FIG Workshop on
Innovative Technologies for an Efficient Geospatial Management of Earth Resources
Lake Baikal, Siberia, July 23-30, 2009

IGI's Modular Systems for Efficient Acquiring of Earth Data

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Germany

www.igi-systems.com
www.litemapper.eu
www.streetmapper.eu

IGI PORTFOLIO

Guidance and Sensor Management Systems

GPS / IMU Systems

Integrated Sensor Systems for Special Applications

IGI's Modular Sensorsystems

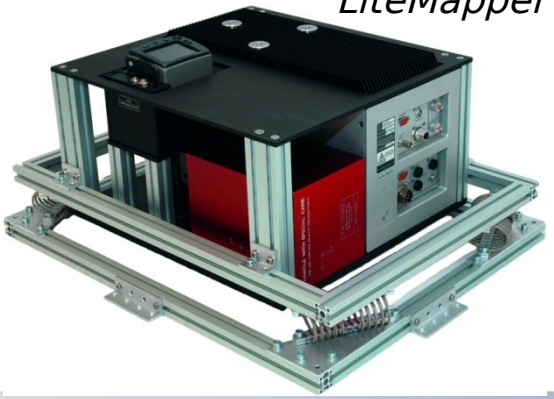
IGI Products:

Quattro-DigiCAM

DigiTHERM

DigiCAM

LiteMapper



StreetMapper

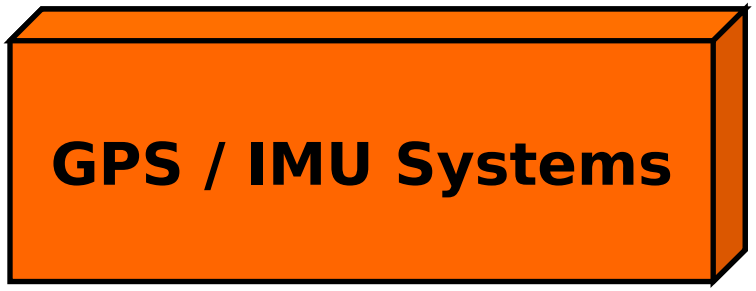
CCNS/AEROcontrol
e.g. for:

JAS

DMC

UCD
UCX
UCXp
UCL


Guidance and
Sensor
Management


GPS / IMU Systems


Integrated Sensor
Systems
for Special
Applications

CCNS: Guidance and Sensor Management

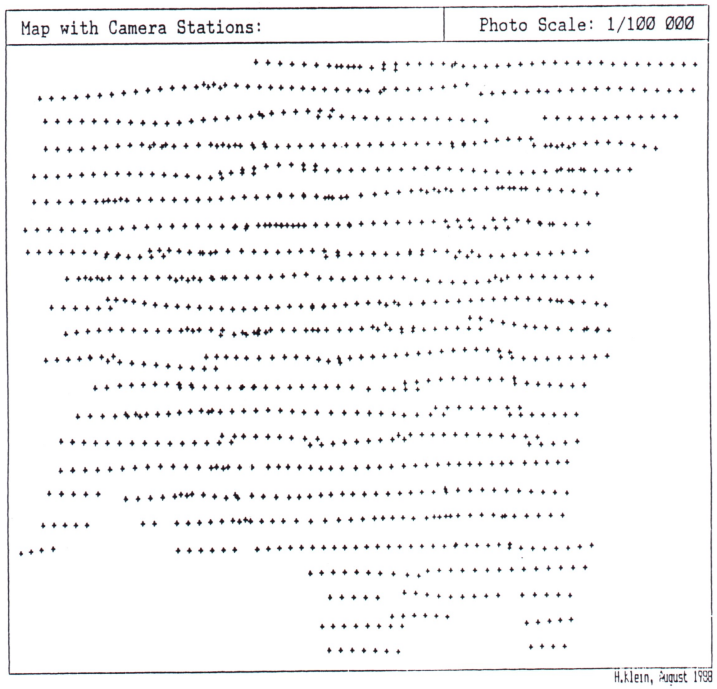
CCNS Hardware

CCNS in operation

Development in Aerial Survey

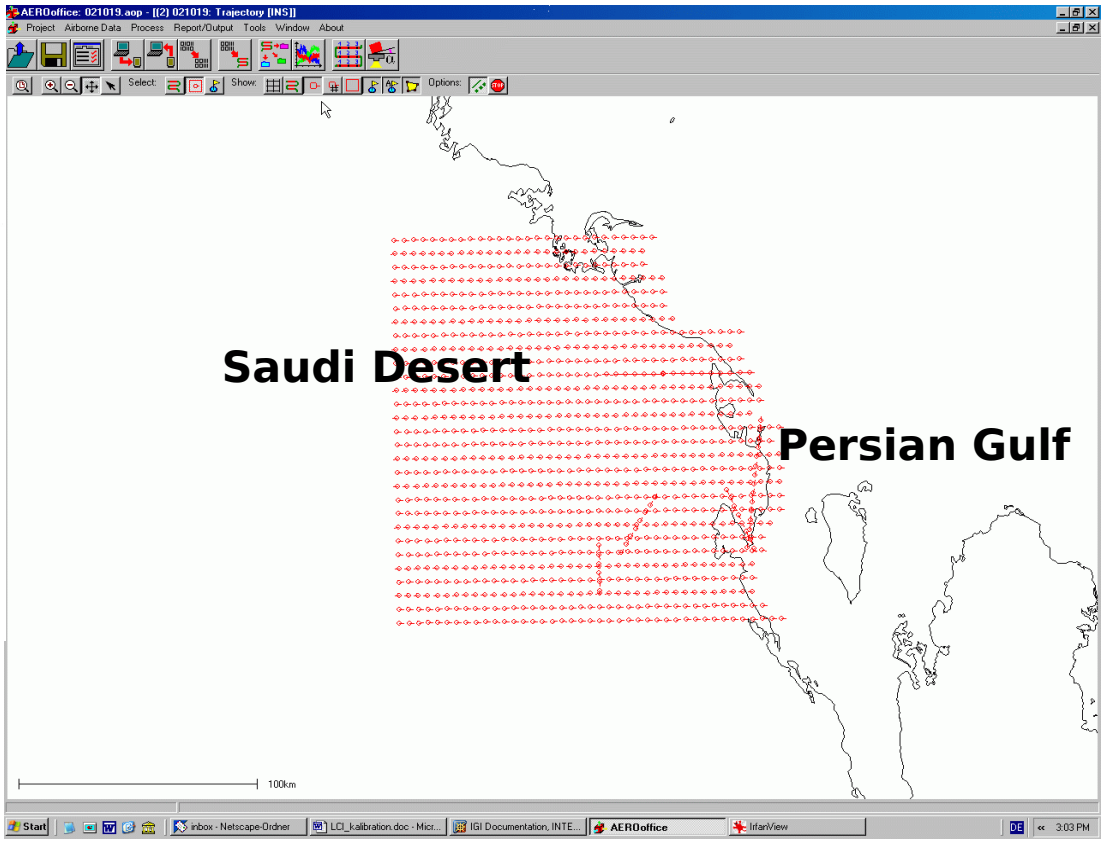
Photoindex

1988



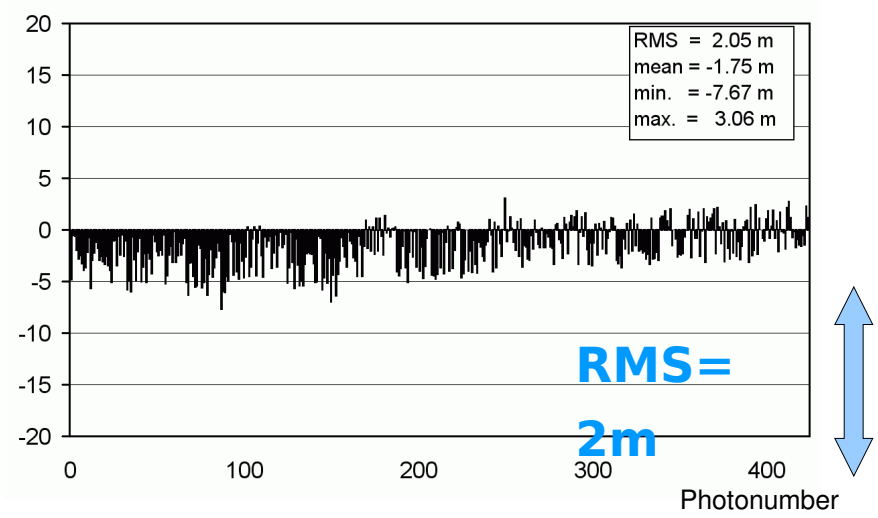
Kalimantan, Indonesia

Today



Guidance Accuracy

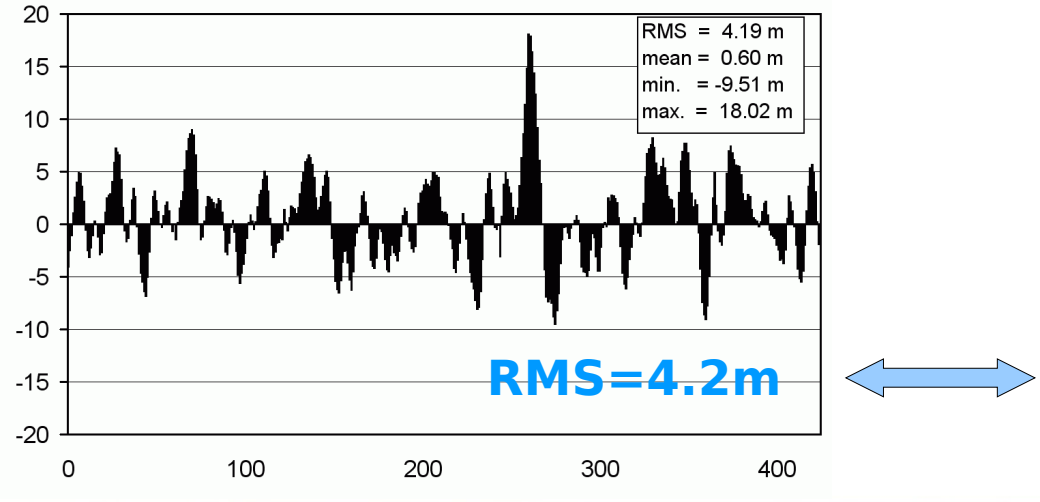
Difference [m] **in flight direction** (caused by the CCNS and the real-time GPS accuracy):



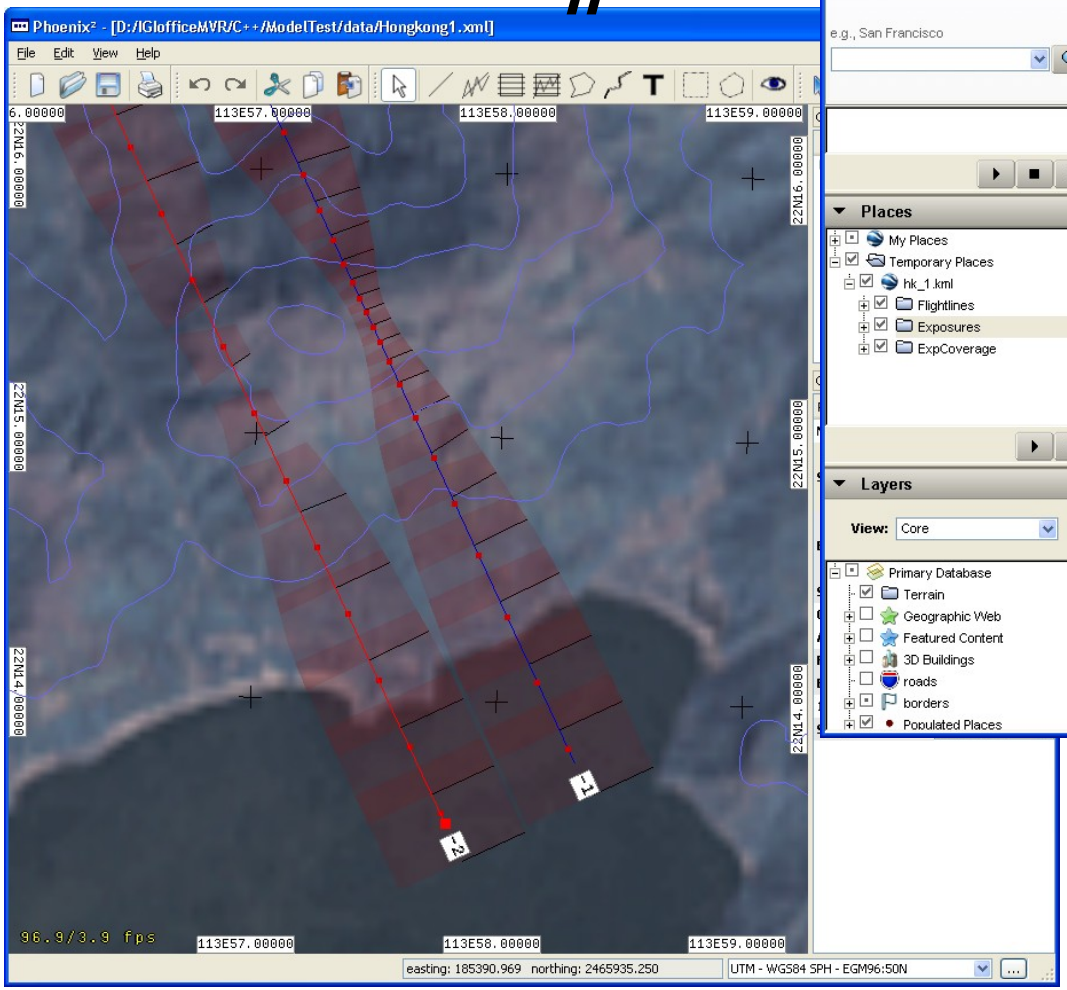
Difference between

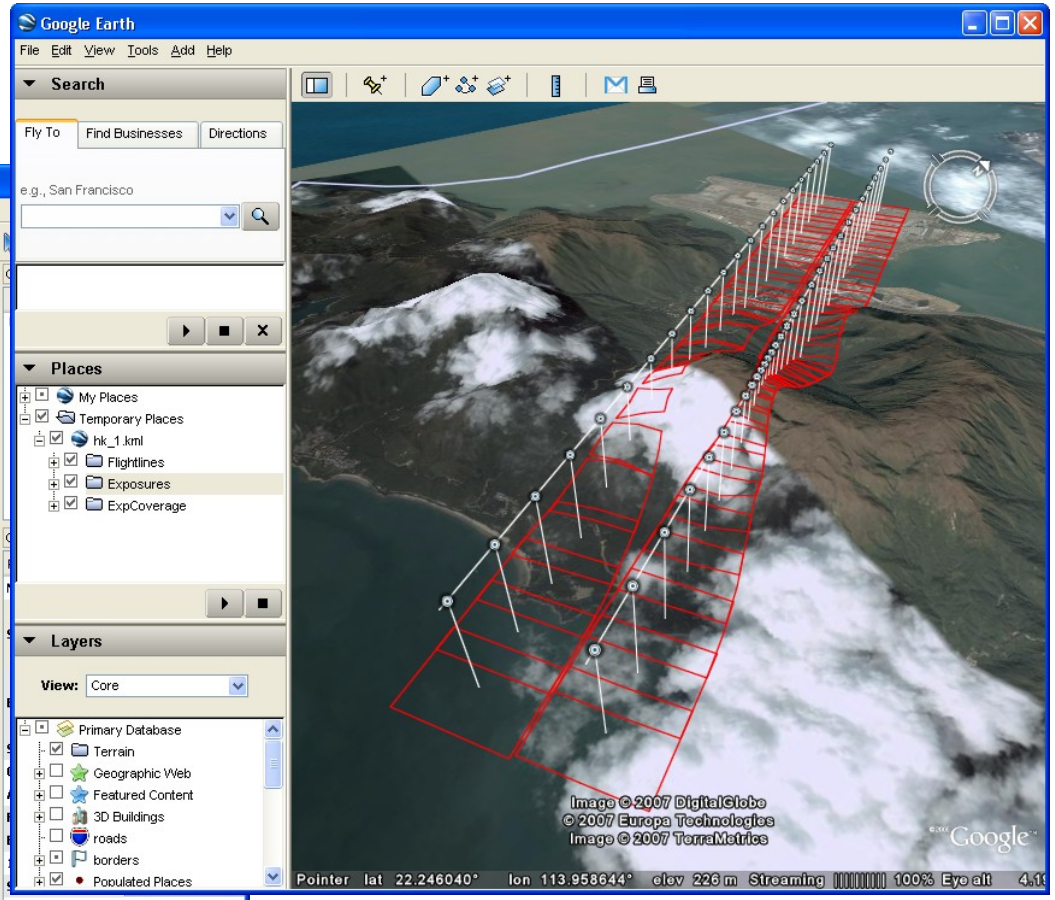
- photo positions from mission planning and
- taken images, (GPS/IMU results)

Difference [m] **perpendicular to the flight direction** (caused by the pilots skills):



Mission Planning and Documentation





Planning with DTMs

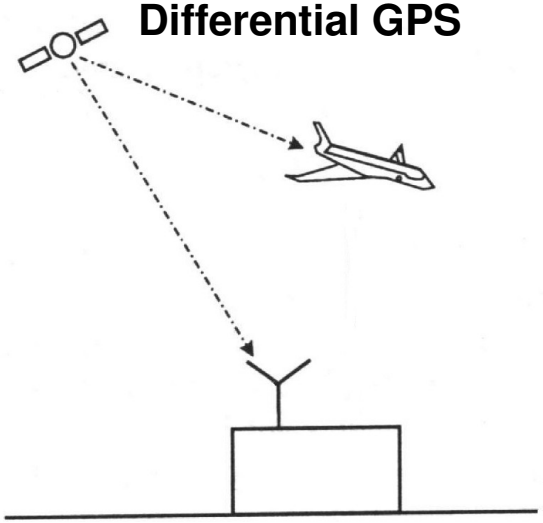
Guidance and Sensor Management

GPS / IMU Systems

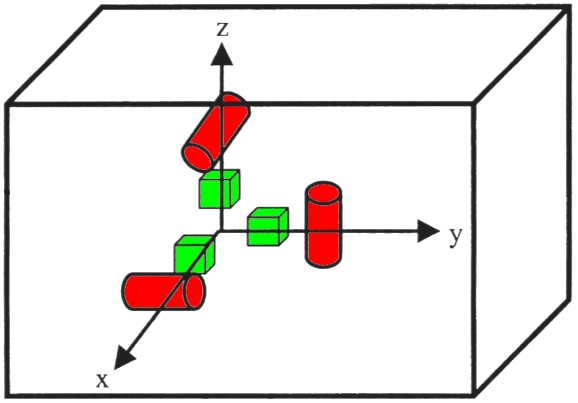
Integrated Sensor Systems for Special Applications

GPS / IMU Integration

Differential GPS



Inertial Measurement Unit



PPP or GPS Monitor Station

Kalman Filter

Position Velocity Attitude

AEROcontrol-IIe

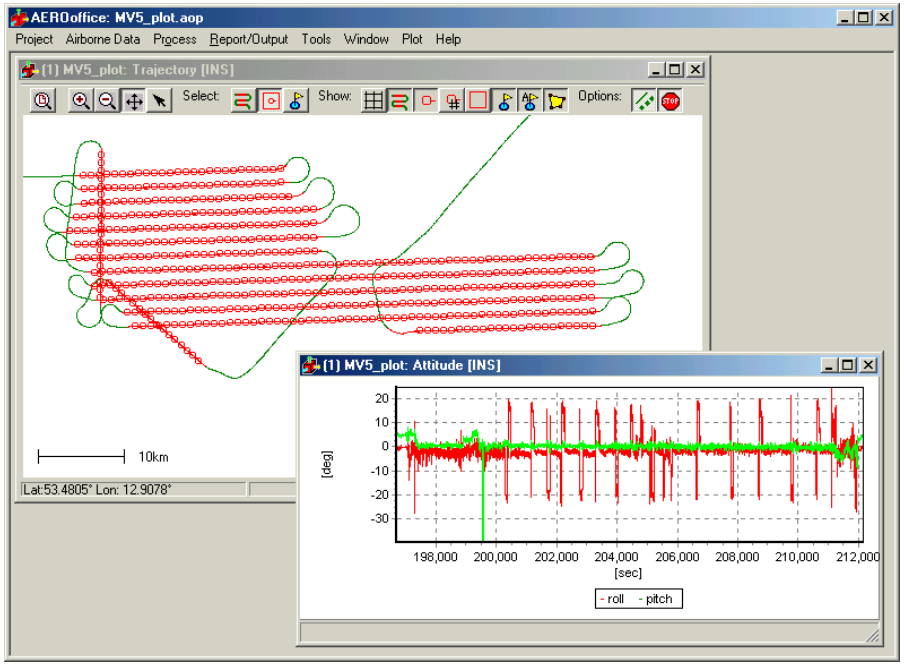
Hardware

SMU Computer

IMU

AEROcontrol-IIe system
SMU incl. 72-chan. L1/L2 GPS w/ IMU

Software

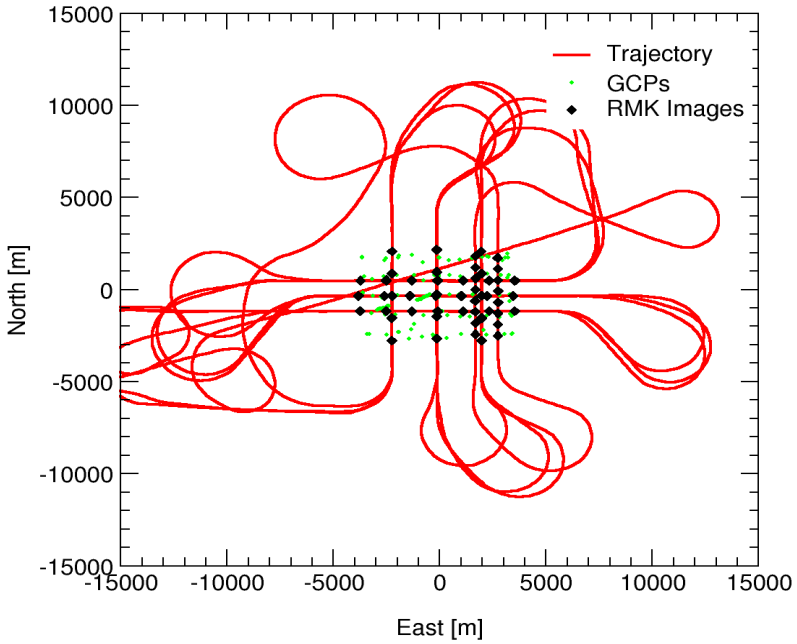


AEROoffice software incl. ***GrafNav***

AEROcontrol Accuracy

Independent Test from Stuttgart University: Achieved Accuracy [RMS]

Δωφ:	**0.003°**	**Δxy:**	**8cm**
Δκ:	**0.007°**	**Δz:**	**5cm**



Vaihingen Test Area

GPS/IMU system for

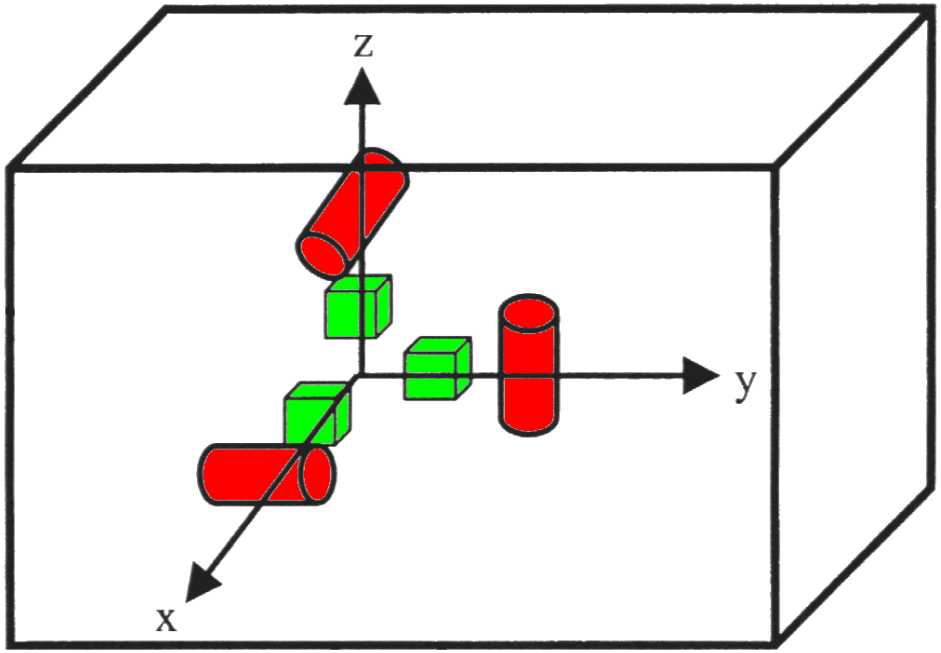
Geosystem
3-DAS-1

Jenoptik
JAS 150

Microsoft-Vexcel
UltraCam D,X,Xp,L

Intergraph
DMC

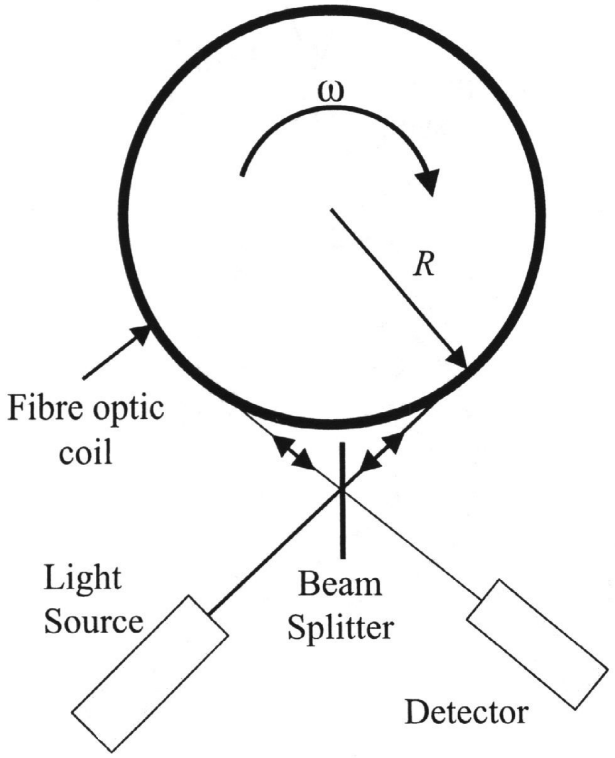
Three accelerometers
Three gyroscopes



Measurement of the motion in all three axes.

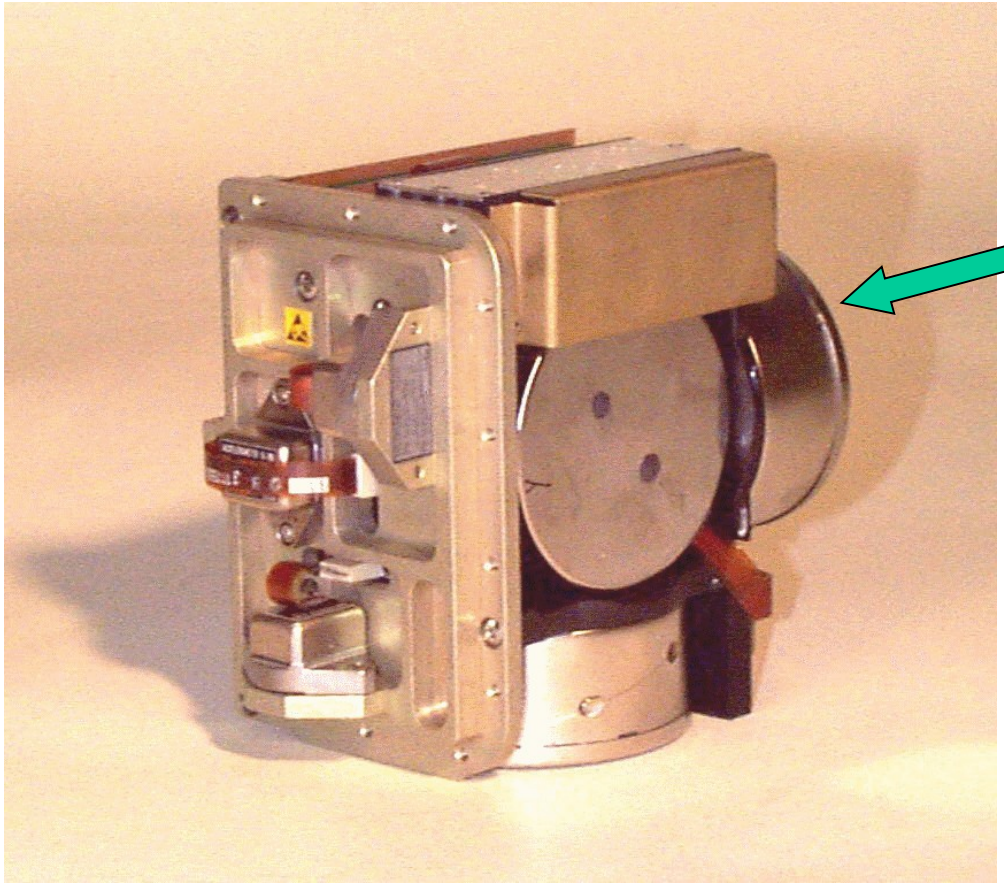
IMU - Inertial Measurement Unit

IMU with fiber-optic gyros



IMU IIe

IGI *IMU-IIe*



AEROcontrol IMU-IIe w/ fiber optic gyros

Drift: **0.03°/h**
Noise: **0.02°/ SQRT(h)**
Rate: **128, 256 or 400 Hz**

High **A**ltitude and **LO**ng Range Research Aircraft

DLR research aircraft Gulfstream 550
with *AEROcontrol IMU-IIe*

GPS Receiver

AEROcontrol internal GPS RX

72 channels
triple frequency
optional *OmniSTAR HP*
optional GLONASS

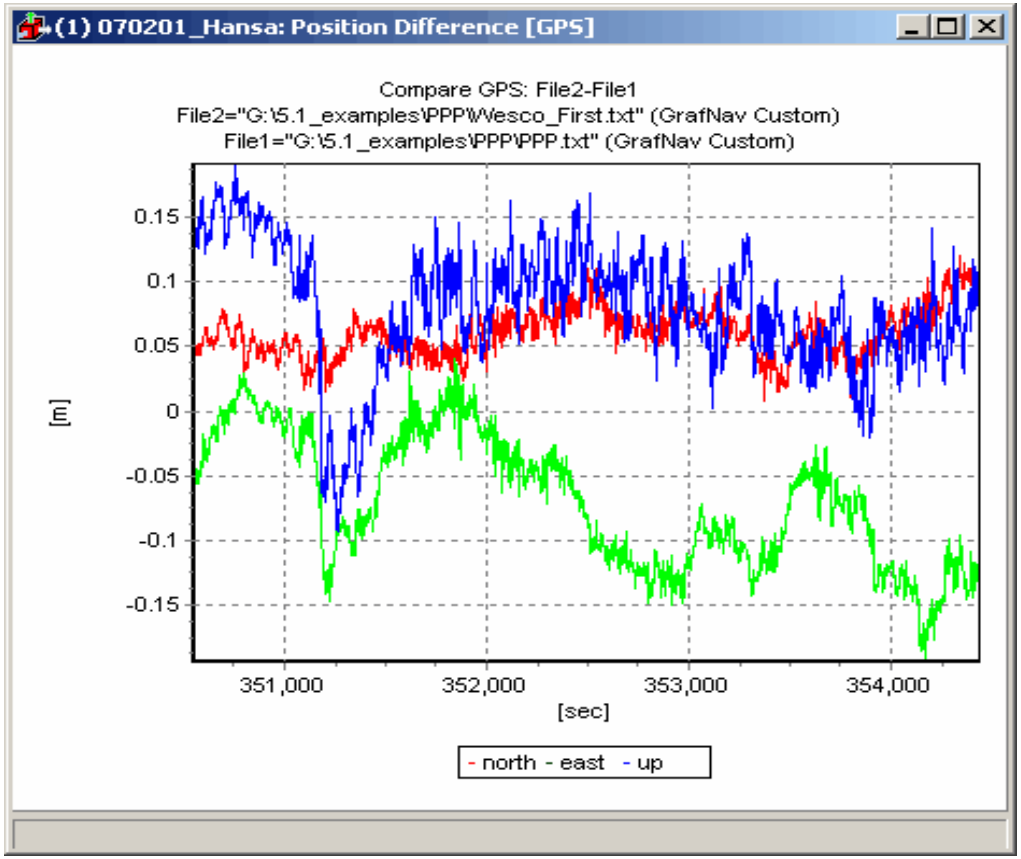
dGPS: with Base Station

Differential Post Processing

- use your own station or
- data from permanent stations (*CORS*):

***IGI* GPS monitor station** **or** **Fixed GPS Network**

PPP – Highest Accuracy w/o Base Station



Precise Point Processing: dGPS-like accuracy without a Base Station

integrated in *AEROoffice* with ***GrafNav* 8.2** by

NovAtel WAYPOINT PRODUCTS GROUP

Geo-referencing with *AEROcontrol*

Position and Attitude from GPS/IMU

Geo-referenced Image Data

DG

Direct **G**eo-referencing

Direct use of calibrated GPS/IMU data to Geo-reference image data.

ISO

Integrated **S**ensor **O**rientation

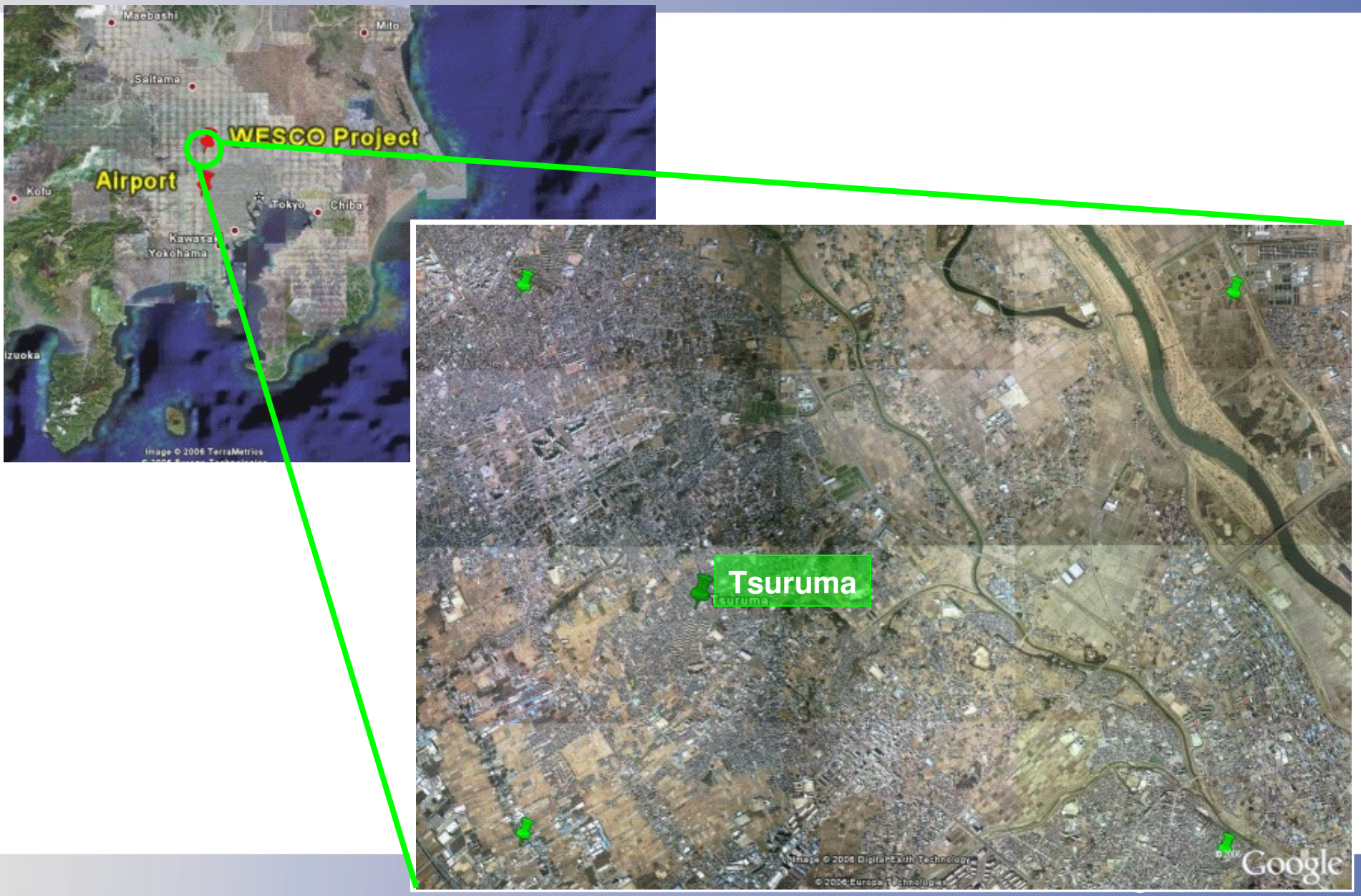
Extended aerial triangulation with GPS/IMU data as an additional input.

Project "WESCO", Japan

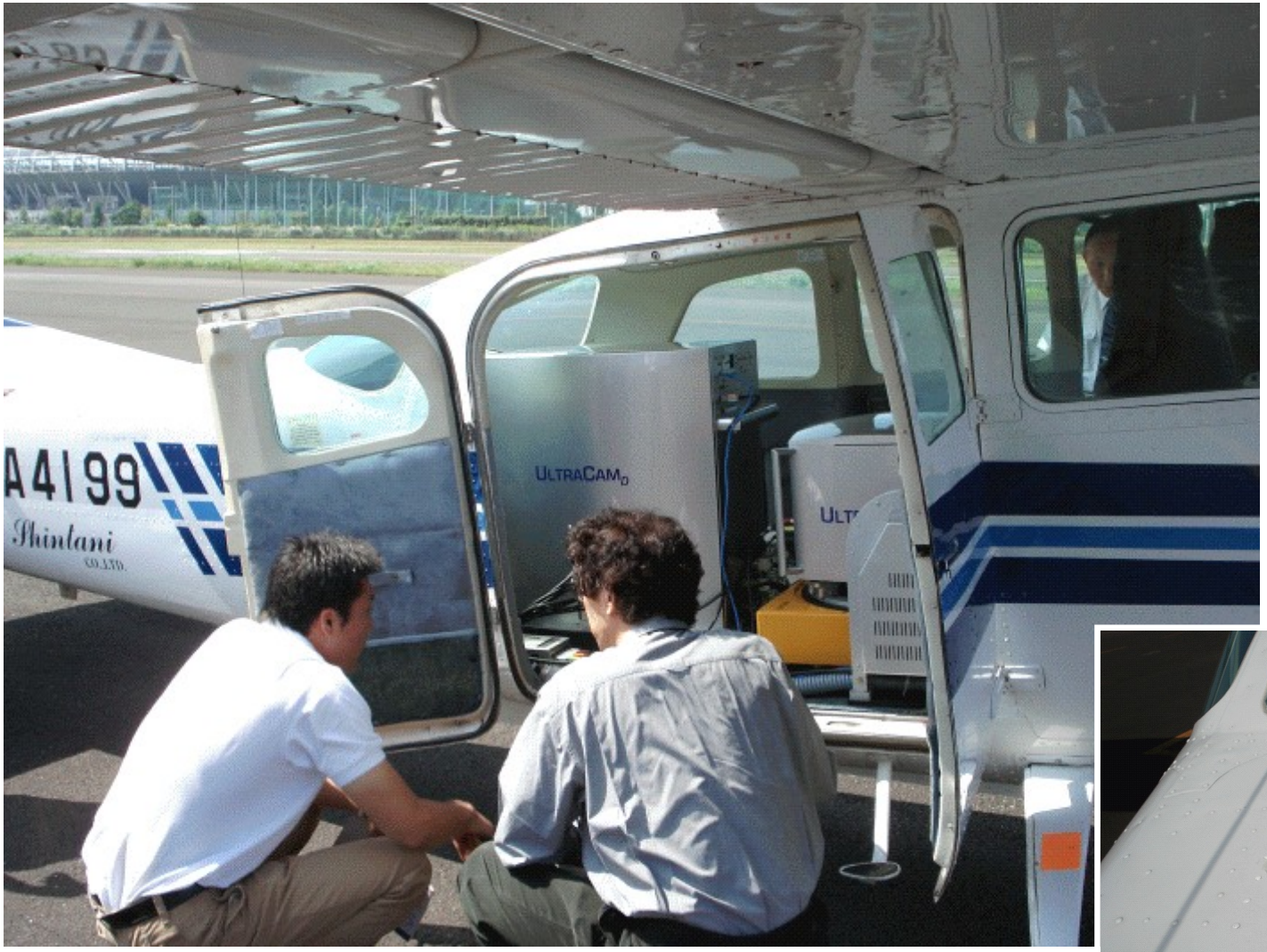
Aerial photography mission conducted for

Date:	**September 21st, 2006**
Area:	**Tsuruma near Tokyo, Japan**
Camera:	***UltraCam*$_D$**
Camera mount:	***GSM-3000***
Camera mount leveling:	***AEROcontrol***
Guidance and precise positioning:	***CCNS/AEROcontrol***
Data processing:	***AEROoffice* and *MATCH-AT***

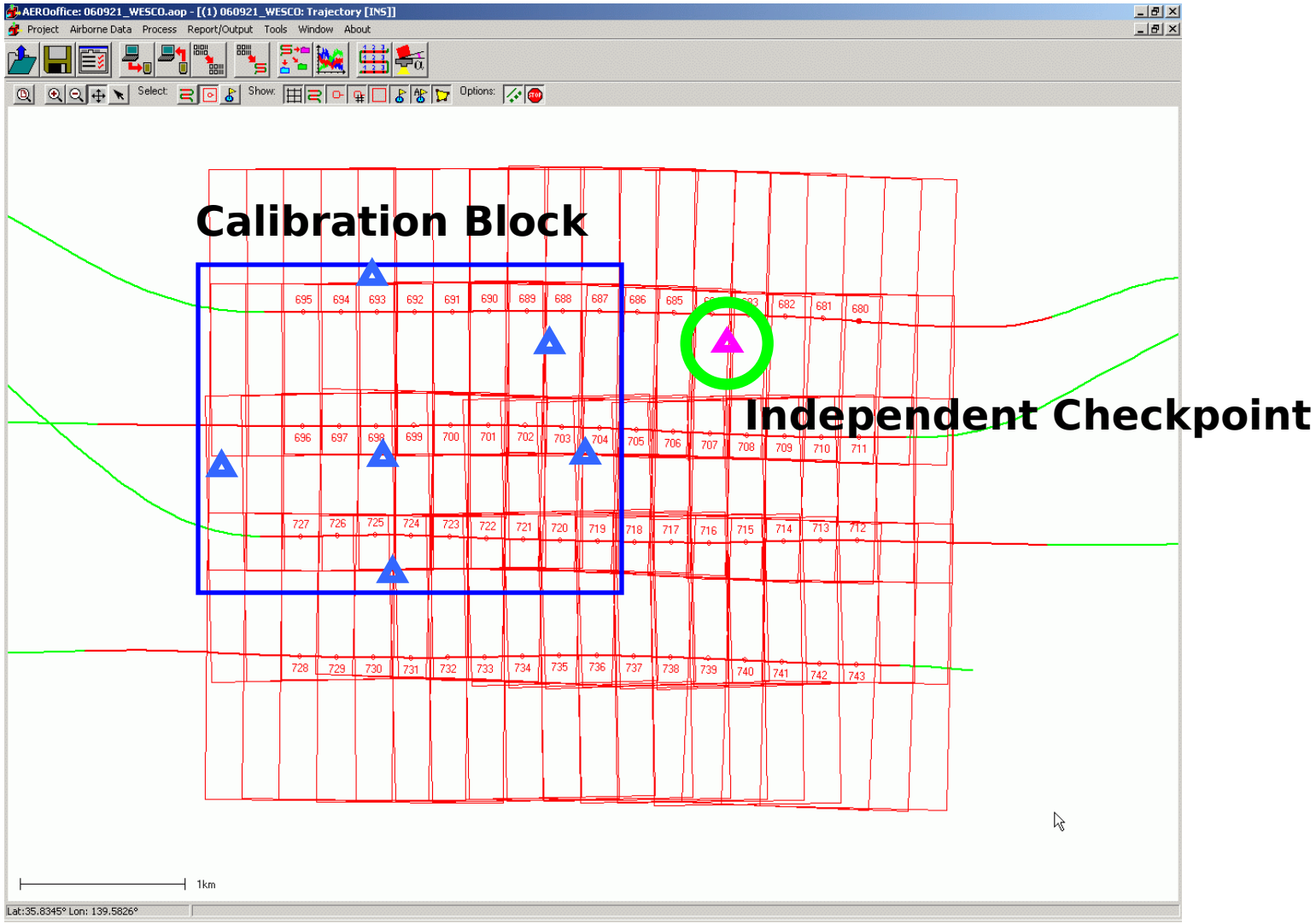
Project "WESCO" - Mission Area

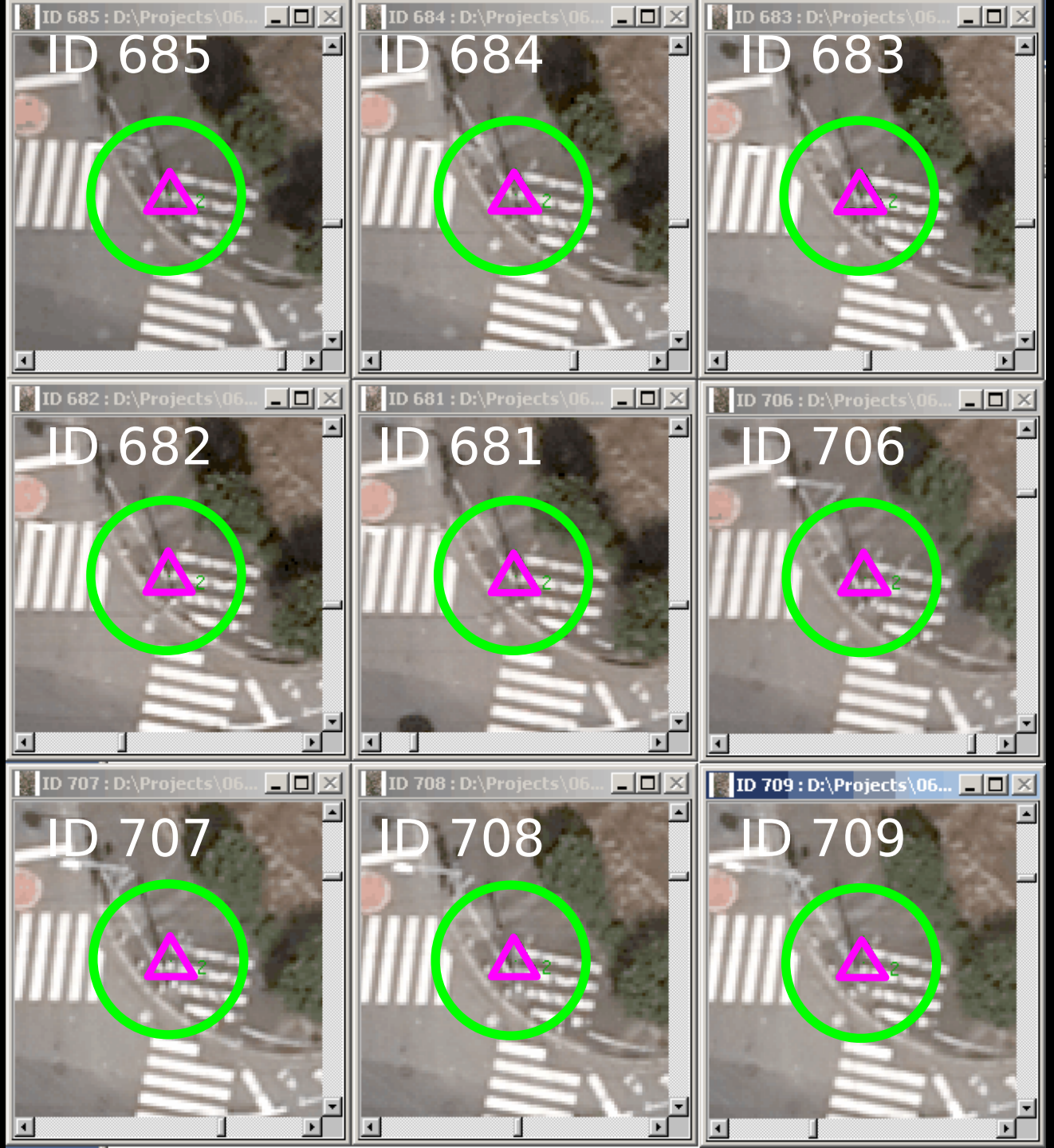


Project "WESCO" - Installation



Project "WESCO" - Mission Overview





Direct geo-refencing:

Check Point position in 9 different images (note the image ID's)

Guidance and Sensor Management

GPS / IMU Systems

Integrated Sensor Systems for Special Applications

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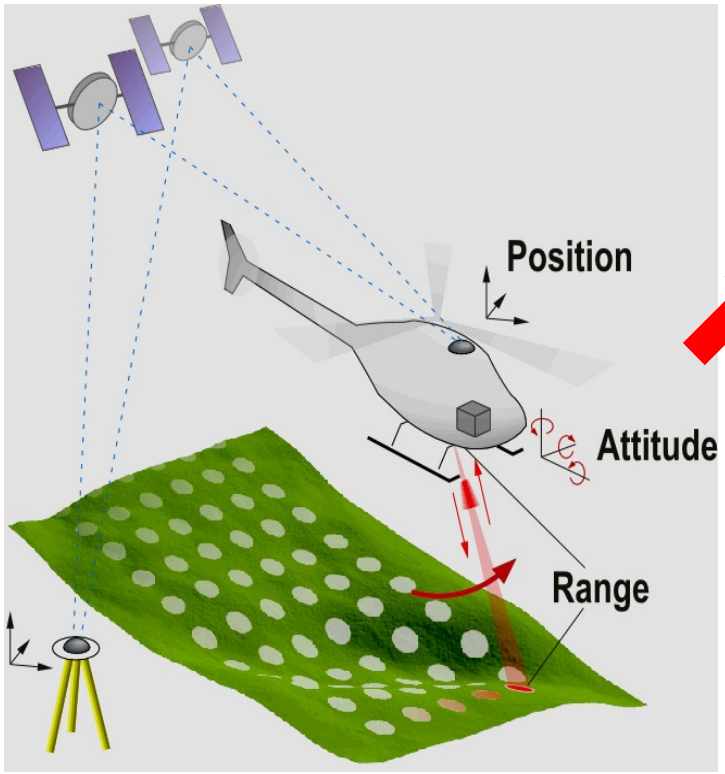
LiteMapper

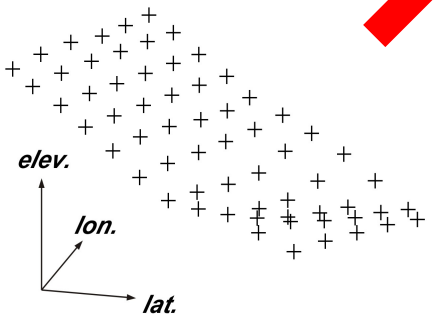
StreetMapper

DigiTHERM / DigiCAM

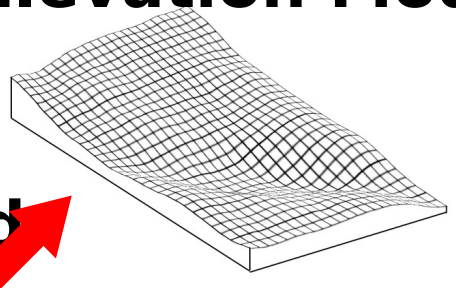
Airborne LiDAR Mapping



Point Cloud



Digital Elevation Model (DE

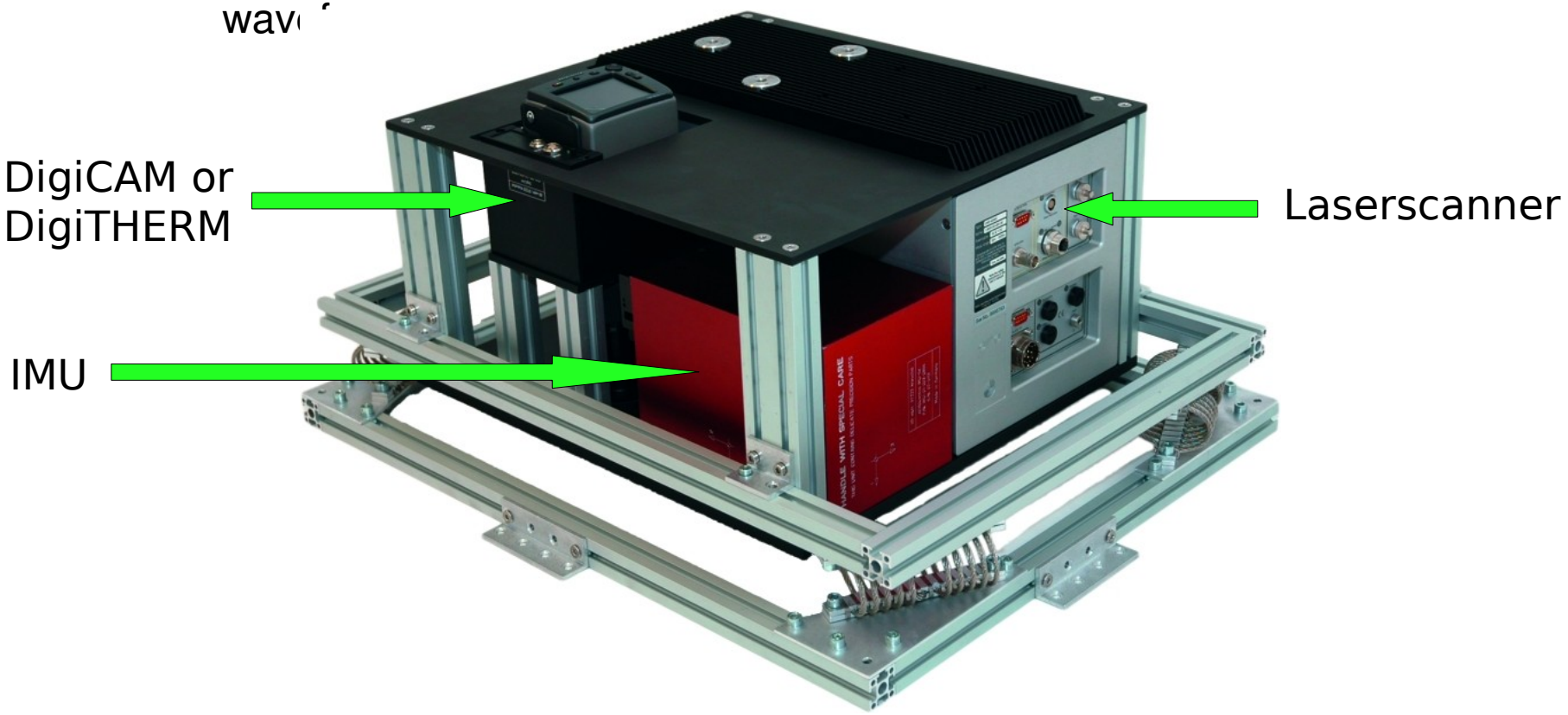


LiteMapper - Components

Max. pulse repetition rate: **240 kHz**

Max. range: **3,600 m**

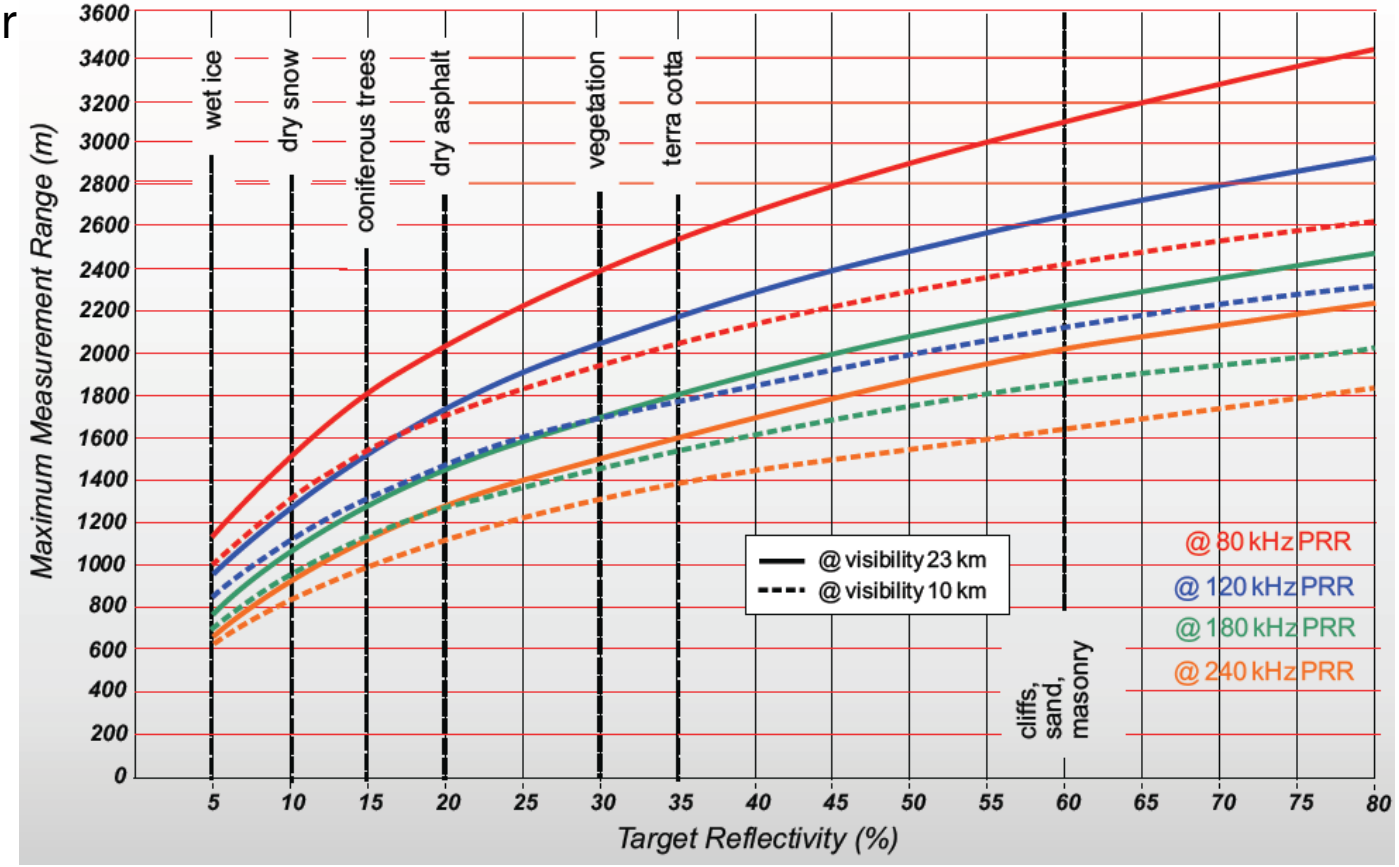
Number of targets / pulses: **unlimited** for digitized wav(



Max. pulse repetition rate: **240 kHz**

Max. range: **3,600 m**

Number of targets / pulses: **unlimited** for digitized waveform



Installation in a *Bell 206 Jet Ranger*

Installation in a *Eurocopter AS 350*

Installation in a *Mi-8*

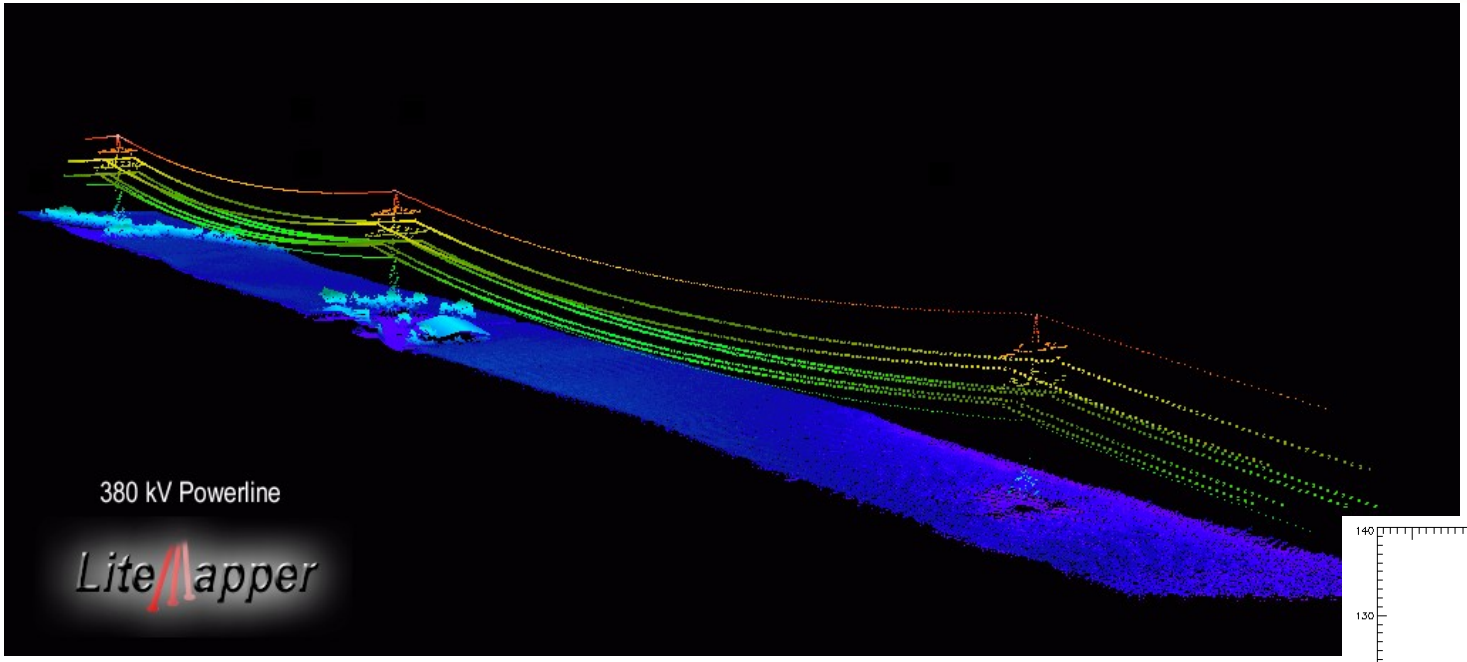
Installation in a *Dornier 228*

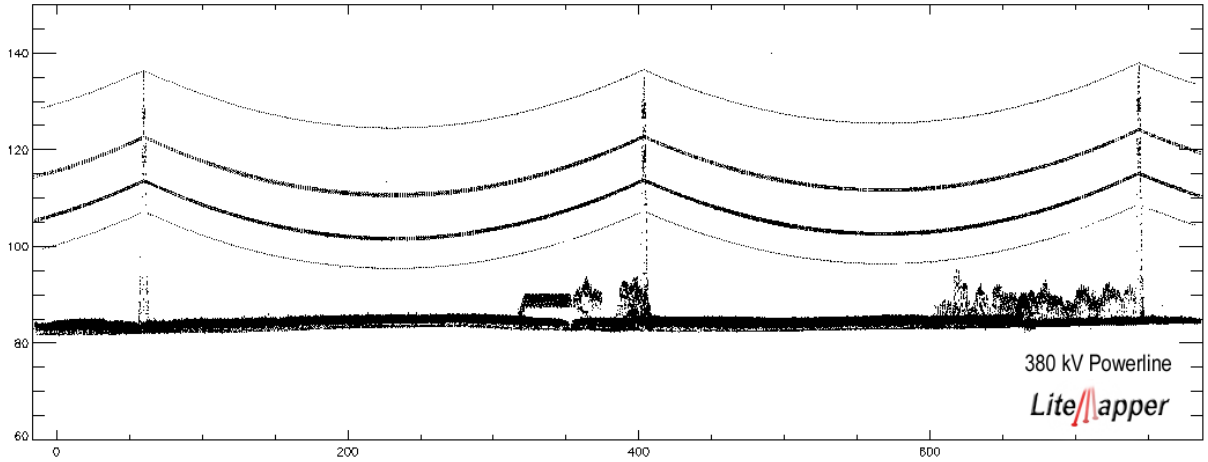
LiteMapper and *DigiCAM*

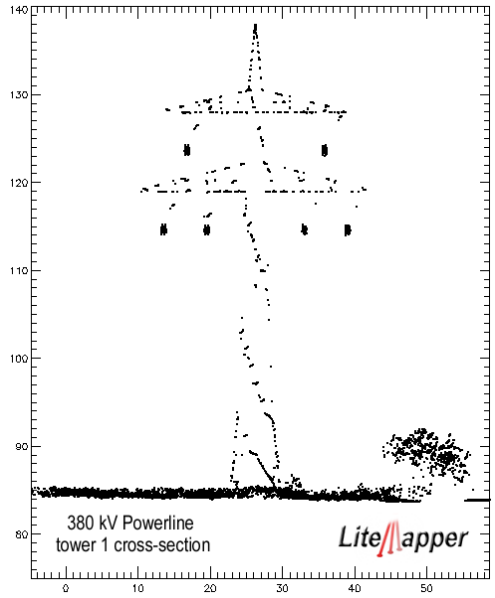
System installation

Eurocopter AS350
CAA, EASA & FAA
certified sensor pod
max. PRR 200kHz
DIGICAM-H/39, 50mm lens

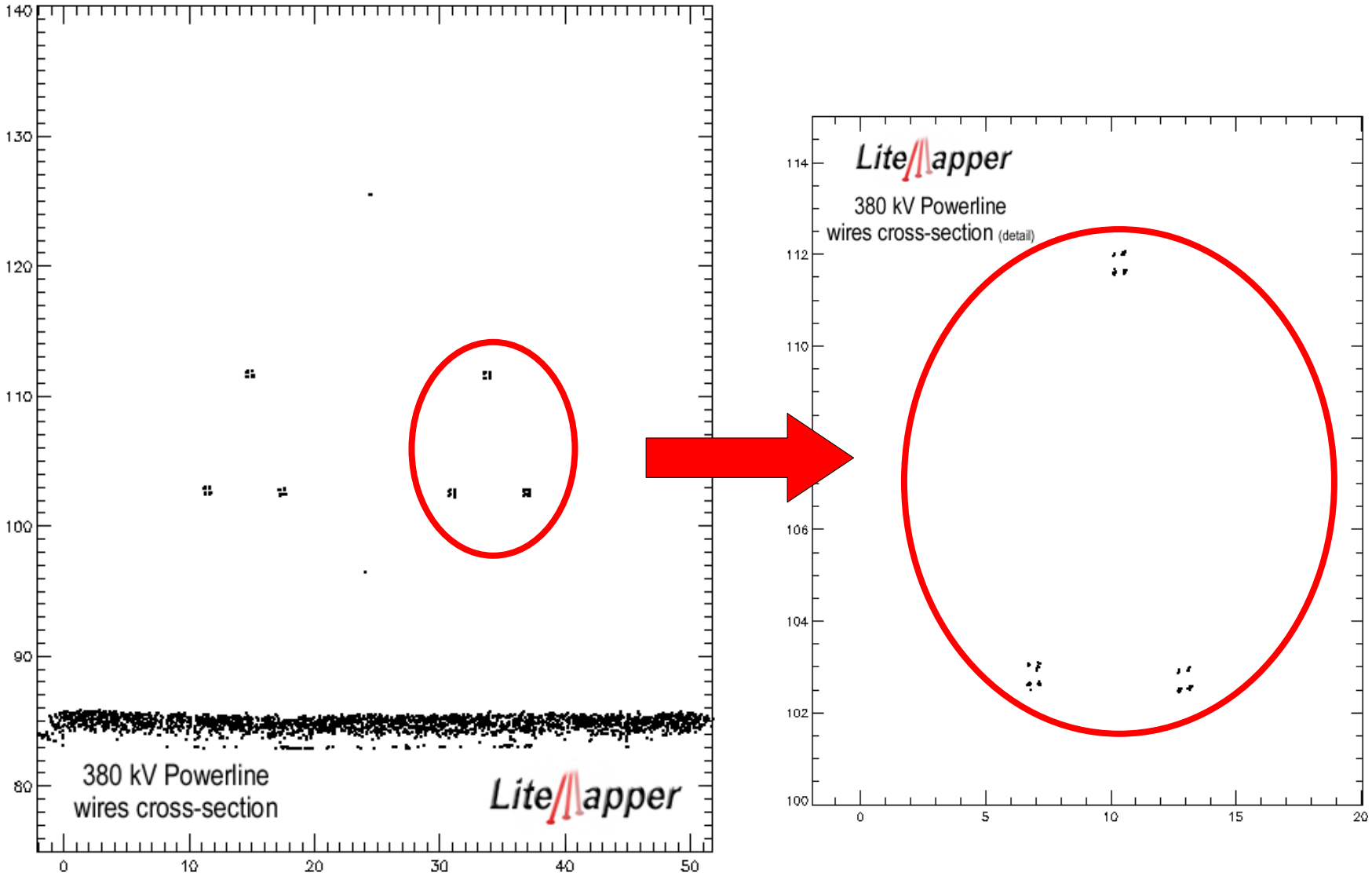
380KV Powerline h = 85m / v= 40kn



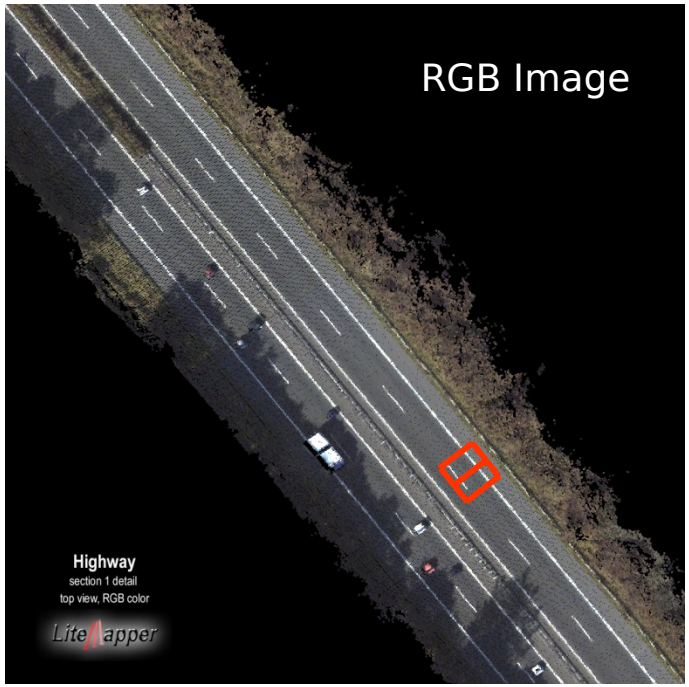


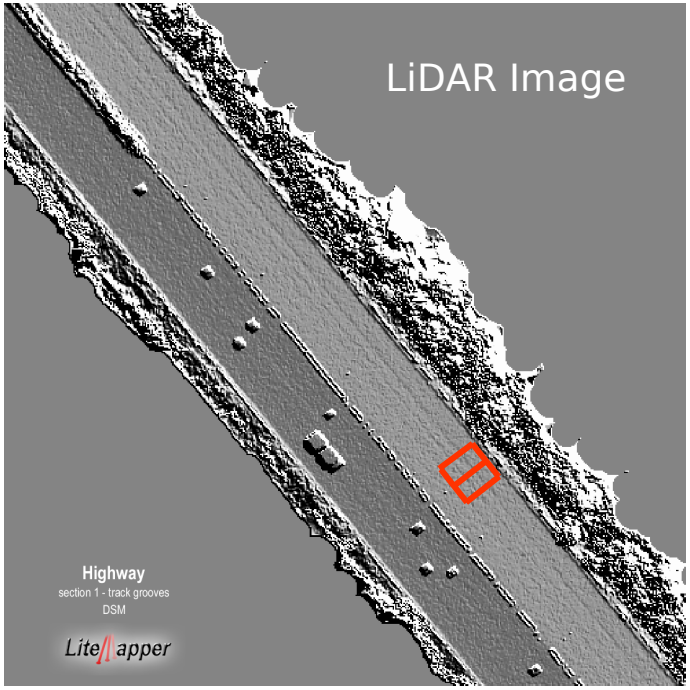


380KV Powerline h = 85m / v= 40kn

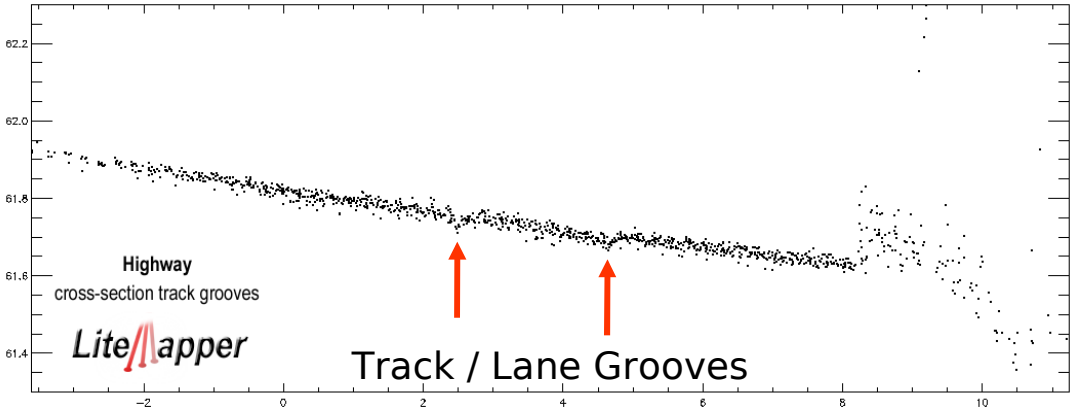


Project “Aalen”

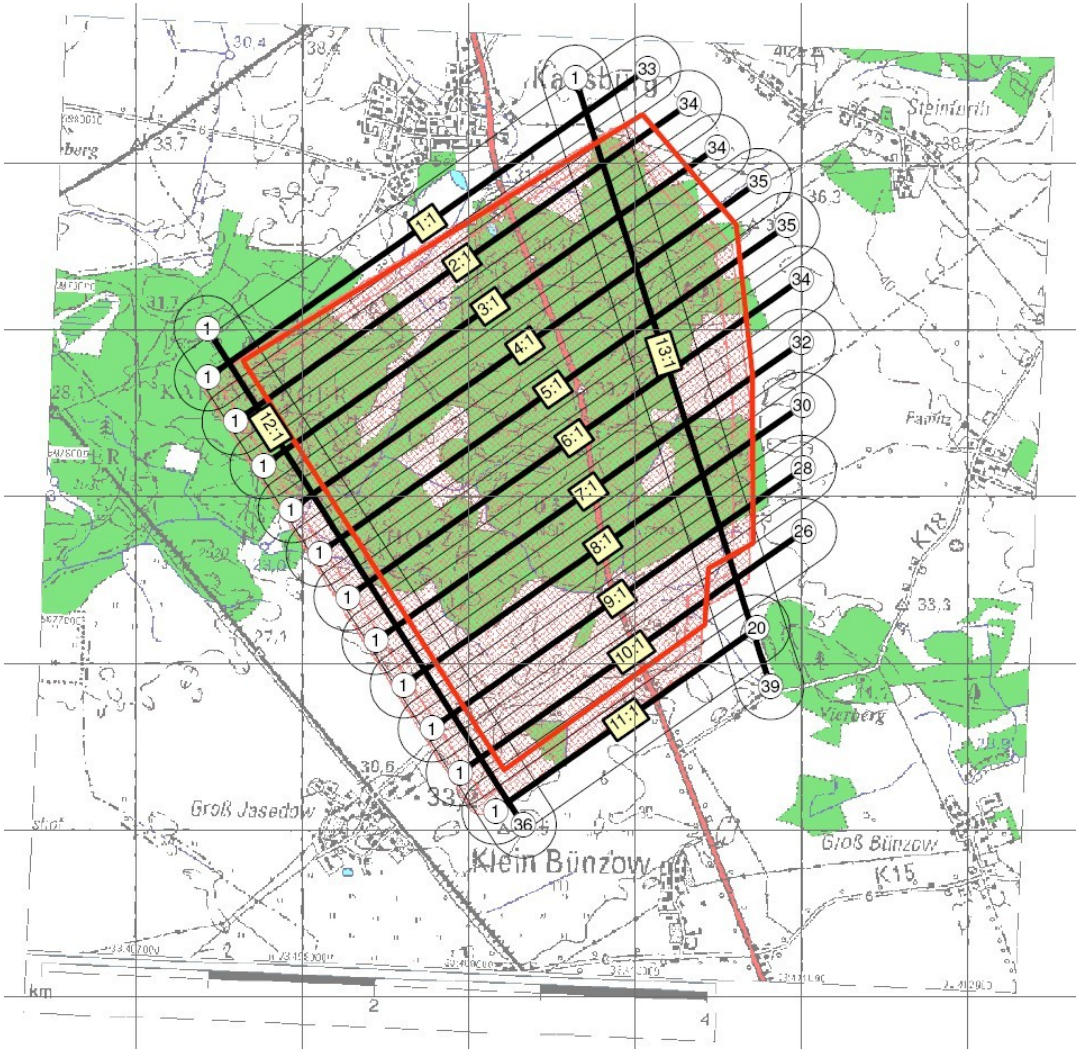




Autoroute A1
Dortmund–Bremen
at Münster



Hansa Luftbild "Karlsburger Holz"



Mission Parameters

Mission type:	Small area
Date:	08/2007
Aircraft:	Eurocopter AS350
Flying height:	1500ft (460m)
Flying speed:	40kts
PRR:	200kHz
Orthophoto GSD:	0.08m

Point density (all points) 33.1 pt/m²
Ground point density 3.7 pt/m²

Customer: WINGAS

Hansa Luftbild "Karlsburger Holz"

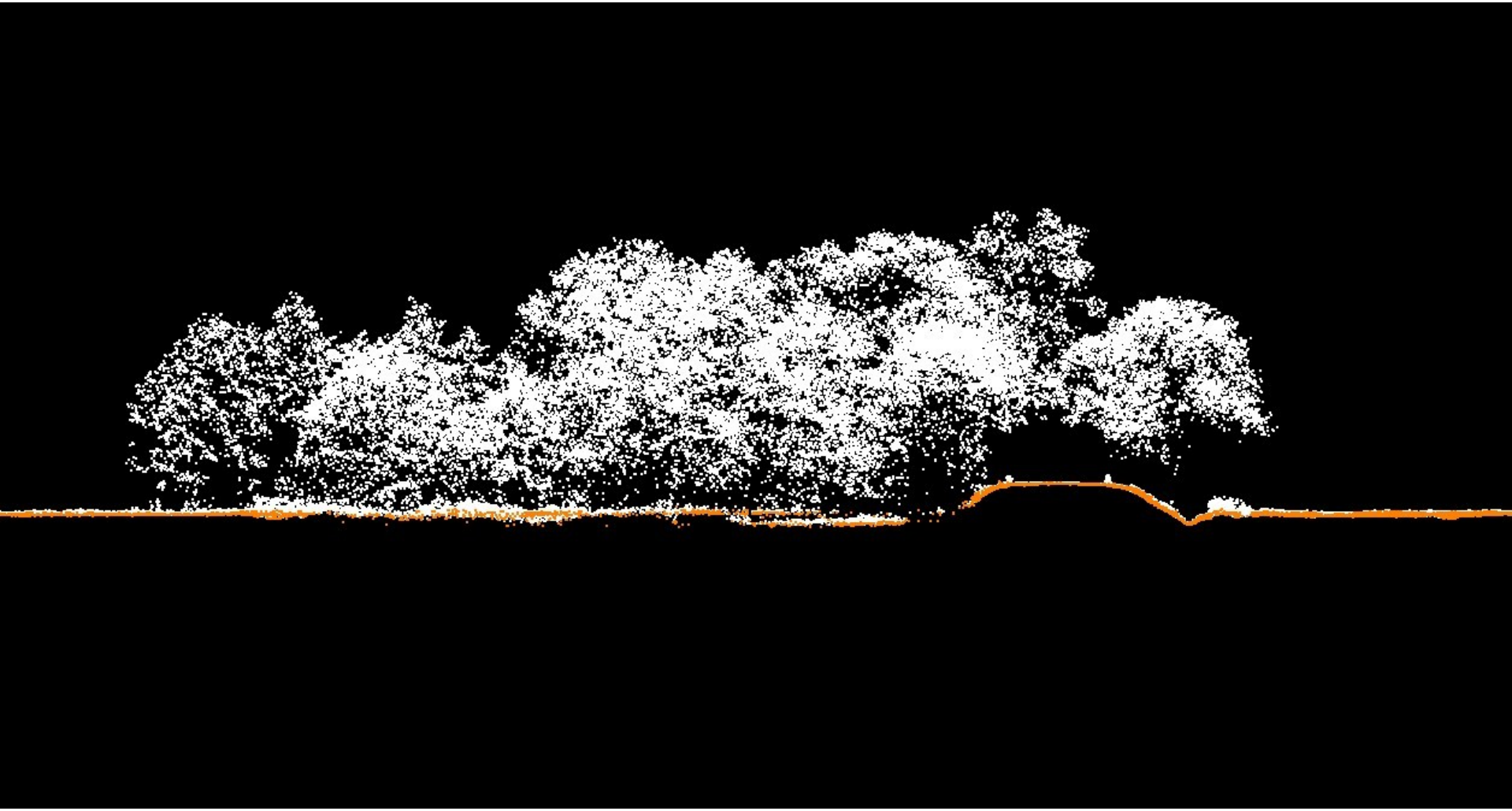
Final LIDAR-accuracies Area 01

GCP Number	Easting	Northing	Known Z	Laser Z	Dz
1-514	3408435.340	5980151.057	29.163	29.200	+0.037
1-504	3408433.332	5980151.060	29.187	29.220	+0.033
1-506	3408434.313	5980150.037	29.188	29.220	+0.032
1-515	3408436.335	5980151.001	29.163	29.190	+0.027
1-500	3408433.205	5980147.086	29.175	29.200	+0.025
1-511	3408435.234	5980148.032	29.162	29.180	+0.018
1-512	3408435.276	5980149.012	29.163	29.180	+0.017
1-501	3408433.233	5980148.088	29.187	29.200	+0.013
1-510	3408435.189	5980147.044	29.150	29.160	+0.010
1-522	3408437.277	5980148.997	29.142	29.150	+0.008
1-523	3408437.314	5980149.994	29.152	29.160	+0.008
BP-2	3408420.823	5980159.152	28.882	28.890	+0.008
1-521	3408437.236	5980147.998	29.133	29.140	+0.007
1-505	3408434.335	5980151.021	29.184	29.190	+0.006
1-503	3408433.330	5980150.060	29.195	29.200	+0.005
1-520	3408437.187	5980146.997	29.116	29.120	+0.004
1-516	3408436.311	5980149.992	29.159	29.160	+0.001
1-507	3408434.270	5980149.041	29.190	29.190	+0.000
1-517	3408436.268	5980148.982	29.151	29.150	-0.001
1-509	3408434.192	5980147.066	29.162	29.160	-0.002
1-518	3408436.232	5980148.001	29.142	29.140	-0.002
1-502	3408433.284	5980149.077	29.203	29.200	-0.003
1-524	3408437.339	5980150.991	29.164	29.160	-0.004
1-513	3408435.308	5980150.016	29.165	29.160	-0.005
1-508	3408434.230	5980148.067	29.176	29.170	-0.006
1-519	3408436.190	5980147.027	29.130	29.120	-0.010
BP-1	3409315.473	5977812.679	31.085	31.070	-0.015
BP-4	3410699.990	5978873.835	29.645	29.600	-0.045
BP-3	3410697.114	5980700.595	32.538	32.470	-0.068

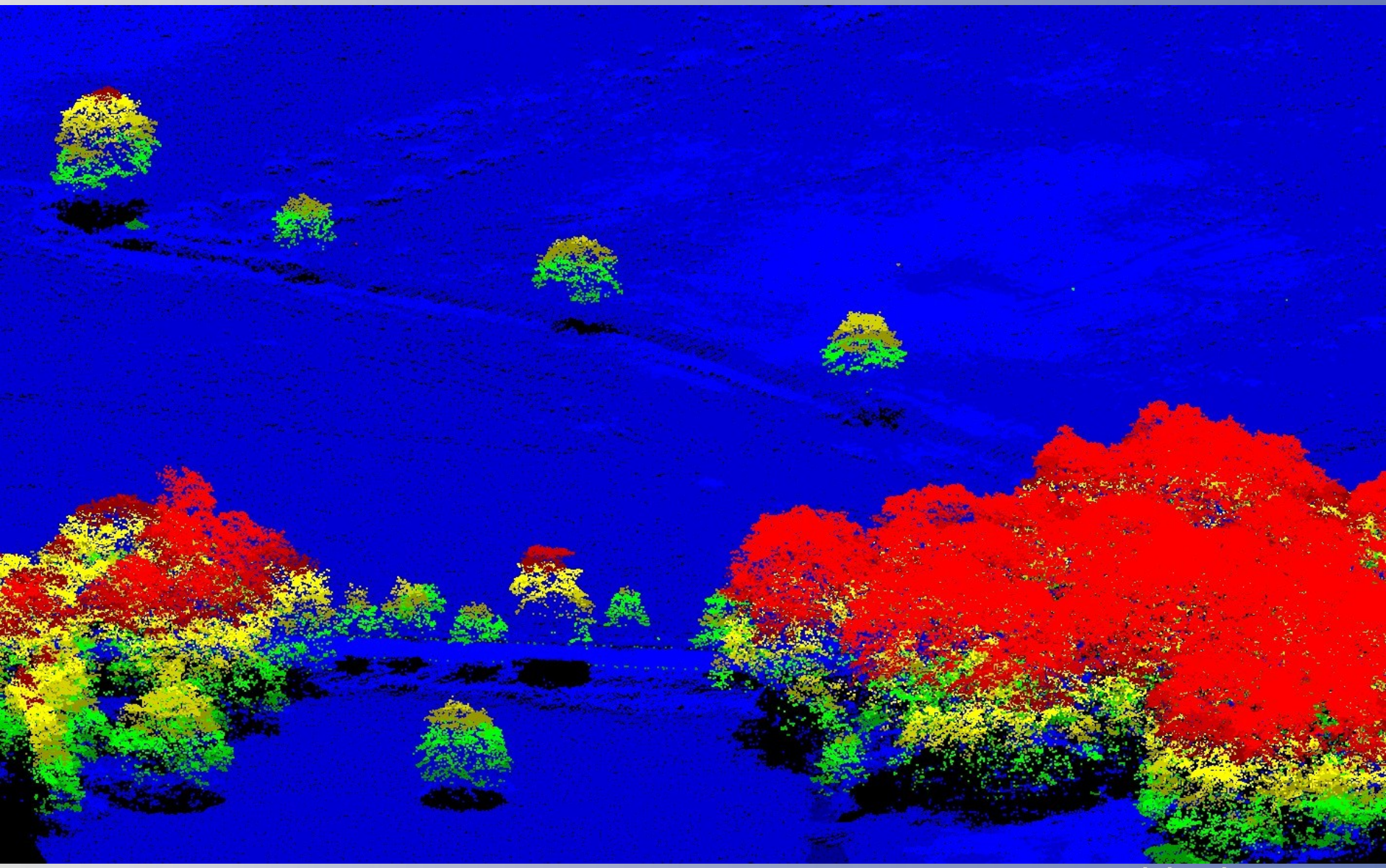
Average dz	+0.003
Minimum dz	-0.068
Maximum dz	+0.037
Root mean square	0.021

RMS: 0.02m

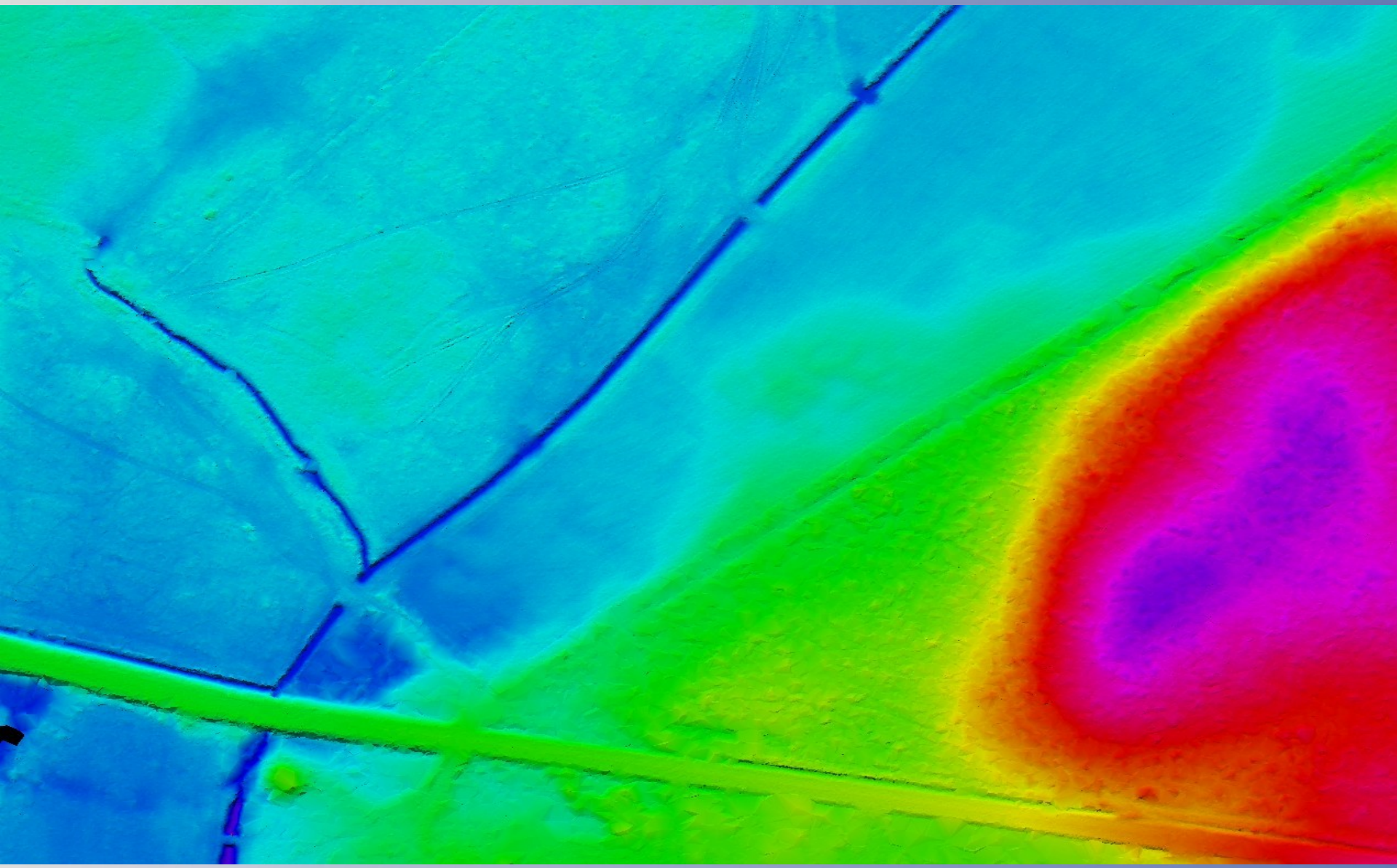
Hansa Luftbild "Karlsburger Holz"



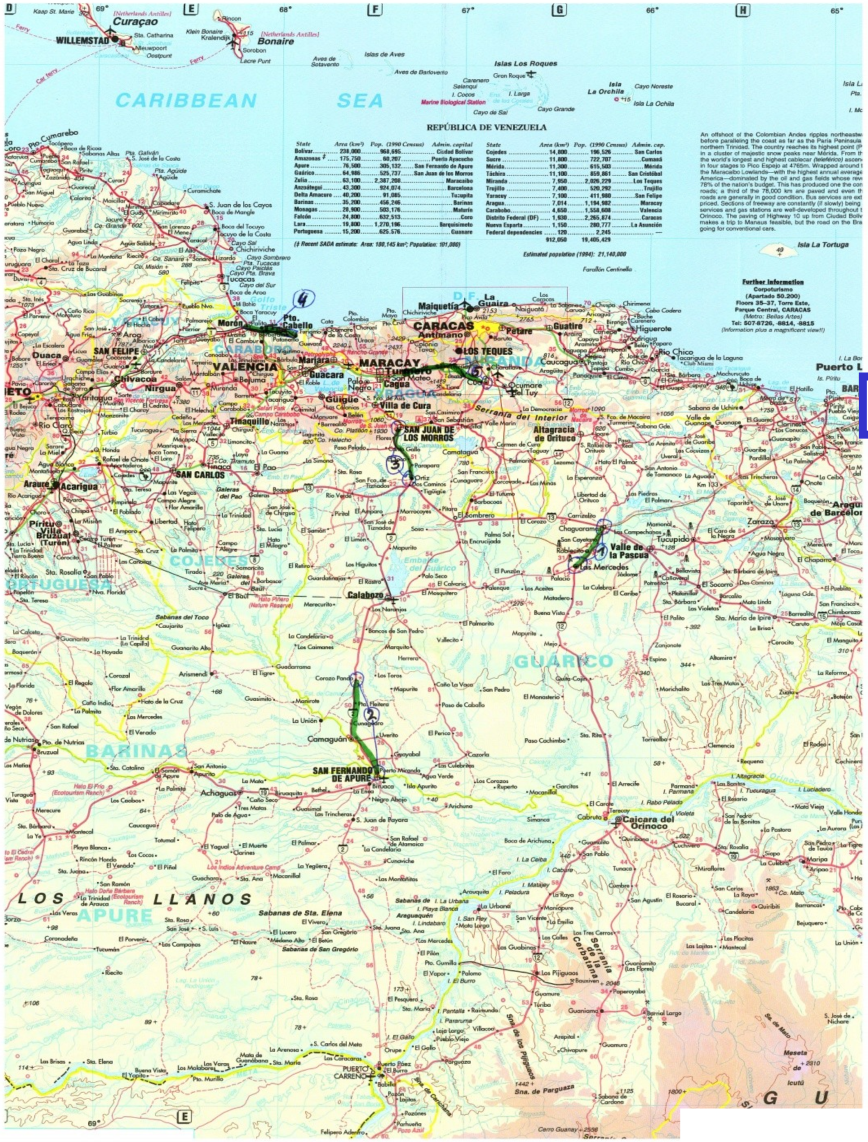
Project: *Hansa Luftbild*



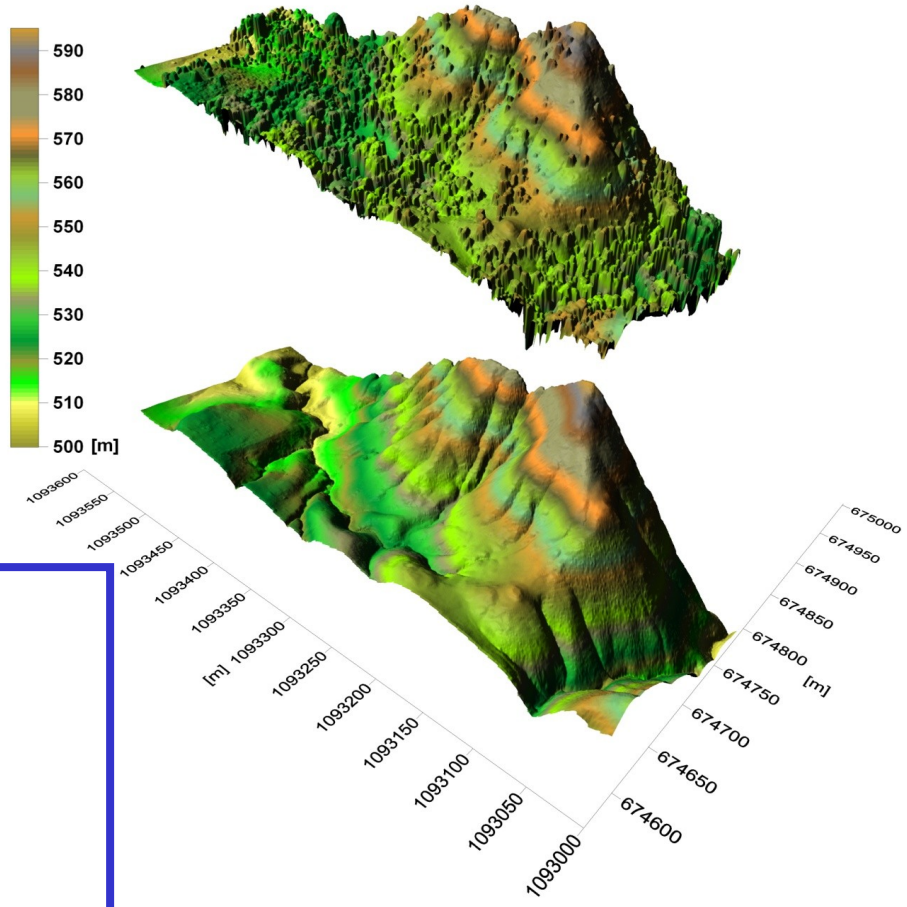
Project: *Hansa Luftbild*

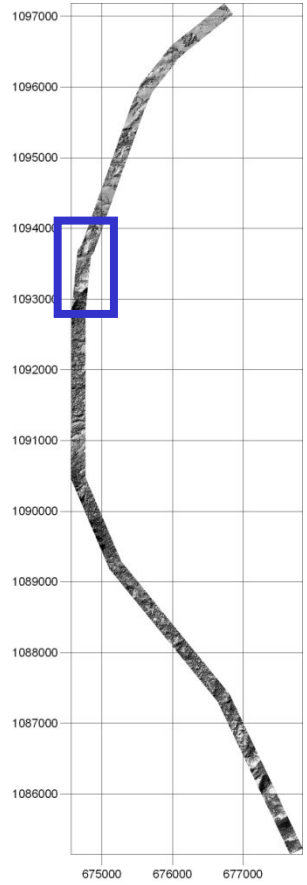


Project: *MILAN*, Venezuela



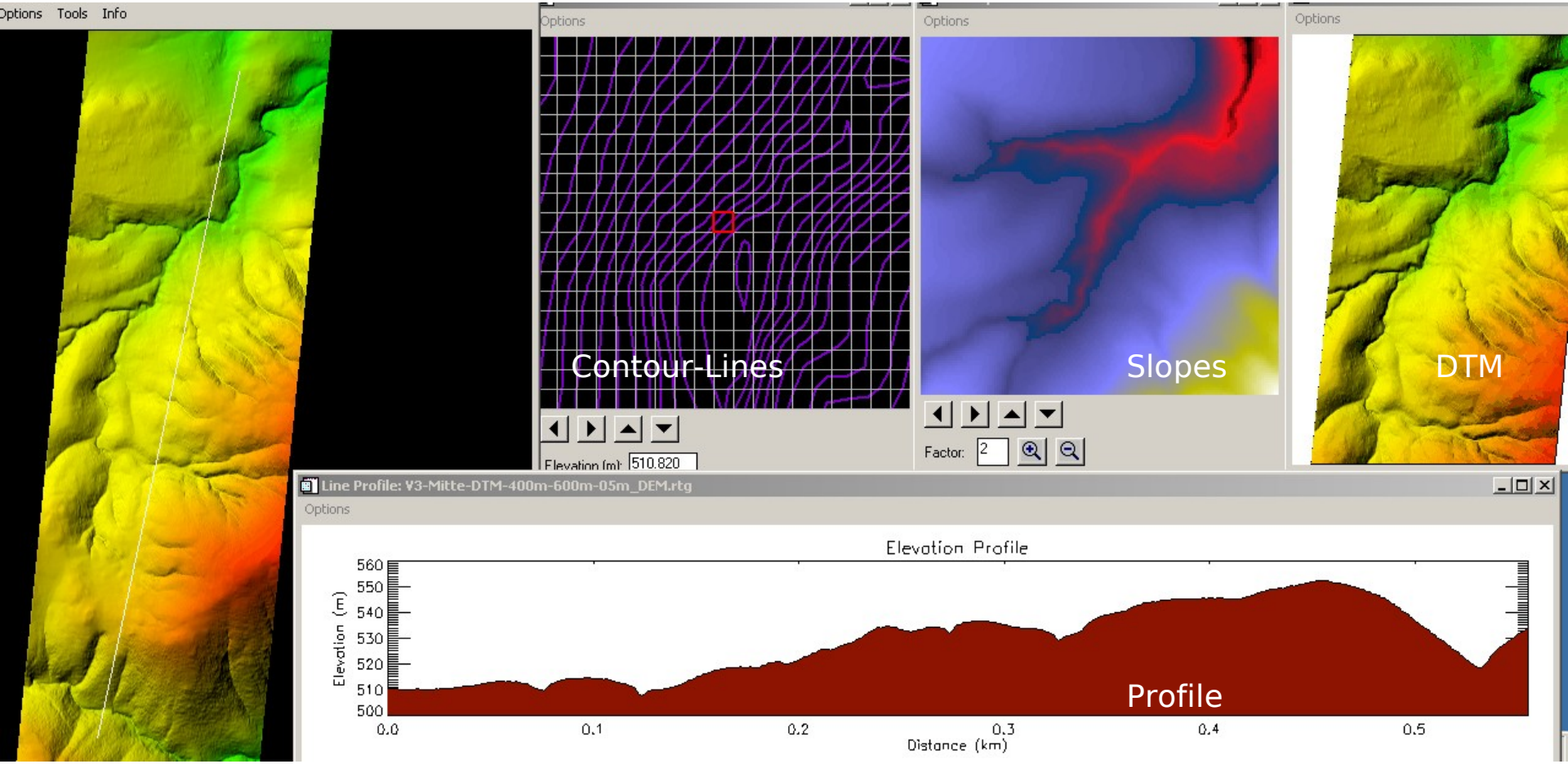
Project: *MILAN*, Venezuela





V3 San Juan de los Morros
approx. 3 km², 14 km * 0,2 km
digital elevation model [DEM]
digital surface model [DSM]
digital terrain model [DTM]
approximated by airborne laser scanning
example
area Middel 400 m * 600 m
3 D Pseudocolor, 0,5 m grid

Project: *MILAN*, Venezuela



Guidance and Sensor Management

GPS / IMU Systems

Integrated Sensor Systems for Special Applications

⇩

LiteMapper

StreetMapper

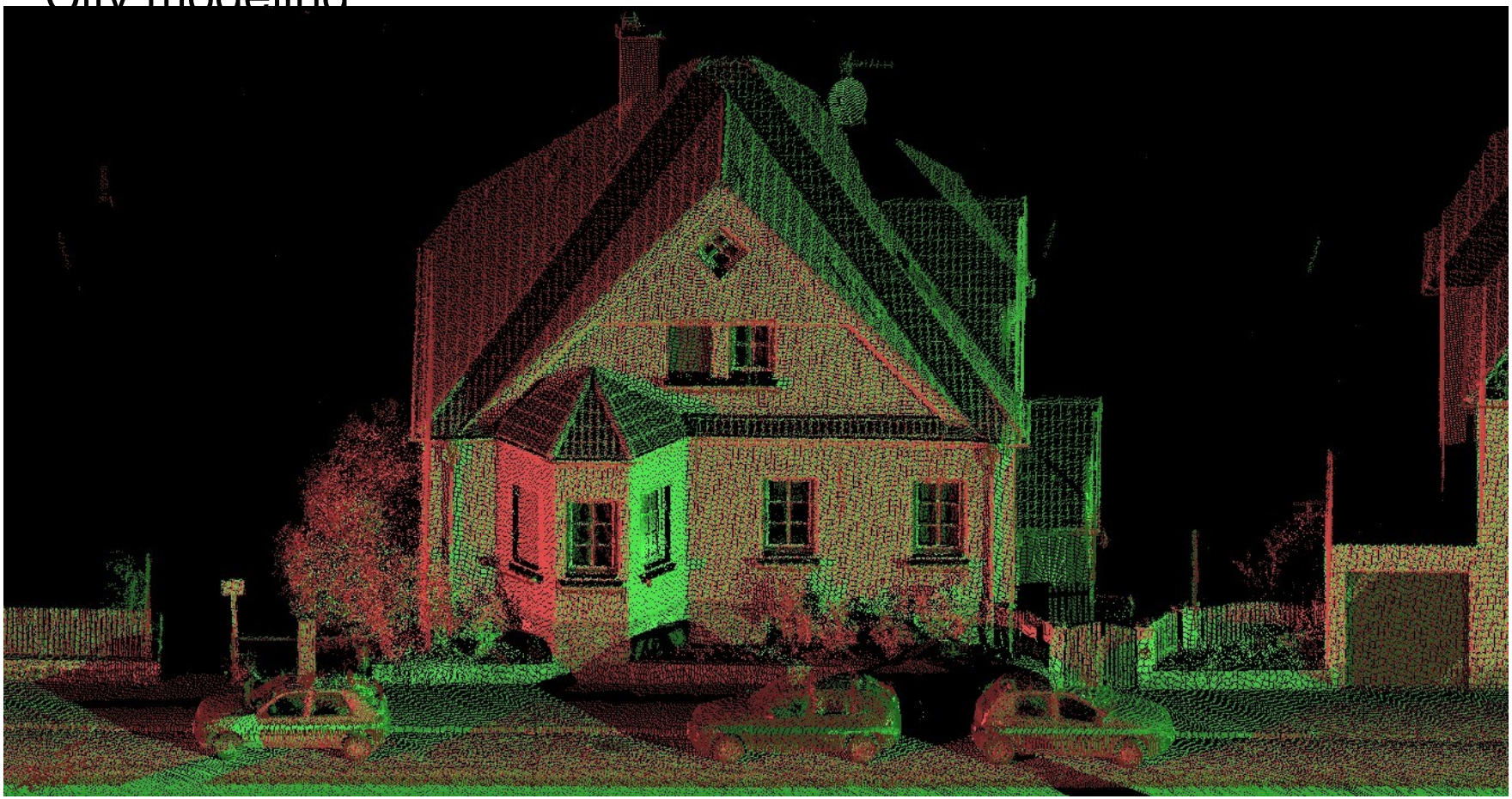
DigiTHERM / DigiCAM

StreetMapper I
2x or 4x 70° Laser

StreetMapper II
1x or 2x 360° Laser

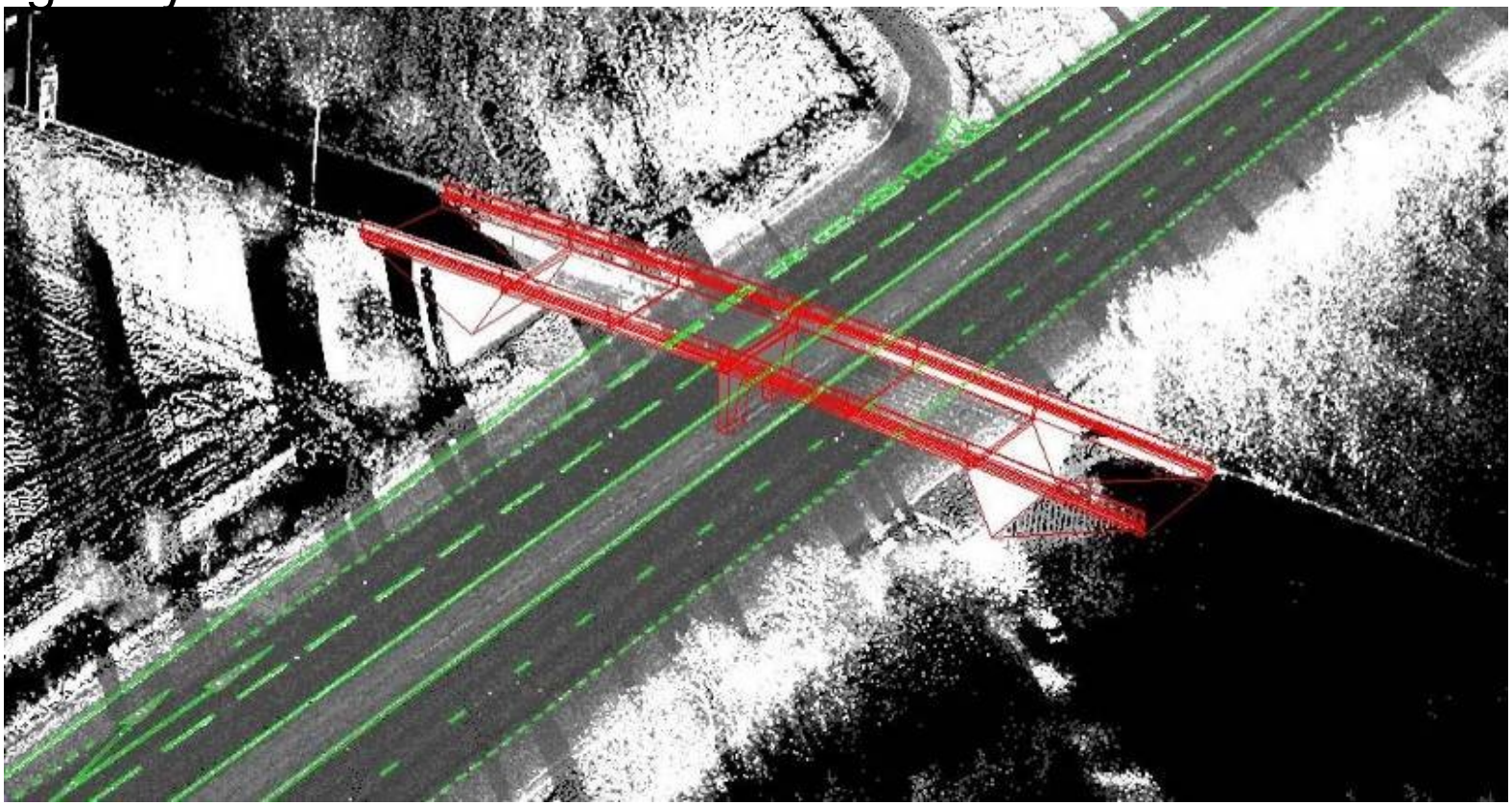
Typical Applications:

- City modeling



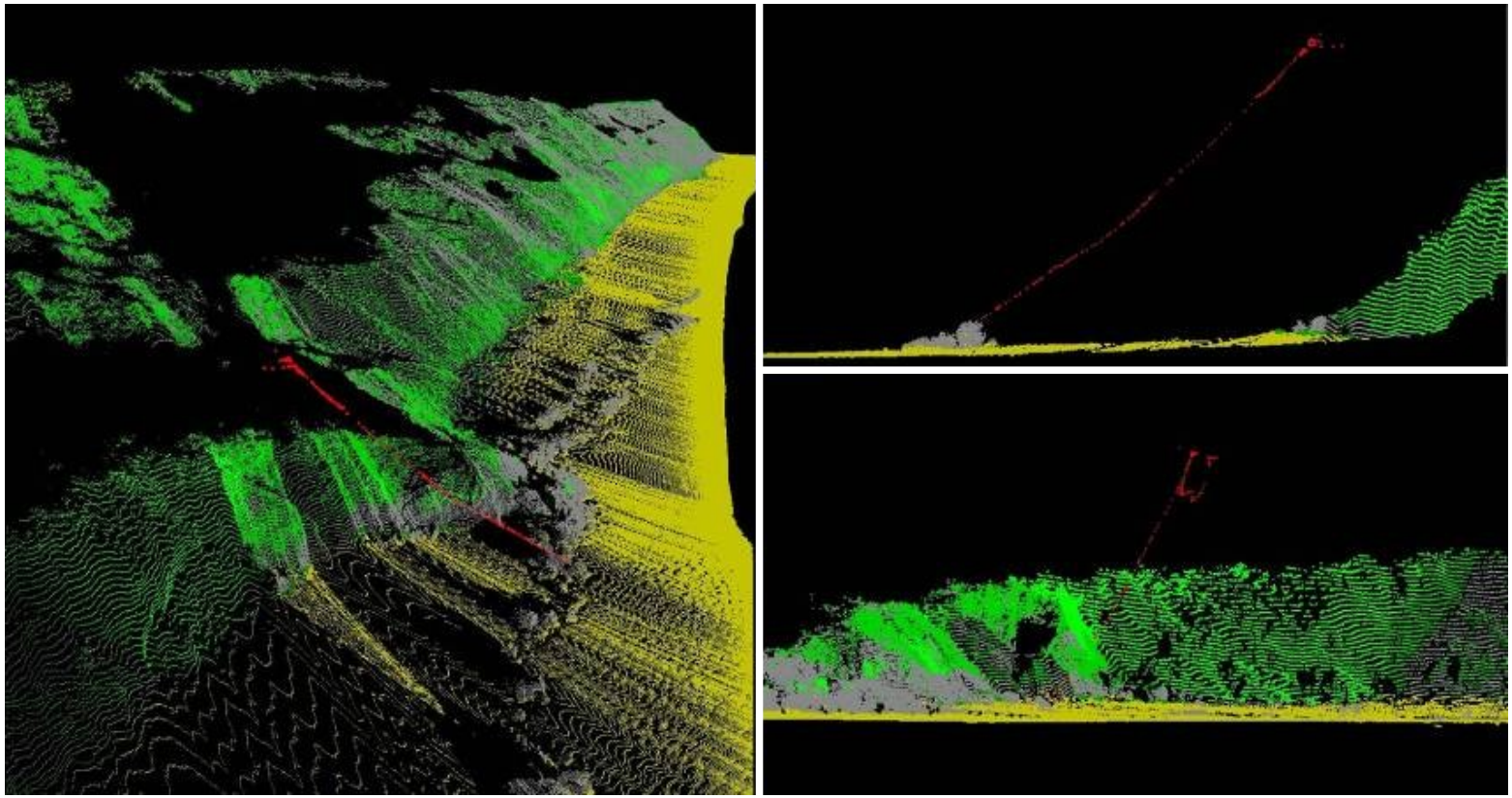
Typical Applications:

Highways



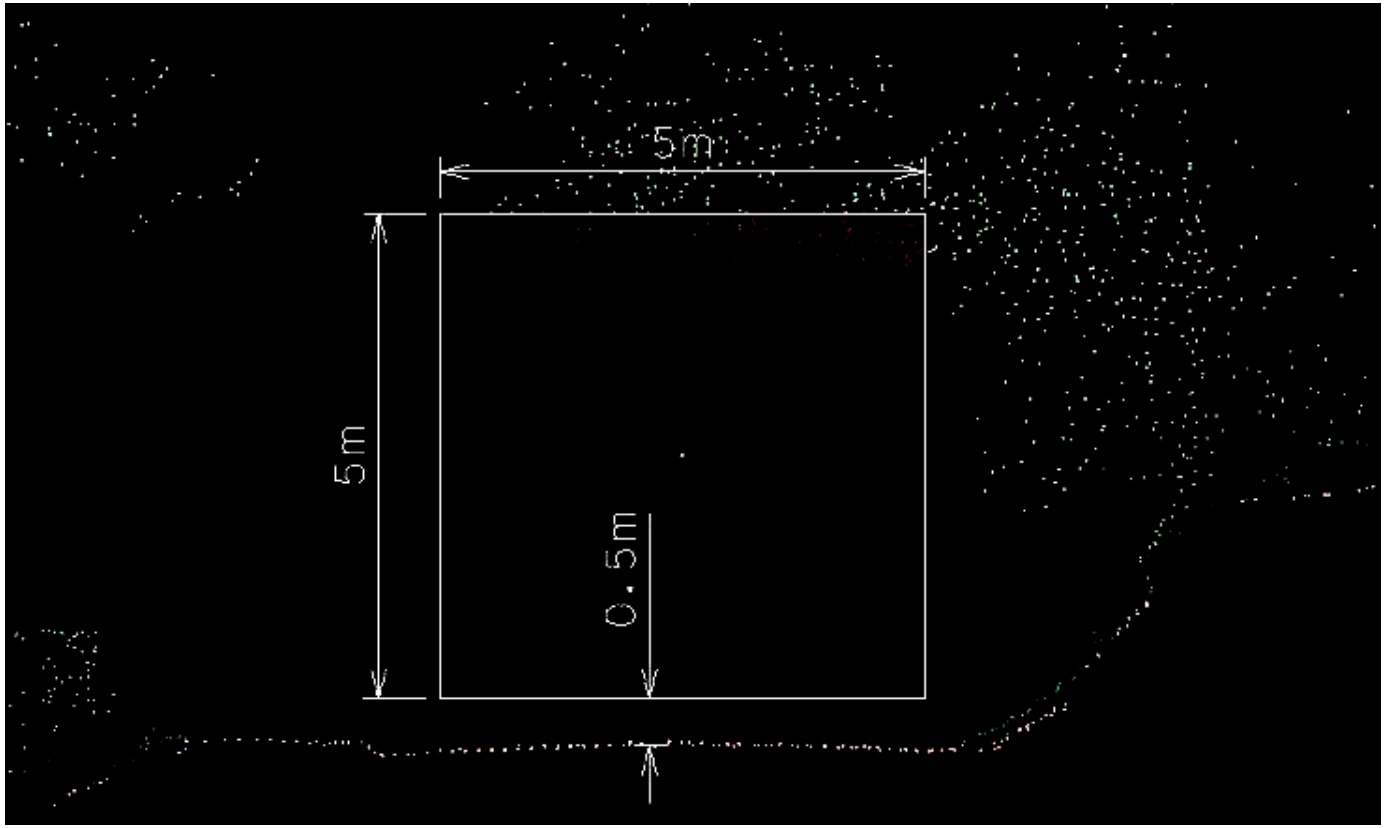
Typical Applications:

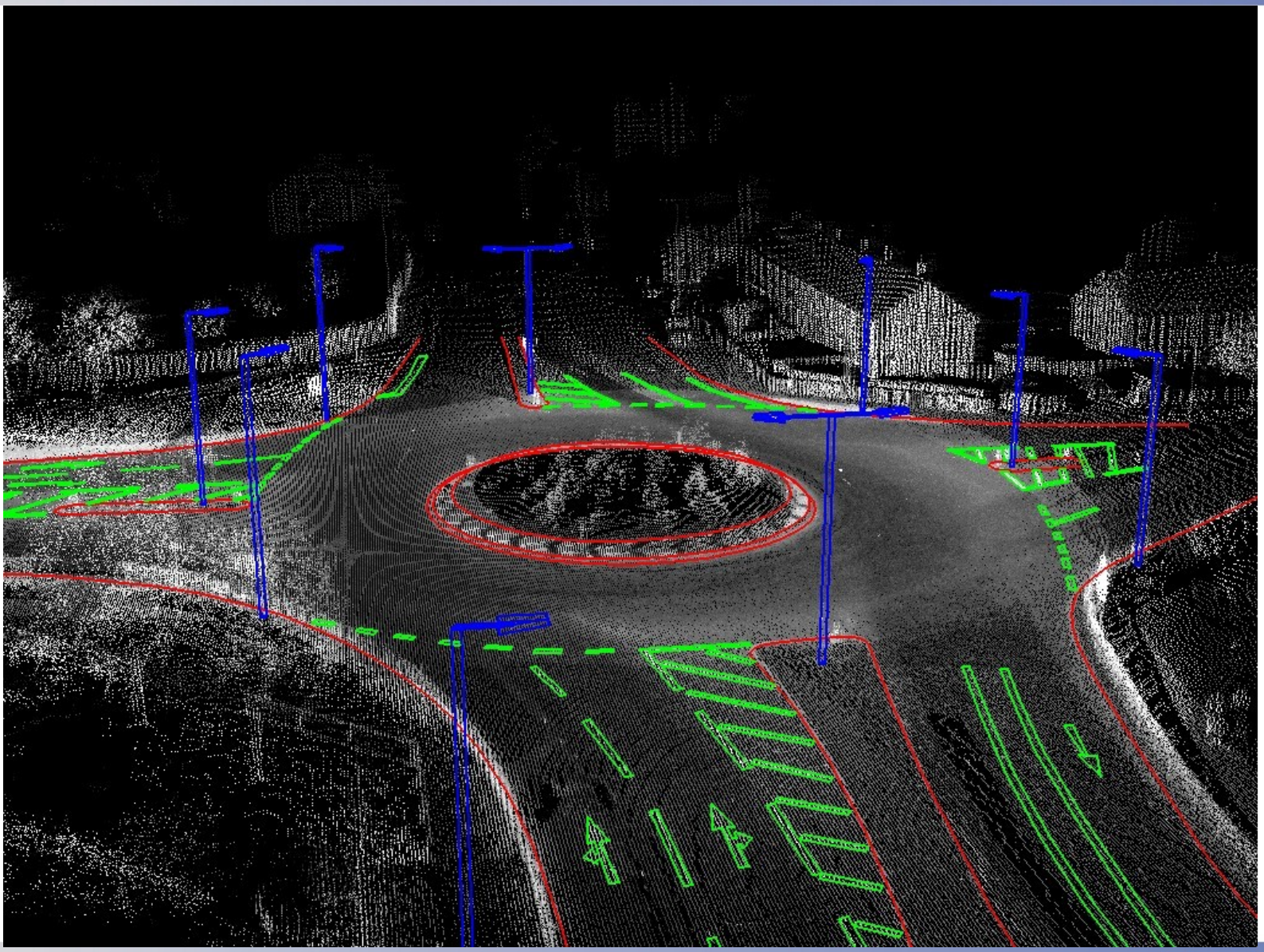
Coastal Surveying



Typical Applications:

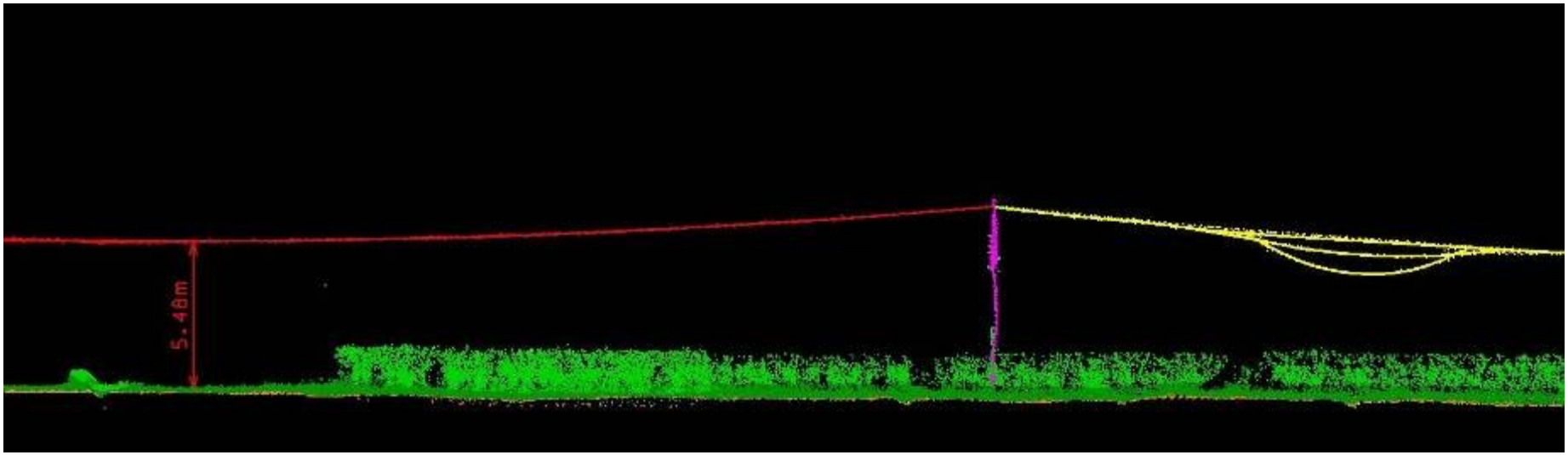
High-load Route Planning





Typical Applications:

Overhead Wire Surveying



Guidance and Sensor Management

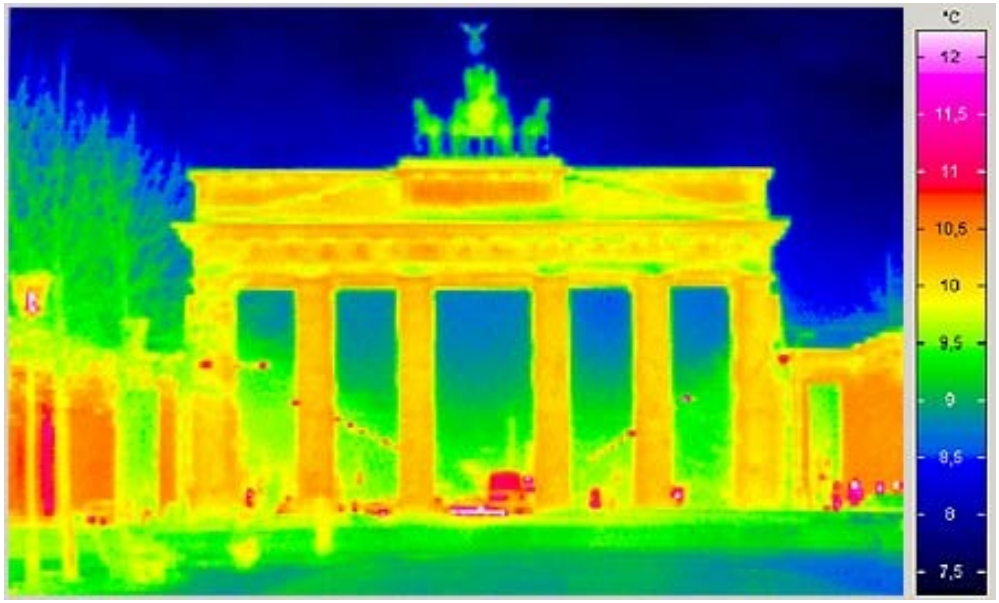
GPS / IMU Systems

Integrated Sensor Systems for Special Applications

⇩

LiteMapper
StreetMapper
DigiTHERM / DigiCAM

Thermography



New Developments - *DigiTHERM*

Uncooled Microbolometer Camera

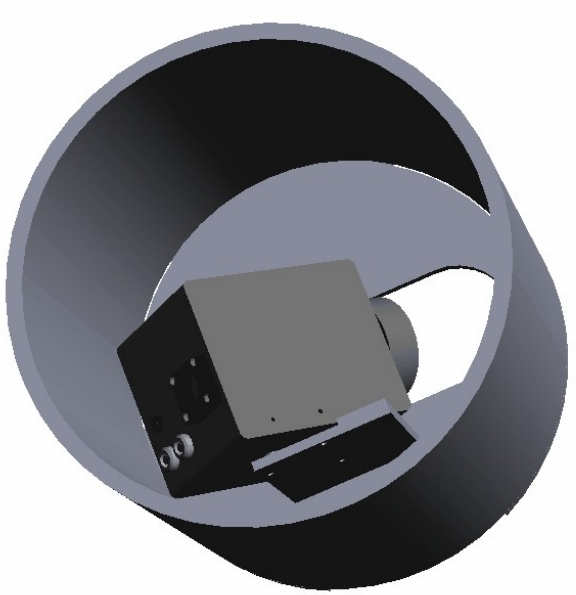
640 * 480 Pixel

Spectral Range 7.5 to 14µm

Max. Image Rate 60Hz

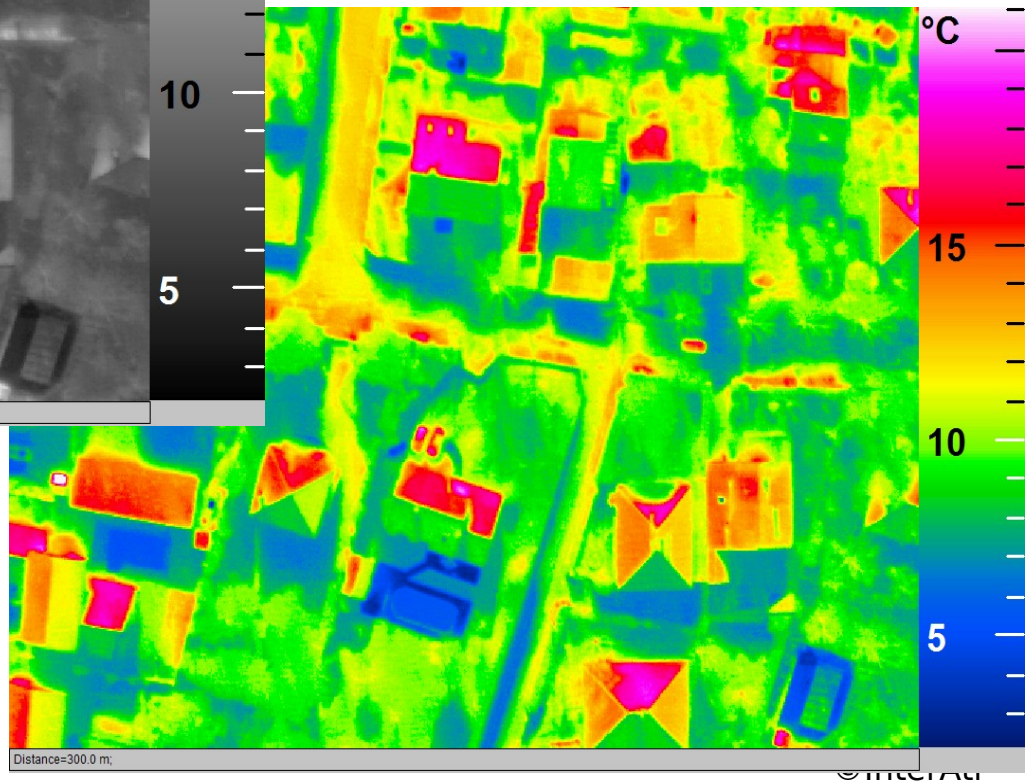
New Developments - *DigiTHERM*

Weight	~ 1kg
Operating Temp.	-15 to +50°C
User Interface and Storage	D*igi*CONTROL
Lens Options	12.5 mm (FOV 65° x 51°)
	30 mm (FOV 30° x 23°)
	50 mm (FOV 18° x 14°)
	75 mm (FOV 12 x 9.1°)
	130 mm (FOV 7° x 5.3°)



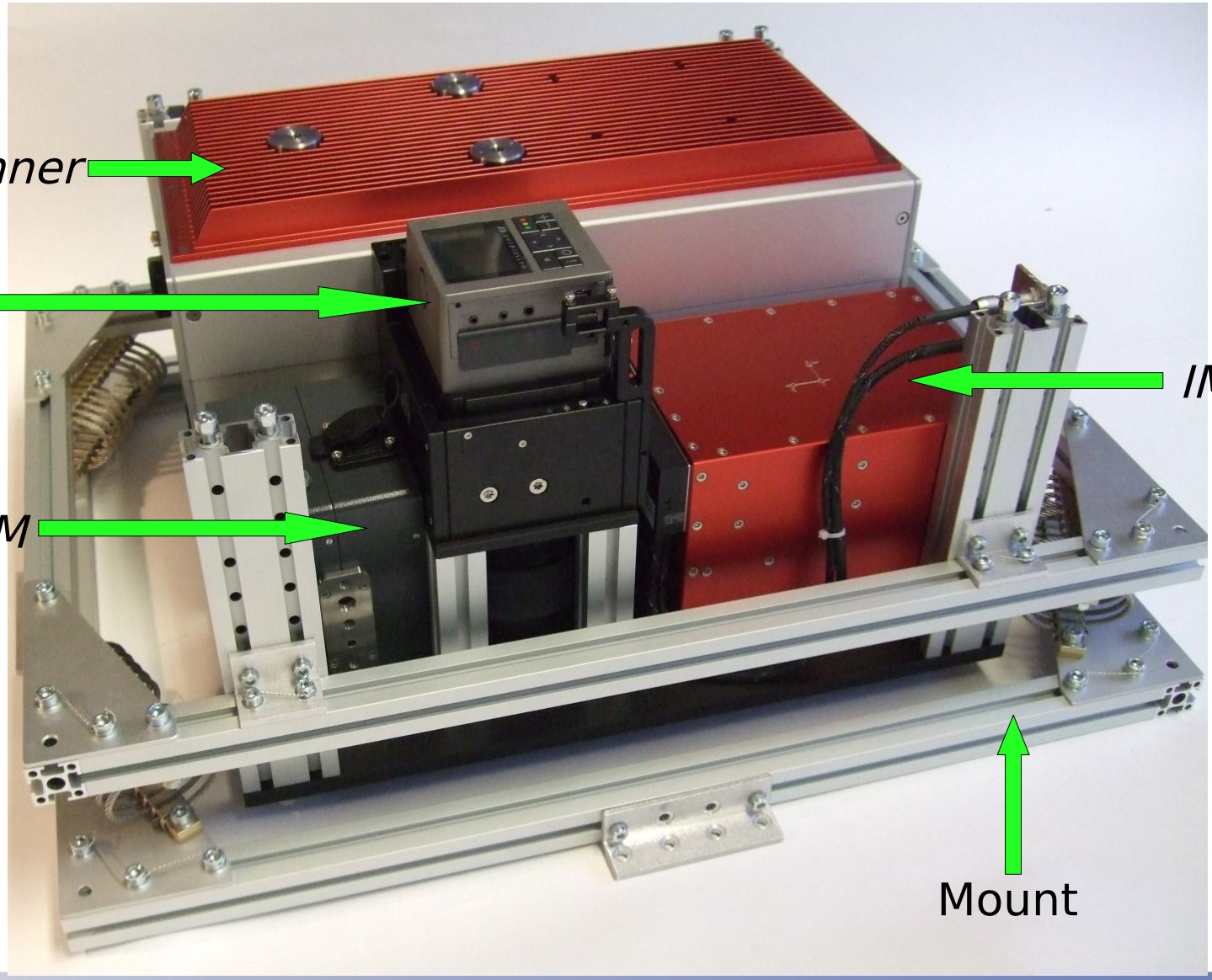
Airborne Thermography

Test flight in the Toulouse area

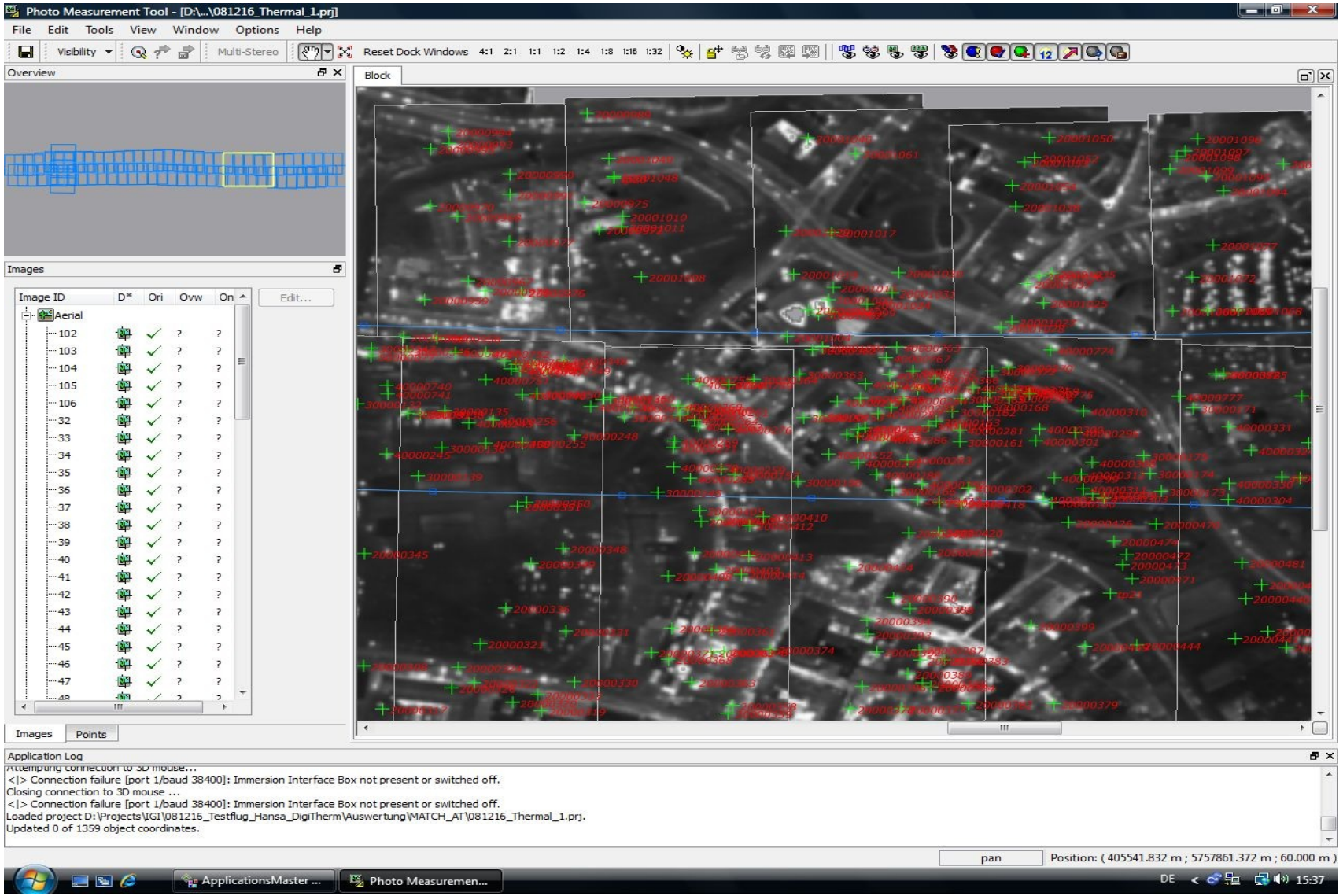


Flying height: ~300 m
GSD: 25 cm
Time of the day: early afternoon

DigiTHERM w/ DigiCAM and LiteMapper



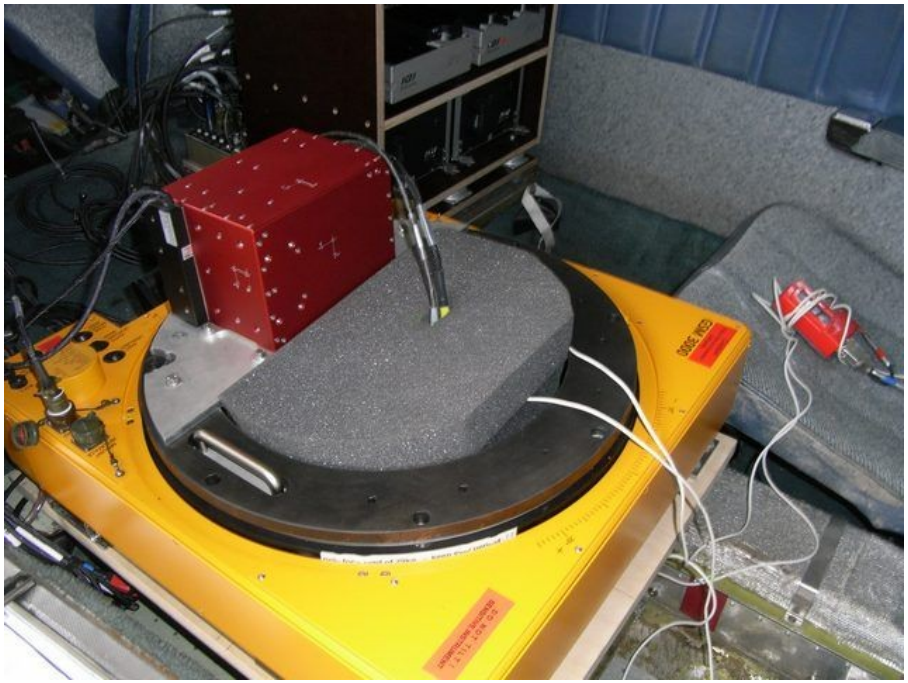
Airborne Thermography



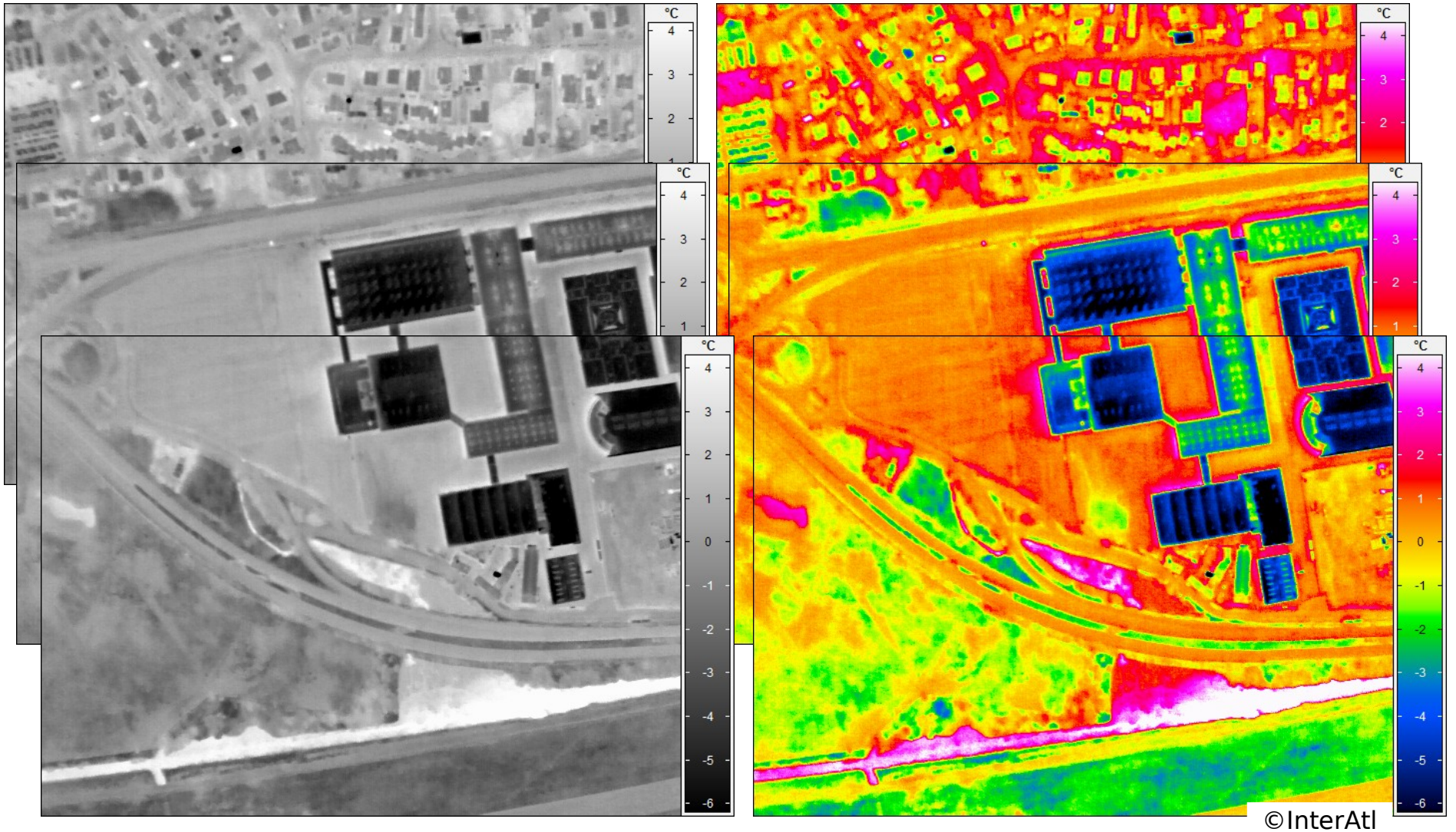
Airborne Thermography

Flight mission in southern France

Flying height:	~1100 m
GSD:	90 cm
Time of the day:	three hours before sunrise



Airborne Thermography



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Guidance and Sensor Management

GPS / IMU Systems

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⇩

LiteMapper
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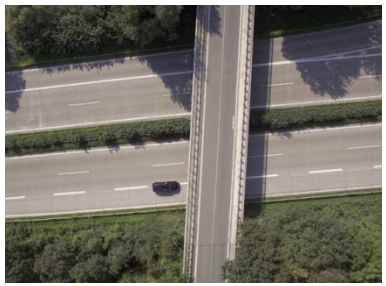
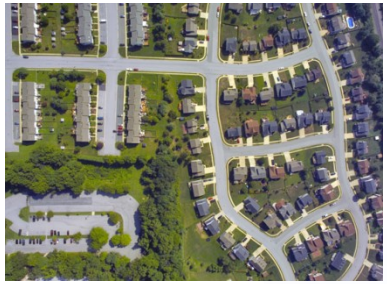
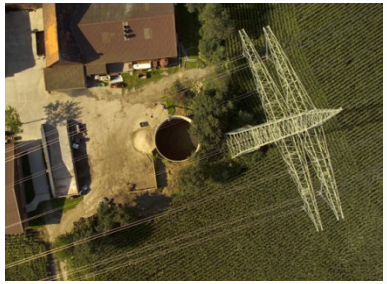
DigiCAM

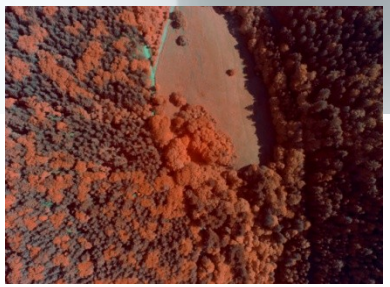
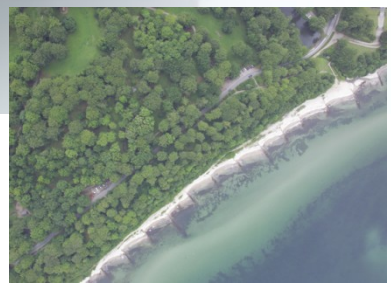











DigiCAM

39 or 60 Mpixel CCD Back

Control Computer with two Storage Units

Graphical User Interface with Touch Screen

DigiCAM Design

Lens Options I

Changeable lenses with bayonet mount

Integrated electronic shutter (central shutter)

Changeable filters for RGB and CIR mode (optional)

Lenses from 28mm to 300mm available

Lens Options II

28mm

35mm

50mm

80mm

100mm

150mm

210mm

300mm

DigiControl Storage Unit

Flash memory units

2 x 250 GB
4000 images each
no height limitation
changeable in flight

Graphical User Interface

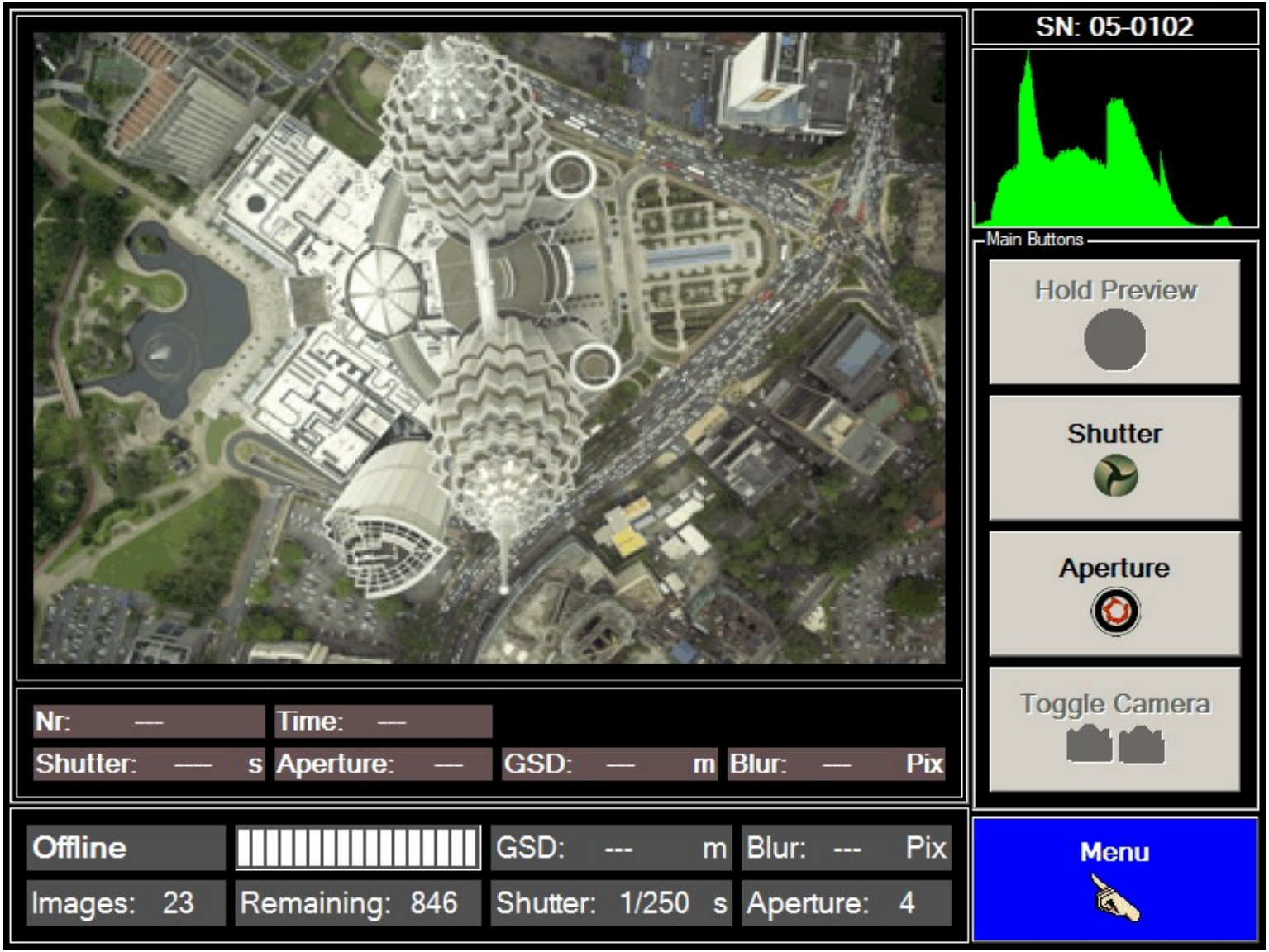
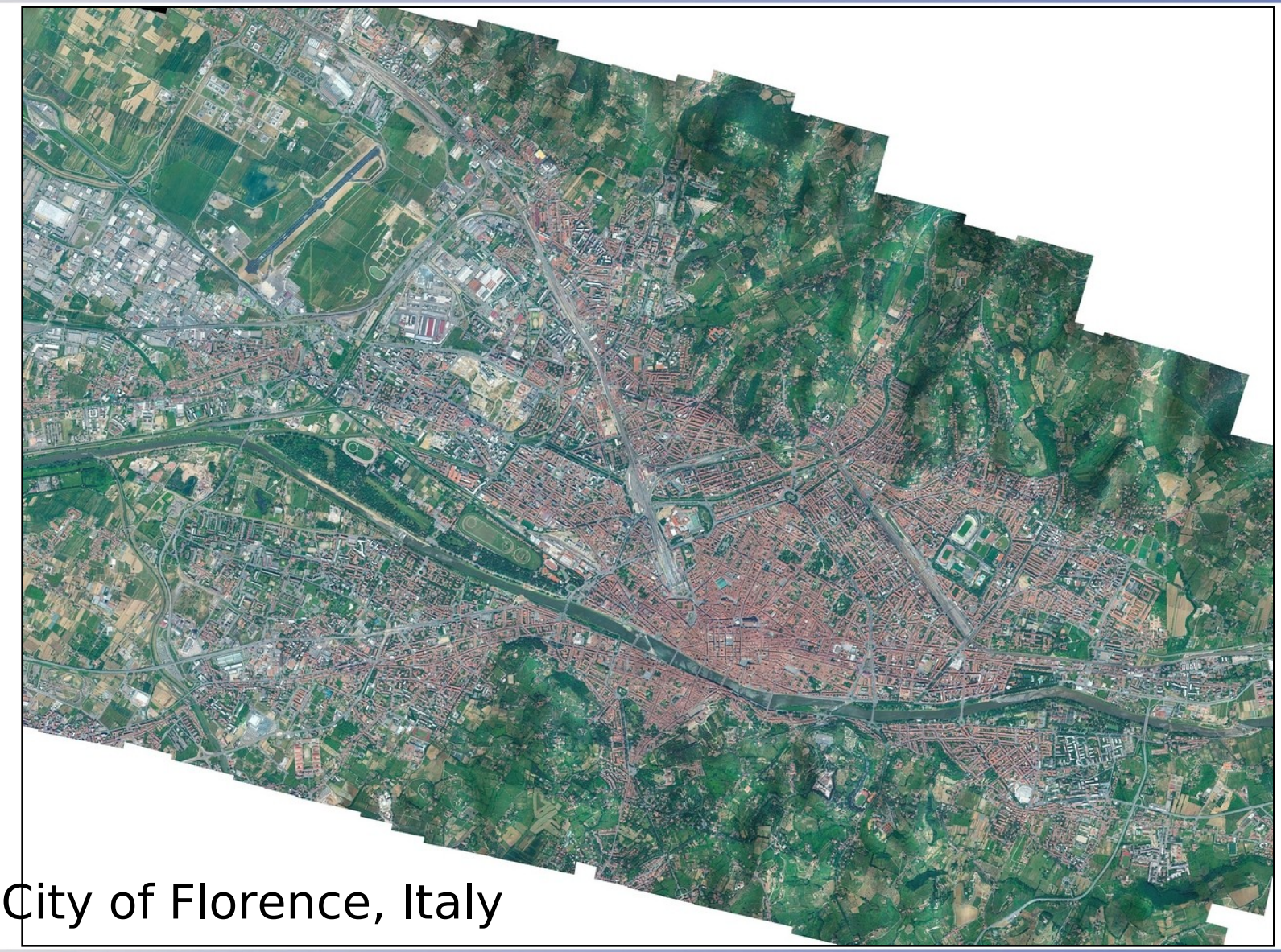
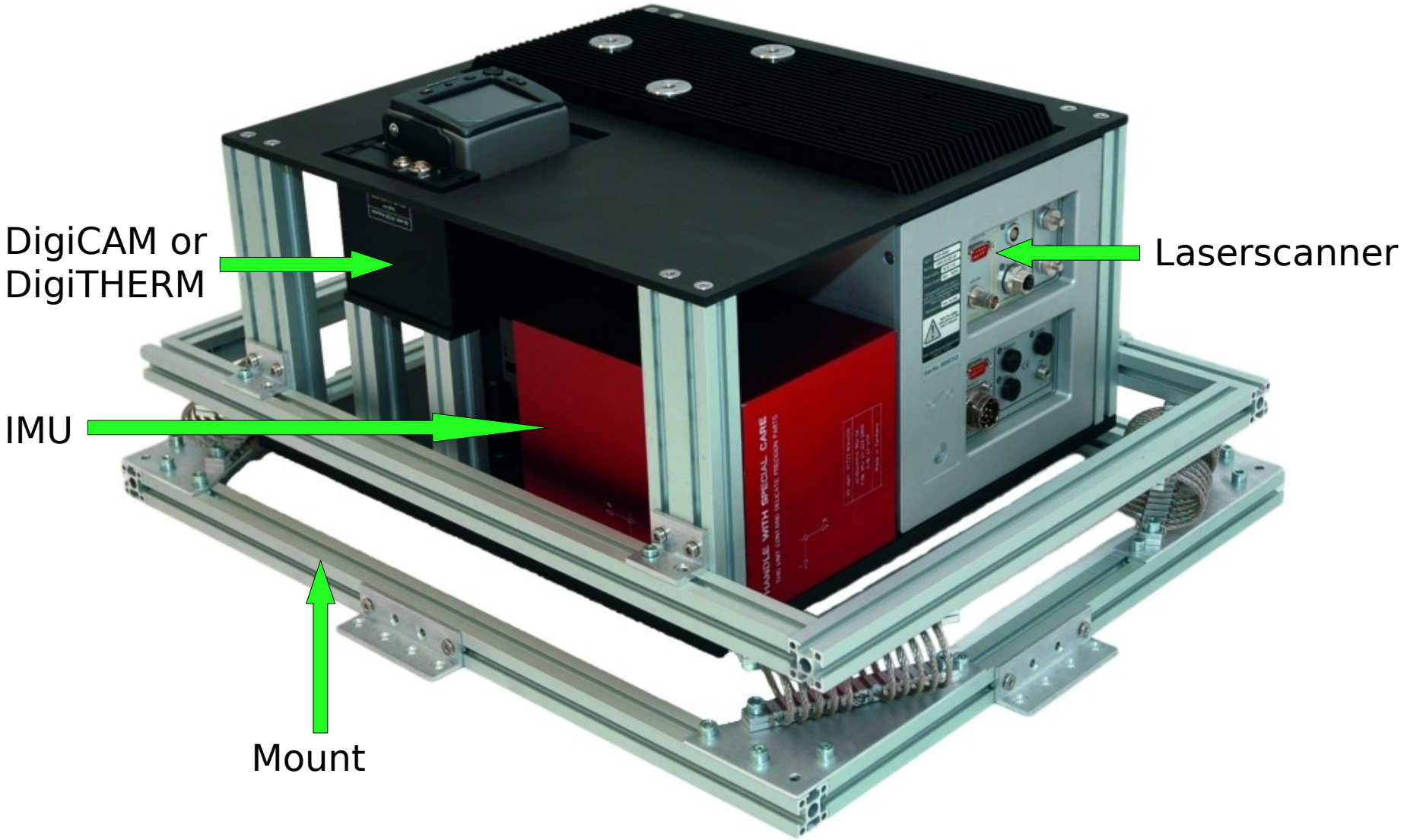


Image Mosaic

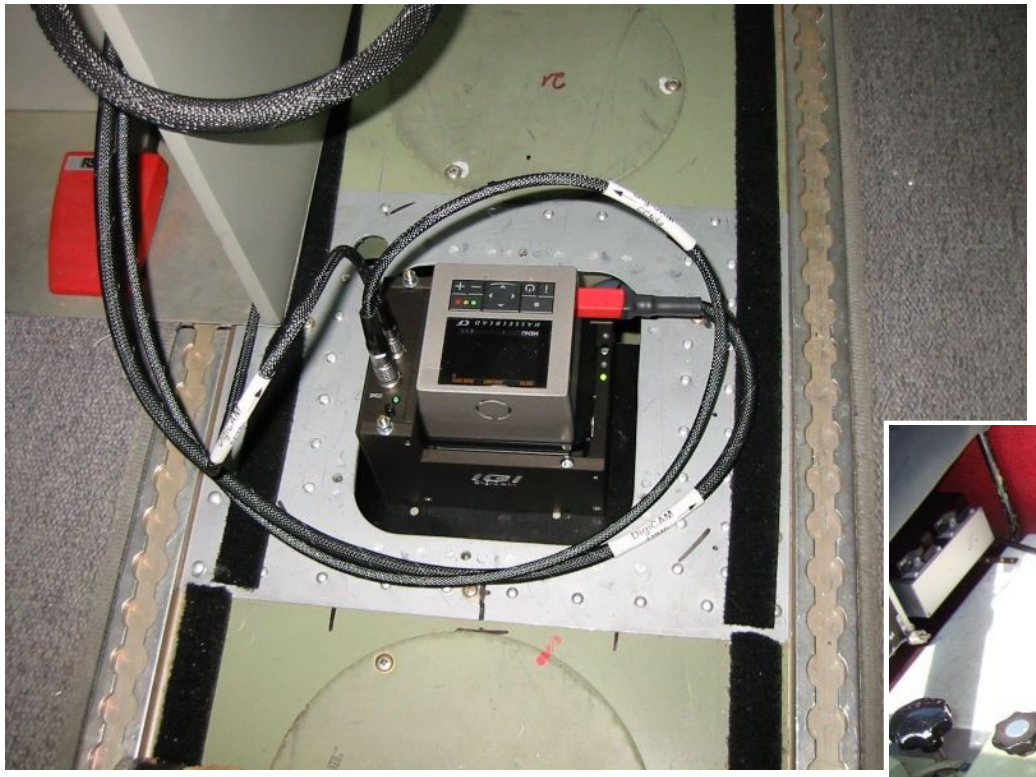


City of Florence, Italy

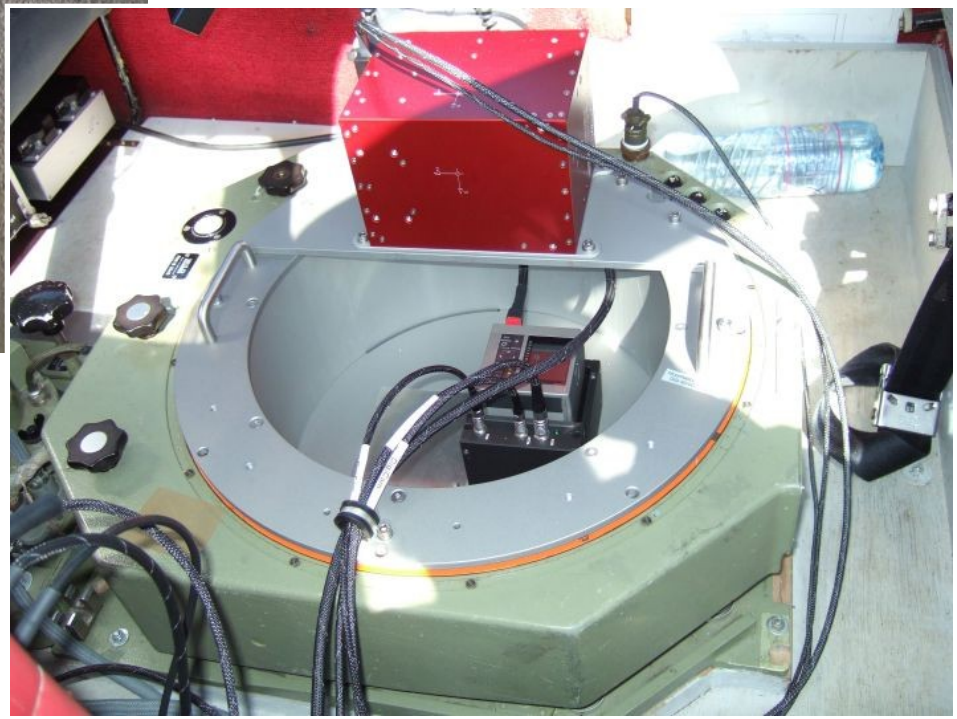
DigiCAM Installation Examples



DigiCAM Installation Examples



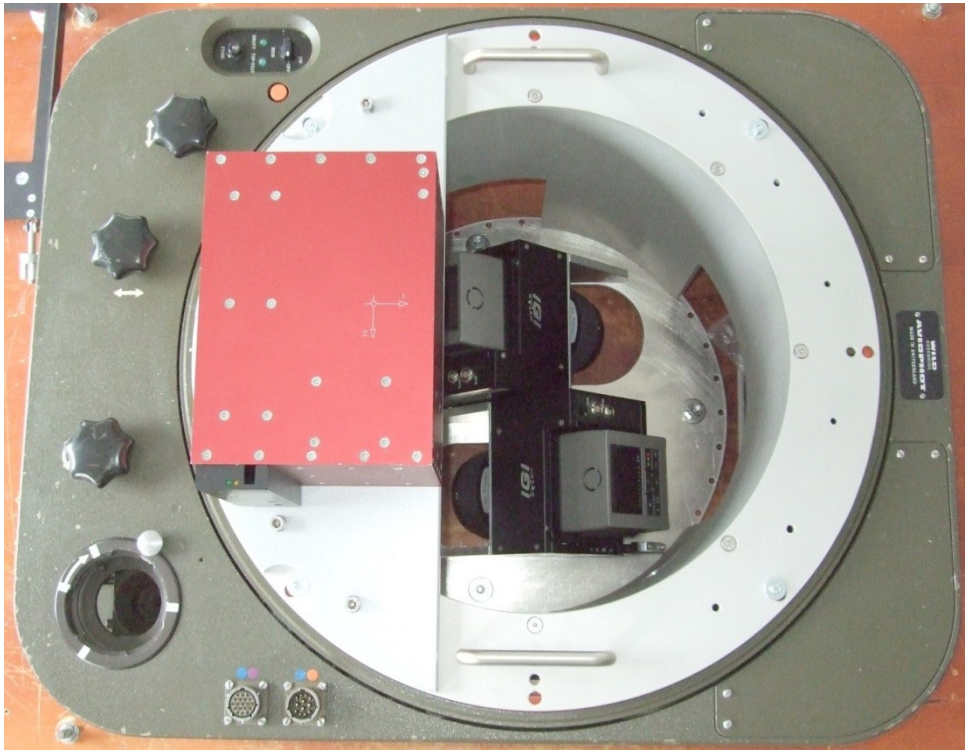
Mounted directly to the fuselage



Fixed in a PAV10 mount

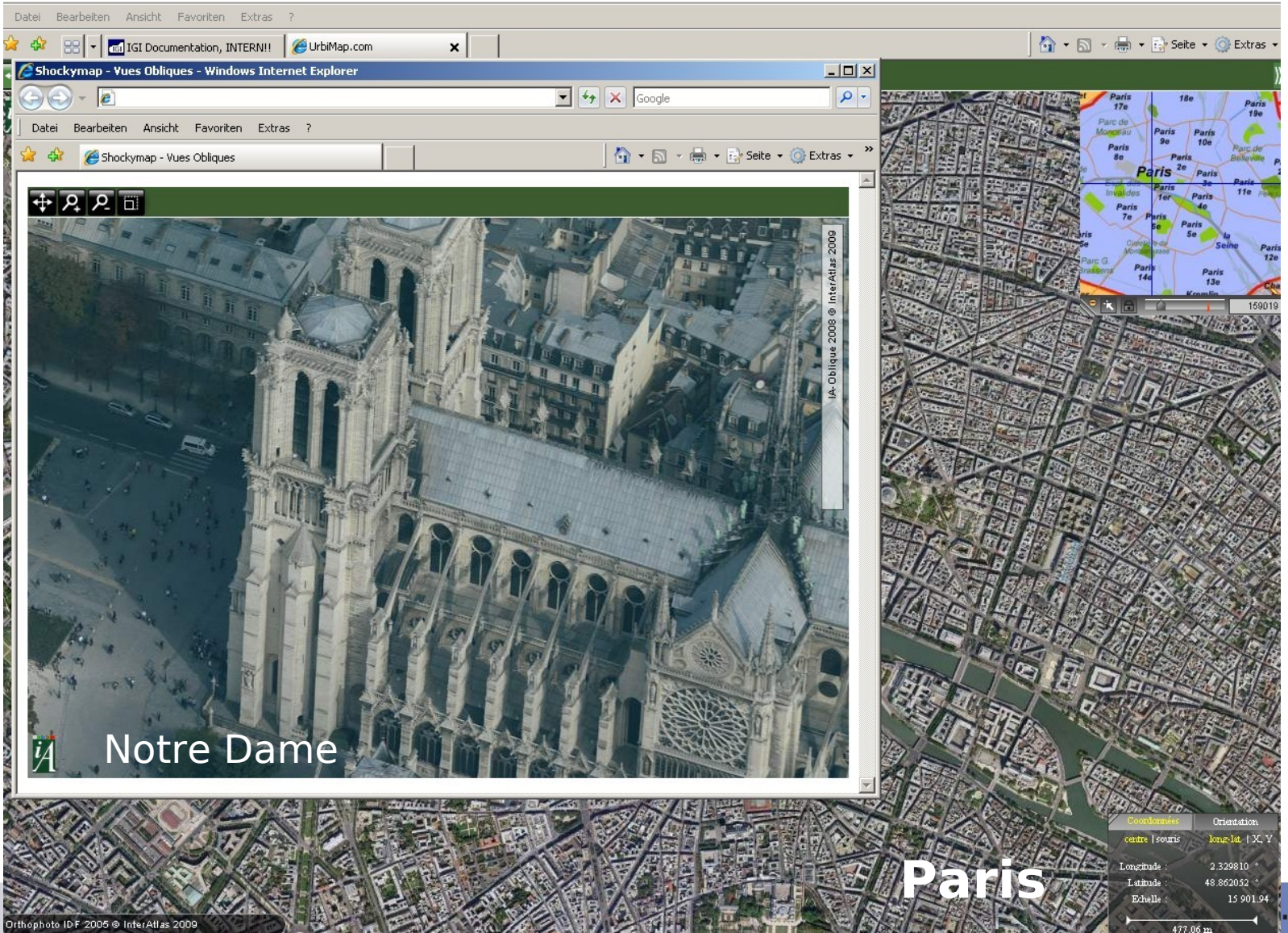
Multiple *DigiCAM-oblique*

2 x 45° (f = 82mm)



4 x 45° (f = 82mm)

Multiple *DigiCAM-oblique*

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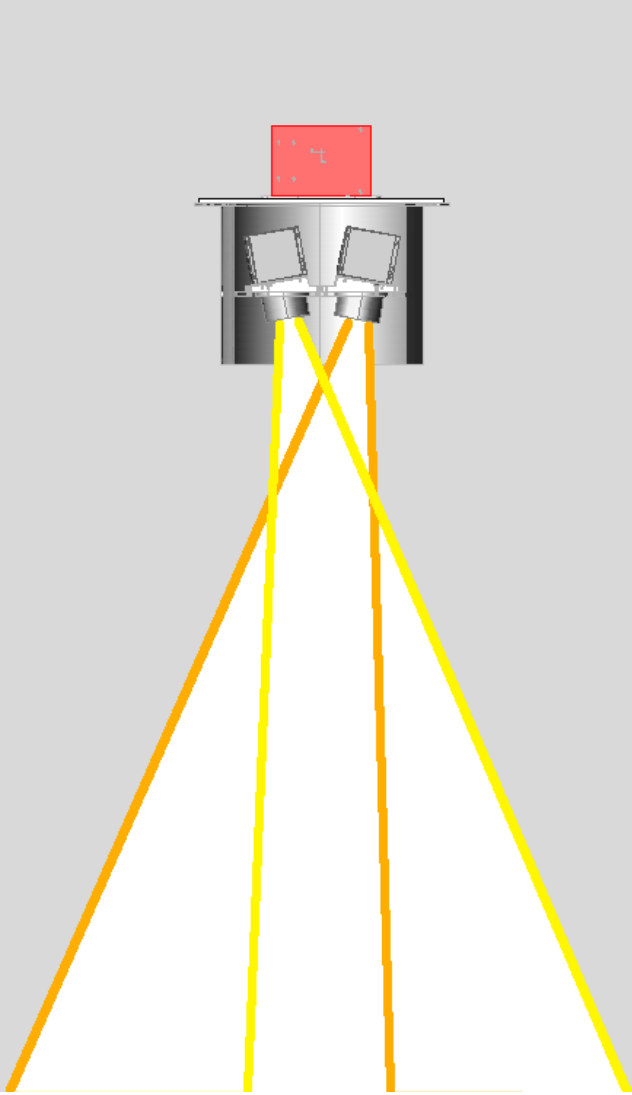
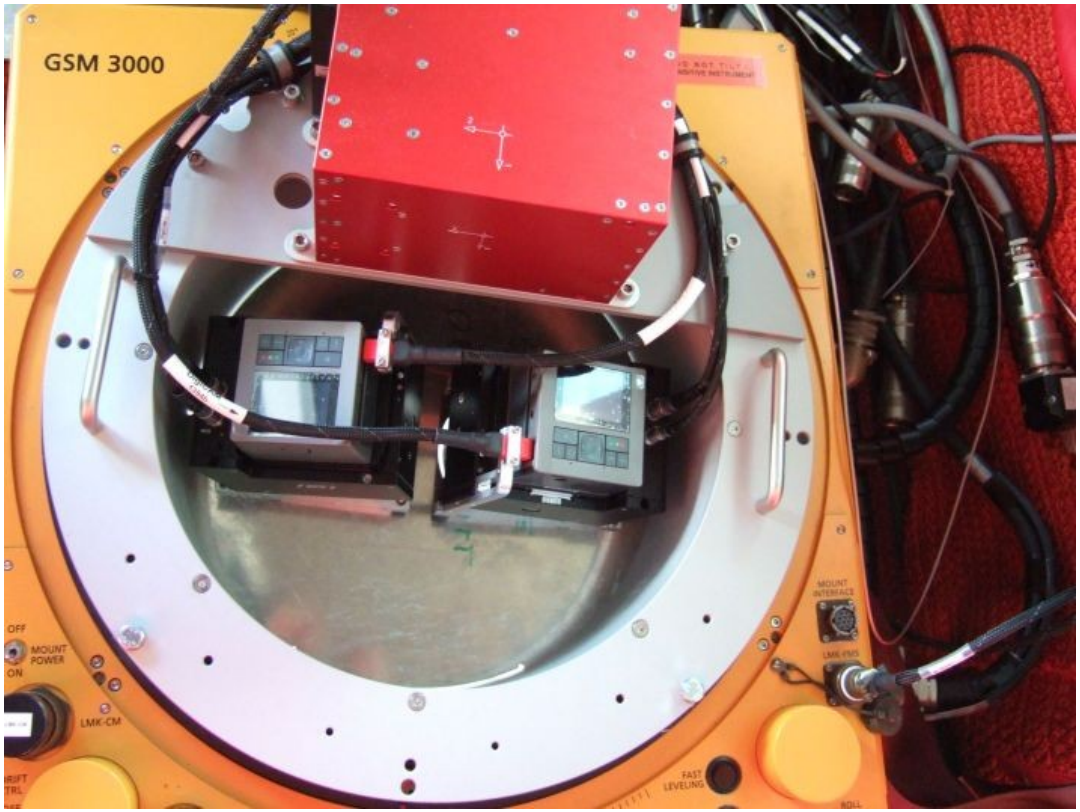
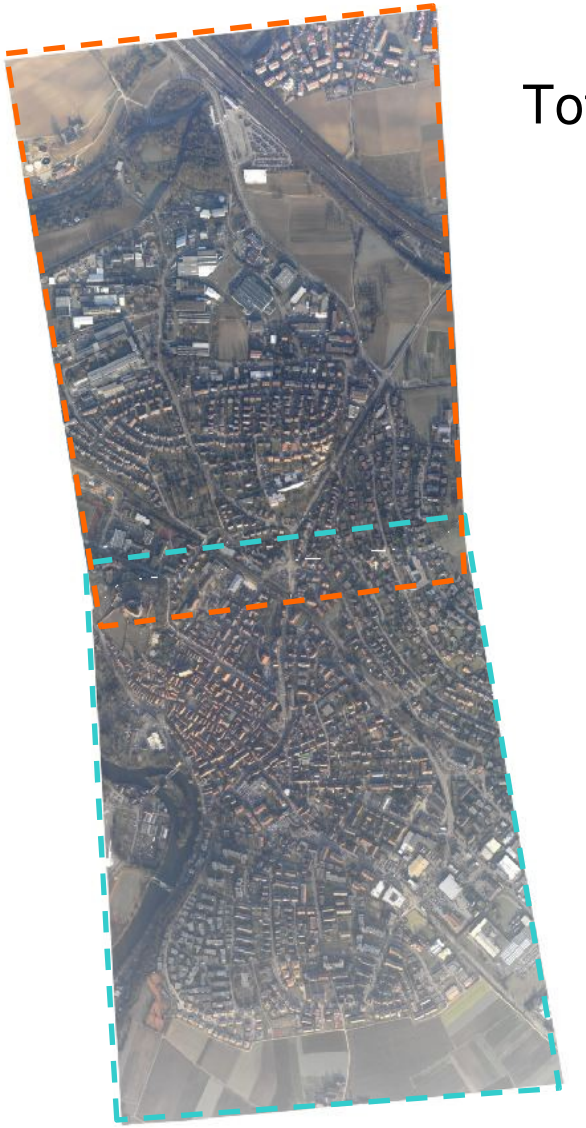
Dual-DigiCAM



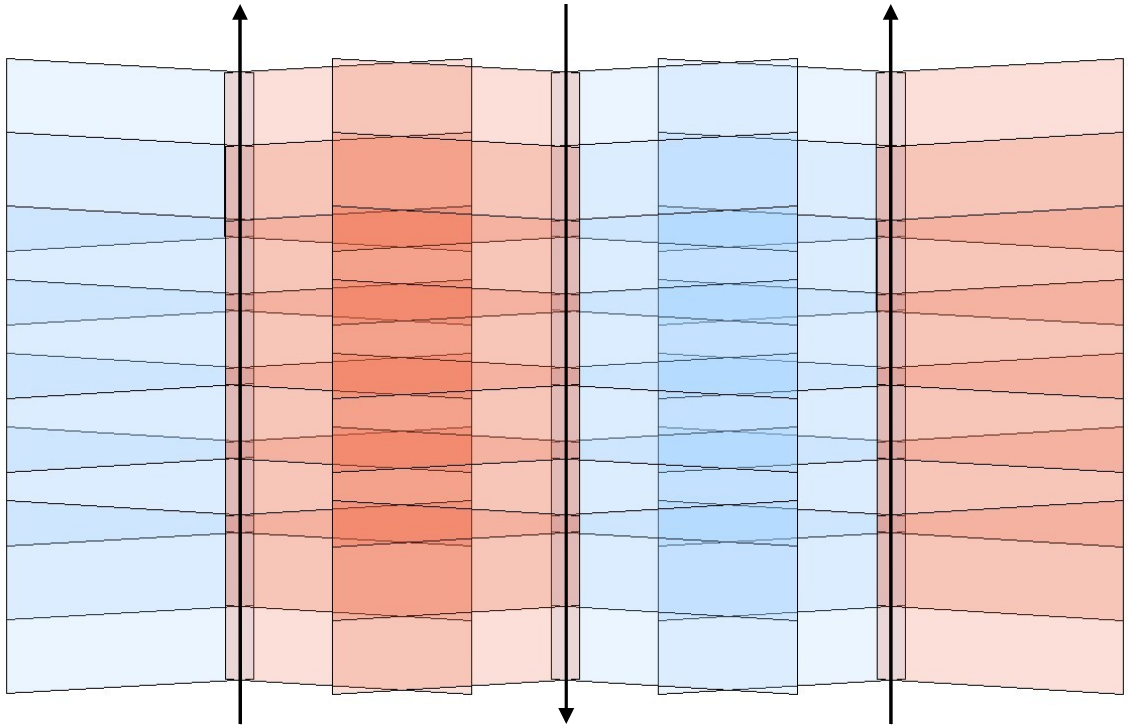


Dual-DigiCAM in a *GSM-3000* stabilized platform

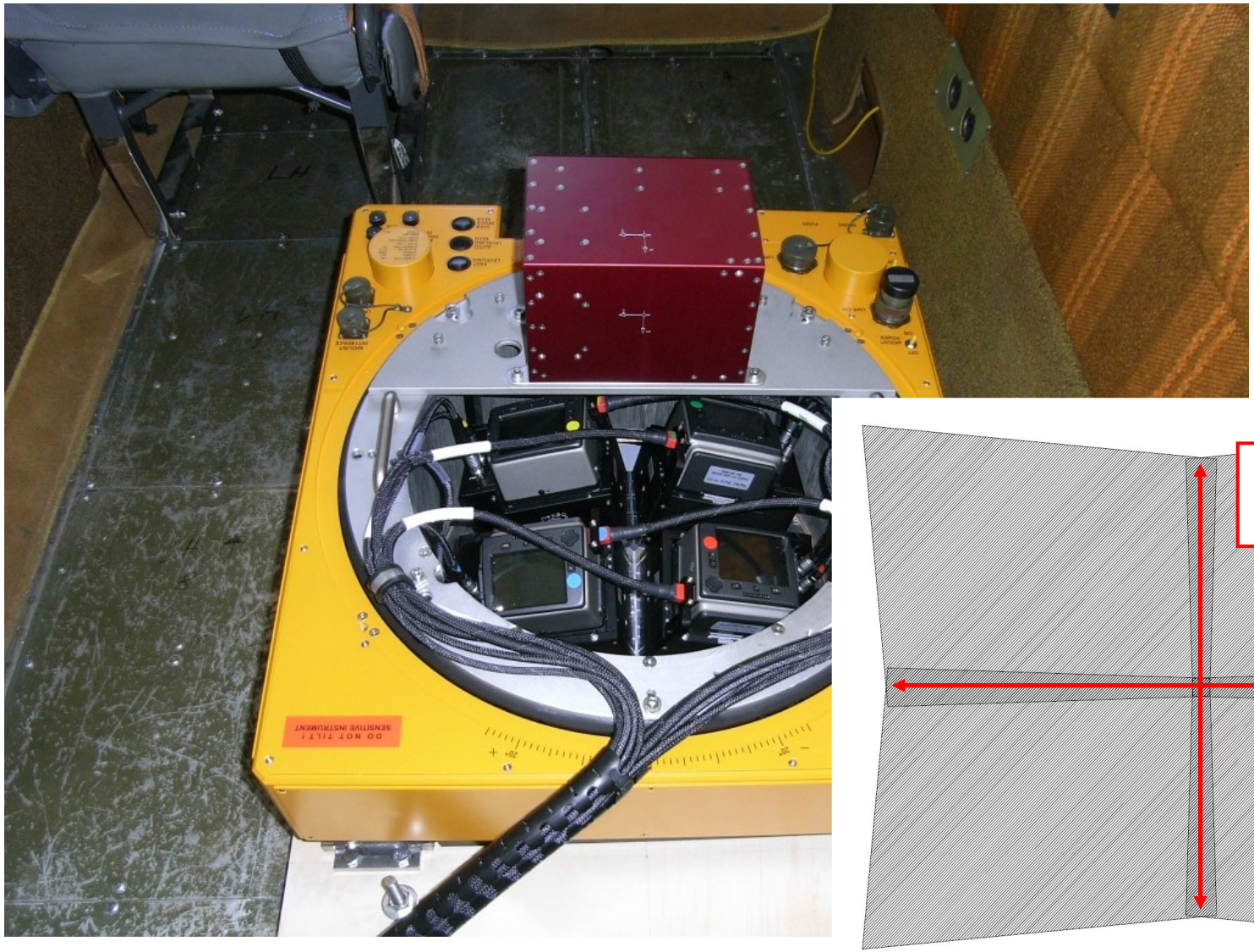
Dual-DigiCAM



Total image size: 14,000 x 5,412 pixel (75 Mpixel)



Quattro-DigiCAM



145 Mpixel

IGI's Modular Sensorsystems

Navigation
Mission Planning
GPS/IMU
Sensor Management
Data Acquisition

IGI's Modular Sensorsystems

IGI Products:

Quattro-DigiCAM

DigiCAM

DigiTHERM

LiteMapper

StreetMapper

CCNS/AEROcontrol
e.g. for:

JAS

DMC

UCD
UCX
UCXp
UCL

For questions please contact IGI:

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