Topics Addressed

• Introduction to UAS
• Current UAS Use Considerations / Regulations
• UAS Platform Decisions: Tactical vs. Strategic
• UAS Missions Supporting Disaster Monitoring
• FAA Modernization and Reform Act of 2012
What is an UAS?

- Unmanned Aircraft: A device used or intended to be used for flight in the air that has no onboard pilot;

- A “SYSTEM” Includes:
  - Unmanned Aircraft (UA)
  - Aircraft Control Station
  - Command & Control Link/s

- Model Remote Control (hobby only)
UAS Nomenclature Designations
### Who’s Flying UAS

#### Public Use Aircraft
- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- Department of Homeland Security
- Department of Interior
- Department of Justice
- NASA
- NOAA
- State Universities
- State Law Enforcement

#### Civil Aircraft – Special Airworthiness Certificates
- AAI Corporation
- General Atomics
- Northrup-Grumman
- AeroVironment…
- Others
What Are They Doing?

- Operational Military Missions
- Research: scientific and academic
- Sensor Development and Testing
- Border Patrol
- Firefighting
- Disaster Relief
- Law Enforcement
- Search and Rescue

- Note: no commercial operations currently authorized
Regulations
Regulations: Public vs Civil Aircraft

- All aircraft must comply with FAA Code of Federal Regulations (CFRs)
- Civil aircraft (airlines, general aviation):
  - Required to obtain airworthiness certification from FAA
  - Compliance with FAA standards for manufacture, maintenance, etc
- Public Aircraft (government owned)
  - By law, are not required to comply with FAA airworthiness standards, but....
  - Must have airworthiness certificate to fly in NAS
    - In-house airworthiness process

NOAA Manta
Regulations: 14 CFR 91

- Title 14, “Aeronautics and Space”, Part 91 “General Operating and Flight Rules”
  - General, visual, and instrument flight rules (VFR, IFR)
  - Equipage, instrument, and certificate requirements
  - Required maintenance
- Created with manned aircraft in mind

“UAS do not or cannot comply to a significant portion of 14 CFR 91 at this time”
Current Methods of Access

• **Certificate of Authorization (COA)**
  - Method available to Public Aircraft only
    - Federal and State government including universities
    - Provide their own airworthiness statement
  - Approval given case by case
  - Provides access to specific areas with limitations and requirements
  - Expires 2 years after approval date unless otherwise noted
  - Takes 3 months for approval

• **Experimental Certificates for UAS**
  - Available to commercial companies for testing aircraft
  - Rigorous airworthiness review by FAA
  - Certificate grants access to specific areas with tight restrictions for operations
UAS Platform
Decisions
UAS Platform Decisions

**Tactical**
LASE / LALE, small-area coverage (over-the-hill assessments)

USGS Raven

| UAF ScanEagle |

**Strategic**
MALE / HALE, large-area coverage, long-duration coverage

NASA Ikhana (Predator B)
Tactical

The situations where tactical UAS (sUAS) can support disaster observations:

- Incident crews use to provide real-time photo / video and IR imagery in tactical situations;
- Direct support to incident operations;
- Conditions where manned aircraft cannot operate (smoke, night, difficult terrain, etc.);
- Support by sUAS is required immediately / ability to launch quickly
Sensor Capabilities

Small UAS < 55 pounds:
- Full Motion Video
- Small Format Frame Camera
- Thermal - Infrared
- Chemical - Gas Plume Detection
- Meteorological temperature
- Radio Telemetry

Larger UAS Platforms:
- Electromagnetic
- Laser Range Finder
- LiDAR
- Hyperspectral
- Radars (SAR)
- Traditional Mapping Camera
- True Multispectral
Small (tactical) UAS typical data captures and systems:

TASE 150 image of fire on George Washington Jefferson NF, VA, 2011 (courtesy of D. Yoel, AAAI)
Strategic

The situations where strategic UAS can support disasters (wildfire) observations:

- Long-endurance data collection flights over remote fire areas, covering a large number of incidents;
- Provide communications link (radio repeater) between Incident Command (IC) and ground resources;
- Provide R/T day / night sensor imagery of fire behavior to IC;
- Ability to fly above, and out of way of all other fire aviation aircraft (out of TFR or FTA).
USGS Efforts

Red Rock Lakes MT. Water Thermal Discharge

Missouri River Erosion, South Dakota
Gray Butte, CA: Flight Test Center
Grand Forks, ND: Flight Operations Center
Florida: Maritime Operations Center
Oklahoma City, OK: National Air Training Center
Corpus Christi, TX: Operations Center
September 2010 Deployment
Northern Region
Southwest Region
Southeast Region
Washington, DC: Air & Marine Headquarters
Fort Drum, NY: Forward Operating Location
Riverside, CA: Air Operations Center
Sierra Vista, AZ: Flight Operations Center

DHS UAS Operating Locations
Hurricane Gustav 2008
Hurricane Hanna 2008
Hurricane Ike 2008
Red River Flooding, multiple years (CBP)
Missouri River Levee / Flooding (CBP)
AZ Wildfires, 2011 (CBP)
Monument Fire; 14 June 2011
## AAAI UAS Performance

The most advanced, commercial, long endurance UAS fleet in the United States

<table>
<thead>
<tr>
<th>UA Type</th>
<th>RS-16™</th>
<th>RS-20™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wingspan</td>
<td>12' 11&quot;</td>
<td>17' 3&quot;</td>
</tr>
<tr>
<td>MGTW</td>
<td>85 lbs</td>
<td>165 lbs</td>
</tr>
<tr>
<td>Endurance</td>
<td>12-16 hrs</td>
<td>6 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12-16 hrs future)</td>
</tr>
<tr>
<td>Ceiling</td>
<td>15,000'</td>
<td>15,000'</td>
</tr>
<tr>
<td>Max Speed</td>
<td>65 kts</td>
<td>75 kts</td>
</tr>
<tr>
<td>Payload Envelope</td>
<td>6 x 6 x 20.5&quot;</td>
<td>10.75 x 10.75 x 34&quot;</td>
</tr>
<tr>
<td>Payload Capacity</td>
<td>25 lbs</td>
<td>65 lbs</td>
</tr>
<tr>
<td>Payload Power (continuous)</td>
<td>100 watts</td>
<td>400 watts</td>
</tr>
<tr>
<td>Launch</td>
<td>Pneumatic Catapult</td>
<td></td>
</tr>
<tr>
<td>Recovery</td>
<td>Belly Land</td>
<td></td>
</tr>
<tr>
<td>Hard Points</td>
<td>0</td>
<td>2@20 lbs ea</td>
</tr>
</tbody>
</table>

© 2013 American Aerospace Advisors, Inc. All Rights Reserved.
RS-16 UAS Missions & Benefits

- Inspection & Surveillance
  - ROW Monitoring

- Emergency Management
  - Oil Spills
  - Fires
  - Hurricanes
  - Tornados
  - Floods
  - Search and Rescue

- Airborne Science

- Flight Test

- Simultaneous Payload Operations
  - Machinery Threat + Oil + Methane(?)
  - Precision Weather, and
  - Ad Hoc Mobile Communications
    - Voice, data & networking

- Far greater endurance

- Ideal for “Dull, Dirty and Dangerous” missions
  - Without putting pilots in harms way

- Higher precision flight profiles

- Smaller signature

- Cost competitive in routine operations
  - Overseas: Now
  - In United States: 2 to 4 years (in rural areas)

© 2013 American Aerospace Advisors, Inc. All Rights Reserved.
Upcoming RS-16 UAS Campaigns

- South Texas
  - Week of March 11th
  - Flying oil spill sensor
  - Can host a few observers

- Natural Gas Pipeline Test
  - Proposed in April May

- Long-Range UAS Demo under COA
  - Proposed on transmission corridor with both oil & gas lines

- 450 square mile FAA flight authorization including areas of the Gulf of Mexico
- Oil Spill Remote Sensing Payload - 1st flight on UAS
On-board Picarro Inc. Gas Analyzer showed extensive pockets of methane seeping into air in the Railroad Valley area, attracted attention of PG&E who purchased 100 of the analyzers for field monitoring of methane leaks.
FAA Modernization and Reform Act of 2012:
Expedited access for UAS public aircraft

- Setting a 30 Sept 2015 deadline for full integration of UAS into the NAS;
- Requiring a comprehensive integration plan within nine months;
- Requiring the FAA to create a annual UAS roadmap;
- Requiring sUAS (under 55 pounds) to be allowed to fly within 27 months;
- Requiring six UAS test sites to be established within six months;
- sUAS (under 55 pounds) be allowed to fly in the U.S. Arctic, 24 hours a day, beyond line-of-sight, at an altitude of at least 2,000 feet, within one year;
- Requiring expedited access for public users, (government) such as law enforcement, firefighters, emergency responders;
- Allowing public users to fly very small UAS (4.4 pounds or less) within 90 days- LOS, below 400 ft., daylight, outside 5 miles from airport or other aviation activities;
- Requiring the FAA to study UAS human-factors and causes of accidents.
Association of Unmanned Vehicle Systems International (AUVSI) has an excellent (Jan 2013) position paper pdf/ ppt entitled:

“Privacy and Legal Issues Associated with UAS Operations”

by Ben Gielow, Govt. Relations Manager & AUVSI General Council; gielow@auvsi.org or www.auvsi.org

POC for DHS CBP Predator UAS Support to National Needs / Emergencies / Disasters (coastal environs, spills, fires, flooding):
• John W. Priddy; DHS-CBP; john.w.priddy@cbp.dhs.gov

USGS UAS National Project Office; Mike Hutt; Denver, CO; mehutt@usgs.gov; 303-202-4296

American Aerospace Advisors, Inc. (AAAI), Airborne Systems Group; Dave Yoel; www.American-Aerospace.net; 484-995-0709
Vince Ambrosia

vincent.g.ambrosia@nasa.gov

650-604-6565