

DRONEFIRE

**Autonomous Aerial Systems for Wildfire
Management in Montana**

Principal Investigators:

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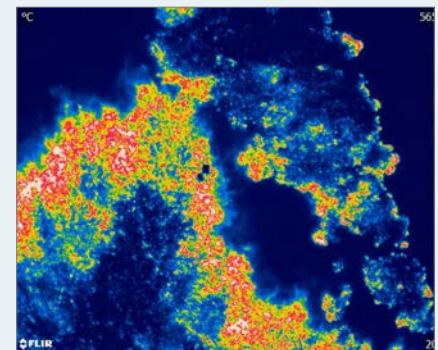
Funding Amount: \$900,000

Brief:

Wildfires in Montana have blackened 62,000 acres of forest and rangeland and cost taxpayers \$32 million so far in 2016. Threats to natural resources, communities, and firefighters are mitigated by reducing fuels and changing forest structure before fires occur. The UM research team has partnered with Montana’s Unmanned Aircraft System (UAS) entrepreneurs to design and test instruments and techniques for providing measurements of fires, forests, and fuels—work that will ultimately lead to adoption of UAS in natural resource management at large. DroneFire is accelerating UAS technology development in Montana and creating opportunities for private enterprise by strategically connecting land managers, researchers, and private companies to natural resource challenges, by streamlining FAA and business procedures, and by teaching and training a UAS workforce.

Objectives and Progress:

1. Establish permanent UAS R&D field laboratory to test new platforms, sensors, and technology:
 - A. Droneport now operational at Lubrecht Experimental Forest; 11 missions flown and seven electro-optical camera systems tested.
 - B. National Certificate of Authority secured for Class G airspace below 400 feet—enhances abilities of researchers and companies to perform missions.
 - C. Five UM UAS are operational to complement private-sector capacity.
2. Cultivate science cadre to develop and test field-usable data products:
 - A. 12 faculty are engaged in UAS research on fire behavior, fuel measurements, weather forecasting, forest growth and yield, watershed assessment, and forest health.
 - B. Eight Montana companies are providing access to 21 drone platforms and 22 sensors.
 - C. Have conducted field campaigns on 7 active fires in SE U.S. and completed site visits to ten companies and institutions in six states—ensuring national reach and relevance.



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continued

3. Build workforce and grow emerging field of UAS applications research:
 - A. 22 UM and MT Tech undergraduates trained in UAS operations and data processing.
 - B. One UM course in UAS mapping offered in Spring 2016. Two additional UM class are in development for training pilots and processing imagery.
 - C. Two UM graduate students are finalists for the Barrett Foundation Business Challenge to develop a drone-based wildfire defensible space technology company.

Return on Investment:

- **Jobs:**
 - Seven graduate students funded to use UAS in research
 - Eight technical staff hired to develop techniques for acquiring and processing UAS data
 - Three faculty funded to develop UAS applications
 - Five companies under contract (\$100K) for data services, platform development, sensor integration, and system evaluation and testing
- **Connections:**
 - Skyfish—Missoula (testing made-in-Montana quadcopter, gimbal, and software)
 - SUATS—Kalispell (integrating thermal and meteorological sensors)
 - Commander Navigation—Hamilton (prototyping multispectral cameras)
 - Big Sky UAV—Helena (grant proposal support)
 - ADAVSO—Boise (acquiring forest and terrain data with fixed wing platform)
 - Tesla Foundation—Global (developing training curricula)
 - The Nature Conservancy—Georgia (measuring active prescribed fires)
 - USFS Rocky Mountain Research Station—Missoula (high-speed videography of fire behavior)
 - Trout Unlimited—Missoula (post-restoration watershed assessment)
- **Leverage – additional grant funds received:**
 - Fire and Smoke Model Evaluation Experiment, Joint Fire Sciences Program: \$199K
 - USFS Rocky Mountain Research Station monitoring active fires: \$50K
 - National Fire Plan, Active Fire Remote Sensing: \$145K
 - PENDING: National Science Foundation: Sediment connectivity and its morphologic and vegetative controls: \$511K
 - PENDING: National Science Foundation: Biophysics of plant-insect interactions: \$887K
- **Output:**
 - 15 research missions completed on active fires.
 - 29 UM faculty, staff, and students in eight departments are working in UAS R&D.
 - Team is engaged in five private partnerships and four public partnerships to connect UAS technology to management needs, with missions underway in fire monitoring, forest inventory and health, and watershed restoration.
 - Team has overcome regulatory constraints, are expanding opportunities to operate UAS in Montana, and are now conducting 2-4 missions per week.
 - UM's Autonomous Aerial Systems Office has been established to provide a permanent institutional home for UAS operations at project end.

