

# **New Run Road Mission**

## **Tactical Fire Remote Sensing Advisory Committee (TFRSAC) Fall 2012 Meeting**

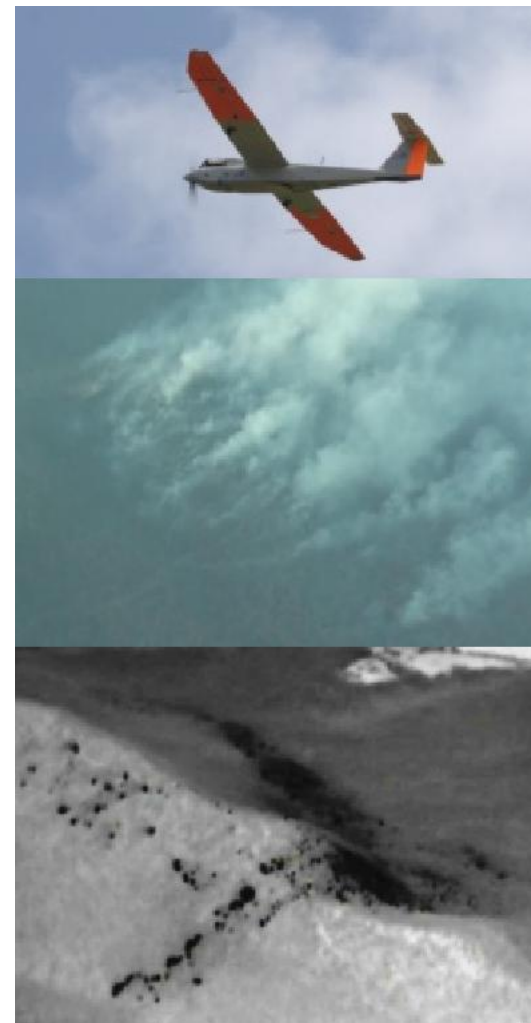
# Purpose

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- Demonstrate and evaluate Unmanned Aircraft System (UAS) capabilities
  - Imaging Sensors
  - Air-to-Ground Telemetry
  - Communications Relay
  - Data Processing and Dissemination
- Flying onboard a “surrogate” (manned) aircraft during a scheduled prescribed fire incident

# Wildland Fire Support

- Tactically taskable tool for Incident Commanders
- Day and night operations without putting pilots in harm's way
- Real-time visible and infrared streaming video on map
  - Fire perimeters
  - Active fire fronts
  - Hot spots outside lines of containment
  - Fire fuel information
- Real-time dissemination of actionable data products
- Real-time locating of fire crews and equipment for increased safety and effectiveness
- Communications Relay
  - Efficiently extending ground communications over-the-ridge through airborne relay (voice, data, network)
- High resolution geo-corrected imagery for post-fire assessments



# Unmanned Aircraft Specifications

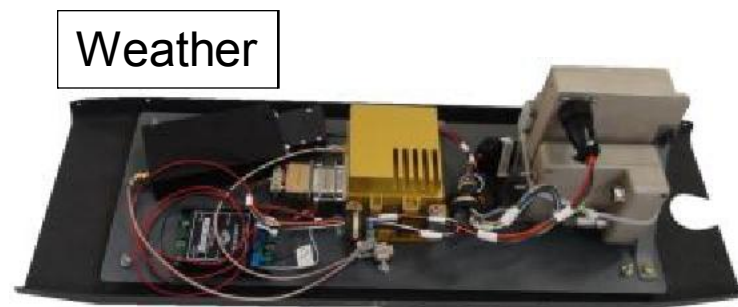
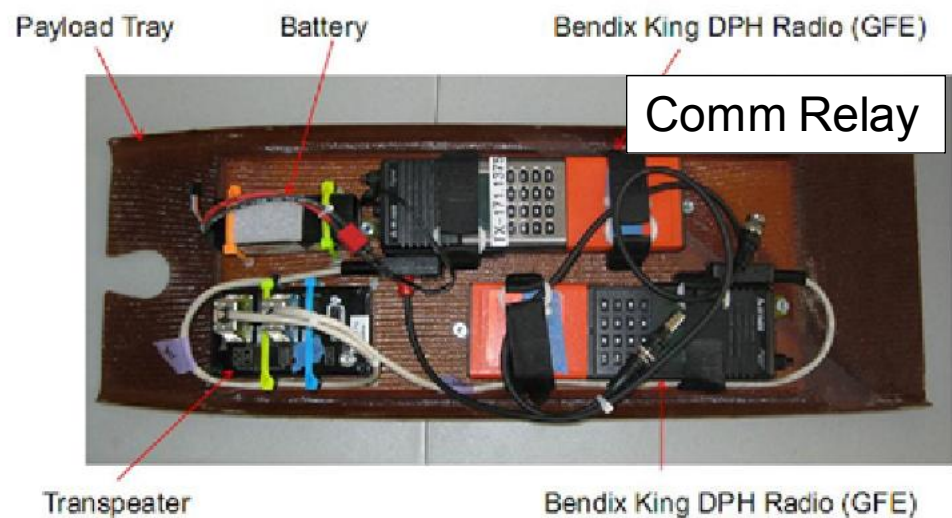
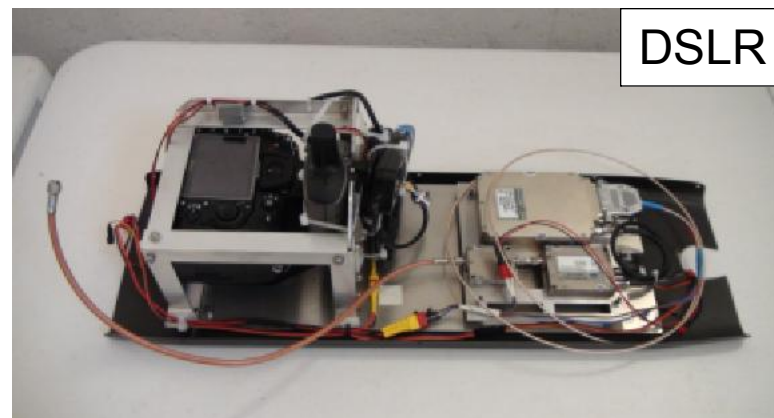
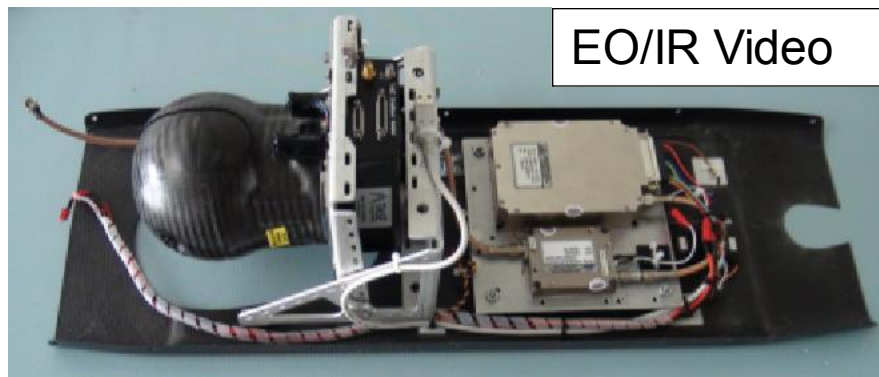
Type	RS-16™		RS-20™	
Wingspan	12' 11"	3.9 m	17' 3"	5.2 m
MGTW	85 lbs	39	165 lbs	75 kg
Endurance	12-16 hrs		6 hrs (12-16 hrs future)	
Ceiling	15,000'	4,572 m	15,000'	4,572 m
Max Speed	65 kts	120 km/hr	90 kts	167 km/hr
Payload Envelope	6 x 6 x 20.5"	150 x 150 x 520 mm	10.75 x 10.75 x 34"	273 x 273 x 863 mm
Payload Capacity	25 lbs	11.4 kg	65 lbs	30 kg
Payload Power	100 watts		400 watts	
Launch	Pneumatic Catapult		Pneumatic Catapult	
Recovery	Belly Land		Belly Land	
Wing Hard Points	No		Yes	



# RS-16 UAS



# RS-16 Payloads









June 6, 2012

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Real-time data product  
production and  
dissemination







# Set up in ~90 minutes





## Pneumatic Launch – from remote sites



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## Auto landing on unimproved surfaces



# Mission Plan

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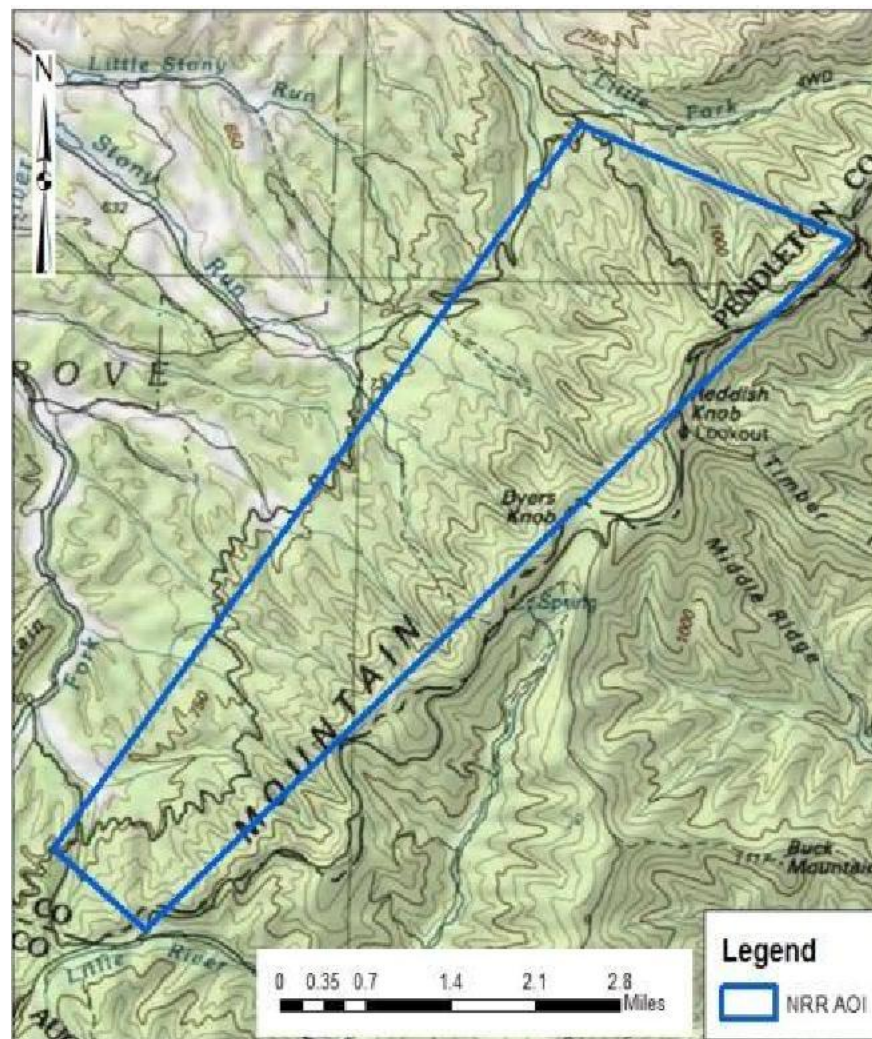
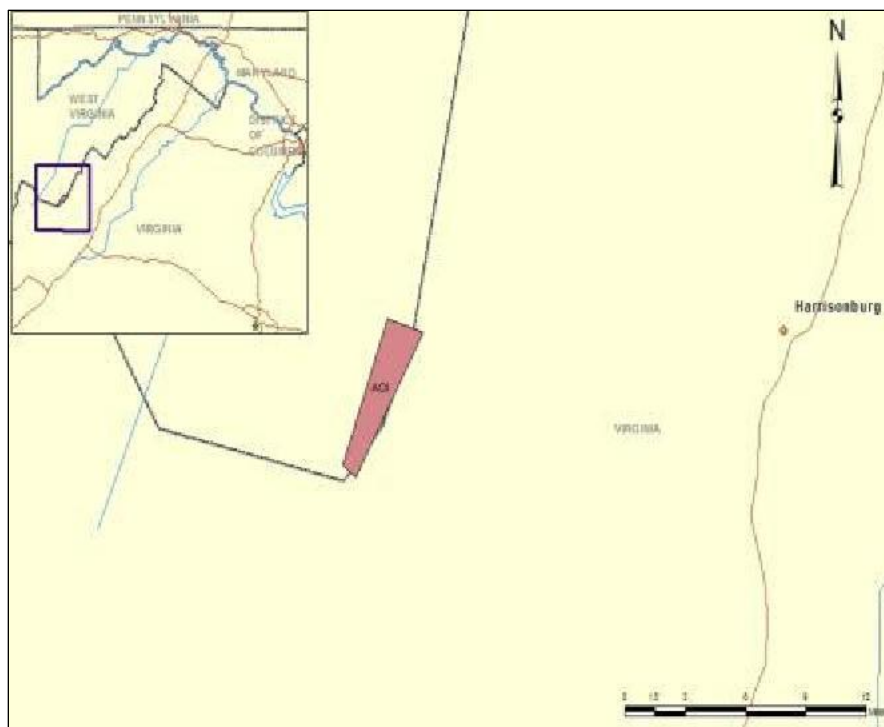
- Map and characterize pre-fire vegetation/fuel conditions of the burn area before and after the prescribed fire event
- Visible and thermal infrared camera systems to map and monitor active fire conditions and fire behavior during the fire event
- Application of airborne communication relay payload to extend the range of ground-based communications technologies typically utilized for incident management
- Application of associated software technologies as part of an integrated system for processing of imagery covering a broad geographic area, and near real-time generation of derivative geospatial products.

# Imaging Payload Specifications

		HD MAPPING	HD VIDEO		TASE 200 VIDEO	
		2.1.1	2.1.2		2.1.3	
Item	Units	EO	EO	LWIR	EO	LWIR
Spectrum	Microns	0.4 to 0.7	0.4 to 0.7	8 to 12	0.4 to 0.7	8 to 12
Type		Frame	Video	Video	Video	Video
Format		JPEG	Progressive	Interlaced	Interlaced	Interlaced
Pixels	Megapixels	12	2	0.37	0.37	0.37
Px HxV	Px	4288 x 2848	1920 x 1080	640 x 480	640 x 480	640 x 480
Pixel Size	Microns	5.49 x 5.49	2.5 x 2.5	17 x 17	TBD	17 x 17
Max Frame Rate	Frames per second	1	30	30	30	30
HFOV Range	Degrees	52	2.9 to 52	17.6	2.5 to 52	9.8
HFOV Nominal	Degrees	52	35.5	17.6	29.5	9.8
Horizontal Ground Sample Distance at 3,000 ft. AGL	Inches	8.2	12.0	17.2	30.0	9.6
Swath width at 3,000 ft. AGL	Feet	2,943	1,920	933	1,580	514
Nominal Sidelap on Final Flight Plan	%	55	32	N/A	17	N/A

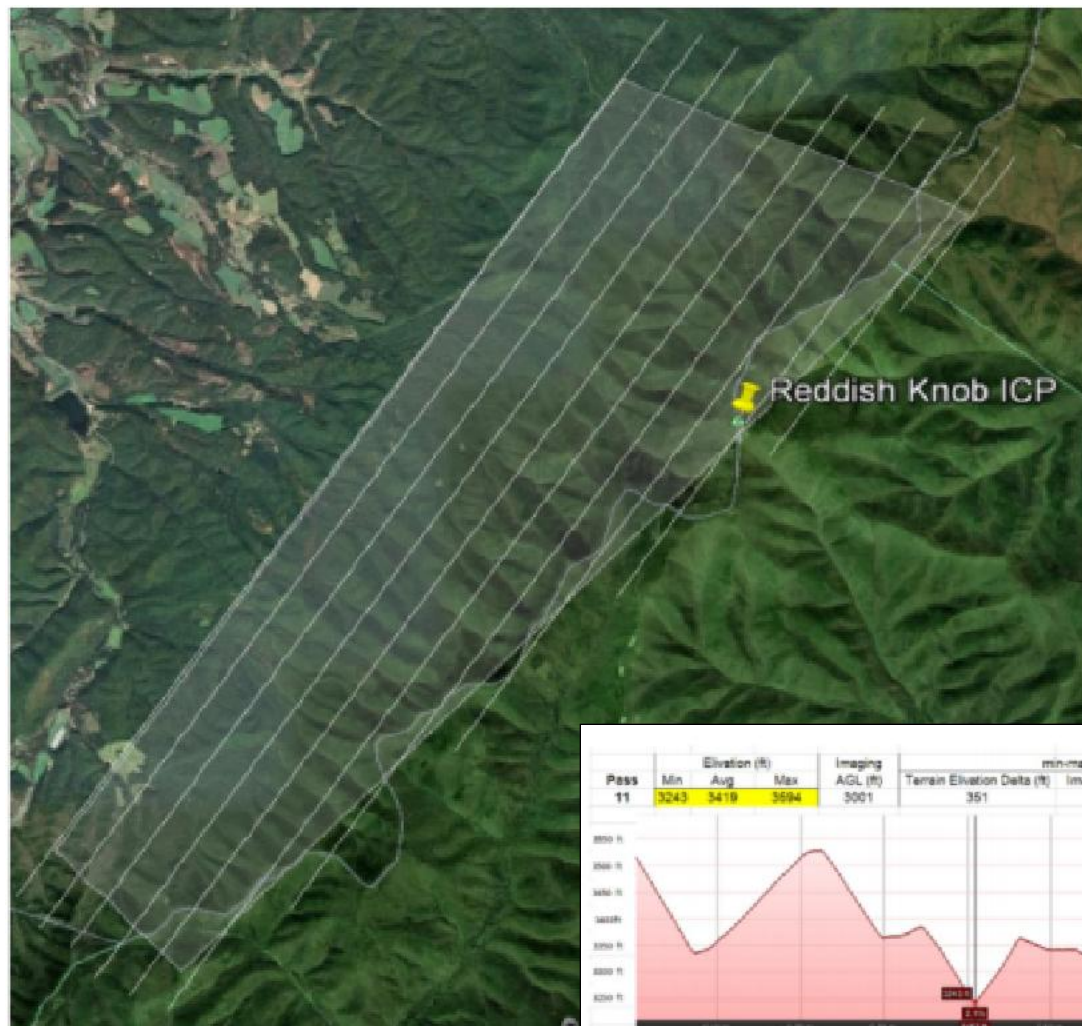


# Area of Operation





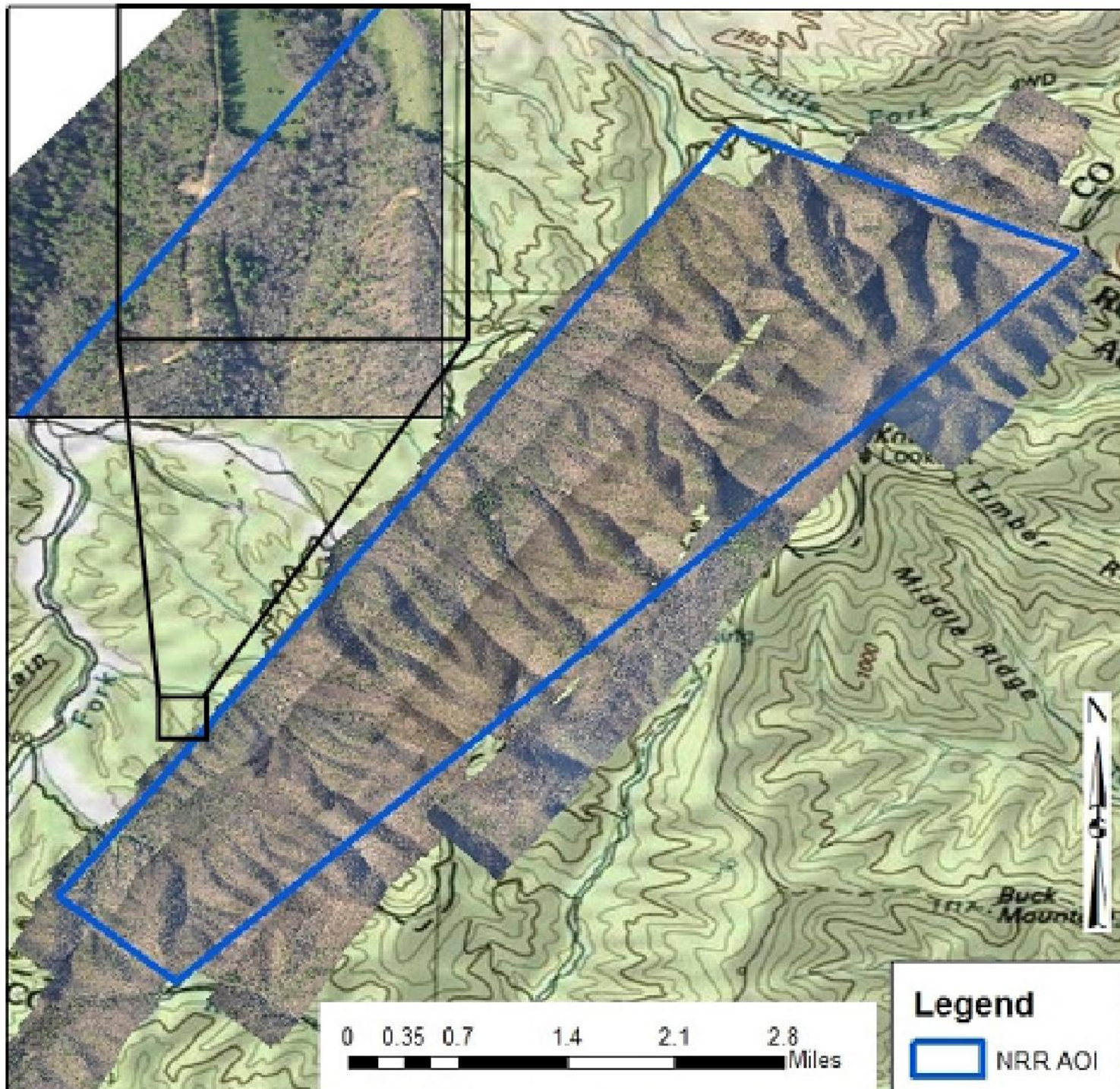
# Nominal Mapping Flight Plan



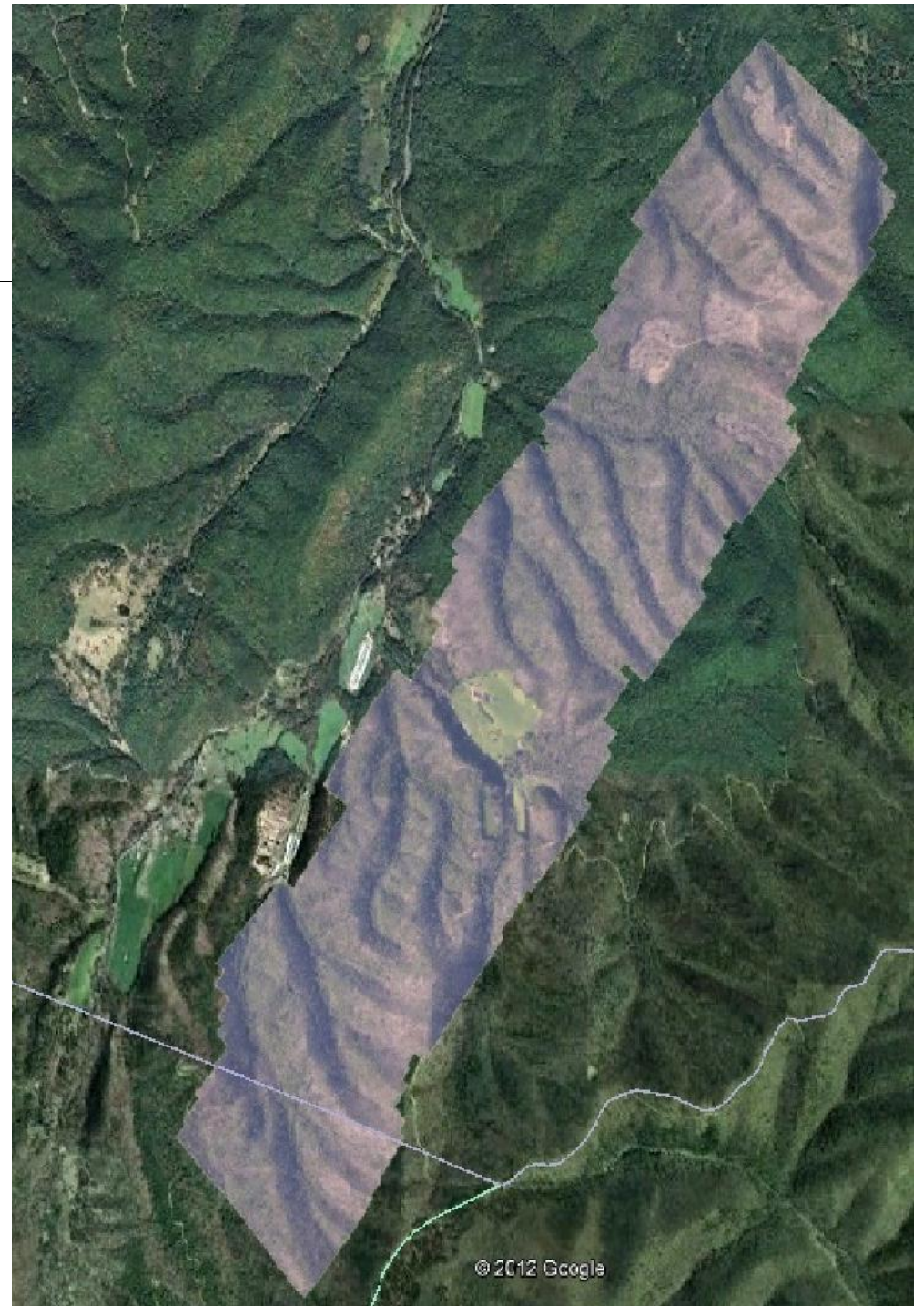
# Cessna 206 (N126Z) Integration



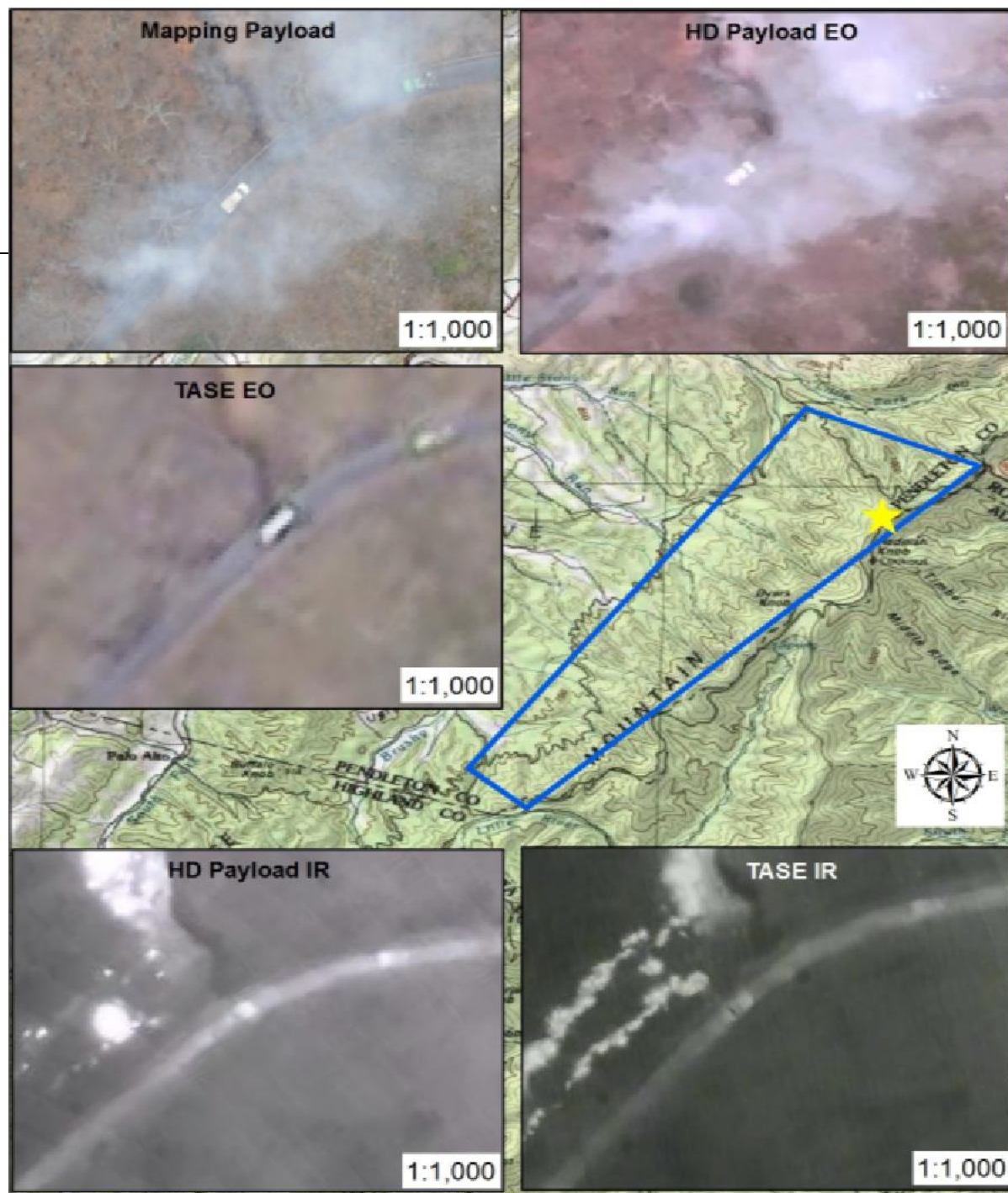








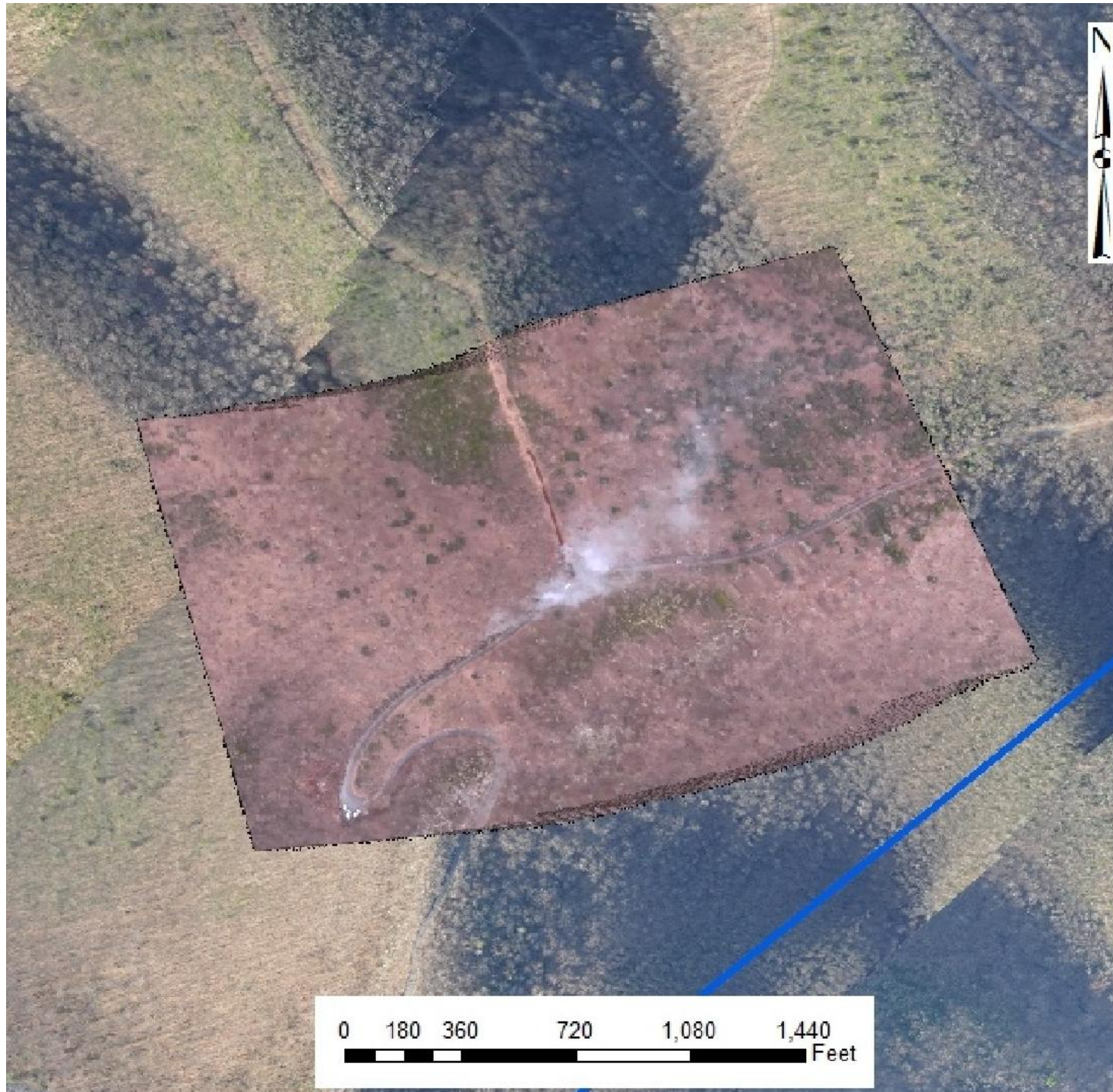




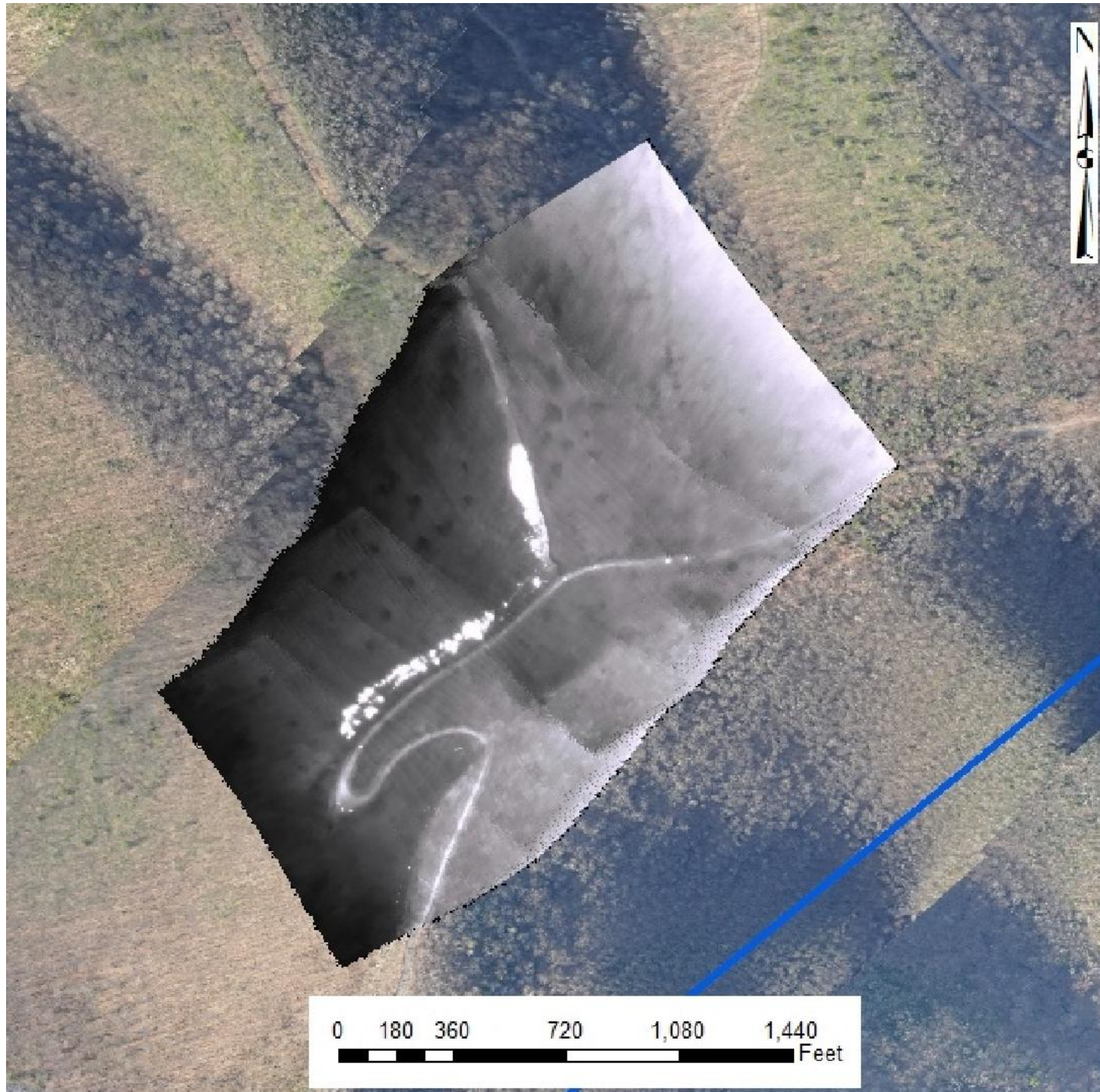
# KMZ's or GeoTIFFs Disseminated in Near Real-time





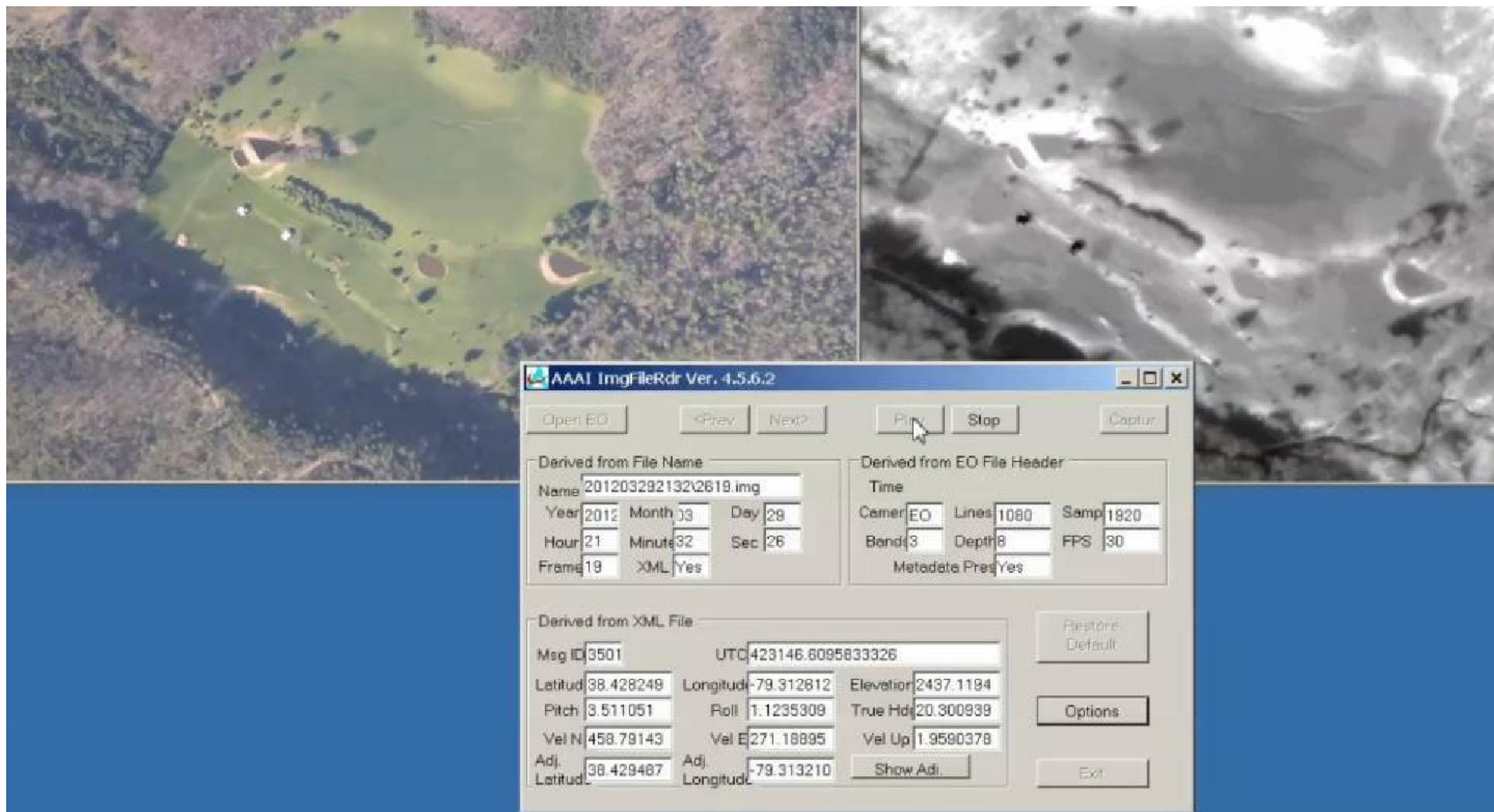




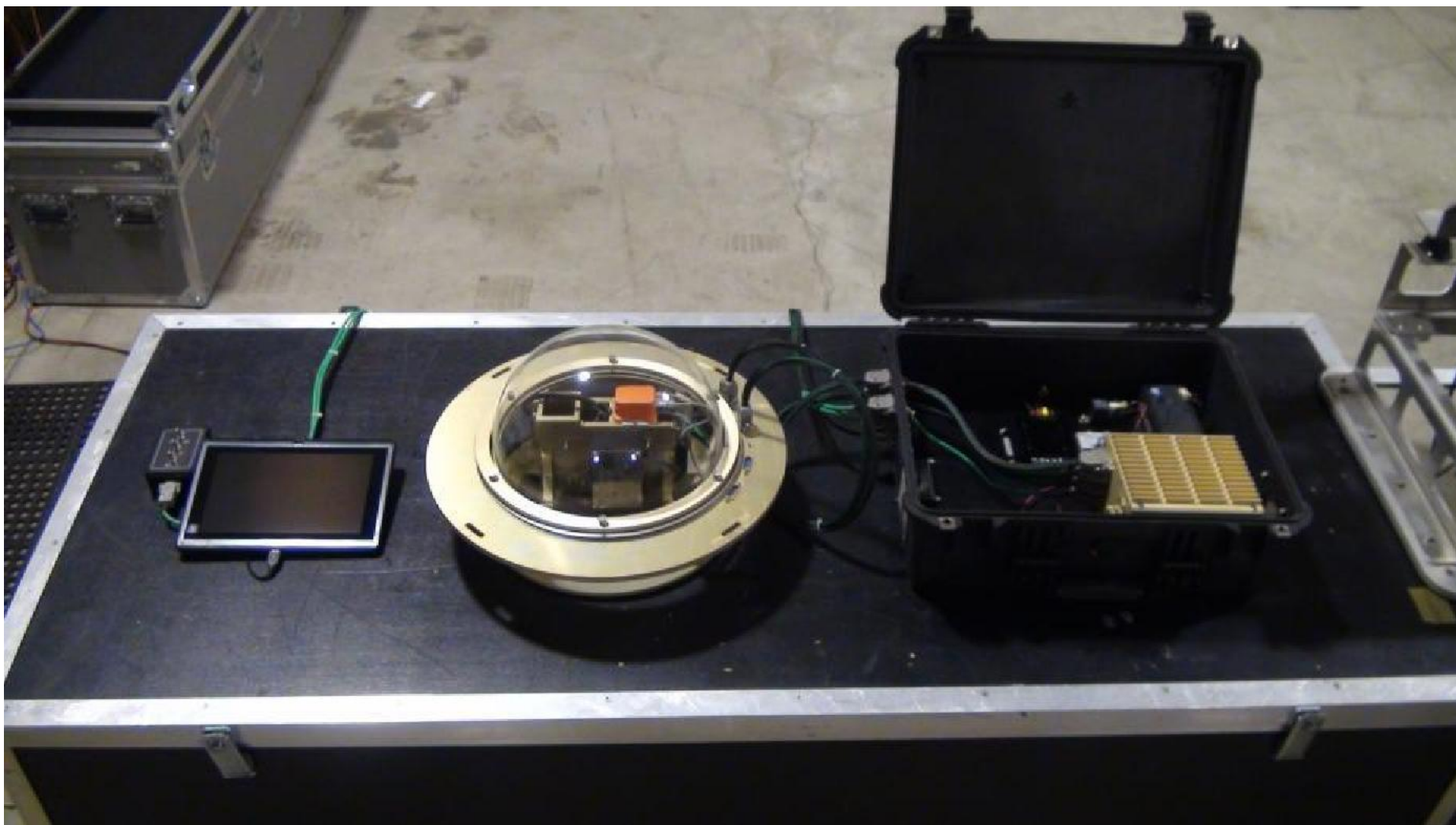




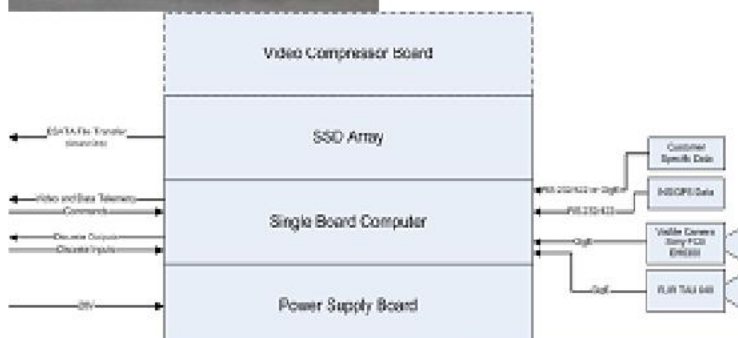
# Simultaneous HD Visible and LWIR



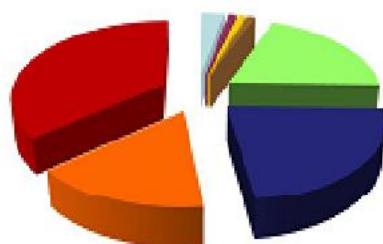
# New Cessna 206 Configuration



# Flight Computers



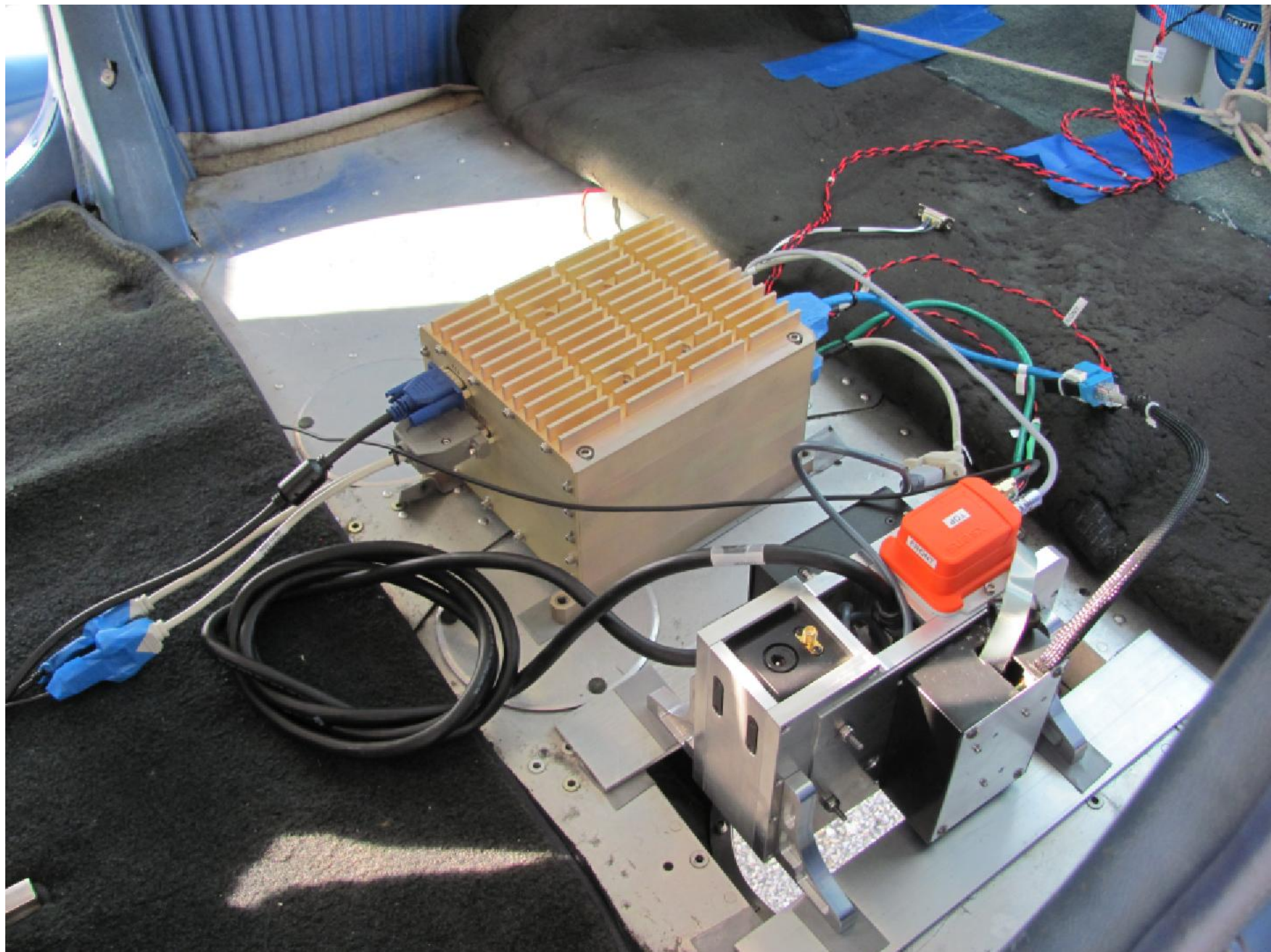
Sample Data Breakdown



Data Type	Data Rate
Radiometer	3.7 Mbps
Spectrometer	1.6 Mbps
IR Camera	2.3 Mbps
Visible Camera	2.0 Mbps
State-of-Health	< 0.1 Mbps
Event Reporting	< 0.1 Mbps
Idle Fill	< 0.1 Mbps
Packet/Frame Overhead	0.3 Mbps
<b>Total</b>	<b>10 Mbps</b>

- **Controller – “Internals”**
  - Intel Core i7 2.2 GHz
  - 8 GB of RAM
  - Up to 1 TB of storage (>140MB/s write speed)
  - 4 GigE Inputs
  - 2 RS-232/422 Inputs
  - 16 Discrete GPIO Port
  - 4 USB Ports
  - Size: 5in x 5in x 7in
- Advance sequencing, data prioritization and bandwidth management



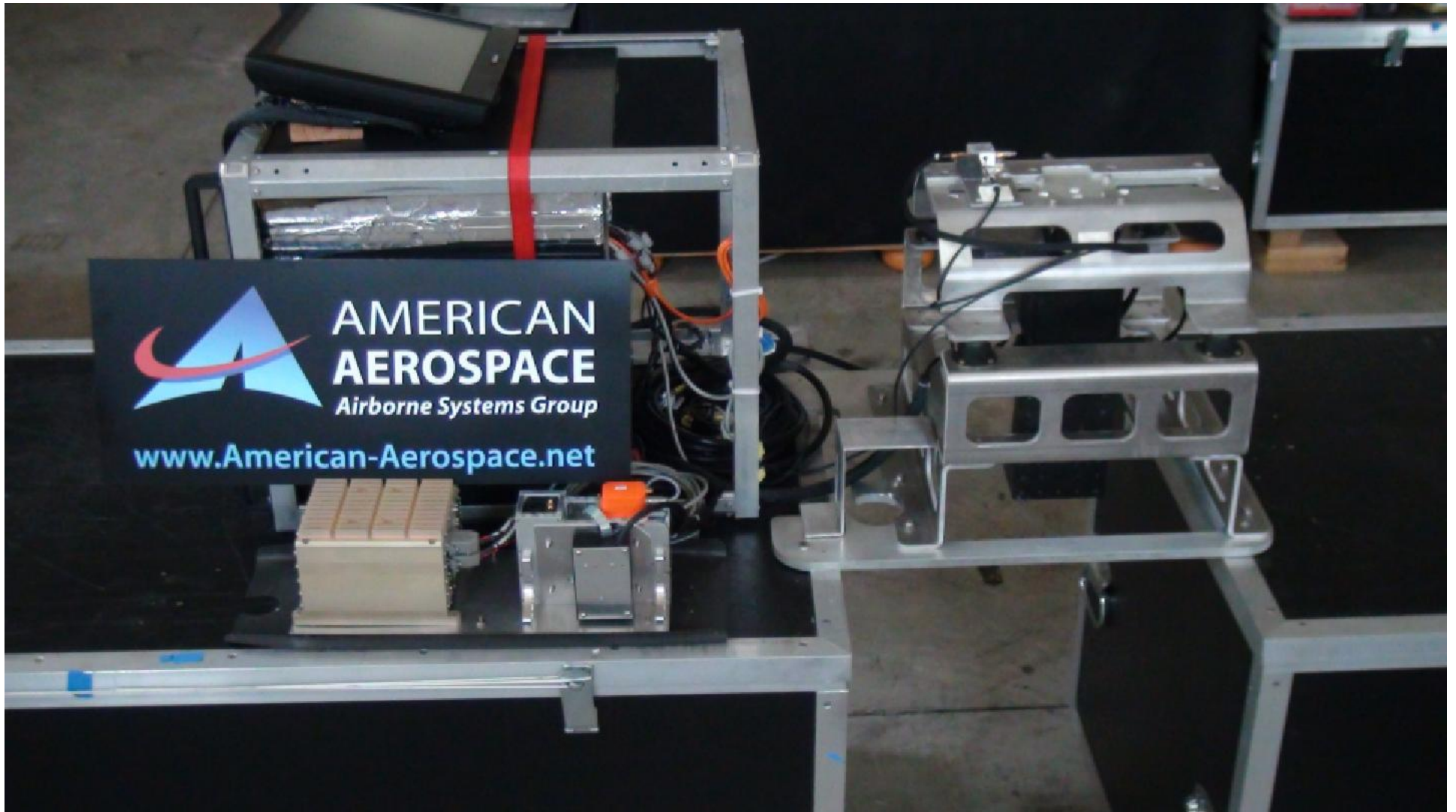




# RS-16 Configuration







# Multi-Payload Fire Mission Package

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- Multispectral Real - Time HD “Video Mapping”
  - Visible Wavelength
  - Long Wave IR
- Mobile Ad Hoc Network Transceiver System
- Interoperable Communications Relay (Voice & Data)
  - Over The Ridge/Over The Horizon
  - Emergency Networking
  - Airborne Modem
- Weather
- Personnel and Asset Tracking
- *Downsize after development to 55# UAS if that becomes the FAA standard*



## **For More Information**

**David Yoel, CEO**  
**[dyoel@American-Aerospace.net](mailto:dyoel@American-Aerospace.net)**  
**(484) 995-0709**