

NCAR Research Applications Laboratory
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Weather Guidance for Advanced Air Mobility

Specialized Guidance for Safe, Reliable Flight

NSF NCAR's Transportation Meteorology Applications Program is committed to facilitating the safe integration of Advanced Air Mobility into the National Airspace.

Better Weather Guidance for the Next Generation of Flight

Package delivery drones and future air taxis will fly closer to the ground where buildings, terrain, and changing weather can make conditions difficult to predict. A sudden gust may force a small aircraft off course. Turbulence between buildings may affect a flight or make an air-taxi ride uncomfortable.

NSF NCAR is working with industry, universities, and national laboratories to turn detailed weather research into guidance that helps operators choose safer routes, plan flights, and respond when conditions change.

Small-Scale Weather, Big Impact

Winds can shift sharply around buildings and across short distances. Fog, low clouds, and icing can also limit where and when an aircraft can fly. Broad regional forecasts may miss these local hazards.

NSF NCAR develops forecasts that show where challenging conditions are likely and how they may affect different aircraft. By combining

Benefits & Impacts

- Real-time, high-resolution, accurate weather guidance
- Wind, turbulence, & visibility hazard prediction throughout urban landscapes
- Translation of microweather predictions to operational impacts
- Safer, more reliable flight planning and operations

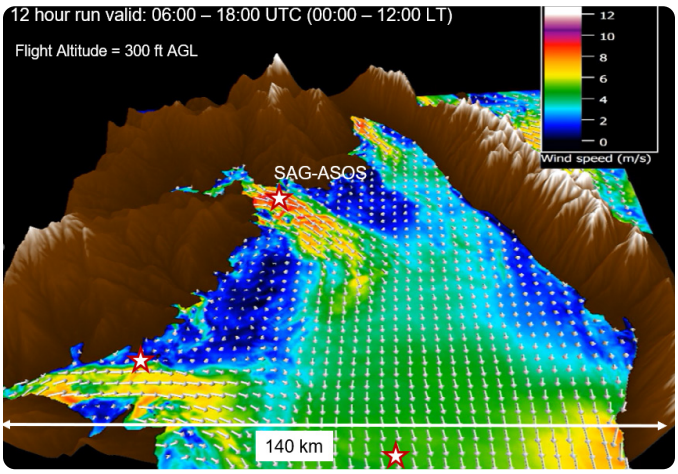
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weather guidance with an aircraft's capabilities, operators can make decisions suited to the flight at hand. The goal is fewer avoidable disruptions while maintaining high safety standards.

From Research to Operations

In Colorado's San Luis Valley, NSF NCAR demonstrated a weather guidance system for uncrewed aircraft. It provided forecasts of hazards such as low visibility, turbulence, and rapidly changing winds to support flight planning. Evaluation showed that the system captured small-scale wind patterns that can affect these aircraft.



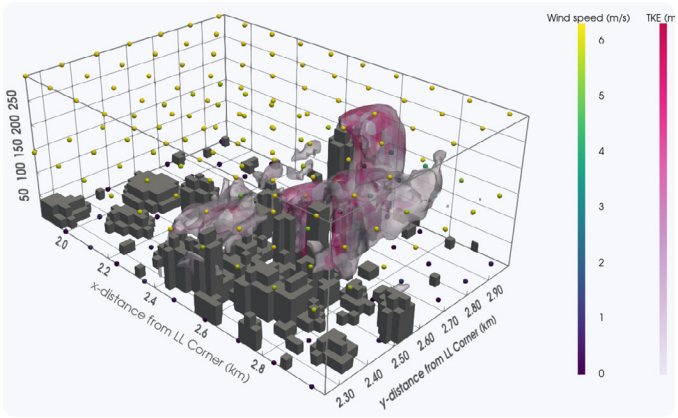
Forecasts of wind speed and direction provided to UAS operators in real time to support pre-flight decision making.

NSF NCAR is also developing FastEddy®, a forecasting system designed to represent how air flows around buildings. It can help identify areas of stronger winds and turbulence, as well as conditions that may lead to fog or low clouds.

> Understanding weather at flight scale supports better decisions.

Research with partners in Oklahoma, near Cincinnati/Northern Kentucky International Airport, and at Embry-Riddle Aeronautical University is bringing this work closer to operational needs. Field studies are also exploring how weather observations collected by uncrewed aircraft can improve forecasts. Working with AAM operators, NCAR is developing new tools to translate microweather predictions into actionable information and tailor it to meet each users' needs.

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Forecasts of wind speed and direction provided to UAS operators in real time to support pre-flight decision making.

> High-resolution weather guidance is helping clear the way for safe, reliable low-altitude flight.

A Clearer Path Forward

For more than four decades, NSF NCAR Transportation Meteorology Applications Program has helped turn aviation weather science into practical tools. That experience is now also supporting a new generation of autonomous low-altitude flight: helping operators navigate local weather, protect passengers and communities, and make reliable service possible.



Microscale weather predictions translated into actionable flight guidance.

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