Camera and Sensor Calibration at the USGS

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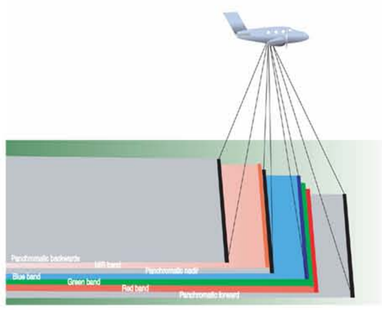
science for a changing world

History

The USGS has been responsible for the characterization and calibration of aerial film cameras since the early 1970s. This mission continues at the USGS Optical Science Lab (OSL), located at USGS Headquarters in Reston, VA. The OSL uses a variety of instruments including a precisely calibrated multi-collimator assembly to determine the radial distortion, decentering, resolution, stereo model flatness, shutter performance and filter transmissivity of aerial film camera systems. Today the OSL continues to provide this critical service to aerial photographers from around the world.

Multi-Collimator Assembly at the USGS Optical Science Laboratory



Digital technologies bring many new technologies to aerial surveying, including multispectral imaging

New Technologies

In 2000 the American Society for Photogrammetry and Remote Sensing (ASPRS) urged the USGS to research the capabilities and potential calibration of digital aerial cameras and sensors. The USGS is now actively researching the capabilities and potential calibration methods for the wide variety of digital airborne cameras through contracts and cooperative efforts between industry, academia and other government agencies.

Product Characterization:

In partnership with NASA's Stennis Space Center the USGS has begun evaluating the accuracy of products derived from digital airborne sensors. Flyers selected from the USGS Cartographic Services Contract (CSC2) have flown over a densely populated target range on the Stennis grounds and delivered ortho products of the range. These products are then analyzed and compared to known ground truth to discern their overall accuracy.

Aerial Photograph of the USGS EROS Data Center in Sioux Falls, SD, one of the target ranges used in Product Characterization

Small- and Medium-format Digital Camera Calibration:

The USGS has established, via a contract with Pictometry, Inc., a laboratory capability for characterizing the geometric performance and stability of small- and medium-format digital cameras. The lab uses a control point cage containing hundreds of control points on three different planes. Analysis of imagery of these points is done using the Australis program developed by Clive Frasier. The lab is operating today at the USGS EROS Data Center today to understand the performance capabilities and limitations of these lower-cost systems.

The Control Point Cage used in digital camera characterization at the USGS EROS Data Center

A digital aerial photograph showing painted targets on an aerial calibration range near Madson, Ohio.

In-Situ Characterization and Calibration:

The USGS has, though a grant to Ohio State University, has developed and is now testing a potential method of calibrating aerial cameras while in flight over a surveyed test range. This method may hold promise for digital cameras and potentially even film cameras. The USGS is actively involved in validating this method through partnerships with industry.

Surveying an aerial target used in *in-situ* camera calibration

Interagency Cooperation:

The USGS is working loosely with other Federal agencies to establish standards and policies for the procurement and use of digital aerial products. These partner agencies include NOAA, NGS, Natural Resourc Conservation Service, Forest Service, Dept. of Agriculture, Corp of Engineers, Fish & Wildlife Service, and NGA.

Interested in Participating?

If you are a camera manufacturer, flyer, aerial data producer or aerial data user and would like to participate in the USGS efforts to improve the calibration and standards for aerial imagery please contact:

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