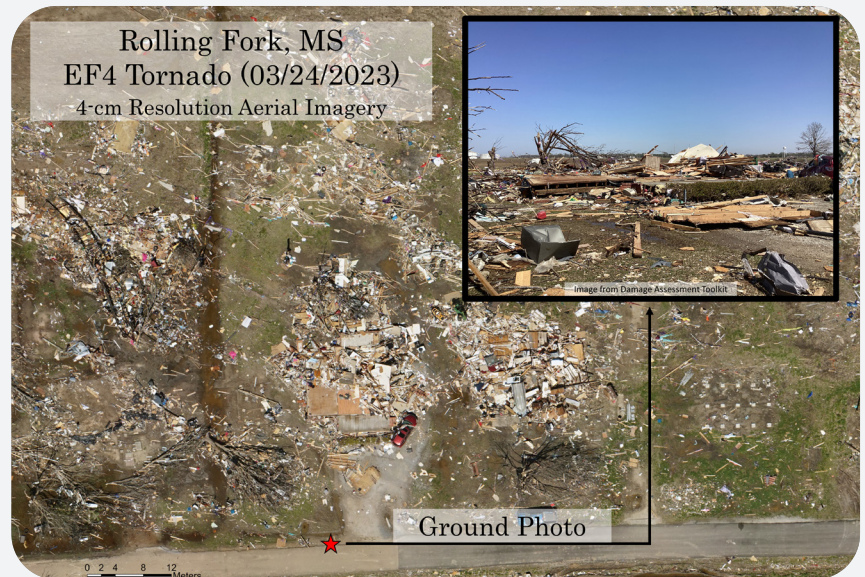# UAS
UNCREWED AERIAL SYSTEMS

Researchers at CIWRO are revolutionizing weather observation and storm damage assessment through state-of-the-art UAS programs. Scientists pilot these aircraft from the ground and direct the drones' weather-sensing program to collect observations from critical data gaps in the lower atmosphere where most impactful weather develops. The University of Oklahoma's patented weather drone, the CopterSonde, delivers high-resolution atmospheric profiles with unprecedented precision, operating successfully in 50 mph winds across over 3,000 research flights.

The damage assessment UAS missions are transforming how scientists understand tornado intensity and distribution by capturing images of destruction. These UAS collect both multispectral imagery and LiDAR-based mapping at resolutions as fine as 2.5 cm, enabling detection of vegetation stress and subtle terrain changes that are often invisible to traditional ground surveys. The dual approach of leveraging UAS technology positions CIWRO as a world-class hub for comprehensive storm research, from real-time atmospheric monitoring to post-event damage analysis.

DELIVERING SIGHT BY FLIGHT

CopterSonde data significantly improved forecast accuracy for those in the path of the devastating EF4 tornado in Rolling Fork, Mississippi, in 2023. Scientists made enhanced predictions of the size, location, reflectivity and rotation of the tornado when assimilated into the NSSL Warn-on-Forecast System. Meanwhile, post-storm damage assessments by UAS provide critical insights previously impossible to obtain, especially in rural areas. When connected with tornado radar data used in warning decisions, these insights help reveal the complexities of tornado interactions with natural and built environments, supporting improved warning guidance.

Rolling Fork, MS
EF4 Tornado (03/24/2023)
4-cm Resolution Aerial Imagery

Image from Damage Assessment Toolkit

Ground Photo

0 2 4   8   12
Meters

3,000+
successful
CopterSonde
flights completed

74+
mph wind
tolerance of
CopterSonde

2.5
cm x pixel imagery
captures damage to
individual shingles

50+
high-impact events
surveyed with
multispectral UAS

INNOVATING ADVANTAGES

CIWRO's comprehensive UAS approach delivers value across multiple sectors and storm phases. Weather-related disruptions cost the aviation and transportation industries over $130 billion each year — losses that could be significantly reduced with improved weather predictions. With machine learning tools for automatic damage detection, these systems support National Weather Service surveys, enhance EF-scale accuracy, and provide decision-makers with unprecedented situational awareness during high-impact weather events.

The UNIVERSITY of OKLAHOMA