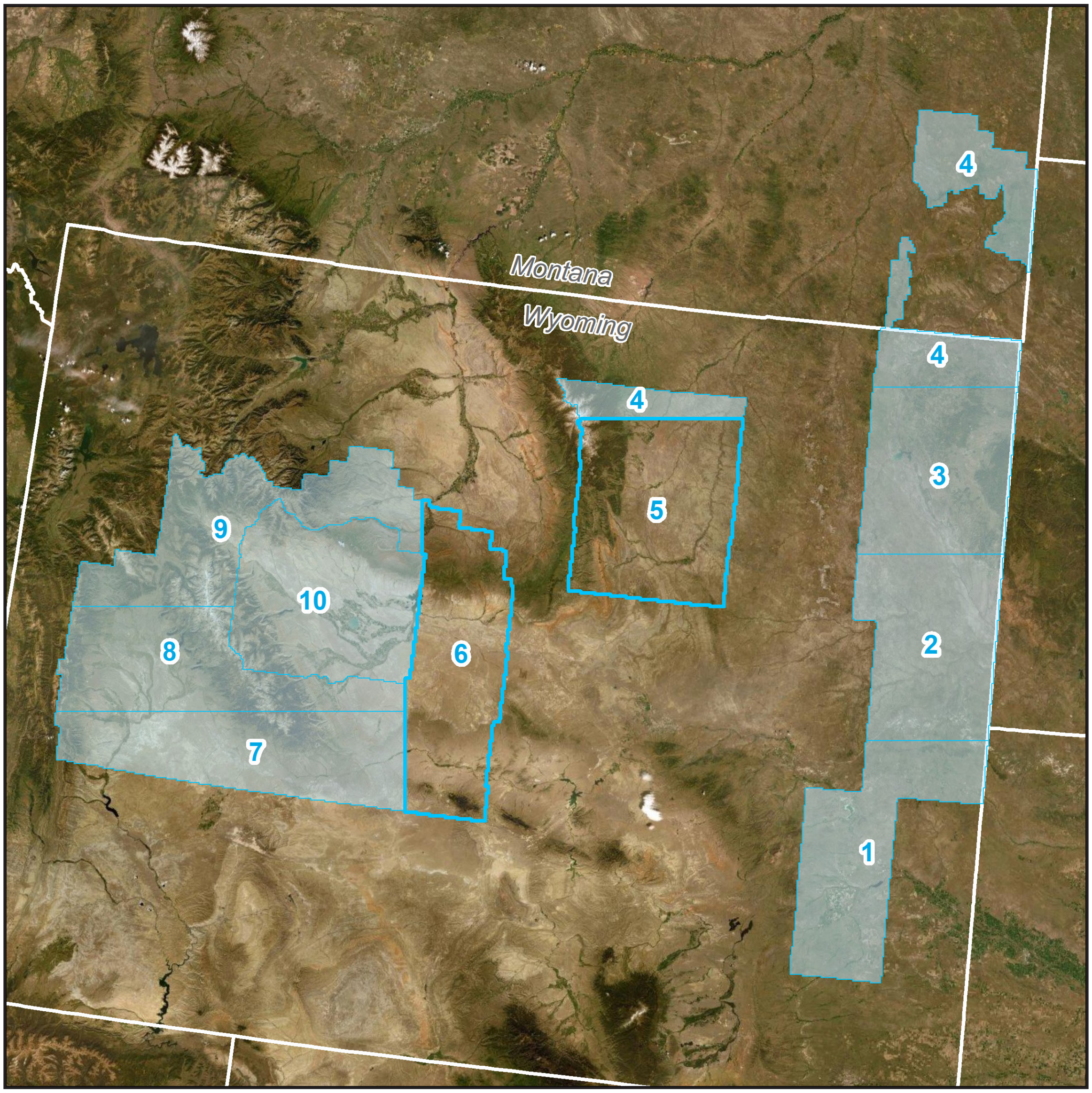
WY FEMA East 2019 D19
Lot 7 Blocks 5 and 6
Airborne Lidar Report

May 2020



Contract # G16PC00022
Task Order # 140G0219F0127

Contractor Woolpert
Project # 79935

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1. Overview

About

This project contains a comprehensive outline of the 140G0219F0127 WY FEMA East 2019 D19 task order issued by the United States Geological Survey's National Geospatial Technical Operations Center (USGS-NGTOC). This task order called for the acquisition and processing of QL2 data over 10 blocks that total approximately 32,466 square miles in Wyoming and Montana.

This report encompasses the Lot 7 Blocks 5 and 6 areas of interest. This AOI totals approximately 6,946 square miles and includes the following counties:

- Fremont
- Hot Springs
- Johnson

Purpose

This project will support the 3DEP mission, and the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment and Planning (MAP) program.

Specifications

Data for this task order was acquired and produced to meet USGS Lidar Base Specification v1.3 standards and the American Society of Photogrammetry and Remote Sensing (ASPRS) Positional Accuracy Standards for Digital Geospatial Data (Edition 1, Version 1.0).

Spatial Reference

Geospatial data products were produced using the following horizontal and vertical spatial data reference system.

Table 1-1. Spatial Reference System

Area of Interest		
Horizontal	**EPSG Code**	6350
	Datum	NAD83 (2011)
	Projection	Albers Equal Area
	Units	Meters
Vertical	**Datum**	NAVD88
	Geoid	GEOID12B
	Units	Meters
	Height Type	Orthometric

Task Order Deliverables

All data products produced as part of this task order are listed below. All tiled deliverables had a tile size of 1,000-meters x 1,000-meters. Tile names are derived from the coordinates of the lower left corner of each tile.

Table 1-2. Deliverables

Lidar Data	
Classified lidar point cloud data	Tiles in .las v1.4 format Classes • 1 – Processed, not Classified • 2 – Ground • 7 – Noise • 9 – Water • 17 – Bridge Decks • 18 – High Noise • 20 – Ignored Ground • 21 – Snow

Breaklines used for hydro-flattening	• Lake and River features as feature classes in an Esri file geodatabase
	  • Water bodies greater than 2 acres as polygon features
	  • Rivers 30.5 meters / 100 feet and greater in width as polyline features
	• Bridges used in DEM generation as point features in Esri shapefile format

Hydro-flattened bare earth digital elevation model (DEM)	1-meter pixel size, 32-bit floating-point; no bridges or overpass structures ERDAS .img format
Intensity Imagery	1-meter pixel size, 8-bit gray-scale (linear rescaling from 16-bit intensity) GeoTIFF format
Flight Line Index	Polygon features in an Esri file geodatabase
Control Data	
Lidar calibration points	Esri shapefile format
Lidar NVA checkpoints	Esri shapefile format
Lidar VVA checkpoints	Esri shapefile format
Other Data	
Tile Index	Esri shapefile format
Snow Polygons	Esri shapefile format
Metadata and Reports	
Metadata	Deliverable-level FGDC CSDGM/USGS MetaParser Compliant metadata in .xml format
Lidar Project Report	Project report with flight logs in .pdf format
Survey Report	Survey report in .pdf format

Figure 1-1. Project Area

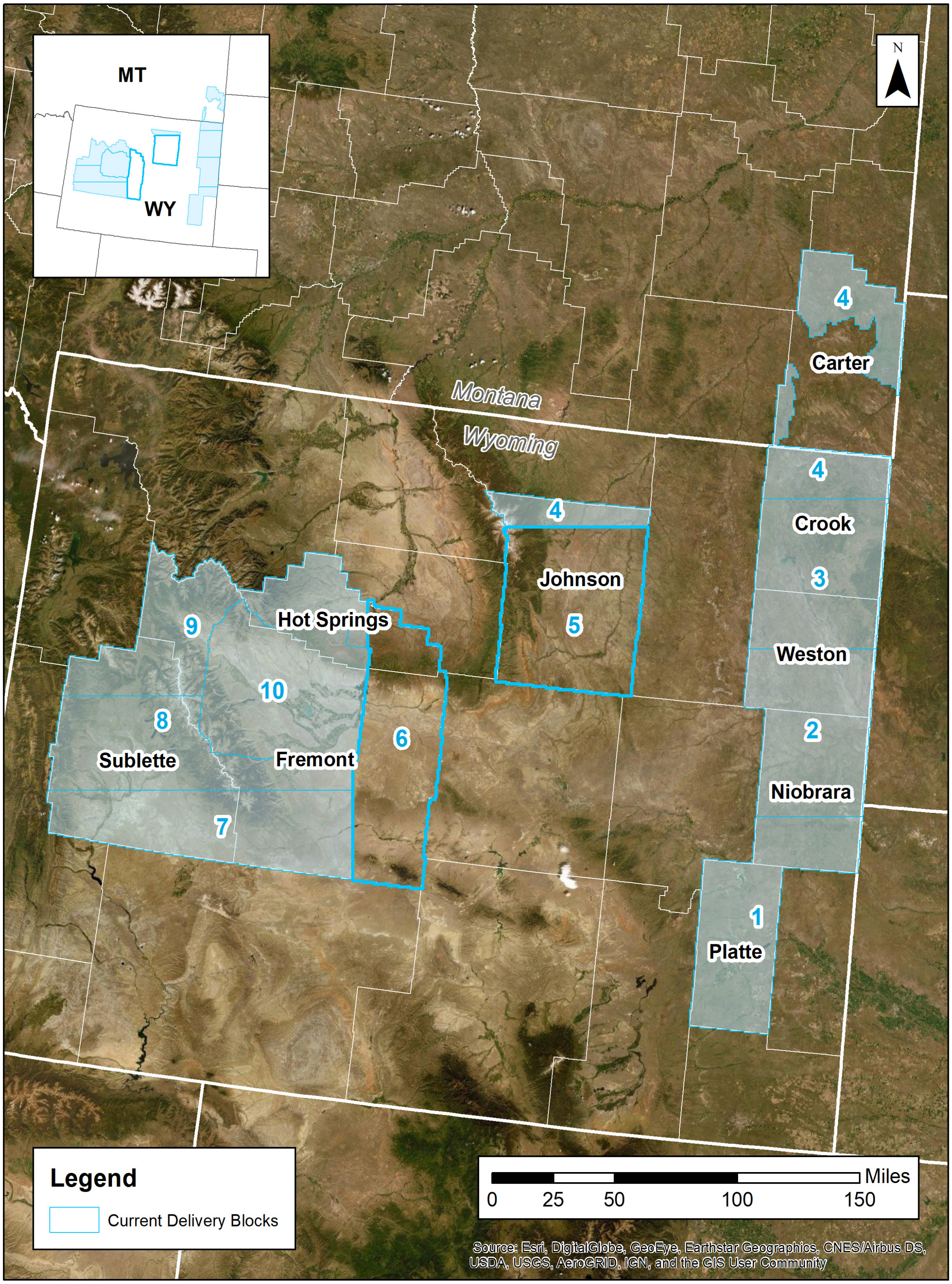
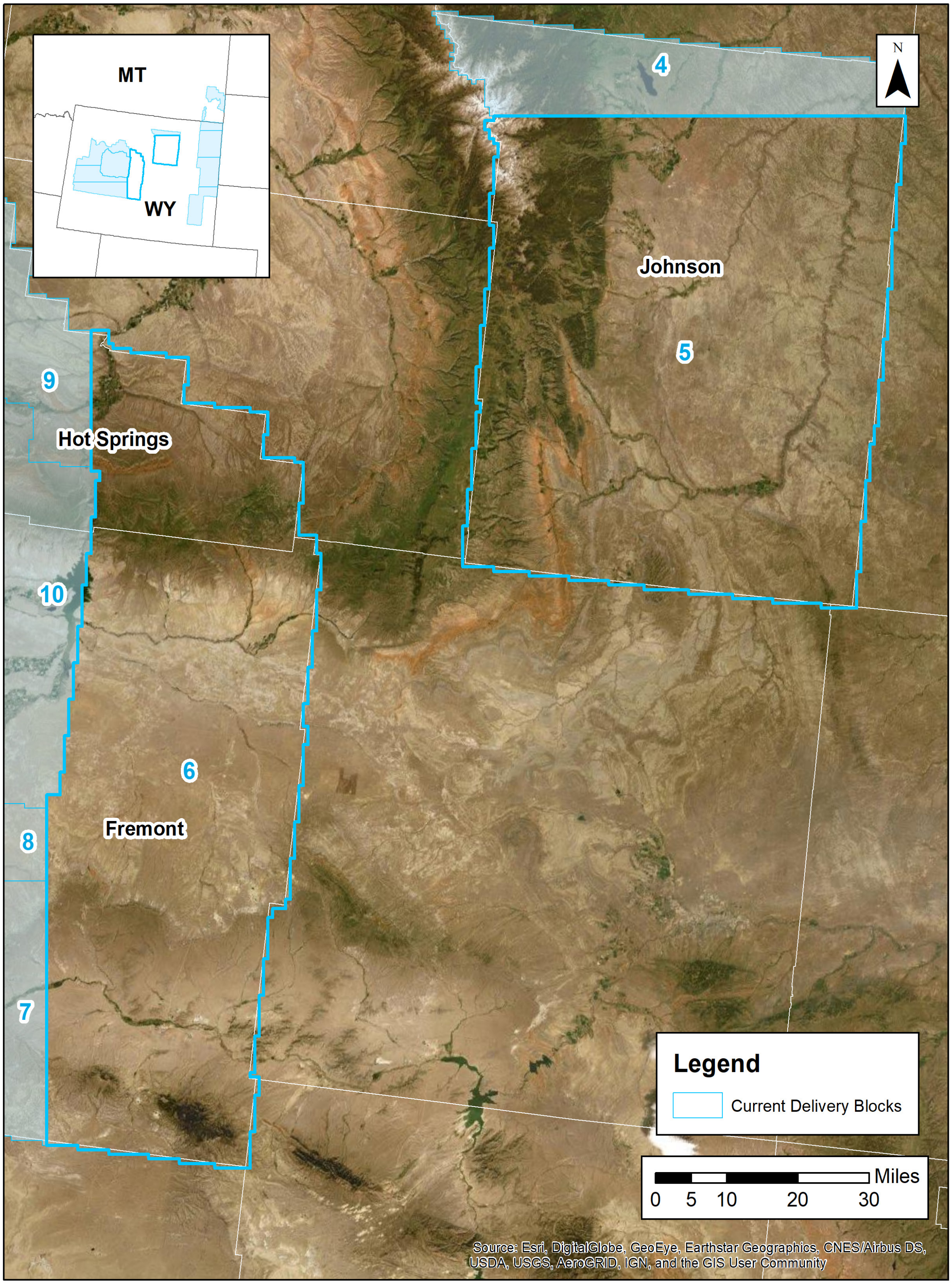


Figure 1-2. Project Area - Blocks 5 and 6



2. Acquisition

Flight Planning

Aerial lidar data was collected using the specifications listed below.

Table 2-1. Acquisition Requirements

Specification	Target
Resolution	• 2 points per square meter • 0.71-meter nominal point spacing
Overlap	At contractor's discretion, but enough to ensure there are no data gaps between usable portions of the swath and nominal point density is achieved
Acquisition Window	Fall 2019 leaf off window running through September 15, 2019
Acquisition Conditions	• Cloud and fog-free between the aircraft and ground • Ground is snow free • Ground has no unusual flooding or inundation, except in cases where the goal of the collection is to map the inundation • Preference of vegetation is leaf-off
Data Voids	Not allowed except • Where caused by water bodies • Where caused by areas of low near infra-red (NIR) reflectivity (i.e. asphalt or composition roofing) • Where caused by lidar shadowing from buildings or other features; or • Where appropriately filled-in by another swath
Control	Airborne Global Positioning System (ABGPS) and Inertial Measurement Unit (IMU) data to be used along with differentially-corrected GPS ground control points

Lidar Sensor Information

Aerial lidar data was acquired for this project using the Leica Terrain Mapper and Optech Galaxy PRIME lidar sensor systems. A total of 1,197 flight lines were collected for this project.

Table 2-2. Leica Terrain Mapper Sensor Info

Sensor Specifications	
Operating Altitude (m AGL)	300 - 5,500 at 10% reflective target
Maximum Measurement Rate (kHz)	2,000
Scan Angle	20 - 40
Scan Width	Up to 70% of flight altitude
Scan Frequency	Programmable up to 125 Hz (7,500 RPM), 250 scan lines per second
Number of Returns	15
Number of intensity measurements	15
Pulse Mode(s)	Up to 35 pulses in air
Laser Specifications	
Laser Beam Divergence	0.25 mrad (1/e)
Laser Classification	Class 4 laser product
Accuracy	
Range Resolution	< 1 cm RMS
Elevation Accuracy	< 5 cm 1 σ
Horizontal Accuracy	< 13 cm 1 σ
Physical Specifications	
Size (cm), Weight (kg) • Scanner • Control Electronics	 • 37 W x 68 L x 26 H cm, 47 kg • 45 W x 47 D x 25 H cm, 33 kg
Operating Temperature • Scanner • Control Electronics	 • 0 - 40°C cabin-side temperature • 0 - 40°C
Flight Management	Leica FlightPro
Power Consumption	922 W @ 22.0 – 30.3 VDC

Source: Leica TerrainMapper Data Sheet
https://leica-geosystems.com/en-US/products/airborne-systems/topographic-lidar-sensors/leica-terrainmapper

Table 2-3. Optech Galaxy PRIME Sensor Info

Sensor Performance	
Performance envelope [1, 2, 3, 4]	150-6000 m AGL, nominal
Absolute horizontal accuracy [2, 3]	1/10,000 × altitude; 1 σ
Absolute elevation accuracy [2, 3]	< 0.03-0.25 m RMSE from 150-6000 m AGL
Laser Configuration	
Topographic laser	1064-nm near-infrared
Laser classification	Class IV (US FDA 21 CFR 1040.10 and 1040.11; IEC/EN 60825-1)
Pulse repetition frequency (effective)	Programmable, 50-1000 kHz
Beam divergence	0.25 mrad (1/e)
Laser range precision [5]	< 0.008 m, 1 σ
Minimum target separation distance	< 0.7 m (discrete)
Range capture	Up to 8 range measurements, including last
Intensity capture	Up to 8 intensity measurements, including last (12-bit)
Sensor Configuration	
Position and orientation system	POS AV™ AP60 (OEM); 220-channel dual frequency GNSS receiver; GNSS airborne antenna with Iridium filters; high-accuracy AIMU (Type 57); non-ITAR
Scan angle (FOV)	10-60°
Swath width	10-115% of altitude AGL
Scan frequency	0-120 Hz advertised (0-240 scan lines/sec)
Scan product	2000 maximum
Flight management system	Optech FMS (Airborne Mission Manager and Nav) with operator console
SwathTRAK™	Dynamic FOV for fixed-width data swaths in variable terrain
PulseTRAK™	Multipulse tracking algorithm with no density loss across PIA transition zones
Roll compensation	±5° minimum
Data storage	Removable SSD (primary); internal SSD (spare)
Power requirements	28 V; 400 W
Dimensions and weight	Sensor: 0.34 × 0.34 × 0.25 m, 27 kg PDU: 0.42 × 0.33 × 0.10 m, 6.5 kg
Operating temperature	0 to +35°C

1. Target reflectivity ≥20%; 99% detection probability
2. Dependent on selected operational parameters; assumes nominal FOV of up to 40° in standard atmospheric conditions (i.e. 23-km visibility) and use of Optech LMS Professional software suite
3. Angle of incidence ≤20°
4. Target size ≥ laser footprint
5. Under Teledyne Optech test conditions, 1 sigma

Source: Optech Galaxy PRIME Airborne Lidar Terrain Mapper Specification Sheet
http://info.teledyneoptech.com/acton/attachment/19958/f-0278/1/-/-/-/-/Galaxy%20PRIME%20Brochure.pdf

GNSS and IMU Equipment

Prior to mobilizing to the project site, flight crews coordinated with the necessary air traffic control personnel to ensure airspace access. Crews were on-site, operating a Global Navigation Satellite System (GNSS) Base Station for the airborne GPS support.

Flight navigation during acquisition was 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.

Base stations were set by acquisition staff and was used to support the aerial data acquisition. See the table below for stations operated during acquisition for the whole project.

Table 2-4. GNSS Base Stations

Station Name	Latitude (DMS)	Longitude (DMS)	Ellipsoid Height L1 Phase Center (Meters)
Base2	42° 50’ 00.77963	104° 24’ 50.76535	1550.411
Base1	43° 19’ 21.88533"	105° 02’ 43.56787"	1514.653
WYRF_CORS	42° 49’ 50.36453"	106° 19’ 38.49771"	1634.444
WYLC_CORS	41° 06’ 16.29488"	104° 46’ 31.29307"	1824.826
P042_CORS	42° 03’ 05.40043"	104° 54’ 38.09615"	1423.359
KGCC_Airport	44° 20’ 55.78123"	105° 32’ 00.99884"	1306.038
AutoAnt	44° 20’ 55.78123"	105° 32’ 00.99884"	1306.038
P033_CORS	43° 57’ 10.41596"	107° 23’ 15.12165"	1376.681
KRIW_Airport	43° 03’ 37.92270"	108° 27’ 18.25590"	1648.117
P715_CORS	43° 30’ 02.74785"	109° 41’ 23.41714"	2988.93
BLW2_CORS	42° 46’ 01.63709"	109’ 3328.03604"	2216.398
TSWY_CORS	43° 40’ 26.70325"	110° 35’ 50.86433"	2191.496
AHID_CORS	42° 46’ 23.20961"	111° 03’ 49.41574"	1976.311

Timeline

Lidar data for Lot 7 Blocks 5 and 6 was collected from July 6, 2019 through August 20, 2019. Acquisition specifications are listed in the table below. An initial quality control process was immediately performed on to review the data coverage, airborne GPS data, and trajectory solution.

Table 2-5. Project Acquisition Specifications

Settings	Leica TerrainMapper Acq. Blocks 1-4, 6-8	Leica TerrainMapper Acq. Block 5	Leica TerrainMapper Acq. Blocks 9, 12-13, 17-19	Leica TerrainMapper Acq. Blocks 10-11, 14-16, 20-21	Optech Galaxy PRIME Acq. Blocks 23 -24
Max. Number of Returns	15	15	15	15	8
Nominal Point Spacing	0.71 m	0.71 m	0.71 m	0.71 m	0.7 m
Nominal Point Density	2 ppsm	2 ppsm	2 ppsm	2 ppsm	2 .73 ppsm
Flying Height Above Ground Level	3,000 m	3,200 m	3,250 m	3,500 m	1,600 m
Flight Speed	150 knots	150 knots	150 knots	150 knots	120 knots
Scan Angle	40°	40°	40°	40°	46°
Scan Rate Used	82 Hz	82 Hz	82 Hz	80 Hz	51 Hz
Pulse Rate Used	600 kHz	650 kHz	650 kHz	670 kHz	250 kHz
Multi-Pulse in Air	Enabled	Enabled	Enabled	Enabled	Enabled
Swath Width	2,184 m	2,329 m	2,366 m	2,548 m	1,358 m
Swath Overlap	25%	25%	25%	25%	20%

For more information, see the Flight Logs in Appendix 1.

Acquisition Quality Assurance

Woolpert developed a quality assurance and validation plan to ensure the acquired lidar data meets the USGS Base Specification Version 1.3. For quality assurance purposes, the lidar data was processed immediately following acquisition to verify the coverage has appropriate density, distribution, and no unacceptable data voids. Accompanying GPS data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements of the task order. Any required re-flights were scheduled at the earliest opportunity.

The spatial distribution of the geometrically usable first return lidar points was reviewed for density requirements as well as regular and uniform point distribution - verifying the lidar data is spaced so that 90% of the cells in a 2*NPS grid placed over the data contain at least one lidar point. The NPS assessment is made against single swath, first return data located within the geometrically usable center portion (typically ~90%) of each swath. Additionally, the data was reviewed for unacceptable data voids – verifying no area greater than or equal to $(4 \times ANPS)^2$ exhibited data coverage gaps.

3. Processing

Processing Summary

Once the lidar data passed initial QC, the dataset was corrected for aircraft orientation and movement. This process used airborne inertial, orientation, and GPS data collected during acquisition along with ground-based GPS data. The data went through a geometric calibration that further corrected each laser point. This calibrated data set was used to create the LAS point cloud. The LAS point data was initially classified into “ground” and “non-ground”, then further refined using the classes specified in this task order. Breaklines were drawn to denote hydrological features. After the hydro-flattening process, the final deliverables products were created.

GNSS-IMU Trajectory Processing

Kinematic corrections for the aircraft position were resolved using aircraft GPS and static ground GPS (1-Hz) for each geodetic control (base station) for three subsystems: inertial measurement unit (IMU), sensor orientation information, and airborne GPS data.

Post-processing of the IMU system data and aircraft position with attitude data was completed to compute an optimally accurate, blended navigation solution based on Kalman filtering technology, or the smoothed best estimate of trajectory (SBET).

Software: POSPac Software v. 5.3, IPAS Pro v.1.35., Novatel Inertial Explorer v8.60.6129

Trajectory Quality

The GNSS trajectory and 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).

Combination Separation

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

The data for this task order was processed with a goal to maintain a combined separation difference of less than ten (10) centimeters.

Estimated Positional Accuracy

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.

PDOP

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

The data for this task order was processed with a goal 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.

Geometric Calibration

After the initial phase was complete, a formal reduction process was performed on the data. Laser point position was calculated by associating the SBET position to each laser point return time, scan angle, intensity, etc. Raw laser point cloud data was created for the whole project area 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. Statistical reports were generated for comparison and used to make the necessary adjustments to remove any residual systematic error.

Software: Proprietary Software, TerraMatch v18, Leica CloudPro 1.2.4

Lidar Data Classification

LAS data was 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 of higher accuracy.

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 the following client-specified classes:

- Class 1 – Default / Processed, but not Classified
- Class 2 – Bare Earth Ground
- Class 7 – Low Noise
- Class 9 – Water
- Class 17 – Bridge Decks
- Class 18 – High Noise
- Class 20 – Ignored Ground
- Class 21 – Snow

Classified LAS files were evaluated through a series of manual QA/QC steps as well as a peer-based review to eliminate remaining artifacts from the ground class. This included a review of the DEM surface to remove artifacts and ensure topographic quality.

Software: Proprietary Software, TerraScan v18

Hydrologic Flattening

The lidar task order required compilation of breaklines defining the following types of water body features:

Lakes, reservoirs, ponds	Minimum of 2-acres or greater Compiled as closed polygons, collected at a constant elevation
Rivers, streams	Nominal width of 30.5 meters / 100 feet Compiled in direction of flow, with both sides maintaining an equal elevation gradient
Bridge breaklines	Breaklines used to enforce a logical terrain surface below a bridge

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. The newly acquired lidar data was utilized to manually compile 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. An integrated software approach was applied 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. All classified ground points from inside the hydrologic feature polygons were reclassified to water, class nine (9).
4. All classified ground points were reclassified from within a buffer along the hydrologic feature breaklines to buffered ground, class twenty (20). The buffer distance was approximately the task order designed nominal pulse spacing distance.
5. Breaklines used for bridge removal during the hydrologic flattening were included with the hydrologic breakline geodatabase deliverable. The purpose of these breaklines is for a more aesthetically pleasing DEM appearance.
6. The lidar ground points and breaklines were used to generate a digital elevation model (DEM).
7. QA/QC for this task was performed by reviewing the hydrologically flattened DEM and hydrologic breakline features. Additionally, a combined approach utilizing commercial off the shelf software and proprietary methods were used to review the overall connectivity of the hydrologic breaklines.

TerraScan was used to add the hydrologic breakline vertices and export the lattice models.

Breaklines defining the water bodies greater than 2-acres were provided as polygon features. Rivers and streams with a nominal minimum width of 30.5 meters (100 feet) were provided as polyline features. All lake and river breaklines compiled as part of the flattening process were provided in an Esri file geodatabase.

Breaklines used for DEM generation were provided as point features in Esri shapefile format.

Software: TerraScan v18, TerraModeler v18, Esri ArcMap v10.4, LP360 v2018.1.57.4

Digital Elevation Model

TerraScan was used to add the hydrologic breakline vertices and export the lattice models. Class 2 (ground) lidar points in conjunction with the hydro breaklines and bridge breaklines were used to create 1-meter hydro-flattened bare-earth raster DEM files. Using automated scripting routines within ArcMap, an 32-bit floating point raster ERDAS .img file was created for each tile. Files were produced to the full extents of the tile boundaries. Each surface is reviewed using Global Mapper to check for any surface anomalies or incorrect elevations found within the surface.

Intensity Imagery

Lidar intensity data derived from the acquired lidar data was linearly rescaled from 16-bit intensity and provided as 1-meter pixel, 8-bit, 256 gray scale GeoTIFF format intensity imagery files. Files were produced to the full extents of the tile boundaries.

Software: TerraScan v18

Metadata

FGDC CSDGM/USGS MetaParser-compliant metadata was produced in XML format. The metadata includes a complete description of the task order client information, contractor information, project purpose, lidar acquisition and ground survey collection parameters, lidar acquisition and ground survey collection dates, spatial reference system information, data processing including acquisition quality assurance procedures, GPS and base station processing, geometric calibration, lidar classification, hydrologic flattening, intensity imagery development, and final product development.

Other metadata deliverables included Esri shapefiles of the ground control and QA/QC points and delivery tile index. A georeferenced, polygonal representation of the detailed extents of each acquired lidar swath was produced as a polygon feature class in an Esri file geodatabase.

4. Accuracy Statement

Horizontal Accuracy

The data sets was produced to meet ASPRS “Positional Accuracy Standards for Digital Geospatial Data” (2014) for a 25.9 cm RMSEx / RMSEy Horizontal Accuracy Class which equates to Positional Horizontal Accuracy = +/- 63.6 cm at a 95% confidence level.

Raw Lidar Swath Testing

This project required the lidar point cloud swath to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSEz target value of 10 cm x 1.9600.

Digital Elevation Model Testing

This project required DEM data to be produced to meet a Non-Vegetated Vertical Accuracy (NVA) value of 19.6 cm at a 95% confidence level using an RMSEz target value of 10 cm x 1.9600 and a Vegetated Vertical Accuracy (VVA) value of 0.30 cm at the 95th percentile error.

Appendix 1: Flight Logs

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Block 6	Day187_90513_A	07/06/2019	187	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Swain	Cessna 404 Titan - N7079F	2213.4	08:54:00	14:54:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Stanton	Leica Terrain Mapper - 90513	2216.7	12:32:00	18:32:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
100	4	10	14,000	Scattered	16	12	30.3

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	8,000	14,340	4,364

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
11	S	15:37:00					LiDAR not activated, aborted line
11	S	15:42:00	15:55:00	00:13:00	24	1.1	restarted line, clds 10-14.5nmi from S end
10	N	15:58:00	16:11:00	00:13:00	24	1	clds 10-15.5 nmi from S end
9	S	16:13:00	16:26:00	00:13:00	26	0.9	clds 9-15.5 nmi from S end
12	N	16:31:00	16:44:00	00:13:00	24	1	roll error 1 nmi, clds 14 - 17 nmi from S end
13	S	16:47:00	17:00:00	00:13:00	23	1	clds 2-5, 14-17 nmi from S end
17	N	17:03:00	17:16:00	00:13:00	19	1.1	clear!
16	S	17:19:00	17:31:00	00:12:00	18	1.2	clouds 17-18 nmi from S end
15	N	17:34:00	17:46:00	00:12:00	17	1.2	clouds 15-18 nmi from S end
14	S	17:49:00	18:02:00	00:13:00	18	1.2	clouds 9-12, 13-18 nmi from S end
							end mission due to clouds

Verify S-Turns After Mission Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day187_90515_A	07/06/2019	187	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilaro	Cessna 404 Titan - N475RC	1739.8	09:36:00	15:36:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1742.2	10:40:00	16:40:00	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
90	3	10	600	Scattered	14	12	30.3

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	14,347	4,505

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 6- Static 14:55:22
21	S	15:36:24	15:49:38	00:13:14	18	1.3	
20	N	15:52:50	16:06:38	00:13:48	19	1.4	takeoff:15:04z
19	S	16:09:36	16:23:10	00:13:34	20	1.2	
18	N	16:26:28	16:39:40	00:13:12	21	1.1	
							Cloudy block 2 an 1
							Static: 17:43:23

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day187_90515_A	07/06/2019	187	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilaro	Cessna 404 Titan - N475RC	1742.4	08:01:00	14:01:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1748.1	12:46:00	18:46:18	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
130	4	10	12,000		15	13	30.06

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	12,940	4,405

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 6/ STATIC 13:14:04
1	S	14:01:54	14:15:25	00:13:31	18	1.4	Takeoff: 1323z
2	N	14:18:18	14:31:32	00:13:14	18	1.4	Failed to initalize in time
3	S	14:34:25	14:47:41	00:13:16	19	1.5	GPS Altitude 14,347 feet block 6
4	N	14:50:26	15:03:29	00:13:03	20	1.5	
5	S	15:06:35	15:19:32	00:12:57	18	1.6	
6	N	15:22:23	15:35:32	00:13:09	17	1.5	
7	S	15:38:27	15:51:41	00:13:14	19	1.3	
8	N	15:54:02	16:07:00	00:12:58	19	1.2	
							Block 2 Flight Line 24
							12,940 GPS MSL'
24	E	16:40:15	16:58:14	00:17:59	17	1.3	
23	W	17:01:15	17:20:25	00:19:10	16	1.2	
22	E	17:23:14	17:41:17	00:18:03	15	1.5	
21	W	17:44:27	18:03:25	00:18:58	13	1.5	
20	E	18:06:24	18:24:44	00:18:20	11	1.7	
19	W	18:27:22	18:46:18	00:18:56	11	2.1	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	**Project Name**	**Unique ID**	**Flight Date (UTC)**	**Day of Year**	**Flight #**
79935	FEMA Wyoming Block 6 and 2	Day188_90513_A	07/07/2019	188	A

Crew	Equipment	Time			Airports
Pilot	**Aircraft Make / Model / Tail #**	**Hobbs Start**	**Local Start**	**UTC Start**	**Departing**
Swain	Cessna 404 Titan - N7079F	2216.7	07:13:00	13:13:00	GCC
Operator	**Sensor Make / Model / Serial #**	**Hobbs End**	**Local End**	**UTC End**	**Arriving**
Stanton	Leica Terrain Mapper - 90513	2223.5	14:15:00	20:15:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
130	4	10	25,000	Clear	16	13	30.06

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	8,000	14,340	4,364

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
Block 6							
9a	S	13:54:00			24	1.1	Clear, patch for line 9
10a	N	14:03:00	14:08:00	00:05:00	25	1.1	patch
11a	S	14:12:00	14:16:00	00:04:00	25	1.1	patch
12a	N	14:21:00	14:29:00	00:08:00	25	1.1	patch
13a	S	14:31:00	14:39:00	00:08:00	24	1.2	patch
14a	N	14:45:00	14:51:00	00:06:00	25	1.1	patch, Auto IT adjusted for dark shadow
15a	S	14:55:00	14:58:00	00:03:00	24	1.2	patch, Auto IT adjusted for dark shadow
16a	N	15:01:00	15:03:00	00:02:00	24	1.1	patch
17a	S	15:06:00	15:08:00	00:02:00	23	1.2	patch
18a	N	15:11:00	15:14:00	00:03:00	22	1.2	fly patch for 475RC possible? Cloud
Block 2							
48		15:49:00	16:08:00	00:19:00	21	1.1	clear all
47		16:10:00	16:28:00	00:18:00	23	1	
46		16:30:00	16:48:00	00:18:00	22	1	
45		16:50:00	17:08:00	00:18:00	19	1.1	
44		17:11:00	17:29:00	00:18:00	20	1.1	
43		17:31:00	17:50:00	00:19:00	20	1.2	
42		17:52:00	18:10:00	00:18:00	15	1.4	
41		18:12:00	18:30:00	00:18:00	18	1.1	
40		18:32:00	18:50:00	00:18:00	19	1.1	
39		18:53:00	19:11:00	00:18:00	19	1.2	
38		19:13:00	19:31:00	00:18:00	19	1.2	
37		19:33:00	19:51:00	00:18:00	18	1.2	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day191_90515_B	07/10/2019	191	B

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibiarlo	Cessna 404 Titan - N475RC	1756.6	09:17:00	15:17:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1761.3	13:16:00	19:16:00	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
250	9	10	12,000		13	10	30.3

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	12,940	4,405

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 4/GPS 13:05:42
							ROLL MOUNT ISSUE
							Reboot in flight
							Circles
60	W	15:17:05	15:29:17	00:12:12	18	1.4	Reflight
19	E	15:40:22	15:52:11	00:11:49	19	1.2	
16	W	15:54:49	16:06:45	00:11:56	19	1.1	
43	N	16:53:02	17:06:08	00:13:06	14	1.3	Block 7 - - 13,533 FE 3,691
42	S	17:09:05	17:22:13	00:13:08	13	1.4	
41	N	17:25:15	17:38:22	00:13:07	12	1.5	
40	S	17:41:38	17:54:30	00:12:52	11	1.6	
39	N	17:57:45	18:10:43	00:12:58	11	1.7	
38	S	18:13:53	18:26:37	00:12:44	12	1.5	
37	N	18:30:00	18:43:00	00:13:00	12	2.2	
36	S	18:46:00	18:58:56	00:12:56	12	1.7	
35	N	19:02:28	19:15:45	00:13:17	14	1.8	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day193_90515_A	07/12/2019	193	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibiarlo	Cessna 404 Titan - N475RC	1767.6	09:59:00	14:59:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1772.7	13:18:00	19:18:00	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
180	9	10	12,000	Clear	22	13	30.1

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	13,533	3,691

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 7/ gps 14:27:00/ T/O: 1436Z
34	S	14:59:45	15:12:43	00:12:58	18	1.7	
33	N	15:15:55	15:29:06	00:13:11	18	1.3	
32	S	15:32:10	15:45:20	00:13:10	16	1.6	
31	N	15:48:20	16:01:14	00:12:54	17	1.7	
30	S	16:04:12	16:17:12	00:13:00	17	1.7	
29	N	16:20:20	16:32:32	00:12:12	17	1.2	
28	S	16:36:21	16:49:30	00:13:09	18	1.2	
27	N	16:53:00	17:06:06	00:13:06	17	1.3	
26	S	17:09:17	17:22:16	00:12:59	15	1.5	
25	N	17:25:57	17:39:10	00:13:13	14	1.5	
24	S	17:42:41	17:55:33	00:12:52	13	1.7	
23	N	17:58:43	18:11:56	00:13:13	16	1.4	
22	S	18:15:20	18:28:26	00:13:06	16	1.3	
21	N	18:32:05	18:45:20	00:13:15	14	1.5	
20	S	18:49:08	19:02:06	00:12:58	17	1.4	
19	N	19:05:18	19:18:26	00:13:08	18	1.5	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day194_90515_A	07/13/2019	194	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibiarlo	Cessna 404 Titan - N475RC	1772.7	09:32:00	15:32:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1778.6	14:24:00	20:24:00	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
170	14	10	12,000	Clear	20	14	30.1

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	13,533	3,691

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 7/ gps 14:52:46/ T/O: 14Z
18	S	15:32:52	15:45:52	00:13:00	21	1.3	
17	N	15:49:10	16:02:16	00:13:06	21	1.2	
16	S	16:05:38	16:18:37	00:12:59	19	1.1	
15	N	16:22:08	16:35:00	00:12:52	17	1.1	
14	S	16:38:13	16:40:16	00:02:03	14	1.4	
13	N	16:54:40	17:07:40	00:13:00	12	1.5	
12	S	17:10:56	17:23:46	00:12:50	11	1.6	
11	N	17:26:46	17:40:17	00:13:31	13	1.5	
10	S	17:43:38	17:56:32	00:12:54	13	1.5	
9	N	18:00:00	18:12:55	00:12:55	14	1.3	
8	S	18:16:24	18:29:23	00:12:59	12	1.4	
7	N	18:32:46	18:46:02	00:13:16	12	1.4	
6	S	18:49:22	19:02:27	00:13:05	12	1.3	
5	N	19:05:48	19:18:46	00:12:58	12	1.3	Nadir Frames underexposed
4	S	19:22:00	19:35:07	00:13:07	11	1.6	Very Dark Cloud Shadows
3	N	19:38:48	19:51:14	00:12:26	11	1.6	
2	S	19:54:55	20:07:41	00:12:46	12	1.6	
1	N	20:11:19	20:24:10	00:12:51	12	1.6	Nadir Frames underexposed

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Block 8	Day195_90513_A	07/14/2019	195	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N7079F	2250.7	08:44:00	14:44:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Stanton	Leica Terrain Mapper - 90513	2257.4	15:43:00	21:43:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
200	9	10	25,000	Clear	23	17	30.07

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	8,000	13,940	4,364

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
Block 8							
30	S	15:32:00	15:47:00	00:15:00	23	0.9	Clear
29	N	15:50:00	16:04:00	00:14:00	23	1	Auto IT adjust for underexposure
28	S	16:06:00	16:21:00	00:15:00	23	1	
27	N	16:24:00	16:37:00	00:13:00	19	1.1	
26	S	16:40:00	16:54:00	00:14:00	20	1.2	
25	N	16:57:00	17:11:00	00:14:00	19	1.2	
24	S	17:14:00	17:28:00	00:14:00	18	1.2	
23	N	17:30:00	17:45:00	00:15:00	18	1.2	
22	S	17:48:00	18:02:00	00:14:00	20	1.2	exceed pitch limit at start of line
21	N	18:04:00	18:19:00	00:15:00	20	1.1	
20	S	18:21:00	18:35:00	00:14:00	18	1.2	
19	N	18:38:00	18:53:00	00:15:00	20	1.2	
18	S	18:56:00	19:09:00	00:13:00	19	1.2	
17	N	19:12:00	19:26:00	00:14:00	19	1.1	
16	S	19:29:00	19:43:00	00:14:00	19	1.1	
15	N	19:46:00	20:00:00	00:14:00	18	1.2	
14	S	20:03:00	20:16:00	00:13:00	19	1.1	
13	N	20:19:00	20:33:00	00:14:00	18	1.2	
12	S	20:36:00	20:49:00	00:13:00	16	1.5	
11	N	20:53:00	21:07:00	00:14:00	20	1.1	exceed roll limit 10 nmi from N end

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY_FEMA	Day195_90515_A	07/14/2019	195	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibiarlo	Cessna 404 Titan - N475RC	1778.6	08:24:00	14:24:00	KGCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90515	1783.8	13:50:00	18:50:00	KGCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
180	10	10	12,000	Clear	19	16	30.06

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	9,842	13,934	4,092

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	82	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 8/ gps 13:52:00:/ T/O:1400z
75	S	14:24:57	14:37:06	00:12:09	17	1.7	
74	N	14:42:02	14:55:53	00:13:51	15	1.8	
73	S	14:58:58	15:12:50	00:13:52	19	1.4	
72	N	15:16:25	15:30:07	00:13:42	17	1.4	
71	S	15:33:18	15:47:25	00:14:07	19	1.3	
70	N	15:50:38	16:04:33	00:13:55	20	1.1	
69	S	16:08:00	16:21:53	00:13:53	18	1.1	
68	N	16:25:48	16:39:46	00:13:58	17	1.3	
67	S	16:42:51	16:56:42	00:13:51	18	1.3	
66	N	17:00:02	17:14:00	00:13:58	16	1.5	
65	S	17:17:12	17:30:54	00:13:42	15	1.5	
64	N	17:34:17	17:48:00	00:13:43	12	1.8	
63	S	17:51:16	18:05:08	00:13:52	14	1.4	
62	N	18:08:24	18:22:05	00:13:41	14	1.4	
61	S	18:25:16	18:39:12	00:13:56	14	1.5	Clouds
60	N	18:42:10	18:50:38	00:08:28	13	1.5	Clouds Manual Stop

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day200_90515_A	07/19/2019	200	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilero	Cessna 404 Titan - N475RC	1783.8	08:34:00	14:34:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1790.3	01:51:00	19:51:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
359	8	10	4,800	Scattered	17	9	29.97

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
1	S	14:34:00	14:47:00	00:13:00	17	1.6	Area 8
2	N	14:50:00	15:03:00	00:13:00	19	1.2	
3	S	15:06:00	15:20:00	00:14:00	15	1.5	
4	N	15:23:00	15:36:00	00:13:00	15	1.3	
5	S	15:39:00	15:53:00	00:14:00	15	1.2	
6	N	15:56:00	16:09:00	00:13:00	14	1.4	
7	S	16:12:00	16:25:00	00:13:00	14	1.6	
8	N	16:28:00	16:41:00	00:13:00	14	1.6	
9	S	16:44:00	16:58:00	00:14:00	13	1.7	
10	N	17:01:00	17:14:00	00:13:00	12	2.2	
31	S	17:29:00	17:34:00	00:05:00	13	1.6	
32	N	17:38:00	17:52:00	00:14:00	13	1.6	
33	S	17:56:00	18:09:00	00:13:00	11	1.8	
34	N	18:12:00	19:26:00	01:14:00	11	1.8	
35	S	18:29:00	18:43:00	00:14:00	15	1.5	
36	N	18:46:00	19:00:00	00:14:00	17	1.4	
37	S	19:03:00	19:17:00	00:14:00	18	1.3	
38	N	19:20:00	19:34:00	00:14:00	17	1.3	
39	S	19:37:00	19:51:00	00:14:00	17	1.3	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day201_90515_A	07/20/2019	201	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilero	Cessna 404 Titan - N475RC	1790.3	12:51:00	18:51:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1795.4	04:35:00	22:35:00	GCC

Conditions							
Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
190	7	10	12,000	Clear	20	10	30.01
Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)				
150	14,000	14,000	5,350				

Settings					
Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
40	S	18:51:00	19:04:00	00:13:00	13	1.3	Area 8
41	N	19:07:00	19:21:00	00:14:00	14	1.2	
42	S	19:24:00	19:38:00	00:14:00	14	1.6	
43	N	19:41:00	19:55:00	00:14:00	14	1.6	
44	S	19:58:00	20:12:00	00:14:00	13	2	
45	N	20:21:00	20:34:00	00:13:00	12	1.6	
46	S	20:37:00	20:50:00	00:13:00	10	2	
47	N	20:58:00	21:12:00	00:14:00	15	1.5	
48	S	21:15:00	21:28:00	00:13:00	14	1.6	
49	N	21:31:00	21:44:00	00:13:00	13	1.8	
50	S	21:47:00	22:01:00	00:14:00	15	1.5	
51	N	22:04:00	22:18:00	00:14:00	14	1.6	
52	S	22:21:00	22:35:00	00:14:00	14	1.6	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day203_90515_A	07/22/2019	203	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Finn	Cessna 404 Titan - N475RC	1795.4	12:50:00	18:50:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1800	03:48:00	21:48:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
140	19	10	12,000	Clear	23	15	30.31

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
53	S	18:50:00	19:04:00	00:14:00	18	1.3	Area 8
54	N	19:07:00	19:21:00	00:14:00	16	1.6	
55	S	19:24:00	19:38:00	00:14:00	17	1.6	
56	N	19:41:00	19:55:00	00:14:00	14	1.9	
57	S	19:58:00	20:11:00	00:13:00	13	1.8	
58	N	20:14:00	20:28:00	00:14:00	15	1.6	
59	S	20:31:00	20:45:00	00:14:00	13	2.5	
5	E	21:30:00	21:48:00	00:18:00	13	1.7	Area 1

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day206_90515_A	07/25/2019	206	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Finn	Cessna 404 Titan - N475RC	1802.4	11:35:00	17:35:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1804.8	12:45:00	18:45:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
40	3	10	12,000	Clear	23	4	30.13

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
47	S	17:35:00	17:49:00	00:14:00	15	2	Area 8, exceeded roll limit halfway
47	N	17:53:00	18:07:00	00:14:00	16	1.7	
60	S	18:13:00	18:28:00	00:15:00	18	1.4	
61	N	18:32:00	18:45:00	00:13:00	17	1.5	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day210_90515_A	07/29/2019	210	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Finn	Cessna 404 Titan - N475RC	1808.6	08:44:00	14:44:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1812.6	11:41:00	17:41:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
0	0	10	12,000	Clear	17	10	30.16

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
30	S	14:44:00	14:57:00	00:13:00	17	1.2	Area 5
29	N	15:02:00	15:16:00	00:14:00	18	1.2	
28	S	15:20:00	15:34:00	00:14:00	17	1.3	
27	N	15:38:00	15:54:00	00:16:00	17	1.4	
26	S	16:00:00	16:14:00	00:14:00	16	1.5	
25	N	16:18:00	16:34:00	00:16:00	15	1.8	
24	S	16:38:00	16:51:00	00:13:00	17	1.5	
23	N	16:58:00	17:12:00	00:14:00	17	2	
1	S	17:20:00	17:21:00	00:01:00	17	1.9	
2	N	17:24:00	17:26:00	00:02:00	17	1.4	
3	S	17:28:00	17:30:00	00:02:00	17	1.4	
4	N	17:33:00	17:35:00	00:02:00	18	1.4	
5	S	17:37:00	17:41:00	00:04:00	18	1.4	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day212_90515_A	07/31/2019	212	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Finn	Cessna 404 Titan - N475RC	1812.6	11:06:00	17:06:00	GCC
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1815.1	12:34:00	18:34:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
180	12	10	12,000	Clear	26	17	30.13

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
22	S	17:06:00	17:20:00	00:14:00	16	1.6	Area 5 (22-6)
21	N	17:23:00	17:37:00	00:14:00	15	1.7	
20	S	17:41:00	17:55:00	00:14:00	17	1.5	
19	N	17:58:00	17:12:00	23:14:00	17	1.5	
6	S	18:16:00	18:20:00	00:04:00	18	1.3	
7	N	18:23:00	18:27:00	00:04:00	18	1.3	
8	S	18:30:00	18:34:00	00:04:00	15	1.8	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day220_90515_A	08/08/2019	220	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gilbero	Cessna 404 Titan - N475RC	1822.2	08:43:00	14:43:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1826.9	12:25:00	18:25:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
280	12	10	12,000	Broken	17	10	30.12

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,512

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
18	N	14:43:00	14:54:00	00:11:00	14	1.5	Area 5
17	S	14:57:00	15:07:00	00:10:00	14	1.5	
16	N	15:12:00	15:19:00	00:07:00	12	1.7	
15	S	15:22:00	15:28:00	00:06:00	11	1.8	
14	N	15:31:00	15:38:00	00:07:00	11	1.8	
65	S	16:09:00	16:26:00	00:17:00	11	1.5	Area 10
64	N	16:29:00	16:46:00	00:17:00	11	2	
63	S	16:49:00	17:05:00	00:16:00	14	1.7	
62	N	17:09:00	17:25:00	00:16:00	14	1.7	
61	S	17:29:00	17:46:00	00:17:00	15	1.7	
60	N	17:49:00	18:06:00	00:17:00	16	1.8	
59	S	18:09:00	18:25:00	00:16:00	17	1.6	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 11	Day206_90513_A	07/25/2019	206	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N7079F	2262	09:05:00	15:05:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2268	14:09:00	19:12:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
310	7	10	180	Scattered	21	6	3021

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	15,682	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
56	S	15:05:00	15:06:00	00:01:00	22	0.9	
55	N	15:09:00	15:13:00	00:04:00	22	1	
54	S	15:16:00	15:20:00	00:04:00	21	1	
53	N	15:22:00	15:26:00	00:04:00	19	1	
52	S	15:28:00	15:32:00	00:04:00	22	1	
51	N	15:35:00	15:40:00	00:05:00	21	1	
50	S	15:45:00	15:52:00	00:07:00	19	1.1	
49	N	15:54:00	16:02:00	00:08:00	19	1.1	
48	S	16:04:00	16:11:00	00:07:00	19	1.2	
47	N	16:14:00	16:21:00	00:07:00	17	1.3	
46	S	16:23:00	16:30:00	00:07:00	19	1.3	
45	N	16:33:00	16:40:00	00:07:00	18	1.4	
44	S	16:42:00	16:49:00	00:07:00	19	1.2	
43	N	16:51:00	17:01:00	00:10:00	19	1.1	
42	S	17:03:00	17:11:00	00:08:00	21	1.2	
41	N	17:13:00	17:23:00	00:10:00	21	1.1	
40	S	17:25:00	17:34:00	00:09:00	20	1.3	
39	N	17:36:00	17:46:00	00:10:00	20	1.3	
38	S	17:48:00	17:57:00	00:09:00	22	1.3	
37	N	17:59:00	18:08:00	00:09:00	24	1.2	
36	S	18:11:00	18:19:00	00:08:00	23	1.2	
35	N	18:22:00	18:31:00	00:09:00	24	1.1	
34	S	18:33:00	18:42:00	00:09:00	24	1.1	
33	N	18:44:00	18:54:00	00:10:00	27	1	
32	S	18:56:00	19:05:00	00:09:00	24	1.1	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 11	Day206_90513_A	07/25/2019	206	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N7079F	2262	09:05:00	15:05:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2268	14:09:00	19:12:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
310	7	10	180	Scattered	21	6	3021

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	15,682	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
31	N	19:07:00	19:17:00	00:10:00	23	1.2	
30	S	19:19:00	19:28:00	00:09:00	25	1.1	
29	N	19:30:00	19:41:00	00:11:00	22	1.2	
28	S	19:44:00	19:55:00	00:11:00	20	1.4	
27	N	19:57:00	20:09:00	00:12:00	20	1.2	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 11	Day207_90513_A	07/26/2019	207	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N7079F	2268	10:13:00	16:13:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2273.8	15:23:00	21:23:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
0	0	10	200	Broken	24	3	3026

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	15,682	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
26	N	16:13:00			16	1.3	N.G. sensor crashed / rebooted
26	S	16:39:00	16:50:00	00:11:00	18	1.1	
25	N	16:53:00	17:04:00	00:11:00	17	1.2	
24	S	17:07:00	17:18:00	00:11:00	19	1.1	
23	N	17:21:00	17:32:00	00:11:00	18	1.3	
22	S	17:34:00	17:45:00	00:11:00	19	1.1	
21	N	17:47:00	17:58:00	00:11:00	19	1.2	
20	S	18:00:00	18:11:00	00:11:00	21	1.1	
19	N	18:13:00	18:24:00	00:11:00	20	1.2	
18	S	18:26:00	18:37:00	00:11:00	21	1.2	
17	N	18:39:00	18:50:00	00:11:00	24	1	
16	S	18:52:00	19:03:00	00:11:00	21	1.1	
15	N	19:05:00	19:16:00	00:11:00	21	1.1	
14	S	19:18:00	19:30:00	00:12:00	22	1.1	
13	N	19:32:00	19:44:00	00:12:00	20	1.2	
12	S	19:45:00	19:57:00	00:12:00	20	1.4	
11	N	20:00:00	20:11:00	00:11:00	20	1.2	
10	S	20:12:00	20:24:00	00:12:00	20	1.3	
9	N	20:26:00	20:37:00	00:11:00	22	1.1	
8	S	20:40:00	20:53:00	00:13:00	23	1.1	
7	N	20:55:00	21:08:00	00:13:00	21	1.1	
6	S	21:10:00	21:23:00	00:13:00	21	1.4	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA East	Day215_90515_A	08/03/2019	215	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Finn	Cessna 404 Titan - N475RC	1816.1	10:07:00	16:07:00	RWI
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
DeHart	Leica Terrain Mapper - 90515	1820.4	01:20:00	19:20:00	GCC

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
20	16	10	12,000	Clear	23	8	30.25

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	14,000	14,000	5,350

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.35	10	40	81	600	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
9	N	16:07:00	16:11:00	00:04:00	12	1.7	Area 5
10	S	16:14:00	16:18:00	00:04:00	12	1.7	
11	N	16:20:00	16:24:00	00:04:00	12	1.7	
12	S	16:27:00	16:31:00	00:04:00	12	1.5	
13	N	16:34:00	16:39:00	00:05:00	12	1.5	
72	S	17:09:00	17:23:00	00:14:00	11	1.6	Area 10
71	N	17:27:00	17:42:00	00:15:00	13	1.5	
70	S	17:45:00	18:00:00	00:15:00	12	1.5	
69	N	18:04:00	18:21:00	00:17:00	14	1.2	
68	S	18:24:00	18:41:00	00:17:00	14	1.5	
67	N	18:44:00	19:01:00	00:17:00	14	1.5	
66	S	19:04:00	19:20:00	00:16:00	13	1.5	Clouds at southern end

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 16	Day216_90513_A	08/04/2019	216	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Sanda	Cessna 404 Titan - N7079F	2281.3	09:58:00	15:58:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2284.6	12:30:00	18:30:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
0	0	10	200	Scattered	26	7	3020

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	16,204	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
39	S	15:58:00	16:14:00	00:16:00	20	1.2	
38	N	16:17:00	16:34:00	00:17:00	21	1.2	
37	S	16:37:00	16:53:00	00:16:00	23	1.1	
36	N	16:56:00	17:12:00	00:16:00	21	1.2	
35	S	17:15:00	17:31:00	00:16:00	23	1.2	
34	N	17:34:00	17:50:00	00:16:00	22	1.2	
33	S	17:53:00	18:10:00	00:17:00	21	1.2	
32	N	18:13:00	18:30:00	00:17:00	22	1.1	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 16	Day217_90513_A	08/04/2019	217	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Sanda	Cessna 404 Titan - N7079F	2285.8	09:46:00	15:46:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2290.7	14:01:00	20:01:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
0	0	10	150	Scattered	22	11	3027

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	16,204	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
31	S	15:46:00	16:02:00	00:16:00	18	1.3	
30	N	16:06:00	16:22:00	00:16:00	19	1.2	
29	S	16:26:00	16:42:00	00:16:00	22	1.1	
28	N	16:45:00	17:01:00	00:16:00	20	1.4	
27	S	17:04:00	17:21:00	00:17:00	21	1.3	
26	N	17:24:00	17:40:00	00:16:00	22	1.2	
25	S	17:43:00	17:59:00	00:16:00	20	1.3	
24	N	18:02:00	18:18:00	00:16:00	23	1	
23	S	18:21:00	18:37:00	00:16:00	20	1.2	
22	N	18:40:00	18:57:00	00:17:00	21	1.1	
1	S	19:06:00	19:22:00	00:16:00	18	1.2	
2	N	19:25:00	19:41:00	00:16:00	19	1.3	
3	S	19:44:00	20:01:00	00:17:00	21	1.1	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 16	Day218_90513_A	08/06/2019	218	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Sanda	Cessna 404 Titan - N7079F	2291.3	11:20:00	17:20:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2295.6	14:32:00	20:32:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
90	15	10	200	Scattered	31	10	3012

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	16,204	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
4	N	17:20:00	17:37:00	00:17:00	21	1.2	
5	S	17:40:00	17:56:00	00:16:00	21	1.1	
6	N	17:59:00	18:16:00	00:17:00	23	1	
7	S	18:18:00	18:36:00	00:18:00	20	1.2	
8	N	18:38:00	18:55:00	00:17:00	19	1.2	
9	S	18:58:00	19:15:00	00:17:00	17	1.2	
10	N	19:17:00	19:34:00	00:17:00	19	1.4	
11	S	19:37:00	19:55:00	00:18:00	22	1.2	
12	N	19:57:00	20:13:00	00:16:00	23	1.3	
13	S	20:16:00	20:32:00	00:16:00	22	1.4	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	Wyoming FEMA Block 16	Day221_90513_A	08/09/2019	221	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Sanda	Cessna 404 Titan - N7079F	2298.6	09:14:00	15:14:00	CPR
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Ryan	Leica Terrain Mapper - 90513	2303	11:43:00	17:43:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
210	7	10	180	Scattered	19	11	3009

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	16,204	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
14	S	15:14:00	15:30:00	00:16:00	15	1.4	
15	N	15:33:00	15:49:00	00:16:00	15	1.4	
16	S	15:52:00	16:08:00	00:16:00	15	1.4	
17	N	16:10:00	16:26:00	00:16:00	18	1.1	
18	S	16:29:00	16:45:00	00:16:00	15	1.4	
19	N	16:49:00	17:05:00	00:16:00	17	1.2	
20	S	17:07:00	17:24:00	00:17:00	18	1.2	
21	N	17:27:00	17:43:00	00:16:00	19	1.1	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY FEMA East LiDAR Block 21	Day224_90511_A	08/12/2019	224	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Costanzo	Cessna 404 Titan - N404CP	7324.2	09:02:00	15:02:00	GTF
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Denham	Leica Terrain Mapper - 90511	7330.2	02:54:00	20:54:00	RIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
220	13	10	7,000	Few	15	9	30.04

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150		17,500	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
1	S	17:09:00	17:22:00	00:13:00	20	1.2	Mount Pitch 17:15
2	N	17:25:00	17:38:00	00:13:00	19	1.2	Mount Pitch 17:29
3	S	17:40:00	17:54:00	00:14:00	21	1.1	
4	N	17:56:00	18:09:00	00:13:00	20	1.2	
5	S	18:12:00	18:25:00	00:13:00	18	1.2	
6	N	18:29:00	18:41:00	00:12:00	19	1.2	
7	S	18:47:00	19:00:00	00:13:00	19	1.1	
8	N	19:07:00	19:19:00	00:12:00	16	1.6	
9	S	19:23:00	19:36:00	00:13:00	19	1.2	
10	N	19:40:00	19:52:00	00:12:00	20	1.1	
11	S	19:56:00	20:09:00	00:13:00	20	1.1	
12	N	20:13:00	20:26:00	00:13:00	19	1.3	

Verify S-Turns After Mission: Yes

Additional Comments

BLOCK 21. Refer to N475RC's Base Log. KRIW. Some Altitude "dips" due to changing air flow over terrain.

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	WY FEMA East LiDAR Block 6RF's Block 15	Day226_90511_A	08/14/2019	226	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Costanzo	Cessna 404 Titan - N404CP	7335.2	09:35:00	15:35:00	GTF
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Denham	Leica Terrain Mapper - 90511	7341.8	03:51:00	21:51:00	CPR

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
230	6	10		Clear	17	8	30.15

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150		16,300	5,443

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
		40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
13	S	17:38:00			23	1.2	BLK 21 - Aborted - Cloud Bank
40	N	17:53:00	18:09:00	00:16:00	25	1.2	BLK 16 RF
33	S	18:14:00	18:30:00	00:16:00	22	1.2	BLK 16 RF
31	N	18:47:00	19:03:00	00:16:00	20	1.4	BLK 15
30	S	19:07:00	19:23:00	00:16:00	22	1.2	BLK 15
29	N	19:27:00	19:43:00	00:16:00	22	1.3	BLK 15
28	S	19:45:00	20:03:00	00:18:00	22	1.2	BLK 15 - Mount Pitch 19:47
27	N	20:06:00	20:24:00	00:18:00	21	1.3	BLK 15
26	S	20:27:00	20:44:00	00:17:00	21	1.2	BLK 15 - Mount Roll 20:28/Mount Pitch 20:44
25	N	20:47:00	21:04:00	00:17:00	21	1.3	BLK 15 - In Cloud 21:04
24	S	21:07:00	21:24:00	00:17:00	19	1.3	BLK 15 21:09 In Cloud

Verify S-Turns After Mission: Yes

Additional Comments

BLOCK 16 ReFlights. BLOCK 15. Refer to N475RC's Base Log. KRIW.

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Liadar	Day228_90513_A	08/16/2019	228	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N404CP	2311.9	10:35:00	16:35:00	KCPR
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90513	2317.7	15:00:00	21:00:00	KRIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
250	6	10		Clear	16	9	30.08

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	17,159	5,302

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
							Block 14/GPS 15:25:25
							Takeoff: 1535z
30	S	16:35:00	16:51:09	00:16:09	18	1.3	wpts 40-44 clou
29	N	16:53:57	17:10:00	00:16:03	18	1.3	
28	S	17:12:30	17:28:18	00:15:48	20	1	
27	N	17:31:07	17:47:31	00:16:24	19	1.2	3-6, 37-38
26	S	17:50:08	18:06:20	00:16:12	19	1.2	30-32
							reflight and patches
31	N	18:19:00	18:21:24	00:02:24	17	1.2	SEVEN thry 15
32	S	18:24:03	18:25:31	00:01:28	17	1.2	nine thru 12
33	N	18:28:12	18:29:53	00:01:41	17	1.2	eight thru 11
34	S	18:32:54	18:34:05	00:01:11	18	1.3	13,14
38	N	18:38:16	18:39:49	00:01:33	18	1.3	1,2,3,4
39	S	18:42:03	18:43:18	00:01:15	18	1.3	1,2,3
39	S	18:49:08	18:50:00	00:00:52	18	1.3	39
37	N	18:53:12	18:53:40	00:00:28	20	1.3	44
36	S	18:55:57	18:57:13	00:01:16	20	1.3	41-44/ refly the reflight clouds
6	N	19:07:31	19:09:00	00:01:29	20	1.3	9,10,11,12
5	S	19:11:49	19:14:13	00:02:24	22	1.2	9,10,11,12
4	N	19:16:37	19:19:53	00:03:16	24	1.2	One thru 12/ UL13
40	S	19:45:28	19:58:15	00:12:47	26	1.3	Block 20
39	N	20:01:07	20:13:28	00:12:21	23	1.2	
38	S	20:16:04	20:58:43	00:42:39	24	1.2	wind 258 at 44kts
37	N	20:31:18	20:43:52	00:12:34	20	1.3	
36	S	20:46:31	20:59:25	00:12:54	20	1.3	

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Blocks 14 & 21	Day228_90515_A	08/16/2019	228	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilaro	Cessna 404 Titan - N475RC	1859.9	08:42:00	14:42:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Kennedy	Leica Terrain Mapper - 90515	1865.1	13:51:00	19:51:00	CPR

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
40	3	10		Clear	15	8	30.1

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	17,159	5,516

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
7	2	40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
7	S	15:10:00	15:26:00	00:16:00	10	1.9	
8	N	15:29:00	15:45:00	00:16:00	10	1.9	few clouds below
9	S	15:49:00	16:05:00	00:16:00	10	1.5	few clouds below
10	N	16:08:00	16:24:00	00:16:00	11	1.5	few clouds below
13	S	16:48:00	17:00:00	00:12:00	14	1.5	**Start Block 21**
14	N	17:05:00	17:17:00	00:12:00	14	1.5	
15	S	17:21:00	17:33:00	00:12:00	13	1.6	
16	N	17:39:00	17:51:00	00:12:00	13	1.5	
17	S	17:56:00	18:08:00	00:12:00	14	1.3	
18	N	18:12:00	18:24:00	00:12:00	12	1.3	
19	S	18:29:00	18:41:00	00:12:00	10	1.6	
20	N	18:45:00	18:57:00	00:12:00	11	2	
							Base overflight @ 19:17

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Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Blocks 19 & 21	Day226_90515_A	08/14/2019	226	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilaro	Cessna 404 Titan - N475RC	1877.3	08:45:00	14:45:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Kennedy	Leica Terrain Mapper - 90515	1883.2	14:35:00	20:35:00	CPR

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
250	3	10		Clear	19	1	30.09

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	17,444	5,516

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
7	2	40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
12	S	15:20:00	15:32:00	00:12:00	11	1.8	
13	N	15:37:00	15:49:00	00:12:00	13	1.5	
14	S	15:52:00	16:05:00	00:13:00	12	2.3	
15	N	16:09:00	16:22:00	00:13:00	12	1.8	
16	S	16:25:00	16:38:00	00:13:00	13	1.5	
17	N	16:41:00	16:53:00	00:12:00	13	1.5	
18	S	16:56:00	17:09:00	00:13:00	12	1.5	
19	N	17:12:00	17:25:00	00:13:00	14	1.4	
20	S	17:28:00	17:41:00	00:13:00	13	1.8	Roll warning waypoint 65
21	N	17:44:00	17:57:00	00:13:00	12	1.9	
22	S	18:00:00	18:13:00	00:13:00	13	1.5	Roll warning waypoint 9
21	N	18:33:00	18:45:00	00:12:00	10	2.5	**Start Block 21**
22	S	18:48:00	08:00:00	13:12:00	14	1.5	
23	N	19:04:00	19:16:00	00:12:00	15	1.5	
24	S	19:19:00	19:30:00	00:11:00	14	1.7	Roll warning waypoint 84
25	N	19:34:00	19:45:00	00:11:00	15	1.7	Roll warning waypoint 9
							Base overflight at 20:01

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Lidar	Day232_90513_A	08/20/2019	232	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gebhart	Cessna 404 Titan - N404CP	2338.5	09:15:00	15:15:00	KCPR
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Galambos	Leica Terrain Mapper - 90513	2344.6	14:23:00	20:23:00	KRIW

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
300	7	10		Clear	19	5	30.19

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	17,000	6,017

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
0.7	2	40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
26	S	15:15:54	15:28:15	00:12:21	21	1.2	Block 21/Takeoff: 14:40z/gps 14:30:44
27	N	15:30:35	15:42:38	00:12:03	23	1.1	
28	S	15:45:28	15:58:14	00:12:46	21	1.4	
29	N	16:00:44	16:12:38	00:11:54	23	1.2	
30	S	16:15:46	16:28:07	00:12:21	22	1.1	
31	N	16:30:18	16:42:17	00:11:59	21	1.2	
							Block 9
63	N	17:21:44	17:34:05	00:12:21	22	1.2	
62	S	17:36:52	17:48:37	00:11:45	24	1.2	
61	N	17:51:09	18:03:49	00:12:40	21	1.2	
60	S	18:06:38	18:18:35	00:11:57	20	1.1	
59	N	18:21:21	18:34:39	00:13:18	20	1.4	
58	S	18:37:18	18:49:35	00:12:17	21	1.2	
57	N	18:51:54	19:04:56	00:13:02	22	1.2	
56	S	19:07:34	19:20:15	00:12:41	24	1.1	
55	N	19:22:48	19:35:50	00:13:02	22	1.2	
54	S	19:39:28	19:52:18	00:12:50	22	1.2	
53	N	19:54:40	20:08:02	00:13:22	22	1.1	
52	S	20:10:37	20:23:48	00:13:11	22	1.2	

Verify S-Turns After Mission: Yes

Additional Comments

Woolpert Lidar Acquisition Log

Project Info			Date		
Project #	Project Name	Unique ID	Flight Date (UTC)	Day of Year	Flight #
79935	FEMA Wyoming Blocks 21 & 9	Day232_90515_A	08/20/2019	232	A

Crew	Equipment	Time			Airports
Pilot	Aircraft Make / Model / Tail #	Hobbs Start	Local Start	UTC Start	Departing
Gibilaro	Cessna 404 Titan - N475RC	1883.7	08:53:00	14:53:00	RIW
Operator	Sensor Make / Model / Serial #	Hobbs End	Local End	UTC End	Arriving
Kennedy	Leica Terrain Mapper - 90515	1888.2	13:26:00	19:26:00	CPR

Conditions

Wind Dir (°)	Wind Speed (kts)	Visibility (mi)	Ceiling (ft)	Cloud Cover	Temp. (°C)	Dew Point (°C)	Pressure ("Hg)
330	8	10		Clear	21	4	30.19

Air Speed (kts)	Altitude AGL (ft)	Altitude MSL (ft)	Airfield Elevation (ft)
150	11,483	17,500	5,516

Settings

Point Spacing (m)	Point Density (ppsm)	Scan Angle/FOV (°)	Scan Frequency (Hz)	Pulse Rate (kHz)	Laser Power (%)
7	2	40	80	670	100

Verify S-Turns Before Mission: Yes

Line #	Direction	Start Time (UTC)	End Time (UTC)	Time On-Line	Satellite	PDOP	Line Notes/Comments
32	S	15:22:00	15:34:00	00:12:00	17	1.5	**Block 21**
33	N	15:37:00	19:49:00	00:12:00	17	1.4	
34	S	15:52:00	16:04:00	00:12:00	16	1.6	
35	N	16:07:00	16:18:00	00:11:00	16	1.7	
36	S	16:25:00	16:30:00	00:05:00	17	1.4	
37	N	16:33:00	16:36:00	00:03:00	18	1.4	
35	N	16:54:00	17:06:00	00:12:00	18	1.3	**Start Block 20**
34	S	17:09:00	17:22:00	00:13:00	15	1.7	
33	N	17:25:00	17:37:00	00:12:00	15	1.8	
32	S	17:41:00	17:53:00	00:12:00	15	2	
31	N	17:56:00	18:08:00	00:12:00	15	2	
30	S	18:12:00	18:25:00	00:13:00	12	1.8	Roll warning waypoint 46
29	N	18:28:00	18:41:00	00:13:00	15	1.9	Roll warning waypoint 42-43, 81
							Base overflight at 18:50

Verify S-Turns After Mission: Yes

Additional Comments