The Challenges and Opportunities of UAS Imagery

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September 22nd, 2015
The Hype

2012

UAVs

As of July 2012

Plateau will be reached in:
- ○ less than 2 years
- • 2 to 5 years
- ● 5 to 10 years
- ▲ more than 10 years
- ❌ before plateau

Technology Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau of Productivity

Volumetric and Holographic Displays
3D Bioprinting
Quantum Computing
Human Augmentation

Expectations
Wireless Power
Hybrid Cloud Computing
HTML5
Gamification
Big Data
Crowdsourcing
Speech-to-Speech Translation
Silicon Anode Batteries
Natural-Language Question Answering
Internet of Things
Mobile Robots
Autonomous Vehicles
3D Scanners
Automatic Content Recognition

3D Printing
BYOD
Complex-Event Processing
Social Analytics
Private Cloud Computing
Application Stores
Augmented Reality
In-Memory Database Management Systems
Activity Streams
NFC Payment
Audio Mining/Speech Analytics
Cloud Computing
Machine-to-Machine Communication Services
Mesh Networks: Sensor
Gesture Control

Predictive Analytics
Speech Recognition
Consumer Telematics
Idea Management
Biometric Authentication Methods
Consumerization
Media Tablets
Mobile OTA Payment

Hosted Virtual Desktops
Virtual Worlds

Home Health Monitoring
Text Analytics

As of July 2012
The Hype

2013
The Hype

2015

[Diagram showing the hype cycle with various technologies and their expected lifecycles as of July 2015]
When Does UAS Make Sense?

Look for a “LOSIRR”

Local
Out of Reach
Small
I can collect
Resolution
Repeat
Google vs UAS Imagery

Google Earth Imagery

UAS Imagery from 70m AGL (Nadir)
Google vs UAS Imagery

Google Earth Imagery

UAS Imagery from 20m AGL (Nadir)
#1: Formalize Your Acquisition Plan

- Consistent altitude
- Nadir imagery
- Site/app specific flight plans
- Field adjustments
- Aerial + terrestrial
#1: Complete Detailed Acquisition Planning

- Consistent altitude
- Nadir vs oblique imagery
- Site/app specific flight plans
- Field adjustments
- Aerial + terrestrial

10-35 degree angle recommended
#1: Complete Detailed Acquisition Planning

- Consistent altitude
- Nadir vs oblique imagery
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Flight plan graphics courtesy of Pix4D
#1: Complete Detailed Acquisition Planning

- Consistent altitude
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- Adjust flight lines to prevailing winds
- Topographic adjustments (to maintain consistent altitude)
- Safety review – surprises, real time modifications
- Visual observer placement
#1: Complete Detailed Acquisition Planning

- Consistent altitude
- Nadir vs oblique imagery
- Site/app specific flight plans
- Field adjustments
- Aerial + terrestrial
#3: Workflow Analysis for 40 Acre Site

Imagery From Manned Aircraft vs UAS

- **Collection Process**
  - **Manned Aircraft** = good weather
  - **UAS** = Potential to fly under cloud cover

- **Collection Costs**
  - **Manned Aircraft** = Fixed costs but very quick. Handful of images.
  - **UAS** = Must travel to site. Several hours on site. 100s-1000s of images.

- **Compilation**
  - **Manned Aircraft** = Capturing breaklines, mass points, etc. for a DTM also includes collection of planimetrics
  - **UAS** = DSM and point cloud can be auto derived. 2D planimetrics must be heads up digitized from an orthoimage or 3D extraction from the point cloud
#3: Workflow Analysis for 40 Acre Site
Imagery From Manned Aircraft vs UAS
#3: Workflow Analysis for 40 acre site

Imagery From Manned Aircraft vs UAS

- **Bare Earth**
  - **Manned Aircraft** = operator can derive bare earth from stereo imagery
  - **UAS** = no software tools for deriving bare earth. Leverage the point cloud

- **Accuracies**
  - **Manned Aircraft** = 0.1’ vertical on hard surfaces
  - **UAS** = 1-3 times your GSD

### US National Accuracy Standards

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#4: Get Better At Data Management

- UAS will drive Big Data
- 200MB – 2GB/minute during collection
- One active UAS operator can easily generate 3TB/week in the field
- Derivative products can easily double your data holdings
#5: Understand Operational Workflows

- Geotagged imagery
- Benefits of RTK units
- To GCP or not to GCP? Validate!
#6: Complexities of Monitoring

- Near Infrared collect via UAS
- 15m AGL, <cm GSD
- Challenges in tracking over time
#6: Complexities of Monitoring
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- Image mosaics
- See trends over time
- NDVI computations
- New trends become clear
Continental Mapping is hiring!

Consider joining – Great resource for all this unmanned