NIROPS Closeout Meeting

Update on UAS in Wildland Fire
Long Endurance Data Collection and Relay Mission
About American Aerospace

• A small business investing in the future of unmanned aviation and remote sensing

• AAAI doesn’t manufacture aircraft. We combine a COTS-based, “airframe agnostic” mission driven philosophy with expertise in aircraft & systems engineering, UAS operations, training, flight safety, and remote sensing to help civil government and commercial customers cost-effectively perform superior missions
## Services

<table>
<thead>
<tr>
<th>Systems Engineering &amp; Technical Analysis</th>
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<tr>
<th>Training</th>
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<tbody>
<tr>
<td>(UAS Pilot Training, Curriculum Development…)</td>
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<tr>
<th>Technology Development &amp; Licensing</th>
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<tr>
<td>(AiRWAI™, Video Exploitation, See-And-Avoid…)</td>
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<tr>
<th>Field Support</th>
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<tr>
<td>(Personnel, Equipment Rentals, UAS Chase…)</td>
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<tr>
<th>Mission Services</th>
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<tr>
<td>(Manned &amp; Unmanned)</td>
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## Mission Experience

<table>
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<tr>
<th>Wildland Fire</th>
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<th>Right-of-Way Monitoring</th>
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<th>Precision Agriculture</th>
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<th>RDTE &amp; Training</th>
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<th>Mapping</th>
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<th>Emergency Response</th>
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Long Endurance Data Collection and Relay Mission:

Demonstrate use of Unmanned Aircraft System (UAS) to provide Incident Commanders with long-endurance, real-time intelligence and communication.
Mission Requirements

- Perform safe, successful UAS missions in a wildland fire environment
- Increase safety and effectiveness of deployed personnel and resources
- Collect day & night burn imagery
  - Without putting pilots in harm’s way
  - Visible and LWIR
- Geo-rectify imagery in near-real time and rapidly distribute actionable data products
  - Fire perimeter and active fire fronts
  - Hot spots outside lines of containment
  - Hot-spots during the mop-up phase
  - Fire fuel info
- Provide beyond line-of-sight voice & data communications
  - Improved communications with mobile field personnel
  - Incompatible radio communications
    - P25, VHF (150 – 175 MHz Forest Service band)
The Recon System 16 (RS-16™)

Mission ready - available for rent or purchase

Mobile Command Center
- Communication Systems
- Computers & Peripherals
- Real-Time Video Exploitation
- Power/Fuel/Crew Support

Customized T-16XL Aircraft
- 12-16 hr Endurance
- EO/IR Video, Comm Relay Payloads
- Launcher
- Ground Support Equipment, Spares
Cessna 172N Aircraft (UAS Surrogate)

Stabilized EO & LWIR Video Cameras – Strut Mounted

~12 Mpx Nadir Mapping Cameras - Mounted over Belly Port
The Recon System 16 (RS-16™)  
General Specifications

### Aircraft
- **Type:** Arcturus T-16XL  
- **Wing span:** 12’ 11”  
- **Fuselage:** 6” x 6” x 6’ 10”  
- **Payload capacity:**  
  - Max Wt: 25 # + fuel  
  - Int. Volume: 6”x6”x20”  
- **Payload power:** ~100 W  
- **Endurance:** 12-16 Hours  
- **Cruise:** 45-80 knots  
- **Service ceiling:** 15K’ MSL  
- **Catapult launch**  
- **Belly landing**  

### Payloads
- EO/IR video gimbals  
- RGB/Multi-spectral mapping cameras  
- Communications relay  
- EO/IR/HD video cameras  
- Video telemetry systems  
- Manned/unmanned compatible  
- Modular design approach  
- The engineering skills and experience needed to efficiently integrate customer payloads  

### Mobile Command Center
- Complete, mobile, self-contained climate-controlled work environment capable of:  
  - Command and control of unmanned aircraft  
  - Managing remote sensing operations with manned and unmanned aircraft  
  - Real-time exploitation and data product distribution  
  - Crew support  
  - Transport of entire mission system  

### AAAI Services
- Mission planning  
- Airspace analysis and regulatory support  
- Training curricula and programs  
- Video exploitation and gap technologies  
- Field equipment rentals  
- Flight crews  
- Flight services  
  - Our aircraft or yours  
  - Our payloads or yours  

**Mission Success - Beyond the Aircraft**
To discover how AAAI can help you perform safe, successful and cost-effective missions, please call **610-225-2604**, or e-mail **dyoel@American-Aerospace.net**.
Primary Fire Mission Aircraft

- Wing Span: 12’ 11”
- Length: 6’ 10”
- P/L Capacity: 25 Lbs.
- Endurance: 12-16 Hours
- Cruise: 50 knots
- Ceiling: 15K’ MSL
- Autopilot
- Magnetometer
- Mode C Transponder
- Autoland System
- Lighting System – day/night ops
- Rail-launch/belly land – runway independent
- Rapid deployment
Video Payload

EO/IR Video Gimbals
Retraction Mechanism

Not Shown
- Blade antenna mounted under left wing

Payload Tray
Video Transmitter Assembly
Door Servo
Gimbal Deployed
UAS Airborne Comm Relay Payload

- **Beyond line-of-sight** voice communications
  - Improved communications with mobile field personnel
  - Incompatible radio communications
    - P25, VHF, UHF, 150 MHz, 800 MHz, 900 MHz, and other frequencies
    - 10 mile range demonstrated in September
- **Ideal solution in remote, dangerous and mountainous terrain**
  - 16 hour UA enables highly effective/low cost solution
- **Future Capabilities Planned**
  - Multichannel voice, data and imagery relay
  - Personnel & asset tracking
Mobile Command Center
2d3 TacitView™ Video Exploitation System

- Video Exploitation System
  - Manned/unmanned aircraft connectivity
  - Network feed compatible (STANAG 4609, MISB)
  - Reads most video file formats
- Frame Imagery Mosaicing
- Processing, Exploitation and Dissemination (PED) on COTS PC hardware
- Provides Computer Vision Enhancement Tools:
  - Stabilization, Super Resolution, Mosaicking
- Integrated database for IRL/IPL
- American Aerospace and 2d3 Inc. are jointly developing civil and commercial applications of TacitView Software
## RS-16 Operations 2010

### Table

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Purpose</th>
<th>No. Flights</th>
<th>Flight Hours</th>
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<tbody>
<tr>
<td>NASA Dryden, CA</td>
<td>2010 February</td>
<td>Aircraft Checkout EP Certification</td>
<td>2</td>
<td>3.4</td>
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<tr>
<td>Fort Pickett ANG, VA</td>
<td>2010 April</td>
<td>RS-16 System Testing</td>
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<td>6</td>
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<tr>
<td>Fort Pickett ANG, VA</td>
<td>2020 May</td>
<td>RS-16 System Testing &amp; Rehearsals</td>
<td>5</td>
<td>7</td>
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<tr>
<td>Fort Pickett ANG, VA</td>
<td>2010 June</td>
<td>Forest Service Mission</td>
<td>4</td>
<td>8</td>
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<tr>
<td>PTRC, NM</td>
<td>2010 September</td>
<td>Military Training Overflight Services</td>
<td>17</td>
<td>45</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>32</strong></td>
<td><strong>69.4</strong></td>
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Weather sensor
Lessons Learned

www.american-aerospace.net

• Aircraft Performance
  – Endurance
  – Launch/Landing

• Rapid Deployment
  – Equipment
  – Personnel
  – Procedures
  – Rapid Mission Planning
  – Logistics

• Crew Size

• Remote Operations

• Video Exploitation

• Mission Requirements,
  Mission System
  Development
David Yoel, CEO
610.225.2604
dyoel@American-Aerospace.net
Nadir Mapping Payloads

www.american-aerospace.net

• High resolution frame imagery
  – From 10 cm (~4”) to 1 meter (3.3’) resolution
    • Multispectral: Green, Blue, Near IR
    • Color (RGB)

• Image sequences are acquired then processed into large area, geo-rectified mosaics

• Nominal Collection rates:
  – 50 cm GSD ~75 nautical miles/hr
  – 30 cm GSD ~65 nautical miles/hr
  – 10 cm GSD ~60 nautical miles/hr

• Geo-rectification latency
  – Real-time vs. overnight