

UNITED STATES DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS  
WASHINGTON 25, D. C.

**National Bureau of Standards**  
**Test Report**

2.2/174928

on

FAIRCHILD CARTOGRAPHIC CAMERA TYPE T-11  
No. 54-013

Equipped with

Bausch & Lomb Planigon Lens No. XF6750

Submitted by

Mark Hurd Aerial Surveys, Inc.  
345 Pennsylvania Ave. South  
Minneapolis 26, Minnesota

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 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	154.12 mm
Calibrated focal length	154.10 mm

The probable errors of these determinations of focal length do not exceed  $\pm 0.10$  mm.

II. Distortion1. Distortion referred to the equivalent focal length

	7.5°	15°	22.5°	30°	37.5°	45°
Average	0	-1	-10	-19	-13	-20

2. Distortion referred to the calibrated focal length

Radius	7.5°	15°	22.5°	30°	37.5°	45°
1	-3	7	1	-6	1	-1
2	-3	9	6	1	13	17
3	-3	3	-3	-6	11	11
4	-3	5	-5	-8	-1	-9
Average	-3	6	0	-5	6	5

Radii 1 and 3 are on the same diagonal but separated in azimuth by 180°. Radii 2 and 4 are on the diagonal making an angle of 90° with 1 and 3. The values of the distortion are measured in microns and indicate the displacement of the image from its distortion-free position. The probable error does not exceed  $\pm 10$  microns.

III. Resolving Power

Emulsion	0°	7.5°	15°	22.5°	30°	37.5°	45°
V-F							
Tangential	63	63	53	53	27	19	27
Radial	63	63	53	39	39	39	46
Plus-X							
Tangential	39	39	32	32	23	16	23
Radial	39	39	32	32	32	32	32

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.

## SUPPLEMENT

V. Principal Point of Autocollimation

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

VI. Collimation Marker Separation

A - B	237.85 mm
C - D	234.94 mm

Markers A and B lie in the line of flight. The probable errors in these separations do not exceed  $\pm 0.01$  mm.

VII. Calibrated Focal Length Markers

B - side	154.11 mm
C - side	154.11 mm

The probable errors in these separations of the calibrated focal length markers do not exceed  $\pm 0.01$  mm.

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June 9, 1966

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SUPPLEMENT

#### IV. Tangential Distortion

$0^\circ$	$\pm 22.5^\circ$	$\pm 30^\circ$	$\pm 37.5^\circ$	$\pm 45^\circ$
0	1	2	5	2

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  $\pm 5$  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 Report No. 174928  
Washington, D.C.  
January 31, 1963

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