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Highlight Article

Fighting Fire with Photography
By Jay Fuhr

AIRBORNE DATA SYSTEMS, INC.

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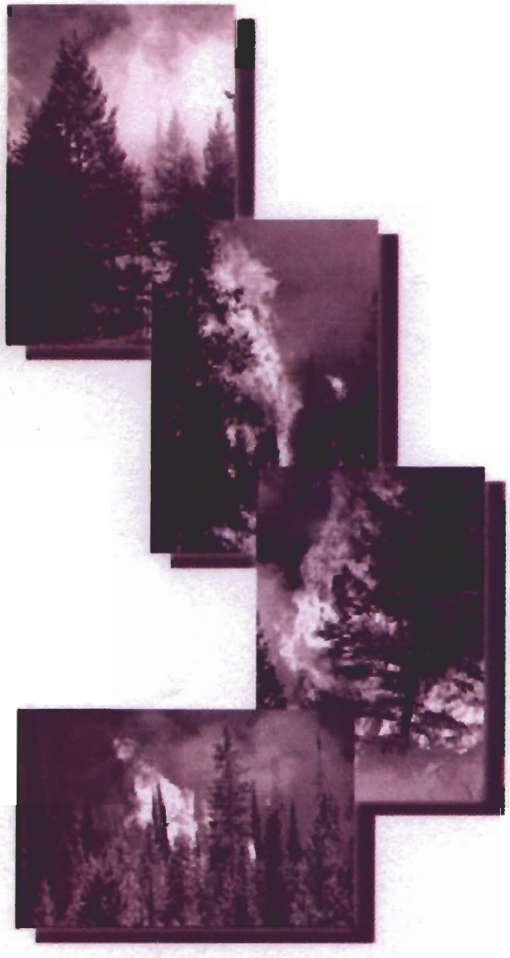

While it can't compete with water as a tool for fighting forest fires, a Minnesota company may have found an additional use for its Spectra-View®.

Field-tested at the request of U.S. Forest Service personnel involved in fighting the Montana wildfires this past fall, the multi-channel digital camera system manufactured by Airborne Data Systems could conceivably add another weapon to the arsenal for crews involved in extinguishing forest fires.

"Aerial photography and satellites have played roles in fighting fires for years now, and they have their place," Airborne Data Systems Founder David Fuhr said. "What we bring to the table is the ability to capture images that are of immediate use to the crews actually fighting the fires, regardless of the weather or time of day or night."

Integrating INS, DGPS and flight guidance software, the company was able to produce imagery with three-meter accuracy within minutes of landing , but that's really that is only the beginning. With its initial use targeting agriculture and forest management practices, the key to the system is images are saved using between one and seven cameras, allowing for multi-spectral imagery and ultimatly multi-spectral uses.

In the field test for fire control, the images were captured on a 1kX1k five-band system, with four of the five cameras capped with filters to achieve specific bandwidths of 490, 560, 660 and 870 mm. The fifth camera acquired imaging in the 3-5 micron thermal range.

Where there is smoke there isn't always fire, but the inverse is also true. Where there is fire, there isn't always smoke. The ability to strip off portions of the color spectrum makes Spectra-View® more powerful than most aerial photographic systems (see Figure 1).

Figure 1. The images below are an example of using strictly true color imaging in detecting hot spots. The white areas in the images are completely obscured by smoke.

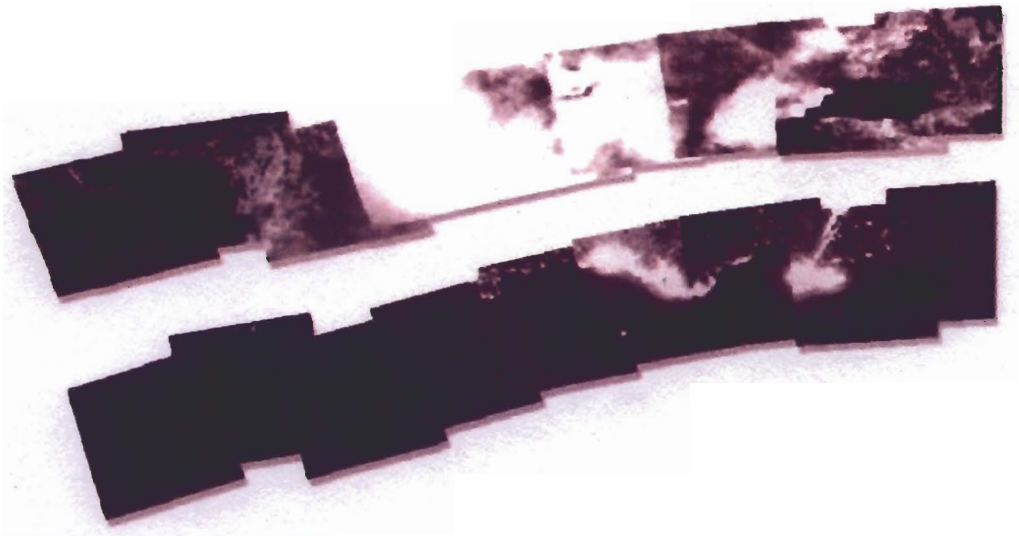

Figure 2. The above image is an example of using a combination of the near infrared band and the thermal (3-5 micron) band to look through the smoke to see the fire.

The dry summer turned entire forests into kindling when the fires began. What could have been in any other year, small undergrowth fires became deadly blazes when the fire jumped to the tree line, at times advancing through huge tracts of land in a single day. The pilots flying the system were tasked to fly the same flame-front from day to day and then the labs would import the data to track the fire.

Tracking the movement of a fire front can be tricky for many reasons, but the images pulled from the sky on Labor Day weekend by Airborne Data Systems showed that it can be done effectively. "I'm not a firefighter, and I certainly don't pretend to be," Fuhr said. "The feedback we received when we were out there gave us an indication of the potential for our system. The images alone wouldn't be enough, but the crews factored in weather and base terrain maps, and came up with fairly strong ideas of where the fire would spread next." By combining all pertinent weather and mapping data, fire fighters were able to get out in front of the fire's predicted path and try to stop it from spreading further. The information was also used to assess which communities might be in danger, and where equipment was needed to try and save homes that were in the path of the fire.

With fires having the ability to push and pull, timeliness is not only a virtue, it's a life-or-death scenario played out again and again on campaigns as large as the Montana wildfires became. Hot spots, in areas thought controlled, can flare and rekindle fires in different directions in very little time. Thermal and near-infra-red imaging can give crews on the ground an added certainty that a fire is out when it is, well, out.

From the moment the plane lands and the removable hard-drive is pulled, the turn-around time is next to nothing. A single scene takes about 30 seconds to process and the scenes are then mosaicked together to produce a map of a given area. The fire lab at Missoula, working with the University of Montana / Missoula remote sensing lab, wereable to do additional post processing using ERDAS IMAGINE®.

Although useful in fighting the Montana wild fires, many steps are already being taken to make the data more useful to firefighters in the field. With recent advances in downlinking, the company is now researching the use of the technology to allow the images to be used virtually as soon as they are acquired. This would allow the GIS people on the ground to begin using the data as soon as it is acquired. With this possibility it will render the data in actual real time, eliminating the small but crucial

time lapse between taking the images and waiting for them on the ground. In addition, the advent of hand-held GPS receivers is an economical asset fire bosses can use to immediately asses the data and make corrections in their attack on the fire. Although fighting fires will always be an extremely dangerous and treacherous job, with these advances in technology it has made it possible for fire fighters in the field to be more aware of the dangers that lay in front of them.

Although this system's fire fighting capabilities are impressive, the system doesn't have to go into cold storage until the next fire pops up. With this system's multi-spectral capabilities, when it's not fighting fires the Forest Service will be able to monitor the health and welfare of trees, in addition to calculating fireloads in potentially dangerous fire locations before they become a problem.

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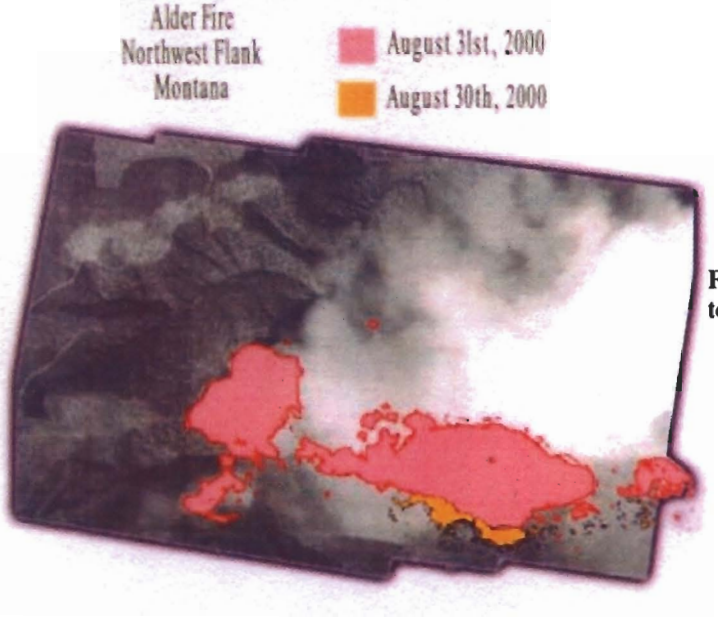

Figure 3. The images at left are an example of using imager to track the daily movement of the fire front.

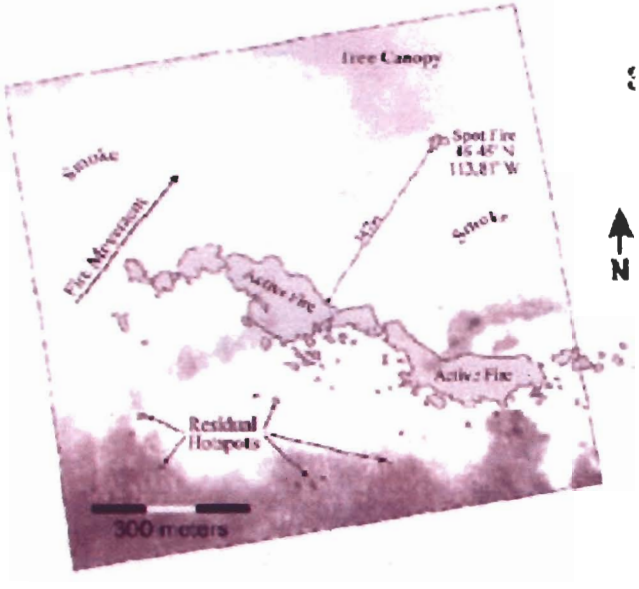

Figure 4. The imagery at right is an example of tracking flame fronts in addition to residual hotspots and spot fires.

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