

Hexagon Geospatial Solutions Division (GSD)

Airborne Sensors from Hexagon

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Sensor portfolio 2013

DPW / Image Processing / GIS / Decision Making

Required Data & Application

Frame

XPro

TerraSolid

Customer's Business Model

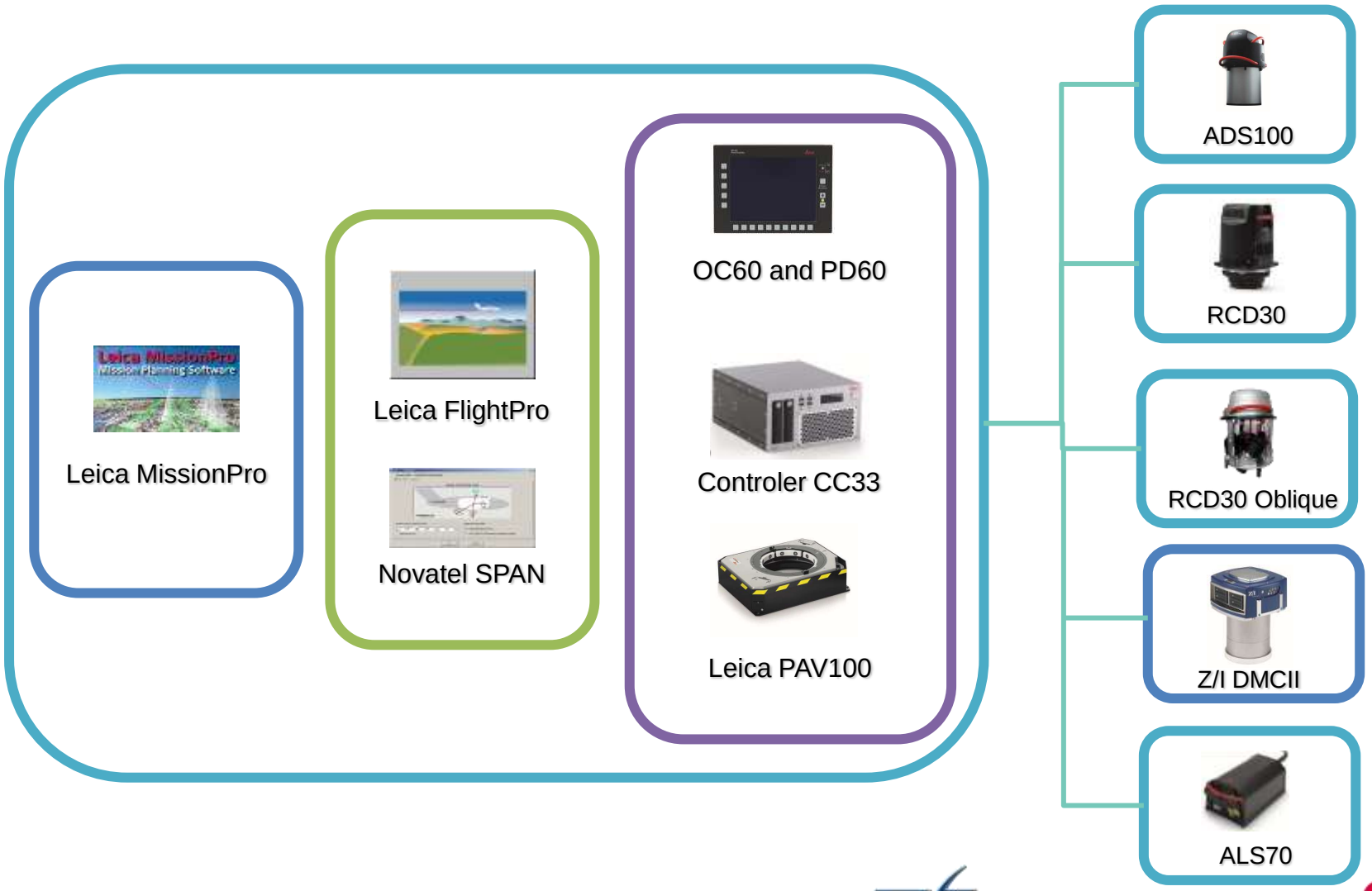
Mount

GNSS/IMU

Flight Management

Flight Planning

Unified Aircraft Installation



Target Markets for Airborne Products

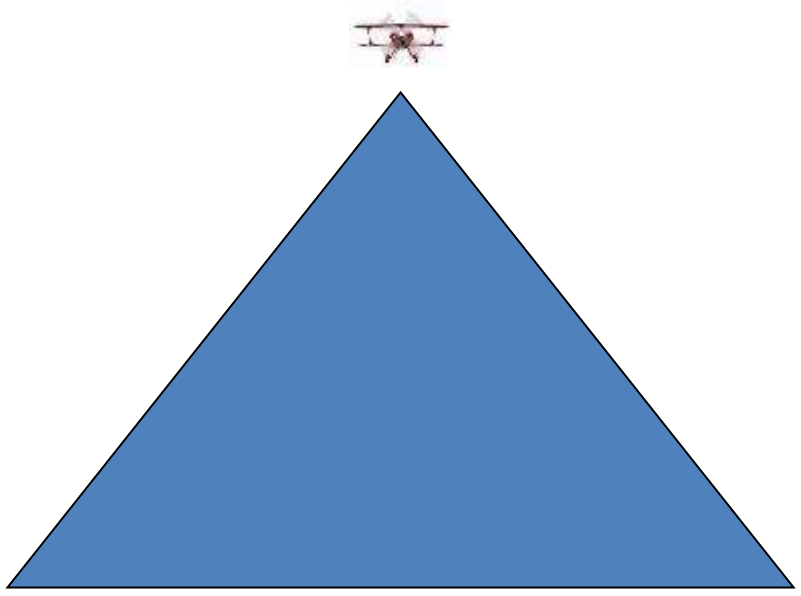
The All New Leica ADS100 Airborne Digital Sensor

Key Features Sensor Head SH100

- **Focal Plate (FPM)**
- Total of 13 CCD lines with 20000 pixels each in three line groups (Forward, Nadir, Backward)
- Pixel size 5um
- TDI stages selectable 1, 2, 4, 8, 15 (1/2, ¼, 1/8, 1/16 @ Cycle time >1ms)
- Two Tetrachroid beamsplitters in
- Forward (25.6°) - full color RGBN –
- Backward (17.7°) - full color RGBN
- One bi-Tetrachroid in
- Nadir - full color RGGBN
- **Dynamic Range of CCD**
- 72dB
- **Resolution A/D converter**
- 14-bit
- **Data Compression**
- Lossless 14-bit
- **Recording Interval per Line (Cycle Time)**
- >0.5ms
- **Spectral Bands**
- Red: 619-651nm
- Green: 525-585nm
- Blue: 435-495nm
- NIR: 808-882nm

Key Features Sensor Head SH100

- **Field of View (FoV)**
- Forward 65.2° across track
- Nadir 77.3° across track
- Backward 72.5° across track
- **Focal Length**
- 62.5mm
- **F-number**
- 4
- **Spectral Range**
- 420-900nm
- **Registration Accuracy**
- 1um
- **Lens Design**
- Telecentric lens design.
- Maintains position & width of filter edges over whole FoV
- Thermic and pressure compensation for high accuracy.
- **Flying Height Multiplier**
- 12.500:1
- 10cm GSD = 1250m AGL
- **Sensor Head SH100**
- Weight ~50 kg with CUS6 IMU
- Height 65 cm
- Diameter 39cm
- **IMU integrated in Sensor Head**
- Leica IPAS20-CUS6 IMU integrated



ADS100 10cm GSD, 2000m Swath, 1254m AGL

Performance Indicators

Inflight QC Options

Video Camera

- Oblique View 17° forward
- Swath width 55° along x 77° across track

Waterfall Images

- Waterfall images during flight available for RGB Nadir

Leica FlightPro

- Full control of data acquisition parameters

Data Recording Performance

Capacity of Mass Memory (Pair)

- Selectable single, joint or backup mode possible
- Joint mode of 2.4 TB, recording time depends on configurations of data acquistion
- Hot swappable in-air

Firmware & Software

- Leica FlightPro Flight Management Software

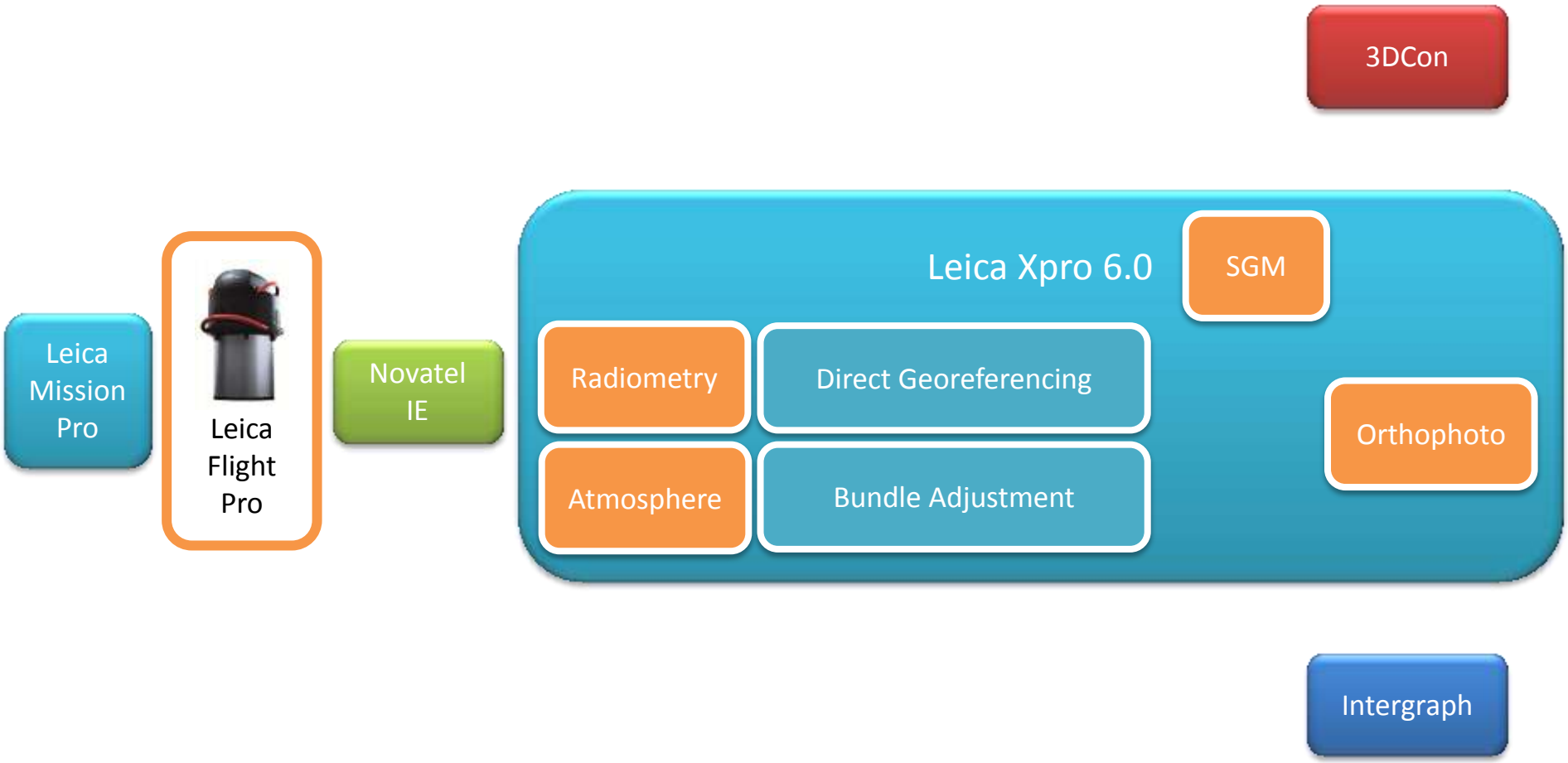
Average Ground Speed (GS) for various GSD @ 0.5ms CT

- GS = 120 kts for GSD of 1.2” / 3cm
- GS = 190 kts for GSD of 2” / 5cm
- GS = 290 kts for GSD 3” / 7.5cm
- GS = >350 kts for GSD 4” / 10cm

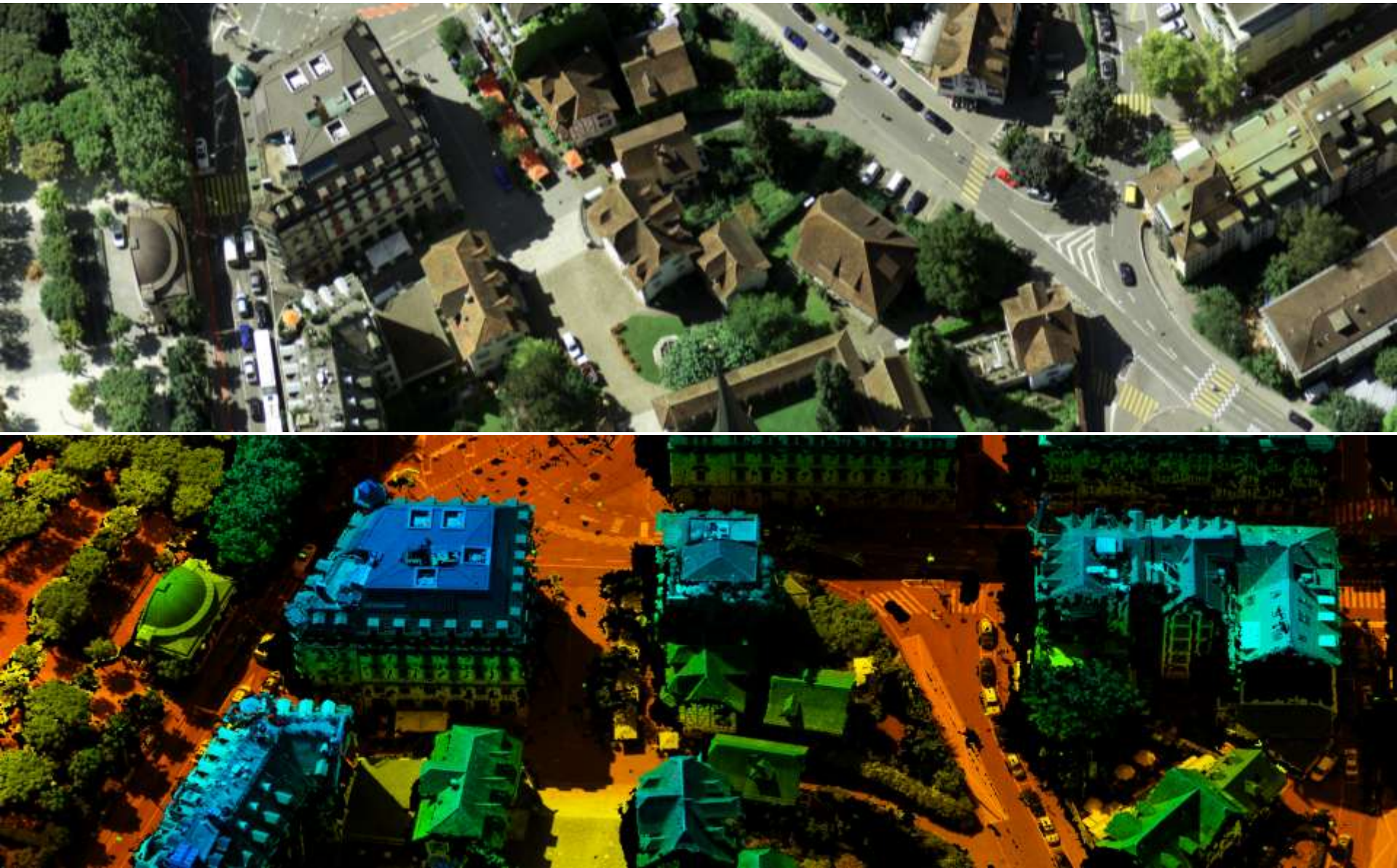
Key Performance Summary

- Full multispectral color swath width of 20000 pixels in RGBN for highest data acquisition efficiency
- Selectable TDI stages for improved sensitivity and expanded operational envelope
- Improved cycle time to acquire smaller GSDs at faster speed
- Full color RGBN in forward, nadir and backward for more flexible stereo interpretation
- Improved Leica PAV100 gyrostabilized mount with adaptive control for improved image quality
- Embedded Novatel SPAN GNSS/IMU with tightly coupled processing to reduce fuel consumption
- End-to-end workflow from mission planning with Leica MissionPro to orthophoto and point cloud generation with LeicaXPro

Leica ADS100 Workflow



Total Geospatial Solutions
Leica ADS and Leica XPro



The new DMC IIe camera system

Key Performance Summary

- Single large format CCD for precise geometry and high radiometric image quality
- High frame rate for efficient use of high speed aircrafts and large forward overlap at high resolution
- Extended airborne storage of 4.8 TByte for more image capacity
- Integrated sensor management for reduced weight and compact aircraft installation
- Embedded Novatel SPAN GNSS/IMU system with tightly coupled processing to reduce fuel consumption
- New Leica PAV100 stabilized mount with adaptive control for improved image quality
- Camera peripherals compatible with all Hexagon airborne sensors
- Complete end-to-end workflow from mission planning to geo-referenced images

Key features Z/I DMC IIe

- **Sensor size**
  - 12096 x 11200 (DMC IIe 140)
  - 15552 x 14144 (DMC IIe 230)
  - 16768 x 14016 (DMC IIe 250)
- **Field of view**
  - 50.7° x 47.3° (DMC IIe 140)
  - 50.7° x 46.6° (DMC IIe 230)
  - 45.5° x 38.6° (DMC IIe 250
- **Ground resolution**
  - 4cm – 80cm (DMC IIe 140)
  - 3cm – 60cm (DMC IIe 230)
  - 2cm – 50cm (DMC IIe 250
- **Frame rate**
  - 2.2 sec (DMC IIe 140)
  - 1.8 sec (DMC IIe 230)
  - 1.8 sec (DMC IIe 250

Key features Z/I DMC IIe

- **Optics**
  - customized lens design by Carl Zeiss
- **Radiometry**
  - 72dB dynamic range
  - 14 bit A/D converter
  - four color channels RGBNIR
  - 390 nm – 925 nm spectral range
- **Storage**
  - newest SSD technology
  - 4.8 TByte on board capacity
  - in-flight exchangeable
  - lossless data compression
- **Environment**
  - Weight 65 kg
  - Power consumption 280 W
  - Operating temperature -20°C to +40°
  - Operating altitude non pressurized 8000m

Key features Z/I DMC IIe

- **OC60 Operator Console**
  - 12.1'' touch-screen with 1024 x 768 resolution
  - sunlight readable
- **PD60 Pilot Display**
  - 6.5'' screen with 1024 x 768 resolution
  - Quick access buttons
- **Integrated GNSS/IMU System**
  - integrated Novatel SPAN MPPC controller
  - class 5 IMU accuracy
  - dual frequency GNSS receiver
- **Integrated sensor management**
  - integrated Leica FlightPro system
  - no external controller box required
  - SW compatible with all Hexagon airborne sensors

Key Features Leica PAV100

- Improvement of performance of LeicaPAV80
- Introducing Adaptive Sensor Control for a more stable flight
- Available for all sensors, most useful for large format cameras

Z/I DMC IIe Airborne Storage

4.8 TByte capacity
4 x MM30 SSD modules

MM30 storage modules are compatible with RCD30 and ADS100

Exchangable in flight
small, light weight

Passive download station for fast data copy

Integrated GNSS/IMU system

Integrated Novatel SPAN MPPS GNSS/IMU system

- Latest multi frequency plus L-Band GPS/INS receiver technology supports GPS L1/L2/L5, GLONASS L1/L2, SBAS and L-Band
- 72 channels
- Class 5 IMU accuracy
- Tight coupling of GNSS and IMU measurements
- Multiband antenna included
- Omnistar support (subscription fee not included)

No external controller required, all hardware components are integrated with DMC IIe camera electronic

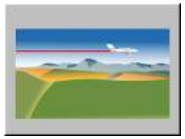
Optional support of 3rd part IMU systems

Z/I DMC IIe Benefits

- **Single large format CCD**
  - for superior geometric accuracy and best radiometric image quality
- **Long focal length**
  - for very high resolution and small occlusion
- **Square image format**
  - to minimize number of stereo models
- **Fast frame rate**
  - for efficient use of high speed aircrafts and high forward overlap
- **Integrated sensor management and GNSS/IMU system**
  - Reduced weight and space requirements for aircraft installation and increased reliability
- **Common sensor peripherals components**
  - Compatible with all Hexagon airborne sensors
- **Common flight management software**
  - Compatible with all Hexagon airborne sensors

Z/I DMC IIe Workflow

Leica MissionPro



Leica FlightPro

Novatel
Inertial Explorer

OC60 and PD60

Leica PAV100

Z/I DMC IIe

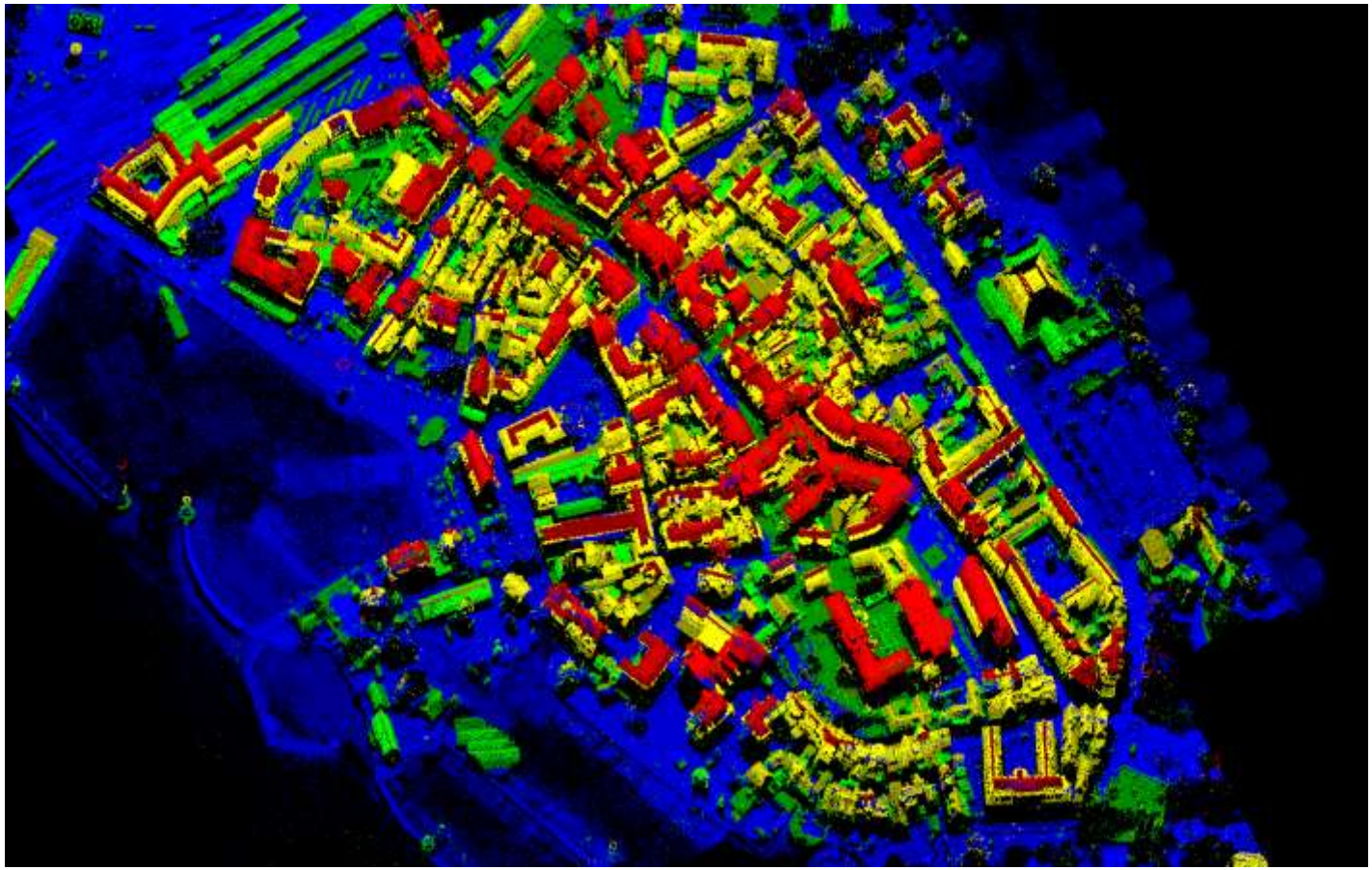
Pure Color
Technology

Radiometry

Atmosphere

Z/I PPS

Info-Clouds from Frame Camera



City of Lindau
5cm GSD
DMC II 140

RCD30 Medium format for photogrammetry

- Multispectral, coregistered RGB and IR
- Mechanical motion compensation, 2 axes
- >1 second frame rate
- 50 mm and 80 mm focal length
- Stabilized lens system
- High accuracy mapping range
- Exchangeable central shutter
- B/H ratio of 0.32 @ 60% overlap (50mm)
- 2 x 60MP, 6um CCD for RGB and NIR
- CC3x can control up to five CH6x
- Image size single head 8956 x 6708
- Image size dual head 13216 x 8956
- 15cm GSD @ 3780ft flying height (50mm)
- Weight CH6x 4 kg, CC3x 6kg

RCD30 Standalone in Uno/Duo Pod

Uses Leica PAV80 for RCD30

Height	**485 mm**
Diameter	**390 mm**
Weight (incl IMU)	**17.5 kg**

RCD30 Standalone Uno Pod

Height	**485 mm**
Diameter	**390 mm**
Weight (incl IMU)	**17.5 kg**

Leica RCD30 for ALS and 3rd party

Uses Leica PAV80 Heavy Load

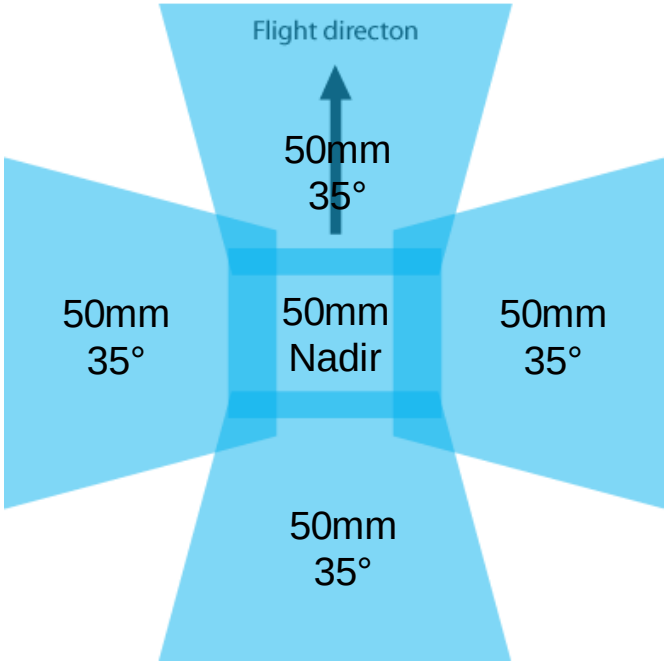
Or installation without mount

RCD30 Oblique Penta Pod

Height	**485 mm**
Diameter	**390 mm**
Weight (incl IMU)	**18 kg**

RCD30 Oblique Trio Configuration

RCD30 Oblique Penta Configuration



tridicon® 3D: Source data parameters

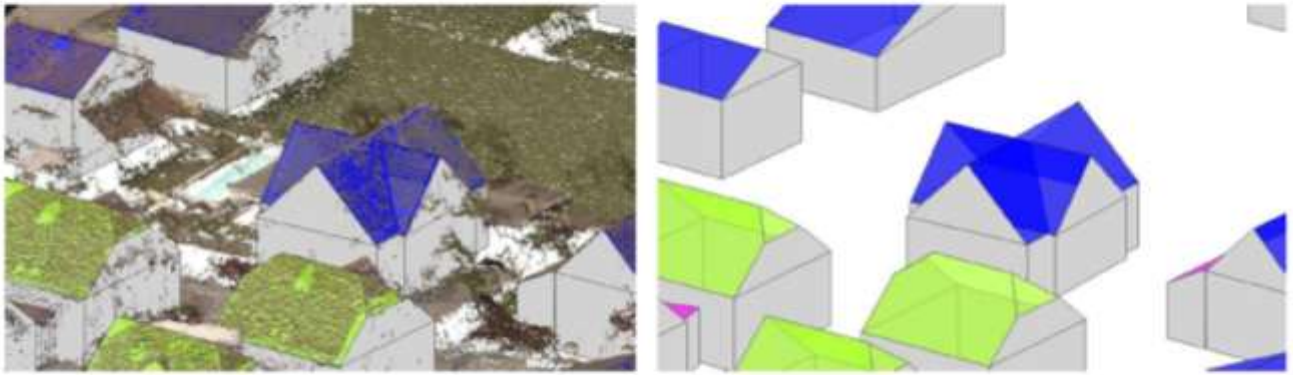
Stereo Aerial Images:

- Camera: **Leica RCD 30 Oblique**
- 1x Nadir, 4x oblique
- vertical / horizontal overlap: 60% / 35%
- ground sample distance (GSD): 4 cm
- camera file and orientation data

tridicon®:
High Definition 3D Point Cloud Generation

some details

tridicon®: Automatic Building Reconstruction (3D BuildingFinder)



tridicon®: Automatic Texturing

Mobile Mapping

Uses a **laser scanner** (or several scanners) in combination with **GNSS** receivers, Inertial Measurement Unit (**IMU**) and a Distance Measurement Instrument (**DMI**) on a mobile platform (**vehicle**) to acquire accurate and precise spatial data.

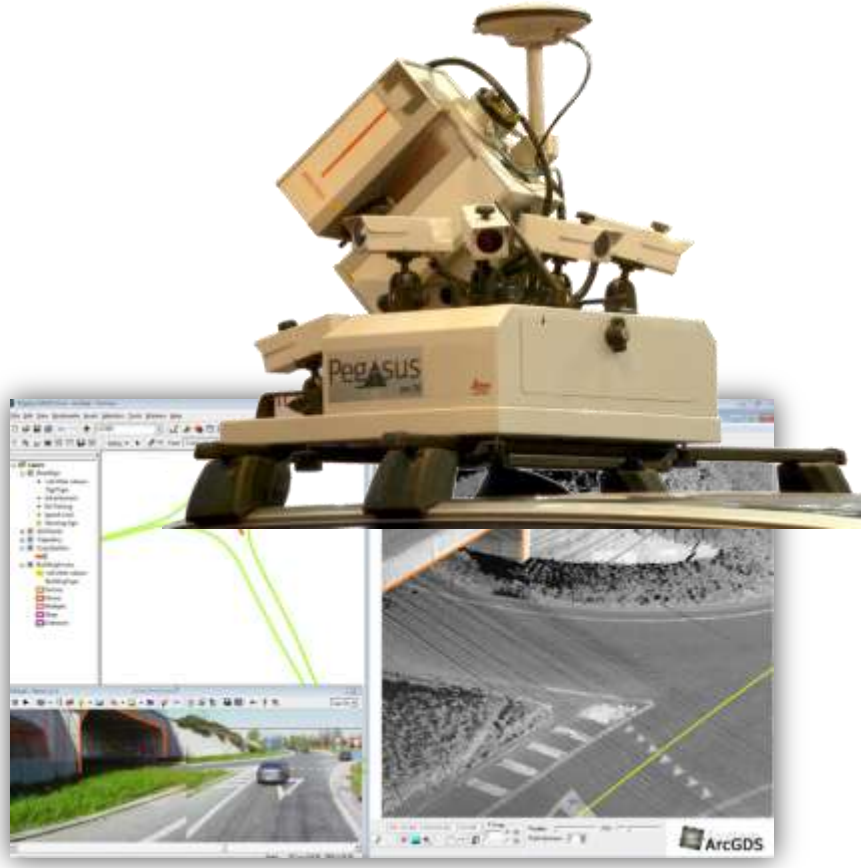
Laser scanner uses an active beam of light (laser pulses) to determine **the relative position** (dX, dY, dZ) and the reflectance properties of points on surrounding buildings.

The result is a cloud of points, of a quality comparable to other remote sensing technologies.

Leica Pegasus:One

Complete Solution-Hardware to Post-Processing

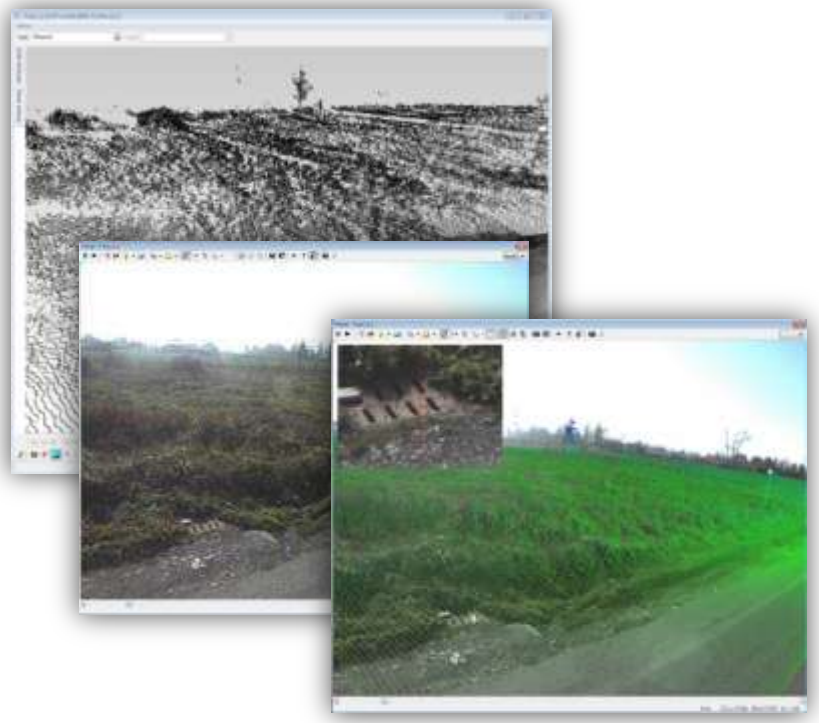
- Marries imaginary and point cloud data into a single calibrated, user intuitive platform
- Plug and play with qualified terrestrial scanners and profilers – no dedicated, modified vehicles are required
- Leica Geosystems Platform roadmap to future portability



Leica Pegasus:One

Complete Solution-Hardware to Post-Processing

- Balances data need with project logistics and speed of post-processing to deliver an ROI enabling platform
- Provides the operator with multiple ways to view collected 3D points – calibrated together
- Software enables access to Esri ArcGIS Desktop, the most popular GIS platform



Leica Pegasus:One

Complete Solution-Hardware to Post-Processing

- LIDAR and image data acquisition
- Data post-processing
- Stereoscopic 3D GIS interface for digitising spatial objects
- Spatial data acquisition of the highest accuracy

Leica Pegasus:One

Plug and Play - Connect & Scan

- No dedicated vehicle needed
- No special modifications

Leica Pegasus:One

Plug and Play - Connect & Scan

- Leica Pegasus:One is field-tested and proven
- The first spatial data acquisition project completed in 2001
- The first NovAtel GNSS/INS system introduced in 2004
- The first test with a terrestrial laser scanner Leica HDS6100 in 2010
- First system sold end of 2011
- First market introduction on Intergeo 2012

Thank you!

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