

United States Department of the Interior



U.S. GEOLOGICAL SURVEY
Reston, Virginia 20192

REPORT OF CALIBRATION
of Aerial Mapping Camera

January 22, 2002

Camera type:	Wild RC30*	Camera serial no.:	5268
Lens type:	Wild Universal Aviogon /4-S	Lens serial no.:	13314
Nominal focal length:	153 mm	Maximum aperture:	f/4
		Test aperture:	f/4

Submitted by: Tuck Engineering, Inc.
Big Stone Gap, Virginia

Reference: Tuck Engineering, Inc. letter of approval, dated
January 16, 2002. Signed by Mr. Tony L. Jackson'.

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: 153.124 mm

II. Lens Distortion

Field angle:	7.5°	15°	22.7°	30°	35°	40°
Symmetric radial (um)	-1	-1	-1	0	1	1
Decentering (um)	0	0	0	1	1	1

Symmetric radial distortion parameters

Decentering distortion parameters

Calibrated principal point

$K_0 = 0.2866 \times 10^{-4}$
 $K_1 = -0.5905 \times 10^{-8}$
 $K_2 = 0.2203 \times 10^{-12}$
 $K_3 = 0.0000$
 $K_4 = 0.0000$

$P1 = -0.5623 \times 10^{-7}$
 $P2 = -0.3112 \times 10^{-7}$
 $P3 = 0.0000$
 $P4 = 0.0000$

$X_p = 0.011$ mm
 $Y_p = -0.006$ mm

The values and parameters for Calibrated Focal Length (CFL), Symmetric Radial Distortion (K_0, K_1, K_2, K_3, K_4), Decentering Distortion ($P1, P2, P3, P4$), and Calibrated Principal Point [point of symmetry] (X_p, Y_p) were determined through a

least-squares Simultaneous Multiframe Analytical Calibration (SMAC) adjustment. The x and y-coordinate measurements utilized in the adjustment of the

above parameters have a standard deviation (a) of ±3 microns.

* Equipped with Forward Motion Compensation

III. Lens Resolving Power in cycles/mm

Area-weighted average resolution: 124

Field angle:	0°	7.5°	15°	22.7°	30°	35°	40°
Radial Lines	134	159	159	159	134	113	113
Tangential lines	134	159	159	113	134	95	80

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 5 to 268 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 tangential lines are perpendicular to a radius.

IV. Filter Parallelism

The two surfaces of the Wild 525 No. 7025 filter accompanying this camera are within 10 seconds of being parallel. The 525 filter was used for the calibration.

V. Shutter Calibration

Indicated time Efficiency (sec) (%)	Rise time (U sec)	Fall Time (U sec)	½ width time (ms)	Nom. Speed (sec.)	
1/125	1775	1779	8.41	1/140	87
1/250	920	922	4.21	1/280	87
1/500	449	443	2.15	1/540	87
1/1000	233	233	1.08	1/1070	87

The effective exposure times were determined with the lens at aperture f/4. The method is considered accurate within 3 percent. The technique used is Method I described in American National Standard PH3.48-1972(R1978).

VI. Film Platen

The film platen mounted in Wild RC30 drive unit No. 5268-631 does not depart from a true plane by more than 13 um (0.0005 in).

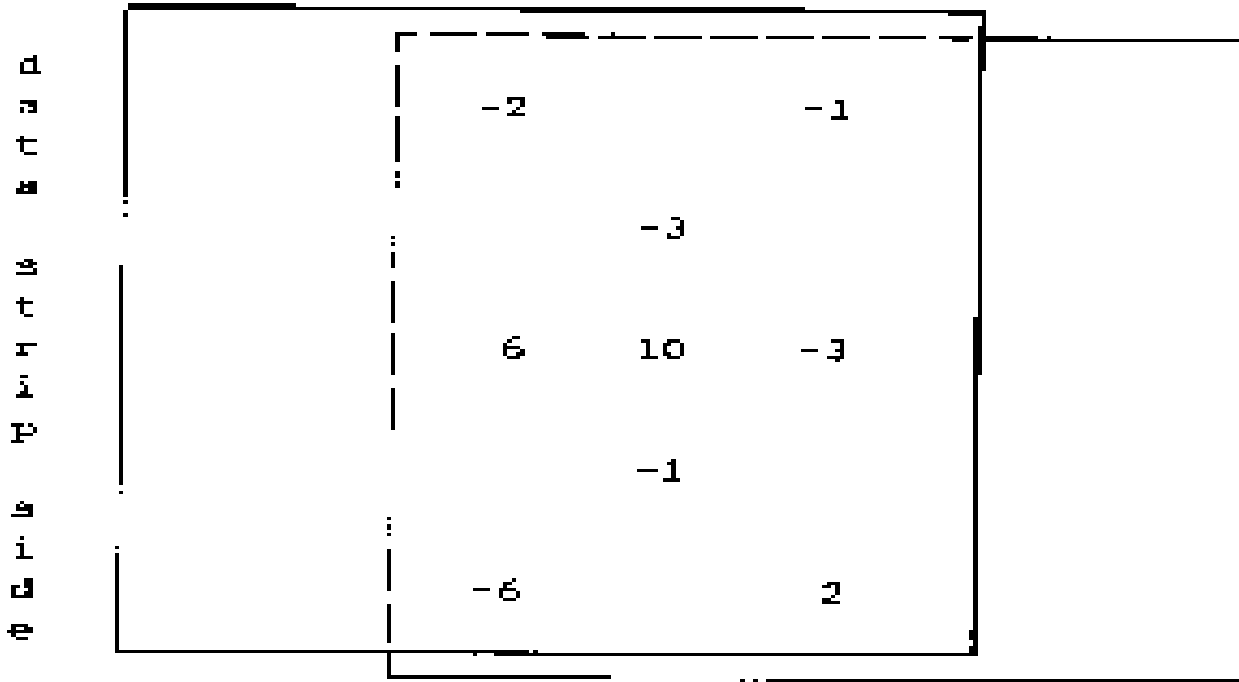
This camera is equipped with a platen identification marker that will register "631" in the data strip area for each exposure.

IX. Stereomodel Flatness

FMC Drive Unit No.:

5268-631

Base/Height ratio: 0.6



Platen ID: 631

Maximum angle of field tested: 40°

Stereomodel
Test point array
(values in micrometers)

The values shown on the diagram are the average departures from flatness (at negative scale) for two computer-simulated stereo models. The values are based on comparator measurements on contact glass (Kodak Micro-flat) diapositives made from Kodak 2405 film exposures. These measurements can vary by as much as ± 5 um from model to model.

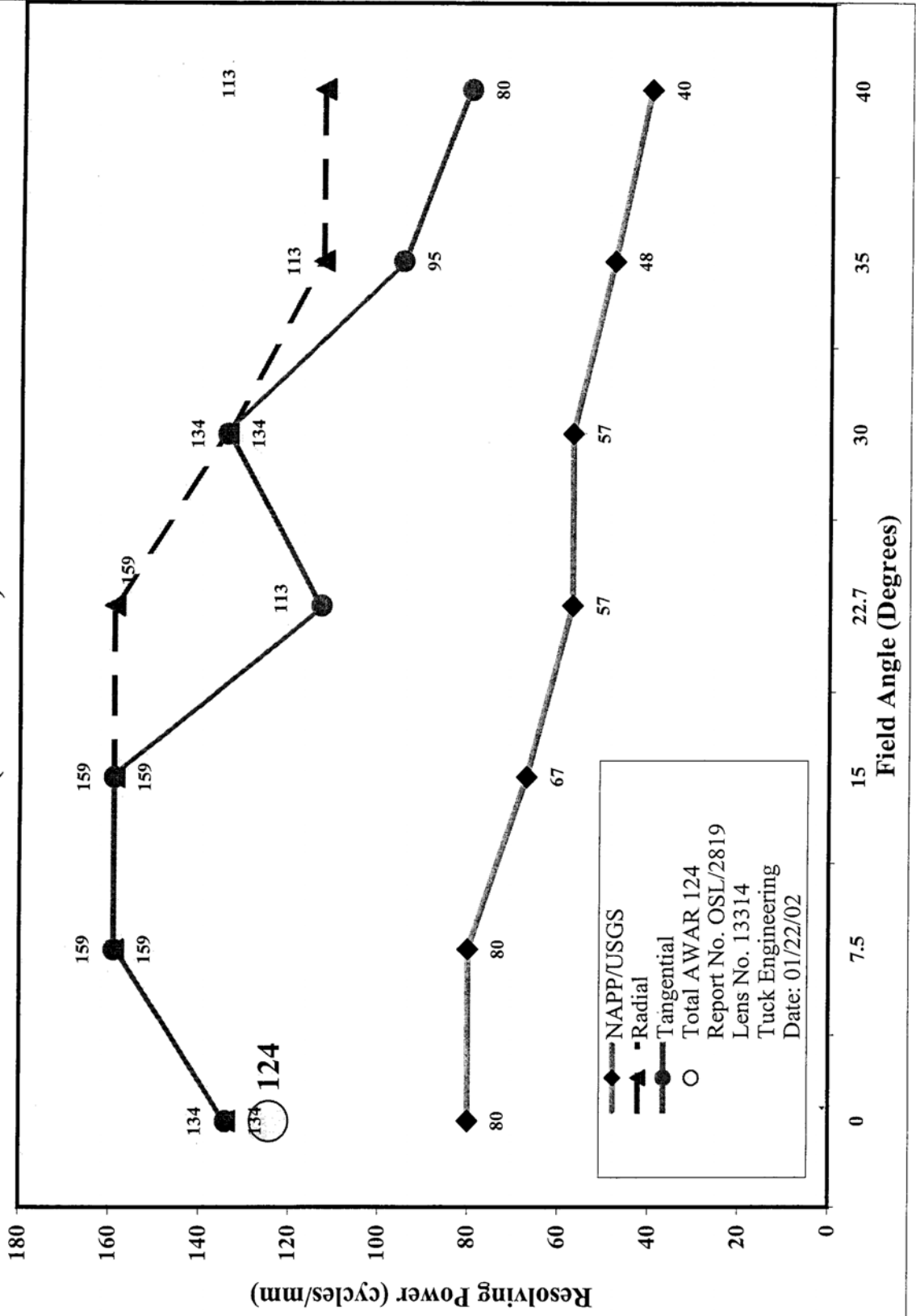
X. System Resolving Power on film in cycles/mm

Area-weighted average resolution: 56					Film:	Type 2405
Field angle:	0°	7.5°	15°	22.7°	30°	35°
Radial Lines	67	67	67	67	67	48
Tangential lines	67	57	57	57	57	48

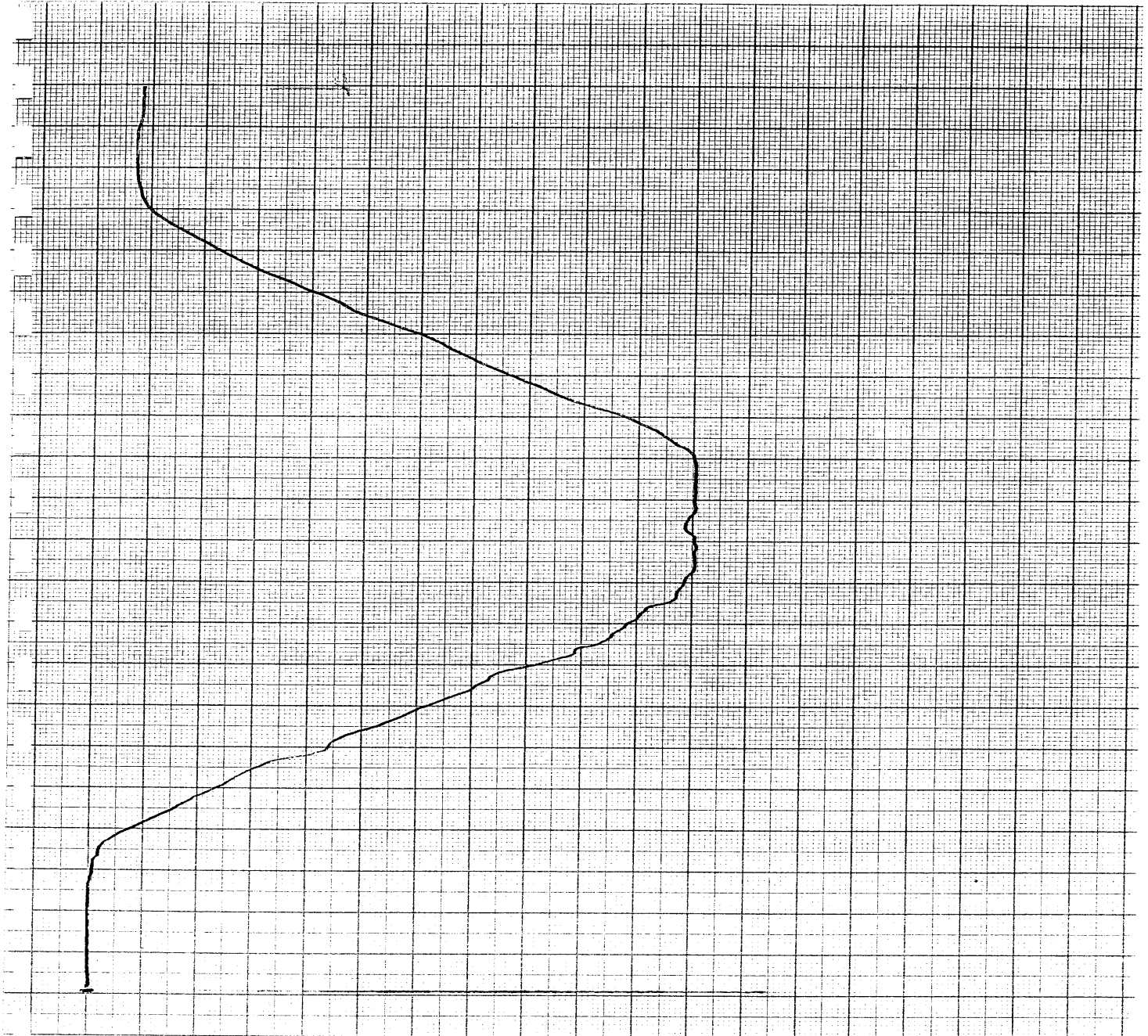
This aerial mapping camera calibration report supersedes the previously issued
USGS Report No. OSL/2519, dated January 20, 1999.

John J. Lenart
Chief, Technology Operations Section
National Mapping Division

Lens Resolving Power at Maximum Aperture (153 mm lens)



◆ NAPP/USGS
 ▲ Radial
 ● Tangential
 ○
 Total AWAR 124
 Report No. OSL/2819
 Lens No. 13314
 Tuck Engineering
 Date: 01/22/02



JLA RECORDING DENSITOMETER #441817	SPECIMEN NUMBER	SURFACE IDENTIFICATION	APERTURE (MICRONS)	MAGNIFICATION	QUANTITY	DATE	FILE NUMBER
	57083	5-6	.36D	1:1	λ50 = 525nm AV2x WILD UAg 14-S 13314	1/18/02	2819
	2mm x .12mm	5-6			# 1025		