.619	.234		.477	-.756	-.153	-.825	-.630+	-.069-
D 57	22	-31.19	3.0	1A	1100.	.935	-.400	.723	.618		.956	-.416	.268	-.481	-.688+	-.065-
D 57	21-22	STEREO PAIR			1100.	.703	-.565	.673	.435	-.281	.717	-.585	.058	-.652	-.659+	-.067-
D 58	4	-1.41	1.5	1F	900.	.387	-.303	.355	.233		.397	-.307	-.070	-.347	-.467+	-.040-
D 58	5	-1.41	1.5	1A	900.	.852	-.016	.606	.518		.873	-.017	.348	-.056	-.525+	-.039-
D 58	4- 5	STEREO PAIR			900.	.619	-.160	.496	.375	-.103	.635	-.163	.139	-.202	-.496+	-.039-
D 58	6	.00	1.5	2V	1900.	.315	-.257	.306	.206	-.167	.324	-.260	-.177	-.295	-.501+	-.035-
D 58	9	9.92	2.0	1F	800.	.224	-.461	.366	.156		.233	-.468	-.272	-.480	-.505-	-.012-
D 58	10	9.92	2.0	1A	800.	.874	-.513	.719	.526		.899	-.516	.344	-.528	-.555+	-.012-
D 58	9-10	STEREO PAIR			800.	.564	-.488	.578	.348	-.315	.582	-.493	.051	-.505	-.531+	-.012-

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GEO-POSITIONING OATA

PHOTO I.D.		COMMANDEO POSITION			MAP ACCURACY	MISS DISTANCE NAUTICAL MILES			ATTITUOE ERRORS OEGREES		EPHEMERIS ERRORS NAUTICAL MILES					
											BEST FIT		COMMANO		COMMAND - BFE	
REV	FRAME	ROLL	CRAB	STEREO	+/- FEET	SIG X	SIG Y	ME	PITCH	ROLL	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK	IN-TRACK	X-TRACK
D 58	11	-10.63	2.0	1F	600.	.315	-.735	.567	.173		.319	-.751	-.193	-.801	-.512+	-.050-
0 58	12	-10.63	2.0	1A	600.	.671	-.937	.816	.437		.683	-.960	.114	-1.008	-.569+	-.048-
D 58	11-12	STEREO PAIR			600.	.493	-.836	.702	.299	-.539	.501	-.855	-.039	-.904	-.540+	-.049-
0 58	13	-7.09	2.0	1F	700.	.419	-.420	.421	.254		.429	-.430	-.084	-.472	-.513+	-.042-
D 58	14	-7.09	2.0	1A	700.	.918	-.022	.650	.576		.940	-.025	.368	-.065	-.572+	-.040-
D 58	13-14	STEREO PAIR			700.	.669	-.221	.548	.420	-.143	.685	-.228	.142	-.269	-.543+	-.041-
0 58	15	-11.34	2.5	1F	700.	.553	-.867	.734	.322		.562	-.889	.036	-.935	-.526+	-.046-
D 58	16	-11.34	2.5	1A	700.	1.093	-.918	1.014	.707		1.116	-.944	.545	-.989	-.571+	-.045-
0 58	15-16	STEREO PAIR			700.	.798	-.890	.872	.493	-.578	.814	-.914	.267	-.960	-.547+	-.046-
D 58	17	-17.01	2.5	1F	1020.	.711	-.974	.858	.401		.722	-1.002	.189	-1.058	-.533+	-.056-
D 58	1B	-17.01	2.5	1A	1020.	1.018	-1.000	1.014	.680		1.037	-1.031	.441	-1.085	-.596+	-.054-
D 58	17-1B	STEREO PAIR			1020.	.864	-.987	.939	.533	-.61B	.879	-1.016	.315	-1.072	-.564+	-.056-
D 59	3	-26.23	2.0	2V	620.	.0B9	-.899	.644	.050	-.498	.077	-.918	-.705	-.999	-.782-	-.081-
0 59	4	-27.65	2.0	2V	600.	.386	-.681	.558	.250	-.368	.384	-.702	-.406	-.787	-.790-	-.085-
D 59	5	.00	2.0	2V	600.	.706	-.232	.530	.473	-.155	.723	-.236	-.060	-.265	-.783+	-.029-
D 59	6	-2.83	2.0	2A	600.	1.100	-.669	.912	.691		1.126	-.685	.309	-.719	-.817+	-.034-
D 63	3	17.01	2.0	2V	1000.	-.106	-.263	.209	-.070	-.161	-.106	-.270	-1.682	-.263	-1.576-	.007+
D 63	4	16.30	2.5	2V	600.	-.339	-1.186	.875	-.225	-.725	-.339	-1.219	-1.929	-1.213	-1.590-	.006+
D 63	5	-36.86	2.5	2F	400.	.091	-1.283	.910	-.075		.084	-1.326	-1.519	-1.395	-1.603-	-.069-
0 63	6	-36.86	2.5	2A	400.	.406	-.948	.731	.339		.409	-.975	-1.241	-1.041	-1.650-	-.066-
D 63	5- 6	STEREO PAIR			400.	.249	-1.116	.825	.153	-.478	.246	-1.149	-1.380	-1.217	-1.626-	-.068-
D 64	2	-8.50	1.5	2F	1000.	.196	-1.381	.989	.083		.190	-1.398	-1.747	-1.424	-1.937-	-.026-
D 64	3	-9.21	2.0	2A	2000.	.009	-.729	.517	.017		.006	-.743	-1.998	-.769	-2.004-	-.026-
D 64	2- 3	STEREO PAIR			1500.	.103	-1.055	.790	.063	-.683	.098	-1.073	-1.872	-1.099	-1.970-	-.026-
D 64	6	-17.72	2.0	1F	1200.	.039	-1.227	.871	-.037		.031	-1.255	-1.969	-1.295	-2.000-	-.040-
D 64	7	-17.72	2.0	1A	1200.	.367	-.868	.668	.265		.370	-.891	-1.667	-.929	-2.037-	-.038-
D 64	6- 7	STEREO PAIR			1200.	.203	-1.047	.776	.127	-.651	.200	-1.073	-1.818	-1.112	-2.018-	-.039-
D 64	8	2.83	3.0	2F	1000.	-.848	-.292	.635	-.535		-.868	-.301	-2.869	-.313	-2.001-	-.012-
0 64	9	2.83	3.0	2A	1000.	-.261	.121	.208	-.165		-.268	.124	-2.313	.113	-2.045-	-.011+
D 64	8- 9	STEREO PAIR			1000.	-.555	-.085	.473	-.357	-.064	-.568	-.088	-2.591	-.099	-2.023-	-.011-
0 64	10	2.83	3.0	2V	600.	-.570	-.570	.570	-.387	-.3B9	-.580	-.591	-2.617	-.603	-2.037-	-.112-

TOP SECRET - GAMBIT

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BCS 39739-65

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME SEC	BURST TIME SEC	COMMAND POSITION LAT DEG	COMMAND POSITION LAT MIN	COMMAND POSITION LONG DEG	COMMAND POSITION LONG MIN	BEST EPHEMERIS LAT DEG	BEST EPHEMERIS LAT MIN	BEST EPHEMERIS LONG DEG	BEST EPHEMERIS LONG MIN	FILM VELOCITY IN./SEC. COMMAND	FILM VELOCITY IN./SEC. ACTUAL	MIRROR POS.	CRAB DEG.	ROLL ANGLE
REV D 4															
1	4498.09	5.1	69	56N	164	19E	69	56.57N	164	19.95E	2.6899	2.690	1	.5	-29.069
2	4512.19	5.1					69	1.00N	163	31.14E	2.7168	2.717	1	.5	-29.069
3	4521.99	5.1	68	21N	162	59E	68	22.26N	162	59.40E	2.8840	2.853	2	1.0	-24.106
4	4607.79	5.9	62	39N	159	17E	62	39.88N	159	17.96E	2.8840	2.884	1	2.D	23.397
5	4620.29	5.9					61	49.63N	158	52.04E	2.8840	2.887	1	2.0	23.397
6	4772.69	6.3	51	31N	154	49E	51	32.15N	154	49.36E	2.7991	2.800	1	2.5	31.196
7	4785.59	6.3					50	39.57N	154	33.15E	2.7714	2.774	1	2.5	31.196
REV D 5															
1	9775.99	5.9	73	13N	145	40E	73	13.35N	145	40.76E	2.4841	2.485	1	.5	-37.577
2	9790.89	5.9					72	15.65N	144	30.29E	2.4841	2.486	1	.5	-37.577
3	9980.59	7.1	59	40N	135	38E	59	40.90N	135	38.41E	3.1229	3.124	1	1.5	-16.307
4	9991.89	7.1					58	55.25N	135	18.42E	3.1541	3.154	1	1.5	-16.3D7
5	10071.D9	6.3	53	33N	133	16E	53	34.10N	133	16.40E	3.2497	3.248	2	2.0	-14.889
6	10082.79	8.9	52	46N	133	00E	52	46.50N	133	.56E	3.2822	3.283	2	2.0	-14.889
7	10136.29	5.4	49	08N	131	54E	49	8.42N	131	53.56E	3.2175	3.218	2	2.0	25.524
8	10161.49	6.3	47	25N	131	25E	47	25.48N	131	24.65E	3.0920	3.093	2	2.0	-24.815
9	10194.39	9.1	45	1DN	130	49E	45	10.90N	130	49.00E	3.1857	3.187	2	2.5	19.852
10	10211.69	6.3	43	59N	130	31E	44	.06N	130	31.11E	2.6899	2.692	2	2.5	36.159
11	10225.39	6.3	43	03N	130	17E	43	3.93N	130	17.32E	2.6633	2.637	2	2.5	36.159
12	10251.49	6.7	41	16N	129	52E	41	16.90N	129	51.87E	3.3482	3.345	2	2.5	-15.598
13	10261.99	6.7	40	33N	129	42E	40	33.82N	129	41.93E	3.3817	3.385	2	2.5	-15.598
14	10280.19	6.3	39	18N	129	25E	39	19.10N	129	25.05E	2.5089	2.510	2	1.5	-43.958
15	10294.29	10.3	38	20N	129	12E	38	21.18N	129	12.26E	2.5594	2.558	2	1.5	-43.958
16	10900.89	6.3	3	22S	121	58E	3	21.65S	121	57.86E	3.1229	3.122	1	3.5	15.598
17	10912.59	6.3					4	9.89S	121	50.25E	3.0614	3.059	1	3.5	15.598
REV D 6															
1	15103.89	5.5	73	14N	123	30E	73	15.12N	123	30.30E	3.0011	2.999	1	1.0	-9.217
2	15115.99	5.5					72	28.30N	122	32.36E	3.0311	3.032	1	1.0	-9.217
3	15401.19	6.3	53	26N	111	01E	53	26.96N	111	1.40E	2.4841	2.483	2	1.5	45.376
4	15411.89	9.7	52	42N	110	47E	52	43.42N	110	46.96E	2.4841	2.486	2	2.0	45.376
5	15427.99	10.6	51	37N	110	26E	51	37.86N	110	25.95E	2.4841	2.486	2	2.0	45.376
6	15620.69	5.9	38	28N	107	02E	38	29.16N	107	1.46E	2.5594	2.556	1	1.5	-43.249
7	15634.39	5.9					37	32.86N	106	49.24E	2.6369	2.636	1	1.5	-43.249
8	15673.29	5.1	34	52N	106	16E	34	52.90N	106	15.70E	3.0011	3.000	2	2.0	34.741
9	15724.99	5.5	31	19N	105	33E	31	20.04N	105	33.37E	2.5850	2.585	2	2.0	-43.958
10	15739.49	12.4	30	19N	105	22E	30	20.30N	105	21.90E	2.6369	2.634	2	2.0	-43.958
11	15781.49	5.3	27	26N	104	50E	27	27.16N	104	49.52E	3.1857	3.188	2	2.5	-36.159
12	15805.99	14.4	25	45N	104	31E	25	46.10N	104	31.16E	3.5542	3.553	2	3.0	-25.524
13	15831.29	7.1	24	01N	104	13E	24	1.70N	104	12.56E	3.5542	3.553	1	3.5	.709
14	15841.39	7.1					23	20.01N	104	5.23E	3.5542	3.553	1	3.5	.709
15	15860.09	5.1	22	02N	103	52E	22	2.81N	103	51.78E	3.1229	3.121	2	2.5	31.905
16	15872.59	30.1	21	10N	103	43E	21	11.20N	103	42.88E	3.1229	3.121	2	2.5	31.905
17	16155.39	7.5	1	42N	100	33E	1	43.08N	100	33.32E	2.7714	2.775	1	3.0	31.905
18	16168.29	7.5					0	49.83N	100	24.95E	2.7168	2.716	1	3.0	31.905
19	16199.69	7.5	1	21S	100	05E	1	19.73S	100	4.57E	3.1857	3.187	3	3.5	-19.852
20	16211.39	7.5					2	7.99S	99	56.98E	3.1541	3.153	3	3.5	-22.688
REV D 7															
1	20363.68	6.3	77	33N	108	50E	77	33.85N	108	50.31E	2.9713	0.000	1	.5	-1.418
2	20375.38	6.3					76	50.78N	107	13.50E	3.0011	0.000	1	.5	-1.418
3	20437.48	5.1	72	54N	100	52E	72	54.98N	100	52.07E	2.6899	0.000	1	1.5	26.233
4	20451.58	5.1					72	.26N	99	47.36E	2.7168	0.000	1	1.5	26.233
5	20618.88	5.1	60	54N	91	47E	60	55.20N	91	47.52E	2.8840	2.887	2	1.5	-26.942
6	20643.18	6.3	59	16N	91	03E	59	17.15N	91	2.73E	3.0011	3.000	1	2.0	21.270
7	20654.88	6.3					58	29.85N	90	42.46E	3.0011	3.000	1	2.0	21.270
8	20670.68	5.1	57	25N	90	16E	57	25.91N	90	16.27E	2.4841	2.486	2	2.0	40.413
9	20696.38	6.7	55	41N	89	36E	55	41.72N	89	36.30E	3.2822	3.280	2	2.0	4.963
10	20706.88	6.7	54	58N	89	21E	54	59.09N	89	20.81E	3.2822	3.280	2	2.0	4.963
11	2D730.38	6.3	53	23N	88	48E	53	23.57N	88	47.72E	2.7440	2.742	2	2.0	-36.868
12	20766.88	6.3	50	54N	88	00E	50	54.93N	88	.10E	2.9713	2.974	1	1.5	-29.778
13	20778.58	6.3					50	7.21N	87	45.69E	3.0011	3.004	1	1.5	-29.778
14	20881.58	6.7	43	05N	B5	53E	43	5.99N	85	52.74E	2.6633	2.663	1	2.5	37.577
15	20894.88	6.7					42	11.46N	85	39.64E	2.6108	2.610	1	2.5	37.577
16	21066.28	5.9	30	26N	83	11E	30	26.72N	83	10.62E	2.9713	2.974	2	2.5	32.614
17	21078.78	15.8	29	34N	83	01E	29	35.21N	83	.85E	2.9419	2.943	2	2.5	32.614
18	21308.28	7.1	13	47N	80	16E	13	47.82N	80	16.34E	3.4841	3.488	2	3.5	0.000
19	21318.38	8.6	13	05N	80	10E	13	6.09N	80	9.55E	3.4841	3.488	2	3.5	0.000
20	21396.78	6.7	7	41N	79	18E	7	42.19N	79	17.56E	3.1541	3.151	1	3.5	20.561
21	21408.88	6.7					6	52.21N	79	9.62E	3.0920	3.091	1	3.5	20.561
REV D 8															
1	25649.88	7.5	80	03N	94	17E	80	3.05N	94	14.78E	2.9419	2.940	3	.5	-4.254
2	25662.78	7.5					79	18.61N	91	33.35E	2.9419	2.940	3	.5	-7.090
3	25682.98	5.5	78	07N	88	02E	78	6.77N	B8	.40E	2.7714	2.773	1	1.0	19.852
4	25696.28	5.5					77	18.27N	86	1.54E	2.7991	2.799	1	1.0	19.852
5	25995.78	9.0	57	39N	68	09E	57	38.97N	68	9.05E	2.5340	2.533	2	1.0	-38.995
6	26009.98	6.7	56	42N	67	47E	56	41.43N	67	46.36E	2.7991	2.799	1	1.5	-31.905
7	26023.28	6.7					55	47.49N	67	25.97E	2.8554	2.851	1	1.5	-31.905
8	26081.18	11.0	51	52N	66	06E	51	52.06N	66	5.42E	3.3482	3.348	2	2.5	3.545
9	26097.58	5.5	50	45N	65	45E	50	45.22N	65	44.67E	3.3817	3.384	2	2.5	3.545
10	26160.18	6.1	46	30N	64	32E	46	29.55N	64	31.99E	3.0311	3.030	2	2.0	-29.069
11	26171.88	10.6	45	42N	64	20E	45	41.68N	64	19.40E	3.0614	3.060	2	2.0	-29.069
12	26253.98	5.3	40	05N	62	58E	40	5.13N	62	57.85E	2.7714	2.771	2	2.0	39.704
13	26270.08	5.3	38	59N	62	43E	38	59.02N	62	43.05E	3.1541	3.152	2	2.5	22.688
14	26292.48	6.4	37	27N	62	23E	37	26.98N	62	22.99E	3.3482	3.152	2	3.0	-20.561
15	26314.58	5.3	35	56N	62	04E	35	56.11N	62	3.77E	3.4496	3.448	2	3.0	9.926
16	26328.08	6.3	35	01N	61	52E	35	.58N	61	52.28E	3.4155	3.413	1	3.0	11.344
17	26338.58	6.3					34	17.37N	61	43.47E	3.4155	3.416	1	3.0	11.344

Approved for Release: 2018/09/11 C05103025

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME SEC	BURST TIME SEC	COMMAND POSITION LAT DEG	MIN	LONG DEG	MIN	BEST EPHEMERIS LAT DEG	MIN	LONG DEG	MIN	FILM VELOCITY IN./SEC. COMMAND	ACTUAL	MIRROR POS.	CRAB DEG.	ROLL ANGLE
REV D 9															
1	30964.88	5.5	8D	47N	75	14E	80	47.34N	75	15.15E	2.5850	2.584	1	1.0	26.942
2	30979.38	5.5					79	58.96N	71	46.78E	2.6108	2.609	1	1.0	26.942
3	31012.18	5.9	78	03N	65	39E	78	3.50N	65	39.74E	2.6369	2.635	1	1.0	26.942
4	31025.88	5.9					77	13.48N	63	38.52E	2.6369	2.635	1	1.0	26.942
5	31062.98	5.3	74	54N	59	15E	74	54.47N	59	15.50E	2.9713	2.968	2	.5	-24.106
6	31079.08	7.1	73	53N	57	43E	73	52.94N	57	43.76E	2.7991	2.798	1	.5	-23.397
7	31091.58	7.1					73	4.79N	56	39.69E	2.8271	2.824	1	.5	-23.397
8	31107.08	8.0	72	04N	55	27E	72	4.68N	55	27.62E	2.7440	2.742	2	.5	-25.524
9	31122.88	5.5	71	03N	54	21E	71	3.02N	54	21.35E	2.7991	2.797	2	.5	-25.524
10	31162.48	6.0	68	27N	52	00E	68	27.11N	52	.51E	2.9128	2.911	2	1.5	20.561
11	31174.98	6.0	67	37N	51	22E	67	37.57N	51	22.10E	2.9128	2.911	2	1.5	20.561
12	31284.48	6.3	60	18N	47	06E	60	18.95N	47	5.63E	2.4841	2.483	2	2.0	43.249
13	31300.58	7.2	59	13N	46	36E	59	13.94N	46	36.45E	2.4841	2.483	2	2.0	43.249
14	31334.68	7.0	56	55N	45	39E	56	55.94N	45	39.56E	2.7991	2.796	2	1.5	-31.905
15	31347.58	7.8	56	03N	45	19E	56	3.63N	45	19.55E	2.8554	2.854	2	1.5	-31.905
16	31384.98	5.1	53	31N	44	25E	53	31.69N	44	25.54E	2.9419	2.938	2	1.5	33.323
17	31400.48	7.5	52	28N	44	05E	52	28.61N	44	4.68E	3.0011	3.000	1	2.0	24.815
18	31412.18	7.5					51	40.95N	43	49.46E	3.0011	3.001	1	2.0	24.815
19	31427.78	7.3	50	37N	43	30E	50	37.36N	43	29.82E	2.7168	2.713	2	1.5	36.868
20	31443.28	6.3	49	33N	43	11E	49	34.12N	43	10.99E	2.7991	2.797	2	2.0	32.614
21	31456.18	8.2	48	41N	42	56E	48	41.45N	42	55.79E	2.7714	2.771	2	2.0	32.614
22	31494.88	10.8	46	03N	42	13E	46	3.25N	42	12.56E	3.1541	3.154	2	2.0	-24.815
23	31514.98	5.7	44	40N	41	51E	44	40.97N	41	51.33E	2.7991	2.797	2	2.0	-41.831
24	31530.98	6.4	43	35N	41	35E	43	35.42N	41	34.98E	3.3482	3.346	2	2.5	-14.889
25	31541.48	6.4	42	52N	41	24E	42	52.39N	41	24.48E	3.3817	3.383	2	2.5	-14.889
26	31560.98	6.2	41	32N	41	05E	41	32.42N	41	5.46E	3.3150	3.315	2	2.5	14.180
27	31615.48	5.9	37	48N	40	15E	37	48.63N	40	15.15E	3.0311	3.029	1	2.5	28.360
28	31627.98	5.9					36	57.25N	40	4.14E	2.9713	2.973	1	2.5	28.360
29	31682.48	5.3	33	12N	39	18E	33	13.02N	39	18.03E	3.6256	3.624	2	2.5	14.180
30	31872.48	5.5	20	09N	36	55E	20	9.40N	36	54.77E	3.4496	3.448	1	3.5	9.217
31	31883.38	5.5					19	24.38N	36	47.13E	3.4155	3.413	1	3.5	9.217
32	31911.28	5.3	17	28N	36	28E	17	29.15N	36	27.76E	2.8554	2.855	2	3.0	-38.995
REV D10															
1	36266.18	6.3	82	11N	61	21E	82	11.05N	61	20.77E	2.7714	2.772	2	.5	17.725
2	36279.18	12.9	81	32N	57	03E	81	32.18N	57	2.12E	2.7714	2.772	2	.5	18.434
3	36463.28	5.9	70	16N	31	23E	70	15.97N	31	22.81E	2.9128	2.911	2	1.5	19.143
4	36475.88	6.0	69	26N	30	38E	69	26.37N	30	37.74E	2.9128	2.911	2	1.0	19.143
5	36494.28	5.6	68	14N	29	37E	68	13.65N	29	37.39E	2.4841	2.487	2	.5	43.958
6	36513.88	5.7	66	56N	28	39E	66	55.84N	28	39.25E	2.8840	2.884	2	1.0	22.688
7	36561.88	6.7	63	44N	26	38E	63	44.09N	26	37.90E	2.9419	2.938	1	2.0	21.270
8	36573.98	6.7					62	55.53N	26	11.12E	2.9419	2.941	1	2.0	21.270
9	36592.98	5.9	61	39N	25	32E	61	39.13N	25	31.59E	3.2175	3.218	1	2.0	5.672
10	36604.28	5.9					60	53.61N	25	9.41E	3.2175	3.218	1	2.0	5.672
11	36617.48	5.1	60	00N	24	45E	60	.36N	24	44.62E	3.2497	3.247	1	1.5	-5.672
12	36629.18	5.1					59	13.11N	24	23.59E	3.2822	3.283	1	1.5	-5.672
13	36646.28	7.1	58	04N	23	54E	58	3.95N	23	54.30E	2.6899	2.691	2	1.5	-36.159
14	36658.08	7.8	57	16N	23	35E	57	16.17N	23	35.00E	2.8840	2.883	2	1.5	-29.069
15	36670.58	7.8	56	25N	23	15E	56	25.50N	23	15.31E	2.9419	2.939	2	2.0	-29.069
16	36688.98	5.5	55	11N	22	48E	55	10.83N	22	47.61E	3.1541	3.151	2	1.5	-19.143
17	36701.08	10.8	54	22N	22	30E	54	21.67N	22	30.16E	3.1857	3.186	2	2.0	-19.143
18	36727.08	9.4	52	36N	21	54E	52	35.90N	21	54.51E	3.3817	3.380	2	2.0	-21.270
19	36744.48	6.3	51	25N	21	32E	51	25.02N	21	31.93E	3.3482	3.344	2	2.0	-24.106
20	36762.58	5.5	50	11N	21	09E	50	11.21N	21	9.41E	3.2175	3.214	2	2.0	-29.778
21	36774.78	5.1	49	21N	20	55E	49	21.42N	20	54.74E	2.5850	2.586	2	2.0	-42.540
22	36783.98	5.4	48	44N	20	44E	48	43.86N	20	43.93E	2.9713	2.969	2	1.5	-36.868
23	36800.08	7.9	47	38N	20	25E	47	38.07N	20	25.51E	3.1229	3.121	2	2.0	-33.323
24	36812.88	22.2	46	46N	20	11E	46	45.74N	20	11.29E	2.6108	2.607	2	2.0	-42.540
25	36847.08	7.1	44	26N	19	35E	44	25.76N	19	34.94E	3.0311	3.028	1	2.0	-29.069
26	36858.38	7.1					43	39.47N	19	23.41E	3.1229	3.120	1	2.0	-29.069
27	36882.58	6.3	42	00N	18	59E	42	.25N	18	59.44E	3.3150	3.313	1	2.5	14.889
28	36893.08	6.3					41	17.18N	18	49.33E	3.2822	3.282	1	2.5	14.889
29	37312.88	5.5	12	26N	13	25E	12	26.68N	13	25.47E	3.4155	3.414	1	3.5	-14.180
30	37323.78	5.5					11	41.65N	13	18.19E	3.4496	3.448	1	3.5	-14.180
31	37375.38	5.5	8	08N	12	44E	8	8.50N	12	44.03E	2.9419	2.940	1	3.0	29.069
32	37388.68	5.5					7	13.56N	12	35.30E	2.8554	2.851	1	3.0	29.069
33	37426.68	7.5	4	36N	12	10E	4	36.64N	12	10.45E	3.3150	3.312	1	3.5	-17.016
34	37437.18	7.5					3	53.29N	12	3.61E	3.3482	3.348	1	3.5	-17.016
35	37454.58	6.3	2	41N	11	52E	2	41.46N	11	52.29E	3.2822	3.282	1	3.5	-16.307
36	37465.08	6.3					1	58.12N	11	45.47E	3.3150	3.312	1	3.5	-16.307
37	37478.88	5.3	1	01N	11	37E	1	1.17N	11	36.51E	3.6256	3.623	2	3.5	-3.545
38	37551.18	5.5	3	57S	10	50E	3	57.02S	10	49.55E	2.6633	2.661	1	3.0	32.614
39	37565.68	5.5					4	56.78S	10	40.11E	2.5594	2.556	1	3.0	32.614
40	37577.38	8.3	5	45S	10	33E	5	44.98S	10	32.49E	2.4841	2.485	2	1.5	45.376
REV D11															
1	41655.78	7.1	78	51N	23	30E	78	51.76N	23	31.14E	2.4841	2.486	2	0.0	-34.741
2	41670.68	15.1	77	58N	21	01E	77	58.32N	21	1.74E	2.4841	2.486	2	.5	-36.159
3	41894.98	5.5	63	26N	4	15E	63	26.28N	4	15.32E	2.6369	2.634	1	2.0	32.614
4	41909.48	5.5					62	28.04N	3	43.94E	2.6108	2.608	1	2.0	32.614
5	41924.98	5.9	61	25N	3	12E	61	25.67N	3	12.33E	2.5089	2.508	1	2.0	36.868
6	41939.88	5.9					60	25.61N	2	43.62E	2.4841	2.486	1	2.0	36.868
7	41954.98	5.3	59	24N	2	16E	59	24.65N	2	16.03E	2.4841	2.486	2	1.0	43.249
8	42155.88	7.1	45	46N	2	17W	45	47.02N	2	16.89W	2.6369	2.634	1	2.5	36.868
9	42169.58	7.1					44	50.94N	2	31.34W	2.5850	2.584	1	2.5	36.868

Approved for Release: 2018/09/11 C05103025

BCS 39739-65

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		LONG		BEST EPHEMERIS LAT		LONG		FILM VELOCITY IN./SEC.		MIR-ROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	PDS.	DEG.	ANGLE
REV D13															
1	53931.28	7.5	30	55S	60	23W	30	54.81S	60	23.00W	2.7440	2.742	1	3.0	-8.508
2	53944.18	7.5					31	47.28S	60	33.19W	2.7168	2.715	1	3.0	-8.508
3	53957.58	6.3	32	42S	60	44W	32	41.75S	60	43.92W	2.9128	2.911	2	3.0	0.000
4	54035.98	7.1	38	00S	61	50W	37	59.75S	61	49.91W	2.5850	2.584	1	3.0	-10.635
5	54049.68	7.1					38	55.19S	62	2.10W	2.5850	2.586	1	3.0	-10.635
REV D14															
1	58504.37	5.5	20	50N	74	01W	20	50.57N	74	1.16W	2.7714	2.770	1	2.5	-39.704
2	58517.67	5.5					19	55.65N	74	10.53W	2.8271	2.828	1	2.5	-39.704
REV D15															
1	63446.67	5.1	47	17N	90	43W	47	17.12N	90	43.34W	2.9128	2.910	1	2.0	-32.614
2	63459.57	5.1					46	24.36N	90	57.52W	2.9713	2.972	1	2.0	-32.614
3	63472.37	5.5	45	32N	91	11W	45	31.97N	91	11.25W	2.5089	2.509	1	1.5	-43.249
4	63486.87	5.5					44	32.60N	91	26.42W	2.5594	2.556	1	1.5	-43.249
5	63522.17	5.5	42	08N	92	01W	42	7.91N	92	1.80W	2.7168	2.713	1	2.0	-38.995
6	63535.47	5.5					41	13.34N	92	14.61W	2.7714	2.772	1	2.0	-38.995
7	63564.67	7.1	39	13N	92	42W	39	13.46N	92	41.85W	3.7355	3.734	2	2.5	-1.418
8	63581.57	7.0	38	04N	92	57W	38	4.02N	92	57.11W	3.4155	3.415	2	2.5	22.688
9	63612.47	100.1	35	57N	93	24W	35	56.98N	93	24.14W	3.7728	3.770	2	3.0	-.709
REV D16															
1	68691.67	24.8	52	56N	111	14W	52	55.06N	111	14.75W	3.3817	3.382	2	0.0	-6.381
2	68747.47	100.1	49	08N	112	24W	49	7.53N	112	24.79W	3.6985	3.698	2	2.5	-11.344
3	68861.27	7.0	41	22N	114	25W	41	21.61N	114	25.08W	3.6985	3.697	2	2.5	-14.889
4	68912.87	7.5	37	50N	115	12W	37	49.70N	115	12.61W	3.2497	3.248	2	2.5	-24.815
5	68923.37	8.6	37	07N	115	21W	37	6.54N	115	21.88W	3.2822	3.282	2	2.5	-25.524
6	68954.97	6.3	34	57N	115	49W	34	56.57N	115	49.04W	3.6256	3.624	2	2.5	-19.852
7	68969.07	7.1	33	59N	116	00W	33	58.54N	116	.83W	3.7728	3.770	2	3.0	-.709
REV D17															
1	75031.67	5.5	16	32S	146	40W	16	32.04S	146	39.71W	2.4841	2.486	1	2.5	34.032
2	75047.37	5.5					17	36.41S	146	50.45W	2.4841	2.486	1	2.5	34.032
REV D19															
1	84494.67	5.5	64	56N	172	32W	64	57.51N	172	30.85W	3.0920	3.093	1	1.5	-17.016
2	84506.77	5.5					64	9.06N	172	59.80W	3.1229	3.121	1	1.5	-17.016
REV D20															
1	3334.57	5.9	70	42N	169	43E	70	42.03N	169	43.62E	2.6633	2.659	1	1.5	30.487
2	3348.27	5.9					69	48.17N	168	52.80E	2.6633	2.662	1	1.5	30.487
3	3468.87	5.1	61	46N	163	31E	61	47.04N	163	31.26E	2.5594	2.557	2	1.0	-43.249
4	3495.87	5.9	59	58N	162	39E	59	58.15N	162	39.33E	3.2175	3.219	1	2.0	11.344
5	3507.17	5.9					59	12.49N	162	19.04E	3.2175	3.219	1	2.0	11.344
6	3518.97	5.1	58	24N	161	59E	58	24.75N	161	58.65E	3.3150	3.319	2	2.0	3.545
7	3538.87	6.3	57	04N	161	26E	57	4.14N	161	25.98E	2.9713	2.969	1	2.0	25.524
8	3551.77	6.3					56	11.82N	161	5.84E	2.9419	2.945	1	2.0	25.524
9	3592.27	5.7	53	27N	160	07E	53	27.22N	160	7.24E	2.8840	2.889	2	1.5	-31.905
10	3604.77	12.9	52	36N	159	50E	52	36.33N	159	50.39E	2.9128	2.913	2	1.5	-31.905
REV D21															
1	8654.97	5.9	71	07N	147	56E	71	6.52N	147	55.95E	3.1229	3.123	1	1.0	-2.127
2	8666.27	5.9					70	22.19N	147	12.13E	3.1541	3.158	1	1.0	-2.127
3	8814.07	5.9	60	32N	140	43E	60	32.23N	140	42.81E	2.4841	2.485	1	2.0	43.958
4	8830.17	5.9					59	27.21N	140	13.28E	2.4841	2.487	1	2.0	43.958
5	8951.97	7.0	51	13N	137	12E	51	12.54N	137	11.61E	3.4155	3.415	2	2.5	-1.418
6	8962.47	9.5	50	30N	136	59E	50	29.71N	136	58.52E	3.4155	3.418	2	2.5	-1.418
7	8989.97	10.3	48	37N	136	26E	48	37.43N	136	25.66E	3.1229	3.119	2	2.0	-33.323
8	9003.57	5.3	47	42N	136	10E	47	41.84N	136	10.11E	3.0614	3.058	2	2.5	-29.778
9	9020.87	6.2	46	31N	135	51E	46	31.08N	135	50.94E	2.6108	2.615	2	1.5	-41.122
10	9049.87	5.5	44	32N	135	20E	44	32.35N	135	20.18E	3.4496	3.453	2	2.5	4.963
11	9060.77	8.4	43	48N	135	09E	43	47.69N	135	9.02E	3.4496	3.449	2	2.5	4.963
12	9657.77	5.9	2	47N	127	37E	2	46.65N	127	36.76E	2.9713	2.972	1	3.0	24.815
13	9670.27	5.9					1	55.07N	127	28.64E	2.9128	2.917	1	3.0	24.815
14	9689.27	5.3	0	37N	127	17E	0	36.70N	127	16.31E	3.3150	3.318	2	3.5	.709
15	9737.67	6.0	2	43S	126	45E	2	42.86S	126	44.91E	2.4841	2.488	2	2.5	41.831
16	9754.57	5.8	3	52S	126	34E	3	52.50S	126	33.93E	2.4841	2.488	2	2.5	41.831
17	9765.87	6.3	4	39S	126	27E	4	39.05S	126	26.57E	2.5594	2.564	1	3.0	34.741
18	9779.97	6.3					5	37.12S	126	17.39E	2.5089	2.507	1	3.0	34.741

PERFORMANCE EVALUATION TEAM
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COMMAND INFORMATION

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	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV D22															
1	13958.77	6.7	72	35N	127	22E	72	35.49N	127	22.30E	2.8271	2.827	2	1.5	23.397
2	13971.67	7.0	71	45N	126	25E	71	45.29N	126	24.76E	2.8554	2.852	2	1.0	24.106
3	14008.07	5.9	69	22N	124	06E	69	22.40N	124	5.45E	3.1541	3.152	1	1.5	4.254
4	14019.37	5.9					68	37.73N	123	27.87E	3.1857	3.187	1	1.5	4.254
5	14037.27	6.3	67	26N	122	33E	67	26.73N	122	32.82E	3.0311	3.033	1	1.5	17.725
6	14048.97	6.3					66	40.18N	121	59.47E	3.0311	3.029	1	1.5	17.725
7	14162.97	7.1	59	02N	117	50E	59	2.19N	117	50.18E	2.4841	2.487	1	2.0	40.413
8	14177.87	7.1					58	1.89N	117	24.79E	2.4841	2.488	1	2.0	40.413
9	14275.07	6.7	51	26N	115	04E	51	26.85N	115	3.90E	3.2175	3.216	1	2.5	17.725
10	14285.97	6.7					50	42.40N	114	50.21E	3.1857	3.186	1	2.5	17.725
11	14432.17	5.9	40	43N	112	13E	40	43.96N	112	13.11E	2.9713	2.969	2	2.5	30.487
12	14444.67	9.1	39	52N	112	02E	39	52.64N	112	1.43E	2.9419	2.937	2	2.0	31.196
13	14461.97	5.9	38	41N	111	46E	38	41.58N	111	45.60E	3.1541	3.153	2	2.5	24.106
14	14473.27	9.1	37	55N	111	36E	37	55.14N	111	35.46E	3.1541	3.152	2	2.5	24.106
15	14497.37	5.3	36	15N	111	15E	36	16.05N	111	14.34E	3.7355	3.731	2	2.5	6.381
16	14548.17	5.3	32	46N	110	32E	32	46.99N	110	31.78E	2.7714	2.766	2	2.0	-44.667
17	14593.37	5.3	29	40N	109	56E	29	40.77N	109	55.81E	3.6619	3.659	2	3.0	-19.143
18	14654.07	5.3	25	30N	109	10E	25	30.46N	109	9.76E	2.9713	2.970	2	2.5	35.450
19	14673.27	5.8	24	11N	108	56E	24	11.24N	108	55.65E	3.4155	3.413	2	3.0	12.762
20	14693.97	5.3	22	45N	108	41E	22	45.81N	108	40.65E	3.6256	3.624	2	3.0	-20.561
21	14714.57	5.1	21	20N	108	26E	21	20.78N	108	25.93E	3.2175	3.216	2	3.0	20.561
22	14733.17	5.3	20	03N	108	13E	20	3.99N	108	12.79E	2.5850	2.581	2	2.0	43.958
23	14753.67	6.7	18	39N	107	59E	18	39.34N	107	58.47E	2.6369	2.633	2	2.0	43.249
24	15058.87	6.7	2	21S	104	37E	2	20.49S	104	36.37E	3.2497	3.249	1	3.5	5.672
25	15069.77	6.7					3	5.41S	104	29.30E	3.1857	3.183	1	3.5	5.672
26	15091.97	7.2	4	37S	104	15E	4	36.87S	104	14.87E	2.6899	2.688	2	2.5	30.487
REV D23															
1	19219.87	5.0	76	45N	111	44E	76	45.33N	111	43.81E	2.7714	2.776	2	.5	-32.614
2	19250.57	8.9	74	50N	108	15E	74	49.74N	108	14.40E	2.5340	2.536	2	1.5	33.323
3	19264.67	9.3	73	56N	106	55E	73	55.79N	106	54.19E	2.5594	0.000	2	.5	33.323
4	19294.87	5.0	71	59N	104	28E	71	58.90N	104	27.59E	3.1857	3.191	2	1.0	-19.143
5	19523.27	6.7	56	46N	94	43E	56	46.02N	94	42.40E	2.5089	2.511	2	1.0	-41.122
6	19537.77	8.7	55	47N	94	20E	55	47.17N	94	20.12E	2.5594	2.559	2	1.5	-41.831
7	19749.07	6.3	41	24N	90	10E	41	24.06N	90	10.30E	3.4155	3.419	1	2.5	-14.180
8	19759.57	6.3					40	40.97N	90	.33E	3.4841	3.490	1	2.5	-14.180
9	19921.36	5.6	29	35N	87	43E	29	35.28N	87	42.69E	3.0920	3.093	2	2.5	34.741
10	19941.77	11.7	28	11N	87	27E	28	11.18N	87	26.97E	2.6899	2.690	2	2.0	43.249
11	19964.67	14.1	26	36N	87	10E	26	36.75N	87	9.65E	3.1541	3.151	2	2.5	31.196
REV D24															
1	24496.76	8.3	79	44N	97	44E	79	43.92N	97	44.00E	2.6633	2.666	3	0.0	-26.942
2	24510.46	8.3					78	56.06N	95	3.00E	2.6369	2.639	3	0.0	-30.487
3	24531.86	6.3	77	39N	91	33E	77	39.00N	91	32.39E	3.0011	3.003	1	.5	-10.635
4	24543.56	6.3					76	55.94N	89	54.21E	3.0311	3.035	1	.5	-10.635
5	24636.46	5.1	71	00N	81	13E	71	.09N	81	12.85E	2.7168	2.720	1	1.5	29.069
6	[illegible]	5.1					70	4.72N	80	19.17E	2.6899	2.693	1	1.5	29.069
7	24861.16	8.6	56	00N	72	13E	55	59.89N	72	12.83E	2.8271	2.827	2	2.0	30.487
8	24874.46	10.8	55	06N	71	53E	55	5.87N	71	53.03E	2.8271	2.827	2	1.5	30.487
9	24928.16	6.8	51	27N	70	40E	51	27.28N	70	39.88E	2.6633	2.662	2	1.5	-38.995
10	24941.06	8.0	50	34N	70	24E	50	34.66N	70	23.72E	2.7168	2.721	2	2.0	-39.704
11	24968.66	5.1	48	42N	69	51E	48	41.96N	69	50.67E	3.0311	3.031	2	2.0	-29.069
12	24983.66	5.5	47	40N	69	34E	47	40.65N	69	33.50E	3.4155	3.418	1	2.5	-9.217
13	24994.56	5.5					46	56.07N	69	21.36E	3.4496	3.449	1	2.5	-9.217
14	25040.46	5.5	43	48N	68	33E	43	48.12N	68	32.86E	2.8554	2.853	2	2.5	32.614
15	25053.76	14.8	42	53N	68	20E	42	53.59N	68	19.53E	2.8271	2.829	2	2.0	33.323
16	25072.76	13.8	41	35N	68	01E	41	35.66N	68	.98E	3.0920	3.089	2	2.0	32.614
17	25111.86	6.2	38	55N	67	25E	38	55.11N	67	24.46E	2.9419	2.945	2	2.0	-40.413
18	25210.76	5.9	32	08N	66	00E	32	8.24N	66	.04E	3.5542	3.556	1	3.0	-8.508
19	25220.86	5.9					31	26.64N	65	51.94E	3.5542	3.554	1	3.0	-8.508
20	25962.56	6.7	19	30S	57	26E	19	29.66S	57	25.56E	2.9419	2.942	1	3.5	1.418
21	25974.66	6.7					20	19.18S	57	17.12E	2.9128	2.916	1	3.5	1.418

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COMMAND INFORMATION

ACC. NO.	SYSTEM TIME SEC	BURST TIME SEC	COMMAND POSITION LAT DEG	COMMAND POSITION LAT MIN	COMMAND POSITION LONG DEG	COMMAND POSITION LONG MIN	BEST EPHEMERIS LAT DEG	BEST EPHEMERIS LAT MIN	BEST EPHEMERIS LONG DEG	BEST EPHEMERIS LONG MIN	FILM VELOCITY IN./SEC. COMMAND	FILM VELOCITY IN./SEC. ACTUAL	MIR-RDR POS.	CRAB DEG.	ROLL ANGLE
REV 025															
1	29814.16	5.1	80	16N	77	39E	80	14.77N	77	32.76E	2.9419	2.944	1	.5	12.053
2	29827.06	5.1					79	30.64N	74	44.91E	2.9713	2.975	1	.5	12.053
3	29860.66	6.3	77	32N	69	04E	77	30.43N	69	.20E	3.0311	3.030	1	1.0	5.672
4	29872.36	6.3					76	47.25N	67	24.07E	3.0614	3.058	1	1.0	5.672
5	29885.86	5.1	75	58N	65	48E	75	56.80N	65	44.86E	3.0920	3.094	2	1.0	4.254
6	29972.66	5.6	70	23N	58	25E	70	21.84N	58	23.40E	2.6633	2.662	2	1.0	38.286
7	30014.96	5.2	67	36N	56	04E	67	34.61N	56	2.54E	2.7714	2.772	2	1.0	-36.868
8	30132.86	6.3	59	43N	51	32E	59	41.65N	51	31.37E	2.9128	2.914	2	1.5	-29.069
9	30145.76	14.7	58	51N	51	09E	58	49.48N	51	8.59E	2.9419	2.941	2	1.5	-29.069
10	30181.46	5.9	56	26N	50	11E	56	24.82N	50	10.26E	3.1857	3.189	2	1.5	-19.143
11	30192.76	7.9	55	40N	49	54E	55	38.94N	49	53.08E	3.2175	3.218	2	1.5	-19.143
12	30213.96	5.5	54	14N	49	23E	54	12.78N	49	22.30E	3.2822	3.286	2	2.0	12.762
13	30236.26	7.1	52	43N	48	52E	52	42.01N	48	51.76E	2.8271	2.892	2	1.5	-34.032
14	30248.76	7.0	51	53N	48	36E	51	51.08N	48	35.37E	2.8840	2.885	2	1.5	-34.032
15	30287.96	7.1	49	13N	47	47E	49	11.12N	47	47.02E	2.8840	2.885	2	1.5	-33.323
16	30300.46	11.4	48	21N	47	33E	48	20.04N	47	32.47E	2.9128	2.912	2	1.5	-33.323
17	30357.16	7.6	44	29N	46	31E	44	28.01N	46	30.80E	2.5594	2.556	2	1.5	-41.831
18	30370.86	8.3	43	33N	46	17E	43	31.86N	46	16.84E	2.6108	2.608	2	1.5	-41.831
19	30382.46	6.6	42	46N	46	06E	42	44.30N	46	5.27E	2.7440	2.742	2	2.5	-40.413
20	30405.96	5.3	41	09N	45	43E	41	7.88N	45	42.48E	3.6985	3.700	2	2.5	7.090
21	30425.46	5.5	39	49N	45	24E	39	47.82N	45	24.19E	3.5190	3.518	1	3.0	1.418
22	30436.36	5.5					39	3.05N	45	14.19E	3.5190	3.520	1	3.0	1.418
23	30479.96	5.5	36	05N	44	36E	36	3.81N	44	35.62E	3.5190	3.521	1	3.0	-7.090
24	30490.86	5.5					35	18.97N	44	26.31E	3.5190	3.519	1	3.0	-7.090
25	30510.76	6.3	33	58N	44	10E	33	57.07N	44	9.61E	3.5190	3.519	1	3.0	2.127
26	30521.26	6.3					33	13.84N	44	.95E	3.5190	3.519	1	3.0	2.127
27	30541.16	5.3	31	53N	43	45E	31	51.89N	43	44.80E	2.8840	2.886	2	2.0	32.614
28	30736.46	5.3	18	28N	41	20E	18	26.23N	41	20.08E	2.7440	2.744	2	2.0	41.122
29	30753.26	5.3	17	18N	41	09E	17	16.86N	41	8.47E	2.6369	2.638	2	2.0	42.540
30	30864.36	6.7	9	39N	39	54E	9	38.06N	39	53.70E	2.7440	2.745	1	2.5	-38.995
31	30877.66	6.7					8	43.14N	39	44.93E	2.7991	2.801	1	2.5	-38.995
32	30934.86	5.9	4	48N	39	08E	4	47.02N	39	7.46E	3.1229	3.123	1	3.5	19.143
33	30947.36	5.9					3	55.44N	38	59.32E	3.0614	3.061	1	3.5	19.143
34	31065.36	5.9	4	10S	37	43E	4	11.06S	37	42.70E	2.4841	2.488	1	2.5	41.122
35	31081.46	5.9					5	17.36S	37	32.22E	2.4841	2.485	1	2.5	41.122
36	31218.36	7.1	14	39S	36	02E	14	40.09S	36	1.75E	2.8271	2.830	1	3.0	-24.106
37	31230.86	7.1					15	31.37S	35	53.30E	2.8554	2.855	1	3.0	-24.106
38	31249.06	5.9	16	45S	35	41E	16	45.99S	35	40.93E	2.8554	2.855	1	3.5	-21.270
39	31261.56	5.9					17	37.22S	35	32.37E	2.8554	2.854	1	3.5	-21.270
40	31283.56	7.6	19	06S	35	17E	19	7.32S	35	17.19E	2.9128	2.914	2	3.5	-11.344
41	31296.06	7.2	19	57S	35	09E	19	58.49S	35	8.49E	2.9128	2.914	2	3.5	-11.344
42	31339.86	6.3	22	56S	34	38E	22	57.59S	34	37.53E	2.5594	2.560	1	3.0	24.106
43	31353.96	6.3					23	55.18S	34	27.38E	2.5089	2.510	1	3.0	24.106
44	31388.06	7.1	26	13S	34	03E	26	14.34S	34	2.43E	2.4841	2.489	2	3.0	-38.286
REV 026															
1	35107.06	5.9	82	02N	64	58E	82	1.66N	64	55.71E	2.8554	2.855	2	.5	17.016
2	35119.96	6.3	81	23N	60	50E	81	22.41N	60	48.38E	2.8554	2.854	2	.5	17.016
3	35135.56	5.6	80	32N	56	37E	80	32.02N	56	35.46E	3.0311	3.033	2	.5	4.254
4	35308.76	9.0	69	45N	35	37E	69	44.30N	35	36.75E	2.9128	2.917	2	1.0	-23.397
5	35321.26	9.0	68	55N	34	54E	68	54.94N	34	54.00E	2.9419	2.941	2	1.0	-23.397
6	35345.86	6.3	67	18N	33	38E	67	17.37N	33	37.87E	3.3150	3.320	2	1.0	-16.307
7	35374.56	5.9	65	23N	32	20E	65	22.91N	32	20.15E	2.6633	2.660	1	1.5	32.614
8	35388.26	5.9					64	28.08N	31	46.54E	2.6633	2.660	1	1.5	32.614
9	35425.96	5.3	61	57N	30	24E	61	56.63N	30	23.54E	3.4841	3.485	2	1.5	5.672
10	35439.16	6.3	61	04N	29	57E	61	3.44N	29	57.28E	3.3150	3.319	1	2.0	-1.418
11	35449.66	6.3					60	21.07N	29	37.28E	3.3150	3.315	1	2.0	-1.418
12	35470.76	5.9	58	56N	28	59E	58	55.79N	28	59.26E	2.7168	2.716	2	1.0	-35.450
13	35484.46	6.0	58	01N	28	36E	58	.33N	28	35.98E	2.7440	2.743	2	1.0	-35.450
14	35495.46	5.3	57	16N	28	18E	57	15.76N	28	18.01E	2.5340	2.535	2	1.5	-41.831
15	35505.86	5.6	56	34N	28	02E	56	33.58N	28	1.57E	2.8271	2.826	2	1.5	-38.995
16	35542.46	6.3	54	05N	27	08E	54	4.87N	27	7.51E	3.3817	3.386	2	2.0	-4.254
17	35552.96	6.3	53	22N	26	53E	53	22.14N	26	52.98E	3.4155	3.417	2	2.0	-4.254
18	35573.66	5.3	51	58N	26	26E	51	57.83N	26	25.45E	3.3817	3.382	2	2.5	5.672
19	35587.56	5.5	51	01N	26	08E	51	1.15N	26	7.73E	3.1541	3.156	2	2.5	21.270
20	35599.66	5.9	50	12N	25	53E	50	11.78N	25	52.77E	3.1229	3.125	2	2.5	21.270
21	35612.06	16.7	49	21N	25	38E	49	21.15N	25	37.85E	3.0011	3.005	2	2.0	26.233
22	35641.46	11.2	47	21N	25	04E	47	20.98N	25	4.02E	2.7168	2.718	2	1.5	41.122
23	35664.76	5.1	45	46N	24	39E	45	45.64N	24	38.59E	3.0311	3.031	2	2.0	26.942
24	35677.16	6.8	44	55N	24	26E	44	54.86N	24	25.51E	3.1229	3.123	2	2.0	23.397
25	35695.46	5.1	43	40N	24	07E	43	39.87N	24	6.72E	3.5897	3.594	2	2.5	13.471
26	35704.86	5.1	43	02N	23	57E	43	1.33N	23	57.29E	3.2497	3.245	2	2.5	18.434
27	35717.06	7.2	42	12N	23	45E	42	11.29N	23	45.27E	3.1229	3.122	2	2.0	24.106
28	35727.56	5.4	41	28N	23	35E	41	28.21N	23	35.12E	3.0311	3.031	2	2.0	27.651
29	36251.36	6.7	5	29N	17	02E	5	28.50N	17	1.85E	2.4841	2.489	1	2.5	45.376
30	36268.26	6.7					4	18.76N	16	50.83E	2.4841	2.489	1	2.5	45.376
31	36343.76	5.9	0	52S	16	02E	0	52.64S	16	1.79E	3.2497	3.248	1	3.5	8.508
32	36355.06	5.9					1	39.22S	15	54.46E	3.2175	3.219	1	3.5	8.508
33	36382.16	7.1	3	31S	15	37E	3	30.89S	15	36.86E	3.2175	3.219	2	3.5	-12.053
34	36393.46	10.9	4	17S	15	30E	4	17.43S	15	29.52E	3.2175	3.219	2	3.5	-12.053
35	36426.16	5.9	6	32S	15	08E	6	32.06S	15	8.20E	2.8271	2.825	1	3.0	-29.778
36	36438.66	5.9					7	23.50S	15	.03E	2.8554	2.854	1	3.0	-29.778
37	36478.46	5.5	10	07S	14	34E	10	7.17S	14	33.87E	2.8271	2.831	1	3.0	-27.651
38	36491.76	5.5					11	1.83S	14	25.07E	2.8554	2.853	1	3.0	-27.651
39	36502.46	9.2	11	45S	14	18E	11	45.79S	14	17.97E	2.8271	2.829	2	3.0	-25.524
40	36514.96	9.6	12	37S	14	10E	12	37.13S	14	9.65E	2.8554	2.853	2	3.0	-25.524
41	36539.56	6.3	14	18S	13	53E	14	18.11S	13	53.17E	3.0614	3.059	1	3.5	-11.344
42	36551.26	6.3					15	6.11S	13	45.28E	3.0311	3.030	1	3.5	-11.344

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COMMAND INFORMATION

ACC. NO.	SYSTEM TIME SEC	BURST TIME SEC	COMMAND POSITION LAT DEG	MIN	LONG DEG	MIN	BEST EPHEMERIS LAT DEG	MIN	LONG DEG	MIN	FILM VELOCITY IN./SEC. COMMAND	ACTUAL	MIR-RDR POS.	CRAB DEG.	ROLL ANGLE
REV D27															
1	40632.46	5.5	69	56N	13	35E	69	56.28N	13	35.55E	2.4841	2.486	1	1.5	38.995
2	40648.16	5.5					68	54.31N	12	41.40E	2.4841	2.486	1	1.5	38.995
3	40657.46	6.3	68	17N	12	11E	68	17.48N	12	11.47E	2.6108	2.611	1	1.5	33.323
4	40671.56	6.3					67	21.50N	11	28.80E	2.6108	2.611	1	1.5	33.323
5	40737.36	6.7	62	58N	8	44E	62	58.33N	8	43.67E	2.6633	2.659	1	1.0	-35.450
6	40750.66	6.7					62	4.82N	8	15.59E	2.6899	2.693	1	1.0	-35.450
7	40768.26	5.3	60	54N	7	40E	60	53.89N	7	40.59E	2.6899	2.693	2	1.0	-35.450
8	40782.56	5.5	59	56N	7	14E	59	56.16N	7	13.76E	2.8271	2.829	1	1.0	-31.196
9	40795.86	5.5					59	2.40N	6	49.98E	2.8840	2.886	1	1.0	-31.196
10	40941.26	7.1	49	11N	3	23E	49	11.05N	3	22.78E	3.1541	3.152	1	2.0	-24.815
11	40952.56	7.1					48	24.88N	3	9.60E	3.1857	3.192	1	2.0	-24.815
12	41145.16	6.3	35	14N	0	01E	35	14.75N	0	1.16E	3.1229	3.123	1	2.5	26.233
13	41156.86	6.3					34	26.60N	0	8.70W	3.0920	3.094	1	2.5	26.233
14	41211.66	5.9	30	41N	0	53W	30	40.92N	0	53.21W	2.8554	2.850	1	2.5	-37.577
15	41224.16	5.9					29	49.40N	1	3.02W	2.9128	2.911	1	2.5	-37.577
REV D29															
1	52810.66	7.1	34	07S	56	17W	34	7.30S	56	16.55W	2.6369	2.637	1	3.0	2.836
2	52824.36	7.1					35	2.85S	56	27.91W	2.6108	2.610	1	3.0	2.836
3	52855.46	6.3	37	09S	56	54W	37	8.81S	56	54.39W	2.4841	2.488	1	2.5	-29.069
4	52871.96	6.3					38	15.55S	57	8.85W	2.4841	2.487	1	2.5	-29.069
REV D31															
1	62334.15	5.0	43	10N	87	01W	43	10.43N	87	1.07W	3.4155	3.419	2	2.5	-26.942
2	62344.75	5.5	42	27N	87	11W	42	26.95N	87	11.56W	3.3817	3.383	1	2.5	-15.598
3	62355.65	5.5					41	42.24N	87	22.16W	3.4155	3.415	1	2.5	-15.598
4	62390.95	5.9	39	17N	87	55W	39	17.30N	87	55.29W	3.5190	3.519	2	3.0	-2.836
5	62401.05	5.8	38	36N	88	04W	38	35.81N	88	4.46W	3.5190	3.529	2	3.0	-2.836
6	62424.55	100.1	36	59N	88	25W	36	59.21N	88	25.33W	3.8106	3.814	2	3.0	-2.127
REV D32															
1	67526.95	24.8	52	14N	106	42W	52	13.39N	106	42.11W	3.3817	3.380	2	0.0	-6.381
2	67582.75	100.1	48	26N	107	50W	48	25.63N	107	50.52W	3.7728	3.776	2	2.5	-.709
3	67717.15	7.0	39	15N	110	07W	39	14.80N	110	7.71W	3.8106	3.810	2	2.5	-2.127
4	67766.65	6.7	35	52N	110	51W	35	51.31N	110	51.48W	3.3817	3.386	1	2.5	-20.561
5	67777.55	6.7					35	6.47N	111	.76W	3.4155	3.416	1	2.5	-20.561
6	67809.35	7.1	32	56N	111	27W	32	55.57N	111	27.17W	3.8106	3.810	2	3.0	-4.963
7	67826.55	5.1	31	45N	111	41W	31	44.74N	111	41.07W	3.2822	3.283	2	2.5	19.852
REV D33															
1	73867.25	5.5	17	23S	142	01W	17	23.33S	142	1.48W	2.4841	2.483	1	2.5	31.905
2	73882.95	5.5					18	27.62S	142	12.27W	2.4841	2.487	1	2.5	31.905
REV D34															
1	77937.55	100.0	68	19N	143	11W	68	19.43N	143	10.66W	2.8554	2.854	2	1.5	34.032
2	78620.25	5.9	21	53N	157	52W	21	52.72N	157	52.58W	3.5190	3.519	2	3.5	2.127
3	78630.35	5.9	21	11N	158	00W	21	11.03N	157	59.76W	3.5190	3.515	2	3.5	2.127
REV D36															
1	2158.05	6.3	70	11N	174	02E	70	11.54N	174	2.70E	2.9713	2.972	1	1.0	-21.979
2	2169.75	6.3					69	25.41N	173	20.97E	3.0011	3.004	1	1.0	-21.979
3	2231.65	5.1	65	19N	170	19E	65	19.23N	170	18.82E	3.2497	3.249	1	1.5	4.963
4	2243.35	5.1					64	32.38N	169	50.11E	3.2822	3.284	1	1.5	4.963
5	2291.65	5.5	61	18N	168	05E	61	18.17N	168	5.44E	2.7991	2.800	1	2.0	30.487
6	2304.95	5.5					60	24.50N	167	39.90E	2.7991	2.800	1	2.0	30.487
7	2373.65	7.5	55	46N	165	45E	55	46.19N	165	44.77E	2.4841	2.489	3	2.0	42.540
8	2388.95	7.5					54	44.00N	165	22.25E	2.5089	2.507	3	2.0	39.704
REV D37															
1	7504.14	5.5	68	44N	150	35E	68	44.63N	150	34.79E	2.4841	2.487	1	1.5	44.667
2	7521.04	5.5					67	37.57N	149	42.17E	2.4841	2.483	1	1.5	44.667
3	7636.24	5.1	59	55N	145	15E	59	55.34N	145	14.97E	2.9128	2.912	1	1.5	-30.487
4	7649.14	5.1					59	3.17N	144	51.91E	2.9419	2.942	1	1.5	-30.487
5	7735.84	5.3	53	11N	142	39E	53	11.14N	142	38.82E	2.8554	2.849	2	1.5	-39.704
6	7765.84	5.3	51	09N	142	00E	51	8.85N	141	59.63E	3.6985	3.700	2	2.0	4.254
7	7788.64	7.1	49	35N	141	32E	49	35.78N	141	31.66E	3.0614	3.059	2	2.0	-29.069
8	7799.94	6.9	48	49N	141	18E	48	49.61N	141	18.31E	3.0920	3.092	2	2.0	-29.069
9	7830.44	6.0	46	45N	140	44E	46	44.88N	140	43.81E	2.8271	2.825	2	2.0	34.032
10	7843.74	6.0	45	50N	140	30E	45	50.44N	140	29.40E	2.7714	2.770	2	2.0	34.032
11	8588.44	6.8	5	18S	131	10E	5	17.92S	131	9.63E	2.4841	2.485	2	2.0	43.249

Approved for Release: 2018/09/11 C05103025

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		COMMAND POSITION LONG		BEST EPHEMERIS LAT		BEST EPHEMERIS LONG		FILM VELOCITY IN./SEC.		MIR-ROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV 038															
1	12776.14	7.0	72	08N	131	40E	72	8.74N	131	40.65E	2.8840	2.885	2	.5	-24.815
2	12788.24	7.4	71	20N	130	48E	71	21.49N	130	48.89E	2.9419	2.944	2	1.0	-25.524
3	12852.64	5.1	67	06N	127	08E	67	7.06N	127	8.21E	2.4841	2.485	2	.5	-41.122
4	12886.84	5.1	64	49N	125	38E	64	50.46N	125	37.87E	2.6899	2.691	1	1.5	33.323
5	12900.94	5.1					63	53.93N	125	4.52E	2.6633	2.662	1	1.5	33.323
6	12920.94	6.7	62	32N	124	20E	62	33.54N	124	20.49E	3.0614	3.061	1	2.0	21.270
7	12933.04	6.7					61	44.82N	123	55.51E	3.0311	3.031	1	2.0	21.270
8	12963.04	7.1	59	42N	122	58E	59	43.72N	122	58.23E	3.1229	3.124	1	1.5	-22.688
9	12974.34	7.1					58	58.01N	122	38.17E	3.1857	3.189	1	1.5	-22.688
10	12994.94	6.3	57	33N	122	03E	57	34.57N	122	3.49E	2.7168	2.717	2	1.5	-38.286
11	13103.34	7.6	50	12N	119	31E	50	13.45N	119	31.32E	2.5089	2.510	2	1.0	-43.958
12	13117.54	7.1	49	14N	119	14E	49	15.45N	119	14.26E	2.5594	2.556	2	2.0	-43.958
13	13246.94	7.5	40	24N	116	59E	40	25.36N	116	58.72E	3.2497	3.248	2	2.5	-24.106
14	13257.44	12.5	39	41N	116	49E	39	42.24N	116	48.95E	3.2822	3.284	2	2.5	-24.106
15	13281.24	5.4	38	03N	116	28E	38	4.45N	116	27.35E	2.7440	2.743	2	2.0	-44.667
16	13328.34	5.3	34	49N	115	47E	34	50.74N	115	46.54E	2.912B	2.913	2	2.0	-41.122
17	13356.74	9.8	32	52N	115	23E	32	53.83N	115	23.01E	2.9419	2.940	2	2.0	-41.122
18	13382.94	6.3	31	05N	115	02E	31	5.92N	115	1.93E	3.2497	3.247	1	2.5	-24.815
19	13393.44	6.3					30	22.66N	114	53.64E	3.3482	3.347	1	2.5	-24.815
20	13447.14	8.6	26	40N	114	13E	26	41.29N	114	12.44E	2.9128	2.911	2	2.5	-41.831
21	13471.74	9.4	24	58N	113	54E	24	59.83N	113	54.17E	3.7728	3.775	2	3.0	-11.344
22	13485.24	5.3	24	03N	113	44E	24	4.14N	113	44.28E	3.4155	3.416	2	3.0	-17.016
23	13497.04	5.3	23	14N	113	36E	23	15.45N	113	35.72E	3.6256	3.623	2	3.0	-20.561
24	13507.44	6.3	22	31N	113	28E	22	32.54N	113	28.23E	3.2497	3.247	2	3.0	-24.815
25	13519.14	8.4	21	43N	113	20E	21	44.25N	113	19.86E	3.2822	3.284	2	3.0	-24.815
26	13817.84	5.0	1	10N	110	00E	1	11.53N	109	59.61E	3.3150	3.316	2	3.0	17.725
27	13921.54	11.3	5	57S	108	52E	5	55.57S	108	52.28E	2.5594	2.554	2	3.0	-38.286
28	13936.14	10.6	6	57S	108	43E	6	55.63S	108	42.75E	2.5850	2.587	2	3.5	-38.995
29	13951.34	5.1	7	59S	108	33E	7	58.13S	108	32.81E	2.7714	2.770	2	3.5	-31.905
REV 039															
1	18067.14	5.9	74	16N	112	13E	74	16.37N	112	13.98E	3.1541	3.152	2	1.0	-6.381
2	18078.44	9.0	73	32N	111	13E	73	32.91N	111	13.09E	3.1857	3.186	2	1.0	-6.381
3	18316.14	7.1	57	45N	99	57E	57	45.90N	99	56.58E	3.1857	3.187	1	2.0	17.725
4	18327.44	7.1					57	.08N	99	38.33E	3.1857	3.187	1	2.0	17.725
5	18354.84	5.3	55	08N	98	57E	55	8.80N	98	56.58E	3.6619	3.660	2	2.0	2.836
6	18537.54	5.9	42	41N	95	20E	42	42.39N	95	19.38E	3.1541	3.152	1	2.5	24.106
7	18548.84	5.9					41	56.03N	95	8.33E	3.1229	3.122	1	2.5	24.106
8	18563.34	5.8	40	55N	94	55E	40	56.52N	94	54.43E	3.3817	3.384	2	2.5	16.307
9	18619.14	6.3	37	06N	94	04E	37	7.26N	94	3.62E	3.1541	3.150	1	2.5	26.942
10	18630.84	6.3					36	19.14N	93	53.44E	3.0920	3.094	1	2.5	26.942
11	18673.74	5.3	33	22N	93	17E	33	22.60N	93	17.32E	3.0011	3.000	2	2.0	-41.831
12	18687.74	6.0	32	24N	93	06E	32	24.96N	93	5.90E	2.8840	2.882	2	2.0	-43.958
13	18698.74	5.3	31	39N	92	57E	31	39.65N	92	57.05E	3.1229	3.124	2	2.5	-38.995
14	18727.14	5.3	29	42N	92	35E	29	42.64N	92	34.63E	2.8554	2.852	2	2.0	-44.667
15	18742.94	6.3	2B	36N	92	23E	28	37.52N	92	22.42E	3.5190	3.521	2	3.0	-17.016
16	18752.94	6.3	27	55N	92	15E	27	56.29N	92	14.77E	3.8487	3.846	2	3.0	-14.180
17	18852.04	7.5	21	06N	91	02E	21	7.48N	91	2.13E	3.0311	3.032	1	3.0	27.651
18	18863.74	7.5					20	19.19N	90	53.87E	2.9419	2.939	1	3.0	27.651
REV 040															
1	23341.24	5.9	77	23N	95	46E	77	23.83N	95	47.21E	2.4841	2.489	1	0.0	-38.995
2	23356.14	5.9					76	28.59N	93	48.40E	2.4841	2.489	1	0.0	-38.995
3	23450.34	6.8	70	25N	85	30E	70	25.78N	85	29.99E	2.5340	2.533	2	1.5	36.159
4	23464.44	7.1	69	29N	84	39E	69	30.21N	84	39.00E	2.5594	2.563	2	1.0	36.868
5	23479.24	5.9	68	31N	83	49E	68	31.66N	83	49.69E	2.4841	2.489	1	1.5	38.995
6	23494.14	5.9					67	32.50N	83	3.87E	2.4841	2.489	1	1.5	38.995
7	23675.94	5.0	55	19N	76	49E	55	20.11N	76	49.29E	3.4841	3.489	2	2.0	-19.143
8	23739.24	5.9	51	01N	75	23E	51	2.30N	75	23.30E	2.4841	2.489	1	2.0	45.376
9	23755.34	5.9					49	56.58N	75	3.47E	2.4841	2.489	1	2.0	45.376
10	23804.84	7.1	46	33N	74	07E	46	34.20N	74	6.66E	2.8271	2.827	1	1.5	-36.868
11	23817.34	7.1					45	43.02N	73	53.18E	2.9128	2.911	1	1.5	-36.868
12	23851.94	6.3	43	20N	73	17E	43	21.24N	73	17.43E	3.3150	3.315	1	2.5	17.725
13	23862.44	6.3					42	38.18N	73	7.00E	3.2822	3.284	1	2.5	17.725
14	23886.44	5.1	40	59N	72	44E	40	59.69N	72	43.80E	3.1857	3.189	2	2.0	-26.942
15	23898.14	6.6	40	11N	72	33E	40	11.65N	72	32.80E	3.2175	3.218	2	2.5	-26.942
16	23911.64	6.3	39	15N	72	20E	39	16.20N	72	20.33E	3.5897	3.591	2	2.5	-25.524
17	24032.74	99.1	30	57N	70	38E	30	57.93N	70	37.62E	3.3150	3.313	2	2.5	26.942

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COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		COMMAND POSITION LONG		BEST EPHEMERIS LAT		BEST EPHEMERIS LONG		FILM VELOCITY IN./SEC.		MIRROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV D41															
1	28621.74	5.1	79	59N	81	22E	79	57.85N	81	16.17E	2.9128	2.913	1	.5	-19.143
2	28634.64	5.1					79	13.15N	78	37.05E	2.9419	2.940	1	.5	-19.143
3	28667.24	5.1	77	17N	73	21E	77	15.57N	73	17.20E	2.5594	2.559	2	0.0	-34.032
4	28681.14	5.1	76	25N	71	31E	76	23.93N	71	28.07E	2.6899	2.695	1	.5	-31.196
5	28695.24	5.1					75	30.88N	69	50.03E	2.7168	2.716	1	.5	-31.196
6	28749.24	5.5	72	05N	65	02E	72	3.11N	65	.04E	2.8271	2.826	1	1.5	26.942
7	28762.54	5.5					71	11.12N	64	3.89E	2.8271	2.826	1	1.5	26.942
8	28788.14	5.5	69	32N	62	30E	69	30.40N	62	27.95E	3.1541	3.155	2	1.0	-12.762
9	28817.84	5.6	67	34N	60	54E	67	32.68N	60	52.77E	2.4841	2.488	2	1.0	38.995
10	28929.04	6.9	60	08N	56	35E	60	6.44N	56	34.34E	3.3150	3.316	2	2.0	7.090
11	28939.54	6.9	59	25N	56	16E	59	23.99N	56	15.31E	3.3150	3.316	2	2.0	7.090
12	28954.04	6.0	58	27N	55	51E	58	25.29N	55	50.13E	3.3482	3.345	2	2.0	7.799
13	28964.54	7.1	57	44N	55	33E	57	42.74N	55	32.63E	3.3482	3.345	2	2.0	7.799
14	28992.74	9.7	55	50N	54	49E	55	48.29N	54	48.34E	2.9419	2.945	2	2.0	28.360
15	29010.74	5.1	54	37N	54	23E	54	35.12N	54	21.91E	2.7440	2.743	1	2.0	34.741
16	29024.84	5.1					53	37.73N	54	2.11E	2.7168	2.715	1	2.0	34.741
17	29039.04	6.7	52	41N	53	43E	52	39.89N	53	42.89E	2.8271	2.826	2	2.0	32.614
18	29052.34	6.9	51	47N	53	26E	51	45.67N	53	25.49E	2.7991	2.800	2	2.0	32.614
19	29097.64	6.3	48	42N	52	31E	48	40.72N	52	30.15E	3.3150	3.314	1	2.5	14.889
20	29108.14	6.3					47	57.79N	52	18.09E	3.3150	3.314	1	2.5	14.889
21	29123.04	5.3	46	58N	52	02E	46	56.83N	52	1.41E	3.4841	3.486	2	2.5	-6.381
22	29171.54	7.1	43	40N	51	11E	43	38.17N	51	10.26E	3.2175	3.217	1	2.5	21.270
23	29182.84	7.1					42	51.83N	50	58.96E	3.1857	3.187	1	2.5	21.270
24	29210.74	5.5	40	59N	50	32E	40	57.34N	50	31.92E	3.4841	3.486	1	2.5	-12.053
25	29221.64	5.5					40	12.59N	50	21.67E	3.4841	3.486	1	2.5	-12.053
26	29236.94	5.4	39	11N	50	08E	39	9.74N	50	7.56E	3.2175	3.219	2	2.5	-27.651
27	29247.54	9.0	38	28N	49	58E	38	26.18N	49	57.96E	3.0011	3.000	2	2.5	-34.741
28	29335.04	5.3	32	28N	48	44E	32	26.19N	48	43.42E	2.6108	2.638	2	2.0	-43.249
29	29354.44	7.3	31	08N	48	28E	31	6.28N	48	27.87E	3.3150	3.312	2	2.5	-25.524
30	29365.24	7.8	30	23N	48	20E	30	21.78N	48	19.34E	3.3482	3.349	2	3.0	-25.524
31	29439.14	7.9	25	18N	47	23E	25	17.10N	47	23.12E	3.3482	3.349	3	3.0	-21.270
32	29450.04	7.9					24	32.14N	47	15.10E	3.3150	3.315	3	3.0	-24.106
33	29598.84	6.7	14	19N	45	31E	14	18.00N	45	30.88E	2.5340	2.533	1	2.5	-44.667
34	29613.34	6.7					13	18.14N	45	21.12E	2.5850	2.591	1	2.5	-44.667
35	29645.84	6.3	11	05N	45	00E	11	3.98N	44	59.41E	3.4155	3.417	2	3.5	2.836
36	29656.34	6.2	10	22N	44	53E	10	20.65N	44	52.45E	3.3817	3.382	2	3.5	2.836
37	29803.24	6.3	0	16N	43	17E	0	14.74N	43	16.49E	2.9713	2.969	2	3.5	-26.942
38	29814.94	6.2	0	32S	43	09E	0	33.47S	43	8.91E	3.0011	3.000	2	3.5	-26.942
39	29986.44	5.5	12	17S	41	17E	12	18.79S	41	16.72E	2.7991	2.800	1	3.0	-25.524
40	29999.74	5.5					13	13.36S	41	7.85E	2.8271	2.827	1	3.0	-25.524
41	30016.84	7.1	14	22S	40	57E	14	23.49S	40	56.39E	3.0011	3.000	2	3.5	-7.799
42	30028.54	7.1	15	10S	40	49E	15	11.45S	40	48.50E	3.0011	3.000	2	3.5	-7.799
REV D42															
1	33923.94	5.5	81	10N	64	31E	81	9.46N	64	29.28E	2.8271	2.825	1	0.0	-22.688
2	33937.24	5.5					80	26.00N	61	.82E	2.8554	2.849	1	0.0	-22.688
3	34123.64	5.9	68	44N	39	38E	68	44.26N	39	37.50E	3.2497	3.247	1	1.5	4.254
4	34134.94	5.9					67	59.44N	39	1.81E	3.2497	3.247	1	1.5	4.254
5	34167.44	8.6	65	50N	37	30E	65	49.94N	37	29.92E	2.5089	2.509	2	1.5	38.995
6	34182.74	8.6	64	49N	36	52E	64	48.72N	36	51.36E	2.5089	2.509	2	1.5	38.995
7	34214.94	6.1	62	40N	35	38E	62	39.41N	35	38.11E	3.1541	3.150	2	1.5	-20.561
8	34224.54	6.3	62	01N	35	18E	62	.75N	35	18.08E	3.3817	3.380	2	1.5	-20.561
9	34239.04	5.5	61	02N	34	49E	61	2.28N	34	49.18E	2.7714	2.769	1	1.0	-34.032
10	34252.34	5.5					60	8.57N	34	23.99E	2.8271	2.823	1	1.0	-34.032
11	34278.74	6.3	58	22N	33	37E	58	21.76N	33	37.33E	3.3482	3.345	2	2.0	-9.926
12	34289.64	6.3	57	38N	33	19E	57	37.58N	33	19.21E	3.3817	3.381	2	2.0	-9.926
13	34301.54	5.3	56	49N	33	00E	56	49.31N	33	.13E	3.5542	3.553	2	2.0	-14.889
14	34324.04	6.7	55	18N	32	26E	55	17.92N	32	25.85E	2.7991	2.800	2	1.5	-41.122
15	34340.54	7.3	54	11N	32	02E	54	10.81N	32	2.07E	2.8271	2.822	2	2.0	-35.450
16	34359.24	6.8	52	55N	31	37E	52	54.66N	31	36.37E	3.3150	3.314	2	2.0	-15.598
17	34370.14	6.4	52	10N	31	22E	52	10.24N	31	21.94E	3.3482	3.347	2	2.0	-15.598
18	34385.54	5.3	51	08N	31	02E	51	7.43N	31	2.20E	3.4496	3.447	2	2.0	-6.381
19	34396.04	6.5	50	25N	30	49E	50	24.57N	30	49.14E	3.4496	3.447	2	2.0	-7.799
20	34406.54	6.9	49	42N	30	37E	49	41.69N	30	36.39E	3.4496	3.446	2	2.0	-7.799
21	34428.34	5.1	48	13N	30	11E	48	12.60N	30	10.84E	3.4496	3.448	2	2.0	19.852
22	34452.44	6.0	46	34N	29	44E	46	34.00N	29	43.90E	3.4841	3.487	2	2.5	-8.508
23	34462.94	6.4	45	51N	29	33E	45	51.02N	29	32.55E	3.4841	3.487	2	2.5	-8.508
24	34474.74	17.6	45	03N	29	20E	45	2.68N	29	20.06E	3.5897	3.593	2	2.5	-19.852
25	34500.54	5.9	43	17N	28	54E	43	16.93N	28	53.65E	3.1541	3.153	1	2.0	-26.942
26	34511.84	5.9					42	30.58N	28	42.45E	3.1857	3.184	1	2.0	-26.942
27	34522.24	5.1	41	48N	28	32E	41	47.91N	28	32.31E	3.0011	3.000	2	2.5	-34.032
28	34554.24	5.9	39	37N	28	02E	39	36.52N	28	2.12E	3.5542	3.551	1	3.0	-4.254
29	34564.34	5.9	29	37N	25	59E	38	55.03N	27	52.89E	3.5542	3.553	1	3.0	-4.254
30	34700.04	5.9					29	36.52N	25	59.32E	3.5542	3.553	1	3.0	-3.545
31	34710.14	5.9	19	37N	24	13E	28	54.89N	25	51.49E	3.5542	3.553	1	3.0	-3.545
32	34845.44	5.9					19	36.75N	24	12.45E	3.5190	3.518	1	3.5	-4.254
33	34855.54	5.9	9	38N	22	34E	18	55.06N	24	5.40E	3.4841	3.489	1	3.5	-4.254
34	34990.64	5.5					9	37.39N	22	34.05E	3.4155	3.416	1	3.5	-4.254
35	35001.54	5.5	3	03N	21	32E	8	52.41N	22	26.86E	3.3817	3.382	1	3.5	-4.254
36	35086.34	5.5	2	03N	21	22E	3	2.60N	21	31.43E	2.6633	2.659	2	3.0	34.032
37	35100.84	5.3	0	00N	21	03E	2	2.82N	21	22.02E	2.5850	2.584	2	3.0	34.032
38	35130.64	5.4	6	07S	20	05E	0	0.00N	21	2.69E	3.4841	3.487	2	3.5	-9.217
39	35219.94	5.3	8	52S	19	39E	6	7.65S	20	4.68E	3.0614	3.058	2	3.0	22.688
40	35259.94	5.9					8	52.10S	19	38.49E	2.7714	2.769	1	3.0	25.524
41	35273.64	5.9	10	59S	19	18E	9	48.39S	19	29.48E	2.6899	2.691	1	3.0	25.524
42	35290.84	5.5					10	59.02S	19	18.12E	2.8840	2.883	1	3.0	19.143
43	35304.14	5.5	14	01S	18	49E	11	53.62S	19	9.30E	2.8271	2.827	1	3.0	19.143
44	35335.24	5.9					14	1.21S	18	48.53E	2.5089	2.509	1	3.0	31.196
45	35350.14	5.9	25	57S	16	46E	15	2.30S	18	38.50E	2.4841	2.484	1	3.0	31.196
46	35510.44	6.3					25	57.49S	16	45.85E	2.4841	2.485	1	2.5	-39.704
47	35520.94	6.3					27	4.71S	16	33.60E	2.4841	2.487	1	2.5	-39.704

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COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		COMMAND POSITION LONG		BEST EPHEMERIS LAT		BEST EPHEMERIS LONG		FILM VELOCITY IN./SEC.		MIRROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV D43															
1	39233.33	5.9	81	54N	46	46E	81	54.60N	46	47.83E	2.6899	2.693	1	1.0	26.942
2	39247.D3	5.9					81	12.30N	42	33.46E	2.7168	2.719	1	1.0	26.942
3	394D7.63	5.3	71	21N	19	52E	71	21.80N	19	52.50E	2.5340	2.536	2	1.0	41.122
4	39438.43	5.9	69	20N	17	57E	69	20.63N	17	56.84E	3.1541	3.153	1	1.0	-13.471
5	39449.73	5.9					68	35.91N	17	19.31E	3.1857	3.189	1	1.0	-13.471
6	39461.93	5.6	67	47N	16	41E	67	47.49N	16	41.29E	2.9128	2.916	2	1.0	-26.942
7	39488.73	5.5	66	00N	15	25E	66	.69N	15	25.61E	2.8271	2.825	1	1.5	29.778
8	39502.03	5.5					65	7.50N	14	51.51E	2.7991	2.796	1	1.5	29.778
9	39520.13	5.9	63	54N	14	08E	63	54.93N	14	8.24E	3.2175	3.217	1	1.5	13.471
10	39531.43	5.9					63	9.54N	13	42.88E	3.2175	3.217	1	1.5	13.471
11	39574.13	5.5	60	17N	12	17E	60	17.42N	12	16.63E	2.8271	2.829	1	1.0	-32.614
12	39587.43	5.5					59	23.65N	11	52.42E	2.8840	2.888	1	1.0	-32.614
13	39622.53	6.3	57	01N	10	53E	57	1.43N	10	53.42E	2.6369	2.634	1	2.0	36.868
14	39636.63	6.3					56	4.19N	10	31.48E	2.6108	2.611	1	2.0	36.868
15	39647.83	10.3	55	18N	10	15E	55	18.68N	10	14.69E	2.5340	2.534	2	2.0	42.540
16	39664.73	16.7	54	09N	9	50E	54	9.94N	9	50.33E	2.5089	2.508	2	2.0	42.540
17	39685.13	5.5	52	46N	9	22E	52	46.86N	9	22.35E	2.5594	2.560	2	2.0	39.704
18	39699.63	6.5	51	47N	9	03E	51	47.75N	9	3.33E	2.5340	2.530	2	2.0	39.704
19	39714.33	6.1	50	47N	8	45E	50	47.78N	8	44.72E	2.5594	2.556	2	1.5	39.704
20	39818.83	7.1	43	40N	6	48E	43	40.23N	6	47.90E	3.4841	3.484	1	2.5	-8.508
21	39828.93	7.1					42	58.82N	6	37.78E	3.5190	3.518	1	2.5	-8.508
22	39903.13	8.3	37	54N	5	28E	37	54.12N	5	28.09E	2.8271	2.824	3	2.5	34.741
23	39915.63	8.3					37	2.73N	5	17.05E	2.8840	2.886	3	2.5	31.905
24	39959.93	6.3	34	00N	4	39E	34	.47N	4	39.29E	2.6108	2.608	1	2.5	40.413
25	39974.03	6.3					33	2.42N	4	27.67E	2.5594	2.556	1	2.5	40.413
26	40009.23	5.3	30	37N	3	59E	30	37.43N	3	59.41E	3.0920	3.093	2	3.0	-33.323
27	40121.13	5.5	22	55N	2	35E	22	55.99N	2	35.24E	2.5594	2.555	1	2.0	-43.958
28	40135.63	5.5					21	56.16N	2	24.83E	2.6108	2.607	1	2.0	-43.958
29	40244.83	7.5	14	25N	1	09E	14	25.42N	1	9.13E	2.7991	2.799	1	3.0	33.323
30	40257.73	7.5					13	32.17N	1	.44E	2.7440	2.740	1	3.0	33.323
31	40343.33	6.3	7	38N	0	04E	7	38.88N	0	3.64E	3.0920	3.089	1	3.0	21.270
32	40355.03	6.3					6	50.61N	0	4.03W	3.0311	3.029	1	3.0	21.270
33	40368.83	5.6	5	53N	0	13W	5	53.68N	0	13.05W	3.5542	3.550	2	3.5	6.381
REV D44															
1	44595.43	7.1	79	51N	14	17E	79	51.54N	14	18.71E	2.6108	2.610	2	1.0	31.196
2	44609.13	17.4	79	03N	11	32E	79	3.84N	11	33.59E	2.6369	2.636	2	1.0	31.196
3	44856.23	6.3	63	06N	8	31W	63	6.38N	8	30.31W	2.7440	2.740	1	1.5	32.614
4	44869.13	6.3					62	14.46N	8	57.79W	2.7440	2.740	1	1.5	32.614
5	45291.63	6.3	33	28N	17	39W	33	28.77N	17	38.55W	3.0614	3.059	2	2.5	28.360
6	45303.33	7.0	32	40N	17	48W	32	40.59N	17	48.12W	3.0011	2.997	2	2.5	28.360
REV D47															
1	60597.73	5.9	77	59N	58	07W	77	58.89N	58	7.57W	3.1229	3.122	1	.5	-7.090
2	60609.03	5.9					77	17.51N	59	47.61W	3.1541	3.150	1	.5	-7.090
3	60838.03	5.5	62	20N	75	29W	62	20.57N	75	29.24W	3.3482	3.346	1	1.5	-4.963
4	60848.93	5.5					61	36.64N	75	51.52W	3.3482	3.346	1	1.5	-4.963
5	61020.23	3.9	50	01N	80	15W	50	.84N	80	15.26W	3.4496	3.449	1	2.5	-7.799
6	61030.73	3.9					49	17.95N	80	27.83W	3.4841	3.483	1	2.5	-7.799
7	61118.63	100.1	43	18N	82	03W	43	18.08N	82	3.30W	3.7728	3.768	2	2.5	-.709
8	61227.93	6.3	35	49N	83	44W	35	49.08N	83	44.16W	3.3817	3.384	2	3.0	-20.561
9	61251.23	7.1	34	13N	84	04W	34	13.20N	84	3.82W	3.8106	3.808	2	3.0	-5.672
10	61269.43	7.3	32	58N	84	19W	32	58.27N	84	18.83W	3.3150	3.312	2	3.0	-22.688
11	61280.33	7.7	32	13N	84	28W	32	13.39N	84	27.68W	3.3482	3.347	2	3.0	-22.688
12	61595.33	3.9	10	34N	88	14W	10	33.93N	88	13.93W	3.3817	3.382	1	3.5	-9.217
13	61607.03	3.9					9	45.65N	88	21.67W	3.3817	3.382	1	3.5	-9.217
14	61748.73	5.1	0	01N	89	54W	0	1.33N	89	54.10W	3.2497	3.244	1	3.5	-9.217
15	61760.43	5.1					0	46.86S	90	1.68W	3.2497	3.249	1	3.5	-9.217
REV D48															
1	66131.63	24.8	64	19N	96	35W	64	18.93N	96	35.21W	3.3817	3.384	2	0.0	-6.381
2	66187.43	5.5	60	34N	98	33W	60	34.25N	98	32.82W	3.3482	3.344	1	1.5	-7.090
3	66198.33	5.5					59	50.19N	98	53.03W	3.3817	3.380	1	1.5	-7.090
4	66330.63	6.3	50	52N	102	11W	50	52.45N	102	10.96W	2.7440	2.740	1	2.0	35.450
5	66343.53	6.3					49	59.78N	102	26.82W	2.7168	2.714	1	2.0	35.450
6	66407.43	6.3	45	38N	103	39W	45	38.41N	103	39.24W	3.4841	3.487	2	2.5	7.799
7	66417.53	8.2	44	57N	103	50W	44	57.03N	103	49.88W	3.4841	3.484	2	2.5	7.799
8	66460.93	5.9	41	59N	104	33W	41	59.07N	104	33.54W	3.5542	3.550	1	2.5	-1.418
9	66471.03	5.9					41	17.61N	104	43.26W	3.5897	3.591	1	2.5	-1.418
10	66480.53	5.1	40	38N	104	52W	40	38.61N	104	52.27W	3.5542	3.551	2	2.5	1.418
11	66489.13	7.1	40	03N	105	00W	40	3.29N	105	.31W	3.8106	3.809	2	2.5	3.545
12	66602.23	7.0	32	18N	106	38W	32	18.09N	106	38.02W	3.8871	3.889	2	3.0	.709
REV D49															
1	72710.22	7.1	21	33S	137	47W	21	34.29S	137	47.01W	2.5850	2.587	1	3.0	-26.942
2	72723.92	7.1					22	30.22S	137	56.73W	2.6369	2.634	1	3.0	-26.942
REV D50															
1	76697.62	5.1	69	34N	137	11W	69	34.23N	137	10.45W	3.2497	3.249	1	1.0	-6.381
2	76709.32	5.1					68	47.94N	137	50.02W	3.2822	3.286	1	1.0	-6.381
3	76817.62	5.5	61	34N	142	26W	61	34.52N	142	25.63W	3.3482	3.344	1	1.5	-7.090
4	76828.52	5.5					60	50.53N	142	46.98W	3.3817	3.385	1	1.5	-7.090

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		COMMAND POSITION LONG		BEST EPHEMERIS LAT		BEST EPHEMERIS LONG		FILM VELOCITY IN./SEC.		MIR-ROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV 052															
1	909.32	7.5	71	40N	179	30W	71	40.28N	179	28.94W	3.2175	3.214	3	1.0	8.508
2	921.02	7.5					70	54.44N	179	43.19E	3.2497	3.250	3	1.0	5.672
3	944.32	5.5	69	22N	178	17E	69	22.63N	178	17.43E	3.0011	3.000	2	1.0	30.487
4	1000.02	6.3	65	40N	175	31E	65	41.02N	175	31.65E	2.5340	2.530	1	1.5	38.995
5	1014.12	6.3					64	44.56N	174	56.36E	2.5089	2.505	1	1.5	38.995
6	1031.02	5.5	63	36N	174	17E	63	36.72N	174	16.86E	2.4841	2.488	1	1.5	42.540
7	1046.72	5.5					62	33.56N	173	42.57E	2.4841	2.488	1	1.5	42.540
REV D53															
1	6285.72	6.3	68	03N	155	02E	68	3.89N	155	1.79E	3.2822	3.286	1	1.0	-9.217
2	6296.22	6.3					67	22.13N	154	30.27E	3.2822	3.288	1	1.0	-9.217
3	6389.02	5.1	61	09N	150	49E	61	9.82N	150	49.42E	3.2497	3.249	1	2.0	15.598
4	6400.72	5.1					60	22.57N	150	27.05E	3.2497	3.250	1	2.0	15.598
5	6412.02	5.0	59	36N	150	06E	59	36.87N	150	6.31E	3.2497	3.250	2	1.5	16.307
6	6632.32	6.3	44	38N	145	11E	44	38.89N	145	10.72E	3.3482	3.346	1	2.5	15.598
7	6642.82	6.3					43	55.85N	144	59.94E	3.3482	3.344	1	2.5	15.598
8	7290.12	7.1	0	32S	136	55E	0	31.42S	136	54.55E	2.8840	2.884	1	3.0	-29.069
9	7302.62	7.1					1	22.90S	136	46.45E	2.9128	2.912	1	3.0	-29.069
10	7462.62	6.3	12	21S	135	02E	12	20.54S	135	1.76E	3.0311	3.032	1	3.5	-7.090
11	7474.32	6.3					13	8.52S	134	53.96E	3.0011	3.001	1	3.5	-7.090
12	7594.32	5.9	21	20S	133	32E	21	19.61S	133	31.79E	2.8840	2.884	1	3.5	-4.254
13	7606.82	5.9					22	10.64S	133	22.95E	2.8554	2.856	1	3.5	-4.254
14	7726.32	5.9	30	17S	131	55E	30	17.26S	131	54.39E	2.6899	2.693	1	3.0	-4.254
15	7740.02	5.9					31	12.89S	131	43.67E	2.6633	2.659	1	3.0	-4.254
REV D54															
1	11518.92	5.5	73	48N	138	46E	73	49.28N	138	47.14E	2.7714	2.772	1	1.0	29.778
2	11532.22	5.5					72	57.86N	137	39.49E	2.7714	2.772	1	1.0	29.778
3	11552.02	5.1	71	39N	136	08E	71	40.75N	136	9.63E	3.5190	3.518	2	1.0	2.127
4	11662.32	5.1	64	21N	130	21E	64	22.95N	130	21.63E	2.6633	2.659	1	1.0	-37.577
5	11676.42	5.1					63	26.31N	129	49.23E	2.6899	2.693	1	1.0	-37.577
6	11692.32	7.5	62	21N	129	15E	62	22.32N	129	14.90E	3.0011	3.001	1	1.0	-27.651
7	11704.02	7.5					61	35.16N	128	50.97E	3.0311	3.034	1	1.0	-27.651
8	11719.62	6.3	60	31N	128	20E	60	32.18N	128	20.67E	3.4841	3.488	2	1.5	-18.434
9	11740.82	9.0	59	05N	127	42E	59	6.43N	127	42.10E	2.5089	2.508	2	1.0	-42.540
10	11755.32	9.0	58	06N	127	17E	58	7.69N	127	17.27E	2.5594	2.555	2	1.0	-42.540
11	11875.32	5.5	49	58N	124	27E	49	59.21N	124	27.42E	3.1541	3.155	1	2.0	24.106
12	11887.42	5.5					49	9.77N	124	12.96E	3.1229	3.126	1	2.0	24.106
13	11912.12	5.3	47	27N	123	45E	47	28.76N	123	44.58E	3.7355	3.735	2	2.5	4.254
14	11929.72	6.3	46	15N	123	25E	46	16.72N	123	25.20E	3.3482	3.345	2	2.5	-19.852
15	11940.22	6.2	45	32N	123	14E	45	33.71N	123	13.94E	3.3817	3.383	2	2.5	-19.852
16	11964.72	5.3	43	52N	122	49E	43	53.30N	122	48.50E	3.4841	3.488	2	2.0	20.561
17	11983.02	6.3	42	37N	122	30E	42	38.25N	122	30.19E	3.0920	3.092	2	2.5	26.942
18	11994.72	6.2	41	49N	122	19E	41	50.24N	122	18.77E	3.0614	3.058	2	2.5	26.942
19	12006.92	5.3	40	59N	122	07E	41	.16N	122	7.08E	3.2822	3.284	2	2.5	18.434
20	12028.52	5.9	39	30N	121	47E	39	31.44N	121	46.91E	3.5542	3.552	1	3.0	-3.545
21	12038.62	5.9					38	49.94N	121	37.69E	3.5542	3.552	1	3.0	-3.545
22	12053.92	5.8	37	45N	121	24E	37	47.06N	121	23.97E	3.8106	3.808	2	2.5	-.709
23	12070.22	6.3	36	38N	121	10E	36	40.03N	121	9.65E	3.2175	3.221	2	2.5	-26.233
24	12081.52	6.7	35	52N	121	00E	35	53.55N	120	59.90E	3.2497	3.246	2	2.5	-26.233
25	12109.02	5.3	33	59N	120	37E	34	.39N	120	36.71E	3.4841	3.486	2	3.0	-13.471
26	12134.72	8.6	32	13N	120	16E	32	14.57N	120	15.67E	2.7168	2.715	2	2.5	36.868
27	12148.42	8.5	31	17N	120	05E	31	18.14N	120	4.69E	2.6633	2.659	2	2.5	36.868
28	12162.62	6.4	30	18N	119	54E	30	19.64N	119	53.46E	2.5850	2.585	2	2.0	44.667
29	12202.12	5.4	27	35N	119	23E	27	36.84N	119	23.00E	3.3150	3.314	2	2.5	26.233
30	12220.42	6.9	26	20N	119	09E	26	21.38N	119	9.23E	3.7728	3.776	2	3.0	4.254
31	12237.82	8.5	25	08N	118	56E	25	9.63N	118	56.32E	3.7355	3.736	2	3.0	-13.471
32	12539.12	6.3	4	25N	115	31E	4	26.52N	115	30.72E	3.3150	3.312	1	3.5	2.127
33	12549.62	6.3					3	43.23N	115	23.89E	3.2822	3.285	1	3.5	2.127
34	12595.32	5.9	0	34N	114	54E	0	34.91N	114	54.24E	2.7168	2.728	1	3.0	30.487
35	12609.02	5.9					0	21.51S	114	45.37E	2.6633	2.659	1	3.0	30.487
36	12623.92	5.0	1	24S	114	36E	1	22.87S	114	35.71E	2.6633	2.660	2	2.5	36.868
37	12642.12	7.1	2	39S	114	24E	2	37.79S	114	23.91E	3.1541	3.151	1	3.5	6.381
38	12653.42	7.1					3	24.29S	114	16.58E	3.1229	3.124	1	3.5	6.381
39	12699.62	8.5	6	36S	113	47E	6	34.31S	113	46.53E	2.6633	2.661	2	3.0	-34.032
40	12713.32	17.7	7	32S	113	38E	7	30.62S	113	37.58E	2.6899	2.689	2	3.0	-34.032
REV D55															
1	16837.02	5.1	74	02N	116	54E	74	2.56N	116	54.74E	2.4841	2.488	1	0.0	-43.958
2	16853.52	5.1					72	58.83N	115	29.68F	2.4841	2.486	1	0.0	-43.958
3	17126.12	6.3	54	47N	103	50E	54	47.61N	103	49.93E	3.1857	3.189	2	1.5	29.778
4	17150.82	5.5	53	06N	103	16E	53	7.04N	103	15.43E	3.1541	3.151	2	2.0	24.106
5	17162.92	6.8	52	17N	102	59E	52	17.71N	102	59.32E	3.1229	3.119	2	2.0	24.106
6	17314.82	7.1	41	55N	100	09E	41	56.11N	100	9.33E	3.5542	3.556	2	2.5	5.672
7	17325.72	6.3	41	10N	99	59E	41	11.37N	99	58.85E	3.5190	3.519	2	2.5	5.672
8	17340.02	5.3	40	12N	99	46E	40	12.65N	99	45.37E	3.5897	3.593	2	2.5	-2.127
9	17358.12	8.7	38	57N	99	29E	38	58.29N	99	28.71E	2.9128	2.911	2	2.0	32.614
10	17374.32	5.9	37	51N	99	14E	37	51.70N	99	14.15E	2.5594	2.556	1	2.0	43.249
11	17389.22	5.9					36	50.44N	99	1.04E	2.4841	2.487	1	2.0	43.249
12	17445.42	5.5	32	58N	98	14E	32	59.17N	98	13.65E	2.8840	2.888	2	2.5	-42.540
13	17469.52	5.3	31	19N	97	54E	31	19.91N	97	54.22E	3.5897	3.589	2	3.0	-24.106
14	17482.72	5.3	30	25N	97	44E	30	25.53N	97	43.78E	3.8487	3.845	2	3.0	-14.180
15	17498.72	5.8	29	19N	97	31E	29	19.60N	97	31.30E	3.3817	3.385	2	3.0	-24.815
16	17514.02	8.0	28	16N	97	20E	28	16.54N	97	19.53E	3.5190	3.518	2	3.0	-13.471
17	17545.62	7.5	26	05N	96	56E	26	6.25N	96	55.70E	3.3482	3.345	1	3.0	17.016
18	17556.12	7.5					25	22.95N	96	47.91E	3.3150	3.317	1	3.0	17.016
19	17596.42	7.1	22	36N	96	19E	22	36.71N	96	18.57E	3.5190	3.518	1	3.5	-8.508
20	17606.52	7.1					21	55.05N	96	11.34E	3.5190	3.518	1	3.5	-8.508
21	17668.92	8.8	17	37N	95	28E	17	37.55N	95	27.62E	3.0920	3.091	2	3.0	24.815
22	17681.02	8.4	16	47N	95	19E	16	47.62N	95	19.30E	3.0311	3.029	2	3.0	24.815

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PERFORMANCE EVALUATION TEAM
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COMMAND INFORMATION

ACC. NO.	SYSTEM TIME	BURST TIME	COMMAND POSITION LAT		COMMAND POSITION LONG		BEST EPHEMERIS LAT		BEST EPHEMERIS LONG		FILM VELOCITY IN./SEC.		MIRROR	CRAB	ROLL
	SEC	SEC	DEG	MIN	DEG	MIN	DEG	MIN	DEG	MIN	COMMAND	ACTUAL	POS.	DEG.	ANGLE
REV D56															
1	22D88.81	5.1	78	23N	1D3	19E	78	23.58N	103	19.56E	2.4841	2.487	1	1.D	41.831
2	221D5.31	5.1					77	23.46N	100	47.32E	2.4841	2.487	I	1.0	41.831
3	22197.41	5.1	71	31N	91	38E	71	31.72N	91	37.92E	2.8554	2.854	2	1.0	34.741
4	22223.61	5.9	69	48N	89	57E	69	48.72N	89	56.74E	3.1229	3.125	1	I.0	-18.434
5	22234.91	5.9					69	4.05N	89	17.70E	3.1541	3.152	1	1.0	-18.434
6	22252.11	5.9	67	55N	88	23E	67	55.82N	88	22.77E	3.1229	3.124	1	1.0	-20.561
7	22263.41	5.9					67	10.85N	87	49.29E	3.1541	3.158	1	1.0	-20.561
8	22405.51	6.2	57	38N	82	44E	57	38.81N	82	43.75E	2.4841	2.482	2	2.0	41.122
9	22432.21	5.5	55	5DN	82	02E	55	5D.40N	82	1.85E	3.1229	3.121	2	2.0	23.397
10	22444.31	7.1	55	00N	81	44E	55	1.20N	81	43.91E	3.0920	3.091	2	2.0	23.397
11	22474.21	5.1	52	59N	81	02E	52	59.46N	81	2.07E	3.0614	3.059	2	1.5	33.323
12	22501.71	7.4	51	06N	80	26E	51	7.30N	80	26.30E	3.1229	3.121	2	2.0	-27.651
13	22513.01	7.8	50	20N	80	12E	50	21.17N	80	12.28E	3.1541	3.151	2	2.0	-27.651
14	22537.51	6.3	48	40N	79	43E	48	41.05N	79	43.05E	3.2822	3.285	1	2.5	19.143
15	22549.21	6.3					47	53.20N	79	29.63E	3.2497	3.245	1	2.5	19.143
16	22590.21	5.4	45	04N	78	45E	45	5.34N	78	44.97E	3.2175	3.215	2	2.0	-25.524
17	22601.91	5.4	44	16N	78	33E	44	17.39N	78	32.84E	3.2497	3.246	2	2.0	-25.524
18	22613.61	7.7	43	28N	78	21E	43	29.42N	78	20.95E	3.1229	3.119	2	2.0	-36.159
19	22660.41	5.9	40	16N	77	36E	40	17.36N	77	35.62E	2.8554	2.851	1	2.0	-37.577
20	22672.91	5.9					39	26.01N	77	24.05E	2.9128	2.912	1	2.0	-37.577
21	22697.31	6.3	37	45N	77	02E	37	45.73N	77	2.04E	3.4841	3.487	2	2.5	9.926
22	22719.41	5.3	36	14N	76	43E	36	14.85N	76	42.72E	2.6633	2.661	2	2.5	41.122
23	22737.81	5.4	34	58N	76	27E	34	59.16N	76	27.02E	2.9128	2.908	2	2.5	34.741
24	22770.61	9.1	32	43N	76	00E	32	44.14N	75	59.87E	2.8840	2.885	2	2.5	-42.540
25	22785.21	9.0	31	43N	75	48E	31	44.02N	75	48.08E	2.9128	2.908	2	2.5	-41.831
REV D57															
1	27369.81	7.5	80	43N	89	31E	80	43.84N	89	33.27E	2.6108	2.609	3	1.0	32.614
2	27383.91	7.5					79	56.50N	86	12.18E	2.7168	2.726	3	1.0	29.778
3	27518.41	6.3	71	33N	69	29E	71	33.70N	69	29.39E	2.9419	2.937	1	.5	-25.524
4	27530.11	6.3					70	47.81N	68	42.04E	2.9713	2.968	I	.5	-25.524
5	27560.D1	7.9	68	49N	66	55E	68	49.81N	66	55.11E	3.0920	3.092	3	1.0	-21.979
6	27572.11	7.9					68	1.79N	66	16.68E	3.0614	3.058	3	1.0	-24.815
7	27585.41	5.6	67	08N	65	37E	67	8.86N	65	37.17E	3.1229	3.117	2	1.5	-22.688
8	27717.61	7.7	58	16N	60	49E	58	16.90N	60	48.60E	3.6256	3.624	2	2.0	-12.762
9	27729.11	6.0	57	29N	60	30E	57	30.26N	60	29.59E	3.6619	3.659	2	2.0	-8.508
10	27745.31	11.3	56	24N	60	04E	56	24.50N	60	3.92E	3.5542	3.550	2	2.0	14.889
11	27761.51	5.3	55	18N	59	39E	55	18.65N	59	39.47E	3.5190	3.518	2	2.0	16.307
12	27783.41	6.6	53	49N	59	08E	53	49.53N	59	8.13E	3.0920	3.091	2	2.0	24.815
13	27795.51	6.2	52	59N	58	52E	53	.23N	58	51.58E	3.0920	3.091	2	2.0	24.815
14	27811.31	5.5	51	55N	58	31E	51	55.81N	58	30.73E	3.0920	3.091	2	2.0	25.524
15	27823.41	6.0	51	05N	58	15E	51	6.44N	58	15.29E	3.0920	3.091	2	2.0	25.524
16	27850.91	6.7	49	13N	57	42E	49	14.11N	57	41.78E	3.4496	3.445	1	2.5	9.217
17	27861.81	6.7					48	29.55N	57	29.04E	3.4496	3.449	1	2.5	9.217
18	27887.41	6.3	46	44N	57	00E	46	44.81N	57	.24E	3.0920	3.092	2	2.5	-31.196
19	27986.21	5.9	39	59N	55	21E	39	59.62N	55	20.83E	3.2175	3.213	1	2.5	-26.233
20	27997.51	5.9					39	13.20N	55	10.43E	3.2497	3.249	1	2.5	-26.233
21	28199.31	5.5	25	21N	52	26E	25	22.28N	52	26.19E	3.0920	3.091	1	3.0	-31.196
22	28211.41	5.5					24	32.38N	52	17.29E	3.1229	3.119	1	3.0	-31.196

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Handle via Byeman
Controls Only

BCS 39739-65

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

COMMAND INFORMATION

ACC. NO.	SYSTEM TIME SEC	BURST TIME SEC	COMMAND POSITION LAT DEG	COMMAND POSITION LAT MIN	COMMAND POSITION LONG DEG	COMMAND POSITION LONG MIN	BEST EPHEMERIS LAT DEG	BEST EPHEMERIS LAT MIN	BEST EPHEMERIS LONG DEG	BEST EPHEMERIS LONG MIN	FILM VELOCITY IN./SEC. COMMAND	FILM VELOCITY IN./SEC. ACTUAL	MIRROR POS.	CRAB DEG.	ROLL ANGLE
REV 058															
1	32791.51	7.1	74	40N	51	18E	74	40.59N	51	18.97E	2.4841	2.486	1	1.0	39.704
2	32806.41	7.1					73	43.37N	49	55.82E	2.4841	2.485	1	1.0	39.704
3	32943.91	6.3	64	39N	41	48E	64	40.36N	41	48.82E	3.1541	3.153	2	1.0	-29.778
4	32961.51	5.5	63	29N	41	08E	63	29.68N	41	7.92E	3.3817	3.378	1	1.5	-1.418
5	32972.41	5.5					62	45.83N	40	44.06E	3.3817	3.378	1	1.5	-1.418
6	32985.21	5.8	61	53N	40	17E	61	54.25N	40	17.34E	3.6619	3.658	2	1.5	0.000
7	33018.71	6.3	59	38N	39	13E	59	38.93N	39	13.19E	3.2822	3.281	1	1.5	-17.725
8	33029.21	6.3					58	56.43N	38	54.60E	3.3150	3.310	1	1.5	-17.725
9	33069.11	5.9	56	14N	37	49E	56	14.56N	37	49.45E	3.3817	3.381	1	2.0	9.926
10	33080.41	5.9					55	28.63N	37	32.39E	3.3817	3.383	1	2.0	9.926
11	33100.31	6.3	54	07N	37	03E	54	7.66N	37	3.63E	3.4155	3.413	1	2.0	-10.635
12	33110.81	6.3					53	24.90N	36	49.07E	3.4496	3.445	1	2.0	-10.635
13	33143.51	7.1	51	11N	36	06E	51	11.55N	36	6.13E	3.4841	3.487	1	2.0	-7.090
14	33153.61	7.1					50	30.32N	35	53.54E	3.4841	3.487	1	2.0	-7.090
15	33175.21	6.3	49	01N	35	27E	49	2.07N	35	27.56E	3.4496	3.448	1	2.5	-11.344
16	33185.71	6.3					48	19.13N	35	15.36E	3.4841	3.485	1	2.5	-11.344
17	33225.31	5.5	45	36N	34	32E	45	37.04N	34	31.62E	3.4155	3.414	1	2.5	-17.016
18	33236.21	5.5					44	52.38N	34	20.14E	3.4496	3.448	1	2.5	-17.016
19	33442.81	5.5	30	42N	31	15E	30	43.19N	31	14.76E	3.3482	3.346	1	3.0	-21.270
20	33453.71	5.5					29	58.28N	31	6.20E	3.3817	3.378	1	3.0	-21.270
REV 059															
1	37998.71	5.5	81	27N	48	59E	81	27.58N	49	1.17E	3.0920	3.094	1	.5	9.217
2	38010.81	5.5					80	48.87N	45	36.86E	3.1229	3.122	1	.5	9.217
3	38419.11	5.3	54	17N	14	56E	54	17.34N	14	56.25E	3.3817	3.382	2	2.0	-26.233
4	38435.51	5.0	53	10N	14	33E	53	10.54N	14	33.54E	3.3482	3.346	2	2.0	-27.651
5	38455.41	5.4	51	49N	14	07E	51	49.40N	14	7.23E	3.7355	3.733	2	2.0	0.000
6	38465.41	19.3	51	08N	13	54E	51	8.60N	13	54.48E	3.5190	3.522	2	2.0	-2.836
7	38487.91	5.1	49	36N	13	27E	49	36.71N	13	26.86E	3.7728	3.773	2	2.0	-4.254
REV 063															
1	59376.40	9.1	75	50N	57	37W	75	50.81N	57	37.61W	3.3482	3.347	2	.5	-15.598
2	59638.00	60.1	58	34N	72	08W	58	34.27N	72	8.41W	3.6985	3.696	2	2.0	-4.254
3	59827.30	5.1	45	42N	76	20W	45	42.43N	76	20.43W	3.5897	3.591	2	2.0	17.016
4	59900.70	9.1	40	41N	77	34W	40	41.38N	77	33.84W	3.5897	3.591	2	2.5	16.307
5	60147.10	7.9	23	46N	80	55W	23	46.95N	80	54.88W	2.8554	2.855	2	2.5	-36.868
6	60159.60	7.9	22	55N	81	04W	22	55.40N	81	3.91W	2.9128	2.910	2	2.5	-36.868
REV 064															
1	64762.50	24.8	71	35N	85	43W	71	35.86N	85	43.26W	3.3817	3.381	2	0.0	-6.381
2	64818.30	60.1	67	55N	89	03W	67	55.58N	89	3.00W	3.3482	3.345	2	1.5	-8.508
3	64934.70	60.0	60	08N	93	37W	60	8.28N	93	37.68W	3.4155	3.418	2	2.0	-9.217
4	65031.40	5.5	53	35N	96	11W	53	35.67N	96	11.33W	3.4155	3.418	1	2.0	-12.762
5	65042.30	5.5					52	51.26N	96	26.12W	3.4496	3.448	1	2.0	-12.762
6	65095.90	5.5	49	12N	97	33W	49	12.45N	97	33.43W	3.3817	3.384	1	2.0	-17.725
7	65106.80	5.5					48	27.89N	97	46.15W	3.4155	3.412	1	2.0	-17.725
8	65230.50	5.9	40	00N	99	53W	40	.83N	99	53.59W	3.5542	3.552	2	3.0	2.836
9	65240.60	5.9	39	19N	100	03W	39	19.34N	100	2.89W	3.5190	3.521	2	3.0	2.836
10	65339.40	5.1	32	32N	101	28W	32	32.95N	101	27.79W	3.8106	3.816	2	3.0	2.836

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D 4							
1	.45	1.73	.13	17	3.75		96.2
2	.41	1.72	.14	17	4.02		95.8
3	.68	1.98	.22	17	4.04		95.5
4	.79	1.20	.12	24	1.44	1.53	93.0
5	.98	1.42	.22	24	1.54	1.90	92.7
6	.88	1.08	.22	35	1.21	2.52	88.9
7	.94	1.28	.22	35	1.38	2.52	88.7
REV D 5							
1	.56	1.90	.22	13	4.15	1.60	96.2
2	.56	1.87	.22	13	3.99	1.45	97.2
3			.12	27		1.68	91.8
4			.10	27		1.61	91.5
5	.42	1.21	.22	33	2.60	2.03	89.6
6	.43	1.20	.22	33	2.53	2.25	89.3
7	.43	1.42	.22	37	3.17	1.57	88.2
8	.57	1.50	.22	39	2.62	2.32	87.7
9	.34	.90	.22	42	2.46		87.1
10	.46	.94	.22	43	1.86	2.32	86.8
11	.52	1.14	.22	43	1.99	2.32	86.6
12	.29	1.16	.22	45	3.75		86.2
13	.35	1.32	.22	45	3.56		86.0
14	.36	1.30	.22	47	3.36		85.8
15	.35	1.55	.22	47	4.52	1.30	85.6
16			.12	79		1.76	89.9
17			.12	79		1.82	90.3
REV D 6							
1	.76	1.58	.11	13	2.13	1.41	96.2
2	.36	1.40	.11	13	3.56	1.32	97.2
3			.10	33		1.72	89.5
4			.20	35		1.98	89.2
5			.22	34		1.93	88.9
6	1.01	1.48	.21	47	1.60	2.06	85.6
7	.62	.99	.12	47	1.46	1.74	85.4
8			.11	51		1.34	85.0
9			.10	54		1.56	84.6
10			.10	54		1.60	84.6
11	.42	.97	.21	57	2.08	2.16	84.4
12	.32	.87	.22	59	2.56	2.32	84.3
13	.28	1.28	.21	61	4.57	2.28	84.3
14	.40	.98	.21	61	2.19	2.28	84.3
15	.81	.97	.21	63	1.17	2.01	84.4
16	.32	.82	.22	64	2.43	2.28	84.4
17	.60	.72	.22	79	1.15	2.30	88.2
18	.55	.70	.22	79	1.20	2.22	88.5
19	.49	1.72	.21	78	3.88	2.20	89.2
20	.39	1.70	.23	78	4.66	1.91	89.5
REV D 7							
1	.28	1.04	.21	9	3.63	1.39	96.2
2	.57	.97	.21	9	1.55	1.09	99.2
3			.21	14		1.80	97.3
4	.56	.97	.21	14	1.57	1.89	96.8
5			.21	26		1.78	92.1
6			.21	28		2.20	91.5
7	.60	.93	.21	28	1.44	1.78	91.2
8	.40	.52	.21	30	1.28	1.84	90.8
9			.11	31		2.00	90.2
10			.11	31		2.00	89.9
11			.11	32		1.89	89.4
12	.60	1.24	.21	36	1.93	2.39	88.6
13	.45	1.02	.11	35	1.90	2.28	88.4
14			.11	44		1.45	86.5
15			.10	44		1.60	86.3
16	.44	1.42	.21	56	3.11	2.06	84.5
17	.40	1.40	.21	56	3.30	2.00	84.5
18	.34	1.96	.21	70	7.57	1.82	85.2
19	.48	1.76	.21	70	4.14	1.78	85.3
20	.40	1.82	.21	75	5.21	1.87	86.5
21	.36	.84	.21	75	2.16	1.87	86.7
REV D 8							
1	.35	.78	.22	6	2.09	1.31	96.2
2	.36	1.06	.22	6	2.67	1.04	100.3
3			.22	8		1.80	99.6
4			.22	8		1.66	99.2
5	.65	1.50	.22	29	2.39	2.06	90.7
6	.48	1.15	.22	30	2.18	2.36	90.4
7	.60	1.24	.22	30	1.93	2.36	90.1
8			.10	35		1.66	88.8
9			.10	35		1.76	88.4
10	.69	1.46	.22	40	2.19	2.16	87.2
11	.66	1.64	.22	40	2.75	2.14	87.0
12	.52	1.82	.22	46	4.08		85.8
13	.44	1.74	.22	47	4.40		85.6
14	.66	1.32	.22	48	1.95	1.70	85.3
15	.42	1.22	.22	50	2.63		85.1
16	.34	1.44	.22	51	4.17		85.0
17	.44	1.52	.22	51	3.45		84.9

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY		DENSITY	SUN ANGLE	BRIGHTNESS	CLOUD	ALTITUDE
	DMIN	DMAX	BASE + FOG	(DEGREES)	RANGE	DMAX	(NM)
REV D 9							
1	.46	.78	.22	5	1.58	1.68	96.2
2	.38	.74	.22	5	1.80	1.30	100.5
3	.94	2.14	.22	8	3.82	2.01	99.4
4	.86	1.82	.22	8	2.67	2.08	99.0
5	.42	2.22	.22	11	8.88		97.9
6	.86	1.86	.20	13	2.79	1.96	97.4
7	.76	1.76	.20	12	2.80	1.90	97.0
8			.11	14		1.26	96.5
9			.12	15		1.38	96.1
10			.11	18		1.56	94.9
11			.10	18		1.42	94.6
12	.66	.76	.13	27	1.13	2.10	91.6
13	.40	1.03	.12	27	2.12	2.34	91.2
14			.20	30		2.38	90.4
15			.12	30		2.16	90.1
16			.10	33		1.81	89.2
17	.60	1.32	.22	34	2.09	2.24	88.9
18	.72	1.28	.20	34	1.75	2.14	88.6
19	.65	1.73	.20	36	3.07	2.42	88.3
20	.34	1.52	.20	37	4.54		88.0
21	.38	1.58	.20	37	4.21		87.8
22	.32	.78	.20	40	2.32		87.1
23	.30	1.10	.20	41	3.41	1.68	86.7
24	.26	1.42	.20	43	6.29		86.5
25	.28	1.56	.22	43	6.13	1.82	86.3
26	.27	.92	.21	44	3.54	2.00	86.0
27	.42	1.50	.20	49	3.52		85.4
28	.46	1.66	.20	49	3.86		85.2
29	.74	1.54	.20	53	2.24	1.62	84.7
30	.75	1.80	.20	65	2.96		84.5
31	.80	1.42	.20	65	1.85		84.6
32	.68	1.35	.12	66	1.87	1.25	84.8
REV D10							
1			.21	3		1.05	96.2
2			.21	3		.72	101.2
3	.37	1.58	.22	17	4.36	2.10	95.6
4	.37	1.50	.22	16	4.01	2.06	95.3
5	.58	1.20	.22	18	1.90	2.20	94.7
6	.38	.65	.22	19	1.62	2.15	94.2
7	.32	.80	.22	23	2.37	2.10	92.9
8	.32	1.48	.22	23	4.66	1.98	92.6
9	.34	1.20	.22	25	3.26		92.1
10	.42	1.35	.22	25	3.01		91.8
11	.34	1.18	.22	27	3.20	2.12	91.4
12	.39	1.21	.22	27	2.77	2.10	91.1
13	.60	1.60	.22	27	2.81	2.40	90.7
14	.47	1.10	.22	29	2.12	2.18	90.4
15	.49	1.38	.22	29	2.69	2.34	90.1
16	.40	1.45	.22	31	3.48	2.20	89.7
17	.46	1.58	.22	31	3.53	2.15	89.4
18	.45	1.52	.21	33	3.38		88.9
19	.44	1.58	.22	35	3.68		88.5
20	.50	2.20	.22	36	7.29		88.1
21	.32	1.20	.22	36	3.49		87.9
22	.44	1.50	.22	37	3.38		87.7
23	.44	1.77	.22	38	4.54		87.4
24	.37	1.26	.22	38	3.12		87.2
25	.26	1.15	.22	42	4.78		86.6
26	.29	1.32	.22	42	4.40		86.5
27	.31	1.15	.22	44	3.45		86.1
28	.33	1.12	.22	44	3.13		86.0
29	.36	1.42	.22	71	3.81		85.6
30	.48	1.50	.22	71	3.11		85.7
31	.42	.58	.22	75	1.36	2.06	86.5
32	.36	.75	.22	75	1.95	2.26	86.8
33	.36	.70	.22	76	1.84	2.24	87.5
34	.38	.80	.22	76	1.93	2.05	87.7
35	.50	.66	.22	77	1.27	2.28	88.1
36	.62	.88	.22	77	1.34	2.28	88.4
37			.22	78		2.22	88.7
38			.12	79		1.69	90.6
39			.12	79		1.65	91.1
40			.12	80		1.62	91.4
REV D11							
1	.34	2.16	.21	7	10.11	1.99	96.2
2	.41	1.99	.20	7	6.37	1.87	99.2
3	.39	.99	.21	24	2.26		92.7
4	.40	1.10	.20	24	2.45		92.3
5	.46	1.00	.20	26	1.97	2.18	91.9
6	.49	1.16	.21	26	2.15	2.22	91.5
7	.54	1.12	.21	27	1.88		91.1
8	.49	.80	.21	41	1.52	2.32	86.9
9	.54	1.13	.20	41	1.89	2.35	86.7

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY		DENSITY	SUN ANGLE	BRIGHTNESS	CLOUD	ALTITUDE
	DMIN	DMAX	BASE + FOG	(DEGREES)	RANGE	DMAX	(NM)
REV D13							
1	.36	1.36	.20	59	3.58		96.2
2	.37	1.51	.20	59	4.05		107.4
3	.34	1.49	.21	58	4.40		108.0
4	.52	2.03	.21	53	5.39		112.0
5	.49	1.72	.21	53	3.88		112.7
REV 014							
1	.34	.92	.21	64	2.51	2.26	96.2
2	.40	.94	.21	64	2.11	2.30	84.6
REV D15							
1	.30	1.12	.22	39	3.47		96.2
2	.32	1.15	.22	39	3.33		86.8
3	.35	1.46	.22	41	4.12		86.6
4	.36	1.52	.22	40	4.23		86.4
5	.36	1.34	.22	44	3.51		85.9
6	.34	1.50	.22	44	4.44		85.7
7	.27	1.10	.22	46	4.19		85.4
8	.28	1.10	.22	48	3.84		85.2
9	.25	.82	.22	50	3.83	.85	84.9
9			.14	50		1.64	84.9
9			.12	50		1.38	84.9
REV 016							
1	.38	.98	.21	33	2.31	2.10	96.2
2	.48	1.09	.20	37	2.06	1.57	87.5
3	.30	1.40	.20	44	4.59		85.7
4	.30	1.20	.21	48	3.74		85.1
5	.36	1.28	.21	48	3.29		85.0
6	.41	1.44	.21	50	3.37		84.8
7	.48	1.42	.21	51	2.86		84.7
REV D17							
1	.44	1.80	.21	73	4.70	2.26	96.2
2	.33	1.89	.20	73	7.11	2.28	98.1
REV D19							
1	.51	2.16	.22	21	6.67	2.25	96.2
2	.56	2.10	.22	21	5.48	2.26	92.0
REV D20							
1	.51	2.26	.12	16	6.75		96.2
2	.58	2.22	.12	16	5.77		94.2
3	.57	.80	.13	24	1.32	1.92	91.0
4			.12	27		2.10	90.4
5			.12	27		2.02	90.1
6			.12	27		1.52	89.9
7			.10	30		1.84	89.4
8			.12	30		1.76	89.1
9	.48	1.95	.12	33	4.56	2.20	88.3
10	.75	1.20	.20	33	1.56	2.40	88.1
REV D21							
1	.43	1.74	.23	15	4.49		96.2
2	.38	1.69	.23	15	4.76		94.3
3	.49	1.31	.15	26	2.32	1.67	90.5
4	.70	.93	.15	26	1.24	2.10	90.2
5	.35	1.72	.23	35	5.46	2.07	87.6
6	.37	1.52	.22	35	4.09	2.17	87.4
7	.44	1.38	.23	37	2.98	1.10	87.0
8	.72	1.63	.23	38	2.53		86.7
9	.47	1.15	.23	39	2.22		86.5
10	.43	1.44	.23	42	3.24		86.0
11	.46	1.52	.23	42	3.31		85.9
12			.15	78		2.16	88.6
13			.14	78		1.62	88.9
14	.71	.99	.22	78	1.34	2.04	89.4
15	.46	.73	.23	80	1.49	2.36	90.7
16	.50	.80	.22	80	1.49	2.40	91.2
17	.48	1.92	.23	79	5.02	2.13	91.5
18	.47	1.97	.23	79	5.49	2.13	92.0

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BCS 39739-65

PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D22							
1			.23	14		2.11	96.2
2			.13	14		1.85	94.8
3			.20	17		1.65	93.8
4			.21	17		1.55	93.5
5	.50	1.10	.21	19	2.00	1.90	93.1
6	.47	.88	.21	19	1.73	1.12	92.7
7	.50	2.11	.21	28	6.27	2.31	90.0
8	.64	2.22	.21	28	6.10	2.10	89.6
9	.92	1.28	.21	35	1.41	1.93	87.7
10	.56	1.19	.12	35	1.89	1.78	87.5
11	.40	1.23	.21	46	2.76	1.93	85.3
12	.41	1.35	.20	46	3.07	1.96	85.2
13	.36	.95	.21	47	2.41	2.01	85.0
14	.40	1.11	.21	47	2.47	2.08	84.9
15			.11	49		1.29	84.7
16			.11	52		1.62	84.4
17			.11	55		1.45	84.3
18	.46	1.16	.21	60	2.29	2.10	84.3
19	.36	1.33	.20	60	3.47	2.20	84.4
20	.31	1.55	.21	62	5.19	2.22	84.4
21	.36	1.65	.21	63	4.88	2.00	84.5
22	.40	1.58	.20	65	3.99	2.10	84.7
23	.40	1.45	.21	66	3.48	2.21	84.8
24	.80	.95	.21	78	1.17	2.14	90.6
25	.77	1.11	.21	78	1.40	2.22	90.9
26	.61	1.10	.13	79	1.63	2.14	91.6
REV D23							
1			.21	9		1.64	96.2
2			.13	12		1.57	96.1
3			.21	12		1.57	95.7
4	.32	1.56	.21	14	5.07		94.8
5	.47	.73	.12	29	1.41	2.09	89.2
6	.66	.90	.12	29	1.28	1.82	88.9
7	.69	1.37	.20	44	1.99	1.87	85.4
8	.66	1.70	.21	44	2.94	1.66	85.3
9	.28	1.42	.21	56	5.29	2.10	84.3
10	.33	2.36	.21	57	15.23	2.07	84.3
11	.31	1.23	.21	59	3.72	1.91	84.3
REV 024							
1			.21	6		1.10	96.2
2	.27	.67	.21	6	2.69	1.05	97.8
3			.21	8		1.54	97.2
4			.21	8		1.18	96.8
5	.48	.68	.21	16	1.35	1.95	94.2
6	.47	.76	.21	16	1.51	2.12	93.9
7	.82	1.28	.21	31	1.56	2.16	88.8
8	.76	1.43	.21	31	1.95	2.21	88.5
9	.72	1.00	.13	35	1.29	2.12	87.5
10	.30	.90	.11	34	2.48	1.75	87.3
11			.11	37		1.78	86.8
12	.86	1.68	.22	38	2.28		86.6
13	.94	1.80	.21	38	2.42		86.4
14	.30	1.00	.21	43	3.10		85.8
15	.47	1.39	.21	43	2.83		85.6
16	.39	1.09	.21	44	2.48	1.58	85.4
17	.45	1.39	.21	46	2.95		85.0
18	.35	1.45	.21	53	4.07		84.4
19	.46	1.50	.21	53	3.24		84.3
20	.36	1.35	.21	70	3.54	2.08	100.0
21	.30	1.45	.20	70	4.84	2.04	100.5

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PERFORMANCE EVALUATION TEAM
REPORT NO. 4022/65

PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY		DENSITY	SUN ANGLE	BRIGHTNESS	CLOUD	ALTITUDE
	DMIN	DMAX	BASE + FOG	(DEGREES)	RANGE	DMAX	(NM)
REV 025							
1			.2D	5		1.26	96.2
2			.20	5		1.D8	97.9
3			.20	8		1.70	96.9
4			.2D	8		1.58	96.6
5	.74	1.D5	.20	9	1.37	1.55	96.2
6	.72	2.08	.20	16	4.43	2.25	93.8
7	.46	1.58	.2D	18	3.53		92.7
8			.10	26		1.68	89.9
9			.1D	26		1.48	89.6
10	.56	1.63	.20	30	3.05	2.32	88.8
11	.58	1.32	.22	30	2.14	2.38	88.6
12	.52	1.53	.20	32	2.96	2.22	88.2
13	.47	.74	.11	33	1.43	1.75	87.8
14	.45	.72	.11	33	1.45	1.64	87.5
15	.75	1.57	.20	37	2.29	2.22	86.9
16	.94	1.7D	.20	37	2.16	2.30	86.7
17	.46	1.D0	.20	41	1.97		85.8
18	.50	1.14	.2D	41	2.07		85.7
19	.35	1.62	.20	42	4.89		85.5
20	.33	1.66	.20	44	5.47		85.3
21	.26	1.16	.20	46	4.83		85.1
22	.30	1.23	.20	46	3.85		85.0
23	.44	1.40	.20	50	3.04	1.90	84.6
24	.50	1.38	.20	50	2.64	2.02	84.6
25	.52	1.46	.20	52	2.75	1.90	84.4
26	.70	1.35	.20	52	1.93	2.04	84.4
27			.10	53		1.44	84.3
28	.33	1.68	.20	66	5.60	1.90	84.9
29	.56	1.42	.20	67	2.44	2.31	85.1
30	.47	1.64	.20	72	3.70	2.34	86.7
31	.44	1.30	.20	72	2.74	2.22	87.0
32	.50	1.10	.20	77	2.00	2.34	88.2
33	.68	1.03	.20	77	1.44	2.24	88.5
34	.40	1.30	.20	80	2.97	2.28	91.7
35	.44	1.56	.20	80	3.60	2.37	92.2
36	.57	1.40	.20	73	2.36	2.33	97.1
37	.42	1.00	.20	73	2.14	2.28	97.6
38	.53	1.58	.20	71	3.06		98.4
39	.50	1.52	.20	71	3.05		98.9
4D	.76	2.04	.20	70	4.00	2.24	99.8
41	.30	1.70	.20	70	6.35	2.24	100.4
42	.40	1.84	.20	67	5.33	2.32	102.3
43	.33	1.78	.20	67	6.26	2.15	102.9
44	.63	1.80	.20	64	3.40	2.30	104.5
REV D26							
1	.22	.38	.20	3	4.02	.82	96.2
2	.24	.38	.20	3	2.28	.68	98.8
3	.28	.48	.20	4	1.85	.90	98.3
4			.20	16		1.84	93.5
5			.21	16		2.06	93.2
6	.30	1.14	.21	18	3.54	1.78	92.5
7	.52	.91	.21	21	1.61	2.28	91.8
8	.52	1.80	.14	21	3.61	2.10	91.5
9	.28	.74	.21	24	2.67		90.6
10	.30	.54	.21	25	1.85	1.54	90.3
11	.31	.62	.21	25	1.99	1.82	90.1
12	.36	1.32	.21	27	3.43	1.76	89.6
13	.43	1.40	.21	27	3.10	1.92	89.3
14	.54	1.38	.20	28	2.43	1.50	89.1
15	.45	1.50	.21	29	3.31		88.8
16	.32	1.23	.21	32	3.59	2.32	88.1
17	.37	1.20	.21	32	2.94	2.16	87.9
18	.32	1.64	.21	34	5.54	1.80	87.5
19	.39	1.20	.21	35	2.75	2.10	87.3
2D	.45	1.22	.21	35	2.47	2.12	87.1
21	.60	1.28	.21	36	2.01	1.87	86.9
22	.39	1.01	.21	39	2.30		86.4
23	.28	.94	.21	40	3.31	2.01	86.1
24	.32	.98	.21	41	2.84		85.9
25	.53	1.72	.21	42	3.58		85.7
26	.34	.90	.21	42	2.46		85.6
27	.34	1.20	.21	43	3.26		85.4
28	.27	.89	.21	44	3.44		85.3
29			.11	77		1.34	88.0
30			.11	77		1.67	88.4
31	.34	.65	.21	78	1.86	2.10	90.3
32	.34	.58	.21	78	1.72	2.00	90.6
33			.11	78		1.72	91.5
34			.11	78		1.57	91.8
35	.43	.89	.21	77	1.89	2.14	92.9
36	.38	.72	.21	77	1.76	2.00	93.3
37	1.24	1.74	.21	75	1.71	1.26	94.7
38	.97	1.58	.21	75	1.84	1.14	95.2
39	.48	1.33	.13	75	2.40	1.70	95.6
40	.78	1.40	.21	75	1.85	1.90	96.0
41	.38	1.52	.21	73	3.95	2.02	97.0
42	.34	1.51	.21	73	4.49	2.12	97.5

PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D27							
1			.13	17		1.80	96.2
2			.13	17		1.63	93.1
3	.62	1.04	.21	18	1.56	2.06	92.9
4	.51	1.21	.21	18	2.17	2.00	92.5
5			.12	23		1.35	90.9
6			.12	23		1.22	90.6
7			.12	25		1.59	90.2
8			.12	26		1.66	89.9
9			.12	26		1.62	89.6
10	.72	1.88	.22	37	3.36	2.42	86.8
11	.76	2.00	.20	37	3.78	2.42	86.6
12	.32	1.86	.21	51	7.08	2.30	84.5
13	.40	2.66	.21	51	59.57	2.28	84.5
14	.62	1.78	.21	54	3.36		84.3
15	.40	1.44	.23	54	3.44		84.3
REV D29							
1	.36	1.18	.20	57	2.98		96.2
2	.33	1.32	.22	57	3.81		111.2
3	.40	1.90	.21	54	5.74		112.8
4	.38	1.20	.22	54	2.84		113.7
REV D31							
1	.44	1.82	.20	42	4.80		96.2
2	.26	.96	.20	43	4.01		85.3
3	.30	1.32	.20	43	4.23		85.2
4	.24	1.34	.20	46	7.47		84.9
5	.30	.94	.20	46	2.93		84.8
6	.27	.92	.20	48	3.54	1.04	84.7
REV D32							
1	.36	1.42	.21	33	3.81		96.2
2	.27	1.39	.21	37	5.59		86.4
3	.42	1.72	.21	46	4.48		84.9
4	.27	.89	.20	50	3.44		84.5
5	.27	1.34	.21	49	5.30		84.5
6	.35	1.36	.21	52	3.71		84.4
7	.44	1.39	.21	53	3.01		84.3
REV D33							
1			.12	72		1.81	96.2
2			.12	72		1.90	99.9
REV D34							
1			.20	18		1.92	96.2
2	.42	2.06	.20	63	6.88	2.46	84.6
3	.30	1.96	.20	63	8.69	2.30	84.7
REV D36							
1	.57	2.12	.20	16	5.56		96.2
2	.76	2.33	.20	16	6.47		92.2
3	.53	1.90	.20	21	4.41		90.8
4	.54	1.98	.21	21	4.83		90.5
5	.39	2.30	.21	25	10.86		89.4
6	.42	2.29	.21	25	10.02		89.2
7			.11	31		1.70	87.8
8			.10	31		1.60	87.5
REV D37							
1	.59	1.00	.21	18	1.56	2.00	96.2
2	.55	1.50	.21	18	2.70	1.85	91.5
3	.40	1.00	.21	26	2.23	1.73	89.0
4	.45	1.23	.21	26	2.50	1.50	88.7
5	.29	.95	.13	32	2.52	1.61	87.1
6	.35	1.12	.21	34	2.92	2.12	86.6
7	.47	1.15	.21	36	2.22		86.3
8	.50	1.66	.21	36	3.56		86.1
9	.29	.55	.21	39	1.97	1.80	85.7
10	.34	.58	.21	39	1.72	1.90	85.5
11	.70	1.62	.21	80	2.56	2.15	92.8

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D38							
1			.11	14		.94	96.2
2			.11	14		1.06	92.8
3	.72	.96	.21	19	1.29	1.94	91.2
4	.45	1.42	.21	21	3.04	1.55	90.5
5	.42	1.30	.21	21	2.85	1.48	90.2
6	.36	1.80	.21	24	5.77	1.82	89.7
7	.36	1.52	.21	24	4.23	1.49	89.5
8	.66	1.08	.21	26	1.55	1.38	88.9
9	.50	1.03	.21	26	1.87	1.91	88.6
10	.80	1.80	.21	27	2.79	2.16	88.2
11			.21	35		2.16	86.4
12			.13	35		2.01	86.2
13	.38	1.50	.21	45	3.87	1.40	84.7
14	.39	1.02	.21	45	2.32	1.60	84.7
15	.62	1.30	.21	47	2.00	1.70	84.5
16			.12	50		1.40	84.3
17			.12	52		1.60	84.2
18			.12	54		1.60	84.2
19			.12	54		1.60	84.2
20			.11	57		1.76	84.3
21	.34	1.33	.21	59	3.72	2.14	84.4
21			.11	59		1.56	84.4
22	.43	.80	.21	60	1.72	2.18	84.5
23	.43	.62	.21	61	1.40	2.34	84.5
24	.44	1.42	.22	62	3.11	2.32	84.6
25	.44	1.48	.22	62	3.31	2.40	84.7
26			.12	78		1.80	90.0
27	.80	1.20	.22	77	1.47	2.44	93.2
28	.70	1.16	.22	77	1.59	2.44	93.7
29	.63	1.60	.22	77	2.72	2.20	94.2
REV D39							
1	.47	.86	.21	11	1.70	1.74	96.2
2	.50	.88	.21	11	1.63	1.42	93.5
3			.12	28		1.48	88.2
4			.11	28		1.46	88.0
5	.54	1.30	.22	30	2.24	2.15	87.5
6	.32	1.55	.21	43	5.02		85.0
7	.30	1.54	.21	43	5.32		84.9
8	.49	1.32	.22	44	2.53	1.53	84.8
9	.28	1.58	.22	49	6.26		84.4
10	.32	1.54	.22	49	4.96		84.4
11	.34	2.22	.21	51	11.22	2.25	84.2
12	.40	2.32	.21	52	11.00	2.26	84.2
13	.36	2.08	.22	53	8.34	1.78	84.2
14	.30	1.80	.22	54	7.10	2.08	84.2
15	.25	2.31	.22	56	22.19	1.90	84.2
16	.25	2.14	.22	56	16.55	2.20	84.2
17			.10	64		1.60	84.8
18			.11	64		1.62	84.9
REV D40							
1			.22	8		1.30	96.2
2			.22	8		1.50	94.6
3	.62	1.50	.22	16	2.47	1.96	92.2
4	.44	1.32	.22	16	2.80	1.99	91.9
5			.11	18		1.53	91.5
6			.11	18		1.32	91.2
7	.52	1.12	.23	30	1.95	1.32	87.5
8	.48	1.52	.22	35	3.18		86.4
9	.59	1.52	.22	35	2.61		86.2
10	.67	1.69	.23	39	2.87		85.6
11	.65	1.90	.22	39	3.74		85.4
12	.26	2.08	.22	42	13.74		85.1
13	.27	1.81	.21	42	8.82		85.0
14	.40	1.10	.22	44	2.45		84.7
15	.48	1.23	.22	44	2.35		84.7
16	.28	2.26	.22	46	15.56	1.76	84.6
17	.44	1.26	.22	54	2.63		84.2
17	.72	1.10	.14	54	1.41		84.2
17	1.10	1.26	.22	54	1.17		84.2
17	.27	.42	.11	54	1.43		84.2
17	.73	1.62	.22	54	2.48		84.2
17	.28	.34	.12	54	1.18		84.2
17	.46	1.29	.22	54	2.60		84.2
17	.34	.52	.12	54	1.41		84.2
17	.86	1.28	.22	54	1.49		84.2
17	.28	1.48	.12	54	4.76		84.2
17	.73	1.98	.22	54	3.81		84.2

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV 041							
1			.22	5		.78	96.2
2			.22	5		.74	95.6
3			.22	8		1.47	94.7
4			.21	9		2.00	94.4
5			.21	9		1.88	94.0
6	.56	1.38	.21	14	2.34	2.01	92.7
7	.48	1.16	.22	14	2.20	1.94	92.3
8			.12	15		1.36	91.7
9	.64	1.72	.22	18	3.07	2.03	91.0
10			.11	26		1.78	88.7
11			.11	26		1.84	88.5
12			.22	28		2.40	88.2
13			.22	27		2.32	88.0
14	.54	1.24	.22	30	2.10	2.25	87.5
15			.11	32		1.72	87.2
16			.11	32		1.84	87.0
17	.56	1.40	.12	33	2.30	2.30	86.7
18			.11	33		2.00	86.5
19	.64	1.83	.22	37	3.47		85.9
20	.73	2.04	.22	37	4.14		85.7
21	.68	1.72	.22	38	2.93		85.6
22	.55	1.48	.22	42	2.65	1.72	85.0
23	.58	1.48	.22	42	2.53	1.85	84.9
24	.30	1.10	.22	44	3.41		84.7
25	.40	1.56	.22	44	3.90		84.6
26	.41	1.44	.22	45	3.37		84.5
27	.29	1.22	.22	46	3.97	1.96	84.4
28			.11	52		1.65	84.1
29	.40	1.64	.22	54	4.26		84.1
30	.40	1.61	.22	54	4.12		84.1
31	.38	1.34	.13	59	2.94	1.40	84.4
32	.74	1.81	.22	59	3.03	1.57	84.4
33	.48	1.63	.22	68	3.58	2.28	86.1
34	.60	1.62	.22	68	2.88	2.27	86.3
35	.43	1.84	.22	72	5.01	2.34	86.9
36	.47	1.65	.22	72	3.74	2.34	87.1
37	.54	1.60	.21	77	3.07	2.10	90.6
38	.42	1.32	.22	77	2.91	2.15	91.0
39	.46	1.65	.22	74	3.82	2.34	96.9
40	.40	1.50	.22	74	3.66	2.37	97.4
41	.41	1.91	.22	74	5.71	1.92	98.1
42	.34	1.75	.22	74	5.85	2.22	98.5
REV D42							
1	.38	1.14	.22	4	2.68		96.2
2	.41	1.10	.22	4	2.40	1.18	96.0
3	.34	.80	.21	17	2.21	2.01	91.4
4	.35	.97	.22	17	2.54	2.11	91.1
5	.51	.83	.22	20	1.51	1.80	90.4
6	.46	1.31	.23	20	2.66	2.02	90.0
7	.38	.83	.23	22	1.99	1.95	89.4
8	.33	1.10	.23	23	3.07	1.80	89.2
9	.40	1.10	.23	25	2.45	1.57	88.9
10	.47	1.12	.23	25	2.16	1.63	88.6
11	.29	.75	.21	27	2.50	1.98	88.1
12	.41	1.11	.22	27	2.42	2.03	87.9
13	.35	1.18	.23	29	3.09		87.7
14	.53	1.51	.22	30	2.84		87.3
15	.57	1.60	.23	31	2.91		87.0
16	.38	1.38	.24	33	3.41		86.7
17	.49	1.52	.23	33	3.12		86.6
18	.48	1.19	.22	34	2.26		86.3
19	.38	1.37	.22	35	3.38		86.2
20	.49	1.45	.23	35	2.90		86.0
21	.44	1.42	.21	37	3.11		85.8
22	.55	1.58	.22	39	2.94		85.5
23	.60	1.83	.22	39	3.64		85.3
24	.56	1.25	.22	40	2.04	2.18	85.2
25	.34	.90	.23	42	2.46	1.98	85.0
26	.39	1.04	.22	42	2.36	1.62	84.9
27	.36	1.01	.22	43	2.55	2.03	84.8
28	.33	1.13	.23	46	3.16		84.5
29	.35	1.15	.22	46	3.00		84.5
30	.90	1.50	.22	55	1.81		84.2
31	.78	1.45	.22	55	1.95		84.2
32	1.30	1.60	.22	64	1.37		85.1
33	.90	1.22	.13	64	1.33		85.2
34	.41	.95	.23	73	2.08	1.82	87.3
35	.39	.82	.22	73	1.91	2.05	87.6
36	.33	1.00	.23	78	2.80	2.20	89.6
37	.40	1.11	.22	78	2.47	2.01	90.0
38	.38	.95	.23	77	2.25	2.14	90.8
39	.46	.94	.23	79	1.86	1.98	93.6
40			.12	78		1.86	95.1
41			.12	78		1.87	95.6
42			.12	76		1.66	96.2
43			.12	76		1.78	96.7
44	.50	1.58	.23	75	3.26	2.14	98.0
45	.45	1.51	.23	75	3.34	2.06	98.6
46	.90	1.68	.23	64	2.20	1.00	105.7
47	.77	1.53	.23	64	2.14	.86	106.4

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D43							
1			.22	3		1.28	96.2
2			.22	3		.94	96.3
3			.22	14		2.25	92.3
4	.34	.54	.22	16	1.61	2.13	91.5
5	.36	.64	.22	16	1.72	2.15	91.3
6	.52	2.24	.22	18	7.50	2.00	91.0
7	.50	.84	.22	20	1.56	2.35	90.4
8	.27	.45	.14	20	1.52	2.12	90.1
9	.36	1.35	.22	22	3.54		89.7
10	.32	1.46	.22	22	4.57		89.5
11			.12	25		1.96	88.6
12			.12	25		1.97	88.4
13	.68	1.12	.14	29	1.51	2.17	87.7
14	1.05	1.45	.23	29	1.49	2.40	87.5
15	.48	.78	.12	31	1.50	1.85	87.3
16	.43	.72	.12	31	1.55	1.97	87.0
17	.64	1.44	.22	33	2.27	2.38	86.7
18	.62	1.40	.22	33	2.22	2.42	86.5
19	.57	1.42	.23	34	2.41	2.46	86.2
20	.38	1.25	.22	42	2.98	2.44	85.0
21	.43	1.56	.22	42	3.67	2.44	84.9
22	.30	1.15	.22	48	3.57	1.42	84.4
23	.31	1.08	.22	48	3.23	.85	84.3
24	.85	1.88	.22	52	2.89		84.2
25	.54	1.65	.13	52	3.02		84.2
26	.89	1.75	.22	53	2.40	1.77	84.2
27			.11	61		.98	84.6
28			.11	61		.95	84.8
29	.72	1.22	.22	69	1.64	2.22	86.1
30	.90	1.45	.22	69	1.71	2.20	86.3
31	.42	.82	.22	74	1.79	2.26	88.0
32	.48	.67	.22	74	1.34	2.17	88.3
33	.40	1.68	.22	75	4.46	2.28	88.6
REV D44							
1	.43	1.56	.22	6	3.67		96.2
2	.24	1.90	.22	5	13.85		95.2
3	.81	1.00	.22	23	1.21	2.22	89.4
4	.64	.86	.22	23	1.29	2.08	89.1
5	.34	.63	.22	52	1.82	2.00	84.1
6	.40	.66	.22	52	1.55	2.20	84.1
REV D47							
1			.21	7		.97	96.2
2			.21	7		.88	94.0
3	.38	1.76	.21	23	5.15		88.9
4	.60	1.72	.22	23	3.22		88.6
5			.10	36		1.02	85.8
6			.13	36		1.56	85.7
7	.28	.60	.21	42	2.28	1.86	84.8
8	.35	1.28	.21	48	3.41		84.1
9	.28	1.48	.21	50	5.63		84.1
10	.26	1.53	.21	52	7.05		84.1
11	.31	1.50	.22	52	4.93		84.1
12			.22	72		2.06	87.2
13			.22	72		1.66	87.5
14	.46	1.28	.22	77	2.58	2.20	91.1
15	.36	1.58	.22	77	4.51	2.18	91.4
REV D48							
1			.13	21		2.05	96.2
1			.23	21		2.10	89.4
1			.13	21		1.72	89.4
2			.22	25		1.52	88.3
3			.22	25		1.50	88.1
4	.33	.80	.22	35	2.29	1.43	86.0
5	.31	.79	.22	35	2.43	1.15	85.8
6	.45	1.35	.21	40	2.83		85.1
7	.55	1.46	.22	40	2.59		85.0
8	.65	1.39	.22	43	2.13		84.6
9	.81	1.55	.22	43	2.09		84.5
10	.56	1.77	.22	44	3.57		84.5
11	.32	1.56	.22	45	5.07		84.4
12	.32	1.16	.20	52	3.36	2.00	84.1
REV D49							
1			.22	68		2.29	96.2
2			.22	68		2.27	103.8
REV D50							
1			.22	16		1.44	96.2
2			.23	16		1.50	90.5
3	.23	1.76	.23	24	14.20	1.86	88.3
4	.23	1.70	.23	24	13.29	1.87	88.1

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV 052							
1	.37	2.37	.22	14	13.60		96.2
2	.38	2.26	.22	14	10.47		90.9
3	.48	2.06	.22	16	6.09		90.4
4	.56	2.26	.22	20	7.17		89.2
5	.54	2.47	.22	20	12.10		89.0
6	.94	2.18	.22	23	4.10	1.76	88.6
7	.88	2.14	.22	23	4.04	1.66	88.3
REV 053							
1			.23	18		1.76	96.2
2			.23	17		1.76	89.7
3	.55	2.16	.22	25	6.15	1.97	87.9
4	.55	2.10	.22	25	5.58	2.06	87.7
5	.49	.63	.22	25	1.25	1.98	87.5
6			.13	41		1.14	84.6
7			.13	41		1.04	84.5
8	.86	1.34	.23	77	1.59	2.20	91.4
9	1.09	1.42	.23	77	1.39	2.20	91.8
10	.46	1.16	.23	75	2.29		97.5
11	.49	1.06	.23	75	1.96		98.0
12	.80	1.30	.23	69	1.63	1.76	103.1
13	.46	1.18	.23	69	2.33	1.68	103.7
14	.59	1.10	.15	61	1.67		109.4
15	.86	1.33	.23	61	1.57		110.0
REV 054							
1			.12	12		1.60	96.2
2			.21	12		1.95	91.5
3			.12	13		1.20	91.0
4	.86	1.36	.21	21	1.62		88.7
5	.77	1.55	.22	21	2.19		88.5
6	.41	1.01	.22	23	2.20	2.00	88.2
7	.47	1.04	.22	23	2.01	2.03	88.0
8			.11	25		1.18	87.7
9			.11	26		1.43	87.3
10			.11	26		1.36	87.1
11	.49	1.06	.22	36	1.96	2.40	85.4
12	.58	1.08	.21	36	1.70	2.32	85.2
13	.33	1.36	.21	38	3.97	1.93	85.0
14	.42	1.68	.21	39	4.28	2.30	84.8
15	.45	1.84	.21	39	4.81	2.36	84.7
16	.49	1.78	.22	41	4.15		84.5
17			.11	43		1.32	84.4
18			.11	43		1.18	84.3
19			.11	44		1.20	84.2
20	.56	1.20	.22	46	1.94	1.82	84.1
21	.49	1.10	.22	46	2.04	1.95	84.1
22	.32	1.12	.21	47	3.24	1.08	84.0
23	.40	1.00	.22	48	2.23	2.13	84.0
24	.40	1.32	.21	48	3.03	2.06	83.9
25			.21	51		2.20	83.9
26			.11	53		1.74	83.9
27			.11	53		1.72	84.0
28			.11	55		1.78	84.0
29			.11	57		1.42	84.2
30			.11	58		1.36	84.3
31	.48	1.12	.22	59	2.12	2.24	84.4
32	.33	.96	.21	76	2.69	2.33	89.4
33	.30	.90	.21	76	2.83	2.30	89.7
34			.21	78		2.32	91.0
35			.21	78		2.38	91.4
36	.44	.70	.21	79	1.50	2.31	91.9
37	.40	1.18	.22	78	2.64	1.90	92.5
38	.43	.98	.21	78	2.06	2.08	92.8
39	.86	1.88	.21	77	2.86	1.61	94.4
40	.72	1.72	.22	77	2.80	1.56	94.9
REV 055							
1			.13	11		1.54	96.2
2			.13	11		1.43	91.4
3	.40	1.02	.22	31	2.27	2.18	86.3
4	.38	1.15	.22	33	2.71		85.9
5	.43	1.00	.22	33	2.10		85.8
6	.66	1.86	.22	43	3.51	2.34	84.3
7	.74	1.68	.22	43	2.62	2.34	84.2
8	.46	1.37	.22	44	2.83	1.84	84.2
9	.83	1.12	.13	46	1.29	1.76	84.1
10	.53	2.30	.22	48	8.16	2.24	84.0
11	.58	2.08	.22	48	5.20	2.25	84.0
12	.28	2.32	.22	51	17.28	2.30	83.9
13	.25	.85	.22	53	3.97	1.97	84.0
14	.24	1.88	.22	54	13.47	2.00	84.0
15	.28	2.28	.22	54	16.11	2.08	84.1
16	.26	1.38	.22	55	6.03	1.88	84.1
17	.28	1.26	.22	58	4.47	2.28	84.3
18	.32	1.34	.22	58	4.03	2.30	84.4
19	.40	1.22	.22	61	2.74	2.25	84.7
20	.46	1.20	.22	61	2.38	2.38	84.8
21	.40	1.35	.22	66	3.13	2.32	85.6
22	.40	1.16	.22	66	2.59	2.38	85.8

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BCS 39739-65

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV 056							
1	.56	1.10	.22	7	1.77	1.56	96.2
2	.65	1.05	.21	7	1.52	.70	93.0
3			.22	14		1.86	90.9
4	.48	1.08	.23	16	2.04	1.80	90.3
5	.44	1.70	.22	16	4.20	1.93	90.1
6			.22	18		1.82	89.7
7			.22	17		1.70	89.5
8	1.00	1.40	.22	28	1.48		86.9
9	.52	1.29	.22	30	2.30		86.5
10	.31	1.54	.22	30	5.14		86.4
11	.51	.98	.22	32	1.75		85.9
12	.51	1.42	.21	34	2.69		85.6
13	.86	2.03	.22	34	3.52		85.5
14	.43	1.80	.22	37	4.80		85.2
15	.62	1.90	.22	37	3.87		85.1
16	.62	1.48	.22	40	2.42		84.7
17	.46	1.17	.22	40	2.31		84.6
18	.40	1.05	.22	41	2.33		84.5
19			.13	45		1.73	84.2
20			.13	45		1.82	84.2
21	.48	1.09	.22	47	2.06	1.48	84.1
22	.50	2.00	.22	49	5.38	2.02	84.0
23	.42	2.26	.22	50	9.52		84.0
24	.38	1.38	.22	51	3.41		84.0
25	.56	1.56	.22	52	2.82		84.1
REV 057							
1			.22	4		1.10	96.2
2	.30	.40	.22	4	1.39	.80	93.8
3			.22	14		1.24	90.8
4			.22	14		1.13	90.5
5			.12	17		1.02	89.9
6			.14	17		1.24	89.6
7	.40	1.16	.22	17	2.59	2.32	89.4
8	.56	1.28	.22	27	2.10	2.03	87.0
9	.56	.72	.22	28	1.20	2.16	86.8
10			.12	29		1.64	86.6
11	.53	.90	.22	30	1.56	2.32	86.3
12	.55	.87	.22	32	1.45	2.16	86.0
13	.66	.76	.21	32	1.12	2.16	85.9
14	.26	.46	.12	34	1.60	1.71	85.7
15	.86	1.20	.22	34	1.37	2.38	85.5
16	.79	.99	.22	36	1.22	2.33	85.2
17			.12	36		2.10	85.1
18			.12	38		1.88	84.8
19	.36	1.59	.21	45	4.57	1.71	84.2
20	.32	1.60	.21	45	5.30	2.10	84.1
21	.52	2.14	.22	59	6.31		84.5
22	.59	2.12	.22	59	5.43		84.6
REV D58							
1	.50	2.20	.22	11	7.29	1.96	96.2
2	.47	2.36	.22	11	10.53	1.83	91.4
3	.38	.80	.22	20	1.93	2.23	88.6
4	.33	1.24	.22	22	3.50	2.33	88.2
5	.35	1.90	.22	22	6.73	2.32	88.0
6	.32	1.80	.22	23	6.62	2.16	87.8
7			.22	26		2.23	87.2
8			.22	26		2.14	87.1
9	.34	1.32	.21	29	3.68	1.15	86.5
10	.38	1.66	.22	29	4.61	.76	86.3
11	.34	1.34	.22	31	3.76		86.0
12	.43	1.26	.22	31	2.68		85.9
13	.38	1.03	.22	34	2.42		85.5
14	.48	1.25	.22	34	2.40		85.4
15	.48	1.64	.22	36	3.62		85.1
16	.46	1.66	.22	36	3.86		85.0
17	.51	1.51	.22	40	2.96		84.7
18	.73	1.70	.22	40	2.71		84.6
19	.84	1.46	.22	54	1.84	1.76	84.1
20	.78	1.53	.22	54	2.12	2.06	84.1
REV D59							
1			.24	3		1.18	96.2
2			.23	3		.98	94.0
3	.26	1.27	.23	31	5.37	2.39	86.0
4	.35	1.30	.23	32	3.48	1.83	85.8
5	.44	1.11	.23	33	2.28		85.6
6	.52	1.30	.23	33	2.33	2.20	85.4
7			.23	35		2.22	85.2

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PHOTOGRAPHIC EVALUATION

ACC. NO.	DENSITY DMIN	DENSITY DMAX	DENSITY BASE + FOG	SUN ANGLE (DEGREES)	BRIGHTNESS RANGE	CLOUD DMAX	ALTITUDE (NM)
REV D63							
1			.22	9		.73	96.2
2			.22	26		1.60	86.7
2	.62	.84	.13	26	1.28	.79	86.7
2	1.09	1.36	.22	26	1.31	1.36	86.7
3	.26	.90	.22	39	3.79	.86	84.5
4	.25	1.02	.22	44	4.66	1.02	84.1
5	.34	1.39	.22	60	3.96	2.28	84.8
6	.38	1.49	.22	60	3.83	2.30	84.9
REV D64							
1	.42	.63	.23	13	1.44	1.22	96.2
2	.38	1.58	.23	17	4.21	1.40	89.0
2			.14	17		1.10	89.0
2			.23	17		1.38	89.0
3			.23	24		1.70	87.0
4	.28	.36	.23	32	1.39	.44	85.6
5	.29	.36	.23	32	1.28	.47	85.5
6	.42	1.40	.22	36	3.17		84.9
7	.43	1.44	.23	36	3.24		84.8
8	.30	1.08	.23	45	3.34	.90	84.1
9	.37	1.15	.22	45	2.80	.70	84.0
10	.33	1.36	.23	52	3.97	1.67	84.0

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APPENDIX B

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PERFORMANCE EVALUATION TEAM
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PHOTOGRAPHS NO. 14 & NO. 15

These two photographs provide a comparison of duplicate photography obtained of radio towers and bridge at Milwaukee, Wisconsin, on Missions 4017 and 4022.

PHOTOGRAPH NO. 14
(Mission 4017)

Rev D31 Frame 003

Altitude:	87.55 NM	Obliquity:	+10.0°
Scale:	1:84,670	Strip	

20X

PHOTOGRAPH NO. 15

Rev D31 Frame 001

Altitude:	85.4 NM	Obliquity:	-24.4°
Scale:	1:89,200	Strip	

20X

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PHOTOGRAPH 14

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PHOTOGRAPH 15

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PHOTOGRAPHS NO. 16 & NO. 17

These two photographs provide a comparison of duplicate photography obtained of a gas storage tank in Chicago, Illinois

PHOTOGRAPH NO. 16
(Mission 4017)

Rev D31 Frame 004

Altitude: 87.3 NM Obliquity: 26.6°
Scale: 1:92,300 Strip

40X

PHOTOGRAPH NO. 17

Rev D31 Frame 003

Altitude: 85.3 NM Obliquity: -13.0°
Scale: 1:86,100 Stereo

40X

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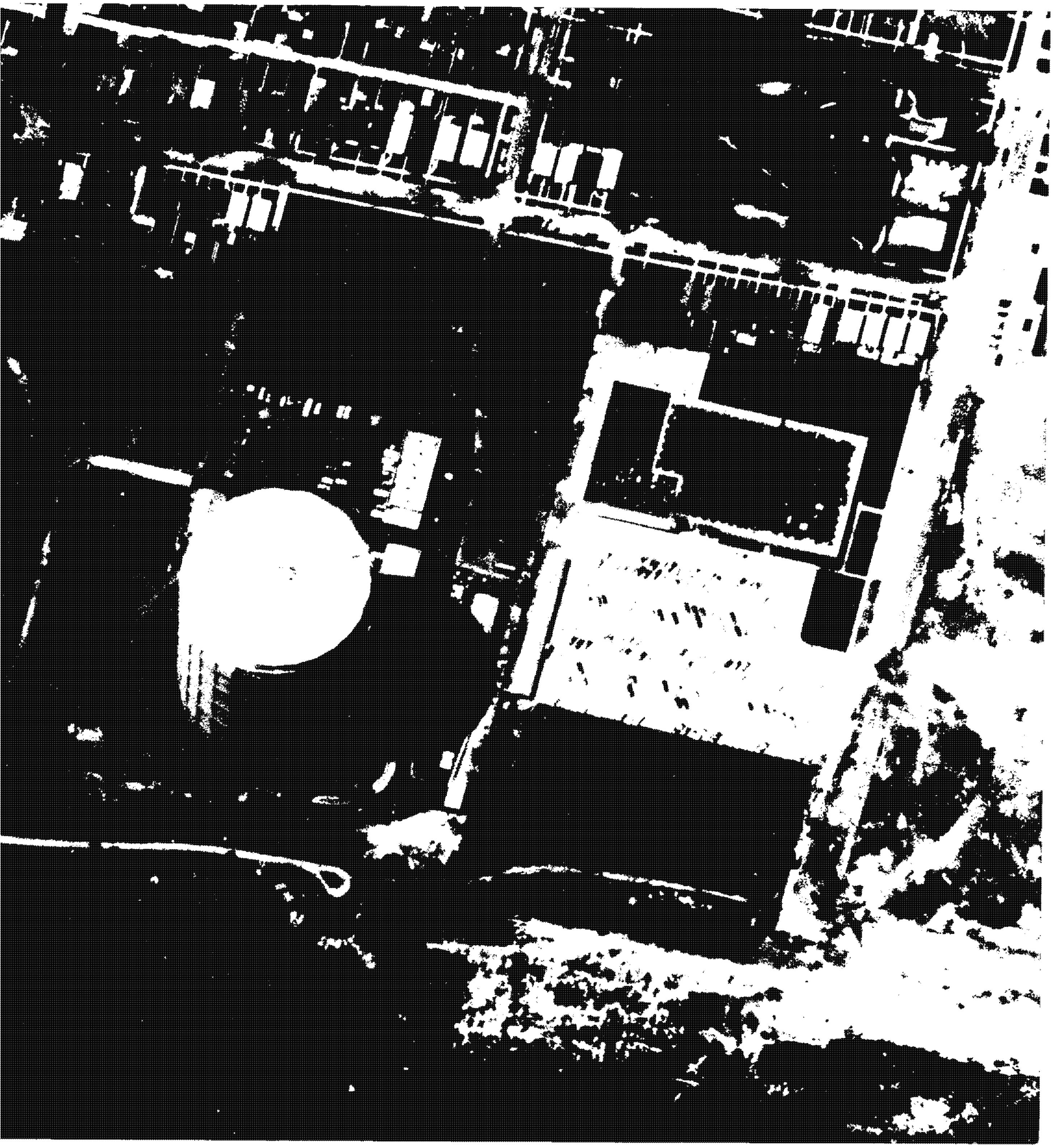

PHOTOGRAPH 16

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PHOTOGRAPH 17

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PHOTOGRAPH NO. 18

Football stadium with game in progress -
Chicago, Ill.

Rev D31 Frame 003

Altitude:	85.2 NM	Obliquity:	-13.0°
Scale:	1:85,900	Stereo	

20X

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PHOTOGRAPH 18

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PHOTOGRAPH NO. 19

Midway Airport, Chicago, Illinois

Rev D31 Frame 002

Altitude: 85.3 NM Obliquity: -13.0°
Scale: 1:86,100 Stereo

10X

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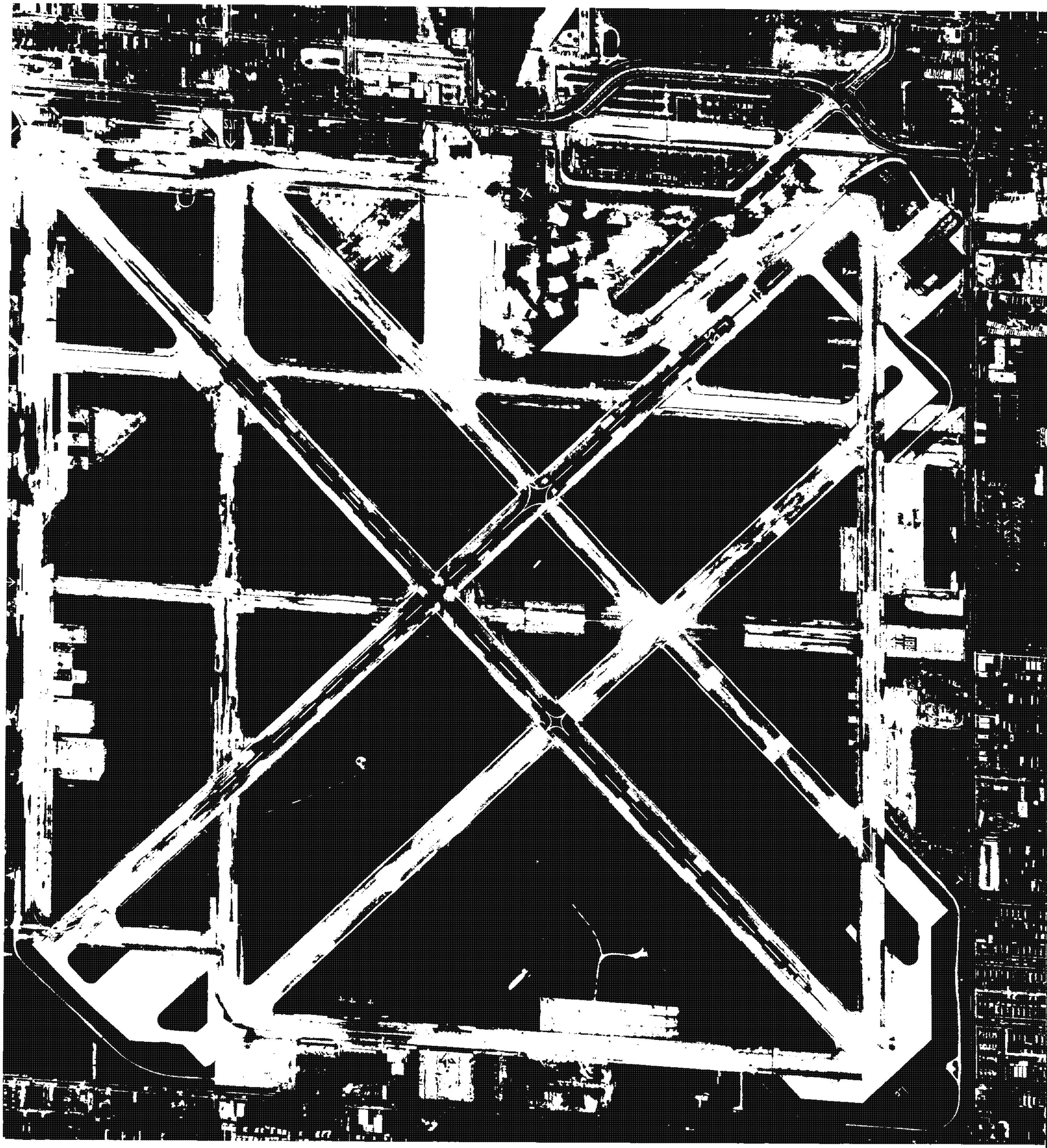

PHOTOGRAPH 19

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PHOTOGRAPH NO. 20

Hangar buildings, Lowry AF Base, Colorado

Rev D48 Frame 011

Altitude:	84.4 NM	Obliquity:	+6.0°
Scale:	1:80,500	Strip	

20X

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PHOTOGRAPH 20

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PHOTOGRAPH NO. 21

Drive-in Theatre at Phenix City, Alabama
Note Speaker Stands

Rev D47 Frame 010

Altitude: 84.1 NM Obliquity: -19.7°
Scale: 1:87,907 Strip

40X

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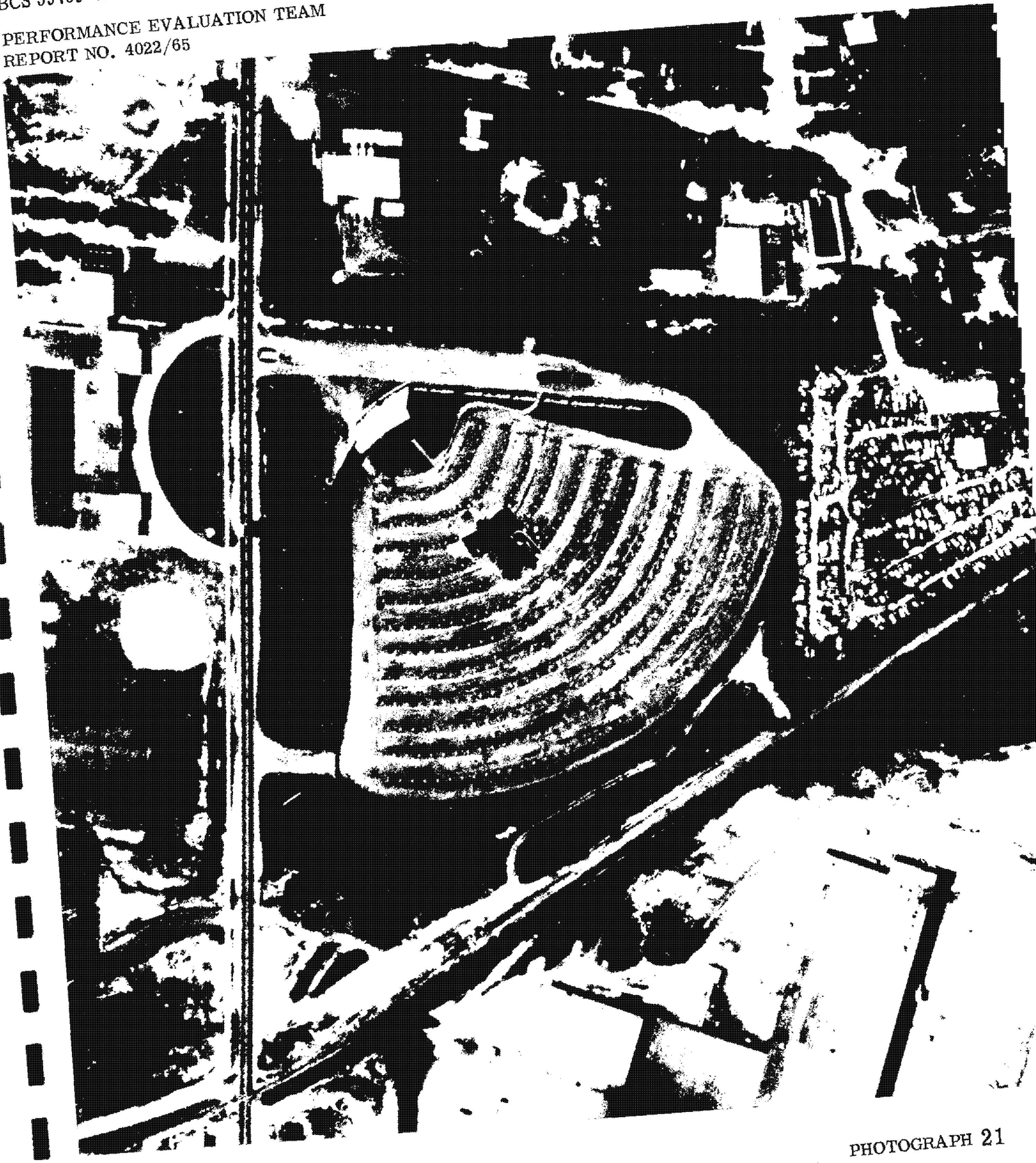

PHOTOGRAPH 21

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