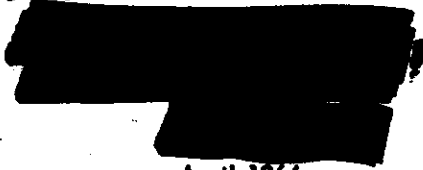


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April 1964

TECHNICAL PUBLICATION



PHOTOGRAPHIC EVALUATION REPORT

MISSION 9062

21 - 26 DECEMBER 1963

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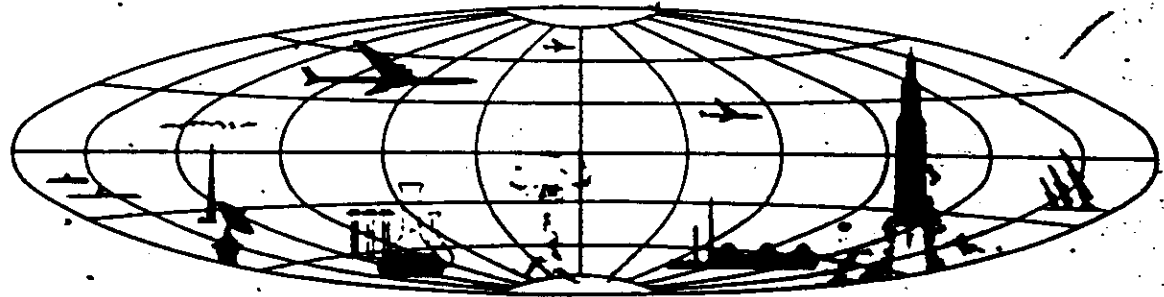
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TECHNICAL PUBLICATION

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NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER

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SUMMARY AND CONCLUSIONS

Mission 9062 (██████████ M-26) was launched into a prograde orbit on 21 December 1963 at 2146Z. The mission accomplished 80 revolutions which included 41 photographic passes. The payload consisted of 5,734 panoramic frames (2,884 FWD, 2,850 AFT), 412 stellar index frames and 416 terrain index frames. A total of 147 targets were reported in the preliminary target readout. The quality of the photography and its suitability for photographic interpretation are generally comparable to Mission 9057.

Both panoramic cameras operated satisfactorily; however, the film from the master (FWD) panoramic camera was seriously degraded by corona fog.

The overall cloud cover of the mission

was 40.3 percent: 41.9 percent was clear, 13.4 percent was completely overcast, and 44.7 percent was obscured to varying degrees.

All auxiliary cameras operated satisfactorily throughout the mission. Sufficient data was acquired from the horizon cameras to determine vehicle attitude. The stellar index camera produced star images through the fifth magnitude and, although some difficulty was encountered in the calculations, yaw was determined for most of the mission. The stellar and terrain index cameras operated simultaneously throughout the mission at the proper ratio of one stellar index exposure for each seven panoramic frames, and the results were good.

GENERAL FLIGHT DATA

Place of Launch: ██████████
Date of Launch: 21 December 1963, 2146Z
Launch Vehicle: Thor w/TAT Booster, and Agena No 1168

The payload capsule was recovered dry on revolution 80, 26 December 1963.

Orbital Parameters:

Planned	Actual (Revolution 57)
Period: 90.04 min.	89.59 min.
Perigee: 100 nm	99.57 nm
Apogee: 215 nm	196.71 nm
Eccentricity: .0144	.0135
Inclination Angle: 65°	64.57°

PART I. CAMERA OPERATION

1. Master (FWD) Panoramic Camera No 130: This camera was operational throughout the mission; however, photography from this unit is seriously degraded by intermittent fog caused by corona static discharges. The fogging first appears in pass D07 and affects almost all subsequent passes, becoming more severe and occurring more frequently as the mission progresses. A diagonal light leak is present between the

second and third frames of most passes, and occasionally shifts into the format of the third frame. Faint shadowgraphs of equipment appear at the start (second or third frame) and end (last or second last frame) of most passes.

Rail scratches and occasional base and emulsion scratches are present throughout. In addition, four small camera-induced emulsion digs are present in the vicinity of the camera

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number on every format. Similar digs are present outside the format on the frequency mark edge.

2. Slave (AFT) Panoramic Camera No 131:

This camera was operational throughout the mission. A minor diagonal light leak is usually present on one of the first three and the next to last frame of each pass. Equipment shadowgraphs appear intermittently on the film and are generally located within the first and second from last frames of most passes.

A few minor corona static discharges are noted throughout the mission, with an increase in frequency and intensity on the last few passes of the mission.

Four small camera-induced scratches are consistently present in the vicinity of the camera number, and four similar scratches are present on the frequency mark edge of the film.

3. Master (FWD) Horizon Cameras:

The port (supply) horizon camera operated normally throughout the mission. Underexposure prevails at the start of most passes but improves on passes which occur over areas of higher sun angles. Where the exposure is sufficient to permit analysis, acuity is very good.

The starboard (take-up) horizon camera operated normally throughout the mission. The exposure is adequate and acuity is very good.

4. Slave (AFT) Horizon Cameras:

The starboard (supply) horizon camera was operational throughout the mission. The exposure is adequate and acuity is very good. The port (take-up) horizon camera was operational throughout the mission. Most passes are underexposed in the northern latitudes, but this condition improves in areas of higher sun angles. The acuity is very good where the exposure is sufficient to permit analysis. Mission 9062 is the first mission to utilize the modified horizon camera. The acuity of the photographs from these cameras is, for the

most part, very good and in some instances excellent.

An experiment was conducted on exposure. The two west-looking (starboard) horizon camera apertures were set at f 8.0 and the east-looking (port) camera apertures were opened to f 6.8. All four camera shutters were set at 1/100 second and Wratten 25 filters were used. The west-looking camera negatives were adequately exposed throughout the mission, but the east-looking camera negatives were, in most instances, underexposed. On passes which occurred near or over the Equator, the east-looking horizon camera negatives were adequately exposed and in one case, pass D18, overexposed.

All horizon frames are vignetted, but the location of the vignetted area is such that it does not seriously interfere with the use of the photography in determining vehicle pitch and roll.

5. Stellar Index Camera No D34/34/31:

This camera operated at a ratio of 7 to 1 with the master unit until the supply of film was exhausted. The shutter remained open during the metering part of the camera cycle between frames 10 and 11 and frames 27 and 28. In addition, approximately 35 percent of each format was rendered unusable because of vignetting and reflections.

The edge of the film opposite the camera number contains a profusion of dendritic edge static. This static is in the border area and does not affect the formats. There are, however, large discharges of dendritic static within the formats of frames 40, 41, 42, and 393, and corona fog on frames 394 to 412.

The last five feet of the film contains transverse emulsion cracks which extend from edge to edge and are spaced approximately 0.25" apart. The gross fog rises and falls in a cyclical manner, which may be due to a very small light leak. (See Stellar Density Readings).

The threshold conditions for stellar imagery changed during the mission and in no instances were stars of greater magnitude than 5.5 recorded. Due to the lack of stellar images, and the unfavorable distribution of the few (5) which are present, the geometry is weak and the data difficult to reduce. Because of poor images, no images, or bad geometry, 128 frames (31 percent) are unusable.

The fiducial crosses on the film are unusable throughout most of the mission because of their low density. As a result, three reseau crosses within the frame area had to be used instead.

6. Terrain Index Camera No D34 34 31: This camera operated simultaneously with the stellar camera throughout the mission. There is dendritic static, the type which occurs when the film is negatively charged,* along the titled edge of the film. Also along this edge are intermittent discharges of edge static (for example: frames 256, 272, 294, 328, and 380) similar to those which occur when the film carries a positive charge. Dendritic static is also found within the format area of frames 81, 112, 178, 179, 205, 206 and 415. The last three frames (414, 415, 416) contain corona static.

A diagonal light leak, which originates at the camera number and extends 0.5" into the format,

is evident on frames 31, 70, 159, 168, 173, 239, 245, 253, and 317.

The grid is well defined in all frames. However, there are small gaps in the grid (Example: Frame 403)..

7. Collateral Equipment:

a. The 200 cycles per second (CPS) frequency marks are present on all frames. They are slightly flared but in no instance do they affect the panoramic formats.

b. The read-out of the binary data block was accomplished without any problems. This is the best operation of the data block to date. The images are bloomed throughout, and due to a slight mistracking of the film the top line of binary images is sometimes partially cut off by the edge of the film.

c. The horizon camera fiducials recorded properly throughout with very little blooming noted.

d. In most instances the stellar and index correlation and fiducial marks recorded too faintly to be used for their intended purpose.

e. The camera-off marker recorded satisfactorily throughout.

f. The camera numbers, though bloomed, are readable and recorded properly throughout.

PART II. FILM

1. Film Processing: This section provides a descriptive evaluation of the exposure and the processing, and comments on the exposure, the density, the processing and the physical condition of the original negative.

Pertinent data was collected during various phases of the processing and more thoroughly

*Eastman Kodak Company. *Manual of Physical Properties of Kodak Aerial and Special Sensitized Materials*. Section 12. "Electrical Properties." Rochester, N.Y. Jun 61 (UNCLASSIFIED)

during the evaluation of the negatives. This is a standard procedure. The community is informed by cable of any extensive defects in the photography which may affect the PI suitability of any mission.

Support organizations provided the processing center with pre-launch samples of the actual film used on this mission. These samples along with fresh process control stock, were sensitometrically exposed and processed a

controlled levels of development. A characteristic curve was prepared from these sensitometric strips and is defined as the Mission Material Processing Curve.

While the film was being prepared for processing, it was inspected for physical damage which could cause processing difficulties. During processing, data was recorded giving the processing conditions and film footage locations where processing changes occur. Changes in the normal course of processing which may affect the film quality were recorded, and after processing, the original negatives were examined frame by frame for defects and damage.

Most of the film on this mission received adequate exposure. The sun angle varied from 0° 04' in pass D71 to 47° in pass D18. Acceptable photography was accomplished with a minimum sun angle of 3° 56' in pass D54 at a latitude of 60° 55' N. The photographs taken at the lower latitudes where the sun angle was relatively high (30° - 40°) have more than optimum density. The greatest variations that are directly attributed to the exposure are the horizon images. In the northern latitudes the port horizons could not be detected when the sun angle was below 14°. The starboard horizon cameras received optimum exposure with the exception of overexposure on the later part of part D18 where the sun angle was 47°.

The stellar index camera film on this mission received less than optimum exposure. A longer exposure time could be used without danger of excessive fog. The terrain index camera film received adequate exposure.

The film from both panoramic cameras received similar processing. The entire mission was subjected to a full level of processing with the exception of ten sections which were processed at the intermediate level. The gross fog density readings range from a minimum of 0.10 to a maximum of 0.30. Some of the higher

readings can be attributed to a corona which fogged sections of the film.

The film from both the stellar and the terrain index camera were processed normally. However, the terrain index film appears to have received less than optimum development.

The densities of the negatives range from medium to heavy. Some of the higher densities again can be attributed to corona.

The density of the stellar negatives is less than optimum for detecting stars and star fields. The densities of the terrain index camera negatives are adequate.

2. Film Degradations:

This section lists some of the more notable film degradations, and a few frames on which examples of each can be found.

a. Master (FWD) Panoramic Camera

Corona	Found on approximately 1500 frames from pass D07 to the end of the mission. Up to pass D16, it is restricted to the first 4 frames of each pass. From pass D16 on, it affects more frames, and becomes more severe. Occasionally, it is noted that the frequency mark edge is more degraded than the tilted edge.
Light Leak	A thin diagonal light leak is present on the first few and last few frames of every pass.
Rail Scratches	Present throughout.
Emulsion Digs	Four small emulsion digs are present in the format, adjacent to camera number, in all frames. Four more are located on the frequency mark edge, outside the format.
Minus Density Streak	Pass D04, frames 28 and 29. Pass D15, frames 1 thru 14.
Edge Static (Frequency Mark Edge)	Pass D07, frame 5.
Manufacturing Splice	Pass D18, frames 53 and 55.
Minus Density Comet	Passes D19, frame 16; D20, frame 100; D21, frame 23; and D22, frame 12; D16, frame 62; D24, frames 29 and 41; D34, frames 7, 12, 24, 26.



D07 07 FWD



D07 07 AFT

FIGURE 2. FIRST OF A CORONA TYPE FOG SHOWING TEXTURAL PATTERN IN PANORAMIC PHOTOGRAPHY (FWD ONLY).

NPIC 000001 11/68

D47 53 FWD

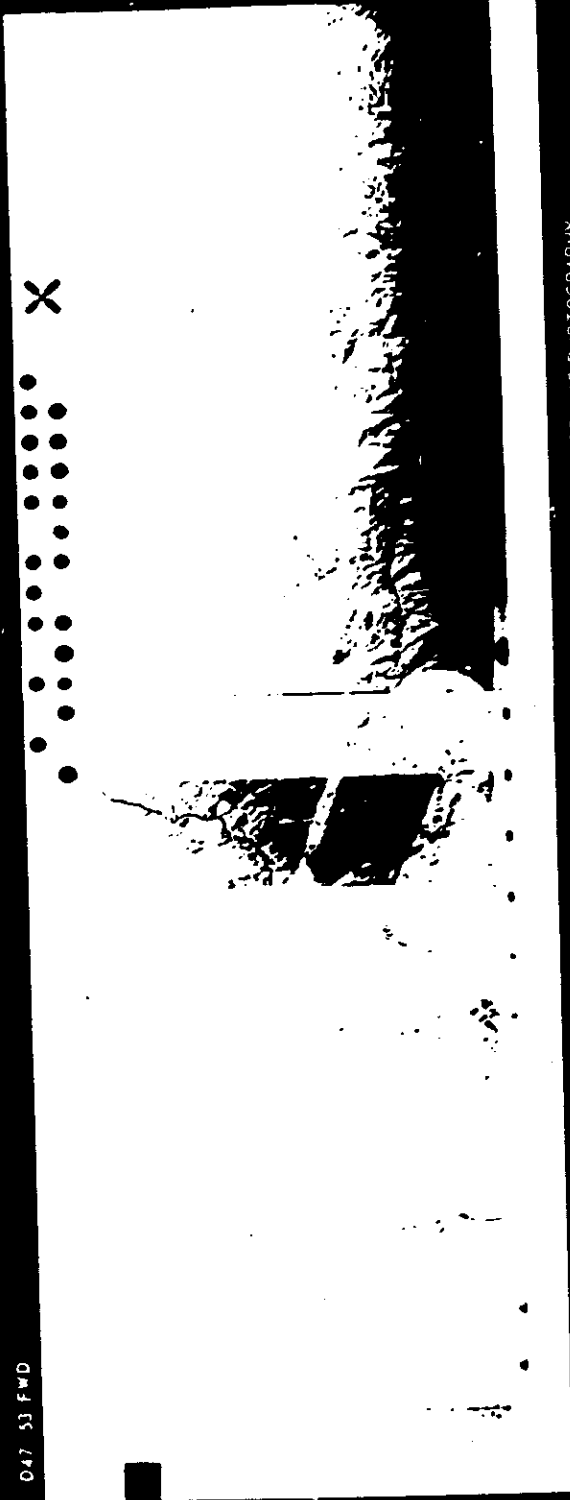


FIGURE 3. SHADOWGRAPH OF CAMERA EQUIPMENT ON LAST FRAME OF PASS IN PANORAMIC PHOTOGRAPHY.

D07 03 AFT



FIGURE 4. DIAGONAL LIGHT STREAK IN PANORAMIC PHOTOGRAPHY.

D05 62 AFT

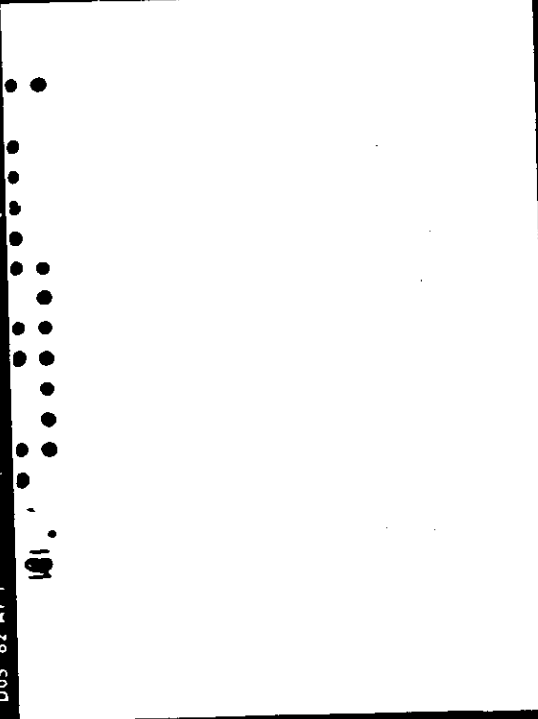


FIGURE 5. DATA BLOCK OFF EDGE OF FILM AND FLARED CAMERA NUMBER IN PANORAMIC PHOTOGRAPHY.

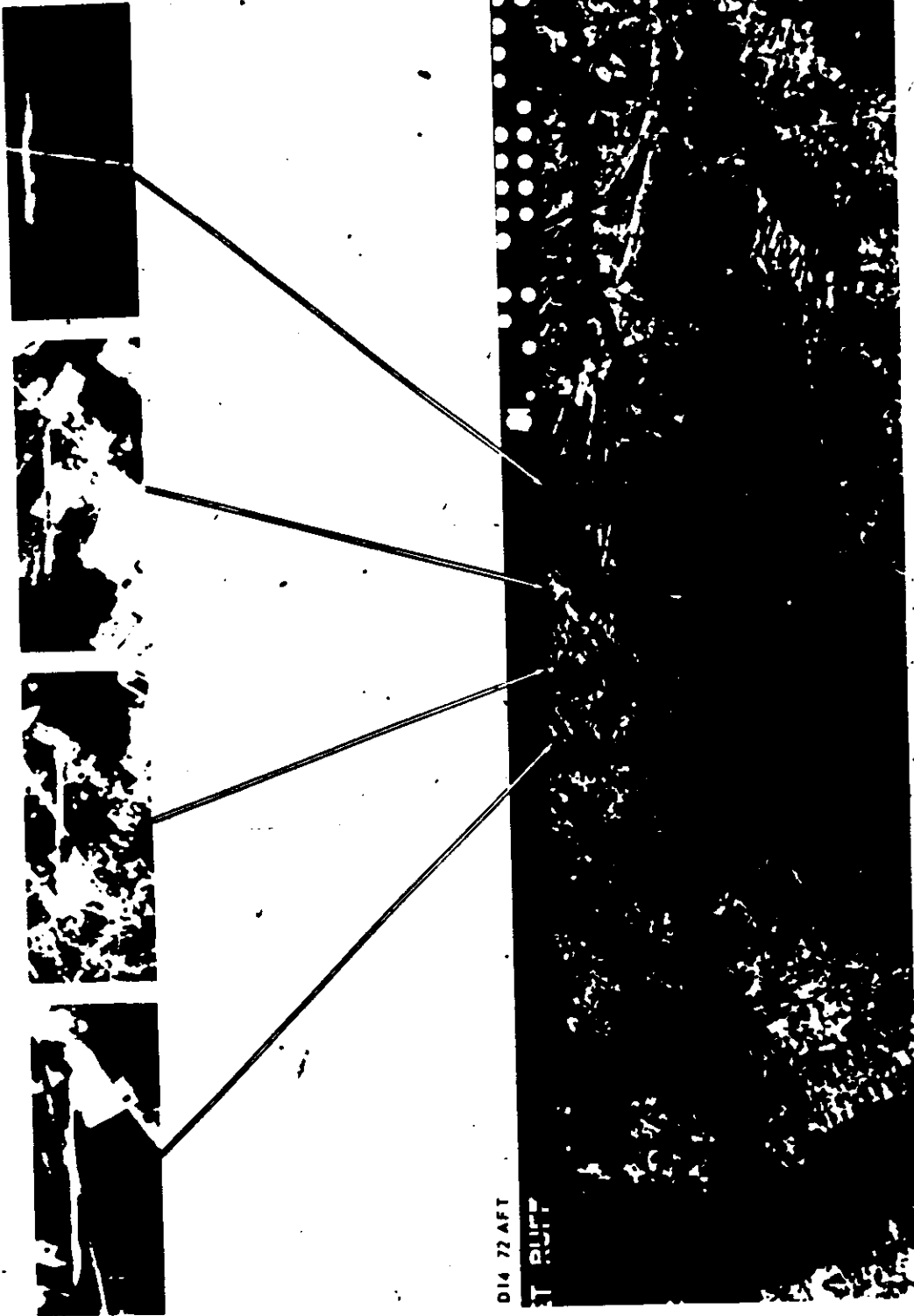
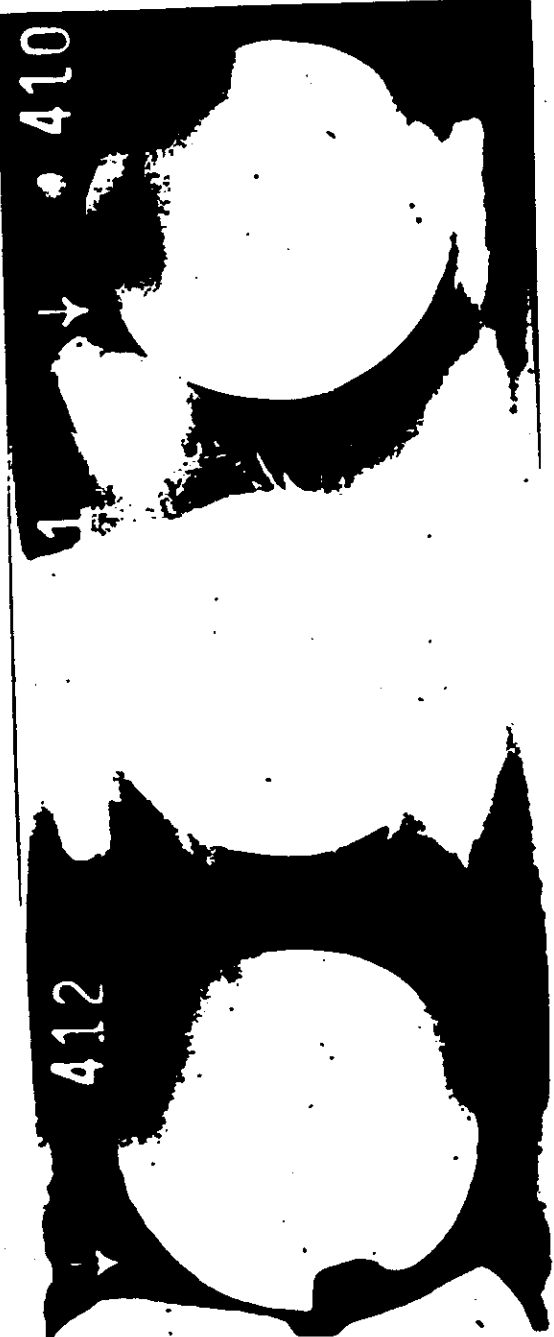


FIGURE 6. DEGRADATION BY DIGS IN PANORAMIC PHOTOGRAPHY.



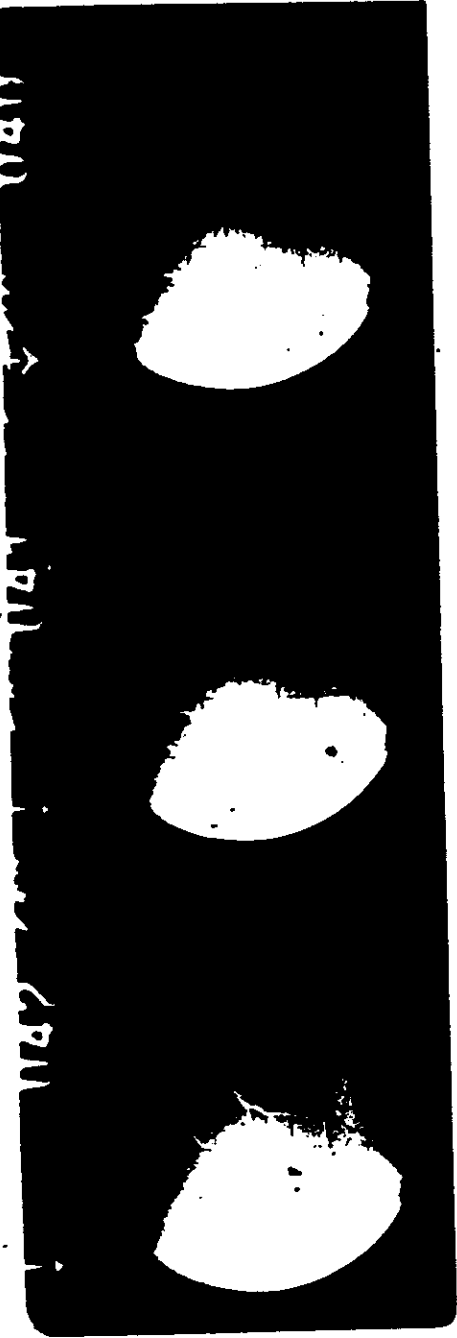
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MPIC 44-8878 157641

FIGURE 7. CORONA STATIC ON STELLAR INDEX PHOTOGRAPHY.

2X ENLARGEMENT



MPIC 44-8877 157601

FIGURE 8. DENDRITIC EDGE STATIC ON STELLAR INDEX PHOTOGRAPHY.

Transverse Bars of Varying Density Passes D21, frame 3.

Emulsion and/or Base Scratches Passes D79, D10, D37, D66, D71, and D72.

Crease Pass D07, frame 67.

Blisters and Pinholes Not excessive.

b. Slave (AFT) Panoramic Camera

Corona Static Passes D91, frame 3; D07, frame 53; D56, throughout; D71, frames 45 to 125; D72, throughout; D24, frames 27 & 75; D77, throughout; D79, throughout.

Light Leaks First few and last few frames of every pass.

Transverse Bars of Varying Density Passes D36, frames 50 to 65 and D66, frames 37 to 50.

Manufacturing Splice Pass D37, frame 73.

Minus Density Comets Passes D66, frame 12; D67, frame 26; D24, frame 54; D25, frame 16; and D19, frame 38.

Emulsion and/or Base Scratches Passes D18, frame 48; D67, frame 26; D24, frame 54; D25, frame 16; and D79, throughout.

Edge Static Pass D79, frames 24 and 26.

Edge Ripple Pass D72, frames 75 and 79.

Blisters and Pinholes Not excessive.

Emulsion Digs Four small emulsion digs are present in the format, adjacent to camera number, in all frames. Four more are located on the frequency mark edge.

Rail Scratches Present throughout.

c. Stellar Index Camera

Shutter Malfunction Frames 10 and 27.

Foreign Matter Frames 36, 63, 75, 107, 109, 286, 287, 292.

Dendritic Static Frames 40, 31, 42, 393.

Edge Static Throughout.

Corona Frames 394 to 412.

Minus Density Dots Frames 352.

Emulsion Cracks Frames 355 to 412.

d. Terrain Index Camera

Minus Density Dots Frames 6, 9, 10, 11, 44, 45, 46, 49, 406, 403.

Edge Static Frames 236, 272, 294, 325, 350.

Scratches Frames 412 to 416.

Foreign Matter Frames 5, 9, 10, 21, 107.

Corona Frames 414 to 416.

Dendritic Static Frames 51, 112, 175, 179, 203, 206, and 415.

Light Leaks Frames 31, 70, 159, 165, 173, 239, 245, 253, 311.

Broken Grid Lines Throughout (Example: 403)

PART III. IMAGE QUALITY

1. Photographic Interpretation (PI) Suitability:
This is a subjective rating by which the relative success of a mission may be measured. It is based upon usability (or interpretability), the degree of confidence which the interpreters

place in the photographs, and their ability to obtain intelligence information from the mission. In determining PI suitability, all factors which affect the amount of information which can be gained from the photography are taken into

consideration. These factors include physical defects in the film or the camera system as well as limiting weather conditions. Targets are rated on an individual basis and fall into one of five categories:

Excellent: A scene in which extremely fine detail is consistently discernible. Edges and corners of buildings are sharp and well defined, contrast is optimum throughout, and there are no degrading factors such as unfavorable atmospheric conditions, camera malfunctions, or processing anomalies.

Good: A scene in which fine details such as small buildings and trails are readily discernible. Edges and corners of buildings are sharp and well defined, contrast is good throughout, and there are no degrading factors such as unfavorable atmospheric conditions.

Fair: A scene in which small buildings and trails are identifiable but edges and corners not sharp and well defined. Contrast may be slightly less than optimum but there are no degrading factors such as unfavorable atmospheric conditions.

Poor: A scene in which small buildings and trails are not readily identifiable and edges and corners not well defined. Contrast is less than optimum and atmospheric conditions or other degradations prevail.

Unusable: A scene in which identification of objects such as cultural features would be inaccurate and incomplete.

2. PI Suitability For Mission 9062: The PI suitability of this mission is considered good in that fine detail is readily discernible through most of the mission. Photo Interpreters reported on 147 targets in the preliminary target readout of which five were given the quality ratings of poor and the remainder a rating of good. Poor quality ratings due to low sun angle were given to three targets, two targets show poor imagery due to atmospheric. Snow cover was

given as a hindering factor on 25 targets; however, in targets such as engine test stands the snow cover was of great assistance in determining blast marks. Highlights of targets covered by the mission are as follows:

ICBM launch site.

A tracking station.

A nuclear weapons bunker within a conventional weapons storage area.

Activity at two rocket engine test facilities.

Identification of equipment at surface-to-air missile sites.

Construction at an airframe plant and at two missile test facilities.

Mission 9062 produced some of the best photography to date from KH-4 camera systems; however, degradations are present. Problems encountered, which have a direct effect on PI suitability, and the extent of degradation are as follows:

Corona Static: Fog, due to corona discharge, affects approximately 1,500 frames of the master (FWD) panoramic negatives. The effects of corona discharge on image quality can be readily seen by a comparison of the resolution target in pass D77, frame 37 FWD and 43 AFT. The slave (AFT) panoramic camera resolves 15 feet whereas the master camera can resolve only 25 feet. MILSPEC Standard 150 was used for interpreting the resolution target. Although not as severely affected, pass D47, frame 31 FWD and 37 AFT covering another resolution target range displays nearly the same results as the target range on pass D77. Corona discharges are present on the slave photography; however, these are of very light intensity and only on the last few passes of the mission. Example: pass D71, frame 125. The corona fogging has an adverse affect on stereo capability on numerous targets in the mission.

Light Leaks: Diagonal patterns and equipment shadowgraphs are present intermittently

STELLAR INDEX PHOTOGRAPHY (2X ENLARGEMENTS)

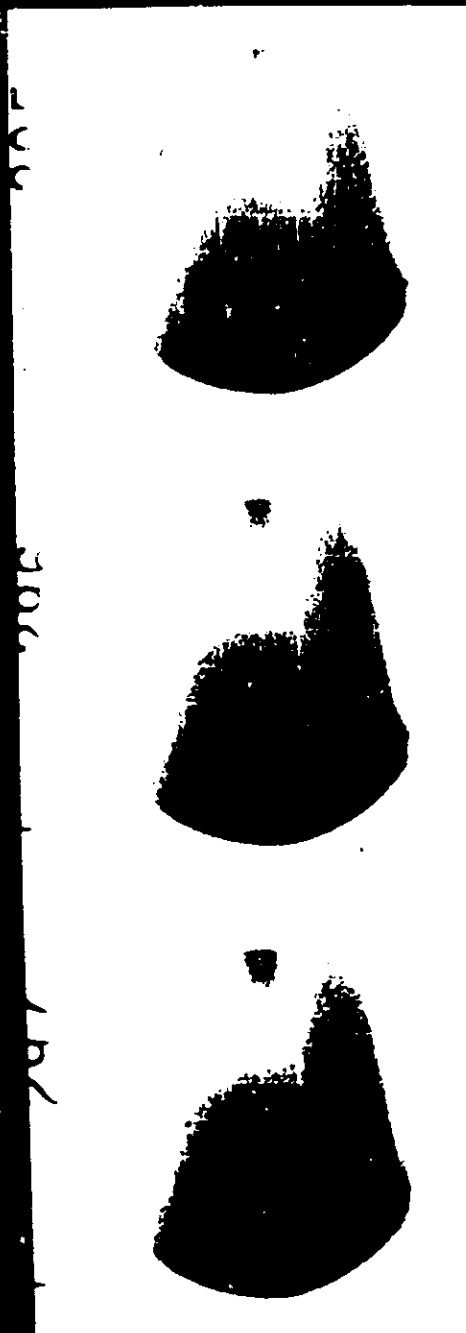


FIGURE 9. AVERAGE STELLAR FIELD, INOPERATIVE CORRELATION LAMPS AND FLARE.

NPIC 11-9818 (12/74)

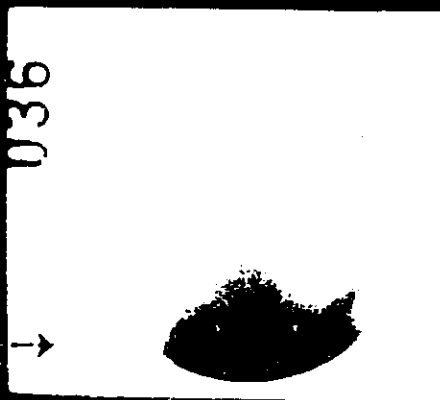


FIGURE 11. FOREIGN MATTER.

NPIC 11-9820 (12/74)



FIGURE 10. DENDRITIC STATIC FROM HIGH ENERGY POINT.

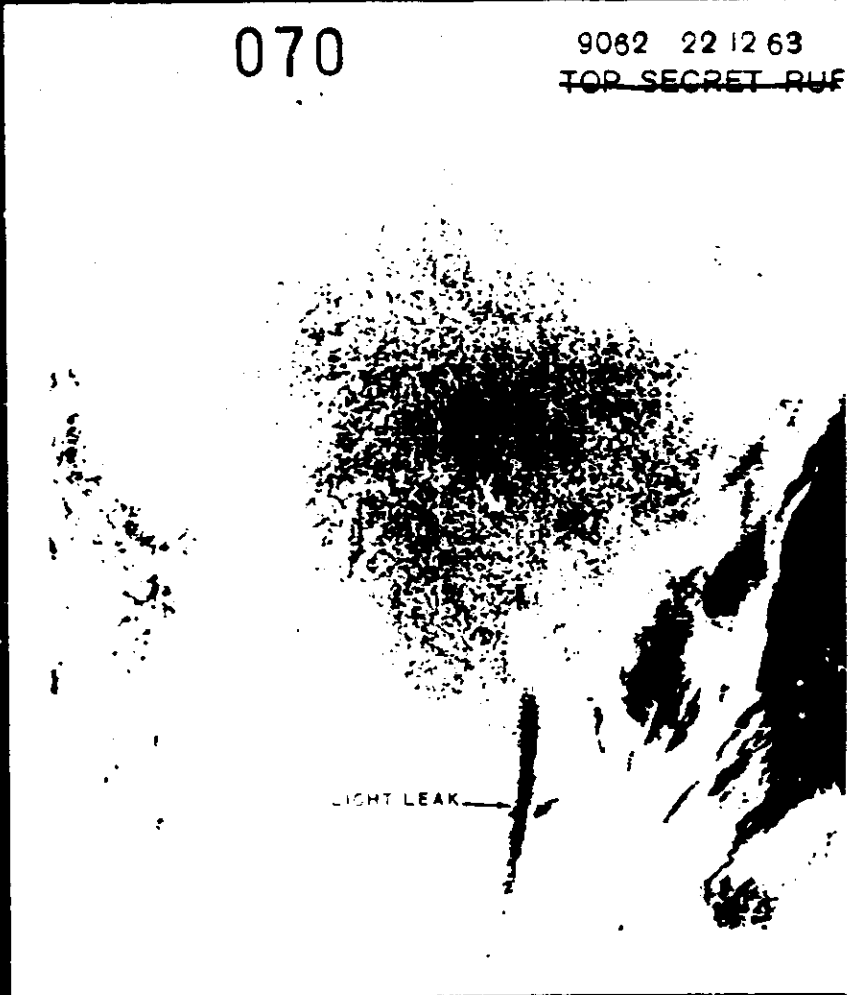
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LIGHT LEAK

FIGURE 12. LIGHT LEAK AND TITLING IN FORMAT IN TERRAIN INDEX PHOTOGRAPH

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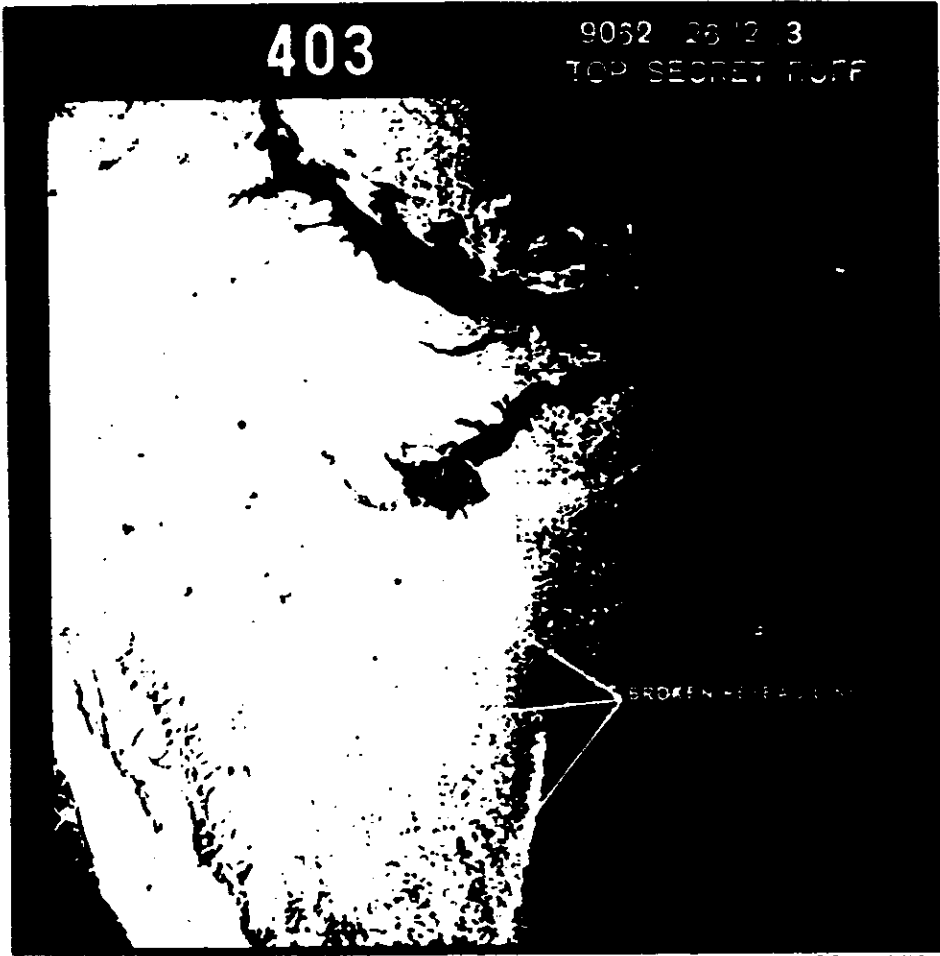


FIGURE 13. BROKEN RESEAU LINES, LIGHT LEAK, EFFECT OF SNOW ON PI SUITABILITY IN TERRAIN INDEX PHOTOGRAPHY.

SPIC 14-0002 12/041

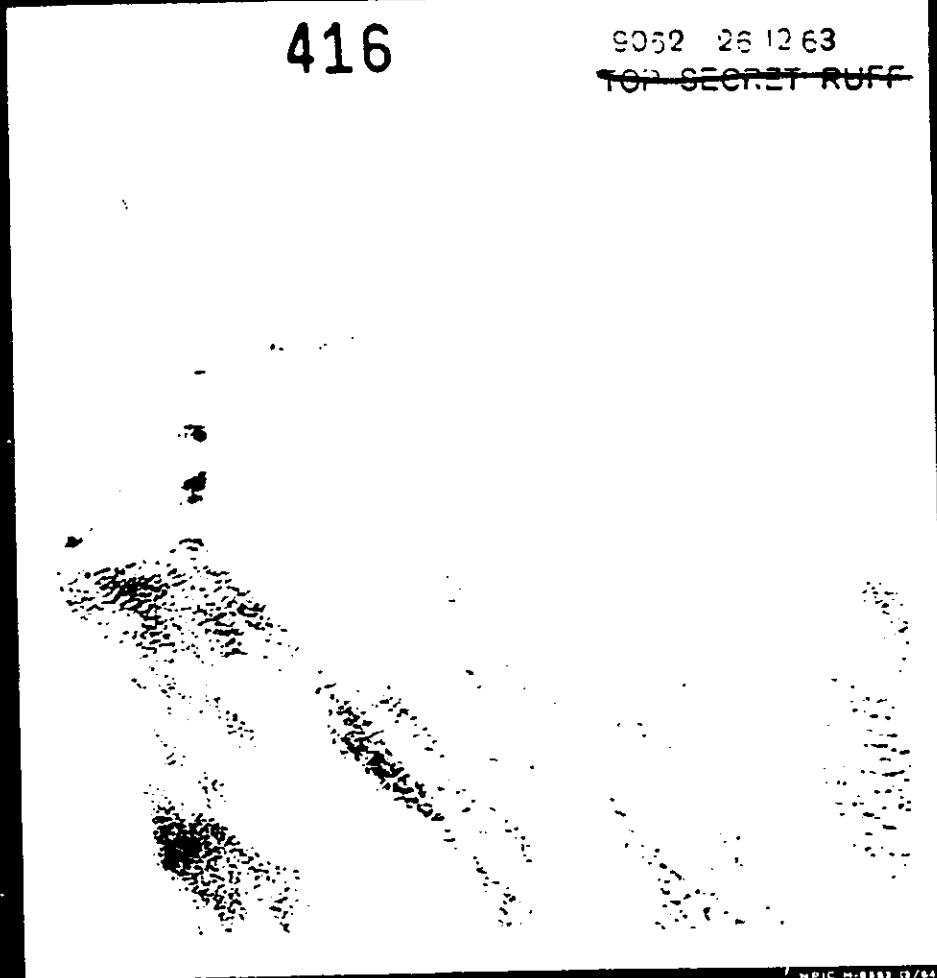
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MPIC M-8882 (2/64)
FIGURE 14. CORONA STATIC, TITLING INTO THE FORMAT AND LONGITUDINAL SCRATCHES IN TERRAIN INDEX PHOTOGRAPHY.

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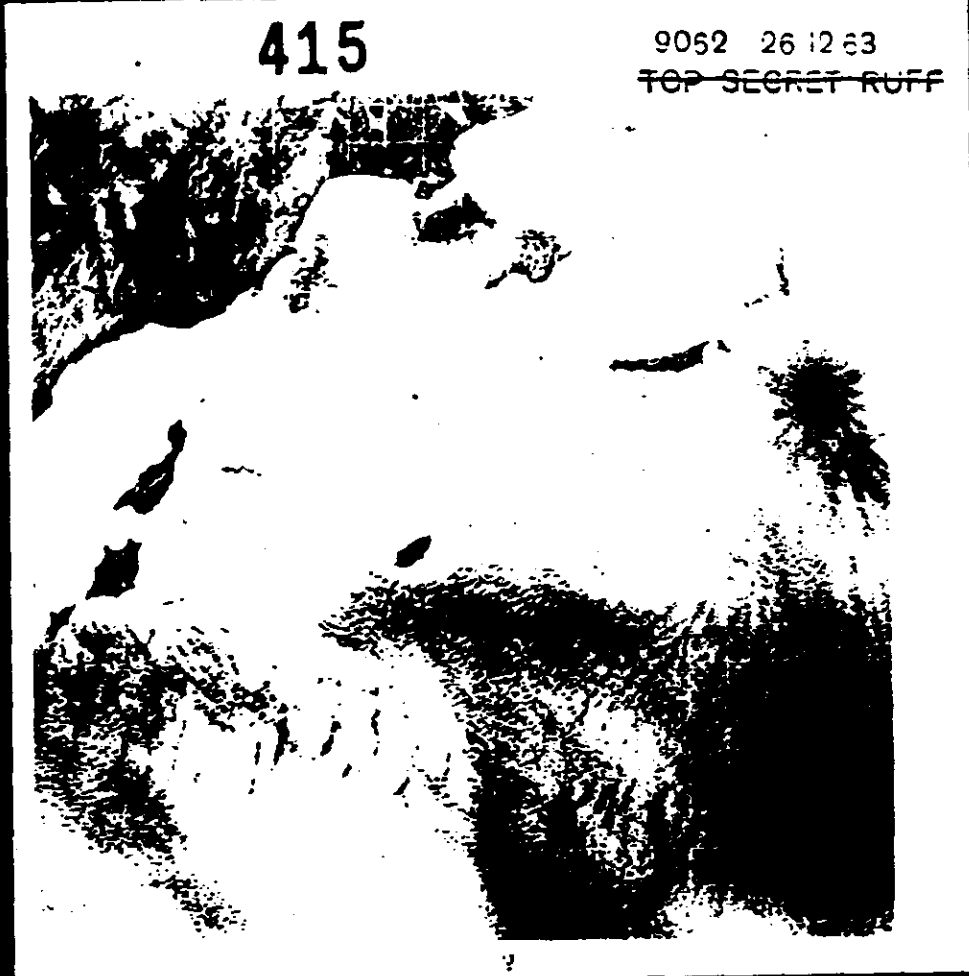


FIGURE 15. DENDRITIC STATIC, TITLING INTO THE FORMAT, AND LONGITUDINAL SCRATCHES IN TERRAIN INDEX PHOTOGRAPHY.



on the second and third frame and on the last three frames of each pass on both master and slave. The light leaks, although of a minor nature, degrade Imagery within the affected areas. Prime examples of these degradations are pass D07, frame 03 AFT (diagonal pattern) and pass D47, frame 53 FWD (shadowgraph). Film transport (a general fogging of portions of the first and last frames occurring during a camera off/on period) is present intermittently throughout both master and slave film. The fogged areas resulting in the diagonal patterns and shadowgraphs are of a minor nature but do degrade imagery within the areas affected.

Scratches and Abrasions: Four small scratches are consistently present in the vicinity of the camera number and also along the opposite edge of the film on all photography. These scratches could cause loss of detail if over a target of interest. Numerous abrasions which would also cause a loss of detail are present on pass D53, frame 23 AFT.

Atmospherics: 40.3 percent of the photographic take is cloud covered. Haze, resulting in the rating of poor quality for a target, is present on pass D23, frame 49 FWD. Examples of industrial haze are present on pass D21, frame 53 FWD and 58 AFT. Ninety-eight known targets were not reported in this mission due to atmospheric.

Sun Angle: Three targets were given a poor quality rating due to low sun angle. Example: pass D34, frame 1.

Image Motion: The first few frames of each pass in both the master and slave cameras display smeared imagery due to uncompensated image motion. It is not apparent under low magnification; however, under higher magnifications used in detailed PI work it becomes a very degrading factor. Example: pass D05, frame 1.

Vignetting: Present on all horizon exposures. If this vignetting increases in size, it could affect the arc of the horizons on future missions. Such a case would hinder accurate determination of vehicle attitude.

3. The Mission Information Potential (MIP):

This is an arbitrary number, not limited by terminal values, which is subjectively assigned to the panoramic photography of a mission and which compares it to the other KH missions. MIP is an example of photography under optimum conditions, discounting adverse atmospheric conditions, minimal sun angles, camera malfunctions or other factors which reduce the quality of the photography. The MIP is based on the best photography found in a mission, even though the photography may be limited to a few frames. Since these frames are considered the best in the mission, they do not indicate the overall success, average quality, or general interpretability of the photography.

Criteria for selection of an MIP frame:

- a. Eliminate all portions of the mission affected by system malfunctions.
- b. Select frames which are free of clouds and atmospheric attenuation.
- c. Eliminate the first ten frames and last frame of a pass as these may be affected by incorrect scan speed.
- d. Select frames that are in a continuous strip of approximately 10 cloud-free frames, as cloud shadows from distant weather fronts are cast for great distances.
- e. Determine from the horizon cameras that the panoramic photography is not affected by apparent vehicle perturbations.
- f. Select targets that are near the center of format and on frames as close as possible to perigee, for scale purposes and to eliminate obliquity.

g. Select frames having as near optimum sun angle as possible, thus eliminating frames having either overexposure or underexposure.

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

4. MIP For Mission 9062: Utilizing the criteria set forth in the preceding items, pass D14 frame 54 FWD and frame 59 AFT were selected as MIP frames for this mission. The mission was given an MIP rating of 85 and is comparable to Mission 9057 (also MIP 85).

The photographic scene covers a city and airfield which are located near the center of the format. Image quality is such that runway markings, aircraft engine nacelles (on the larger aircraft), small privately owned aircraft and vehicles in parking lots and on the highways are discernible.

Stereo quality is a contributing factor to the overall PI suitability of a mission. The stereo models achieved on this mission are of good quality although numerous models will be affected somewhat by corona fog. Those evaluated have a generally favorable base-to-height ratio of 0.60.

25 FWD

7X ENLARGEMENT



30 AFT

7X ENLARGEMENT



MPIC W-8495 D/761

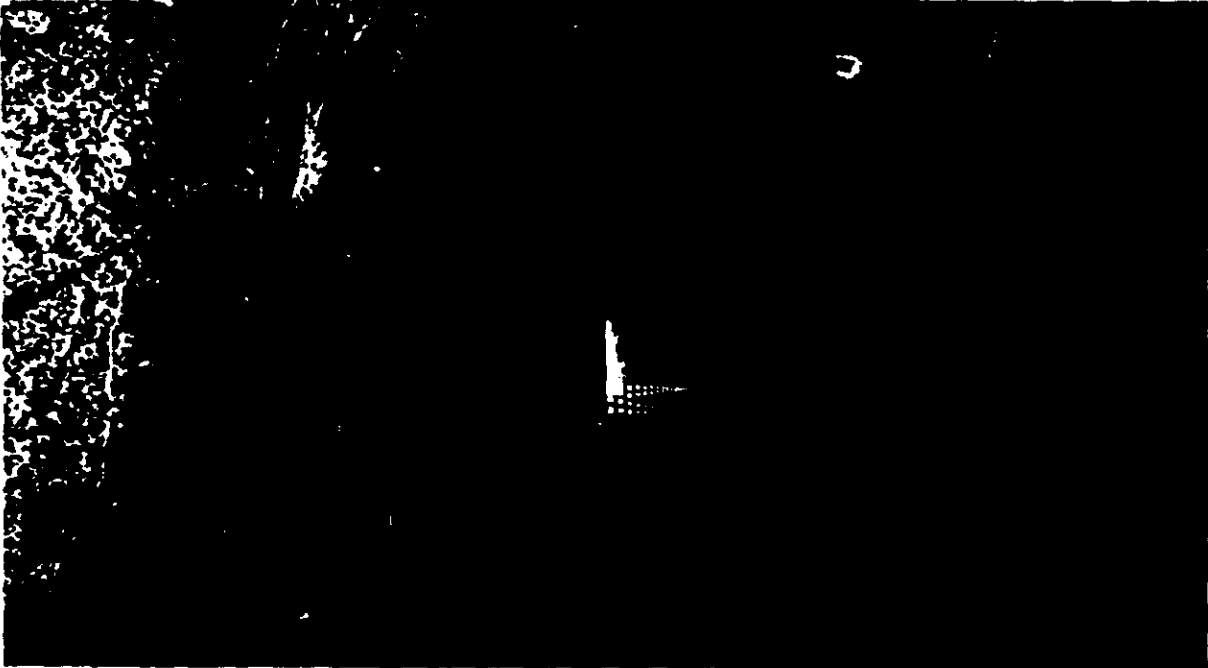
FIGURE 16. GOOD QUALITY PANORAMIC PHOTOGRAPHY (CONTRAST DIFFERENCE DUE TO SUN AZIMUTH).



D47 31 FWD

25 FOOT GROUND RESOLUTION

6X ENLARGEMENT



D47 37 AFT

15 FOOT GROUND RESOLUTION

6X ENLARGEMENT

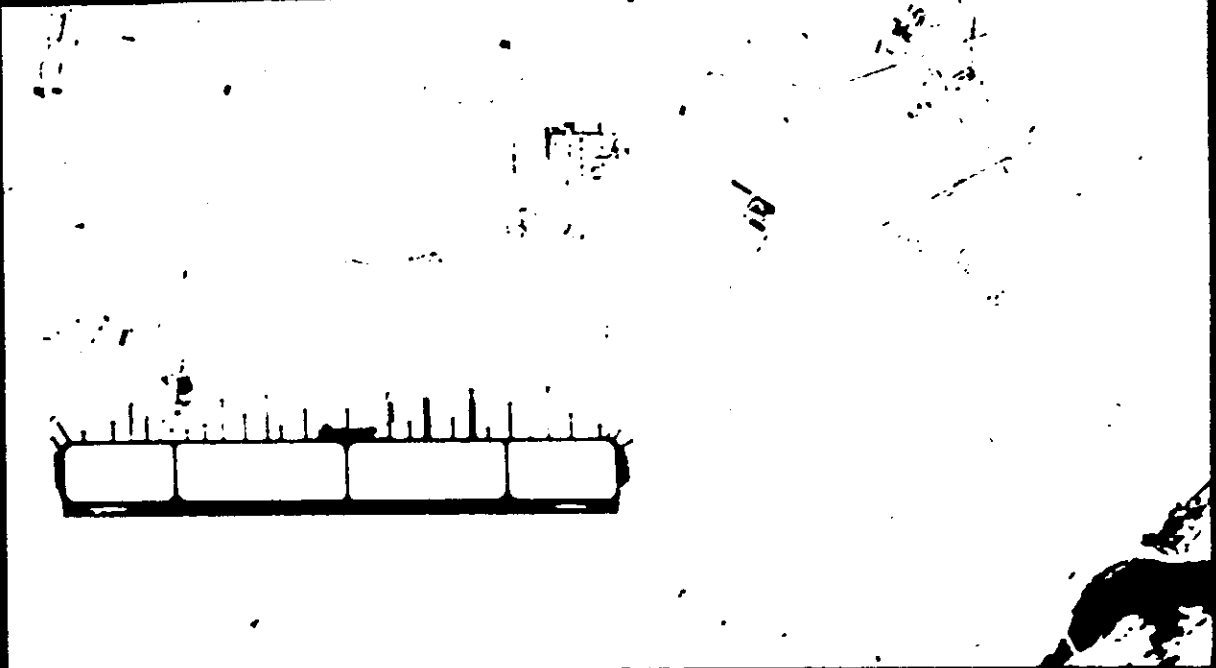


REF ID: A666 12/001

FIGURE 17. PANORAMIC PHOTOGRAPHY OF RESOLUTION TEST RANGE AT FORT HUACHUCA, ARIZONA.

D05 56 FWD

10X ENLARGEMENT



D05 62 AFT

10X ENLARGEMENT

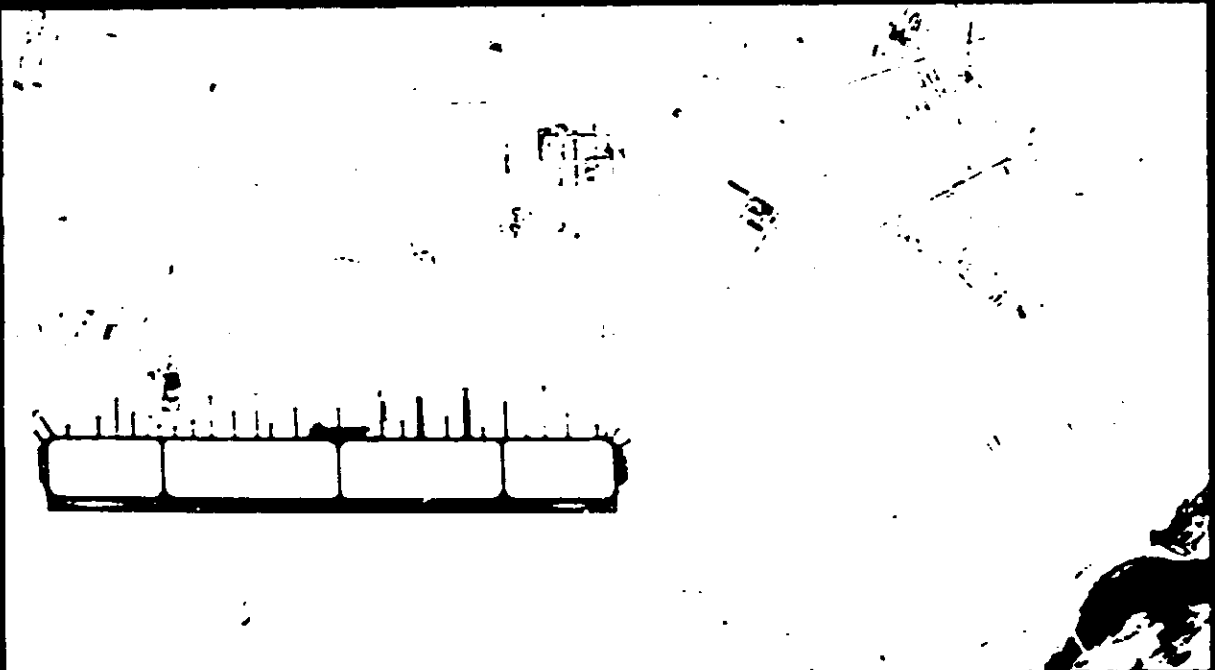


FIGURE 18. COMPARISON BETWEEN FWD AND AFT PRIOR TO CORONA EFFECT IN PANORAMIC PHOTOGRAPHY.



D21 53 FWD

10X ENLARGEMENT



D21 58 AFT

10X ENLARGEMENT



FIGURE 19. EFFECT OF SMOKE, HAZE AND LOW SUN ANGLE ON PI SUITABILITY OF PANORAMIC PHOTOGRAPHY.



D14 26 FWD

10X ENLARGEMENT



D14 26 AFT

10X ENLARGEMENT

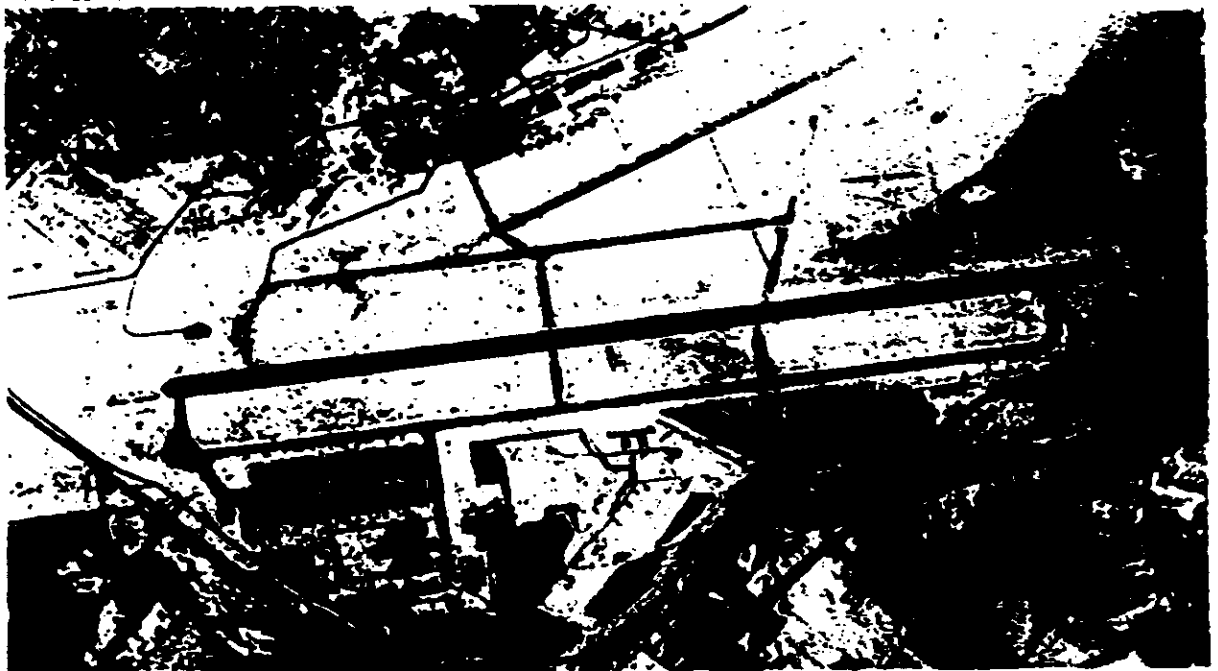
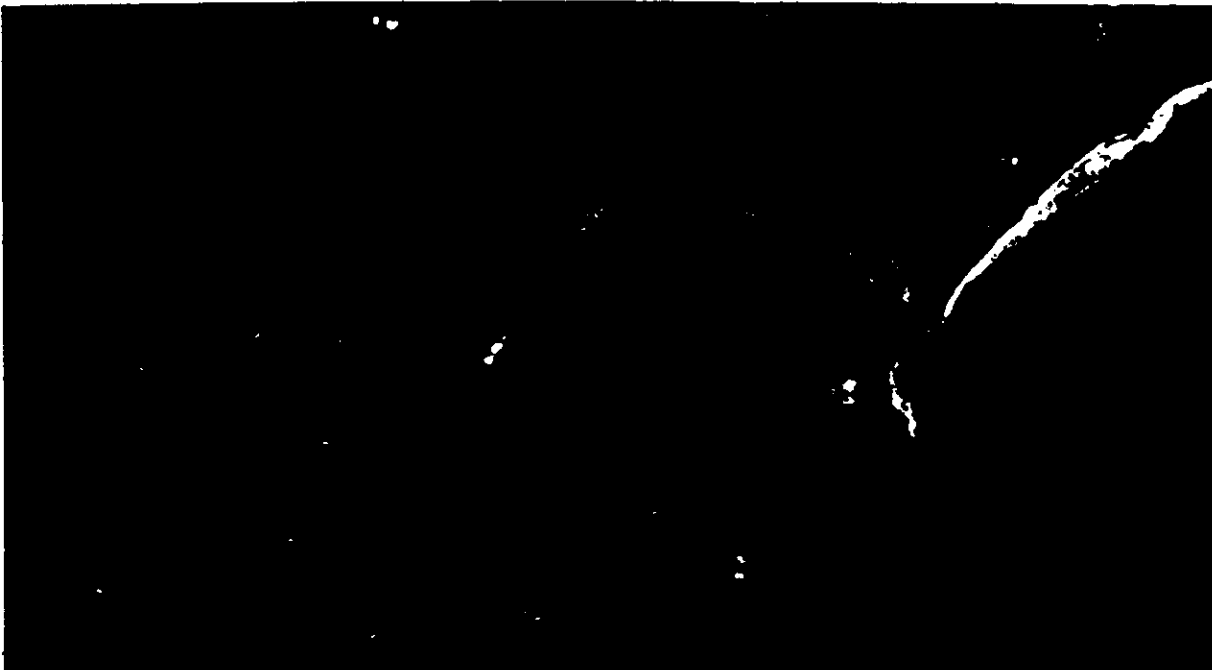


FIGURE 20. EFFECT OF SNOW ON PI SUITABILITY OF PANORAMIC PHOTOGRAPHY.



D77 37 FWD

20X ENLARGEMENT



D77 43 AFT

20X ENLARGEMENT

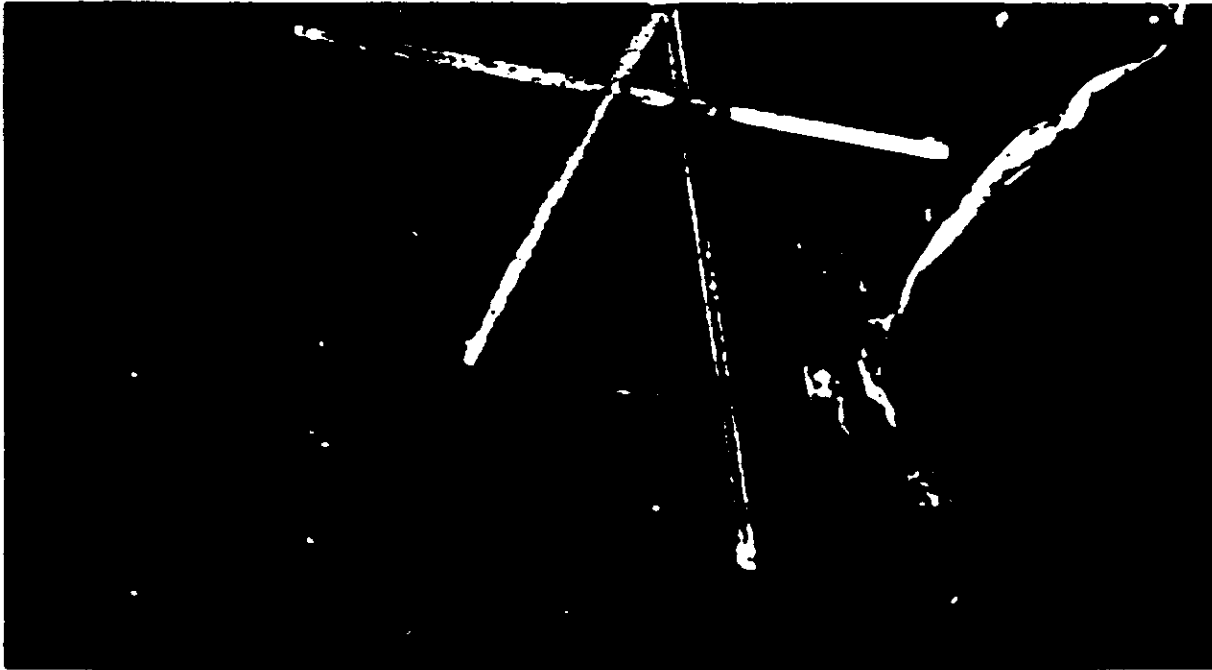


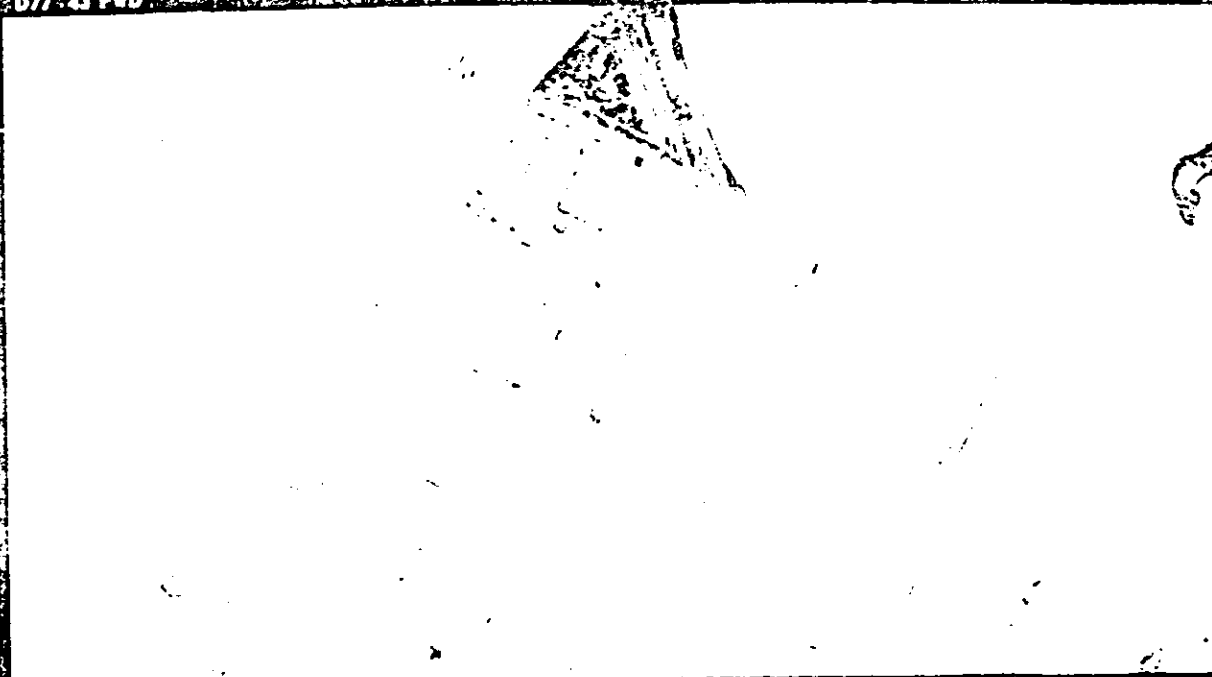
FIGURE 21 FWD CAMERA CORONA DEGRADATION AT RESOLUTION TEST RANGE, WEBSTER FIELD, NAS, MD

TOP SECRET KRYPTON

NO FOREIGN DISSEM

D77-43 FVD

30X ENLARGEMENT



D77-43 FVD

30X ENLARGEMENT

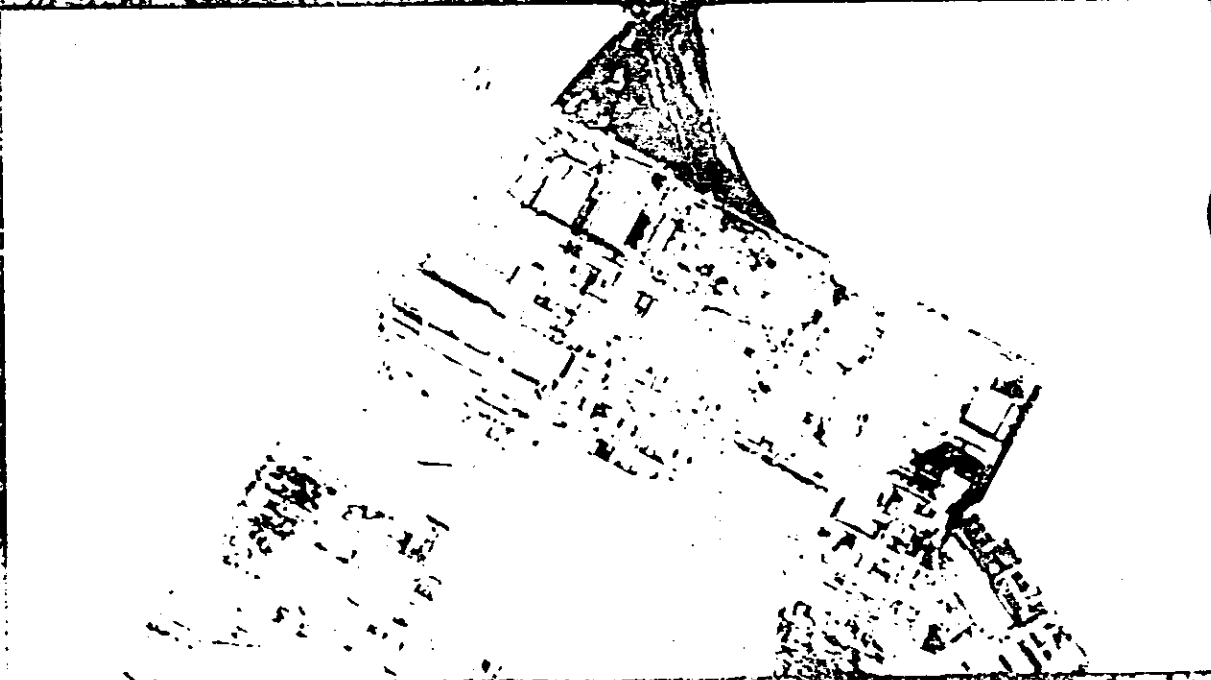
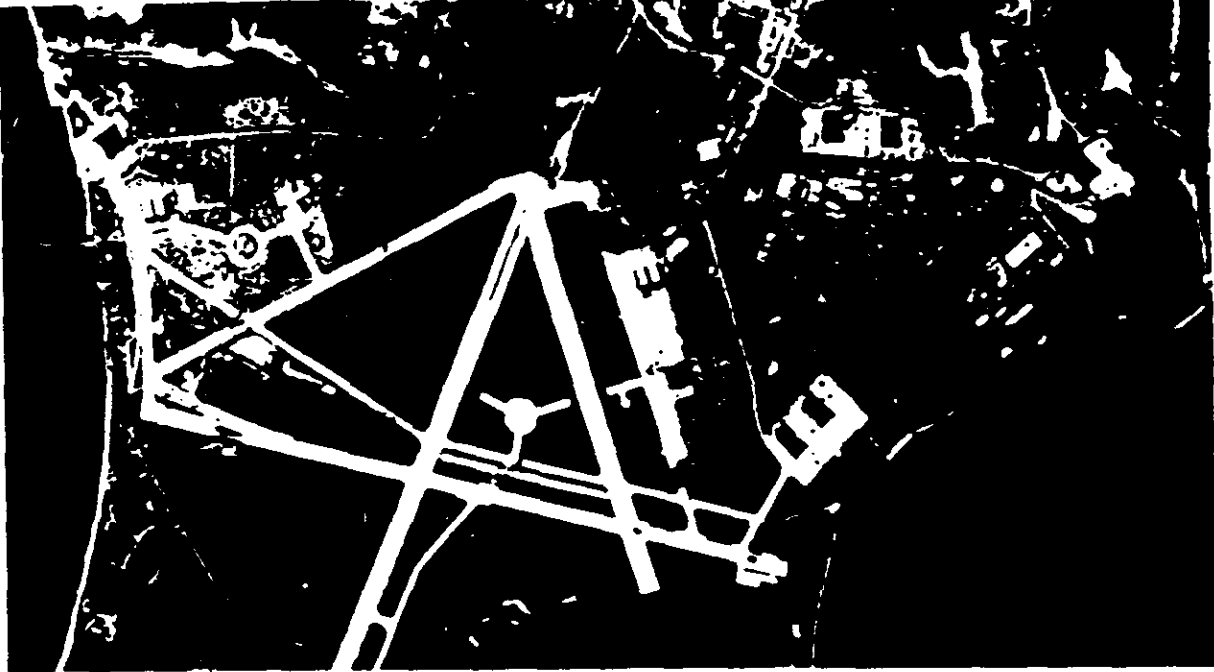


FIGURE 22. FVD CAMERA CORONA DEGRADATION AT NORFOLK NAVAL BASE, VA.



D77 36 FWD

10X ENLARGEMENT



D77 42 AFT

10X ENLARGEMENT



FIGURE 23. FWD CAMERA CORONA STATIC AND COMPRESSION ELONGATION DISTORTION (NOTE CIRCLES PATIENT NAS. MD.)

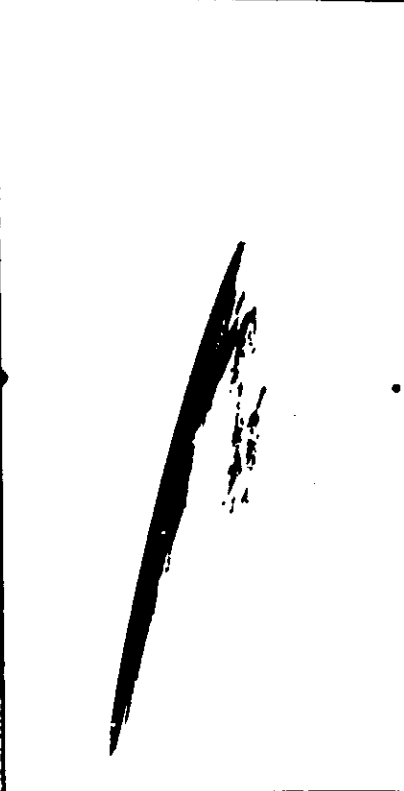
2X ENLARGEMENT



PORT CAMERAS

PASS D21

2X ENLARGEMENT



STARBOARD CAMERAS

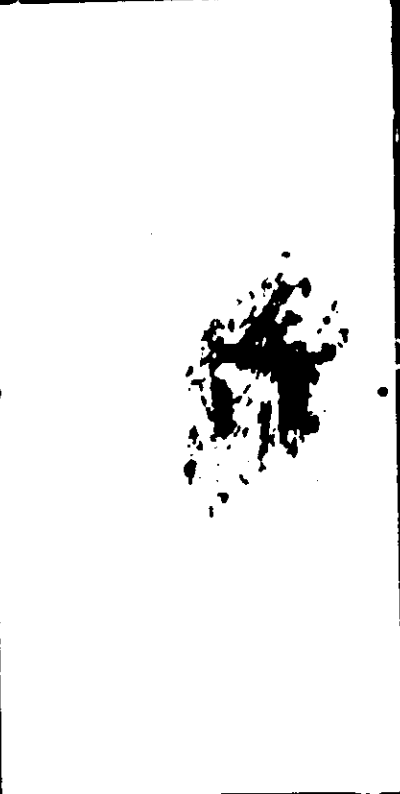
PASS D21

FIGURE 24. PHOTOGRAPHY FROM HORIZON CAMERAS AT 59°N LATITUDE.

4 2410 000005 07/001

TOP SECRET RUFF
NO FOREIGN DISSEM

2X ENLARGEMENT



PORT CAMERAS

PASS D21

2X ENLARGEMENT

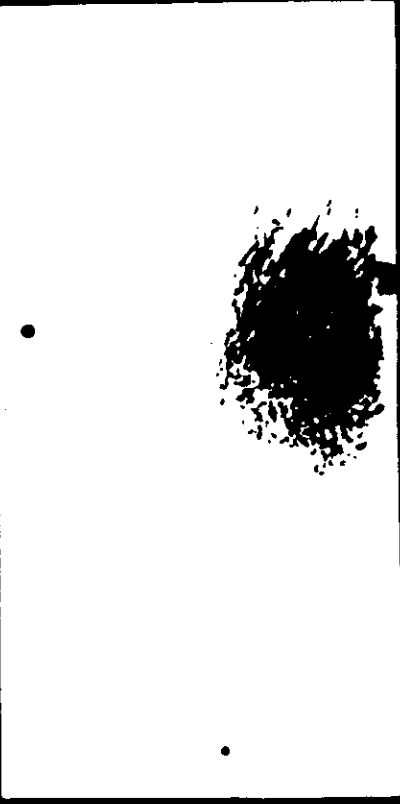


STARBOARD CAMERAS

PASS D21

FIGURE 15. PHOTOGRAPHY FROM HORIZON CAMERAS AT 52°N LATITUDE.

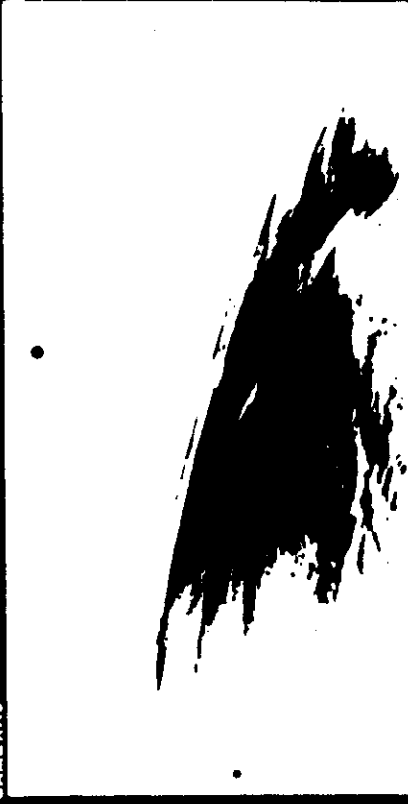
2X ENLARGEMENT



PORT CAMERAS

PASS D21

2X ENLARGEMENT



STARBOARD CAMERAS

PASS D21

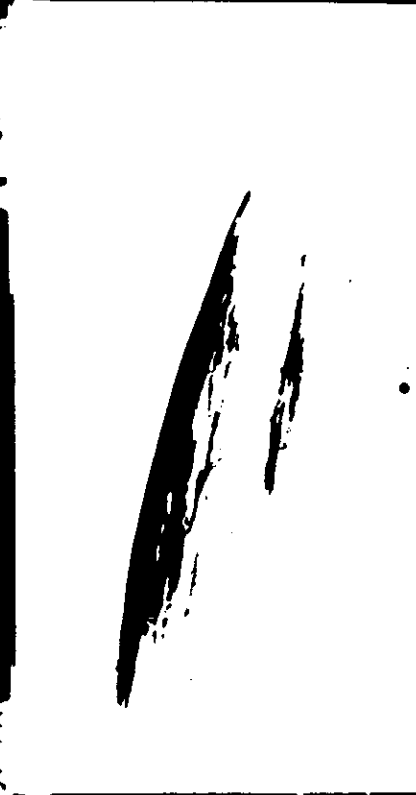
FIGURE 26. PHOTOGRAPHY FROM HORIZON CAMERAS AT 42°N LATITUDE.

TOP SECRET - RUFF
NO FOREIGN DISSEM

STANDARD CAMERA



STANDARD CAMERA



POST CAMERA



STANDARD CAMERA



PASS P1

PASS P1

FIGURE 27 - PHOTOGRAPHY FROM HORIZON CAMERAS AT 37°N LATITUDE.

TOP SECRET - RUFF

D14 54 FWD

10X ENLARGEMENT



WPIC 44-8887 13/801

FIGURE 28. MISSION INFORMATION POTENTIAL, FWD PANORAMIC PHOTOGRAPHY.

TOP SECRET RUFF
NO FOREIGN DISSEM

D14 59 AFT

10X ENLARGEMENT



FIGURE 29. MISSION INFORMATION POTENTIAL, AFT PANORAMIC PHOTOGRAPHY.

TOP SECRET RUFF
NO FOREIGN DISSEM

~~TOP SECRET RUFF~~

APPENDIX A. SYSTEM SPECIFICATIONS

Panoramic Cameras

	Master (Fwd)	Slave (Aft)
Camera No	130	131
Lens Serial No	1052435 (I-45)	1062435 (I-46)
Slit Width	0.250"	0.250"
Aperture	f 3.5	f 3.5
Filter	W 21	W 21
Operational Focal Length	609.602 mm	609.602 mm
Film Type	4401	4401
Film Length	7,800'	7,800'
Splices	2	1
Emulsion	46-2-11-3	46-2-11-3
static Bench Test		
High Contrast	261	244
Low Contrast	144	159
Dynamic Test		
Pre-ship High Contrast	191	189
Pre-ship Low Contrast	136*	125
Post-ship High Contrast	175	192
Post-ship Low Contrast	91	99

Stellar and Terrain Index Cameras

	Stellar	Index
Camera No	D34 34 31	D34 34 31
Lens Serial No	10402	S11902
Reseau Serial No	31	34
Filter	None	W 21
Aperture	f 1.9	f 1.9
Exposure Time	2 secs	1.500 sec
Operational Focal Length	Not Reported	Not Reported
Film Type	4401	4400
Film Length	75'	135'
Splices	None	None
Emulsion	5-6 1-5-3	9-5-63
Perpendicularity of Reseau	Not Reported	Not Reported
Location of Principal Point	Not Reported	Not Reported

Horizon Cameras

	Starboard (Take-up)	Port (Supply)	Starboard (Supply)	Port (Take-up)
Panoramic Camera No	130	130	131	131
Lens Serial No	S13532	S13531	S13522	S13527
Exposure Time	1/100 sec	1/100 sec	1/100 sec	1/100 sec
Aperture	f 8.0	f 6.8	f 8.0	f 6.8
Filter	W 25	W 25	W 25	W 25
Operational Focal Length	54.98 mm	54.68 mm	54.93 mm	55.08 mm
Average Lines/mm	103	101	112	93
Radial Distortion				
10° off axis	.003 mm	.001 mm	.005 mm	.000 mm
20° off axis	.009 mm	.007 mm	.018 mm	.004 mm
Tangential Distortion	.006 mm	.003 mm	.003 mm	.006 mm

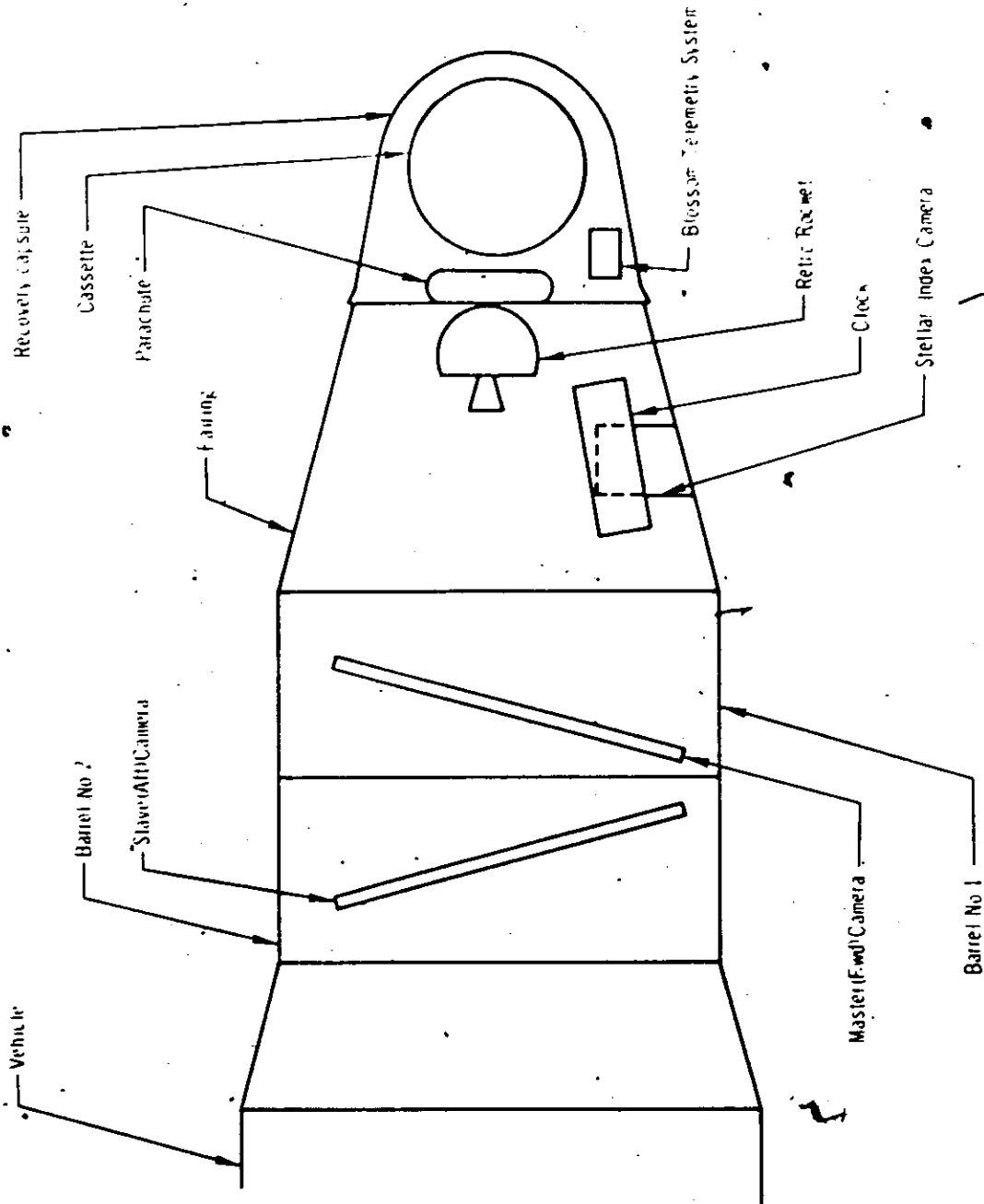
Camera No 130

Resolution	Take-up						Supply					
	0	10	15	20	25	27.5	0	10	15	20	25	27.5
Angle Off Axis	0	10	15	20	25	27.5	0	10	15	20	25	27.5
Radial Distortion	170	139	101	89	92	63	170	140	97	89	92	71
Tangential Distortion	170	123	95	84	62	48	170	116	95	75	55	42

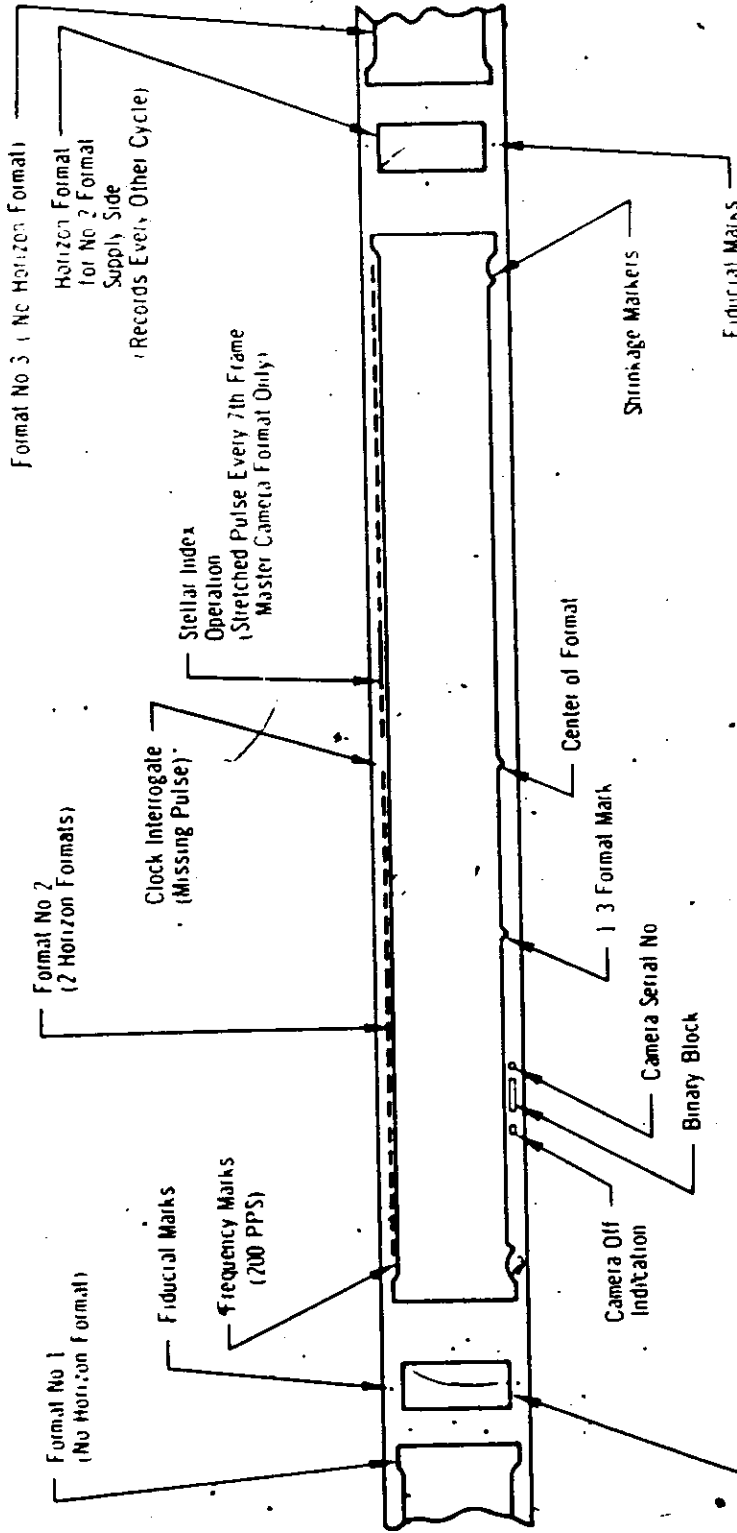
Camera No 131

Resolution	Supply						Take-up					
	0	10	15	20	25	27.5	0	10	15	20	25	27.5
Angle Off Axis	0	10	15	20	25	27.5	0	10	15	20	25	27.5
Radial Distortion	170	105	87	75	82	67	164	128	105	97	105	97
Tangential Distortion	170	110	89	75	52	42	164	119	108	86	60	51

VEHICLE LAYOUT



FILM SPECIFICATIONS FORMAT LAYOUT



Format No 1
(No Horizon Format)

Fiducial Marks

Frequency Marks
(200 PPS)

Format No 2
(2 Horizon Formats)

Clock Interrogate
(Missing Pulse)

Stellar Index
Operation
(Stretched Pulse Every 7th Frame
Master Camera Format Only)

Format No 3 (No Horizon Format)

Horizon Format
for No 2 Format
Supply Side
(Records Every Other Cycle)

Camera Off
Indication

Camera Serial No

Binary Block

1/3 Format Mark

Center of Format

Shrinkage Markers

Fiducial Marks

Slave(ATI)Panoramic Camera No 131

Viewed With Negative Emulsion Down

Direction of Film Transport →

Direction of Scan ←

Direction of Vehicle Motion ↑

Master(Fwd)Panoramic Camera No 130

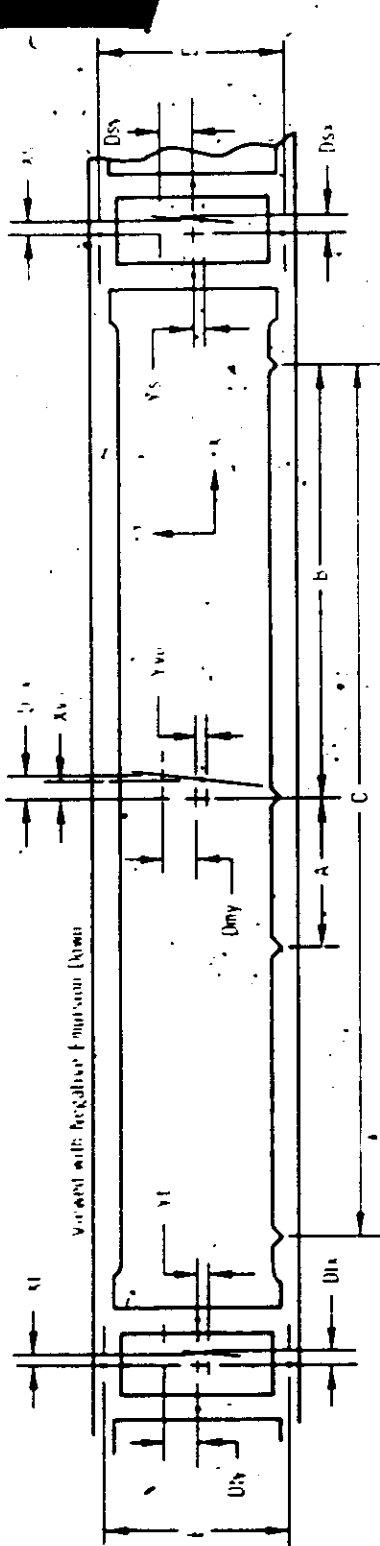
Viewed With Negative Emulsion Down

Direction of Film Transport →

Direction of Scan ←

Direction of Vehicle Motion ↑

FILM SPECIFICATIONS
FORMAT SPECIFICATIONS



Master Format (mm)	Vehicle Make-Up	Scan Direction	Side-Art Camera	Vehicle Make-Up	Scan Direction
A 76.1	X1 -0.667	D1x -0.014	A 76.2	X1 -0.715	D1x -0.005
B 355.6	Y1 -0.171	D1y -3.000	B 355.5	Y1 -0.324	D1y -2.000
C 711.0	Xs 0.267	Ds1 0.005	C 711.5	Xs -0.520	Ds1 0.003
D 56.471	Ys 0.018	Ds2 -2.000	D 56.485	Ys -0.254	Ds2 1.000
E 56.481	Xv0 +1.328	Dm1 -0.010	E 56.500	Xv0 +0.592	Dm1 0.004
	Yv0 +1.566	Dm2 1.000		Yv0 -0.125	Dm2 -0.020

Formal dimensions

	Panoramic	Take-Up	Supply
Height	757.6		
Width	55.4		

Formal dimensions

	Panoramic	Take-Up	Supply
Height	757.6		
Width	55.4		

- NOTE 1. All dimensions are in millimeters and are average dimensions of three formats
 2. Height of main format is taken at center of format
 3. D1, Dm, Ds, X and Y dimensions are taken 10 MM above point defining target center
 4. Format Sign Convention -X1Y +XsY



APPENDIX B. TECHNICAL COMPENDIUM

1. Master (Furd) Panoramic Camera

Pass	Frame	Unv. Time	Sun Time	Sun Elev.	Alt. (yd-)	Pitch	Roll (All Minus)	Cloud Cat.	Over-lap	Limiting				Terrain			
										D Min	D Max	A	Fog	D Min	D Max	A	Exp
D03	02	0212	1133	8 22	237824	15 04	0 51	1111	0	0.70	2.10	1.40	0.24	0.70	2.10	1.40	1 174
D04	26	0312	1213	16 12	222521	15 09	1 06	1111	11.5	0.51	2.11	1.60	0.25	0.51	2.11	1.60	1 237
D05	63	0518	1321	21 19	210722	15 30	0 25	1111	8.0	0.78	2.07	1.49	0.22	0.78	1.68	0.90	1 252
D05	80	0519	1331	26 07	207779	15 13	0 39	1111	5.0	0.60	1.90	1.50	0.21	0.63	1.56	0.93	1 256
D07	01	0811	1111	6 28	212576	15 34	0 46	3111	0	0.66	1.58	0.92	0.24	0.66	1.48	0.82	1 157
D07	04	0812	1120	6 56	237008	15 35	0 46	1111	1.0	0.47	1.62	1.15	0.24	0.52	1.28	0.76	1 197
D07	15	0812	1132	8 11	237008	15 28	0 44	3111	5.0	0.78	1.80	1.02	0.24	0.88	1.48	0.60	1 210
D08	11	0944	1222	14 44	226501	15 22	0 51	4311	8.0	1.22	2.05	0.83	0.23	1.22	2.00	0.78	1 233
D14	20	1847	1312	21 51	212805	14 52	0 52	2222	8.0	1.70	2.13	0.53	0.23	1.73	2.10	0.37	1 252
D14	30	1848	1318	25 52	209560	14 55	0 54	4222	8.0	0.95	2.08	1.13	0.23	1.22	1.82	0.60	1 254
D14	49	1849	1325	27 52	206815	15 04	0 47	1111	8.0	0.45	2.02	1.57	0.23	0.52	1.30	0.68	1 257
D14	53	1849	1327	28 10	205709	15 07	0 44	2222	8.0	0.54	1.75	1.21	0.23	0.54	1.28	0.74	1 258
D14	66	1850	1332	28 29	204603	15 17	0 37	3244	8.0	0.47	1.90	1.42	0.23	0.47	1.68	1.21	1 260
D18	14	0011	1124	8 33	238137	15 12	0 41	3311	5.0	-0.90	2.14	1.24	0.23	0.97	2.12	1.15	1 215
D18	20	0042	1133	9 24	232754	15 15	0 40	1114	5.0	0.32	1.90	1.58	0.23	0.46	1.88	1.42	1 218
D19	04	0210	1048	4 39	243415	15 30	0 34	1111	0	0.49	1.58	1.09	0.27	0.57	0.99	0.42	
D20	10	0313	1200	13 20	227067	14 56	1 36	1111	5.5	0.61	1.91	1.30	0.25	0.74	1.83	1.09	1 227
D20	73	0316	1216	20 53	214016	15 09	0 45	1344	NR	0.69	2.04	1.35	0.25	0.78	1.93	1.15	1 245
D21	01	0511	1117	7 45	237120	15 24	0 52	1111	0	1.00	1.86	0.86	0.30	1.30	1.86	0.56	1 164
D21	53	0513	1208	14 24	226763	15 28	0 41	1111	6.0	0.63	1.99	1.36	0.25	0.63	1.93	1.30	1 232
D21	57	0514	1212	14 55	222058	15 25	0 44	1111	7.0	0.55	2.03	1.45	0.26	0.55	0.82	0.24	1 233
D21	67	0516	1254	23 25	212790	14 44	0 30	5555	NR	NR	2.04	NR	0.29	NR	NR	NR	1 234
D21	109	0518	1314	27 53	207301	15 19	0 24	1111	7.0	0.78	1.92	1.14	0.28	0.54	1.36	0.52	1 256
D22	10	0641	1115	7 58	236765	15 06	0 56	2222	4.0	0.49	1.73	1.24	0.27	0.49	1.05	0.56	1 214
D23	32	0815	1241	21 21	217197	15 14	0 39	4334	7.5	0.68	2.03	1.55	0.14	0.65	1.32	0.64	1 246
D23	41	0816	1247	22 33	213325	15 03	0 42	4344	NR	0.40	2.13	1.73	0.11	0.45	0.76	0.31	1 248
D24	06	0942	1129	9 47	230773	15 57	0 33	2111	7.5	0.55	1.78	1.23	0.24	0.88	1.78	0.90	1 222
D24	59	0946	1249	23 26	213085	16 14	0 30	1114	8.0	0.48	2.28	1.80	0.24	0.69	2.28	1.59	1 254
D25	17	1120	1301	31 39	202463	14 40	0 30	1111	7.5	0.62	1.96	1.34	0.24	0.68	1.74	1.06	1 263
D24	27	0041	1119	10 00	231941	15 03	0 39	2223	7.0	0.60	2.00	1.40	0.23	0.60	2.00	1.40	1 227
D26	45	0345	1243	23 39	213376	14 46	0 53	4234	7.0	0.94	2.21	1.27	0.23	1.44	1.70	0.26	1 252
D26	61	0345	1243	23 41	213376	14 49	0 54	1114	NR	0.99	2.22	1.23	0.24	1.20	1.76	0.56	1 253
D37	14	0510	1112	9 20	235794	16 33	1 04	1111	7.5	0.42	1.87	1.45	0.24	0.53	1.61	1.08	1 225
D37	78	0513	1205	17 51	221092	14 45	0 55	1111	7.5	0.52	2.01	1.49	0.23	0.60	1.77	1.17	1 244
D37	85	0513	1208	18 20	221092	14 34	0 54	1111	8.5	0.96	2.05	1.09	0.23	0.96	2.05	1.09	1 245
D38	06	0640	1055	7 14	235305	15 45	0 32	1331	7.0	0.44	1.48	1.04	0.23	0.44	1.34	0.90	1 216
D38	27	0641	1117	10 05	230131	15 18	0 41	1111	8.0	1.14	1.91	0.77	0.23	1.24	1.54	0.30	1 227
D39	42	0810	1111	9 12	234811	15 07	0 34	1112	7.5	1.13	1.91	0.78	0.23	1.13	1.71	0.58	1 225
D39	127	0814	1217	20 15	216154	14 38	0 34	1111	8.0	0.74	1.98	1.24	0.11	1.00	1.90	0.90	1 247
D40	65	0913	1154	15 55	219895	15 39	0 34	2111	8.5	0.96	1.81	0.85	0.11	0.98	1.81	0.83	1 240
D40	93	0915	1215	21 35	212099	15 44	0 45	4244	8.5	1.00	2.13	1.11	0.18	1.23	1.82	0.59	1 246
D46	19	1848	1303	31 28	202825	15 50	0 23	1111	9.0	0.55	1.98	1.43	0.22	0.65	1.92	1.27	1 261
D46	30	1848	1305	34 22	202823	15 19	0 31	4444	7.5	1.30	2.22	0.92	0.22	NR	NR	NR	1 262
D47	03	2016	1246	30 28	206918	15 39	0 31	1111	2.0	0.62	1.98	1.36	0.22	0.90	1.70	0.80	1 228
D47	25	2017	1255	32 47	204521	15 14	0 29	1111	7.0	0.39	1.70	1.31	0.16	0.68	1.78	1.10	1 261
D47	31	2017	1257	33 24	203589	15 04	0 29	1111	6.5	0.40	1.84	1.44	0.15	0.58	1.45	0.87	1 262
D47	47	2018	1303	34 53	202658	14 40	0 27	1111	6.0	0.40	1.68	1.28	0.12	0.54	1.40	0.86	1 263
D50	10	0040	1118	11 55	229040	15 19	0 38	8111	7.0	0.44	2.08	1.64	0.18	0.58	1.72	1.14	1 230
D52	16	0241	1129	13 47	223234	15 16	0 38	1111	7.5	0.57	2.00	1.43	0.23	0.60	1.90	1.30	1 235
D53	05	0509	1032	5 38	232351	15 43	0 32	1113	0	0.48	1.66	1.18	0.23	0.53	1.21	0.68	1 183
D54	03	0637	1016	3 56	212295	14 47	0 56	4411	0.3	0.29	1.77	1.48	0.23	0.29	0.49	0.20	1 196
D55	18	0809	1048	8 13	231157	15 21	0 59	4444	5.0	0.68	1.86	1.18	0.24	0.68	0.99	0.31	1 224
D56	17	0939	1104	10 20	230556	14 42	1 21	2111	6.5	0.60	1.77	1.17	0.27	0.76	1.73	0.97	1 230
D56	26	0040	1121	14 58	219996	15 33	0 31	4444	8.5	0.59	1.77	1.18	0.27	NR	NR	NR	1 238
D67	06	0208	1101	12 06	228497	15 25	0 36	2112	6.0	0.68	1.95	1.27	0.24	0.68	1.70	1.02	1 229
D67	61	0211	1144	20 15	215418	14 38	0 57	1322	6.5	0.60	2.07	1.47	0.24	0.68	1.94	1.26	1 247

1. Master (Hard) Panoramic Camera (Continued)

Pass	Frame	Univ. Time	Sun Time	Sun Elev.	Alt. (yds)	Pitch (All Minus)	Roll (All Minus)	Cloud Cat.	Overlap	Limiting				Terrain			
										D Min	D Max	A	Fog	D Min	D Max	A	Exp
D68	13	0339	1107	12 37	23177	15 20	0 29	1111	7.0	0.59	1.93	1.34	0.25	0.59	1.80	1.21	1 234
D69	06	0507	1026	6 37	232070	15 37	1 10	1111	5.0	0.43	1.50	1.07	0.23	0.66	1.20	0.54	1 219
D70	52	0641	1142	20 33	213880	14 24	0 27	1111	6.5	NR	NR	NR	0.12	NR	NR	NR	1 245
D72	72	0939	1123	16 42	220701	15 25	0 32	1111	7.0	0.68	1.96	1.28	0.24	NR	NR	NR	1 240
D72	82	0940	1129	18 03	216591	15 08	0 37	1111	7.0	0.48	1.98	1.50	0.20	NR	NR	NR	1 242
D74	11	1245	1233	37 53	202158	16 27	0 37	1111	5.5	1.20	2.02	0.82	0.10	1.20	1.53	0.63	1 260
D77	14	1711	1155	26 14	210419	15 36	0 33	1124	6.5	0.76	2.06	1.30	0.11	0.76	2.00	1.24	1 251

Terrain

D Min Range 0.29-1.73
 D Max Range 0.49-2.28
 Average D Min 0.78
 Average D Max 1.65
 Mean D Min 0.65
 Mean D Max 1.80

Limiting

D Min Range 0.20-1.62
 D Max Range 0.27-2.30
 Average D Min 0.63
 Average D Max 1.77
 Mean D Min 0.55
 Mean D Max 2.00

Gross Fog Range 0.10-0.30
 Average Gross Fog 0.22

2. Slave (Alt) Panoramic Camera

Pass	Frame	Univ. Time	Sun Time	Sun Elev.	Alt. (yds)	Pitch (All Minus)	Roll (All Minus)	Cloud Cat.	Overlap	Limiting				Terrain			
										D Min	D Max	A	Fog	D Min	D Max	A	Exp
D03	08	0212	1133	8 22	237824	14 29	0 51	1144	2.0	0.70	2.10	1.30	0.24	0.70	2.10	1.40	1 211
D04	32	0345	1243	16 42	222521	14 24	1 06	1111	4.0	0.25	2.08	1.83	0.26	0.50	2.08	1.58	1 236
D04	61	0347	1302	22 37	214279	14 31	0 32	1211	5.0	0.60	2.30	1.70	0.24	0.60	2.08	1.48	1 247
D07	69	0518	1324	24 19	210722	14 03	0 25	1111	4.0	0.74	2.10	1.30	0.21	0.74	1.66	0.92	1 251
D05	86	0519	1331	26 07	207779	14 33	0 52	1111	5.0	0.47	1.58	1.11	0.20	0.57	1.46	0.89	1 254
D07	93	0811	1108	5 50	242576	13 52	0 45	1111	0.0	0.48	1.06	0.58	0.25	0.53	0.98	0.45	1 187
D07	07	0811	1114	6 28	239792	14 02	0 44	1111	0.0	0.43	1.30	0.87	0.25	0.45	1.03	0.58	1 204
D07	10	0812	1120	6 56	237008	14 06	0 44	1111	0.0	0.45	1.47	1.02	0.25	0.45	1.14	0.69	1 207
D08	08	0944	1220	14 35	226501	14 18	0 49	1111	4.0	1.13	1.92	0.79	0.23	1.13	1.92	0.21	1 229
D08	22	0945	1242	16 04	221857	15 01	0 42	1111	4.0	0.66	1.50	1.14	0.23	0.73	1.16	0.43	1 235
D14	26	1847	1312	24 51	212805	14 38	0 54	2222	4.0	1.60	2.10	0.50	0.22	1.60	2.08	0.48	1 250
D14	36	1848	1318	25 52	209560	14 32	0 53	4222	4.0	1.16	2.14	0.95	0.22	1.26	1.95	0.69	1 252
D14	55	1849	1326	27 49	206815	14 29	0 53	1111	4.0	0.49	1.53	1.04	0.23	0.59	1.53	0.94	1 255
D14	59	1849	1327	28 10	205709	14 16	0 38	1111	4.0	0.52	1.63	1.11	0.22	0.64	1.23	0.89	1 255
D14	72	1850	1332	28 29	204603	14 04	0 41	3244	4.0	0.62	1.98	1.36	0.22	0.69	1.69	1.00	1 257
D18	19	0041	1124	8 33	238137	14 17	0 40	3211	1.0	1.04	2.15	1.11	0.22	1.16	2.13	0.97	1 215
D18	27	0041	1123	9 34	232754	14 17	0 41	1111	2.0	0.35	2.15	1.80	0.22	0.82	2.13	1.31	1 218
D19	30	0210	1048	4 39	244415	13 34	0 44	1111	0.0	0.35	0.93	0.58	0.23	0.40	0.68	0.28	1 205
D29	17	0343	1200	13 20	227067	14 22	1 09	1111	3.0	0.56	1.99	1.43	0.22	0.90	1.73	0.82	1 227
D29	89	0346	1246	20 53	214016	14 25	0 44	1344	4.0	0.65	2.10	1.45	0.21	0.65	1.82	1.17	1 244
D21	07	0511	1117	7 45	237120	14 03	0 41	1111	0.0	0.41	1.56	1.15	0.22	0.79	1.46	0.67	1 212
D21	50	0512	1208	14 21	226763	14 19	0 29	1111	3.0	0.59	2.01	1.32	0.23	0.59	1.91	1.32	1 231
D29	63	0514	1212	14 55	222058	14 19	0 30	5555	NR	NR	NR	NR	0.23	NR	NR	NR	1 212
D21	74	0516	1254	23 25	213790	14 15	0 28	5555	NR	NR	NR	NR	0.23	NR	NR	NR	1 247
D21	114	0518	1314	27 53	207300	14 15	0 18	1111	4.0	0.89	1.77	0.88	0.23	1.07	1.57	0.90	1 255
D22	10	0640	1107	7 07	212518	14 25	0 56	1111	1.0	0.46	1.28	0.82	0.24	0.46	1.11	0.65	1 212
D22	53	0643	1154	12 50	210911	14 09	0 42	1111	4.0	1.00	1.84	0.84	0.21	1.23	1.60	0.37	1 237
D23	38	0815	1201	21 21	217197	14 31	0 43	4334	4.0	0.89	2.03	1.74	0.15	0.89	1.22	0.33	1 246

2. Slave (Alt) Panoramic Camera (Continued)

Pass	Frame	Univ. Time	Sun Time	Sun Elev.	Alt. (Nd-)	Pitch (All Minus)	Roll (All Minus)	Cloud Cat.	Over-lap	Limiting				Terrain			
										D Min	D Max	A	Fog	D Min	D Max	A	Exp
D23	17	0816	1247	22 23	213325	11 25	0 42	4344	5.0	0.50	2.11	1.61	0.11	0.58	0.84	0.26	1 247
D24	07	0941	1124	9 15	236021	14 01	0 26	1111	4.0	0.58	1.66	1.08	0.20	0.58	1.48	0.90	1 222
D21	03	0946	1249	21 36	213685	12 32	0 39	1131	3.0	0.48	2.21	1.73	0.19	0.84	2.21	1.37	1 251
D25	22	1120	2301	31 39	202463	11 50	0 31	1111	5.0	0.64	2.00	1.36	0.20	0.75	1.73	0.98	1 260
D34	06	0940	1050	6 17	237224	14 37	0 38	2222	3.0	0.30	1.95	1.65	0.20	0.78	1.70	0.92	1 214
D36	30	0845	1233	23 29	213376	11 25	0 56	4234	4.0	0.88	2.30	1.42	0.19	1.40	1.60	0.20	1 251
D37	29	0510	1112	9 20	235794	13 08	0 53	1111	3.0	0.40	1.64	1.24	0.20	0.58	1.51	0.93	1 226
D37	84	0513	1205	17 51	221092	15 04	0 53	1111	6.0	0.58	2.01	1.43	0.22	0.86	2.01	1.15	1 243
D38	08	0640	1049	6 28	235305	14 02	0 36	1111	3.0	0.45	1.14	0.69	0.22	0.45	1.00	0.55	1 217
D38	39	0641	1114	10 00	230131	14 23	0 46	2122	5.0	0.78	1.80	1.02	0.23	0.78	1.03	0.25	1 226
D39	48	0810	1111	9 12	217171	12 56	0 30	1112	4.0	0.66	1.80	1.14	0.23	0.69	1.51	0.82	1 226
D39	133	0814	1217	20 15	216174	15 02	0 44	1111	6.0	0.52	1.93	1.41	0.13	0.78	1.78	0.91	1 247
D40	69	0941	1154	15 55	216895	13 48	0 37	2312	6.0	0.97	1.94	0.97	0.12	0.97	1.87	0.90	1 239
D40	91	0945	1215	21 35	212099	13 54	0 47	2142	5.0	0.44	2.01	1.57	0.13	1.46	1.68	0.22	1 244
D46	25	1848	1303	34 22	202823	14 14	0 31	1111	5.0	0.50	1.74	1.24	0.22	0.82	1.72	0.92	1 260
D47	09	2016	1246	30 21	206918	14 02	0 30	1111	4.0	0.56	1.91	1.36	0.22	0.55	1.28	0.73	1 255
D47	31	2017	1255	32 47	201529	14 30	0 28	1111	5.0	0.44	1.58	1.14	0.22	0.44	1.36	1.12	1 260
D47	37	2017	1257	33 24	203549	14 49	0 27	1111	5.0	0.38	1.92	1.54	0.18	0.38	1.54	1.16	1 261
D47	53	2018	1303	34 53	202658	14 55	0 26	1111	6.0	0.29	1.46	1.17	0.12	0.29	1.67	1.38	1 262
D50	19	0940	1114	11 55	229040	14 25	0 32	1112	3.0	0.27	1.96	1.69	0.12	0.29	1.67	1.38	1 229
D52	22	0341	1129	13 47	223234	14 36	0 42	1111	0.0	0.56	1.96	1.38	0.22	0.62	1.77	1.15	1 236
D53	09	0509	1032	5 38	232351	13 49	0 25	1113	0.0	0.39	1.30	0.91	0.23	0.43	1.11	0.68	1 212
D54	06	0637	1016	3 56	242295	14 32	0 50	4111	2.0	0.21	1.13	0.92	0.18	0.26	0.54	0.25	1 212
D55	23	0809	1048	8 13	231157	14 20	0 56	4444	8.0	0.48	1.62	1.14	0.22	0.48	0.84	0.36	1 224
D55	98	0812	1158	20 33	217450	14 18	0 46	4222	6.5	1.22	2.01	0.79	0.22	1.43	1.81	0.36	1 247
D56	23	0939	1104	10 20	215556	14 38	1 12	2411	6.0	0.39	1.78	1.29	0.21	0.59	1.64	1.05	1 260
D56	30	0942	1155	19 44	16976	15 00	0 37	1111	6.0	0.53	1.90	1.37	0.21	0.58	1.39	0.81	1 246
D66	32	0940	1121	14 58	219996	14 16	0 39	4444	7.0	0.57	1.51	0.94	0.20	NR	NR	NR	1 236
D67	11	0208	1100	12 06	22497	14 27	0 21	2111	5.0	0.50	2.05	1.55	0.21	0.50	1.43	0.93	1 232
D68	19	0239	1107	12 37	23177	14 12	0 24	1111	4.0	0.51	1.68	1.17	0.22	0.51	1.63	1.12	1 234
D69	12	0507	1026	6 37	212070	13 35	0 50	2111	2.5	0.47	1.20	0.73	0.21	0.47	1.10	0.63	1 223
D70	57	0641	1142	20 33	215880	14 51	0 33	1111	6.0	0.89	1.90	1.01	0.10	0.89	1.65	0.76	1 247
D70	85	0642	1156	24 14	210154	14 55	0 45	1111	4.0	0.68	2.12	1.44	0.10	0.98	2.00	1.02	1 252
D71	01	0805	0931	0 04	241060	14 41	0 48	5555	NR	0.20	0.27	0.07	0.15	NR	NR	NR	1 165
D71	25	0806	1005	3 54	235738	13 46	0 41	5555	NR	0.56	1.75	1.19	0.21	NR	NR	NR	1 219
D71	50	0807	1036	8 01	230649	14 24	0 33	4444	2.5	0.40	1.68	1.28	0.21	NR	NR	NR	1 227
D71	75	0808	1109	11 16	225830	15 07	0 41	3444	6.5	0.87	1.71	0.88	0.21	NR	NR	NR	1 234
D71	100	0809	1118	15 20	221219	14 45	0 45	4412	4.0	0.98	1.68	0.70	0.11	0.98	1.58	0.60	1 240
D71	121	0811	1140	19 57	213374	14 00	0 31	5111	5.0	1.62	1.81	0.19	0.19	1.62	1.81	0.19	1 244
D72	11	0936	1024	6 28	234986	13 53	0 31	4341	2.5	0.47	1.30	0.87	0.20	0.78	0.98	0.20	1 252
D72	82	0940	1126	17 07	216591	14 31	0 41	1111	6.5	0.38	1.96	0.98	0.22	1.08	1.84	0.76	1 242
D74	04	1245	1233	36 50	202158	13 06	0 41	1111	4.0	1.04	1.72	0.68	0.10	1.42	1.64	0.22	1 247
D77	18	1711	1153	25 36	230419	13 48	0 33	1144	5.0	0.54	2.01	1.37	0.11	0.66	1.88	1.22	1 254
D79	24	2012	1201	28 28	206663	NR	NR	3445	3.0	0.43	2.13	1.70	0.19	0.63	1.34	0.71	1 254

NR indicates information not available.

Terrain		Limiting	
D Min Range	0.26-1.62	D Min Range	0.20-1.62
D Max Range	0.54-2.21	D Max Range	0.27-2.30
Average D Min	0.72	Average D Min	0.63
Average D Max	1.54	Average D Max	1.77
Mean D Min	0.57	Mean D Min	0.48
Mean D Max	1.68	Mean D Max	2.00

Gross Fog Range 0.10-0.27
Average Gross Fog 0.19