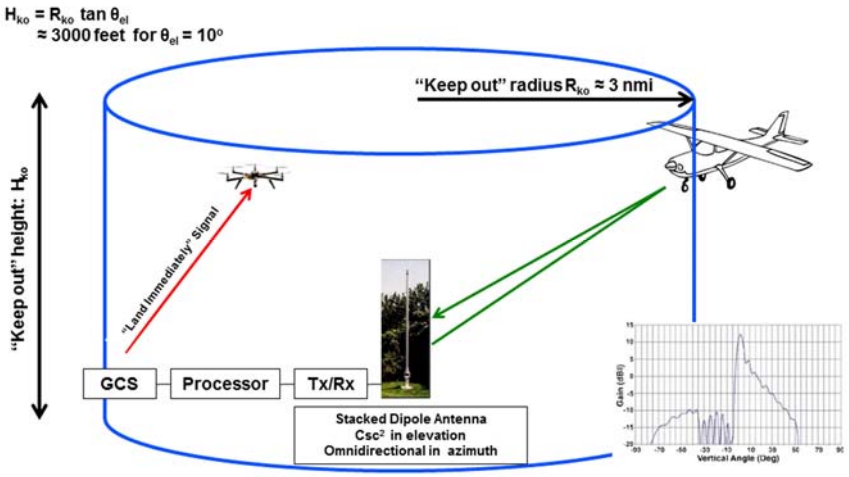
A. Project Description Narrative

NOAA's National Severe Storms Laboratory and the University of Oklahoma are exploring concepts for improved atmospheric boundary layer sensing using small unmanned aerial systems (sUAS). Such measurements may significantly enhance the lead-time and accuracy of severe weather warnings.

A focus-area is a concept dubbed "3D-Mesonet". This involves sUAS vertical soundings of temperature, moisture and wind, eventually from many sites within Oklahoma's operational weather station network.

The program is for development, test and performance analysis of a novel, radar-based “detect and avoid” concept supporting migration to a future operational 3D-Mesonet. Routine operations at many Mesonet sites will require rigorous demonstration that FAA “detect and avoid” requirements can be met. As illustrated in the figure below, our concept involves a stationary antenna, paired with low-cost transmit/receive/processing functions to detect aircraft penetrating a “geo-fence” around the Mesonet site during sUAS operations.



A prototype geo-fence radar and real-time aircraft detection algorithms will be developed and the system will be integrated with the sUAS ground control station. The moveable prototype will be operated at several of the target Mesonet sites to characterize performance in different “clutter” environments using aircraft targets of opportunity. A preliminary “safety case” will be prepared and briefed to appropriate FAA and NASA personnel.

B. Schedule/Timeframe for Project Completion

Radar design is underway and, subject to funding availability, the prototype will be integrated during the spring of 2016. Data collection and analysis will commence in the summer of 2016, in conjunction with (but not limited to) planned sUAS weather observations by OU SoM and NSSL researchers. A final report and briefing will be delivered in May of 2017.

C. Description of the Positive Impact

A future operational 3D-Mesonet would provide scientists and forecasters unprecedented, fine-scale information on the structure and evolution of the pre-storm boundary layer. Exploiting these data for improved forecasts and warning will involve significant, high-impact research locally and at partner organizations. The 3D-Mesonet concept is not viable however unless FAA approves routine, unattended sUAS operations on a Mesonet-wide basis. This research will begin the multi-year process of developing the robust, data-driven safety case necessary for such approval.