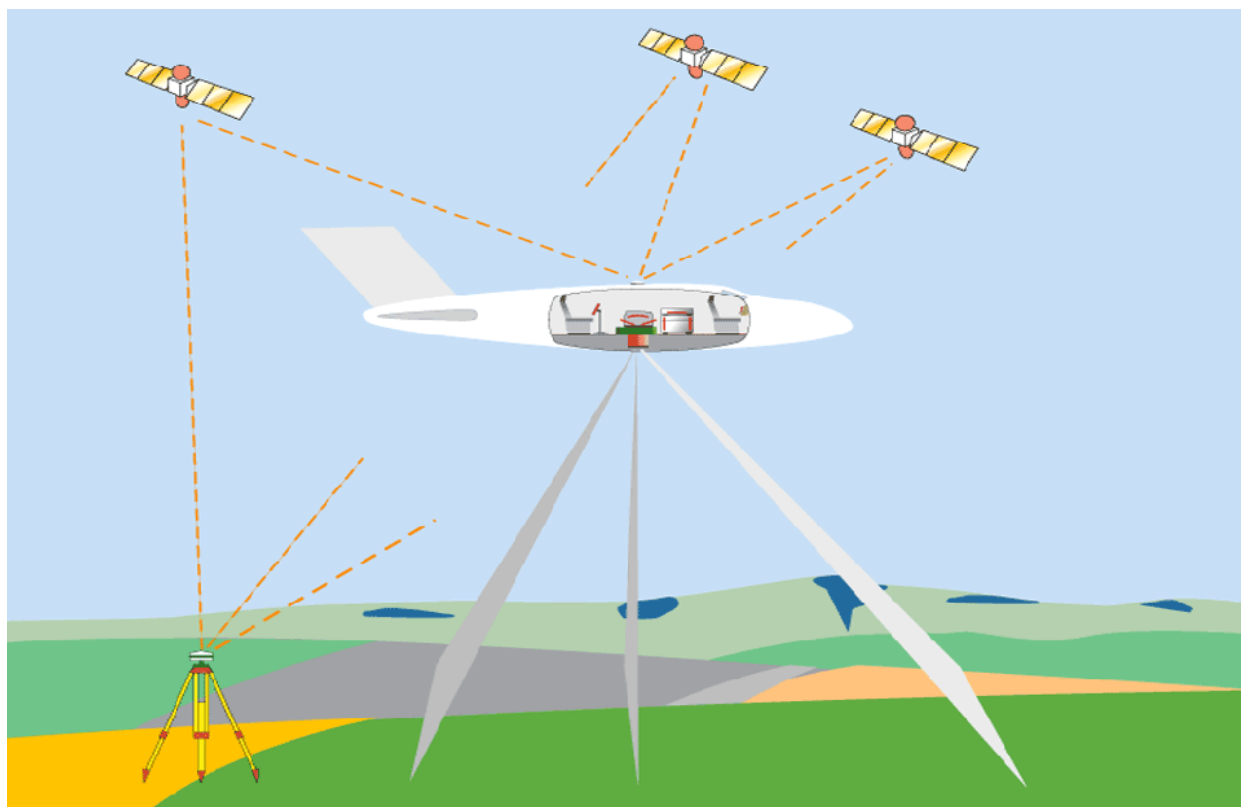


ADS40 Calibration Certificate



This certificate is valid for

Sensor Head	Serial Number	Control Unit	Serial Number
SH51	30101	CU40	31101

Inspector

Calibration certificate issued on **8 January 2007**

by **Muzaffer Adigüzel**

Certificate and calibration data ID **870107_30101_070108-1** Document code 870107

ADS
40

Leica Geosystems
Heinrich-Wild-Strasse
9435 Heerbrugg
Switzerland

Leica
Geosystems

Components

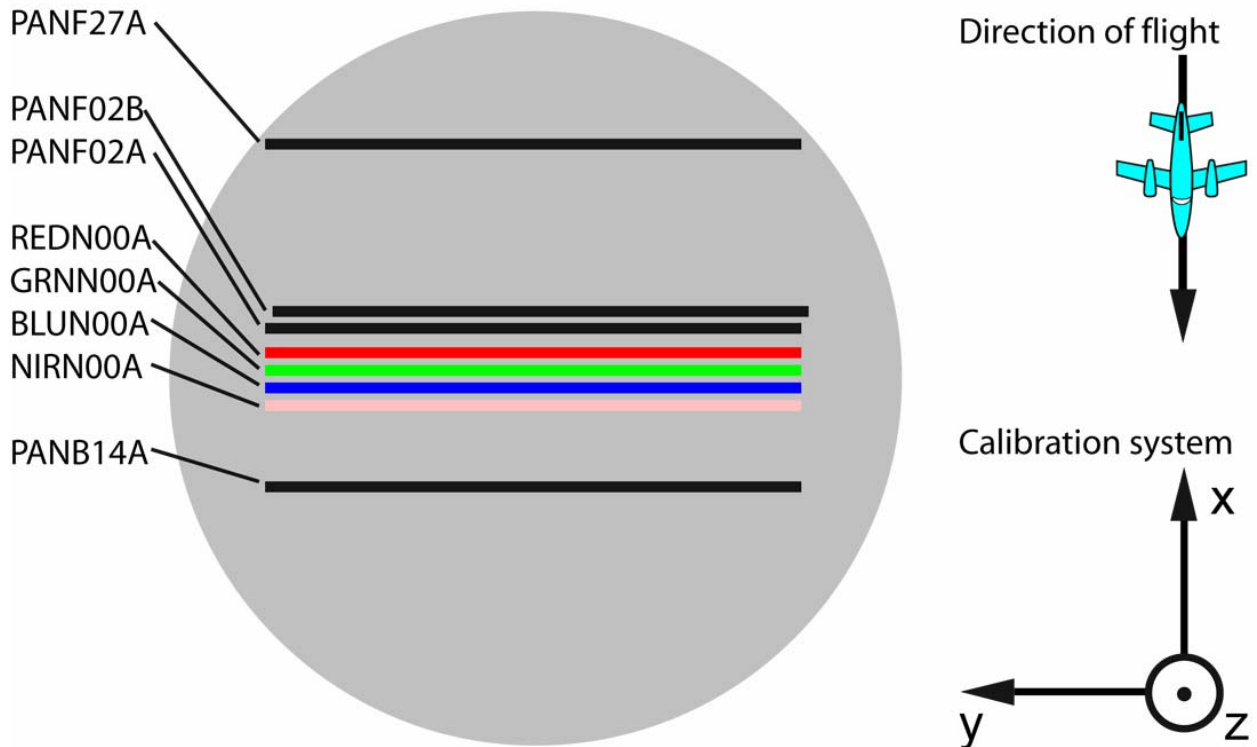
Component	Device	Type	Serial Number
SH51 #30101	Lens system	DO64-810000	21955 / 0057
	Focal Plate Module cover	FCO	02
	Focal Plate Module (FPM)	FPM-A	02
	Inertial Measurement Unit	LN200	
CU40 #31101	POS-system with GPS	IPAS	1035

Nominal FPM layout of tested system

End pixel coordinates are center of pixel coordinates.
 Middle coordinates are between pixels 6000 and 6001.
 All values in [mm]

Line Name	X	Y, Pixel 1	Y, Center	Y, Pixel 12000
PANF27A	32.18400	38.99675	0.00000	38.99675
PANF02B	02.21000	-38.99345	0.00330	39.00005
PANF02A	02.18400	-38.99675	0.00000	38.99675
REDN00A	00.01300	-38.99345	0.00330	39.00005
GRNN00A	-00.01300	-38.99675	0.00000	38.99675
BLUN00A	00.00000	-38.99345	0.00330	39.00005
NIRN00A	00.00000	-38.99675	0.00000	38.99675
PANB14A	-15.81600	-38.99675	0.00000	38.99675

View from top of Sensor Head



Calibration process

Adjustment of optical systems in optical laboratory

	Passed	Date	Inspector
<i>DSNU (Dark Signal Non Uniformity)</i>	ok	01.12.06	Bernhard Riedl
<i>PRNU (Photo Response Non Uniformity)</i>	ok	01.12.06	Bernhard Riedl
<i>MTF</i>	ok	01.12.06	Bernhard Riedl
<i>Best image plane</i>	ok	01.12.06	Bernhard Riedl

Flight and data processing

	Passed	Date	Inspector
<i>Test flight</i>	ok	13.12.06	M. Herrmann
<i>GPS and IMU data processing</i>	ok	14.12.06	Muzaffer Adigüzel
<i>Image data processing</i>	ok	14.12.06	Muzaffer Adigüzel
<i>Geometrical calibration</i>	ok	08.01.07	Muzaffer Adigüzel

Inspection

Inspectors

<i>Name</i>	Bernhard Riedl	08.01.2007	
<i>Position</i>	ADS Production Manager		
<i>Name</i>	Udo Tempelmann	08.01.2007	
<i>Position</i>	ADS System Engineer		

ADS40 calibration process specification

<i>Inspection plan</i>	Document code 862100
<i>Leica ADS40 system calibration process</i>	870106

Maintenance

<i>Last date of service</i>	
<i>Recommendations</i>	

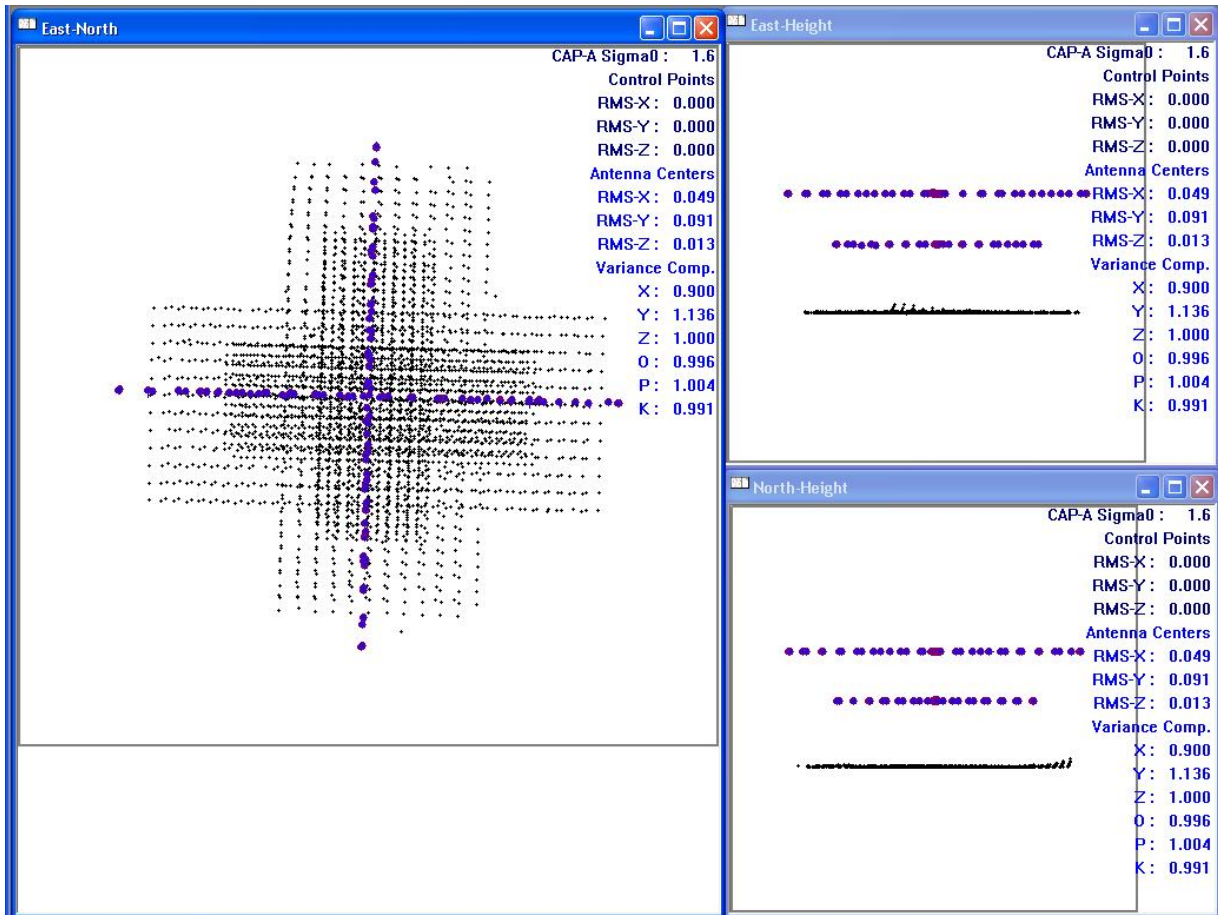
Results of geometrical calibration

Calibrated apparent of x/y-coordinates for all sensor lines are contained on the calibration file attached to this certificate. File: **30101-070108-1.zip**

Stereo lines (A-lines of staggered panchromatic pairs)

Included lines	PANF27A PANF02A PANB14A
Calibration method	Estimation of additional parameters in simultaneous bundle adjustment
Sigma naught of bundle adjustment	1.6 micron
Mean local redundancy	> 0.5
Accuracy of calibrated apparent pixel coordinates	±1.0 micron

Final bundle adjustment result after elimination of tie point blunders and before introduction of ground control:



IMU misalignment

Misalignment results in [rad]:	ω =	+0.0000099207	± 0.0000063478
	ϕ =	-0.0005434150	± 0.0000066794
	κ =	+0.0024583531	± 0.0000203868

Color lines

Included lines	BLUN00A REDN00A GRNN00 NIRN00A
Calibration method	Optimal robust polynomial fit of tie point residuals from bundle adjustment
Mean accuracy of estimated fit for:	
Blue, Green, Red	± 1.2 micron
NIRF18	± 1.2 micron
Accuracy of apparent pixel-coordinates	± 1 micron
Relative accuracy of lines:	
Blue, Green, Red	± 1.0 micron

B - lines of staggered panchromatic line pairs

Included lines	PANF02B
Calibration method	Transfer of A-lines results, using the known staggering offset
Accuracy of apparent pixel coordinates	Same as for A-lines
Relative accuracy between the lines of a staggered pair	± 0.5 micron