

## Scientists take to the sky for research

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Rick Perk is doing much more than traveling while flying over land and water in a Piper Saratoga aircraft. The University of Nebraska-Lincoln assistant geoscientist is conducting research.

With the assistance of two on-call pilots—retired Air National Guard pilot Greg Love and Darrell Nelson, retired dean of the Agricultural Research Division—Perk collects remotely sensed image data for researchers associated with universities and governmental agencies across the United States.

UNL's Center for Advanced Land Management Information Technologies has been conducting the research since the early 2000s. That's when a National Science Foundation grant allowed for the purchase of the aircraft and a subsequent NASA EPSCoR (Experimental Project to Stimulate Competitive Research) grant provided money for an Airborne Imaging Spectroradiometer for Applications, or an AISA sensor system.

The AISA imager installed in the aircraft collects and records the quantity of visible and near-infrared light reflected from a target on the surface.

“To the untrained eye, we're taking pictures,” Perk said.

However, much more is involved. The AISA system collects multiple “looks” at a single target from different portions of the visible and near-infrared portions of the spectrum, Perk said. The multiple images provide detailed, high quality spectral data to analyze conditions related to a specific target.

For example, the data will reveal the level of chlorophyll in plants, which is an indirect indicator of fertilizer requirements. It also will predict potential toxic algal blooms in water based on the presence and quantities of specific algal pigments.

“UNL is the only university with a program capable of providing this type of airborne research

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support and data collection capability, and as such as been hired to conduct the research both locally and across the country,” Perk said.

One benefit from operating the AISA is an ongoing collaboration with the Nebraska Department of Environmental Quality to monitor Nebraska lakes, including the Fremont State Lakes Recreation Area.

Previously, the DEQ and the School of Natural Resources conducted traditional water sampling and analysis and CALMIT graduate students studied spectral data collected on-site.

The airborne imagery allows for accurate and detailed analysis of the toxic algae levels throughout every square meter of the lake system without the need for additional ground data collection.

“Traditional lake monitoring protocols are very time and labor intensive,” Perk said. “Using the airborne system, data can be collected and a map can be generated in about five hours.”

Similar efforts have been conducted at Carter Lake near Omaha, Lake Minnetonka in Minneapolis, the Choptank River near Easton, Md., and three lakes in the greater Indianapolis area.

Other AISA work has included monitoring invasive species along coastal and inland waterways, carbon sequestration, wheat streak mosaic virus and evapo-transpiration related to cropping systems and riparian areas.

Not all of the research is conducted from the plane. In addition to the airborne data collection system, CALMIT also conducts close-range research of the same areas using non-imaging equipment. But it is the work with AISA that is setting UNL apart.

“The airborne program was originally conceived to augment CALMIT’s world-class field data

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collection capabilities and systems,” Perk said. “The program’s success is well beyond most early expectations and now provides airborne services to a much larger local and national research community.”

Image data have been provided to researchers associated with four federal agencies, six state agencies and 32 universities in 20 states, he said. About 10 terabytes of image data and products have been collected, processed and delivered to the research community through the program.