Construction
Use of Lidar
Digital Twin
& BIM

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April 2019
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Key Elements for Success

• High Definition Survey and geolocation

• NexGen BIM Modeling

• Digital Collaboration and Mobility

• The internet of things and advanced analytics
Digital Twin and BIM Example

Navisworks as the Hub

*Easy interactive design review
*Design and model in one place
*Project collaboration
*Time and cost management
*Realtime project visualisation
The Plan

- Major International Airport Expansion
The Site

- 36 Acres
- Weekly Flights in under 10 minutes
- Data processed in the Cloud in 4 hours
- Safety and Productivity gains
Lidar and imagery are necessary components
Lidar with RGB faster and more accurate than other paths
Immediate validation on earth works avoiding costly rework
Clear communication from Super
Schedule Improvements
Safety Gains
The Increasing Use of Drones and Lidar

- Easy and user-friendly integration
- Successful integration in the marketplace
- Control scanner via UAV remote controller
- No user action during operation → RXPCutter
Safety Risk Assessment

Follow established Safety Protocols

EASA A-NPA 2015-10

FAA NPRM RIN 2120-AJ60
## Construction Decision Matrix on Drones

### Decision-Making Process for the Use of UAV Technology in Construction

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Decision</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
<td><strong>Service</strong></td>
<td><strong>Make or Buy</strong></td>
</tr>
<tr>
<td>mission according to local legislation</td>
<td>generally permitted</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td><strong>UAV Operation</strong></td>
<td><strong>Point Cloud + Orthophoto</strong></td>
</tr>
<tr>
<td><strong>Mission</strong></td>
<td><strong>Output Result</strong></td>
<td><strong>Quality (GSD)</strong></td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td><strong>Photogrammetry</strong></td>
<td><strong>20mm/pixel</strong></td>
</tr>
<tr>
<td><strong>Processing Software</strong></td>
<td><strong>Code</strong></td>
<td><strong>Agisoft PhotoScan Pro</strong></td>
</tr>
<tr>
<td><strong>Mission Planning Software</strong></td>
<td><strong>AlphaFlight 2</strong></td>
<td><strong>Pix4D Mapper</strong></td>
</tr>
<tr>
<td><strong>Camera</strong></td>
<td><strong>Sony Alpha 6000</strong></td>
<td><strong>Canon 5D20</strong></td>
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<tr>
<td><strong>Data Storage</strong></td>
<td><strong>SD Card</strong></td>
<td><strong>Cloud</strong></td>
</tr>
<tr>
<td><strong>System Hardware</strong></td>
<td><strong>Alienware Area-51</strong></td>
<td><strong>Riegls, Ricoh</strong></td>
</tr>
</tbody>
</table>

### UAV Parameters

- **Quality (GSD):**
  - 20mm/pixel
  - 40mm/pixel
  - 60mm/pixel
  - 100mm/pixel

- **Frequency:**
  - Monthly
  - Once
  - Biweekly
  - Annually

- **Method:**
  - Photogrammetry
  - Lidar

- **Alternative Software:**
  - Pix4D Mapper
  - DroneDeploy
  - Autodesk ReCap360

- **Camera Models:**
  - Sony Alpha 6000
  - Canon 5D20

- **Data Storage:**
  - SD Card
  - Cloud
  - SSD

- **System Hardware:**
  - Alienware Area-51
  - Riegls, Ricoh

- **Mission Planning Software:**
  - Mission Planner
  - UgCS
RIEGL’s UAV Platforms

- **RiCOPTER (with RiCC) / BathyCopter (with RiCC)**
  - 8S batteries
  - < 55 lbs (25 kg) MTOM
  - 30 min. flight time @ 14 lbs (6.5 kg) payload

- **RiCOPTER-M (with RiCC)**
  - ...multi-purpose / multi-sensor platform
  - optional transponder integration (ADS-B)
  - **12S batteries (stronger / more powerful engines)**
  - 88 lbs (40 kg) MTOM
  - flight time:
    - 25 min. flight time @ 22 lbs (10 kg) payload
    - 20 min. flight time @ 33 lbs (15 kg) payload
UAV Payloads

- **VUX-SYS (VUX-1UAV / VUX-1LR)**
  - AP20 + Control Unit (CU)
  - APX-20 UAV

- **miniVUX-1UAV**
  - APX-15 UAV
  - APX-20 UAV

- **BDF-1 (profiler)**
  with APX-15 UAV integrated

- **miniVUX-1DL**
  - APX-15 UAV
  - APX-20 UAV
RIEGL VUX-240 – Key Facts

- **RIEGL VUX-240** is an online waveform processing LiDAR scanner
- up to **1.8 MHz** (1800 kHz) pulse repetition rate, enabling up to **1.5 million measurements per second** on the ground
- wide field of view of **75 degrees**
- excellent **multiple target detection** capability up to **15 targets** per laser shot
- high point densities: e.g. **1900 pts/m²** (typ. multirotor: @ 8m/s, 50m AGL), **625 pts/m²** (typ. multirotor: @ 8m/s, 150m AGL)
- data storage on SSD, **240 Gbyte**
- provides web-interface by WLAN (or LAN)
- weight: ≤ **3.8kg**
- **NEW** integrated camera control and time stamping for **up to 4 cameras**
- **NEW** mechanical and electrical interface for INS/GNSS integration APX-20 UAV INS/GNSS system
VUX- / miniVUX-series: Camera Options

- Oblique „wide“:
  2 x Sony A6000

- Oblique „narrow“:
  2 x Sony A6000

- Nadir:
  Sony A6000 or Sony 7R

- Thermal (Flir Tau 2):
  Sony A6000 or Sony 7R
RIEGL Multi-Sensor Integrations

• VUX-SYS with APX-20 UAV INS/GNSS
  – Flir Tau 2 thermal camera
  – Sony Alpha 7R

weight: 5.7 kg
Key Benefit Areas

• Design Management
• Scheduling
• Site and Materials Management
• Crew and Subcontractor Tracking
• Quality Control
• Contract Management
• Performance Management
• Document Management
Thank you for your kind attention!