A Practical Analysis: Integration of sUAS imagery with Terrestrial Mobile Mapping.

Presented by: Whitney Smelser

Special Thank you to James Murphy and Justin Theriault with Trimble Navigation
Getting the Complete Picture

Mobile Mapping Professionals have integrated different data sets collected from other methods such as sonar. It is only logical to utilize sUAS imagery in the same way.
INTEGRATING UAV DATA ACQUISITION WITH TERRESTRIAL 3D LASER SCANNING
ACCURACY COMPARISON

Sean Finn, F3 & Associates, Inc.
Eric Horbatiuk, F3 & Associates, Inc.

ABSTRACT

Typical UAV data collection for uses in civil, industrial, and commercial measurement solutions does not provide engineering grade georeferenced data without the implementation of additional technologies and techniques. With the use of traditional survey methods found in photogrammetry, such as flight panels, control traverses, ground based scanning, and redundant quality checks, the accuracy and precision of the data can be greatly increased. F3 & Associates, Inc. and VDOS Global provided topographic data in the form of a 3D point cloud. Comparisons of the elevation values were conducted using 3D modeling software to calculate planes in both of the datasets. The results indicated that the UAV data with the addition of traditional surveying and ground based 3D laser scanning techniques produced topographic information that had an elevation discrepancy between terrestrial 3D laser scanning data that averaged within engineering grade accuracy in areas with close proximity of a survey control point.
2015 Leica Geosystems High-Definition Survey Contest
Civil/Survey Category

PLAN
SCALE: 1"=100'

DRONE DATA / MS50 DATA / HDS P20 DATA

LEICA CYCLONE CLOUD TO CLOUD REGISTRATION

POINT CLOUD DATA
SCALE: NTS

LEICA CYCLONE 3D DATA COLLECTION WITH DRONE

NOTES:
1. 3D LIDAR Scan Performed by FJ Associates, Inc. on May 12-14th, 2015
2. Scanpoints shown in LIDAR Drunken Feet
3. Portion of Site Inaccessible due to Site Condition, drone flugs used to collect topographic data.

SURVEY

CONTROL TRAVERSE
NUMBER OF CONTROL POINTS: 41
2D USER SUMMER
NUMBER OF SCANNING STATIONS: 1
3D USER SUMMER
NUMBER OF DRONE FLIGHTS: 3
IMAGES TAKEN 6,731

CLOUD REGISTRATION
METHOD: MARS ACQUISITION
TOTAL NUMBER OF POINTS: 701,024,271

SCALE
- 1" = 100'
- 1" = 100 Feet

DESIGN BY: D.A.
DRAWN BY: D.M.
SCALE 1"=100'
SHEET 3 OF 3
JOB NUMBER: 00119

FOR DETAIL 'D' REMOVE 3D PRINT

TruSection™

Courtesy Leica Geosystems
What is the need?

Gaps in Data Outside the Corridor can be Filled in Effectively.
Time of Day Shading Reduced

- Mission Planning For Traditional Manned Aircraft Could Produce Different Time of Day Results.
- Causes more editing back in the office.
- Editing effort reduced by deploying the sUAS at the same time when driving the site.
- Less Mission Planning Constraints with sUAS.
Typical Mobile Mapping Point Clouds
More are Coming On Board

Survey
Utilities
Engineering
Mapping
Cost Analysis
Manned Aircraft vs. sUAS

• One Day area of Manned Aircraft Coverage: +/-30,000 acres
• Dispatch Management
• Cost to fly $200 per hour or more
• Current regulations Allowing Flight over general population
• Air Worthy Certificate Required.

• One Day of sUAS: 1,000 acres or less.
• No Dispatch Management
• Cost to fly $100 per hour or less
• Currently Restricted Flights over General Population.
• No Air Worthy Certificate Required.
# Precision Analysis

## Mobile Mapping
- General Corridor width 200m
- Within 50m of Lidar Head 1cm or better Point Cloud Error
- Camera Better than 1 cm Resolution.
- Real Time Kinematic GNSS
- 100 meter validation

## sUAS
- Normal Flight at 75-150m (400m Max) Flight Height
- 2-3cm total Displacement Point Cloud Error.
- Camera 1 cm Resolution.
- PPK / RTK GNSS processing
- 5 Ground Control Points for each 2 square Kilometers.
Point Cloud and Imagery Software

Using Trimble software:
• sUAS - Trimble Business Center (20K)
• Mobile Mapping – Trident (20K)
Supplemental Surface Comparison QA/QC – Trimble Realworks (20K)

60K Software Investment
Point Cloud and Imagery Workflow

• UX5 data automated processing with TBC
  Approximately 8-10 hours
  (16gig RAM w/ dedicated graphics card)

Point Cloud and Ortho Imagery

• Trident Grid Factory
  • Output LAS 1.2 format
  • Extract features
    Asset Management
    Classified Point Cloud

• Import MM LAS file into TBC to Blend Point Cloud
• TRW - QA/QC
• Then bring back into Trident to Prepare Deliverables
Thank you!

Whitney Smelser
wasan004@yahoo.com
805.208.0828