NATIONAL BUREAU OF STANDARDS

REPORT OF TEST
on

182733

ONE AERO PRECISION AERIAL CAMERA

Equipped with
C. P. Goerz Aerotar Lens No. 757622

Submitted by

Aero Service Corporation
210 East Courtland Street
Philadelphia, Pa. 19120

The lens contained in this camera has a nominal focal length of 8 1/4 inches and maximum aperture of f/6.8. All measurements were made at aperture f/11. These measurements were made with collimated incident light, using a K-3 filter, a tungsten source and Eastman Kodak spectroscopic emulsion Type V-F and Aerographic Plus-X on micro flat glass plates. Development was in D-19 at 68°F for three minutes with continuous agitation.

I. Focal Lengths

Equivalent focal length   210.07 mm
Calibrated focal length   210.10 mm

The probable errors of these determinations of focal length do not exceed ±0.10 mm.

II. Distortion

β	$\bar{D}_e$	$\bar{D}_c$	D_c for Azimuth Angle			
			0°	90°	180°	270°
degrees	μ	μ	μ	μ	μ	μ
0	0	0	0	0	0	0
7.5	0	-5	-5	-5	-5	0
15	0	-9	-7	-5	-5	-5
22.5	2	-12	-7	-7	-9	-13
30	32	12	14	18	10	4

Values of the distortion are measured for each of four radii of the focal plane separated by 90° in azimuth. Values of the distortion based upon the equivalent focal length, $\bar{D}_e$, are determined for points separated by 7.5° from the axis for each of the four radii. The average value of $\bar{D}_e$ is reported and

from these values a calibrated focal length is derived to minimize the average value distortion over the entire field. The average value of the distortion referred to the calibrated focal length is given under the heading $\bar{D}_c$. Values of the distortion D_g based on the calibrated focal length determined for each of the four radii are listed under the azimuth angles 0, 90, 180, and 270 degrees. The values of the distortion are given in microns and indicate the displacement of the image from its distortion-free position. A positive value indicates a displacement from the center of the plate. The probable error does not exceed ±10 microns.

III. Resolving Power

Emulsion	0°	7.5°	15°	22.5°	30°
V-F					
Tangential	46	46	39	39	39
Radial	46	53	39	34	39
Plus-X					
Tangential	34	34	29	29	29
Radial	34	39	29	24	29

The values of the resolving power are given at 7.5° intervals from the center of the field and are obtained by photographing suitable test charts comprised of patterns of parallel lines. The series of patterns of the test chart are imaged on the negative with the lines spaced in a geometric series of the fourth root of two lines to the millimeter. The row marked "tangential" gives the number of lines per millimeter in the image on the negative of the finest pattern of the test chart that is distinctly resolved into separate lines when the lines lie perpendicular to the radius drawn from the center of the field. The row marked "radial" gives similar values for the pattern of test lines lying parallel to the radius.

IV. Principal Point of Autocollimation

The lines joining opposite pairs of collimation index markers intersect at an angle of 90° ±1 minute, and their intersection indicates the location of the principal point of autocollimation with a probable error not exceeding ±0.03 mm.

V. Collimation Marker Separation

A - B   222.23 mm
C - D   222.32 mm

Markers A and B lie in the line of flight. The probable errors in these separations do not exceed ±0.02 mm.

VI. Tangential Distortion

0°	±7.5°	±15°	±22.5°	±30°
0	0	1	2	4

The values of the tangential distortion are measured in microns and indicate the displacement of the image from its distortion-free position. These

values represent a displacement of the central image from a straight line
connecting corresponding image points at equal but opposite angular separa-
tions from the axis. The probable error does not exceed ±5 microns.

The two surfaces of the Goerz filter accompanying this camera are paral-
lel to within ten seconds of arc.

VII. Shutter Calibration

Indicated Shutter Setting	Effective Shutter Speed	Efficiency
	Seconds	Percent
150	.0059 = 1/170	81%
250	.0035 = 1/286	79%

The effective shutter speeds were determined with the lens at aperture f/11
and are correct within ±3%. The technique used was a modification of the
method described in American Standard PH33.4-1959.

In mechanical and optical characteristics this camera when used with an
approved platen complies with the U.S. Department of Agriculture Specifica-
tion No. ASCS-AP-201 (Revision) for a precision aerial camera dated May 22,
1963.

For the Director,

Francis E. Washer, Chief
Refractometry Section
Metrology Division

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