

March 25, 2004

Keystone Aerial Surveys, Inc.  
Northeast Philadelphia Airport  
Philadelphia, Pennsylvania 19114

Attn: Mike Rambo

Re: Measurement Report

GEOD Corporation was retained by Keystone Aerial Surveys, Inc. to determine the horizontal and vertical offset of the GPS antenna mounted on the exterior of aircraft No. N6098X from the film plane of the Leica RC30 photogrammetric camera (Serial Number 5063) mounted within. The purpose of this report is to document the procedures used and present the final results of the combined measurements.

Upon arrival at Keystone's hangar, GEOD personnel determined the best orientation of the aircraft to facilitate the measurements. Keystone personnel then jacked the aircraft into the predetermined normal flight attitude. Measurement points were marked and numbered on the exterior of the aircraft. A point in the center of the nose (point number 200) and a point on top of a fin at the base of the rudder (point number 203) were selected to define the Y measurement axis. A screw in a similar position on each wing tank (point number 202 starboard side and point number 201 port side) was selected to define the X measurement axis. The screws securing the GPS antenna to the exterior of the plane (point numbers 204 through 207) were numbered beginning with the forward side screw and proceeding clockwise. On the camera inside the aircraft, the four holes through which the center fiducial marks are projected (points 208 through 211) were numbered beginning with the forward hole and proceeding clockwise.

The first measurements made were between the camera fiducial marks. Using an Alvin engineers scale graduated to a half millimeter, the distance between adjacent and opposite fiducial marks was measured. The same measurements were made between the screws on the GPS antenna.

Next, three observation points (point numbers 1 through 3) were set up around the aircraft to collect the measurements that would determine the relative horizontal position of the aircraft, the camera, and the GPS antenna. All the points on the camera could be observed from both points 1 and 2. All the exterior points could be observed from points 2 and 3, while observation point 1 could see the starboard wing point, the tail point and the GPS points. These measurements were made using a Topcon GTS-300 total station. This instrument's angular accuracy is specified at "1 second standard deviation based on DIN18723" and its distance accuracy is specified at "+/- 2 mm + 2 ppm". All distance measurements were made using the instruments internal EDM to a mini-prism assembly placed on the measurement point.

Finally, measurements were made to determine the vertical offset of the GPS antenna from the camera film plane. First, a spot on the hangar floor near the location of the GPS antenna was

marked. Using a carpenters level and a Lufkin steel rule graduated in millimeters, the distance from the top of the dome of the antenna to the mark on the hangar floor was measured. A Zeiss NI-2 automatic level was then employed to level from the mark on the hangar floor to each of the camera fiducial marks. An engineers scale was then used to measure from the top dome of the GPS antenna to each of the screws.

All of these physical measurements were then combined into a least squares adjustment. The point on the tail (point number 203) was assigned the horizontal coordinate of (0,0). The starboard fiducial mark (point number 209) was assigned the elevation of 0. The direction from the tail point to the nose point (point number 200) was set as the positive Y axis. Additionally, the angles between adjacent fiducial marks and GPS antenna screws were constrained to be close to 90 degrees. The adjustment resulted in standard deviations for the camera and antenna points of approximately 1.5 mm. The full results can be viewed in the included copy of the adjustment output listing.

The final horizontal position of the center of the film plane (point number 300) and the center of the GPS antenna (point number 301) were computed by mathematically intersecting the opposite measurement points on each. The final vertical position of the film plane was computed by averaging the vertical position of each fiducial mark. The final vertical position of the top of the dome of the antenna was taken from the level adjustment.

Based on these observations, the center of the film plane is 0.0097 M to starboard, 0.0175 M aft, and 0.8577 M below the top center of the dome of the GPS antenna.

Please note that the final position of the camera film plane (point 300) is the mathematical intersection of the holes through which the center fiducial marks are projected. The user of these observations should consult with the manufacturer's published camera geometry to relate these observation locations to camera geometry such as the "entrance node" and/or the "rear node" needed for airborne GPS computations. Also, the final position of the GPS antenna (point 301) is the center of the antenna at the top of the dome. The L1 & L2 phase center relationship to this point is to be determined by separate observations.

Sincerely,

GEOD Corporation

Paul J. Emilius Jr., PLS  
Vice President Surveying

Summary of Files Used and Option Settings  
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Project Folder and Data Files

Project Name N6098X  
Project Folder G:\1608\AIRCRAFT #N6098X-01-24-04\STARNET  
Data File List N6098X.dat

Project Option Settings

STAR\*NET Run Mode : Adjust with Error Propagation  
Type of Adjustment : 3D  
Project Units : Meters; DMS  
Coordinate System : LOCAL  
Apply Average Scale Factor : 1.0000000000  
Input/Output Coordinate Order : North-East  
Angle Data Station Order : At-From-To  
Distance/Vertical Data Type : Slope/Zenith  
Convergence Limit; Max Iterations : 0.010000; 50  
Default Coefficient of Refraction : 0.070000  
Earth Radius : 6372000.00 Meters  
Create Coordinate File : Yes  
Create Ground Scale Coordinate File : No  
Create Dump File : No

Instrument Standard Error Settings

Project Default Instrument  
Distances (Constant) : 0.002000 Meters  
Distances (PPM) : 2.000000  
Angles : 10.000000 Seconds  
Directions : 10.000000 Seconds  
Azimuths & Bearings : 10.000000 Seconds  
Zeniths : 10.000000 Seconds  
Elevation Differences (Constant) : 0.015240 Meters  
Elevation Differences (PPM) : 0.000000  
Differential Levels : 0.002403 Meters / Km  
Centering Error Instrument : 0.000000 Meters  
Centering Error Target : 0.000000 Meters  
Centering Error Vertical : 0.000000 Meters

Project Library Instrument Sideshots

Note: n/a  
Distances (Constant) : 0.002000 Meters  
Distances (PPM) : 2.000000  
Angles : 5.000000 Seconds  
Directions : 5.000000 Seconds  
Azimuths & Bearings : 5.000000 Seconds  
Zeniths : 5.000000 Seconds  
Elevation Differences (Constant) : 0.002000 Meters  
Elevation Differences (PPM) : 0.000000  
Differential Levels : 0.002403 Meters / Km  
Centering Error Instrument : 0.000000 Meters  
Centering Error Target : 0.002000 Meters  
Centering Error Vertical : 0.002000 Meters

Project Library Instrument Traverse

Note: n/a  
Distances (Constant) : 0.002000 Meters

Distances (PPM)	:	2.000000
Angles	:	5.000000 Seconds
Directions	:	5.000000 Seconds
Azimuths & Bearings	:	5.000000 Seconds
Zeniths	:	5.000000 Seconds
Elevation Differences (Constant)	:	0.002000 Meters
Elevation Differences (PPM)	:	0.000000
Differential Levels	:	0.002403 Meters / Km
Centering Error Instrument	:	0.000000 Meters
Centering Error Target	:	0.000000 Meters
Centering Error Vertical	:	0.000000 Meters

Summary of Unadjusted Input Observations

Number of Entered Stations (Meters) = 15

Partially Fixed	N	E	Elev	Description
	StdErr	StdErr	StdErr	
209	4.2509	-0.1418	0.0000	CAMERA
	FREE	FREE	FIXED	
203	0.0000	0.0000	0.4558	TAIL
	FIXED	FIXED	FREE	
204	4.3035	-0.2612	0.8492	GPS
	FREE	FREE	0.0005	
205	4.2694	-0.2274	0.8492	GPS
	FREE	FREE	0.0005	
206	4.2351	-0.2615	0.8482	GPS
	FREE	FREE	0.0005	
207	4.2694	-0.2954	0.8497	GPS
	FREE	FREE	0.0005	
208	4.3624	-0.2508	0.0000	CAMERA
	FREE	FREE	0.0005	
210	4.1421	-0.2524	-0.0010	CAMERA
	FREE	FREE	0.0005	
211	4.2521	-0.3616	-0.0010	CAMERA
	FREE	FREE	0.0005	

Free Stations	N	E	Elev	Description
1	-1.0056	7.6091	-1.4662	TR_XCT
200	9.0140	0.0000	-0.2756	NOSE
2	14.8708	6.0689	-1.4945	TR_XCT
3	12.2140	-2.8106	-1.5051	TR_XCT
202	6.6183	5.4354	0.2119	WING
201	6.6237	-5.4492	0.2216	WING

Number of Angle Observations (DMS) = 74

At	From	To	Angle	StdErr
208	209	211	90-00-00.00	FIXED
211	208	210	90-00-00.00	FIXED
210	211	209	90-00-00.00	FIXED
209	210	208	90-00-00.00	FIXED
204	205	207	90-00-00.00	0.00
207	204	206	90-00-00.00	0.00
206	207	205	90-00-00.00	0.00
205	206	204	90-00-00.00	0.00
1	2	3	327-17-42.50	5.00
1	3	2	32-42-20.50	5.00
2	1	3	78-53-04.80	5.00
2	3	1	281-06-59.00	5.00
3	1	2	291-35-14.20	5.00
3	2	1	68-24-47.00	5.00
1	2	202	349-37-54.50	58.32
1	2	203	283-04-10.50	59.86
1	2	204	309-32-37.00	50.81
1	2	205	309-29-12.00	51.00
1	2	206	309-11-58.00	50.96
1	2	207	309-15-28.00	50.78
1	2	208	309-52-28.50	50.72
1	2	209	309-41-04.50	51.32
1	2	210	308-45-30.50	51.20
1	2	211	308-57-03.50	50.60
1	3	202	22-20-05.50	57.74
1	3	203	315-46-24.00	59.28
1	3	204	342-14-49.00	50.14
1	3	205	342-11-27.00	50.33

1	3	206	341-54-13.00	50.29
1	3	207	341-57-41.00	50.10
1	3	208	342-34-48.00	50.04
1	3	209	342-23-16.50	50.66
1	3	210	341-27-58.50	50.53
1	3	211	341-39-21.00	49.92
2	1	200	51-33-26.50	55.55
2	1	201	59-56-19.50	39.27
2	1	202	9-55-47.00	56.37
2	1	203	27-44-35.50	36.79
2	1	204	36-28-02.50	42.61
2	1	205	36-15-13.00	42.58
2	1	206	36-18-34.00	42.48
2	1	207	36-31-16.50	42.51
2	1	208	36-33-45.50	42.73
2	1	209	35-51-50.00	42.64
2	1	210	36-02-56.00	42.32
2	1	211	36-44-27.50	42.40
2	3	200	332-40-16.00	66.32
2	3	201	341-03-04.50	53.42
2	3	202	291-02-43.50	67.01
2	3	203	308-51-27.50	51.63
2	3	204	317-35-05.00	55.92
2	3	205	317-22-01.50	55.91
2	3	206	317-25-08.50	55.83
2	3	207	317-38-10.00	55.85
2	3	208	317-40-53.50	56.02
2	3	209	316-58-30.00	55.95
2	3	210	317-09-50.00	55.71
2	3	211	317-51-26.50	55.77
3	1	200	356-57-21.00	100.04
3	1	201	63-30-35.00	71.27
3	1	202	342-24-37.00	48.37
3	1	203	25-17-05.50	41.34
3	1	204	20-22-52.50	55.58
3	1	205	20-13-54.50	55.35
3	1	206	20-31-30.50	55.24
3	1	207	20-40-38.50	55.46
3	2	200	65-22-12.00	106.71
3	2	201	131-55-32.00	80.37
3	2	202	50-49-12.00	60.99
3	2	203	93-41-39.50	55.58
3	2	204	88-47-47.50	66.86
3	2	205	88-38-41.50	66.67
3	2	206	88-56-23.50	66.57
3	2	207	89-05-28.50	66.76

Number of Distance Observations (Meters) = 90

From	To	Distance	StdErr	HI	HT	Type
208	209	0.1555	0.0005	0.000	0.000	S
209	210	0.1555	0.0005	0.000	0.000	S
210	211	0.1555	0.0005	0.000	0.000	S
211	208	0.1555	0.0005	0.000	0.000	S
208	210	0.2180	0.0005	0.000	0.000	S
209	211	0.2180	0.0005	0.000	0.000	S
204	205	0.0480	0.0005	0.000	0.000	S
205	206	0.0480	0.0005	0.000	0.000	S
206	207	0.0480	0.0005	0.000	0.000	S
207	204	0.0480	0.0005	0.000	0.000	S
204	206	0.0680	0.0005	0.000	0.000	S
205	207	0.0680	0.0005	0.000	0.000	S
1	2	15.9510	0.0020	0.000	0.000	S
1	3	16.8330	0.0020	0.000	0.000	S
1	2	15.9513	0.0020	0.000	0.000	S
1	3	16.8330	0.0020	0.000	0.000	S

1	2	15.9510	0.0020	0.000	0.000	S
1	3	16.8325	0.0020	0.000	0.000	S
2	1	15.9510	0.0020	0.000	0.000	S
2	3	9.2673	0.0020	0.000	0.000	S
2	1	15.9513	0.0020	0.000	0.000	S
2	3	9.2670	0.0020	0.000	0.000	S
2	1	15.9510	0.0020	0.000	0.000	S
2	3	9.2675	0.0020	0.000	0.000	S
3	1	16.8330	0.0020	0.000	0.000	S
3	2	9.2677	0.0020	0.000	0.000	S
3	1	16.8330	0.0020	0.000	0.000	S
3	2	9.2675	0.0020	0.000	0.000	S
3	1	16.8335	0.0020	0.000	0.000	S
3	2	9.2675	0.0020	0.000	0.000	S
1	202	8.1032	0.0029	0.000	0.000	S
1	203	7.9122	0.0029	0.000	0.000	S
1	204	9.7716	0.0029	0.000	0.000	S
1	205	9.7257	0.0029	0.000	0.000	S
1	206	9.7344	0.0029	0.000	0.000	S
1	207	9.7807	0.0029	0.000	0.000	S
1	208	9.6306	0.0029	0.000	0.000	S
1	209	9.4793	0.0029	0.000	0.000	S
1	210	9.5110	0.0029	0.000	0.000	S
1	211	9.6602	0.0029	0.000	0.000	S
1	202	8.1030	0.0029	0.000	0.000	S
1	203	7.9127	0.0029	0.000	0.000	S
1	204	9.7716	0.0029	0.000	0.000	S
1	205	9.7257	0.0029	0.000	0.000	S
1	206	9.7354	0.0029	0.000	0.000	S
1	207	9.7808	0.0029	0.000	0.000	S
1	208	9.6302	0.0029	0.000	0.000	S
1	209	9.4788	0.0029	0.000	0.000	S
1	210	9.5099	0.0029	0.000	0.000	S
1	211	9.6601	0.0029	0.000	0.000	S
2	200	8.5214	0.0029	0.000	0.000	S
2	201	14.2699	0.0029	0.000	0.000	S
2	202	8.4505	0.0029	0.000	0.000	S
2	203	16.1794	0.0029	0.000	0.000	S
2	204	12.5391	0.0029	0.000	0.000	S
2	205	12.5509	0.0029	0.000	0.000	S
2	206	12.5970	0.0029	0.000	0.000	S
2	207	12.5853	0.0029	0.000	0.000	S
2	208	12.3536	0.0029	0.000	0.000	S
2	209	12.3923	0.0029	0.000	0.000	S
2	210	12.5421	0.0029	0.000	0.000	S
2	211	12.5044	0.0029	0.000	0.000	S
2	200	8.5209	0.0029	0.000	0.000	S
2	201	14.2704	0.0029	0.000	0.000	S
2	202	8.4510	0.0029	0.000	0.000	S
2	203	16.1795	0.0029	0.000	0.000	S
2	204	12.5391	0.0029	0.000	0.000	S
2	205	12.5509	0.0029	0.000	0.000	S
2	206	12.5971	0.0029	0.000	0.000	S
2	207	12.5848	0.0029	0.000	0.000	S
2	208	12.3541	0.0029	0.000	0.000	S
2	209	12.3936	0.0029	0.000	0.000	S
2	210	12.5426	0.0029	0.000	0.000	S
2	211	12.5034	0.0029	0.000	0.000	S
3	200	4.4325	0.0029	0.000	0.000	S
3	201	6.4179	0.0029	0.000	0.000	S
3	202	10.1113	0.0029	0.000	0.000	S
3	203	12.6860	0.0029	0.000	0.000	S
3	204	8.6393	0.0029	0.000	0.000	S
3	205	8.6802	0.0029	0.000	0.000	S
3	206	8.7014	0.0029	0.000	0.000	S
3	207	8.6605	0.0029	0.000	0.000	S

3	200	4.4319	0.0029	0.000	0.000	S
3	201	6.4179	0.0029	0.000	0.000	S
3	202	10.1118	0.0029	0.000	0.000	S
3	203	12.6860	0.0029	0.000	0.000	S
3	204	8.6388	0.0029	0.000	0.000	S
3	205	8.6802	0.0029	0.000	0.000	S
3	206	8.7019	0.0029	0.000	0.000	S
3	207	8.6600	0.0029	0.000	0.000	S

Number of Zenith Observations (DMS) = 78

From	To	Zenith	StdErr	HI	HT
1	2	90-06-08.20	5.00	0.000	0.000
1	3	90-07-56.10	5.00	0.000	0.000
1	2	90-06-05.70	5.00	0.000	0.000
1	3	90-07-56.30	5.00	0.000	0.000
1	2	90-06-08.70	5.00	0.000	0.000
1	3	90-08-01.30	5.00	0.000	0.000
2	1	89-53-52.00	5.00	0.000	0.000
2	3	90-03-48.70	5.00	0.000	0.000
2	1	89-53-54.30	5.00	0.000	0.000
2	3	90-03-50.20	5.00	0.000	0.000
2	1	89-53-56.30	5.00	0.000	0.000
2	3	90-03-55.70	5.00	0.000	0.000
3	1	89-52-04.70	5.00	0.000	0.000
3	2	89-56-00.00	5.00	0.000	0.000
3	1	89-52-03.20	5.00	0.000	0.000
3	2	89-56-01.80	5.00	0.000	0.000
3	1	89-52-03.70	5.00	0.000	0.000
3	2	89-56-01.80	5.00	0.000	0.000
1	202	78-03-34.50	71.39	0.000	0.000
1	203	75-56-32.80	72.81	0.000	0.000
1	204	76-17-08.40	59.07	0.000	0.000
1	205	76-13-21.00	59.34	0.000	0.000
1	206	76-14-14.70	59.29	0.000	0.000
1	207	76-18-05.00	59.02	0.000	0.000
1	208	81-14-29.50	60.44	0.000	0.000
1	209	81-06-15.10	61.38	0.000	0.000
1	210	81-07-51.20	61.18	0.000	0.000
1	211	81-16-17.50	60.25	0.000	0.000
1	202	78-02-57.00	71.39	0.000	0.000
1	203	75-56-40.20	72.81	0.000	0.000
1	204	76-17-08.90	59.07	0.000	0.000
1	205	76-13-20.00	59.34	0.000	0.000
1	206	76-14-16.30	59.29	0.000	0.000
1	207	76-18-02.20	59.02	0.000	0.000
1	208	81-14-19.40	60.44	0.000	0.000
1	209	81-06-14.70	61.38	0.000	0.000
1	210	81-08-00.10	61.18	0.000	0.000
1	211	81-16-23.80	60.25	0.000	0.000
2	200	81-46-30.50	68.29	0.000	0.000
2	201	83-05-41.80	41.04	0.000	0.000
2	202	78-21-00.60	68.51	0.000	0.000
2	203	83-04-36.80	36.27	0.000	0.000
2	204	79-13-10.30	46.39	0.000	0.000
2	205	79-13-54.00	46.35	0.000	0.000
2	206	79-16-29.80	46.18	0.000	0.000
2	207	79-15-43.80	46.22	0.000	0.000
2	208	83-02-46.00	47.32	0.000	0.000
2	209	83-04-05.50	47.17	0.000	0.000
2	210	83-09-20.40	46.62	0.000	0.000
2	211	83-08-10.60	46.76	0.000	0.000
2	200	81-46-21.40	68.29	0.000	0.000
2	201	83-05-39.20	41.04	0.000	0.000
2	202	78-20-55.40	68.51	0.000	0.000
2	203	83-04-33.40	36.27	0.000	0.000



From	To	Bearing	StdErr	FIXED	200	203
204	79-13-10.30	46.39	0.000	0.000	0.000	2
205	79-13-54.00	46.35	0.000	0.000	0.000	2
206	79-16-21.00	46.18	0.000	0.000	0.000	2
207	79-15-42.20	46.22	0.000	0.000	0.000	2
208	83-02-53.60	47.32	0.000	0.000	0.000	2
209	83-04-33.00	47.17	0.000	0.000	0.000	2
210	83-09-28.90	46.62	0.000	0.000	0.000	2
211	83-08-04.00	46.76	0.000	0.000	0.000	2
200	73-53-53.70	129.15	0.000	0.000	0.000	3
201	74-23-18.90	89.38	0.000	0.000	0.000	3
202	80-13-10.30	57.49	0.000	0.000	0.000	3
203	81-06-11.60	45.99	0.000	0.000	0.000	3
204	74-10-19.00	66.46	0.000	0.000	0.000	3
205	74-15-12.30	66.16	0.000	0.000	0.000	3
206	74-17-36.10	66.01	0.000	0.000	0.000	3
207	74-12-45.00	66.30	0.000	0.000	0.000	3
200	73-53-54.90	129.15	0.000	0.000	0.000	3
201	74-23-25.00	89.38	0.000	0.000	0.000	3
202	80-13-09.00	57.49	0.000	0.000	0.000	3
203	81-06-18.50	45.99	0.000	0.000	0.000	3
204	74-10-09.60	66.46	0.000	0.000	0.000	3
205	74-15-08.10	66.16	0.000	0.000	0.000	3
206	74-17-37.40	66.01	0.000	0.000	0.000	3
207	74-12-39.40	66.30	0.000	0.000	0.000	3

Number of Azimuth/Bearing Observations (DMS) = 1

Adjustment Statistical Summary

=====  
Convergence Iterations = 5  
Number of Stations = 15  
Number of Observations = 250  
Number of Unknowns = 42  
Number of Redundant Obs = 208

Observation	Count	Sum Squares of StdRes	Error Factor
Coordinates	7	0.131	0.150
Angles	74	5.111	0.288
Distances	90	19.495	0.510
Az/Bearings	1	0.000	0.000
Zeniths	78	8.699	0.366
Total	250	33.436	0.401

Warning: The Chi-Square Test at 5.00% Level Exceeded Lower Bound  
Lower/Upper Bounds (0.904/1.096)

Adjusted Coordinates (Meters)

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Station      N           E           Elev  Description
1            -1.0057      7.6090     -1.4672 TR_XCT
209          4.2512     -0.1422      0.0000 CAMERA
203          0.0000      0.0000      0.4550 TAIL
200          9.0140      0.0000     -0.2767 NOSE
2           14.8707      6.0690     -1.4956 TR_XCT
3           12.2140     -2.8106     -1.5062 TR_XCT
202          6.6183      5.4354      0.2108 WING
204          4.3033     -0.2613      0.8493 GPS
205          4.2693     -0.2274      0.8492 GPS
206          4.2354     -0.2615      0.8483 GPS
207          4.2694     -0.2954      0.8497 GPS
208          4.3614     -0.2510     -0.0000 CAMERA
210          4.1424     -0.2524     -0.0010 CAMERA
211          4.2526     -0.3612     -0.0010 CAMERA
201          6.6238     -5.4492      0.2205 WING

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Adjusted Observations and Residuals

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Adjusted Coordinate Observations (Meters)  
 (Stations with Partially Fixed Coordinate Components)

Station	Component	Adj Coordinate	Residual	StdErr	StdRes
204	Elev	0.8493	0.0001	0.0005	0.2
205	Elev	0.8492	0.0000	0.0005	0.0
206	Elev	0.8483	0.0001	0.0005	0.3
207	Elev	0.8497	-0.0000	0.0005	0.1
208	Elev	-0.0000	-0.0000	0.0005	0.1
210	Elev	-0.0010	-0.0000	0.0005	0.0
211	Elev	-0.0010	-0.0000	0.0005	0.1

Adjusted Angle Observations (DMS)

At	From	To	Angle	Residual	StdErr	StdRes
208	209	211	90-00-00.00	-0-00-00.00	FIXED	0.0
211	208	210	90-00-00.00	0-00-00.00	FIXED	0.0
210	211	209	90-00-00.00	-0-00-00.00	FIXED	0.0
209	210	208	90-00-00.00	0-00-00.00	FIXED	0.0
204	205	207	90-00-00.00	0-00-00.00	0.00	0.0
207	204	206	90-00-00.00	-0-00-00.00	0.00	0.0
206	207	205	90-00-00.00	0-00-00.00	0.00	0.0
205	206	204	90-00-00.00	-0-00-00.00	0.00	0.0
1	2	3	327-17-44.79	0-00-02.29	5.00	0.5
1	3	2	32-42-15.21	-0-00-05.29	5.00	1.1
2	1	3	78-53-00.78	-0-00-04.02	5.00	0.8
2	3	1	281-06-59.22	0-00-00.22	5.00	0.0
3	1	2	291-35-15.99	0-00-01.79	5.00	0.4
3	2	1	68-24-44.01	-0-00-02.99	5.00	0.6
1	2	202	349-37-39.04	-0-00-15.46	58.32	0.3
1	2	203	283-04-10.42	-0-00-00.08	59.86	0.0
1	2	204	309-32-32.87	-0-00-04.13	50.81	0.1
1	2	205	309-29-10.71	-0-00-01.29	51.00	0.0
1	2	206	309-12-02.20	0-00-04.20	50.96	0.1
1	2	207	309-15-29.26	0-00-01.26	50.78	0.0
1	2	208	309-52-00.73	-0-00-27.77	50.72	0.5
1	2	209	309-41-07.43	0-00-02.93	51.32	0.1
1	2	210	308-45-33.12	0-00-02.62	51.20	0.1
1	2	211	308-57-17.24	0-00-13.74	50.60	0.3
1	3	202	22-19-54.25	-0-00-11.25	57.74	0.2
1	3	203	315-46-25.63	0-00-01.63	59.28	0.0
1	3	204	342-14-48.08	-0-00-00.92	50.14	0.0
1	3	205	342-11-25.92	-0-00-01.08	50.33	0.0
1	3	206	341-54-17.40	0-00-04.40	50.29	0.1
1	3	207	341-57-44.46	0-00-03.46	50.10	0.1
1	3	208	342-34-15.93	-0-00-32.07	50.04	0.6
1	3	209	342-23-22.64	0-00-06.14	50.66	0.1
1	3	210	341-27-48.32	-0-00-10.18	50.53	0.2
1	3	211	341-39-32.45	0-00-11.45	49.92	0.2
2	1	200	51-33-35.99	0-00-09.49	55.55	0.2
2	1	201	59-56-16.54	-0-00-02.96	39.27	0.1
2	1	202	9-55-50.16	0-00-03.16	56.37	0.1
2	1	203	27-44-29.90	-0-00-05.60	36.79	0.2
2	1	204	36-27-49.70	-0-00-12.80	42.61	0.3
2	1	205	36-14-50.76	-0-00-22.24	42.58	0.5
2	1	206	36-18-10.07	-0-00-23.93	42.48	0.6
2	1	207	36-31-06.27	-0-00-10.23	42.51	0.2
2	1	208	36-33-41.87	-0-00-03.63	42.73	0.1
2	1	209	35-51-46.83	-0-00-03.17	42.64	0.1
2	1	210	36-02-52.86	-0-00-03.14	42.32	0.1
2	1	211	36-44-19.64	-0-00-07.86	42.40	0.2
2	3	200	332-40-35.21	0-00-19.21	66.32	0.3

2	3	201	341-03-15.76	0-00-11.26	53.42	0.2
2	3	202	291-02-49.38	0-00-05.88	67.01	0.1
2	3	203	308-51-29.12	0-00-01.62	51.63	0.0
2	3	204	317-34-48.91	-0-00-16.09	55.92	0.3
2	3	205	317-21-49.98	-0-00-11.52	55.91	0.2
2	3	206	317-25-09.29	0-00-00.79	55.83	0.0
2	3	207	317-38-05.49	-0-00-04.51	55.85	0.1
2	3	208	317-40-41.08	-0-00-12.42	56.02	0.2
2	3	209	316-58-46.04	0-00-16.04	55.95	0.3
2	3	210	317-09-52.08	0-00-02.08	55.71	0.0
2	3	211	317-51-18.85	-0-00-07.65	55.77	0.1
3	1	200	356-57-06.97	-0-00-14.03	100.04	0.1
3	1	201	63-30-43.62	0-00-08.62	71.27	0.1
3	1	202	342-24-20.18	-0-00-16.82	48.37	0.3
3	1	203	25-17-09.64	0-00-04.14	41.34	0.1
3	1	204	20-22-58.90	0-00-06.40	55.58	0.1
3	1	205	20-14-00.12	0-00-05.62	55.35	0.1
3	1	206	20-31-35.86	0-00-05.36	55.24	0.1
3	1	207	20-40-38.64	0-00-00.14	55.46	0.0
3	2	200	65-21-50.98	-0-00-21.02	106.71	0.2
3	2	201	131-55-27.63	-0-00-04.37	80.37	0.1
3	2	202	50-49-04.19	-0-00-07.81	60.99	0.1
3	2	203	93-41-53.65	0-00-14.15	55.58	0.3
3	2	204	88-47-42.91	-0-00-04.59	66.86	0.1
3	2	205	88-38-44.13	0-00-02.63	66.67	0.0
3	2	206	88-56-19.87	-0-00-03.63	66.57	0.1
3	2	207	89-05-22.65	-0-00-05.85	66.76	0.1

Adjusted Distance Observations (Meters)

From	To	Distance	Residual	StdErr	StdRes
208	209	0.1548	-0.0007	0.0005	1.3
209	210	0.1549	-0.0006	0.0005	1.3
210	211	0.1548	-0.0007	0.0005	1.3
211	208	0.1549	-0.0006	0.0005	1.3
208	210	0.2190	0.0010	0.0005	2.0
209	211	0.2190	0.0010	0.0005	2.0
204	205	0.0480	0.0000	0.0005	0.1
205	206	0.0481	0.0001	0.0005	0.1
206	207	0.0480	0.0000	0.0005	0.1
207	204	0.0481	0.0001	0.0005	0.1
204	206	0.0680	-0.0000	0.0005	0.1
205	207	0.0679	-0.0001	0.0005	0.1
1	2	15.9510	-0.0001	0.0020	0.0
1	3	16.8324	-0.0006	0.0020	0.3
1	2	15.9510	-0.0003	0.0020	0.2
1	3	16.8324	-0.0006	0.0020	0.3
1	2	15.9510	-0.0001	0.0020	0.0
1	3	16.8324	-0.0001	0.0020	0.1
2	1	15.9510	-0.0001	0.0020	0.0
2	3	9.2685	0.0012	0.0020	0.6
2	1	15.9510	-0.0003	0.0020	0.2
2	3	9.2685	0.0015	0.0020	0.7
2	1	15.9510	-0.0001	0.0020	0.0
2	3	9.2685	0.0010	0.0020	0.5
3	1	16.8324	-0.0006	0.0020	0.3
3	2	9.2685	0.0007	0.0020	0.4
3	1	16.8324	-0.0006	0.0020	0.3
3	2	9.2685	0.0010	0.0020	0.5
3	1	16.8324	-0.0011	0.0020	0.6
3	2	9.2685	0.0010	0.0020	0.5
1	202	8.1034	0.0002	0.0029	0.1
1	203	7.9122	0.0000	0.0029	0.0
1	204	9.7721	0.0006	0.0029	0.2
1	205	9.7263	0.0006	0.0029	0.2
1	206	9.7353	0.0008	0.0029	0.3

1	207	9.7813	0.0006	0.0029	0.2
1	208	9.6300	-0.0006	0.0029	0.2
1	209	9.4799	0.0006	0.0029	0.2
1	210	9.5108	-0.0003	0.0029	0.1
1	211	9.6604	0.0002	0.0029	0.1
1	202	8.1034	0.0004	0.0029	0.1
1	203	7.9122	-0.0004	0.0029	0.2
1	204	9.7721	0.0006	0.0029	0.2
1	205	9.7263	0.0006	0.0029	0.2
1	206	9.7353	-0.0002	0.0029	0.1
1	207	9.7813	0.0005	0.0029	0.2
1	208	9.6300	-0.0002	0.0029	0.1
1	209	9.4799	0.0011	0.0029	0.4
1	210	9.5108	0.0008	0.0029	0.3
1	211	9.6604	0.0003	0.0029	0.1
2	200	8.5217	0.0003	0.0029	0.1
2	201	14.2697	-0.0002	0.0029	0.1
2	202	8.4508	0.0003	0.0029	0.1
2	203	16.1795	0.0001	0.0029	0.0
2	204	12.5396	0.0004	0.0029	0.2
2	205	12.5512	0.0003	0.0029	0.1
2	206	12.5968	-0.0002	0.0029	0.1
2	207	12.5854	0.0001	0.0029	0.0
2	208	12.3542	0.0006	0.0029	0.2
2	209	12.3932	0.0009	0.0029	0.3
2	210	12.5416	-0.0005	0.0029	0.2
2	211	12.5031	-0.0013	0.0029	0.5
2	200	8.5217	0.0008	0.0029	0.3
2	201	14.2697	-0.0007	0.0029	0.2
2	202	8.4508	-0.0002	0.0029	0.1
2	203	16.1795	0.0000	0.0029	0.0
2	204	12.5396	0.0004	0.0029	0.2
2	205	12.5512	0.0003	0.0029	0.1
2	206	12.5968	-0.0003	0.0029	0.1
2	207	12.5854	0.0006	0.0029	0.2
2	208	12.3542	0.0001	0.0029	0.0
2	209	12.3932	-0.0004	0.0029	0.2
2	210	12.5416	-0.0010	0.0029	0.3
2	211	12.5031	-0.0003	0.0029	0.1
3	200	4.4330	0.0005	0.0029	0.2
3	201	6.4183	0.0004	0.0029	0.1
3	202	10.1122	0.0009	0.0029	0.3
3	203	12.6857	-0.0003	0.0029	0.1
3	204	8.6386	-0.0006	0.0029	0.2
3	205	8.6798	-0.0004	0.0029	0.1
3	206	8.7006	-0.0008	0.0029	0.3
3	207	8.6598	-0.0007	0.0029	0.2
3	200	4.4330	0.0011	0.0029	0.4
3	201	6.4183	0.0004	0.0029	0.1
3	202	10.1122	0.0004	0.0029	0.1
3	203	12.6857	-0.0003	0.0029	0.1
3	204	8.6386	-0.0002	0.0029	0.1
3	205	8.6798	-0.0004	0.0029	0.1
3	206	8.7006	-0.0013	0.0029	0.5
3	207	8.6598	-0.0002	0.0029	0.1

Adjusted Zenith Observations (DMS)

From	To	Zenith	Residual	StdErr	StdRes
1	2	90-06-07.06	-0-00-01.14	5.00	0.2
1	3	90-07-57.42	0-00-01.32	5.00	0.3
1	2	90-06-07.06	0-00-01.36	5.00	0.3
1	3	90-07-57.42	0-00-01.12	5.00	0.2
1	2	90-06-07.06	-0-00-01.64	5.00	0.3
1	3	90-07-57.42	-0-00-03.88	5.00	0.8
2	1	89-53-53.38	0-00-01.38	5.00	0.3

2	3	90-03-55.41	0-00-06.71	5.00	1.3
2	1	89-53-53.38	-0-00-00.92	5.00	0.2
2	3	90-03-55.41	0-00-05.21	5.00	1.0
2	1	89-53-53.38	-0-00-02.92	5.00	0.6
2	3	90-03-55.41	-0-00-00.29	5.00	0.1
3	1	89-52-03.05	-0-00-01.65	5.00	0.3
3	2	89-56-04.85	0-00-04.85	5.00	1.0
3	1	89-52-03.05	-0-00-00.15	5.00	0.0
3	2	89-56-04.85	0-00-03.05	5.00	0.6
3	1	89-52-03.05	-0-00-00.65	5.00	0.1
3	2	89-56-04.85	0-00-03.05	5.00	0.6
1	202	78-02-55.06	-0-00-39.44	71.39	0.6
1	203	75-56-23.80	-0-00-09.00	72.81	0.1
1	204	76-17-13.80	0-00-05.40	59.07	0.1
1	205	76-13-18.70	-0-00-02.30	59.34	0.0
1	206	76-14-24.51	0-00-09.81	59.29	0.2
1	207	76-17-53.35	-0-00-11.65	59.02	0.2
1	208	81-14-11.45	-0-00-18.05	60.44	0.3
1	209	81-05-46.95	-0-00-28.15	61.38	0.5
1	210	81-07-54.04	0-00-02.84	61.18	0.0
1	211	81-16-12.73	-0-00-04.77	60.25	0.1
1	202	78-02-55.06	-0-00-01.94	71.39	0.0
1	203	75-56-23.80	-0-00-16.40	72.81	0.2
1	204	76-17-13.80	0-00-04.90	59.07	0.1
1	205	76-13-18.70	-0-00-01.30	59.34	0.0
1	206	76-14-24.51	0-00-08.21	59.29	0.1
1	207	76-17-53.35	-0-00-08.85	59.02	0.1
1	208	81-14-11.45	-0-00-07.95	60.44	0.1
1	209	81-05-46.95	-0-00-27.75	61.38	0.5
1	210	81-07-54.04	-0-00-06.06	61.18	0.1
1	211	81-16-12.73	-0-00-11.07	60.25	0.2
2	200	81-46-34.60	0-00-04.10	68.29	0.1
2	201	83-05-34.10	-0-00-07.70	41.04	0.2
2	202	78-21-01.58	0-00-00.98	68.51	0.0
2	203	83-04-32.77	-0-00-04.03	36.27	0.1
2	204	79-13-20.07	0-00-09.77	46.39	0.2
2	205	79-13-57.95	0-00-03.95	46.35	0.1
2	206	79-16-34.62	0-00-04.82	46.18	0.1
2	207	79-15-37.12	-0-00-06.68	46.22	0.1
2	208	83-02-48.85	0-00-02.85	47.32	0.1
2	209	83-04-07.34	0-00-01.84	47.17	0.0
2	210	83-09-20.88	0-00-00.48	46.62	0.0
2	211	83-08-04.77	-0-00-05.83	46.76	0.1
2	200	81-46-34.60	0-00-13.20	68.29	0.2
2	201	83-05-34.10	-0-00-05.10	41.04	0.1
2	202	78-21-01.58	0-00-06.18	68.51	0.1
2	203	83-04-32.77	-0-00-00.63	36.27	0.0
2	204	79-13-20.07	0-00-09.77	46.39	0.2
2	205	79-13-57.95	0-00-03.95	46.35	0.1
2	206	79-16-34.62	0-00-13.62	46.18	0.3
2	207	79-15-37.12	-0-00-05.08	46.22	0.1
2	208	83-02-48.85	-0-00-04.75	47.32	0.1
2	209	83-04-07.34	-0-00-25.66	47.17	0.5
2	210	83-09-20.88	-0-00-08.02	46.62	0.2
2	211	83-08-04.77	0-00-00.77	46.76	0.0
3	200	73-53-51.06	-0-00-02.64	129.15	0.0
3	201	74-23-37.48	0-00-18.58	89.38	0.2
3	202	80-13-26.71	0-00-16.41	57.49	0.3
3	203	81-06-24.48	0-00-12.88	45.99	0.3
3	204	74-10-36.78	0-00-17.78	66.46	0.3
3	205	74-15-16.21	0-00-03.91	66.16	0.1
3	206	74-17-56.89	0-00-20.79	66.01	0.3
3	207	74-12-51.09	0-00-06.09	66.30	0.1
3	200	73-53-51.06	-0-00-03.84	129.15	0.0
3	201	74-23-37.48	0-00-12.48	89.38	0.1
3	202	80-13-26.71	0-00-17.71	57.49	0.3

3	203	81-06-24.48	0-00-05.98	45.99	0.1
3	204	74-10-36.78	0-00-27.18	66.46	0.4
3	205	74-15-16.21	0-00-08.11	66.16	0.1
3	206	74-17-56.89	0-00-19.49	66.01	0.3
3	207	74-12-51.09	0-00-11.69	66.30	0.2

Adjusted Azimuth/Bearing Observations (DMS)

From	To	Bearing	Residual	StdErr	StdRes
203	200	N00-00-00.00E	0-00-00.00	FIXED	0.0



Adjusted Bearings (DMS) and Horizontal Distances (Meters)

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 (Relative Confidence of Bearing is in Seconds)

From	To	Bearing	Distance	95% RelConfidence		
				Brg	Dist	PPM
1	2	N05-32-26.15W	15.9509	97.84	0.0011	66.5973
1	3	N38-14-41.36W	16.8324	97.82	0.0011	65.9950
1	202	N15-54-47.11W	7.9278	116.66	0.0029	363.5684
1	203	N82-28-15.73W	7.6752	123.78	0.0030	391.0220
1	204	N55-59-53.28W	9.4936	103.72	0.0019	202.8333
1	205	N56-03-15.44W	9.4465	105.43	0.0017	183.5668
1	206	N56-20-23.96W	9.4559	103.77	0.0019	204.1308
1	207	N56-16-56.90W	9.5030	105.34	0.0017	182.3163
1	208	N55-40-25.43W	9.5176	106.39	0.0023	237.4225
1	209	N55-51-18.72W	9.3657	108.20	0.0020	214.6910
1	210	N56-46-53.04W	9.3971	105.95	0.0023	239.5119
1	211	N56-35-08.91W	9.5485	108.93	0.0020	208.6359
2	3	S73-20-34.63W	9.2685	97.91	0.0007	80.8443
2	200	S46-01-09.84W	8.4341	155.20	0.0030	356.7943
2	201	S54-23-50.38W	14.1662	108.92	0.0034	242.3460
2	202	S04-23-24.01W	8.2767	116.07	0.0028	337.7254
2	203	S22-12-03.75W	16.0615	78.39	0.0027	165.1218
2	204	S30-55-23.54W	12.3184	102.67	0.0016	128.7244
2	205	S30-42-24.61W	12.3302	101.45	0.0018	150.0064
2	206	S30-45-43.92W	12.3768	102.65	0.0016	128.1282
2	207	S30-58-40.12W	12.3650	101.44	0.0018	149.2278
2	208	S31-01-15.71W	12.2633	104.68	0.0019	154.5438
2	209	S30-19-20.67W	12.3026	102.79	0.0022	175.4850
2	210	S30-30-26.71W	12.4522	104.45	0.0018	147.9825
2	211	S31-11-53.48W	12.4134	102.74	0.0022	180.2809
200	3	N41-17-34.39W	4.2590	212.18	0.0033	767.6005
200	203	S00-00-00.00W	9.0140	0.00	0.0040	447.3593
201	3	N25-16-02.26E	6.1817	143.11	0.0036	574.7405
202	3	N55-50-21.18W	9.9654	111.69	0.0027	271.4174
203	3	N12-57-31.72W	12.5332	74.95	0.0026	203.9407
204	3	N17-51-42.46W	8.3113	108.12	0.0015	186.2235
204	205	S44-53-02.03E	0.0480	8119.84	0.0007	15028.9123
204	206	S00-08-04.64W	0.0679	8485.25	0.0006	8782.9976
204	207	S45-06-57.97W	0.0481	8119.84	0.0007	14908.6934
205	3	N18-00-41.24W	8.3541	103.71	0.0020	236.7515
205	206	S45-06-57.97W	0.0481	8119.84	0.0007	14908.6934
205	207	N89-54-08.71W	0.0679	8506.83	0.0006	8782.9976
206	3	N17-43-05.50W	8.3759	108.02	0.0015	184.7112
206	207	N44-53-02.03W	0.0480	8119.84	0.0007	15028.9123
207	3	N17-34-02.72W	8.3332	103.71	0.0020	237.5298
208	209	S44-37-43.49E	0.1548	3068.35	0.0007	4708.2201
208	210	S00-22-33.70W	0.2190	3167.02	0.0006	2741.6132
208	211	S45-22-16.51W	0.1549	3068.35	0.0007	4694.7891
209	210	S45-22-16.51W	0.1549	3068.35	0.0007	4694.7891
209	211	N89-38-00.69W	0.2190	3168.72	0.0006	2741.6135
210	211	N44-37-43.49W	0.1548	3068.35	0.0007	4708.2201

Error Propagation

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Station Coordinate Standard Deviations (Meters)

Station	N	E	Elev
1	0.001781	0.001368	0.000482
209	0.001305	0.001171	0.000000
203	0.000000	0.000000	0.001248
200	0.001647	0.000000	0.001481
2	0.001540	0.002241	0.000480
3	0.001186	0.001774	0.000482
202	0.001833	0.001422	0.001243
204	0.001181	0.001188	0.000465
205	0.001307	0.001051	0.000465
206	0.001181	0.001192	0.000464
207	0.001307	0.001051	0.000464
208	0.001160	0.001380	0.000474
210	0.001167	0.001325	0.000474
211	0.001385	0.001173	0.000474
201	0.002080	0.001638	0.001486

Station Coordinate Error Ellipses (Meters)

Confidence Region = 95%

Station	Semi-Major Axis	Semi-Minor Axis	Azimuth of Major Axis	Elev
1	0.004992	0.002302	33-17	0.000944
209	0.003209	0.002849	12-01	0.000000
203	0.000000	0.000000	0-00	0.002446
200	0.004032	0.000000	0-00	0.002903
2	0.006149	0.002547	119-47	0.000941
3	0.004608	0.002458	66-39	0.000945
202	0.004591	0.003344	162-04	0.002437
204	0.002915	0.002885	61-25	0.000910
205	0.003201	0.002573	1-28	0.000910
206	0.002923	0.002886	67-23	0.000910
207	0.003199	0.002573	1-09	0.000910
208	0.003412	0.002799	75-51	0.000930
210	0.003252	0.002845	81-04	0.000930
211	0.003426	0.002828	14-49	0.000930
201	0.005232	0.003824	19-43	0.002913

Relative Error Ellipses (Meters)

Confidence Region = 95%

Stations From	To	Semi-Major Axis	Semi-Minor Axis	Azimuth of Major Axis	Vertical
1	2	0.007566	0.001062	84-11	0.000236
1	3	0.007983	0.001110	51-26	0.000239
1	202	0.004484	0.002882	73-41	0.002255
1	203	0.004992	0.002302	33-17	0.002264
1	204	0.004775	0.001923	35-23	0.001201
1	205	0.004836	0.001711	30-23	0.001201
1	206	0.004758	0.001927	35-03	0.001200
1	207	0.004861	0.001710	30-12	0.001201
1	208	0.004920	0.002235	38-41	0.001250
1	209	0.004920	0.001995	30-54	0.000944
1	210	0.004835	0.002234	36-55	0.001250
1	211	0.005050	0.001974	30-07	0.001250
2	3	0.004400	0.000749	163-00	0.000166
2	200	0.006433	0.002820	125-33	0.002748
2	201	0.007483	0.003429	145-54	0.002759
2	202	0.004659	0.002792	96-24	0.002253
2	203	0.006149	0.002547	119-47	0.002262

2	204	0.006133	0.001580	119-39	0.001198
2	205	0.006066	0.001844	122-11	0.001198
2	206	0.006161	0.001580	119-30	0.001198
2	207	0.006083	0.001839	122-27	0.001198
2	208	0.006228	0.001880	118-44	0.001248
2	209	0.006133	0.002152	122-05	0.000941
2	210	0.006309	0.001832	118-37	0.001248
2	211	0.006186	0.002229	123-10	0.001248
200	3	0.004514	0.003083	67-58	0.002748
200	203	0.004032	0.000000	0-00	0.003558
201	3	0.004290	0.003551	117-49	0.002759
202	3	0.005400	0.002697	31-37	0.002253
203	3	0.004608	0.002458	66-39	0.002262
204	3	0.004360	0.001538	74-34	0.001200
204	205	0.001891	0.000722	45-02	0.001270
204	206	0.002795	0.000597	90-10	0.001270
204	207	0.001892	0.000717	135-13	0.001270
205	3	0.004202	0.001975	70-20	0.001200
205	206	0.001892	0.000717	135-13	0.001270
205	207	0.002802	0.000597	0-04	0.001270
206	3	0.004390	0.001538	74-41	0.001200
206	207	0.001891	0.000722	45-02	0.001270
207	3	0.004191	0.001977	70-50	0.001200
208	209	0.002303	0.000729	45-26	0.000930
208	210	0.003362	0.000600	90-27	0.001307
208	211	0.002304	0.000727	135-28	0.001307
209	210	0.002304	0.000727	135-28	0.000930
209	211	0.003364	0.000600	0-26	0.000930
210	211	0.002303	0.000729	45-26	0.001307

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 02 00000032 Instrument Standard Error Settings  
 03 00000034 Project Default Instrument  
 03 00000048 Project Library Instrument Sideshots  
 03 00000063 Project Library Instrument Traverse  
 01 00000078 Summary of Unadjusted Input Observations  
 02 00000081 Entered Stations  
 03 00000083 Partially Fixed Coordinates  
 03 00000104 Free Coordinates  
 02 00000112 Angle Observations  
 02 00000190 Distance Observations  
 02 00000284 Zenith Observations  
 02 00000366 Azimuth/Bearing Observations  
 01 00000371 Adjustment Statistical Summary  
 01 00000395 Adjusted Coordinates  
 01 00000415 Adjusted Observations and Residuals  
 02 00000418 Adjusted Coordinate Observations  
 02 00000430 Adjusted Angle Observations  
 02 00000508 Adjusted Distance Observations  
 02 00000602 Adjusted Zenith Observations  
 02 00000684 Adjusted Azimuth/Bearing Observations  
 01 00000689 Adjusted Bearings and Horizontal Distances  
 01 00000742 Error Propagation  
 02 00000745 Station Coordinate Standard Deviations  
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 02 00000785 Relative Error Ellipses  
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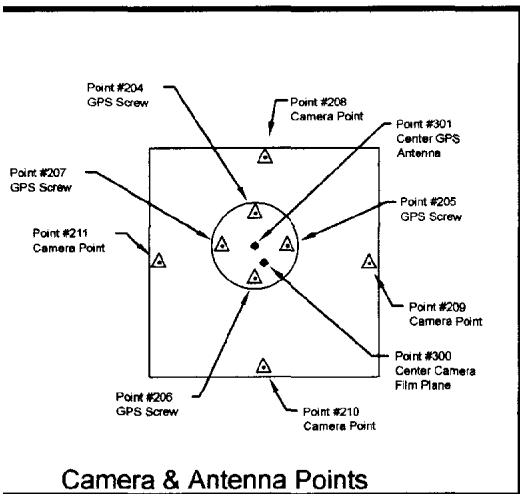
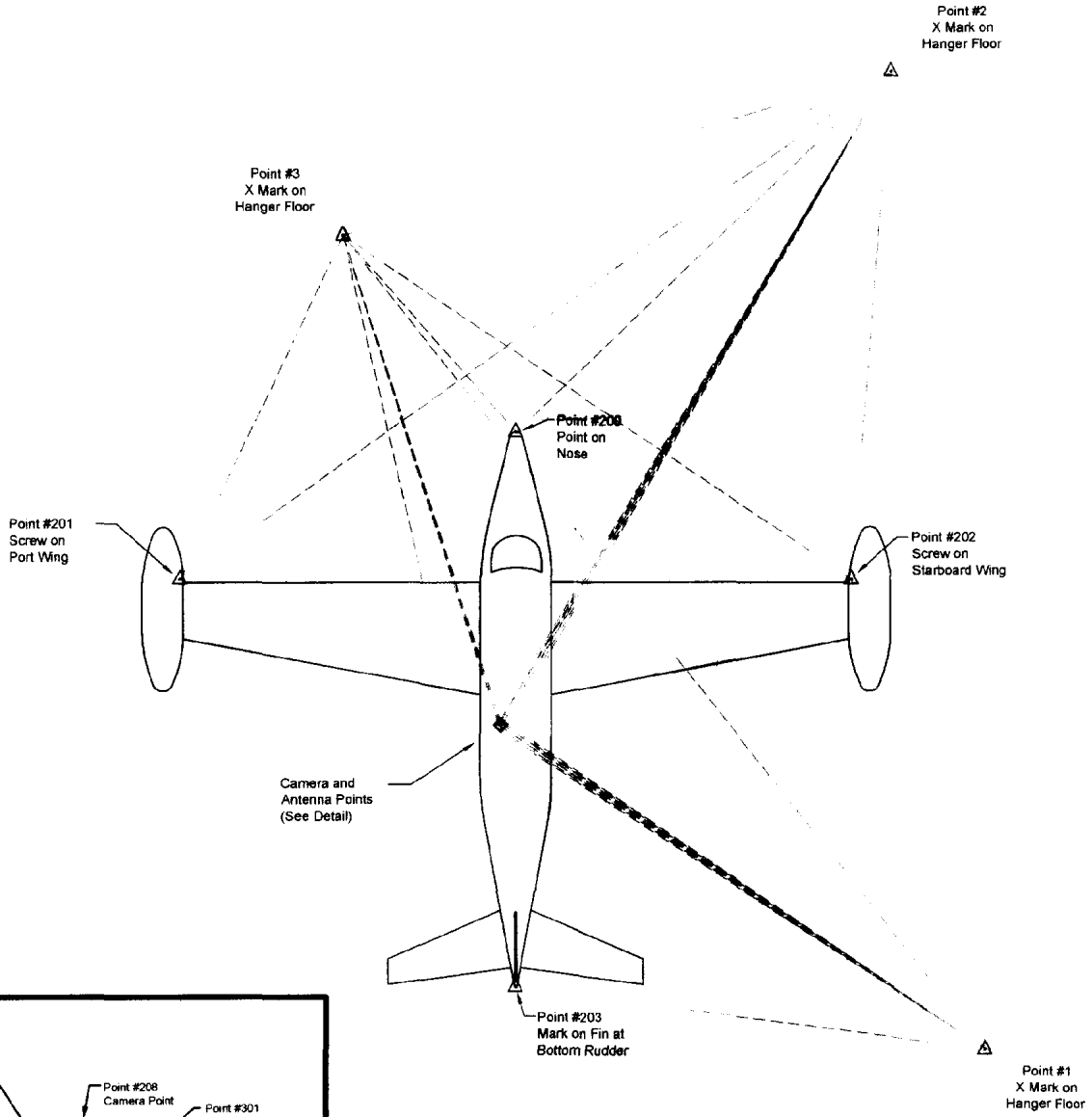
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**GEOD**

SURVEYING & AERIAL MAPPING  
Executive Office

18-24 Kanouse Road, Newfoundland, New Jersey 07435



Camera & Antenna Points

Aircraft No. N69622

**Final Coordinates**  
**Project: 1608**  
**Client: Keystone Aerial Surveys**  
**Aircraft: N6098X**

**GEOD Corporation**  
**March 22, 2004**

Point	X Coordinate (Meters)	Y Coordinate (Meters)	Elevation (Meters)	Description
1	7.6090	-1.0057	-1.4672	TR-XCT
2	6.0690	14.8707	-1.4956	TR-XCT
3	-2.8106	12.2140	-1.5062	TR-XCT
200	0.0000	9.0140	-0.2767	NOSE POINT
201	-5.4492	6.6238	0.2205	WING POINT
202	5.4354	6.6183	0.2108	WING POINT
203	0.0000	0.0000	0.4550	TAIL POINT
204	-0.2613	4.3033	0.8493	GPS SCREW
205	-0.2274	4.2693	0.8492	GPS SCREW
206	-0.2615	4.2354	0.8483	GPS SCREW
207	-0.2954	4.2694	0.8497	GPS SCREW
208	-0.2510	4.3614	0.0000	CAMERA POINT
209	-0.1422	4.2512	0.0000	CAMERA POINT
210	-0.2524	4.1424	-0.0010	CAMERA POINT
211	-0.3612	4.2526	-0.0010	CAMERA POINT
300	-0.2517	4.2519	0.0005	CENTER FILM PLANE
301	-0.2614	4.2694	0.8582	CENTER GPS ANT @ TOP DOME

**NOTES:**

The calculated centerline of the GPS antenna is 0.97 cm. port of the calculated centerline of the camera film plane.

The calculated centerline of the GPS antenna is 1.75 cm. forward of the calculated centerline of the camera film plane.

The measured elevation of the top of the dome of the GPS antenna is 85.77 cm. higher then the calculated centerline of the camera film plane.