## LIDAR ACQUISITION REPORT



### FY 2013 GEORGIA DNR ELEVATION DATA

### NOAA COASTAL SERVICES CENTER (CSC)

CONTRACT NUMBER: EA133C11CQ0010 REQUISITION ORDER NUMBER NCNP0000-12-02645

Woolpert Project Number: 072875

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# **SECTION 1: OVERVIEW**

This report contains a comprehensive outline of the airborne LiDAR data acquisition for Morgan, Putnam, Hancock, and Baldwin Counties, as part of the FY13 GA DNR Elevation Data EA133C-11-CQ-0010/T-0014; Contract Number EA133C11CQ0010; Requisition Order Number NCNP0000-12-02645, for the NOAA Coastal Services Center (CSC). The task order area Morgan, Putnam, Hancock, and Baldwin Counties was approximately 1455 square miles. The LiDAR data was collected and processed to meet a Nominal Post Spacing (NPS) of 1.0 meter. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath.

LIDAR data was collected using an Optech Gemini LiDAR System in Multi-Pulse mode. Gemini LiDAR System collects up to four returns (echo) per pulse, recording attributes such as time stamp and 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:

The aerial LiDAR was collected at the following sensor specifications for Morgan, Putnam, Hancock, and Baldwin Counties Project:

Post Spacing (Minimum):	3.28 ft / 1.0 m
AGL (Above Ground Level) average flying height:	5,500 ft / 1,676 m
MSL (Mean Sea Level) average flying height:	5,850 ft / 1,783 m
Average Ground Speed:	130 knots / 149 mph
Field of View (full):	40 degrees
Pulse Rate:	125 kHz
Scan Rate:	34 Hz
Side Lap (Minimum):	25%
Flight Lines Flown at these specifications:	1 - 142 (AII)

The LiDAR data was produced in Georgia State Plane East Zone, North American Datum of 1983 (NAD83). Coordinate positions were specified in units of US Survey Feet. The vertical datum used for the project was referenced to North American Vertical Datum of 1988 (NAVD88) in units of US Survey Feet.

Table 1.1: LiDAR Acquisition Specifications							
Project	Post Spacing	Number of Flight Lines	Number of Collection Days	Acquisition Dates			
Morgan, Putnam, Hancock, and Baldwin Counties, GA	1.0-meter Average	142	6	December 19,2012 December 22,2012 December 28,2012 December 30,2012 January 04,2013 January 05,2013			

Table 1.2: LiDAR Flight Summary. 1-Meter Nominal Post Spacing					
Date of Flying	Lines Flown	Time ON/Off Line (UTC)	Time On/Off Line (Local - EST/EDT)		
December 19,2012 Optech Gemini 09SEN258 2 lifts	Lift 1 Lines 1-18 (Morgan Co.) Lift 2 Lines 19-25 (Morgan Co.)	15:22 - 18:40 20:51 - 22:35	10:22 AM - 1:40 PM 3:51 PM - 5:35 PM		
December 22,2012 Optech Gemini 09SEN258 2 lifts	Lift 1 Lines 26-36 (Morgan Co.) Lift 2 Lines 37-48 (Morgan Co.)	15:02 - 18:15 20:38 - 23:03	10:02 AM - 1:15 PM 3:38 PM - 6:03 PM		
December 28,2012 Optech Gemini 09SEN258	49-59 (Putnam Co.)	22:48 - 00:53	5:48 PM - 7:53 PM		
December 30,2012 Optech Gemini 09SEN258 2 lifts	Lift 1 Lines 60-70 (Putnam, Baldwin) Lift 2 Lines 71-79 ((Putnam, Baldwin)	14:59 - 18:58 20:52 - 00:15	9:59 AM - 1:58 PM 3:52 PM - 7:15 PM		
January 4,2013	Lift 1 Lines 80-86 (Putnam, Baldwin, Hancock)	20:15 - 22:40	3:15 PM - 5:40 PM		
2 lifts	Lift 2 Lines 87-96 ((Putnam, Baldwin, Hancock)	23:50 - 03:15	6:50 PM - 10:15 PM		
	Lift 1 Lines 97-106 (Putnam, Baldwin, Hancock)	05:57 - 08:58	00:57 AM - 3:58 AM		
January 5,2013 Optech Gemini 09SEN258 4 lifts	Lift 2 Lines 107-113 (Baldwin, Hancock)	10:30 - 12:25	5:30 AM - 7:25 AM		
	Lift 3 Lines 114-129 (Baldwin, Hancock)	16:44 - 21:16	11:44 AM - 4:16 PM		
	Lift 4 Lines 130-142 (Baldwin, Hancock)	22:07 - 00:33	5:07 PM - 7:33 PM		

Figure 1.1: LiDAR Flight Diagram



# **SECTION 2: FLIGHT ACQUISITION**

The LiDAR data was acquired with an Optech Gemini LIDAR System (09SEN258) in Multiple Pulse in Air (MPiA) mode, on board a Cessna 310 (N1107Q). Woolpert owns all the equipment used for the ground control and ABGNSS missions with the exception of CORS stations.

Table 2.1 lists the specifications and the requirements of the ALTM Gemini, bearing serial numbers 09SEN258 and 09CON258.

Table 2.1: System Specifications							
	Specifications						
Serial numbers	Sensor Head 09SEN Control Rack 09CON	258 1258					
Operating altitude	150 – 4000 m nominal						
	Laser Repetition Rate	Horizontal Accuracy (m 1 δ)	Vertical Accuracy (m 1 δ) AGL				
General Enhanced Accuracy Specifications	33 kHz 50 kHz	1/5500 x altitude	< 5 cm up to 500 m < 10 cm up to 1 km < 15 cm up to 2 km < 20 cm up to 3 km < 25 cm up to 4 km				
	70 kHz	1/5500 x altitude	< 5 cm up to 500 m < 10 cm up to 1 km < 15 cm up to 2 km				
	100 kHz	1/5500 x altitude	< 10 cm up to 500 m < 15 cm up to 1 km < 20 cm up to 2 km				
	125 kHz	1/5500 x altitude	< 10 cm up to 500 m < 15 cm up to 1km				
	143 kHz	1/5500 x altitude	< 15 cm up to 500 m < 20 cm up to 1 km				
	167 kHz	1/5500 x altitude	< 35 cm @ 750 m				
Range capture	Up to 4 range measurem	ents for each pulse including	g last				
Intensity capture	12 bit dynamic range for	each measurement					

Table 2.1: System Specifications					
	Specifications				
Scan frequency	Variable; maximum 70 Hz				
Scan angle	Variable from 0 to $\pm 25^{\circ}$ , in increments of $\pm 1^{\circ}$				
Scanner Product	Scan Angle x Scan Frequency ≤ 1000				
Roll compensation	5 Hz update rate				
	(Scan angle + Roll Comp. Angle = FOV, i.e. $\pm 25^{\circ}$ allows $\pm 5^{\circ}$ compensation)				
Swath width	Variable; 0 to 0.93 x altitude m				
Position Orientation System	Applanix – Optech custom POS including internal 12 channel dual frequency 50 Hz GPS receiver				
Laser repetition rate	33 kHz (maximum AGL 4.0 km)				
	50 kHz (maximum AGL 3.0 km)				
	70 kHz (maximum AGL 2.5 km)				
	100 kHz (maximum AGL 2.0 km)				
	125 kHz (maximum AGL 1.6 km)				
	142 kHz (maximum AGL 1.4 km)				
Data storage hard drive	Ruggedized removable hard drive, (10hr continuous log time @ 100 KHz)				
Beam divergence	Dual 0.3 mrad (1/e) and 0.8 mrad (1/e)				
Eye safe range	See eye safety table				
Laser classification	Class IV (FDA CFR 21)				
Power requirements	28 V (continuous), 45 A (maximum)				
Operating temperature	Control rack: 10 to 35° C				
	Sensor head: -10 to 35° C (assuming the use of thermal jacket)				
Storage Temperature	Control Rack: – 10 ° to 50° C				
	Sensor Head: 0 ° to 50° C				
Humidity	0 – 95% non-condensing				
Control Rack Measurements	653mm x 591mm x 485mm, 55kg				
Sensor Head Measurements	298mm x 249mm x 437mm, 23kg				

Woolpert's Aerial Acquisition Team coordinated with the necessary Air Traffic Control personnel prior to flying to ensure access.

Flight navigation is performed using Optech ALTM-NAV (Airborne Laser Terrain Mapper Navigation Software). The pilots are thoroughly trained and highly 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 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 GNSS receivers collecting at 2 Hz.

All Woolpert aerial sensors are equipped with Litton LN200 series IMU's operating at 200 Hz.

A base-station unit was mobilized for the imagery acquisition mission, and was operated by a member of the Woolpert survey and/or flight crew. Each base-station setup consisted of one (1) Trimble 5000 series dual frequency receiver, one (1) Trimble Zephyr Geodetic L1/L2 dual frequency antenna, one (1) 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.

GNSS Base Station operated during the acquisition mission is listed below.

All GNSS base station data and point locations were tied together, along with the ground control.

### WEATHER

No significant weather issues occurred during the flight mission.

### **GROUND CONDITIONS**

The project area was relatively flat terrain, so the project area was able to be flown at one flight altitude throughout Morgan, Putnam, Baldwin, and Hancock Counties. No flood or ponding occurred.

### **GPS BASE STATION INFORMATION**

GPS Base Station Used: MLJ A - PID# AI1576 (Putnam, Polk, Baldwin Counties) and Madison Airport 52A (Morgan County)

Table 2.2: GNSS Base Stations						
Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height (L1 Phase Center) Feet			
MLJ A	N 33° 09' 13.75604"	W 83° 14' 29.66338"	285.121			
Madison Airport 52A	N 33° 36′ 46.36758″	W 83° 27′ 42.40181″	605.493			

Figure 2.1: GNSS Base Station Locations



#### MAPS

Map of the project location is provided in shapefile format.

# **SECTION 3: LIDAR DATA PROCESSING**

The collected data was shipped back to the Woolpert Dayton, Ohio office for processing and quality control. All data was downloaded into a standard Woolpert directory structure. The data was immediately checked for missing files, corrupt files, etc. Once verified, the GPS data was processed using Applanix PosPac 5.3 and PosGNSS 5.1 software packages, combining airborne GPS data with base station / CORS ground data. The GPS quality control process includes checking the data to within specs in regards to positional accuracy (<10cm), PDOP (<3), etc.

The LiDAR data was processed with DashMap v5.1061 software from Optech. The processed LiDAR data was immediately checked against the flight line layout via MicroStation V8, using TerraScan. Each flight data was checked for spatial accuracy and completeness, data quality, any data voids, clarity of the intensity imagery, point spacing specs, etc.

The results of the data analysis were immediately provided back to the flight crew. Any re-flight areas were immediately re-flown.

A Maximum Position Dilution of Precision (PDOP) of < 3.0 was achieved.

### **GPS/IMU PROCESSING SUMMARY**

 Table 3.1: Mission Specific Base Stations, Combined Separation, Estimated Positional Accuracy and PDOP

Date	Base	Base Combined Separation: PDOP Maximum Horizont Average Difference Positional Accurac		Maximum Horizontal Positional Accuracy:	Maximum Vertical Positional Accuracy:	
Sensor Head	Station(s)	(Feet)	Average	(Feet)	(Feet)	
December 19,2012 09SEN258 "A" Flight	MLJ A	0.06	1.9	0.04	0.07	
December 19,2012 09SEN258 "B" Flight	MLJ A	0.05	1.6	0.03	0.06	
December 22,2012 09SEN258 "A" Flight	er 8 MLJ A 0.06 1.8 ht		0.03	0.06		
December 22,2012 09SEN258 "B" Flight	MLJ A	0.05	2.1	0.03	0.07	
December 28,2012 09SEN258	Madison Airport 52A	0.06	1.9	0.04	0.07	
December 30,2012 09SEN258 "A" Flight	Madison Airport 52A	0.05	1.8	0.03	0.06	
December 30,2012 09SEN258 "B" Flight	Madison Airport 52A	0.06	2.0	0.04	0.06	

 Table 3.1: Mission Specific Base Stations, Combined Separation, Estimated Positional Accuracy and PDOP

1 DOI						
Date Sensor Head	Base Station(s)	Combined Separation: Average Difference (Feet)	PDOP Average	Maximum Horizontal Positional Accuracy: (Feet)	Maximum Vertical Positional Accuracy: (Feet)	
January 4,2013 09SEN258 "A" Flight	Madison Airport 52A	0.05	1.6	0.03	0.06	
January 4,2013 09SEN258 "B" Flight Airport 52A		0.06	2.1	0.03	0.07	
January 5,2013 09SEN258 "A" Flight	Madison Airport 52A	0.05	2.0	0.03	0.06	
January 5,2013 09SEN258 "B" Flight	Madison Airport 52A	0.05	1.8	0.03	0.06	
January 5,2013 09SEN258 "C" Flight	Madison Airport 52A	0.06	1.9	0.03	0.06	
January 5,2013 09SEN258 "D" Flight	Madison Airport 52A	0.06	2.0	0.04	0.07	

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) cm, often achieving results well below this threshold.



Figure 3.1: Horizontal and Vertical Positional Accuracies from Day 363

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 run in both directions to remove directional specific anomalies. The closer these two solutions match; in general, the better is the overall reliability of the solution. Woolpert's goal is to maintain a Combined Separation Difference of < 10cm, often achieving results well below this cap.



Figure 3.2: GPS Combined Separation from Day 363

Figure 3.3: GPS Altitude Plot from Day 363





Figure 3.4: Horizontal GPS Distance from Base Station from Day 363

Figure 3.5: PDOP from Day 363



## **COVERAGE CHECKS**

Project verification coverage checks are provided in shapefile format.

# **FLIGHTS**

The GNSS Trajectory, along with high quality IMU data, is a key factor in determining the overall positional accuracy of the final sensor data.



Figure 3.6: Flight Trajectory from Day 363

Each mission "As-flown" trajectories were provided in shapefile format.

### APPLICATIONS AND WORK FLOW OVERVIEW

- 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.
- 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.2.70, Proprietary Software, TerraMatch v. 13.01.
- 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. 13.003.
- The .LAS files were evaluated through a series of manual QA/QC steps to eliminate remaining artifacts and small undulations from the ground class. Software: TerraScan v. 13.003.
- All water bodies greater than two acres and all rivers with a nominal 100 foot width or larger were hydro-flattened using stereo compilation methods.
   Software: LP360, proprietary tools, Microstation v8, TerraScan v.13.003.

### 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 of the task order data was imported and classified, cross flights and survey ground control data was imported and calculated for an accuracy assessment. As a QA/QC measure, Woolpert has developed a routine to generate accuracy statistical reports by comparison among LiDAR points, ground control, and TINs. The LiDAR is adjusted accordingly to reduce any vertical bias 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 bare earth DEM surface was hydrologically flattened for water body features that were greater than 2 acres and rivers and streams of 30.5 meters (100 feet) and greater nominal width.
- The LiDAR LAS files for this task order have been 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).
- FGDC Compliant metadata was developed for the task order in .xml format for the final data products.
- The final LiDAR data was delivered in 5,000' x 5,000' tiles using NAD 1983(2011), Georgia State Plane Coordinate System, West Zone, and expressed in US Survey Feet for Morgan and Putnam Counties. The final LiDAR data was delivered in 5,000' x 5,000' tiles using NAD 1983(2011), Georgia State Plane Coordinate System, East Zone, and expressed in US Survey Feet for Baldwin and Hancock Counties. The vertical datum used for this survey is North American Vertical Datum 1988 (NAVD88), and expressed in US Survey Feet. The vertical datum used for this project was referenced to NAVD 1988, US Survey Feet, GEOID 12A.

# **SECTION 4: SENSOR CALIBRATION**

Calibration flights were performed prior to arriving on the project site. The calibration was performed at Falcon Field Airport in Peachtree City, GA. To accomplish the formal calibration, Woolpert has established a calibration range of an airport runway. The calibration ranges has been ground surveyed to an accuracy of better than 1 cm. The mission consisted of 3 different altitudes flown along and across the runway and opposing directions which is required in order to capture the pitch, roll, heading, and torsion errors.



Figure 4.1: Misalignment Errors



Table 4.1: Calibration Flight Parameters							
Altitude	Scan Angle	Scap Erog	DDE	Speed	Direction	Description	# of
(AGL)	(Hall)	Scall Fley	ГКГ	(KHULS)	Direction	Puilding /Across	газзез
1219m	0.5	35	100	130	<b>Bi-direction</b>	Runway	4
						Building/Across	
1219m	20	35	100	130	<b>Bi-direction</b>	Runway	4
						Along/Across	
1219m	25	35	100	130	<b>Bi-direction</b>	Runway	4
						Along/Across	
1737	20	29.5	100	130	<b>Bi-direction</b>	Runway	4
						Along/Across	
2250	20	32	100	150	<b>Bi-direction</b>	Runway	4



#### [CALIBRATION]

NumSensors=1

NumCameras=0

TimeLag=0.00001300

IMURoIIMis=-0.0028

IMUPitchMis=0.014

IMUHeadingMis=0.002

IMURoII=-0.004000

IMUPitch=-0.044680

IMUHeading=0.000000

UserToImuEx=0.00000

UserToImuEy=-0.0016

UserToImuEz=-0.390

UserToImuDx=-0.090

UserToImuDy=-0.008

UserToImuDz=-0.096

UserToRefDx=-0.051000

UserToRefDy=-0.030000

UserToRefDz=-0.488000

IntensityGainFor3070=20.000000

UseLeftDroopCorrection=15.000000

UseRightDroopCorrection=15.000000

meteoCorrMethod=2 Temperature=-6.000000 Pressure=1012.872240 scannerAngleDiffThreshold=2.000000 ScannerAngleLimitingSmootherOn=0

[RangeOffset33KHz]

FirstPulseRange=-2.971802

SecondPulseRange=-3.113822

ThirdPulseRange=-3.205173

LastPulseRange=-5.379880

[RangeOffset50KHz]

FirstPulseRange=-2.921530

SecondPulseRange=-3.063551

ThirdPulseRange=-3.154901

LastPulseRange=-5.329609

[RangeOffset70KHz]

FirstPulseRange=-2.890816

SecondPulseRange=-3.032837

ThirdPulseRange=-3.124187

LastPulseRange=-5.298895

[RangeOffset100KHz] FirstPulseRange=-2.875020 SecondPulseRange=-3.017040 ThirdPulseRange=-3.108391 LastPulseRange=-5.283099

[RangeOffset125KHz] FirstPulseRange=-2.866668 SecondPulseRange=-3.008688 ThirdPulseRange=-3.100039 LastPulseRange=-5.274746

[RangeOffset142KHz]

FirstPulseRange=-2.852321

SecondPulseRange=-2.994341

ThirdPulseRange=-3.085692

LastPulseRange=-5.260400

[RangeOffset166KHz]

FirstPulseRange=-2.903853

SecondPulseRange=-3.045873

ThirdPulseRange=-3.137224

LastPulseRange=-5.311932

[OpticalModel]

BEAM0\_PITCH=0.000000 BEAM0\_ROLL=0.000000 DX0=0.000000 DY0=0.000000 DZ0=0.000000 MIRROR\_PITCH=0.000000 WINDOW\_PITCH=0.000000 WINDOW\_YAW=0.000000

[ScannerPolynomialCoefficients]

DegreeOfPoly=5

a0=-0.01200000000000

a1=1.01887700000000

a2=0.00004000000000

a3=0.00000100000000

a4=-0.000000523000000

a5=0.0000000000000000

[MeteoCrystalPolyCoeff]

CrystalFreq=100.000000

CrystalResolution=10.000000

DegreeOfPoly=-1

f1=0.00000000

f2=0.00000000

f3=0.00000000

f4=0.00000000

f5=0.00000000

#### [INTENSITY]

IntensityTable33Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable50Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable70Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable100Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable125Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable142Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

IntensityTable166Khz=G:\PH\Aerial\Data\_Acquisition\Calibration\_Reports\LiDAR\Optech\56108\56108 res file\intensity.tbl

The following measurements were calculated in the lab at Optech and will remain constant.

Table 4.2: O	otech Gemini S/N 09SEN258 IMU Lever Arm Values
Referer	ce (Scanner Mirror) to IMU Misalignment (POS/AV)
Х	0.000 °
Y	-0.016 °
Z	-0.390 °
	Reference to IMU Lever Arm (POS/AV)
Х	-0.090 m
Y	0.008 m
Z	-0.096 m

The positioning of the GPS antenna on the aircraft was field surveyed by Woolpert using a total station to  $\pm$  0.02m.

Table 4.3: N1	1107Q: Cessna 310 with Optech Gemini S/N 09SEN258
installed Leve	er Arm Values
	Reference Point to GPS Antenna
Х	-0.043 m
Y	-0.052 m
Z	-1.134 m

# **SECTION 5: FLIGHT LOGS**

This section contains the Flight Log(s) covering the project. Flight Logs list mission specific details such as crew members, airports, weather conditions, real time PDOP values and document any issues encountered during the mission. Flight Logs are filled out by the sensor operator during the acquisition flight.

						**00	ibe	int –				
-	A 1154		DD/MM/YEAR	Day of Year	Pro	ject #	1	Phase #	-	Proje	et Name	
Opter	ch LIDAI	8 (L)	12/19/2012	354	72	2875		2		FY13 4 Geo	orgia Counties	
	Operator	_		Aircraft	HOBI	85 Start	-	Local Start	fime	2000 Start Time	Ba	54
	JORDON			N1107Q	17	79.3	_	9:56:00		14:56:00 PM	WOOLP	ERT PIN
	Pilot			Sensor Type	HOB	BS END	+	Local End T	Ime	Zulu End Time	P	0
d Dir/Ca	FLOTD	Valbility	Collina	Cloud Co	ar W Temp	82.8	w Rolet	14:00:00	ervi	Hasa (Size (Cloud	N	A
Cal	Im	10+	Centing	CI O	er so treing	10	7	Fless	30.1	CL	Departing	52
Frequenc	cy Hai	If-Angle	System PF	IF Roll	Divergence	Multi	pulse	-	ARF		DIGITIZER	52
34		20	125		Mode WD NR X	OFF ON FIX		OFF X SAMPL BOUNDA	ON E	Range Gate	Threshol er Trigger Edge 1 PPS edge	
speed	130		AGL	5500	INCSE	5700	-	Avg. tlev.		Adi. AGL	Was kange	
ine#	Dir.	Missio	in ID#	Line End Time	Time On	Line	sv's	HDOP	PDOP	Line No.	otes/Comments	
Test	n/a			1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	n/a		n/a	n/a	n/a	GPS Began Logging At:	1	10:00
		1 Tim	nes entered a	re Zulu / GMT 🎗					Verify S-Turr	s Before Mission	Yes X	No
	12.2.4	15:0	0:00	15:07:00			18	1	1.8	Static	Alignment	
1	120	15:2	2:22	15:22:46	0:00:	24	18	-1	1.8	Aborted- Airsp	eed too high	(rejec
1	120	15:3	6:44	15:39:14	0:02:	30	18	1	1.9	and the second sec	0	
2	300	15.4	4:51	15:47:47	0:02	56	18	1	1.9			
3	120	15.5	2.07	15.55.04	0.02.	57	17	1	19			-
4	300	15.5	9-49	16:02:12	0.02.	24	18	1	1.5			-
4	120	15.5	7,20	10.03.12	0.03.	17	10		1.0			-
5	120	10:0	1.29	16:10:46	0.03:	1/	1/	1	1.0			_
7	300	16:1	5:40	16:19:28	0:03:	48	18	1	1.5			
<u>/</u>	200	16:2	3:27	16:27:12	0:03:	45	18	1	1.4			
°	120	10:3	3:04	16:38:06	0:05:	25	1/	0.8	1.4			
9	120	16:4	3:04	16:48:29	0:05:	25	16	0.8	1.6			
10	300	16:5	3:25	16:59:34	0:06:	09	16	0.8	1.6			
11	120	17:0	4:10	17:10:10	0:06:	00	16	0.8	1.6			
12	300	17:1	6:06	17:22:53	0:06:	47	17	0.9	1.8			
13	120	17:2	7:34	17:34:19	0:06:	45	17	0.9	1.8			
14	300	17:3	9:14	17:46:24	0:07:	10	18	0.9	1.7			
15	120	17:5	0:23	17:57:50	0:07:	27	19	0.9	1.6			
16	300	18:0	2:56	18:10:48	0:07:	52	17	0.9	1.5			
17	120	18:1	5:07	18:23:30	0:08:	23	18	0.9	1.4			
18	300	18:2	9:55	18:39:57	0:10:	02	16	0.9	2.1			
		18:4	9:00	18:54:00			17	1	2	Static	Alignment	
-					1							
					1							
Times	entered a	are Zulu /	GMT ↑		P:	age	Т	1		Verify S-Turns After Mis	sion Yes y	No
		/			Addition	al Comments	_	-			^	Drive #

1					V	Voolp	ert				
Onte	-		DD/MM/YEAR	Day of Year	Project	2	Phase II	-1	Proje	ct Name	
white	Diretator		12/19/2012	354	7287 HORES 5	5	2 Local Start	Time	FY13 4 Geo	rgia Counties	
	JORDON			N1107Q	1782.	8	15:24:	00	20:24:00	WOOLPI	RT PIN
-	Pilot			Sensor Type	HOBBS	IND	Local End	Time	Zulu End Time	PI	
	FLOYD		Opte	ch- Geminî 108	1784.	9	17:56:	00	22:56:00	N/	A
find Dir/S	peed	Visibility	Ceiling	Cloud Cov	er % Temp	Dew Poin	t Pres	sure	Haze/Fire/Cloud	Departing	52A
20	0/4	10+		CL 0	20	6.	1	30.04	CL	Arriving	52A
Frequer	ICY H	alf-Angle	System Pl	Compensation	Divergence Mode	Multipulse		ARF		DIGITIZER	-
24	31.2	20	100	1000	• C	OFF	OFF X	ON	Range Gate	Threshold	4
34		20	125	ONX	WO	ON	SAMP	u 🗖	Las	er Trigger Edge	. A .
Parent I			101	OFF	NR X	FIX X	BOUND	ARY		1 PPS edge	
Speed	130		AGL	5500	57	700	Avg. Liev.		Adi: AGL	Max Kange	-
Line #	Dir.	Missio	on ID#	Line End Time	Time On Lin	e SV's	HDOP	PDOP	Line No	otes/Comments	
Test	n/a				n/a	n/a	n/a	n/a	GPS Began Logging At:	1	0:00
	_	\$ Tim	nes entered a	re Zulu / GMT I			1	Verify S-Turns	s Before Mission	Yes X	No
		20:3	0:00	20:36:00		21	0.8	1.5	Static	Alignment	
19	120	20:5	1:08	21:01:41	0:10:3	3 22	0.7	1.3	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.11	
20	300	21:0	6:54	21:17:57	0:11:03	3 22	0.7	1.3			
21	120	21:2	2:31	21:33:27	0:10:50	5 23	0.7	1.3			
22	300	21:3	8:22	21:48:58	0:10:36	5 21	0.8	1.6			
23	120	21:5	3:37	22:04:02	0:10:25	5 19	0.9	2.2			
24	300	22:0	8:38	22:19:41	0:11:03	3 21	0.9	2.1			
25	120	22:2	4:30	22:35:29	0:10:59	9 21	1	1.9			
		22:4	8:00	22:53:00	0:05:00	) 21	1	1.9	Static	Alignment	
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Time	entered	are Zulu /	/ GMT ↑		Pag		1		Verify S-Turns After Miss	sion Yes V	No
	- chiereu		1		Additional C	Comments:	-			· · · · ·	Drive #

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	-	10	DD/MM/YE	IR I	Day of Year	Proje	ect #	-	Phase #	1	Proje	t Name	
Opte	ch UD	AR	12/22/201	2	357	728	875	A 1-	2	1163	FY13 4 Geo	rgia Counties	_
	JORDAN			N110	ft 7Q	178	5.7		Local Start 9:26:0	Time:	2010 Start Time 14:26:00	WOOL	PERT PIN
-	Pilot			Sensor	ype	HOBB	SEND	-	Local End 1	Time	Zulu End Time	1.000	PID
	FLOYD		0	otech- Ge	mini 108	178	9,4	UNIS	13:41:0	00	18:41:00	1	N/A
Wind Dir/S	peed	Visibility	Ceil	ng	Cloud Cove	r% Temp	-	Dew Point	Press	sure	Haze/Fire/Cloud	Departing	52A
26	0/6	104	K.	CL	0	1		-10	CL III	30.16	CL	Arriving	52A
Frequer	ιcγ	Half-Angle	System	PRF	Roll	Divergence	Mu	ltipulse	_	ARF		DIGITIZER	11. 7
. de		1.01	1.0	1	compensation	(induc	OFF		OFF X	ON	Range Gate	Thresh	old
34	1	20	12	5	ONX	WD	ON		SAMPL		Lase	r Trigger Edge	
	-21-			_	OFF	NRX	FIX	x	BOUNDA			1 PPS edge	
Air Speed	120	_	AGL		0	MSL	700		Avg. Elev.	_	Adi. AGL	Max Range	
-	130	1 600		550	0	5	700						
Line #	Dir.	Missi	on ID#	Lir	e End Time	Time On L	ine	SV's	HDOP	PDOP	Line No	tes/Comments	
lest	n/a	1.70	mes entere	d are Zuli	/GMT T	nya	-	n/a	n/a	n/a Varify S-Turi	GPS Began Logging At:	Yes V	9:41 No
	1	14:4	1:00	1	4:46:00	0:05:0	00	20	1	1.4	Static	Alignment	
26	300	15:0	2:18	1	5:03:09	0:00:5	51	20	0.9	1.8	Multipulse	was off- re	eject
26	300	15:1	0:50	1	5:22:17	0:11:2	27	20	0.9	1.8			
27	120	15:2	27:00	1	5:38:07	0:11:0	07	18	1	1.9			
28	300	15:4	3:53	1	5:55:08	0:11:1	15	18	1	1.9	La la secolaria	-	
29	120	16:0	0:03	1	5:11:21	0:11:1	18	19	0.8	1.3	DC Buffer Ove	erflow- Rei	ect Line
29	300	16:1	7:45	1	5:29:03	0:11:1	18	18	0.8	1.4			
30	120	16:3	3:21	1	5:43:55	0:10:3	34	17	0.8	1.6			
31	300	16:4	8:48	1	6:59:52	0:11:0	)4	18	0.8	1.7			
32	120	17:0	)4:48	1	7:14:53	0:10:0	)5	17	0.8	1.8			
33	300	17:2	20:14	1	7:30:48	0:10:3	34	17	0.8	1.8			
34	120	17:3	35:35	1	7:45:21	0:09:4	16	19	0.8	1.4			
35	300	17:5	51:21	1	3:01:12	0:09:5	51	17	0.8	1.5			
36	120	18:0	)5:39	1	8:15:18	0:09:3	39	18	0.8	1.4			
		18:3	84:00	1	8:39:00	0:05:0	00	18	0.8	1.4	Static	Alignment	
						0:00:0	00						
						0:00:0	00						
						0:00:0	00						
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						0:00:0	00						
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		1		1		0:00:0	00						
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↑ Times	s entere	d are Zulu	/ GMT 1	`		Pa	ge		1		Verify S-Turns After Miss	ion Yes	X No
						Additional	commer	115					Drive #
												1	
												1	
												1	

		_				100	he					
Opte	ch LIDA	B DD/M	M/YEAR	Day of Year	Projec	10	-	Phase #		Proje	s Name	
	Operator	12/2	2/2012 Alia	357 raft	HOBRE	Start	-	Local Start	Time	FY13 4 Geo ZULU Start Time	rgia counties Ras	
	Other		N11	07Q	1789	.4	1	15:11:0	0	20:11:00	WOOLPE	RT PIN
_	Pilot	-	Senso	Туре	HOBBS	END		Local End 1	Time	Zulu End Time	PID	
-	FLOYD		Optech- G	emini 108	1792	.0	The Car	18:19:0	0	23:19:00	N//	4
d Dir/S	peed	Visibility	Ceiling	Cloud Cove	er % Temp	-	Dew Point	Press	iure	Haze/Fire/Cloud	Departing	52
260	0/10	10+	CL	0	12	3	-11		30.14	CL	Arriving	52
requer	ncy Ha	f-Angle Sy	ystem PRF	Roll	Divergence	Mu	ltipulse		ARF	-	DIGITIZER	_
24		20	125			OFF		OFF X	ON	Range Gate	Threshold	
34		20	125	ONX	WD	ON		SAMPL	.E	Lase	r Trigger Edge	
	11			OFF	NRX	FIX	х	BOUNDA	ARY		1 PPS edge	- (1)
peed	120	AGL	55	00	MSL 5	700	-	Avg. Elev.	_	Adi, AGL	Max Range	-
no #	130	Mission ID		ine End Time	Time On U	100	SV/s	HDOP	PDOR	Line No.	tes/Comments	_
Tort	oli.	Wission ID	-	ine end time	nime on u	ne	343	nuor		GPS Regan Logging At:	tes/comments	c-10
-	14.6	T Times e	ntered are Zu	u/GMT I		_			Verify S-Tur	ns Before Mission	Yes X	No
	1.1	20:19:0	0 2	20:24:00	0:05:0	0	21	0.8	1.5	Static	Alignment	
37	300	20:38:2	5 2	0:48:55	0:10:3	0	22	0.8	1.36			
38	120	20:54:1	0 2	21:03:07	0:08:5	7	22	0.8	1.5			
39	300	21:08:1	4 2	1:17:26	0:09:1	2	21	0.8	1.7			
40	120	21:22:0	2 2	1:30:33	0:08:3	1	20	0.9	1.6			
41	300	21:36:0	8 2	1:44:45	0:08:3	7	20	1.2	2.2			
42	120	21:49:2	1	A. F. B. C. B.	########	###	20	1.3	2.1	Finished Line, but ALTM	-NAV shut down u	Inexpect
43	300	22:04:1	9 7	2:11:48	0:07:2	9	20	1.3	2	-	1.	0.000
44	120	22:16:3	9 2	22:23:37	0:06:5	8	19	1.1	1.8			
45	300	22:29:0	7 2	22:35:57	0:06:5	0	19	1	1.3			
46	120	22:39:2	7 2	22:46:05	0:06:3	8	19	1	1.3			
47	300	22:50:3	7 2	22:57:02	0:06:2	5	20	0.9	1.3			
48	120	23:00:0	2 2	23:03:31	0:03:2	9	20	1	1.8			
		23:12:4	9 2	23:17:00	0:04:1	1	20	1	1.8	Static	Alignment	
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
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					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
Times	s entered a	re Zulu / GN	/т ↑		Pag	ze i	—	1	-	Verify S-Turns After Miss	ion Yes X	No
								-			^	

						V	Vool	pe	rt					
-	1.1.6.	0	D/MM/YEAR	- 1 - 2	Day of Year	Projec	1.0	i –	Phase #	1		Project Name		
Opte	ch UDA	R	2/28/2012	11	363	7287	5		2		FY13 4	Georgia Co	unties	
	Operator	1	_	Aircraft	_	HOBBS	Start	-	Local Start	Time	ZULU Start Time		Bat	e .
	Pilot	_	_	Sensor Two		1792 HOBBS	.9 END	-	16:37:0	0	Z1:37:00 Zolia End Time	-	NG	5
	FLOYD		Opt	ech- Gemi	ni 108	1795	.5		20:17:0	0	1:17:00		A115	76
/ind Dir/S	peed	Visibility	Ceilin	8	Cloud Cov	er % Temp	Dew	Point	Press	ure	Haze/Fire/Cloud		eparting	KML
Ca	lm	10+	114	CL	0	12		2		30	CL		Arriving	KML
Frequer	icy Ha	If-Angle	System P	RF	Roll	Divergence	Multip	ulse	-	ARF		DIGI	TIZER	
34		20	125	O	N X		OFF ON FIX X			ON E	Range Gâte	Laser Trigg 1 Pi	Threshold er Edge PS edge	
Speed	130		NOL.	5500	)	5	700		ALL LICES	-	AND AGE	-	tax manage	
Line#	Dir.	Mission	n ID#	Line	End Time	Time On Lin	ne 5	V's	HDOP	PDOP	Lin	e Notes/Co	mments	
Test	n/a	-				n/a	- 3	n/a	n/a	n/a	GPS Began Logging	At:	1	7:18
_	-	‡ Tim	es entered	are Zulu /	GMT I	-	_		_	Verify S-Tur	ns Before Mission	Yes	x I	No
	1.1	22:18	3:00	22:	28:00	0:10:0	0	22	0.8	1.2	Sta	tic Alig	nment	_
49	347	22:48	3:18	22:	48:48	0:00:3	0	20	0.9	1.7	DC Buffer	Overfl	ow Re-F	ly 49
49	347	22:55	5:43	22:	56:16	0:00:3	3 3	20	0.9	1.7	DC Buffer	Overfl	ow Re-F	ly 49
49	347	23:02	2:32	23:	04:27	0:01:5	5	19	0.8	1.6	La contra de la contra de			
50	167	23:10	0:20	23:	13:12	0:02:5	2 3	20	0.8	1.4				
51	347	23:17	7:55	23:	21:39	0:03:4	4	19	0.8	1.4				
52	167	23:26	5:23	23:	30:48	0:04:2	5	19	0.8	1.4				
53	347	23:35	5:07	23:	40:20	0:05:1	3	19	0.8	1.3				
54	167	23:45	5:07	23:	51:04	0:05:5	7 :	18	0.9	1.7				
55	347	23:55	5:28	0:0	02:03	0:06:3	5 :	17	1.1	1.8				
56	167	0:06	:37	0:1	L4:09	0:07:3	2 :	17	1	1.9				
57	347	0:18	:39	0:2	26:33	0:07:5	4 :	18	1	1.9				
58	167	0:31	:42	0:4	10:39	0:08:5	7 :	19	1	1.5				
59	347	0:44	:51	0:5	53:49	0:08:5	8 1	18	1	1.5				
		1:10	:00	1:1	15:00	0:05:0		19	1	1.4	Sta	tic Alig	nment	
						0:00:0	0							
						0:00:0	0							
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						0:00:0	0	-						
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Time		ana Zerba d	CNAT A			0:00:0		┯┸	4		Valle C Turne Mar			
- Times	s entered a	are Zulu /	GNU 个			Additional	e		1		verify S-Turns After I	viission	Tes X	No Dalma ii
						Additional	Comments:							Drive #

					W	oolpe	ert				
-			DD/MM/YEAR	Day of Year	Project #		Phase #	1 -	Projec	t Name	
Opte	ich LIUA	к	12/30/2012	367	72875		2		FY13 4 Geo	rgia Counties	
	Operator		_	Alteralt	HOBBS Sta	er.	Local Start	Time	ZULU Start Time	-	Base
-	DRDON	-	<u> </u>	N110/Q	1796.5 HOBBS FR	n.	9:29:0	U	14:29:00	-	PID
	FLOYD	_	Opte	ch- Gemini 108	1800.8		14:25:	00	19:25:00	A	11576
Wind Dir/S	peed	Visibility	Ceiling	Cloud Cove	ar% Temp	Dew Point	Pres	sure	Haze/Fire/Cloud	Departing	KMLI
Ca	lm	10+		CL 0	2	-2	1111	30.38	CL	Arriving	KML
Frequer	ncy Ba	if-Angle	System PR	F Roll	Divergence	Multipulse		ARF		DIGITIZER	$1 \rightarrow 0.12$
			-	Compensation	Mode	OFF	OFF V	ON	Range Gate	Thresh	old
34	2113	20	125	ON	wo		SAMP		lase out	r Trigger Edge	1
		1911					ROUND			a nor side	=
Air Speed	_		AGL	OFF	MSL	HA X	Avg. Elev.	457	Adj. AGL	Max Range	_
1 T	130			5500	570	00	1			1	
Line #	Dir.	Missi	on ID#	Line End Time	Time On Line	SV's	HDOP	PDOP	Line No	tes/Comments	
Test	n/a	1			n/a	n/a	n/a	n/a	GPS Began Logging At:	1	9:37
	_	‡ Tir	nes entered a	re Zulu / GMT T		_		Verify S-Tur	as Before Mission	Yes X	No
		14:3	7:00	14:42:00	0:05:00	18	1	1.9	Static	Alignment	
60	347	14:5	9:41	15:09:06	0:09:25	18	1	1.9	in an a share		
61	167	15:1	4:32	15:19:30	0:04:58	18	1	1.9	DC Buffer (	Overload R	le-Fly
61	167	15:3	1:27	15:47:53	0:16:26	19	1	1.3			
62	347	15:5	3:02	16:09:33	0:16:31	18	1	1.4			
63	167	16:1	4:55	16:31:08	0:16:13	18	1	1.7			
64	347	16:3	6:13	16:52:49	0:16:36	17	1	1.8	Y :		
65	167	16:5	7:28	17:14:37	0:17:09	18	1	1.7	-		
66	347	17:1	.9:40	17:35:58	0:16:18	17	0.9	1.5			
67	167	17:4	0:43	17:57:01	0:16:18	17	1.1	2			
68	347	18:0	1:58	18:18:04	0:16:06	16	1.1	1.9			
69	167	18:2	2:15	18:38:17	0:16:02	16	1.1	1.7			
70	347	18:4	2:15	18:58:23	0:16:08	19	1	1.7			
		19:1	.8:00	19:23:00	0:05:00	19	1	1.8	Static	Alignment	
					0:00:00						
					0:00:00						
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					0:00:00		<b>I</b>				
					0:00:00	<b>—</b>	<b>I</b>				
↑ Times	s entered a	are Zulu ,	/ GMT 个		Page		1		Verify S-Turns After Miss	ion Yes	X No
					Additional Co	mments:	_				Drive #

					V	Voolp	ert			
Onto	eb Lina	0	MM/YEAR	Day of Year	Project	14	Phase #	-	Proje	et Name
opre	CH LINA	12/	/30/2012	367	7287	5	2	-	FY13 4 Geo	orgia Counties
	JORDON	1	N	11070	1800.	B	15:25:	00	20:25:00	NGS
	Pilot		Se	nsor Type	HOBBS	END	Local End	Time	Zulu End Time	PID
	FLOYD		Optech	- Gemini 108	1804.	2	19:13:	00	0:13:00	Al1576
find Dir/S	peed	Visibility	Ceiling	Cloud Cov	er% Temp	Dew Poi	nt Pres	sure	Haze/Fire/Cloud	Departing KML
Ca	lm	10+	C	CL O	11	2.1	4	30.38	CL	Arriving KML
Frequer	ncy Ha	alf-Angle	System PRF	Roll	Divergence	Multipulse	-	ARF	1	DIGITIZER
34		20	125	ONX	wo				Range Gate	Threshold er Trigger Edge
Speed	1.15	AG	L	OFF		FIX X	BOUND Avg. Elev.	ARY	Adi, AGL	1 PPS edge
	130		5	500	57	700	1			10.12
Line #	Dir.	Mission (	D#	Line End Time	Time On Lin	e SV's	HDOP	PDOP	Line N	otes/Comments
Test	n/a				n/a	n/a	n/a	n/a	GPS Began Logging At:	15:31
-	_	I Times	entered are	Zulu / GMT I		1.	1	Verify S-Ture	as Before Mission	Yes X No
-		20:31:	00	20:36:00	0:05:00	21	0.7	1.3	Static	Alignment
71	347	20:52:	54	21:09:14	0:15:20	20	0.9	1.6		
72	167	21:13;	34	21:29:41	0:16:07	20	1.3	2.1		
73	347	21:33:	37	21:49:58	0:16:2:	1 20	1.2	2		
74	167	21:55:	26	22:11:25	0:15:59	9 19	0.8	1.3		
75	347	22:15;	24	22:31:35	0:16:13	1 21	0.7	1,2		
76	167	22:35:	59	22:51:52	0:15:53	3 21	0.8	1.3		
77	347	22:55:	50	23:12:28	0:16:38	3 18	0.8	1.4		
78	167	23:16:	07	23:31:45	0:15:38	3 18	0.8	1.4		
79	347	23:35:	51	23:51:34	0:15:43	3 16	0.9	1.6		
		0:06:0	00	0:11:00	0:05:00	) 16	0.9	1.6	Static	Alignment
			_		0:00:00	)				
			_		0:00:00	)				
			_		0:00:00	)				
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					0:00:00	, <b>I</b> -				
• Time:	s entered	are Zulu / G	MT↑		Pag	e	1		Verify S-Turns After Mis	sion Yes X No
					Autonal	wannents:				Unve #

1-							Noc	pipe	rt				
1		10	DD/MM/YEAR		Day of Year	Proje	ct #	1	Phase #	11	Proje	d Name	
Opte	ch LID	AR	1/4/2013	-	4	728	75		2		FY13 4 Geo	rgia Counties	
-	Operator			Airera	dt .	HOBBS	Start	-	Local Start	Time	ZULU Start Time	Ba	se
-	JORDON			N110	/q	180	6.9	-	14:45:0	JO Liana	19:43:00	NG	51
	FLOYD	_	Opt	ech- Ge	mini 108	1805	9.7		17:59:0	00	22:59:00	All	576
Wind Dir/S	peed	Visibility	Ceilin	8	Cloud Cove	ar % Temp	D	ew Point	Press	ure	Haze/Fire/Cloud	Departing	KMU
Ca	Im	10+		CL	0	12	2	5	111	30.29	CL	Arriving	KML
Freque	NEY I	Half-Angle	System P	RF	Roll	Divergence	Mult	ipulse	1	ARF		DIGITIZER	-
-	11	-	1.1	- F	Compensation	Mode	OFF	-	OFF X	ON	Range Gate	Threshol	d
34		20	125		ONX	WO	ON	=	SAMPL		Lase	er Trigger Edge	
11.000		100	1.00			NR	ENV.		BOUNDA			1 PDS ardga	=
Air Speed			AGL	-		MSL	I the	~	Ave Elev.		Adi, AGL	Max Range	
17.5	130			550	00	5	700						
Line #	Dir.	Missi	on ID#	Lit	e End Time	Time On L	ine	SV's	HDOP	PDOP	Line No	ites/Comments	
Test	n/a	0				n/a		n/a	n/a	n/a	GPS Began Logging At:		4:55
-		‡ Tin	nes entered	are Zulu	/GMT\$					Verify S-Turn	s Before Mission	Yes X	No
		19:5	5:00	2	00:00	0:05:0	0	22	0.8	1.4	Static	Alignment	_
80	347	20:1	5;51	2	0:31:33	0:15:4	2	22	0.9	1,7			
81	167	20:3	7:51	2	0:53:39	0:15:4	8	19	1.2	2.1			
82	347	20:5	8:50	2	1:15:08	0:16:1	.8	21	1.3	2.1			
83	167	21:2	0:01	2	1:36:02	0:16:0	)1	20	1.2	1.8			
84	347	21:4	0:42	2	1:57:45	0:17:0	)3	20	0.8	1.3			
85	167	22:0	2:59	2	2:19:00	0:16:0	)1	22	0.8	1.2			
86	347	22:2	3:15	2	2:40:25	0:17:1	0	20	0.8	1.6	5 E		
		22:5	2:00	2	2:57:00	0:05:0	0	20	0.8	1.4	Static	Alignment	
						0:00:0	00						
						0:00:0	00						
						0:00:0	00						
						0:00:0	00						
		<b>_</b>				0:00:0	00						
						0:00:0	0						
<u> </u>	<u> </u>					0:00:0				⊢			
┣──	<b>—</b>					0:00:0				⊢			
L	<b>—</b>					0:00:0				┝──┤			
┣──	<b>—</b>					0:00:0				┝──┤			
<u> </u>	<b>—</b>					0:00:0				┝──┤			
┝──	<b>—</b>					0:00:0				⊢			
<u> </u>	<b>—</b>					0:00:0				⊢			
┣──	<b>—</b>					0:00:0				⊢			
<u> </u>	<b>—</b>	<b>—</b>				0:00:0				⊢−−			
	<u> </u>					0:00:0	0			$ \downarrow \downarrow$			
	<b>—</b>					0:00:0				⊢			
<u> </u>	<u> </u>	<u> </u>				0:00:0	0	_	Ļ			_	
↑ Time	s entere	a are Zulu ,	/ GMT 个			Pa	ge		1		Verify S-Turns After Miss	ion Yes X	No
⊢						Additional	comment	э.				-+	Drive #

Optich: LUDR         Diraction         Diraction         Partie         Parit         Partie         Partie	Detect + LIDAR         Detect + LIDAR         Detect + LIDAR         Provide         Provid         Pr						N	Vool	pe	rt					
Opticity         1/4/2013         4         7237         2         PY13 # Georgia Countie           Optical         Annah         100800/H         Annah         100800/H         20000/H         20000/H         Annah         Annah <th< th=""><th>Index full DDAR         1/4/331         4         7287.         2         PY13 &amp; Georgia Countin           dynamic         All role         All role         Jack For the         All role         All role</th><th></th><th></th><th>DD</th><th>/MM/YEAR</th><th>Day of Year</th><th>Projet</th><th>14</th><th></th><th>Phase #</th><th></th><th></th><th>Project N</th><th>ame</th><th></th></th<>	Index full DDAR         1/4/331         4         7287.         2         PY13 & Georgia Countin           dynamic         All role         All role         Jack For the         All role			DD	/MM/YEAR	Day of Year	Projet	14		Phase #			Project N	ame	
Operator         Attribut         Houst Start         Adult Start from         Adul	Anality         JBBD Cont         Last Start free         Auto Start free	Opte	ch LIDAR	1.1.1	1/4/2013	4	728	75.	-	2	1.1	FY1	3 4 Georgia	Counties	
NOON         VIL270         VIL270 </td <td>NOON         N1070         183.40         33.400         33.400         33.400         33.400         965           FLOT         Optic-forminal         131.3         23.400         Axt (bla Dime         Axt (bla Di</td> <td></td> <td>Operator</td> <td>1</td> <td></td> <td>Aircraft</td> <td>HOBBS</td> <td>Start</td> <td></td> <td>Local Start</td> <td>lime</td> <td>ZULU Start Time</td> <td> 1</td> <td></td> <td>Base</td>	NOON         N1070         183.40         33.400         33.400         33.400         33.400         965           FLOT         Optic-forminal         131.3         23.400         Axt (bla Dime         Axt (bla Di		Operator	1		Aircraft	HOBBS	Start		Local Start	lime	ZULU Start Time	1		Base
Here         Jamma Type         Jamma Type </td <td>Here         tearer tyse         uses to to         tear to target the second to the second to target to the second to target to the second to target to ta</td> <td></td> <td>JORDON</td> <td></td> <td>N</td> <td>11107Q</td> <td>1809</td> <td>.7</td> <td>C.X.</td> <td>18:24:0</td> <td>0</td> <td>23:24:00</td> <td></td> <td></td> <td>NGS</td>	Here         tearer tyse         uses to to         tear to target the second to the second to target to the second to target to the second to target to ta		JORDON		N	11107Q	1809	.7	C.X.	18:24:0	0	23:24:00			NGS
NUT         Opplet-formini Die         1313.7         2232.80         34.200         94175           BDI/Speed         Vielliny         Calling         Calling         Calling         Calling         Depenting         Presure         Name         Painting         Painting <td>UPU         Operate-Germin Lik         Table / Table</td> <td></td> <td>Pilot</td> <td>-</td> <td>Ser</td> <td>nsor Type</td> <td>HOBBS</td> <td>END</td> <td>_</td> <td>Local End T</td> <td>ime</td> <td>Zulu End Time</td> <td></td> <td></td> <td>PID</td>	UPU         Operate-Germin Lik         Table / Table		Pilot	-	Ser	nsor Type	HOBBS	END	_	Local End T	ime	Zulu End Time			PID
	Dit/Specifie         Visibility         Call or call	-	FLOYD	- 535	Optech	- Gemini 108	1813	.7		22:42:0	ġ	3:42:00			411576
Cal         10+         CL         0         12         5         30.29         CL         Arring         P           34         20         125         0hrrgener         Methode         Same L         Methode         Methode         Methode         Methode         Methode         Same L         Methode         Methode <td>Calm         10+         CL         0         12         5         30.29         CL         Arrives         Normalization           34         20         125         500         0</td> <td>d Dir/Sp</td> <td>veed Vi</td> <td>sibility</td> <td>Ceiling</td> <td>Cloud Cove</td> <td>er% Temp</td> <td>Dew</td> <td>Point</td> <td>Press</td> <td>ure</td> <td>Haze/Fire/Cloue</td> <td>ď</td> <td>Departing</td> <td>K</td>	Calm         10+         CL         0         12         5         30.29         CL         Arrives         Normalization           34         20         125         500         0	d Dir/Sp	veed Vi	sibility	Ceiling	Cloud Cove	er% Temp	Dew	Point	Press	ure	Haze/Fire/Cloue	ď	Departing	K
recurry         National         System PR         Real         Ownerate         Market         AR         DIGITIZER           34         20         125         00 []         00 []         00 []         00 []         00 []         SAMPL         Interfigent Fagent	return         Half.Age         System PB         Ball         Owners         Multipude         ABF         OUTILIT           3.4         2.0         12.5         on         on<	Ca	lm	10+	C	L 0	12	2	5	1.10	30.29	CL		Arriving	K
34       20       125       Image       orf       orf       orf       orf       orf       orf       orf       orf       orf       Image       Interchald         aged       orf       x       with origina Ai       x       x       orf       x       with origina Ai       x       x       tot         130       5500       23:36:00       0:05:00       18       1       1.9       Static Alignment       18:31       18:31       10:31:37       10:27:39       0:16:21       19       0.8       1.5       13:31       13:32:26       0:16:21       18       0.8       1.5       13:31       13:32:26       0:15:49       18       0.8       1.5       13:33       13:32:35       13:31       13:32:35	34       20       125       000 x x y y y x y y y y y y y y y y y y	requen	cy Half-	Angle	System PRF	Roll	Divergence	Multipu	ilse	1.	ARF		D	IGITIZER	-
Solution       LO       12.0       0.12.3       0.12.3       0.12.4       0.12.4       0.12.4       0.12.5	3-4         2-0         12.5         original         Weils         original         Same Figure Edge         1975 edge           130         5500         5700         Figure 20         Adii Acii         Mark Bane           130         5500         5700         Figure 20         Adii Acii         Inter Northweils         Adii Acii         Mark Bane           130         5500         5700         Figure 20         Northweils         Adii Acii         Mark Bane           130         5500         5700         Figure 20         Northweils         Mark Bane         Inter Northweils         Inter Northweils </td <td>3/</td> <td></td> <td>0</td> <td>125</td> <td>compensation</td> <td>Mude</td> <td>OFF</td> <td>1</td> <td>OFF X</td> <td>ON</td> <td>Range Gate</td> <td></td> <td>Thres</td> <td>hold</td>	3/		0	125	compensation	Mude	OFF	1	OFF X	ON	Range Gate		Thres	hold
Interf         NR         INX         INX         INX         INX         INX         INX         NUMANY         IPS safe         IPS safe <thips safe<<="" td=""><td>ered         AG         FIX         BOUMARY         IPPS dag         IPPS dag           130         5500         5700         VIC. BeV         Mak. AGL         Mak. Branze           na         Div.         Makin IDP         Line End Time         SVIS         HDDP         PDP         Line Notes/Comments         IR.31           ets         n/a         N/a<!--</td--><td>54</td><td>4</td><td></td><td>125</td><td>ONX</td><td>WD</td><td>ON</td><td></td><td>SAMPL</td><td>£</td><td>0111111</td><td>Laser T</td><td>rigger Edge</td><td>-</td></td></thips>	ered         AG         FIX         BOUMARY         IPPS dag         IPPS dag           130         5500         5700         VIC. BeV         Mak. AGL         Mak. Branze           na         Div.         Makin IDP         Line End Time         SVIS         HDDP         PDP         Line Notes/Comments         IR.31           ets         n/a         N/a </td <td>54</td> <td>4</td> <td></td> <td>125</td> <td>ONX</td> <td>WD</td> <td>ON</td> <td></td> <td>SAMPL</td> <td>£</td> <td>0111111</td> <td>Laser T</td> <td>rigger Edge</td> <td>-</td>	54	4		125	ONX	WD	ON		SAMPL	£	0111111	Laser T	rigger Edge	-
Add.       Add.       Add.       Add. Add.       Math. A	Ladi         Mole         Mole <t< td=""><td></td><td></td><td></td><td></td><td>OFF</td><td>NRX</td><td>FIX X</td><td></td><td>BOUNDA</td><td>RY</td><td>(d) - env</td><td>_</td><td>1 PPS edge</td><td>111</td></t<>					OFF	NRX	FIX X		BOUNDA	RY	(d) - env	_	1 PPS edge	111
ne #       Dit.       Mission 100       Line End Time       Time On Line       SV:       HOD <sup>A</sup> PDOP       Line Notes/Comments         rest       n/A       n/A       n/A       n/A       n/A       n/A       m/A       GPS Began Logging At:       18:31         23:31:00       23:36:00       0:05:00       18       1       1.9       Static Alignment       std       std         37       347       23:50:02       0:06:49       0:16:21       19       0.8       1.5       std	ne # Dit. Mission ID# Line End Time Time On Line 3V's H00P POOP Line Note/Comments Times entered are Zulu / GMT ↑ Line End Time 0 Line 3V's H00P POOP Line Note/Comments 18:31 Verify STures Endered Mission 1/2 x 1 Kef 23:31:00 23:36:00 0:05:00 18 1 1.9 Static Alignment 18:31 Verify STures Endered Mission 1/2 x 1 Kef 23:31:00 23:36:00 0:05:00 18 1 1.9 Static Alignment 18:31 Verify STures Endered Mission 1/2 x 1 Kef 37 347 23:50:28 0:06:49 0:16:21 19 0.8 1.5 38 167 0:11:37 0:27:39 0:16:02 18 0.8 1.5 39 347 0:34:15 0:49:59 0:15:44 19 0.7 1.3 30 167 0:54:28 1:10:27 0:15:59 18 0.8 1.5 31 347 1:15:43 1:32:26 0:16:43 17 0.8 1.8 32 167 1:36:50 1:52:39 0:15:49 18 0.7 1.5 33 347 1:57:56 2:13:17 0:15:21 20 0.7 1.2 44 167 2:18:24 2:32:59 0:14:35 19 0.7 1.5 35 347 2:38:09 2:53:44 0:15:35 17 0.7 1.6 16 167 2:58:26 3:13:35 0:15:09 20 0.7 1.2 3:24:00 3:29:00 0:05:00 20 0.8 1.4 In-flight Alignment 0:00:00 1 0 0:00:00 1 0	peed	130	A	<u>م</u>	500	MSL 5	700	A	vg. Elev.	-	Adi. AGL		Max Bange	E
rest       n/a       n/a       n/a       n/a       n/a       GPS Began Logging At:       18:31         Verify STurms Before Mission       Vera       x       Koj         37       347       23:31:00       23:36:00       0:05:00       18       1       1.9       Static Alignment       Koj         38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5 </td <td>ry/s       ry/s       ry/s       ry/s       ry/s       ry/s       ry/s       GPS Begen Logging At:       18.31         3       47       23:351:00       23:351:00       23:351:00       23:351:00       18.8       1       1.9       Static Alignment       rs       rs</td> <td>ne#</td> <td>Dir.</td> <td>Mission</td> <td>ID#</td> <td>Line End Time</td> <td>Time On Li</td> <td>ne S</td> <td>V's</td> <td>HDOP</td> <td>PDOP</td> <td>t:</td> <td>Line Notes</td> <td>/Comments</td> <td>+</td>	ry/s       ry/s       ry/s       ry/s       ry/s       ry/s       ry/s       GPS Begen Logging At:       18.31         3       47       23:351:00       23:351:00       23:351:00       23:351:00       18.8       1       1.9       Static Alignment       rs	ne#	Dir.	Mission	ID#	Line End Time	Time On Li	ne S	V's	HDOP	PDOP	t:	Line Notes	/Comments	+
Verify STURNS Before Mission       Yed       x       No       No       x       No       <	Times entered are Zulu / GMT *       Verify STurns Refore Mission       Yeal       x       Kel         23:31:00       23:36:00       0:05:00       18       1       1.9       Static Alignment         37       347       23:50:28       0:06:49       0:16:21       19       0.8       1.5         38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         39       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         20       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         21       167       1:36:50       1:52:39       0:15:41       19       0.7       1.2         20       167       1:54:38       1:32:26       0:16:43       17       0.8       1.8         21       167       1:56:50       1:51:21       20       0.7       1.2	est	n/a				n/a		la	n/a	n/a	GPS Began Logg	ing At:	12	18:31
23:31:00       23:35:00       0:05:00       18       1       1.9       Static Alignment         37       347       23:50:28       0:06:49       0:16:21       19       0.8       1.5         38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         39       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         00       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         347       1:36:50       1:52:39       0:15:49       18       0.7       1.5         347       1:36:50       1:52:39       0:14:35       19       0.7       1.5         33       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         4       167       2:8:24       2:32:59       0:14:35       19       0.7       1.5         35       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         6       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         1       0:00:00       1       1	1       1       1.9       Static Alignment         37       347       23:50:28       0:06:49       0:16:21       19       0.8       1.5         38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         39       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         00       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         347       1:36:50       1:52:39       0:15:44       19       0.7       1.5         347       1:36:50       1:52:39       0:15:49       18       0.7       1.5         33       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         44       167       2:18:24       2:32:59       0:14:35       19       0.7       1.5         347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         45       347       2:38:09       3:29:00       0:00:00       1.4       In-flight Alignment         6       167       2:58:26       3:13:35       0:15:09       20       0.8       1.4	-	T	1 Time	s entered are	Zulu / GMT \$	0.050	. 1 .		1	Verify S-Tur	ns Before Mission	Ye	s x	No
8/       34/       23:50:28       0:06:49       0:16:21       19       0.8       1.5         88       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         89       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         90       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         91       347       1:36:50       1:52:39       0:16:43       17       0.8       1.8         92       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         93       347       1:57:56       2:13:17       0:15:21       20       0.7       1.5         95       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         96       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         97       .2       .2       .2       .2       .2       .2       .2         98       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         98       167       0:0	347       23:50:28       0:06:49       0:16:21       19       0.8       1.5         388       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         393       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         00       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         347       1:15:43       1:32:26       0:16:43       17       0.8       1.8         32       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         33       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         44       167       2:18:24       2:32:59       0:14:35       19       0.7       1.5         347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         6       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         1       0:00:00       1       1       1n-flight Alignment       1       1         1       0:00:00       1       1       1       1 </td <td></td> <td></td> <td>23:31</td> <td>:00</td> <td>23:36:00</td> <td>0:05:0</td> <td>0 1</td> <td>18</td> <td>1</td> <td>1.9</td> <td>S</td> <td>tatic A</td> <td>lignmen</td> <td>t</td>			23:31	:00	23:36:00	0:05:0	0 1	18	1	1.9	S	tatic A	lignmen	t
38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         39       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         30       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         31       347       1:15:43       1:32:26       0:16:43       17       0.8       1.8         32       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         33       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         44       167       2:8:09       2:53:44       0:15:35       17       0.7       1.6         36       347       2:38:09       2:53:44       0:15:09       20       0.7       1.2         4       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         4       167       2:58:26       3:13:35       0:15:09       20       0.8       1.4       In-flight Alignment         4       0:00:00	38       167       0:11:37       0:27:39       0:16:02       18       0.8       1.5         39       347       0:34:15       0:49:59       0:15:44       19       0.7       1.3         00       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         01       347       1:15:43       1:32:26       0:16:43       17       0.8       1.8         02       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         03       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         41       167       2:18:24       2:32:59       0:14:35       19       0.7       1.5         25       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         13:24:00       3:29:00       0:00:00              167       2:58:26       3:13:35       0:15:09       20       0.8       1.4       In-flight Alignment         16       0:00:00	37	347	23:50	:28	0:06:49	0:16:2	1 1	19	0.8	1.5	1. Sec. 1. Sec. 1.			
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90       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         91       347       1:15:43       1:32:26       0:16:43       17       0.8       1.8         92       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         93       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         94       167       2:18:24       2:32:59       0:14:35       19       0.7       1.5         95       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         96       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         96       167       2:58:26       3:13:35       0:15:09       20       0.8       1.4       In-flight Alignment         96       167       2:58:26       3:13:35       0:15:09       20       0.8       1.4       In-flight Alignment         97       3:24:00       3:29:00       0:00:00       Image: State	30       167       0:54:28       1:10:27       0:15:59       18       0.8       1.5         31       347       1:15:43       1:32:26       0:16:43       17       0.8       1.8         32       167       1:36:50       1:52:39       0:15:49       18       0.7       1.5         33       347       1:57:56       2:13:17       0:15:21       20       0.7       1.2         34       167       2:18:24       2:32:59       0:14:35       19       0.7       1.5         35       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         36       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         37       3:24:00       3:29:00       0:05:00       20       0.8       1.4       In-flight Alignment         0       0:00:00               1       0:00:00               2       0:00:00                1       0:00:00         <	89	347	0:34:	15	0:49:59	0:15:4	4 1	19	0.7	1.3	(			
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95       347       2:38:09       2:53:44       0:15:35       17       0.7       1.6         96       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         96       3:24:00       3:29:00       0:05:00       20       0.8       1.4       In-flight Alignment         97       1       0:00:00       1       1       1       1       1         98       1       1       0:00:00       1       1       1       1       1         98       1       1       0:00:00       1<	95     347     2:38:09     2:53:44     0:15:35     17     0.7     1.6       96     167     2:58:26     3:13:35     0:15:09     20     0.7     1.2       3:24:00     3:29:00     0:05:00     20     0.8     1.4     In-flight Alignment       0:00:00     0:00:00     0     0:00:00     0     0:00:00       0     0:00:00     0     0     0:00:00       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0       0     0:00:00     0     0	94	167	2:18:	24	2:32:59	0:14:3	5 1	19	0.7	1.5				
96       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         3:24:00       3:29:00       0:05:00       20       0.8       1.4       In-flight Alignment         0:00:00       0:00:00       0       0       0       0       0       0         0       0:00:00       0       0       0       0       0       0       0         0       0:00:00       0       0       0       0       0       0       0       0       0         0       0:00:00       0 </td <td>∂6       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         3:24:00       3:29:00       0:05:00       20       0.8       1.4       In-flight Alignment         0:00:00       0:00:00       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0       0:00:00       0       0:00:00       0         0:00:00       0:00:00       0       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0:00:00       0:00:00       <td< td=""><td>95</td><td>347</td><td>2:38:</td><td>09</td><td>2:53:44</td><td>0:15:3</td><td>5 1</td><td>17</td><td>0.7</td><td>1.6</td><td></td><td></td><td></td><td></td></td<></td>	∂6       167       2:58:26       3:13:35       0:15:09       20       0.7       1.2         3:24:00       3:29:00       0:05:00       20       0.8       1.4       In-flight Alignment         0:00:00       0:00:00       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0       0:00:00       0       0:00:00       0         0:00:00       0:00:00       0       0:00:00       0       0:00:00       0       0:00:00         0:00:00       0:00:00       0:00:00       0:00:00 <td< td=""><td>95</td><td>347</td><td>2:38:</td><td>09</td><td>2:53:44</td><td>0:15:3</td><td>5 1</td><td>17</td><td>0.7</td><td>1.6</td><td></td><td></td><td></td><td></td></td<>	95	347	2:38:	09	2:53:44	0:15:3	5 1	17	0.7	1.6				
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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       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:00:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00         0:0:0:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00         0:0:00:00       0:00:00       0:00:00 </td <td>0:00:00       0:00:00         0:00:00       0:00:00</td> <td></td> <td></td> <td>3:24:</td> <td>00</td> <td>3:29:00</td> <td>0:05:0</td> <td>0 2</td> <td>20</td> <td>0.8</td> <td>1.4</td> <td>In-</td> <td>flight A</td> <td>Alignme</td> <td>nt</td>	0:00:00       0:00:00         0:00:00       0:00:00			3:24:	00	3:29:00	0:05:0	0 2	20	0.8	1.4	In-	flight A	Alignme	nt
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0:00:00     Image     1     Verify S-Turns After Mission     Yes     x     No       Additional Comments:     Drive     Drive     Drive     Drive	Times entered are Zulu / GMT  Page 1 Verify S-Turns After Mission Yes X No Additional Comments: Drive I						0:00:0	0	$\rightarrow$						
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							Additional	Comments:							Drive

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in.		DD/	MM/YEAR	Day of Year	Project #	- I	Phase#	T	Projec	t Name	
Opter	ch LIDA	R 1/	/5/2013	5	72875		2	0.5	FY13 4 Geo	rgia Counties	-
-	Operator		A	äreraft	HOBBS Start		Local Start	Time	ZULU Start Time	Bas	e
	SIMMONS		NL Exe	1107Q	1814.0		12:15:0	DO	5:15:00	NG	s
	SWAIN		Optech	Gemini 108	1818.0		4:20:0	0	9:20:00	A115	76
nd Dir/Sp	eed	Visibility	Ceiling	Cloud Cov	er % Temp	Dew Point	Pres	sure	Haze/Fire/Cloud	Departing	KFFC
Ca	lm	10+	CI	0	4	-5	5.7 11	3035	100 10 120	Arriving	K52A
Frequen	or Hi	alf-Angle	System PRF	Roll	Divergence	Multipulse		ARF		DIGITIZER	
				Compensation	Mode	DEEL I	OFE		Bange Gate	Threshold	-
34		20	125	ONEX	Wo		SAMP		Lase	r Trigger Edge	
1			ara.				ROUND			t por sites	Ξ.
Speed	-	AG	iL.	UPP	MSL		Avg. Elev.	ant	Adj. AGL	Max Range	
-20	130		5	500	570	0	· · · · · · ·		1	1.15.24	
line #	Dir.	Mission I	D#	Line End Time	Time On Line	5V's	HDOP	PDOP	Line No	tes/Comments	
Test	n/a				n/a	n/a	n/a	n/a	GPS Began Logging At:	1 HARRY	
		T Times	entered are	Zulu / GMT I	1	-	-	Verify S-Turns	Before Mission	Yes X	No
		5:44:0	00	5:50:00	0:06:00	19	1.4.4	1.38	In-fligh	t Alignment	
97	N	5:57:3	30	6:14:00	0:16:30	19	1.1.1	1.42			
98	S	6:23:0	01	6:37:00	0:13:59	21		1.41			
99	N	6:44:1	10	6:58:00	0:13:50	21		1.5			
100	5	7:02:0	00	7:15:00	0:13:00	20		1.55			
.01	N	7:20:0	09	7:34:00	0:13:51	19	_	1.49			
102	S	7:39:0	03	7:52:26	0:13:23	20		1.22			
103	Ň	7:58:1	4	8:10:39	0:12:25	19		1.51			
L04	S	8:15:0	08	8:26:36	0:11:28	18		1.39			
105	N	8:31:4	18	8:43:30	0:11:42	18		1.32			
106	S	8:47:3	33	8:58:57	0:11:24	16		2.13			
		9:03:0	00	9:07:00	0:04:00				In-fligh	t Alignment	
					0:00:00						
					0:00:00						
					0:00:00						
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	entered	are Zulu / G	MT ↑		Page		1	,	Verify S-Turns After Miss	ion Yes X	No
Times					J 3-						

				2.2.2	V	Vool	per	t				-
1044	-	AP .	DD/MM/YEAR	Day of Year	Projec			Phase # Project Name				
cibre	Optech chi/An 1/5/2013		5	5 72875		1.0	2		FY13 4 Georgia Counties			
	Operator	IC.		Aircraft	HOBBS	Start	-	A-55-D	Dime.	ZULU Start Time Ba		e. 5
-	Pilot Sensor Type		ienspr Type	HOBBS	END	-	Local End T	ime	9:55:00 NG5		,	
	SWAIN	1 - TV	Opter	th- Gemini 108	1820	.8		7:47:00	D	12:47:00	AI15	76
Wind Dir/S	peed	Visibility	Ceiling	Cloud Cov	er % Temp	Dew	Point	Press	ure	Haze/Fire/Cloud	Departing	K52A
Ca	lm	10+	5.00	CL 0	4	210 2	-4	11.73	3039		Artiving	KMLJ
Frequer	ку	Half-Angle	System PR	F Roll	Divergence	Multip	alse	-	ARF		DIGITIZER	
17.77		1.1	2.5	Compensation	Mode	OFF		DFF X	ON	Range Gate	Threshold	
34	1	20	125	ON	wo	ON	i I	SAMPL		Laser	Trigger Edge	
	10	" where is	1.1.1.1	OFF	NR	FIX Y	i ()				1 PPS edge	3
Air Speed	_		AGL		MSL	1 ml	Av	g. Elev.		Adi. AGL	Max Range	
1	130	C 11		5500	5	700						
Line #	Dir.	Missic	on ID#	Line End Time	Time On Lin	ne S	iV's	HDOP	PDOP	Line Not	es/Comments	
Test	n/a				n/a		n/a	n/a	n/a	GPS Began Logging At:		
		I Tin	nes entered a	re Zulu / GMT I			-		Verity S-Turn	s Before Mission	Yes X	No
		10:1	9:00	10:23:00	0:04:0	0 2	21		1.42	In-flight	Alignment	1.1
107	N	10:3	0:09	10:41:54	0:11:4	5	19		1.68	· · · · · · · · · · · · · · · · · · ·		
108	S	10:4	7:23	10:59:10	0:11:4	7	19	_	1,6			
109	N	11:0	5:26	11:17:33	0:12:0	7	19		1.43			
110	S	11:2	2:40	11:34:25	0:11:4	5 2	20		1.33			
111	N	11:3	9:20	11:51:11	0:11:5	1 2	21		1.32			
112	5	11:5	6:26	12:08:31	0:12:0	5 3	18	ſ.,	1.56			
113	N	12:1	3:54	12:25:57	0:12:0	3	19	1.000	1.72			
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
					0:00:0	0						
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		1			0:00:0	0						
		1			0:00:0	0						
		1			0:00:0	0	+					
		1			0:00:0	0						
		1			0:00:0	0						
↑ Times	s entere	d are Zulu /	′ GMT ↑		Pag	ze	<u>г</u> -	1		Verify S-Turns After Missi	on Yes X	No
					Additional	Comments:	-	_		-	^	Drive #

1		-			Wo	olpe	rt	-	1.1			
Date	Link	0	D/MM/YEAR	Day of Year	Project #		Phase # Project P			t Name		
opre	CA LIDA	* 11 T	1/5/2013	5	72875		2		FY13 4 Georgia Countles			
-	IORDAN N11		Aircraft	HOBES Start		Local Start Time		ZULU Start Time Sese				
-	Pitet	-	s	ensor Type	HOBBS END	-	Local End	lime	Zulu End Time		PID	
	FLOYD		Opter	h- Gemini 108	1826.1	1177	16:18:0	Ó	21:18:00		A11576	
Wind Dir/Sp	peed	Visibility	Ceiling	Cloud Cov	er% Temp	Dew Point	Press	ure	Haze/Fire/Cloud	Departin	g	KMU
Ca	lm	10+		CL 0	9	-3	C 11	30.4		Arriving		KML
Frequen	icy Ha	alf-Angle	System PR	F Roll Compensation	Divergence M Mode	ultipulse	1.1	ARF	1	DIGITIZER	-	-
1007	111				OFF		OFF X	ON	Range Gate	Thre	shold	_
34	<	20	125	ONX	WD ON		SAMP		Laser	Trigger Edge	122	1
		-	_	OFF	NR X FIX	x	BOUND/			1 PPS edge	1.1	
Air Speed	120	A	GL		MSL F700		Ave. Elev.	_	Adi. AGL	Max Ban	te-	-
	130			5500	5700		10.00					
Line #	Dir.	Mission	ID#	Line End Time	Time On Line	SV'S	HDOP	PDOP	Cor Design Ab	s/Comment		-
test	n/a	A	_		n/a	nya	nya	N/a Verify S-Tu	The second secon	es v	N	
	-	16:24	:00	16:30:00	0:06:00	17	0.9	1.7	Static /	lignme	nt	
114	347	16:44	:52	16:56:34	0:11:42	17	0.8	1.6				
115	167	17:01	:13	17:13:08	0:11:55	17	0.8	1.4				
116	347	17:17	:06	17:28:59	0:11:53	16	1.1	2.1				
117	167	17:33	:24	17:45:23	0:11:59	16	1	1.9				
118	347	17:49	:16	18:01:32	0:12:16	17	1	1.7	1			
119	167	18:06	:08	18:17:40	0:11:32	19	0.8	1.5				
120	347	18:22	:11	18:33:45	0:11:34	18	0.9	1,8	1			
121	167	18:38	:04	18:49:10	0:11:06	19	1	1.9				
122	347	18:53	:14	19:04:06	0:10:52	18	1	2.3				
123	167	19:08	:06	19:18:36	0:10:30	20	0.8	1.5				
124	347	19:22	:44	19:32:48	0:10:04	20	0.8	1.5				
125	167	19:36	:39	19:39:55	0:03:16 22		0.7	1.3	Reject- flew off line			
125	167	19:50	:05		###############	21	0.7	1.3	Completed line- ALTM-NAV shut d		t down	
126	347	20:03	:56	20:04:42	0:00:46	21	0.7	1.3	Reject- Swath die	l not sa	/e pro	perly.
126	347	20:11	:35	20:21:03	0:09:28	21	0.7	1.3				
127	167	20:25	:22	20:34:40	0:09:18	21	0.7	1.6				
128	347	20:38	:42	20:47:24	0:08:42	19	0.7	2.2				
129	167	20:52	:02	21:00:48	0:08:46	21	1.3	2.1	Ch-cl	llaw		
		21:11	:00	21:16:00	0:05:00	21	1.2	2	Static A	Allgnme	nt	
					0:00:00			<u> </u>				
					0:00:00			<u> </u>				
					0:00:00			<u> </u>				
					0:00:00			<u> </u>				
					0:00:00			<u> </u>				
			-+		0:00:00			<u> </u>				
A 7			-+		Baga		1		Verify S-Turps After Missi	n Yes	Ţ	No
É					Additional Commen	nts:	1		Terriy 5-Turns Arter Wilssi	res	^	Drive #
SEND ERRO	R REPORT M	ESSAGE AFTER	LINE 125. CL	OSED OUT OF ALTM	AND RESTART IN TURN.							

					W	oolpe	rt				
Opte	ch LIDA	R	DD/MM/YEAR	Day of Year	Project #		Phase #		Pro	ect Name	
4/3/2013 5 Operator Aircraft		Aircraft	HOBBS Start		Local Start Time		2010 Start Time Base		e		
	JORDAN			N1107Q	1826.1	1	15:42:0	0	21:42:00	NG	5
-	FLOYD		Opt	Sensor Type ech- Gemini 108	HOBBS END 1828.9	-	19:55:0	lime 0	Zulu End Time 0:55:00	PIC	76
nd Dir/Sr	peed	Visibility	Ceilin	t Cloud Cov	er% Temp	Dew Point	Press	ure	Haze/Fire/Cloud	Departing	KML
Ca	lm	10+		CL 0	12	0		30.29		Arriving	KML
Frequen	rcy Ha	II-Angle	System P	RF Roll	Divergence	Multipulse		ARF		DIGITIZER	
34		20	125		Wo				Range Gate La	Threshold	
Speed	1	-	AGL	UFF	MR	HX X	Ave. Elev.	urt	Adi, AGL	Max Range	
	130			5500	570	0					
ine#	Dir.	Missie	on ID4	Line End Time	Time On Line	5V's	HDOP	PDOP	Line M	lotes/Comments	
Test	n/a	- T - 10		The I CAAT T	n/a	n/a	n/a	π/a	GPS Began Logging At	1	6:48
		21:4	8:00	21:53:00	0:05:00	21	0.8	1.3	Stati	Alignment	NO
130	347	22:0	7:41	22:16:02	0:08:21	21	0.7	1.3			
131	167	22:2	0:47	22:29:34	0:08:47	20	0.7	1.6	1		
132	347	22:3	4:07	22:42:23	0:08:16	19	0.8	1.4			
133	167	22:4	7:23	22:55:42	0:08:19	19	0.8	1.4			
134	347	23:0	0:21	23:08:17	0:07:56	18	0.8	1.4			
135	167	23:1	3:16	23:21:05	0:07:49	17	0.8	1.6			
136	347	23:2	6:00	23:33:28	0:07:28	17	1.1	1.8			
137	167	23:3	8:18	23:45:29	0:07:11	17	1	1.9			
138	347	23:5	0:05	23:56:57	0:06:52	19	0.8	1.5			
140	347	0:0:	3:07	0:18:13	0:05:06	18	0.8	1.5			
141	167	0:22	2:44	0:27:43	0:04:59	18	0.8	1.5			
142	347	0:32	1:59	0:33:44	0:01:45	19	0.7	1.3			
		0:48	3:00	0:53:00	0:05:00	19	0.8	1.4	Stati	c Alignment	
					0:00:00						
					0:00:00						
					0:00:00						
					0:00:00						
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	$\vdash$				0:00:00						
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	entered a	are Zulu /	/ GMT 个		Page		1		Verify S-Turns After Mi	ssion Yes X	No

# SECTION 6: FINAL ACCURACY ASSESSMENT

### FINAL VERTICAL ACCURACY ASSESSMENT

The vertical accuracy statistics were calculated by comparison of the LiDAR bare earth points to the ground surveyed QA/QC points.

Table 6.1: Overall Vertical Accuracy Statistics					
Average error	-0.027	Survey Feet			
Minimum error	-0.297	Survey Feet			
Maximum error	0.281	Survey Feet			
Average magnitude	0.139	Survey Feet			
Root mean square	0.171	Survey Feet			
Standard deviation	0.171	Survey Feet			

Table 6.2: Control Point Comparison Analysis						
Point ID	Easting Survey Feet	Northing Survey Feet	Elevation Survey Feet	Dz Survey Feet		
2014	461845.2	1220269	399.989	0.281		
2006	284544.5	1211705	556.761	0.279		
2019	247288	1257905	630.629	0.231		
2011	255855	1187178	500.385	0.195		
2054	251857.7	1333943	689.546	0.124		
2008	303742.7	1231531	543.704	0.066		
2009	254363.4	1205341	561.528	0.032		
2003	346203.7	1139345	389.716	0.024		
2050	225483.4	1345774	763.551	-0.001		
2018	293265.8	1266901	514.687	-0.017		
2012	358547.9	1214199	381.218	-0.018		
2017	275066.2	1273238	564.126	-0.046		

Table 6.2: Control Point Comparison Analysis						
Point ID	Easting Survey Feet	Northing Survey Feet	Elevation Survey Feet	Dz Survey Feet		
2000	329009.4	1101476	487.254	-0.074		
2021	377186.1	1163980	582.788	-0.078		
2020	217565.9	1301883	758.728	-0.088		
2013	398457.6	1250450	707.804	-0.134		
2002	336055.4	1123353	282.772	-0.152		
2001	331404.1	1097642	426.692	-0.182		
2004	283361.1	1137396	465.403	-0.213		
2005	314083.4	1153274	461.458	-0.248		
2015	450554.7	1186329	534.188	-0.268		
2051	256005.9	1357686	713.357	-0.297		

#### VERTICAL ACCURACY CONCLUSIONS

LAS Swath Fundamental Vertical Accuracy (FVA) Tested 0.333 feet fundamental vertical accuracy at a 95 percent confidence level, derived according to NSSDA, in open terrain using (RMSEz) x 1.96000 Tested against the TIN using independent check points.

Approved By:							
Title	Name	Signature	Date				
Associate							
LiDAR Specialist	Oian Xiao	M	July 18, 2013				
Certified Photogrammetrist #1281		y					

