



RASPET FLIGHT RESEARCH LABORATORY

# ANNUAL REPORT

*FUTURE FOCUSED • MISSION READY*



# 2023







# TABLE OF CONTENTS

---

2 4

ABOUT, VISION & MISSION

PREMO NAMED DIRECTOR  
OF MSU'S RASPET FLIGHT  
RESEARCH LAB

I

6

DIRECTOR'S MESSAGE

8

MSU WORKS TOWARD BETTER  
PREDICTION OF PEARL RIVER  
FLOODING THROUGH DRONES  
AND DATA-DRIVEN MODELS

10

FIRST RESPONDERS  
GAIN UAS PILOTING SKILLS  
THROUGH MSU, FEMA

12

TEROS HIGHLIGHTED  
AT THUNDER OVER THE SOUND  
AIR & SPACE SHOW

14

BY THE NUMBERS

16

NEWS ON SOCIAL

---

## FUTURE FOCUSED MISSION READY





# ABOUT RASPET

*Raspet Flight Research Laboratory (RFRL) is a historic, nationally recognized leader in the field of experimental aviation research. Founded in 1948, Raspet stands out as one of the university's most longstanding and prominently established research entities with a 75-year history of excellence. True to its heritage, today Raspet continually advances modern concepts in experimental aviation through the research, development, testing, and evaluation of Uncrewed Aircraft Systems (UAS) and their associated technologies.*





# OUR VISION

EXPAND THE ENVELOPE, EXPLORE THE POSSIBLE, AND  
ENABLE THE NEXT ERA OF AVIATION

# OUR MISSION

ADVANCE AEROSPACE TECHNOLOGIES, PRACTICES, AND SAFETY THROUGH  
SOLUTION-ORIENTED AERONAUTICAL RESEARCH AND PARTNERSHIPS TO SOLVE  
THE MOST CHALLENGING PROBLEMS FOR OUR CUSTOMERS AND THE NATION.







# PREMO NAMED DIRECTOR OF MSU'S RASPET FLIGHT RESEARCH LAB

**Rob Premo is now leading Mississippi State University's Raset Flight Research Laboratory, one of the country's leading academic research centers dedicated to the advancement of Uncrewed Aircraft Systems.**

Premo joined MSU in January 2023 as director of the MSU Center for Cyber Innovation after garnering more than 30 years of federal experience with the U.S. Marine Corps and the Missile Defense Agency. He continues to serve as director for the Center for Cyber Innovation while leading Raset.

"Rob brings extensive experience in leadership and strategic program management to our research enterprise, and I appreciate him stepping up to lead the Raset team," said MSU Vice President for Research and Economic Development Julie Jordan. "Raset has a dynamic team that is working every day with state and federal partners to develop solutions for uncrewed aircraft systems and further their integration into the national airspace. I know that momentum will continue under Rob's leadership."

Prior to joining MSU, Premo served as program director for the Missile Defense Agency's Advanced Programs and concept exploration portfolio, where he oversaw the rapid delivery of advanced capabilities to warfighters. He has served in various roles with the Huntsville-based agency since 2009. His 20 years in the Marines included multiple deployments in support of combat and contingency operations, as well as multiple staff tours. He earned a bachelor's degree in nuclear engineering from the University of Arizona and is a graduate of the Marine Corps Amphibious Warfare School and the Marine Corps Command and Staff College.

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*Rob brings extensive experience in leadership and strategic program management to our research enterprise, and I appreciate him stepping up to lead the Raset team.*

**- MSU Vice President for Research and Economic Development Julie Jordan**

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*Raspet research engineer working in the anechoic chamber used in developing quieter uncrewed aircraft.*



# A MESSAGE FROM DIRECTOR ROB PREMO

In 2023, Raspet Flight Research Laboratory continued its legacy of groundbreaking achievements. With substantial investment in research, we joined forces with numerous partners to push the boundaries of experimental aviation, particularly in the realm of Uncrewed Aircraft Systems (UAS). Through our annual report, I am delighted to present our key endeavors that reinforce Raspet's pivotal role as a frontrunner in UAS research.

With an unwavering focus on the future and a readiness for mission deployment, Raspet stands as the singular institution globally recognized as both the Federal Aviation Administration's UAS Safety Research Facility and an official UAS Test Site for the Department of Homeland Security. Our overarching vision propels our mission and guides our daily endeavors. The vision gains strength through our collaboration with esteemed university faculty, as well as dedicated graduate and undergraduate research assistants.

In 2023, Raspet expanded our burgeoning research and flight teams by welcoming new talent – including three full-time positions, five graduate research assistants, and five undergraduate research assistants. This unprecedented growth underscores Raspet's dedication to offering Mississippi State University engineering students an exceptional, hands-on learning experience beyond traditional classrooms, enhancing their skills and capabilities. Moreover, it fast-tracks our mission to execute and deliver cutting-edge, practical aeronautical research to our government and industry partners, propelling aviation into the future.

In 2024, Raspet commemorates 75 years of unwavering excellence in aviation research. Our 75th anniversary coincides with the completion of a \$700,000 facility renovation, generously supported by the Appalachian Regional Commission, and the establishment of a new all-weather testing laboratory.

As we reflect on our achievements from the past year, we celebrate our strides in unmanned aviation research while envisioning boundless possibilities for future exploration and development. We extend our gratitude to all who collaborate with us, redefining the boundaries of what is achievable.

## HAIL STATE!





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*Advanced modeling for river forecasting  
and flood mapping is critical to saving  
lives and protecting property.*

**- NGI Director Robert Moorhead**

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# MSU WORKS TOWARD BETTER PREDICTION OF PEARL RIVER FLOODING THROUGH DRONES AND DATA-DRIVEN MODELS

**More than a year ago, residents of Jackson began voluntary evacuations as the National Weather Service issued a flood warning for the Pearl River. In 2020, the Pearl River reached its third highest crest in history, flooding hundreds of homes and businesses in Hinds and Rankin counties. The next time it happens, an advanced river mapping system created using drone technology at Mississippi State University could improve flood warnings and enhance mitigation efforts.**

MSU's Raspet Flight Research Laboratory flew its TigerShark, a large Group 3 uncrewed aircraft equipped with a complex camera payload, along the banks of the Pearl River from Carthage to Jackson over two days in the summer of 2023 to capture detailed imagery of where the water is and where it can go. The drone flights are the sixth in a series that began in 2018 as part of an ongoing research project led by MSU's Northern Gulf Institute, a NOAA Cooperative Institute, to develop concepts of operation to exploit uncrewed aerial systems for flood prediction and model improvement.

"Advanced modeling for river forecasting and flood mapping is critical to saving lives and protecting property," said NGI Director Robert Moorhead.

Mississippi's Pearl River, the second longest river in the state, stretches more than 450 miles and covers almost two thirds of the state. Home to one million people who live in neighborhoods and communities that border its banks, the Pearl River rises in Edinburg in rural Neshoba County and runs south, winding its way through some of Mississippi's most populated cities, including the capital city of Jackson, before emptying into the Mississippi Sound.

As the TigerShark scanned 454 nautical miles of the Pearl River, Moorhead and Lee Hathcock, a data

acquisitions coordinator for NGI, observed the UAS operation on display screens from inside Raspet's Ground Control Station, where images were delivered in real time.

"The better your models are, the better you can predict future floods," said Hathcock, who processes the images collected to generate updated maps for river forecasting.

"It is a pretty straightforward approach," said Jamie Dyer, a professor of meteorology and climatology at MSU. "The high-resolution images provide us a baseline that allows us to see where water exists, which can then be used to define areas at risk of becoming inundated during a flood event. Also, with that data we can build and verify models to better predict the extent of flooding before it actually occurs."

While it can be difficult, even dangerous, for researchers to access hard-to-reach areas of Mississippi's river systems, Raspet's experienced flight team combined with the largest, most capable UAS fleet in academic use, offers a safe, reliable alternative for data collection.

"These flights further expand use of UAS and UAS technology as an important research tool while advancing UAS integration into the National Airspace System," said Raspet Director Rob Premo. "The project also demonstrates how MSU's research centers work together to leverage resources and create solutions to real-world challenges."

The first flight of the two-day exercise marked the second time for Raspet's TigerShark to fly at Mississippi's busiest airport—Jackson-Medgar Wiley Evers International Airport (JAN), taking off on the runway and sharing civilian airspace with traditional aircraft. For the second flight, the TigerShark flew out of Carthage-Leake County Airport, one of more than 40 cooperative airports across seven states that support Raspet's UAS operations.

*Raspet's TigerShark captures images of the Pearl River near the Ross Barnett Reservoir with a complex camera payload that will be used to create an advanced river mapping system to better predict future floods. (Photo by Nicole Thomas)*



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*UAS technology has the power to save lives. This training is an investment in our first responder community, ensuring they are well-equipped to respond to hazardous or dangerous situations and improving their safety and effectiveness when called to action.*

**- Raspet Flight Lab Director Rob Premo**

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# FIRST RESPONDERS GAIN UAS PILOTING SKILLS THROUGH MSU, FEMA

**First responders—often the fastest to the scene of an emergency or disaster—are now more proficient and effective in piloting small uncrewed aircraft systems with the aid of two Mississippi State-based research divisions.**

Nine agencies across three states recently sent their first responders to MSU's Raspet Flight Research Laboratory for an intensive, hands-on training program which is in partnership with the MSU-led Alliance of System Safety of UAS through Research Excellence, or ASSURE, and the Federal Emergency Management Agency.

Dubbed "ASSUREd Safe," the UAS education initiative includes six ASSURE-member universities which are leading a total of 36 trainings for two years.

"UAS technology has the power to save lives," said Raspet Flight Lab Director Rob Premo. "This training is an investment in our first responder community, ensuring they are well-equipped to respond to hazardous or dangerous situations and improving their safety and effectiveness when called to action."

During the first, two-day flight exercise led by Raspet pilots at MSU's North Farm, first responders practiced maneuvers along a designated flight path using an established test lane to evaluate efficiency and accuracy and to improve situational awareness.

"It's the difference between not knowing how big this grass fire is and knowing where it ends," said Therese Apel, an exercise participant and volunteer firefighter from Rankin County.

"With reliable, dependable and affordable UAS technologies readily available on the market, the use of drones among first responders has

steadily increased in recent years along with the need for standards-based training," said David Battaly, associate director of ASSURE.

Jarred Payne, a West Virginia detective who traveled to Mississippi to sharpen his skills as a drone pilot, said his department regularly deploys drones to support public safety.

"We use them for suspect apprehensions, search-and-rescue missions, disaster recovery and crash reconstruction," said Payne.

To increase access to UAS education, the courses are offered at no cost to first responders. Other ASSURE universities hosting training events to reach their local first responder community are Kansas State University, New Mexico State University, University of North Dakota, University of Vermont and Sinclair College.

The courses include Introduction to UAS Flight Operations for Emergency Response and Introduction to UAS Data Analytics for Emergency Response. ASSUREd Safe is already working to expand its curriculum portfolio to include additional UAS courses relevant to the first-responder community, which includes a variety of agencies such as law enforcement, firefighters and emergency management. ASSUREd Safe also plans to add special topics related to identified aircraft use, real-world scenarios and position-specific considerations.

"As pilots, we have a shared responsibility to protect our air space system with safe flight operations," said Raspet Pilot Sean Meacham. "This training allows us to share our knowledge and experiences to support first responders in their duties as the use of small UAS increases."





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*I'm looking forward to the future of Raspet and the new research opportunities Teros brings to the table for us with its expanded capabilities.*

**- Raspet Pilot Peter McKinley**

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# TEROS HIGHLIGHTED AT 'THUNDER OVER THE SOUND' AIR & SPACE SHOW

**Hundreds of aviation enthusiasts got their first look at Mississippi State's Teros, the largest, most sophisticated uncrewed aircraft system in academic use, during "Thunder Over the Sound" Air & Space Show at Keesler Air Force Base in Biloxi in the spring of 2024.**

MSU's Raspet Flight Research Lab, the nation's leading academic research institute dedicated exclusively to the advancement of uncrewed aircraft systems, is only the second entity in the world to secure the autonomous aircraft.

"Raspet has the distinction of operating the largest fleet of uncrewed aircraft at any U.S. academic research institution, and that fleet includes not one, but two Teros," said Raspet's Director Rob Premo.

The air show, a first for Teros, provided a unique opportunity to introduce the state-of-the-art aircraft to a broader audience on Mississippi's Gulf Coast. It also strengthened Raspet's commitment to recruit the next generation of aerospace talent.

Raspet's pilots, who are among only a few in the world trained to operate Teros, traveled with the aircraft, sharing their knowledge and experiences with aviation fans and students from area high schools who participated in a STEM expo during the air show.

"It's exciting," said Raspet pilot Peter McKinley. "I'm looking forward to the future of Raspet and the new research opportunities Teros brings to the table for us with its expanded capabilities."

Teros can also be equipped with a 4G LTE cellular system when cell service is unavailable to support first responders during disaster response or other emergency scenarios.

"With 24-hour flight endurance and 600-pound payload capacity, Teros can carry multiple payloads that perform a vast array of applications," said Austin Wingo, Raspet's Associate Director of Flight Operations. "This advanced UAS technology allows us to offer even greater mission capabilities to our public and private partners to further advance aviation research."

Teros is expected to be the first UAS of its kind to become type certified by the Federal Aviation Administration, meaning it is designed for complete future integration into the national airspace.

Raspet Flight Research Laboratory is the nation's leading academic research center dedicated to the advancement of uncrewed aircraft systems. Raspet is the only institute in the world designated both as the FAA's UAS Safety Research Facility and as official UAS Test Sites for both the FAA and the Department of Homeland Security, placing the research center at the helm of studying and developing UAS safety and certification standards.

Home to a fleet of the largest and most capable unmanned aircraft in academic use, Raspet conducts UAS research on behalf of federal agencies and commercial industry partners, helping grow Mississippi's aerospace sector.

*Raspet pilot Austin Wingo talks to students who are interested in aviation about Teros and its capabilities during the STEM Expo at Thunder Over the Sound Air & Space Show.*





# BY THE NUMBERS



# 2023 RESEARCH PROJECTS

## \$1.8 MIL

AWARDS

## \$5.6 MIL

PROPOSALS

## \$11.4 MIL

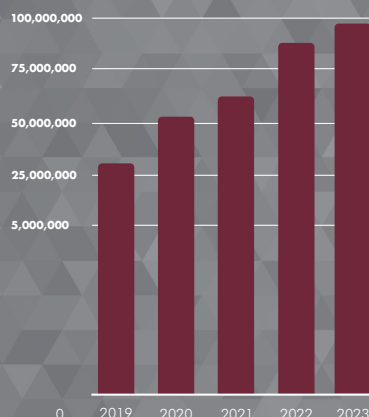
EXPENDITURES

2019	\$31,400,000
2020	\$51,300,000
2021	\$63,300,000
2022	\$88,800,000
2023	\$94,500,000

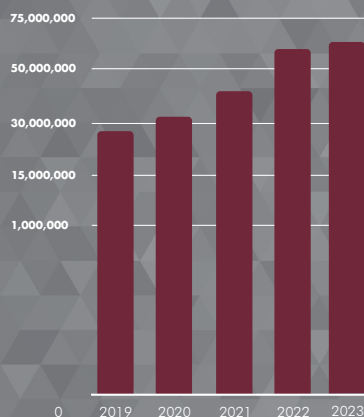
2019	\$29,000,000
2020	\$32,200,000
2021	\$41,900,000
2022	\$62,000,000
2023	\$63,900,000

2019	\$8,000,000
2020	\$23,200,000
2021	\$31,400,000
2022	\$41,900,000
2023	\$53,300,000

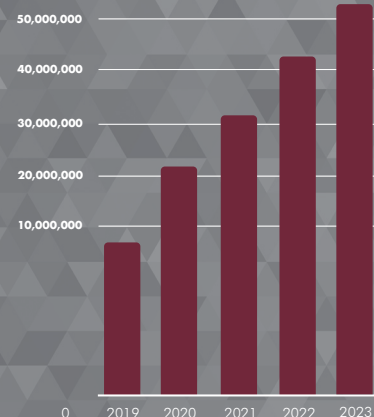
### TOTAL PROPOSALS



### TOTAL AWARDS



### TOTAL EXPENDITURES





## NEWS

## ON SOCIAL



TWITTER: @MSStateRaspet

FACEBOOK: @MSURaspet

INSTAGRAM: @MSStateRaspet

LINKEDIN: MSU's Raspet Flight Research Laboratory

MSU Raspet Flight Research Laboratory reposted



Mississippi Development A... · 8/23/23

Innovative R&D with practical benefits for Mississippi is underway at @MSStateRaspet, which is using drones to help predict future floods. This is a sterling example of the R&D taking place in our research institutions! [bit.ly/3KChUpJ](https://bit.ly/3KChUpJ) #MightyMS #EconDev #RandD



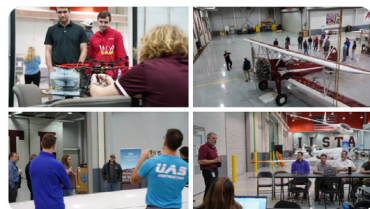
From msstate.edu

4 10 587



MSU Raspet Flight Research... · 1/23/23

Raspet is proud to work with @ASSUREuas and @fema to support first responders. As part of their training, our partners toured Raspet to learn more about our facilities and our fleet.



1 6 201



MSU Raspet Flight Research... · 1/24/23

Raspet's engineering and flight teams deliver the latest #UAS research to our government and industry partners to support the safe, responsible integration of #UAS into the National Airspace System.

ASSUREuas @ASSUREuas · 1/23/23

The @ASSUREuas final report for "Verification & Validation of Remote ID Standards," by @MSStateRaspet @msstate is posted here: [assureuas.org/projects/verif...](https://assureuas.org/projects/verif...) @FAANews @FAADroneZone



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MSU Raspet Flight Research Laborat...

@MSStateRaspet

Collaboration at work. Raspet recently hosted Valence Vector Labs for a briefing and tour of our hangar and indoor test facilities to discuss how to maximize our combined experience and expertise to further advance uncrewed aviation research.



msstateraspet



34 likes

msstateraspet We're halfway through November – but let's fly back through the month of October with our engineering and flight teams... more

November 17, 2023



MSU Raspet Flight Research... · 3/23/23

Raspet is supporting @CAVS\_MSSTATE and @MSU\_AG research to advance precision livestock agriculture with a sky view of a @clearpathrobots Warthog remotely herding cattle. #UAS technology allows researchers on the ground to more accurately record and measure the herd's movement.



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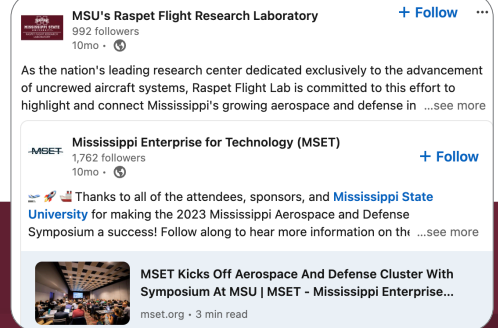
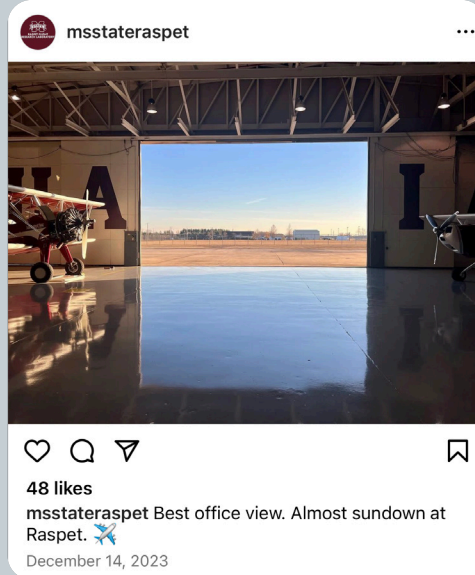
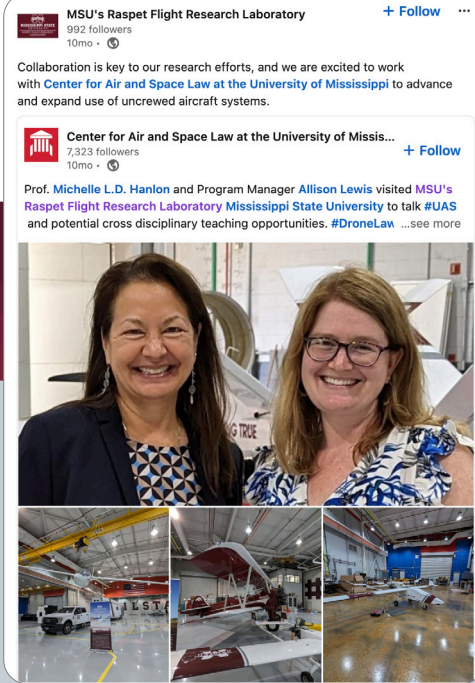
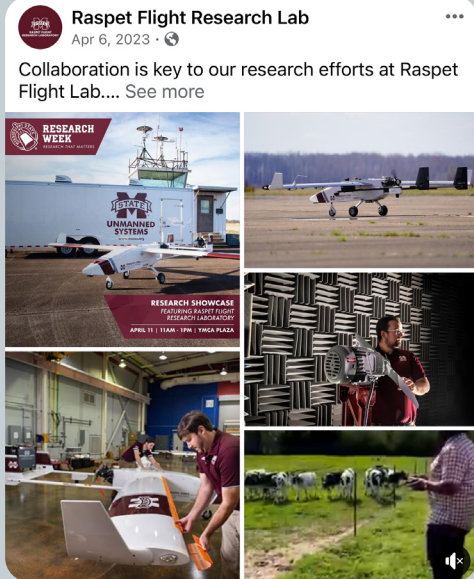
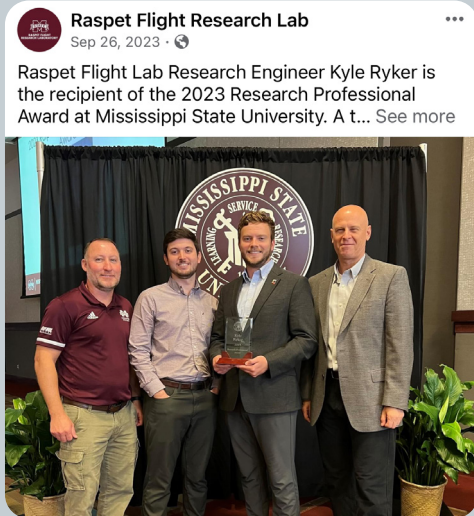
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Liked by msstateadmit and 62 others

msstateraspet Eyes on you. 🧐👁️ Raspet research engineer Jake Sims wears eye tracking glasses for a research flight to measure on-board pilot visual performance in seeing and avoiding other aircraft. The glasses record his eye movements using sensor technology that follows what he is looking at in real time.

November 16, 2023









**MISSISSIPPI STATE UNIVERSITY™**  
**RASPET FLIGHT RESEARCH**  
**LABORATORY**



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