



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

REPORT OF CALIBRATION July 18, 1978

of Aerial Mapping Camera

Camera type	<u>Zeiss RMK A 15/23</u>	Camera serial no.	<u>21219</u>
Lens type	<u>Zeiss Pleogon A</u>	Lens serial no.	<u>98179</u>
Nominal focal length	<u>153 mm</u>	Maximum aperture	<u>f/5.6</u>
		Test aperture	<u>f/5.6</u>

Submitted by

Maps, Inc.

Baltimore, Maryland 21224

Reference: Letter dated July 11, 1978 from Mr. Thomas S. Stone

These measurements were made on Kodak micro flat glass plates, 0.25 inch thick with spectroscopic emulsion type V-F Panchromatic, developed in D-19 at 68°F for 3 minutes with continuous agitation. These photographic plates were exposed on a multicollimator camera calibrator using a white light source rated at approximately 3500K.

I. Calibrated Focal Length: 152.395 mm

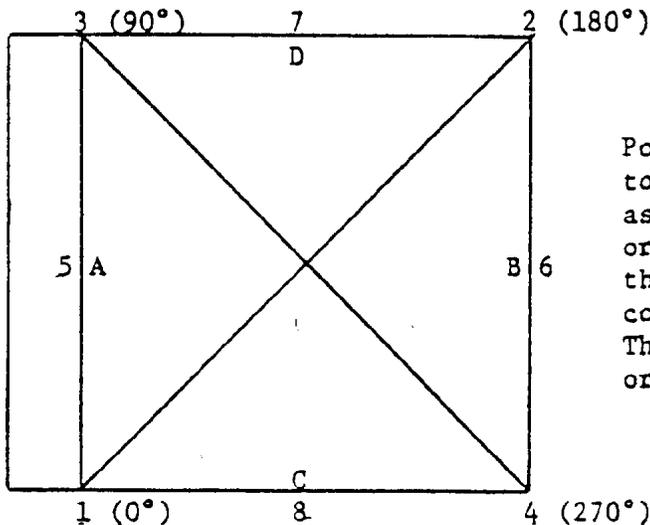
This measurement is considered accurate within 0.005 mm

II. Radial Distortion:

Field angle (degrees)	\bar{D}_c	D_c for azimuth angle			
		0° A-C	90° A-D	180° B-D	270° B-C
	μm	μm	μm	μm	μm
7.5	-5	-5	-4	-5	-4
15	-6	-7	-7	-6	-5
22.5	-4	-5	-4	-5	-1
30	1	-1	1	-1	4
35	0	-1	1	-1	3
40	4	1	8	2	4

The radial distortion is measured for each of 4 radii of the focal plane separated by 90° in azimuth. To minimize plotting error due to distortion, a full least-squares solution is used to determine the calibrated focal length. \bar{D}_c is the average distortion for a given field angle. Values of distortion D_c based on the calibrated focal length referred to the calibrated principal point (point of symmetry) are listed for azimuths 0°, 90°, 180°, and 270°. The radial distortion is given in micrometres and indicates the radial displacement of the image from its ideal position for the calibrated focal length. A positive value indicates a displacement away from the center of the field. These measurements are considered accurate within 5 μm .

VII. Principal Point and Fiducial Coordinates



Positions of all points are referenced to the principal point of autocollimat as origin. The diagram indicates the orientation of the reference points wth the camera is viewed from the back, or contact positive with the emulsion up. The direction-of-flight fiducial marke or data strip is to the left.

	<u>X coordinate</u>	<u>Y coordinate</u>
Indicated principal point, corner fiducials (G)	0.039 mm	-0.040 mm
Indicated principal point, midside fiducials	-0.001	-0.002
Principal point of autocollimation	0.0	0.0
Calibrated principal point (point of symmetry)	0.031	-0.001

Fiducial Marks

1	-103.336 mm	-103.619 mm
2	103.485	103.611
3	-103.728	103.571
4	103.774	-103.619
5	-112.996	-0.091
6	112.965	0.087
7	-0.107	113.007
8	0.109	-112.987

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2 292.779 mm 3-4 293.231 mm

Lines joining these markers intersect at an angle of 89° 59' 11"

Midside fiducials

5-6 225.961 mm 7-8 225.994 mm

Lines joining these markers intersect at an angle of 90° 00' 35"

Corner fiducials (perimeter)

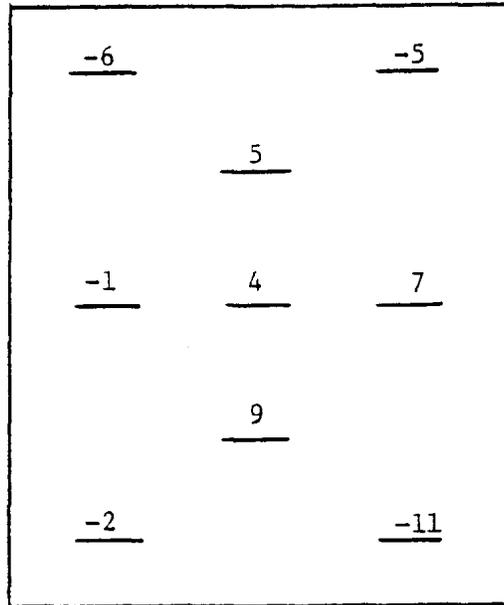
1-3 207.191 mm 2-3 207.212 mm

1-4 207.110 mm 2-4 207.230 mm

The method of measuring these distances is considered accurate within 0.005 mm.

STEREOMODEL FLATNESS TEST AND FILM RESOLUTION

Camera No. 21219 Lens No. 98179 Magazine No. 36285
 Focal length 152.395 mm Maximum angle of field tested 40°
 Base-height ratio 0.6 Accuracy of determination 5 μm



→
 Direction of flight

Stereomodel
 Test point array
 (values in micrometres)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereomodels based on comparator measurements on contact glass (Kodak micro flat) diapositives made from Kodak 2405 film exposures.

Resolving Power, in cycles/mm Area-weighted average resolution 39.3
 Film: Type 2405

Field angle:	0°	7.5°	15°	22.5°	30°	35°	40°
Radial lines	67	67	57	48	40	34	34
Tangential lines	67	57	48	40	34	34	24

This report supersedes the previous calibration of this camera contained USGS Report of Calibration No. RT-R/210, dated September 23, 1975.

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