WOOLPERT

TN 27 County QL2 Lidar (Cumberland Plateau)

USGS/ Rolla, MO

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Section 1: Overview

Project Name: TN 27 COUNTY QL2 LIDAR (CUMBERLAND PLATEAU)

Project: # 75556

This report contains a comprehensive outline of the TN 27 County QL2 Lidar (Cumberland Plateau) Lidar Processing task order for the United States Geological Survey (USGS). This task is issued under USGS Contract No. G10PC00057, Task Order No. G15PD00394. This task order requires lidar data to be acquired over 27 counties: Anderson, Bledsoe, Bradley, Cannon, Campbell, Claiborne, Clay, Coffee, Cumberland, DeKalb, Fentress, Franklin, Grundy, Hamilton, Jackson, Marion, McMinn, Meigs, Morgan, Overton, Pickett, Polk, Putnam, Rhea, Roane, Warren and White Counties (approximately 11,912 square miles). The lidar was collected and processed to meet a maximum Nominal Post Spacing (NPS) of 0.7 meter. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath.

The data was collected using :

- Two Leica ALS80 HP 1000 kHz Multiple Pulses in Air (MPiA) lidar systems on board Woolpert aircraft. The ALS80 sensor collects up to four returns per pulse, as well as intensity data, for the first three returns. If a fourth return was captured, the system does not record an associated intensity value. The aerial lidar was collected at the following sensor specifications

Table 1.1: ALS80 Specifications - Woolpert	
Post Spacing	2.3 ft / 0.7 m
AGL (Above Ground Level) average flying height	6,500 ft / 1,981 m
Average Ground Speed:	150 knots / 173 mph
Field of View (full)	40 degrees
Pulse Rate	272 kHz
Scan Rate	50 Hz
Side Lap	25%

- Two Leica ALS70 500 kHz Multiple Pulses in Air (MPiA) lidar sensors owned and operated by Quantum Spatial. The sensor was mounted in Quantum Spatial aircraft. The aerial lidar was collected at the following sensor specifications:

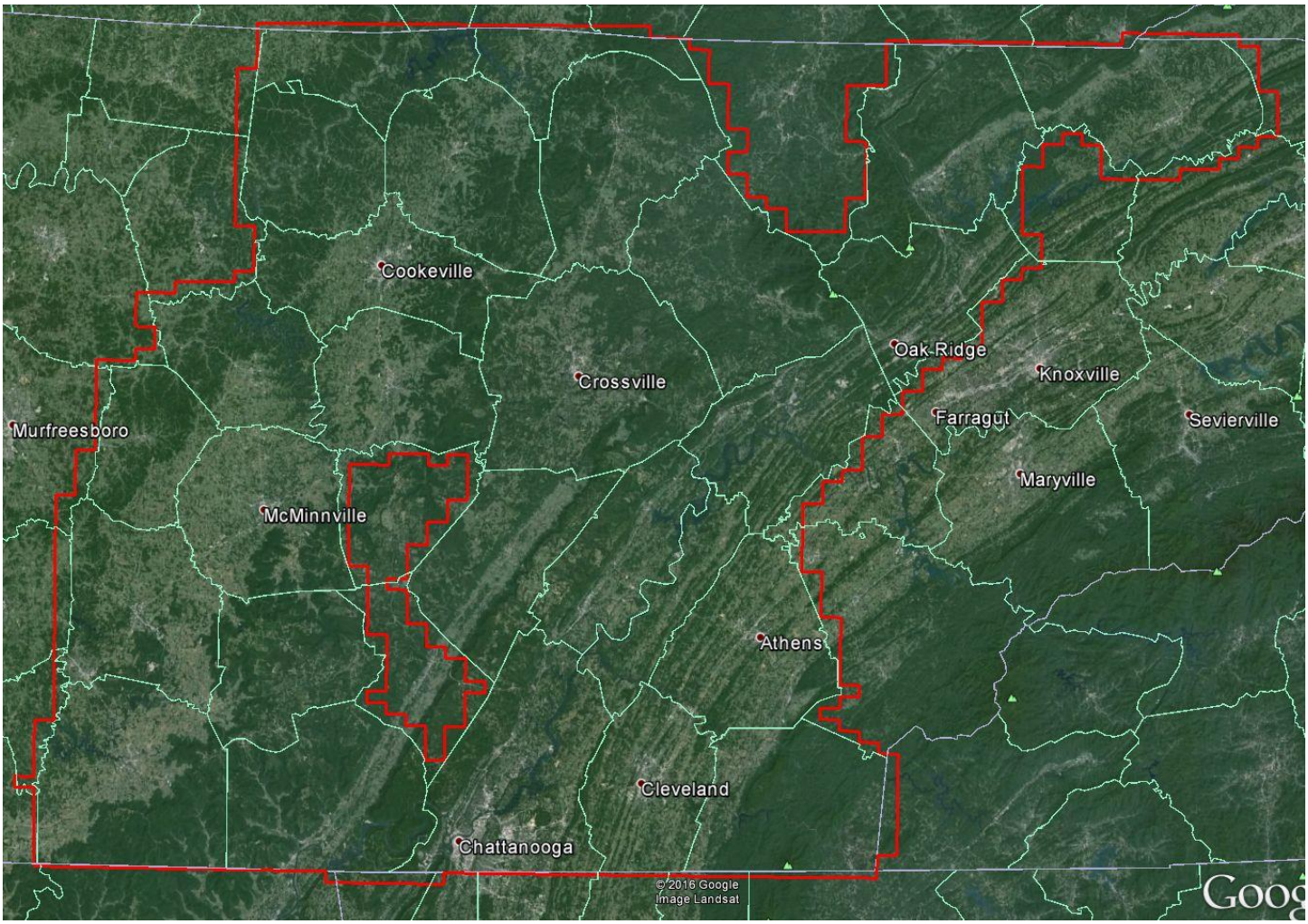
Table 1.2: ALS70 Specifications Quantum Spatial	
Post Spacing	2.3 ft / 0.7 m
AGL (Above Ground Level) average flying height	6,500 ft / 1,981 m
Average Ground Speed:	150 knots / 173 mph
Field of View (full)	40 degrees
Pulse Rate	277 kHz
Scan Rate	53 Hz
Side Lap	25%

- One Leica ALS70 500 kHz Multiple Pulses in Air (MPiA) lidar sensor owned and operated by **PAR**. The sensor was mounted in PAR Spatial aircraft. The aerial lidar was collected at the following sensor specifications:

Table 1.3: ALS70 Specifications PAR	
Post Spacing	2.3 ft / 0.7 m
AGL (Above Ground Level) average flying height	5899 ft / 1,798 m
Average Ground Speed:	115 knots / 132 mph
Field of View (full)	40 degrees
Pulse Rate	136 kHz
Scan Rate	46 Hz
Side Lap	25%

The lidar data was processed and projected in Tennessee State Plane Zone NAD83(2011) US Survey Feet. The vertical datum used for the task order was referenced to NAVD 1988, GEOID12B, US Survey Feet.

Figure 1.1: Lidar Task Order AOI



Section 3: Lidar Data Processing

Applications and Work Flow Overview

1. Resolved kinematic corrections for three subsystems: inertial measurement unit (IMU), sensor orientation information and airborne GPS data. Developed a blending post-processed aircraft position with attitude data using Kalman filtering technology or the smoothed best estimate trajectory (SBET).
   Software: POSPac Software v. 5.3, IPAS Pro v.1.35., Novatel Inertial Explorer v8.60.6129
2. Calculated laser point position by associating the SBET position to each laser point return time, scan angle, intensity, etc. Created raw laser point cloud data for the entire survey in LAS format. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift.
   Software: ALS Post Processing Software v.2.75 build #25, Proprietary Software, TerraMatch v. 16.01., Add Leica Cloud Pro v1.2.3
3. Imported processed LAS point cloud data into the task order tiles. Resulting data were classified as ground and non-ground points with additional filters created to meet the task order classification specifications. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. Based on the statistical analysis, the lidar data was then adjusted to reduce the vertical bias when compared to the survey ground control.
   Software: TerraScan v.16.01.
4. The LAS files were evaluated through a series of manual QA/QC steps to eliminate remaining artifacts from the ground class.
   Software: TerraScan v.16.01.

Global Navigation Satellite System (GNSS) – Inertial Measurement Unit (IMU) Trajectory Processing

Equipment

Flight navigation during the lidar data acquisition mission is performed using IGI CCNS (Computer Controlled Navigation System). The pilots are skilled at maintaining their planned trajectory, while holding the aircraft steady and level. If atmospheric conditions are such that the trajectory, ground speed, roll, pitch and/or heading cannot be properly maintained, the mission is aborted until suitable conditions occur.

A base-station unit was mobilized for each acquisition mission where a CORS station was not utilized. Each base-station setup consisted of one Trimble 4000 – 5000 series dual frequency receiver, one Trimble Compact L1/L2 dual frequency antenna, one 2-meter fixed-height tripod, and essential battery power and cabling. Ground planes were used on the base-station antennas. Data was collected at 1 or 2 Hz.

The GNSS base station operated during the Lidar acquisition missions is listed below:

Table 3.1: Base Station

Station (Name)	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height (L1 Phase center) (Meters)
3A2 Airport	**36°24'38.18504"**	**83°33'16.65420"**	**328.261**
KCSV Airport	**35°57'11.51797"**	**85°04'58.11586"**	**540.552**
KMMI Airport	**35°23'50.38275"**	**84°33'39.65374"**	**219.601**
KSRB Airport	**36°03'25.84401"**	**85°31'41.63673"**	**282.057**
KYDH CORS	**36°38'18.83236"**	**85°17'53.06167"**	**259.17**
NCRB CORS	**35°19'15.69238"**	**83°47'48.68949"**	**606.725**
NGS PID FB3472	**35°57'48.37916"**	**83°52'23.47564"**	**221.499**
NGS PID GB2678	**36°20'06.48343"**	**84°09'43.97422"**	**324.27**
P778 CORS	**35°14'25.23825"**	**85°48'53.53346"**	**552.338**
TN23 CORS	**35°55'10.68490"**	**84°59'57.56518"**	**527.522**
TN24 CORS	**36°08'03.69715"**	**85°29'57.81747"**	**309.655**
TN26 CORS	**35°26'35.11875"**	**84°37'48.33555"**	**258.117**
TN29 CORS	**35°14'46.27419"**	**84°34'06.13537"**	**199.557**

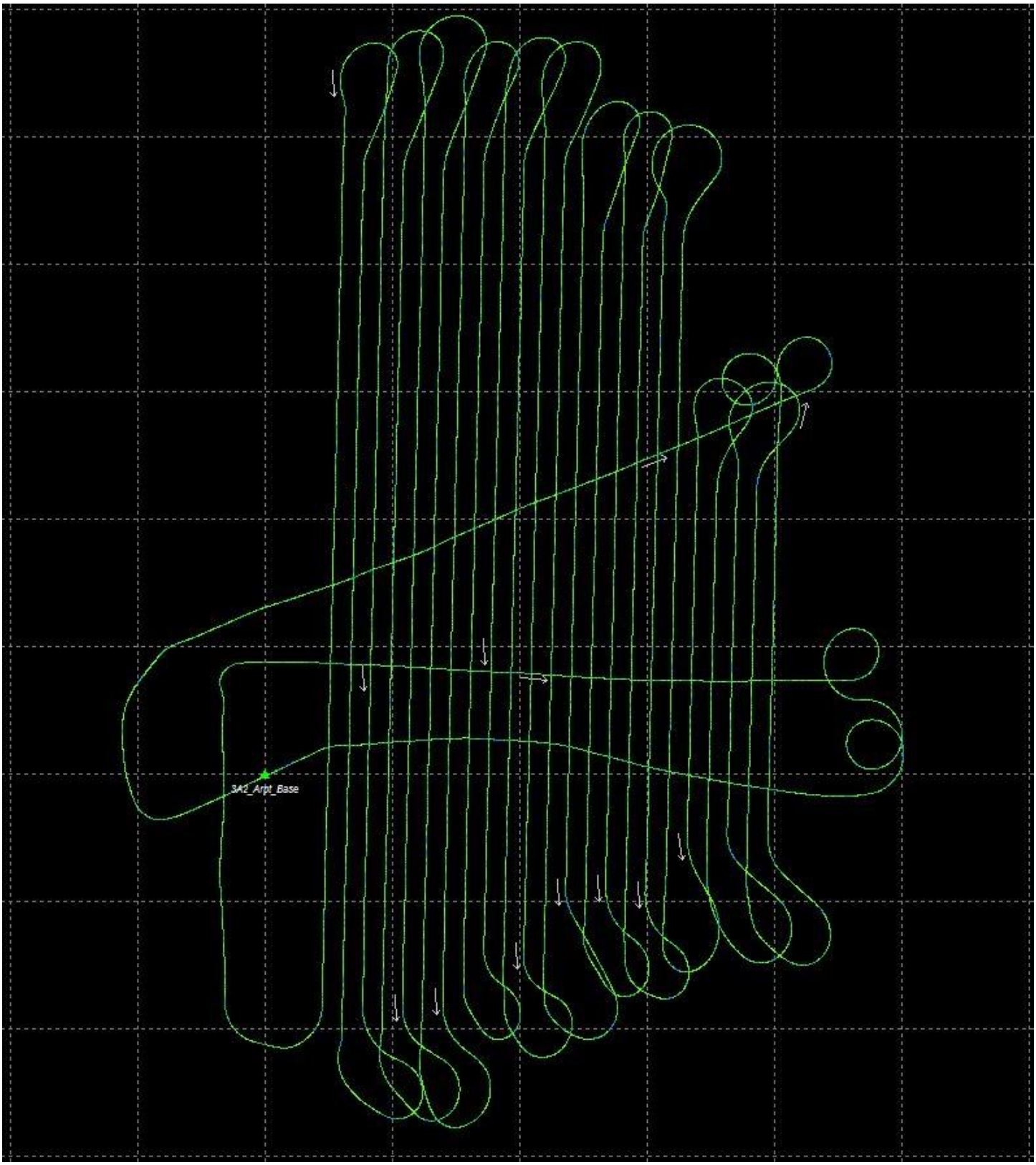
Data Processing

All airborne GNSS and IMU data was post-processed and quality controlled using Applanix MMS software. GNSS data was processed at a 1 and 2 Hz data capture rate and the IMU data was processed at 200 Hz.

Trajectory Quality

The GNSS Trajectory, along with high quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the combined separation, the estimated positional accuracy, and the Positional Dilution of Precision (PDOP).

Figure 3.1: Trajectory, Day33715_PAR_A

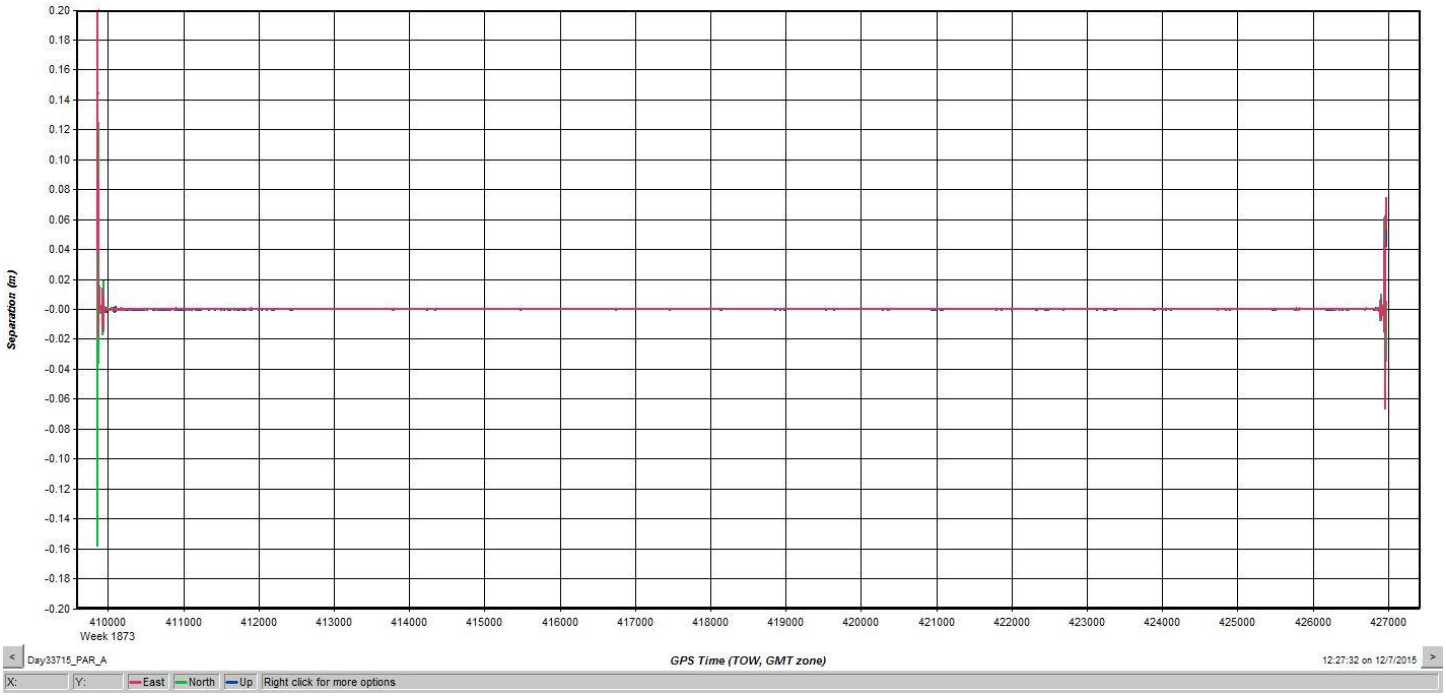


Combination Separation

The Combined Separation is a measure of the difference between the forward run and the backward run solution of the trajectory. The Kalman filter is processed in both directions to remove the combined directional anomalies. In general, when these two solutions match closely, an optimally accurate reliable solution is achieved.

Woolpert's goal is to maintain a Combined Separation Difference of less than ten (10) centimeters. In most cases we achieve results below this threshold.

Figure 3.2: Combined Separation, Day33715_PAR_A

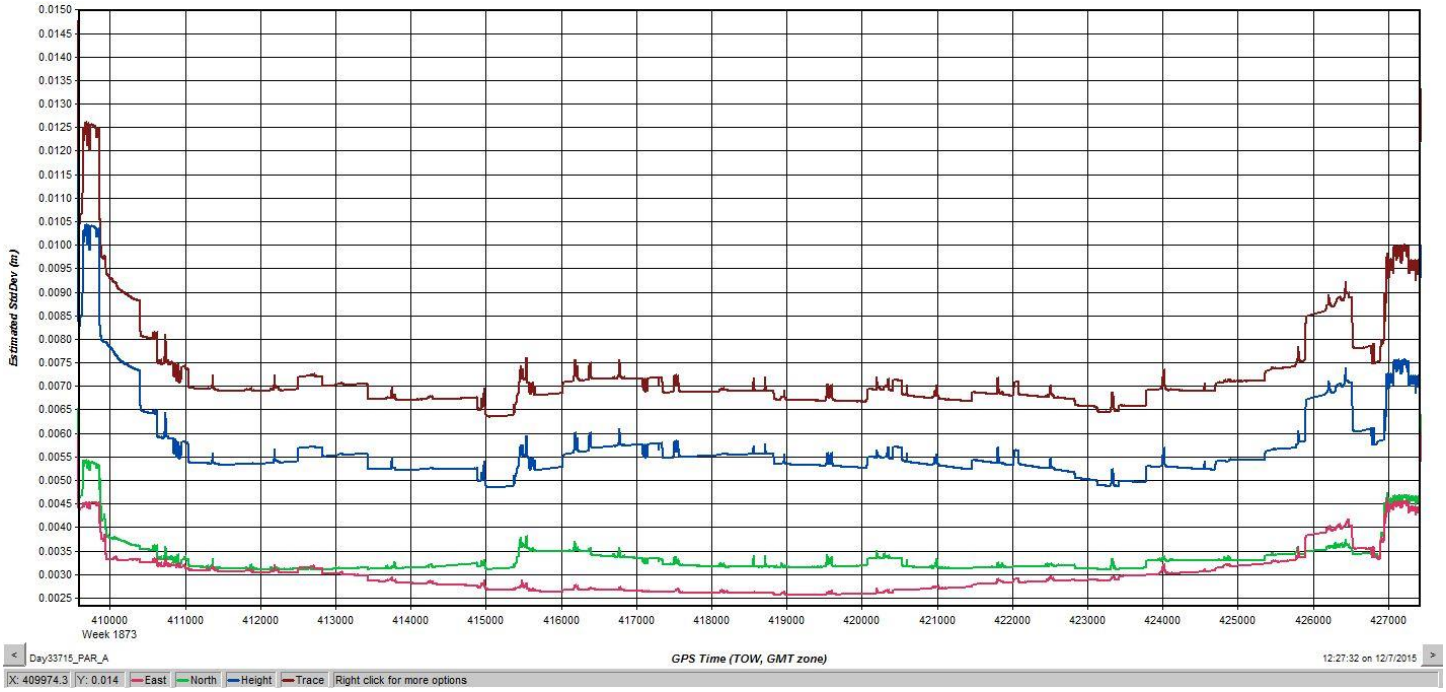


Estimated Positional Accuracy

The Estimated Positional Accuracy plots the standard deviations of the east, north, and vertical directions along a time scale of the trajectory. It illustrates loss of satellite lock issues, as well as issues arising from long baselines, noise, and/or other atmospheric interference.

Woolpert's goal is to maintain an Estimated Positional Accuracy of less than ten (10) centimeters, often achieving results well below this threshold.

Figure 3.3: Estimated Positional Accuracy, Day33715_PAR_A

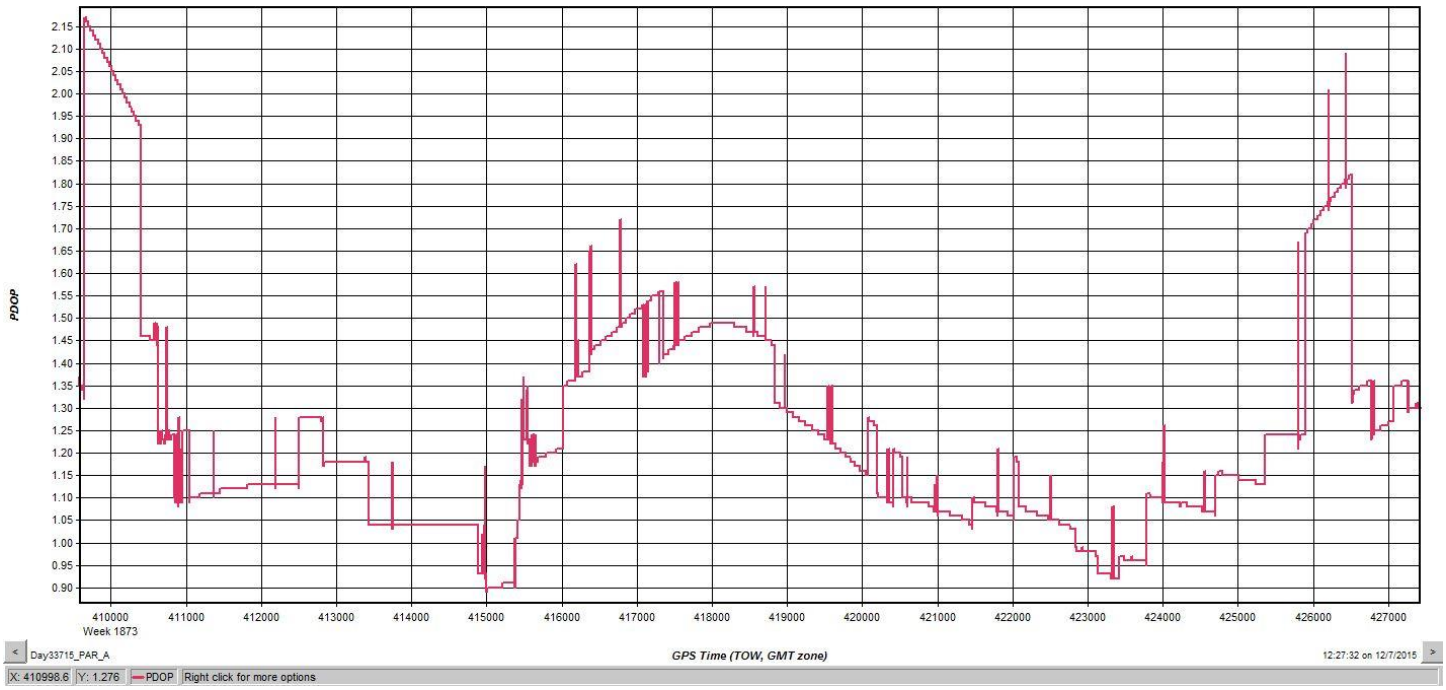


PDOP

The PDOP measures the precision of the GPS solution in regards to the geometry of the satellites acquired and used for the solution.

Woolpert's goal is to maintain an average PDOP value below 3.0. Brief periods of PDOP over 3.0 are acceptable due to the calibration and control process if other metrics are within specification.

Figure 3.4: PDOP, Day33715_PAR_A



Lidar Data Processing

When the sensor calibration, data acquisition, and GPS processing phases were complete, the formal data reduction processes by Woolpert lidar specialists included:

- Processed individual flight lines to derive a raw "Point Cloud" LAS file. Matched overlapping flight lines, generated statistics for evaluation comparisons, and made the necessary adjustments to remove any residual systematic error.
- Calibrated LAS files were imported into the task order tiles and initially filtered to create a ground and non-ground class. Then additional classes were filtered as necessary to meet client specified classes.
- Once all project data was imported and classified, survey ground control data was imported and calculated for an accuracy assessment. As a QC measure, Woolpert has developed a routine to generate accuracy statistical reports by comparisons against the TIN and the DEM using surveyed ground control of higher accuracy. The lidar is adjusted accordingly to meet or exceed the vertical accuracy requirements.
- The lidar tiles were reviewed using a series of proprietary QA/QC procedures to ensure it fulfills the task order requirements. A portion of this requires a manual step to ensure anomalies have been removed from the ground class.
- The lidar LAS files are classified into the Default (Class 1), Bare-earth (Class 2), Buildings (Class 6), Low Noise (Class 7), Water (Class 9), Ignored Ground (Class 10), Bridge Decks (Class 17) and High Noise (Class 18) classifications.
- FGDC Compliant metadata was developed for the task order in .xml format per product.
- The horizontal datum used for the task order was referenced to Tennessee State Plane Zone NAD83(2011) US Survey Feet. The vertical datum used for the task order was referenced to NAVD 1988, US Survey Feet, GEOID12B.

Section 2: Acquisition

The lidar data was acquired with a Leica ALS80HP 1000 kHz Multiple Pulses in Air (MPiA) Lidar Sensor System. The ALS80 HP lidar system, developed by Leica Geosystems of Heerbrugg, Switzerland, includes the simultaneous first, intermediate and last pulse data capture module, the extended altitude range module, and the target signal intensity capture module.

The ALS80HP 1000 kHz Multiple Pulses in Air (MPiA) Lidar System has the following specifications:

Table 2.1: ALS80 HP Lidar System Specifications	
Operating Altitude	100 – 7,620 meters
Scan Angle	0 to 72° (variable)
Swath Width	0 to 1.5 X altitude (variable)
Scan Frequency	0 – 200 Hz (variable based on scan angle)
Maximum Pulse Rate	1000 kHz (Effective)
Range Resolution	Better than 1 cm
Elevation Accuracy	6 - 19 cm single shot (one standard deviation)
Horizontal Accuracy	5 – 43 cm (one standard deviation)
Number of Returns per Pulse	Unlimited
Number of Intensities	3 (first, second, third)
Intensity Digitization	8 bit intensity + 8 bit AGC (Automatic Gain Control) level
MPiA (Multiple Pulses in Air)	8 bits @ 1nsec interval @ 50kHz
Laser Beam Divergence	0.22 mrad @ $1/e^2$ (~0.15 mrad @ 1/e)
Laser Classification	Class IV laser product (FDA CFR 21)
Eye Safe Range	400m single shot depending on laser repetition rate
Roll Stabilization	Automatic adaptive, range = 75 degrees minus current FOV
Power Requirements	28 VDC @ 25A
Operating Temperature	0-40°C
Humidity	0-95% non-condensing
Supported GNSS Receivers	Ashtech Z12, Trimble 7400, Novatel Millenium

The lidar data was acquired with a Leica ALS70 500 kHz Multiple Pulses in Air (MPiA) Lidar Sensor System. The ALS70 lidar system, developed by Leica Geosystems of Heerbrugg, Switzerland, includes the simultaneous first, intermediate and last pulse data capture module, the extended altitude range module, and the target signal intensity capture module.

The ALS70 500 kHz Multiple Pulses in Air (MPiA) Lidar System has the following specifications:

Table 2.1: ALS70 Lidar System Specifications	
Operating Altitude	200 – 3,500 meters
Scan Angle	0 to 75° (variable)
Swath Width	0 to 1.5 X altitude (variable)
Scan Frequency	0 – 200 Hz (variable based on scan angle)
Maximum Pulse Rate	500 kHz (Effective)
Range Resolution	Better than 1 cm
Elevation Accuracy	7 - 16 cm single shot (one standard deviation)
Horizontal Accuracy	5 – 38 cm (one standard deviation)
Number of Returns per Pulse	7 (infinite)
Number of Intensities	3 (first, second, third)
Intensity Digitization	8 bit intensity + 8 bit AGC (Automatic Gain Control) level
MPiA (Multiple Pulses in Air)	8 bits @ 1nsec interval @ 50kHz
Laser Beam Divergence	0.22 mrad @ $1/e^2$ (~0.15 mrad @ 1/e)
Laser Classification	Class IV laser product (FDA CFR 21)
Eye Safe Range	400m single shot depending on laser repetition rate
Roll Stabilization	Automatic adaptive, range = 75 degrees minus current FOV
Power Requirements	28 VDC @ 25A
Operating Temperature	0-40°C
Humidity	0-95% non-condensing
Supported GNSS Receivers	Ashtech Z12, Trimble 7400, Novatel Millenium

Prior to mobilizing to the project site, flight crews coordinated with the necessary Air Traffic Control personnel to ensure airspace access.

Woolpert survey crews were onsite, operating a Global Navigation Satellite System (GNSS) Base Station for the airborne GPS support. CORS stations were also used in support of acquisition.

The lidar data was collected in seventy nine separate (79) missions, flown as close together as the weather permitted, to ensure consistent ground conditions across the project area.

An initial quality control process was performed immediately on the lidar data to review the data coverage, airborne GPS data, and trajectory solution. Any gaps found in the lidar data were relayed to the flight crew, and the area was re-flown.

Figure 2.1: Lidar Flight Layout, TN 27 County QL2 Lidar (Cumberland Plateau)

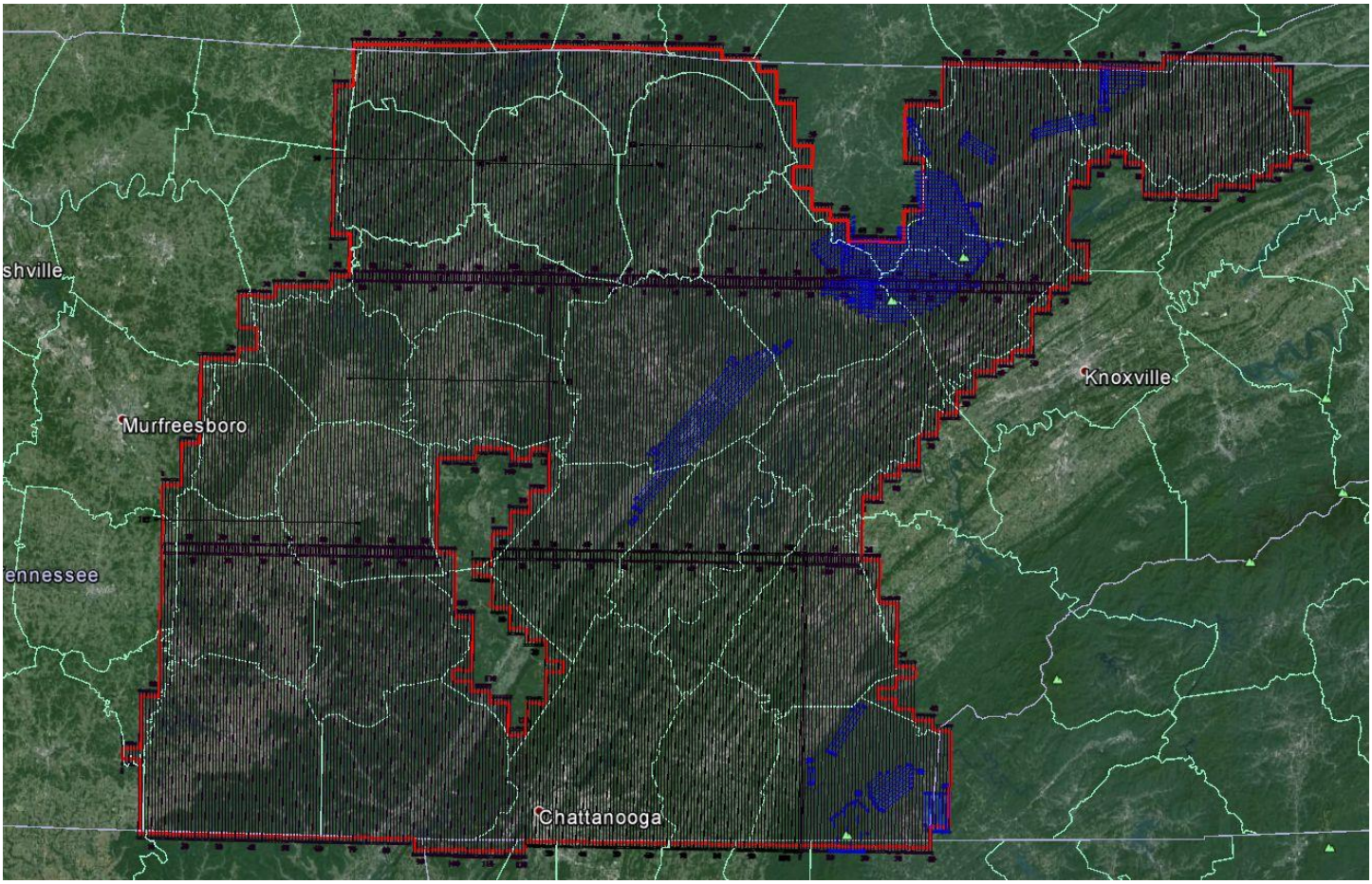


Table 2.2: Airborne Lidar Acquisition Flight Summary

Date of Mission	Lines Flown	Mission Time (UTC) Wheels Up/ Wheels Down
January 2, 2016- SH8191	1-11,	15:53 - 19:05
January 3, 2016- SH8191	69, 86, 10-110	15:58 - 17:10
January 5, 2016 SH8191	63, 69-70, 77-76, 80	22:43 - 0:50
December 3, 2015 - SH7169_A	A38-A60	17:46 - 22:42
December 3, 2015 - SH7169_B	A34-A37	23:26 - 0:52
December 3, 2015 - SH8194	82-89	17:23 - 21:24
December 4, 2015 - SH8191	10-21,	14:31 - 18:58
December 4, 2015 - SH7169_A	A01-A11	2:20 -5:25
December 4, 2015 - SH7169_B	A11-A17	5:56 - 8:27
December 4, 2015 - SH7169_C	A22-A33, UL001,UL002, A61-A67	16:13 - 20:29
December 4, 2015 - SH7169_D	A18-A21,	21:18 - 22:53
December 4, 2015 - SH8194_A	7-8, 43-55	14:40 - 19:15
December 4, 2015 - SH8194_B	76-81	22:59 - 0:55
December 5, 2015 - SH8191	42398.00	15:51 - 19:23
December 5, 2015 - SH8194_A	64 - 75	16:08 - 19:30
December 5, 2015 - SH8194_B	56-64	21:58 - 0:36
December 5, 2015 - SH7169_A	A17-A32, UL001-UL002	4:41 - 8:32
December 5, 2015 - SH7169_B	A70-A82, A125-A129, UL001-UL002	16:10 - 21:18
December 5, 2015 - SH7169_C	A63-A69	21:48 - 0:47
December 6, 2015 - SH7169	A60-A62	16:02 - 17:46
December 6, 2015 - SH7169_	A33-A45	1:49 - 6:50
December 6, 2015 - SH8194	37-43	23:04 - 1:15
December6, 2015 - SH8191	30-41	22:47 - 2:16
December 8, 2015 - SH8191_A & B	1-5, 42-63	15:27 - 19:53
December 8, 2015 - SH8194_A	25-36	15:39 - 19:50
December 8, 2015 - SH8194_B	9-24, 36-37	21:22 - 2:32
December 8, 2015 - SH7169	A46-A59	17:49 - 22:58
December 9, 2015 - SH7169	89-108, 121-124, UL001-UL002	23:42 - 3:21
December 12 , 2015 - SH7169	A11-A17	21:44, 23:57
December 13, 2015 - SH7169_A	109-120	18:50-22:19

December 13, 2015 - SH7169_B	A15-A25	23:48 - 4:40
December 14, 2015 - SH8191	102-111	17:18 - 20:35
December 15, 2015 - SH7169_A	A27-A55	14:46 - 19:48
December 15, 2015 - SH7169_B	A01-A14	21:30 - 1:18
December 15, 2015 - SH8170	91-110	14:45 - 21:37
December 15, 2015 - SH8191	63-70, 76-101	15:40 - 19:43
December 15, 2015 - SH8194_A	6-8, 15, 38-40, 90-91; 45-50	15:27-20:10
December 15, 2015 - SH8194_B	35-44	21:38-0:38
December 16, 2015 - SH7169	A56-A65	1:52 - 4:07
December 16, 2015 - SH8170_	69-90, 113-127	14:59 - 22:14
December 16, 2015 - SH8191_	64-75	15:48 - 20:08
December 16, 2015 - SH8194	21-34	15:30 - 20:12
December 16, 2015 - SH8191	51-63, 113	23:53, 4:30
December 17, 2015 - SH8194	1-20, 22	15:30 - 4:04
December 19, 2015 - SH8170	68-86, 91, 101, 110	14:36 - 21:42
December 19, 2015 - SH8191_	38-64	14:38 - 19:27
December 19, 2015 - SH8194_A	2, 112; 25-37	14:55 - 19:55
December 19, 2015 - SH8194_B	1-24, 80, 111	21:50 - 2:30
December 20, 2015 - SH8191	11-29,	18:03 - 22:00
December 20, 2015 - SH8194	46-71	0.75
December 20, 2015 - SH8194_A	30-40	0:30 - 3:00
December 20, 2015 - SH8194_B	41-45, 72-81	18:05 - 22:05
December 8, 2015_SN7178	127-136	18:11 – 22:46
December 15, 2015_SN7178-A	98-107	13:44 – 18:03
December 15, 2015_SN7178-B	108-113	19:03 – 22:00
December 16, 2015_SN7161	63.00	17:29 – 18:47
December 16, 2015_SN7178	301-302	17:33 – 19:19
December 19, 2015_SN7161-A	63-74	13:07 – 17:49
December 19, 2015_SN7178-A	282-284, 301-303	18:56 – 21:58

December 19, 2015_SN7161-B	**75-77**	**19:22 – 21:13**
December 20, 2015_SN7178-A	**264-273**	**13:16 – 17:24**
December 20, 2015_SN7161-A	**160-165**	**14:24 – 17:00**
December 20, 2015_SN7161-B	**147-160**	**18:08 – 22:16**
December 20, 2015_SN7178-B	**274-280, 281**	**18:19 – 21:40**
January 2, 2016_SN7161-B	**175-183**	**17:34 – 20:57**
January 3, 2016_SN7178-A	**34-40**	**15:07 – 17:12**
January 3, 2016_SN7161-A	**144-146, 166-174**	**14:54 – 19:23**
January 3, 2016_SN7178-B	**26-33**	**18:37 – 20:59**
January 3, 2016_SN7161-B	**142-143**	**20:38 – 21:56**
January 5, 2016_SN7178	**16-25**	**14:56 – 17:49**
January 5, 2016_SN7178	**42658.00**	**19:31 – 21:15**
January 6, 2016_SN7178	**41-49**	**16:03 – 18:48**
January 6, 2016_SN7161	**137-141**	**16:33 – 18:55**
January 11, 2016_SN7161-A	**137-141**	**15:10 – 17:38**
January 11, 2016_SN7161-B	**50-56**	**19:27 – 22:21**
January 12, 2016_SN7161	**57-62**	**14:31 – 16:32**
January 12, 2016_SN7178	**42378.00**	**15:57 – 17:24**
January 13, 2016_SN7178	**61-62**	**15:03 – 16:27**

Section 4: Hydrologic Flattening

HYDROLOGIC FLATTENING OF LIDAR DEM DATA

TN 27 County QL2 Lidar (Cumberland Plateau) Lidar processing task order required the compilation of breaklines defining water bodies and rivers. The breaklines were used to perform the hydrologic flattening of water bodies, and gradient hydrologic flattening of double line streams and rivers. Lakes, reservoirs and ponds, at a minimum size of 2-acre or greater, were compiled as closed polygons. The closed water bodies were collected at a constant elevation. Rivers and streams, at a nominal minimum width of 30 meters (100 feet), were compiled in the direction of flow with both sides of the stream maintaining an equal gradient elevation.

LIDAR DATA REVIEW AND PROCESSING

Woolpert utilized the following steps to hydrologically flatten the water bodies and for gradient hydrologic flattening of the double line streams within the existing lidar data.

1. Woolpert used the newly acquired lidar data to manually draw the hydrologic features in a 2D environment using the lidar intensity and bare earth surface. Open Source imagery was used as reference when necessary.
2. Woolpert utilizes an integrated software approach to combine the lidar data and 2D breaklines. This process “drapes” the 2D breaklines onto the 3D lidar surface model to assign an elevation. A monotonic process is performed to ensure the streams are consistently flowing in a gradient manner. A secondary step within the program verifies an equally matching elevation of both stream edges. The breaklines that characterize the closed water bodies are draped onto the 3D lidar surface and assigned a constant elevation at or just below ground elevation.
3. The lakes, reservoirs and ponds, at a minimum size of 2-acre or greater and streams at a minimum size of 30 meters (100 feet) nominal width, were compiled to meet task order requirements. **Figure 4.1** illustrates an example of 30 meters (100 feet) nominal streams identified and defined with hydrologic breaklines. The breaklines defining rivers and streams, at a nominal minimum width of 30 meters (100 feet), were draped with both sides of the stream maintaining an equal gradient elevation.
4. All ground points were reclassified from inside the hydrologic feature polygons to water, class nine (9).
5. All ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class ten (10).
6. The lidar ground points and hydrologic feature breaklines were used to generate a new digital elevation model (DEM).

Figure 4.1: Example Hydrologic Breaklines

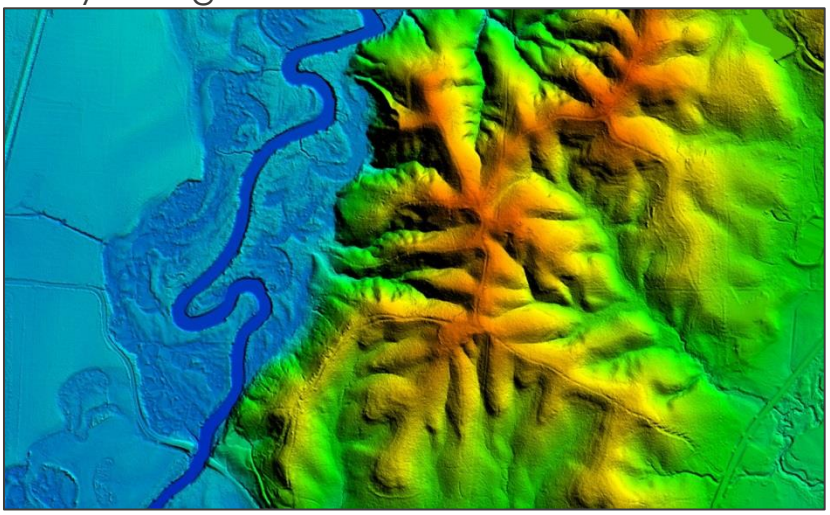


Figure 4.2 reflects a DEM generated from original lidar bare earth point data prior to the hydrologic flattening process. Note the "tinning" across the lake surface.

Figure 4.3 reflects a DEM generated from lidar with breaklines compiled to define the hydrologic features. This figure illustrates the results of adding the breaklines to hydrologically flatten the DEM data. Note the smooth appearance of the lake surface in the DEM.

Figure 4.2

Figure 4.3

Terrascan was used to add the hydrologic breakline vertices and export the lattice models. The hydrologically flattened DEM data was provided to USGS in ERDAS .IMG format.

The hydrologic breaklines compiled as part of the flattening process were provided to the USGS as an ESRI Shapefile The breaklines defining the water bodies greater than 2-acre and for the gradient flattening of all rivers and streams at a nominal minimum width of 30 meters (100 feet) were provided as a Polygon-Z and Polyline-Z shape file, respectively.

DATA QA/QC

Initial QA/QC for this task order was performed in Global Mapper v15, by reviewing the grids and hydrologic breakline features. Additionally, ESRI software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

Edits and corrections were addressed individually by tile. If a water body breakline needed to be adjusted to improve the flattening of the DEM data, the area was cross referenced by tile number, corrected accordingly, a new DEM file was regenerated and reviewed.

Section 5: ACCURACY ASSESSMENT

Accuracy Assessment

The vertical accuracy statistics were calculated by comparison of al lidar points to the ground surveyed QC points.

Table 5.1: Overall Vertical Accuracy Statistics		
Average error	-0.002	US Feet
Minimum error	-0.440	US Feet
Maximum error	+0.470	US Feet
Average magnitude	0.132	US Feet
Root mean square	0.165	US Feet
Standard deviation	0.165	US Feet

Table 5.2: RAW Swath Quality Check Point Analysis NVA

Point ID	Easting (US Feet)	Northing (US Feet)	TIN Elevation (US Feet)	Dz (US Feet)
2002	2032528.730	816315.440	759.020	-0.280
2003	2055453.920	824058.750	826.280	0.080
2004	1957492.430	635022.150	670.250	0.060
2005	2080864.480	821546.050	1083.250	-0.040
2006	2092995.050	826501.670	949.920	0.070
2007	2110730.580	811312.980	529.940	0.200
2008	2137635.840	828823.070	1046.620	-0.380
2009	1977919.310	609104.480	617.780	0.010
2010	2157525.990	774215.730	1433.920	-0.160
2011	2161256.260	821315.800	686.670	-0.300
2012	2167537.360	795720.190	1060.020	-0.010
2013	2165354.520	745769.820	956.440	0.310
2015	2034622.040	738215.840	514.380	0.080
2016	2047903.970	736655.300	593.680	-0.060
2017	2062910.950	770369.940	534.150	0.190
2018	2074396.410	744546.970	529.650	0.140
2019	2123471.570	753758.440	1122.760	-0.130
2020	2039289.850	775963.480	597.360	0.200
2021	2195462.040	768696.880	1007.010	-0.030
2022	2232384.180	812138.770	1013.500	0.070
2023	2274568.940	805449.280	883.060	-0.160

2024	2285786.840	763826.290	1738.830	-0.080
2025	2208133.020	748072.530	955.050	0.010
2026	2305471.140	744156.310	1609.720	0.020
2027	2342668.750	737574.540	1399.920	0.180
2028	2322362.830	810009.960	1635.060	0.210
2029	2351198.070	787627.100	1580.190	0.150
2030	2052418.310	674550.180	977.380	0.080
2031	2078667.780	669140.160	1070.250	0.140
2032	2112694.810	671522.020	1125.730	0.210
2033	2151390.810	706432.670	1074.970	0.160
2034	2186125.180	660101.430	1868.330	0.180
2035	2262227.370	698129.430	1788.170	0.190
2036	2107114.860	719262.760	980.280	0.360
2037	2212996.450	686651.600	1913.330	0.400
2038	2333272.510	682971.680	1593.630	-0.020
2039	2359886.160	703584.130	1456.170	0.050
2040	2394534.910	671379.900	1277.510	0.040
2041	2418772.530	674997.300	1404.000	0.020
2042	2435146.400	656308.190	1550.460	-0.210
2043	2457718.770	674931.750	1363.180	0.130
2044	2423410.530	636885.550	1316.020	-0.230
2045	2461588.990	642436.440	1069.600	0.000
2046	2464593.320	762945.180	1553.700	0.050
2047	2482223.390	787191.310	1190.990	0.040
2048	2517752.920	825792.400	967.110	-0.070
2049	2506680.230	813093.590	978.300	-0.080
2050	2491564.360	741069.060	1760.920	-0.070
2051	2513520.800	739395.840	1168.240	-0.160
2052	2535223.100	793699.470	1150.840	0.040
2053	2541822.970	812914.970	1056.820	-0.020
2054	2546505.170	806515.380	1468.640	-0.310
2055	2572719.740	816367.120	1117.880	0.240
2056	2552054.680	770121.240	1105.610	0.060
2057	2611426.970	794386.980	1230.820	-0.300
2058	2650541.130	812386.640	1220.390	0.040
2059	2679112.380	789571.710	1623.880	0.300
2060	2586134.310	780093.140	1117.330	0.060
2061	2611194.580	776185.470	1639.670	-0.390
2062	2648872.200	775637.240	1664.130	-0.160
2063	2636986.440	745104.870	1068.340	-0.050
2064	2668622.540	771650.660	1412.190	-0.010

2065	2687348.030	762071.870	1194.360	0.240
2066	2718709.770	775812.610	1063.870	0.050
2067	2679305.450	824378.150	1536.130	0.190
2068	2691662.650	827558.590	1535.950	0.070
2069	2706507.710	807153.130	1428.650	-0.100
2071	2536737.530	759982.930	1158.040	-0.070
2072	2556608.280	741156.330	1141.530	-0.100
2073	2548639.200	685485.400	963.700	0.040
2074	2533836.840	672776.370	874.580	-0.080
2077	2011365.690	595716.180	1124.560	0.200
2078	2056237.940	597932.490	996.700	-0.100
2079	2114489.140	614886.360	1031.700	0.220
2081	1943410.180	542920.130	703.300	-0.210
2082	2017492.700	498613.880	1025.490	-0.140
2083	2043070.330	495754.480	944.760	0.000
2084	1978336.590	516563.250	1107.240	-0.210
2085	1985155.220	552747.210	1170.150	0.050
2086	2003964.210	571585.840	1100.900	0.140
2087	2131800.700	579664.060	971.260	0.040
2088	2079962.670	523199.340	939.990	0.180
2089	2097382.120	590829.890	1000.400	-0.070
2090	2186356.980	595111.470	1971.950	-0.030
2091	2248027.790	593475.270	1778.860	0.100
2092	2286477.780	581716.320	1731.660	0.080
2093	2298001.000	611422.880	2005.580	-0.090
2094	2247695.570	652601.230	1843.870	0.050
2095	2386851.100	647673.810	1291.990	0.120
2096	2362976.740	565041.410	932.730	0.020
2097	2410581.320	598594.940	766.890	-0.110
2098	2338365.260	558334.210	1383.380	0.000
2099	2483361.480	616627.010	881.620	0.270
2100	2506544.270	636505.610	830.860	0.150
2101	2520748.910	649263.190	824.480	0.080
2103	2404941.600	558527.750	812.450	-0.180
2104	2455303.050	550119.940	1130.480	0.350
2106	2449981.570	587687.840	858.410	-0.210
2107	2192206.070	521109.360	1717.830	-0.170
2108	2241040.610	569519.860	1916.630	0.100
2109	2208471.800	461581.680	849.440	-0.190
2111	1897951.560	470199.950	884.970	-0.040
2112	1911282.600	451906.180	891.530	-0.120

2113	1941957.680	419677.460	988.550	0.180
2114	1967919.460	438183.750	1115.340	0.160
2115	2006244.110	469772.520	1057.570	-0.190
2116	2159925.010	478797.200	1784.810	0.140
2118	2306062.930	498413.270	774.650	0.030
2119	2283524.780	457393.610	795.220	-0.110
2120	2254478.650	527880.120	1868.020	-0.080
2121	2332315.970	475395.890	755.980	-0.080
2122	2366763.230	517236.590	790.810	0.080
2123	2398622.360	529254.010	870.160	-0.050
2124	2423440.060	510663.960	794.330	0.000
2125	1882864.470	293854.010	982.700	-0.130
2126	1889149.330	391675.430	1127.090	-0.270
2127	1913392.880	377343.280	1048.390	0.030
2128	1932772.570	309532.130	946.270	0.280
2129	1908767.210	310146.890	963.390	-0.010
2130	1976085.200	391732.470	1054.610	0.170
2131	2002774.310	355247.060	1025.010	-0.070
2132	1965123.680	302477.470	976.540	0.180
2133	1985039.860	305767.910	1845.500	0.290
2134	2017170.250	330100.390	1917.640	-0.110
2135	2043099.560	335865.400	1845.950	-0.150
2136	2081513.090	272315.170	635.700	0.090
2137	1889288.680	259702.320	927.020	-0.310
2138	1912904.590	290201.650	993.230	0.040
2139	2036318.360	296045.340	676.880	-0.170
2140	2063478.520	257100.340	612.050	0.040
2141	2051522.830	398282.430	1889.180	-0.190
2142	2084897.480	379207.570	1875.510	-0.020
2143	2108739.760	308771.510	659.920	-0.270
2144	2069141.320	312448.290	1785.840	-0.070
2145	2145245.840	235197.120	711.520	0.120
2146	2093820.520	258068.740	817.780	0.080
2147	1991056.900	270306.100	660.570	-0.280
2148	2177823.990	254666.650	662.110	-0.050
2149	2165158.270	405782.940	738.220	-0.170
2150	2203412.650	260595.450	675.560	-0.130
2151	2218907.930	265767.130	694.450	-0.130
2152	2250774.580	277940.490	754.600	0.050
2153	2299908.570	302737.860	876.140	0.040
2154	2311602.820	312762.530	795.520	-0.210

2155	2286383.520	292464.670	792.710	-0.050
2156	2182574.970	289494.060	757.220	-0.270
2157	2192992.230	308124.730	701.480	-0.440
2158	2209568.160	331838.380	714.150	0.270
2159	2220552.690	349982.170	686.860	0.040
2160	2227444.850	370117.130	740.480	-0.180
2161	2242059.220	406561.990	737.890	0.110
2162	2261793.790	422698.830	690.390	0.000
2163	2274113.510	440968.110	731.690	-0.250
2164	2350871.790	493388.100	750.220	-0.240
2165	2338282.170	347724.200	701.930	0.050
2166	2363074.100	376718.570	791.130	0.050
2167	2375070.460	406222.990	916.180	-0.030
2168	2408587.000	363889.960	808.550	-0.080
2169	2399598.530	341143.750	796.690	0.090
2170	2402596.860	281288.350	842.530	0.020
2171	2428665.750	271259.240	1226.690	0.050
2172	2417536.300	314437.410	753.820	-0.020
2173	2431873.410	261653.430	1759.400	0.060
2174	2469066.080	256602.720	1857.930	0.010
2176	2328554.160	431972.520	772.390	-0.150
2177	2387843.250	406601.030	859.410	0.100
2178	2420645.700	400519.450	848.960	0.060
2179	2259198.740	250932.620	847.360	-0.010
2180	2253451.390	261550.920	795.750	-0.250
2181	2307321.470	282418.860	860.200	-0.050
2182	2325941.500	263449.160	868.340	0.160
2183	2336273.550	294181.570	806.830	-0.130
2184	2353378.130	290487.830	852.490	-0.030
2185	2380918.050	317412.730	827.350	0.140
2186	2177992.840	425011.500	780.540	-0.410
2187	2455245.070	280381.310	1670.620	0.010
2188	2349297.270	369856.850	809.120	-0.140
2189	2274270.560	285181.110	865.640	-0.150
2190	2236665.980	256306.470	921.220	-0.110
2191	2191295.270	266241.600	679.370	-0.220
2192	2262990.830	276834.190	820.160	0.190
2193	2118499.040	239035.470	836.410	0.090
2195	2029226.940	335012.850	1913.050	0.110
2196	2000309.940	321428.960	1948.030	0.160
2197	1953159.850	302799.450	968.990	0.200

2198	1991916.700	506871.650	1112.890	0.060
2199	2029027.080	496935.790	1032.370	-0.160
2200	2145031.560	578108.590	1320.130	0.030
2201	2213063.290	598850.940	1868.990	0.110
2202	2261070.930	590160.750	1828.160	-0.090
2203	2301110.210	574891.770	1672.240	0.060
2204	2390175.680	579260.050	833.400	0.000
2205	2400060.440	588040.350	801.030	-0.040
2206	2025993.360	752329.300	542.340	0.060
2207	2060691.420	738553.690	530.850	0.470
2208	2086869.880	749263.170	989.350	0.170
2209	2103300.170	747714.390	1010.310	0.250
2210	2183657.450	767320.830	1031.080	-0.190
2211	2223329.550	815183.220	977.900	-0.040
2212	2255559.660	814894.500	1044.670	-0.170
2213	2266452.530	809572.090	931.490	-0.380
2214	2296921.320	747360.910	1673.250	0.020
2215	2331499.440	744964.520	1521.310	0.000
2216	2354737.770	736363.710	1285.580	0.260
2217	2367319.490	733220.820	1411.060	0.120
2218	2374085.040	722451.660	1275.740	0.420
2219	2385846.090	704140.450	1506.560	0.190
2221	2445057.500	665240.090	1449.310	0.110
2222	2465820.950	686503.140	1334.020	0.090
2223	2474212.220	781203.000	1162.870	0.020
2224	2492591.810	797655.830	1373.480	-0.060
2225	2529920.390	825957.480	967.570	0.110
2226	2501464.220	732453.600	1110.820	-0.180
2227	2523731.200	752872.770	1138.610	-0.230
2228	2565046.930	774748.790	1085.570	-0.010
2229	2693229.720	768930.920	1195.110	0.140
2230	2730127.490	789998.460	1150.570	0.150
2232	2599515.150	785532.450	1168.500	0.160
2233	2410621.850	672267.010	1251.900	-0.200
2234	2248461.331	274710.384	774.210	0.364
2235	2284711.611	299017.373	890.020	-0.165
2236	2294791.633	311096.067	761.970	-0.135
2237	2332191.024	362514.478	717.730	-0.201
2238	2371663.846	414824.023	809.990	0.001
2239	2382669.854	428646.737	871.470	-0.033
2240	2229659.005	263932.878	803.930	-0.174

2241	2309828.540	308261.496	849.870	-0.122
2242	2279254.894	353857.823	786.520	-0.102
2243	2304646.063	292185.612	931.830	-0.252
2244	2221632.956	258957.040	740.230	-0.081

VERTICAL ACCURACY CONCLUSIONS

Raw Swath Non-Vegetated Vertical Accuracy (NVA) Tested 0.574 US feet Non vegetated vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using (RMSEz) x 1.96000 as defined by the National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the TIN using all points.

LAS Swath Non-Vegetated Vertical Accuracy (NVA) Tested 0.323 US feet Non vegetated vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using (RMSEz) x 1.96000 as defined by the National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the TIN using ground points.

Table 5.3: NVA Check Point Analysis DEM

Point ID	Easting (US Feet)	Northing (US Feet)	DEM Elevation (US Feet)	Dz (US Feet)
2002	2032528.730	816315.440	759.023	0.277
2003	2055453.920	824058.750	826.293	-0.093
2004	1957492.430	635022.150	670.283	-0.093
2005	2080864.480	821546.050	1083.184	0.106
2006	2092995.050	826501.670	950.004	-0.154
2007	2110730.580	811312.980	529.922	-0.182
2008	2137635.840	828823.070	1046.684	0.316
2009	1977919.310	609104.480	617.782	-0.012
2010	2157525.990	774215.730	1433.896	0.184
2011	2161256.260	821315.800	686.593	0.377
2012	2167537.360	795720.190	1060.014	0.016
2013	2165354.520	745769.820	956.474	-0.344
2015	2034622.040	738215.840	514.402	-0.102
2016	2047903.970	736655.300	593.672	0.068
2017	2062910.950	770369.940	534.212	-0.252
2018	2074396.410	744546.970	529.672	-0.162
2019	2123471.570	753758.440	1122.884	0.006
2020	2039289.850	775963.480	597.372	-0.212
2021	2195462.040	768696.880	1007.014	0.026
2022	2232384.180	812138.770	1013.484	-0.054
2023	2274568.940	805449.280	883.074	0.146
2024	2285786.840	763826.290	1738.827	0.083

2025	2208133.020	748072.530	955.144	-0.104
2026	2305471.140	744156.310	1609.746	-0.046
2027	2342668.750	737574.540	1399.936	-0.196
2028	2322362.830	810009.960	1634.997	-0.147
2029	2351198.070	787627.100	1580.166	-0.126
2030	2052418.310	674550.180	977.404	-0.104
2031	2078667.780	669140.160	1070.294	-0.184
2032	2112694.810	671522.020	1125.735	-0.215
2033	2151390.810	706432.670	1074.884	-0.074
2034	2186125.180	660101.430	1868.327	-0.177
2035	2262227.370	698129.430	1788.157	-0.177
2036	2107114.860	719262.760	980.254	-0.334
2037	2212996.450	686651.600	1913.338	-0.408
2038	2333272.510	682971.680	1593.686	-0.036
2039	2359886.160	703584.130	1456.206	-0.086
2040	2394534.910	671379.900	1277.515	-0.045
2041	2418772.530	674997.300	1404.026	-0.046
2042	2435146.400	656308.190	1550.506	0.164
2043	2457718.770	674931.750	1363.185	-0.135
2044	2423410.530	636885.550	1316.065	0.185
2045	2461588.990	642436.440	1069.604	-0.004
2046	2464593.320	762945.180	1553.616	0.034
2047	2482223.390	787191.310	1190.985	-0.035
2048	2517752.920	825792.400	967.084	0.096
2049	2506680.230	813093.590	978.274	0.106
2050	2491564.360	741069.060	1760.917	0.073
2051	2513520.800	739395.840	1168.385	0.015
2052	2535223.100	793699.470	1150.845	-0.045
2053	2541822.970	812914.970	1056.914	-0.074
2054	2546505.170	806515.380	1468.646	0.304
2055	2572719.740	816367.120	1117.884	-0.244
2056	2552054.680	770121.240	1105.624	-0.074
2057	2611426.970	794386.980	1230.845	0.275
2058	2650541.130	812386.640	1220.405	-0.055
2059	2679112.380	789571.710	1623.937	-0.357
2060	2586134.310	780093.140	1117.424	-0.154
2061	2611194.580	776185.470	1639.717	0.343
2062	2648872.200	775637.240	1664.177	0.113
2063	2636986.440	745104.870	1068.274	0.116
2064	2668622.540	771650.660	1412.276	-0.076
2065	2687348.030	762071.870	1194.385	-0.265
2066	2718709.770	775812.610	1063.824	-0.004
2067	2679305.450	824378.150	1536.206	-0.266
2068	2691662.650	827558.590	1535.936	-0.056

2069	2706507.710	807153.130	1428.666	0.084
2071	2536737.530	759982.930	1157.995	0.115
2072	2556608.280	741156.330	1141.635	-0.005
2073	2548639.200	685485.400	963.644	0.016
2074	2533836.840	672776.370	874.634	0.026
2077	2011365.690	595716.180	1124.535	-0.175
2078	2056237.940	597932.490	996.674	0.126
2079	2114489.140	614886.360	1031.664	-0.184
2081	1943410.180	542920.130	703.273	0.237
2082	2017492.700	498613.880	1025.484	0.146
2083	2043070.330	495754.480	944.744	0.016
2084	1978336.590	516563.250	1107.264	0.186
2085	1985155.220	552747.210	1170.155	-0.055
2086	2003964.210	571585.840	1100.954	-0.194
2087	2131800.700	579664.060	971.274	-0.054
2088	2079962.670	523199.340	940.004	-0.194
2089	2097382.120	590829.890	1000.404	0.066
2090	2186356.980	595111.470	1971.938	0.042
2091	2248027.790	593475.270	1778.887	-0.127
2092	2286477.780	581716.320	1731.747	-0.167
2093	2298001.000	611422.880	2005.638	0.032
2094	2247695.570	652601.230	1843.917	-0.097
2095	2386851.100	647673.810	1291.975	-0.105
2096	2362976.740	565041.410	932.704	0.006
2097	2410581.320	598594.940	766.843	0.157
2098	2338365.260	558334.210	1383.416	-0.036
2099	2483361.480	616627.010	881.614	-0.264
2100	2506544.270	636505.610	830.783	-0.073
2101	2520748.910	649263.190	824.493	-0.093
2103	2404941.600	558527.750	812.373	0.257
2104	2455303.050	550119.940	1130.485	-0.355
2106	2449981.570	587687.840	858.313	0.307
2107	2192206.070	521109.360	1717.827	0.173
2108	2241040.610	569519.860	1916.618	-0.088
2109	2208471.800	461581.680	849.443	0.187
2111	1897951.560	470199.950	884.994	0.016
2112	1911282.600	451906.180	891.564	0.086
2113	1941957.680	419677.460	988.524	-0.154
2114	1967919.460	438183.750	1115.304	-0.124
2115	2006244.110	469772.520	1057.584	0.176
2116	2159925.010	478797.200	1784.767	-0.097
2118	2306062.930	498413.270	774.683	-0.063
2119	2283524.780	457393.610	795.193	0.137
2120	2254478.650	527880.120	1868.017	0.083

2121	2332315.970	475395.890	755.973	0.087
2122	2366763.230	517236.590	790.833	-0.103
2123	2398622.360	529254.010	870.163	0.047
2124	2423440.060	510663.960	794.323	0.007
2125	1882864.470	293854.010	982.684	0.146
2126	1889149.330	391675.430	1127.035	0.325
2127	1913392.880	377343.280	1048.364	-0.004
2128	1932772.570	309532.130	946.264	-0.274
2129	1908767.210	310146.890	963.374	0.026
2130	1976085.200	391732.470	1054.654	-0.214
2131	2002774.310	355247.060	1025.004	0.076
2132	1965123.680	302477.470	976.534	-0.174
2133	1985039.860	305767.910	1845.477	-0.267
2134	2017170.250	330100.390	1917.638	0.112
2135	2043099.560	335865.400	1845.897	0.203
2136	2081513.090	272315.170	635.693	-0.083
2137	1889288.680	259702.320	927.014	0.316
2138	1912904.590	290201.650	993.234	-0.044
2139	2036318.360	296045.340	676.883	0.167
2140	2063478.520	257100.340	611.982	0.028
2141	2051522.830	398282.430	1889.208	0.162
2142	2084897.480	379207.570	1875.518	0.012
2143	2108739.760	308771.510	659.923	0.267
2144	2069141.320	312448.290	1785.767	0.143
2145	2145245.840	235197.120	711.533	-0.133
2146	2093820.520	258068.740	817.793	-0.093
2147	1991056.900	270306.100	660.563	0.287
2148	2177823.990	254666.650	662.113	0.047
2149	2165158.270	405782.940	738.203	0.187
2150	2203412.650	260595.450	675.513	0.177
2151	2218907.930	265767.130	694.493	0.087
2152	2250774.580	277940.490	754.693	-0.143
2153	2299908.570	302737.860	876.144	-0.044
2154	2311602.820	312762.530	795.453	0.277
2155	2286383.520	292464.670	792.713	0.047
2156	2182574.970	289494.060	757.273	0.217
2157	2192992.230	308124.730	701.493	0.427
2158	2209568.160	331838.380	714.253	-0.373
2159	2220552.690	349982.170	686.883	-0.063
2160	2227444.850	370117.130	740.523	0.137
2161	2242059.220	406561.990	737.883	-0.103
2162	2261793.790	422698.830	690.433	-0.043
2163	2274113.510	440968.110	731.753	0.187
2164	2350871.790	493388.100	750.313	0.147

2165	2338282.170	347724.200	701.983	-0.103
2166	2363074.100	376718.570	791.183	-0.103
2167	2375070.460	406222.990	916.204	0.006
2168	2408587.000	363889.960	808.543	0.087
2169	2399598.530	341143.750	796.683	-0.083
2170	2402596.860	281288.350	842.603	-0.093
2171	2428665.750	271259.240	1226.785	-0.145
2172	2417536.300	314437.410	753.823	0.017
2173	2431873.410	261653.430	1759.437	-0.097
2174	2469066.080	256602.720	1857.887	0.033
2176	2328554.160	431972.520	772.393	0.147
2177	2387843.250	406601.030	859.363	-0.053
2178	2420645.700	400519.450	848.943	-0.043
2179	2259198.740	250932.620	847.393	-0.023
2180	2253451.390	261550.920	795.743	0.257
2181	2307321.470	282418.860	860.193	0.057
2182	2325941.500	263449.160	868.363	-0.183
2183	2336273.550	294181.570	806.763	0.197
2184	2353378.130	290487.830	852.313	0.207
2185	2380918.050	317412.730	827.433	-0.223
2186	2177992.840	425011.500	780.533	0.417
2187	2455245.070	280381.310	1670.767	-0.157
2188	2349297.270	369856.850	809.113	0.147
2189	2274270.560	285181.110	865.823	-0.033
2190	2236665.980	256306.470	921.254	0.076
2191	2191295.270	266241.600	679.403	0.187
2192	2262990.830	276834.190	820.183	-0.213
2193	2118499.040	239035.470	836.433	-0.113
2195	2029226.940	335012.850	1913.018	-0.078
2196	2000309.940	321428.960	1948.028	-0.158
2197	1953159.850	302799.450	968.994	-0.204
2198	1991916.700	506871.650	1112.894	-0.064
2199	2029027.080	496935.790	1032.374	0.156
2200	2145031.560	578108.590	1320.195	-0.095
2201	2213063.290	598850.940	1868.957	-0.077
2202	2261070.930	590160.750	1828.097	0.153
2203	2301110.210	574891.770	1672.167	0.013
2204	2390175.680	579260.050	833.413	-0.013
2205	2400060.440	588040.350	801.023	0.047
2206	2025993.360	752329.300	542.362	-0.082
2207	2060691.420	738553.690	530.832	-0.452
2208	2086869.880	749263.170	989.364	-0.184
2209	2103300.170	747714.390	1010.384	-0.324
2210	2183657.450	767320.830	1031.074	0.196

2211	2223329.550	815183.220	977.924	0.016
2212	2255559.660	814894.500	1044.674	0.166
2213	2266452.530	809572.090	931.504	0.366
2214	2296921.320	747360.910	1673.247	-0.017
2215	2331499.440	744964.520	1521.316	-0.006
2216	2354737.770	736363.710	1285.575	-0.255
2217	2367319.490	733220.820	1411.086	-0.146
2218	2374085.040	722451.660	1275.705	-0.385
2219	2385846.090	704140.450	1506.526	-0.156
2221	2445057.500	665240.090	1449.306	-0.106
2222	2465820.950	686503.140	1334.115	-0.185
2223	2474212.220	781203.000	1162.885	-0.035
2224	2492591.810	797655.830	1373.576	-0.036
2225	2529920.390	825957.480	967.554	-0.094
2226	2501464.220	732453.600	1110.884	0.116
2227	2523731.200	752872.770	1138.585	0.255
2228	2565046.930	774748.790	1085.594	-0.014
2229	2693229.720	768930.920	1195.115	-0.145
2230	2730127.490	789998.460	1150.485	-0.065
2232	2599515.150	785532.450	1168.495	-0.155
2233	2410621.850	672267.010	1251.895	0.205
2234	2248461.331	274710.384	774.303	-0.457
2235	2284711.611	299017.373	890.014	0.171
2236	2294791.633	311096.067	761.943	0.162
2237	2332191.024	362514.478	717.773	0.158
2238	2371663.846	414824.023	810.003	-0.014
2239	2382669.854	428646.737	871.473	0.030
2240	2229659.005	263932.878	803.893	0.211
2241	2309828.540	308261.496	849.873	0.119
2242	2279254.894	353857.823	786.473	0.149
2243	2304646.063	292185.612	931.814	0.268
2244	2221632.956	258957.040	740.223	0.088

VERTICAL ACCURACY CONCLUSIONS

Bare-Earth DEM Non-Vegetated Vertical Accuracy (NVA) Tested 0.335 US feet Non-Vegetated vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using (RMSEz) x 1.96000 as defined by the National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM.

Table 5.4: VVA Quality Check Point Analysis DEM				
Point ID	Easting (US Feet)	Northing (US Feet)	DEM Elevation (US Feet)	Dz (US Feet)
3002	2032555.954	816305.933	757.953	0.108
3003	2092986.196	826467.299	949.584	-0.005
3004	2110865.522	811172.475	533.502	-0.063
3005	2161258.826	821220.897	691.173	-0.119
3006	2223588.627	815070.275	936.584	0.025
3007	2255402.069	814934.521	1051.014	0.182
3008	2266397.388	809555.099	931.144	-0.072
3010	2039339.080	776022.589	597.822	-0.378
3011	2062932.246	770318.058	535.062	-0.762
3012	2034611.920	738064.842	528.572	-0.364
3013	2047952.002	736655.429	590.662	-0.178
3014	2060760.738	738546.530	529.602	-0.471
3015	2074307.598	744735.610	524.532	-0.453
3016	2107167.784	719182.093	978.324	-0.692
3017	2123778.637	753837.616	1137.365	0.229
3018	2052340.545	674541.185	978.584	-0.245
3019	2078632.122	669272.568	1067.114	-0.872
3020	2112628.541	671433.636	1126.115	-0.211
3021	2151398.905	706399.525	1074.924	-0.296
3022	2137622.124	828761.939	1045.034	0.336
3023	2186241.212	660033.683	1864.687	-0.232
3024	2167617.589	795834.955	1060.734	-0.373
3025	2183584.052	767310.667	1038.364	0.021
3026	2285748.169	763928.601	1740.707	-0.548
3027	2213036.754	686621.469	1913.158	-0.484
3028	2247723.445	652538.864	1845.607	-0.232
3029	2262101.255	698178.307	1785.607	-0.483
3030	2296903.539	747422.223	1672.787	-0.066
3031	2322379.073	810078.544	1638.797	-0.364
3032	2333246.592	682885.252	1593.556	-0.189
3033	2342541.204	737728.167	1407.096	-0.239
3034	2351268.304	787602.344	1578.736	-0.292
3035	2354692.926	736380.532	1286.965	-0.355
3036	2359805.741	703541.555	1451.106	-0.334
3038	2410625.912	672324.893	1253.515	-0.492
3039	2418786.517	674933.152	1404.876	0.090
3041	2465806.337	686568.694	1340.125	-0.044
3042	2464580.971	762909.916	1549.026	-0.404
3043	2474283.286	781199.702	1160.665	-0.282

3044	2482237.319	787219.855	1189.275	-0.111
3045	2506660.510	813199.899	976.484	-0.255
3046	2546544.455	806472.400	1471.376	-0.012
3047	2513485.486	739539.699	1169.785	-0.236
3048	2523749.576	752777.936	1133.835	0.294
3049	2536801.274	760012.787	1157.465	-0.076
3050	2565068.133	774669.366	1080.734	-0.192
3051	2599423.627	785328.916	1160.625	-0.505
3052	2650611.489	812435.237	1219.665	-0.187
3053	2679224.773	824592.695	1566.956	-0.267
3054	2691620.686	827580.936	1535.116	-0.402
3055	2706521.551	807028.244	1424.076	0.103
3057	2611161.437	775998.553	1635.947	0.054
3058	2648881.697	775683.517	1659.777	-0.486
3059	2636903.594	744996.672	1067.014	0.163
3060	2668718.547	771514.773	1410.166	0.015
3061	2687180.656	762103.013	1191.655	-0.148
3062	2730066.304	790028.683	1147.465	-0.298
3063	2556658.830	741186.008	1148.645	-0.415
3064	2534233.193	672137.807	878.344	-0.466
3065	2548658.671	685453.743	963.814	-0.151
3067	1957456.901	635027.774	670.563	-0.430
3068	2011420.130	595496.216	1126.725	0.059
3069	2131770.420	579513.785	971.774	-0.304
3070	1985204.415	552829.825	1169.185	-0.132
3071	1978328.724	516583.767	1108.774	0.036
3072	1991930.242	506841.283	1111.814	-0.282
3073	2017579.976	498626.478	1024.924	-0.046
3074	2029214.198	496940.715	1040.514	0.043
3075	2042976.375	495746.178	943.894	-0.244
3076	2079840.224	523321.689	943.514	-0.460
3077	2145066.290	578178.750	1322.625	-0.098
3078	2186349.995	595126.072	1970.128	-0.115
3079	2212944.620	598778.901	1871.867	0.127
3080	2286233.062	581483.291	1723.327	-0.368
3081	2301046.938	574933.252	1671.117	0.018
3082	2338382.350	558451.244	1367.895	0.188
3083	2363161.753	564998.122	928.074	-0.212
3084	2400096.555	587960.159	801.323	-0.164
3085	2386758.126	647664.882	1293.365	-0.110
3086	2423426.978	636913.282	1318.745	-0.186
3087	2461763.640	642551.281	1067.454	-0.059
3088	2483359.158	616523.460	877.754	-0.195
3091	2450068.314	587612.634	848.793	-0.125

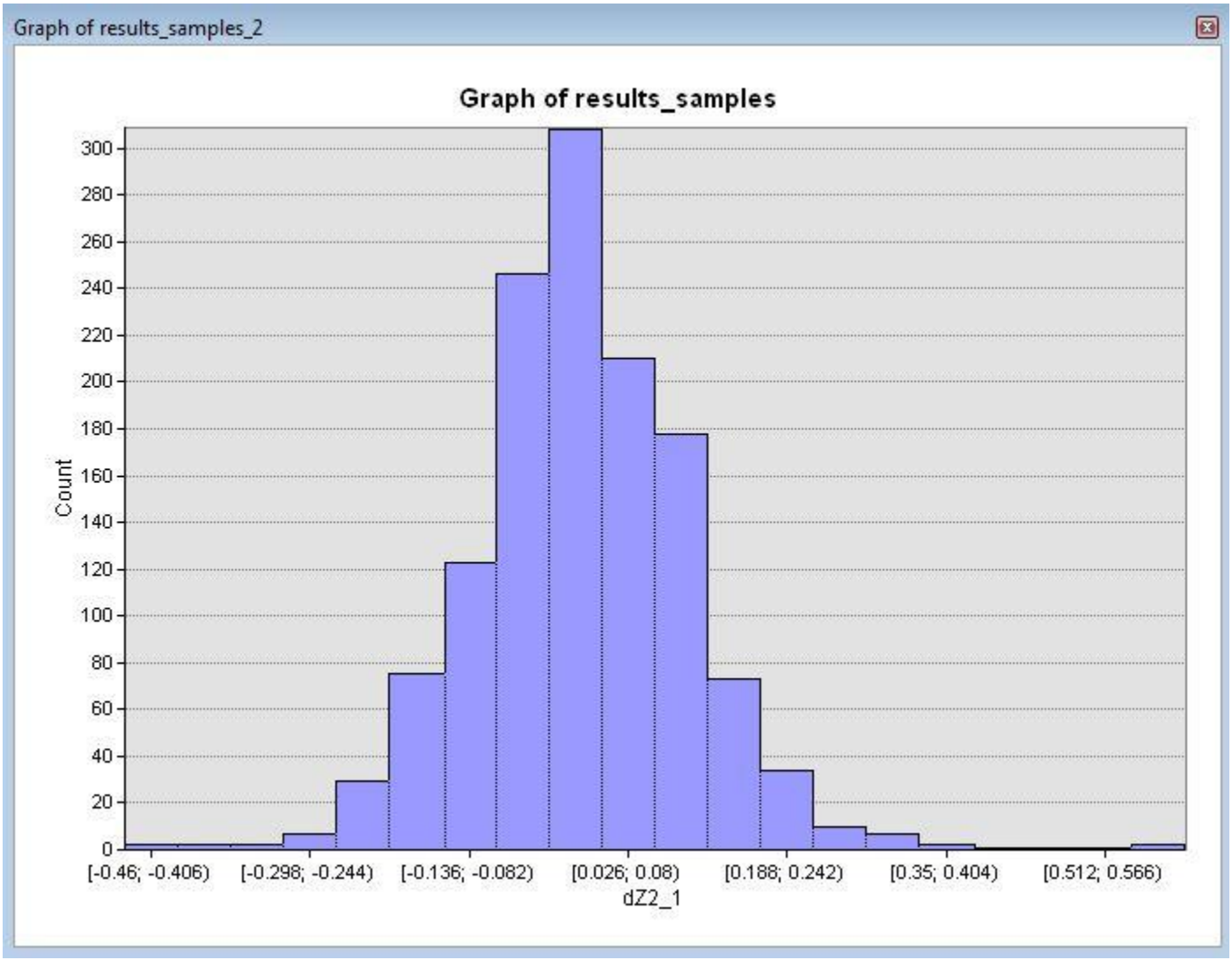
3092	2455346.301	550112.479	1131.245	-0.329
3093	2423501.741	510654.991	793.493	-0.341
3094	2405114.553	558614.346	812.273	-0.177
3095	2398604.053	529132.063	870.613	0.069
3096	2366713.263	517152.903	792.553	-0.611
3097	2350891.013	493403.791	752.043	-0.401
3098	2332282.019	475400.970	756.803	-0.291
3099	2306112.740	498487.800	776.533	-0.144
3100	2283525.352	457362.996	794.793	-0.123
3101	2208424.984	461527.114	851.043	0.004
3102	2254621.092	527711.962	1861.817	0.352
3103	2241179.172	569498.310	1909.498	-0.135
3104	2192121.516	521046.853	1712.527	-0.176
3105	2159910.910	478515.767	1785.117	-0.243
3107	1897899.010	470194.479	883.614	-0.113
3108	2006132.435	469646.105	1061.074	0.117
3109	1889195.787	391596.233	1123.425	-0.204
3110	1913502.118	377478.832	1047.454	-0.376
3111	1941863.848	419682.421	988.314	-0.487
3112	1967743.293	438307.440	1108.034	-0.355
3113	1976105.914	391787.780	1054.374	0.304
3114	2003165.739	355513.840	1028.394	-0.421
3115	2051576.742	398325.495	1886.058	0.024
3116	2084827.997	379203.391	1875.898	0.015
3117	1882914.379	293839.369	984.044	-0.013
3118	1933008.107	309344.829	957.044	-0.785
3119	1953339.423	302732.606	969.434	-0.168
3120	1965074.980	302476.896	977.034	-0.558
3121	1985081.904	305791.422	1846.227	-0.315
3122	2000209.450	321358.956	1945.718	-0.150
3123	2017128.831	330059.354	1917.358	0.079
3124	2029260.055	334999.957	1912.788	-0.010
3125	2043113.154	335843.426	1846.807	0.030
3126	2069097.201	312445.185	1787.817	-0.041
3127	2081601.761	272465.016	636.493	0.980
3128	2093842.383	258098.141	819.113	0.064
3129	2118450.401	239082.553	847.093	-0.375
3130	2177796.650	254718.930	662.523	-0.266
3131	1912894.143	290137.004	993.594	-0.126
3132	1991129.488	270121.385	658.883	0.364
3133	2063170.428	257075.801	614.342	0.700
3134	2182634.070	289510.924	759.253	0.305
3135	2193006.642	308024.347	705.833	0.228
3136	2220249.980	349806.052	686.303	-0.260

3137	2227464.608	370156.139	739.533	0.244
3138	2261719.721	422537.969	689.683	-0.525
3139	2191251.280	266164.643	683.383	-0.092
3140	2203540.057	260623.279	671.583	0.151
3141	2218881.144	265732.021	694.753	0.063
3142	2236718.156	256216.010	919.074	-0.165
3143	2250922.273	277362.037	754.063	-0.092
3144	2274336.620	285184.876	868.843	0.082
3145	2286536.515	292451.651	792.693	-0.321
3146	2300097.581	302825.531	872.473	0.164
3147	2311776.881	312698.391	799.213	-0.386
3148	2338268.602	347799.768	703.303	-0.139
3149	2349385.516	369817.671	810.263	0.245
3150	2374885.920	406029.181	915.284	-0.104
3151	2420673.368	400457.029	849.273	0.124
3152	2408569.311	363860.360	807.603	-0.135
3153	2399415.159	341120.639	791.763	-0.258
3154	2353339.624	290497.864	853.493	-0.234
3155	2336201.681	294042.367	810.253	0.091
3156	2307199.125	282380.212	861.973	-0.350
3157	2253559.938	261581.275	794.563	-0.027
3158	2259276.601	250957.650	849.063	-0.056
3159	2325827.948	263427.706	858.493	-0.079
3160	2402847.349	281034.762	843.213	-0.434
3161	2426744.706	271487.953	1198.235	0.034
3162	2431859.953	261610.537	1759.297	-0.273
3163	2468699.905	256488.459	1829.637	-0.282
3164	1889123.313	259574.394	924.454	0.265
3165	2178040.391	425011.420	778.793	0.483
3166	2165180.974	405937.842	740.463	0.074
3167	2108567.961	308821.740	663.393	0.162
3168	2328609.807	432008.276	776.353	0.059
3169	1912513.850	536698.162	747.163	-0.075
3170	2279214.529	353704.773	789.533	-0.267
3171	2332151.970	362347.813	718.133	0.110
3172	2382455.111	428518.172	874.104	-0.081
3173	2284621.945	299010.420	888.844	-0.226

VERTICAL ACCURACY CONCLUSIONS

Vegetated Vertical Accuracy (VVA) Tested 0.544 US feet at the 95th percentile reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. VVA Errors larger than 95th percentile include:
Point 3011, Easting 2062932.246, Northing 770318.058, Z-Error 0.762 US feet
Point 3016, Easting 2107167.784, Northing 719182.093, Z-Error 0.692 US feet
Point 3019, Easting 2078632.122, Northing 669272.568, Z-Error 0.872 US feet
Point 3026, Easting 2285748.169, Northing 763928.601, Z-Error 0.548 US feet
Point 3096, Easting 2366713.263, Northing 517152.903, Z-Error 0.611 US feet
Point 3118, Easting 1933008.107, Northing 309344.829, Z-Error 0.785 US feet
Point 3120, Easting 1965074.980, Northing 302476.896, Z-Error 0.558 US feet
Point 3127, Easting 2081601.761, Northing 272465.016, Z-Error 0.980 US feet
Point 3133, Easting 2063170.428, Northing 257075.801, Z-Error 0.700 US feet

Figure 5.1: LIDAR Relative Accuracy Histogram



RELATIVE ACCURACY ASSESSMENT AND CONCLUSION

The relative accuracy for the TN 27 County QL2 Lidar (Cumberland Plateau) Lidar tested at 0.109 feet RMSDz.

Approved by:	Name	Signature	Date
Associate Member, Lidar Specialist Certified Photogrammetrist #1381	Qian Xiao		June 2016

Section 6: Flight Logs

Flight logs for the project are shown on the following pages:

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/4/2015	Day of Year 338	Mission Name / Job # 75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH- #### ☒	241	4:59	22:59
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			242	6:55	0:55

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
81	N	23:13	23:25:04	0:11:52	16	1	1	Alt-6891, 153 kts
80	S	23:28:05	23:39:29	0:11:11	17	1	1	
79	N	23:41:57	23:53:30	0:11:33	17	1	1	
78	S	23:56:36	0:08:17	00:11:41	17	1	1	
77	N	0:10:35	0:22:16	0:11:41	17	1	1	
76	S	0:25:09	0:36:36	0:11:27	15	1	1	
↑ Times entered are Zulu / GMT ↑				1:09:25 Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/5/2015	Day of Year 339	Mission Name / Job # Second Flight 75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N604CP ☐ N1115D ☒ N675CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-#### ☒	246	3:58	21:58
Pilot: Swain			Hobbs End 248	Local End Time 6:36	Zulu End Time 0:36

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	Arriving ICAO
	+10							KSRB	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes ☒ No ☐
64	N	22:11	22:23:22	0:11:24	19	1	1	Alt-6908, 158 kts
63	S	22:26:02	22:37:26	0:11:24	19	1	1	
62	N	22:40:27	22:51:45	0:11:18	18	1	1	
61	S	22:54:09	22:05:33	00:11:24	15	1	1	
60	N	23:09:46	23:21:21	0:11:35	16	1	1	
59	S	23:23:31	23:34:54	0:11:23	17	1	1	
58	N	23:37:14	23:49:32	0:12:18	17	1	1	
57	S	23:51:45	0:03:14	0:11:29	16	1	1	
56	N	0:06:14	0:17:27	0:11:13	16	1	1	
								75'56? So far 89-76 and 55-44
		↑ Times entered are Zulu / GMT ↑		1:43:28	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/3/2016	3	75556	2	TN_27_County-Reflights Block 6

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
GALAMBOS	N1107Q	2951.7	9:58:00	15:58:00	NGS
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
LaROCQUE	OTHER	2953.7	11:10:00	17:10:00	Sparport 1987

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
180 3	10	Clear		3	-2	30.13		Departing	KSRB
								Arriving	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	255	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi	X	B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	6500	Ft	7175	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	15:22:15
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission	Yes X No
69	S	15:58:38	16:12:47	8:22:34	15	0.8	1.2	Reflight "Block 6"	
86	N	16:01:03	16:21:31	0:00:00	15	0.8	1.2	Patch 10 to the North from S. end	
				0:00:00				Manual Stop	
108	N	16:29:03	16:33:45	0:00:00	15	0.8	1.2	Patch 10 to the North from S. end	
				0:00:00				Manual Stop	
109	N	16:42;19	16:47:03	0:00:00	19	0.6	1.1	Patch 10 to the North from S. end	
				0:00:00				Manual Stop	
110	N	16:55:27	17:09:23	0:00:00	20	0.6	1.1	Reflight entire line	
				0:00:00				Sensor 8191	
				0:00:00					
				0:00:00				Static: 17:35:26 - 17:37:26	
				0:00:00					
				0:00:00				***Note Extended Logging Error**	
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00	16	0.7	1.2		
				0:00:00	16	0.7	1.2		
				0:00:00	16	0.7	1.2		
				0:00:00					
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				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments: Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/3/2015	Day of Year 337	Mission Name / Job # 75556

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107O ☐	SH-7177 ☐ SH_6157 ☐ SH-7108 ☒		12:23	17:23
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain				4:24	21:24

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID
	Yes ☒ No ☐	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KFFC
								Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	41	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2+2 ☐ 4+3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 18:37
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes ☒ No ☐
89	N	19:00	19:11:57	0:11:34	18	1	1	Sun Angle=27
88	S	19:15:03	19:36:38	0:11:35	18	1	1	Sun Angle=26
87	N	19:30:00	19:41:43	0:11:43	19	1	1	Sun Angle=25
86	S	19:43:12	19:55:55	00:12:43	18	1	1	Sun Angle=23
85	N	19:58:18	20:10:00	0:12:18	17	1	1	Sun Angle=22
84	S	20:12:45	20:24:44	0:11:59	18	1	1	Sun Angle=20
83	N	20:27:58	20:39:47	0:11:51	18	1	1	Sun Angle=19
82	S	20:42:43	20:54:10	0:11:33	18	1	1	Sun Angle=15
		↑ Times entered are Zulu / GMT ↑		1:35:16	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments:	Drive #
System worked well, no issues.	

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/4/2015	Day of Year 337	Mission Name / Job # 75556 Block 2 and Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N111SD ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH- #### ☒	236	8:40	14:40
Pilot			Hobbs End	Local End Time	Zulu End Time
Swain			241	1:15	19:15

Passengers	Using or Relying on CORS		GPS Base #1	Operator	PID	KSRB
	Yes ☐	No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
7	S	15:15	15:26:53	0:11:38	17	1	1	lock 2, 7050 feet, 160 kts, Sun Angle=23-
8	N	15:32:16	15:43:41	0:11:25	17	1	1	Block 2, Sun Angle=25-26
55	S	15:58:31	16:10:07	0:11:36	17	1	1	l to Block 1, Lake on North End, Sun Ang
54	N	16:14:20	16:25:47	00:11:27	16	1	1	Sun Angle=29
53	S	16:28:31	16:40:00	0:11:29	16	1	1	Sun Angle=29-30
52	N	16:43:44	16:55:16	0:11:32	15	1	1	Sun Angle=31
51	S	16:58:02	17:09:27	0:11:25	14	1	1	Sun Angle=31
50	N	17:12:45	17:24:14	0:11:31	14	1	1	Sun Angle=31
49	S	17:26:01	17:38:27	0:11:26	15	1	1	Sun Angle=31
48	N	17:42:01	17:53:40	0:11:39	18	1	1	Sun Angle=31
47	S	17:56:04	18:07:34	0:11:30	17	1	1	Sun Angle=31
46	N	18:10:12	18:21:42	0:11:30	18	1	1	Sun Angle=31-30
45	S	18:24:27	18:35:55	0:11:28	18	1	1	Sun Angle=30
44	N	18:38:39	18:50:04	0:11:25	20	1	1	Sun Angle= 29
43	S	error	error					ta, check antenna, 18:55 restart, all app
↑ Times entered are Zulu / GMT ↑				2:41:01	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/5/2015	Day of Year 339	Mission Name / Job # 75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' #### ☒	242	10:08	16:08
Pilot: Swain			Hobbs End	Local End Time	Zulu End Time

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
75	N	16:22	16:33:48	0:11:22	15	1	1	Alt-6901, 159 kts, SA=29
74	S	16:37:04	16:48:37	0:11:33	17	1	1	SA=30
73	N	16:52:05	17:03:33	0:11:28	17	1	1	SA=31
72	S	17:06:46	17:18:15	00:11:34	14	1	1	SA=31
71	N	17:21:48	17:33:10	0:11:12	15	1	1	SA=31
70	S	17:36:18	17:47:55	0:11:37	16	1	1	SA=31
69	N	17:51:31	18:03:02	0:11:31	17	1	1	SA=31
68	S	18:06:08	18:17:46	0:11:38	16	1	1	SA=30
67	N	18:21:31	18:32:52	0:11:21	17	1	1	SA=30
66	S	18:35:50	18:47:15	0:11:25	18	1	1	SA=29
65	N	18:50:25	19:01:48	0:11:22	19	1	1	SA=28
64	S	19:04:39	19:15:15		19	1	1	Same IMU Error as yesterday
								75'56? So far 89-76 and 55-44
↑ Times entered are Zulu / GMT ↑				2:06:03	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #2

Leica ALS	MM/DD/YYYY 12/6/2015	Day of Year 340	Mission Name / Job # Second Flight 75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N675RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-#### ☒	249	5:04	23:04
Pilot: Swain			Hobbs End 251	Local End Time 7:15	Zulu End Time 1:15

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO KSRB
	+10							Arriving ICAO KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
43	S	23:26	23:38:07	0:11:22	18	1	1	ALT=6896, SPD=158
42	N	23:40:58	23:52:14	0:11:16	18	1	1	
41	S	23:54:39	0:05:59	0:11:20	16	1	1	
40	N	0:08:53	0:20:06	00:11:13	16	1	1	
39	S	0:22:43	0:34:15	0:11:32	16	1	1	
38	N	0:36:59	0:47:59	0:11:00	17	1	1	
37	S	0:50:24	1:01:43	0:11:19	17	1	1	Clouds on north and south end
↑ Times entered are Zulu / GMT ↑				1:19:02 Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/2/2016	216	75556	2	TN_27_County

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
GALAMBOS	N1107Q	2947.3	10:53:00	15:53:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
LaROCQUE	OTHER	2951.7	2:05:00	19:05:00	KMMI

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	KSRB
Calm	10	Clear		2	-4	30.36		Arriving	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	255	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi	X	B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	6500 Ft	7160 Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 15:34:30
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
1	S	15:53:26	16:07:57	8:36:57	16	0.7	1.2	Block 10
2	N	16:11:00	16:25:57	0:00:00	16	0.7	1.3	Extrended logging error
3	S	16:29:18	16:43:56	0:00:00	15	0.7	1.2	
4	N	16:47:07	17:01:50	0:00:00	17	0.7	1.1	
5	S	17:05:02	17:19:24	0:00:00	19	0.6	1.1	
6	N	17:22:24	17:37;15	0:00:00	18	0.6	1	
7	S	17:40:35	17:54;53	0:00:00	18	0.6	1	
8	N	17:58:19	18:12:46	0:00:00	18	0.6	1	
9	S	18:16:02	18:30:23	0:00:00	18	0.6	1	
10	N	18:33:23	18:47:44	0:00:00	18	0.6	1	
11	S	18:51:15	19:05:28	0:00:00	18	0.6	1	
				0:00:00				Static: 19:24:08 - 19:26:08
				0:00:00				
				0:00:00				
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				0:00:00				
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↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission Yes X No

Additional Comments:

Drive #: 808654

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/16/2015	350	75556	2	tn 27 counties block 6

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
SMITH	N7079F	207.7	8:59:00	14:59:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
GEBHART	OTHER	215.0	4:14:00	22:14:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	CSV
								Arriving	CSV

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	6499 Ft	7175 Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
121	e	15:16:00	15:18:00		15	0.8	1.4	
122	w	15:22:00	15:24:00		15	0.8	1.4	
123	e	15:28:00	15:30:00		14	0.8	1.5	
124	w	15:34:00	15:36:00		14	0.8	1.5	
125	e	15:40:00	15:41:00		14	0.8	1.5	
126	w	15:45:00	15:46:00		14	0.8	1.4	
127	e	15:49:00	15:50:00		14	0.8	1.4	
113	s	16:02:00	16:07:00		14	0.8	1.3	
114	n	16:10:00	16:16:00		13	0.8	1.5	
115	s	16:19:00	16:27:00		13	0.8	1.4	
116	n	16:29:00	16:37:00		13	0.8	1.4	
117	s	16:41:00	16:51:00		14	0.8	1.2	
118	n	16:58:00	17:09:00		17	0.6	1	
119	s	17:13:00	17:24:00		17	0.6	1	
120	n	17:26:00	17:37:00		16	0.6	1.2	reboot
90	s	18:09:00	18:25:00		17	0.6	1.2	
89	n	18:28:00	18:41:00		17	0.6	1.2	
88	s	18:45:00	19:01:00		18	0.6	1.1	
87	n	19:04:00	19:18:00		16	0.6	1.3	
86	s	19:21:00	19:36:00		16	0.6	1.4	clds wp 59 to end
112	e	19:46:00	19:55:00		17	0.6	1.2	
65	s	20:08:00	20:23:00		19	0.6	1.1	
66	n	20:26:00	20:39:00		20	0.6	1.1	
67	s	20:42:00	20:56:00		19	0.6	1.2	
68	n	20:59:00	21:12:00		20	0.6	1.1	gnss error
69	s	21:46:00	22:00:00		19	0.6	1.2	clds wp 27-various to the end
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No

Additional Comments: Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/19/2015	353	75556	2	tn 27 counties block 6

Operator	Aircraft	HOBBS Start	Local Start Time	ZULU Start Time	Base
SMITH	N7079F	215.0	8:36:00	14:36:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
GEBHART	OTHER	222.1	3:42:00	21:42:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	CSV
								Arriving	CSV

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used	Waveform Mode	Pre-Trigger Dist.
150 Kts	6499 Ft	7175 Ft	Yes [ ] No [ ]	@ NS :	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes [X] No [ ]
86	n	14:53:00	15:09:00		16	0.7	1.3	
85	s	15:12:00	15:26:00		16	0.7	1.3	
84	n	15:29:00	15:45:00		15	0.7	1.3	
83	s	15:48:00	16:02:00		15	0.7	1.3	
82	n	16:05:00	16:21:00		14	0.7	1.4	
81	s	16:24:00	16:38:00		14	0.7	1.4	
80	n	16:41:00	16:56:00		16	0.6	1.1	
79	s	16:59:00	17:13:00		17	0.6	1	
78	n	17:16:00	17:31:00		17	0.6	1.1	
77	s	17:34:00	17:48:00		17	0.6	1.2	
76	n	17:51:00	18:07:00		20	0.6	1.1	
75	s	18:10:00	18:24:00		20	0.6	1.1	
74	n	18:27:00	18:41:00		21	0.6	1.1	
73	s	18:44:00	18:58:00		20	0.6	1.2	
72	n	19:01:00	19:16:00		19	0.6	1.4	
71	s	19:19:00	19:32:00		20	0.6	1.2	
70	n	19:36:00	19:50:00		20	0.6	1.1	
69	s	19:58:00	20:12:00		21	0.6	1.1	
68	n	20:15:00	20:30:00		22	0.6	1	
110	s	20:38:00	20:44:00		20	0.6	1.1	reflt wp 12-40
101	n	20:51:00	21:05:00		20	0.6	1	
91	s	21:09:00	21:22:00		23	0.6	0.9	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes [X] No [ ]

Additional Comments:

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY	Day of Year	Mission Name / Job #
	12/8/2015	342	75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' 8888 ☒	249	9:39	15:39
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			255	1:50	19:50

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
33	S	16:06	16:17:26	0:11:25	14	1	2	ALT=6890, SPD= 152kts
32	N	16:20:59	16:32:12	0:11:13	15	1	1	
31	S	16:34:45	16:46:17	0:11:32	15	1	1	
30	N	16:49:04	17:00:25	00:11:21	13	1	1	
29	S	17:02:38	17:14:10	0:11:32	13	1	1	
28	N	17:16:37	17:27:53	0:11:16	14	1	1	
27	S	17:30:11	17:41:28	0:11:17	16	1	1	
26	N	17:44:33	17:55:53	0:11:20	16	1	1	
25	S	17:59:00	18:10:20	0:11:20	16	1	1	ved logs powered down the system. Flew
34	N	18:36:00	18:47:16	0:11:16	17	1	1	
35	S	18:50:05	19:01:28	0:11:23	17	1	1	
36	N	19:05:15	19:16:00 (?)		18	1	1	Aircraft below, had to close Shutter
↑ Times entered are Zulu / GMT ↑				########## Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/15/2015	Day of Year 349	Mission Name / Job # 75556 Block 1/Block 5

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' #### ☒	260	9:27	15:27
Pilot			Hobbs End	Local End Time	Zulu End Time
Swain			265	2:10	20:10

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
40	N	15:40	15:52:18	0:11:22	15	1	1	Clouds on the north end- will refly
8	S	16:00:42	16:10:00	0:09:18	17	1	1	Cut line short for the air traffic
8	S	16:14:56	16:17:11	0:02:15	16	1	1	Continued line
7	N	16:19:41	16:30:58	00:11:17	16	1	1	
6	S	16:33:41	16:44:59	0:11:18	14	1	1	
90	E	16:53:59	17:01:43	0:07:44	14	1	1	
40	N	17:08:31	17:10:46	0:02:15	16	1	1	Re-flying the clouded part
39	S	17:13:05	17:24:28	0:11:23	17	1	1	
38	N	17:26:51	17:38:08	0:11:17	16	1	1	
91	W	17:50:50	17:58:36	0:07:46	17	1	1	
15	S	18:09:06	18:20:23	0:11:17	18	1	1	
—	—	Block5	——-	———-	—-	—	—	——
50	S	18:26:05	18:39:27	0:13:22	18	1	1	
49	N	18:41:56	18:55:08	0:13:12	19	1	1	
48	S	18:58:28	19:11:49	0:13:21	19	1	1	
47	N	19:14:17	19:27:01	0:12:44	17	1	1	
46	S	19:29:26	19:42:12	0:12:46	18	1	1	
45	N	19:44:45	19:57:29	0:12:44	18	1	1	
↑ Times entered are Zulu / GMT ↑				###########	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/16/2015	Day of Year 350	Mission Name / Job # 75556 Block 5

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH- #### ☒	268	9:30	15:30
Pilot			Hobbs End	Local End Time	Zulu End Time
Swain			273	2:12	20:12

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
34	S	15:51	16:05:16	0:13:42	16	1	1	
33	N	16:08:08	16:20:47	0:12:39	16	1	1	
32	S	16:23:40	16:37:06	0:13:26	13	1	1	
31	N	16:40:05	16:52:19	00:12:14	14	1	1	
30	S	16:55:06	17:07:39	0:12:33	16	1	1	
29	N	17:10:34	17:22:50	0:12:16	17	1	1	
28	S	17:25:20	17:37:48	0:12:24	16	1	1	Haze moving in.
27	N	17:40:30	17:52:44	0:12:14	16	1	1	Haze
26	S	17:55:17	18:07:38	0:12:21	17	1	1	Haze
25	N	18:10:30	18:22:37	0:12:07	17	1	1	
24	S	18:25:06	18:37:22	0:12:18	17	1	1	nsor Error. Forgot to do 360's after it die
22	S	19:10:07	19:22:32	0:12:25	16	1	1	clouds at 12.5/20.0 nmi refly
23	N	19:25:44	19:37:54	0:12:10	17	1	1	
21	S	19:42:13	19:51:26	0:09:13	16	1	1	clouds forming
↑ Times entered are Zulu / GMT ↑				###########	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY	Day of Year	Mission Name / Job #
	12/17/2015	351	75556 Block 5

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N604CP ☐ N111SD ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH- #### ☒	273	6:05	15:30
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			277	10:04	4:04

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
19	S	0:27	0:36:41	0:09:10	17	1	1	
20	N	0:39:50	0:48:58	0:09:08	13	1	1	
17	S	0:51:41	1:00:56	0:09:15	13	1	1	
18	N	1:03:56	1:13:04	00:09:08	15	1	1	
15	S	1:15:36	1:24:48	0:09:12	15	1	1	
16	N	1:27:36	1:36:49	0:09:13	15	1	1	
13	S	1:39:16	1:48:31	0:09:15	16	1	1	
14	N	1:51:16	2:00:27	0:09:11	16	1	1	
11	S	2:02:54	2:12:16	0:09:20	15	1	1	
12	N	2:14:53	2:24:09	0:09:17	16	1	1	
9	S	2:29:24	2:34:45	0:05:21	18	1	1	
10	N	2:37:33	2:42:51	0:05:18	19	1	1	
7	S	2:45:24	2:50:41	0:05:17	19	1	1	
8	N	2:53:40	2:58:58	0:05:18	19	1	1	
5	S	3:02:22	3:05:42	0:03:20	17	1	1	
6	N	3:08:35	3:13:55	0:05:20	17	1	1	
3	S	3:17:13	3:20:33	0:03:20	15	1	2	
4	N	3:23:12	3:26:30	0:03:28	15	1	2	
1	S	3:28:47	3:32:07	0:03:20	15	1	2	
2	N	3:34:05	3:38:18	0:04:13	16	1	1	or *Sensor has stopped recording raw da
22	S	3:45:06	3:47:37	0:02:21	16	1	1	Reflew Section from yesterday
↑ Times entered are Zulu / GMT ↑				########### Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY 12/19/2015	Day of Year 353	Mission Name / Job # 75556 Block 5 and 6

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-#### ☒	277	8:55	14:55
Pilot: Swain			Hobbs End: 282	Local End Time: 1:55	Zulu End Time: 19:55

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KCSV

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain: Course/Up ___ Fine/Down ___	Mode: Single ☐ Multi ☐ 2+2 ☐ 4+3 ☐
40	50	272	100		

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
		Block 5						
2	S	15:19:09	15:22:28	0:03:19	15	1	1	
112	E	15:27:27	15:36:44	0:09:17	15	1	1	
		Block 6						
37	S	16:14:06	16:27:06	0:13:00	14	1	1	
36	N	16:29:40	16:44:11	0:14:31	15	1	1	
35	S	16:46:41	16:58:52	0:12:11	17	1	1	
34	N	17:02:35	17:16:52	0:14:17	17	1	1	
33	S	17:19:08	17:32:19	0:13:11	18	1	1	
32	N	17:35:08	17:49:04	0:13:57	18	1	1	
31	S	17:51:18	18:04:21	0:13:03	21	1	1	
30	N	18:06:54	18:20:45	0:13:51	20	1	1	
29	S	18:22:51	18:36:00	0:13:09	21	1	1	
28	N	18:38:07	18:52:17	0:14:10	21	1	1	
27	S	18:54:38	19:07:41	0:13:03	19	1	1	
26	N	19:10:05	19:23:35	0:13:30	20	1	1	
25	S	19:26:20	19:39:35	0:13:15	19	1	1	
↑ Times entered are Zulu / GMT ↑				########## Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY: 12/20/2015	Day of Year: 354	Mission Name / Job #: 75556 Block 10

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N111SD ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' #### ☒	287	12:05	18:05
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			291	4:05	22:05

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID
	Yes ☐ No ☒	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	Arriving ICAO
	+10							KMMI	KCSV

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	,900-7,00 Ft	Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes ☒ No ☐
		Block 10						
72	NE	20:28:18	20:30:08		19	1	1	
73	SW	20:33:26	20:35:10		19	1	1	
74	N	20:39:23	20:40:46		19	1	1	
75	S	20:43:45	20:45:25		19	1	1	
76	N	20:48:16	20:49:57		20	1	1	
77	S	20:52:36	20:54:20		20	1	1	
78	N	20:57:16	20:58:58		21	1	1	
79	S	21:01:51	21:03:35		21	1	1	
80	N	21:06:37	21:08:18		21	1	1	
81	S	21:11:03	21:12:47		22	1	1	
45	N	21:16:55	21:21:44		22	1	1	
44	S	21:24:15	21:29:24		20	1	1	
43	N	21:31:44	21:36:33		20	1	1	
42	S	21:39:17	21:44:24		19	1	1	
41	N	21:46:41	21:51:31		18	1	1	
		↑ Times entered are Zulu / GMT ↑		0	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #1

Leica ALS	MM/DD/YYYY: 12/20/2015	Day of Year: 354	Mission Name / Job #: 75556 Block 10

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-8888 ☒	287	12:05	18:05
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			—.-	—.-	— —

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KMMI
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KMMI
	+10							Arriving ICAO	KCSV

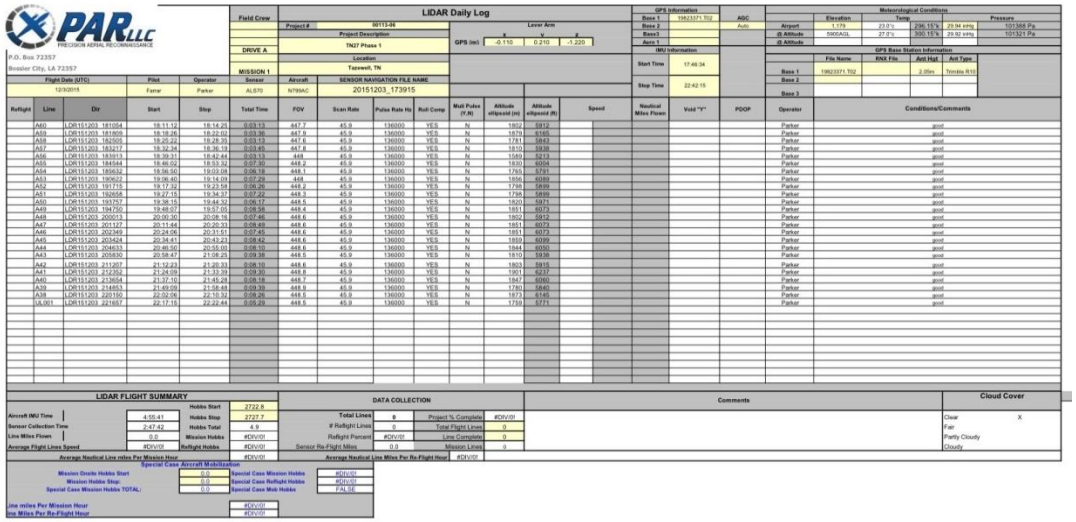
Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	8,900 Ft	Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
		Block 10						
46	NE	18:24:12	18:26:26		23	1	1	
47	SW	18:28:43	18:31:22		23	1	1	
48	NE	18:33:42	18:36:16		23	1	1	
49	SW	18:38:48	18:41:29		23	1	1	
50	S	18:43:49	18:44:27		22	1	1	
51	N	18:47:22	18:48:03		21	1	1	
52	S	18:51:57	18:53:31		21	1	1	
53	N	18:56:17	18:57:50		21	1	1	
54	S	19:00:27	19:02:05		21	1	1	
55	N	19:04:56	19:06:41		20	1	2	
56	S	19:09:40	19:11:38		20	1	2	
57	N	19:14:55	19:17:00		20	1	1	
58	S	19:19:27	19:21:39		18	1	1	
59	N	19:24:35	19:26:47		20	1	1	
60	S	19:29:42	19:32:04		20	1	1	
61	N	19:35:07	19:37:13		20	1	1	
62	S	19:40:18	19:42:19		21	1	1	
63	N	19:45:59	19:46:56		21	1	1	
64	NE	19:48:45	19:49:19		20	1	1	
65	SW	19:52:24	19:53:30		19	1	1	
66	NE	19:56:28	19:58:18		20	1	1	
67	SW	20:01:31	20:03:50		21	1	1	
68	NE	20:06:57	20:09:14		21	1	1	
69	SW	20:12:30	20:14:57		22	1	1	
70	NE	20:17:49	20:19:53		20	1	1	
71	SW	20:23:10	20:25:23		20	1	1	
↑ Times entered are Zulu / GMT ↑				0 Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

Field Crew			
	Project #	06113-06	
	Project Description		
DRIVE A	TN27 Phase 1		
	Location		
MISSION 1	Tazewell, TN		

Lever Arm: X / Y / Z — GPS (m): -0.110 / 0.210 / -1.220

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME
12/3/2015	Ferrar	Parker	ALS70	N799AC	20151203_173915

GPS Information: Base 1 1962371.T02; Base 2; Base3; Aero 1
IMU Information: Start Time 17:46:34; Stop Time 22:42:15
AGC: Auto

Meteorological Conditions

	Elevation	Temp	Pressure
Airport	1,179	23.0 °c	29K 15"k 29.94 inHg 1013368 Pa
d) Altitude	5900AGL	27.0 °c	30K 15"k 29.92 inHg 1013321 Pa
d) Altitude			

GPS Base Station Information

	File Name	RNX File	Ant Hgt	Ant Type
Base 1	1962371.T02		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Multi Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	A60	LDR151203_181054	18:11:12	18:14:25	0:03:13	447.7	45.9	136000	YES	N	1802	5912					Parker	good
	A59	LDR151203_181809	18:18:26	18:22:02	0:03:36	447.6	45.9	136000	YES	N	1879	6165					Parker	good
	A58	LDR151203_182505	18:25:22	18:28:35	0:03:13	447.6	45.9	136000	YES	N	1781	5843					Parker	good
	A57	LDR151203_183217	18:32:34	18:36:19	0:03:45	447.8	45.9	136000	YES	N	1810	5938					Parker	good
	A56	LDR151203_183913	18:39:31	18:42:44	0:03:13	448	45.9	136000	YES	N	1589	5213					Parker	good
	A55	LDR151203_184544	18:46:02	18:53:32	0:07:30	448.2	45.9	136000	YES	N	1830	6004					Parker	good
	A54	LDR151203_185632	18:56:50	19:03:08	0:06:18	448.1	45.9	136000	YES	N	1745	5791					Parker	good
	A53	LDR151203_190632	19:06:40	19:14:09	0:07:29	448	45.9	136000	YES	N	1816	6089					Parker	good
	A52	LDR151203_191715	19:17:32	19:23:58	0:06:26	448.2	45.9	136000	YES	N	1798	5899					Parker	good
	A51	LDR151203_192658	19:27:15	19:34:37	0:07:22	448.3	45.9	136000	YES	N	1796	5899					Parker	good
	A50	LDR151203_193757	19:38:15	19:44:32	0:06:17	448.5	45.9	136000	YES	N	1820	5971					Parker	good
	A49	LDR151203_194750	19:48:07	19:57:05	0:08:58	448.4	45.9	136000	YES	N	1851	6073					Parker	good
	A48	LDR151203_200013	20:00:30	20:08:16	0:07:46	448.6	45.9	136000	YES	N	1802	5912					Parker	good
	A47	LDR151203_201127	20:11:44	20:20:33	0:08:49	448.6	45.9	136000	YES	N	1851	6073					Parker	good
	A46	LDR151203_202349	20:24:06	20:31:51	0:07:45	448.6	45.9	136000	YES	N	1851	6073					Parker	good
	A45	LDR151203_203424	20:34:41	20:43:23	0:08:42	448.6	45.9	136000	YES	N	1859	6099					Parker	good
	A44	LDR151203_204633	20:46:50	20:55:00	0:08:10	448.6	45.9	136000	YES	N	1844	6050					Parker	good
	A43	LDR151203_205830	20:58:47	21:06:25	0:09:38	448.6	45.9	136000	YES	N	1810	5938					Parker	good
	A42	LDR151203_211207	21:12:23	21:20:33	0:08:10	448.6	45.9	136000	YES	N	1803	5915					Parker	good
	A41	LDR151203_212352	21:24:09	21:33:39	0:09:30	448.8	45.9	136000	YES	N	1901	6237					Parker	good
	A40	LDR151203_213654	21:37:10	21:45:28	0:08:18	448.7	45.9	136000	YES	N	1847	6060					Parker	good
	A39	LDR151203_214853	21:49:09	21:58:48	0:09:39	448.8	45.9	136000	YES	N	1780	5840					Parker	good
	A38	LDR151203_220150	22:02:06	22:10:32	0:08:26	448.5	45.9	136000	YES	N	1873	6145					Parker	good
	UL001	LDR151203_221657	22:17:16	22:22:44	0:05:28	448.5	45.9	136000	YES	N	1759	5771					Parker	good

LIDAR FLIGHT SUMMARY

	Hobbs Start	2722.8	
Aircraft INU Time	4:55:41	Hobbs Stop	2727.7
Sensor Collection Time	2:47:42	Hobbs Total	4.9
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	#DIV/0!	Reflight Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour			#DIV/0!

DATA COLLECTION

Total Lines	9	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	9
Reflight Percent	#DIV/0!	Line Complete	9
Sensor Re-Flight Miles	0.0	Mission Lines	9
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour		#DIV/0!	
Line Miles Per Re-Flight Hour		#DIV/0!	

PAR LLC
LIDAR Daily Log
Field Crew
Flight #
Project Number:
TN27 Phase 1
DRIVE A
Location:
Teanwd, TN
MISSION 2
Aircraft
N1911B
SENSOR NAVIGATION FILE NAME:
20151203_234200
GPS (sec)
Lever Arm
GPS Information
Base 1
Base 2
Base 3
Aero 1
IMU Information
Start Time
Stop Time
Airport
Elevation
Meteorological Conditions
Pressure
Flight Date (EST)
Pilot
Operator
Sensor
Total Time
POV
Scan Rate
Pulse Rate Hz
Roll Comp
Roll Pulse Per Line
Altitude (Meters)
Speed
Number Min Pass
Void "V"
PDOP
Operator
File Name
GPS Pass Satellites
Alt Type
Conditions/Comments
Refuge
Line
Div
Start
Stop
Parker
Aa 870
4/Helic
12/2015
Parker
Parker
Parker
Parker
Parker
LIDAR FLIGHT SUMMARY
Hobbs Start
Hobbs Stop
Hobbs Total
Meter Total
Refuel Hobbs
Aircraft MX Time
Aircraft Hobbs Time
Line Miles Flown
Average Flight Lines Speed
DATA COLLECTION
Total Lines
# of Full Lines
Reflight Flown
Sensor Re-Flight Miles
Project % Complete
Total Flight Lines
Total Line Miles
Mission Lines
Average Nautical Line miles Per Mission Hour
Aircraft Maintenance
Mission Ovrds Hobbs Start
Mission Ovrds Hobbs Stop
Special Case Mission Hobbs
Special Case Mins Hobbs
Line miles Per Mission Hour
Line Miles Per Re-Flight Hour
Comments
Cloud Cover
Clear
Fair
Partly Cloudy
Cloudy

United States Geological Survey
June 2016

PAR LLC
P.O. Box 73357
Bossier City, LA 71357

LIDAR Daily Log

Field Crew	
Project #	16TI126
Project Name	TN27 Phase 1
GPS Units	-0.110 to -0.210
Lever Arm	x: y: z:
DRIVE A	
Location	Yaswell, TN
MISSION 3	
Aircraft	N74WC
SENSOR NAVIGATION FILE NAME	2017-2104_142-1640

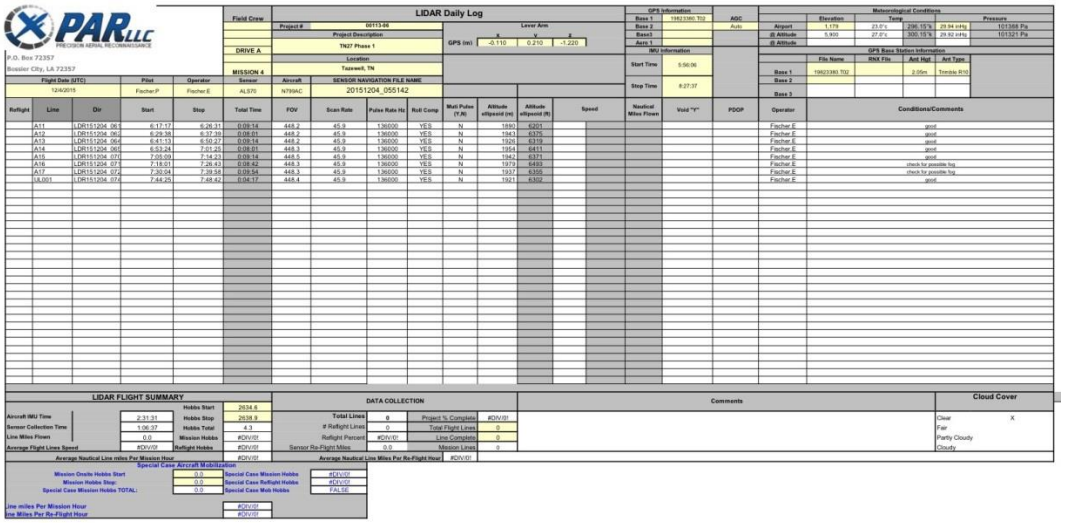
GPS Antennas	
Base 1	1992330.702
Base 2	
Base 3	
Aux 1	
INU Information	
Start Time	2:20:36AM
Stop Time	5:26:19

Airports	
Airport	4,179
# Airports	3566ft
# Aircraft	1

Meteorological Conditions		
	Start	Finish
Temp	21°c	27°c
Wind	286.15°k	297.15°k
Pressure	29.94 inHg	29.54 inHg
	101348 Pa	101181 Pa

GPS & Base Station Filenames			
	File Name	GPS Rate	Start Time
Base 1	1992330.702	2.00m	Throttle 830
Base 2			
Base 3			

| Flight Data (ATS) | | |



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 73357
Bossier City, LA 72357

LIDAR Daily Log

Field Crew			
DRIVE A			
MISSION 4			

Project #	00113-06
Project Description	TN27 Phase 1
Location	Tazewell, TN

Lever Arm

	x	y	z
GPS (m)	-0.110	0.210	-1.220

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME
12/4/2015	Fischer.P	Fischer.E	ALS70	N799AC	20151204_055142

GPS Information

Base 1	19823380.T02	ADC	
Base 2		Auto	
Base3			
Aero 1			

INU Information

Start Time	5:56:06
Stop Time	8:27:37

Meteorological Conditions

	Elevation	Temp		Pressure	
Airport	1,179	23.0°c	296.15°k	29.94 inHg	101358 Pa
@ Altitude	5,900	27.0°c	300.15°k	29.92 inHg	101321 Pa
@ Altitude					

GPS Base Station Information

	File Name	RNX File	Ant Hgt	Ant Type
Base 1	19823380.T02		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Multi Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	A11	LDR151204_061	6:17:17	6:26:31	0:09:14	448.2	45.9	136000	YES	N	1880	6201					Fischer.E	good
	A12	LDR151204_062	6:29:38	6:37:39	0:08:01	448.2	45.9	136000	YES	N	1943	6375					Fischer.E	good
	A13	LDR151204_063	6:41:13	6:50:27	0:09:14	448.2	45.9	136000	YES	N	1926	6319					Fischer.E	good
	A14	LDR151204_065	6:53:24	7:01:25	0:08:01	448.3	45.9	136000	YES	N	1954	6411					Fischer.E	good
	A15	LDR151204_071	7:05:09	7:14:23	0:09:14	448.5	45.9	136000	YES	N	1942	6371					Fischer.E	good
	A16	LDR151204_073	7:18:01	7:26:43	0:08:42	448.3	45.9	136000	YES	N	1979	6493					Fischer.E	check for possible fog
	A17	LDR151204_072	7:30:04	7:39:58	0:09:54	448.3	45.9	136000	YES	N	1937	6355					Fischer.E	check for possible fog
	GL001	LDR151204_074	7:44:25	7:48:42	0:04:17	448.4	45.9	136000	YES	N	1921	6302					Fischer.E	good

LIDAR FLIGHT SUMMARY

		Hobbs Start	2634.6
Aircraft INU Time	2:31:31	Hobbs Stop	2638.9
Sensor Collection Time	1:06:37	Hobbs Total	4.3
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	#DIV/0!	Reflight Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour			#DIV/0!

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour			#DIV/0!
Line Miles Per Re-Flight Hour			#DIV/0!

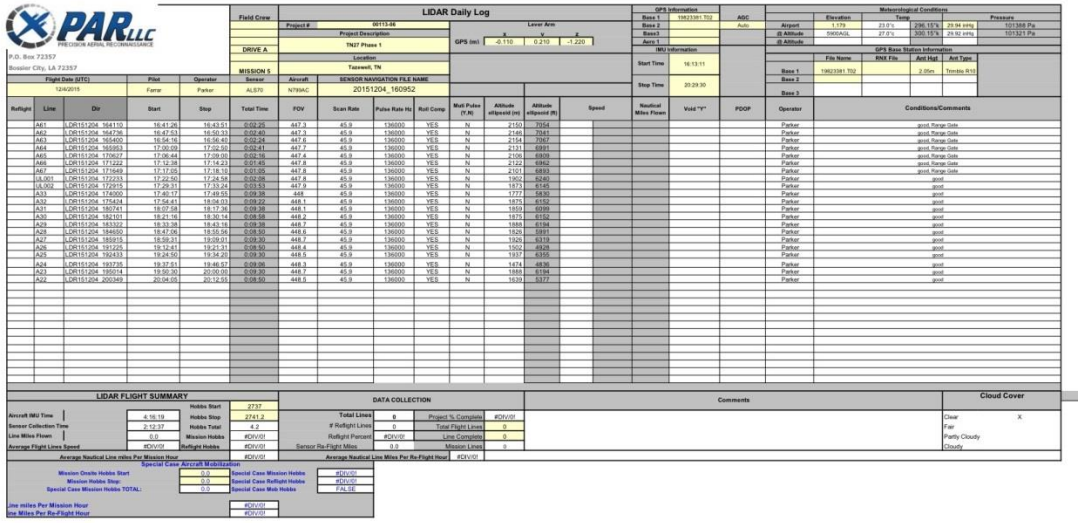
DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

Field Crew			
Pilot	Operator	Sensor	
Farrar	Parker	ALS70	

Project #	00113-06
Project Description	TN27 Phase 1
DRIVE A	
Location	Tazewell, TN
MISSION 5	

Lever Arm

	X	Y	Z
GPS (m)	-0.110	0.210	-1.220

Flight Date (UTC)	Aircraft	SENSOR NAVIGATION FILE NAME
12/4/2015	N799AC	20151204_160952

GPS Information

Base 1	19823381.T02	AGC
Base 2		Auto
Base3		
Aero 1		

IMU Information

Start Time	16:13:11
Stop Time	20:29:30

Meteorological Conditions

	Elevation	Temp		Pressure
Airport	1,179	23.0 's	296.15°k	29.94 inHg	101358 Pa
@ Altitude	5900AGL	27.0 's	300.15°k	29.92 inHg	101321 Pa
@ Altitude				

GPS Base Station Information

	File Name	RINEX File	Ant Hgt	Ant Type
Base 1	19823381.T02		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Mult Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	A61	LDR151204_164110	16:41:26	16:43:51	0:02:25	447.3	45.9	136000	YES	N	2150	7054					Parker	good, Range Gate
	A62	LDR151204_164736	16:47:53	16:50:33	0:02:40	447.3	45.9	136000	YES	N	2146	7041					Parker	good, Range Gate
	A63	LDR151204_165400	16:54:16	16:56:40	0:02:24	447.6	45.9	136000	YES	N	2154	7067					Parker	good, Range Gate
	A64	LDR151204_165953	17:00:09	17:02:50	0:02:41	447.7	45.9	136000	YES	N	2131	6991					Parker	good, Range Gate
	A65	LDR151204_170627	17:06:44	17:09:00	0:02:16	447.4	45.9	136000	YES	N	2106	6909					Parker	good, Range Gate
	A66	LDR151204_171222	17:12:38	17:14:23	0:01:45	447.8	45.9	136000	YES	N	2122	6962					Parker	good, Range Gate
	A67	LDR151204_171649	17:17:05	17:18:10	0:01:05	447.8	45.9	136000	YES	N	2101	6893					Parker	good, Range Gate
	UL001	LDR151204_172233	17:22:50	17:24:58	0:02:08	447.8	45.9	136000	YES	N	1902	6240					Parker	good
	UL002	LDR151204_172915	17:29:31	17:33:24	0:03:53	447.9	45.9	136000	YES	N	1873	6145					Parker	good
	A33	LDR151204_174000	17:40:17	17:49:55	0:09:38	448	45.9	136000	YES	N	1777	5830					Parker	good
	A32	LDR151204_175424	17:54:41	18:04:03	0:09:22	448.1	45.9	136000	YES	N	1875	6152					Parker	good
	A31	LDR151204_180741	18:07:58	18:17:36	0:09:38	448.1	45.9	136000	YES	N	1859	6099					Parker	good
	A30	LDR151204_182101	18:21:16	18:30:14	0:08:58	448.2	45.9	136000	YES	N	1875	6152					Parker	good
	A29	LDR151204_183322	18:33:38	18:43:16	0:09:38	448.7	45.9	136000	YES	N	1886	6184					Parker	good
	A28	LDR151204_184650	18:47:06	18:55:56	0:08:50	448.6	45.9	136000	YES	N	1826	5991					Parker	good
	A27	LDR151204_185915	18:59:31	19:09:01	0:09:30	448.7	45.9	136000	YES	N	1926	6319					Parker	good
	A26	LDR151204_191225	19:12:41	19:21:31	0:08:50	448.4	45.9	136000	YES	N	1002	4928					Parker	good
	A25	LDR151204_192433	19:24:50	19:34:20	0:09:30	448.5	45.9	136000	YES	N	1937	6355					Parker	good
	A24	LDR151204_193735	19:37:51	19:46:57	0:09:06	448.3	45.9	136000	YES	N	1474	4836					Parker	good
	A23	LDR151204_195014	19:50:30	20:00:00	0:09:30	448.7	45.9	136000	YES	N	1886	6184					Parker	good
	A22	LDR151204_200349	20:04:05	20:12:55	0:08:50	448.5	45.9	136000	YES	N	1839	6377					Parker	good

LIDAR FLIGHT SUMMARY

		Hobbs Start	2737
Aircraft IMU Time	4:16:19	Hobbs Stop	2741.2
Sensor Collection Time	2:12:37	Hobbs Total	4.2
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	#DIV/0!	Reflight Hobbs	#DIV/0!

Average Nautical Line miles Per Mission Hour: #DIV/0!

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE

Line miles Per Mission Hour: #DIV/0!
Line Miles Per Re-Flight Hour: #DIV/0!

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Completed	0
Sensor Re-Flight Miles	0.0	Mission Lines	0

Average Nautical Line Miles Per Re-Flight Hour: #DIV/0!

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	

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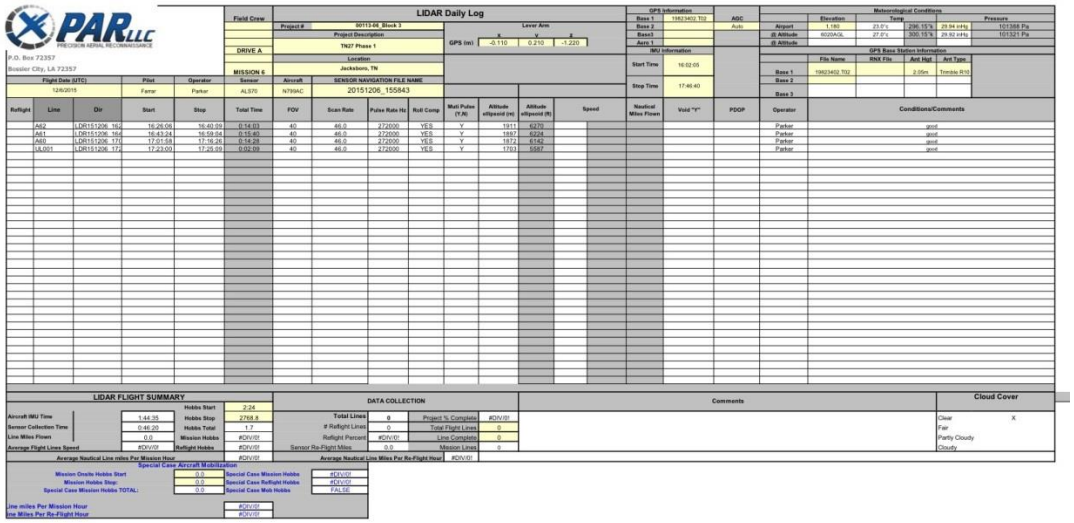
AERIAL MAPPING SPECIALISTS
P.O. Box 73357
Bossier City, LA 71357

LIDAR Daily Log

| Field Crew | | | | Project # | | 181134 | | | |



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PRECISION AERIAL RECONNAISSANCE
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Bossier City, LA 72357

LIDAR Daily Log

Field Crew			
	Project #	90113-06_Block 3	
	Project Description	TN27 Phase 1	
DRIVE A	Location	Jacksboro, TN	
MISSION 6			

Lever Arm: X 0.110, Y 0.210, Z -1.220 (GPS (m))

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME
12/6/2015	Ferrar	Parker	ALS70	N799AC	20151206_155843

GPS Information		ADC
Base 1	19823402.T02	
Base 2		Auto
Base3		
Aero 1		
@ Altitude		

INU Information	
Start Time	16:02:05
Stop Time	17:46:40

Meteorological Conditions		Temp		Pressure
	Elevation			
Airport	1,180	23.0°c	296.15°k	29.84 inHg / 1013.66 Pa
@ Altitude	6020AGL	27.0°c	300.15°k	29.92 inHg / 1013.21 Pa
@ Altitude				

GPS Base Station Information	File Name	RINX File	Ant Hgt	Ant Type
Base 1	19823402.T02		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Multi Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Valid "Y"	PDOP	Operator	Conditions/Comments
	AE2	LDR151206_162	16:26:06	16:40:09	0:14:03	40	46.0	272000	YES	Y	1911	6270					Parker	good
	AE1	LDR151206_164	16:43:24	16:59:04	0:15:40	40	46.0	272000	YES	Y	1897	6224					Parker	good
	AE0	LDR151206_170	17:01:58	17:16:26	0:14:28	40	46.0	272000	YES	Y	1872	6142					Parker	good
	LIL001	LDR151206_172	17:23:00	17:25:09	0:02:09	40	46.0	272000	YES	Y	1703	5587					Parker	good

LIDAR FLIGHT SUMMARY

		Hobbs Start	2:24	
Aircraft IMU Time	1:44.35	Hobbs Stop	2768.8	
Sensor Collection Time	0:46.20	Hobbs Total	1.7	
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!	
Average Flight Lines Speed	#DIV/0!	Reflight Hobbs	#DIV/0!	
Average Nautical Line miles Per Mission Hour			#DIV/0!	

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

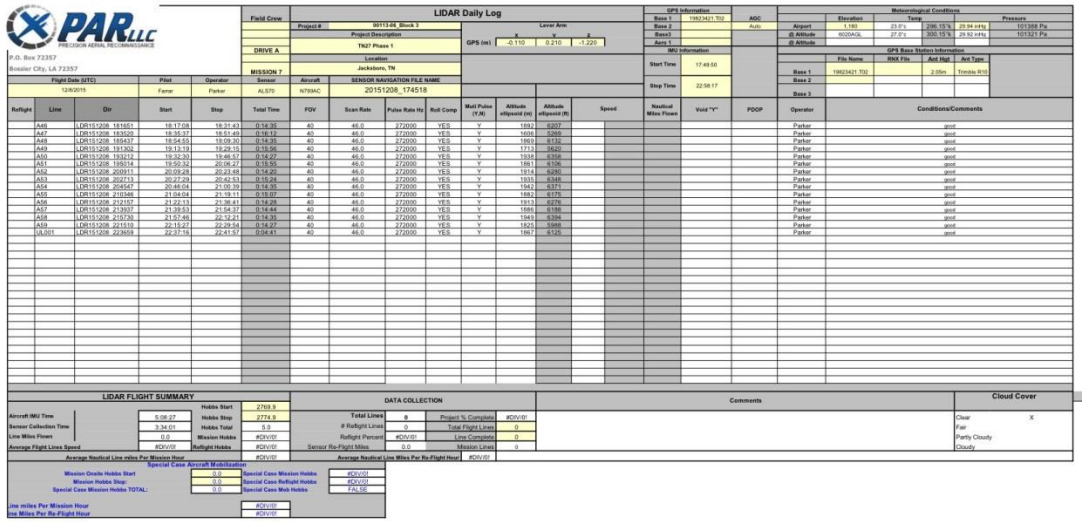
Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour		#DIV/0!	
Line Miles Per Re-Flight Hour		#DIV/0!	



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PRECISION AERIAL RECONNAISSANCE
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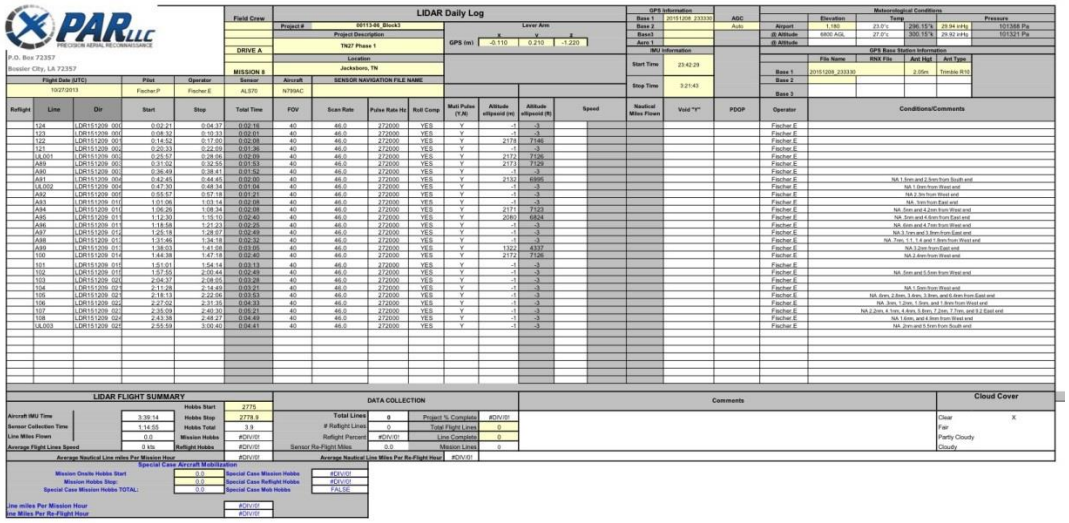
Bossier City, LA 72357

LIDAR Daily Log

| | | |



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Boosler City, LA 72357

LIDAR Daily Log

Field Crew			
	Project #	00113-06_Block3	
	Project Description		
	TN27 Phase 1		
DRIVE A	Location		
	Jacksboro, TN		
MISSION 8	Aircraft	SENSOR NAVIGATION FILE NAME	

Lever Arm: x / y / z — GPS (m): -0.110 / 0.210 / -1.220

Flight Date (UTC)	Pilot	Operator	Sensor
10/27/2013	Fischer,P	Fischer,E	ALS70

GPS Information: Base 1 — 20151208_233330; Base 2; Base3; Aero 1; ADC: Auto

IMU Information: Start Time 23:42:29; Stop Time 3:21:43

Meteorological Conditions

	Elevation	Temp	Pressure
Airport	1,180	23.0°c / 296.15°k	29.94 inHg / 101368 Pa
@ Altitude	6800 AGL	27.0°c / 300.15°k	29.92 inHg / 101321 Pa
@ Altitude			

GPS Base Station Information

	File Name	RINX File	Ant Hgt	Ant Type
Base 1	20151208_233330		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Multi Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	124	LDR151209_00(	0:02:21	0:04:37	0:02:16	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	123	LDR151209_00(	0:08:32	0:10:33	0:02:01	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	122	LDR151209_00(	0:14:52	0:17:00	0:02:08	40	46.0	272000	YES	Y	2178	7146					Fischer,E	
	121	LDR151209_002	0:20:33	0:22:09	0:01:36	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	UL001	LDR151209_00(	0:25:57	0:28:06	0:02:09	40	46.0	272000	YES	Y	2172	7126					Fischer,E	
	A89	LDR151209_00(	0:31:02	0:32:55	0:01:53	40	46.0	272000	YES	Y	2171	7129					Fischer,E	
	A90	LDR151209_00(	0:36:49	0:38:41	0:01:52	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	A91	LDR151209_00(	0:42:45	0:44:45	0:02:00	40	46.0	272000	YES	Y	2132	6995					Fischer,E	NA 1.9nm and 2.5nm from South end
	UL002	LDR151209_00(	0:47:30	0:49:34	0:01:04	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 1.9nm from West end
	A92	LDR151209_00(	0:53:57	0:57:18	0:01:21	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 1.9n from West end
	A93	LDR151209_010	1:01:06	1:03:14	0:02:08	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 1nm from East end
	A94	LDR151209_01(	1:06:26	1:08:34	0:02:08	40	46.0	272000	YES	Y	2171	7123					Fischer,E	NA .5nm and 4.2nm from West end
	A95	LDR151209_011	1:12:30	1:15:10	0:02:40	40	46.0	272000	YES	Y	2080	6824					Fischer,E	NA .5nm and 4.6nm from East end
	A96	LDR151209_01:	1:18:58	1:21:23	0:02:25	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA .6nm and 4.7nm from West end
	A97	LDR151209_01:	1:25:18	1:28:07	0:02:49	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 3.1nm and 3.9nm from East end
	A98	LDR151209_01:	1:31:46	1:34:18	0:02:32	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 7nm, 1.1, 1.4 and 1.9nm from West end
	A99	LDR151209_01:	1:38:03	1:41:08	0:03:05	40	46.0	272000	YES	Y	1322	4337					Fischer,E	NA 3.2nm from East end
	100	LDR151209_01(	1:44:39	1:47:18	0:02:40	40	46.0	272000	YES	Y	2172	7126					Fischer,E	NA 2.4nm from West end
	101	LDR151209_01(	1:51:01	1:54:14	0:03:13	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	102	LDR151209_01(	1:57:55	2:00:44	0:02:49	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA .5nm and 5.5nm from West end
	103	LDR151209_02(	2:04:37	2:08:05	0:03:28	40	46.0	272000	YES	Y	-1	-3					Fischer,E	
	104	LDR151209_02(	2:11:28	2:14:49	0:03:21	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 1.9nm from West end
	105	LDR151209_02(	2:18:13	2:22:06	0:03:53	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA .6nm, 2.8nm, 3.4nm, 3.9nm, and 6.4nm from East end
	106	LDR151209_02(	2:27:02	2:31:35	0:04:33	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA .5nm, 1.2nm, 1.9nm, and 1.9nm from West end
	107	LDR151209_02(	2:35:09	2:40:30	0:05:21	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 2.2nm, 4.1nm, 4.4nm, 5.6nm, 7.2nm, 7.7nm, and 9.2 East end
	108	LDR151209_02(	2:43:38	2:48:27	0:04:49	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA 1.6nm, and 4.6nm from West end
	UL003	LDR151209_02(	2:55:59	3:00:40	0:04:41	40	46.0	272000	YES	Y	-1	-3					Fischer,E	NA .2nm and 5.5nm from South end

LIDAR FLIGHT SUMMARY

		Hobbs Start	2775
Aircraft IMU Time	3:39:14	Hobbs Stop	2778.9
Sensor Collection Time	1.14:55	Hobbs Total	3.9
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	0 kts	Reflight Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour			#DIV/0!

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour			#DIV/0!
Line Miles Per Re-Flight Hour			#DIV/0!

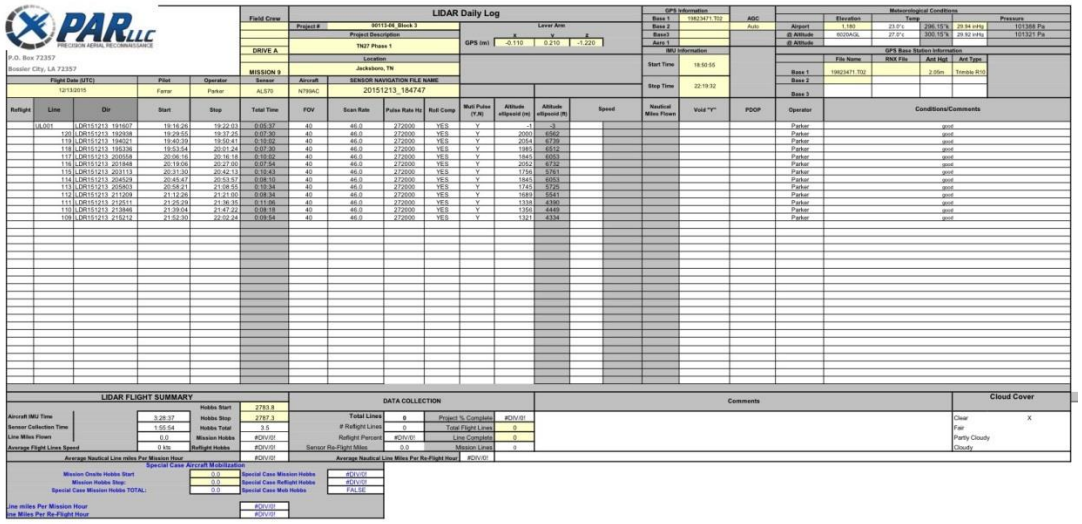
DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

Field Crew		
DRIVE A		
MISSION 9		

Project #	90113-08_Block 3
Project Description	TN27 Phase 1
Location	Jacksboro, TN

Lever Arm

	x	y	z
GPS (m)	-0.110	0.210	-1.220

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME
12/13/2015	Ferrar	Parker	ALS70	N799AC	20151213_184747

GPS Information

		ADC
Base 1	1982/471.702	
Base 2		Auto
Base3		
Aero 1		

IMU Information

Start Time	18:50:55
Stop Time	22:19:32

Meteorological Conditions

	Elevation	Temp		Pressure
Airport	1,180	23.0°c	296.15°k	29.94 inHg	101368 Pa
@ Altitude	6020AGL	27.0°c	300.15°k	29.92 inHg	101321 Pa
@ Altitude					

GPS Base Station Information

	File Name	RNX File	Ant Hgt	Ant Type
Base 1	1982/471.702		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Mult Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	UL001	LDR151213_191607	19:16:26	19:22:03	0:05:37	40	46.0	272000	YES	Y	-1	-3					Parker	good
	120	LDR151213_192938	19:29:55	19:37:25	0:07:30	40	46.0	272000	YES	Y	2001	6562					Parker	good
	119	LDR151213_194021	19:40:39	19:50:41	0:10:02	40	46.0	272000	YES	Y	2054	6739					Parker	good
	118	LDR151213_195336	19:53:54	20:01:24	0:07:30	40	46.0	272000	YES	Y	1983	6512					Parker	good
	117	LDR151213_200558	20:06:16	20:16:18	0:10:02	40	46.0	272000	YES	Y	1845	6053					Parker	good
	116	LDR151213_201848	20:19:06	20:27:00	0:07:54	40	46.0	272000	YES	Y	2052	6732					Parker	good
	115	LDR151213_203113	20:31:30	20:42:13	0:10:43	40	46.0	272000	YES	Y	1756	5761					Parker	good
	114	LDR151213_204529	20:45:47	20:53:57	0:08:10	40	46.0	272000	YES	Y	1845	6053					Parker	good
	113	LDR151213_205803	20:58:21	21:08:55	0:10:34	40	46.0	272000	YES	Y	1745	5725					Parker	good
	112	LDR151213_211209	21:12:26	21:21:00	0:08:34	40	46.0	272000	YES	Y	1689	5541					Parker	good
	111	LDR151213_212511	21:25:29	21:36:35	0:11:06	40	46.0	272000	YES	Y	1338	4390					Parker	good
	110	LDR151213_213946	21:39:04	21:47:22	0:08:18	40	46.0	272000	YES	Y	1356	4449					Parker	good
	109	LDR151213_215212	21:52:30	22:02:24	0:09:54	40	46.0	272000	YES	Y	1321	4334					Parker	good

LIDAR FLIGHT SUMMARY

		Hobbs Start	2783.8
Aircraft IMU Time	3:28:37	Hobbs Stop	2787.3
Sensor Collection Time	1:55:54	Hobbs Total	3.5
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	0 kts	Reflight Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour			#DIV/0!

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour			#DIV/0!
Line Miles Per Re-Flight Hour			#DIV/0!

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	

PAR LLC
Precision Aerial Remote Sensing
P.O. Box 73357
Bossier City, LA 73357

LIDAR Daily Log

Field Crew
Project #: 0211CE_Elev1
Project Phase 1
Task Phase 1
Location:
Jacksboro, TN
SENSOR NAVIGATION FILE NAME:
20151205_164325

Lever Arm: X -0.310, Y 0.270, Z -1.220

GPS Information: Base 1 1903280.702; Base 2; Base 3

INU Information: Start Time 4:41:40; Stop Time 8:33:42

ABC: Auto

Atmospheric Conditions: Pressure: Airport 1,180 (23.5 in); Aircraft 1,200 (27.2 in); @ Altitude 3,500 (27.2 in); Temp: Airport 286.15 K (57.2 F); Aircraft 285.15 K (54.0 F); @ Altitude 274.15 K (34.7 F); Pressure: 101325 Pa; 101325 Pa; 101325 Pa

Flight Date (UTC): 12/5/2015
Flight # | Line | Dir | Pilot: Pilot# | Operator: Trimble E | Start | Stop | Total Time | Aircraft: Sensor: AL70 | N794AL | FOV | Scan Rate | Pulse Rate Hz | Roll Comp | Mult Pulse in Air | Altitude above ground | Altitude above MSL | Speed | Nominal Ride Level | Void "Y" | PDOP | Operator | Conditions/Comments

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Mult Pulse in Air	Altitude above ground	Altitude above MSL	Speed	Void "Y"	PDOP	Operator	Conditions/Comments
	217	LCR1205_05	5:02:44	5:07:27	0:05:13	65	48.0	272000	YES	Y	5323	5483				Fischer E	ame
	A18	LCR1205_06	5:11:05	5:16:20	0:05:54	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A19	LCR1205_07	5:18:40	5:23:41	0:05:41	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A20	LCR1205_08	5:26:12	5:31:31	0:05:59	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A21	LCR1205_09	5:33:31	5:38:17	0:05:13	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A22	LCR1205_10	5:41:03	5:46:12	0:05:43	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A23	LCR1205_11	5:48:53	5:54:34	0:06:17	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A24	LCR1205_12	5:57:04	6:02:25	0:05:56	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A25	LCR1205_13	6:04:29	6:10:35	0:06:42	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A26	LCR1205_14	6:14:21	6:18:36	0:04:45	65	48.0	272000	YES	Y	5441	5498				Fischer E	ame
	A27	LCR1205_15	6:22:14	6:27:27	0:05:48	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A28	LCR1205_16	6:30:11	6:35:23	0:05:47	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A29	LCR1205_17	6:38:05	6:43:20	0:05:50	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A30	LCR1205_18	6:46:01	6:51:21	0:05:56	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A31	LCR1205_19	6:53:35	6:58:57	0:05:57	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A32	LCR1205_20	7:01:31	7:06:50	0:05:54	65	48.0	272000	YES	Y	5391	5547				Fischer E	ame
	A33	LCR1205_21	7:09:27	7:13:38	0:04:46	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A34	LCR1205_22	7:16:58	7:22:20	0:05:57	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A35	LCR1205_23	7:24:47	7:30:06	0:05:54	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A36	LCR1205_24	7:32:36	7:37:52	0:05:51	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A37	LCR1205_25	7:40:24	7:45:38	0:05:49	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A38	LCR1205_26	7:48:13	7:53:26	0:05:48	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A39	LCR1205_27	7:56:01	8:01:15	0:05:49	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A40	LCR1205_28	8:03:49	8:08:59	0:05:45	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A41	LCR1205_29	8:11:37	8:16:54	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A42	LCR1205_30	8:19:25	8:24:42	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A43	LCR1205_31	8:27:13	8:32:30	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A44	LCR1205_32	8:35:01	8:40:18	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A45	LCR1205_33	8:42:49	8:47:58	0:05:44	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A46	LCR1205_34	8:50:37	8:55:54	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A47	LCR1205_35	8:58:25	9:03:42	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame
	A48	LCR1205_36	9:06:13	9:11:30	0:05:52	65	48.0	272000	YES	Y	5441	5594				Fischer E	ame

LIDAR FLIGHT SUMMARY

Aircraft WU Time	3:53:53	Hobbs Start	2748.7
Sensor Collection Time	2:06:26	Hobbs Stop	2753.8
Line Flight Time	1:58:21	Hobbs Total	5.1
Average Flight Lines Board	#DIV/0!	Reflight Hobbs	#DIV/0!

Average Nautical Line miles Per Mission Hour: #DIV/0!

Special Case Mission Hobbs: 0.0
Special Case Mission Hobbs: 0.0
Special Case Mob Hobbs: 0.0

Mission Check Hobbs Start: #DIV/0!
Mission Check Hobbs Stop: #DIV/0!

Line miles Per Mission Hour: #DIV/0!
Sq Miles Per Re-Flight Hour: #DIV/0!

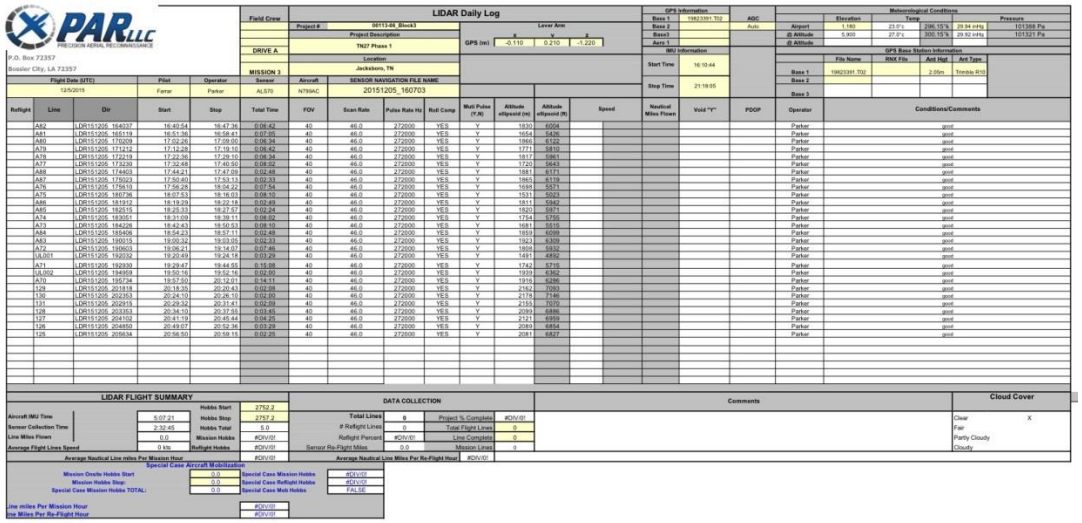
DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Flight Lines	0
Sensor Re-Flight Miles	0.0	Mission Lines	0

Comments

Cloud Cover

Clear	
Part	X
Partly Cloudy	
Cloudy	



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

Field Crew	
DRIVE A	
MISSION 3	

Project #	00113-68_Block3
Project Description	TN27 Phase 1
Location	Jacksboro, TN

Lever Arm

	x	y	z
GPS (m)	-0.110	0.210	-1.220

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME:
12/5/2015	Ferrar	Parker	ALS70	N799AC	20151205_160703

GPS Information

		ADC
Base 1	196233911.T02	
Base 2		Auto
Base3		
Aero 1		

IMU Information

Start Time	16:10:44
Stop Time	21:19:05

Meteorological Conditions

	Elevation	Temp		Pressure
Airport	1,180	23.0°c	296.15°k	29.94 inHg	101368 Pa
@ Altitude	5,900	27.0°c	300.15°k	29.92 inHg	101321 Pa
@ Altitude					

GPS Base Station Information

	File Name	RNX File	Ant Hgt	Ant Type
Base 1	196233911.T02		2.05m	Trimble R10
Base 2				
Base 3				

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Multi Pulse (Y,N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	PDOP	Operator	Conditions/Comments
	A82	LDR151205_164027	16:40:54	16:47:36	0:06:42	40	46.0	272000	YES	Y	1830	6004					Parker	good
	A81	LDR151205_165119	16:51:36	16:58:41	0:07:05	40	46.0	272000	YES	Y	1654	5426					Parker	good
	A80	LDR151205_170209	17:02:26	17:09:00	0:06:34	40	46.0	272000	YES	Y	1965	6122					Parker	good
	A79	LDR151205_171212	17:12:28	17:19:10	0:06:42	40	46.0	272000	YES	Y	1771	5810					Parker	good
	A78	LDR151205_172219	17:22:36	17:29:10	0:06:34	40	46.0	272000	YES	Y	1817	5961					Parker	good
	A77	LDR151205_173230	17:32:48	17:40:50	0:08:02	40	46.0	272000	YES	Y	1720	5643					Parker	good
	A88	LDR151205_174403	17:44:21	17:47:09	0:02:48	40	46.0	272000	YES	Y	1981	6171					Parker	good
	A87	LDR151205_175023	17:50:40	17:53:13	0:02:33	40	46.0	272000	YES	Y	1865	6119					Parker	good
	A76	LDR151205_175613	17:56:28	18:04:22	0:07:54	40	46.0	272000	YES	Y	1698	5571					Parker	good
	A75	LDR151205_180736	18:07:53	18:16:03	0:08:10	40	46.0	272000	YES	Y	1531	5023					Parker	good
	A86	LDR151205_181912	18:19:29	18:22:18	0:02:49	40	46.0	272000	YES	Y	1811	5942					Parker	good
	A85	LDR151205_182515	18:25:33	18:27:57	0:02:24	40	46.0	272000	YES	Y	1920	5971					Parker	good
	A74	LDR151205_183051	18:31:09	18:39:11	0:08:02	40	46.0	272000	YES	Y	1754	5755					Parker	good
	A73	LDR151205_184228	18:42:43	18:50:53	0:08:10	40	46.0	272000	YES	Y	1681	5515					Parker	good
	A84	LDR151205_185406	18:54:23	18:57:11	0:02:48	40	46.0	272000	YES	Y	1859	6099					Parker	good
	A83	LDR151205_190015	19:00:32	19:03:05	0:02:33	40	46.0	272000	YES	Y	1923	6309					Parker	good
	A72	LDR151205_190603	19:06:21	19:14:07	0:07:46	40	46.0	272000	YES	Y	1808	5932					Parker	good
	UL001	LDR151205_192032	19:20:49	19:24:18	0:03:29	40	46.0	272000	YES	Y	1481	4852					Parker	good
	A71	LDR151205_192930	19:29:47	19:44:55	0:15:08	40	46.0	272000	YES	Y	1742	5715					Parker	good
	UL002	LDR151205_194959	19:50:16	19:52:16	0:02:00	40	46.0	272000	YES	Y	1939	6362					Parker	good
	A70	LDR151205_195734	19:57:50	20:12:01	0:14:11	40	46.0	272000	YES	Y	1916	6286					Parker	good
	129	LDR151205_201818	20:18:35	20:20:43	0:02:08	40	46.0	272000	YES	Y	2162	7093					Parker	good
	130	LDR151205_202253	20:24:10	20:26:10	0:02:00	40	46.0	272000	YES	Y	2179	7146					Parker	good
	131	LDR151205_202915	20:29:32	20:31:41	0:02:09	40	46.0	272000	YES	Y	2155	7070					Parker	good
	128	LDR151205_203353	20:34:10	20:37:55	0:03:45	40	46.0	272000	YES	Y	2089	6886					Parker	good
	127	LDR151205_204102	20:41:19	20:45:44	0:04:25	40	46.0	272000	YES	Y	2121	6959					Parker	good
	126	LDR151205_204850	20:49:07	20:52:36	0:03:29	40	46.0	272000	YES	Y	2080	6854					Parker	good
	125	LDR151205_205634	20:56:50	20:59:15	0:02:25	40	46.0	272000	YES	Y	2081	6827					Parker	good

LIDAR FLIGHT SUMMARY

		Hobbs Start	2752.2
Aircraft IMU Time	5:07.21	Hobbs Stop	2757.2
Sensor Collection Time	2:32.45	Hobbs Total	5.0
Line Miles Flown	0.0	Mission Hobbs	#DIV/0!
Average Flight Lines Speed	0 kts	Reflight Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour			#DIV/0!

Special Case Aircraft Mobilization

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop:	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour			#DIV/0!
Line Miles Per Re-Flight Hour			#DIV/0!

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

Cloud Cover

Clear	X
Fair	
Partly Cloudy	
Cloudy	

PAR LLC
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Bossier City, LA 73397

LIDAR Daily Log

Field Crew
Flight #
SITE# & Block
Project Name
TNQ1 Phase 1
DRIVE A
Location
Jacksion, TN
MISSION #
MISSION NAVIGATION FILE NAME
20151005_214053
Aircraft
N14HC
Scan Rate
Pulse Rate Hz
Roll Comp
Roll Plane Pass
Altitude (above msl)
Altitude (above msl)
Speed
Lever Arm
GPS (m)
GPS Information
Base 1
Base 2
Aero 1
IMU Information
Start Time
Stop Time
Normal Mid-Point
Valid "Y"
PDOP
MRC
Airport
El Airfield
El Altitude
Elevation
Meteorological Conditions
File Name
Base 1
Base 2
Base 3
Operator
Conditions/Comments

Flight Date (MTD): 10/5/2015
Pilot: Farve
Operator: Parker

Refligh	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Roll Plane Pass	Altitude (above msl)	Altitude (above msl)	Speed	Normal Mid-Point	Valid "Y"	PDOP	Operator	Conditions/Comments
	A59	LM151005_221458	22:14:58	22:34:54	0:19:56	40	45.0	270000	YES	Y	1725	5659					Parker	strat
	A60	LM151005_221914	22:19:14	22:38:11	0:18:57	40	45.0	270000	YES	Y	1761	5778					Parker	strat
	A62	LM151005_222818	22:28:18	22:47:21	0:19:03	40	45.0	270000	YES	Y	1761	5778					Parker	strat
	A61	LM151005_221908	23:13:42	23:29:28	0:15:46	40	45.0	270000	YES	Y	1901	6241					Parker	strat
	A63	LM151005_223813	23:38:13	23:54:01	0:15:48	40	45.0	270000	YES	Y	1901	6241					Parker	strat
	A64	LM151005_230105	23:51:21	0:06:55	0:14:43	40	45.0	270000	YES	Y	1827	5996					Parker	strat
	A65	LM151006_000000	0:00:00	0:14:34	0:14:34	40	45.0	270000	YES	Y	1827	5996					Parker	strat
	(A.01)	LM151006_002902	0:43:41	0:52:31	0:08:50	40	45.0	270000	YES	Y	1852	6076					Parker	strat

LIDAR FLIGHT SUMMARY

Aircraft Mid Time	2:29:05	Hobbs Start	2757.3	
Aircraft Block Time	1:51	Hobbs Stop	2760.3	
Line Miles Flown	183	Hobbs Total	3.0	
Average Flight Line Speed	#DIV/0!	Refligh Miles	#DIV/0!	
Average Nautical Line miles Per Mission Hour		Aircraft Maintenance	#DIV/0!	

Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs
Mission Onsite Hobbs Stop	0.0	Special Case Mission Hobbs
Special Case Mission Hobbs TOTAL	0.0	Special Case Mob Hobbs
Line miles Per Mission Hour	#DIV/0!	
Line Miles Per Re-Flight Hour	#DIV/0!	

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Re-Flight Lines	0	Total Flight Lines	0
Refligh Percent	#DIV/0!	Total Flight Miles	0
Service Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour		#DIV/0!	

Comments

Cloud Cover

Clear	
Partly Cloudy	X
Cloudy	

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LIDAR Daily Log

Field Crew
Project #: 201512
Project Name: TN27 County QL2 Lidar (Cumberland Plateau)
Task/ Phase #: 1
Location: Jackson, TN
SENSOR NAVIGATION FILE NAME: 20151206_114627
GPS (m): -0.110 | 0.270 | -1.220
Lever Arm: X | Y | Z

GPS Information
Base 1: 1002401.702
Base 2
Base 3
INU Information
Start Time: 1:49:11
Stop Time: 6:50:16

ADC: Auto

Atmospheric Conditions
Temp
Airport: 71.5 | 295.15 K | 2134 mHg | 101268 Pa
Field Data: 77.21 | 298.15 K | 2134 mHg | 101268 Pa
@ Altitude: 4000ft | 277.21 | 280.15 K | 2134 mHg | 101268 Pa

Antenna
File Name: 1002401.702
Base 1
Base 2
Base 3

GPS Base Station Information
Point ID: Antenna Height: Ant Type
2.05m: Trimble SPS

Flight Date (UTC)	Pilot	Operator	Aircraft	Sensor	Mission #	Flight #	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate (Hz)	Roll Comp	Mult Pulse in Air	Altitude (Above Ground)	Altitude (Above MSL)	Speed	Inertial Nav Used	Void "Y"	POOP	Operator	Conditions/Comments
12/6/2015	Pilot	Operator	Aircraft	Sensor	MISSION 5	Flight #	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate (Hz)	Roll Comp	Mult Pulse in Air	Altitude (Above Ground)	Altitude (Above MSL)	Speed	Inertial Nav Used	Void "Y"	POOP	Operator	Conditions/Comments
	Pacha P	Pacha E	AL370	N756AL																				
Refuge	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate (Hz)	Roll Comp	Mult Pulse in Air	Altitude (Above Ground)	Altitude (Above MSL)	Speed	Inertial Nav Used	Void "Y"	POOP	Operator	Conditions/Comments
A33	L12m1326_02		2:20:21	2:45:24	0:13:23	40	46.0	272000	YES	Y	1694	5871					Pacha E	ppd
A34	L12m1326_02		2:45:01	3:02:48	0:13:20	40	46.0	272000	YES	Y	1633	4994					Pacha E	ppd
A35	L12m1326_03		3:02:48	3:20:45	0:13:30	40	46.0	272000	YES	Y	1633	4994					Pacha E	ppd
A36	L12m1326_03		3:23:21	3:38:54	0:13:31	40	46.0	272000	YES	Y	1691	5486					Pacha E	ppd
A37	L12m1326_04		3:38:54	3:56:41	0:13:36	40	46.0	272000	YES	Y	1691	5486					Pacha E	ppd
A38	L12m1326_04		4:01:48	4:19:27	0:13:29	40	46.0	272000	YES	Y	1852	6079					Pacha E	ppd
A39	L12m1326_05		4:19:27	4:34:52	0:13:30	40	46.0	272000	YES	Y	1852	6079					Pacha E	ppd
A40	L12m1326_05		4:38:52	4:54:21	0:13:29	40	46.0	272000	YES	Y	1572	5861					Pacha E	ppd
A41	L12m1326_06		4:54:21	5:11:14	0:13:31	40	46.0	272000	YES	Y	1572	5861					Pacha E	ppd
A42	L12m1326_06		5:11:14	5:28:56	0:13:40	40	46.0	272000	YES	Y	1376	4536					Pacha E	ppd
A43	L12m1326_07		5:28:56	5:43:19	0:13:31	40	46.0	272000	YES	Y	1376	4536					Pacha E	ppd
A44	L12m1326_07		5:53:12	6:09:11	0:13:30	40	46.0	272000	YES	Y	1401	4783					Pacha E	ppd
A45	L12m1326_08		6:09:11	6:24:36	0:13:31	40	46.0	272000	YES	Y	1401	4783					Pacha E	ppd
A46	L12m1326_08		6:24:36	6:42:20	0:13:32	40	46.0	272000	YES	Y	1783	6851					Pacha E	ppd
A33	L12m1326_09		6:42:20		0:13:22	40	46.0	272000	YES	Y	1783	6851					Pacha E	ppd

LIDAR FLIGHT SUMMARY

Aircraft WU Time	5:03:05	Hobbs Start	2769.7
Sensor Collection Time	3:14:05	Hobbs Stop	2783.3
Last Refuge	A33	Hobbs Total	13.6
Average Flight Loss Speed	#DIV/0!	Refuel Hobbs	#DIV/0!
		Refuel Hobbs	#DIV/0!

Average Nautical Line miles Per Mission Hour: #DIV/0!

Special Case Mission Hobbs: 0.0
Special Case Mission Hobbs: 0.0
Special Case Mission Hobbs: 0.0

Line miles Per Mission Hour: #DIV/0!
Sq Miles Per Re-Flight Hour: #DIV/0!

DATA COLLECTION

Total Lines	0	Project % Complete	#DIV/0!
# Refuge Lines	47	Total Flight Lines	0
Refuge Time	#DIV/0!	Total Flight Hours	0
Sensor Re-Flight Miles	0.0	Mission Lines	0

Average Nautical Line Miles Per Re-Flight Hour: #DIV/0!

Comments

Cloud Cover

Clear	
Fair	X
Partly Cloudy	
Cloudy	

PAR LLC
Professional Aerial Resources
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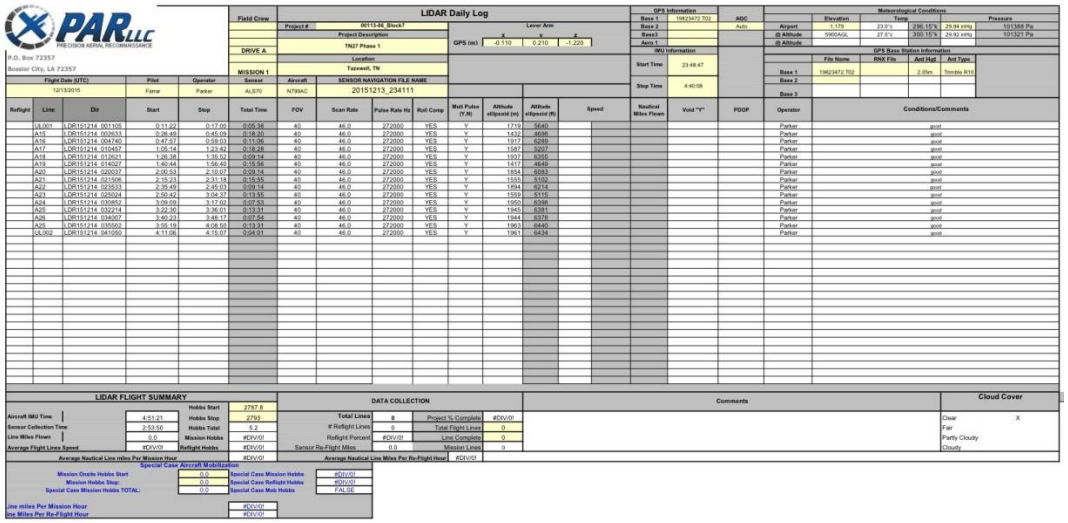
Bossier City, LA 71171

LIDAR Daily Log

Field Crew
Project #
DRIVE A
MISSION 7
Flight Date (UTC)
Operator
Parker
Sensor
ALS70
Aircraft
Cirrus
Location
Talowah, TN
SESSION NAVIGATION FILE NAME
20151212_214146
GPS (sec)
Lever Arm
GPS Information
Base 1
Base 2
Base 3
Airports
Airport
Elevation
Obs
Weather
Aircraft
File Name
AGL Alt
Sensor Description
Ant Type
Flight Line
Dir
Start
Stop
Total Time
FOV
Scan Rate
Pulse Rate (Hz)
Roll Comp
Mid Pulse Freq
Altitude (Meters)
Altitude (Feet)
Speed
Nominal Roll Limit
Yield "Y"
FOOP
Operator
Conditions/Comments

LIDAR FLIGHT SUMMARY
DATA COLLECTION
Comments
Cloud Cover



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PRECISION AERIAL RECONNAISSANCE
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Bossier City, LA 72357

LIDAR Daily Log

Field Crew: DRIVE A
MISSION 1

Project #: 00113-06_Block7
Project Description: TN27 Phase 1
Location: Tazewell, TN

Lever Arm: x | y | z
GPS (m): -0.110 | 0.210 | -1.220

GPS Information: Base 1: 19823472.T02; Base 2; Base3; Aero 1
ADC: Auto
IMU Information: Start Time: 23:48:47; Stop Time: 4:40:08

Meteorological Conditions

	Elevation	Temp	Pressure
Airport	1,179	23.6°c	29.94 inHg / 101388 Pa
@ Altitude	5900AGL	27.6°c	29.92 inHg / 101321 Pa
@ Altitude			

GPS Base Station Information

	File Name	RINX File	Ant Hgt	Ant Type
Base 1	19823472.T02		2.05m	Trimble R10
Base 2				
Base 3				

Flight Date (UTC)	Pilot	Operator	Sensor	Aircraft	SENSOR NAVIGATION FILE NAME
12/13/2015	Farrar	Parker	ALS70	N799AC	20151213_234111

Reflight	Line	Dir	Start	Stop	Total Time	FOV	Scan Rate	Pulse Rate Hz	Roll Comp	Mult Pulse (Y, N)	Altitude ellipsoid (m)	Altitude ellipsoid (ft)	Speed	Nautical Miles Flown	Void "Y"	POOP	Operator	Conditions/Comments
	UL001	LDR151214_001105	0:11:22	0:17:00	0:05:38	40	46.0	272000	YES	Y	1719	5640					Parker	good
	A15	LDR151214_002633	0:26:49	0:45:09	0:18:20	40	46.0	272000	YES	Y	1432	4696					Parker	good
	A16	LDR151214_004740	0:47:57	0:59:03	0:11:06	40	46.0	272000	YES	Y	1917	6289					Parker	good
	A17	LDR151214_010457	1:05:14	1:23:42	0:18:28	40	46.0	272000	YES	Y	1587	5207					Parker	good
	A18	LDR151214_012621	1:26:38	1:36:52	0:09:14	40	46.0	272000	YES	Y	1937	6355					Parker	good
	A19	LDR151214_014027	1:40:44	1:56:40	0:15:56	40	46.0	272000	YES	Y	1417	4649					Parker	good
	A20	LDR151214_020037	2:00:53	2:10:07	0:09:14	40	46.0	272000	YES	Y	1854	6083					Parker	good
	A21	LDR151214_021506	2:15:23	2:31:18	0:15:55	40	46.0	272000	YES	Y	1555	5102					Parker	good
	A22	LDR151214_023533	2:35:49	2:45:03	0:09:14	40	46.0	272000	YES	Y	1894	6214					Parker	good
	A23	LDR151214_025024	2:50:42	3:04:37	0:13:55	40	46.0	272000	YES	Y	1559	5115					Parker	good
	A24	LDR151214_030852	3:09:00	3:17:02	0:07:53	40	46.0	272000	YES	Y	1950	6398					Parker	good
	A25	LDR151214_032214	3:22:30	3:36:01	0:13:31	40	46.0	272000	YES	Y	1945	6381					Parker	good
	A26	LDR151214_034007	3:40:23	3:48:17	0:07:54	40	46.0	272000	YES	Y	1944	6376					Parker	good
	A25	LDR151214_035502	3:55:19	4:08:50	0:13:31	40	46.0	272000	YES	Y	1963	6440					Parker	good
	UL002	LDR151214_041050	4:11:06	4:15:07	0:04:01	40	46.0	272000	YES	Y	1961	6434					Parker	good

LIDAR FLIGHT SUMMARY

Aircraft IMU Time	4:51:21	Hobbs Start	2787.8
Sensor Collection Time	2:53:56	Hobbs Stop	2793
Line Miles Flown	0.0	Hobbs Total	5.2
Average Flight Lines Speed	#DIV/0!	Mission Hobbs	#DIV/0!
Average Nautical Line miles Per Mission Hour	#DIV/0!	Reflight Hobbs	#DIV/0!

Special Case Aircraft Mobilization

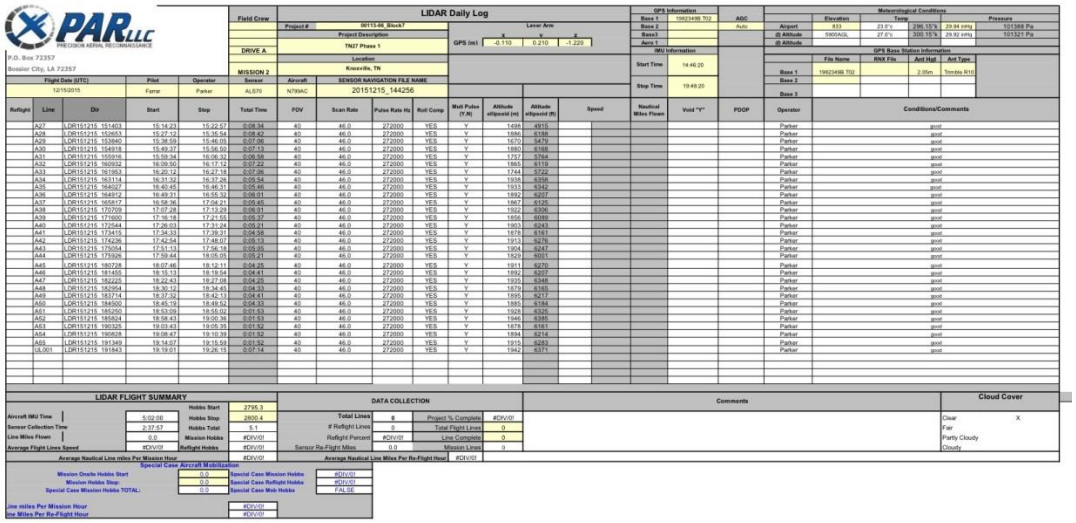
Mission Onsite Hobbs Start	0.0	Special Case Mission Hobbs	#DIV/0!
Mission Hobbs Stop	0.0	Special Case Reflight Hobbs	#DIV/0!
Special Case Mission Hobbs TOTAL:	0.0	Special Case Mob Hobbs	FALSE
Line miles Per Mission Hour		#DIV/0!	
Line Miles Per Re-Flight Hour		#DIV/0!	

DATA COLLECTION

Total Lines	9	Project % Complete	#DIV/0!
# Reflight Lines	0	Total Flight Lines	0
Reflight Percent	#DIV/0!	Line Complete	0
Sensor Re-Flight Miles	0.0	Mission Lines	0
Average Nautical Line Miles Per Re-Flight Hour	#DIV/0!		

Comments

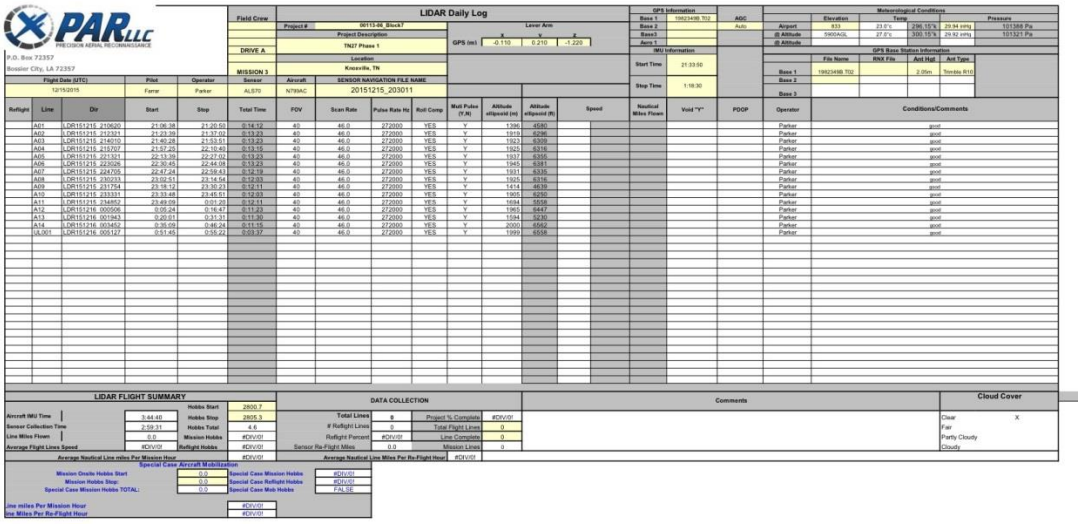
Cloud Cover	
Clear	X
Fair	
Partly Cloudy	
Cloudy	



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

| Field Crew | | |



PAR LLC
PRECISION AERIAL RECONNAISSANCE
P.O. Box 72357
Bossier City, LA 72357

LIDAR Daily Log

| | | |

PAR LLC
LIDAR Daily Log
Field Crew
Project #
SITE# & Block?
Project Phase #
TEST Phase 1
DRIVE #
Location
MISSION #
Knoxville, TN
Aircraft
SESSION NAVIGATION FILE NAME
Sensor
20151216_214917
GPS (sec)
Lever Arm
GPS Information
Base 1
Base 2
Base 3
Weather
Start Time
Stop Time
Airport
Elevation
Temp
Wind
Barometer
Base 1
Base 2
Base 3
Flight Date (DTC)
Pilot
Operator
Flight #
Line
Dir
Start
Stop
Total Time
FOV
Scan Rate
Pulse Rate Hz
Roll Comp
Mid Pulse Pitch
Altitude Pitch
Altitude Altitude (m)
Speed
Nominal Mid Scan
Void +/-°
FOOP
Operator
Conditions/Comments
LIDAR FLIGHT SUMMARY
Aircraft IMU Time
Sensor Collection Time
Line Miles Flown
Average Flight Lines Based
Hobbs Start
Hobbs Stop
Hobbs Total
Mission Hobbs
Budget Hobbs
Average Nautical Line miles Per Mission Hour
Special Ops Aircraft Maintenance
Mission Check Hobbs Start
Mission Check Hobbs Stop
Special Case Mission Hobbs TOTAL:
Line miles Per Mission Hour
Line Miles Per In-Flight Hour
DATA COLLECTION
Total Lines
Hotspot Lines
Total Flight Time
Survey Re-Flight Miles
Average Nautical Line Miles Per In-Flight Hour
Project % Complete
Total Flight Lines
Ave Flight Speed
Mission Lines
Comments
Cloud Cover
Clear
Few
Partly Cloudy
Cloudy

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	1/5/2016	5	75556	2	TN_27_County-Reflights Block 2, 5, 6

Operator	Aircraft	HOBBS Start	Local Start Time	Zulu Start Time	Base
GALAMBOS	N1107Q	2953.7	4:43:00	22:43:00	NGS
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
LaROCQUE	OTHER	2955.7	6:07:00	0:05:00	Sparport 1987

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
calm	10+	Clear		5	-8	3040		Departing	KSRB
								Arriving	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	255	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi	X	B	

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	6500	Ft	7175	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 22:10:00
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
76	N	22:43:43	22:47:53	0:00:00	19	0.6	1.1	Reflight Blk 6" Steam over the silo
				0:00:00				Patch 10 to the North from S. end
				0:00:00				Manual Stop
77	N	22:50:22	22:54:53	0:00:00	17	0.6	1.2	Patch 10 to the North from S. end
				0:00:00				Manual Start/Stop UL001
x	E	22:59:37	23:00:57	0:00:00	18	0.6	1.1	x-flight over Nuclear Silos UL002
				0:00:00				Manual Start/Stop
63	SE	23:17:39	23:23:11	0:00:00	17	0.7	1.3	Block 2
69	SW	23:29:37	23:31:24	0:00:00	16	0.7	1.2	
70	NE	23:34:36	23:36:08	0:00:00	17	0.7	1.2	
80	S	23:56:40	0:04:45	0:00:00	17	0.7	1.2	Block 5 Manual Stop
				0:00:00				Static 00:16:27
				0:00:00				
				0:00:00				
				0:00:00				Sensor 8191
				0:00:00				***Note Extended Logging Error**
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No

Additional Comments:

Drive # 808654

WOOLPERT FLIGHT LOG SHEET #2

Leica ALS	MM/DD/YYYY 12/8/2015	Day of Year 342	Mission Name / Job # Second Flight 75556 Block 1

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N111SD ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' #### ☒	255	3:22	21:22
Pilot			**Hobbs End**	**Local End Time**	**Zulu End Time**
Swain			260	8:32	2:32

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID	KSRB
	Yes ☐ No ☒	GPS Base #2	Operator	PID	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	KSRB
	+10							Arriving ICAO	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify 5-Turns Before Mission Yes ☒ No ☐
36	N	21:43	21:54:56	0:11:25	22	1	1	
37	S	21:57:49	22:09:14	0:11:34	21	1	1	
24	N	22:13:24	22:24:54	0:11:30	21	1	1	
23	S	22:27:40	22:39:10	00:11:30	20	1	1	
22	N	22:41:44	22:53:01	0:11:27	19	1	1	
21	S	22:55:35	23:07:04	0:11:29	18	1	1	
20	N	23:09:29	23:20:51	0:11:22	18	1	1	
19	S	23:23:14	23:34:43	0:11:29	19	1	1	e error, but this time the warnings disap
18	N	23:38:52	23:50:08	0:11:16	17	1	1	
17	S	23:52:21	0:03:50	0:11:29	17	1	1	
16	N	0:06:13	0:17:27	0:11:14	16	1	1	
15	S	-error-12:20:13	0:31:41	-error-	16	1	1	but this one didn't recover. Reboot and
14	N	0:58:10	1:09:27	0:11:17	18	1	1	
13	S	1:11:44	1:23:12	0:11:28	17	1	1	
12	N	1:25:49	1:37:05	0:11:16	15	1	1	
11	S	1:39:15	1:50:43	0:11:28	17	1	1	
10	N	1:53:16	2:04:28	0:11:12	16	1	1	
9	S	2:06:52	2:18:20	0:11:28	18	1	1	
↑ Times entered are Zulu / GMT ↑				##########	Total Time On Line			Verify 5-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues. Drive #

WOOLPERT FLIGHT LOG SHEET #2

Leica ALS	MM/DD/YYYY: 12/15/2015	Day of Year: 349	Mission Name / Job #: 75556 Block 5

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D X N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-' #### X	265	3:38	21:38
Pilot: Swain			Hobbs End: 268	Local End Time: 6:38	Zulu End Time: 0:38

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID: KSRB
	Yes ☐ No X	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO: KSRB
	+10							Arriving ICAO: KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes X No ☐
44	S	21:52	22:05:39	0:12:54	22	1	1	
43	N	22:07:54	22:20:43	0:12:49	18	1	1	
42	S	22:23:02	22:35:54	0:12:52	19	1	1	
41	N	22:38:36	22:51:27	00:12:51	20	1	1	
40	S	22:53:55	23:06:45	0:12:50	20	1	1	
39	N	23:09:17	23:22:05	0:12:48	17	1	1	
38	S	23:24:33	23:37:35	0:13:01	17	1	1	
37	N	23:40:17	23:53:18	0:13:01	16	1	1	
36	S	23:55:50	0:08:40	0:12:50	16	1	1	
35	N	0:11:07	0:24:04	0:12:57	18	1	1	
								— —
↑ Times entered are Zulu / GMT ↑				##########	Total Time On Line			Verify S-Turns After Mission Yes X No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #2

Leica ALS	MM/DD/YYYY 12/19/2015	Day of Year 353	Mission Name / Job # 75556 Block 5 and 6

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N475RC ☐ N404CP ☐ N1115D ☒ N475CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH-#### ☒	282	3:50	21:50
Pilot: Swain			Hobbs End: 286	Local End Time: 8:30	Zulu End Time: 2:30
Passengers	Using or Relying on CORS: Yes ☐ No ☒		GPS Base #1 Operator		PID KCSV
			GPS Base #2 Operator		PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO	Arriving ICAO
	+10							KCSV	KSRB

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐ 2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	6,500 Ft	6,988 Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
		Block 5						
24	N	22:07:18	22:21:07	0:13:39	18	1	1	
23	S	22:23:45	22:37:04	0:13:19	18	1	1	
22	N	22:39:22	22:52:59	00:13:37	19	1	1	
21	S	22:55:03	23:08:17	0:13:14	17	1	1	
20	N	23:10:42	23:24:14	0:13:32	17	1	1	
19	S	23:26:25	23:39:51	0:13:26	16	1	1	
18	N	23:42:09	23:55:33	0:13:24	17	1	1	
17	S	23:58:15	0:11:35	0:13:20	18	1	1	
16	N	0:14:10	0:17:40	0:03:30	16	1	1	
15	S	0:20:05	0:23:23	0:03:18	17	1	1	
14	N	0:25:53	0:29:17	0:03:24	16	1	1	
13	S	0:31:25	0:34:32	0:03:07	13	1	1	
12	N	0:37:09	0:40:34	0:03:25	14	1	1	
11	S	0:43:40	0:45:56	0:02:16	14	1	1	
10	N	0:48:20	0:50:46	0:02:26	14	1	1	
9	S	0:52:44	0:55:04	0:02:20	17	1	1	
8	N	0:57:23	0:59:51	0:02:28	17	1	1	
7	S	1:01:48	1:04:08	0:02:20	17	1	1	
6	N	1:06:22	1:08:47	0:02:25	16	1	1	
5	S	1:11:49	1:13:16	0:01:27	18	1	1	
4	N	1:15:34	1:16:53	0:01:19	17	1	1	
3	S	1:19:10	1:20:32	0:01:22	17	1	1	
2	N	1:22:45	1:24:08	0:01:23	17	1	1	
1	S	1:26:09	1:27:29	0:01:20	19	1	1	
111	E	1:38:55	1:46:42	0:07:47	18	1	1	
80	S	2:08:28	2:10:27	0:01:59	18	1	1	Block 5 Reflight
↑ Times entered are Zulu / GMT ↑				########## Total Time On Line				Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

WOOLPERT FLIGHT LOG SHEET #3

Leica ALS	MM/DD/YYYY 12/20/2015	Day of Year 354	Mission Name / Job # 75556 Block 10

Operator	Aircraft	Sensor	Hobbs Start	Local Start Time	Zulu Start Time
Carlton	N675RC ☐ N404CP ☐ N1115D ☒ N675CP ☐ N1107Q ☐	SH-7177 ☐ SH_6157 ☐ SH- #### ☒	287	7:30	0:30
Pilot			Hobbs End	Local End Time	Zulu End Time
Swain			293	10:00	3:00

Passengers	Using or Relying on CORS	GPS Base #1	Operator	PID KMMI
	Yes ☐ No ☒	GPS Base #2	Operator	PID

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing ICAO KMMI
	+10							Arriving ICAO KMMI

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Gain	Mode	
40	50	272	100	Course/Up ___ Fine/Down ___	Single ☐ Multi ☐	2 + 2 ☐ 4 + 3 ☐

Air Speed	AGL	MSL	Threshold	Waveform Mode	Pre-Trigger Dist.
150 Kts	,900-7,00 Ft	Ft	/	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At: 14:30
↕ Times entered are Zulu / GMT ↕								Verify S-Turns Before Mission Yes ☒ No ☐
		Block 10						
40	S	0:52:57	0:59:40		17	1	1	
39	N	1:02:07	1:08:31		17	1	1	
38	S	1:11:05	1:17:48		16	1	1	
37	N	1:20:23	1:26:43		17	1	1	
36	S	1:29:15	1:35:56		17	1	1	
35	N	1:38:08	1:44:26		17	1	1	
34	S	1:49:26	1:58:45		17	1	1	
33	N	2:00:53	2:09:41		17	1	1	
32	S	2:12:07	2:21:23		18	1	1	
31	N	2:23:52	2:32:35		19	1	1	
30	S	2:35:06	2:44:21		19	1	1	
↑ Times entered are Zulu / GMT ↑				0	Total Time On Line			Verify S-Turns After Mission Yes ☒ No ☐

Additional Comments: System worked well, no issues.

Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/15/2015	349	75556	2	tn 27 counties block 6

Operator	Aircraft	HOBBS Start	Local Start Time	Zulu Start Time	Base
SMITH	N7079F	200.8	8:45:00	14:45:00	
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time**	**Zulu End Time**	**PID**
GEBHART	OTHER	207.7	4:37:00	21:37:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	CSV
								Arriving	CSV

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	
				Gain - Fine/Down		Multi		B	

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	6499 Ft	7175 Ft	Yes		No		@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Verify S-Turns Before Mission Yes X No
110	s	15:03:00	15:17:00		17	0.7	1.2	cld wp14,smoke wp38,39
109	n	15:19:00	15:33:00		17	0.7	1.2	smoke wp38
108	s	15:36:00	15:50:00		15	0.7	1.4	smoke wp38
107	n	15:53:00	16:07:00		15	0.7	1.3	
106	s	16:11:00	16:24:00		15	0.7	1.4	
105	n	16:27:00	16:41:00		14	0.7	1.4	
104	s	16:45:00	16:59:00		15	0.7	1.2	
103	n	17:02:00	17:16:00		17	0.7	1.2	
102	s	17:19:00	17:33:00		16	0.7	1.1	
101	n	17:37:00	17:50:00		16	0.7	1.2	gnss error
								reboot in air
100	s	18:29:00	18:43:00		18	0.7	1.1	
99	n	18:46:00	19:00:00		20	0.7	1	
98	s	19:04:00	19:18:00		18	0.7	1.2	
97	n	19:22:00	19:35:00		17	0.7	1.4	
96	s	19:39:00	19:53:00		17	0.7	1.3	
95	n	19:56:00	20:10:00		18	0.7	1.2	
94	s	20:14:00	20:27:00		20	0.7	1.1	
93	n	20:31:00	20:45:00		21	0.7	1.1	
92	s	20:48:00	21:02:00		19	0.7	1.2	
91	n	21:05:00	21:19:00		19	0.7	1.1	gnss error
↑ Times entered are Zulu / GMT ↑			Page		1			Verify S-Turns After Mission Yes X No

Additional Comments: Drive #

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/4/2015	338	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBS Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2889.3	8:31:00	14:31:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**	**Zulu End Time IMU**	**PID**
FLOYD	OTHER	2893.4	12:58:00	18:58:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	ksrb
calm	10	clr	0	1	-1	30.54		Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed	AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	6500	varies	varies	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
10	185.5	15:11:15	15:23:03		16	0.7	1.3	
11	05.5	15:27:57	15:39:50	0:00:00	17	0.7	1.2	
12	185.5	15:43:30	15:54:36	0:00:00	17	0.7	1.2	
13	05.5	15:59:34	16:11:36	0:00:00	17	0.7	1.2	
14	185.6	16:15:07	16:27:15	0:00:00	16	0.8	1.4	
15	185.5	16:46:17	16:58:15	0:00:00	16	0.7	1.2	engine died mid line so we re-flew from north to south
16	05.5	17:01:35	17:13:34	0:00:00	14	0.8	1.4	
17	185.6	17:17:29	17:29:18	0:00:00	14	0.8	1.4	
18	05.5	17:33:33	17:45:34	0:00:00	15	0.7	1.2	
19	185.6	17:49:20	18:01:31	0:00:00	18	0.6	1	
20	05.6	18:05:14	18:17:20	0:00:00	17	0.7	1.1	
21	185.7	18:21:31	18:33:30	0:00:00	17	0.7	1.2	
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:	Drive #
At the end of line 20 we received a "IMU data are missing" warning "GNSS data gap detected" and a "ALS error-No data received from SPAN for 5 SEC" errors	134

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/6/2015	340	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBS Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2898.9	16:47:00	22:47:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**		**PID**
FLOYD	OTHER	2902.4	21:16:00	2:16:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	ksrb
calm	10	clr	0	8	6	30.29	n/a	Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed	AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	6500	varies	varies	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
30	05.6	23:19:45	23:31:30		18	0.7	1.1	sun angle 0 for all lines
31	185.8	23:35:09	23:46:33	0:00:00	18	0.6	1.1	
32	05.7	23:50:18	0:01:44	0:00:00	16	0.7	1.2	
33	185.8	0:05:30	0:16:52	0:00:00	17	0.7	1.2	
34	05.7	0:20:38	0:32:06	0:00:00	16	0.7	1.3	
35	185.8	0:36:18	0:47:18	0:00:00	16	0.7	1.2	
36	05.7	0:50:54	0:01:38	0:00:00	17	0.6	1.1	
37	185.8	1:05:28	1:16:39	0:00:00	17	0.6	1.1	
38	05.8	1:20:05	1:30:41	0:00:00	16	0.7	1.1	
39	185.8	1:34:40	1:46:04	0:00:00	15	0.7	1.2	
40	05.8	1:49:17	1:58:12	0:00:00	17	0.7	1.1	
41	185.8	2:02:10	2:11:35	0:00:00	17	0.7	1.2	
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

At the end of line 41 we received a "IMU data are missing" warning "GNSS data gap detected" and a "ALS error-No data received from SPAN for 5 SEC" errors

Drive # 133

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/8/2015	342	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2902.4	9:27:00	15:27:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**		**PID**
FLOYD	OTHER	2906.4	13:53:00	19:53:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
calm	10	clr	0	9	6	30.15	n/a	Departing	ksrb
								Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
150		6500	varies	varies	Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
42	185.9	16:15:08	16:24:26	0:00:00	14	0.8	1.5	28deg sun angle
43	05.8	16:27:47	16:37:02	0:00:00	14	0.8	1.4	29deg sun angle
44	185.9	16:40:25	16:49:53	0:00:00	13	0.8	1.5	29deg sun angle
45	05.8	16:53:24	17:02:28	0:00:00	13	0.8	1.4	30deg sun angle
46	185.9	17:07:38	17:15:10	0:00:00	13	0.8	1.4	30deg sun angle
47	05.9	17:18:48	17:25:55	0:00:00	13	0.8	1.4	31deg sun angle
48	185.9	17:29:06	17:36:30	0:00:00	17	0.7	1.2	31deg sun angle
49	05.9	17:40:25	17:47:27	0:00:00	16	0.7	1.1	31deg sun angle
50	186.0	17:50:27	17:57:42	0:00:00	15	0.7	1.3	31deg sun angle
51	05.9	18:01:36	18:05:39	0:00:00	16	0.7	1.4	31deg sun angle
52	186.0	18:12:57	18:17:08	0:00:00	15	0.7	1.3	30deg sun angle
53	05.9	18:20:22	18:24:27	0:00:00	15	0.7	1.3	30deg sun angle
54	186.0	18:27:18	18:31:25	0:00:00	16	0.6	1.2	30deg sun angle
55	06.0	18:34:33	18:38:44	0:00:00	18	0.6	1.2	29deg sun angle
56	186.0	18:42:00	18:46:10	0:00:00	17	0.6	1.2	29deg sun angle
57	06.0	18:49:25	18:52:57	0:00:00	17	0.6	1.2	28deg sun angle
58	186.0	18:56:03	18:59:43	0:00:00	17	0.6	1.2	28deg sun angle
59	06.0	19:02:38	19:06:09	0:00:00	17	0.6	1.2	27deg sun angle
60	186.0	19:08:56	19:12:25	0:00:00	17	0.6	1.2	27deg sun angle
61	06.0	19:15:31	19:19:08	0:00:00	16	0.7	1.2	26deg sun angle
62	275.8	19:25:48	19:31:29	0:00:00	15	0.9	1.4	25deg sun angle
								start 2nd flight
5	04.3	23:41:59	23:49:44		17	0.7	1.1	0deg sun angle, BLOCK 1
4	184.4	23:52:56	0:00:56	0:00:00	16	0.7	1.2	
3	04.3	0:04:16	0:12:02	0:00:00	16	0.7	1.3	
2	184.4	0:15:32	0:23:30	0:00:00	16	0.7	1.3	
1	04.3	0:27:12	0:35:01	0:00:00	16	0.7	1.3	
63	095.6	0:54:24	1:00:02	0:00:00	18	0.6	1.1	block 2
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

when taxiing out we received a Gnss/imu data error, logged out of flight exectuion and re-started.
wx for 2nd flight: wind calm, vis 10, clr, temp/dew point15/2 alt.30.02 Hobbs start 2906.4 hobbs end 2910.2 Imu start local/zulu 15:20:00/21:20:00
Imu end local/zulu 19:30:47/01:30:47
we attempted to start line 64 but received %return errors(only 3-60%) so we stopped the line and tryed re-flying opposite direction with the same problem.

Drive #: 130

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/15/2015	350	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBS Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2913.1	9:40:00	15:40:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**		**PID**
FLOYD	OTHER	2917.1	13:43:00	19:43:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	ksrb
calm	10	clr	0	13	8	29.96	n/a	Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed	AGL	MSL	Waveform Used				Waveform Mode		Pre-Trigger Dist.
150	varies	7175 Ft	Yes		No	x	@ NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
63	095.5	16:08:38	16:13:56	0:00:00	15	0.7	1.3	block 2
69	241.4	16:20:02	16:21:44	0:00:00	14	0.8	1.4	8975 msl 69 and 70
70	061.2	16:25:36	16:27:06	0:00:00	14	0.8	1.4	
				0:00:00				
101	184.9	16:46:53	16:56:13	0:00:00	15	0.7	1.2	block 5
100	004.9	16:59:26	17:09:15	0:00:00	15	0.8	1.3	
99	184.9	17:12:30	17:21:11	0:00:00	16	0.8	1.3	
98	004.8	17:24:18	17:33:41	0:00:00	16	0.7	1.1	
97	184.9	17:37:06	17:45:57	0:00:00	16	0.7	1.2	
96	04.8	17:49:40	17:59:00	0:00:00	17	0.7	1.1	
95	184.9	18:01:40	18:10:48	0:00:00	18	0.6	1.1	
94	004.8	18:13:51	18:23:04	0:00:00	18	0.6	1.1	
93	184.8	18:26:02	18:35:05	0:00:00	18	0.6	1.1	
92	004.8	18:38:28	18:47:26	0:00:00	18	0.6	1.1	
91	184.8	18:50:38	18:59:24	0:00:00	19	0.6	1.1	
90	004.7	19:02:49	19:12:02	0:00:00	18	0.6	1.2	
89	184.8	19:16:06	19:25:27	0:00:00	17	0.7	1.4	
88	004.7	19:28:33	19:37:59	0:00:00	17	0.6	1.4	
87	004.7	21:59:46	22:08:59	0:00:00	21	0.7	1.2	start 2nd flight
86	184.8	22:12:16	22:21:58	0:00:00	18	0.7	1.3	
85	004.7	22:25:08	22:22:34:22	0:00:00	18	0.7	1.1	
84	184.8	22:37:57	22:47:44	0:00:00	20	0.7	1.1	
83	004.7	22:50:53	23:00:04	0:00:00	20	0.6	1	
82	184.7	23:03:21	23:13:04	0:00:00	18	0.6	1.1	
81	004.6	23:16:36	23:25:38	0:00:00	17	0.7	1.1	
80	184.7	23:29:26	23:44:02	0:00:00	17	0.7	1.2	
79	004.6	23:47:16	0:00:42	0:00:00	16	0.7	1.3	
78	184.7	0:03:56	0:18:38	0:00:00	18	0.6	1.1	
77	004.5	0:21:39	0:35:01	0:00:00	17	0.7	1.2	
76	184.6	0:38:24	0:53:02	0:00:00	17	0.7	1.1	
				0:00:00				
				0:00:00				
				0:00:00				
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				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

Data Gap error when we finished line 88 and after line 76. 2ND flight hobbs start/stop 2917.1/ 2920.5 IMU local start/stop15:34:00/18:58:00 Zulu
start/stop21:34:00/00:58:00 WX: wind calm, SKC clear, Temp/dew point 18/9, alt. 29.90

Drive #

131

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/14/2015	348	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2910.2	11:18:00	17:18:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**		**PID**
FLOYD	OTHER	2913.1	14:35:00	20:35:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
260/15	10	clr	0	17	8	29.62	n/a	Departing	ksrb
								Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		varies		6965	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
111	185.1	18:06:57	18:17:05	0:00:00	21	0.6	1.1	block 5, sun angle 30
110	005.0	18:20:05	18:28:47	0:00:00	21	0.6	1.1	sun angle 30
109	185.0	18:32:09	18:42:02	0:00:00	21	0.6	1.1	sun angle 29
108	005.0	18:45:04	18:53:58	0:00:00	23	0.6	1.1	sun angle 29
107	185.0	18:57:33	19:07:38	0:00:00	22	0.6	1.1	sun angle 28
106	004.9	19:11:00	19:20:20	0:00:00	20	0.7	1.3	sun angle 27
105	185.0	19:25:23	19:35:41	0:00:00	20	0.7	1.4	sun angle 26
104	004.9	19:42:55	19:51:59	0:00:00	20	0.7	1.3	sun angle 24
103	185.0	19:55:13	20:05:22	0:00:00	21	0.6	1.2	sun angle 23
102	004.9	20:09:23	20:18:33	0:00:00	22	0.6	1.1	sun angle 21
				0:00:00				
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↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

Extremely bumpy flight

Drive #

131

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/16/2015	350	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2920.5	9:47:00	15:48:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**			**PID**
FLOYD	OTHER	2924.6	14:08:00	20:08:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	ksrb
160/9	10	clr		16	10	29.92	n/a	Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		varies		6965	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
75	184.6	16:04:03	16:19:25	0:00:00	16	0.7	1.2	
74	004.5	16:22:53	16:36:35	0:00:00	13	0.8	1.4	
73	184.6	16:40:48	16:55:14	0:00:00	14	0.8	1.2	
72	004.5	16:58:49	17:13:03	0:00:00	17	0.6	1.1	
71	184.6	17:18:43	17:32:43	0:00:00	16	0.7	1.1	
70	004.5	17:36:39	17:50:44	0:00:00	16	0.7	1.3	
69	184.5	17:54:33	18:08:56	0:00:00	17	0.6	1.2	
68	004.4	18:12:42	18:26:28	0:00:00	17	0.6	1.2	
67	184.5	18:30:13	18:44:25	0:00:00	17	0.6	1.2	
66	004.4	18:48:07	19:02:05	0:00:00	18	0.6	1.1	gnssimu data gap error after line
65	184.5	19:23:02	19:37:00	0:00:00	16	0.7	1.4	
64	004.4	19:40:27	19:54:12	0:00:00	16	0.8	1.4	
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				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

Drive #: 134

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/17/2015	351	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2924.6	17:53:00	23:53:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**			**PID**
FLOYD	OTHER	2928.9	22:30:00	4:30:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
330/4	10	clr		6	1	29.9	n/a	Departing	ksrb
								Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		varies		6965	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
63	184.5	0:13:47	0:28:13	0:00:00	16	0.7	1.1	
62	004.4	0:31:38	0:45:50	0:00:00	16	0.7	1	
61	184.5	0:49:12	1:03:39	0:00:00	13	0.8	1.3	
60	004.3	1:06:47	1:20:31	0:00:00	15	0.7	1.2	
59	184.4	1:23:50	1:38:22	0:00:00	15	0.7	1.2	
58	004.3	1:41:34	1:55:22	0:00:00	16	0.6	1.2	
57	184.4	1:58:58	2:13:15	0:00:00	16	0.7	1.2	
56	004.3	2:16:35	2:30:51	0:00:00	17	0.6	1.2	
55	184.4	2:34:00	2:48:21	0:00:00	18	0.6	1.1	
54	004.3	2:51:25	3:05:28	0:00:00	19	0.6	1	
53	184.4	3:08:24	3:22:12	0:00:00	17	0.6	1.2	
52	004.3	3:25:07	3:39:04	0:00:00	15	0.7	1.6	
51	184.3	3:42:08	3:56:15	0:00:00	16	0.6	1.4	
113	094.3	4:07:38	4:17:34	0:00:00	18	0.6	1.2	
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:	Drive #
	134

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/19/2015	353	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2928.9	8:38:00	14:38:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**			**PID**
FLOYD	OTHER	2933.5	13:27:00	19:27:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
210/3	10	clr		-1	-4	30.47	n/a	Departing	ksrb
								Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		6500		6988	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
64	185.6	15:09:57	15:23:50	0:00:00	16	0.8	1.3	
63	005.5	15:27:58	15:42:46	0:00:00	15	0.8	1.3	
62	185.6	15:47:49	16:00:46	0:00:00	17	0.7	1.3	
61	005.4	16:04:36	16:19:27	0:00:00	14	0.8	1.4	
60	185.5	16:22:23	16:36:06	0:00:00	14	0.8	1.4	
59	005.4	16:39:49	16:54:33	0:00:00	15	0.8	1.3	
58	185.5	16:58:24	17;11:55	0:00:00	16	0.7	1.1	
57	005.4	17:15:24	17:29:43	0:00:00	17	0.7	1.2	
56	185.5	17:33:05	17:46:31	0:00:00	17	0.7	1.2	
55	005.4	17:49:48	18:04:03	0:00:00	20	0.6	1.1	
54	185.5	18:07:00	18:20:20	0:00:00	20	0.6	1.1	
53	005.3	18:24:11	18:38:22	0:00:00	21	0.6	1.1	
52	185.4	18:42:17	18:56:06	0:00:00	20	0.6	1.2	
51	005.3	18:59:41	19:13:32	0:00:00	19	0.6	1.4	
50	185.4	22:08:23	22:22:30	0:00:00	17	0.7	1.2	start 2nd flight, hobbs start 2933.5
49	005.3	22:25:43	22:39:53	0:00:00	18	0.6	1.1	
48	185.4	22:43:17	22:56:44	0:00:00	19	0.6	1	
47	005.3	23:00:17	23:13:57	0:00:00	16	0.8	1.4	
46	185.4	23:17:44	23:31:05	0:00:00	17	0.7	1.2	
45	005.3	23:34:57	23:48:25	0:00:00	16	0.7	1.3	
44	185.4	23:51:48	0:05:25	0:00:00	17	0.6	1.2	
43	005.2	0:08:44	0:22:08	0:00:00	17	0.6	1.1	
42	185.3	0:25:20	0:38:27	0:00:00	16	0.6	1.2	
41	005.2	0:41:58	0:55:20	0:00:00	14	0.8	1.3	
40	185.3	0:58:44	1:12:18	0:00:00	17	0.7	1.1	
39	005.2	1:15:30	1:28:42	0:00:00	17	0.7	1.2	
38	185.3	1:31:46	1:45:30	0:00:00	16	0.6	1.1	Hobbs end 2937.8
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:	Drive #
2nd flight wx: wind 280/07, 10sm vis, clr, temp 06, dew pt. -06, alt 30.46 local start/stop 15:49:00/21:28:00, zulu start/stop 21:49:00/02:28;00	133

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/20/2015	354	75556	2	USGS_TN_BLOCK10

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2937.8	13:03:00	18:03:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**			**PID**
FLOYD	OTHER	2941.9	17:00:00	22:00:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
calm	10	clr blw 12k		8	-2	30.47	n/a	Departing	kmmi
								Arriving	kmmi

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		6500		7160	Ft	Yes		No	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
29	186.1	18:21:41	18:34:14	0:00:00	22	0.6	1.1	
28	006.0	18:37:39	18:49:59	0:00:00	22	0.6	1	
27	186.1	18:54:33	19:07:00	0:00:00	20	0.6	1.3	
26	006.0	19:10:32	19:22:39	0:00:00	19	0.7	1.5	
25	186.1	19:26:17	19:38:42	0:00:00	20	0.6	1.2	
24	006.0	19:42:09	19:54:10	0:00:00	21	0.6	1.1	
23	196.1	19:59:35	20:14:01	0:00:00	21	0.6	1.1	
22	005.9	20:17:37	20:02:05	0:00:00	20	0.6	1.1	
21	186.0	20:36:02	20:50:35	0:00:00	19	0.6	1.1	
20	005.9	20:54:33	21:08:38	0:00:00	20	0.6	1	
19	186.0	21:12:52	21:27:43	0:00:00	22	0.6	0.9	
18	005.9	21:31:05	21:45:25	0:00:00	20	0.7	1.1	
17	186.0	0:26:44	0:41:45	0:00:00	17	0.7	1	start 2nd flight, Hobbs start 2941.9
16	005.9	0:45:15	0:59:27	0:00:00	15	0.7	1.2	
15	186.0	1:38:18	1:18:15	0:00:00	16	0.7	1.1	
14	005.8	1:22:04	1:36:23	0:00:00	18	0.7	1.2	
13	185.9	1:41:17	1:56:24	0:00:00	17	0.6	1.2	
12	005.8	1:59:56	2:14:01	0:00:00	17	0.6	1.3	
11	185.9	2:17:08	2:32:39	0:00:00	19	0.7	1.4	hobbs end 2944.8
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

flight 2 weather wind calm, vis. 10sm, SKC CLR, temp 04, dew pt. 01, ALT 30.38. loacl start /stop 19:05:00/21:46:00, ZULU start/stop 00:05:00/02:46:00

Drive #: 133

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/20/2015	354	75556	2	USGS_TN_BLOCK10

Operator	Aircraft	HOBBs Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2937.8	13:03:00	18:03:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**			**PID**
FLOYD	OTHER	2941.9	17:00:00	22:00:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
calm	10	clr blw 12k		8	-2	30.47	n/a	Departing	kmmi
								Arriving	kmmi

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	50	272	100	Gain - Course/Up	X	Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150		6500		7160	Ft	Yes		No	x	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
29	186.1	18:21:41	18:34:14	0:00:00	22	0.6	1.1	
28	006.0	18:37:39	18:49:59	0:00:00	22	0.6	1	
27	186.1	18:54:33	19:07:00	0:00:00	20	0.6	1.3	
26	006.0	19:10:32	19:22:39	0:00:00	19	0.7	1.5	
25	186.1	19:26:17	19:38:42	0:00:00	20	0.6	1.2	
24	006.0	19:42:09	19:54:10	0:00:00	21	0.6	1.1	
23	196.1	19:59:35	20:14:01	0:00:00	21	0.6	1.1	
22	005.9	20:17:37	20:02:05	0:00:00	20	0.6	1.1	
21	186.0	20:36:02	20:50:35	0:00:00	19	0.6	1.1	
20	005.9	20:54:33	21:08:38	0:00:00	20	0.6	1	
19	186.0	21:12:52	21:27:43	0:00:00	22	0.6	0.9	
18	005.9	21:31:05	21:45:25	0:00:00	20	0.7	1.1	
17	186.0	0:26:44	0:41:45	0:00:00	17	0.7	1	start 2nd flight, Hobbs start 2941.9
16	005.9	0:45:15	0:59:27	0:00:00	15	0.7	1.2	
15	186.0	1:38:18	1:18:15	0:00:00	16	0.7	1.1	
14	005.8	1:22:04	1:36:23	0:00:00	18	0.7	1.2	
13	185.9	1:41:17	1:56:24	0:00:00	17	0.6	1.2	
12	005.8	1:59:56	2:14:01	0:00:00	17	0.6	1.3	
11	185.9	2:17:08	2:32:39	0:00:00	19	0.7	1.4	hobbs end 2944.8
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Figure 8-Turns After Mission Yes X No

Additional Comments:

flight 2 weather wind calm, vis. 10sm, SKC CLR, temp 04, dew pt. 01, ALT 30.38. loacl start /stop 19:05:00/21:46:00, ZULU start/stop 00:05:00/02:46:00

Drive #: 133

Woolpert

Leica LIDAR	MM/DD/YEAR	Day of Year	Project #	Phase #	Project Name
	12/5/2015	339	75556	2	USGS_TN_BLOCK2

Operator	Aircraft	HOBBS Start	Local Start Time IMU	ZULU Start Time IMU	Base
Linville	N1107Q	2893.4	9:51:00	15:51:00	WOOLPERT PIN
Pilot	**Sensor Type**	**HOBBS END**	**Local End Time IMU**		**PID**
FLOYD	OTHER	2896.8	14:23:00	19:23:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud		
calm	10	clr	0	7	0	30.6	n/a	Departing	ksrb
								Arriving	ksrb

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain	X	Mode		Threshold Values	
40	50	272	100	Gain - Course/Up		Single		A	PreSet
				Gain - Fine/Down		Multi		B	PreSet

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150	6500 Ft	varies Ft	Yes		No	x	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	Base GPS Began Logging At:
		↕ Times entered are Zulu / GMT ↕						Figure 8-Turns Before Mission Yes X No
1	185.4	16:30:33	16:42:39		17	0.7	1.3	sun angle 29 deg
2	05.4	16:45:42	16:57:50	0:00:00	17	0.7	1.2	sun angle31 deg
3	185.5	17:02:52	17:14:57	0:00:00	16	0.8	1.3	sun angle 31 deg
4	05.4	17:18:29	17:30:27	0:00:00	14	0.8	1.4	sun angle 31 deg
5	185.5	17:33:56	17:46:01	0:00:00	16	0.7	1.1	sun angle 31 deg
6	05.4	17:48:49	18:00:46	0:00:00	17	0.7	1.2	sun angle 31 deg
9	185.5	18:03:17	18:15:27	0:00:00	15	0.7	1.2	sun angle 30 deg
21	05.5	18:19:58	18:31:57	0:00:00	17	0.7	1.2	sun angle 31 deg; re-flight line 21
22	185.7	18:34:57	23:02:00	0:00:00	17	0.7	1.2	sun angle 29deg
23	05.6	18:49:49	19:01:55	0:00:00	19	0.6	1.2	sun angle 29 deg
24	185.7	19:05:34	19:17:00	0:00:00	19	0.6	1.2	sun angle 27 deg
				0:00:00				Start 2nd flight
25	05.7	22:27:19	22:39:09	0:00:00	19	0.7	1.2	
26	185.7	22:42:06	22:53:47	0:00:00	17	0.7	1.3	
27	05.6	22:57:25	22:09:02	0:00:00	15	0.8	1.4	
28	185.7	23:14:15	23:25:56	0:00:00	16	0.7	1.2	
29	05.7	23:28:48	23:40:26	0:00:00	17	0.7	1.1	
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑			Page		1			Figure 8-Turns After Mission Yes X No

Additional Comments:

After we ended line 24 we received a "IMU data are missing" warning "GNSS data gap detected" and a "ALS error-No data received from SPAN for 5 SEC" errors lines 25-29 hobbs start 2896.8 hobbs end 2898.9 local start time IMU 15:42:00 end time 00:13:00 WX Wind calm, VIS +10, SKC CLR, temp/dew point 14/-1, pressure 30.52

We started line 25 and after about 5 min on the line we received a "ALS error-TDC ran out of buffer" so we shut down flight execution and re-started System: ALS 8191

Drive # 133

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

SN7178_121515A

MISSION: 20151215_134116 DATE: 12/15/15 LEICA ALS-70 DI1

PILOT: [redacted] Radtke OPERATOR: Iverson AIRCRAFT: N22GE

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (MPiA-Disabled/Enabled) (WF Settings)
26999										1344		1	static A 8498.2 Hobbs
TN 3DEP					53	40	277	255		1402			Take OFF CHA
Woolpert					53	[redacted]	277	255		1415			Fly over CORS TN22
		105	S	155	53	40	277	255	7037	1433	1447	1	
		104	N	164					7028	1451	1505		
		103	S	156					7028	1509	1523		
		102	N	156					7034	1528	1542		
		101	S	160					7034	1545	1559		
		100	N	159					7031	1603	1617		
		99	S	163					7031	1620	1634		
		98	N	162					7031	1638	1652		
		106	S	162					7034	1656	1710		smoke PLumb
		107	N	162					7034	1713	1727		
		XF	W						6998	1732	1737		Cross Flight
											1747		Fly over CORS TN22
											1756		Land CHA 8502.1 Hobbs
											1803		static A
										1903			static B
										1917			Take OFF CHA

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	NOTES:
⊘ 26999		16		5.8	.7	A	1344	1803	
○						WX			ship Drive: SLOth
○									BackUp: CH32 back that drive up

AERO-METRIC, INC. N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 **FAX: 888-253-6695** E-Mail: amephoto@aerometric.com

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

SN7178 121515 B

MISSION: 20151215_185921 DATE: 12/15/15 LEICA ALS-70 DI2

PILOT: Radtke OPERATOR: Iverson AIRCRAFT: N22GE

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (MPiA-Disabled/Enabled) (WF Settings)
26999					53	40	[redacted]	255		1929		1	Fly over CORS TN22
TN 3DEP		108	S	153	53	40	277	255	7037	1943	1957	1	
Woolpert		109	N	160					7034	2000	2015		
		110	S	153					7028	2019	2033		
		111	N	150					7004	2037	2051		
		112	S	157					7004	2055	2110		
		113	N	162					7017	2114	2127		
		XF	W	139					7001	2131	2134		crossflight
											2143		Fly over CORS TN22
											2153		Land CHA 8504.7 Hobbs
											2200		static B
											2154		Low Voltage warning

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
○						B	1903	2200		
○						WX				
○										

AERO-METRIC, INC. N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 **FAX: 888-253-6695** E-Mail: amephoto@aerometric.com

RE-FLOW ON 12-19-15

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151216_ DATE: 12-16-15 LEICA ALS-70 JS1

PILOT: JESSE JACOBSON OPERATOR: JIM SCHOONE AIRCRAFT: N66R SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GMT START	TIME GMT STOP	MM70 DRIVE	REMARKS
26999										17:29	18:02		FERRY: CHA → SITE .5
TN WOOLPERT											17:50		CORS TN22
		63	180	150	53	40	277	12-3		18:02	18:17	K6	REFLY NO ABGPS
		~~64~~	0							18:20			DATA LOGGING ERROR - SHUT DOWN
										18:30			RE-ESTABLISHING ABGPS
													CLOSING OUT
											18:47		FERRY: SITE → CHA .2

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
⊘ 26999	183	—		.5	.7		17:29	—		BASE SET UP AT CHA BY CREW OF N22GE
○						WX				
○										

Quantum Spatial N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 FAX: 888-253-6695 E-Mail: amephoto@quantumspatial.com

Scanned by CamScanner

OPERATORS FLIGHT LOG

YYYYMMDD_TIME(GPS)

MISSION: 20151216_173015 DATE: 12-16-15 LEICA ALS-70

PILOT: Ted Radtke OPERATOR: Emily Dyreson AIRCRAFT: N22GE SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (ft)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (Strt Hdgs 8509.7)
26999										17:45	18:12		CHA → site .5
TN 3DEP	301	114	180	140	53	40	277		7000	18:12	18:28	SSD1	possible thin clouds last 1 mi. South end
Woodpert blocks 8/9	302	115	0	160	↓	↓	↓		↓	18:32	18:46	↓	clouds 0-5 mi FSE; 5-8 mi FSE
	X	VL 001	272	154	↓	↓	↓		↓	18:50	18:52	↓	cross tie for lines 114-115
										18:52	19:12		site → CHA
													8506.1

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	NOTES
⊘ 26999		2		0.7	0.7		17:33 19:14	17:38 19:19	CORS: TN22 - 17:56 fig. 8 - 17:59 fig. 8 - 18:52 CORS: TN22 - 19:02
○					1.4	WX			
○									

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151219-130340 DATE: 12-19-15A LEICA ALS-70 JS1

PILOT: JESSE JACOBSON OPERATOR: JIM SCHOONE AIRCRAFT: N6GR SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GMT START	TIME GMT STOP	MM70 DRIVE	REMARKS
26999										13:07	13:42		FERRY: CHA → SITE .6
TN: WESTPORT											13:39		CORS TN22
	1	63	180	150	53	40	277	12-3		13:42	13:56	17	
		64	0	"	"	"	"	"		14:00	14:15	"	
		65	180	"	"	"	"	"		14:17	14:32	"	
		66	0	"	"	"	"	"		14:35	14:50	"	
	5	67	180	"	"	"	"	"		14:53	15:08	"	
		68	0	"	"	"	"	"		15:11	15:26	"	
		69	180	"	"	"	"	"		15:29	15:43	"	
		70	0	"	"	"	"	"		15:47	16:02	"	
		71	180	"	"	"	"	"		16:05	16:19	"	
	10	72	0	"	"	"	"	"		16:22	16:38	"	
		73	180	"	"	"	"	"		16:40	16:55	"	
	12	74	0	"	"	"	"	"		16:59	17:14	"	
	X	021	270	"	"	"	"	"		17:16	17:20	"	
											17:29		CORS TN22
											17:47		FERRY: SITE → CHA .3

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
⊘ 26999	183	12		3.6	.9	4.5	13:07	17:47		
○						WX SKC				
○										

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151219-130340 | DATE: 12-19-15A | LEICA ALS-70 JSI

PILOT: JESSE JACOBSEN | OPERATOR: JIM SCHOONE | AIRCRAFT: N6GR | SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GMT START	TIME GMT STOP	MM70 DRIVE	REMARKS
26999										13:07	13:42		FERRY CHA → SITE .6
TN-WOOLPERT											13:39		CORS TN22
	1	63	180	150	53	40	277	12-3		13:42	13:56	17	
		64	0	"	"	"	"	"		14:00	14:15	"	
		65	180	"	"	"	"	"		14:17	14:32	"	
		66	0	"	"	"	"	"		14:35	14:50	"	
	5	67	180	"	"	"	"	"		14:53	15:08	"	
		68	0	"	"	"	"	"		15:11	15:26	"	
		69	180	"	"	"	"	"		15:29	15:43	"	
		70	0	"	"	"	"	"		15:47	16:02	"	
		71	180	"	"	"	"	"		16:05	16:19	"	
	10	72	0	"	"	"	"	"		16:22	16:38	"	
		73	180	"	"	"	"	"		16:40	16:55	"	
	12	74	0	"	"	"	"	"		16:59	17:14	"	
	X	021	270	"	"	"	"	"		17:16	17:20	"	
											17:29		CORS TN22
											17:47		FERRY SITE → CHA .3

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
⊘ 26999	183	12		3.6	.9	4.5	13:07	17:47		
○						WX SKC				
○										

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

2nd lift

MISSION: 20151219_185318 DATE: 12-19-15 LEICA ALS-70

PILOT: Ted Radtke OPERATOR: Emily Dyreson AIRCRAFT: N22GE SENSOR: 7178

8510.0 start Hobbs

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (ft)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999										19:08	19:35		CHA → site .5
TN3DEP	282	095	180	162	53	40	277		7000	19:35	19:48	SSD1	
Woolpert blocks 8/9	283	096	0	140						19:53	20:08		
	284	097	180	164						20:12	20:25		
	X	UL 001	270	128						20:29	20:31		cross tie for lines 95-97
	301	114	0	140						20:37	20:52		(reflown from 12-16)
	302	115	180	162						20:56	21:10		(reflown from 12-16)
	303	116	0	145						21:14	21:28		
	X	UL 002	270	143						21:32	21:33		cross tie for lines 114-116
										21:33	21:52		site → CHA
													End Hobbs 8512.8

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP
∅ 26999	183	6		2.0	0.8		18:56	19:01
○					2.8		21:53	21:58
○						WX		

NOTES: CORS: TN22 - 19:19, f.g. 8 - 19:25
f.g. 8 - 21:34, CORS: TN22 - 21:41

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151219-191828 | DATE: 12-19-15 B | LEICA ALS-70 JSR

PILOT: JESSE JACOBSON | OPERATOR: JIM SCHOONE | AIRCRAFT: N66R | SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GMT START	TIME GMT STOP	MM70 DRIVE	REMARKS
26999										19:[illegible]	19:53		FERRY: CHA → SITE .6
TN-WCOLPERT											19:41		CORS TN22
	1	75	180	150	53	40	277	12-3		19:53	20:08	17	
		76	0	↓	↓	↓	↓	↓		20:11	20:26	↓	
		77	180	↓	↓	↓	↓	↓		20:29	20:43	↓	
		~~78~~	0							20:47	—		DATA LOGGING STOPPED
											20:59		CORS TN22
											21:13		FERRY: SITE → CHA .2

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
⊘ 26999	183	3		.9	.8		19:28			
○						WX SKC				
○										

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

1st Lift

MISSION: 20151220_131310 DATE: 12-20-15

PILOT: Ted Radtke OPERATOR: Emily Dyreson

LEICA ALS-70

AIRCRAFT: N22GE SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (ft)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999										13:28	13:54		start Hobbs 8512.8
TN 3DEP	264	077	180	151	53	40	277		7000	13:54	14:09	SD1	CHA 7 site 4
Woodpert blocks 8/9	265	078	0	157						14:12	14:27		
	266	079	180	148						14:30	14:45		
	267	080	0	163						14:48	15:02		
	268	081	180	148						15:06	15:20		
	269	082	0	162						15:24	15:38		
	270	083	180	146						15:42	15:56		
	271	084	0	165						16:00	16:14		
	272	085	180	152						16:18	16:32		
	273	086	0	163						16:36	16:50		
	X	UL 001	267	148						16:53	16:56		cross tie for lines 77-86
										16:56	17:17		site → CHA
													End Hobbs 8516.6

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	NOTES
⊘ 26999	183	10		3.0	0.8		13:16	13:21	CORS: TN22 - 13:40 fig 8 - 13:45
○							17:19	17:24	fig. 8 - 16:56, CORS: TN22 - 17:07
○					3.8	WX			

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151220-141950 | DATE: 12-20-15A | LEICA ALS-70 | JSB

PILOT: JESSE JACOBSON | OPERATOR: JIM SCHOONE | AIRCRAFT: N6BR | SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GMT START	TIME GMT STOP	MM70 DRIVE	REMARKS
26999										13:00	13:14		FERRY: CHA → R2R .2
TN-WOLFPEAT										14:24	14:46		FERRY: R2R → SITE .4
	1	165	0	150	53	40	277	12-3		14:46	15:00	15	
		164	180	"	"	"	"	"		15:03	15:17	"	
		163	0							15:19	15:34		
		162	180							15:36	15:51		
	5	161	0							15:53	16:08		
	/	160	180							16:10	16:24		POOP OUT OF RANGE MID LINE
	/	160	0							16:27	/		ABORT LINE - POOP OUT OF RANGE 10 MILES IN
	X	ULI	W	/	/	/	/	/		16:42	16:44	/	
											17:00		FERRY: SITE → R2R .3

KRZR

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	
Ø 26999	183	5		1.9	.9	2.6	14:24	17:00	
○						WX BKN 10K			
○									

NOTES: BASE SET AT KR2R

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20151220-180416 | DATE: 12-20-15B. | LEICA ALS-70 JS2

PILOT: JESSE JACOBSON | OPERATOR: JIM SCHOONE | AIRCRAFT: N6GR | SENSOR: 7161

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME GAT START	TIME GAT STOP	MM70 DRIVE	REMARKS
26999										18:08	18:27		FERRY: RZR → SITE .4
TN-WOOLPERT	1	160	0	150	53	40	27.7	12-3		18:27	18:41	15	
		159	180							18:44	18:59		
		158	0							19:01	19:16		
		157	180							19:18	19:33		
	5	156	0							19:35	19:50		
		155	180							19:52	20:07		
		154	0							20:09	20:24		
		153	180							20:26	20:41		
		152	0							20:44	20:58		
	10	151	180							21:01	21:15		
		150	0							21:18	21:32		
		149	180							21:35	21:49		
		148	0							21:52	22:06		
	14	147	180							22:09	22:23		
	X	ULI	90	↓	↓	↓	↓	↓		22:26	22:30	↓	
											22:46		FERRY: SITE → RZR .3
										22:53	23:12		FERRY: RZR → TYS .3

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	
∅ 26999	183	14		4.0	1.0	4.7	18:08	22:46	
○						WX OVC			
○									

NOTES: BASE SET AT KRZR

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TN 27 County QL2 Lidar (Cumberland Plateau) Lidar

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

2nd lift

MISSION: 20151220_181620 DATE: 12-20-15 LEICA ALS-70

PILOT: Ted Rathke OPERATOR: Emily Dyreson AIRCRAFT: N22GE SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999													8516.6 Hobbs start
TN 3DEP	274	087	180	156	53	40	277		7000	18:30	18:54		CHA → site .4
woodpert blocks 8/9	275	088	0	160						18:54	19:08	SSD4	
	276	089	180	155						19:11	19:25		
	277	090	0	165						19:29	19:43		
	278	091	180	148						19:47	20:01		
	279	092	0	164						20:06	20:18		
	280	093	180	152						20:21	20:32		
	X	VL 001	89	161						20:36	20:48		
	281	094	0	165						20:52	20:54		cross tie for lines 87-94
										21:00	21:14		
										21:14	21:34		site → CHA
													End Hobbs 8519.7

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP
⊘ 26999	183	8		2.3	0.8		~~18:41~~ 18:19	18:24
○					3.1	WX	21:35	21:40
○								

NOTES: CORS: TN22 - 18:40, Fig. 8 - 18:46
Fig. 8 - 21:14, CORS: TN22 - 21:24

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LIDAR FLIGHT LOG

MISSION: 20160102_26999_B_7161_N6GR DATE: 1-2-16

PILOT: YBARROLA OPERATOR: JACOBUS AIRCRAFT:

ALTM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
QSI 26999	183	N	157	53	40	277	2149	1809	1823	13		
	182	S	156	53	40	277	2149	1827	1840	13		
	181	N	158	53	40	277	2165	1845	1858	13		
	180	S	157	53	40	277	2149	1902	1915	13		
	179	N	161	53	40	277	2147	1919	1932	13		
	178	S	156	53	40	277	2164	1936	1950	13		
	177	N	162	53	40	277	2161	1953	2007	13		
	176	S	159	53	40	277	2144	2010	2024	13		
	175	N	161	53	40	277	2162	2027	2041	13		KRZR
	ULOOS	W	147	53	40	277	2172	2053	2057	4		This is ALT APPROX POINT THAT UW 12-20 15 b. 7161.

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START: 1734-1739	STOP: 2053-2057	NOTES:
○	183	9	81	2.5	0.7		KRZR	KRZR	
○						WX High Clouds			
○									

AERO-METRIC, INC. N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 **FAX: 888-253-6695** E-Mail: amephoto@aerometric.com

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160103. 143005 | DATE: 1-3-16A | LEICA ALS-70

PILOT: TED | OPERATOR: M AUST | AIRCRAFT: N226E | SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999		40	S	163	53	40	277	255	7.0 ft	1507	1521		LIFT A
		39	N	148						1526	1539		
		38	S	158						1543	1556		
		37	N	152						1600	1615		
		36	S	161						1618	1631		
		35	N	153						1635	1649		
		34	S	158						1652	1706		
			E	145						1710	1712		MANUAL CROSSFLIGHT
													LOSS COMMUNICATION WITH
													DATA LOGGER WHEN WE
													LANDED
													ALSO GOT LOW VOLTAGE
													WARNING

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	NOTES
		7		CHA → BGF	15mn	5min	9:30	12:30	BASE STATION - NOVATEL
						WX OVERCAST			SET POINT AT BGF - 2 METER
									START 9:25A
									STOP 4:30P

Quantum Spatial N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 FAX: 888-253-6695

LIDAR FLIGHT LOG

MISSION: 20160103_26999_A_7161_N6GR DATE: 1-3-16

PILOT: YBARROLA OPERATOR: JACOBUS AIRCRAFT: N6GR

ALTM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
QSI26999	174	N	147	53	40	277	2155	1523	1538	14		
	173	S	150	53	40	277	2139	1542	1556	13		PowerPlant
	172	N	152	53	40	277	2155	1600	1614	13		
	171	S	158	53	40	277	2139	1618	1632	14		
	170	N	155	53	40	277	2141	1635	1649	13		
	169	S	152	53	40	277	2143	1653	1707	14		
	168	N	154	53	40	277	2151	1711	1725	13		
	167	S	150	53	40	277	2139	1729	1743	13		
	166	N	150	53	40	277	2170	1746	1800	14		
	146	S	159	53	40	277	2155	1806	1820	14		
	145	N	156	53	40	277	2173	1824	1837	13		
	144	S	162	53	40	277	2148	1841	1854	13		
	ULOO1	E	158	53	40	277	2203	1859	1906	7		Crossline

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
	183	12	52	3.7	0.7	KRZR	1454-1459	1918-1923	
						WX High Clouds			

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160103, 180748 | DATE: 1-3-16 | LEICA ALS-70

PILOT: TED | OPERATOR: M ALST | AIRCRAFT: N2068 | SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999		33	S	157	53	40	277	255	7.3^	1839	1852		LIFT B
		32	N	154						1856	1910		
		31	S	158						1914	1928		
		30	N	150						1931	1945		
		29	S	162						1948	2002		
		28	N	154						2006	2020		
		27	S	152						2023	2037		
		26	N	160						2040	2054		
			E	164						2057	2059		MANUAL CROSSFLIGHT

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
○		8		BGF	N/A	5 MIN	1:20	4:20		
○						WX OVERCAST SOME HAZE				
○										

Quantum Spatial N.6216 Resource Drive Sheboygan Falls, WI. 53085 PHONE: 920-467-2655 FAX: 888-253-6695

LIDAR FLIGHT LOG

MISSION: 20160103-26999-B-7161-N6GR DATE: 1-3-16

PILOT: YBARROLA OPERATOR: JACOBUS AIRCRAFT: N6GR

ALTM

PROJECT NUMBER	LINE NO. & Hdg		GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
QSI26999	143	N	150	53	40	277	2172	2103	2117	13		
	142	S	155	53	40	277	2125	2120	2134	13		
	ULOOI	E	157	53	40	277	2158	2138	2140	2		

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
	183	2	52	0.6	1.1	KRZR	2038-2044	2152-2156	Had to Restart system
						WX			inFlight and Flew over
									base station before 1st line

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160105_142547 | DATE: 1-5-16 | LEICA ALS-70

PILOT: TED | OPERATOR: M HUST | AIRCRAFT: N226E | SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	Lbl	Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
I6799		25	S	155	53	40	277	255	7.3[04]	1456	1509		LIFT A
		24	N	152						1513	1527		
		23	S	157						1530	1544		
		22	N	152						1548	1601		
		21	S	158						1605	1618		
		20	N	156						1622	1635		
		19	S	159						1639	1653		
		18	N	156						1656	1710		
		17	S	158						1717	1726		
		16	N	158						1730	1743		
			E	160						1746	1749		MANUAL CROSSFLIGHT
													BASE STATION @ KBGF

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP
○		10		CHA → BGF		5min	9:20	1:10
○						WX CLEAR		
○								

NOTES: 2m HEIGHT - NOVATEL
START 9:00A

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TN 27 County QL2 Lidar (Cumberland Plateau) Lidar

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160105 - 185715 DATE: 1-5-16 LEICA ALS-70

PILOT: TED OPERATOR: M AUST AIRCRAFT: N22GE SENSOR: 1178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999		15	S	161	53	40	277	255	7.5[2]	1931	1945		LIFT B
		14	N	163						1948	2002		
		13	S	156						2005	2019		
		12	N	160						2022	2036		
		11	S	158						2039	2053		
		10	N	158						2056	2110		
			E	159						2113	2115		MANUAL CROSSFLIGHT

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
		6		BGF		5min	2:00	4:40		
						WX				

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TN 27 County QL2 Lidar (Cumberland Plateau) Lidar

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160106_153058 | DATE: 1-6-15 | LEICA ALS-70

PILOT: TED | OPERATOR: M AUST | AIRCRAFT: N226E | SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26799		49	S	149	53	40	277	255	700	1603	1618		
		48	N	163						1622	1635		
		47	S	147						1639	1654		
		46	N	162						1658	1711		
		45	S	149						1715	1729		
		44	N	160						1733	1747		
		43	S	148						1757	1805		
		42	N	166						1809	1822		
		41	S	150						1826	1841		
			E	155						1846	1848		MANUAL CROSSFLIGHT

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES: BASE STATION AT KBGF
○				CHA → BGF		5min	10:30	2:15		2M HEIGHT NOVATEL
○						WX OVERCAST				START: 10:15A
○										STOP: 2:30P

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TN 27 County QL2 Lidar (Cumberland Plateau) Lidar

LIDAR FLIGHT LOG

ALTM

MISSION: 20160106-26999_A-7161-N6GR DATE: 1-6-16

PILOT: YBARROLA OPERATOR: JACOBUS AIRCRAFT: N6GR

PROJECT NUMBER	LINE NO. & Hdg	GND SPEED (KTS)	SCAN FREQ	SCAN ANGLE	PRF	ALT (m)	TIME START	TIME STOP	Laser Time	TZPK	REMARKS
QSI 26999	141 N	161	53	40	277	2152	1655	1708	13		LOST SAT INFO during line
	140 S	150	53	40	277	2147	1713	1727	14		
	139 N	162	53	40	277	2144	1731	1744	13		
	138 S	144	53	40	277	2140	1749	1804	15		
	137 N	158	53	40	277	2132	1807	1821	13		
	UL001 E	145	53	40	277	2159	1827	1829	2		Crossline

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START:	STOP:	NOTES:
	183	5	22	1.6	0.8	KRZR	1633-1636	1850-1855	Air start after system error
						WX High Clouds			

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YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160111-26999_A_SN7161_N6GR | DATE: 1-11-16A | LEICA ALS-70 [redacted]

PILOT: YBARROLA | OPERATOR: JACOBUS | AIRCRAFT: N6GR

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (MPiA-Disabled/Enabled) (WF Settings)
QSI 26999	1	137	N	158	53	40	277	X	2133	1544	1558	017	
	2	138	S	153	53	40	277	X	2139	1603	1616	017	
	3	139	N	158	53	40	277	X	2159	1620	1634	017	
	4	140	S	156	53	40	277	X	2162	1638	1651	017	
	5	141	N	158	53	40	277	X	2165	1655	1709	017	
	6	UL001	W	140	53	40	277	X	2136	1714	1716	017	CROSSLINE

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
○	183	5	22	1.5	0.8	KRZR	1510-1515	1733-1738		
○						WX HIGH CLOUDS				
○										

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160111_26999_B_SN7161_N66R DATE: 1-11-16B LEICA ALS-70 [redacted]

PILOT: YBAROLLA OPERATOR: JACOBUS AIRCRAFT: N66R

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (MPiA-Disabled/Enabled) (WF Settings)
QSI26999	1	S0	N	160	S3	40	277	X	2150	1953	2006	017	
	2	S1	S	156	S3	40	277	X	2146	2010	2024	017	
	3	S2	N	152	S3	40	277	X	2209	2028	2042	017	
	4	S3	S	150	S3	40	277	X	2240	2047	2100	017	
	5	S4	N	157	S3	40	277	X	2240	2105	2119	017	
	6	S5	S	158	S3	40	277	X	2177	2123	2137	017	
	7	S6	N	154	S3	40	277	X	2146	2141	2155	017	
	8	ULOO	W	142	S3	40	277	X	2172	2200	2203	017	CROSS LINE

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
O	183	7	15	2.2	1.2	KBGF	1927-1932	2216-2221		
O						WX HIGH CLOUDS				
O										

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160112-26999-A-SN7161-N6GR DATE: 1-12-16 A LEICA ALS-70 [redacted]

PILOT: YBARROLA OPERATOR: JACOBUS AIRCRAFT: N6GR

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS (MPiA-Disabled/Enabled) (WF Settings)
QSI26999	1	S7	N	146	53	40	277	X	2145	1459	1514	017	
	2	S8	S	154	53	40	277	X	2137	1518	1532	017	
	3	S9	N	140	53	40	277	X	2142	1537	1551	017	
	4	60	S	152	53	40	277	X	2131	1555	1609	017	
	5	61	N	151	53	40	277	X	2135	1614	1628	017	
	6	62	S	151	53	40	277	X	2131	1632	—		Laser did not Fire, System failed to Shut off unable to manual capture System in Failed State requiring Shutdown

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
○	183	5	1	1.5	1.3	KBGF	1431-1436	n/a		
○						WX HIGH CLOUDS				
○										

YYYYMMDD_TIME(GPS)

OPERATORS FLIGHT LOG

MISSION: 20160112 - 145406 DATE: 1-12-16 LEICA ALS-70

PILOT: TED OPERATOR: M AUST AIRCRAFT: N22GE SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	Lbl	Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	TIME START	TIME STOP	MM70 DRIVE	REMARKS
26999		9	S	160	53	40	277	255	7.1ft	1557	1610		WIND 280° @ 47 KTS
		8	N	145						1614	1622		
		7	S	158						1625	1632		
		6	N	147						1636	1643		
		5	S	160						1648	1653		
		4	N	143						1656	1702		
		3	S	154						1706	1707		
		2	N	139						1710	1711		
		1	S	183						1714	1715		
			W	120						1720	1724		MANUAL CROSSFLIGHT

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP	
○		9		KCNA		5 min	9:50		
○						WX			
○									

NOTES: FLEW OVER BASE STATION AT KBGF

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OPERATORS FLIGHT LOG

MISSION: 20160113-150117 | DATE: 01-13-16 | LEICA ALS-70 JS1

PILOT: MICAH YBARROLA | OPERATOR: JIM SCHOONE | AIRCRAFT: N22GE | SENSOR: 7178

PROJECT NUMBER AND NAME	LINE No.	LINE Lbl	LINE Hdg	GND SPEED (KTS)	FREQ Hz	SCAN ANGLE	PRF kHz	FIXED GAIN	Flying Ht. (m)	GPS TIME START	GPS TIME STOP	MM70 DRIVE	REMARKS	
26999										14:12	14:46		FERRY: CHA → BGF	.6
TN										15:03	15:27		FERRY: BGF → SITE	.5
		062	0	150	53	40	277	255		15:27	15:42	4		
		061	180	↓	↓	↓	↓	↓		15:46	15:59	↓		
	X	ULI	W	↓	↓	↓	↓	↓		16:03	16:06	↓		
											16:27		FERRY: SITE → BGF	.4
										16:42	17:06		FERRY: BGF → CHA	.4

STATUS	TOTAL LINES	FLOWN	LEFT	AIRCRAFT SITE	AIRCRAFT FERRY	STATIC	START	STOP		NOTES:
⊗ 26999		2	Ø	.6	1.9	1.5	15:03	16:27		61+62
○						WX SKC VIS 10+				CROSS OVER 57-62
○										BASE SET AT KBGF

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Section 7: Final Deliverables

The final lidar deliverables are listed below.

- LAS v1.4 classified point cloud
- LAS v1.4 raw unclassified point cloud flight line strips.
- Hydro Breaklines as ESRI shapefile
- Bridge Breaklines as ESRI shapefile
- Digital Elevation Model in ERDAS .IMG format
- 8-bit intensity images in .TIF format
- 2D Building polygons as ESRI Geodatabase
- Tile layout provided as ESRI shapefile
- Control Points provided as ESRI shapefile
- FGDC compliant metadata per product in XML format
- Lidar processing report in pdf format
- Survey report in pdf format