

# Summary of the Sources Sought Notice: Thermal Imaging Services to Support Mapping of Wildland Fires

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## Introduction

In March 2013, the United States Department of Agriculture (USDA) Forest Service, Remote Sensing Applications Center (RSAC) conducted a market survey, through a Sources Sought Notice (SS), to determine if there were an adequate number of interested and qualified firms with the capability to complete work related to the collection of thermal infrared imagery for mapping of fire activity on active wildland fire incidents.

## Background

Infrared systems in the wildland fire community are used to detect, monitor, and map fire activity over large geographic areas. This information provides fire intelligence to incident management teams and assists in the efficient and effective utilization of fire suppression resources. The current system in use by the Forest Service National Infrared Operations (NIROPS) is the Phoenix Dual Channel Line Scanner. RSAC and the Forest Service were seeking information related to thermal infrared (TIR) imaging services to support detection and mapping of wildland fire activity on active incidents when NIROPS assets are fully assigned or unavailable. While different fire mapping systems have different capabilities and can provide a wide range of products, the primary purpose of this RFI was to assess the capabilities of the market place to provide thermal imagery suitable for producing GIS vector and map products in a short timeframe. The thermal imagery would be utilized by Infrared Interpreters (IRINs) with minimal, if any, additional training to derive vector and map products for delivery to the incident management teams.

To ensure consistency with NIROPS products and capabilities, the Forest Service and RSAC specified that firms responding to the Sources Sought Notice include information on capabilities to deliver specific output products and services. These included:

- Imagery should have spatial resolution sufficient to detect small spot fires of 10 inches or less while acquiring imagery at a rate of approximately 500,000 acres per hour
- The thermal sensor system should be a dual channel system capable of detection in the 3-5  $\mu\text{m}$  and 8-12  $\mu\text{m}$  channels
- Imagery should be completely mosaicked, no gaps or “holidays”, and ortho-corrected to a locational accuracy within 10 meters (90 percent CEP) of its true ground location
- Imagery should be delivered in a non-proprietary digital file format, preferably GeoTiff, and without licensing restrictions

- The system should be capable of safely and reliably acquiring imagery and then delivering the GIS-ready imagery directly off the plane or immediately after landing.

Firms were also given the option of providing information on additional products and channels (visible, near infrared, short wave infrared) that could be useful for daytime missions.

## Summary of Infrared Vendor Responses

Fourteen firms responded to the Sources Sought Notice during the 30 day response period. Table 1 lists the 14 firms that responded along with their capabilities to acquire thermal imagery. Of the 14 firms, 5 submitted incomplete responses. Of these 5 firms, 1 went out of business in 2013 after submitting an incomplete response, 2 had no aerial mapping experience of any type indicated in their responses, 1 was a start-up that did not begin operation until January of 2013, and 1 had experience only in thermal inspection of residential and commercial structures. The remaining 9 firms listed in Table 1 demonstrated in their responses that their sensor systems can acquire thermal infrared imagery, and that their output products can meet the desired Forest Service and RSAC specifications for spatial resolution, geographic coverage, locational accuracy, and delivery format. One of the firms submitted a proposed system rather than an existing system in its response. Seven of the firms have had at least some experience in wildland fire mapping, with the levels of experience ranging from test missions to operational fire mapping. The following section of the report lists the 8 infrared vendors that have existing systems with brief descriptions of their systems.

## Brief Synopses of the Infrared Vendors and Systems

<b>Company Name</b>	<b>Aerial Thermal Imaging LLC</b>
Mailing Address	8831 S. Redwood Road, Suite D2, West Jordan, UT 84088
Primary Contact	Eric Olsen
Telephone	801-915-7734
Email	Eric@AerialThermalImaging.com
Website	www.aerialthermalimaging.com
General Sensor Description	ATI Fire Finder

**Remarks:** The system uses dual 640x480 infrared microbolometer cameras to acquire the thermal imagery. The imagery is geo-referenced using data from the aircraft GPS and IMU then mosaicked. The output mosaic is produced after the mission. The output mosaic can be delivered in several output formats, including GeoTiff.

<b>Company Name</b>	<b>Avwatch Inc.</b>
Mailing Address	3 Robinwood Circle, Forestdale, MA 02644
Primary Contact	Christopher Kluckhuhn
Telephone	508-360-4398
Email	clk@avwatch.us

Website [www.avwatch.us](http://www.avwatch.us)

General Sensor Description Multispectral Sensor Package With Dual Channel Thermal IR

**Remarks:** The system includes dual channel thermal IR with other multispectral capability designed to operate at 3,000-5,000 feet AGL as either a gimbaled system or locked to acquire nadir imagery. The system outputs geo-referenced digital stills from the video that can be downlinked. It is not clear from the submission if the ortho-rectified mosaics are produced during or after the mission.

**Company Name** **Fuhr Flying Service**

Mailing Address 500 Airport Drive, Redwood Falls, MN 56283

Primary Contact David Fuhr

Telephone 507-644-5419

Email [dfuhr@airbornedatasystems.com](mailto:dfuhr@airbornedatasystems.com)

Website [www.airbornedatasystems.com](http://www.airbornedatasystems.com)

General Sensor Description Spectra View SV-5-6MS-2T Multi-Spectral Camera System

**Remarks:** The camera system collects Blue, Green, Red and NIR imagery plus 3-5  $\mu\text{m}$  and 8-12  $\mu\text{m}$  thermal IR imagery. Collected imagery is geo-referenced on the aircraft using position and attitude data from the DGPS/INS system. Terrain correction is accomplished using 10-meter NED data. Imagery is output in several formats including Geo-Tiff, JPEG2000, and KMZ. Imagery is uploaded to the company servers after the mission. No imagery mosaics are produced.

**Company Name** **GeoVantage Inc.**

Mailing Address 3 Centennial Drive, Suite 350, Peabody, MA 01960

Primary Contact Matthew Herring

Telephone 781-856-4775

Email [matt@geovantage.com](mailto:matt@geovantage.com)

Website [www.GeoVantage.com](http://www.GeoVantage.com)

General Sensor Description GeoVantage Multispectral + Thermal Sensor

**Remarks:** The sensor system includes a 4-band (B, G, R, and NIR) camera module and a two camera LWIR module with a 24° FOV enclosed in a STC'd pod that can be mounted externally on a fixed-wing or rotary-wing aircraft using a GeoVantage mount. The pod also contains the GPS and IMU units. Imagery ortho-correction and mosaicking are performed after the mission. Products can be output in several digital file formats, including Geo-Tiff.

**Company Name** **Kolob Canyons Air Services**

Mailing Address 943 S. Main St., Suite #6, Cedar City, UT 84720

Primary Contact Jeff Obering

Telephone 435-531-3062

Email [kolobair@yahoo.com](mailto:kolobair@yahoo.com)

Website [www.kolobair.com](http://www.kolobair.com)

General Sensor Description FireMapper 2.0

**Remarks:** The FireMapper 2.0 sensor system is a dual channel thermal IR system that utilizes uncooled microbolometers. The sensor system utilizes an Applanix INS/IMU for aircraft orientation and attitude

data. The imagery, aircraft position and attitude data are uploaded to the Cedar City facility after the mission, ortho-corrected and mosaicked, then uploaded to the company FTP site. Mosaics are output in Geo-Tiff file format.

<b>Company Name</b>	<b>Range and Bearing</b>
Mailing Address	2200 Rimland Road, Suite 220, Bellingham, WA 98226
Primary Contact	Doug Campbell
Telephone	855-451-4295
Email	info@rangeandbearing.com
Website	www.rangeandbearing.com
General Sensor Description	Pervasive Stare HDR

**Remarks:** The sensor system consists of a LWIR sensor and a step-stare imager with a 110° FOV and a nominal swath width of 12 miles. Other imagers such as MWIR, SWIR, and VIS can be utilized by the system. Collected imagery is ortho-corrected and mosaicked during the mission. Output products are disseminated using an Aircell ATG (air-to-ground) Internet system. Imagery products are output in several digital file formats, including Geo-Tiff, JPEG2000, NITF, and KML/KMZ. Derived vector products (point, polygon) can also be disseminated during a mission

<b>Company Name</b>	<b>VeriMap PLUS Inc.</b>
Mailing Address	5520 2 <sup>nd</sup> St. SW, Calgary, AB
Primary Contact	David Stonehouse
Telephone	403-606-0412
Email	david_s@verimap.com
Website	www.verimap.com
General Sensor Description	Mitsubishi IR-M700

**Remarks:** The sensor system consists of a MWIR sensor and a step-stare imager with a selectable 40° - 90° FOV. Collected imagery is ortho-rectified and mosaicked during the mission for delivery on landing. The vendor noted in their response that planned upgrades to the system in July 2013 will increase the production rate to 1,000,000 acres per hour and allow for dissemination of vector files (point) during the mission using an Iridium satellite phone system.

<b>Company Name</b>	<b>Xiomas Technologies LLC</b>
Mailing Address	1317 Skyway Dr., Ypsilanti, MI 48197
Primary Contact	John Green
Telephone	734-646-6535
Email	johngreen@xiomas.com
Website	www.xiomas.com
General Sensor Description	Xiomas Wide Area Imager (WAI)

**Remarks:** The sensor system consists of MWIR/LWIR thermal sensor utilizing a Quantum Well Infrared Photodetector (QWIP) camera and a step-stare mirror system with a FOV of 90°. The system utilizes an Applanix POS 510 unit for aircraft attitude and position data and 10-meter NED for elevation data. Acquired imagery is ortho-rectified and mosaicked during the mission and output in JPEG2000 file format. The sensor system also has a 3-band CIR camera for daytime missions.

**TABLE 1 - SUMMARY OF INFRARED VENDOR RESPONSES TO THE SOURCES SOUGHT NOTICE**

Company Name	Thermal Bands	Other Bands	Mount	Platform	Production Rate (ac/hr)	Fire Experience	Completeness of Response	Comments
Advanced Reconnaissance Corp.	2	VNIR, SWIR	Nadir	N/A	500,000	No	Complete	Focus on hyperspectral sensors for military applications; Proposed thermal system only
Aerial Thermal Imaging	2	—	Gimbaled	Cessna 210	50,000	No	Complete	Oil field facility thermal imaging
Avwatch	2	Vis	Gimbaled	Light plane, ex. Cessna 172	—	Yes	Complete	Projects with USFS-MTDC and CalFire
Chloeta Fire LLC	—	—	—	—	—	Yes	Incomplete	No thermal imaging capability; No mapping experience
Fuhr Flying Services	2	VNIR	Nadir	Piper Navajo PA-31	400,000	Yes	Complete	Previous CWN contract with NIFC
GeoVantage Inc.	1	VNIR	Nadir, External pod	Light aircraft, ex. Cessna 170	20,000	Tests	Complete	Project with NPS-Branch of Wildland Fire in Fall 2012
Goudy Construction Inc.	1	—	Gimbaled	—	—	No	Incomplete	No mapping experience of any type
Kolob Canyons Air Services	2	—	Nadir	Aero Commander 690	—	Yes	Complete	Flew infrared in 2009
Quantum IR Technologies	1	—	—	—	—	—	Incomplete	No longer in business, Fall 2013
Range and Bearing	1	Vis, MWIR, SWIR	Nadir	Piper Cheyenne II	2,100,000	Yes	Complete	Flew infrared in 2013 for NIFC; Can downlink imagery from aircraft
Terravion	2	VNIR	Nadir, External pod	Light aircraft, ex. Cessna 170	—	No	Incomplete	Start-up Jan. 2013; Focus on ag. applications; Proposed thermal system only
ThermaScan Solutions LLC	1	—	Hand	—	—	No	Incomplete	Residential/commercial thermal imaging firm
VeriMap PLUS Inc.	1	—	Nadir	Piper Navajo PA-31	550,000	Yes	Complete	Flew infrared for Alberta ESRD in 2003, 2010
Xiomas LLC	2	VNIR	Nadir	Piper Navajo	680,000	Tests	Complete	Projects with NIROPS and RSAC