Sinclair Community College

National UAS Training and Certification Center

The Emerging Unmanned Aerial Systems Industry

June 25, 2015

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Workforce Development &
Corporate Services

SINCLAIR
UAS Training and Certification Center

Today's Agenda

- The Importance of Civil UAS
- Sinclair UAS Background and Vision
- Small UAS and Airspace Examples
- Leading Civil UAS Applications
- Curriculum and Training
- Modeling and Simulation
- Public Outreach and Education
- Overview of FAA UAS Policy
- High Altitude UAS Concepts
- Summary and Questions

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The Importance of Civil UAS

UAS Economic Impact

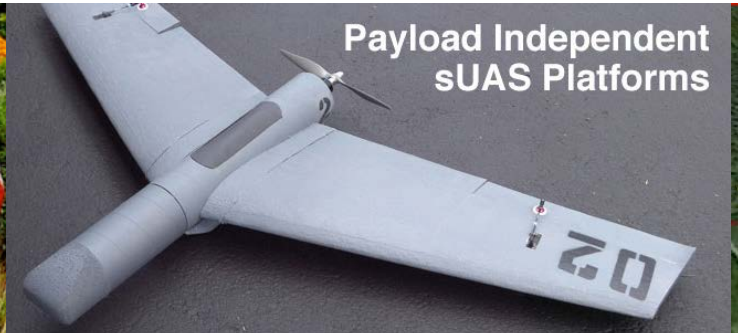
- AUVSI's March 2013 study, *Economic Impact of Unmanned Aerial Systems (UAS) Integration in the United States*, stated:
  - More than $13.6 billion economic impact between 2015 and 2018 growing to more than $82.1 billion over 10 years
  - Integration will create more than 24,000 manufacturing jobs and more than 70,000 new jobs between 2015 and 2018

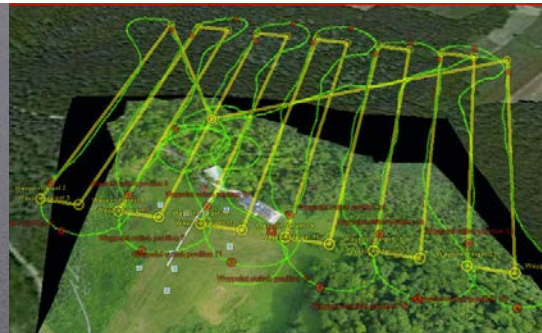
Career Opportunities

- Example careers in UAS include:
  - Pilots
  - Observers (ground-based or airborne)
  - Sensor and/or payload operators
  - Mission Planners
  - Engineers
  - Technicians (maintenance, electronics, IT, etc)
  - Manufacturers
  - Data Analysts
- Larger and more complex systems will require more personnel and separate job categories than smaller and simpler systems

Why Develop UAS?

- Three D's of unmanned aircraft:
  - Dangerous
    - Environments that could risk a crew's life
  - Dirty
    - Chemical, biological, or radioactive contamination
  - Dull
    - Long hours or stressful assignments





Industry Emergence and Evolution

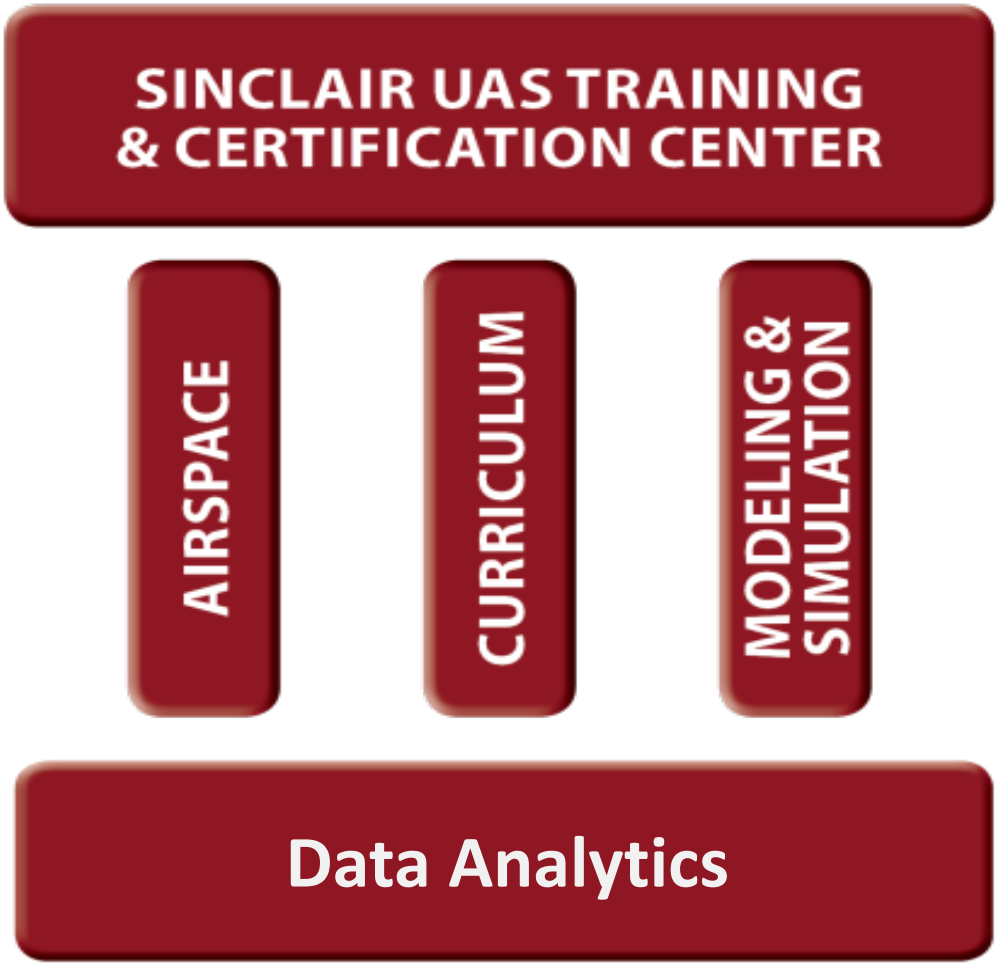
- Early entry involves investment and risk but supports industry alignment
- Constant updates are needed to assure programs are directionally correct in an evolving market
- Action must be taken rather than waiting until the UAS civil industry fully forms
- Leveraging existing resources and development of partnerships are vital
- Linkages must be made between emerging applications and future jobs

Sinclair UAS Background and Vision

Sinclair's UAS Vision

- Create a National Center for UAS Training and Certification at Sinclair Community College
  - Establish a national leadership position in Workforce Development and Training to support the growing UAS market
  - Align with the state/region's UAS strategy being driven by the Dayton Development Coalition, the State of Ohio, and Wright-Patterson Air Force Base
  - A partnership approach with leaders in the UAS market, including
    - Industry
    - Government
    - Academia

Sinclair UAS Strategic Framework

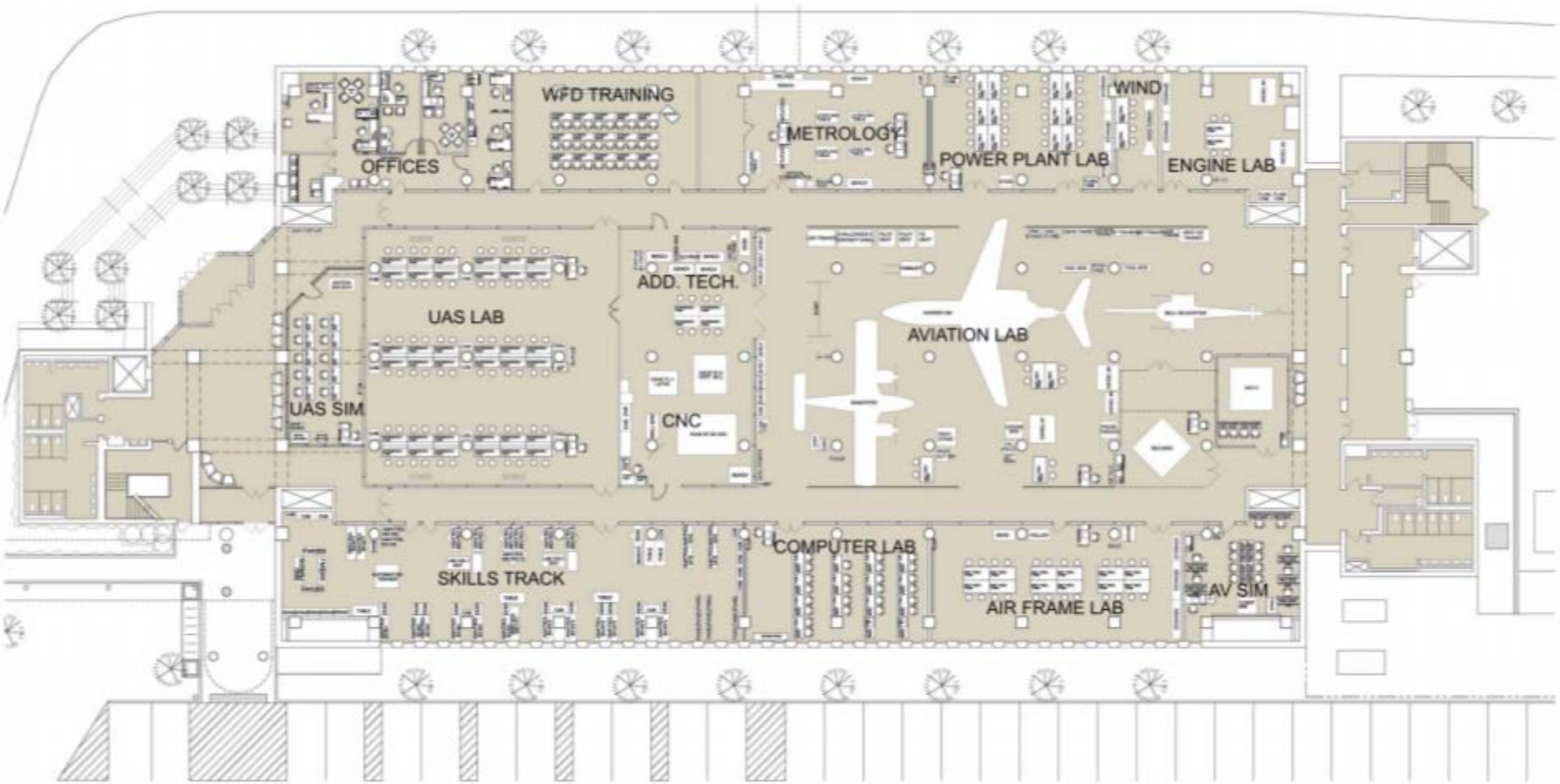


Sinclair UAS Strategic Commitment

- The Sinclair Board approved a $1.4M investment in May 2013 to support the continued expansion of the UAS programs
- Total internal Sinclair investment to date > $8M
- Over $4M of state UAS capital funding awarded to Sinclair

Phase I: 2009-12	Phase II: 2013-16	Phase III: 2017-22	Phase IV: 2023+
Early Market Positioning and Industry Alignment	Strategic Investment to Ensure Leadership Position	Scale and Growth	Sustaining the Vision

Sinclair UAS Center Floor Plan



UAS Indoor Flying Pavilion

Looking northeast in the Parking Lot

Looking south inside the Flying Pavilion

Looking southeast on Fifth Street

Aerial looking southeast

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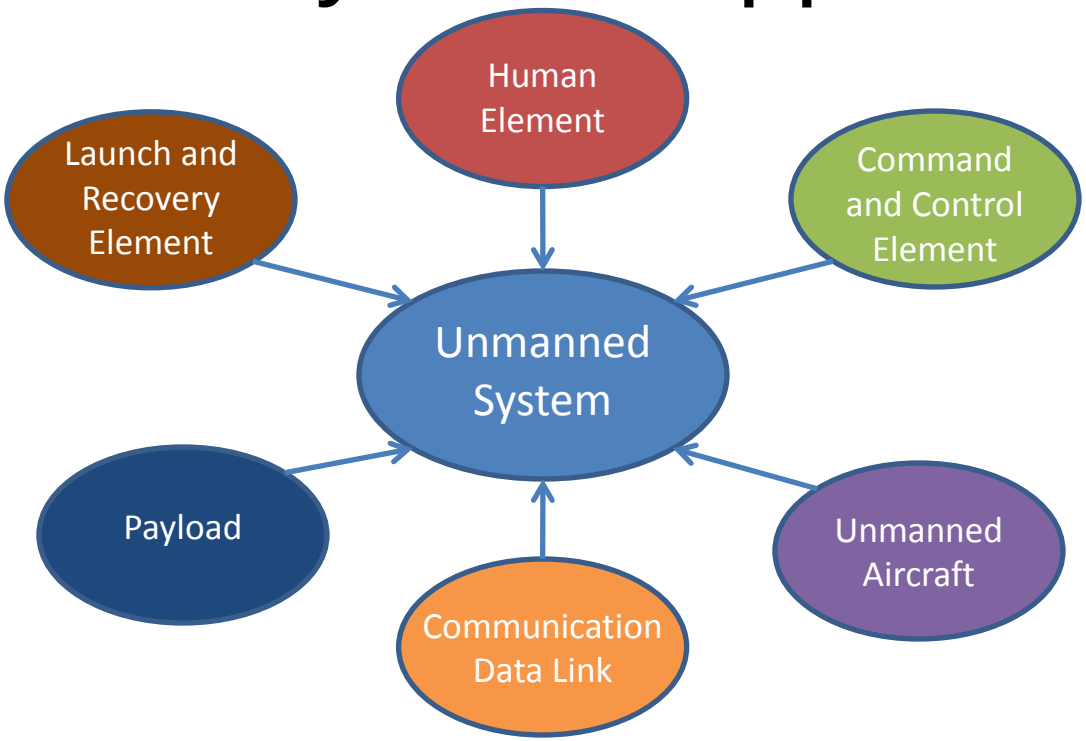
Small UAS and Airspace Examples

Sinclair's Systems Approach to UAS






Examples from Sinclair's UAS Fleet

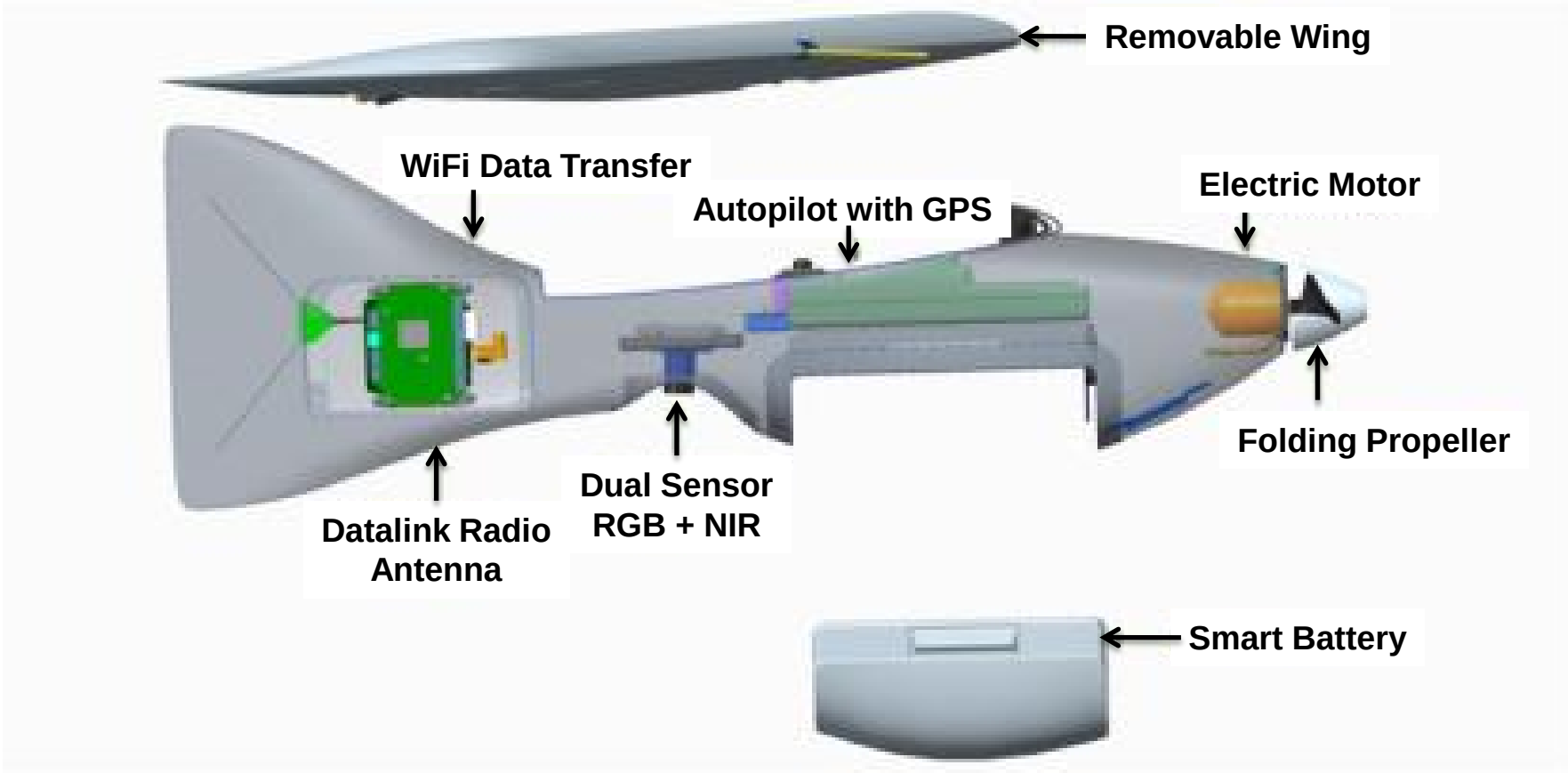
Fixed Wing – Sentera Vireo/Phoenix

- Carries EO/IR video and multispectral imaging payloads
- Delivers actionable data via data link to ground station
- Electrically powered
- Ultra-portable, single person operation
- Hand launched/autonomous landing
- Operates in winds up to 30+ mph
- Low operating and sustainment costs

Vireo/Phoenix – Specifications

- Endurance: Up to 1.0 hour typical
- Gross Takeoff Weight: 3.1 lbs. (1.4 kg)
- Typical Operating Altitude: 200-400 ft
- Payload: .45 lbs.
- Cruise Speed: 35 mph
- Dash Speed: 46 mph
- Wingspan: 38 inches (96cm)
- Durability: 75 flights MTBR (Mean Time Between Repairs)

Vireo/Phoenix – Aircraft Components



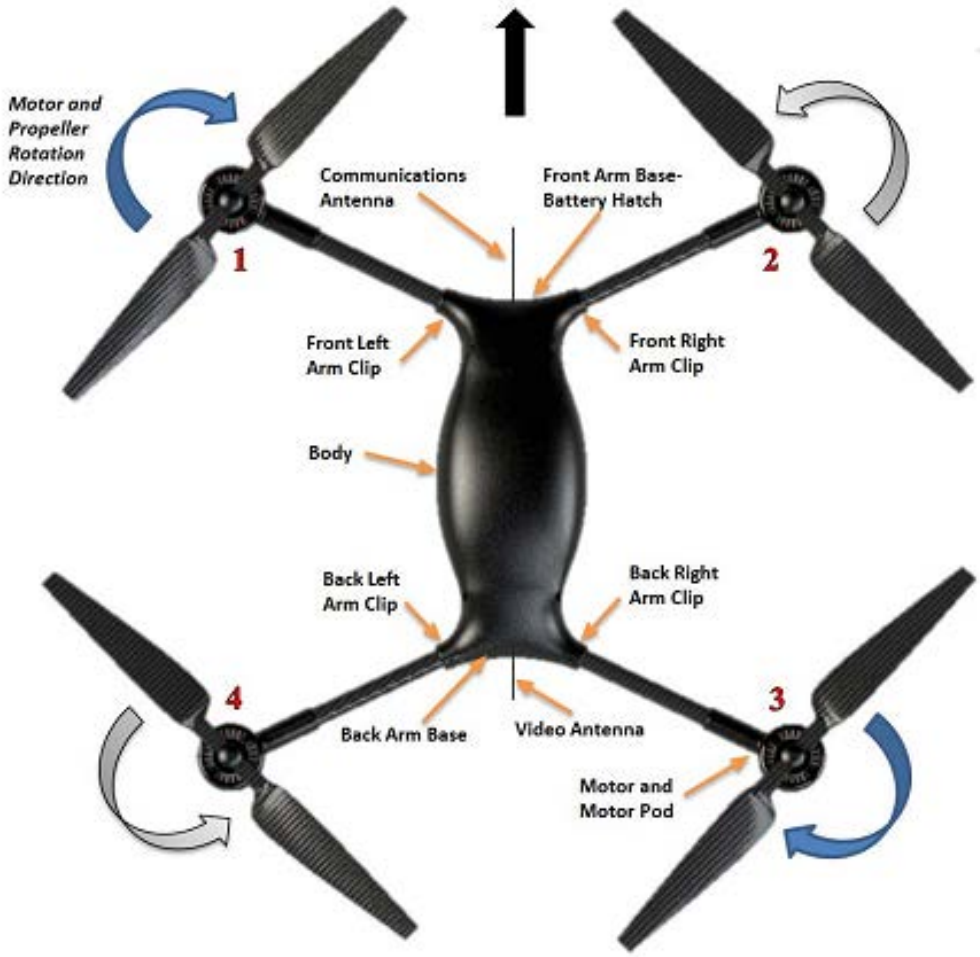
VTOL – Lockheed Martin Indago

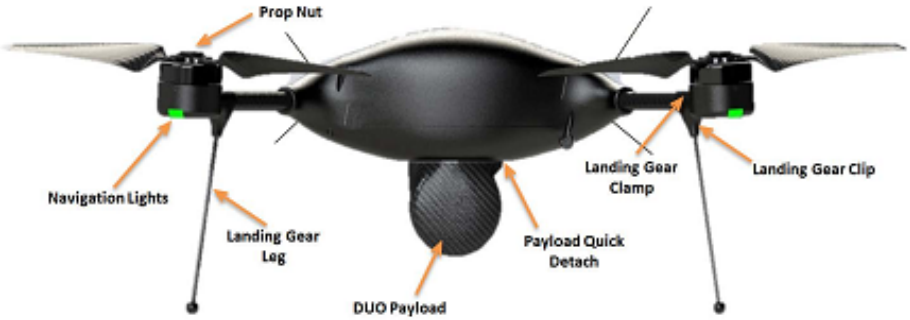
- Compact folding design
- Digital IP data link (video & comm.)
- Vision-aided guidance
- Quiet, rugged, all-weather
- Extended hover capabilities
- Hand launched, autonomous landing
- Ultra-portable, single person operation
- Low operating and sustainment costs
- Hand controller and/or full 3D GCS

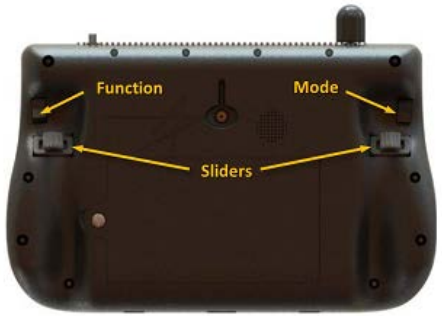
Indago - Specifications

- Endurance: 45-50 minutes
- Weight: 5 lbs.
- Typical Operating Altitude: 10-400 ft
- Payload: Dual Band Sensor
- Cruise Speed: 0-30 mph
- Dash Speed: 45 mph
- Dimensions(L x W x H):
  - Open: 32x32x7 inches
  - Folded: 12x9x6 inches

Indago – Aircraft Components







Airspace Access

Wilmington COAs and Section 333 Waiver

Expanded Springfield COAs

Airspace Access

OSU Don Scott Airport COA

NCMR COA

Airspace Access

Miami-Oxford Airport COA

KOXD Mode C Transponder Veil

UAS Indoor Flight Range

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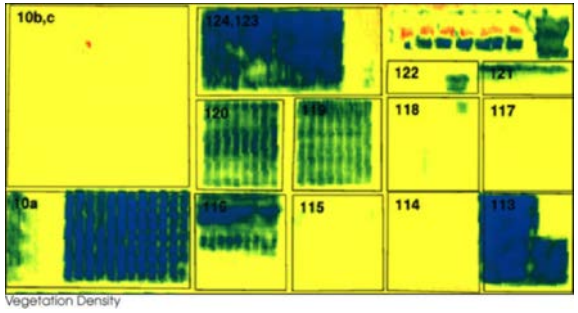
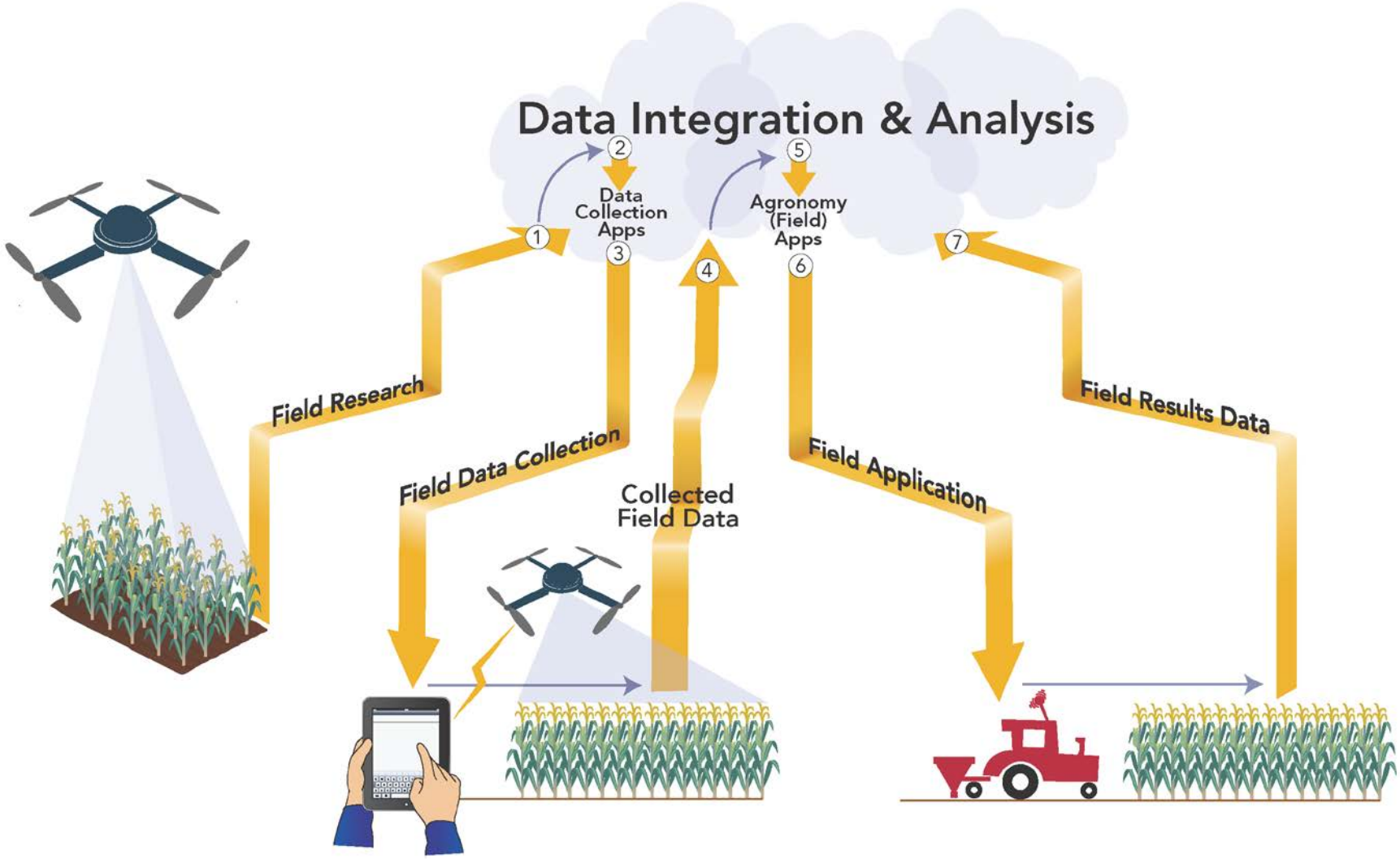
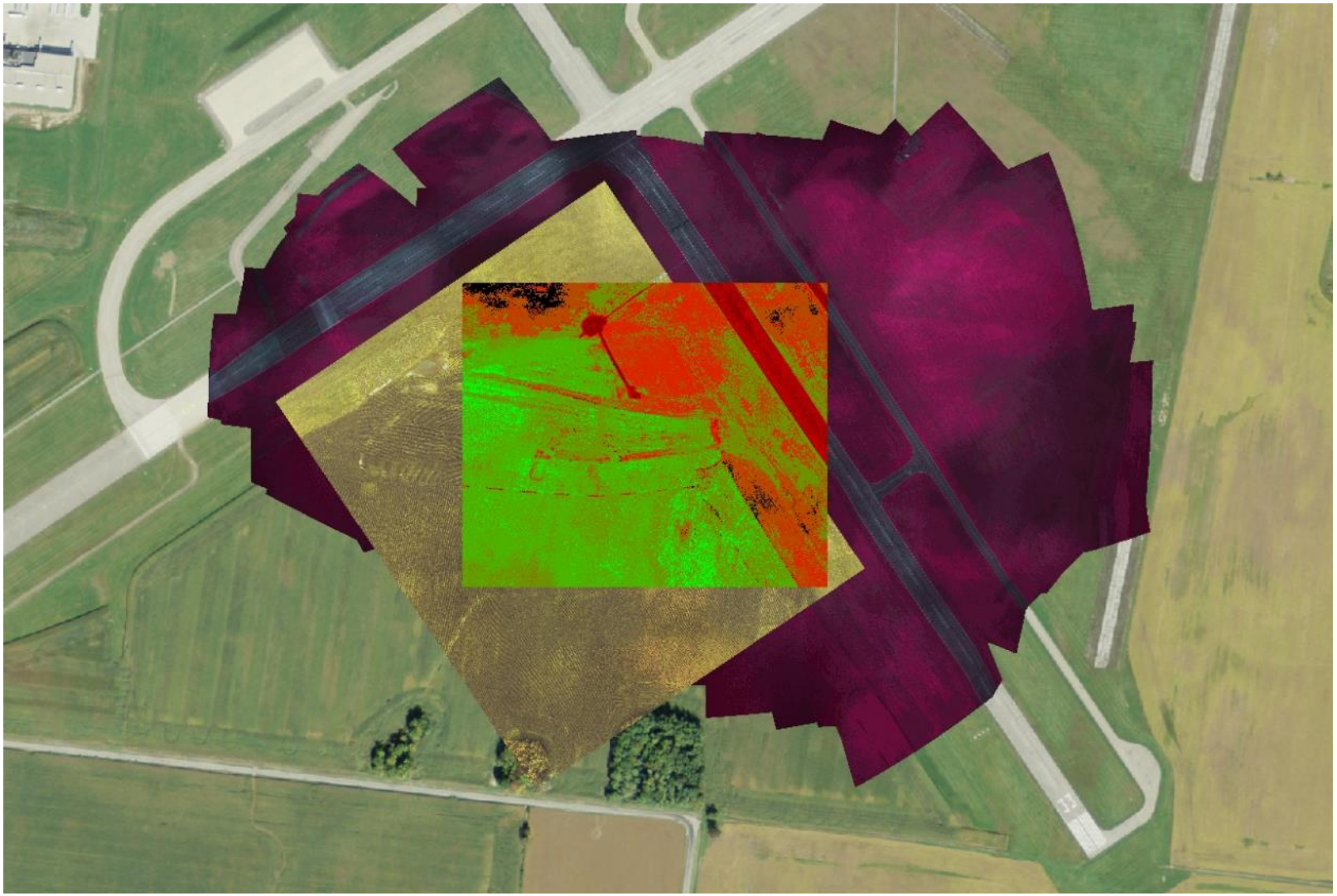
Leading Civil UAS Applications

Civil and Commercial Applications

- Precision Agriculture
  - 80% of projected civil UAS operation
  - Blight and Infestation Monitoring
  - Irrigation
  - Harvest Readiness
- First Responder Leadership
  - Operations are already allowed by waiver
  - Disaster Damage/Scene Assessment
  - Emergency Response and Awareness
  - Search and Rescue
- Geospatial Information
  - National commercial applicability
  - Mapping
  - Infrastructure
  - Natural Resources




Data Integration & Analysis
1
2
Data Collection Apps
3
4
5
Agronomy (Field) Apps
6
7
Field Research
Field Data Collection
Collected Field Data
Field Application
Field Results Data



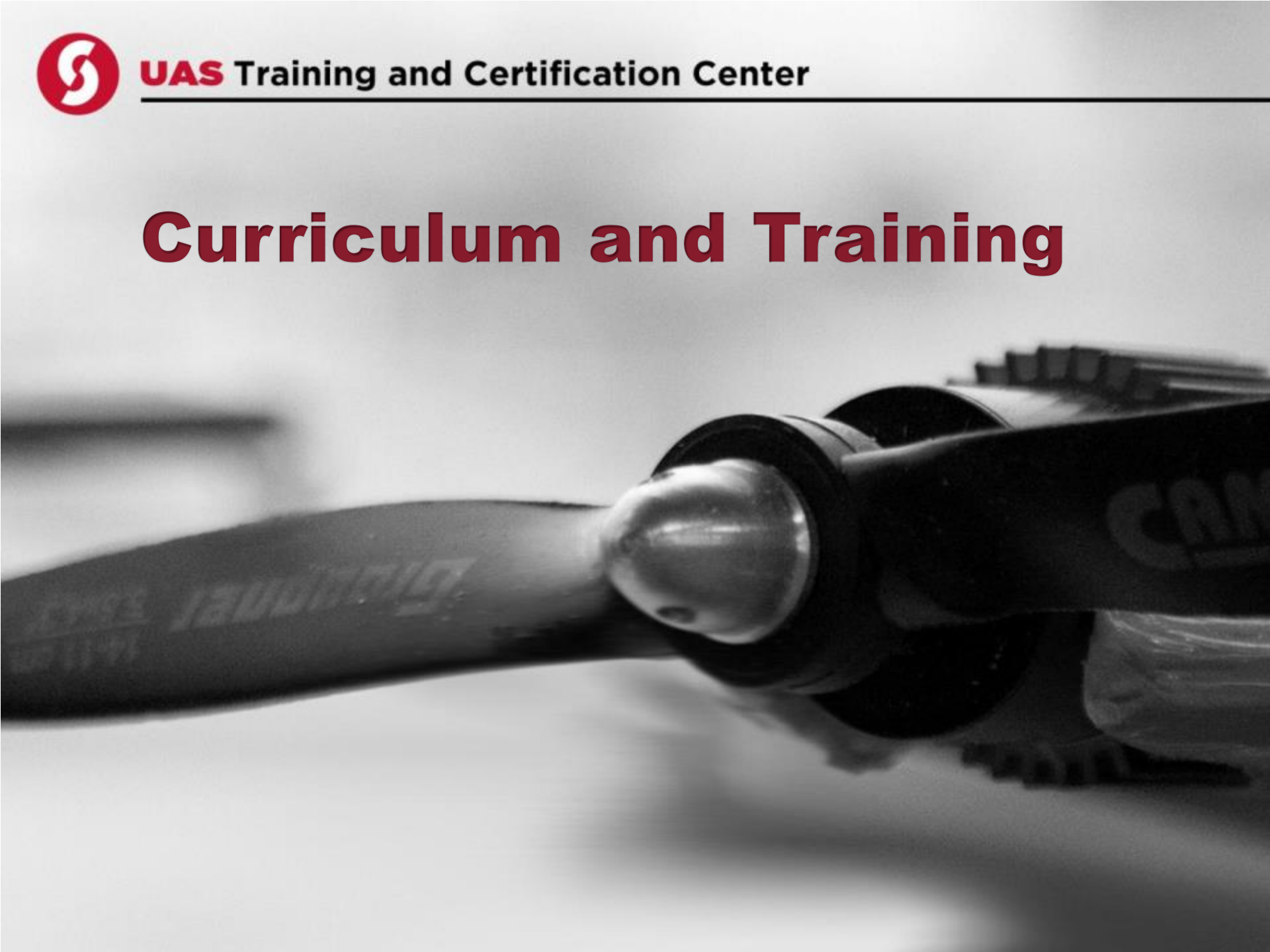
Multispectral Image Collected with Sinclair's Vireo Highlighting Precision Agriculture Applications at Springfield-Beckley Airport

Altavian

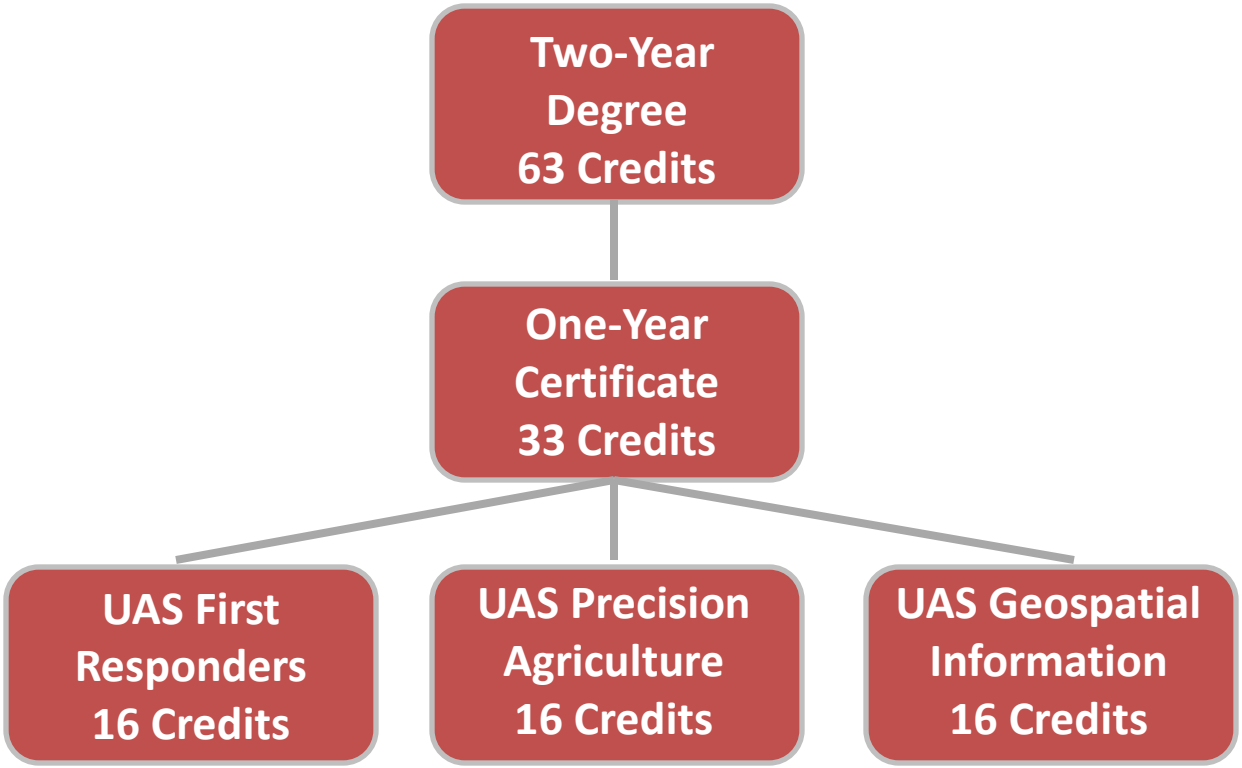
Video Screenshot Collected with the Sinclair Vireo Highlighting how First Responders can use UAS to Gain Situational Awareness

High Resolution Imagery Collected with Sinclair's Nova Block III Highlighting Geospatial and Mapping Applications

Curriculum and Training



Curriculum - Academic Programs



Curriculum - Workforce Training

Topic	Format(s)	Duration
Introduction to UAS	In-Person/Online	1 day/3 wks
Precision Agriculture for UAS	In-Person/Online	1 day/3 wks
Current State of UAS Standards and Regulations	In-Person/Online	1 day/3 wks
UAS and the Law	In-Person/Online	1 day/3 wks
Geospatial Information for UAS	In-Person/Online	2 days/5 wks
UAS for First Responder Leadership	In-Person/Online	2 days/5 wks
COA Smart	In-Person/Online	2 days/5 wks
Airworthiness	In-Person	2 days
UAS Platform Training		
Altavian – Nova Block III (OEM training provider)	Blended	5 wks online & 8 days onsite
FourthWing - Vireo	Blended	5 wks online & 4 days onsite
Custom Courses and Consulting		

OEM Training Partnerships

OEM ORIGINAL EQUIPMENT MANUFACTURER

Training for Altavian Nova Block III UAS and Sensor Package

Modeling and Simulation

RealFlight 7.5 – Pre-Flight Lab

Flight Controls

Multiple Small UAS Types

First Person View

Multiple Small UAS Types

L3 Simulation and AFRL EPA

Crew Station

UAS Simulation Lab

Sensor Operator View

Pilot Operator View

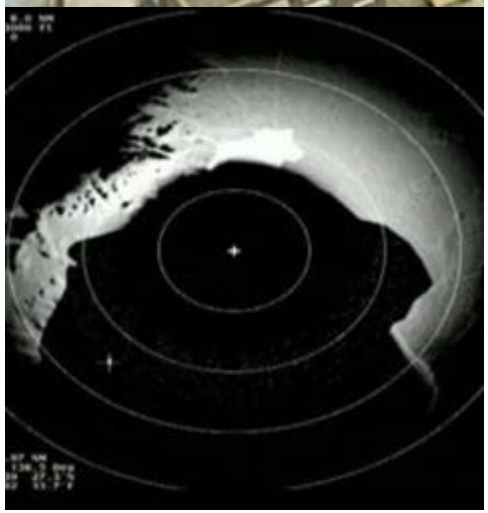
Modeling and Simulation Efforts In Progress

- AFRL collaboration focused on modular game-based simulation for research and training

- Aegis - Vampire
  - Addition of an instructor and 5 student workstations including new Toughbook PCs and ground control stations
  - Includes scenario development and student assessment capabilities

Modeling and Simulation Efforts In Progress

- Simlat – IMPACT
  - Addition of an instructor and 5 student workstations leveraging existing L3 station hardware
  - Ability to connect to existing Sinclair UAS ground control stations
  - Incorporates the PANEL scenario management and student assessment module
  - Incorporates a Synthetic Aperture Radar simulation module



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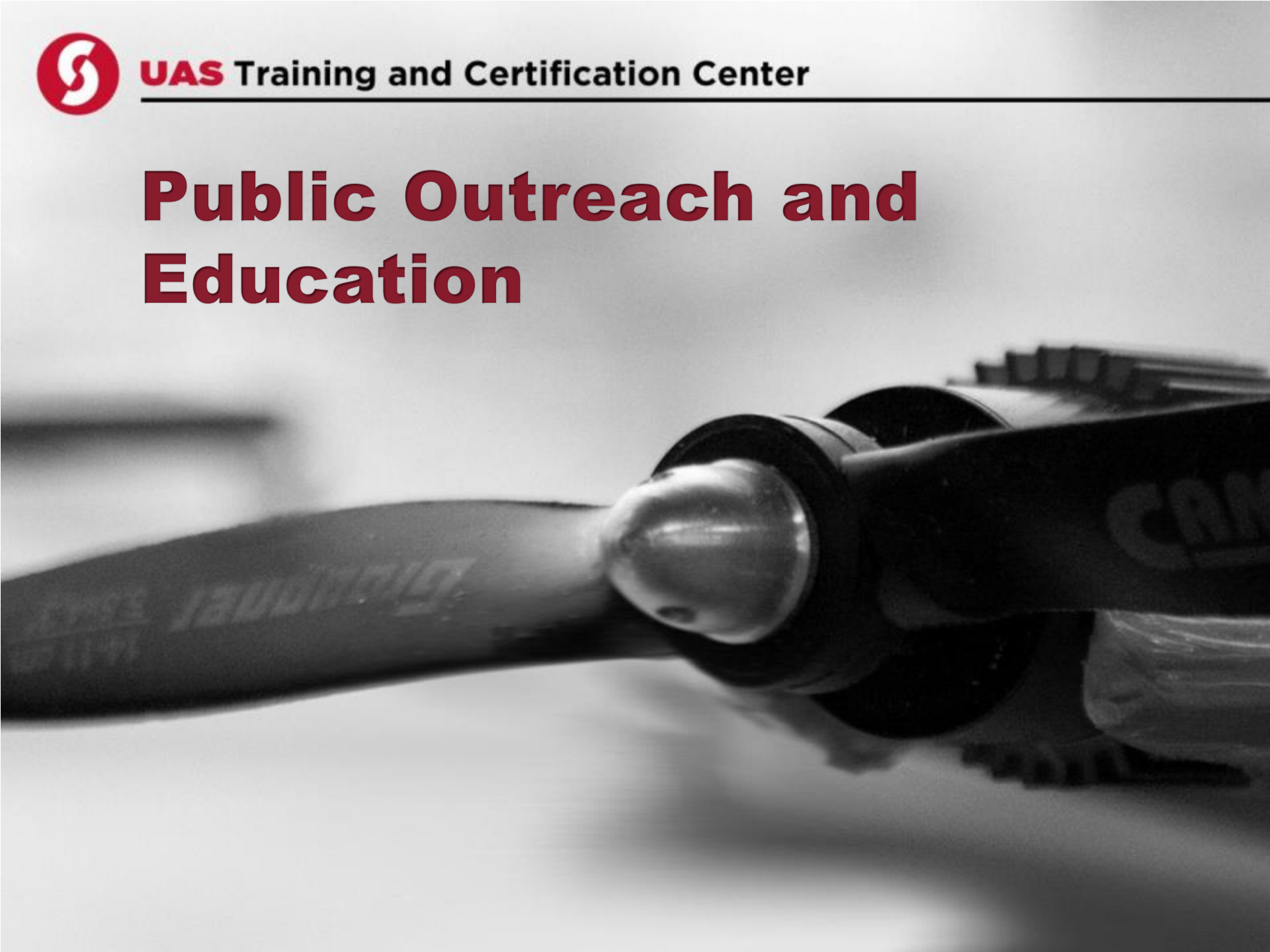
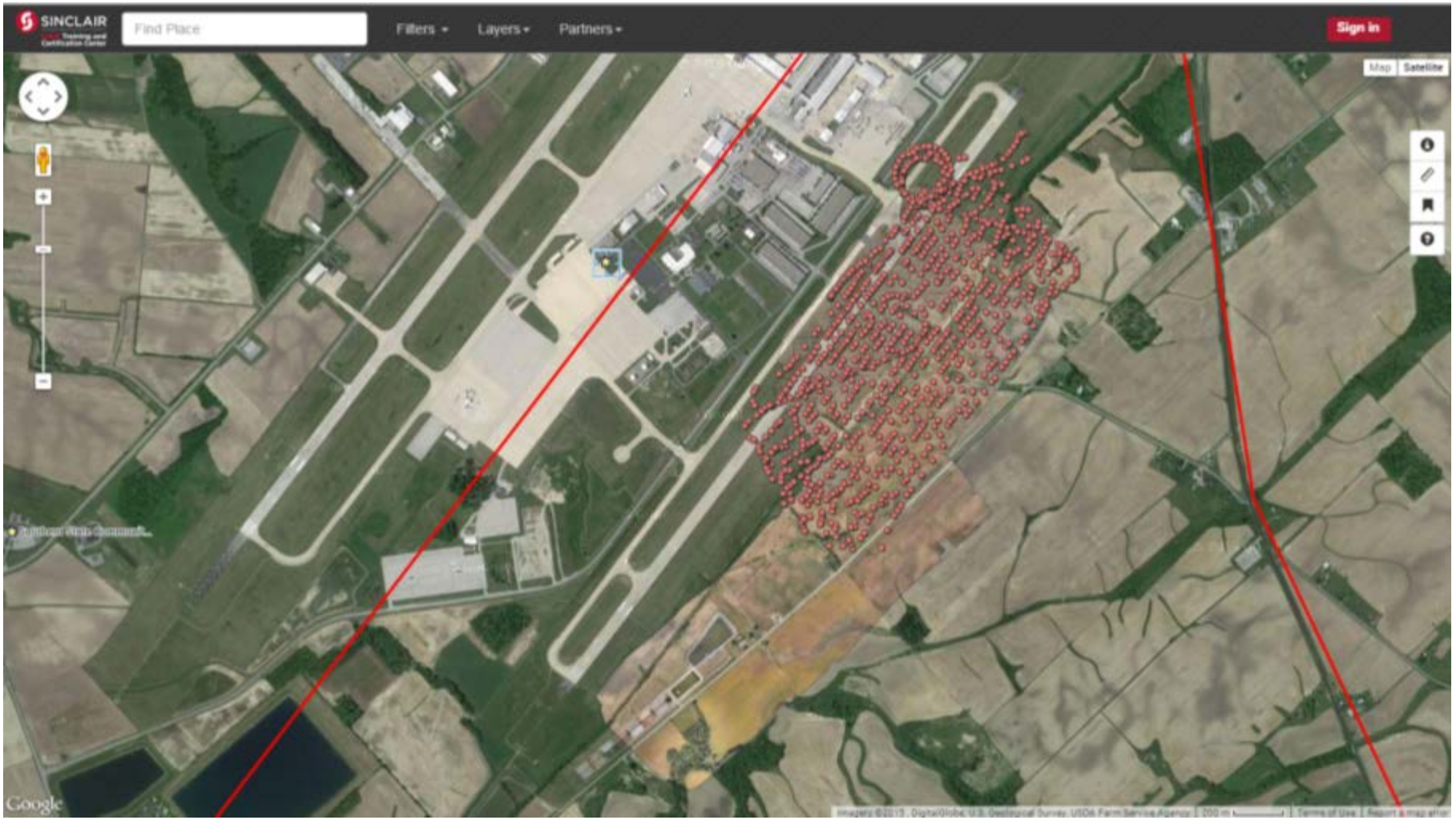
Public Outreach and Education



Sinclair Google Maps Data Portal



UNMANNED SYSTEMS ACADEMIC SUMMIT

August 24, 2015 • Sinclair Conference Center • 9am-5pm

Presentations related to UAS research and development, education and training, and commercialization and technology transfer

Networking opportunities with leading UAS academic researchers and educators

Tours of the newly renovated National UAS Training and Certification Center and UAS Indoor Flight Range

Demonstrations and hands-on activities including UAS simulation and indoor flight operations.

CO-HOSTED BY:

SINCLAIR
UAS Training and Certification Center

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

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Overview of FAA UAS Policy

Current Model Aircraft Operations

- The FAA strongly suggests that recreational operators
  - Fly below 400 feet and remain clear of surrounding obstacles
  - Keep the aircraft within visual line of sight at all times
  - Remain well clear of and do not interfere with manned aircraft operations
  - Don't fly within 5 miles of an airport unless you contact the airport and control tower before flying
  - Don't fly near people or stadiums
  - Don't fly an aircraft that weighs more than 55 lbs
  - Don't be careless or reckless with your unmanned aircraft – you could be fined for endangering people or other aircraft

Airworthiness, Section 333s, COAs

- FAA issued airworthiness certificates
  - Standard Airworthiness Certificate
  - Special or Experimental Airworthiness Certificates
- Certificates of Authorization
  - Public operators
- Section 333 Exemptions
  - Commercial operators
  - COAs are still required under 333 Exemptions

FAA sUAS Notice of Proposed Rulemaking

- Operational Limitations
  - Unmanned aircraft must weigh less than 55 lbs. (25 kg)
  - Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the operator or visual observer
  - At all times the small unmanned aircraft must remain close enough to the operator for the operator to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses
  - Small unmanned aircraft may not operate over any persons not directly involved in the operation
  - Daylight-only operations (official sunrise to official sunset, local time)
  - Must yield right-of-way to other aircraft, manned or unmanned
  - May use visual observer (VO) but not required

FAA sUAS Notice of Proposed Rulemaking

- Operational Limitations (Cont.)
  - First-person view camera cannot satisfy “see-and-avoid” requirement but can be used as long as requirement is satisfied in other ways
  - Maximum airspeed of 100 mph (87 knots)
  - Maximum altitude of 500 feet above ground level
  - Minimum weather visibility of 3 miles from control station
  - No operations are allowed in Class A (18,000 feet & above) airspace
  - Operations in Class B, C, D and E airspace are allowed with the required ATC permission
  - Operations in Class G airspace are allowed without ATC permission
  - No person may act as an operator or VO for more than one unmanned aircraft operation at one time

FAA sUAS Notice of Proposed Rulemaking

- Operational Limitations (Cont)
  - No careless or reckless operations
  - Requires preflight inspection by the operator
  - A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS
  - Proposes a microUAS option that would allow operations in Class G airspace, over people not involved in the operation, provided the operator certifies he or she has the requisite aeronautical knowledge to perform the operation

FAA sUAS Notice of Proposed Rulemaking

- Operator Certification and Responsibilities
  - Pilots of a small UAS would be considered “operators”
  - Operator Certification and Responsibilities
  - Operators would be required to
    - Pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center
    - Be vetted by the Transportation Security Administration
    - Obtain an unmanned aircraft operator certificate with a small UAS rating (like existing pilot airman certificates, never expires)
    - Pass a recurrent aeronautical knowledge test every 24 months
    - Be at least 17 years old

FAA sUAS Notice of Proposed Rulemaking

- Operators would be required to (Cont.)
  - Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the proposed rule
  - Report an accident to the FAA within 10 days of any operation that results in injury or property damage
  - Conduct a preflight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is safe for operation

FAA sUAS Notice of Proposed Rulemaking

- Aircraft Requirements
  - FAA airworthiness certification not required
  - However, operator must maintain a small UAS in condition for safe operation and prior to flight must inspect the UAS to ensure that it is in a condition for safe operation
  - Aircraft Registration required (same requirements that apply to all other aircraft).
  - Aircraft markings required (same requirements that apply to all other aircraft)
  - If aircraft is too small to display markings in standard size, then the aircraft simply needs to display markings in the largest practicable manner

FAA sUAS Notice of Proposed Rulemaking

- Model Aircraft
  - Proposed rule would not apply to model aircraft that satisfy all of the criteria specified in Section 336 of Public Law 112-95
  - The proposed rule would codify the FAA's enforcement authority in part 101 by prohibiting model aircraft operators from endangering the safety of the NAS

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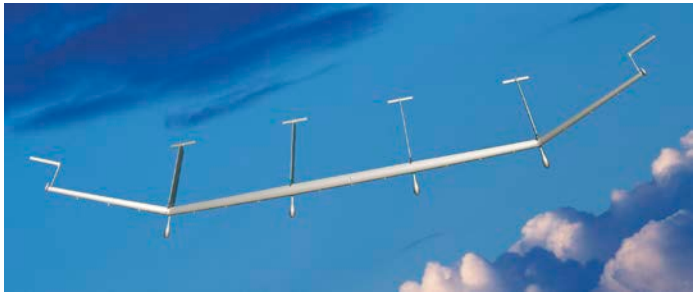
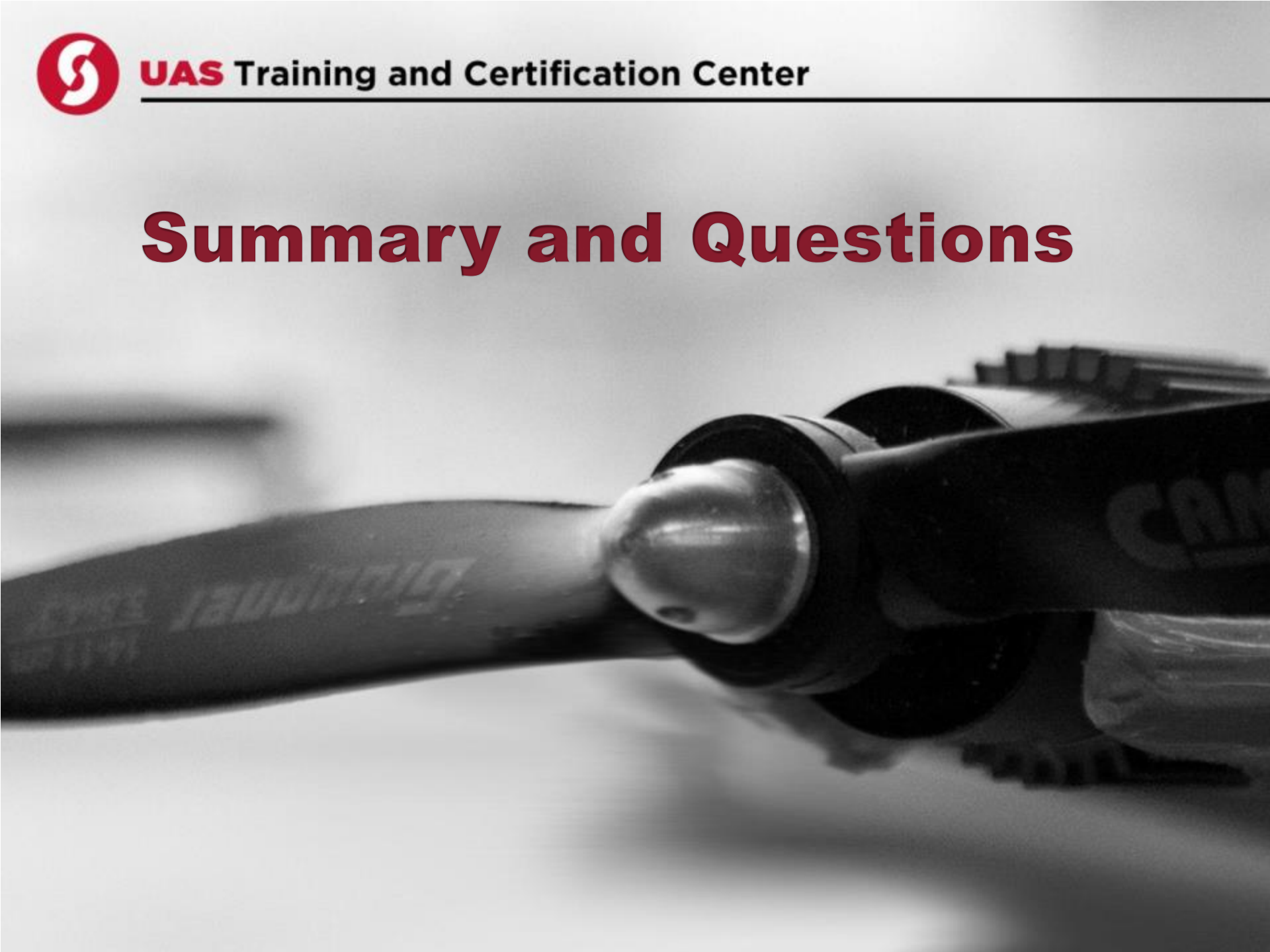
High Altitude UAS Concepts

Example High Altitude UAS



Summary and Questions



In Summary

- The UAS industry is rapidly growing enabled by advances in technology, broader public acceptance, and regulatory development
- Many opportunities exist for collaborations between those in established industries and civil UAS research and commercialization efforts
- Developing the next generation of the UAS workforce and researchers is vital for civil UAS to reach its full potential

Questions