

Aerial Mapping

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Trimble Navigation Limited



Cornerstone Mapping, the Trimble Digital Sensor System (DSS) and an Infrared Imager: A Case Study in Collaboration & Innovation

Innovative thinking and industrious teamwork result in a unique solution for obtaining directly georeferenced airborne thermal imaging.

Background

Cornerstone Mapping (www.cornerstonemapping.com), based in Lincoln, Nebraska, is a small aerial survey and mapping organization prominent in the geomatics community for providing specialized geospatial image data. The company was formed in 2002 with a mandate of providing high-resolution digital imaging to the growing local GIS community. With a “get-it-done” confidence, Cornerstone has successfully delivered many demanding and unique projects over the past 10 years. To do this they operate two airplanes (a single-engine Cessna 182 and a Piper Saratoga) along with the turnkey Trimble Digital Sensor System (DSS).



White/lighter regions of this thermal image show warmer buildings.

The Challenge: Creating an Energy Consumption Map for the City of Grand Island, Nebraska

The Energy Efficiency and Conservation Block Grant Program, part of the American Recovery and Reinvestment Act of 2009, represents a presidential priority of using the cheapest, cleanest, and most reliable energy technologies available. With funding from this program, the city of Grand Island, Nebraska, sought to help all of its citizens save on energy.

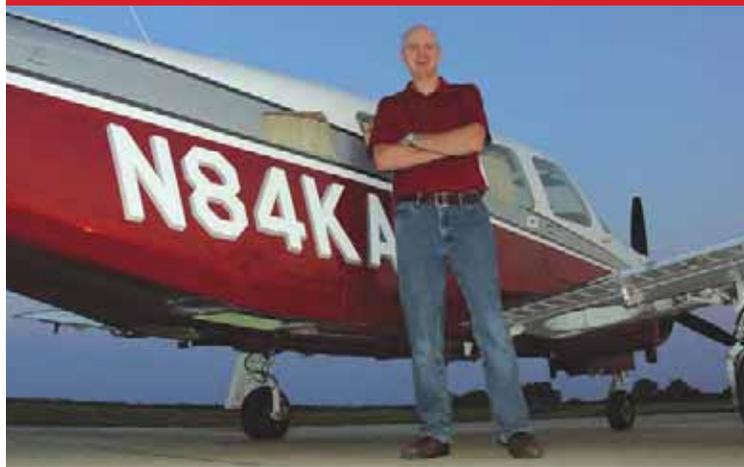
“We decided to create an ‘energy consumption map’ of the entire city area,” said Chad Nability of the city of Grand Island. “Using thermal imaging technology, we wanted to identify specific buildings that could benefit from energy conservation technologies. We were thrilled to find that a local Nebraska firm, Cornerstone Mapping, was uniquely capable of performing this work. We had worked with Cornerstone in the past and we were confident in their ability to deliver what we needed.”

This map would clearly identify buildings that were radiating, or “leaking”, heat into the atmosphere. This information could then be used to educate local residents and businesses about consumption reduction measures they could take to minimize their heating costs. It was necessary that the map be created as cost-effectively as possible, so traditional ground surveying was out of the question. The most efficient approach was to collect thermal infrared and visible images from the air using Direct Georeferencing.

Cornerstone Mapping and a Customized Trimble DSS

Performing a georeferenced airborne thermal imaging project is a formidable challenge because there are no turnkey systems built specifically for that purpose on the market today. A customized solution was necessary. To build that solution, collaboration between Cornerstone Mapping and Applanix (www.applanix.com), a wholly-owned Trimble company (www.trimble.com), was required. Each brought their own specific and unique experiences and expertise to the task.

Trimble has been a leader in Direct Georeferencing for many years with its DSS. The DSS is an “end-to-end” solution, built for producing highly accurate, high-resolution color and color-infrared digital orthophotos and orthomosaics. Including a USGS-certified metric camera, this out-of-the-box solution is the digital



Aaron Schepers, President of Cornerstone Mapping, and his DSS equipped Piper Saratoga. The DSS camera ports under the belly are in green.



Trimble's DSS is a leader in Direct Georeferencing.

imaging standard for aerial survey and remote sensing applications requiring rapid, cost-effective solutions.

The next step was to integrate the thermal imager. As an off-the-shelf mapping solution, the DSS is an ideal platform for further aerial mapping customization and extension, thanks to its flexible architecture and componentized design.

Applanix' POS AV, a hardware and software system specifically designed for directly georeferencing airborne sensor data, is integrated into the DSS and is the source of accurate and reliable positioning and orientation data required for directly georeferencing camera data. The challenge with directly georeferencing thermal data was twofold: physically integrating a third-party infrared imager

with the DSS, and facilitating effective "communication" between the infrared camera and the POS AV.

Cornerstone and the custom-built "DSS Thermal" ultimately performed this project with excellent results. Flying at night – when the temperature difference between indoors and outdoors is maximized, and thermal loading (a condition where sun-warmed objects radiate heat, masking indoor heat loss) is minimized – Cornerstone Mapping surveyed 42 square miles of city territory over 4 hours. Thermal imagery of ½ meter resolution was collected over the entire area, with the camera triggered every 0.8 seconds collecting 5400 frames in total.

The data was developed into individual orthophotos and put together into a single mosaic. This mosaic lined up very

well with the color DSS orthophotos of the same area taken in 2010, allowing a second data layer to be added for the area. The data can now be used by individual homeowners and large building operators to identify areas of heat loss and work toward more energy-efficient buildings. The potential savings are enormous.

Ongoing Collaboration

Cornerstone Mapping identifies Trimble as an industry leader, and one that continues to innovate. "Any company operating in the aerial survey space should look at Trimble and Applanix as partners. They are always innovating, and they support your application, not just their product. That is a big differentiator," explains Schepers.

CORPORATE PROFILE

Trimble Aerial and Land Mobile Mapping

Trimble sees a growing convergence over the next 5–10 years among the fields of land survey, mapping and GIS, and aerial mapping as data processing and expertise are moving into the field. Driving this convergence is the ability to rapidly obtain accurate geospatial data from a variety of sources, including digital imaging, scanning, and GNSS+inertial systems. Rapidly converting this data into answers is the key.

To meet this challenge, Trimble is focused on developing unique technology, solutions and services for the acquisition and exploitation of geospatial data. Trimble's solutions streamline the capture and maintenance of high-accuracy as-built models from the planning phase,

through design and construction, to the subsequent maintenance phase—delivering significant improvements in productivity. This same capability enables the creation of baseline models and post-event updates for emergency rapid response, disaster management, and security applications.

Trimble provides hardware and software for aerial and land mobile mapping, including ruggedized aerial metric cameras and complete turn-key camera/laser scanner systems for airplanes, helicopters, trucks, boats, and other manned and unmanned vehicles.

Trimble's software provides complete workflows for extracting answers rapidly.

Integrated solutions for aerial and land mobile mapping, transportation, utilities and energy transmission and distribution industries, and rapid response

The addition of eCognition image analysis software to Trimble's portfolio of solutions empowers you to develop unique solutions for virtually any geospatial application.

For more information, visit www.trimble.com/buy-geospatial or join the community at www.ecognition.com/community.

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