

UAS Overview: NC Surveys Forum

April 10, 2014

Kyle Snyder,
NGAT Center Director



NC STATE UNIVERSITY

Agenda

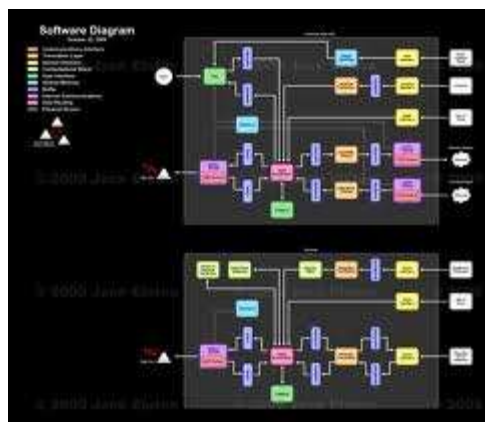
- UAS Overview
 - Components
 - Capabilities / Applications
 - Facts vs Myths
- Regulations
 - FAA
 - COA Process
 - NC (CIO, NGAT, NCDOT)
- NC UAS Program
 - Ecosystem
 - Industry engagement
 - Research
 - Flight Operations





A soldier launches an RQ-11 Raven.





TASE150 Series



TASE200 Series



TASE300 Series



TASE400



UAS - It's a System!



1- Camera/Gimbal

- ## 5- Communication System

- ## 4- Flight Control System

- ## 6- Airframe



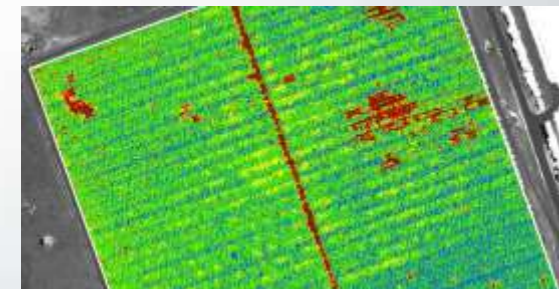
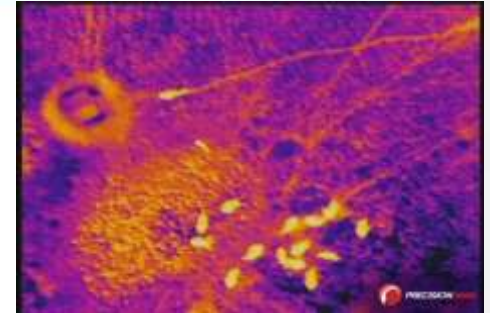
Hundreds of Potential Use Cases



- Emergency Response
- Mapping / Aerial Photography
- Homeland Security
- Civil Air Patrol
- Agriculture
- Mining
- Forestry
- Wildlife Resources
- Transportation
- Investigation
- Drug Enforcement
- Anti-terrorism
- Law Enforcement
- First Responder Support
- Weather Research
- Disaster Analysis
- Airport Planning
- Entertainment
- Others

UAS for Agriculture Research

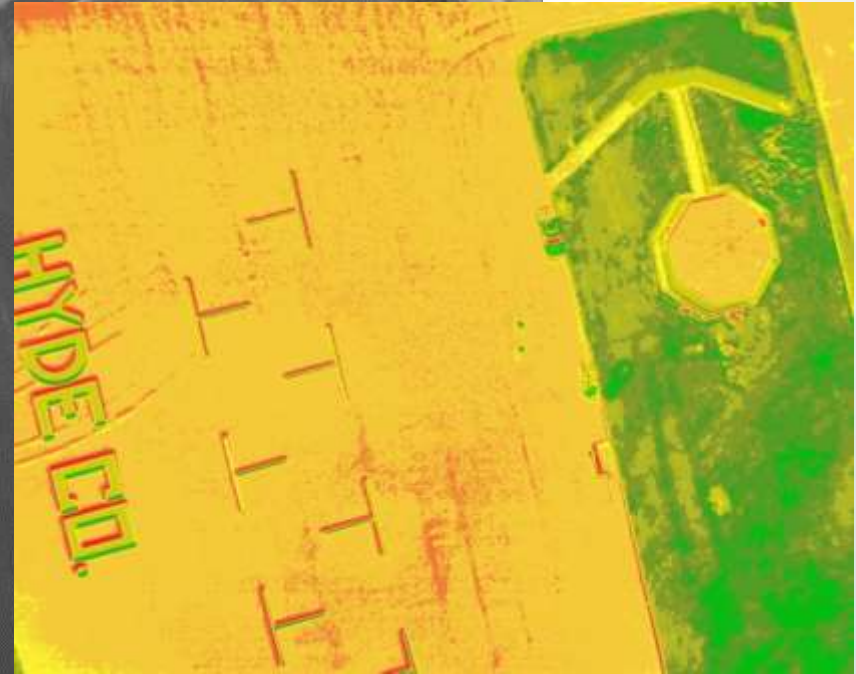
- Aerial Surveying/Mapping
 - Terrain modeling
 - Assessments- damage, crop types
 - Ground Sensor data capture- RFID
- Crop Analysis
 - Thermal: Soil/Vegetation Moisture
 - NDVI development
 - Plant height, spacing
 - Stresses
 - Yield prediction
- Aerial Application
 - At night
 - Precision
 - Low altitude = greater penetration, reduced drift
- Herd Management
 - Health Monitoring
 - Tracking



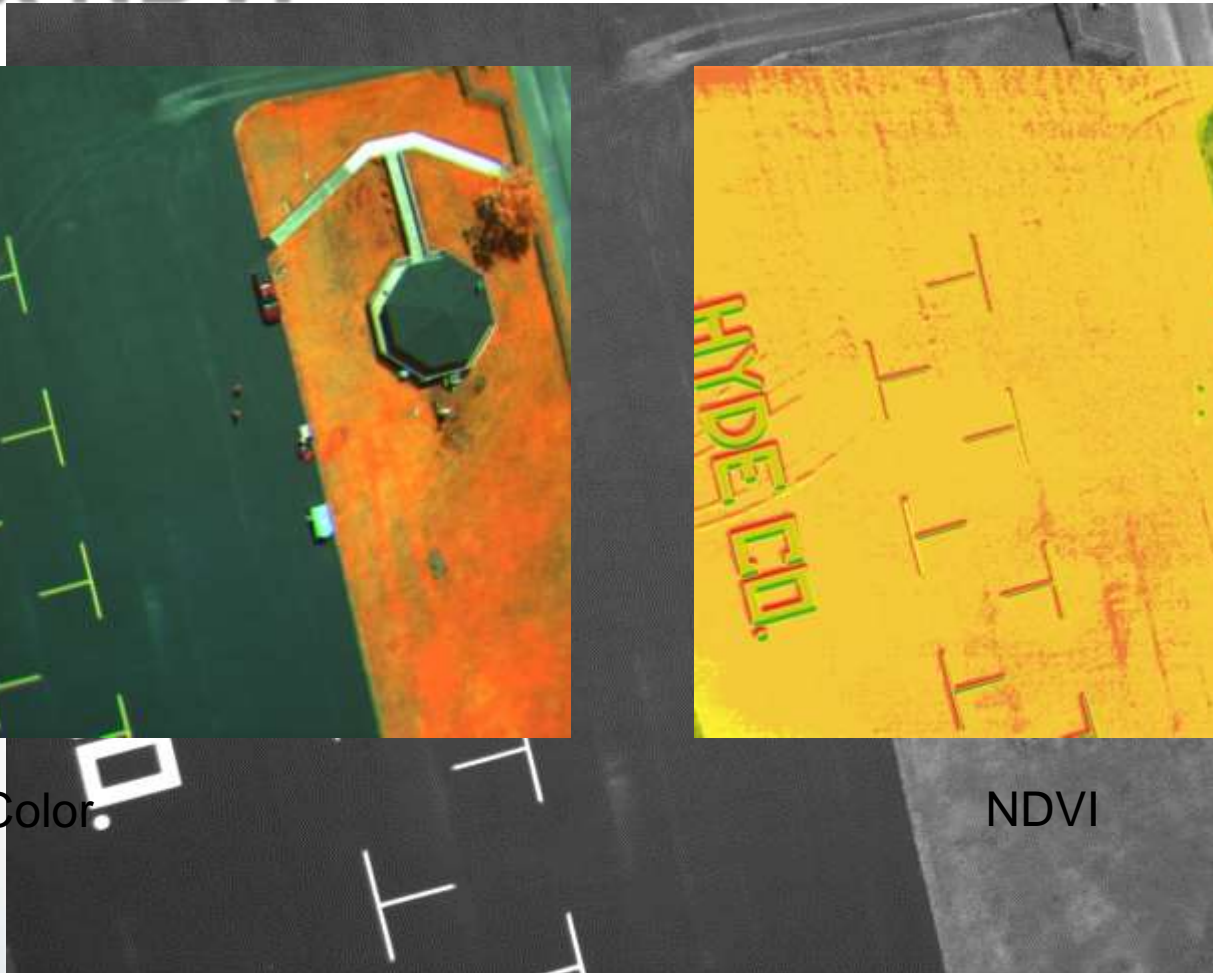
Normalized Difference Vegetation Index NDVI



False Color



NDVI

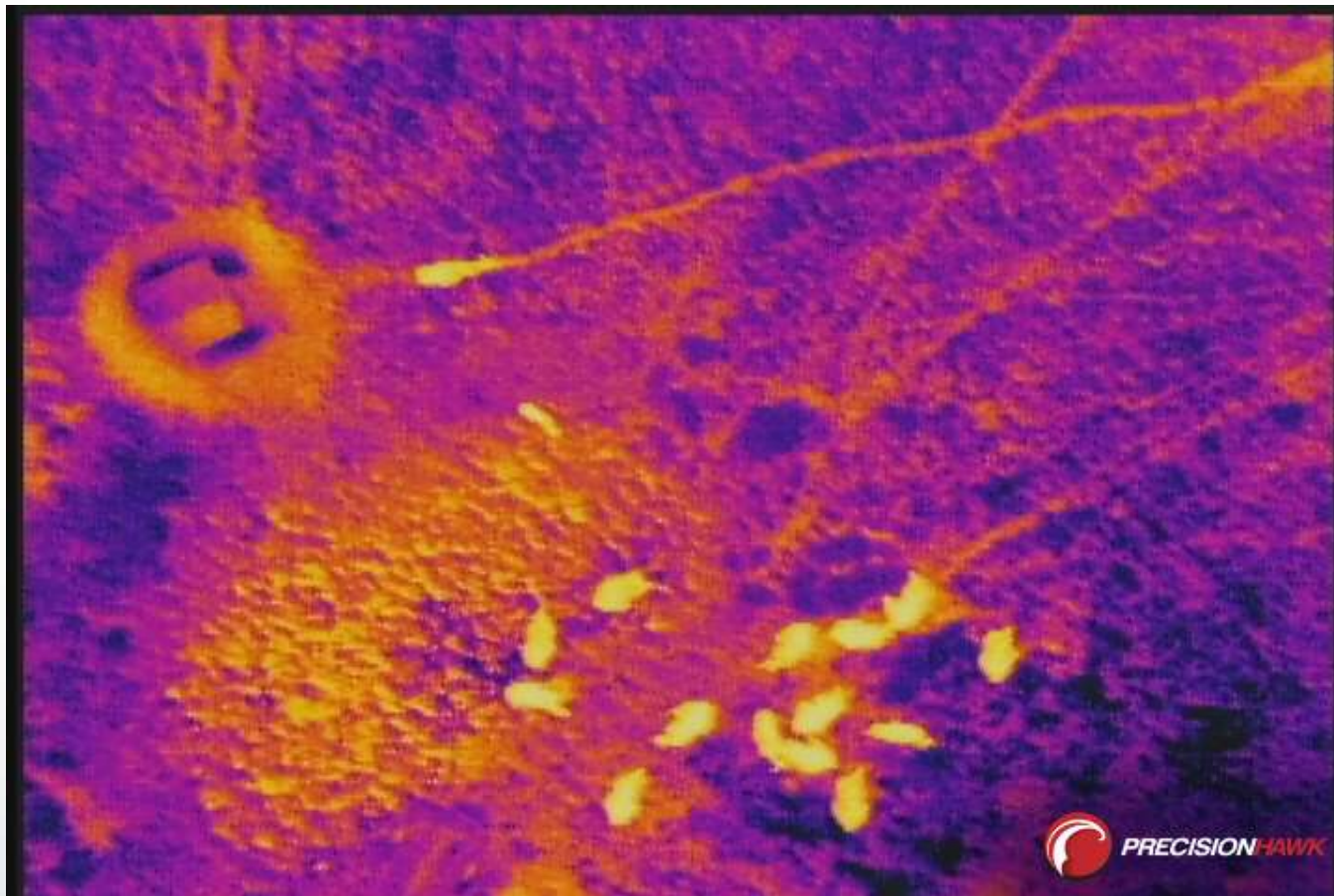


Original

Classified Multispectral



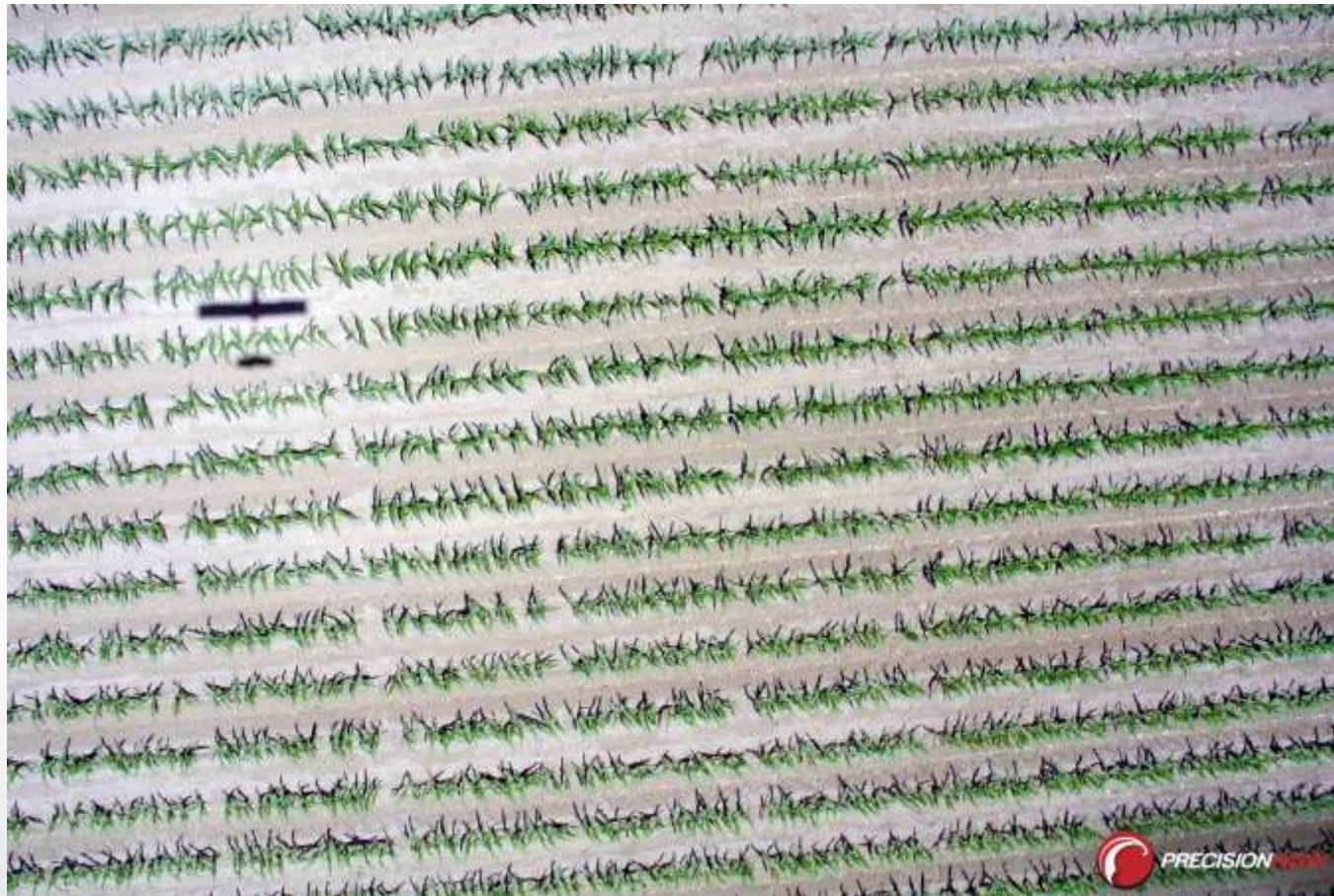
Livestock Monitoring



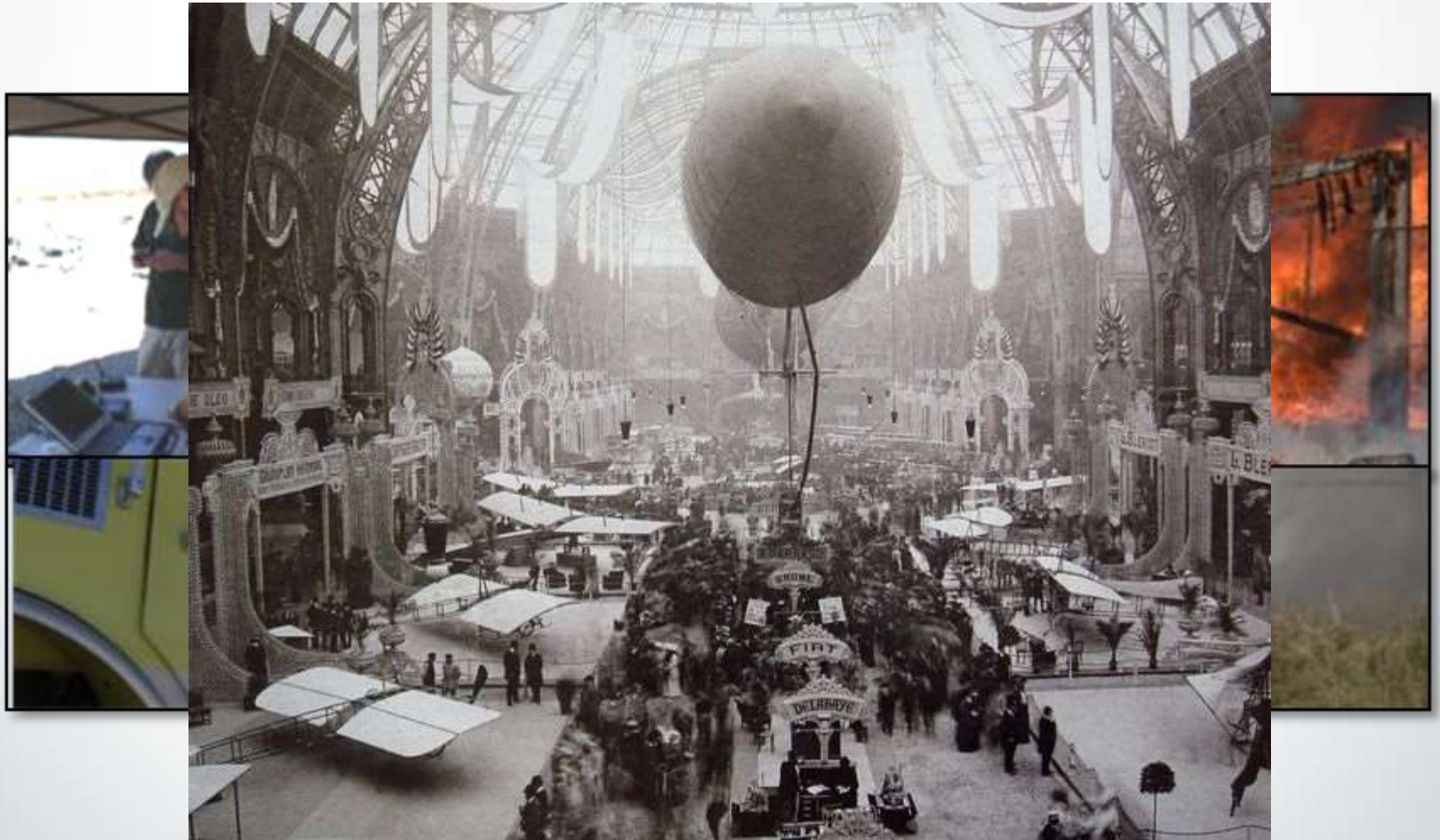
Thermal: Soil/Vegetation Moisture



High Resolution Imagery



Full Motion Video Capture



UAS Facts vs Myths

- UAVs are just R/C airplanes with expensive price tags
- September 2015 UAS operations will be commercially legal
- There are no laws governing UAS operations
- There is little concern for citizens' privacy rights by UAS operators/advocates
- A private farmer can buy his own UAV, equip it with a camera, fly over his farm, and use that imagery to improve his production and knowledge.

The UAS Landscape

- FAA
 - No commercial operations allowed today, only agencies providing “public value”
 - Certificate of authorizations (COAs) are waivers
 - Sept 2015- Congressional integration goal
 - Test Site decision 12/30/13
 - ND, NV, NY, AK, TX, VA
 - “NextGen” transition over next 10+ years
 - Privacy responsibility by default
 - More interest in autonomy
 - Nov 2014- FAA Release of **small** UAS NPRM (Part 107)
- Dept. of Defense
 - Drawing down from theater
 - Contract services for UAS management/operations
 - Many systems of multiple sizes
 - Returning interest in autonomy
- Industry
 - Global
 - Traditional contractors, start-ups
 - Services, manufacturing, integrators, components
 - Needs multi-disciplinary talent!
- Academia
 - Developing degree, certificate, private (for profit) training programs
 - Sponsoring COAs for wide range of research
- Hobbyists = recreational

State of the (NC) State : Legislation

SECTION 7.16.(e) Until July 1, 2015, no State or local governmental entity or officer may procure or operate an unmanned aircraft system or disclose personal information about any person acquired through the operation of an unmanned aircraft system unless the State CIO approves an exception specifically granting disclosure, use, or purchase. Any exceptions to the prohibition in this subsection shall be reported immediately to the Joint Legislative Oversight Committee on Information Technology and the Fiscal Research Division. The following definitions apply in this section:

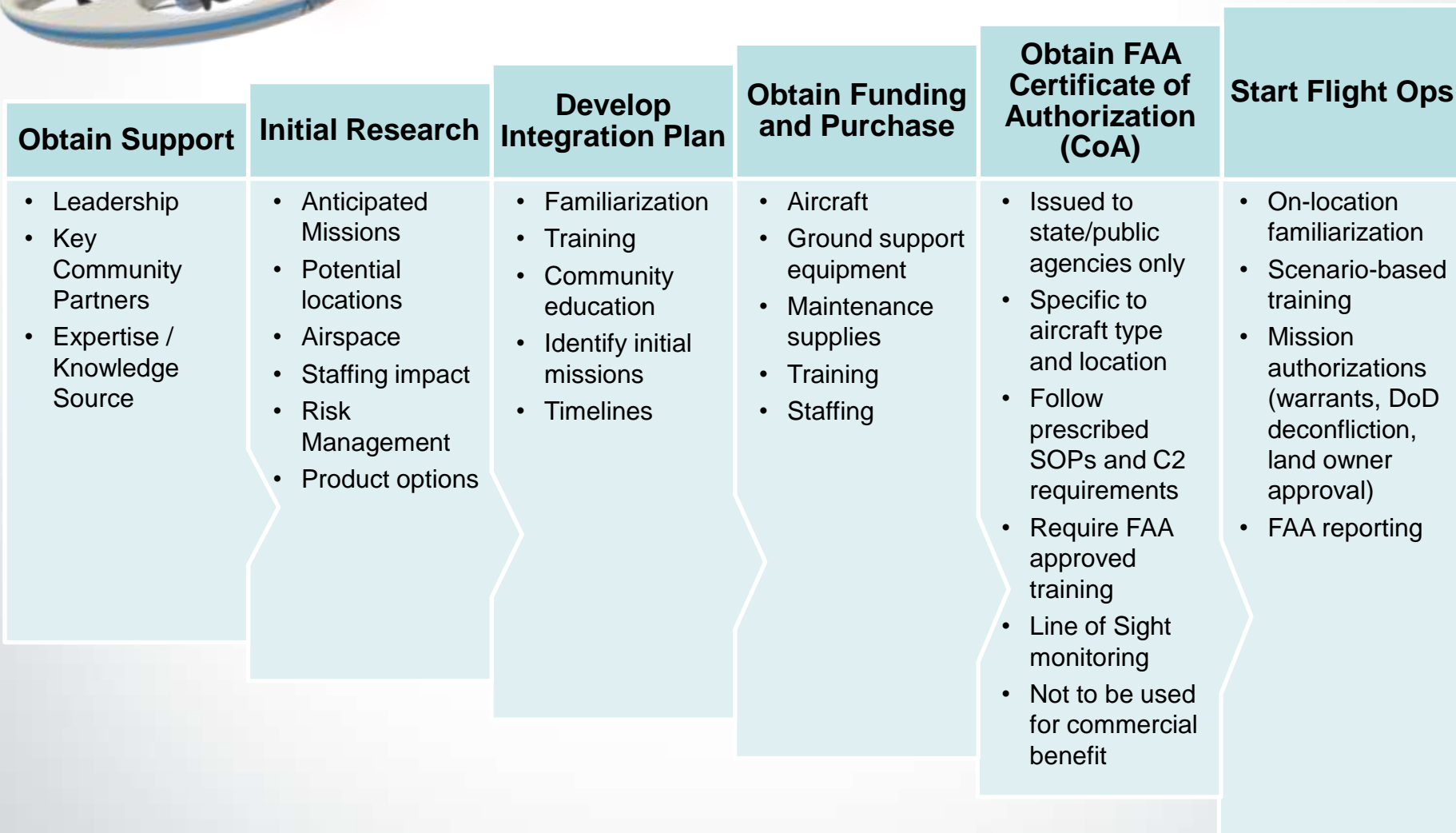
- (1) "Unmanned aircraft" means an aircraft that is operated without the possibility of human intervention from within or on the aircraft.
- (2) "Unmanned aircraft system" means an unmanned aircraft and associated elements, including communication links and components that control the unmanned aircraft that are required for the pilot in command to operate safely and efficiently in the national airspace system.

SECTION 7.16.(f) If the State Chief Information Officer determines that there is a requirement for unmanned aircraft systems for use by State or local agencies, planning may begin for the possible development, implementation, and operation of an unmanned aircraft system program within the State of North Carolina. This planning effort shall be accomplished in coordination with the Chief Information Officer for the Department of Transportation and the DOT Aviation Division Director. If the State CIO decides to plan for an unmanned aircraft system program, a proposal for the implementation of the program shall be provided by March 1, 2014, to the Joint Legislative Oversight Committee on Information Technology, the Joint Transportation Legislative Oversight Committee, and the Fiscal Research Division. At a minimum, the proposal shall include the following:

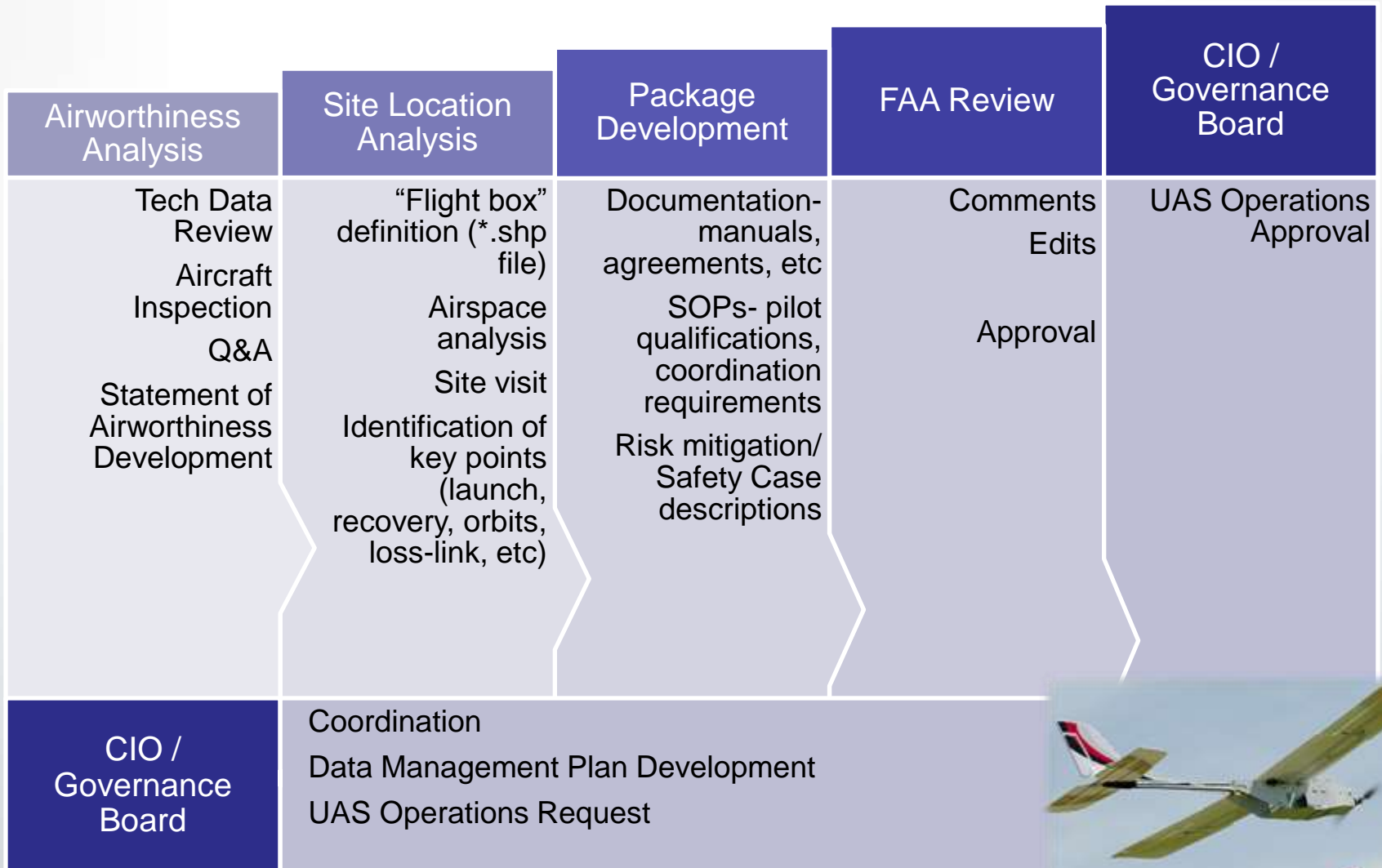
- (1) Governance structure to include the appropriate use at each level of government.
- (2) Guidelines for program implementation to include limitations on unmanned aircraft system use.
- (3) Potential participants.
- (4) Costs associated with establishing a program.
- (5) Potential sources of funding.
- (6) Issues associated with establishing a program to include limitations on entities that may already have purchased unmanned aircraft systems.
- (7) Recommendations for legislative proposals.



Path to a UAS Program



NGAT COA Process



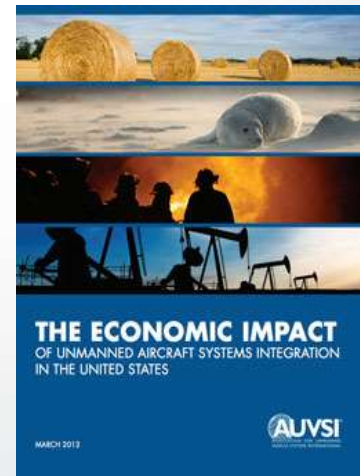
The UAS Opportunity

The state
is poised to support an
emerging private
industry that would bring
new jobs and related
economic
development.

FAA estimates
that 7,500
commercial UAS
will be viable
within 5 years.

Annual market
sales of \$11B in
the US.

The Association for Unmanned Vehicle Systems
International estimates a UAS industry can
create almost 1,200 jobs and \$600 million in
economic activity in NC by 2025.



NGAT Center: Introduction

- Organizational Structure
NGAT
 - ITRE → ORIED → NCSU
 - Mechanical and Aerospace Engineering Dept.
 - NCDOT-Division of Aviation
 - State CIO
- Staff
 - NGAT Center Director- Kyle Snyder
 - NGAT Flight Operations Manager- Tom Zajkowski
 - NGAT Airspace Consultant- Randy Breedlove
- History: **NextGen Air Transportation Center**
 - Relaunched in May 2012 with UAS Program focus
 - 2012: Build foundation
 - 2013: Begin UAS flight operations
 - First Flight at Hyde County- March 21, 2013
 - Summer flights for agriculture research at Hyde County
 - First Flight at Caratoke (Moyock)- November 5, 2013
 - 2014: Governance, Research, Integration



Building a UAS Ecosystem in NC

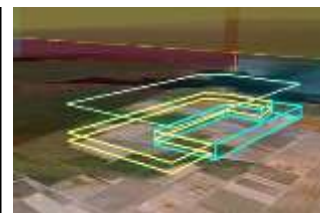
User Capability Requirements



Initial Design and Development



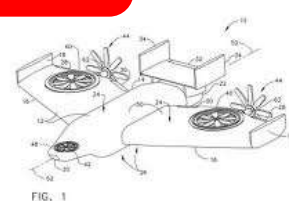
Testing



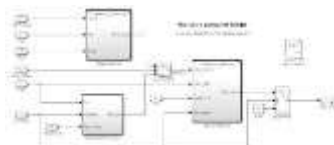
Sustainment / Maintenance



Production Design



Manufacturing



Fielding



Training



Current NC Policy Efforts

Cross-functional workgroup established to research issues and prepare legislative report

- NCSU
- State CIO
- DOT
- DENR
- NC Military Foundation
- Duke University
- Governor's Policy and Legal offices
- NC Innovation Center (iCenter)
- NC National Guard
- NC Department of Commerce
- Research Triangle Institute

CIO Governance Report

Due Date
3/1/14

- ☒ Governance structure to include the appropriate use at each level of government.
- ☒ Guidelines for program implementation to include limitations on unmanned aircraft system use.
- ☒ Potential participants.
- ☒ Costs associated with establishing a program.
- ☒ Potential sources of funding.
- ☒ Issues associated with establishing a program to include limitations on entities that may already have purchased UAVs
- ☒ Recommendations for legislative proposals.

UAS Statewide Integration

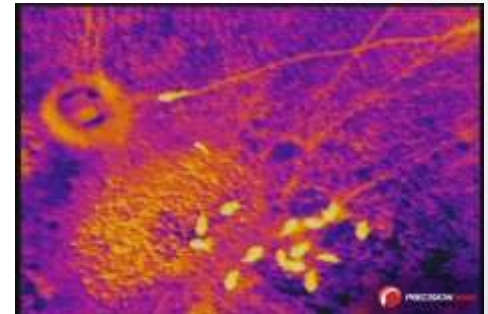
- Dept. of Public Safety
 - Emergency Management- preparedness, response
 - GIS- mapping, surveys
 - Search / Search and Rescue
- Dept. of Transportation
 - Small area surveys, Photogrammetry
 - Construction and Structures- Infrastructure inspections
- Dept. of Environment and Natural Resources
 - Wildlife Resources
 - Land and Water Stewardship
- Dept. of Agriculture
 - Forestry
- NC National Guard
 - Counterdrug
- State Bureau of Investigations, Highway Patrol
 - Law Enforcement
- *Commercial Industries*
 - Survey
 - Aerial Photography
 - Contract services

***Any state agency
operation requires
approval from SCIO***



NGAT Center: UAS Research

- Operational Safety
 - Airspace Integration- manned and unmanned sharing airspace
 - Communications, procedures, technologies (sense and avoid)
- Training
 - Education requirements
 - Licensing and certification standards
 - K-12 STEM integration
- Policy (**collaboration with SCIO**)
 - National and state requirements
 - Data management
 - Privacy protection
- Applications
 - Agriculture- aerial imaging (crop health), aerial application
 - Small area surveys- mapping, 3D modeling, remote sensing
 - Wildlife/herd management
 - Public Safety- infrastructure inspections, emergency response
 - Cargo delivery
- Scientific
 - Autonomy development- robot-vehicle collaboration, human-machine collaboration
 - Data (imagery) analytics



Current NC UAS COA Flight Locations

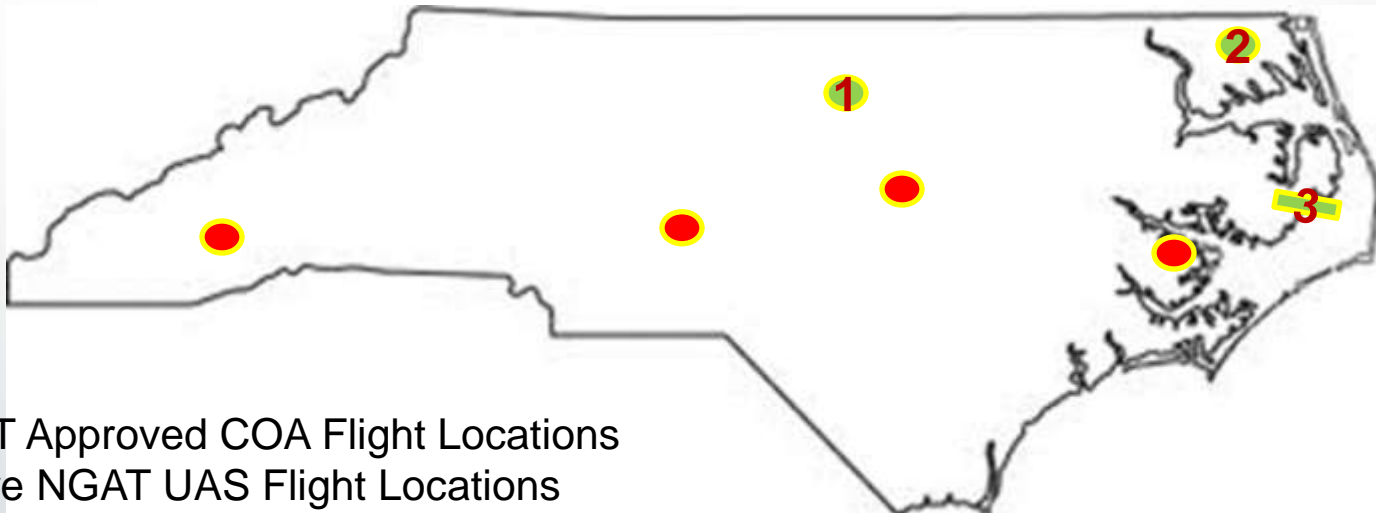
1- Butner



2- Caratoke (Moyock)

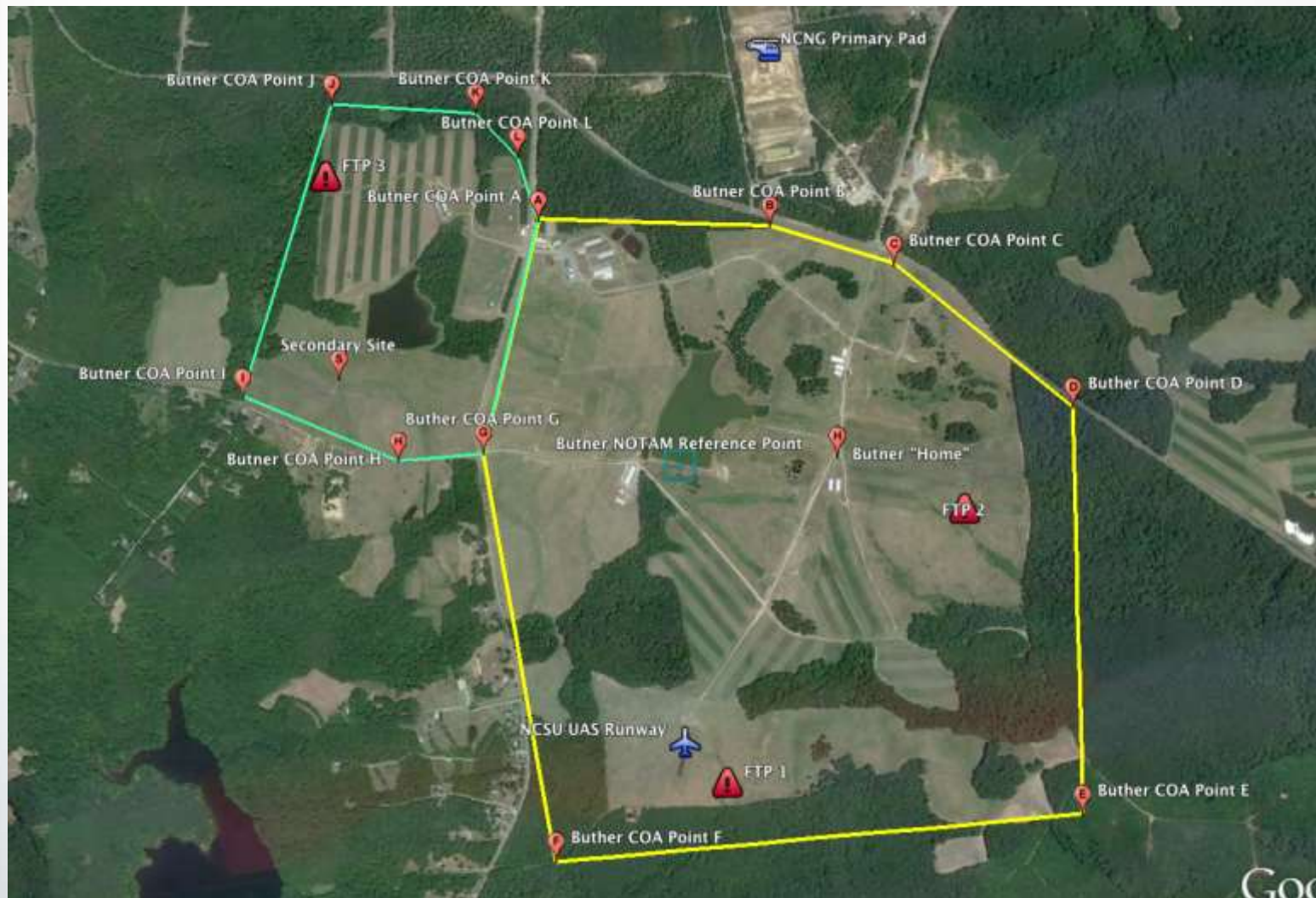


3- Hyde County

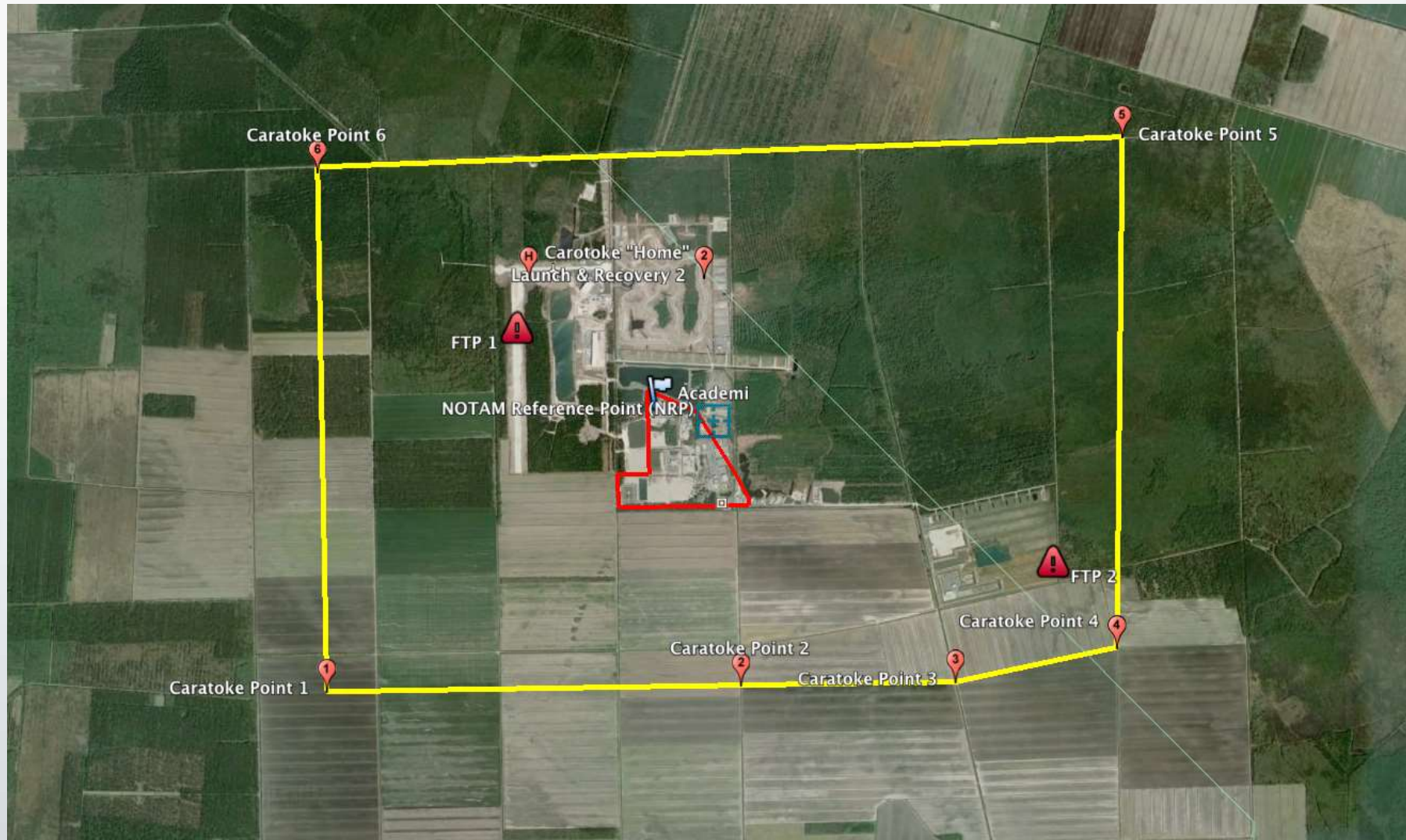


- NGAT Approved COA Flight Locations
- Future NGAT UAS Flight Locations

Butner COA



Caratoke COA



Current Gull Rock Test Site COA



The Gull Rock Test Site- Hyde County



Current Fleet with COA Locations



Vireo (FourthWing Inc)

- GRTS
- Caratoke
- Butner



Super Swiper (Bosh Technologies)

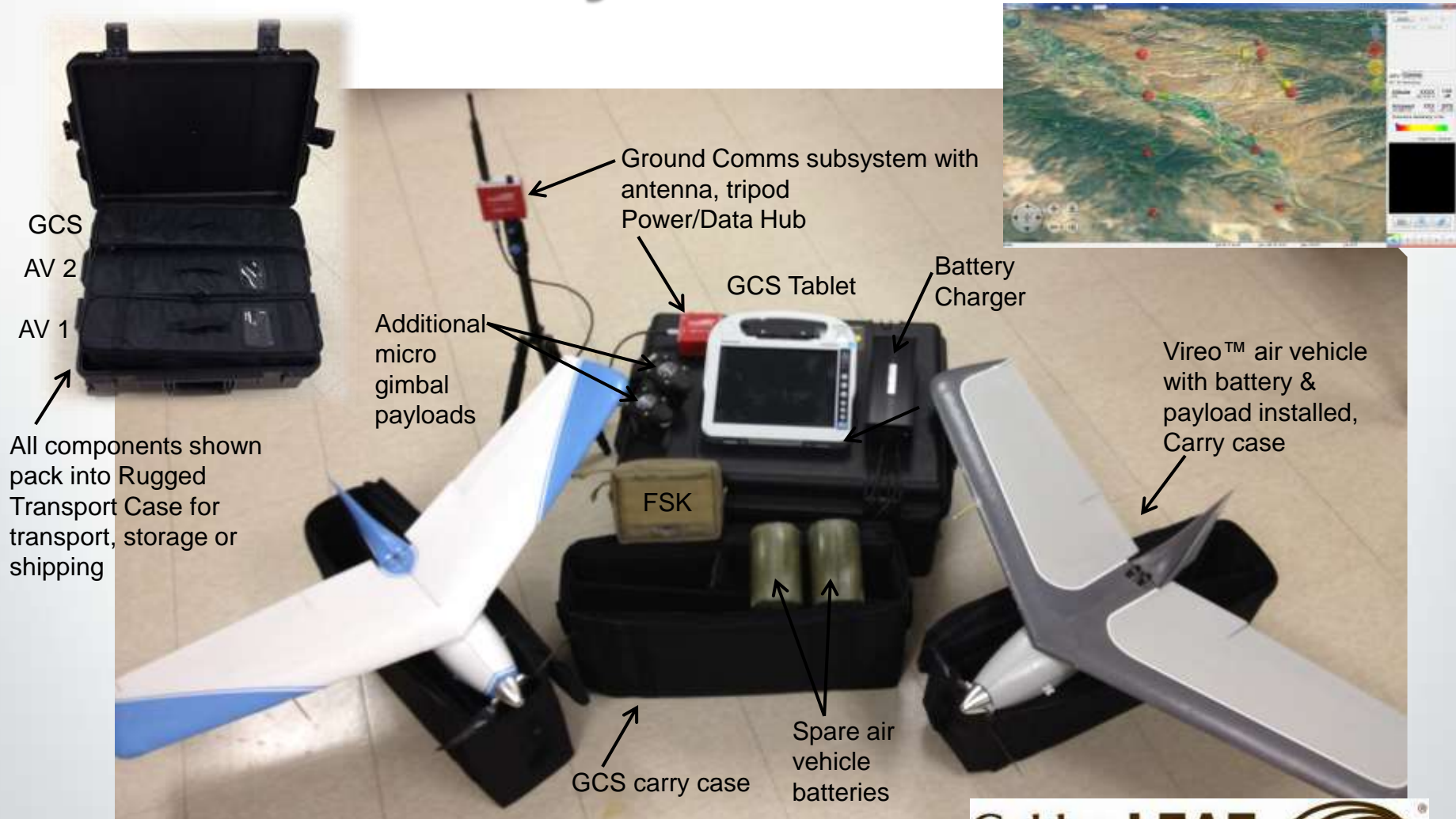
- GRTS



Condor II (Bosh Technologies / Leptron)

- GRTS

Vireo™ UAS System



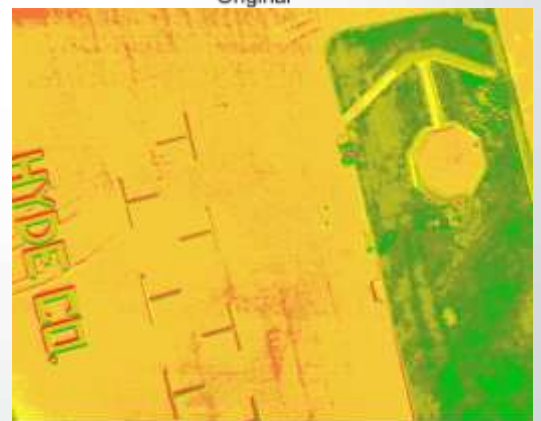
2014 Research Fleet Expansion



NGAT 2013 Flying



Original



NDVI

Industry in NC



- Existing Companies
 - Blue Force Technologies
 - Precision Hawk
 - Bird Aerospace
 - Vx Aero
 - Bosh Global Services
 - Academi
 - RTI
 - L-3 STRATIS
 - Carolina Unmanned
 - Aerobot Services
 - Duncan Parnell
 - VetDS
 - HondaJet*
- Interested Companies
 - **Bosh Precision Ag**
 - Simulyze
 - VTOL Dynamics
 - Leica Geosystems
 - **KSI Video**
 - **Olaeris**
 - ESUS Inc
 - Terra Flight
 - Dunan Systems International
 - Adaptive Aerospace Group
 - Raytheon
 - L-3 Unmanned Systems
 - Aerovironment

What's Next?

- Open Lake Wheeler
- Open Research Stations
- Research Projects
 - University
 - Industry
 - State Agencies
- Program Development
 - GRTS (Hyde County) utilization
 - NGAT Membership Program launch
 - Including NGAT Flight Lab Development at Lake Wheeler
 - Statewide Emergency Response Program
 - Statewide Ag Research Program (thru Cooperative Extension Program)



Upcoming Events

- NC House UAS LRC meeting #3- 3/17
- NC House UAS LRC meeting #4- April 23 1:00pm
- 2014 Spring Reception- May 5 @ NCSU Centennial Campus
Lonnie Pool Golf Course Clubhouse 5:00-7:00
- AUVSI Unmanned Systems North America 2014 (Orlando, FL)-
May 10-15
- 2014 UAS Demo Day at Butner- Summer
- 2014 Fall Reception- TBD
- 2014 UAS Demo Day at GRTS- TBD
- 2015 Unmanned Systems Career Day Event- Feb 15

For More Information



Contact:

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*It is not really necessary to look too far into the future;
we see enough already to be certain it will be magnificent.
Only let us hurry and open the roads.*

- Wilbur Wright