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REPORT OF CALIBRATION

of Aerial Mapping Camera

Camera Type Wild Heerbrugg RC-10
Lens Type Aviotar
Nominal Focal Length 12 inches

Camera Serial No. 1758
Lens Serial No. AtII 4114
Maximum Aperture f/4
Test Aperture f/8

Submitted by
NASA, Ames Research Center
Moffett Field, California 94035

Reference: Telephone conversation of July 31, 1974 with Mr. E. G. Frey, Airborn Science, Ames Research Center

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

I. Calibrated Focal Length: 304.68 mm

This measurement is considered accurate within 0.04 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	µm	µm	µm	µm	µm
7.5	-3	-4	-2	-1	-5
15	2	-1	2	6	1
22.5	-2	-5	-3	1	-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, the calibrated focal length is derived to equalize the absolute values of the maximum positive and maximum negative distortions. $\bar{D}_c$ is the average distortion for a given field angle. Values of distortion D_c based on the calibrated focal length are listed for azimuth angles 0, 90, 180, and 270 degrees. The radial distortion is given in micrometers 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. Tangential Distortion

Field Angle	7.5°	15°	22.5°
Displacement in μm	1	1	3

The values reported are displacements from the center image point of a straight line connecting corresponding image points at equal field angles along opposite radii of the focal plane. The method of measurement is considered accurate within 5 μm.

IV. Resolving Power, in cycles/mm Area Weighted Average Resolution 32.5

Field Angle:	0°	7.5°	15°	22.5°	30°	37.5°	45°
Tangential lines	56	56	56	48			
Radial lines	56	56	14	12			

The resolving power is obtained by photographing a series of test bars and examining the resulting image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable assurance. The series of patterns has spatial frequencies in a geometric series having a ratio of the fourth root of two. Tangential lines are those perpendicular to the radius from the center of the field. Radial lines are those lying parallel to the radius.

V. Principal Point of Autocollimation

The lines joining opposite pairs of collimation index markers intersect at an angle within 1 minute of 90° and their intersection indicates the location of the principal point of autocollimation within 0.03 mm. This condition is true for both the corner and mid-side fiducials.

VI. Collimation Marker Separation

1-2	299.809 mm	1-3	212.005 mm
3-4	299.826 mm	3-2	211.992 mm
A-B	219.981 mm	2-4	212.007 mm
C-D	220.000 mm	4-1	212.019 mm

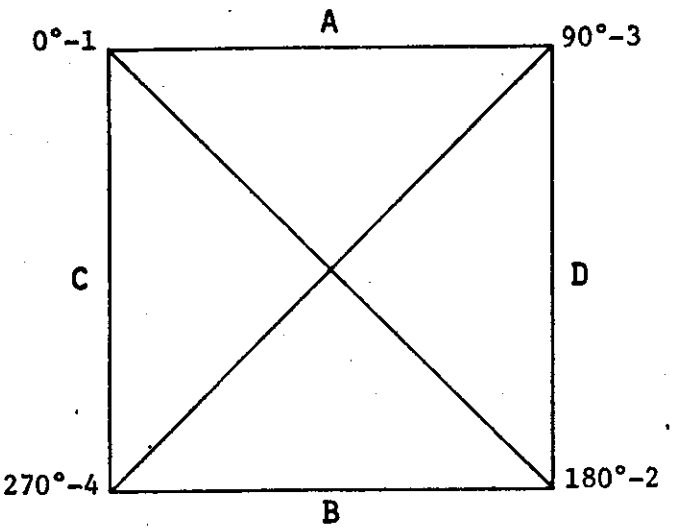
Markers A and B lie in the line of flight. The method of measuring these separations is considered accurate within 0.005 mm.

VII. Filter Parallelism

The two surfaces of the Wild 525 Pan No. 4039 filter accompanying this camera are within ten seconds of being parallel. This filter was used for the calibration.

VIII. Magazine Platen

The platen mounted in Wild RC-10 film magazine, No. 1758-139 does not depart from a true plane by more than 13 micrometers (0.0005 inch).



The diagram indicates the orientation of the reference points when the camera is viewed from the back. The direction of flight fiducial marker or data strip is at the top.

IX. Shutter Calibration

Indicated Shutter Speed	Effective Shutter Speed	Efficiency
1/200	7.2 ms = 1/140 s	94%
1/400	3.4 ms = 1/295 s	90%
1/600	2.0 ms = 1/500 s	85%
1/800	1.6 ms = 1/625 s	83%
1/1000	1.2 ms = 1/830 s	82%

The effective shutter speeds were determined with the lens at aperture f/8. The method is considered accurate within 3%. The technique used was a modification of the method described in American Standard PH3.4-1959.

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