2013 AEROTRIANGULATION and ORTHORECTIFICATION for

Teton County – 1955 Imagery

Data Development Report

July 2013

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DATA DEVELOPMENT REPORT

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1. Project Information

The purpose of this report is to document the orientation, aerotriangulation, and orthorectification processes and results for the 1955 Teton County Imagery.

Aerial Photography was acquired in the summer of 1955.

Orthorectification was performed in the summer of 2013.

The datums for this project are as follows:

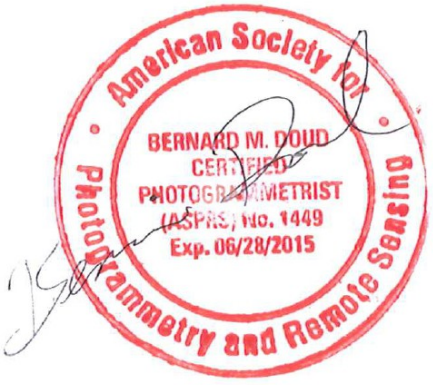
Horizontal Datum: State Plane Wyoming West NAD83 US Feet

Vertical Datum: NAVD88 US Feet

Other relevant project parameters:

Single band, B/W imagery

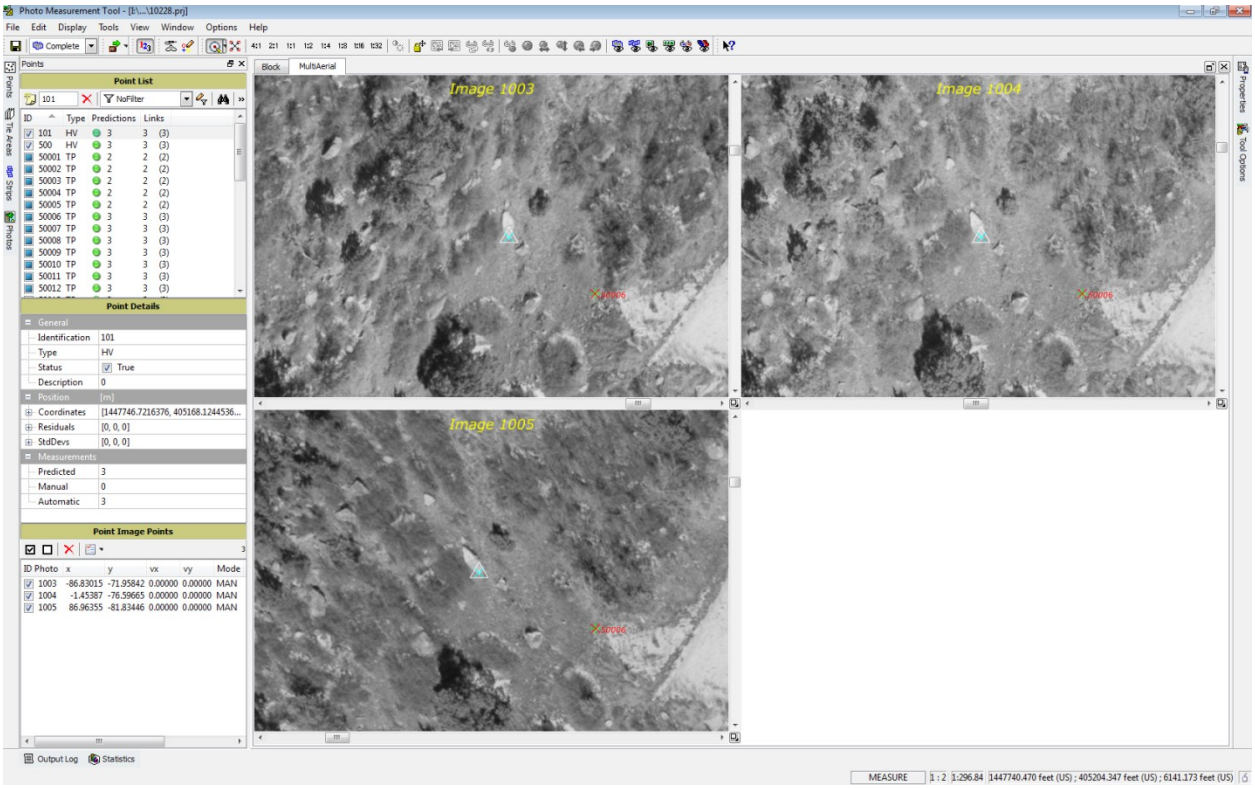
1’ pixel resolution



Bernie Doud, CP, GISP

July 9, 2013

2. Aerotriangulation Process



Trimble-Inpho's Match-AT software (Version 5.5) was utilized to perform fully analytical digital aero-triangulation. Manually measured tie points extended full control for each stereo model.

Camera calibration data was not available for the 1955 flight other than a 210-mm client-provided focal length. The other parameters were approximated based on modern camera calibrations.

In this process we assigned an approximate X-Y value to the center of each image, based on visual matching to the same features in Google Earth. The image block was then stitched together by manually measuring tie points. These points tie each image to its neighbors in the same flightline and also to those in adjacent flightlines. Photo identifiable control points, common to the 1955 imagery and current Google Earth imagery, were identified and measured manually. Out of necessity, many of these were less-than-ideal features such as peaks, saddles, and bushes that had changed minimally over the 58-year time period. These photo IDs, along with tie points and images, were then processed together in a final bundle adjustment to refine the photo

center points and provide the best orientation solution that minimized cumulative error throughout the project.

Once the AT solution was complete, we used Inpho DTMaster (version 5.5) to check every model and ground control point in stereo. We confirmed that some of the expected errors with the photo IDs did exist. These errors were introduced through a variety of factors:

- Imperfect camera calibration
- Minor positional differences between photo IDs over 58 years
- Existing error in Google Earth imagery and terrain surface

The worst resulting errors were vertical in nature and did affect the horizontal integrity of the orthophotos (see Horizontal Accuracy section).

In conjunction with minimizing ground control error, we ensured that all parallax was cleared and that all tie points were on the ground – with no points floating or digging. Our QA/QC procedures aim to find gross errors and correct them before the AT results are passed on to our ortho technicians.

3. Digital Orthorectification Process

An Aero-Graphics-generated 50 foot autocorrelated grid was used for the orthorectification surface, and the digital imagery underwent automatic orthorectification in a one-step batch process using Inpho's OrthoMaster software. Aero-Graphics heavily utilizes Inpho's distributed processing features. This allows multiple idle workstations to process ortho tiles simultaneously and greatly expedites turnaround time.

The orthorectified imagery tiles were then adjusted in Inpho's OrthoVista software to compute subtle radiometric adjustments that compensate for visual effects within individual images. OrthoVista then performed a block-wide brightness/contrast balance by adjusting adjacent images to match. This achieves a uniform appearance across the project. Multiple orthophotos were combined into one seamless, balanced and geometrically-perfect ortho mosaic.

Aero-Graphics then conducted its standard quality control procedures. The orthoimagery was inspected by a QC Inspector completely removed from the project, where linear and above-ground features were reviewed to detect misalignment and warping. In addition, the Project Manager and AT/Ortho Manager spot-checked all deliverables for correct balance, accuracy, and data integrity prior to delivery.

4. Horizontal Accuracy

Foundational accuracy challenges notwithstanding, the final orthophoto was surprisingly accurate in the most important locations. The most appropriate benchmarks to compare the 1955 imagery were 2009 NAIP imagery and USGS 7.5’ quadrangles. Our random spot checks found no horizontal error in many of the flat valley areas, but more significant errors were present near the mountain peaks and ridges.