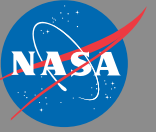


# GRC 1-pagers for NASA ARMD Wildfire Management Workshop

National Aeronautics and  
Space Administration



POC: Jerry Welch, NASA Glenn Research Center

## **Airborne Hyperspectral Sensing of Wildland Fuel Condition And Real-Time Thermal Imaging of Fires**

POC: John Lekki, NASA Glenn Research Center

## **Robotic Systems/Instrument Packages with High-Temperature Capability**

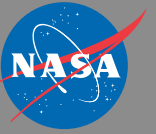
POC: Gary Hunter, NASA Glenn Research Center

## **Enhanced Communications Capability in Scalable Traffic Management for Emergency Response Operations (STEReO)**

POC: Chuck Sheehe, NASA Glenn Research Center

# AIRBORNE HYPERSPECTRAL SENSING OF WILDLAND FUEL CONDITION AND REAL-TIME THERMAL IMAGING OF FIRES

National Aeronautics and  
Space Administration



NASA Glenn Research Center has world-leading capabilities in high-temperature technologies and real-time communications. The integration of hyperspectral imager, thermal imager, navigation and data systems can provide dynamic wildfire information for decision support.



## BACKGROUND

### Sensors

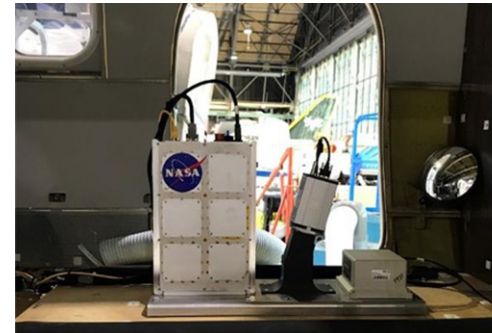
- Hyperspectral imager for high-resolution wildland fuel condition assessment and monitoring.
- Thermal imager for identification of fire location and spread rates.

### Processing and High-Rate Delay Tolerant Networking

- High-Rate Delay Tolerant Networking for seamlessly solving the communication from airborne sensor to ground.
- Hyperspectral and thermal data will be processed into georeferenced fire information products.

### High-Rate Optical

- Radio Frequency communication through smoke plume.
- Optical communication for covering large areas with a single ground station.



## VISION

An airborne sensing system for high-resolution mapping of fuel condition, fire location, and spread rate to fill in the gap between satellite acquisitions.

## IMPACT

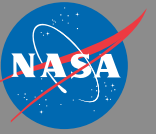
Airborne imaging and high-rate real-time communication.

- Helpful for dynamic assessment of fire location, movement, fuel condition, and fire environment.
- Understand post-fire effects such as ecological impacts, as well as understanding surface condition and erosion potential which has implications for things like water quality.

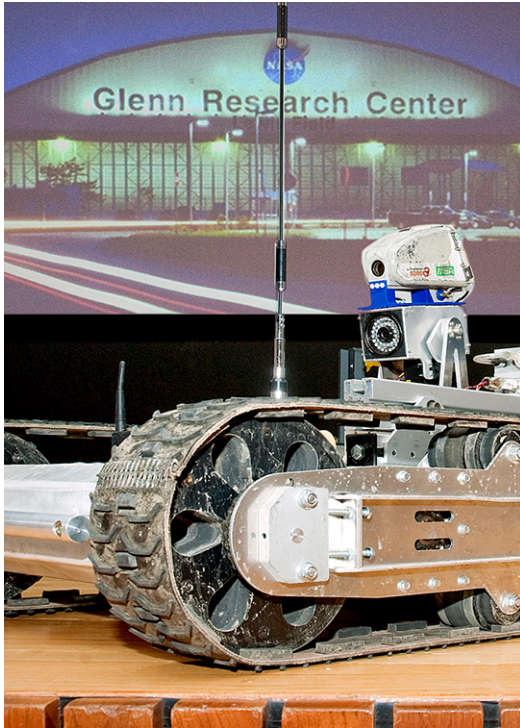
Flight-tested technology that can provide rich, real-time decision support information of the fire environment.

# ROBOTIC SYSTEMS/INSTRUMENT PACKAGES WITH HIGH-TEMPERATURE CAPABILITY

National Aeronautics and  
Space Administration



NASA Glenn Research Center has world-leading capabilities in fire detection and high-temperature technologies. The development of rover or drone systems can provide real-time, unique situational awareness in wildfire conditions.



## BACKGROUND

### Fire Detection

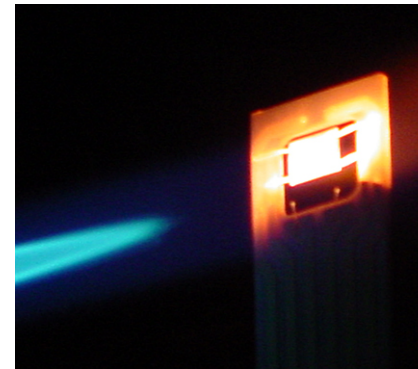
- Developed sensor technologies for first responders working with Fire Protection Research Foundation, USDA, Cleveland Division of Fire, and Tualatin Valley Fire & Rescue.
- Twenty years of fire-fighting relevant technology advancement.

### Robotics

- Collaborated with Cleveland Fire, Department of Homeland Security, and more to safely survey hazardous conditions.
- Pioneered the concept of a “Firewalker” to explore harsh environments such as hydrothermal vents.

### High-Temperature Technologies

- Work with unique materials, power, and intelligent system capabilities able to withstand harsh, caustic environments.
- Provide expertise, fabrication and testing facilities, and capabilities from years of jet engine research.



## VISION

Go where we need to go so the first responder does not have to.

Sensors, data processing, microprocessing, power, communications, and advanced materials developed to take the heat of Venus can provide crucial information on conditions from close to or even within a wildfire.

## IMPACT

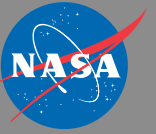
Be one step ahead of the wildfire and get information to those who need it.

- Work with the first responders to understand what they need to know, when they need to know it, and where we have to go to find this out.
- Tailor this system to provide what professionals need to better fight wildfires.

Insertion of the robotic drones with high-temperature sensor capabilities may help maximize safety of first responders during a fire fighting mission.

# ENHANCED COMMUNICATIONS CAPABILITY IN SCALABLE TRAFFIC MANAGEMENT FOR EMERGENCY RESPONSE OPERATIONS (STEReO)

National Aeronautics and  
Space Administration



NASA Glenn Research Center has world-class communications systems expertise and is applying that knowledge to space and terrestrial challenges. For faster, smarter, safer emergency response operations, the STEReO project is combining technologies to build a system that is greater than the sum of its parts.



## BACKGROUND

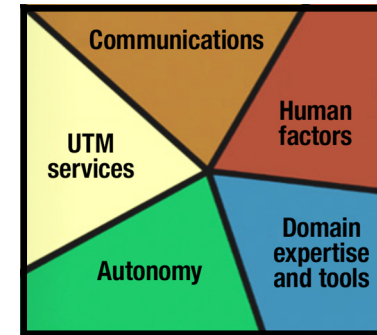
NASA Glenn Research Center is collaborating with NASA Ames Research Center to provide new and enhanced communications capability.

- Capabilities include vehicle-to-vehicle communications especially for small unmanned aerial systems (sUAS).
- Long-term partner agreements are in place with the United States Forest Service and California Fire Service.
- Working to bring online communications so firefighters are within range and help is quickly on the way.

## IMPACT

Realizing the need for redundant communications systems to enable the shared operating environment, NASA Glenn provided:

- Wireless local Area Network, satellite communications for low cellular coverage areas.
- FirstNet cellular routers for connection to the public Safety Broadband Service for First Responders.
- Multivendor subscriber identity module (SIM) cards that allow the use of any cellular provider.



## VISION

The goal of the STEReO system is to provide a scalable sUAS traffic management solution specifically for emergency response operations.

- Provide an extension to the unmanned aircraft systems traffic management (UTM) network considering the unique needs and characteristics of wildfire disaster situations and the response to combat them.
- Provide a system that will work well with sUAS but also has the potential to represent a dynamic airspace with multiple manned and unmanned vehicles.
- Increase the capacity of available communications, reduce the latency of data transfer and provide a persistent network for the use of sUAS emergency responders.

Through these efforts, and due to the data flowing through the network, STEReO will provide operational resiliency to dynamic changes during emergency response events.