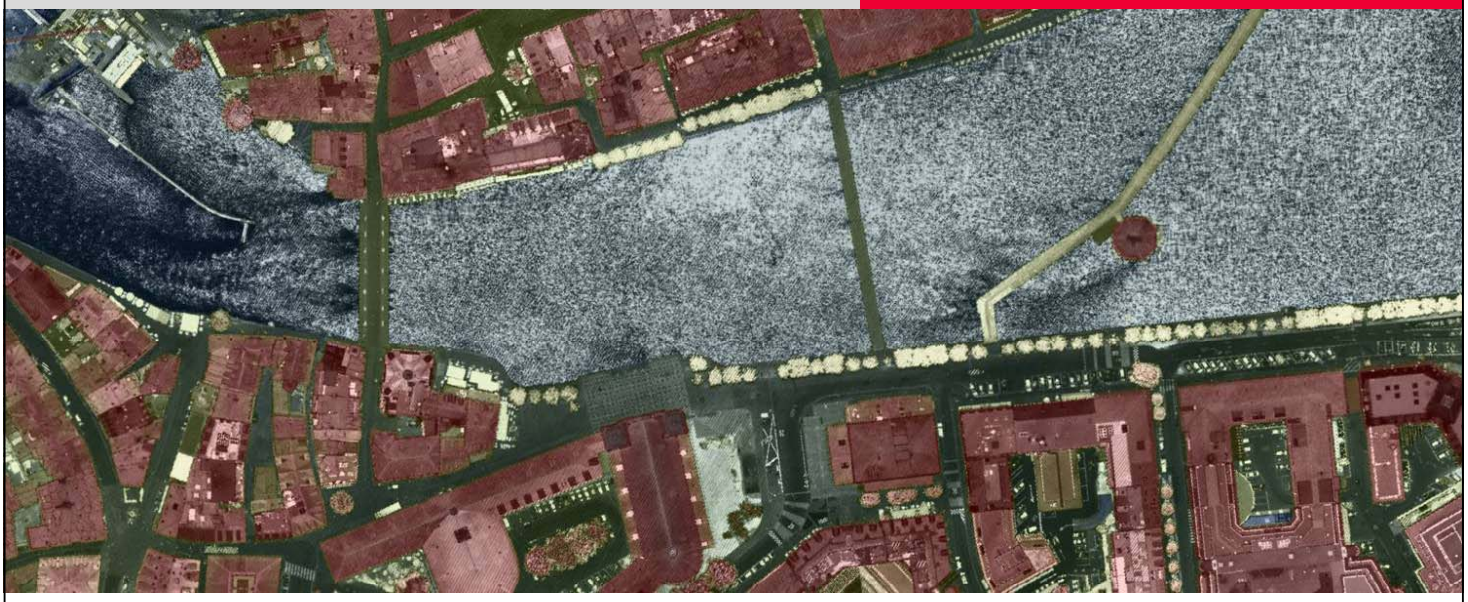

Point clouds and pixels
new technology solutions for imaging and scanning sensors

Ron Roth

Photogrammetry Week

September 2009

- when it has to be right

Leica Geosystems

Topics for discussion

Drivers for advanced technologies

New applications and implied requirements

- **Airborne imaging**
- **Airborne LIDAR**

Imaging solutions (ADS80, RCD100/105)

LIDAR solutions (ALS60, ALS Corridor Mapper)

Peripheral solutions (FPES, FCMS, OC52, PAV80)

Conclusions

- when it has to be right

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Drivers for advanced technology
why do we continue development?

Because we can

Because of business needs

- **Addressing new applications**
- **Reducing end-product (i.e., data, information) cost**

Both business needs come into play in the continued development of airborne sensors

New applications and implied requirements
airborne imaging

Application	Implied requirements
Remote sensing in near-shore marine environments	Consistent color radiometry
Forestry	Consistent color radiometry, including in near infrared Stereo imaging in color / false-color IR
Large-area projects	High data production efficiency / low cost per pixel •Fly more hours per day •More pixels per hour •Faster processing speed
Automated filtering and classification	All bands acquired simultaneously at high resolution

New applications and implied requirements
airborne LIDAR

Application	Implied requirements
Large-map-scale applications (land development and engineering)	•High point density •High scan rate •High accuracy
Forest inventory	High foliage penetration
Large area mapping	High measurement rate
Use by non-traditional practitioners (e.g., ground survey firms)	Ease of use

Important metrics for airborne LIDAR

Point density versus measurement rate

- Point density ➔ more important for site development, corridor mapping, urban modeling
- Measurement rate ➔ more important in large area surveys

Measurement rate, scan rate and accuracy

- Measurement rate quadruples ➔ scan rate doubles
- Point density doubles ➔ accuracy doubles

Airborne imaging solutions
ADS80

Now in 3rd generation

- Retains patented tetrachroid ➔ all 4 bands perfectly co-registered and at same resolution
- Improved SNR for expanded operation time/season
- Higher line rate (more pixels/second)
- SSD storage media decreases size/weight
- XPro processing at the speed of flight

SH81 – ideal orthophoto machine (including CIR)

SH82 – true stereo in all 4 bands without pan sharpening

Key productivity advantage in feature collection: less operator fatigue due to line perspective format

Airborne imaging solutions
RCD100/105

RCD105 originally developed as imaging solution for ALS50-II and ALS60

Evolved into first all-in-one turn-key solution for medium-format imaging

Integrated IPAS20 position/attitude measurement systems

3 user-interchangeable lenses

SSD storage media

Ideal for:

- Smaller job sizes
- Users transitioning from film to digital

Airborne LIDAR solutions
ALS60 and ALS Corridor Mapper

5th generation ALS

Full-altitude (5000 m AGL) ALS60 and low-profile Corridor Mapper (1000 m AGL) variants

Combination of large aperture and highest performance laser for highest sensitivity in all operating scenarios

33% measurement rate increase

Multiple Pulses in Air (MPiA) to maximum altitude provides 2:1 productivity improvement

30% scan rate increase

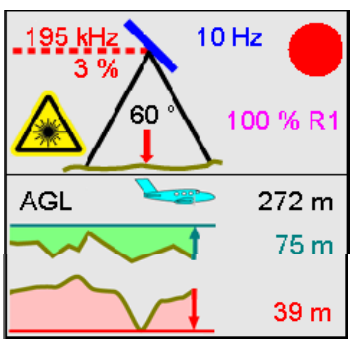
Peripheral solutions
FPES, FCMS, OC52 and PAV80

Peripherals are central to increasing productivity and system support

FPES enhanced to embed all ALS sensor settings in flight plan

FCMS in now unified operator interface software for ALS and ADS

- Automatic sensor set-up for ALS and ADS
- Consistent look and feel for multi-system owners
- Concise summary information



Peripheral solutions
FPES, FCMS, OC52 and PAV80

OC52

- larger display reduces operator fatigue
- Touch-screen interface with optional keyboard (for 3rd-party sensors)

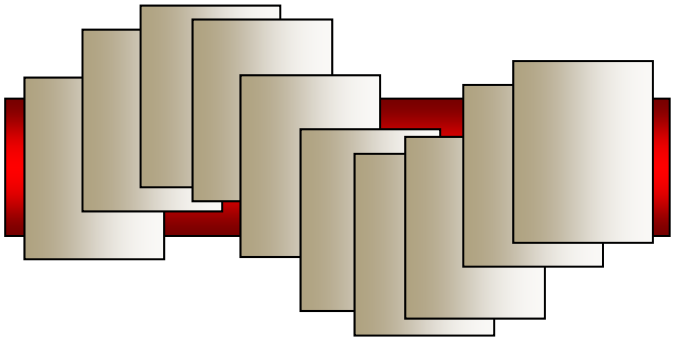
PAV80 is high-performance stabilized platform for ADS80, RCD100, ALS, ALS + RCD105, 3rd-party sensors

- Wider weight/balance tolerances
- Higher stabilization accuracy

Arguments for stabilized LIDAR (1)
does LIDAR need it?

ALS is adequately roll stabilized, but…

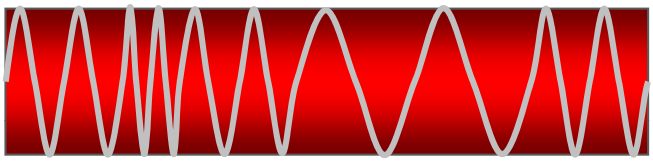
- any auxiliary sensors are not
- they must be tied to the ALS for accurate IMU information



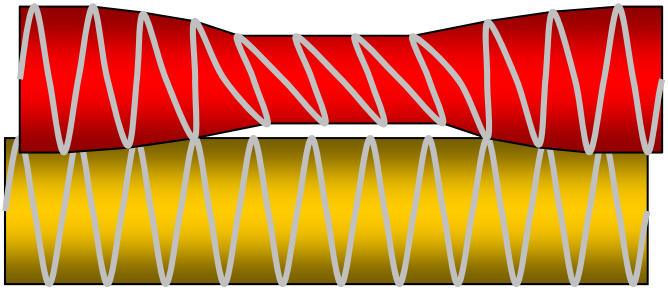
Arguments for stabilized LIDAR (2)
does LIDAR need it?

ALS point density, swath more consistent when stabilized

- Along track spacing not affected by pitch down (compression) and pitch up (stretching)



- Cross-winds cause yaw, which reduces swath width, making gaps between flight lines more likely



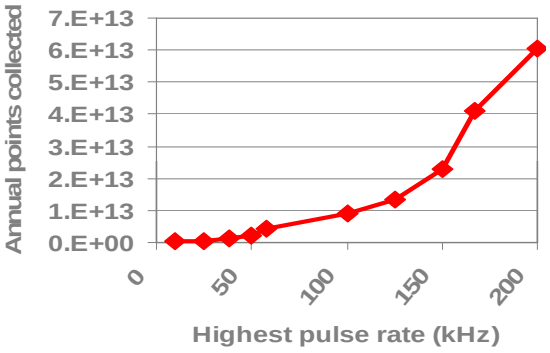
Conclusions
why stop now?

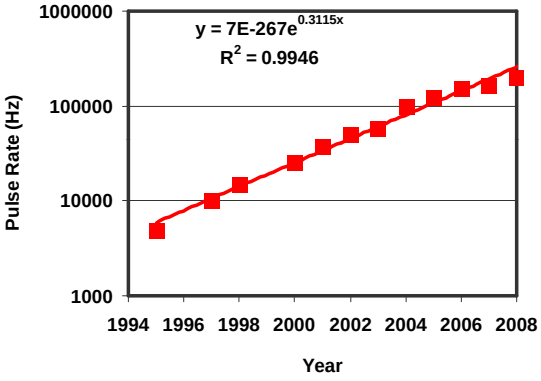
"Tools" (both hardware and software) are stable

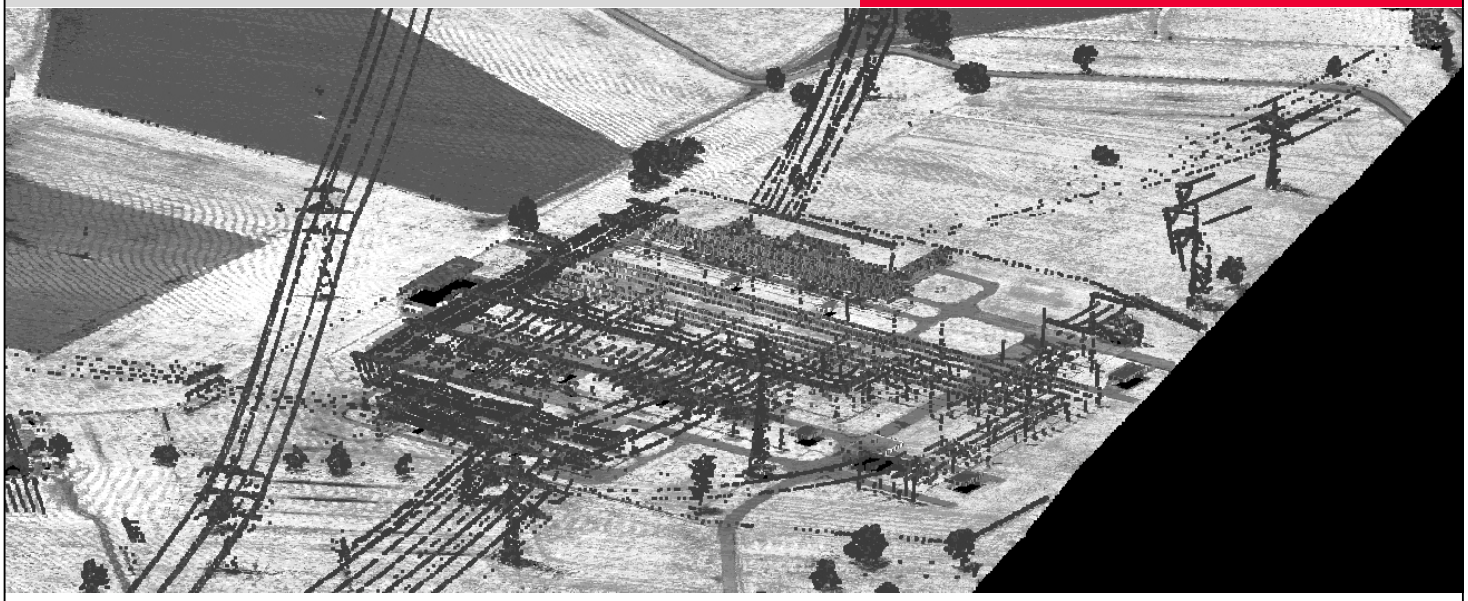
New applications will emerge, along with more frequent updates, driven by constantly falling "cost per data point"

Development will still continue

- Airborne imaging ➔ software focus
- Airborne LIDAR ➔ hardware still leading software







Thank you

please visit us in Keplerstrasse 11, floor 6

ron.roth@leicaus.com

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