FORM NBS-259
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U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D.C.

NATIONAL BUREAU OF STANDARDS
REPORT OF TEST

181411

on

ONE AERIAL CAMERA TYPE K-17 (MODIFIED)

Equipped with

Bausch Lomb Metrogon Lens No. MA1212

Submitted by

Airagon Engineering Company
2001 Military Hwy., N. W.
San Antonio 13, Texas

The lens contained in this camera has a nominal focal length of 6 inches and maximum aperture of f/6.3. All measurements were made at aperture f/8, because of limitations imposed by the apertures of the camera calibrator. 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	152.33 mm
Calibrated focal length	152.35 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	-2	-2	-2	-2	-2
15	12	9	6	12	12	4
22.5	51	46	43	51	55	36
30	100	92	80	110	98	80
37.5	125	115	110	140	113	96
45	-102	-115	-133	-103	-113	-113

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. From these values of $\bar{D}_e$, 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_c 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°	37.5°	45°
V-F							
Tangential	46	46	32	32	27	23	11
Radial	46	46	32	32	27	23	14
Plux-X							
Tangential	32	32	23	23	19	16	10
Radial	32	32	23	23	19	16	10

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	222.60 mm
C - D	222.62 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°	22.5°	30°	37.5°	45°
0	2	5	10	20

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 separations from the axis. The probable error does not exceed ±5 microns.

The two surfaces of the filter accompanying this camera are parallel to within ten seconds of arc.

For the Director,

Francis E. Washer, Chief
Refractometry Section
Metrology Division

NBS Test No. 181411
July 23, 1964