



RASPET FLIGHT RESEARCH
LABORATORY

Unmanned Aircraft Systems (UAS): An update from the MSU Raspet Flight Research Laboratory

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Outline

- I. General UAS Updates & Considerations
- II. MSU RFRL Overview & Update
- III. Additional UAS Resources
- IV. Q&A Discussion



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General UAS Update & Considerations

3 Types of sUAS Operations:

- **Commercial Operations**
 - CFR 14 Part 107
 - Certain limitations can be waived on case-by-case basis.
 - New provisions allow for UAS operations 1) At night, and/or 2) Over people, when certain requirements are met.
- **Civil / Public Operations**
 - FAA Certificate of Authorization (COA), and/or
 - CFR 14 Part 107
 - *FAA Reauthorization 2018 contains multiple sections dedicated to public UAS operations.
- **Hobby / Recreational Operations**
 - ~~Section 336~~ ~~Special Rule for Model Aircraft.~~
 - *FAA Reauthorization 2018 immediately repealed.
 - Must pass FAA TRUST exam and operate within defined limitations.



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General UAS Update & Considerations

COMMERCIAL sUAS Operations

- Commercial UAS operations governed via CFR Part 107 and FAA approved Certificates of Authorization/Waiver.
- “Operations of UAS Over People” final rule effective 4/21/2021.
***Amends CFR Part 107 with provisions for:**
 - UAS Operations Over People and Vehicles (varying “Categories” of UAS).
 - UAS Operations at Night (requires anti-collision lighting).
 - Updated sUAS operator recurrency training.
- Requires aircraft registration (> 0.55 lb) with FAA prior to flight.
- Operations in Controlled Airspace require Airspace Authorization via FAA Low Altitude Authorization & Notification Capability (LAANC). Facilitated through FAA approved “UAS Service Suppliers”.



General UAS Update & Considerations

PUBLIC / CIVIL sUAS Operations

- Still operating via FAA COA and/or CFR Part 107 as applicable.
- Special privileges granted by FAA for Public Safety sUAS ops.
- Specific sections of FAA Reauthorization 2018 pertaining to Public UAS operations include:
 - Section 346: Public Unmanned Aircraft Systems
 - Section 353: Emergency Exemption Process
 - Section 355: Public UAS Operations by Tribal Governments
 - Section 359: Study on Fire Department and Emergency Service Agency Use of UAS
 - Section 366: Strategy for Responding to Public Safety Threats...UAS
 - Section 368: Public UAS Access to Special Use Airspace
 - Significant rule-making developments are possible in coming years as a result of these Sections. MSU directly involved in FAA research for First Responder and Emergency Management UAS operations.



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General UAS Update & Considerations

HOBBY/RECREATIONAL sUAS Operations

Person may operate a small UAS (< 55 lbs.) without FAA certification IF:

- Flown for recreational purposes.
 - Flown in accordance with community based guidelines developed in coordination with the FAA.
 - Academy of Model Aeronautics (AMA) provides standard template for “community based guidelines”.
 - Flown within visual line-of-sight (VLOS)
 - Does not interfere with manned aircraft.
 - Operating altitude < 400' AGL
-
- Recreational operators now required to pass The Recreational UAS Safety Test (TRUST) administered **online** by the FAA.
 - Recreational operators now required to register aircraft with FAA if aircraft weighs > 0.55 lbs.
 - Same registration requirement as commercial UAS operations under Part 107.
 - Recreational sUAS operating rules apply to **Educational use of sUAS.**



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General UAS Update & Considerations

3 WAYS DRONE PILOTS CAN MEET REMOTE ID RULE

Drone Remote Identification

Standard Remote ID Drones



- Remote ID capability is built into the drone
- From takeoff to shutdown, drone broadcasts:
 - Drone ID
 - Drone location and altitude
 - Drone velocity
 - Control station location and elevation
 - Time mark
 - Emergency status

Drone Remote Identification

Drones With Remote ID Broadcast Module



- Remote ID capability through module attached to drone
- Limited to visual line of sight operations
- From takeoff to shutdown, drone broadcasts:
 - Drone ID
 - Drone location and altitude
 - Drone velocity
 - Takeoff location and elevation
 - Time mark

FAA-Recognized Identification Area (FRIA)

Drones Without Remote ID



- Drones without Remote ID can operate without broadcasting
- Drones without Remote ID must operate within visual line of sight and within the FRIA
- Anyone can fly there, but FRIAs can only be requested by community-based organizations and educational institutions

Special Considerations with growing importance:

REMOTE ID

- FAA Remote ID rule went into effect 4/21/2021.
- OEM compliance required by September 2022.
- Operator compliance required by September 2024.
- Remote ID intended to enable more advanced sUAS operations including:
 - eCommerce package deliveries
 - Beyond Visual Line-of-Sight (BVLOS) operations
 - Urban Air Mobility (UAM) / Advanced Air Mobility (AAM)
- Remote ID also intended to facilitate enforcement of sUAS rules and regulations:
 - Facilitates sUAS detection and operator ID.



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General UAS Update & Considerations

Special Considerations with growing importance:

LAW ENFORCEMENT RESPONSE



Federal Aviation
Administration

DRONE Law Enforcement Response

Detect all available elements of the situation; attempt to locate and identify individuals operating the drone.
(Look at windows/balconies/roof tops).

Report incident to the FAA Regional Operations Center (ROC). Follow-up assistance can be obtained through FAA Law Enforcement Assistance Program (**LEAP**) special agents.

Observe the UAS and maintain visibility of the device; look for damage or injured individuals. Note: Battery life is typically 20 to 30 minutes.

Notice features: Identify the type of device (**fixed-wing/multi-rotor**), its size, shape, color, payload (i.e., **video equipment**), and activity of device.

Execute appropriate police action: Maintain a safe environment for general public and first responders. Conduct a field interview and document ALL details of the event per the guidance provided by the FAA.
[faa.gov/uas/resources/law_enforcement/](https://www.faa.gov/uas/resources/law_enforcement/)

Always follow agency policies: Take appropriate action based on the facts and circumstances of the incident and site/area specific laws and rules. The FAA's enforcement action does NOT impact ANY enforcement action(s) taken by law enforcement.

Local ordinances that may apply include, but are not limited to: Reckless endangerment, criminal mischief, voyeurism, inciting violence.



Federal Aviation
Administration

FAA Drone Incident Reporting

Document and provide the following information to FAA:

- Identity of operators and witnesses (**name, contact information**)
- Type of operation (**hobby, commercial, public/governmental**)
- Type of device(s) and registration information (**number/certificate**)
- Event location and incident details (**date, time, place**)
- Evidence collection (**photos, video, device confiscation**)

Contact your FAA LEAP agent or an FAA ROC for assistance:

Western ROC	AK, AZ, CA, CO, HI, ID, MT, NV, OR, UT, WA, WY	206-231-2089	9-WSA-OPSCTR@faa.gov
Central ROC	AR, IA, IL, IN, KS, LA, MI, MN, MO, ND, NE, NM, OH, OK, SD, TX, WI	817-222-5006	9-CSA-ROC@faa.gov
East ROC	AL, CT, FL, GA, KY, MA, ME, MS, NC, NH, PR, RI, SC, TN, VI, VT DC, DE, MD, NJ, NY, PA, VA, WV	404-305-5180 404-305-5150	9-ESA-ROC@faa.gov 9-ESA-ROC@faa.gov



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General UAS Update & Considerations

Special Considerations with growing importance:

CYBER-SECURITY & COUNTER-UAS

- DOD prohibits use of certain foreign produced UAS at all military installations and critical infrastructure. (Latest guidance 2021)
- DHS follows similar protocol.
- Known cyber-security vulnerabilities associated with market leader DJI (China).
- Part of a broader “Counter-UAS” issue.
- “Blue sUAS” are current domestic produced alternatives that have been vetted by Federal gov’t and provide best available cyber-security (downside = short supply, high \$)



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Raspet Flight Research Laboratory

Raspet Flight Research Lab Overview

The MSU Raspet Flight Research Laboratory is one of the nation's leading academic UAS Research, Development, Testing & Evaluation institutions.

- 3 National Designations for UAS Research:
 - National Lead for the FAA's UAS Center of Excellence
 - FAA's Designated UAS Safety Research Facility
 - National Lead for the Department of Homeland Security's Common UAS Test Site
- Manned & Unmanned Aircraft Fleets.
- 100,000 ft² of climate-controlled laboratory, test & hangar facilities.
- On-site KSTF airfield access with custom UAS Control Tower.
- 25,000+ sq. mi. of FAA Authorized Airspace.



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MSU RFRL Namesake Dr. August "Gus" Raspet



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Raspet Flight Research Laboratory

Experimental Aviation Research & Development



Aurora Flight Sciences



Honda Jet



Stark Aerospace



Airbus Helicopter



GE Aviation



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MSU RFRL

Who We Are Today



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What We Fly



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Griffon Aerospace Outlaw G2

- Primary UAS operational asset from 2017 - 2019
- 180 lbs. GTOW
- 25 lbs. payload
- 14-ft wingspan
- 4 - 6 hour endurance
- 40+ NM range
- 10,000' Ceiling



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NASC Tigershark XP Block-3

- 515 lb. GTOW
- 95 lb. payload
- 22-ft wingspan
- 8+ hour endurance
- 50+ NM Range
- 15,000' Ceiling
- Day/night Operation

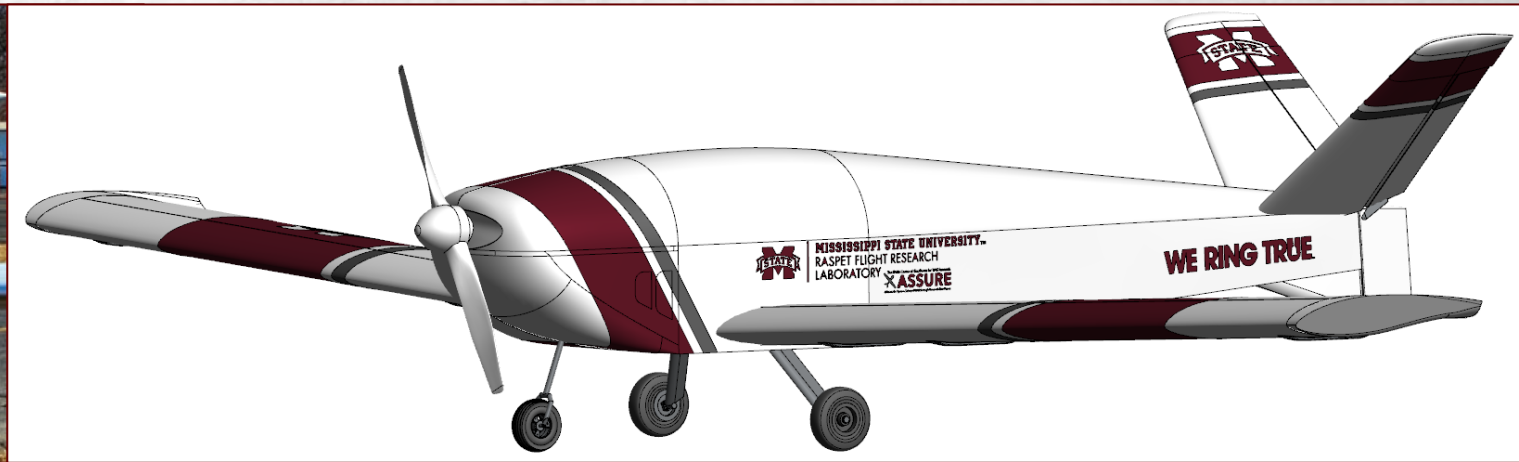


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NASC TEROS Group 4 UAS

- Newest UAS asset arriving January 2022
- 1st entry into Group 4 UAS ops capability
- 1,800 lb. GTOW
- 400+ lb. payload
- 44-ft wingspan
- 24-hour endurance
- 24,000' Ceiling
- 60+ NM Range with extendable SATCOM



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Where We Fly



JMAA works with MSU to fly unmanned planes at Jackson airport



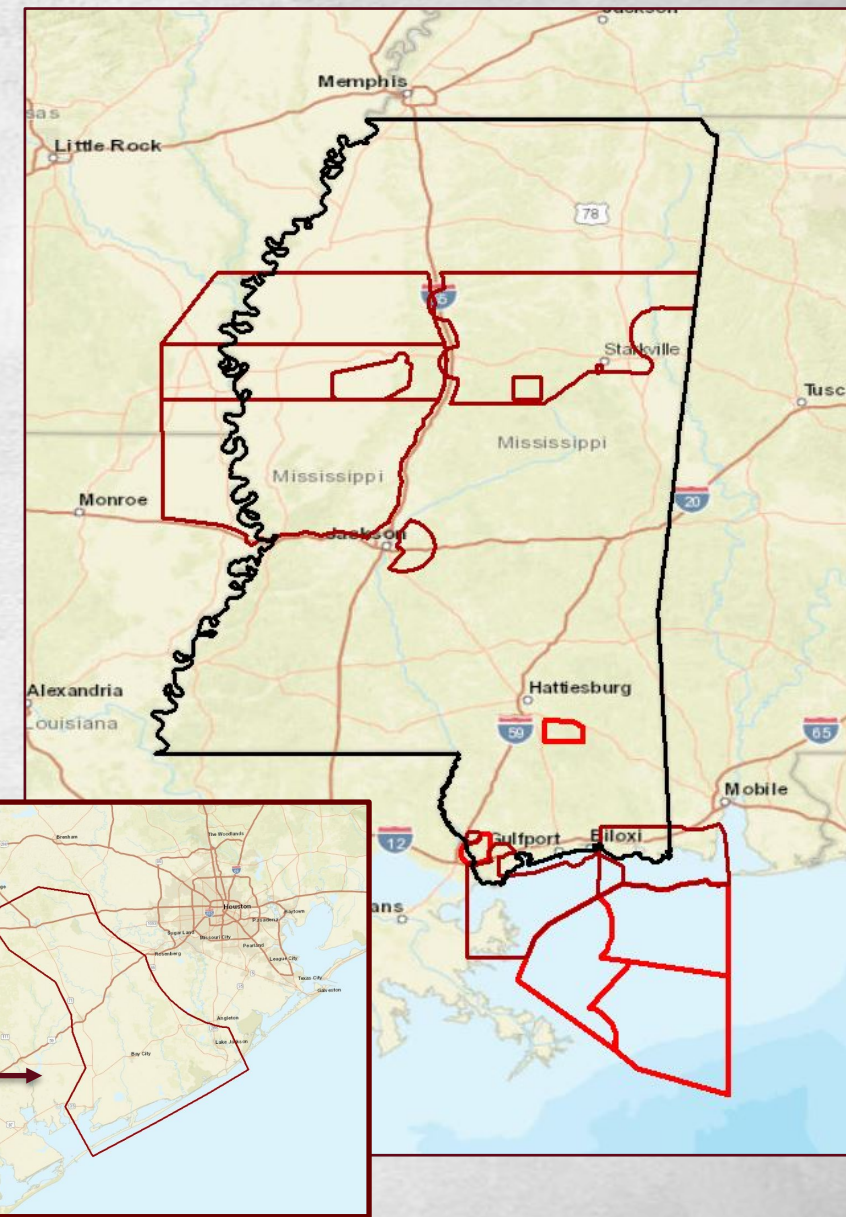
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Where We Fly

RFRL UAS Airspace Access

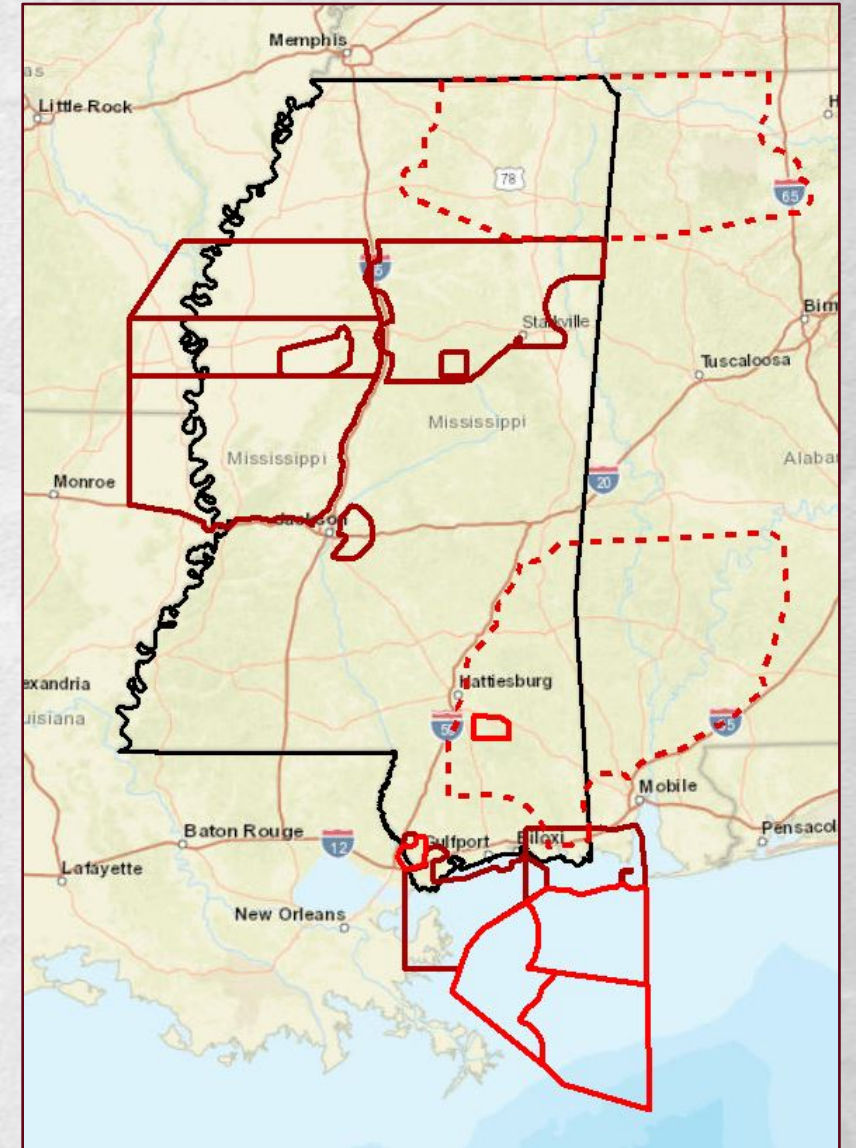
- **25,000+ sq. miles of FAA Certificate of Authorization (COA) Airspace** from SFC – 15,000' MSL.
- **1,900+ sq. miles of Special Use Airspace**
 - 330 sq. miles of **Restricted Airspace** access from SFC – 29,000' MSL through formal agreements with **Camp Shelby** and **NASA Stennis Space Center**.
 - 1,600 sq. miles of **Warning Area Airspace** access from SFC – 60,000' MSL through formal agreement with **Gulfport Combat Readiness Training Center**.
- **23 cooperative airports** supporting UAS flight operations across MS, AL, AR, LA, OK and TX.
- **Class C, D, E Controlled Airspace Access**



Where We Fly...next!

Potential RFRL Future Airspace Access

- 40,000+ sq. miles of potential FAA COA Airspace.
- 45+ potential cooperative airports
- Supporting UAS research and development efforts with Mississippi Power & Alabama Power (Southern Company) and the Tennessee Valley Authority (TVA).



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Where We Fly

Mobile Ground Control Stations (GCS)

- 28', 40', and 48' Mobile GCSs
- Fully Self-contained with dedicated maintenance station and segregated cockpit environment.
- GCS functions:
 - Flight operations
 - Sensor/Payload data collection
 - Flight test data collection
 - On site data analysis

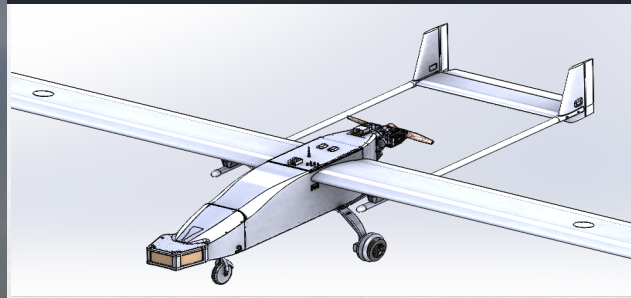
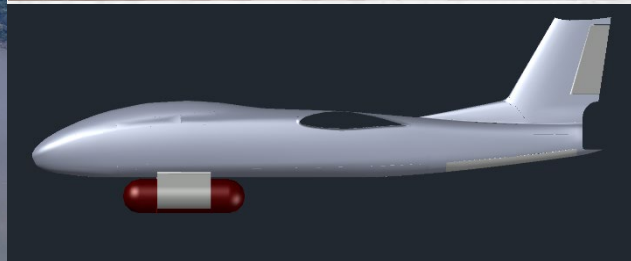


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What We Do

Experimental Aviation Research & Development





FAA UAS Center of Excellence

The FAA's Center of Excellence for UAS Research
ASSURE
Alliance for System Safety of UAS through Research Excellence

 **ASSURE**
Alliance for System Safety of UAS through Research Excellence

- Supports applied UAS regulatory research directed by the FAA.
- 57 Total Projects
 - 33 Active, 16 Completed, 11 Proposed
- \$110M Total Funding since inception.
- \$38.7M funding ongoing projects.
- 10 additional projects (\$6.6M) funded by NASA, FEMA, and NIST.

CORE TEAM
Alabama
UNIVERSITY of ALABAMA in HUNTSVILLE
Alaska
UNIVERSITY of ALASKA in FAIRBANKS
Arizona
EMBRY AERONAUTICAL UNIVERSITY-PRESCOTT
California
UNIVERSITY of CALIFORNIA DAVIS
Florida
EMBRY RIDDLE AERONAUTICAL UNIVERSITY
Kansas
KANSAS STATE UNIVERSITY
UNIVERSITY of KANSAS
WICHITA STATE UNIVERSITY
Montana
MONTANA STATE UNIVERSITY
New Mexico
NEW MEXICO STATE UNIVERSITY
North Carolina
NORTH CAROLINA STATE UNIVERSITY
North Dakota
UNIVERSITY of NORTH DAKOTA
Oregon
OREGON STATE UNIVERSITY
Ohio
SINCLAIR COMMUNITY COLLEGE
THE OHIO STATE UNIVERSITY
Pennsylvania
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INDIANA STATE UNIVERSITY
Israel
TECHNION - ISRAEL INSTITUTE of TECHNOLOGY
Louisiana
LA TECH UNIVERSITY
Canada
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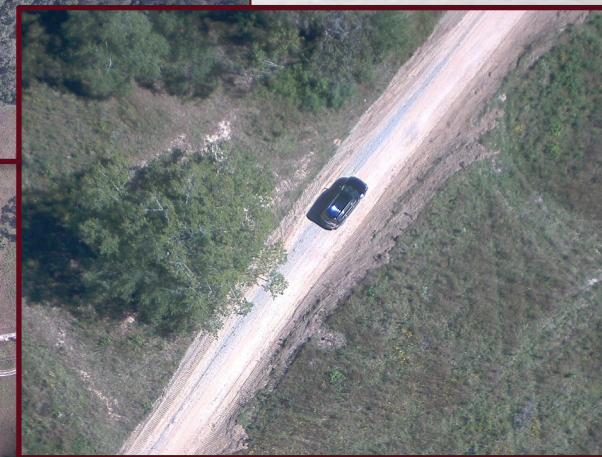
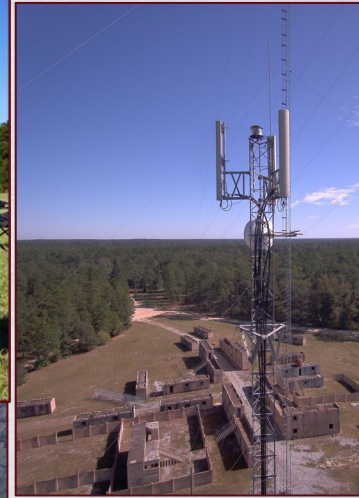
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DHS Common UAS Test Site



- Full-scale operational evaluations and exercises supporting the DHS Science & Technology (S&T) Directorate and the 9 component DHS agencies.
- Land and maritime test environments
- Scientific analysis of UAS threshold and objective operational requirements:
 - Flight characteristics and performance
 - Size, weight, and specification accuracy
 - Human factors and pilotage
 - Deployment speed
 - Scenario and mission set effectiveness
 - Payload/sensor performance including spatial, spectral, temporal, and radiometric resolution



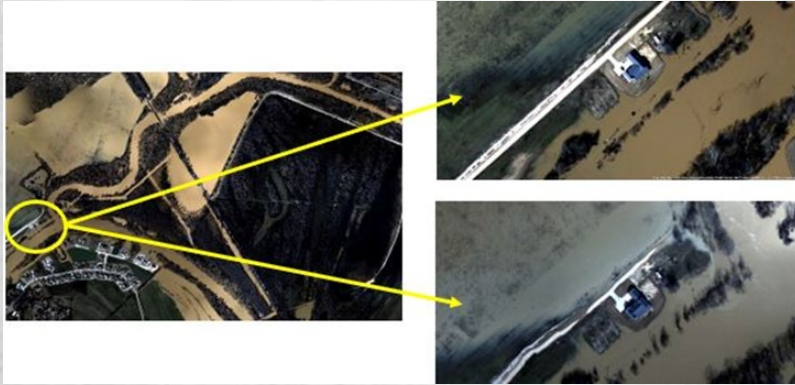
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UAS Flood Monitoring & Forecasting

MSU's NGI + RFRL conducted aerial flood monitoring in the MS Delta

- Continuous data over multiple days tracked rising/receding flood waters
- Results helped improve NWS flood forecasting models



NOAA BVLOS Large UAS Operations

Enabling Beyond Visual Line-of-Sight (BVLOS) operations with Large UAS.



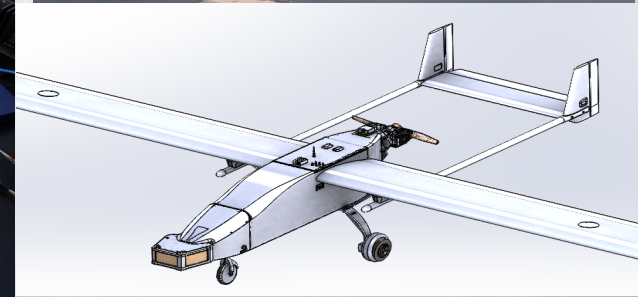
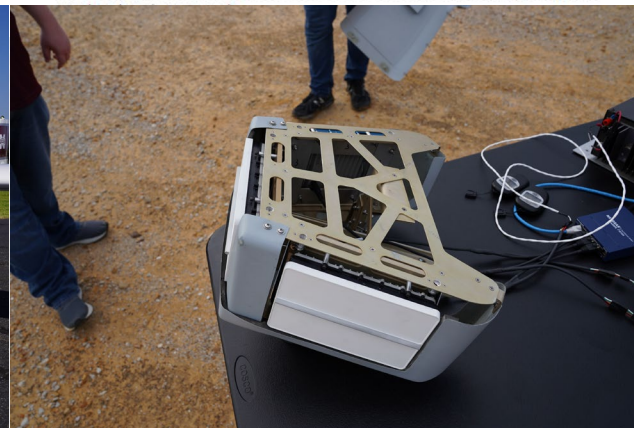
UAS missions supporting flood forecasting following Hurricane Delta landfall

With operations based along the Mississippi River near Greenville, Mississippi, the Northern Gulf Institute collaborated with the Raspet Flight Research Laboratory at Mississippi State University to deploy an unmanned aircraft system for several hours over flood-inundated land during October to collect imagery.

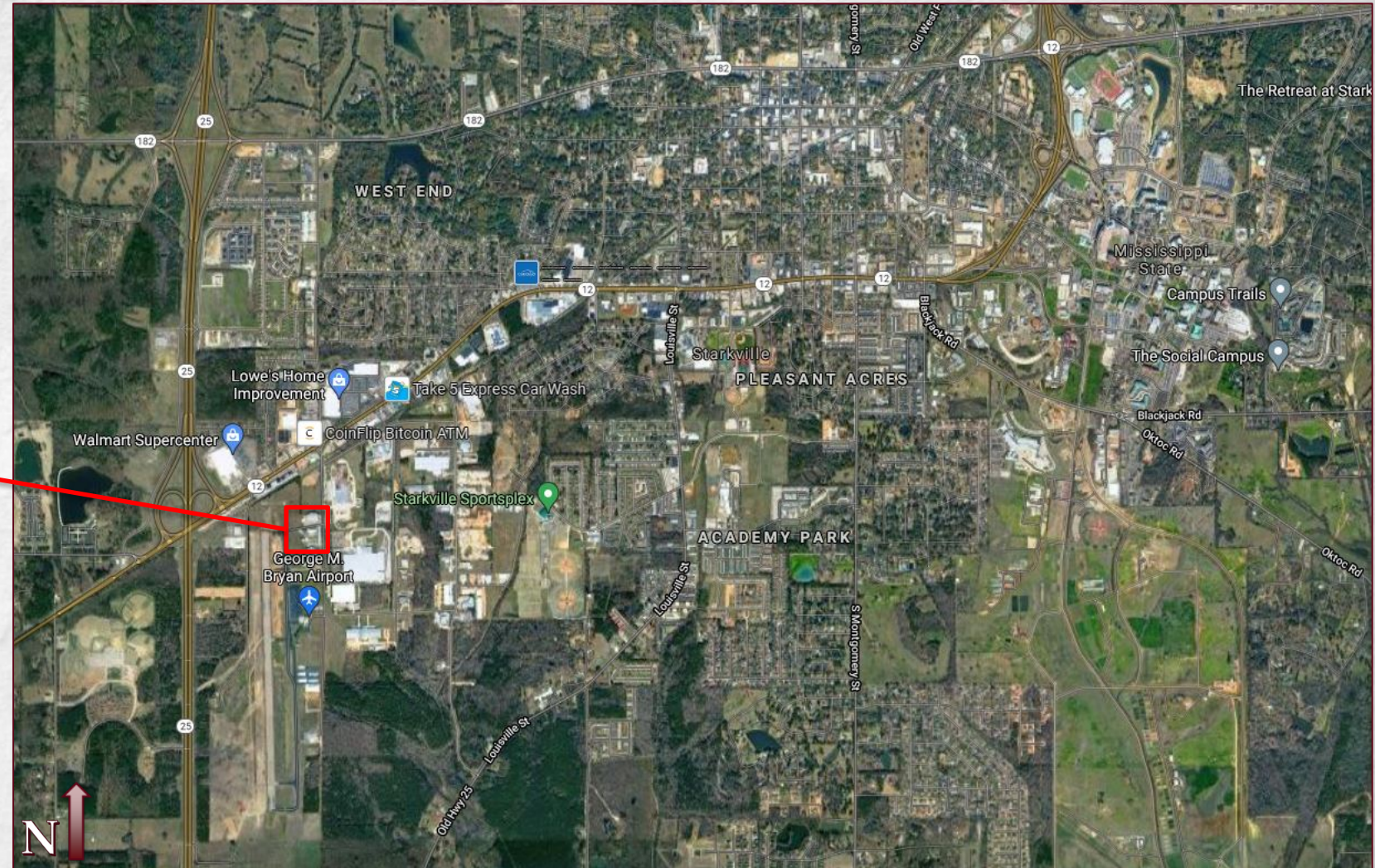


Drones are helping scientists understand major weather events

A few days after Hurricane Delta made landfall in Louisiana on October 9, researchers from NOAA, the Northern Gulf Institute and the Raspet Flight Research Laboratory launched a TigerShark XP3 UAS platform near the banks of the Mississippi River. The TigerShark — a large drone — flew over long stretches of the river, collecting imagery of the riverbanks that would give scientists details about the flooding impact



Where We're Located: 112 - 114 Airport Rd.



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Additional UAS Resources

- Federal Aviation Administration (FAA) UAS Resources:
 - *Recreational/Hobby UAS - https://www.faa.gov/uas/recreational_fliers/
*Includes Educational and Research use of small UAS.
 - ASSURE Research studies - https://www.faa.gov/uas/research_development/
 - Commercial UAS - https://www.faa.gov/uas/commercial_operators/
 - Public/Gov't UAS - https://www.faa.gov/uas/public_safety_gov/
- Mississippi State University (MSU) UAS Resources:
 - MSU UAS & Model Aircraft Policy (OP 79.11) -
<https://www.policies.msstate.edu/sites/www.policies.msstate.edu/files/7911.pdf>
 - MSU Extension - <https://extension.msstate.edu/blog/so-you-got-drone>
 - MSU Raspet Flight Lab - <https://www.raspet.msstate.edu/>



Questions?



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www.msuas.org

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Backup



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