



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 20192

REPORT OF CALIBRATION of Aerial Mapping Camera

February 17, 2010

Camera type:	Wild RC30*	Camera serial no.:	5046
Lens type:	Wild Universal Aviogon /4	Lens serial no.:	13086
Nominal focal Length:	153 mm	Maximum aperture:	f/4
		Test aperture:	f/4
Submitted by:	Richard Crouse & Associates, Inc. Frederick, Maryland		

Reference:

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:** 152.929 mm

II. Lens Distortion

Field angle:	7.5°	15°	22.7°	30°	35°	40°
Symmetric radial (μm)	0	0	0	0	1	-1
Decentering tangential (μm)	0	0	0	0	1	1

Symmetric radial distortion	Decentering distortion	Calibrated principal point
$K_0 = 0.1809\text{E-}04$	$P_1 = -0.4614\text{E-}08$	$x_p = 0.006 \text{ mm}$
$K_1 = -0.5025\text{E-}08$	$P_2 = -0.5104\text{E-}07$	$y_p = 0.001 \text{ mm}$
$K_2 = 0.2565\text{E-}12$	$P_3 = 0.0000$	
$K_3 = 0.0000$	$P_4 = 0.0000$	
$K_4 = 0.0000$		

The values and parameters for Calibrated Focal Length (CFL), Symmetric Radial Distortion (K_0, K_1, K_2, K_3, K_4), Decentering Distortion (P_1, P_2, P_3, P_4), and Calibrated Principal Point [point of symmetry] (x_p, y_p) were determined through a least-squares Simultaneous Multiframe Analytical Calibration (SMAC) adjustment. The x and y-coordinate measurements utilized in the adjustment of the above parameters have a standard deviation (σ) of ± 3 microns.

* Equipped with Forward Motion Compensation

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 86

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	95	95	95	95	95	80	67
Tangential Lines	95	80	80	95	95	80	67

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 5 to 268 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 525 filter No. 7765 accompanying this camera are within 10 seconds of being parallel. This filter was used for the calibration.

V. Shutter Calibration

Indicated Time (sec)	Rise Time (μ sec)	Fall Time (μ sec)	$\frac{1}{2}$ Width Time (ms)	Nom. Speed (sec)	Efficiency (%)
1/125	736	732	9.25	1/110	95
1/250	364	362	4.71	1/220	95
1/500	189	192	2.37	1/440	95
1/1000	98	92	1.21	1/870	95

The effective exposure times were determined with the lens at aperture $f/4$. The method is considered accurate within 3 percent. The technique used is described in International Standard ISO 516:1999(E).

VI. Film Platen

The platen mounted in Wild drive unit No. 5046 does not depart from a true plane by more than 13 μ m (0.0005 in).

This camera is equipped with a platen identification marker that will register "460" in the data strip area for each exposure.

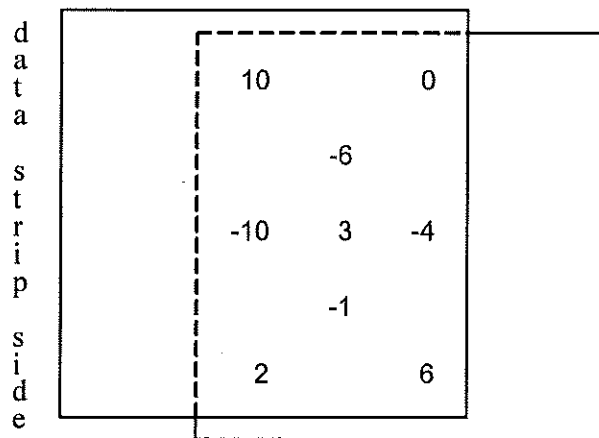
IX. Stereomodel Flatness

FMC Drive Unit No: 5046

Base/Height ratio: 0.6

Platen ID: 460

Maximum angle of field tested: 40°



Stereomodel Test Point Array
(values in micrometers)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereo models. The values are based on comparator measurements on Agfa Avitone P3P copy film made from Kodak 2405 film exposures. These measurements are considered accurate to within 5 µm.

X. System Resolving Power on film in cycles/mm

Area-weighted average resolution: 41

Film: Type 2405

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	48	48	48	40	48	48	40
Tangential Lines	48	40	40	40	40	34	34

This aerial mapping camera calibration report supersedes the previously issued USGS Report No. OSL/3296, dated January 30, 2007.

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Geography Discipline