



# United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Reston, Virginia 20192

REPORT OF CALIBRATION  
of Aerial Mapping Camera

October 3, 2005

Camera type:	Wild RC20*	Camera serial no.:	N/A
Lens type:	Wild Normal Aviogon A4-F	Lens serial no.:	7192
Nominal focal length:	210 mm	Maximum aperture:	f/4
		Test aperture:	f/4.6**

Submitted by: Keystone Aerial Surveys, Inc.  
Philadelphia, Pennsylvania

Reference: Keystone Aerial Surveys, Inc. purchase order  
No. 1401, dated September 30, 2005.

These measurements were made on Agfa glass plates, 0.19 inch thick, with spectroscopic emulsion type APX 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 5200K.

I. Calibrated Focal Length: 213.705 mm

This measurement is considered accurate within 0.005 mm

II. Radial Distortion

Field angle	$\bar{D}_C$	$D_C$ for azimuth angle			
		0° A-C	90° A-D	180° B-D	270° B-C
degrees	um	um	um	um	um
7.5	9	10	8	7	10
15	6	4	4	6	10
22.7	-4	-6	-5	-6	-2
30	-1	-2	1	-2	-2

The radial distortion is measured for each of four 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 micrometers and indicates the radial displacement away from the center of the field. These measurements are considered accurate within 5 um.

\* Equipped with Forward Motion Compensation

\*\* Limitation imposed by collimator aperture

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 57

Field angle:	0°	7.5°	15°	22.7°	30°
Radial Lines	116	116	58	35	35
Tangential lines	116	98	82	58	58

The resolving power is obtained by photographing a series of test bars and examining the resultant image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 3 to 195 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

IV. Filter Parallelism

The two surfaces of the Wild 420 filter No. 6901 and the 525 filter No. 6276 accompanying this camera are within 10 seconds of being parallel. The 525 filter was used for the calibration.

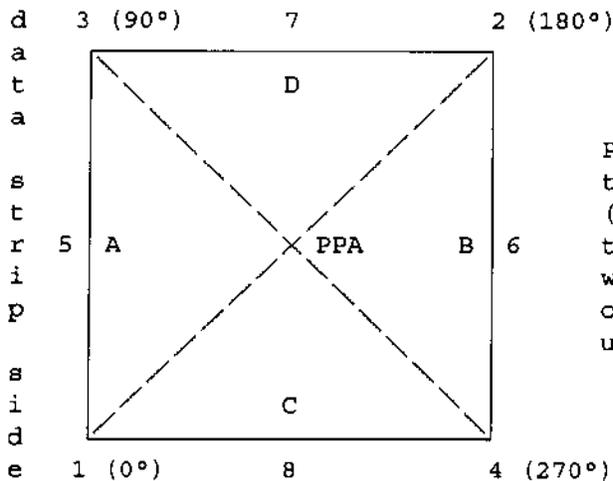
V. Shutter Calibration

( Not Applicable )

VI. Film Platen

( Not Applicable )

VII. Principal Points and Fiducial Coordinates



Positions of all points are referenced to the principal point of autocollimation (PPA) as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The data strip is to the left.

	<u>X coordinate</u>	<u>Y coordinate</u>
Indicated principal point, corner fiducials	0.025 mm	0.004 mm
Indicated principal point, midside fiducials	0.022	0.007
Principal point of autocollimation	0.0	0.0
Calibrated principal point (point of symmetry)	0.014	-0.007

Fiducial Marks

1	-105.982 mm	-105.999 mm
2	106.029	106.004
3	-105.978	106.007
4	106.028	-105.999
5	-109.980	0.008
6	110.031	0.006
7	0.022	110.004
8	0.021	-109.997

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 299.823 mm                      3-4: 299.821 mm

Lines joining these markers intersect at an angle of 90° 00' 04"

Midside fiducials

5-6: 220.010 mm                      7-8: 220.001 mm

Lines joining these markers intersect at an angle of 90° 00' 01"

Corner fiducials (perimeter)

1-3: 212.006 mm                      2-3: 212.008 mm

1-4: 212.009 mm                      2-4: 212.003 mm

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

  
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 Geography Discipline