AIRBORNE LIDAR TASK ORDER REPORT

UNITED STATES GEOLOGICAL SURVEY
NRCS LAUREL MS 0.7 NPS LIDAR

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PROJECT REPORT

USGS LAUREL MS 0.7M NPS LIDAR PROCESSING

WOOLPERT PROJECT #73741

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Summary of Contents

List of Figures

List of Tables

SECTION 1: OVERVIEW

PROJECT NAME: USGS-NRCS LAUREL MS 0.7 NPS LIDAR

WOOLPERT PROJECT #73741

This report contains a comprehensive outline of the Laurel MS Lidar Processing task order for the United States Geological Survey (USGS). This task order requires lidar data to be acquired in two separate AOI's over 10 counties in Mississippi; Attala, Leake, Lexington, Montgomery, Scott, Smith, Webster Counties and a portion of Carroll, Choctaw and Jasper Counties and two counties in Alabama; Washington and Choctaw. The combined area of both AOI's is approximately 7,400 square miles. The lidar was collected and processed to meet a maximum Nominal Post Spacing (NPS) of 0.7 meters. 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 a Leica ALS70 and an Optech ALTM Gemini lidar sensor. Both sensors collect up to four returns (echo) 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:

ALS70 SPECIFICATIONS

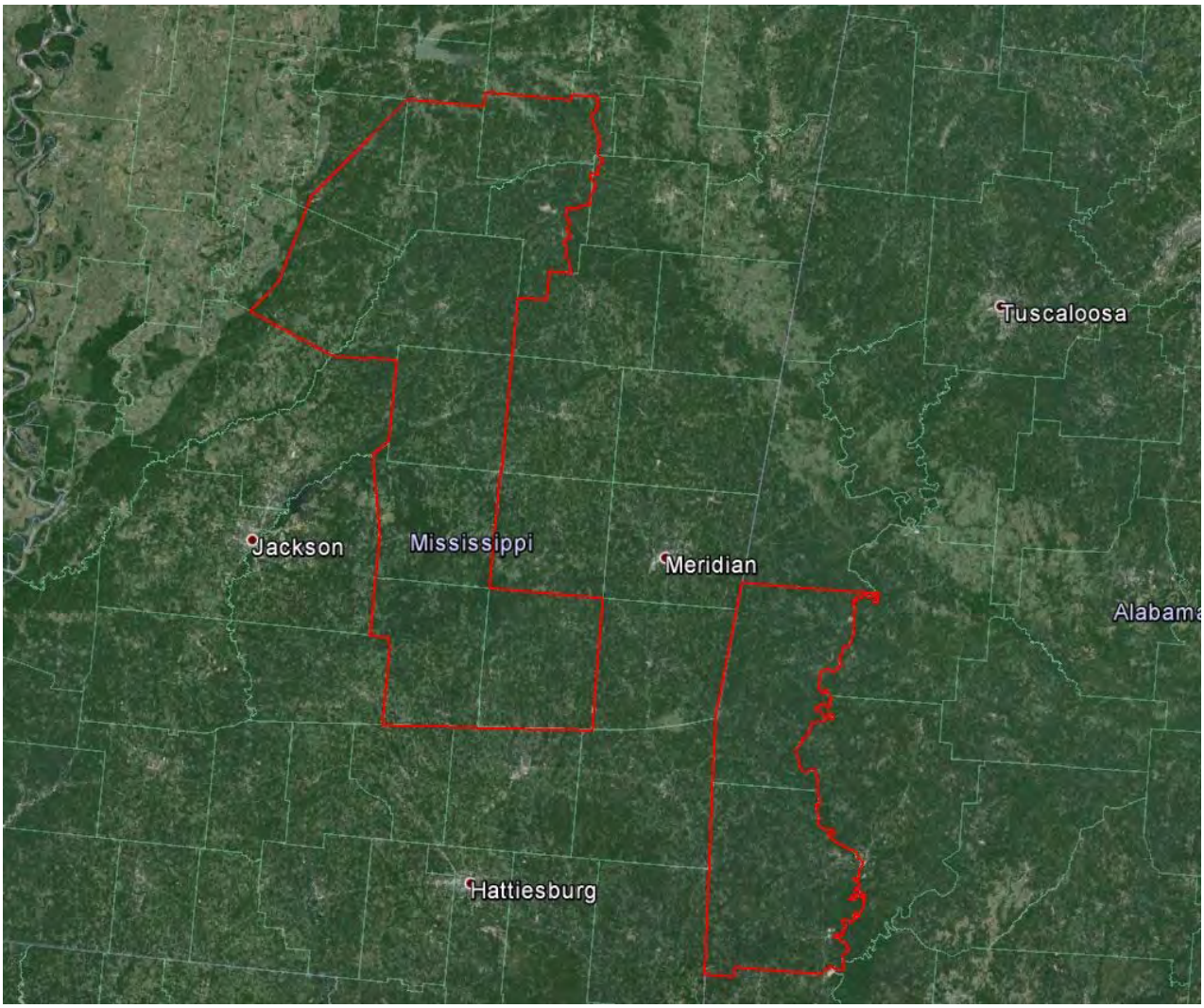
Post Spacing (Minimum):	2.3 ft / 0.7m
AGL (Above Ground Level) average flying height:	6,500 ft / 1,981 m
MSL (Mean Sea Level) average flying height:	variable
Average Ground Speed:	150 knots / 173 mph
Field of View (full):	40 degrees
Pulse Rate:	272 kHz
Scan Rate:	42.3 Hz
Side Lap (Average):	25%

OPTECH ALTM GEMINI SPECIFICATIONS

Post Spacing (Minimum):	2.3 ft / 0.7m
AGL (Above Ground Level) average flying height:	5,000 ft / 1,524 m
MSL (Mean Sea Level) average flying height:	variable
Average Ground Speed:	130 knots / 149 mph
Field of View (full):	24 degrees
Pulse Rate:	125 kHz
Scan Rate:	46 Hz
Side Lap (Average):	30%

The lidar data for this AOI was processed and projected in UTM, Zone 16N, North American Datum of 1983 (2011) in units of meters. The vertical datum used for the task order was referenced to NAVD 1988, GEOID12A, in units of meters.

Figure 1.1 Lidar Task Order AOI



SECTION 2: ACQUISITION

The existing lidar data was acquired with a Leica ALS70 500 kHz Multiple Pulses in Air (MPiA) lidar sensor system, on board a Cessna 404 and Cessna 310 aircraft. 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 system software is operated on an OC50 Operation Controller aboard the aircraft.

Table 2.1: ALS70 Lidar System Specifications

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

Specification	
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

Table 2.2: Optech ALTM Gemini Lidar System Specifications

The ALTM Gemini Multiple Pulses in Air (MPiA) Lidar System has the following specifications:

Specification	
Operating Altitude	150 – 4,000m AGL nominal, 10% reflective target
Scan Angle	0 to 50° (variable)
Swath Width	0 to 1.5 X altitude (variable)
Scan Frequency	0 – 70 Hz (variable based on scan angle)
Maximum Pulse Rate	167kHz
Range Resolution	Better than 1 cm
Elevation Accuracy	5 - 35 cm single shot (one standard deviation)
Horizontal Accuracy	1/5,500 x altitude (m AGL)
Number of Returns per Pulse	4 (first, second, third, last)
Number of Intensities	3 (first, second, third)
Intensity Digitization	12 bit dynamic measurement range
Laser Beam Divergence	Dual Divergence: .25 mrad (1/e) and 0.8 mrad(1/e) nominal
Laser Classification	Class IV laser product (FDA CFR 21)
Eye Safe Range	400m single shot depending on laser repetition rate
Roll Compensation	±5° at full FOV
Power Requirements	28 VDC @ 35A
Operating Temperature	0-40°C
Humidity	0-95% non-condensing

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

Woolpert survey crews were onsite, operating multiple Global Navigation Satellite System (GNSS) Base Stations for the airborne GPS support.

The lidar data was collected in forty-one (41) separate 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: Laurel MS 0.7m NPS Lidar

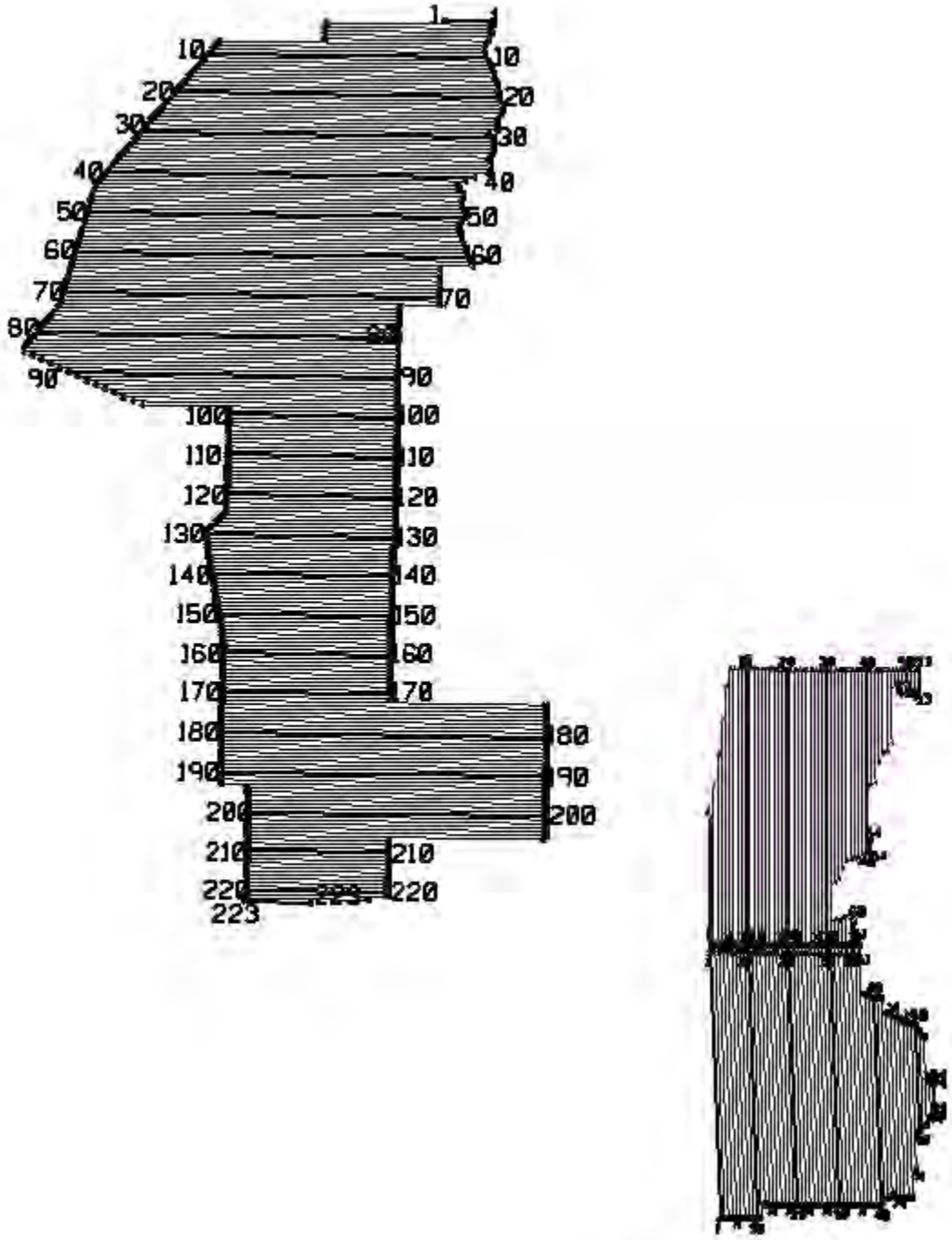


Table 2.3: Airborne Lidar Acquisition Flight Summary

Airborne Lidar Acquisition Flight Summary			
Date of Mission	**Lines Flown**	**Mission Time (UTC) Wheels Up/ Wheels Down**	**Mission Time (Local = EDT) Wheels Up/ Wheels Down**
January 7, 2014 – SensorOP108	1-12 Alabama	20:24-1:51	3:24PM-7:51PM
January 8, 2014 – SensorOP108_A	13-24 Alabama	15:15 – 20:37	10:15AM–3:24PM
January 8, 2014 – SensorOP108_B	25-26 Alabama	22:14-23:43	5:14PM – 6:43PM
January 9, 2014 – SensorOP108_A	27-28 Alabama	15:35 – 17:14	10:35AMPM – 12:14PM
January 9, 2014 – SensorOP108_B	28-39 Alabama	22:04 – 03:13	5:04PM – 10:13PM
January 11, 2014 – SensorOP108	40-51 Alabama	20:00 – 03:00	3:00PM – 10:00PM
January 12, 2014 – SensorOP108_A	52-63 Alabama	15:11 – 20:10	10:11AM – 3:10PM
January 12, 2014 – SensorOP108_B	8, 64-74 Alabama	21:15 – 02:04	4:15PM – 9:04PM
January 12, 2014 – SensorALS-7177	224-227,1-17 Mississippi	16:01 – 22:30	11:01AM – 6:30PM
January 14, 2014 – SensorOP108_A	75-86 Alabama	13:00 – 17:35	8:00AM – 12:35PM
January 14, 2014 – SensorOP108_B	87-102 Alabama	18:20 – 23:30	1:20PM – 6:30PM
January 14, 2014 – SensorALS-7177	17-36 Mississippi	15:46 – 23:01	10:46AM – 6:01PM
January 15, 2014 – SensorOP108	103-122,39 Alabama	20:10 – 01:15	3:10PM – 8:15PM
January 15, 2014 – SensorALS7177_A	37-44 Mississippi	15:37 – 18:30	10:37AM – 1:30PM
January 15, 2014 - SensorALS_7177_B	44 Mississippi	15:37 – 18:30	10:37AM – 1:30PM
January 16, 2014 – SensorOP108_A	103-106 Mississippi	15:55 – 18:15	10:55AM – 1:15PM
January 16, 2014 – SensorOP108_B	107-126 Mississippi	19:50 – 00:40	2:50PM – 7:40PM
January 17, 2014 – SensorOP108_A	127-140,102-100 Mississippi	14:10 – 18:56	8:10AM – 12:56PM
January 17, 2014 – SensorOP108_B	99-92 Mississippi	20:12 – 23:55	3:12PM – 6:55PM
January 17, 2014 – SensorALS-7177	44-61 Mississippi	15:58 – 23:02	10:58AM – 6:02PM

Airborne Lidar Acquisition Flight Summary			
Date of Mission	**Lines Flown**	**Mission Time (UTC)** **Wheels Up/** **Wheels Down**	**Mission Time (Local = EDT)** **Wheels Up/** **Wheels Down**
January 18, 2014 – SensorOP108_A	91-83 Mississippi	15:00 – 19:10	10:00AM – 2:10PM
January 18, 2014 – SensorOP108_B	82-76 Mississippi	19:50 – 23:30	2:50PM – 6:30PM
January 18, 2014 – SensorALS-7108_A	61-55,31-53 Alabama	15:17 – 22:26	10:17AM – 5:26PM
January 18, 2014 – SensorALS-7108_B	30-23 Alabama	15:17 – 22:26	10:17AM – 5:26PM
January 18, 2014 – SensorALS-7177	62-76 Mississippi	15:53 – 22:55	10:53AM – 5:55PM
January 19, 2014 – SensorOP108_A	75-65 Mississippi	14:15 – 19:30	9:15AM – 2:30PM
January 19, 2014 – SensorOP108_B	64-59 Mississippi	20:00 – 23:10	3:00PM – 6:10PM
January 19, 2014 – SensorALS-7108	22-1 Alabama	15:00 – 22:55	10:00AM – 5:55PM
January 19, 2014 – SensorALS-7177	77-95 Mississippi	16:13 – 22:50	11:13AM – 5:40PM
January 20, 2014 – SensorOP108	58-49 Mississippi	14:40 – 19:45	9:40AM – 2:45PM
January 20, 2014 – SensorALS-7108	111-129 Mississippi	16:51 – 21:58	11:51AM – 4:58PM
January 20, 2014 – SensorALS-7177	96-110,226 Mississippi	16:57 – 20:46	11:57AM – 3:46PM
January 21, 2014 – SensorOP108_A	103,48-38 Mississippi	14:20 – 19:55	9:20AM – 2:55PM
January 21, 2014 – SensorOP108_B	156,141-154,37-35,155 Mississippi	20:35 – 01:00	3:35PM – 8:00PM
January 21, 2014 – SensorALS-7108	130-146 Mississippi	15:12 – 20:46	10:12AM – 3:46PM
January 21, 2014 – SensorALS-7177	149-173,157 Mississippi	16:14 – 21:40	11:14AM – 4:40PM
January 22, 2014 – SensorALS-7177	174-175,228 Mississippi	19:52 – 21:06	2:52PM – 4:06PM
January 25, 2014 – SensorALS-7108_A	42-44,123 Mississippi	17:12 – 19:12	12:12PM – 2:12PM
January 25, 2014 – SensorALS-7108_B	44,4,1 Alabama	20:44 – 21:50	3:44PM – 4:50PM
February 15, 2014 – SensorOP108_A	1-18,36-34	18:02 – 22:53	1:02PM – 5:53PM
February 15, 2014 – SensorOP108_B	19-33 Mississippi	00:27 – 04:00	7:27PM – 11:00PM

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.

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, Dashmap v5, Proprietary Software, TerraMatch v. 14.01.

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.14.011.

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.14.011.

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.

The aircraft are all configured with a NovAtel Millennium 12-channel, L1/L2 dual frequency Global Navigation Satellite System (GNSS) receivers collecting at 2 Hz.

All Woolpert aerial sensors are equipped with a Litton LN200 series Inertial Measurement Unit (IMU) operating at 200 Hz.

A base-station unit was mobilized for each acquisition mission, and was operated by a member of the Woolpert acquisition team. 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.

Woolpert's acquisition team was on site, operating GNSS base stations, along with utilizing CORS stations.

The GNSS base station operated during the lidar acquisition missions are listed below:

Table 3.1: GNSS Base Station

Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height (L1 Phase center) (Meters)
4R3 Airport	31°28'34.80705"	87°53'39.08557"	-16.355
1R8 Airport	30°52'19.57915"	87°49'09.05563"	40.204
ALCH CORS	31°27'03.54641"	88°11'45.15525"	24.221
5A6 Airport	33°28'09.84531"	89°43'43.51209"	84.366
MSBS CORS	31°58'11.97847"	89°15'53.56820"	94.128
LUL Airport	31°39'59.15016"	89°10'11.99644"	44.466
ALBU CORS	32°04'53.89579"	88°13'59.33200"	18.285
MEI Airport	32°20'08.32408"	88°44'36.30917"	60.643
MPE Airport	32°48'03.00580"	89°07'30.38851"	106.937
MSDC CORS	32°26'22.97118"	89°06'44.44342"	120.008

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

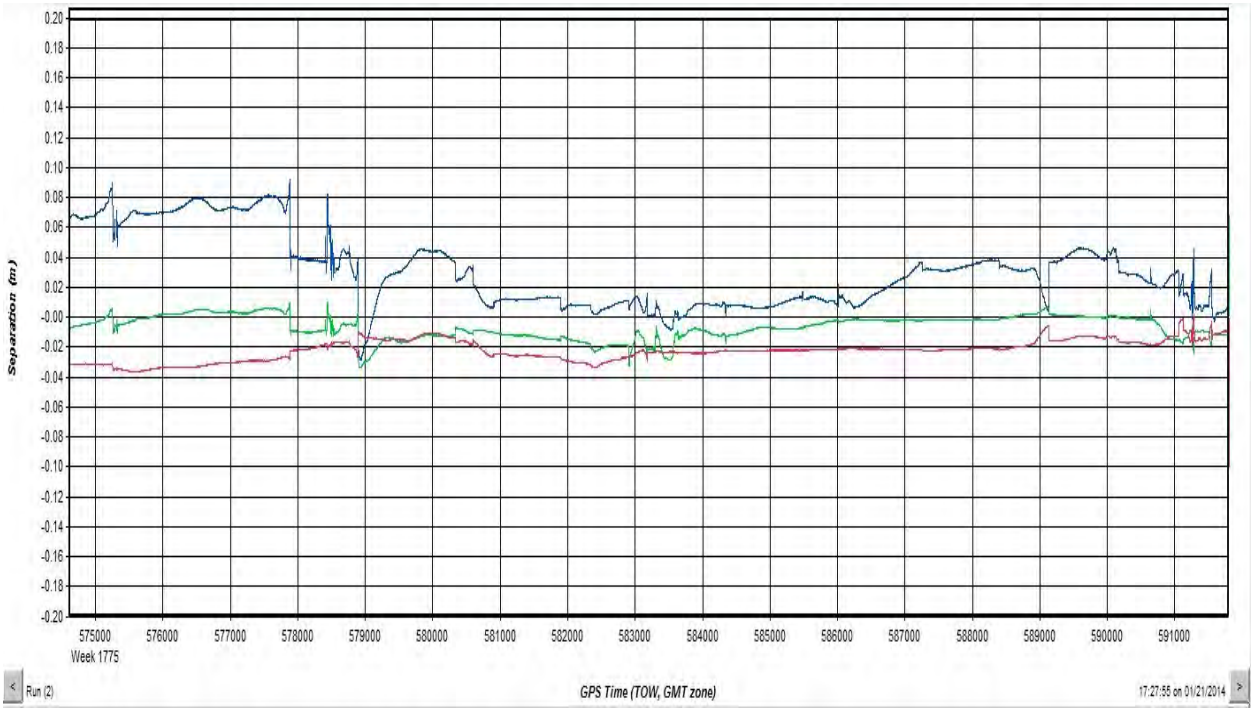
The GNSS Trajectory, along with high quality IMU data are key factors in determining the overall positional accuracy of the final sensor data. Within the trajectory processing, there are many factors that affect the overall quality, but the most indicative are the Combined Separation, the Estimated Positional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

Combined 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 3.1: Combined Separation, Day01814 SH7177_A

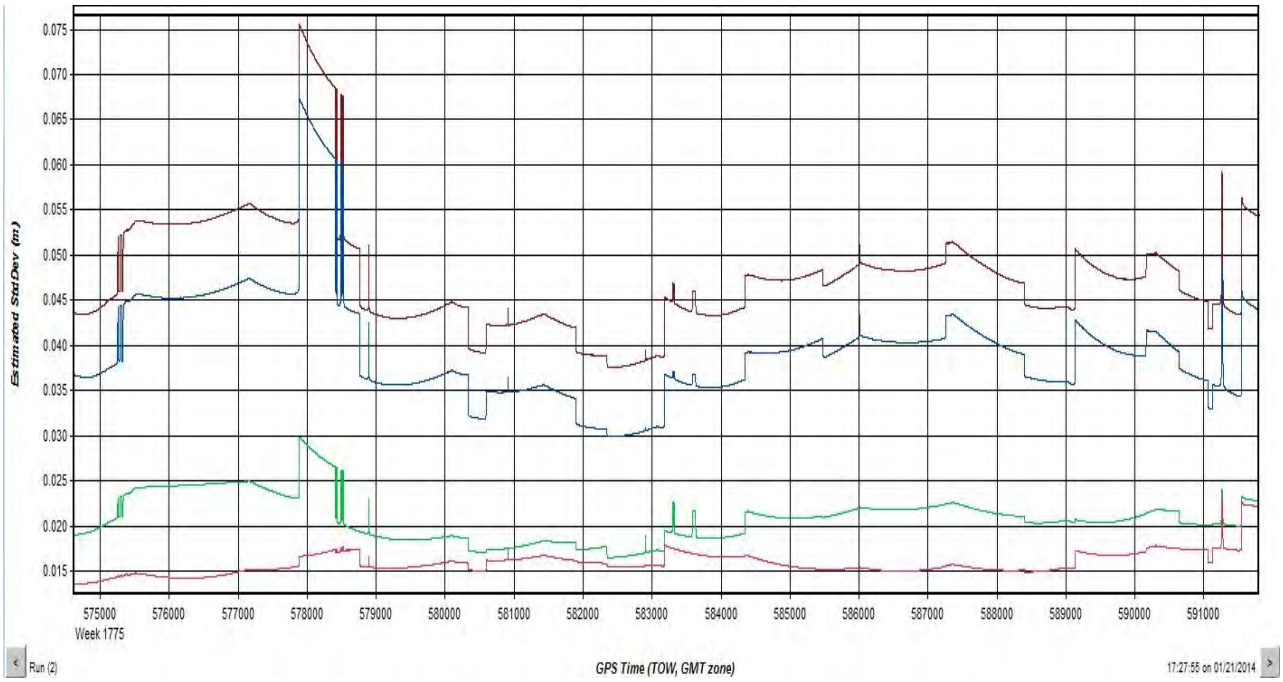


Estimated Positional Accuracy

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 3.2: Estimated Positional Accuracy, Day01814 SH7177_A

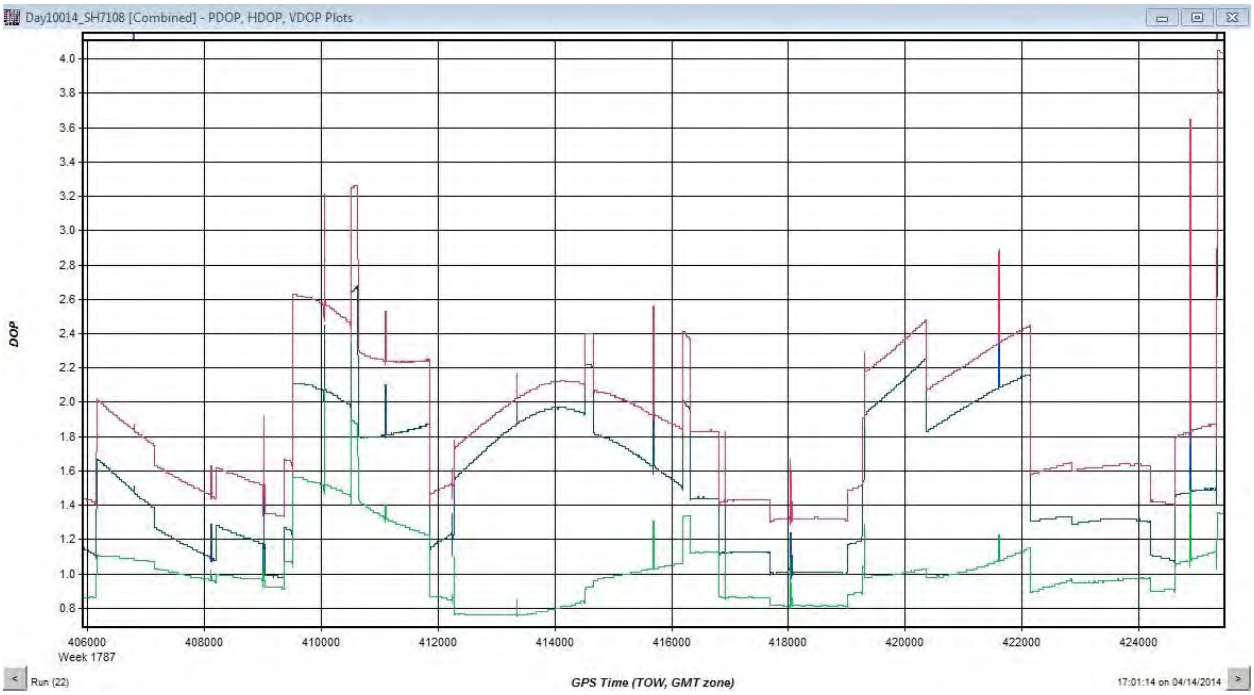


PDOP

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 3.3: PDOP, Day01814 SH7177_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), Ground (Class 2), Noise (Class 7), Water (Class 9), Ignored Ground (Class 10), Overlap default (Class 17), and Overlap Ground (Class 18) classifications.

- FGDC Compliant metadata was developed for the task order in .xml format for the final data products.

SECTION 4: HYDROLOGIC FLATTENING

HYDROLOGIC FLATTENING OF LIDAR DEM DATA

Laurel MS 0.7m NPS 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-acres 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 30.5 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-acres or greater and streams at a minimum size of 30.5 (100 feet) nominal width, were compiled to meet task order requirements. **Figure 4.1** illustrates an example of 30.5 meters (100 feet) nominal streams identified and defined with hydrologic breaklines. The breaklines defining rivers and streams, at a nominal minimum width of 30.5 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

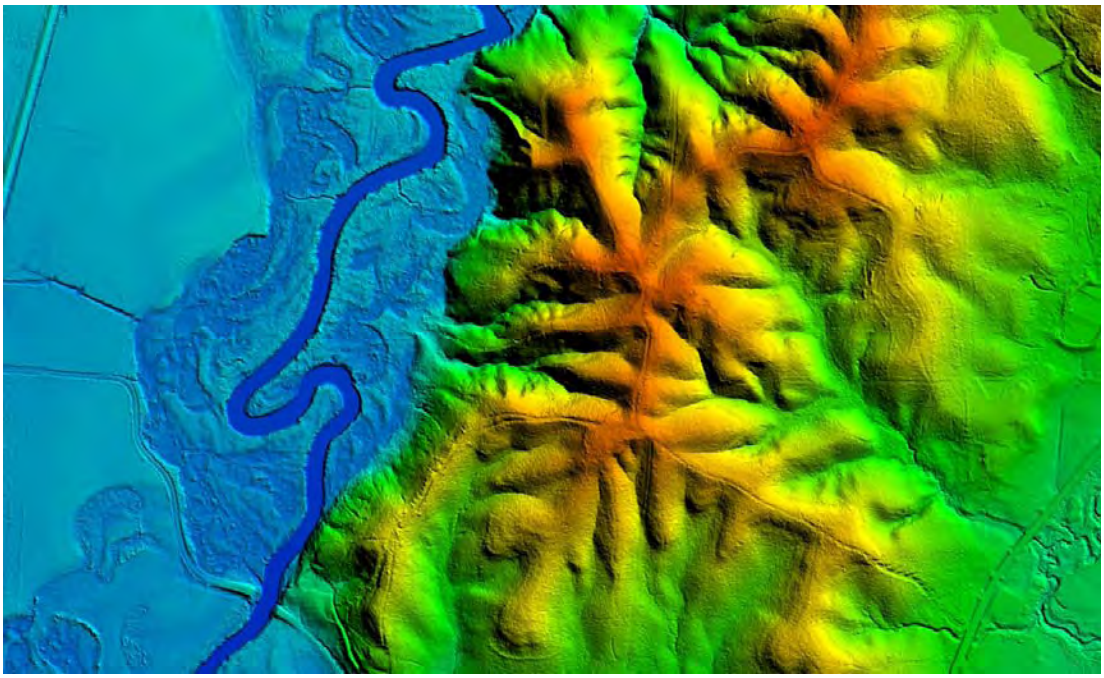


Figure 4.2 reflects a DEM generated from original lidar bare earth point data prior to the hydrologic flattening process. Note the "tinning" across the lake surface.

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 at a 1-meter cell size.

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-acres were provided as a PolygonZ file. The breaklines compiled for the gradient flattening of all rivers and streams at a nominal minimum width of 30.5 meters (100 feet) were provided as a PolylineZ file.

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: FINAL ACCURACY ASSESSMENT

FINAL VERTICAL ACCURACY ASSESSMENT

The vertical accuracy statistics were calculated by comparison of the unclassified lidar points to the ground surveyed quality check points.

Table 5.1: Overall Vertical Accuracy Statistics

Average error	0.041	meters
Minimum error	-0.030	meters
Maximum error	0.270	meters
Root mean square	0.066	meters
Standard deviation	0.053	meters

Table 5.2: Raw Swath Quality Check Point Analysis, FVA, UTM 16N, NAD83, NAVD88 GEOID12A, Laurel MS 0.7m NPS Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	TIN Elevation (meters)	Dz (meters)
2001_L	303439.704	3734859.479	110.52	0.02
2002_L	246562.823	3727902.498	73.74	0.02
2003_L	294922.5	3713919.212	116.87	0.03
2004_L	257408.832	3706067.984	109	0
2005_L	231647.344	3709304.136	119.53	-0.03
2006_L	286614.346	3680362.94	153.04	0.01
2007_L	258256.386	3662957.391	142.1	0
2007A_L	256397.023	3666577.374	118.9	0.02
2008_L	230705.65	3681103.782	145.85	0.06
2009_L	279017.611	3650420.885	166.4	0
2010_L	241528.435	3647772.477	99.53	0.04
2011_L	204897.545	3654972.458	99.46	0.06
2012_L	281350.962	3631289.485	111.5	0.02
2013_L	247537.118	3624814.959	107.64	0.01
2014_L	274740.202	3591838.477	126.23	0.07

Point ID	Easting (UTM meters)	Northing (UTM meters)	TIN Elevation (meters)	Dz (meters)
2015_L	250112.856	3594119.722	117.93	0.02
2016_L	245943.822	3552314.921	134.68	0.27
2018_L	277691.214	3534868.249	153.91	0.08
2019_L	313913.619	3538389.159	159.99	0.08
2020_L	309576.888	3561458.768	127.06	0.07
2021_L	273311.232	3558039.802	124.29	0.04
2022_L	260785.236	3607149.882	129.1	0.02
2023_L	276310.321	3686447.209	121.62	0.04
2024_L	251168.148	3582597.08	137	0.02
2025_L	286712.792	3550493.374	129.6	0.1
2026_L	312578.262	3529550.615	97.82	0.07
2001	368089.536	3568114.547	89.1	0
2002	390036.497	3570689.537	58.9	0
2003	400814.934	3564100.128	32.76	0.02
2004	398080.761	3555444.935	21.77	0.03
2005	384497.796	3550719.731	48.23	0.01
2006	365629.448	3551122.583	137.44	-0.01
2007	367801.678	3530211.962	39.29	0.02
2008	388635.305	3527667.466	21.58	0.01
2009	362780.723	3517086.477	85.09	-0.02
2010	391686.72	3513444.089	12.91	0.01
2011	367337.925	3498877.614	88.36	0.17
2012	390391.504	3498030.015	56.78	0.04
2013	407588.463	3485507.863	40.4	0.09
2014	386318.273	3480204.269	47.14	0.06
2015	365544.26	3481537.506	71.79	0.01
2016	369979.798	3463943.949	71.28	0.1

Point ID	Easting (UTM meters)	Northing (UTM meters)	TIN Elevation (meters)	Dz (meters)
2017	388933.675	3467724.287	44.78	0.01
2018	401850.159	3461427.878	17	0.02
2019	403641.656	3451551.948	18.54	-0.02
2020	387795.12	3450774.119	67.66	0.13
2021	365661.039	3446049.96	86.85	0.11
2022	379147.276	3560097.131	52.82	0.07
2023	363545.509	3476263.145	74.88	0.05
2024	399539.257	3490376.998	77.95	-0.02

VERTICAL ACCURACY CONCLUSIONS

LAS Raw Swath Fundamental Vertical Accuracy (FVA) Tested 0.129 meters fundamental 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.

Bare-Earth DEM Fundamental Vertical Accuracy (FVA) Tested 0.137 meters fundamental 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.

SUPPLEMENTAL VERTICAL ACCURACY ASSESSMENTS

Table 5.3: Quality Check Point Analysis, Urban, UTM 16N, NAD83, NAVD88 GEOID12A, Laurel MS 0.7m NPS Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
3001_L	248777.249	3724603.693	77.97	0.073
3002_L	247726.178	3724482.791	86.88	0.019
3003_L	302755.607	3713181.712	130.26	0.029
3004_L	289456.596	3713561.763	119.1	0.015
3005_L	245827.762	3708774.519	121.9	0.005

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
3006_L	297814.105	3687770.204	159.2	0.039
3007_L	258322.255	3660690.1	144.96	0.071
3008_L	233640.403	3663164.053	80.84	0.021
3009_L	260335.080	3660136.585	120.87	0.031
3010_L	222327.603	3642560.168	72.35	0.083
3011_L	221703.411	3643385.436	78.51	0.109
3012_L	263674.687	3624855.686	110.72	0.084
3013_L	261196.542	3623890.581	108.61	0.106
3014_L	280206.771	3605823.661	125.76	0.025
3015_L	249676.268	3582547.791	147.85	0.091
3016_L	261805.576	3546962.095	164.46	0.065
3017_L	258463.897	3528675.999	88.39	0.011
3018_L	283474.118	3540301.91	133.15	0.097
3019_L	284641.463	3540444.121	131.16	0.07
3020_L	311726.630	3558115.168	117.09	0.088
3021_L	266432.284	3582265.408	149.22	0.042
3022_L	266805.673	3585062.094	140.85	0.063
3023_L	276384.329	3686416.905	123.94	0.05
3024_L	251116.883	3582600.852	138.31	0.031
3025_L	286698.702	3550426.482	128.52	0.143
3026_L	312393.692	3529804.691	102.48	0.065
3001	368101.266	3568144.701	90.71	0.234
3002	390024.011	3570724.245	59.2	0.058
3003	400800.797	3564099.93	32.46	0.005
3004	386135.359	3551013.767	39.34	0.008
3005	384500.105	3550695.187	48	0.055
3006	373863.446	3539852.887	49.3	0.133

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
3007	362172.386	3533557.104	108.39	0.024
3008	374936.374	3527679.251	38.55	0.16
3009	374229.958	3515178.761	71.8	0.125
3010	391492.705	3513388.219	13.43	0.052
3011	367376.446	3498780.614	88.17	0.091
3012	391236.672	3501847.732	46.59	0.097
3013	407604.429	3485512.57	40.12	0.001
3014	402102.664	3478944.034	19.95	0.075
3015	380887.347	3481667.774	56.66	0.187
3016	369994.420	3463929.718	71.35	0.012
3017	383284.780	3469569.293	63.25	0.07
3018	401846.128	3459502.247	14.06	0.03
3019	404004.327	3451247.159	15.13	0.064
3020	386289.641	3449462.335	91.51	0.105
3021	380084.422	3446190.195	66.56	0.032
3022	379158.071	3560122.642	52.82	0.171
3023	380980.133	3482268.692	49.72	0.203
3024	399614.844	3490347.417	78.6	0.052

ACCURACY CONCLUSIONS

Urban Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.180 meters supplemental vertical accuracy at the 95th percentile in the Urban supplemental class reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. Urban Errors larger than 95th percentile include:

- Point 3001, Easting 368101.266, Northing 3568144.701, Z-Error 0.234 meters
- Point 3015, Easting 380887.347, Northing 3481667.774, Z-Error 0.187 meters
- Point 3023, Easting 380980.133, Northing 3482268.692, Z-Error 0.203 meters

Table 5.4: Quality Check Point Analysis, Tall Weeds and Crops, UTM 16N, NAD83, NAVD88 GEOID12A, Laurel MS 0.7m NPS Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
4001_L	303327.610	3734838.39	107.15	0.071
4002_L	247422.981	3726151.797	73.26	0.227
4002A_L	246615.768	3727846.769	73.42	0.024
4003A_L	269081.813	3703435.077	111.41	0.043
4003B_L	266728.979	3715608.755	117.19	0.034
4004A_L	268099.397	3705578.789	137.1	0.013
4004B_L	266576.699	3715586.457	118.52	0.045
4005_L	237197.603	3709130.496	103.57	0.095
4006_L	287354.029	3679709.811	142.45	0.075
4007_L	256377.618	3666063.477	108.26	0.085
4008_L	234113.293	3681027.214	104.98	0.019
4008A_L	236212.075	3677383.818	96.45	0.135
4009_L	277665.536	3651539.52	126.2	0.233
4010_L	230557.462	3648026.57	71.3	0.162
4011_L	202468.568	3655675.715	91.11	0.094
4012_L	281240.988	3631096.637	111.67	0.182
4013_L	246845.261	3624062.573	111.1	0.147
4014_L	274615.600	3591869.807	128.22	0.022
4015_L	250613.906	3592817.883	113.71	0.13
4016_L	246263.854	3551630.203	134.88	0.073
4017_L	256725.310	3528148.662	95.8	0.079
4018_L	279103.015	3535699.708	159.43	0.114
4019_L	309962.506	3541580.214	141.53	0.015
4020_L	309604.552	3561410.337	126	0.01
4021_L	272337.649	3558114.573	107.41	0.197

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
4021A_L	272323.720	3558085.331	107.04	0.117
4022_L	260753.668	3607133.379	128.71	0.081
4022A_L	261318.261	3606408.96	130.6	0.037
4023_L	274979.027	3686821.975	125.74	0.018
4024_L	254173.177	3583047.568	136.96	0.064
4025_L	286564.647	3552524.954	120.7	0.086
4026_L	313130.321	3529475.8	110.25	0.094
4001	369724.506	3568534.522	77.54	0.002
4002	390071.966	3569730.448	68.3	0.015
4003	398897.922	3564256.573	30.27	0.229
4004	396114.986	3554671.666	29.61	0.1
4005	379397.161	3559277.653	45.71	0.055
4006	369738.887	3549431.742	140.98	0.111
4007	367797.864	3530230.235	40.25	0.054
4008	388652.741	3527649.201	20.56	0.166
4009	366783.731	3515982.458	113.87	0.094
4010	388213.408	3515021.756	52.07	0.088
4011	375725.565	3498792.409	37.87	0.081
4012	390420.134	3498038.278	57.17	0.271
4013	408316.707	3485203.171	41.03	0.036
4014	390001.107	3479283.368	44.42	0.068
4015	365537.187	3481501.331	71.4	0.027
4016	369576.329	3464425.521	58.84	0.001
4017	389326.717	3465509.308	39.4	0.047
4018	403535.209	3461374.033	15.4	0.05
4019	403648.756	3451572.748	18.57	0.045
4020	387811.630	3450791.855	68.08	0.056

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
4021	365653.672	3446063.363	86.98	0.092
4022	379181.231	3560131.956	52.36	0.139
4023	363570.772	3476239.093	74.78	0.117
4024	397710.399	3489710.133	59.46	0.014

ACCURACY CONCLUSIONS

Tall Weeds/Crops Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.228 meters supplemental vertical accuracy at the 95th percentile in the Tall Weeds/Crops supplemental class reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. Tall Weeds/Crops Errors exceeding the 95th percentile include:

- Point 4009_L, Easting 277665.536, Northing 3568144.701, Z-Error 0.234 meters
- Point 4003, Easting 398897.922, Northing 3481667.774, Z-Error 0.187 meters
- Point 4012, Easting 390420.134, Northing 3498038.278, Z-Error 0.271 meters

Table 5.5: Quality Check Point Analysis, Brush Lands and Trees, UTM 16N, NAD83, NAVD88 GEOID12A, Laurel MS 0.7m NPS Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
5001_L	303026.991	3734881.394	102.05	0.263
5002_L	247396.877	3726227.672	73.22	0.112
5003_L	266892.277	3715563.682	117.64	0.189
5004_L	256186.394	3706936.427	108.45	0.123
5005_L	231744.925	3709351.004	122.12	0.05
5006_L	288219.914	3680826.513	160.44	0.12
5007_L	256389.516	3666095.384	108.27	0.146
5008_L	233098.173	3678392.168	129.49	0.011
5009_L	279009.398	3650435.773	166.93	0.077
5010_L	232181.004	3646762.15	73.31	0.123
5011_L	209363.221	3659081.165	106.5	0.147
5012_L	281217.550	3631071.627	111.88	0.286
5013_L	248473.698	3628986.53	108.51	0.211
5014_L	273326.071	3591231.546	137.79	0.043
5015_L	250613.607	3592773.882	113.87	0.185
5016_L	249133.467	3551442.083	120.27	0.166
5017_L	255260.338	3528145.793	117.46	0.206
5018_L	277147.838	3533893.776	142.77	0.177
5020_L	308760.760	3561424.798	131.47	0.203
5022A_L	264437.031	3607395.117	129.56	0.107
5022B_L	262731.178	3607655.407	140.98	0.138
5023_L	278400.841	3686273.114	139.95	0.04
5024_L	248005.657	3581706.067	132	0.14
5025_L	286976.751	3551625.547	123.02	0.112
5026_L	313095.834	3529484.282	110.28	0.036

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
5001	366200.872	3568910.69	87.34	0.083
5002	389061.077	3567189.377	33.41	0.202
5004	398094.570	3555442.825	22.14	0.258
5005	388897.208	3551609.402	47.61	0.218
5006	371059.168	3553361.15	159.27	0.019
5007	367813.348	3530211.778	39.89	0.12
5008	388521.879	3527477.337	20.8	0.206
5009	366006.825	3515383.929	103.95	0.203
5010	388269.617	3515056.362	50.44	0.149
5011	375429.518	3499324.122	32.06	0.116
5012	391201.869	3501916.629	46.03	0.06
5013	407565.293	3485521.564	40.77	0.046
5014	386062.118	3479520.236	39.86	0.109
5015	370096.502	3484591.46	78.98	0.012
5016	369598.520	3464414.577	58.85	0.185
5017	389315.233	3465498.69	39.58	0.17
5018	403601.752	3461363.039	15.49	0.1
5019	403741.015	3451201.172	16.26	0.085
5020	387811.945	3450802.806	68.56	0.34
5021	366680.087	3446224.603	82.43	0.047
5022	379149.387	3560079.858	52.74	0.025
5023	363610.185	3476263.687	75.72	0.072
5024	398257.743	3489673.403	62.22	0.173

ACCURACY CONCLUSIONS

Brush Lands and Trees Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.261 meters supplemental vertical accuracy at the 95th percentile in the Brush Lands and Trees supplemental class reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. Brush Lands and Trees Errors larger than 95th percentile include:

- Point 5001_L, Easting 303026.991, Northing 3734881.394, Z-Error 0.263 meters
- Point 5012_L, Easting 281217.550, Northing 3631071.627, Z-Error 0.286 meters
- Point 5020, Easting 387811.945, Northing 3450802.806, Z-Error 0.340 meters

Table 5.6: Quality Check Point Analysis, Forested and Fully Grown, UTM 16N, NAD83, NAVD88 GEOID12A, Laurel MS 0.7m NPS Lidar

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
6001_L	302217.644	3734837.491	106.56	0.136
6001A_L	302190.769	3734826.501	107.32	0.104
6002_L	245437.321	3729566.014	70.36	0.08
6002A_L	245414.554	3729548.367	70.47	0.089
6003_L	266587.139	3715548.307	118.48	0.011
6003A_L	266597.758	3715523.901	118.64	0.033
6004_L	254920.787	3706873.821	124.39	0.122
6004A_L	254891.924	3706870.396	123.01	0.021
6005_L	234605.468	3709329.845	84.69	0.104
6005A_L	234584.414	3709301.872	84.07	0.077
6006_L	286579.418	3680783.384	157.93	0.017
6006A_L	286582.584	3680849.827	160.77	0.036
6007_L	256334.953	3666687.256	121.89	0.003
6007A_L	256340.267	3666716.046	121.43	0.168
6008_L	234608.084	3680942.249	116.2	0.117
6008A_L	234576.342	3680944.354	115.95	0.052
6009_L	277591.481	3651503.581	126.01	0.041

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
6009A_L	277595.195	3651531.439	126.11	0.062
6010_L	239754.883	3647164.907	88.03	0.061
6010A_L	239704.817	3647158.983	83.65	0.06
6011_L	206607.283	3656881.312	96.72	0.048
6011A_L	206607.106	3656863.495	96.13	0.061
6012_L	281206.815	3631099.982	110.76	0.157
6012A_L	281194.304	3631090.392	110.53	0.137
6013_L	247530.437	3624896.433	108.42	0.154
6013A_L	247541.195	3624945.269	108.66	0.189
6014_L	275504.473	3591686.032	120.59	0.016
6014A_L	275477.827	3591693.693	120.78	0.016
6015_L	250681.555	3592073.592	117.92	0.034
6015A_L	250676.739	3592105.736	118.12	0.052
6016_L	245100.077	3551459.905	103.74	0.017
6016A_L	245072.949	3551457.469	103.32	0.024
6017_L	258474.476	3528725.342	87.33	0.084
6017A_L	258510.404	3528709.648	87.4	0.129
6018_L	279988.157	3537778.142	152.29	0.123
6018A_L	280002.176	3537816.032	152.93	0.119
6019_L	309875.768	3541112.196	140.74	0.085
6019A_L	309865.410	3541082.318	140.87	0.143
6020_L	308893.558	3561479.256	128.78	0.073
6020A_L	308911.038	3561467.709	129.17	0.008
6021_L	274216.300	3558004.478	115.2	0.131
6021A_L	274226.814	3557974.613	114.86	0.028
6022_L	263947.380	3607296.019	133.53	0.153
6022A_L	263932.559	3607299.362	133.99	0.046

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
6023_L	275536.568	3688667.023	136.29	0.037
6023A_L	275518.477	3688685.033	135.28	0.109
6024_L	254154.213	3582998.192	136.2	0.008
6024A_L	254206.183	3582955.973	136.09	0.11
6025_L	286369.986	3551405.958	126.74	0.011
6025A_L	286348.670	3551405.734	126.83	0.117
6026_L	312615.481	3529525.573	97.17	0.058
6027_L	312645.444	3529503.154	97.02	0.003
6001	367355.247	3568278.384	87.95	0.11
6002	390072.041	3570686.571	60.73	0.031
6003	401093.577	3563976.868	31.23	0.168
6004	398050.811	3555450.069	22	0.256
6005	388835.820	3551646.5	49.08	0.083
6006	364575.470	3550905.419	134.87	0.029
6008	388989.254	3527941.344	16.32	0.166
6010	390818.651	3511492.364	18.76	0.072
6011	367434.936	3498202.006	86.41	0.163
6012	383202.660	3500319.592	42.1	0.054
6013	408299.033	3485205.947	40.3	0.044
6014	386108.670	3479452.618	37.07	0.016
6015	370891.269	3484267.338	72.24	0.036
6016	370201.838	3463792.518	70.03	0.153
6017	390342.176	3463128.882	26.07	0.044
6018	401864.056	3461377.485	16.66	0.552
6019	403633.812	3451178.561	17.39	0.026
6022	380157.268	3561213.373	40.82	0.287
6022	380104.337	3561232.519	41.17	0.025

Point ID	Easting (UTM meters)	Northing (UTM meters)	DEM Elevation (meters)	Abs. Dz (meters)
6023	365504.188	3481500.449	71.88	0.011

ACCURACY CONCLUSIONS

Forested and Fully Grown Land Cover Classification Supplemental Vertical Accuracy (SVA) Tested 0.177 meters supplemental vertical accuracy at the 95th percentile in the Forested/Fully Grown supplemental class reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. Forested/Fully Grown Errors larger than 95th percentile include:

- Point 6013A_L, Easting 247541.195, Northing 3624945.269, Z-Error 0.189 meters
- Point 6004, Easting 398050.811, Northing 3555450.069, Z-Error 0.256 meters
- Point 6018, Easting 401864.056, Northing 3461377.485, Z-Error 0.552 meters
- Point 6022, Easting 380157.268, Northing 3561213.373, Z-Error 0.287 meters

CONSOLIDATED VERTICAL ACCURACY ASSESSMENT

ACCURACY CONCLUSIONS

Consolidated Vertical Accuracy (CVA) Tested 0.207 meters consolidated vertical accuracy at the 95th percentile level; reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines and tested against the DEM. CVA is based on the 95th percentile error in all land cover categories combined.

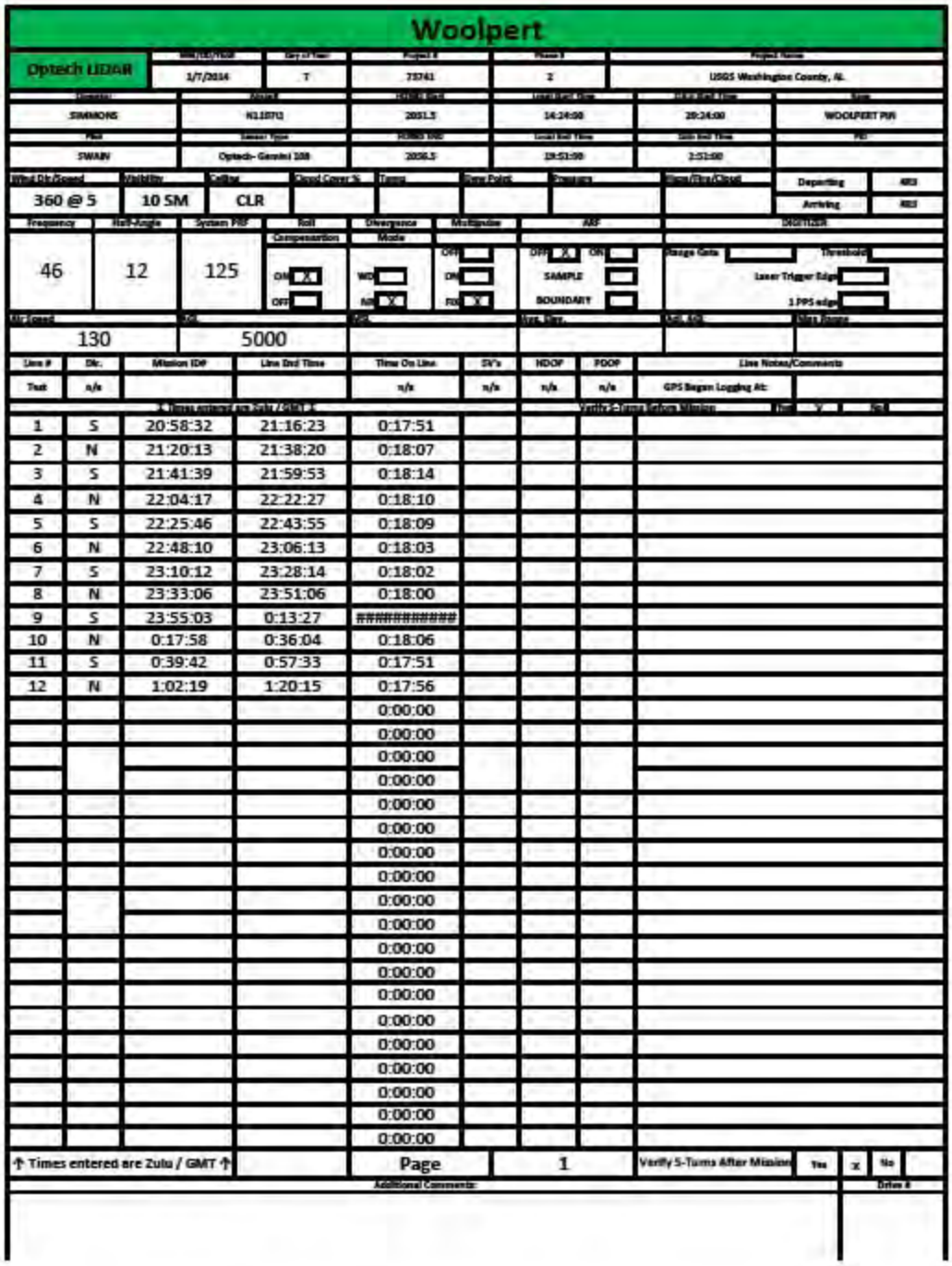
- Point 3001, Easting 368101.266, Northing 3568144.701, Z-Error 0.234 meters
- Point 4003, Easting 398897.922, Northing 3564256.573, Z-Error 0.229 meters
- Point 4012, Easting 390420.134, Northing 3498038.278, Z-Error 0.271 meters
- Point 5004, Easting 398094.570, Northing 3555442.825, Z-Error 0.258 meters
- Point 5005, Easting 388897.208, Northing 3551609.402, Z-Error 0.218 meters
- Point 5020, Easting 387811.945, Northing 3450802.806, Z-Error 0.340 meters
- Point 6004, Easting 398050.811, Northing 3555450.069, Z-Error 0.256 meters
- Point 6022, Easting 380157.268, Northing 3561213.373, Z-Error 0.287 meters
- Point 4002_L, Easting 247422.981, Northing 37626151.797, Z-Error 0.227meters
- Point 4009_L, Easting 277665.536, Northing 3651539.520, Z-Error 0.233 meters
- Point 5001_L, Easting 303026.991, Northing 3734881.394, Z-Error 0.263 meters
- Point 5012_L, Easting 281217.550, Northing 3631071.627, Z-Error 0.286 meters
- Point 5013_L, Easting 248473.698, Northing 3628986.530, Z-Error 0.211 meters
- Point 6018, Easting 401864.056, Northing 3461377.485, Z-Error 0.552 meters

Approved By:			
Title	Name	Signature	Date
Associate Lidar Specialist Certified Photogrammetrist #1281	Qian Xiao		December 2014

SECTION 6: FLIGHT LOGS

FLIGHT LOGS

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



Woolpert

Optech LIDAR

1/7/2014	7	73741	2	USGS Washington County, AL
SIMMONS	N1107Q	2051.5	14:24:00	20:24:00
SWAIN	Optech- Gemini 108	2056.5	19:51:00	2:51:00

WOOLPERT PIR

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure
360 @ 5	10 SM	CLR				

Frequency	Half-Angle	System PRF
46	12	125

Roll Compensation: ON ☒ OFF ☐

Divergence Mode: WD ☐ NR ☒

ON ☐ ON ☐ FIX ☒

OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐

Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Air Speed	AGL
130	5000

Line #	Dir.	Mission ID#	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:
1	S	20:58:32	21:16:23	0:17:51				
2	N	21:20:13	21:38:20	0:18:07				
3	S	21:41:39	21:59:53	0:18:14				
4	N	22:04:17	22:22:27	0:18:10				
5	S	22:25:46	22:43:55	0:18:09				
6	N	22:48:10	23:06:13	0:18:03				
7	S	23:10:12	23:28:14	0:18:02				
8	N	23:33:06	23:51:06	0:18:00				
9	S	23:55:03	0:13:27	###########				
10	N	0:17:58	0:36:04	0:18:06				
11	S	0:39:42	0:57:33	0:17:51				
12	N	1:02:19	1:20:15	0:17:56				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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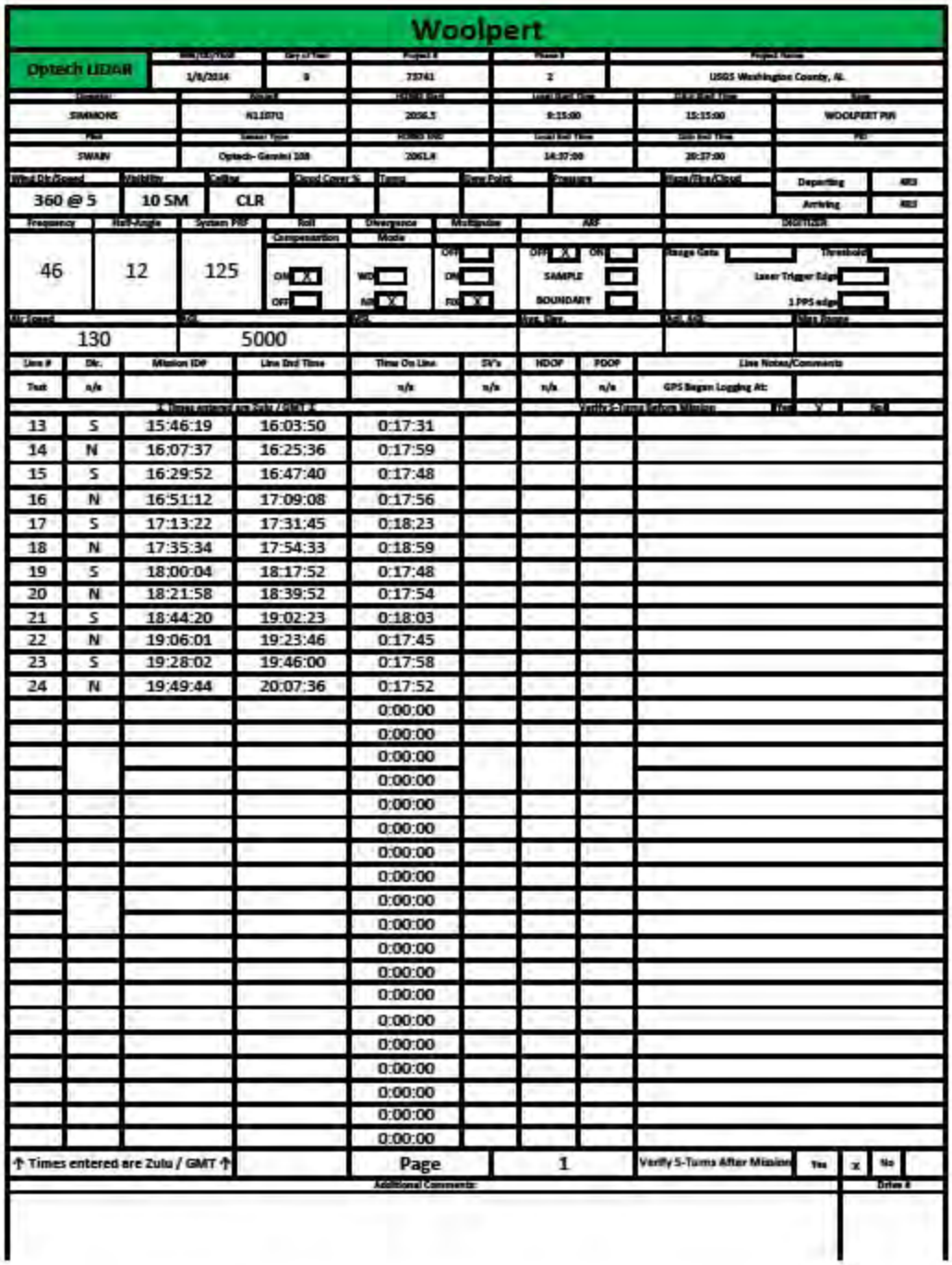
↑ Times entered are Zulu / GMT ↑

Page 1

Verify 5-Turns After Mission Yes X No

Additional Comments:

Drive #



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Phase #	Project Name
1/8/2014	8	73741	2	USGS Washington County, AL

Operator	Aircraft	Flight #	Local Start Time	GPS End Time	Base
SIMMONS	N110TQ	2036.5	9:15:00	15:15:00	WOOLPERT PVR
PIC	**Sensor Type**	**POS/IMU SN#**	**Local End Time**	**GPS End Time**	**PIC**
SWAIN	Optech- Gemini 108	2061.4	14:37:00	20:37:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	ABQ
360 @ 5	10 SM	CLR						Arriving	ABQ

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
46	12	125	ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Alt Speed	Alt	Alt	Area, Sq.	Alt. Adj.	Alloy Range
130	5000				

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission	Yes	X	No	
13	S	15:46:19	16:03:50	0:17:31						
14	N	16:07:37	16:25:36	0:17:59						
15	S	16:29:52	16:47:40	0:17:48						
16	N	16:51:12	17:09:08	0:17:56						
17	S	17:13:22	17:31:45	0:18:23						
18	N	17:35:34	17:54:33	0:18:59						
19	S	18:00:04	18:17:52	0:17:48						
20	N	18:21:58	18:39:52	0:17:54						
21	S	18:44:20	19:02:23	0:18:03						
22	N	19:06:01	19:23:46	0:17:45						
23	S	19:28:02	19:46:00	0:17:58						
24	N	19:49:44	20:07:36	0:17:52						
				0:00:00						
				0:00:00						
				0:00:00						
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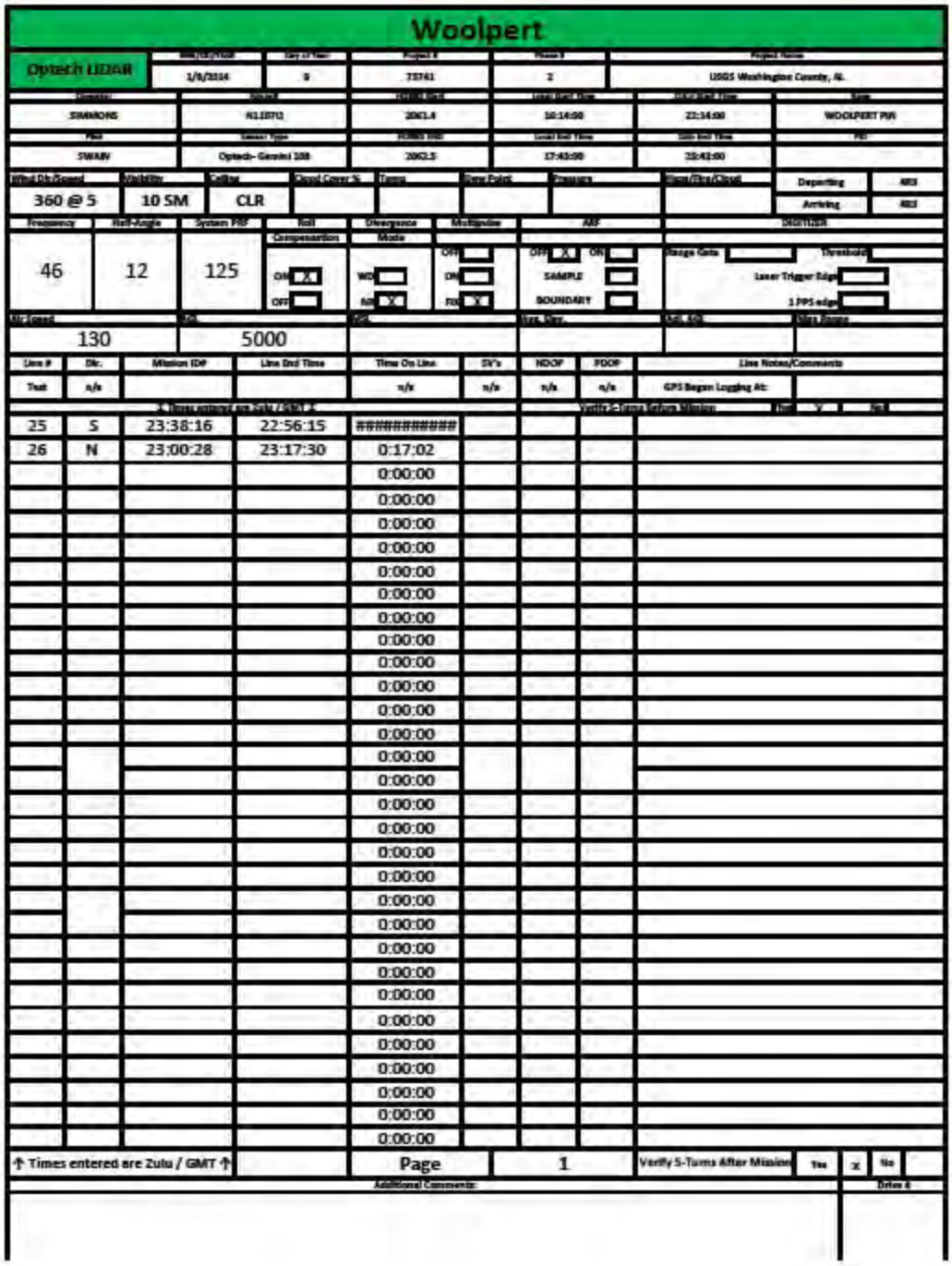
↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission	Yes	X	No	

Additional Comments: Drive #



Woolpert

Optech LIDAR

	Day of Year	Project #	Phase #	Project Name
1/9/2014	9	73741	2	USGS Washington County, AL

SIMMONS	N110TG	2061.4	16:14:00	22:14:00	WOOLPERT PIR
Pilot	Sensor Type		Local End Time		
SWAIN	Optech- Gemini 108	2062.5	17:42:00	23:42:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure		Departing	
360 @ 5	10 SM	CLR						Arriving	

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	DIGITIZER
46	12	125	ON ☒ OFF ☐	W ☐ N ☒	OFF ☐ ON ☐ FIX ☒	OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐

Range Gate ☐ Threshold ☐

Laser Trigger Edge ☐

1 PPS edge ☐

Air Speed	AGL				
130	5000				

Line #	Dir.	Mission ID#	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:
25	S	23:38:16	22:56:15	############				
26	N	23:00:28	23:17:30	0:17:02				
				0:00:00				
				0:00:00				
				0:00:00				
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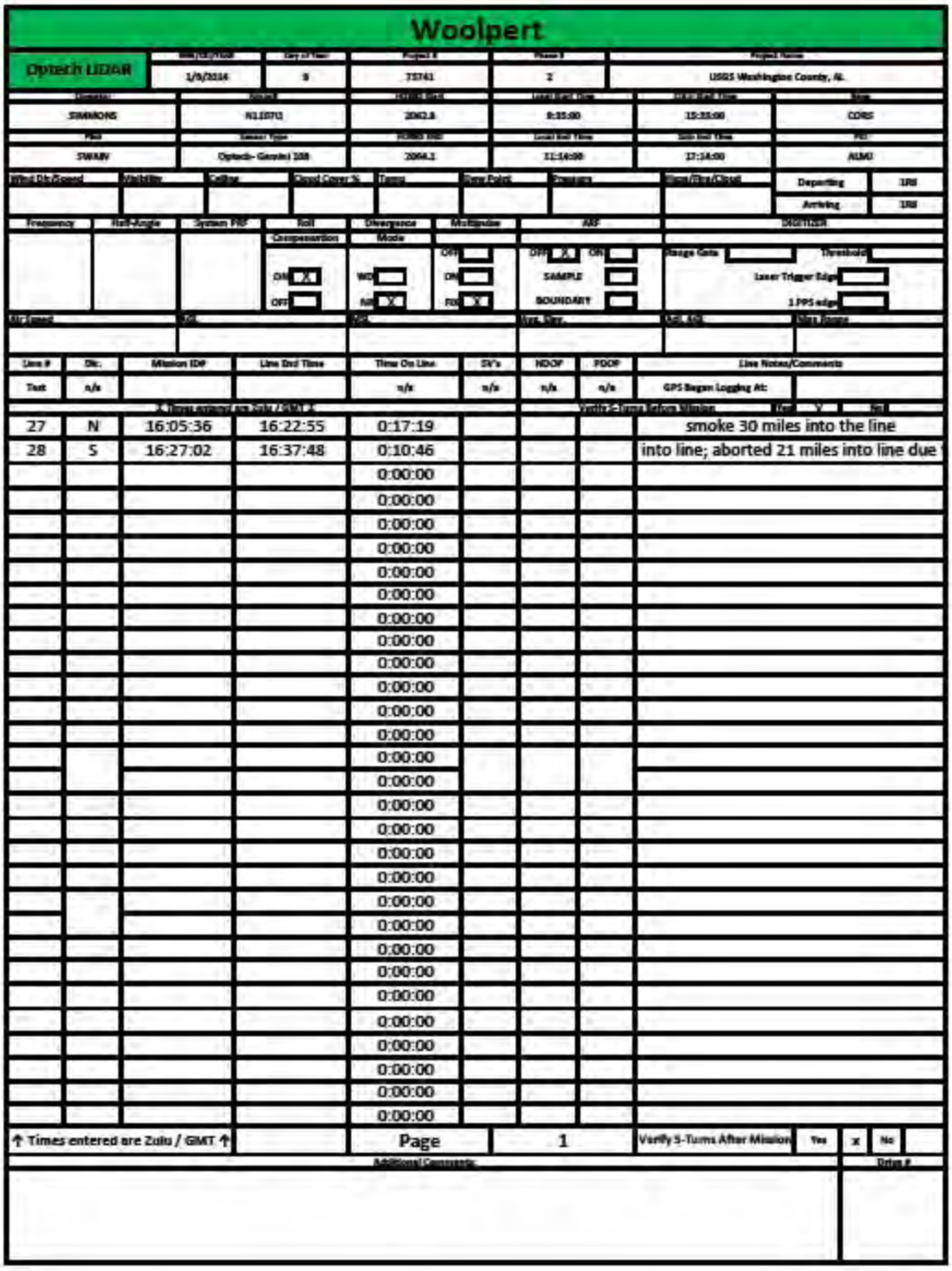
Additional Comments:



Woolpert

Optech LIDAR

Mm/Dd/Year	Day of Year	Project #	Phase #	Project Name
1/9/2014	9	73741	2	USGS Washington County, AL

Operator	Aircraft	Hobbs Start	Local Start Time	Zulu Start Time	Base
SIMMONS	N110TG	2062.8	9:35:00	15:35:00	CORS
Pilot	Sensor Type	Hobbs End	Local End Time	Zulu End Time	FBO
SWAIN	Optech- Gemini 108	2064.1	11:14:00	17:14:00	ALMU

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Rain/Fog/Cloud	Departing	1R8
								Arriving	1R8

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ARF	DIGITIZER
			ON ☒ OFF ☐	WD ☐ NR ☒	OFF ☐ ON ☐ FO ☒	OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐	Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Air Speed	AGL	MSL	Avg. Elev.	Lat. Alt.	Max Range

Line #	Dir.	Mission ID#	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 5-Turns Before Mission		Yes	Y	No
27	N	16:05:36	16:22:55	0:17:19				smoke 30 miles into the line	
28	S	16:27:02	16:37:48	0:10:46				into line; aborted 21 miles into line due	
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
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↑ Times entered are Zulu / GMT ↑				Page	1		Verify 5-Turns After Mission	Yes x	No

Additional Comments:	Drive #

Woolpert

Optech LIDAR					
	1/9/2014	9	73741	2	USGS Washington County, AL
SIMMONS	N110TQ		2064.1	16:04:00	22:54:00	CORS
SWAIN	Optech- Gemini 208		2069.0	21:15:00	3:12:00	KUMJ

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Clear/Fair/Cloud	Departing	TPA
								Arriving	KBPM

Frequency	Roll-Jungle	System PRF	Roll Compensation	Divergence Mode	Multiplier	ARF	DIGITIZER
			ON X	WD	OFF	OFF X ON	Range Gate	Threshold
			OFF	NR X	DN	SAMPLE	Laser Trigger Edge
					FIX X	BOUNDARY	1 PPS edge

Air Speed	Alt.	Hdg.	Drift	Acft. Dir.	Acft. Alt.	Elev. Datum

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	NDOP	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 5-Turns Before Mission: Yes X No
28	N	22:45:37	23:02:54	0:17:17				
29	S	23:07:06	23:24:24	#VALUE!				
30	N	23:28:08	23:45:06	0:16:58				
31	S	23:49:05	0:06:10	##########				
32	N	0:09:56	0:27:08	0:17:12				
33	S	0:31:26	00:48:27	#VALUE!				
34	N	0:51:59	1:09:24	0:17:25				
35	S	1:12:54	1:30:44	0:17:50				
36	N	1:34:46	1:51:44	0:16:58				
37	S	1:55:17	2:12:16	0:16:59				
38	N	2:15:55	2:32:41	0:16:46				
39	S	2:36:25	2:52:00	0:15:35				
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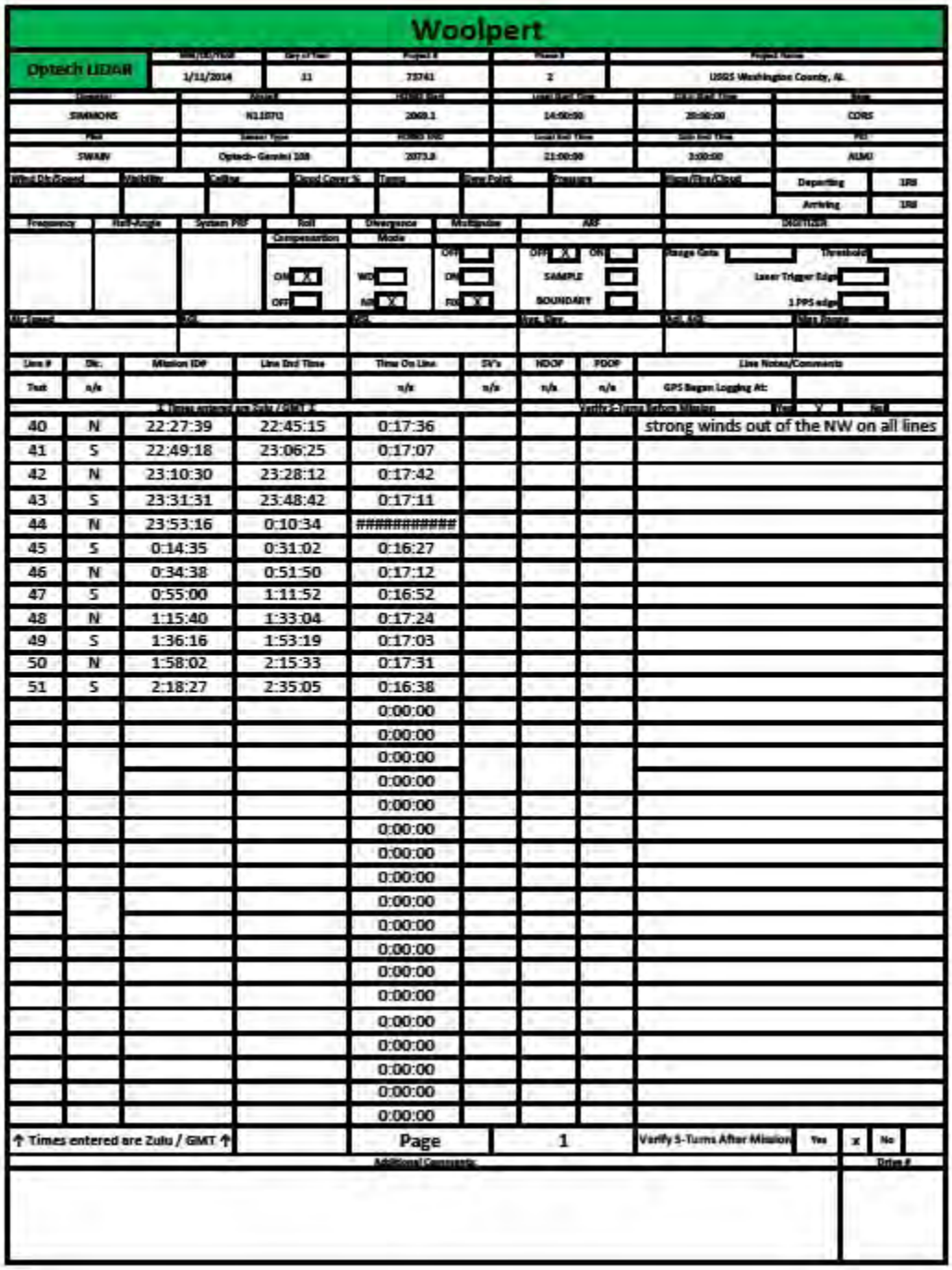
↑ Times entered are Zulu / GMT ↑				Page	1	Verify 5-Turns After Mission:	Yes	x	No	

Additional Comments: Drive #

IFR CONDITIONS OVER THE AIRPORT SO WE COULD NOT GET BACK IN; HAD TO DIVERT TO KBPM



Woolpert

Optech LIDAR

1/11/2014	11	73741	2	USGS Washington County, AL	
SIMMONS	N110TU	2069.1	14:00:00	20:00:00	CORS
SWAIN	Optech- Gemini 108	2073.8	21:00:00	3:00:00	ALMO

Departing 1R8

Arriving 1R8

Roll Compensation: ON ☒ OFF ☐

Divergence Mode: WD ☐ NR ☒

Multipulse: OFF ☐ ON ☐ FIX ☒

ARF: OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐

Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	NDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
40	N	22:27:39	22:45:15	0:17:36				strong winds out of the NW on all lines
41	S	22:49:18	23:06:25	0:17:07				
42	N	23:10:30	23:28:12	0:17:42				
43	S	23:31:31	23:48:42	0:17:11				
44	N	23:53:16	0:10:34	############				
45	S	0:14:35	0:31:02	0:16:27				
46	N	0:34:38	0:51:50	0:17:12				
47	S	0:55:00	1:11:52	0:16:52				
48	N	1:15:40	1:33:04	0:17:24				
49	S	1:36:16	1:53:19	0:17:03				
50	N	1:58:02	2:15:33	0:17:31				
51	S	2:18:27	2:35:05	0:16:38				
				0:00:00				
				0:00:00				
				0:00:00				
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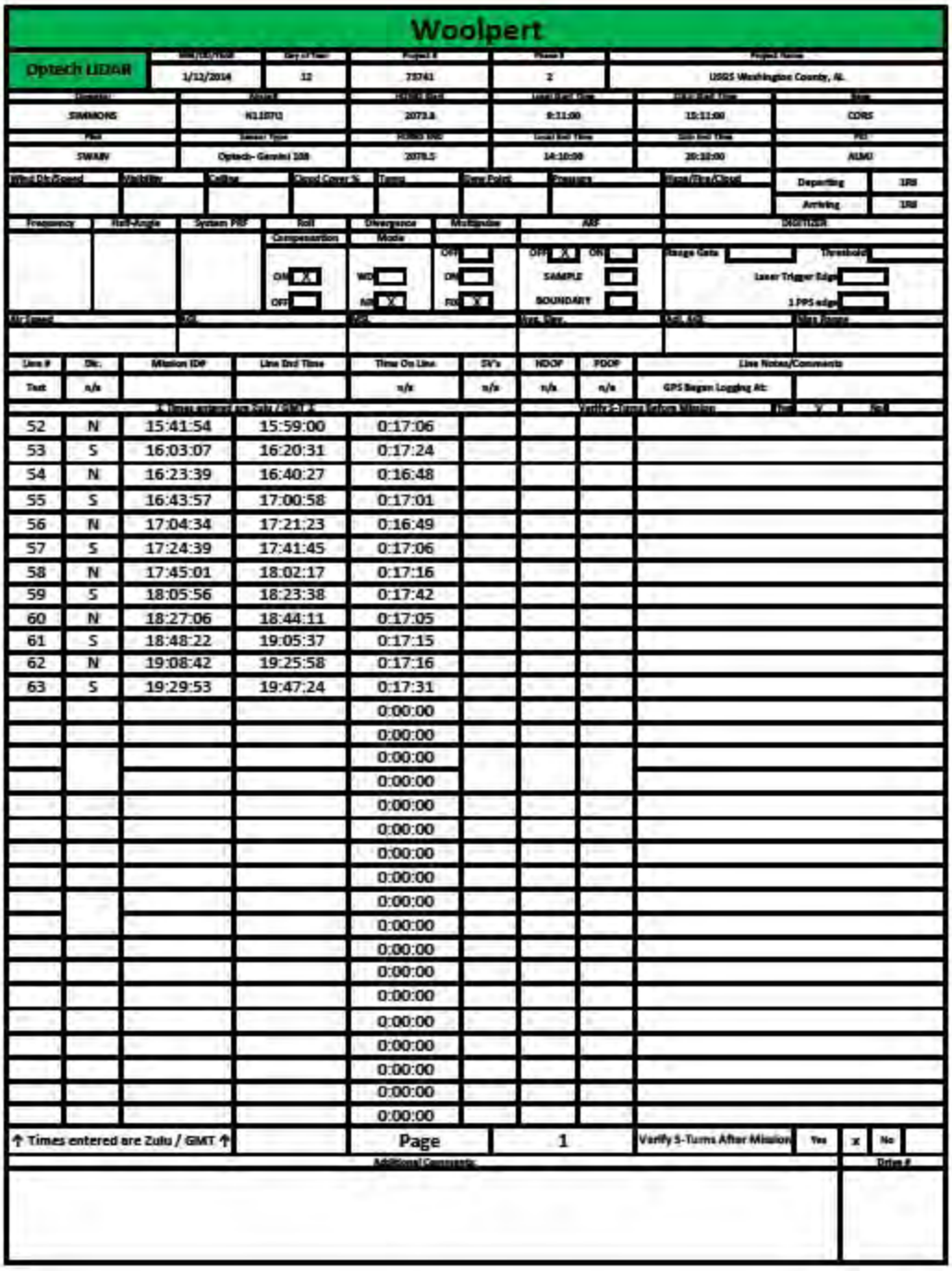
↑ Times entered are Zulu / GMT ↑

Page 1

Verify S-Turns After Mission Yes x No

Additional Comments

Drive #



Woolpert

Optech LIDAR	MM/DD/YYYY	Day of Year	Project #	Phase #	Project Name
	1/12/2014	12	73741	2	USGS Washington County, AL
Operator	[illegible]	[illegible]	Local Start Time	Zulu Start Time	Base
SIMMONS	N11071	2073.8	9:11:00	15:11:00	CORS
Pilot	Sensor Type	[illegible]	Local End Time	Zulu End Time	FBO
SWAIN	Optech- Gemini 108	2078.5	14:10:00	20:10:00	ALMJ

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Rain/Fog/Cloud	Departing	1R8
								Arriving	1R8

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ARF	DIGITIZER
			ON ☒ OFF ☐	WD ☐ NR ☒	OFF ☐ ON ☐ FIX ☒	OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐	Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Air Speed	AGL	MSL	Avg. Elev.	[illegible]	[illegible]

Line #	Dir.	Mission ID#	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	Y	No
52	N	15:41:54	15:59:00	0:17:06					
53	S	16:03:07	16:20:31	0:17:24					
54	N	16:23:39	16:40:27	0:16:48					
55	S	16:43:57	17:00:58	0:17:01					
56	N	17:04:34	17:21:23	0:16:49					
57	S	17:24:39	17:41:45	0:17:06					
58	N	17:45:01	18:02:17	0:17:16					
59	S	18:05:56	18:23:38	0:17:42					
60	N	18:27:06	18:44:11	0:17:05					
61	S	18:48:22	19:05:37	0:17:15					
62	N	19:08:42	19:25:58	0:17:16					
63	S	19:29:53	19:47:24	0:17:31					
				0:00:00					
				0:00:00					
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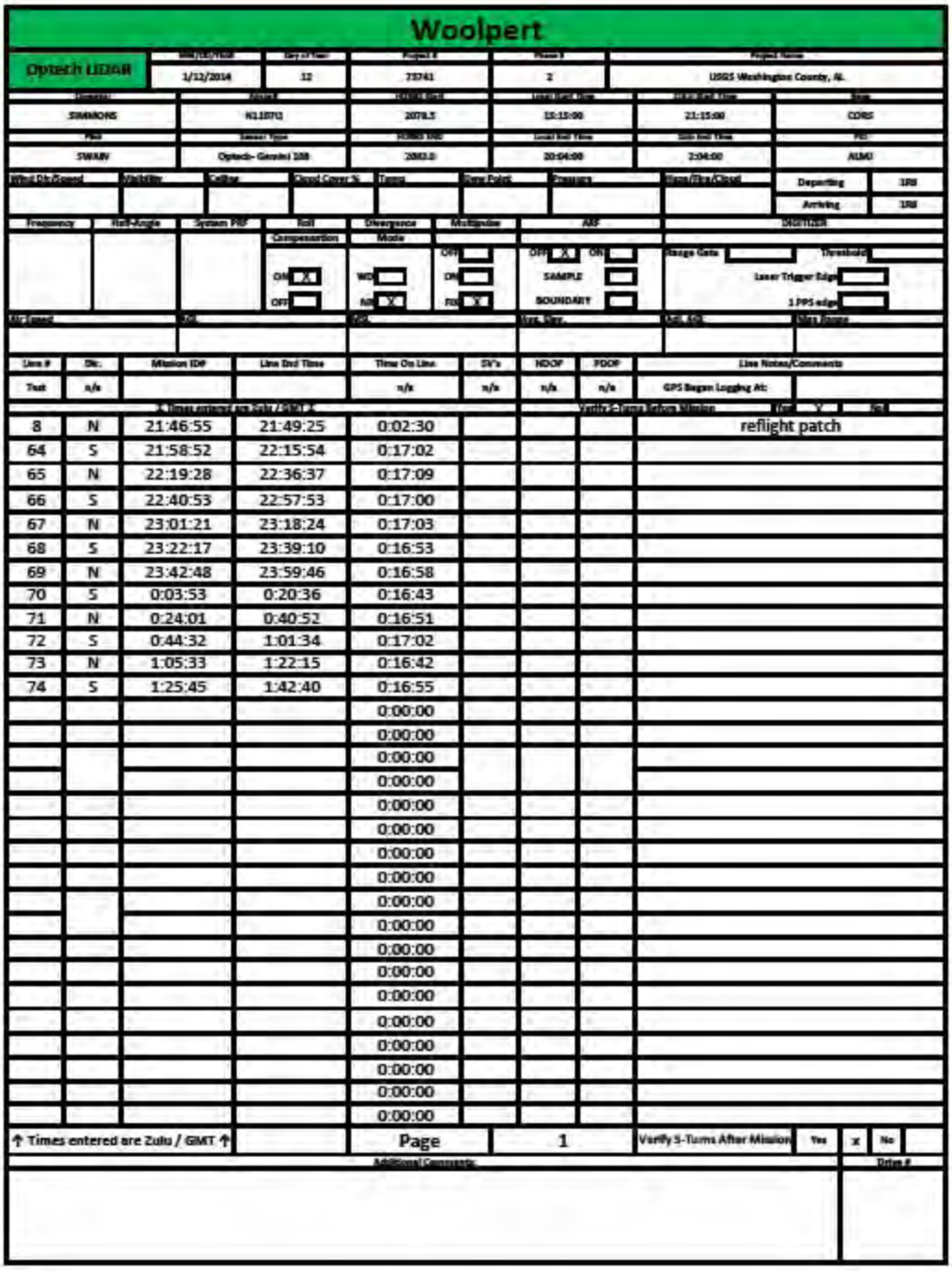
Additional Comments:	Drive #



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Phase #	Project Name
1/12/2014	12	73741	2	USGS Washington County, AL

Operator	Aircraft	Flight Log #	Local Start Time	Start End Time	Base
SIMMONS	N110TQ	2078.5	15:15:00	21:15:00	CORS
PIC	**Sensor Type**	**HOBBS END**	**Local End Time**	**Shift End Time**	**PIC**
SWARY	Optech- Gemini 108	2083.0	20:54:00	2:04:00	ALMO

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tie/Closed	Departing	IRR
								Arriving	IRR

Frequency	Roll Angle	System PRF	Roll Compensation	Divergence Mode	Multiplier	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Mr Speed	Roll	Pitch	Drift Dir.	Drift Amt	Miles Flown

Line #	Dir.	Mission ID#	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 2-Turns Before Mission: Yes X / No
8	N	21:46:55	21:49:25	0:02:30				reflight patch
64	S	21:58:52	22:15:54	0:17:02				
65	N	22:19:28	22:36:37	0:17:09				
66	S	22:40:53	22:57:53	0:17:00				
67	N	23:01:21	23:18:24	0:17:03				
68	S	23:22:17	23:39:10	0:16:53				
69	N	23:42:48	23:59:46	0:16:58				
70	S	0:03:53	0:20:36	0:16:43				
71	N	0:24:01	0:40:52	0:16:51				
72	S	0:44:32	1:01:34	0:17:02				
73	N	1:05:33	1:22:15	0:16:42				
74	S	1:25:45	1:42:40	0:16:55				
				0:00:00				
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Additions/Comments:

Drive #

Woolpert

Leica LIDAR					
	1/12/2014	1214	73741	3	Laurel, Mississippi
Operator	Aircraft		Laser Start Time		Base
GALAMBOS	N404CP	2941.0	10:01:00	10:01:00	WOOLPERT PIN
Pilot	Sensor Type		Local Start Time		PIC
GEBHART	AIS-7177	2948.5	5:30:00	22:30:00	SAE/E:04am 1404z

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Sky/Cloud		
Calm	10	CLEAR	0	8	4	3017		Departing	KGWO
								Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

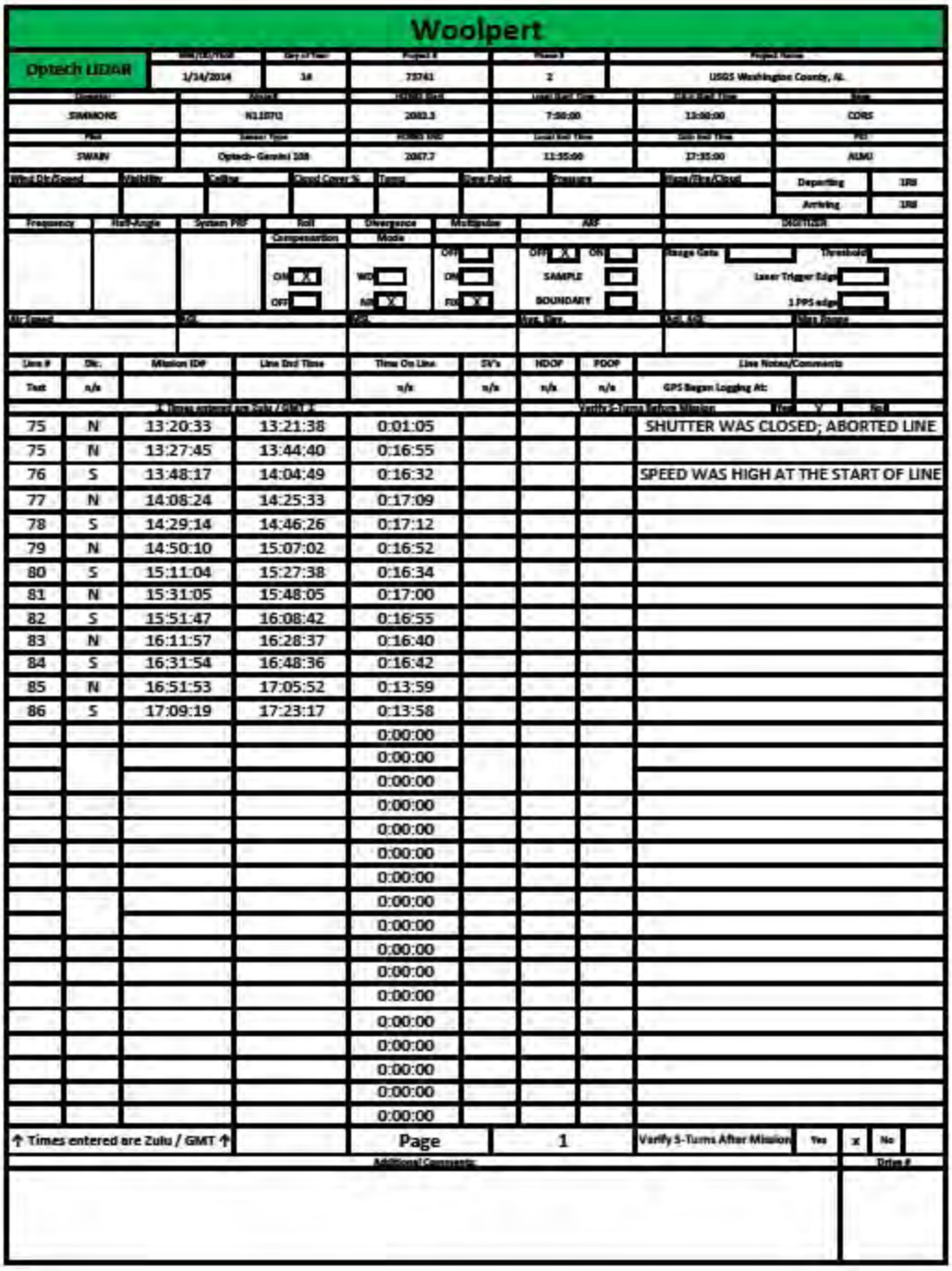
Nr Speed		AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Rts	6500	Ft	6634	Ft	Yes		Mix	X	@	NS		Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Test	n/a	15:39:10	15:39:22	n/a	n/a	n/a	n/a	GPS Began Logging At:	15:23:30
↑ Times entered are Zulu / GMT ↑								Verify 2 Turns Before Mission Start: Yes X No	
224	N	16:01:25	16:13:28	9:02:18	14	0.7	1.3	9:29am/15:29z	
225	S	16:24:09	16:38:09	0:00:00	14	0.8	1.4	Flight-Lines 1-124, 224-227 6634'	
227	N	16:48:21	16:50:47	0:00:00	13	0.8	1.4	15:38:11-15:42:11 over base	
test		16:52:19	16:53:04	0:00:00				TDC error see remarks	
				0:00:00				Reboot/ GPS Start logging 17:03:00	
				0:00:00				Overfly base 17:10:00 - 17:12:15	
227	N	17:28:46	17:44:30	0:00:00	17	0.7	1.2		
1	E	17:47:35	17:50:04	0:00:00	18	0.6	1.1	Standing Water in project area from	
2	W	17:53:36	18:03:07	0:00:00	18	0.6	1.1	heavy rains.....	
3	E	18:06:02	18:15:07	0:00:00	18	0.6	1.1		
4	W	18:19:00	18:28:39	0:00:00	19	0.6	1.1		
5	E	18:31:51	18:40:39	0:00:00	20	0.6	1.1		
6	W	18:44:02	18:53:10	0:00:00	19	0.6	1.2		
7	E	19:01:33	19:16:14	0:00:00	18	0.7	1.4		
8	W	19:14:47	19:34:35	0:00:00	17	0.7	1.4		
9	E	19:38:04	19:52:49	0:00:00	17	0.6	1.2		
10	W	19:56:16	21:11:27	0:00:00	18	0.6	1.2		
11	E	20:14:50	20:30:53	0:00:00	19	0.6	1.2		
12	W	20:34:22	20:50:37	0:00:00	20	0.6	1.2		
13	E	20:54:11	21:10:24	0:00:00	18	0.6	1		
14	W	21:13:19	21:29:49	0:00:00	19	0.6	1		
15	E	21:33:19	21:50:05	0:00:00	19	0.6	1.1		
16	W	21:53:48	22:10:36	0:00:00	16	0.6	1.4		
17	E	22:14:16	22:30:00	0:00:00	16	0.6	1.3	TDC error see remarks/Refly	
				0:00:00					
				0:00:00					
				0:00:00				Overfly Base: 22:45:46	
				0:00:00				Wheels Down:	
				0:00:00				22:57z/4:57pm	
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission: Yes X No	

Additional Comments:

A TDC data fetch timeout error due to no mem switch signal on I/O Axis 1 connection on TDC/

Drive #: 70-2 #1



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Mission #	Project Name
1/14/2014	14	73741	2	USGS Washington County, AL

Operator	Aircraft	Flight Start	Local Start Time	GPS End Time	Base
SIMMONS	N110TQ	2083.3	7:50:00	13:00:00	CORS
PIC	**Sensor Type**	**Flight End**	**Local End Time**	**GPS End Time**	**PIC**
SWAIN	Optech- Gemini 108	2087.7	11:55:00	17:35:00	ALMU

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tie/Closed	Departing	IRR
								Arriving	IRR

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	Alt	Pdop	Base Sta.	Amb. Alt	Mon Stops

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Text	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑ — Verify 5-Turns Before Mission: Yes X No

75	N	13:20:33	13:21:38	0:01:05				SHUTTER WAS CLOSED; ABORTED LINE
75	N	13:27:45	13:44:40	0:16:55				
76	S	13:48:17	14:04:49	0:16:32				SPEED WAS HIGH AT THE START OF LINE
77	N	14:08:24	14:25:33	0:17:09				
78	S	14:29:14	14:46:26	0:17:12				
79	N	14:50:10	15:07:02	0:16:52				
80	S	15:11:04	15:27:38	0:16:34				
81	N	15:31:05	15:48:05	0:17:00				
82	S	15:51:47	16:08:42	0:16:55				
83	N	16:11:57	16:28:37	0:16:40				
84	S	16:31:54	16:48:36	0:16:42				
85	N	16:51:53	17:05:52	0:13:59				
86	S	17:09:19	17:23:17	0:13:58				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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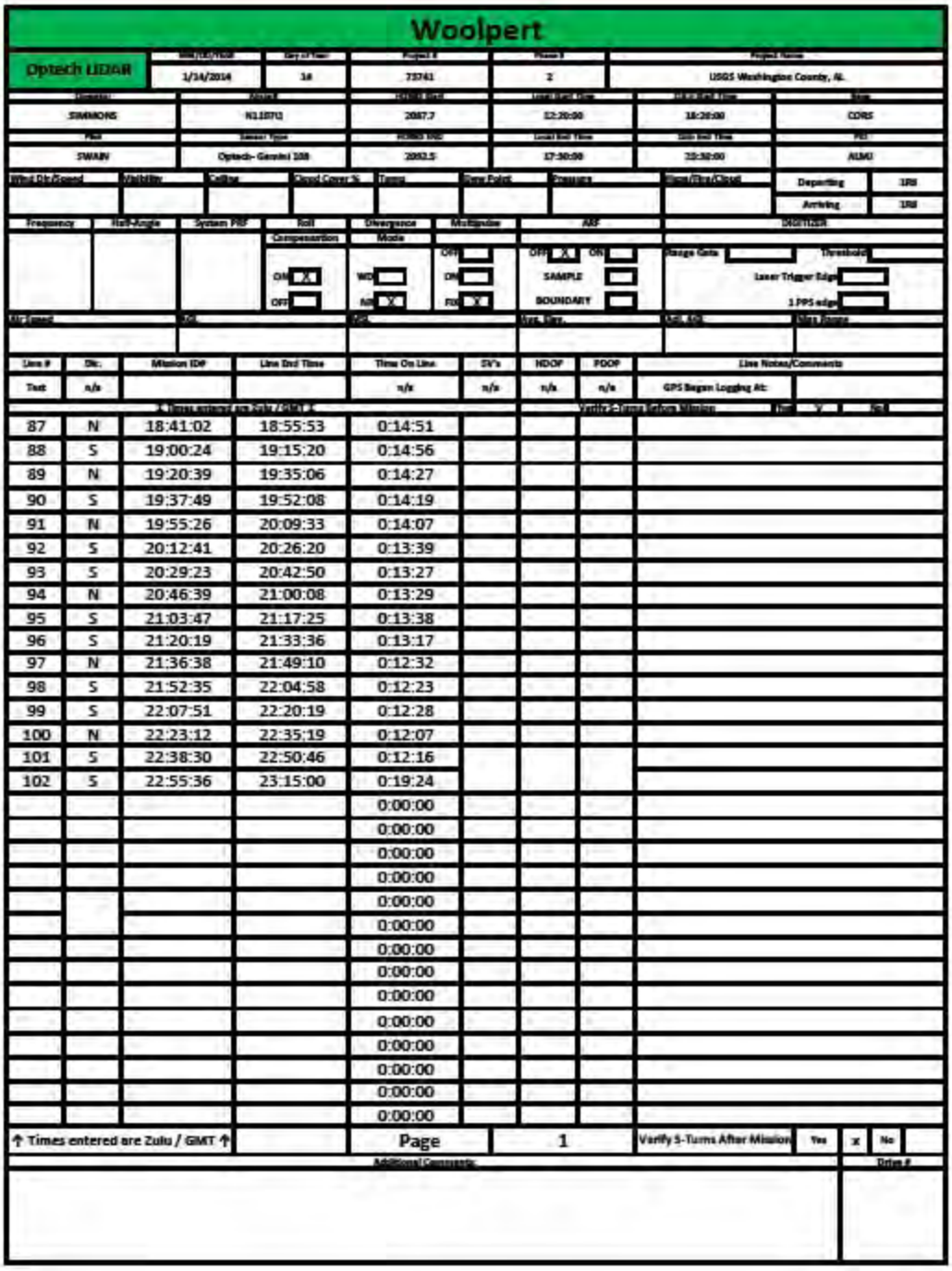
				0:00:00				
				0:00:00				

↑ Times entered are Zulu / GMT ↑ — Page 1 — Verify 5-Turns After Mission: Yes X No

Additional Comments: — Disk #



Woolpert

Optech LIDAR

Date/GMT/YEAR	Day of Year	Project #	Phase #	Project Name
1/14/2014	14	73741	2	USGS Washington County, AL

Operator	Aircraft	Flight Start	Local Start Time	Lift-off Time	Base
SIMMONS	N110TQ	2087.7	12:20:00	16:20:00	CORS

PIC	Sensor Type	Flight End	Local End Time	Lift-off Time	PIC
SWAIN	Optech- Gemini 108	2092.5	17:30:00	22:32:00	ALMO

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tire/Closet	Departing	IRR
								Arriving	IRR

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	Roll	Pitch	Drift	Alt. Std.	Alt. Agl	Video Frame

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Text	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑ — Verify 5-Turns Before Mission: Yes X No

87	N	18:41:02	18:55:53	0:14:51				
88	S	19:00:24	19:15:20	0:14:56				
89	N	19:20:39	19:35:06	0:14:27				
90	S	19:37:49	19:52:08	0:14:19				
91	N	19:55:26	20:09:33	0:14:07				
92	S	20:12:41	20:26:20	0:13:39				
93	S	20:29:23	20:42:50	0:13:27				
94	N	20:46:39	21:00:08	0:13:29				
95	S	21:03:47	21:17:25	0:13:38				
96	S	21:20:19	21:33:36	0:13:17				
97	N	21:36:38	21:49:10	0:12:32				
98	S	21:52:35	22:04:58	0:12:23				
99	S	22:07:51	22:20:19	0:12:28				
100	N	22:23:12	22:35:19	0:12:07				
101	S	22:38:30	22:50:46	0:12:16				
102	S	22:55:36	23:15:00	0:19:24				
				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				

↑ Times entered are Zulu / GMT ↑ — Page 1 — Verify 5-Turns After Mission: Yes X No

Additions/Comments: — Disk #

Woolpert

Leica LIDAR	Collection Date: 1/14/2014	Date of Year: 14	Project #: 73741	Flight #: 1	Project Name: Laurel, Mississippi
Operator: GALAMBOS	Aircraft: N404CP	Takeoff Time: 2948.5	Lower Start Time: 9:46:00	Upper Start Time: 15:46:00	Base: WOOLPERT PIN
Pilot: GEBHART	Sensor Type: ALS-T177	Takeoff Alt: 2956.4	Lower End Time: 5:01:00	Upper End Time: 22:01:00	PID: SA6/7:40 am

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Sky/Cloud	Departing	KGWO
190 5	10	Clear	0	7	4	3005		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Nr Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 Kts	6500 Ft	6634 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	15:33:17	15:33:32	n/a	n/a	n/a	n/a	GPS Began Logging At: 15:18:10
↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission: Yes X No
17	E	15:46:14	16:03:23	8:30:30	14	0.7	1.4	9:22/1522z
18	W	16:06:22	16:24:08	0:00:00	14	0.7	1.4	Overfly Base: 1542z/9:42am
19	E	16:27:20	16:43:52	0:00:00	13	0.8	1.4	Standing Water in project area from
20	W	16:47:11	17:05:37	0:00:00	14	0.8	1.4	heavy rains.....
21	E	17:08:37	17:26:30	0:00:00	15	0.7	1.2	
22	W	17:29:09	17:48:14	0:00:00	17	0.6	1.2	
23	E	17:51:32	18:09:23	0:00:00	19	0.6	1	
24	W	18:12:47	18:32:08	0:00:00	19	0.6	1.1	
25	E	18:34:55	18:53:05	0:00:00	18	0.7	1.3	
26	W	18:56:18	19:16:18	0:00:00	18	0.7	1.3	
27	E	19:19:00	19:37:27	0:00:00	19	0.6	1.2	
28	W	19:40:26	20:00:26	0:00:00	19	0.6	1	
29	E	20:03:17	20:21:13	0:00:00	18	0.6	1.1	
30	W	20:24:15	20:44:26	0:00:00	20	0.5	1	
31	E	20:46:50	21:05:48	0:00:00	20	0.6	1	
32	W	21:09:10	21:29:56	0:00:00	18	0.6	1.1	
33	E	21:32:59	21:51:57	0:00:00	18	0.7	1.2	
34	W	21:55:16	22:15:52	0:00:00	16	0.8	1.4	
35	E	22:18:38	22:37:56	0:00:00	16	0.7	1.2	
36	W	22:42:34	23:01:08	0:00:00	15	0.7	1.2	
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				Overfly Base: 2307z
				0:00:00				5:16 PM
				0:00:00				
				0:00:00				Static: N/A
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission: Yes X No

Additional Comments:	Drive #
	ALS 70 #1

Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Phase #	Project Name
1/15/2014	15	73741	2	USGS Washington County, AL

Operator	Aircraft	Flight Start	Local Start Time	UTC Start Time	Base
SIMMONS	N110TQ	2052.5	14:10:00	20:10:00	CORS
PIC	**Sensor Type**	**Flight End**	**Local End Time**	**UTC End Time**	**PIC**
SHELTON	Optech- Gemini 108	2058.5	19:15:00	1:15:00	ALMU

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

Frequency	Roll Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	Alt	Alt	Ave. Elev.	Alt. AGL	Elev Range

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:
↑ Times entered are Zulu / GMT ↑								Verify 2-Turns Before Mission: Yes X No
103	N	20:28:17	20:40:46	0:12:29				
104	S	20:44:19	20:56:38	0:12:19				
105	N	20:59:30	21:12:00	0:12:30				
106	S	21:16:03	21:28:27	0:12:24				
107	N	21:31:33	21:44:20	0:12:47				
108	S	21:46:55	21:58:40	0:11:45				
109	N	22:03:30	22:14:20	0:10:50				
110	S	22:17:31	22:27:27	0:09:56				
111	N	22:30:44	22:41:41	0:10:57				
112	S	22:44:49	22:52:16	0:07:27				
113	N	22:55:36	23:02:59	0:07:23				
114	S	23:05:35	23:12:54	0:07:19				
115	N	23:15:58	23:23:08	0:07:10				
116	S	23:26:09	23:32:52	0:06:43				
117	N	23:35:25	23:42:27	0:07:02				
118	S	23:44:56	23:51:23	0:06:27				
119	N	23:54:37	0:00:44	###########				
120	S	0:04:13	0:07:24	0:03:11				
121	N	0:09:55	0:12:50	0:02:55				
122	S	0:15:19	0:18:02	0:02:43				
39	S	0:36:09	0:52:55	0:16:46				REFLIGHT
				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 5-Turns After Mission: Yes X No

Additional Comments:

Data #

Woolpert

Leica LIDAR					
	1/15/2014	1518	73741	1	Laurel, Mississippi

GALAMBOS	N404CF	2956.4	9:37:00	15:37:00	WOOLPERT PIN
PIC	Sensor Type	Flight Log #	Lidar Start Time	Data Start Time	POI
JEEHART	ALS-7177	2961.4	12:30:00	18:30:00	SAD/

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud	Departing	KGWO
350 8	10	Clear	0	5	-7	3025		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Air Speed	AGL	MSL	Waveform Used				Waveform Mode	Pre-Trigger Dist.
150 Kts	6500 Ft	6634 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:	15:04:37
↑ Times entered are Zulu / GMT ↑								Verify S-Turns Before Mission	Yes X No
37	E	15:37:07	15:57:23	8:24:49	15	0.7	1.2	Takeoff: 15:10	
38	W	16:00:37	16:24:12	0:00:00	14	0.7	1.3	Overfly base: 15:19:18	
39	E	16:27:09	16:47:13	0:00:00	13	0.8	1.4	Standing Water in project area from	
40	W	16:51:20	17:14;16	0:00:00	16	0.7	1.2	heavy rains.....	
41	E	17:17:13	17:36:48	0:00:00	16	0.7	1.2	Very Turbulent updrafts/down	
42	W	17:40:07	18:02:12	0:00:00	18	0.7	1.2	drown drafts	
43	E	18:05:04	18:24:29	0:00:00	18	0.6	1.1		
44	W	18:28:06	18:30:50	0:00:00	20	0.6	1	TDC Error see remarks	
				0:00:00				Overfly Base: 18:43:30	
				0:00:00					
				0:00:00				File # 20140115_150106	
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
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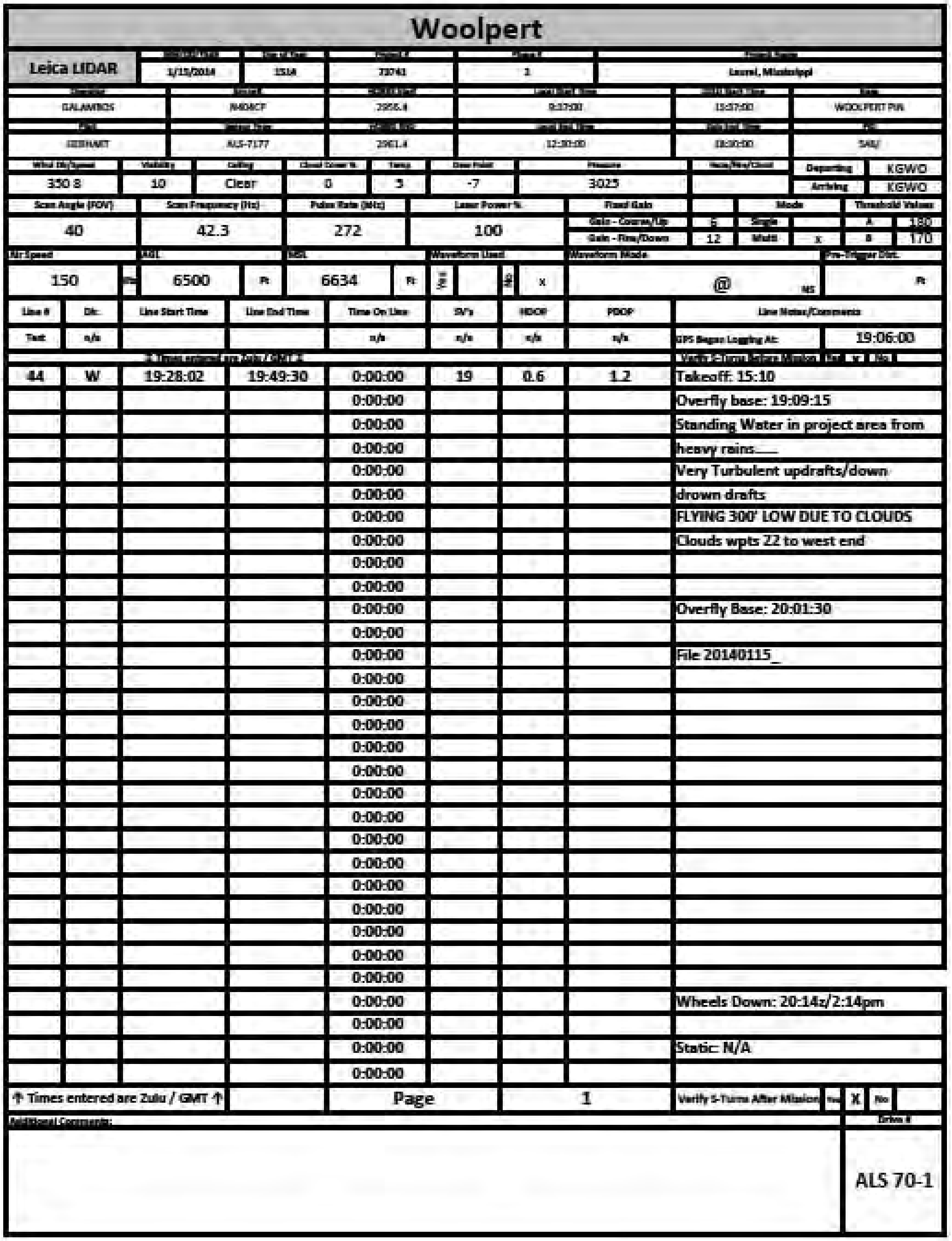
				0:00:00					
				0:00:00					
				0:00:00				Wheels Down:	
				0:00:00					
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments:

A TDC data fetch timeout error due to no mean switch signal on I/O Axis 1 connection on TDC/

Drive #

ALS 70-2



Woolpert

Leica LIDAR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1/15/2014	15JA	73741	1	Laurel, Mississippi
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GALAMBOS	N404CP	2956.4	9:37:00	15:37:00	WOOLPERT PVN
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GEBHART	ALS-7177	2961.4	12:30:00	18:30:00	SAU

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	KGWO
350 8	10	Clear	0	3	-7	3025		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	x	B	170

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.	
150	Kts	6500	Ft	6634	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:	19:06:00
↓ Times entered are Zulu / GMT ↓								Verify S-Turns Before Mission Yes x No	
44	W	19:28:02	19:49:30	0:00:00	19	0.6	1.2	Takeoff: 15:10	
				0:00:00				Overfly base: 19:09:15	
				0:00:00				Standing Water in project area from	
				0:00:00				heavy rains.___	
				0:00:00				Very Turbulent updrafts/down	
				0:00:00				drown drafts	
				0:00:00				FLYING 300' LOW DUE TO CLOUDS	
				0:00:00				Clouds wpts 22 to west end	
				0:00:00					
				0:00:00					
				0:00:00				Overfly Base: 20:01:30	
				0:00:00					
				0:00:00				File 20140115_	
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
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				0:00:00				Wheels Down: 20:14z/2:14pm	
				0:00:00					
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No	

Additional Comments:	Drive #
	ALS 70-1

Woolpert

Optech LIDAR					
	1/16/2014	16	73741	2	USGS Laurel, MS

SIMMONS	N110T01	2009.1	9:55:00	15:55:00	CORS
PIC	Sensor Type	POWER ON	Local Roll Time	Shift End Time	PIC
SHELTON	Optech- Gemini 108	2101.2	12:15:00	18:15:00	BAY SPRINGS

Wheels Up/Down	Visibility	Ceiling	Cloud Cover %	Fuses	Base Point	Frequency	Base/Time/Closed		
								Departing	LUL
								Arriving	LUL

Frequency	Roll-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
			ON X	WD	OFF	OFF X ON	Range Gate Threshold
			OFF	Nar X	ON	SAMPLE	Laser Trigger Edge
					FD X	BOUNDARY	1 PPS edge

Air Speed	Roll	Pitch	Drift Dir.	Drift Amt	Video Frame

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Text	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission	Yes	X	No	
103	W	16:52:58	17:05:57	0:12:59								
104	E	17:09:55	17:19:27	0:09:32								
105	W	17:23:01	17:33:10	0:10:09								
106	E	17:36:17	17:45:52	0:09:35								
				0:00:00								
				0:00:00								
				0:00:00								
				0:00:00								
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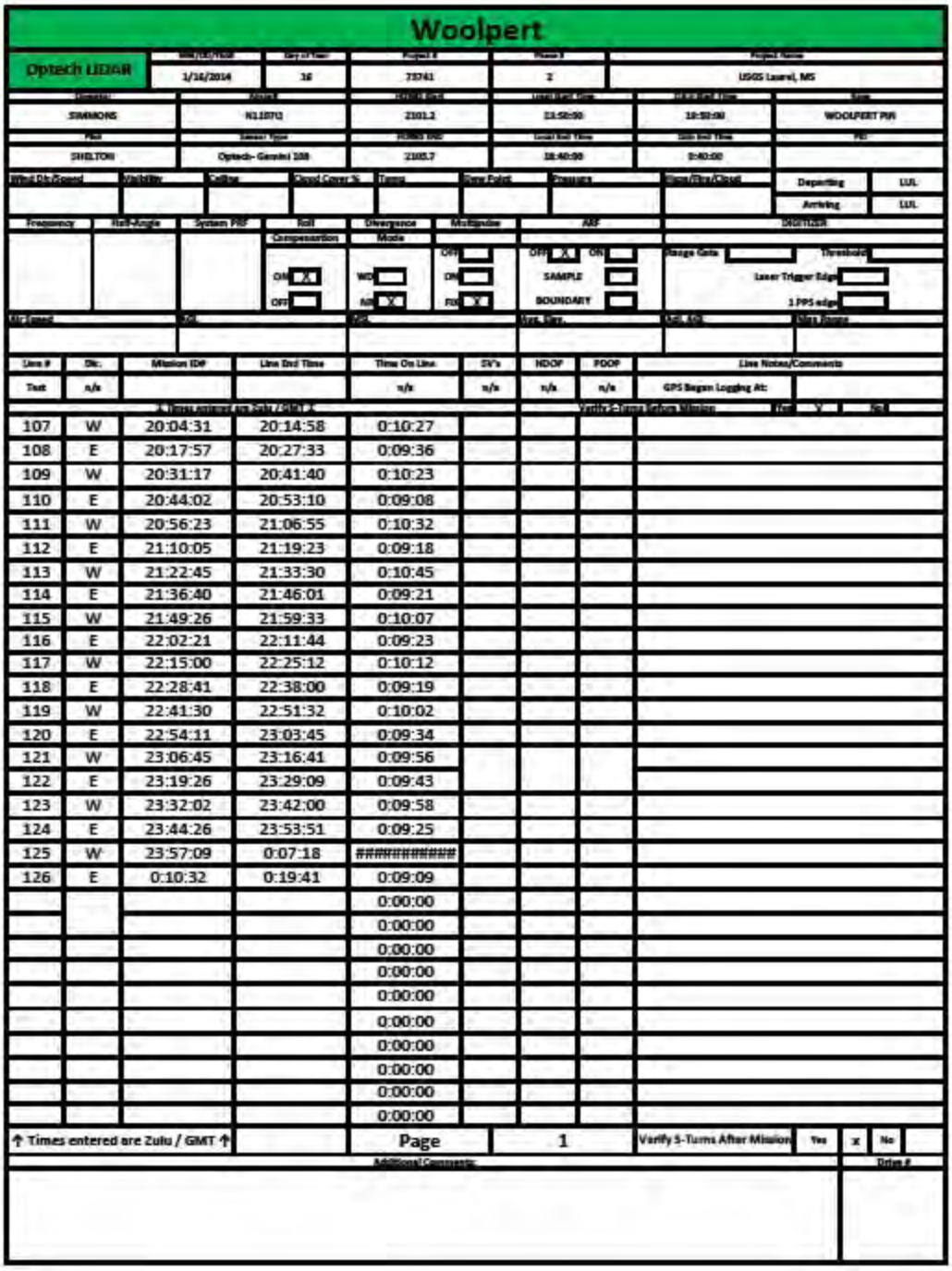
↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission	Yes	X	No	

Additional Comments:	Data #



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Mission #	Project Name
1/16/2014	16	73741	2	USGS Laurel, MS

Operator	Aircraft	Flight Log #	Local Start Time	GPS Start Time	Site
SIMMONS	N118TQ	2101.2	13:50:00	18:50:00	WOOLPERT PVI

PIC	Sensor Type	Flight Log End	Local End Time	GPS End Time	PIC
SHELTON	Optech- Gemini 108	2105.7	18:40:00	0:40:00	

Wheels Up/Down	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tire/Closed	Departing	LUL
								Arriving	LUL

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	Alt	Hdg	Ave. Elev.	Calc. Alt	Miles Flown

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑ — Verify 5-Turns Before Mission: Yes X No

107	W	20:04:31	20:14:58	0:10:27				
108	E	20:17:57	20:27:33	0:09:36				
109	W	20:31:17	20:41:40	0:10:23				
110	E	20:44:02	20:53:10	0:09:08				
111	W	20:56:23	21:06:55	0:10:32				
112	E	21:10:05	21:19:23	0:09:18				
113	W	21:22:45	21:33:30	0:10:45				
114	E	21:36:40	21:46:01	0:09:21				
115	W	21:49:26	21:59:33	0:10:07				
116	E	22:02:21	22:11:44	0:09:23				
117	W	22:15:00	22:25:12	0:10:12				
118	E	22:28:41	22:38:00	0:09:19				
119	W	22:41:30	22:51:32	0:10:02				
120	E	22:54:11	23:03:45	0:09:34				
121	W	23:06:45	23:16:41	0:09:56				
122	E	23:19:26	23:29:09	0:09:43				
123	W	23:32:02	23:42:00	0:09:58				
124	E	23:44:26	23:53:51	0:09:25				
125	W	23:57:09	0:07:18	##########				
126	E	0:10:32	0:19:41	0:09:09				
				0:00:00				
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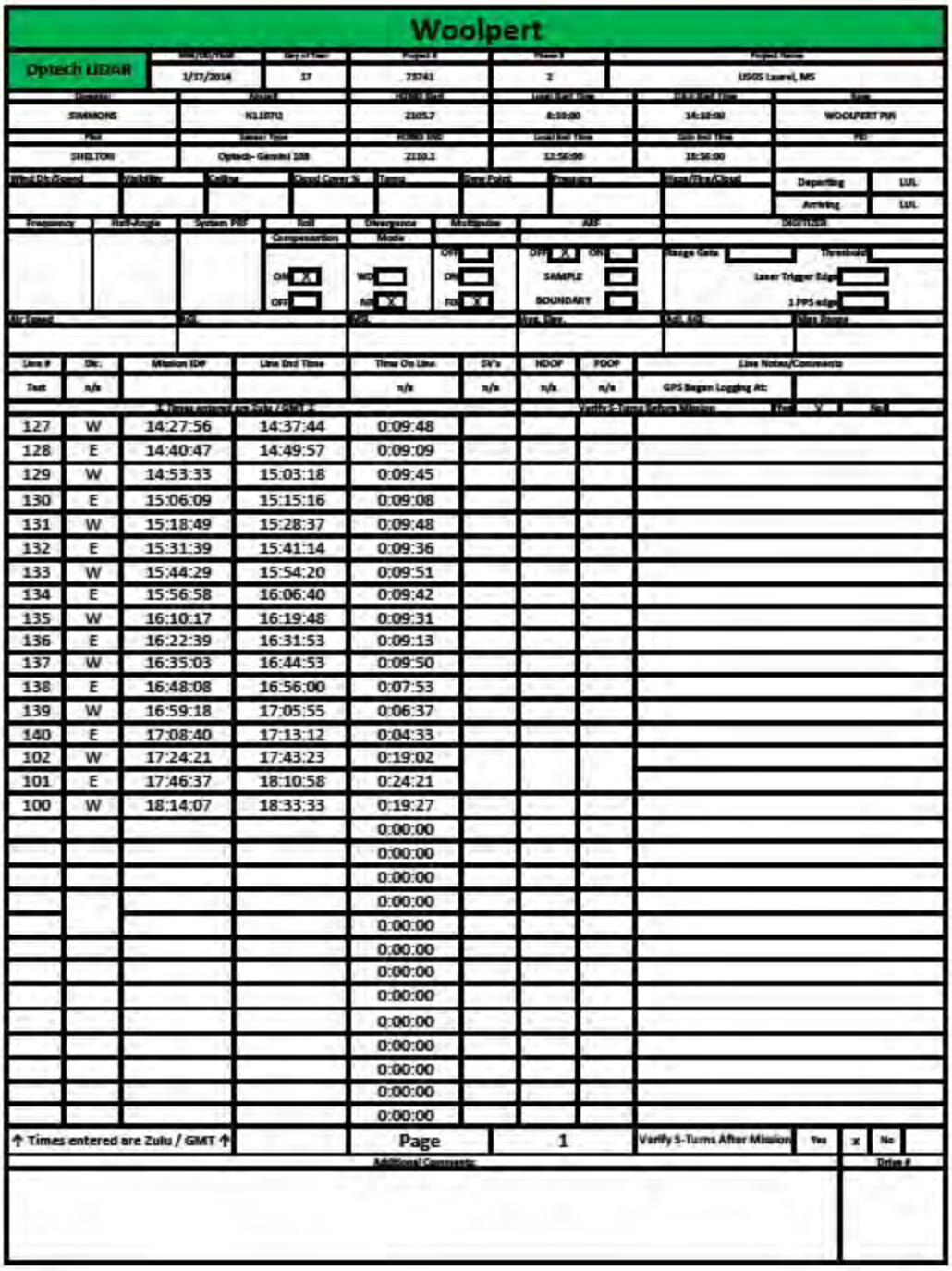
↑ Times entered are Zulu / GMT ↑ — Page 1 — Verify 5-Turns After Mission: Yes X No

Additional Comments: — Data #



Woolpert

Optech LIDAR	Mth/Dd/Yrbb	Day of Year	Project #	Phase #	Project Name
	1/17/2014	17	73741	2	USGS Laurel, MS

Operator	Aircraft	Flight Mod	Local Start Time	GPS Start Time	Site
SIMMONS	N118TQ	2105.7	8:10:00	14:10:00	WOOLPERT PVI
PIC	Sensor Type	ROBES END	Local End Time	GPS End Time	PIC
SHELTON	Optech- Gemini 108	2110.1	12:56:00	18:56:00	

What Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tim/Closed	Departing	LUL
								Arriving	LUL

Frequency	Roll-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ABF	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Alt Speed	Roll	Pitch	Drift Dir.	Drift Amt	Miles Flown

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Text	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑								Verify 2-Turns Before Mission	Yes	X	No	
127	W	14:27:56	14:37:44	0:09:48								
128	E	14:40:47	14:49:57	0:09:09								
129	W	14:53:33	15:03:18	0:09:45								
130	E	15:06:09	15:15:16	0:09:08								
131	W	15:18:49	15:28:37	0:09:48								
132	E	15:31:39	15:41:14	0:09:36								
133	W	15:44:29	15:54:20	0:09:51								
134	E	15:56:58	16:06:40	0:09:42								
135	W	16:10:17	16:19:48	0:09:31								
136	E	16:22:39	16:31:53	0:09:13								
137	W	16:35:03	16:44:53	0:09:50								
138	E	16:48:08	16:56:00	0:07:53								
139	W	16:59:18	17:05:55	0:06:37								
140	E	17:08:40	17:13:12	0:04:33								
102	W	17:24:21	17:43:23	0:19:02								
101	E	17:46:37	18:10:58	0:24:21								
100	W	18:14:07	18:33:33	0:19:27								
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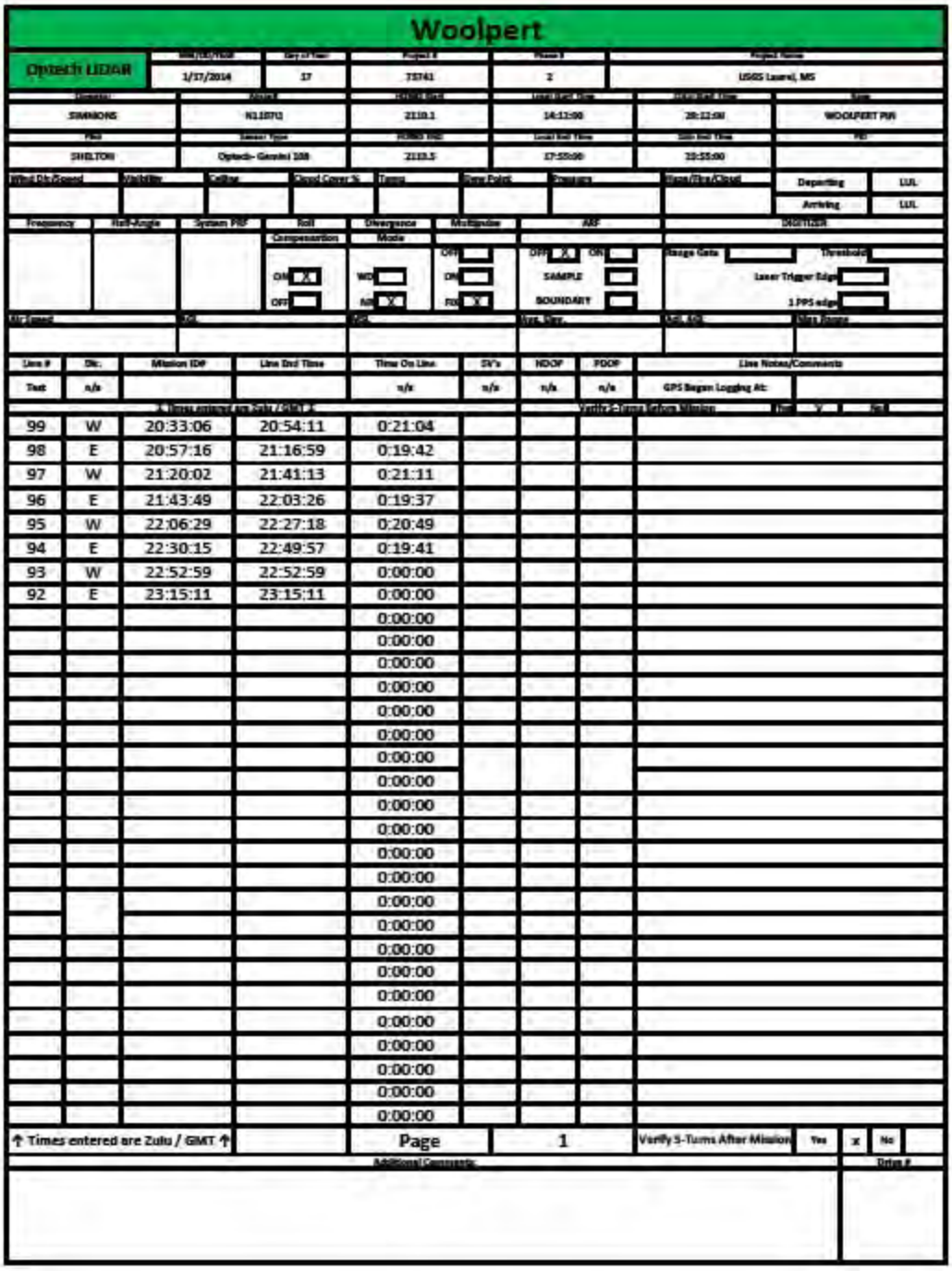
↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission	Yes	X	No	

Additional Comments:

Drive #



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Phase #	Project Name
1/17/2014	17	73741	2	USGS Laurel, MS

Operator	Aircraft	Flight Log #	Local Start Time	Start End Time	Base
SIMMONS	N118TQ	2110.1	14:11:00	20:12:00	WOOLPERT PVR
PIC	Sensor Type	POWER ON#	Local End Time	GPS End Time	PIC
SHELTON	Optech- Gemini 108	2110.5	17:55:00	23:55:00	

What Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tim/Closed	Departing	LUL
								Arriving	LUL

Frequency	Roll-Angle	System PRF	Roll Compensation	Divergence Mode	Multiplier	AGC	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Alt Speed	Roll	Pitch	Drift Dir.	Drift Amt	Miles Flown

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:

↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission	Yes	X	No	
99	W	20:33:06	20:54:11	0:21:04								
98	E	20:57:16	21:16:59	0:19:42								
97	W	21:20:02	21:41:13	0:21:11								
96	E	21:43:49	22:03:26	0:19:37								
95	W	22:06:29	22:27:18	0:20:49								
94	E	22:30:15	22:49:57	0:19:41								
93	W	22:52:59	22:52:59	0:00:00								
92	E	23:15:11	23:15:11	0:00:00								
				0:00:00								
				0:00:00								
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Additions/Comments:

Disk #

Woolpert

Leica LIDAR					
	1/17/2014	1718	73761	1	Laurel, Mississippi
Operator	Aircraft		Lower Start Time		Base
GALAMBOS	N404CP	2965.3	9:58:00	15:58:00	WOOLPERT PIN
Pilot	Sensor Type	Upper End Time		Job End Time	POC
EBERHART	ALS-7177	2973.7	5:01:00	23:02:00	SA4/7:19am

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud	Departing	KGWO
300 8	10	CLEAR	0	4	-7	3013		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Nr Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 Hz	6500 Ft	6634 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	15:51:03	15:51:20	n/a	n/a	n/a	n/a	GPS Began Logging At:	14:12:03
↑ Times entered are Zulu / GMT ↑								Verify S-Turns Before Mission Yes	X No
44	W	15:58:28	16:06:37	8:39:30	15	0.7	1.2	UL 002 Partial Patch	
45	E	16:09:52	16:29:38	0:00:00	14	0.8	1.1	8:16am/1416z takeoff 1st time	
46	W	16:32:55	16:55:37	0:00:00	15	0.8	1.1	TDC ERRORS, TDC won't initialize	
47	E	16:58:23	17:18:51	0:00:00	16	0.7	1.1	Replaced with old board	
48	W	17:21:06	17:44:29	0:00:00	17	0.6	1.1	9:31am/1531z 2nd time	
49	E	17:47:15	18:07:31	0:00:00	18	0.6	1.1	Overfly base: 15:53:47	
50	W	18:10:52	18:34:04	0:00:00	20	0.6	1.1	Standing Water in project area from	
51	E	18:36:48	18:57:05	0:00:00	19	0.6	1.1	heavy rains....	
52	W	19:00:35	19:23:28	0:00:00	17	0.7	1.4		
53	E	19:26:05	19:46:42	0:00:00	19	0.7	1.3		
54	W	19:49:46	20:13:06	0:00:00	18	0.8	1.3		
55	E	20:15:42	20:35:29	0:00:00	20	0.6	1		
56	W	20:38:41	21:00:35	0:00:00	20	0.6	1.1		
57	E	21:04:20	21:24:31	0:00:00	19	0.6	1.1	slightly low at end of line	
58	W	21:27:35	21:51:09	0:00:00	17	0.7	1.3		
59	E	21:53:44	22:14:14	0:00:00	16	0.7	1.3		
60	W	22:17:23	22:40:52	0:00:00	15	0.7	1.3		
61	E	22:42:50	23:02:41	0:00:00	15	0.7	1.2	slightly fast	
				0:00:00					
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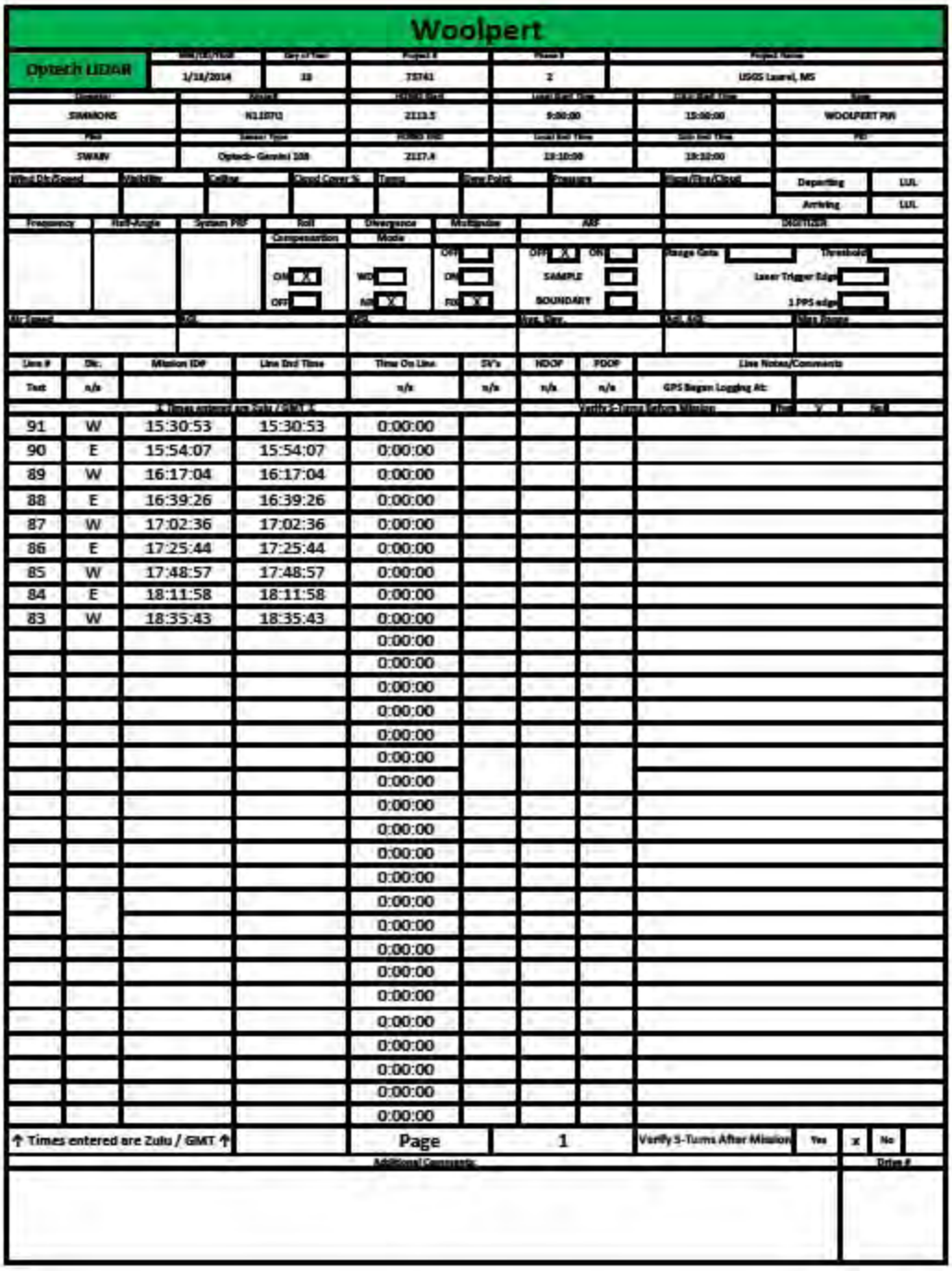
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00				Overfly Base: 23:19:05	
				0:00:00				Wheels Down:	
				0:00:00					
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1			

Additional Comments:

A TDC data fetch timeout error due to no mem switch signal on I/O Axis 1 connection on TDC/

Drive #: ALS-70 #2



Woolpert

Optech LIDAR

1/18/2014	18	75741	2	USGS Laurel, MS
SIMMONS	N11071	2113.5	9:00:00	15:00:00	WOOLPERT PIR
SWAIN	Optech- Gemini 108	2117.4	13:10:00	19:10:00	

Depart LUL
Arriving LUL

Frequency | Half-Angle | System PRF | Roll Compensation: ON ☒ OFF ☐ | Divergence Mode: WD ☐ NR ☒ | Multipulse: OFF ☐ ON ☐ FIX ☒ | ARF: OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐

DIGITIZER: Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Line #	Dir.	Mission ID#	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:
91	W	15:30:53	15:30:53	0:00:00				
90	E	15:54:07	15:54:07	0:00:00				
89	W	16:17:04	16:17:04	0:00:00				
88	E	16:39:26	16:39:26	0:00:00				
87	W	17:02:36	17:02:36	0:00:00				
86	E	17:25:44	17:25:44	0:00:00				
85	W	17:48:57	17:48:57	0:00:00				
84	E	18:11:58	18:11:58	0:00:00				
83	W	18:35:43	18:35:43	0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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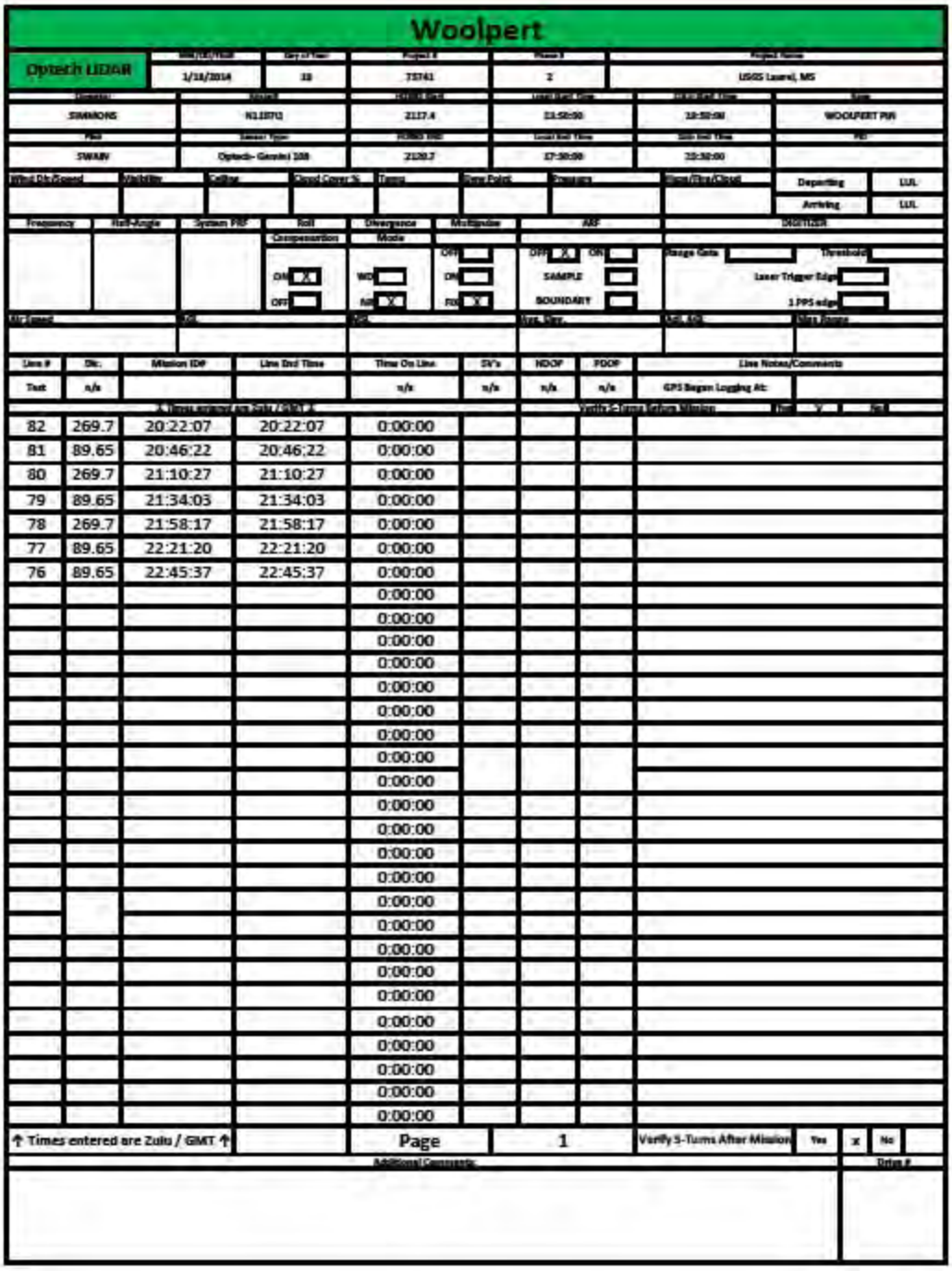
↑ Times entered are Zulu / GMT ↑ | Page 1 | Verify 5-Turns After Mission Yes x No

Additional Comments: | Drive #



Woolpert

Optech LIDAR

1/18/2014	18	75741	2	USGS Laurel, MS

SIMMONS	N1187Q	2117.4	13:50:00	18:50:00	WOOLPERT PVR
SWAIN	Optech- Gemini 108	2120.7	17:30:00	22:30:00	

Wind Dir/Speed | Visibility | Ceiling | Cloud Cover % | Temp | Dew Point | Pressure | Rime/Fire/Cloud

Departing LUL

Arriving LUL

Frequency | Half-Angle | System PRF | Roll Compensation | Divergence Mode | Multipulse | ARF | DIGITIZER

Roll Compensation: ON ☒ OFF ☐

Divergence Mode: WD ☐ NR ☒

Multipulse: OFF ☐ ON ☐ FIX ☒

ARF: OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐

Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Line #	Dir.	Mission ID#	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:
82	269.7	20:22:07	20:22:07	0:00:00				
81	89.65	20:46:22	20:46:22	0:00:00				
80	269.7	21:10:27	21:10:27	0:00:00				
79	89.65	21:34:03	21:34:03	0:00:00				
78	269.7	21:58:17	21:58:17	0:00:00				
77	89.65	22:21:20	22:21:20	0:00:00				
76	89.65	22:45:37	22:45:37	0:00:00				
				0:00:00				
				0:00:00				
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Additional Comments: | Drive #

Woolpert

Leica LIDAR					
	1/18/2014	18	73741		chadrow
SMITH		N404CP	4555.6	9:17:00	15:17:00
RADER		AUS-710B	4562.8	4:26:00	22:26:00

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud		
200/5	10			0	-5	3028		Departing	mei
								Arriving	mei

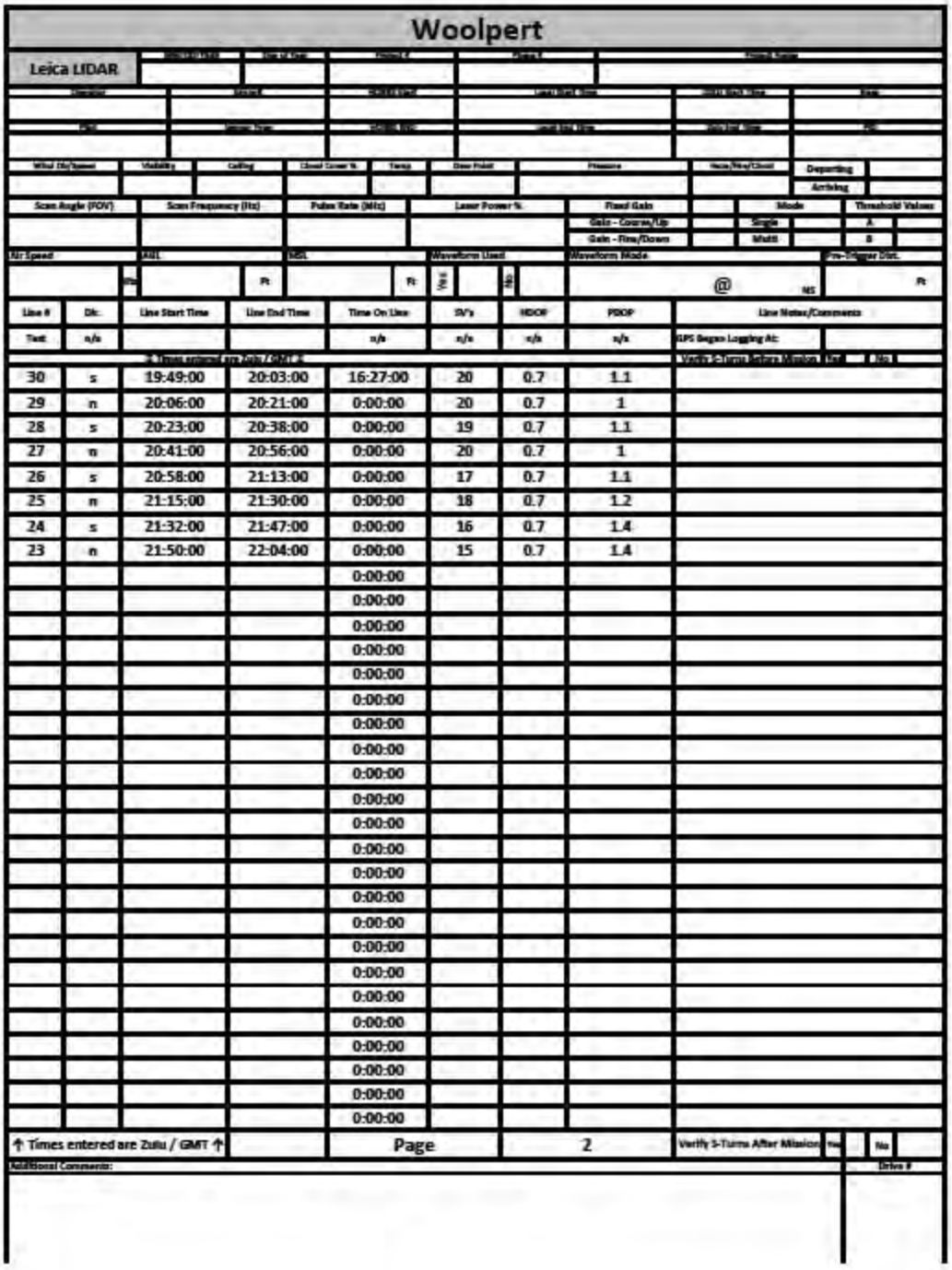
Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode			Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	120	
				Gain - Fine/Down	12	Multi	x	B	100	

NJ Speed	AGL		MSL		Waveform Used				Waveform Mode		Pre-Trigger Dist.	
150	Kts	6500	Ft	6500	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:	15:07:00
↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission	Yes x No
61	s	15:41:00	15:42:00	7:30:00	14	0.7	1.3		
60	n	15:44:00	15:46:00	0:00:00	15	0.7	1.2		
59	s	15:49:00	15:51:00	0:00:00	15	0.7	1.2		
58	n	15:53:00	15:56:00	0:00:00	15	0.7	1.2		
57	s	15:58:00	16:00:00	0:00:00	14	0.7	1.4		
56	n	16:03:00	16:05:00	0:00:00	14	0.7	1.4		
55	s	16:08:00	16:09:00	0:00:00	14	0.7	1.4		
31	n	16:12:00	16:29:00	0:00:00	13	0.7	1.5		
32	s	16:31:00	16:42:00	0:00:00	16	0.7	1.1		
33	n	16:46:00	16:58:00	0:00:00	17	0.7	1.1		
34	s	17:00:00	17:11:00	0:00:00	17	0.7	1.1		
35	n	17:14:00	17:24:00	0:00:00	17	0.7	1.2		
36	s	17:27:00	17:37:00	0:00:00	18	0.7	1.1		
37	n	17:39:00	17:50:00	0:00:00	18	0.7	1.1		
38	s	17:52:00	18:02:00	0:00:00	19	0.7	1.1		
39	n	18:05:00	18:15:00	0:00:00	19	0.7	1.1		
40	s	18:17:00	18:27:00	0:00:00	19	0.7	1.1		
54	n	18:29:00	18:30:00	0:00:00	19	0.7	1.1		
41	n	18:33:00	18:39:00	0:00:00	19	0.7	1.1		
42	s	18:42:00	18:48:00	0:00:00	17	0.7	1.5		
43	n	18:51:00	18:56:00	0:00:00	18	0.7	1.5		
44	s	18:59:00	19:03:00	0:00:00	18	0.7	1.3		
45	n	19:06:00	19:10:00	0:00:00	19	0.7	1.2		
46	s	19:12:00	19:16:00	0:00:00	19	0.7	1.2		
47	n	19:20:00	19:21:00	0:00:00	19	0.7	1.2		
48	s	19:23:00	19:24:00	0:00:00	19	0.7	1.2		
49	n	19:27:00	19:28:00	0:00:00	19	0.7	1.2		
50	s	19:30:00	19:31:00	0:00:00	19	0.7	1.2		
51	n	19:33:00	19:34:00	0:00:00	19	0.7	1.1		
52	s	19:36:00	19:38:00	0:00:00	18	0.7	1.2		
53	n	19:40:00	19:41:00	0:00:00	19	0.7	1.1		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission	Yes x No

Additional Comments: Strike #

FLI4.9-02 10/16/12 R 07



Woolpert

Leica LIDAR

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

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

Air Speed		AGL		MSL		Waveform Used		Waveform Mode	Pre-Trigger Dist.
	Kts		Ft		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 No	
30	s	19:49:00	20:03:00	16:27:00	20	0.7	1.1		
29	n	20:06:00	20:21:00	0:00:00	20	0.7	1		
28	s	20:23:00	20:38:00	0:00:00	19	0.7	1.1		
27	n	20:41:00	20:56:00	0:00:00	20	0.7	1		
26	s	20:58:00	21:13:00	0:00:00	17	0.7	1.1		
25	n	21:15:00	21:30:00	0:00:00	18	0.7	1.2		
24	s	21:32:00	21:47:00	0:00:00	16	0.7	1.4		
23	n	21:50:00	22:04:00	0:00:00	15	0.7	1.4		
				0:00:00					
				0:00:00					
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↑ Times entered are Zulu / GMT ↑			Page		2			Verify S-Turns After Mission Yes No	

Additional Comments:

Drive #

Woolpert

Leica LIDAR					
	1/18/2014	181A	73741	1	Laurel, Mississippi

Operator	Aircraft	Flight Line #	Laser Start Time	Start Shot Value	Base
GALAMBOS	N404CP	2973.7	9:53:00	15:53:00	WOOLPERT PIN
Pilot	**Sensor Type**	**Flight Alt**	**Laser End Time**	**End Shot Value**	**PIC**
EBERHART	ALS-7177	2981.5	9:55:00	22:55:00	SAR/

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud	Departing	KGWO
190 7	10	Clear	0	-3	-4	3022		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Nr Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 Khz	6500 Ft	6634 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	15:39:07	15:39:34	n/a	n/a	n/a	n/a	GPS Began Logging At:	15:23:58
		↑ Times entered are Zulu / GMT ↑						Verify 5-Turns Before Mission	Yes X No
62	W	15:53:02	16:17:31	9:00:02	15	0.7	1.2	Takeoff: 1529z/9:29 am	
63	E	16:20:00	16:40:02	0:00:00	13	0.8	1.5	Overfly base: 15:37:33	
64	W	16:43:09	17:06:06	0:00:00	17	0.6	1	Standing Water in project area from	
65	E	17:08:52	17:28:48	0:00:00	17	0.6	1.1	heavy rains.....	
66	W	17:31:49	17:55:45	0:00:00	18	0.7	1.1		
67	E	17:58:30	18:17:49	0:00:00	19	0.6	1.1		
68	W	18:21:06	18:45:12	0:00:00	19	0.6	1.1		
69	E	18:47:51	19:07:21	0:00:00	17	0.8	1.5		
70	W	19:10:44	19:34:48	0:00:00	19	0.6	1.2		
71	E	19:37:36	19:56:35	0:00:00	18	0.7	1.2		
72	W	19:59:40	20:13:46	0:00:00	20	0.5	1	TDC ERROR Ovefly base 20:22:00	
72	W	20:07:01	21:21:47	0:00:00	17	0.7	reflight	GPS Began Logging At: 20:34	
73	E	21:24:30	21:45:53	0:00:00	17	0.7	1.3	Overfly Base: 20:38:56	
74	W	21:45:04	22:07:38	0:00:00	16	0.8	1.4		
75	E	22:10:36	22:28:18	0:00:00	15	0.7	1.2		
76	W	22:31:39	22:55:04	0:00:00	15	0.7	1.2		
				0:00:00					
				0:00:00					
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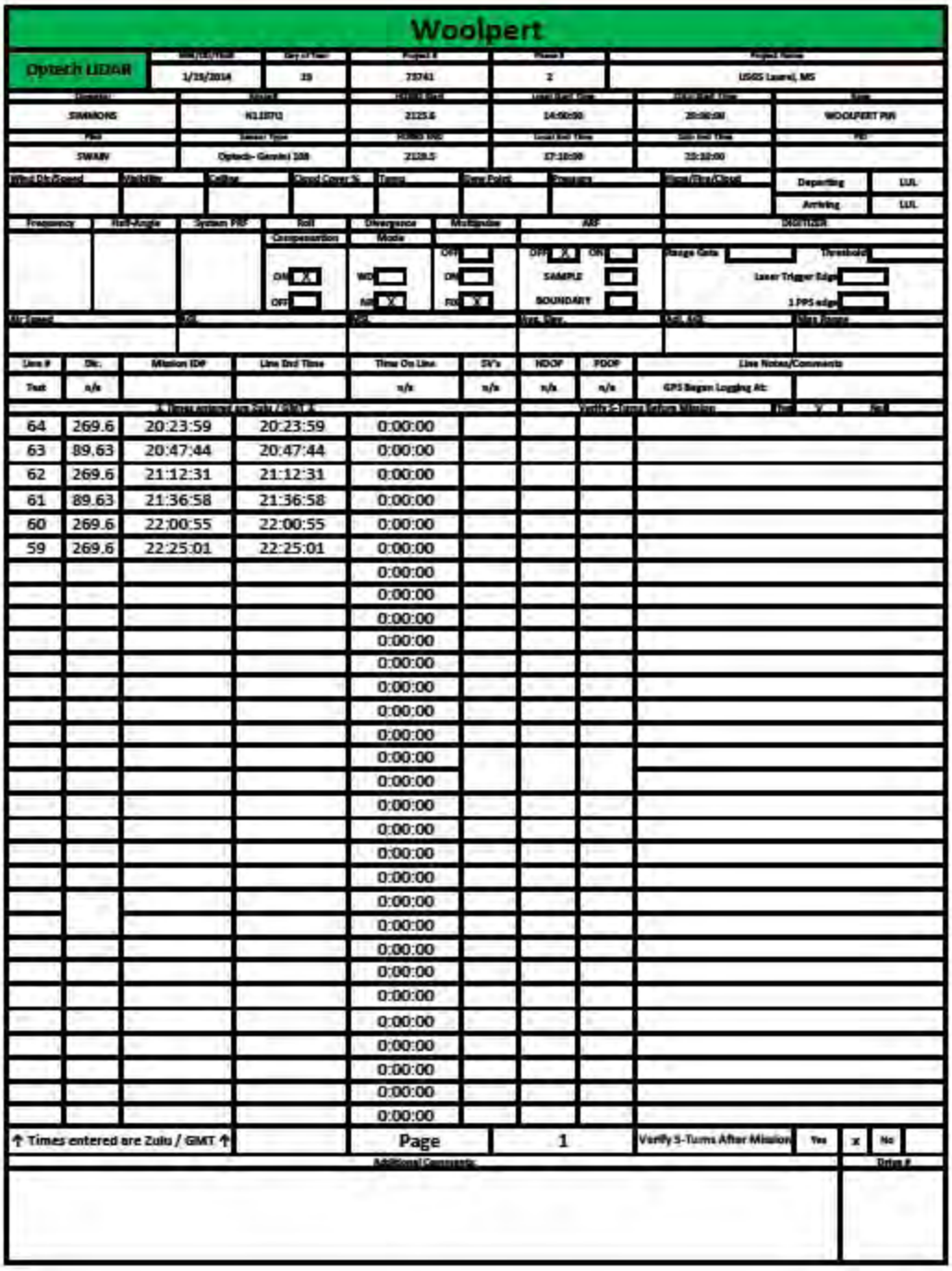
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00				Overfly Base: 23:11:01	
				0:00:00				Wheels Down:	
				0:00:00				Landing: 5:20pm	
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission	Yes X No

Additional Comments: Drive #

A TDC data fetch timeout error due to no mem switch signal on I/O Axis 1 connection on TDC/

ALS 70#2



Woolpert

Optech LIDAR

MM/DD/YYYY	Day of Year	Project #	Phase #	Project Name
1/19/2014	19	73741	2	USGS Laurel, MS

Operator	Aircraft	Hobbs Start	Local Start Time	Zulu Start Time	Base
SIMMONS	N118TQ	2125.6	14:00:00	20:00:00	WOOLPERT PIR
Pilot	**Sensor Type**	**Hobbs End**	**Local End Time**	**Zulu End Time**	**PDI**
SWAIN	Optech- Gemini 108	2128.5	17:10:00	22:10:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Time/Elev/Cloud		
								Departing	LUL
								Arriving	LUL

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ARF	DIGITIZER
					OFF ☐	OFF ☒ ON ☐	Range Gate ☐ Threshold ☐
			ON ☒	WD ☐	ON ☐	SAMPLE ☐	Laser Trigger Edge ☐
			OFF ☐	NR ☒	FIX ☒	BOUNDARY ☐	1 PPS edge ☐

Air Speed	AGL	MSL	Avg. Elev.	Coll. Alt.	Map Scale

Line #	Dir.	Mission ID#	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 5-Turns Before Mission			Yes Y	No
64	269.6	20:23:59	20:23:59	0:00:00					
63	89.63	20:47:44	20:47:44	0:00:00					
62	269.6	21:12:31	21:12:31	0:00:00					
61	89.63	21:36:58	21:36:58	0:00:00					
60	269.6	22:00:55	22:00:55	0:00:00					
59	269.6	22:25:01	22:25:01	0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
				0:00:00					
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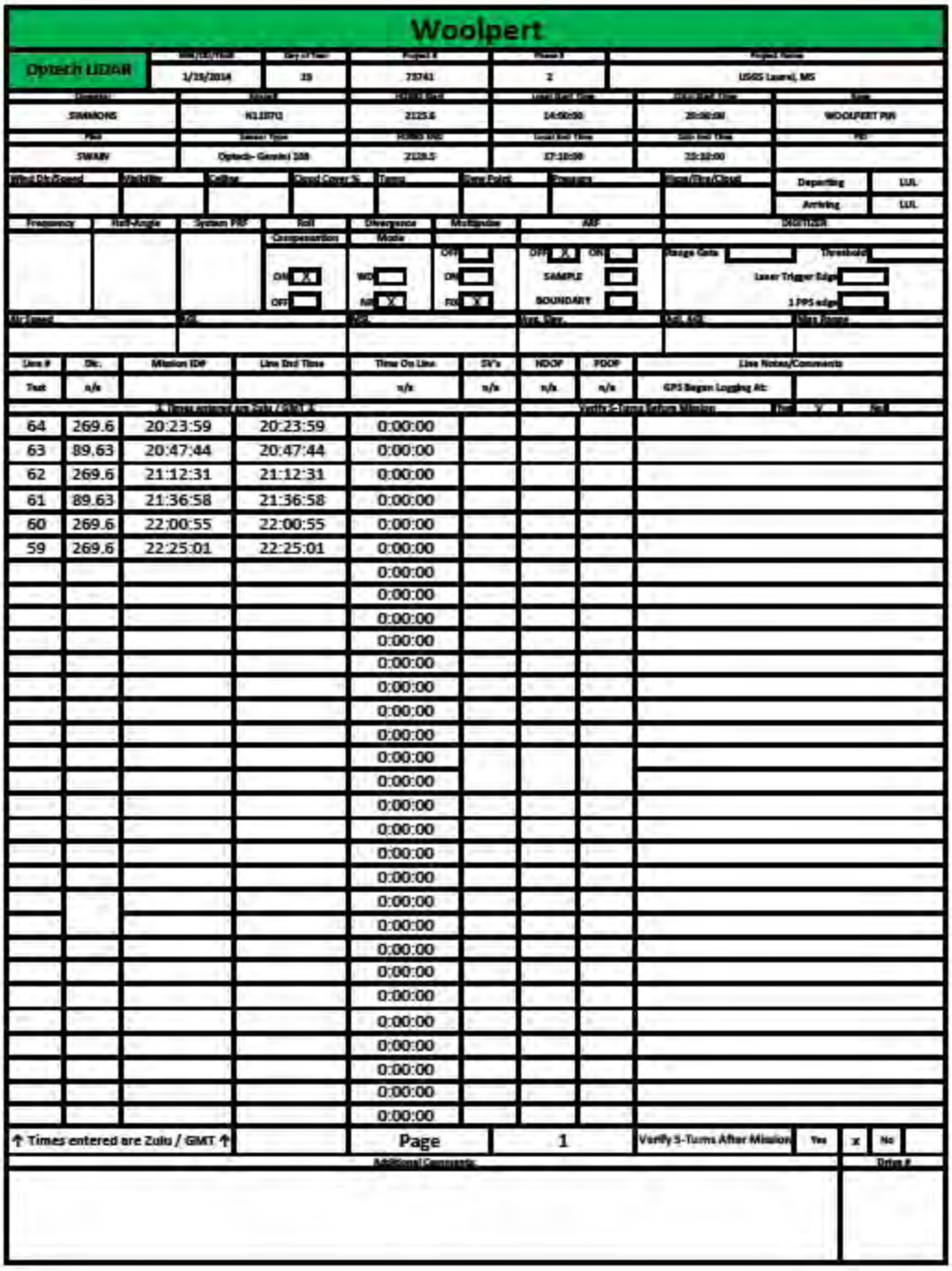
↑ Times entered are Zulu / GMT ↑				Page	1		Verify 5-Turns After Mission	Yes x	No

Additional Comments:

Drive #



Woolpert

Optech LIDAR

Date (M/D/YYYY)	Day of Year	Project #	Mission #	Project Name
1/23/2014	23	73741	2	USGS Laurel, MS

Operator	Aircraft	Flight Log #	Local Start Time	Local End Time	Base
SIMMONS	N118TQ	2125.6	14:50:00	20:00:00	WOOLPERT PAR
PIC	Sensor Type	Hobbs End	Local End Time	GPS End Time	PIC
SWAIN	Optech- Gemini 108	2128.5	17:10:00	22:10:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Base/Tire/Chisel	Departing	LUL
								Arriving	LUL

Frequency	Roll-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ABF	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	Roll	Pitch	Drift Dir.	Drift Amt	Video Frame

Line #	Dir.	Mission ID#	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 5-Turns Before Mission: Yes X No
64	269.6	20:23:59	20:23:59	0:00:00				
63	89.63	20:47:44	20:47:44	0:00:00				
62	269.6	21:12:31	21:12:31	0:00:00				
61	89.63	21:36:58	21:36:58	0:00:00				
60	269.6	22:00:55	22:00:55	0:00:00				
59	269.6	22:25:01	22:25:01	0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission: Yes X No

Additions/Comments:

Data #

Woolpert

Leica LIDAR					
	1/19/2014	19	73741		chadsw

SMITH	IN404CP	4562.8	9:00:00	15:00:00	
PILOT	SENSOR TYPE	FLYING HGT	LAUNCH TIME	LAND TIME	POC
RADER	AUS-710R	4570.8	9:55:00	22:55:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud		
calm	10			2	1	3018		Departing	mei
								Arriving	mei

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode			Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	120	
				Gain - Fine/Down	12	Multi	X	B	100	

NJ Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 Kts	6500 Ft	6500 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:	14:51:00
		↑ Times entered are Zulu / GMT ↑						Verify S-Turns Before Mission	Yes X No
22	s	15:25:00	15:40:00	7:41:00	14	0.7	1.4		
21	n	15:42:00	15:59:00	0:00:00	15	0.7	1.2		
20	s	16:01:00	16:16:00	0:00:00	14	0.7	1.3		
19	n	16:19:00	16:36:00	0:00:00	14	0.7	1.4		
18	s	16:38:00	16:53:00	0:00:00	17	0.7	1.1		
17	n	16:55:00	17:12:00	0:00:00	16	0.7	1.3		
16	s	17:14:00	17:29:00	0:00:00	17	0.7	1.2		
15	n	17:32:00	17:48:00	0:00:00	19	0.7	1.1		
14	s	17:50:00	18:06:00	0:00:00	19	0.7	1.1		
13	n	18:08:00	18:24:00	0:00:00	18	0.7	1.1		
12	s	18:26:00	18:41:00	0:00:00	19	0.7	1.1		
11	n	18:43:00	18:59:00	0:00:00	17	0.7	1.5		
10	s	19:01:00	19:16:00	0:00:00	19	0.7	1.2		
9	n	19:18:00	19:33:00	0:00:00	19	0.7	1.2		
8	s	19:36:00	19:51:00	0:00:00	18	0.7	1.2		
7	n	19:53:00	20:08:00	0:00:00	20	0.7	1		
6	s	20:10:00		0:00:00	20	0.7	1.1	tdc error reboot	
6	s	20:44:00	20:59:00	0:00:00	17	0.7	1.1		
5	n	21:01:00	21:16:00	0:00:00	18	0.7	1.1		
4	s	21:18:00	21:31:00	0:00:00	17	0.7	1.2		
3	n	21:33:00		0:00:00	16	0.7	1.3	tdc error reboot	
3	n	22:00:00	22:11:00	0:00:00	15	0.7	1.4		
2	s	22:13:00	22:22:00	0:00:00	15	0.7	1.3		
1	n	22:24:00		0:00:00	15	0.7	1.2	tdc error reboot	
1	n	22:37:00	22:44:00	0:00:00	15	0.7	1.2		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments: Strike #

FLI4.9-02 10/16/12 R 07

Woolpert

Leica LIDAR					
	1/19/2014	1914	73741	1	Laurel, Mississippi

Operator	Aircraft				
GALAMBOS	N404CP	2981.5	10:13:00	16:13:00	WOOLPERT PIN
Pilot	Sensor Type				PIC
GEBHART	AUS-7177	2989.1	8:40:00	22:50:00	SAR/

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud		
020 9	10	Clear	0	6	-3	3025		Departing	KGWO
								Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Nr Speed	AGL		MSL		Waveform Used			Waveform Mode		Pre-Trigger Dist.	
150	Kts	6500	Ft	6634	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	16:04:08	16:04:23	n/a	n/a	n/a	n/a	GPS Began Logging At:	15:36:00
		* Times entered are Zulu / GMT *						Verify 5-Turns Before Mission	Yes X No
77	E	16:13:24	16:31:41	9:29:30	13	0.8	1.4	Takeoff: 1541Z/9:41am	
78	W	16:34:54	16:54:36	0:00:00	16	0.7	1.1	Overfly base: 15:50:50	
79	E	16:57:46	17:17:19	0:00:00	16	0.7	1.1	Standing Water in project area from	
80	W	17:20:15	17:39:47	0:00:00	17	0.6	1.2	heavy rains.....	
81	E	17:42:42	18:01:30	0:00:00	18	0.6	1.1		
82	W	18:04:30	18:23:37	0:00:00	20	0.6	1.1		
83	E	18:26:22	18:46:20	0:00:00	19	0.6	1.1		
84	W	18:49:05	19:08:45	0:00:00	17	0.6	1.5		
85	E	19:11:36	19:31:36	0:00:00	19	0.7	1.2		
86	W	19:34:36	19:54:13	0:00:00	18	0.6	1.2		
87	E	19:56:57	20:15:55	0:00:00	20	0.6	1.1		
88	W	20:18:49	20:36:52	0:00:00	20	0.6	1.1		
89	E	20:39:29	20:57:14	0:00:00	18	0.6	1.1		
90	W	20:59:49	21:17:05	0:00:00	18	0.6	1.1		
91	E	21:19:26	21:36:31	0:00:00	17	0.7	1.3		
92	W	21:39:29	21:55:45	0:00:00	16	0.7	1.3		
93	E	21:58:08	22:14:00	0:00:00	16	0.8	1.3		
94	W	22:16:56	22:32:36	0:00:00	15	0.8	1.3		
95	E	22:35:07	22:50:04	0:00:00	15	0.8	1.1		
				0:00:00					
				0:00:00					
				0:00:00					
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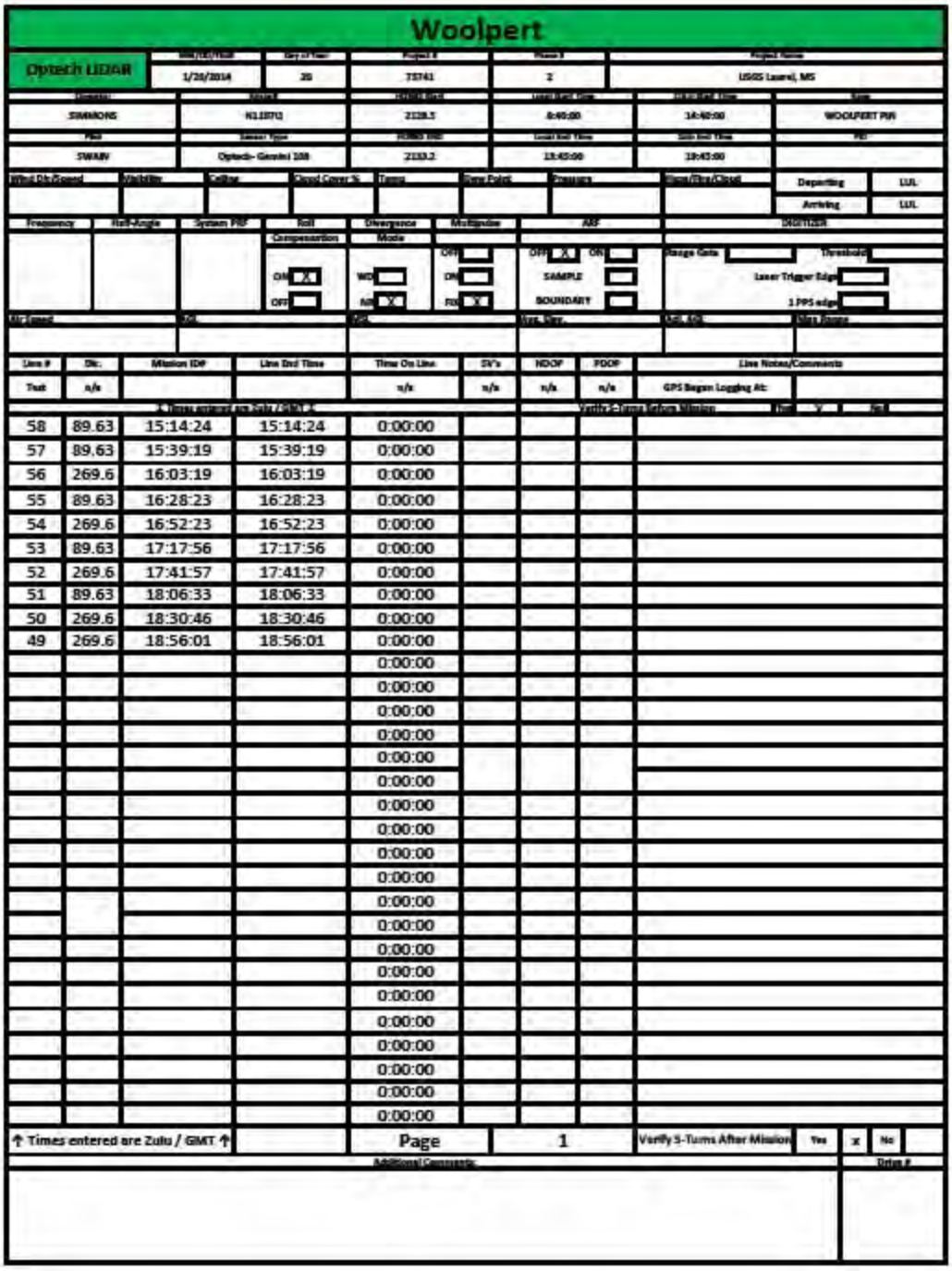
				0:00:00					
				0:00:00				Overfly Base: 23:07:10	
				0:00:00				Wheels Down: 5:17 pm	
				0:00:00					
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission	Yes X No

Additional Comments: Drive #

A TDC data fetch timeout error due to no mem switch signal on I/O Axis 1 connection on TDC/



Woolpert

Optech LIDAR

1/20/2014	20	73741	2	USGS Laurel, MS
SIMMONS	N110TG	2128.5	8:40:00	14:40:00	WOOLPERT PIR
SWAIN	Optech- Gemini 108	2133.2	13:45:00	19:45:00	

Wind Dir/Speed | Visibility | Ceiling | Cloud Cover % | Temp | Dew Point | Pressure | Time/Elev/Cloud

Departing LUL
Arriving LUL

Frequency | Half-Angle | System PRF | Roll Compensation | Divergence Mode | Multipulse | ARF | DIGITIZER

Roll Compensation: ON ☒ OFF ☐
Divergence Mode: WD ☐ NR ☒
Multipulse: OFF ☐ ON ☐ FIX ☒
ARF: OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐
Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Air Speed | AGL | ASL | Avg. Elev. | Coll. Alt. | Sling Range

Line #	Dir.	Mission ID#	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:
58	89.63	15:14:24	15:14:24	0:00:00				
57	89.63	15:39:19	15:39:19	0:00:00				
56	269.6	16:03:19	16:03:19	0:00:00				
55	89.63	16:28:23	16:28:23	0:00:00				
54	269.6	16:52:23	16:52:23	0:00:00				
53	89.63	17:17:56	17:17:56	0:00:00				
52	269.6	17:41:57	17:41:57	0:00:00				
51	89.63	18:06:33	18:06:33	0:00:00				
50	269.6	18:30:46	18:30:46	0:00:00				
49	269.6	18:56:01	18:56:01	0:00:00				
				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				
				0:00:00				
				0:00:00				

↑ Times entered are Zulu / GMT ↑ | Page 1 | Verify 5-Turns After Mission Yes x No

Additional Comments: | Drive #

Woolpert

Leica LIDAR					
	1/20/2014	20	73741		laurel
Operator	Aircraft		Lidar Start Time	Lidar End Time	Base
SMITH	N404CP	4571.0	10:51:00	16:51:00	
Pilot	Sensor Type	Lidar Alt. AGL	Lidar End Time	Data End Time	PIC
RADER	ALS-710R	4576.2	9:58:00	21:58:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Sky/Cloud	Departing	mpe
210/4	10			10		3011		Arriving	mpe

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode			Threshold Values	
				Gain - Course/Up	6	Single		A	120
40	42.3	272	100	Gain - Fine/Down	12	Multi	x	B	100

Air Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 kts	6500 Ft	var 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:	16:40:00
↑ Times entered are Zulu / GMT ↑								Verify S-Turns Before Mission	Yes x No
111	w	17:14:00	17:23:00	11:01:00	18	0.6	1.1		
112	e	17:26:00	17:35:00	0:00:00	19	0.6	1.1		
113	w	17:37:00	17:46:00	0:00:00	18	0.6	1.1		
114	e	17:49:00	17:57:00	0:00:00	19	0.6	1.1		
115	w	18:00:00	18:09:00	0:00:00	21	0.6	1		
116	e	18:11:00	18:20:00	0:00:00	19	0.6	1.2		
117	w	18:23:00	18:32:00	0:00:00	19	0.6	1.2		
118	e	18:34:00	18:43:00	0:00:00	17	0.6	1.4		
119	w	18:45:00	18:54:00	0:00:00	17	0.6	1.4		
120	e	18:57:00	19:05:00	0:00:00	19	0.6	1.2		
121	w	19:08:00		0:00:00	19	0.6	1.2	tdc error-reboot	
121	w	19:36:00	19:45:00	0:00:00	18	0.6	1.2		
122	e	19:48:00	19:57:00	0:00:00	19	0.6	1.1		
123	w	19:59:00	20:08:00	0:00:00	19	0.6	1.1		
124	e			0:00:00				tdc error-reboot	
124	w	20:38:00	20:47:00	0:00:00	18	0.6	1.1		
125	e	20:49:00	20:58:00	0:00:00	18	0.6	1.1		
126	w	21:01:00	21:11:00	0:00:00	18	0.6	1.2		
127	e	21:13:00	21:23:00	0:00:00	17	0.6	1.3		
128	w	21:25:00	21:35:00	0:00:00	16	0.6	1.4		
129	e	21:38:00	21:48:00	0:00:00	16	0.6	1.3		
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes x No

Additional Comments: Drive #

FLI4.9-02 10/16/12 R 07

Woolpert

Leica LIDAR					
	1/20/2014	2014	73741	1	Laurel, Mississippi

GALAMBOS	N404CP	2989.1	16:57:00	16:57:00	WOOLPERT PIN
Pilot	Sensor Type				PIC
JEEHART	ALS-7177	2901.8	2:46:00	20:46:00	SAE/

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud		
020 9	10	Clear	0	12	-1	3007		Departing	KGWO
								Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	X	B	170

Nr Speed	AGL		MSL		Waveform Used			Waveform Mode		Pre-Trigger Dist.	
150	6500	Ft	6634	Ft	Yes		No	X	@ NS		Ft

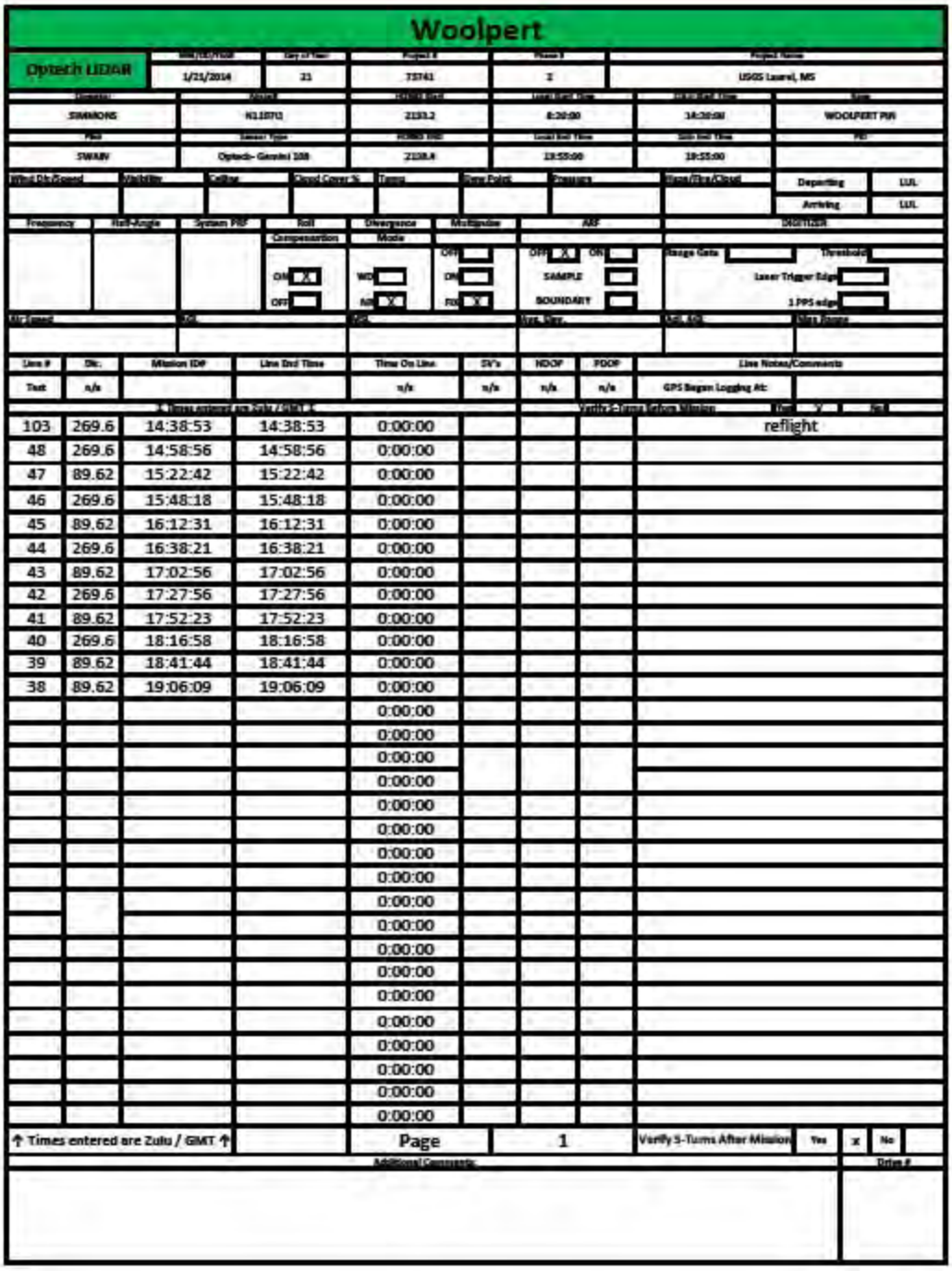
Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:
		↑ Times entered are Zulu / GMT ↑						Verify S-Turns Before Mission Yes X No
96	W	16:57:43	17:12:46	10:44:49	17	0.7	1.2	Takeoff: 16:28Z / 10:28
97	E	17:15:26	17:29:23	0:00:00	19	0.6	1.1	Overfly base: 16:23:31
98	W	17:32:16	17:46:11	0:00:00	18	0.6	1.1	Standing Water in project area from
99	E	17:51:23	18:00:21	0:00:00	19	0.6	1.2	heavy rains.....
100	W	18:03:45	18:12:49	0:00:00	21	0.6	1	
101	E	18:15:46	18:24:44	0:00:00	19	0.6	1.2	
102	W	18:27:49	18:36:47	0:00:00	19	0.6	1.2	
103	E	18:39:44	18:48:38	0:00:00	17	0.6	1.4	
104	W	18:51:47	19:01:00	0:00:00	19	0.7	1.2	
105	E	19:03:43	19:12:34	0:00:00	19	0.6	1.2	
106	W	19:15:44	19:24:57	0:00:00	19	0.6	1.2	
107	E	19:27:53	19:36:53	0:00:00	19	0.6	1.2	
108	W	19:40:08	19:49:11	0:00:00	18	0.6	1.2	
109	E	19:51:40	20:00:21	0:00:00	18	0.6	1.1	
110	W	20:03:35	20:12:40	0:00:00	19	0.7	1.1	
Z26	N	20:31:34	20:46:28	0:00:00	19	0.6	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				Overfly Base: 20:57:12
				0:00:00				Wheels Down/Landing: 2107z/3:07pm
				0:00:00				
				0:00:00				Static: N/A
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission Yes X No

Additional Comments:

A TDC data fetch timeout error due to no mem switch signal on I/O Axis 1 connection on TDC/

Drive #

ALS70 #2



Woolpert

Optech LIDAR

MM/DD/YYYY	Day of Year	Project #	Phase #	Project Name
1/21/2014	21	73741	1	USGS Laurel, MS

Operator	Aircraft	Hobbs Start	Local Start Time	Zulu Start Time	Base
SIMMONS	N110TG	2133.2	8:20:00	14:20:00	WOOLPERT PIR
Pilot	**Sensor Type**	**Hobbs End**	**Local End Time**	**Zulu End Time**	**PDI**
SWAIN	Optech- Gemini 108	2138.4	13:55:00	19:55:00	

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

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	ARF	DIGITIZER
			ON ☒ OFF ☐	WD ☐ NR ☒	OFF ☐ ON ☐ FIX ☒	OFF ☒ ON ☐ SAMPLE ☐ BOUNDARY ☐	Range Gate ☐ Threshold ☐ Laser Trigger Edge ☐ 1 PPS edge ☐

Air Speed	AGL	MSL	Avg. Elev.	Coll. Alt.	Max Range

Line #	Dir.	Mission ID#	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 5-Turns Before Mission	Yes X	No
103	269.6	14:38:53	14:38:53	0:00:00				reflight
48	269.6	14:58:56	14:58:56	0:00:00				
47	89.62	15:22:42	15:22:42	0:00:00				
46	269.6	15:48:18	15:48:18	0:00:00				
45	89.62	16:12:31	16:12:31	0:00:00				
44	269.6	16:38:21	16:38:21	0:00:00				
43	89.62	17:02:56	17:02:56	0:00:00				
42	269.6	17:27:56	17:27:56	0:00:00				
41	89.62	17:52:23	17:52:23	0:00:00				
40	269.6	18:16:58	18:16:58	0:00:00				
39	89.62	18:41:44	18:41:44	0:00:00				
38	89.62	19:06:09	19:06:09	0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
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				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page	1	Verify 5-Turns After Mission	Yes x	No

Additional Comments:	Drive #

Woolpert

Optech LIDAR	1/21/2014	21	73741	2	USGS Laurel, MS
SIMMONS	N110771	2138.4	14:55:00	20:33:00	WOOLPERT PIR
SWAIN	Optech- Gemini 108	2142.0	15:00:00	1:00:00	

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

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multipulse	AGF	DIGITIZER
			ON X / OFF	WD / NR X	OFF / ON / FD X	OFF X / ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Alt Speed	Roll	Pitch	Drift Dir.	Drift Ang	Video Frame

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At:
↑ Times entered are Zulu / GMT ↑								Verify 2-Turns Before Mission: Yes X No
156	358.9	20:49:21	20:49:21	0:00:00				
141	309.7	21:04:23	21:04:23	0:00:00				
142	129.7	21:12:41	21:12:41	0:00:00				
143	309.7	21:21:00	21:21:00	0:00:00				
144	129.7	21:29:39	21:29:39	0:00:00				
145	309.7	21:37:42	21:37:42	0:00:00				
146	129.7	21:47:00	21:47:00	0:00:00				
147	309.7	21:55:11	21:55:11	0:00:00				
148	129.7	22:04:17	22:04:17	0:00:00				
149	309.7	22:12:33	22:12:33	0:00:00				
150	129.7	22:21:53	22:21:53	0:00:00				
151	309.7	22:29:54	22:29:54	0:00:00				
152	129.7	22:38:00	22:38:00	0:00:00				
153	309.7	22:44:58	22:44:58	0:00:00				
154	309.7	22:52:05	22:52:05	0:00:00				
37	89.62	23:08:39	23:08:39	0:00:00				
36	269.6	23:32:11	23:32:11	0:00:00				
35	269.6	23:57:10	23:57:10	0:00:00				
155	178.7	0:27:07	0:27:07	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			Verify 5-Turns After Mission: Yes X No

Additions/Comments:

Drive #

Woolpert

Leica LIDAR					
	1/21/2014	21	73741		laurel
SMITH	IN404CP	4576.2	9:12:00	15:12:00	
RADER	AUS-710R	4581.8	2:46:00	20:46:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud	Departing	mpe
320/12	10			9	-3	3005		Arriving	mpe

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	120
				Gain - Fine/Down	12	Multi	X	B	100

Nir Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 kts	6500 Ft	var Ft	Yes		No	X	@ NS	Ft

Line #	Dir.	Line Start Time	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments	
Text	n/a			n/a	n/a	n/a	n/a	GPS Began Logging At:	15:00:00
		↑ Times entered are Zulu / GMT ↑						Verify S-Turns Before Mission	Yes X No
130	w	15:24:00	15:36:00	7:28:00	14	0.7	1.3		
131	e	15:39:00	15:49:00	0:00:00	15	0.7	1.2		
132	w	15:52:00	16:04:00	0:00:00	14	0.7	1.4		
133	e	16:07:00	16:16:00	0:00:00	14	0.7	1.4		
134	w	16:19:00	16:31:00	0:00:00	16	0.7	1.1	clds wp 22,21,12	
135	e	16:34:00	16:43:00	0:00:00	16	0.7	1.1		
136	w	16:47:00	16:58:00	0:00:00	16	0.7	1.2		
137	e	17:01:00	17:10:00	0:00:00	17	0.7	1.2		
138	w	17:13:00	17:24:00	0:00:00	18	0.6	1.1		
139	e	17:27:00	17:36:00	0:00:00	18	0.6	1.1		
140	w	17:39:00	17:50:00	0:00:00	19	0.6	1.1		
141	e	17:53:00	18:02:00	0:00:00	20	0.6	1		
142	w	18:05:00	18:15:00	0:00:00	18	0.6	1.1		
143	e	18:18:00	18:27:00	0:00:00	19	0.6	1.1		
144	w	18:30:00	18:40:00	0:00:00	17	0.7	1.4		
145	e	18:43:00	18:52:00	0:00:00	18	0.7	1.4	clds wp 33 ,34	
146	w	18:55:00	19:05:00	0:00:00	19	0.7	1.3	clds wp 32 ,2	
147	e			0:00:00				tdc error-reboot	
147	w	19:35:00	19:44:00	0:00:00	19	0.6	1.1		
148	e	19:47:00	19:56:00	0:00:00	19	0.6	1.1		
146	w	19:58:00	19:59:00	0:00:00	19	0.6	1.1	refit wp 32,31	
145	e	20:04:00	20:05:00		20	0.6	1	refit wp 33,34	
134	w	20:11:00	20:15:00		20	0.6	1	refit wp 22,21,12	
146	e	20:25:00	20:26:00		19	0.6	1.1	refit wp 2	
↑ Times entered are Zulu / GMT ↑				Page		1		Verify S-Turns After Mission	Yes X No

Additional Comments: Drive #

FLI4.9-02 10/16/12 R 07

Woolpert

Leica LIDAR					
	1/21/2014	2118	73741	3	Laurel, Mississippi
Operator	Aircraft		Flight Line #	Laser Start Time	Start Time Zulu	Base
GALAMBOS	N404CP		2903.8	10:14:00	16:14:00	WOOLPERT PIN
Pilot	Sensor Type		Flight Alt	Laser End Time	End Time Zulu	PIC
GEBHART	ALS-7177		3000.8	2:40:00	21:40:00	SAE/

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Cloud	Departing	KGWO
350 11 pg 26	10	Clear	0	4	-6	3018		Arriving	KGWO

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
				Gain - Course/Up	6	Single		A	180
40	42.3	272	100	Gain - Fine/Down	12	Multi	X	B	170

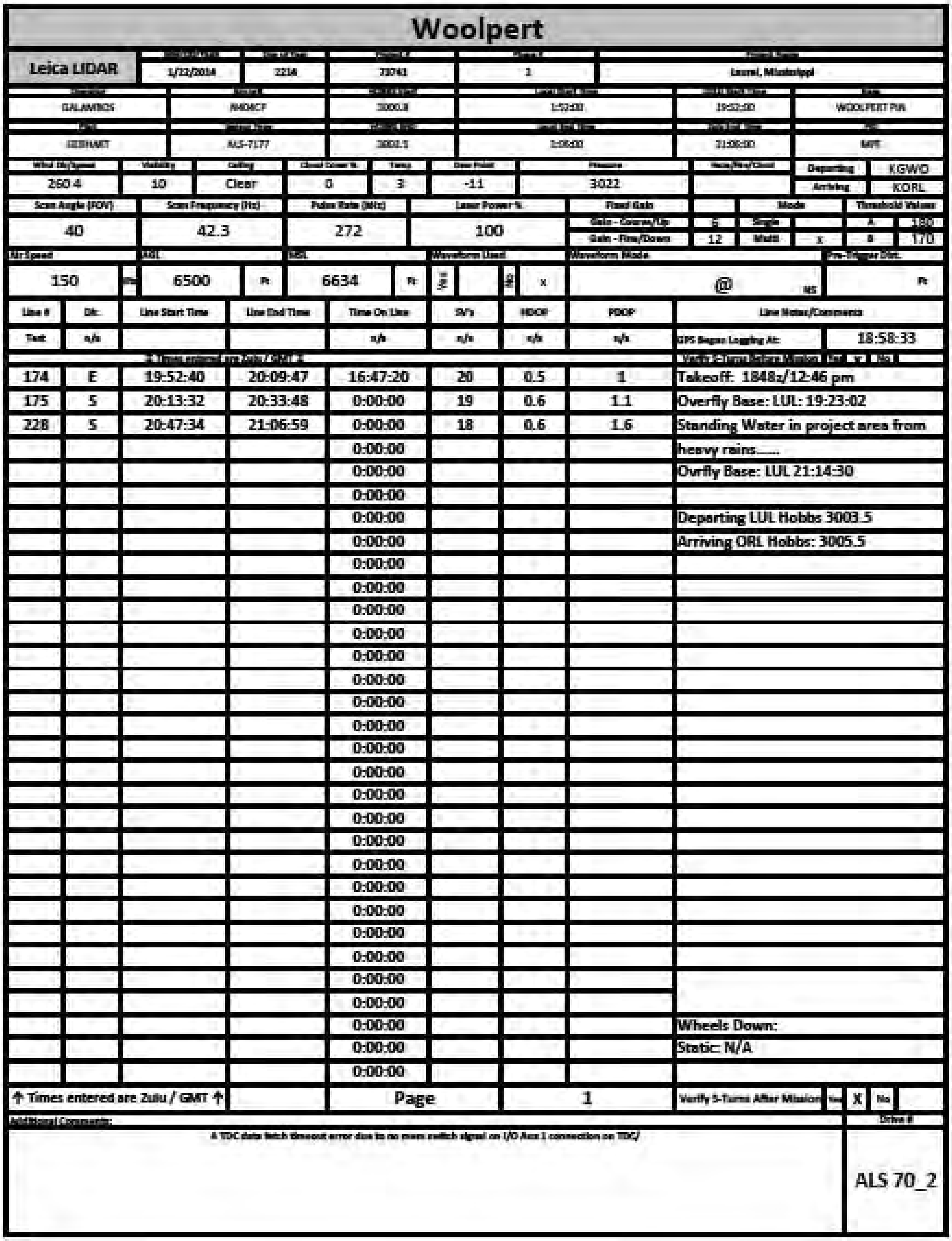
Nr Speed	AGL		MSL		Waveform Used			Waveform Mode		Pre-Trigger Dist.	
150	Kts	6500	Ft	6634	Ft	Yes		No	X	@ NS	Ft

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:	15:11:25
↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission	Yes X No
149	W	16:14:24	16:24:32	9:04:10	15	0.7	1.1	Takeoff: 1517z/ 9:17am	
150	E	16:27:35	16:36:35	0:00:00	17	0.6	1	Overfly base: 15:26:18/ overfly MPE	
151	W	16:39:23	16:49:23	0:00:00	15	0.7	1.2	Standing Water in project area from	
152	E	16:52:10	17:01:05	0:00:00	17	0.8	1.1	heavy rains.....	
153	W	17:04:34	17:14:35	0:00:00	16	0.7	1.2		
154	E	17:17:18	17:26:06	0:00:00	19	0.6	1		
155	W	17:29:47	17:39:42	0:00:00	18	0.6	1.1		
156	E	17:42:28	17:51:03	0:00:00	19	0.6	1.1		
157	W	17:54:06	18:03:40	0:00:00	19	0.7	1.1	Offline wpt 26	
158	E	18:06:30	18:15:15	0:00:00	18	0.6	1.1		
159	W	18:08:17	18:28:04	0:00:00	19	0.6	1.1		
160	E	18:30:44	18:39:11	0:00:00	17	0.7	1.4		
161	W	18:42:24	18:51:48	0:00:00	17	0.7	1.4		
162	E	18:54:36	19:03:25	0:00:00	17	0.7	1.3		
163	W	19:06:39	19:15:54	0:00:00	19	0.7	1.3		
164	E	19:18:27	19:26:58	0:00:00	19	0.6	1.3		
165	W	19:29:54	19:39:08	0:00:00	19	0.8	1		
166	E	19:41:44	19:50:44	0:00:00	18	0.6	1		
167	W	19:53:42	20:02:51	0:00:00	20	0.6	1.1		
168	E	20:05:34	20:14:27	0:00:00	20	0.6	1		
169	W	20:17:00	20:26:08	0:00:00	20	0.6	1		
170	E	20:29:11	20:37:44	0:00:00	20	0.6	1		
171	W	20:40:31	20:49:32	0:00:00	18	0.6	1.1		
172	E	20:52:00	21:09:04	0:00:00	17	0.7	1.4		
173	W	21:12:02	21:29:37	0:00:00	17	0.7	1.4		
157	W	21:35:32	21:40:06	0:00:00	17	0.7	1.4	Reflight - Patch	
				0:00:00					
				0:00:00				Overfly Base: MPE 21:52:44	
				0:00:00				Wheels Down: 22-20/4:20pm	
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission	Yes X No

Additional Comments:

A TDC data fetch timeout error due to no mem switch signal on I/O Axs 1 connection on TDC/

Drive #



Woolpert

Leica LIDAR	1/22/2014	2214	73741	1	Laurel, Mississippi

GALAMBOS	N404CP	3000.8	1:52:00	19:52:00	WOOLPERT PVR
GERHART	ALS-7177	3003.5	3:06:00	21:06:00	MPE

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	KGWO
260 4	10	Clear	0	3	-11	3022		Arriving	KORL

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	180
				Gain - Fine/Down	12	Multi	x	B	170

Air Speed		AGL		MSL		Waveform Used				Waveform Mode	Pre-Trigger Dist.
150	Kts	6500	Ft	6634	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:	18:58:33
		↓ Times entered are Zulu / GMT ↓						Verify 5-Turns Before Mission Yes x No	
174	E	19:52:40	20:09:47	16:47:20	20	0.5	1	Takeoff: 1848z/12:46 pm	
175	S	20:13:32	20:33:48	0:00:00	19	0.6	1.1	Overfly Base: LUL: 19:23:02	
228	S	20:47:34	21:06:59	0:00:00	18	0.6	1.6	Standing Water in project area from	
				0:00:00				heavy rains......	
				0:00:00				Ovrfly Base: LUL 21:14:30	
				0:00:00					
				0:00:00				Departing LUL Hobbs 3003.5	
				0:00:00				Arriving ORL Hobbs: 3005.5	
				0:00:00					
				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					
				0:00:00					
				0:00:00					
				0:00:00				Wheels Down:	
				0:00:00				Static: N/A	
				0:00:00					
↑ Times entered are Zulu / GMT ↑				Page		1		Verify 5-Turns After Mission Yes X No	

Additional Comments:

A TDC data fetch timeout error due to no mass switch signal on I/O Aux 1 connection on TDC/

Drive #

ALS 70_2

Woolpert

Leica LIDAR					
	1/25/2014	25	73741		laurel
Operator	Aircraft		Launch Time	Land Time	
SMITH	N404CF	4583.1	11:12:00	17:12:00	
Pilot	Sensor Type	Flight ID	Local Time	Data Log Time	POC
RADER	ALS-710B	4585.1	1:12:00	19:12:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Clouds		
Z30/8	10			6	-6	3008		Departing	386
								Arriving	386

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode		Threshold Values	
40	42.3	272	100	Gain - Course/Up	6	Single		A	120
				Gain - Fine/Down	12	Multi	X	B	100

Air Speed	AGL	MSL	Waveform Used			Waveform Mode	Pre-Trigger Dist.
150 kts	6500 ft	var 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:	16:58:00
↑ Times entered are Zulu / GMT ↑								Verify S-Turns Before Mission	Yes X No
42	e			11:58:00				tdc error reboot	
42	e	17:58:00	18:00:00	0:00:00	19	0.6	1.1	refit wp 67-72	
44	w	18:03:00	18:26:00	0:00:00	19	0.6	1.1	refit	
123	w	18:44:00	18:47:00	0:00:00	19	0.6	1.3	refit wp 10-1	

↑ Times entered are Zulu / GMT ↑ Page 1 Verify S-Turns After Mission Yes X No

Additional Comments: Strike #

FLI4.9-02 10/16/12 R 07

Woolpert

Leica LIDAR					
	1/25/2014	25	72741		chadaw
Operator	Aircraft				
SMITH	N404CF	4585.6	2:44:00	20:44:00	
Pilot	Sensor Type				
RADER	ALS-710R	4586.7	5:50:00	21:50:00	

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fog/Clouds		
280/13	10			13	-9	2999		Departing	mci
								Arriving	mci

Scan Angle (FOV)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power %	Fixed Gain		Mode			Threshold Values	
40	42.3	272	100	Gain - Course/Up	5	Single		A	120	
				Gain - Fine/Down	12	Multi	x	B	100	

Air Speed	AGL		MSL		Waveform Used			Waveform Mode		Pre-Trigger Dist.	
150	6500	ft	6500	ft	Yes		Alt	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:	20:36:00
↑ Times entered are Zulu / GMT ↑								Verify S-Turns Before Mission	Yes x No
44	n	21:01:00	21:03:00	18:41:00	16	0.7	1.5	refit wp 13-9	
4	s	21:14:00	21:27:00	0:00:00	16	0.7	1.4	refit	
1	n	21:29:00	21:36:00	0:00:00	16	0.7	1.2	refit	

↑ Times entered are Zulu / GMT ↑		Page	1	Verify S-Turns After Mission	Yes	x	No	
Additional Comments:								Drive #

FLI4.9-02 10/16/12 R 07

Woolpert

Optech LIDAR	Date (M/D/YYYY)	Day of Year	Project #	Phase #	Project Name
	2/13/2014	46	73741	2	USGS Jasper County, MS

Operator	Aircraft	Flight Line #	Local Start Time	GPS Start Time	Area
GALANBOS	N1107Q	2144.4/2146.8	12:02:00	18:02:00	WOOLPERT PIR
Pilot	**Sensor Type**	**POWER ENG**	**Local End Time**	**GPS End Time**	**PIC**
SHELTON	Optech- Gemini 108	2151.9	4:53:00	22:53:00	LUL Airport

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Haze/Fire/Cloud	Departing	FFC/LUL
310 4	10	Clear	0	9	0	3022		Arriving	LUL

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multiplier	AGC	DIGITIZER
46	12	125	ON X / OFF	WD / NR Y	OFF / ON / FIX Y	OFF X ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	AGL	ASL	Max. Elev.	Avg. Elev.	Min Range
130	5000	5260	390		

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a	18:01:10	18:01:29	n/a	n/a	n/a	n/a	GPS Began Logging At: 17:40:00
↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission: Yes Y / No
1	E	18:02:48	18:13:01	0:10:13	21	0.9	1.46	Late start .8 miles
2	W	18:16:31	18:27:54	0:11:23	22	0.8	1.41	
3	E	18:31:26	18:37:36	0:06:10	22	0.8	1.44	TURN OFF FOR TRAFFIC
3	E	18:41:59	18:48:12	0:06:13	22	0.8	1.44	Continuation of flight-line 3
4	W	18:51:13	19:02:32	0:11:19	21	0.8	1.35	
5	E	19:06:19	19:17:15	0:10:56	19	0.8	1.4	
6	W	19:20:04	19:31:23	0:11:19	19	0.8	1.5	
7	E	19:34:23	19:45:36	0:11:13	18	0.9	1.6	
8	W	19:48:31	20:03:23	0:14:52	17	1.1	1.9	
9	E	20:03:41	20:15:28	0:11:47	17	1.1	2	
10	W	20:18:14	20:30:10	0:11:56	17	1	2	
11	E	20:33:00	20:43:52	0:10:52	18	0.9	1.7	
12	W	20:46:54	20:58:31	0:11:37	17	1	1.7	west end light smoke
13	E	21:01:36	21:12:29	0:10:53	17	0.9	1.8	
14	W	21:15:32	21:26:54	0:11:22	17	0.9	1.8	
15	E	21:29:37	21:40:43	0:11:06	17	0.9	1.8	
16	W	21:44:30	21:55:23	0:10:53	17	0.8	1.4	
17	E	21:58:08	22:09:11	0:11:03	17	0.8	1.4	
18	W	22:12:19	22:23:42	0:11:23	17	0.8	1.4	
1	E	22:26:33	22:28:36	0:02:03	17	0.8	1.4	Fill in gap at beginning
36	S	22:33:00	22:38:28	0:05:28	17	0.8	1.4	Cross Flight
34	W	22:41:39	22:46:52	0:05:13	18	0.8	1.5	
35	E	22:49:34	22:52:30	0:02:56	18	0.8	1.5	
				0:00:00				Landing 23:01z/5:01pm
				0:00:00				Static 230252z
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
				0:00:00				
↑ Times entered are Zulu / GMT ↑				Page	1			Verify 5-Turns After Mission: Yes X / No

Additional Comments:

Disk #: 00660 256gb

Woolpert

Optech LIDAR	MM/DD/YYYY	Day of Year	Project #	Phase #	Project Name
	2/15/2014	46	73741	2	USGS Jasper County, MS

Operator	Aircraft	Flight Start	Local Start Time	GPS Start Time	Area
GALAMBOS	N1107Q	2151.9	8:27:00	0:27:00	WOOLPERT PVR
Pilot	**Sensor Type**	**Flight End**	**Local End Time**	**GPS End Time**	**PIC**
SHELTON	Optech- Gemini 108	2155.8	10:00:00	004:00	LUL Airport

Wind Dir/Speed	Visibility	Ceiling	Cloud Cover %	Temp	Dew Point	Pressure	Runs/Files/Closed	Departing	KLUL
Calm	10	Clr	0	10	1	3015		Arriving	KLUL

Frequency	Half-Angle	System PRF	Roll Compensation	Divergence Mode	Multiplier	AGC	DIGITIZER
46	12	125	ON X / OFF	WD / NR Y	OFF / ON / FIX Y	OFF X ON / SAMPLE / BOUNDARY	Range Gate / Threshold / Laser Trigger Edge / 1 PPS edge

Air Speed	AGL	MSL	Area Elev.	AGL Alt	Max Range
130	5000	5260	260		

Line #	Dir.	Mission ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line Notes/Comments
Test	n/a			n/x	n/x	n/x	n/x	GPS Began Logging At: 0:08:47
↑ Times entered are Zulu / GMT ↑								Verify 5-Turns Before Mission: Yes / No
19	E	0:27:10	0:38:31	0:11:21	22	0.8	1.3	Takeoff: 6:17pm/00:17z
20	W	0:41:45	0:53:30	0:11:45	22	0.8	1.3	Landing: 04:12z/10:12pm
21	E	0:56:35	1:07:37	0:11:02	22	0.8	1.3	
22	W	1:11:03	1:22:44	0:11:41	22	1.2	1.4	
23	E	1:25:45	1:36:47	0:11:02	21	1.1	2	
24	W	1:40:12	1:51:52	0:11:40	22	1	1.6	
25	E	1:54:44	2:05:47	0:11:03	21	0.9	1.5	
26	W	2:09:12	2:21:07	0:11:55	22	0.8	1.5	
27	E	2:23:59	2:35:02	0:11:03	25	0.8	1.5	
28	W	2:38:44	2:50:27	0:11:43	25	0.8	1.5	
29	E	2:53:15	3:04:20	0:11:05	25	0.7	1.4	
30	W	3:07:33	3:19:30	0:11:57	23	0.8	1.5	
31	E	3:22:56	3:33:22	0:10:26	23	0.8	1.5	
32	W	3:39:04	3:49:09	0:10:05	23	0.7	1.4	
33	E	3:51:39	3:59:34	0:07:55	22	0.8	1.3	
				0:00:00				
				0:00:00				Static: 04:15:16
				0:00:00				
				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			Verify 5-Turns After Mission: Yes / No

Additional Comments:

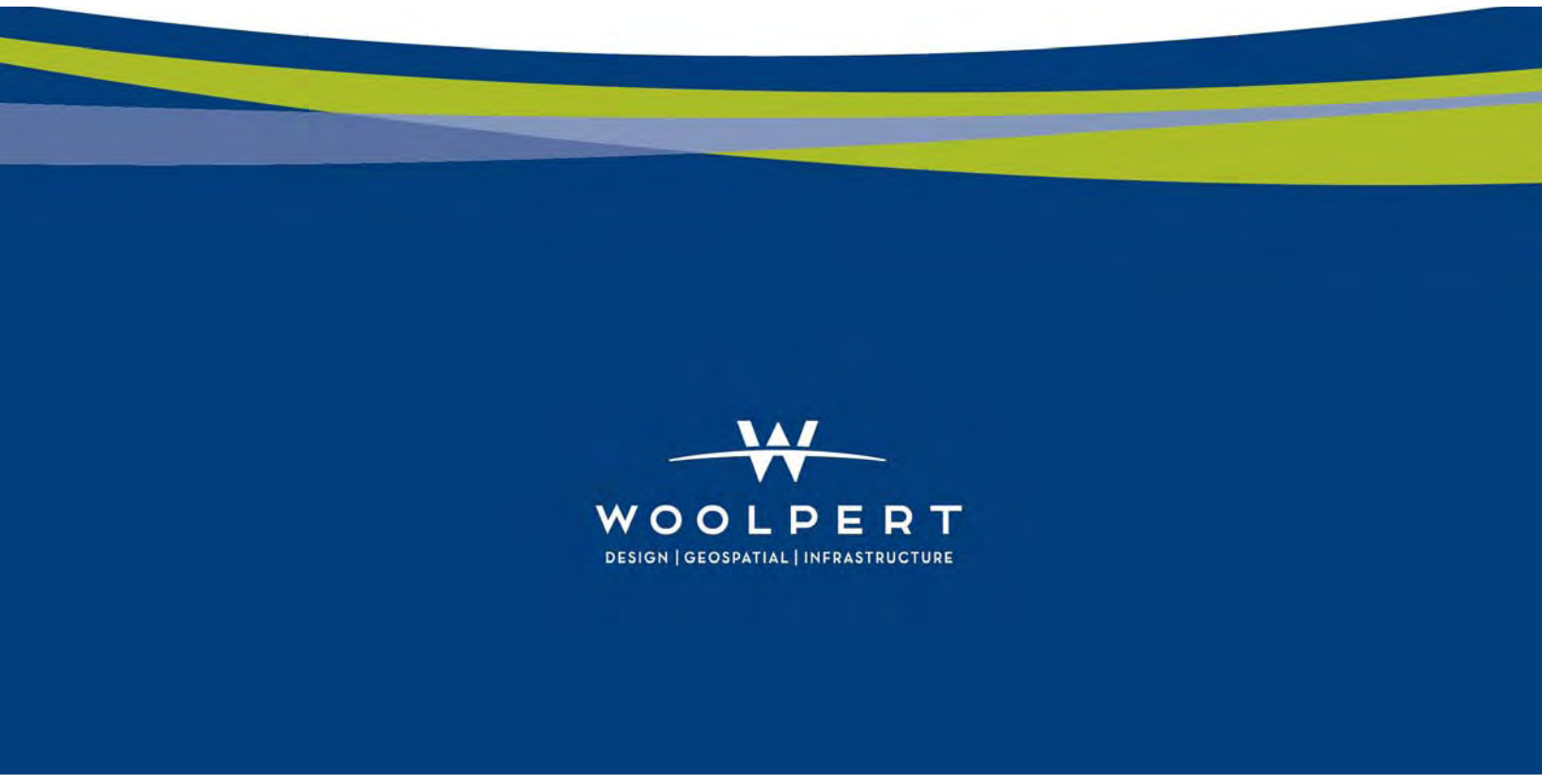
Disp #: 305

SECTION 7: FINAL DELIVERABLES

FINAL DELIVERABLES

The final lidar deliverables are listed below.

- LAS v1.2 classified point cloud
- LAS v1.2 raw unclassified point cloud flight line strips no greater than 2GB. Long swaths greater than 2GB will be split into segments)
- Hydrologically flattened Polygon z and Polyline z shapefiles
- Hydrologically flattened bare earth 1-meter DEM in ERDAS .IMG format
- 8-bit gray scale intensity images
- Tile layout and data extent 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


WOOLPERT
DESIGN | GEOSPATIAL | INFRASTRUCTURE