

Meet the RAAVEN

Robust Autonomous Aerial Vehicle-Endurant Nimble

CU Boulder engineers were the first to deploy an unmanned aircraft system (UAS) to collect data from supercell thunderstorms in 2010. Lessons learned from construction and field work with those early vehicles informed the design of the RAAVEN. These custom-built UAS were catapulted from vehicles or ground stations into storms in summer 2019.

The design and construction of RAAVEN was led by CU IRISS Managing Engineer Steve Borenstein with assistance from a team of staff engineers and undergraduate students.

“The way we launch these and their durability have made us much nimbler in responding and re-deploying than we have been in the past,” Borenstein said. “I don’t think we could have designed these to work as well as they have during this project without the time in the field we have had – experiencing the conditions, making repairs and learning what was needed to get these up and get the data back.”

The CU team used three of these aircraft simultaneously during the 2019 deployment across the Great Plains as part of the largest and most ambitious drone-based investigations of meteorological phenomena ever. In all, the CU team totaled over 40 hours of air time on 51 flights, including seven tornado-producing storms.

The drones are modular in design, meaning parts from one can be used to repair another. That means fewer down days for large repairs and easier fixes in the field.

Lithium Ion battery cells are longer lasting and safer than traditional LiPo

25 Hz data logging at 1 ms timing precision

Redundant Sensor Technology
Including BlackSwift Technology multi-hole 3D wind probe with IMU, Vaisala RSS-421 and iMet EE03 Pressure, Temperature and Humidity, VectorNav VN-200 IMU & GPS

Large ailerons and flaps provide rapid control and steep controlled landings. All controls use digital communication to reduce noise.

Custom avionics system designed by **CU IRISS** + Based on the **ArduPilot open source system**

Cruise Endurance 3 hrs at speed of 38 mph
Top airspeed ~80 mph

Unique ‘boom tail’ adds stability, an active elevator and improves performance to the flying wing

HD 1080p Video Camera

Built from lightweight, high-strength foam from RiteWing RC

- The drones are designed to rapidly launch from the top of vehicles, offering more mobility and faster response times.

- They do not need a runway to land, offering even more flexibility in the field.

Wingspan 91”
Custom manufactured by RiteWing RC

Three drones operate simultaneously and in coordination during deployments

