Peregrine Aerial Survey 2020 Boresite

DMC III Camera S/N 27542

- 1. The boresite data was flown on 2/18/2020 using the calibration field located in Abbotsford, British Columbia.
- 2. Below is the flight pattern flown for the boresite calibration.



3. Processed the GNSS / IMU data through Inertial Explorer version 8.80.2305 using a Differential Solution with 3 CORS stations. The processed trajectory contained additional projects in addition to the boresite calibration field.



4. The figures below display the estimated position accuracy, estimated attitude accuracy, combined separation of the post processed trajectory. The solution was a Fixed solution in both directions with less than 5 cm position separation between the forward and reverse solutions.





5. An initial Exterior Orientation for the photos in the calibration block was computed in IPASCO+ software, version 2.32 to provide good drives to the ground control points in the ISAT block. For this initial E, no datum shifts or misalignment angles were applied.

6. The Pass / Tie points were all generated using Automated Point Measurement in ISAT with stringent point matching enabled and a 9 x 9 thinning filter applied. All blundered image points, and pass / tie points with residuals greater than 2 ums, single ray points, 2-Ray points in Triple or greater overlap areas were eliminated. The figure below displays the final distribution of the pass / tie points.



7. The two figures below display the layout of the control and check points in the bundle adjustment. There were 39 control points used and 19 check points. All of the ground control and check points were photo identifiable points.





8. An aerial triangulation solution was computed using just the ground control without integrating the GNSS / IMU solution. This was used to compute the misalignment angles and datum shifts for the IMU. The figure below shows the results of this borsite calibration. The calibration was processed using IPASCO+, version 2.32.

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9. A new set of Exterior orientation parameters was computed from the GNSS / IMU trajectory using the new boresite misalignment angles and datum shifts. This was imported into the ISAT project and a new absolute bundle adjustment was computed. This adjustment integrated the Exterior orientation generated from the IMU trajectory with the IMU positions weighted at 0.5 meters and the attitude angles weighted at .01 degrees. The ground control was weighted at 0.1 meters. A dynamic shift / drift was computed for the IMU positions on each line. The figures below show the results of the bundle adjustment.

🕄 Photo Triangulation Results	- D ×
Summary Stats Photo Stats Object Stats Point Stats Exterior Orientation GPS INS Se	lf-Calibration
Parameter         X/Omega         Y/Phi         Z/Kappa           RMS Control         0.031         0.035         0.038           RMS Deck         0.024         0.038         0.049           RMS Limits         0.0100         0.100         0.100           Max Ground Residual         0.071         0.095         0.114           Residual Limits         0.300         0.300         0.300           MAS Photo Potition         0.031         0.027         0.021           RMS Photo Potition         0.031         0.027         0.021           Mean Sid Dev Photo Position         0.001         0.001         0.001           Mean Sid Dev Photo Position         0.002         0.001         Solution Status: Soluti           Current Count         Cameras used: [1]         Project Setting	igma: 0.8067 um (x, y): 0.7199; 0.6010 um itions: 4 udom: 5573 uders: 0 uders: 0 on Successful.
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1 Measure	d Control	XYZ	0.015	-0.002	-0.011	0.019	0.012	0.011	0.021	5	547277.988	5434799.870	134	ŧ.
3 Measure	d Control	XYZ	0.003	-0.001	-0.028	0.028	0.009	0.009	0.017	12	547246.759	5434228.947	106	<i>i</i>
3 Measure	1 Uneck	XYZ	0.045	0.042	-0.028	0.067	0.007	0.007	0.015	12	54/812./Ub	5434177.032	58	1
10 Medsure	d Control	~~~~	-0.025	0.000	0.004	0.025	0.007	0.007	0.014	12	547707.137 E47700.04E	5434167.372 E434030.707	110	2
12 Measure	d Control	- WZ	0.010	0.014	0.020	0.059	0.007	0.010	0.015	6	549274 533	5434169 152	61	í
14 Measure	d Check	- XVZ	-0.035	-0.004	.0.019	0.030	0.007	0.007	0.010	3	548267 111	5434790.996	50	à
15 Measure	d Control	XYZ	0.013	-0.044	-0.008	0.024	0.011	0.011	0.043	3	548278 222	5434813 735	52	à
17 Measure	1 Check	XYZ	0.012	0.032	-0.004	0.034	0.011	0.013	0.051	3	548692 152	5434783 600	6F	5
18 Measure	d Control	XYZ	0.014	0.012	0.006	0.020	0.011	0.011	0.024	3	548691.826	5434787.246	65	5
31 Measure	d Control	XYZ	-0.012	-0.056	-0.030	0.065	0.007	0.007	0.016	8	548775.339	5434032.782	58	3
19 Measure	d Control	XYZ	0.010	-0.064	-0.007	0.065	0.011	0.012	0.024	3	549122.072	5434847.962	60	J
22 Measure	d Control	XYZ	-0.004	-0.010	-0.038	0.040	0.012	0.012	0.022	5	549764.629	5434782.832	63	3
24 Measure	d Control	XYZ	-0.050	0.047	0.094	0.116	0.012	0.012	0.022	5	549752.801	5434768.268	62	2
25 Measure	d Control	XYZ	0.017	-0.006	-0.003	0.018	0.009	0.009	0.018	7	549773.529	5434109.591	54	4
27 Measure	d Check	XYZ	0.016	0.026	-0.085	0.091	0.009	0.010	0.022	7	549778.709	5434108.186	54	4
26 Measure	d Control	XYZ	0.028	-0.022	-0.114	0.119	0.009	0.010	0.018	7	549811.753	5434109.936	54	4
21 Measure	d Check	XYZ	0.008	0.024	0.000	0.025	0.012	0.012	0.035	5	549764.676	5434774.666	63	3
6 Measure	d Control	XYZ	-0.026	0.019	0.005	0.032	0.008	0.008	0.017	8	547203.888	5433517.137	58	3
Measure Measure	d Control	XYZ	-0.015	-0.014	-0.002	0.021	0.008	0.008	0.017	8	547204.176	5433517.647	58	3
38 Measure	d Uheck	XYZ	-0.037	0.032	0.045	0.067	0.007	0.007	0.017	6	548693.285	5433440.992	66	j -
33 Measure	a Control		0.056	0.028	-0.017	0.065	0.005	0.007	0.015	Б	548718.432 E401E1 770	5433435.55U E40000.070	66	
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22 Measure	d Control	- WZ	-0.043	0.036	0.032	0.095	0.007	0.007	0.010	4	549759.024	5433395 914	67	5
32 Measure	d Check	XYZ	-0.026	-0.075	0.000	0.084	0.000	0.009	0.021	7	549761.867	5433387 897	63	á
68 Measure	1 Control	XYZ	-0.051	-0.061	-0.072	0.108	0.009	0.009	0.017	Ġ	547184.369	5432726 507	62	i i
69 Measure	d Check	XYZ	0.009	-0.030	0.001	0.032	0.009	0.009	0.019	8	547177.505	5432726.014	64	4
70 Measure	1 Control	XYZ	0.038	-0.024	-0.014	0.047	0.009	0.009	0.016	8	547177 514	5432726 469	64	1 ~
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10. The RMS of the control and check points were as follows with respect to the flown GSD of the project (5 cms).

**Control Points:** 

.62 GSD X .70 GSD Y .76 GSD

Check Points:

.48 GSD X .76 GSD Y .98 GSD Z