RASPET FLIGHT RESEARCH LABORATORY

ANNUAL REPORT

2021

MISSISSIPPI STATE UNIVERSITY™

RASPET FLIGHT RESEARCH LABORATORY

CONTENTS

OUR VISION

Raspet's vision is simple: to become the finest academic aviation/aerospace research development test and evaluation facility of its kind in the world.

OUR MISSION

The Raspet Flight Research Laboratory accelerates Mississippi State University's success through the execution of applied aeronautical research that safely integrates technologies and advances the aerospace body of knowledge and industry state-of-the-art.

DIRECTOR'S MESSAGE

Our research team had a productive 2021, and I'm pleased to share with you this overview of our most significant initiatives. During this latest calendar year, the Raspet Flight Research Laboratory received more than $8.4 million in new research funding.

In this year's annual report, we're highlighting several of our unmanned aircraft system research efforts, including working alongside energy companies to potentially expand their use of UAS in inspections, our role in helping the National Oceanic and Atmospheric Administration hone its flood forecasting models, and efforts to enable UAS to fly cooler, quieter and with more efficiency and in increasingly diverse weather conditions.

In 2021, Raspet continued advancing key Federal Aviation Administration initiatives while cementing Mississippi State University's leadership in enabling technologies, air traffic simulation and modeling, and in demonstrating safe flight operations in densely populated airspace.

I'm appreciative of the hard work and ingenuity our team demonstrated and thankful for the support of our campus and industry collaborators, our sponsors, and the MSU leadership team.

Please consider interacting with us via our social media channels you'll find referenced elsewhere in this publication and on our website at ***www.raspet.msstate.edu***.

Wishing you a safe and productive 2022!

Tom Brooks
Director, Raspet Flight Research Laboratory


STATE

RASPET, SOUTHERN CO. WORK TO EXPAND UAS USE

Southern Company and Mississippi State announced in April a new collaboration that will expand the energy company's use of unmanned aircraft systems to map critical infrastructure, assess weather-related damage and conduct routine utility inspections.

The collaboration between Southern Company and Mississippi State's Raspet Flight Research Laboratory will enable the use of larger, more sophisticated unmanned aircraft systems, known as UAS, in pursuing beyond-visual-line-of-sight operations approval from the FAA for the energy company's inspection and mapping efforts.

"The value proposition offered by the potential utilization of the next generation of unmanned aircraft systems in the utility industry beyond the visual line of sight is tremendous," said Harry Nuttall, director of Aerial Services for Southern Company. "This collaboration with MSU enables us to seek out the ability to perform numerous tasks in a safer and more efficient way while expanding the very definition of what is possible for our company. This allows us to eliminate the need to place employees at risk operating helicopters and fixed wing aircraft in a hazardous wired environment."

In 2015, after thorough exploration, Southern Company began using UAS to reduce the duration of storm-related outages and to perform power line inspections more safely, lowering operating and maintenance costs and reducing environmental impacts.

With utility infrastructure that includes more than 27,000 miles of transmission lines across 120,000 square miles in the Southeast, UAS provide Southern Company a quicker and more detailed assessment of areas and infrastructure impacted by severe weather.

MSU's Raspet Flight Laboratory was designated in 2020 as the FAA's UAS Safety Research Facility, placing the lab at the helm of studying and developing safety and certification standards as UAS become increasingly integrated in the U.S. national airspace system.

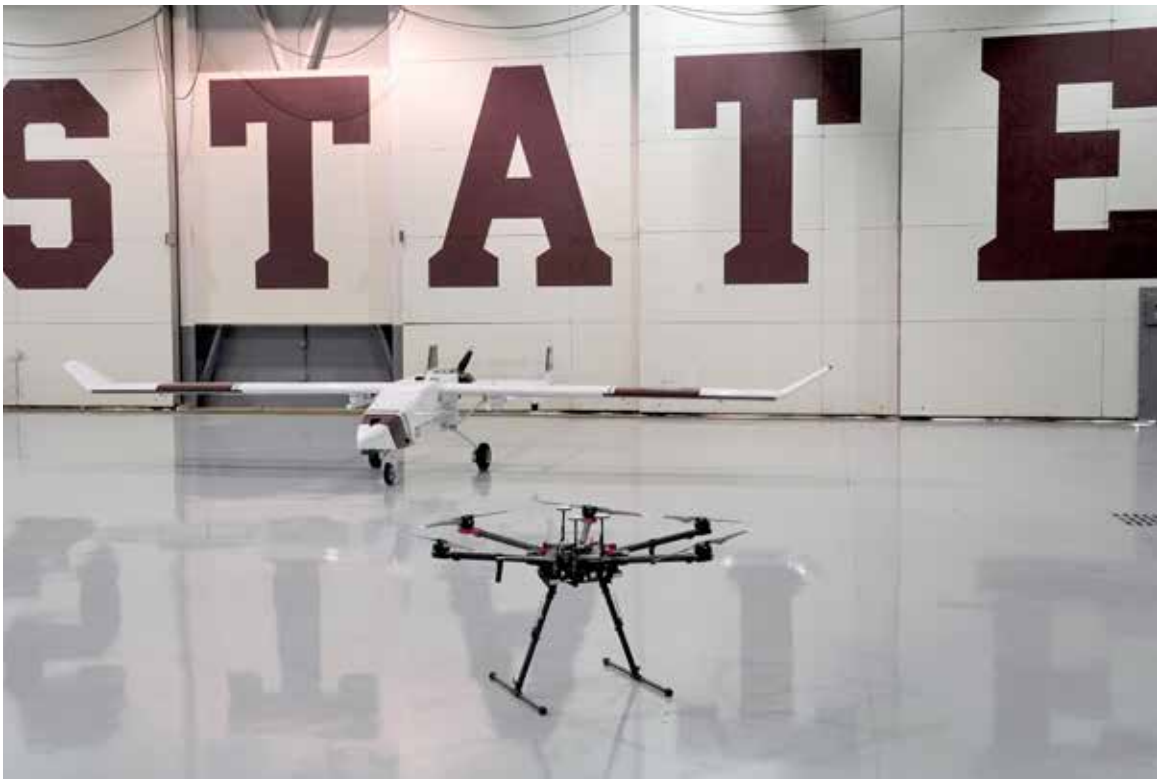
"Our efforts with Southern Company seek to facilitate increased future use of larger, more sophisticated unmanned aircraft systems," said Tom Brooks, director of the Raspet Flight Lab. "These larger aircraft systems provide significantly enhanced safety and greater operational range, coverage, and reliability, while increasing payload capacity and on-board avionics."

Southern Company subsidiaries, Alabama Power, Georgia Power and Mississippi Power, already maintain a fleet of small Group 1 and Group 2 UAS weighing less than 55 pounds. Through collaboration with Mississippi State, the company is researching the benefits of larger Group 3 aircraft, which can weigh up to 1,320 pounds, and Group 4 aircraft weighing in excess of 1,320 pounds—both of which fly at altitudes up to 18,000 feet.

Under the new agreement, Raspet is assisting Southern Company in evaluating and selecting viable Group 3 and Group 4 UAS platforms and on-board sensor systems enabling those UAS to effectively detect and avoid other aircraft in surrounding airspace. Raspet and Southern Company are working together to gather and validate safety data and operations procedures required for the FAA review-and-certification process. ■

TOP: The collaborative research between Southern Company and Raspet is pursuing FAA approval for UAS operations beyond visual line of sight. Bottom: An example of a small UAS (foreground), which weighs less than 55 pounds, is shown with an example of a large UAS, some of which exceed 1,320 pounds.

> Our efforts with Southern Company seek to facilitate increased future use of larger, more sophisticated unmanned aircraft systems. These larger aircraft systems provide significantly enhanced safety and greater operational range, coverage, and reliability, while increasing payload capacity and on-board avionics. **~ Tom Brooks**



WANT BETTER WEATHER? HOW ABOUT A BETTER UNDERSTANDING OF CLIMATE?

By Mike Wasem

For eight days in November 2021, something unexpected was in the skies above the wheat and corn fields near the small towns of Blackwell and Tonkawa in the north-central reaches of Oklahoma.

It wasn't a bird, a weather balloon, or even an airplane. Instead, each day, an uncrewed aerial system, or UAS, left the Blackwell-Tonkawa Municipal Airport and flew 1,000 feet above the farms, ranches and the Salt Fork Arkansas River to its destination 13 miles away: the Atmospheric Radiation Measurement, or ARM, user facility's Southern Great Plains atmospheric observatory.

The UAS test flights, operated by the Raspet Flight Research Laboratory at Mississippi State University, were a mission to demonstrate safe operations and collect atmospheric data. ARM and Raspet designed the Oklahoma flights as a continuation of a previous payload testing on the MSU TigerShark UAS platform in Mississippi.

ARM, a U.S. Department of Energy Office of Science user facility, worked with Raspet for much of 2021 to fine-tune the performance of UAS used in atmospheric research. Raspet provided expertise in engineering, flight operations and staggered visual observation.

Data gathered by ARM can lead to a greater understanding of atmospheric processes and better modeling of climate in Earth system models.

Piloted remotely, the UAS followed a carefully planned flight path. Meanwhile, staggered visual observers stationed at farms and ranches between the airport and the SGP tracked the UAS to ensure safe operations. All flights avoided clouds and required a minimum of three miles of visibility.

High above the SGP, UAS pilots used different flight patterns to provide horizontal and vertical context to the collected data, including:

- meteorological parameters (temperature, dew point, pressure, winds)
- trace gases (water and carbon dioxide)
- aerosol properties (total number concentration, size distribution, absorption, and composition)
- surface properties (surface temperature and multispectral images).

Teams from the Raspet Flight Research Laboratory and ARM pose with the TigerShark at the Blackwell-Tonkawa Municipal Airport. (Jason Tomlinson)

This wing-mounted probe uses ports to measure things like true air speed, wind speed and direction, temperature, pressure, and relative humidity. (Jason Tomlinson, PNNL)

Among other things, the Oklahoma flights were a proof-of-concept mission designed to evaluate the implementation of customized instrumentation and demonstrate safe operations, according to Beat Schmid, ARM Aerial Facility manager.

"The Oklahoma flights met all objectives," said Schmid. "We learned a lot, we operated safely, and the instruments performed as expected."

Raspet's work with the ARM Aerial Facility didn't end in Oklahoma.

"Raspet is an acknowledged leader in this area of aviation; we have valued their advice and counsel," said Schmid. "As we move toward regular atmospheric observations and data collection with (ARM's) ArcticShark platform, we will continue to work with Raspet and lean on their expertise."

Operating its TigerShark above the Southern Great Plains atmospheric observatory was rewarding for the MSU team, said Tom Brooks, director of Raspet.

"Even more fulfilling than establishing this joint effort as the first in decades to operate a UAS of this size over this premier research facility are the quality relationships established between our team and ARM's and the knowledge that, together, we're advancing discovery science," said Brooks.

During the Oklahoma mission, with each landing at the Blackwell-Tonkawa Municipal Airport, new operational information was learned, and each flight brought back gigabytes of new ARM data. Those data are now freely available on ARM Data Discovery.

ARM collects, processes, quality-checks, stores, and distributes continuous measurements gathered in climate-critical locations worldwide. Scientists use ARM data to drive the research of atmospheric processes, while others use the data sets to improve predictive computer models of earth systems.

"Everybody around the world can download our research data free of charge," said Fan Mei, who oversees science activities for the ARM Aerial Facility. ■

Mike Wasem is a staff writer with Pacific Northwest National Laboratory.

A Raspet flight lab unmanned aircraft flies over the Mississippi River between Greenville, Mississippi, and Lake Village, Arkansas, in the aftermath of Hurricane Delta. (Photo courtesy MSU Northern Gulf Institute)

EYES IN THE SKY HELPFUL FOR FLOOD PREDICTION, DISASTER RECOVERY

A Greenwood, Mississippi, family watched as floodwaters inched closer to their back door.

Federal weather experts in Slidell, Louisiana, assured the family they would not have to evacuate, confidently predicting the Yalobusha River would recede within its banks without damaging the residence. How could they know from 275 miles away?

They had a good view – one provided courtesy a Mississippi State University researcher and an unmanned aircraft system operated by MSU's Raspet Flight Research Laboratory. It was a view proven undeniably accurate.

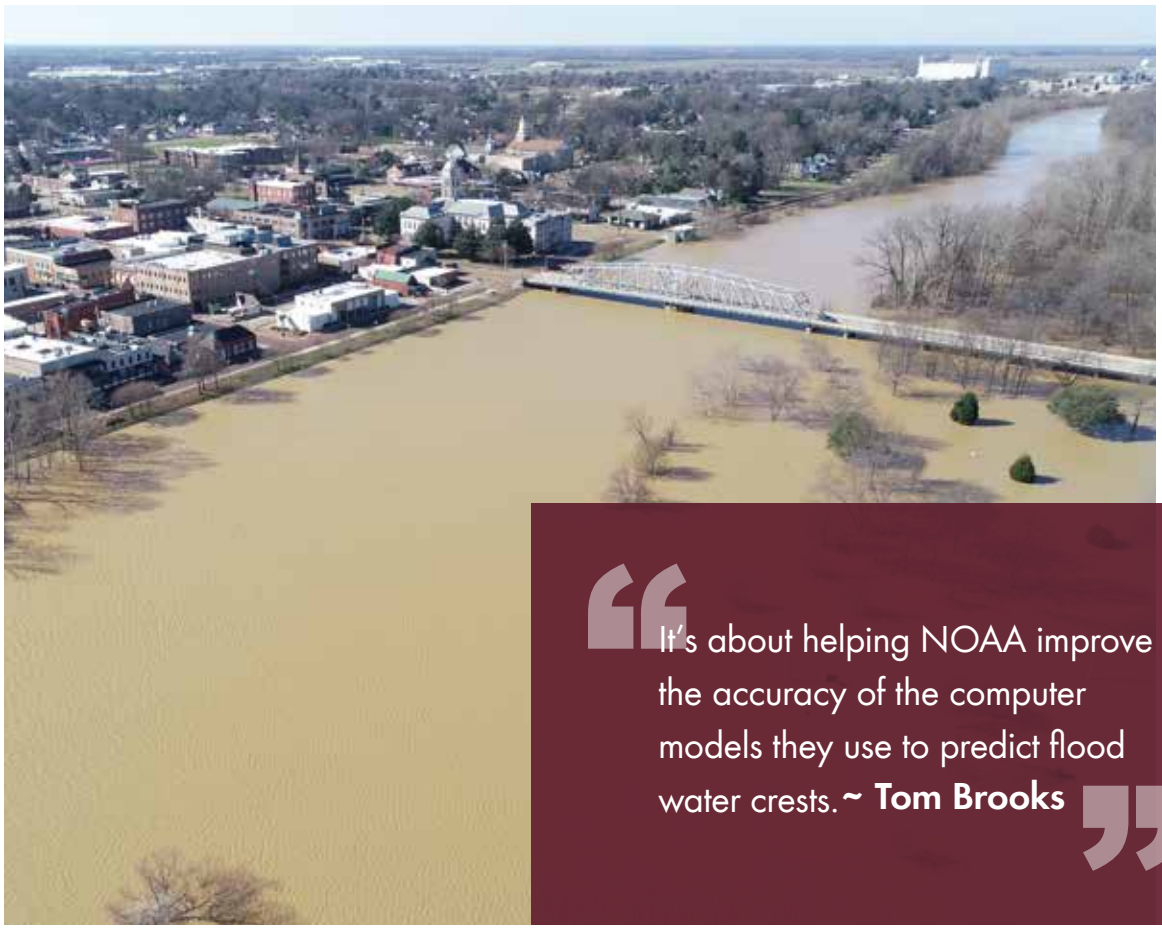
During early 2019, heavy rains hammered the region. Robert Moorhead, director of MSU's Northern Gulf Institute, was prepared. Raspet personnel had earlier integrated one of the Institute's multiple sensor payloads into an unmanned aircraft system – enabling near real-time data transmission to the National Oceanic and Atmospheric Administration's National Weather Service, River Forecast Centers, and emergency management personnel. The payload has the capability of transmitting data with 6-inch resolution when flying 4,500 feet above the ground.

When flood threats first became apparent, MSU contacted NOAA and its National Weather Service, offering to bring the aircraft and a rapid response team to Greenwood.

The research missions, said Tom Brooks, director of the Raspet Flight Research Laboratory, are about more than assisting NOAA, and residents, with a one-time event.

"It's about helping NOAA improve the accuracy of the computer models they use to predict flood water crests," Brooks said.

TOP: An aerial view obtained by a UAS of the Yalobusha River well above flood stage in suburban areas around Greenwood, Mississippi, during February 2019. (Photo courtesy MSU Northern Gulf Institute). BOTTOM: Rising waters threaten to flood downtown Greenwood. (Photo courtesy MSU Northern Gulf Institute)



> It's about helping NOAA improve the accuracy of the computer models they use to predict flood water crests. **~ Tom Brooks**

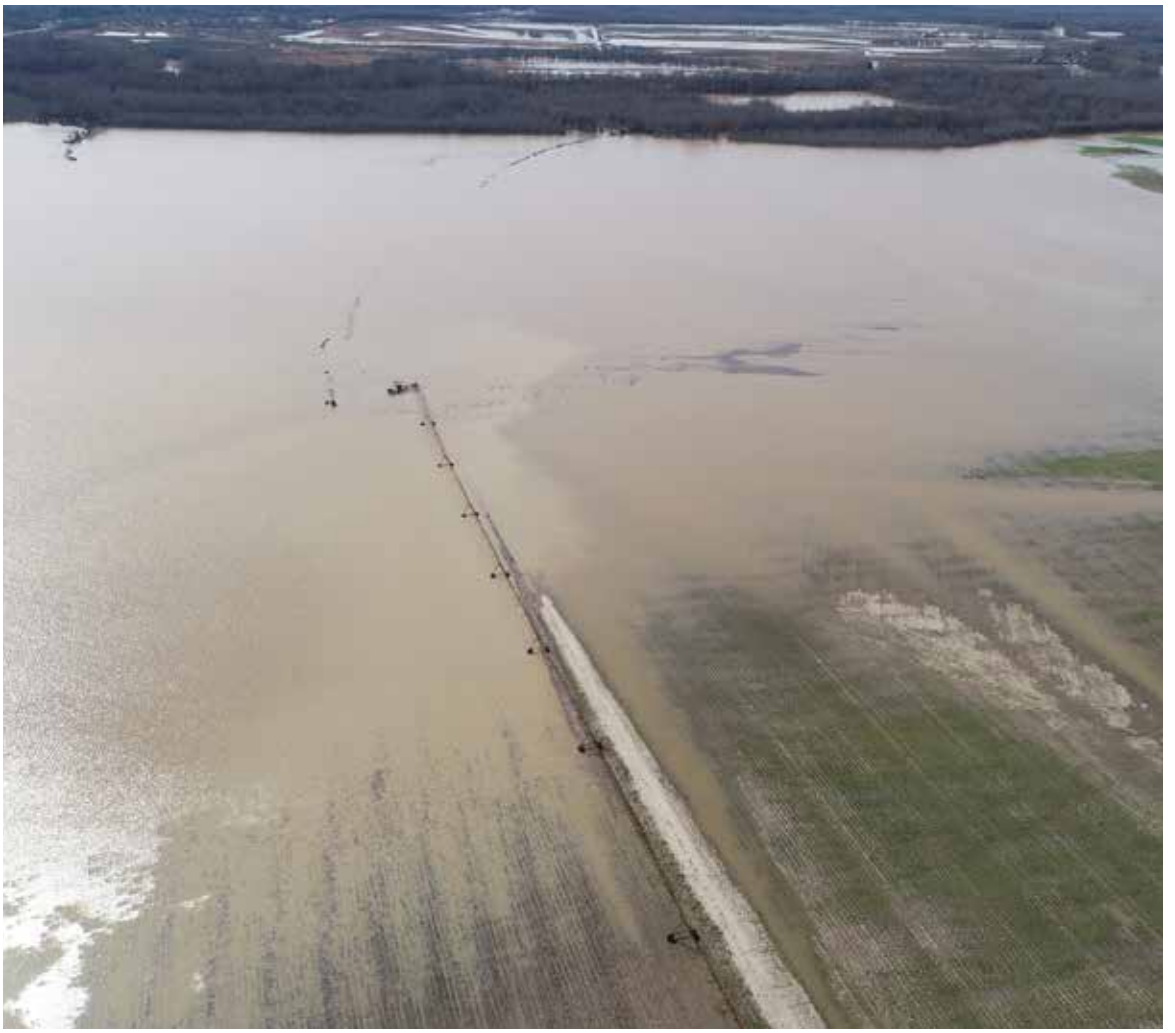
Models, as seen during the world's battle against Covid-19, are only as accurate as the data supporting them. In the ongoing project with NOAA, MSU is demonstrating the feasibility of incorporating unmanned aircraft systems, commonly known as UAS or drones, into the immediate aftermath of severe weather events, and the extent by which they can hone computer models' flood forecasting capabilities. In an earlier news release, NOAA said the information MSU personnel provided was impactful.

"We were able to see the water as it rose over the course of two days, which helped our office confirm when the crest had been reached," said Suzanne Van Cooten, hydrologist-in-charge at the NOAA National Weather Service Lower Mississippi River Forecast Center in Slidell, Louisiana. "This visual information really helps us improve our forecasts so we can provide critical information to those in an affected area."

Having detailed information in-hand, even on cloudy days when satellite imagery isn't as helpful, can help emergency personnel better know how to manage evacuations or distribute resources.

Raspet and NGI have teamed on six such NOAA-sponsored research flights, including as recently as September 2021 when the two groups collected aerial imagery of the rain-soaked Golden Triangle region as the remnants of Hurricane Ida exited Mississippi. Though this time, thankfully, lives were not at risk from flooding, the provided data proved helpful in fine-tuning future flood forecasts. ■

Aerial imagery of a flooded roadway in west central Mississippi. (Photo courtesy Northern Gulf Institute)



Tom Brooks adjusts one in an array of microphones at Greenwood-LeFlore Airport in preparation for acoustic measurements of an unmanned aircraft system flight.

BROOKS TABBED **TO LEAD RASPET FLIGHT LAB**

An engineer with decades of experience in the design, testing and certification of aircraft systems now leads Mississippi State University's Raspet Flight Research Laboratory.

Tom Brooks' selection as interim director of the university's distinguished research center was announced in November 2020, and he was named director of Raspet, which focuses on unmanned aircraft systems, in March 2021.

Since 2018, Brooks had served as Raspet's chief research engineer. Prior to joining MSU, Brooks spent nearly 30 years in leadership positions at Texas aerospace company Bell Textron.

During his career at Bell Textron, Brooks led the team responsible for certifying the world's first commercial fly-by-wire rotorcraft. His technical paper detailing development and testing of this rotorcraft's flight control system for tilt rotors was published in the Journal of the American Helicopter Society. In addition to multiple industry awards, he has several patents and patents pending for work related to advancing flight control systems in both the U.S. and Europe.

Brooks received his Bachelor of Science degree in aeronautics from Embry-Riddle Aeronautical University with post-graduate studies in feedback control systems, airplane stability and control, and aerodynamics at Mississippi State. He is a veteran of the U.S. Marine Corps.

He holds FAA certification as a Designated Engineering Representative and an FAA airplane and power plant license. Since joining Raspet, he has supported funded research contracts for testing and evaluating icing protection systems for unmanned aircraft systems, known as UAS, and UAS-based radar jamming systems.

Raspet was recently designated as the Federal Aviation Administration's UAS Safety Research Facility, placing the research center at the helm of studying and developing UAS safety and certification standards. Raspet works closely with the MSU-led FAA Center of Excellence for Unmanned Aircraft Systems, also known as the Alliance for System Safety of UAS through Research Excellence or ASSURE. ■

An aircraft flight path during treatment of a field is shown.

HELPING AG AVIATORS, UAS OPERATORS NAVIGATE JOINT AIRSPACE

One hundred years after airplanes were first used in applying insecticide to crops, a Mississippi State flight lab seeks to understand how today's agricultural aviators can safely share the skies with technology those early agriculturalists could not have imagined – unmanned aircraft systems.

Agricultural aviators treat more than 125 million acres of U.S. cropland each year, according to the National Agricultural Aviation Association. Flying as low as 10 feet off the ground and at speeds up to 140 miles per hour, ag aviators share this low altitude space with unmanned aircraft systems, often referred to as UAS or drones, with greater frequency than other manned aircraft.

"With UAS increasingly populating the skies, it's in everyone's interest to better understand how these two types of aircraft can safely share airspace," said Tom Brooks, director of MSU's Raspet Flight Research Laboratory. "We're synthesizing available agricultural aviation data to better understand typical flight patterns and tendencies of our ag fliers. We're identifying trends and plan to later integrate this data with existing predictive models that will account for this vital aspect of aviation in developing safe integration of UAS into the national airspace system."

With unmanned aircraft systems already aiding emergency officials with disaster relief operations, support for agricultural efforts, and environmental assessments, full integration into the national airspace system would enable UAS to safely and regularly operate in conjunction with manned aircraft during both emergency and non-emergency operations, while using many of the same air traffic management systems and procedures. By law, UAS must give the right-of-way to manned aircraft.

Agricultural aviation appears, in some ways, to be an understudied aspect of aviation, according to Raspet researchers. Topographical obstacles, the curvature of the earth and the positioning of radars at airport terminals, for example, limit radar-provided information on low-flying agricultural aircraft. A widely used national database provides radar information for flights as low as 1,000 feet, but many agricultural aviators spend much of their time at heights 500 feet and lower.

> Most of this low-altitude data is below what the major radar networks are able to cover. We can fill in some of these gaps. ~ **Kyle Ryker**

(Photo by Getty Images)

For its analysis, Raspet has drawn from some 35,000 individual flight data logs of ag aviators via the National Agricultural Aviation Association and the Mississippi Agricultural Aviation Association. Data from 20 states are included, and Raspet researchers have worked to analyze regional trends.

"Most of this low-altitude data is below what the major radar networks are able to cover," said Kyle Ryker, a Raspet research engineer who co-leads the effort with Madison Dixon, research director. "We can fill in some of these gaps."

The data includes things like ag aircraft's climb and descent rates, spray and cruise speeds and turning radii. Having a documented understanding of ag aviation operations can allow for better training of UAS operators who fly in rural areas and are more likely to encounter ag aviators, Dixon said.

"Aerial applications are labor intensive," said Andrew D. Moore, National Agricultural Aviation Association CEO. "Ag pilots are looking for ground-affixed obstacles and trying to ensure precise, targeted applications, and studies have shown it is extremely difficult, if not impossible, for manned aircraft pilots to see UAS. The National Agricultural Aviation Association appreciates the MSU flight lab's efforts to ensure the safety of manned agricultural aircraft as UAS traffic increases."

As the project progresses and Raspet develops and refines its predictive computer models, follow-on efforts will begin integrating the datasets into widely used safety tools designed to predict air traffic densities and representative trajectories, Ryker said.

"Our work involves normalization of the ag aviator dataset to make it compatible with existing airspace characterization tools. This will ensure full visibility and awareness of this unique segment of aviation operations," Ryker said.

Technological advancements in agriculture and aviation since the Aug. 3, 1921, flight to dispatch sphinx moth caterpillars from a Catalpa tree crop in Troy, Ohio, are nearly unimaginable, Brooks said.

"As a leader in both agricultural and UAS research, Mississippi State is well positioned to help each of these sectors understand the needs and concerns of the other and to provide regulators with the necessary data to ensure both groups excel," Brooks said. ■

A joint effort between TVA and Raspet seeks to scale the power provider's existing UAS operations to include larger UAS, such as the one shown above.

TVA LOOKS TO RASPET, LARGE UAS TO AID INSPECTIONS

The Tennessee Valley Authority and a Mississippi State flight research laboratory are collaborating on expanding the company's use of unmanned aircraft systems for inspections in order to improve safety and lower costs.

The partnership between TVA, which supplies electricity to nearly 10 million people across seven Southeastern states, and Mississippi State's Raspet Flight Research Laboratory draws from the flight lab's expertise in evaluating unmanned aircraft systems, known as UAS, and its associated technologies.

"TVA is building the energy system of the future, and we need to use the latest technology

to do it," said David Hill, general manager TVA Aviation Services. "This partnership puts TVA on the leading edge of UAS technology, in order to continue to provide low-cost, clean, reliable power across seven states."

MSU's Raspet Flight Lab was designated in 2020 as the Federal Aviation Administration's UAS Safety Research Facility, placing the lab at the helm of studying and developing safety and certification standards as UAS become increasingly integrated in the U.S. national airspace system.

Central to the new joint effort is the utilization of larger UAS, categorized as Group 3 unmanned aircraft, to scale the power provider's existing UAS operations. Group 3 aircraft can weigh up to 1,320 pounds and fly at altitudes not exceeding 18,000 feet.

With more than 16,300 miles of line, more than 100,000 transmission structures, and hundreds of communication towers and properties located throughout an 80,000-square-mile region, TVA has the second largest transmission system in North America. Inspecting its resources regularly, including after weather events, is key in TVA sustaining its 99.999 percent service reliability since 2000. Finding new ways to safely increase inspection efficiency helps reduce operating costs, keeping TVA power rates lower than 80 percent of the top 100 utilities in the nation.

UAS are not presently permitted to operate unless they can be seen visually by the pilot or a trained observer working with the pilot. The FAA and UAS industry leaders worldwide, including Raspet, are researching and evaluating methods to expand UAS operations safely past this present limitation. For example, Raspet researchers are among those investigating various technologies that enable UAS to reliably detect and avoid other aircraft in surrounding airspace.

"Future FAA-approved implementation of detect–and–avoid systems will allow UAS to operate safely beyond visual line of site – a necessary step for these systems to reach their full potential," said Tom Brooks, director of the Raspet Flight Lab. "We're working alongside TVA in evaluating UAS technologies and determining how they align with TVA's present and future operational needs."

Research Director Madison Dixon is Raspet's principal investigator for the project.

"TVA and Raspet are closely collaborating on this research effort," said Dixon. "Group 3 aircraft have tremendous potential to expand safe, efficient unmanned inspections. Together, we'll work to ensure this potential is reached." ■

(Photo courtesy Kansas State University)

FIRST RESPONDERS TO BENEFIT FROM COMPETITION RASPET CO-MANAGES

An unmanned aircraft system design and build challenge co-managed by Mississippi State University's Raspet Flight Research Laboratory culminates in mid-2022 with live flight competitions in Starkville.

The U.S. Department of Commerce's National Institute of Standards and Technology, known as NIST, is hosting the competition to advance the use of unmanned aircraft systems in first responder search-and-rescue operations.

Participants are competing for up to $720,000 in prizes during the challenge.

Known as the First Responder UAS Triple Challenge, the contest is managed by Kansas State University, in partnership with Raspet.

NIST's Public Safety Communications Research, or PSCR, division began accepting entries during 2021.

"Our goal at PSCR is to accelerate the development and adoption of advanced wireless communications for the public safety community," said Dereck Orr, division chief. "These prize competitions are a way for us to find solvers from around the world to help us with this important research."

Prize recipients will be determined by a panel of judges, assisted by a team of subject matter experts, through various stages of the competitions.

"Unmanned aircraft systems are increasingly revolutionizing various aspects of society, including how emergency responders do their jobs," said Tom Brooks, Raspet director. "Mississippi State welcomes the opportunity to bring our UAS experience to support this competition that is sure to advance technologies available to public safety professionals."

The competition is comprised of three challenges with three different focus areas—all aimed at advancing UAS technology to support critical, lifesaving missions:

- The FastFind: UAS Search Optimized Challenge is focused on search and rescue operations using optical sensors and data analysis to improve image detection and location.
- The LifeLink: UAS Data Relay Challenge is centered on supporting continuous delivery of broadband data in a degraded cellular area.
- The Shields Up! Securing UAS Navigation and Control Challenge asks participants to identify cybersecurity threats and countermeasures to prevent navigation and control of the UAS.

The UAS Search Optimized and the UAS Data Relay events both culminate with live flight competitions in Starkville during the week of June 20, 2022, weather permitting.

"This project has been a long time in the making for our team at K-State," said Kurt Barnhart, who is leading the Kansas State contract team. "We are privileged to be able to partner with the challenge team at NIST in their ongoing effort to push innovative technologies forward for first responders to use as they work tirelessly to help us when we need it the most. We're also excited to be working jointly with the excellent team at Mississippi State's Raspet Flight Research Laboratory to develop and deliver three competitions."

The First Responder UAS Triple Challenge offers participants the chance to use their ingenuity and hardware-building expertise to meet public safety's needs. ■

Cavin Skidmore, a flight operations technician at MSU's Raspet Flight Research Lab, launches an unmanned aircraft system.

> "Unmanned aircraft systems are increasingly revolutionizing various aspects of society, including how emergency responders do their jobs." **~ Tom Brooks**

3-D printed ice shapes, designed by Raspet to mimic impacts of ice accumulation, are shown on the leading edge of a TigerShark's wings.

ANTI-ICING SYSTEM TO **TAKE FLIGHT**

The Raspet Flight Research Laboratory is spearheading research that could make unmanned aircraft systems operational in icy conditions.

The Mississippi State researchers are leading an icing system development and technology team in what the U.S. Department of Defense hopes will result in lightweight anti-icing systems, leading to certification for UAS to operate in forecasted icing conditions.

The DOD awarded $5 million for this effort that also includes the university's aerospace engineering department and several industry partners.

The entire team is evaluating the use of a new carbon-nanotube coating, part of an intelligently controlled ice protection system. One aspect of the flight testing includes 3-D printed ice shapes designed by Raspet to mimic frozen formations affixed to the wings. Results from those tests help inform the development of the ice protection system.

"Our innovative approach allows us to replicate the most severe in-flight icing conditions before traveling to cold and remote areas," said Tom Brooks, Raspet director. "This allows us to conduct nearly unlimited test flights at a much lower cost and generate the data we need to develop effective, low-cost and retrofittable anti-icing system solutions for use on today's sophisticated unmanned aircraft."

NASA-designed software models predicted the shapes, and test flights were conducted, assessing these shapes' impact on aerodynamic performance. Icing increases drag, reduces lift and adds weight to aircraft.

"As ice builds on the wings, a process referred to as ice accretion negatively impacts the aerodynamics of the wing," Brooks said. "Raspet's application of these 3D-printed shapes to aircraft wings enables our researchers to validate the computer modeling used to predict changes in lift and controllability caused by the ice."

Today's traditional ice countering technologies used on commercial and private airplanes, such as antifreeze pumps to spray the wings or inflatable bladders expanded on wing sections to dislodge ice, are too heavy and energy intensive to work on UAS. The newly developed coating for UAS has extremely high heat conductivity, allowing it to transfer warmth from small heat strips on the wings' leading edges to counter ice formation.

If proven successful, the ice protection system, which is retrofittable to existing aircraft and easy to install, would also be of much interest in the civilian aviation industry, Brooks explained.

Wings equipped with the icing protection system arrived at Raspet in February 2022 where they were tested prior to additional test flights in known icing conditions.

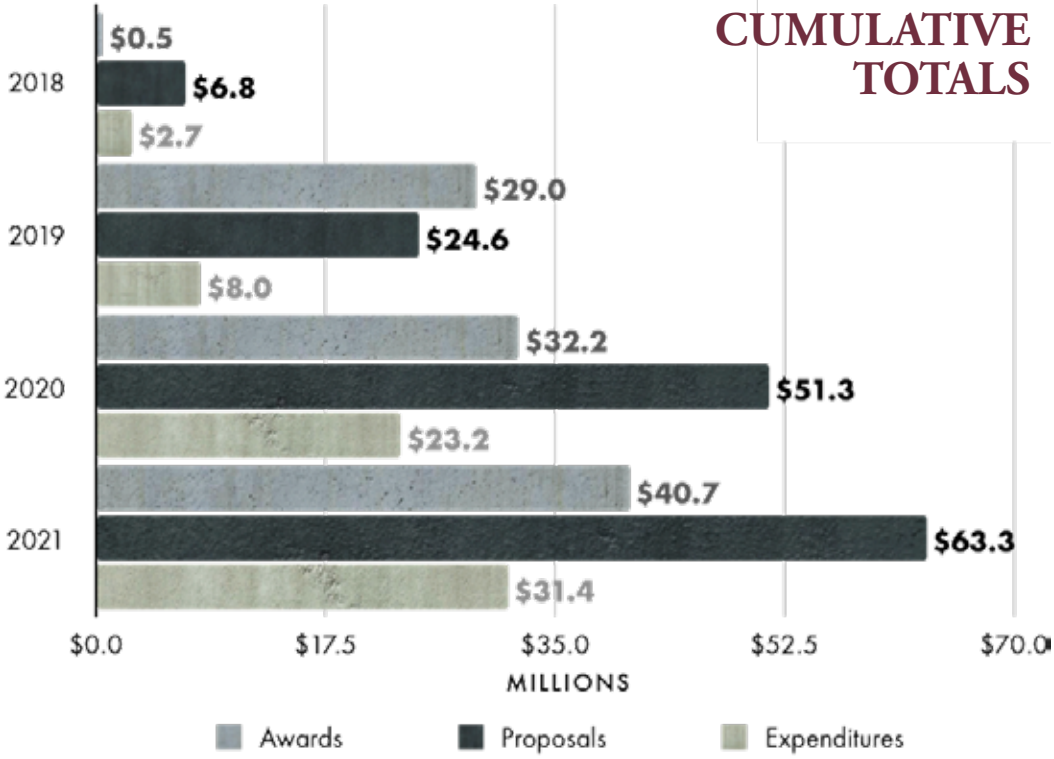
"Because it's easy and inexpensive to install on existing aircraft, this lightweight anti-icing system has tremendous potential for use in general aviation," Brooks said.

Raspet's two state-of-the-art TigerShark Block 3 XP aircraft support the project. Each weighs about 350 pounds, can carry 100 pounds of payload and fly for 8-12 hours before refueling. The MSU laboratory also has worked with MSU Professor of Aerospace Engineering David Thompson, a well-known expert in aircraft icing, to create the 3-D predicted-shape models.

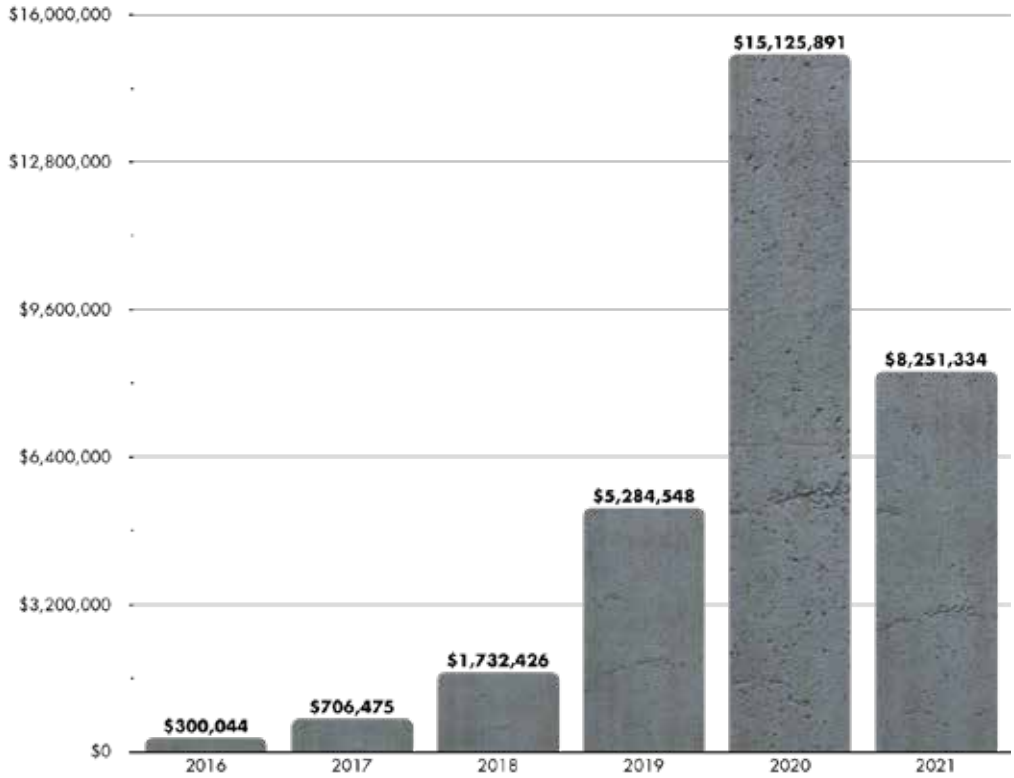
Other Raspet partners include Ohio's private, nonprofit Battelle, Kansas' Ultra Electronics ICE Inc., and Pennsylvania's Navmar Applied Science Corp. ■

FINANCIAL HIGHLIGHTS

CUMULATIVE TOTALS



TOTAL EXPENDITURES



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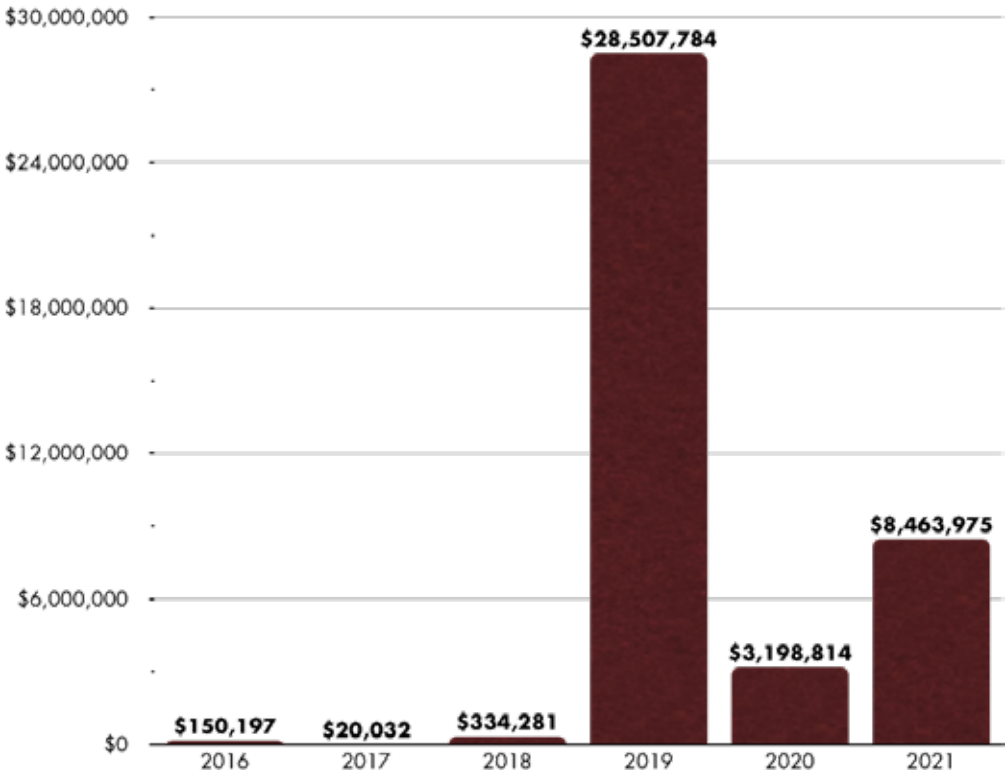

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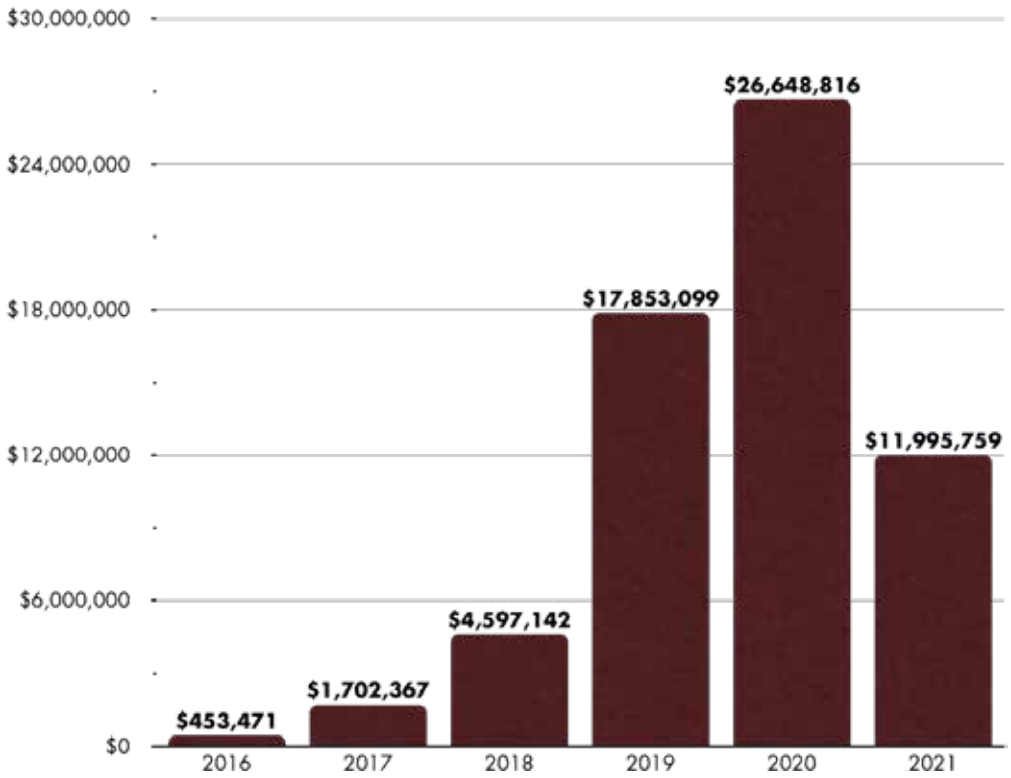

NEWS ON **SOCIAL**

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Raspet Flight Laboratory

msstateraspet Raspet recently hosted a visit for the Starkville Oktibbeha School District's Unmanned Aviation Campers. Some of our staff toured the campers around our facilities and talked with them about some of the research we do in the unmanned aircraft systems field. We enjoyed visiting with the future minds of our profession and look forward to seeing them again. #UAS #Drones #WeRingTrue #brightfuture #mindsoftomorrow

29w

24 likes

JULY 19, 2021

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msstateraspet Today's spotlight lands on Raspet's business manager Courtney Jethroe. She joined Raspet in summer 2020 as an accountant and then was promoted to business manager. Courtney is originally from Starkville, Mississippi. She holds a bachelor's degree in accounting from Campbell University, where she was a member of the women's varsity basketball team. She enjoys working out, reading informational/inspirational books, and cooking/baking with her kids. She is also a certified personal trainer. #weringtrue #hailstate #spotlight #uas

18w

20 likes

OCTOBER 7, 2021

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MSU's Raspet Flight Research Laboratory
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In our role as the FAA's UAS Safety Research Facility, we're writing the flight safety plan for unmanned aircraft. Here's a 30-second glimpse. #uas #drones #WeRingTrue https://lnkd.in/ePRPgqR

FAA selects Raspet to lead UAS safety efforts
youtube.com

10

MSU's Raspet Flight Research Laboratory
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Mississippi State's Raspet Flight Research Laboratory, part of the FAA's UAS Center of Excellence, ASSURE, leads a research effort to measure pilots' abilities to detect other air traffic. The work has implications in the development of detect and avoid standards for unmanned aircraft systems. Baseline experiments measuring a pilot's field of vison recently began. Much work lies ahead, including a series of test flights this summer. #WeRingTrue #uas #drones

18

MSU Raspet Flight Research Laboratory
@MSStateRaspet

See how we're imagining the possibilities of flight in @msstate Raspet Flight Research Laboratory. #WeRingTrue #UAS #UAV #drone

youtube.com
Raspet Flight Research Laboratory
This video provides an overview of the Raspet Flight Research Laboratory at Mississippi State University. It trac...

9:20 AM · Mar 31, 2021 · Twitter Web App

MSU Raspet Flight Research Laboratory
@MSStateRaspet

Making history: Our TigerShark made history. It was the first unmanned aircraft system to fly in @JacksonAirports controlled airspace. Read today's story: shorturl.at/agDLP #WeRingTrue #UAS #UAV #drone

5:08 PM · May 26, 2021 · Twitter Web App

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An sUAS undergoes evaluation of its potential Remote ID solution by @msstate Raspet Flight Research Laboratory. Such evaluations, part of an @ASSUREuas project, provide data to validate proposed ASTM Remote ID standards for acceptance by @FAANews. #WeRingTrue #UAS #UAV #drone

9:16 AM · May 4, 2021 · Twitter Web App

1 Retweet **1** Like

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Flights of Spring: A Raspet pilot taxis a Stearman biplane. Built in 1941, Boeing's PT-17 was the primary training aircraft for the US Army Corps. Acquired by MSU in 1950, it's used today by Raspet for towing and experimental flight testing. #WeRingTrue

10:08 AM · May 7, 2021 · Twitter Web App

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Quiet, please. Our @DeptofDefense-sponsored research could enable UAS to one day fly cooler, quieter and with more efficiency. Recent ground tests provide baseline data on engine and propeller noise. #WeRingTrue #UAS #uav #drone @msstate

9:22 AM · Jul 27, 2021 · Twitter Web App

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I C U: 👀 A 12-camera motion capture system tracks a small UAS in our @msstate lab during a Detect and Avoid experiment. The test is part of an @ASSUREuas research project sponsored by @USRAedu and completed in partnership with @Iris_Automation. #WeRingTrue #UAS #drone

9:12 AM · Aug 25, 2021 · Twitter Web App

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