



**Indiana State  
University**



## ***The Game of Drones***

**Dr. Richard Baker**

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# Agenda

- UAS in Academia
- Drones or UAS – What are they?
- Who can fly them?
- Applications
- What does it mean?

# **UAS ACTIVITIES IN ACADEMIA**

# Student activities



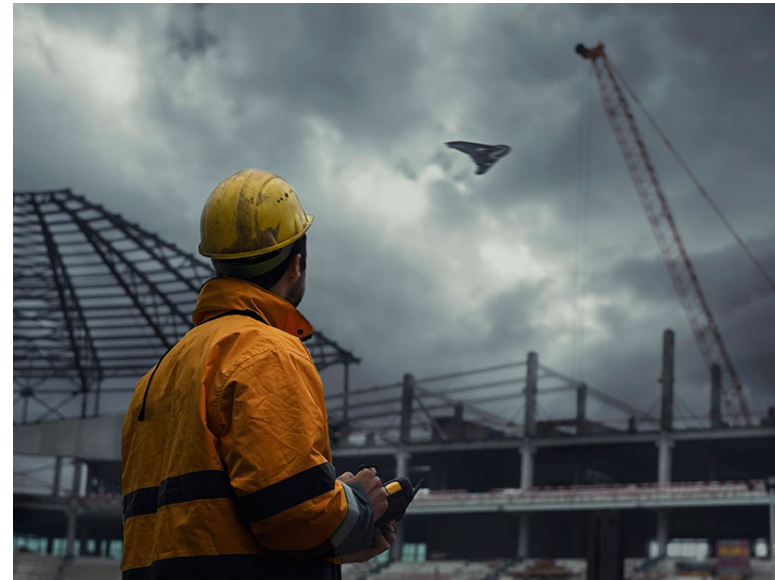


# Student activities



# Drones: a.k.a. UAS

800+ UAV manufacturers each making 2 to 3 models



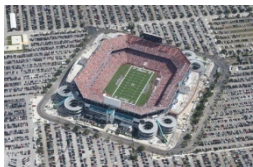
# UAS Industry Future

- Study by AUVSI on 2013
- Growth of Unmanned Systems industry
  - \$110 Billion by 2025
  - over 100,000 jobs
- Economics potentials
  - Workforce development / Job Opportunities
  - \$10 billion in losses each year integration delayed
  - Daily loss rate of \$27.6 million



# Unmanned Systems

## Example Applications



Border Security

Arctic Research

Firefighting

Flood Monitoring

Crop Dusting

Mining

Farming

Aerial Photography

Real-estate

Communications

Industrial Logistics

Pollution Monitoring

Storm Research

HAZMAT Detection

Asset Monitoring

Event Security

Port Security

Construction

Cargo

Broadcasting

Search & Rescue

Volcanic Research

Pipeline Monitoring

Filmmaking

Crowd Control

Aerial News Coverage

Wildlife Monitoring

Forensic Photography

Power line Surveying

Damage Assessment





# **UNMANNED AERIAL SYSTEMS (UAS) OVERSIGHT**

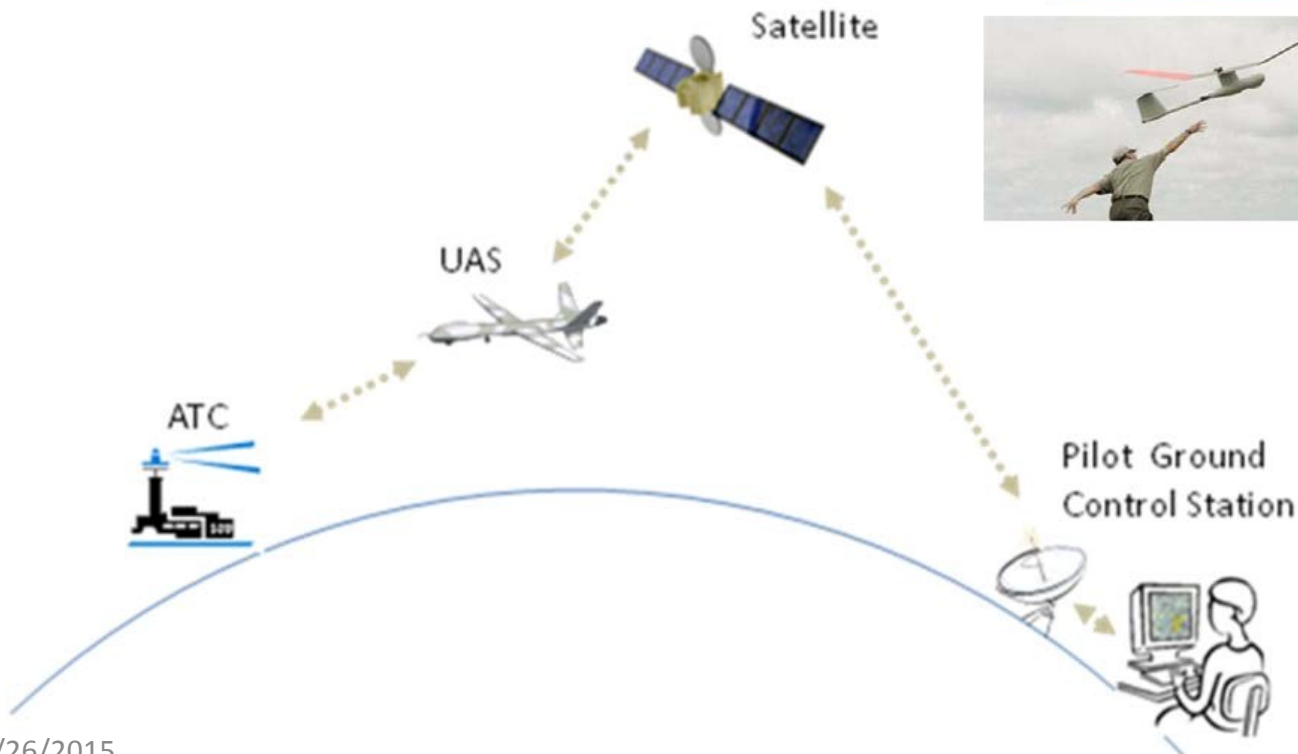
# UAS / Drone

- Numerous terms for UAS
  - Unmanned Aerial Vehicle (UAV; remote vehicle element)
  - Unmanned Aircraft/Aerial Systems (UAS)
  - Remotely Piloted Aircraft (RPA)
  - aerial target drone (drone)
- UAS (Unmanned Aerial System)
  - An aircraft without a pilot onboard
  - Remotely controlled or autonomous
  - Used for tasks without risk to human operators/crew



# What are UAS?

- **FAA defines UAS as a *system***
  - Unmanned Aircraft (UA)



# Regulatory Environment



## Three major considerations

- UAS operate within NAS, and must comply with applicable regulations designated for general flight ops (e.g., see and avoid)
- There is concern (from manned pilots) regarding the potential for midair collisions
- Since UAS can interact with conventional aircraft (within NAS), they are expected to be held to a standard of *equivalent level of safety* (ELOS)



# Regulations

- Advisory Circular 91-57, published in 1981, acknowledges model aircraft are not UAS
- FAA Notice 8900.227 Unmanned Aircraft Systems Operational Approval
  - Guidance and Policy
  - Certificate of Authority or Waiver (COA)
  - Personnel/aircrew qualifications
- Section 333 Exemption to FAA Modernization and Reformation Act of 2012 allows commercial operations for small UAS



# Who can fly them?

- Flying in the National Airspace System is regulated by the FAA
- Three ways to fly UAS
  - Hobby or model aircraft
  - Government (Public) Operations
  - Commercial (Civil) Operations





# Who can fly them?

	Public Operations	Civil Operations (including Section 333)	Hobby or Recreational
Type	<ul style="list-style-type: none"> <li>Governmental</li> </ul>	<ul style="list-style-type: none"> <li>Commercial/</li> <li>Compensation for Hire</li> </ul>	Hobbyist
Requirements	<ul style="list-style-type: none"> <li>Must verify Public Aircraft Operator eligibility and be Certificate of Waiver or Authorization (COA)</li> </ul>	<ul style="list-style-type: none"> <li>Must be granted Exemption                             <ul style="list-style-type: none"> <li>AND Certificate of Waiver or Authorization (COA), or</li> </ul> </li> <li>Special Airworthiness Certificate                             <ul style="list-style-type: none"> <li>– Restricted Category</li> <li>– Experimental</li> </ul> </li> </ul>	Must comply with Section 336 of FAA Modernization and Reform Act of 2012
Rules	<ul style="list-style-type: none"> <li>Detailed in COA</li> <li>Self-certification of crew and equipment</li> </ul>	<ul style="list-style-type: none"> <li>Detailed in COA; restrictions                             <ul style="list-style-type: none"> <li>outlined in Exemption</li> </ul> </li> </ul>	Generally must operate in visual line-of-sight, under 400', avoid manned aircraft, operate during daylight hours and fly according to community based safety guidelines

# Proposed Small UAS Rule

- **Currently in DRAFT**
  - Notice of Proposed Rulemaking (NPRM) Published to Federal
  - Register on February 23, 2015
  - Public comment period concluded on April 24, 2015
- **Small commercial UAS projected to be largest growth sector**





# **UNMANNED AERIAL SYSTEMS (UAS) APPLICATIONS**

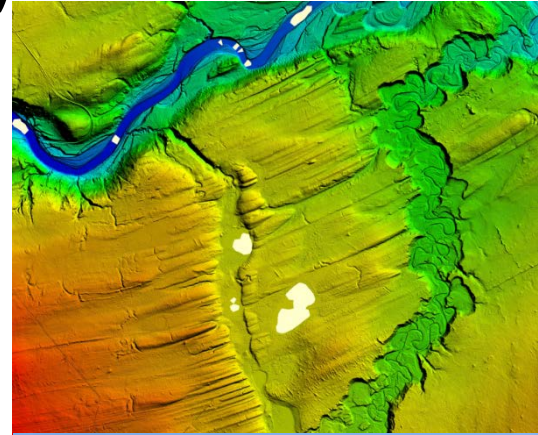
# Uses of UAS - Civil

- Communications (relay)
- Damage/infrastructure assessment
- Search and rescue
- Security
- Aerial photography
- Conservation/Wildlife
- Emergency response / Law



# Uses of UAS - Commercial

- Precision agriculture
- Aerial photography, filming and videography
- Communications (service provider)
- Construction
- Mapping / Surveying
- Infrastructure inspection
- Natural resource exploration
- Logistics



# **UNMANNED AERIAL SYSTEMS (UAS)**

## **WIIFM**



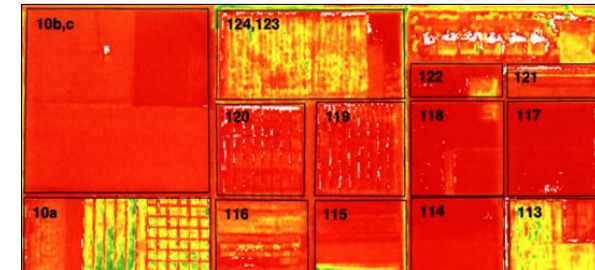
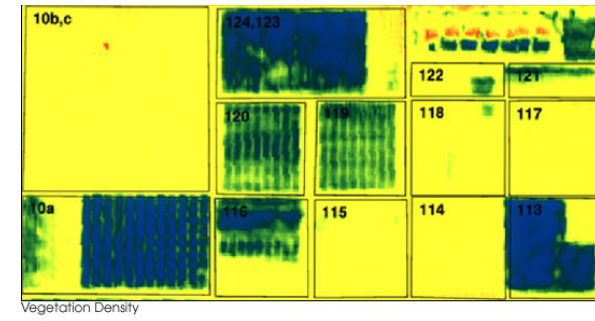
# Why do we care?

- New technologies
  - Change
  - Methods
  - Opportunities
  - Challenges
  - RISK



# Public Issues

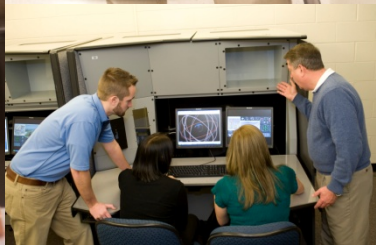
- Storage
- Security
- Privacy
- Safety
- Policies



# Summary

- Emerging technology
- New methods and applications
- New challenges to the National Airspace System
- Need safety and policies as manned aircraft
- First step in Risk Management – THINK!





# DISCUSSION