

REVIEW OF ANNUAL LOT 4
DUTCHESS AND PUTNAM COUNTY
AEROTRIANGULATION RESULTS FROM AEROMETRIC
BY
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
DESIGN SERVICES BUREAU PHOTOGRAMMETRY SECTION
FOR
CYBER SECURITY AND CRITICAL INFRASTRUCTURE COORDINATION

November 30, 2004

The Aerometric Aerotriangulation Adjustment is acceptable

Contract Required File Submittals

In accordance with the contract specifications, all required files were submitted for review. The adjustment report was well presented and the plots were a great help in analyzing the data. The adjustment consists of 1281 digital imagery (nominal scale 1:25 400)

Photography Analysis

The digital imagery was flown with a Z(I DMC with a calibrated focal length of 120 mm. The digital imagery covers the ortho tile areas well. No strip transitions were noted due to re-flights or other possible constraints.

The Root Mean Square Error (RMS) of the Airborne GPS after shift/drift correction is $X = 0.256$ ft, $Y = 0.198$ ft and $Z = 4.301$ ft. The camera/antenna offset was not entered during the aerotriangulation adjustment but calculated as part of the shift/drift correction. The surveyed values for the camera/antenna offset are $X = 0.037$ ft, $Y = 0.085$ ft and $Z = 4.203$ ft. The differences between the computed offset values and surveyed values are within the accuracy of Airborne GPS position determination. The results are similar to the results of Annual Lot 2 and 3. This is an excellent result that contributed to the success of the adjustment. The flight lines were well executed and on line.

The average elevation for the high level photography is 10 000 ft above the terrain as calculated from a digital terrain model generated from the tie points. The range of flying height above

terrain is 8 800 to 10 500 feet and equates to a scale range of 22 300 – 26 800. A 12 micron pixel will give a maximum pixel resolution of 1.0 ft at the maximum scale of 1: 26 800. The 12 micron resolution thus will support the 1 foot ortho imagery.

The photography component was well executed with good coverage. The Airborne GPS data collection was excellent. The final results from the Airborne GPS were almost 3 times as good as in Annual Lot 1 and very similar to Annual Lot 2 and 3.

Control Analysis

A combination of targeted and non targeted control points and Airborne GPS points are used to control the block. The 42 horizontal control points cover the area to be controlled well. Of the 42 control points 23 were ties points to other counties, 15 were horizontal/vertical targeted control and 4 were vertical only control points as the targets were not found on the imagery. Weighting of the 15 horizontal/vertical and 4 vertical only points at 0.2 ft was appropriate and the highest horizontal residual (0.814 ft) was at point DUT05. The highest vertical residual (1.166 ft) was for point WES102. The horizontal Root Mean Square of the residuals of the targeted points is $X = 0.313$ ft and $Y = 0.375$ and well within tolerance. Block ties to Annual Lot 1 consists of 23 photo identifiable points which were weighted appropriately at 2 ft. The Root Mean Square of the residuals was $X = 1.120$ ft and $Y = 0.783$ ft. Airborne GPS supplemented the control and was weighted 0.1 feet which is lower than we expected indicating that the Airborne GPS was of excellent quality.

Tie Point Analysis

The total number of image points in the block is 79 704. The redundancy of measurements (the number of unknowns divided by the number of observations) at 0.58 is very good. Tie points were generated by automated and manual measurement means. Averages of 62 points per image are recorded.

No tie point anomalies were noted in the aerotriangulation.

Tie to Annual Lot 1

The central aerotriangulation block is also tied to Annual Lot 1 in the west and north with a total of 23 points. The points are evenly distributed along the border. The highest block tie residual is 3.3 ft at block tie point T2004223043. This point is located in Ulster County (Annual Lot 1) just south of Kingston.

Photo Measurements

The Root Mean Square for photo measurements is 2.9 micron in Easting and 2.3 microns in the Northing. The Root Mean Square results are very similar to the aerotriangulation results from Annual Lot 2 and Annual Lot 3

Summary

The flight portion of the project was well executed. The Airborne GPS data collection and processing were well done.

The targeting / survey portion were well executed. Four targets were not located on the photography and were used only as vertical control points.

A good distribution of tie points exists between strips and between individual images.

This aerotriangulation block was well tied to Annual Lot 1.

The aerotriangulation measurements and adjustment were well executed. Control and Airborne GPS were appropriately weighted in the adjustment. The accuracy of this adjustment is very good and exceeds the requirements for this project.

NYSDOT's review indicates that this is a well executed aerotriangulation adjustment.