

RASPET FLIGHT RESEARCH LABORATORY

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

Madison Dixon, PMP Research Director – MSU RFRL September 8, 2022





<u>Outline</u>

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



3 Types of sUAS Operations: (All 3 types require sUAS registration with FAA)

Commercial Operations

- <u>CFR 14 Part 107</u>
- Certain limitations can be waived on case-by-case basis.
- Special 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
- o <u>CFR 14 Part 107</u>
- Hobby / Recreational Operations
 - Section 336 Special Rule for Model Aircraft.
 - *FAA Reauthorization 2018 immediately repealed.
 - *Title 49 USC 44809 Exception for limited recreational operations of UAS.
 - Must pass FAA TRUST exam and operate within defined limitations.











COMMERCIAL sUAS Operations

- Commercial UAS operations governed via 14 CFR Part 107 and FAA approved Certificates of Authorization/Waiver.
- "Operations of UAS Over People" final rule effective 4/21/2021. *<u>Amends CFR Part 107 with provisions for:</u>
 - UAS Operations Over People and Vehicles (Categories 1-4 of UAS).
 - UAS Operations at Night (requires anti-collision lighting).
 - Updated sUAS operator recurrency training (now fully online).
- Operations in Controlled Airspace require Airspace Authorization via FAA Low Altitude Authorization & Notification Capability (LAANC). Facilitated through FAA approved "UAS Service Suppliers". Locations without LAANC capability require traditional airspace authorization with ~ 90 day turnaround time.









PUBLIC / CIVIL sUAS Operations

- Still operating via FAA COA and/or CFR Part 107 as applicable.
- Waive-able provisions of CFR Part 107 also remain applicable.
- FAA Certificates of Waiver/Authorization (COAs) available for operations outside the framework of CFR Part 107. Requires case-by-case review and approval by FAA based on comprehensive operational safety case.
- Special expedited waivers and authorizations granted by FAA for <u>Public Safety</u> sUAS ops under Special Government Interests (SGI) program.
- Be cognizant of cyber-security vulnerabilities of certain COTS UAS depending on your specific mission and Concept of Operations.
 Domestic manufacturer "Blue sUAS" may be needed in some cases.







HOBBY/RECREATIONAL sUAS Operations

<u>Person may operate a small UAS (< 55 lbs.) OR even a large UAS (> 55 lbs.)</u> without FAA remote pilot 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
- Additional limitations may apply.
- Recreational operators 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.





UNMANNED AIRCRAFT SYSTEMS BEYOND VISUAL LINE OF SIGHT AVIATION RULEMAKING COMMITTEE

MARCH 10, 2022

FINAL REPORT

R S I T Y TM

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Special Considerations with growing importance:

BVLOS

- BVLOS ARC Final Report issued March 2022.
- Offers BVLOS recommendations for UAS up to sizes equivalent with Light Sport Aircraft.
- Risk-based approach to BVLOS UAS operations.
- Final recommendations mired in debate with many aviation stakeholders still strongly opposed.
- Remains TBD how FAA will incorporate recommendations into NPRM (ETA TBD also).
- *UAS Remote ID is mandatory prerequisite.
- *Remote ID also intended to facilitate enforcement of sUAS rules and regulations:
 - Facilitates sUAS detection and operator ID.





Special Considerations with growing importance:

UAS Detection & Counter-UAS (C-UAS)

- Senate Committee on Homeland Security held special hearing "Protecting the Homeland from Unmanned Aircraft Systems" on July 14, 2022.
- Key themes of hearing were addressing next steps to protect domestic targets from weaponized UAS, and to protect U.S. public/civil UAS operators from cyber-security threats associated with certain foreign produced UAS.
- This is a positive, much needed development to address security risk!
- UAS detection, identification, and response is critical first step. Counter-UAS with comms and/or kinetic interdiction means will come with time.
- MSU currently testing UAS detection system on campus.







Special Considerations with growing importance:

LAW ENFORCEMENT RESPONSE



Federal Aviation

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/

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.



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	404-305-5180	9-ESA-ROC@faa.gov
	DC, DE, MD, NJ, NY, PA, VA, WV	404-305-5150	9-ESA-R0C@faa.gov



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.







MSU RFRL Namesake Dr. August "Gus" Raspet





Experimental Aviation Research & Development



Aurora Flight Sciences



Airbus Helicopter



Honda Jet



Stark Aerospace



GE Aviation



Who We Are Today













Griffon Aerospace Outlaw G2

- Primary UAS operational asset from 2017 2019
- 180 lbs. GTOW
- 25 lbs. payload
- 14-ft wingspan

XASSURE

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VERSITY_m

40+ NM range 10,000' Ceiling

SIPPI STATE UNIVERSITY.

• 4 - 6 hour endurance

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NASC Tigershark XP-3

- Primary UAS operational asset from 2019 present
- 515 lb. GTOW
- 95 lb. payload
- 22-ft wingspan

- 8+ hour endurance
- 60+ NM Range
- 15,000' Ceiling





NASC TEROS Group 4 UAS

- Newest UAS asset arrived August 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













Where We Fly RFRL's UAS Airspace Access

- 40,000+ sq. miles of FAA Certificate of Authorization (COA) Airspace from SFC – 15,000'.
- 1,900+ sq. miles of Special Use Airspace
 - Restricted Airspace access from SFC 29,000' MSL at Camp Shelby and NASA Stennis Space Center.
 - 1,600 sq. miles of Warning Area Airspace access from SFC – 60,000' MSL through agreement with Gulfport Combat Readiness Training Center.
- **40+ cooperative airports** supporting UAS flight operations across MS, AL, AR, LA, OK and TX.
- <u>Class C</u>, D, & E Controlled Airspace Operations





Where We Fly Mobile Ground Control Stations (GCS)

- 28', 40', and 48' Mobile GCSs
- Fully Self-contained with dedicated maintenance stations and segregated flight deck environments.
- GCS functions:
 - Flight operations support
 - Sensor/Payload data collection
 - Flight test data collection
 - On site data processing and analysis





Singing River Island (SRI) UAS Maritime Operations Base

- Dedicated staff office, UAS hangar bay, and UAS launch/recovery areas all available on site.
- Extensive staging, training, and exercise infrastructure with secure access restriction available.
- Industrial boat launch and dock infrastructure in place to support multi-domain cooperative maritime-air research efforts.
- 2,500 ft. runway would enable Group 3-4 UAS operations from SRI for numerous critical applications (e.g. Disaster Response, SAR, Infrastructure Inspection, Coastal and Environmental Monitoring, and more)











What We Do Experimental Aviation Research & Development







FAA UAS Center of Excellence





XASSURE

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.

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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





Unmanned Aircraft Systems Program 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







Large-UAS BVLOS Portfolio

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



- MSU RFRL & NGI + NOAA UAS
- Supports NOAA's National Weather Service (NWS) and River Forecast Centers (RFCs)
- Real-time aerial flood monitoring.
- Multi-spectral data collection to improve flood-level forecasting.

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- Supports TVA Aviation Services Division
- Develop Group 3 UAS concept and operational capability for electrical infrastructure inspection. •
- LIDAR data collection of electrical infrastructure.
- FAA COA development/submittal.



- MSU RFRL + Southern Company
- Supports Southern Company Services, Inc. – Aviation Services.
- Group 3-4 UAS Technology Survey
- Multi-Payload Technology Survey.
- Inspection & Mapping applications.
- FAA COA development/submittal.

Where We're Located: 114 Airport Rd., Starkville, MS 39759





Additional UAS Resources

- Federal Aviation Administration (FAA) UAS Resources:
 - *Recreational/Hobby UAS <u>https://www.faa.gov/uas/recreational_fliers/</u>
 *Includes Educational and Research use of small UAS.
 - ASSURE Research studies <u>https://www.faa.gov/uas/research_development/</u>
 - Commercial UAS <u>https://www.faa.gov/uas/commercial_operators/</u>
 - Public/Gov't UAS <u>https://www.faa.gov/uas/public_safety_gov/</u>
- <u>Mississippi State University (MSU) UAS Resources:</u>

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 MSU UAS & Model Aircraft Policy (OP 79.11) -<u>https://www.policies.msstate.edu/sites/www.policies.msstate.edu/files/7911.pdf</u>

- MSU Extension <u>https://extension.msstate.edu/blog/so-you-got-drone</u>
- MSU Raspet Flight Lab <u>https://www.raspet.msstate.edu/</u>



Questions?

UNMANNED SYSTEMS www.msuas.org

Contact:

Madison Dixon Research Director MSU Raspet Flight Research Laboratory mdixon@raspet.msstate.edu





