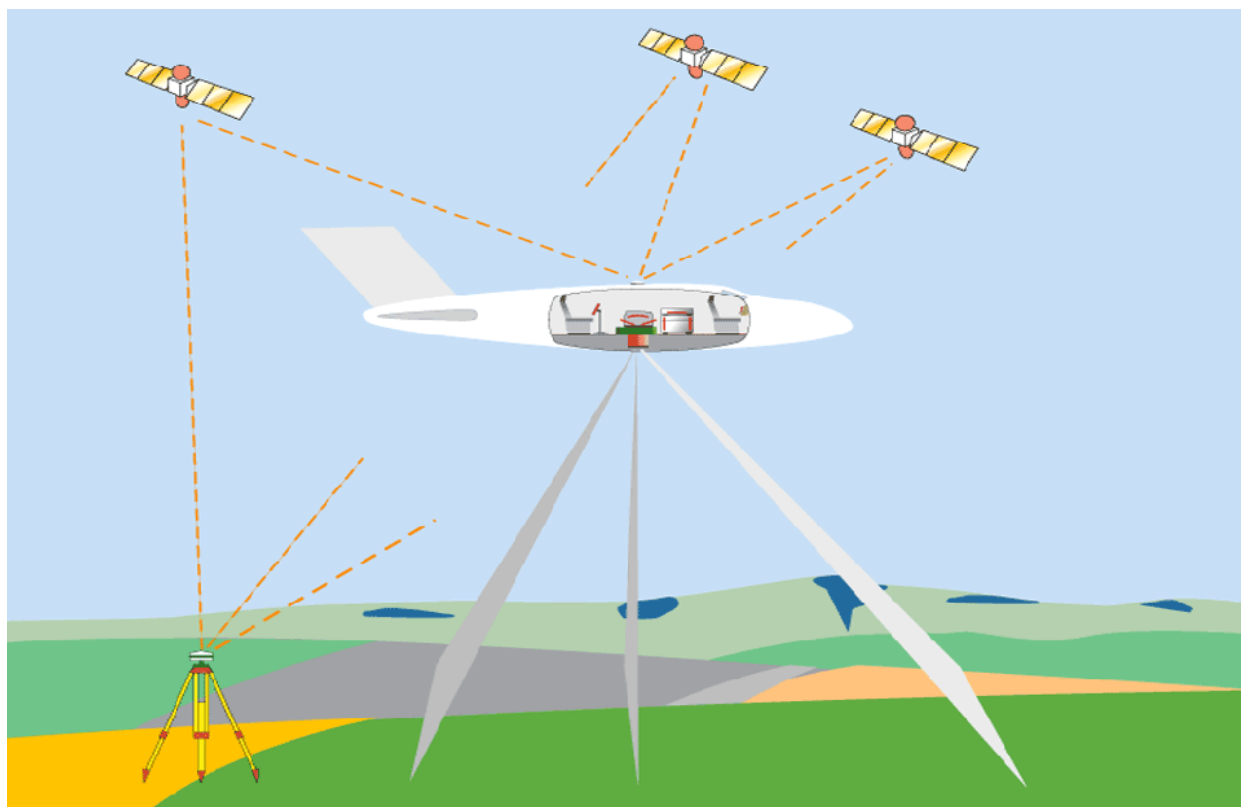


# ADS40 Calibration Certificate



This certificate is valid for

Sensor Head	Serial Number	Control Unit	Serial Number
<b>SH51</b>	<b>30027</b>	<b>CU40</b>	<b>31027</b>

Calibration certificate issued on

**01 April 2008**

Inspector

*M. Adigüzel*

by

**Muzaffer Adigüzel**

Certificate and calibration data ID **870107\_30027\_080401-1**

Document code 870107

**ADS  
40**

Leica Geosystems AG  
Heinrich-Wild-Strasse  
9435 Heerbrugg  
Switzerland

**Leica**  
Geosystems

## Components

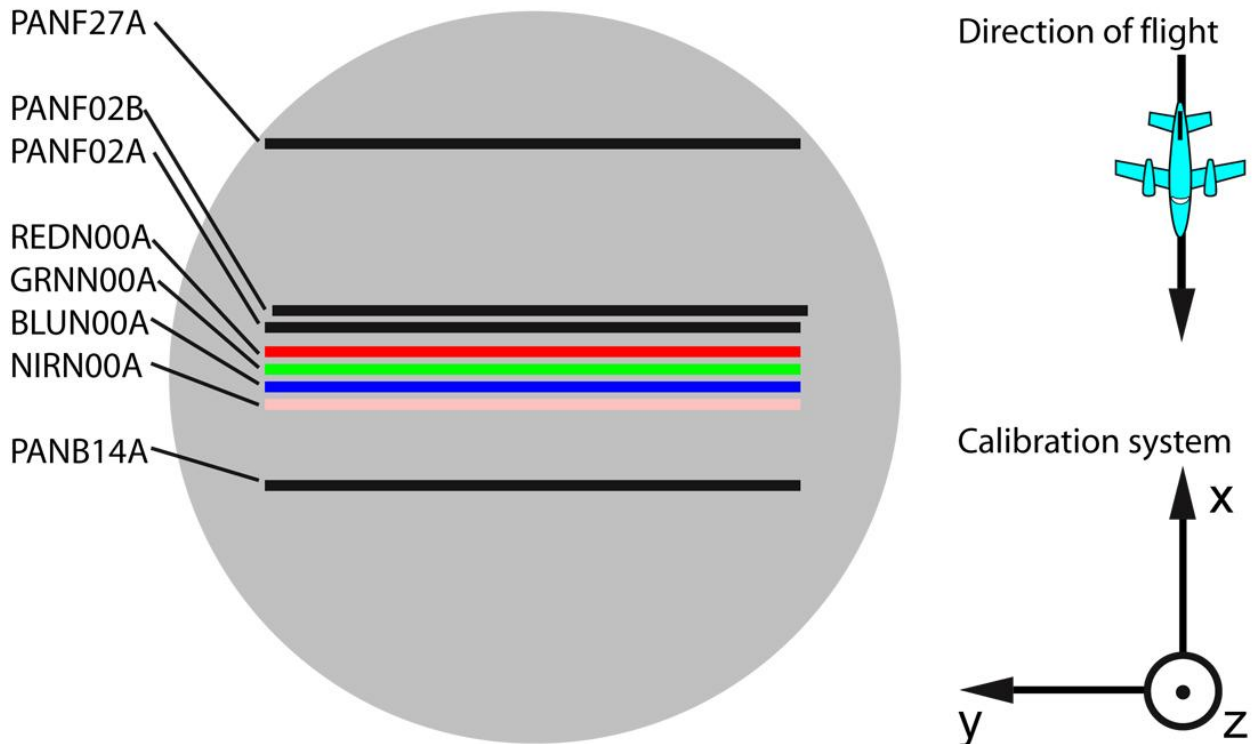
Component	Device	Type	Serial Number
SH51 #30027	Lens system	DO64-810000	21955 / 0025
	Focal Plate Module cover	FCO	25
	Focal Plate Module (FPM)	FPM-A	25
	Inertial Measurement Unit	LN200	
CU40 #31027	Positioning system including GPS	POS	483

## 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



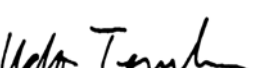
	Passed	Date	Inspector
<i>DSNU (Dark Signal Non Uniformity)</i>	<b>ok</b>	<b>26.11.2007</b>	<b>Bernhard Riedl</b>
<i>PRNU (Photo Response Non Uniformity)</i>	<b>ok</b>	<b>26.11.2007</b>	<b>Bernhard Riedl</b>
<i>MTF</i>	<b>ok</b>	<b>26.11.2007</b>	<b>Bernhard Riedl</b>
<i>Best image plane</i>	<b>ok</b>	<b>26.11.2007</b>	<b>Bernhard Riedl</b>

### Flight and data processing

	Passed	Date	Inspector
<i>Test flight</i>	<b>ok</b>	<b>02.02.2008</b>	<b>Customer</b>
<i>GPS and IMU data processing</i>	<b>ok</b>	<b>27.03.2008</b>	<b>Muzaffer Adigüzel</b>
<i>Image data processing</i>	<b>ok</b>	<b>27.03.2008</b>	<b>Muzaffer Adigüzel</b>
<i>Geometrical calibration</i>	<b>ok</b>	<b>01.04.2008</b>	<b>Muzaffer Adigüzel</b>

## Inspection

### Inspectors

<i>Name</i>	<b>Bernhard Riedl</b>	<b>01.04.2008</b>	
<i>Position</i>	ADS Production Manager		
<i>Name</i>	<b>Gert Ferrano</b>	<b>01.04.2008</b>	
<i>Position</i>	ADS System Engineer		
<i>Name</i>	<b>Udo Tempelmann</b>	<b>01.04.2008</b>	
<i>Position</i>	ADS Software Manager		

### 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>	

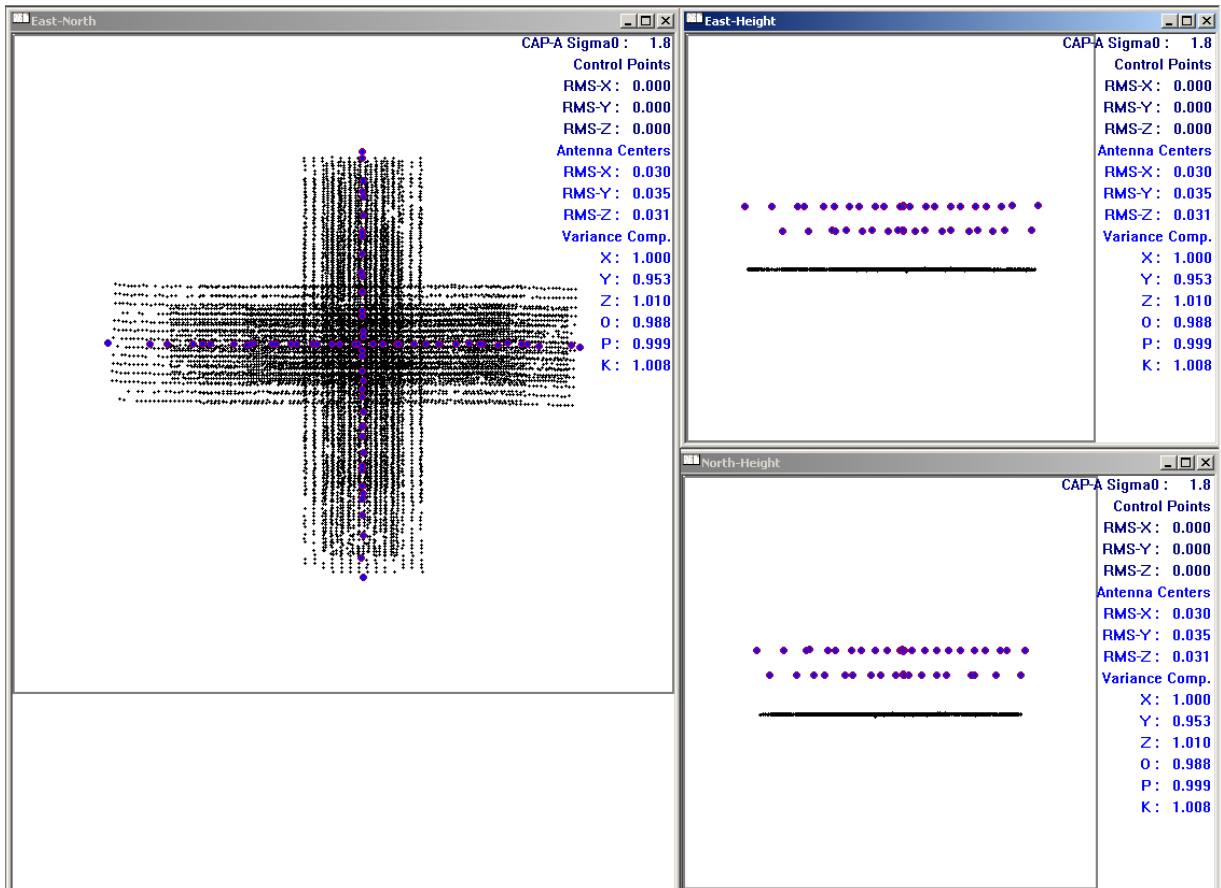
## Results of geometrical calibration

Calibrated apparent pixel coordinates for all sensor lines are contained on the calibration file attached to this certificate. File: **30027-080401-1.zip**

### Stereo lines

A-lines	PANF27A	PANF02A	PANB14A
Calibration method	Estimation of additional parameters in simultaneous bundle adjustment		
Sigma naught of bundle adjustment	1.8 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]:	$\omega$ =	0.0004556372	± 0.0000048056
	$\phi$ =	0.0001959860	± 0.0000047526
	$\kappa$ =	0.0002014568	± 0.0000160951

***Color lines***

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Included lines	BLUN00A REDN00A GRNN00A NIRN00A
Calibration method	Optimal robust polynomial fit of tie point residuals from bundle adjustment
Mean accuracy of estimated fit for:	
Blue, Green, Red	± 1.0 micron
NIR	± 1.0 micron
Accuracy of apparent pixel-coordinates	± 1 micron

***Lines of staggered panchromatic line pair***

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