



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 20192

REPORT OF CALIBRATION of Aerial Mapping Camera

June 27, 1997

Camera type: Wild RC30*	Camera serial no.:
Lens type: Wild Normal Aviotar /4-S	Lens serial no.: 17126
Nominal focal length: 305 mm	Maximum aperture: f/4
	Test aperture: f/6.6**

Submitted by: Air Photographics, Inc.
Martinsburg, West Virginia

Reference: Air Photographics, Inc., purchase order
No. 5112, dated June 25, 1997.

These measurements were made on Kodak Micro-flat glass plates, 0.25 inch thick, with spectroscopic emulsion type 157-01 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: 303.361 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	0	-1	1	0	0
15	-2	-1	-2	-1	-3
22.7	1	0	2	0	3

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 0.005 mm.

- * Equipped with Forward Motion Compensation
- ** Limitation imposed by collimator aperture

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 77

Field angle:	0°	7.5°	15°	22.7°
Radial Lines	81	96	68	68
Tangential lines	81	96	81	68

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 2.5 to 135 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

~~... lines are perpendicular to a radius from the center of the field, and~~ tangent

Filter Parallelism

surfaces of the Wild 430 No. 7624 and the 525 No. 7654 filters accompanying this camera are within 10 seconds of being parallel. The 525 filter was used for the calibration.

IV. Fi

The two accompanying was used

Filter Calibration

(Not Applicable)

V. Shu

(N

mm Platen

(Not Applicable)

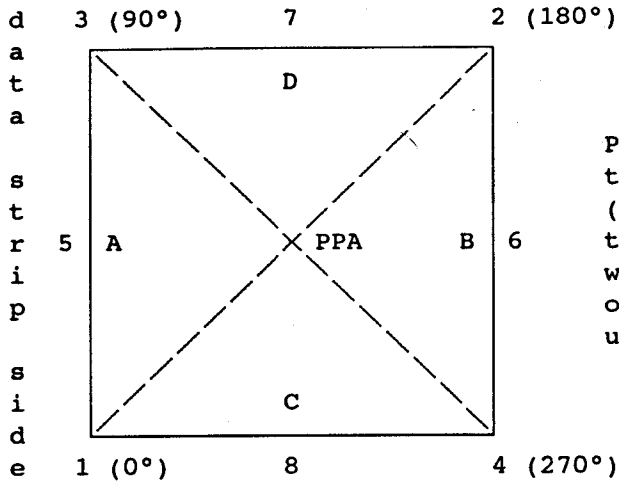
VI. Fil

(N

For GPS applications, the nominal entrance pupil distance from the focal plane is 314 mm.

Note: Fo pl

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	-0.007 mm	0.007 mm
Indicated principal point, midside fiducials	-0.010	0.008
Principal point of autocollimation	0.0	0.0
Calibrated principal point (point of symmetry)	0.000	0.021

Fiducial Marks

1	-106.016 mm	-105.992 mm
2	105.999	106.003
3	-106.003	106.007
4	105.988	-105.992
5	-112.009	0.009
6	111.997	0.008
7	-0.004	112.003
8	-0.017	-111.992

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2: 299.820 mm 3-4: 299.806 mm

Lines joining these markers intersect at an angle of 90° 00' 05"

Midside fiducials

5-6: 224.006 mm 7-8: 223.995 mm

Lines joining these markers intersect at an angle of 89° 59' 49"

Corner fiducials (perimeter)

1-3: 211.999 mm 2-3: 212.001 mm

1-4: 212.004 mm 2-4: 211.995 mm

in 0.005 mm

The method of measuring these distances is considered accurate with

Bradish F. Johnson

Bradish F. Johnson
Chief, Optical Science Laboratory
National Mapping Division

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