

SUPPLEMENTAL STATEMENT
Reference Number: 26176

AeroVironment, Inc. submits this supplemental statement in support of its application to conduct experimental operations. The Commission inquires of the purpose of these experiments in the context of other sites where an experimental authorization has been granted.

Each additional site presents a unique environment to test the radio transmissions that direct the command and control and payload features of the small unmanned aircraft system (SUAS). Research and information that result from each site is provided to the Federal Aviation Administration (FAA) and is a critical element of the FAA's congressionally mandated project to integrate SUAS into civilian airspace.

As the Commission knows intuitively, how far radio waves travel depends on many factors. Whether transmitted over water or land, the height above sea level, presence of infrastructure, mountains or hills, vegetation, forest or other terrain, whether daylight, dusk or night, climate and weather, are among the variables affecting propagation quality. Each of the proposed sites seeks to replicate an environment where commercial SUAS is envisioned. AeroVironment is aware of no credible testing and research of SUAS commercial operations detailed in the application. The experiments at current and proposed sites are intended to build a research portfolio. A critical facet of this research is characterizing the SUAS datalink behavior and performance in several environments while engaging in representative mission sets. The work is an important element of AeroVironment's investment in a core platform of SUAS commercial uses and upon which future investment relies.

These experiments are integral to the FAA's comprehensive review addressing SUAS operations in the nation's civilian airspace. SUAS operations are currently prohibited, unless the FAA has designated a defined geographical area for SUAS use via a Certificate of Authorization (COA). The FAA will not move to embrace pervasive SUAS presence until a record is established showing SUAS operations in multiple environments supporting varied purposes.

As noted, the detailed results from AeroVironment's experiments are documented and submitted for FAA review on a monthly basis. The Commission's authorization is critical to developing a record demonstrating the safety and effectiveness of commercial small unmanned aircraft. Commercial use is contingent upon unmanned aircraft systems operating safely within assigned flight areas and causing no harm to the public. How the aircraft is able to function to deliver specific objectives within a sector's institutional protocols and other variables is only revealed when the SUAS is tested in an actual mission environment. The FAA examines how a system is designed, constructed and manufactured; including the engineering processes, software development and control, configuration management, and quality assurance procedures supporting the aircraft.

AeroVironment's experience is that adjustments are frequently necessary to address particular users and environments, which often present technical challenges for the radio technology operating the aircraft and transmitting the payload information. The experiments range from core testing that the aircraft returns to base when it encounters interference to

operational surveillance and monitoring in varied environments. Showing that SUAS radio technology is effective and resilient in a range of environments and for varied purposes is integral to the FAA's ultimate decision.

Current Sites

The Simi Valley, California site is AeroVironment's design, research and technical facility. The sites at China Lake, California, East Kern, California, Oxnard, California, San Luis Obispo, California, Dugway Proving Ground, Utah, and Fayetteville, North Carolina are Department of Defense facilities. The experiments are performed in the context of AeroVironment's relationships with the US military and interested federal civilian agencies. These experiments are based on possible refinements and improvements to mission objectives. These sites provide a secure location and efficient access for federal personnel to participate in the experiments. The experiments are conducted within military controlled airspace.

The sites in Ventura and Ojai, California involve experiments conducted with the Ventura County Sheriff's office for public safety purposes, particularly use of a SUAS in a wilderness and mountain area for search and rescue. The FAA has granted a Certificate of Authorization (COA) to operate a SUAS within a defined portion of civilian airspace in the County.

The sites on the North Slope of Alaska relate to experiments supporting oilfield operations in the Arctic. The purpose is to test how SUAS aerial surveillance can discern oil spill and other hazards in arctic waters and assist in response. The FAA granted a COA for portions of North Slope civilian airspace to permit the experiments.

The Rolle Field, Yuma Arizona site is one of several sites seeking designation by the FAA as a range to test SUAS civilian use. If authorized, AeroVironment intends testing how an SUAS can best serve state and local public safety and emergency response. The Rolle Field site presents an environment of extreme climate ranges. Over a year's time, both extremely hot desert conditions as well as sub-freezing weather are experienced.

Proposed Sites

Below describes each of the proposed sites and why each of the experiments is vital to showing how SUAS can be integrated into civilian airspace.

- Coalinga, Fresno County, California

The purpose of the test is surveillance of petroleum infrastructure and operations and integrating that information into the real-time monitoring, analysis and management systems built around digital technology.

The Coalinga oil fields in the San Joaquin Valley lie at the bottom of the Diablo Range. Large and widely spread, most of the wells are on high ground circling the valley. The arid climate supports grassland scrub. The Coalinga fields are the site of the largest solar thermal enhanced oil recovery demonstration facility. The thermal solar to steam facility

is directed to extracting heavy oil reserves. The project uses over 7600 mirrors that focus the sun's energy onto a solar boiler.

With unique infrastructure producing solar energy, core challenges are presented in refining how best to identify and monitor the equipment. The purpose of the experiments is to establish an operating plan able to survey these particular operations, discerning deficiencies and providing an effective means to report and analyze the information.

- San Ardo, Monterey County, California

The San Ardo oil fields are in the upper Salinas Valley in the southern part of Monterey County. Most fields are located on the east bank of the Salinas River and in the hills of the Coast Ranges. Elevations in the field range from 130 meters to 340 meters. Vegetation varies from that close to the river to grassland and oak woodland in the hills. The San Ardo fields will test how the aircraft transitions from transmitting in generally open grassland areas to the surrounding hills and their woodland environs and that the surrounding hills present no challenges to consistent payload quality.

Throughout the San Ardo fields, various recovery techniques are used to extract the oil. A distinguishing quality of this test is the ability of the video information transmitted from the aircraft to discern varied land formations and the different operating equipment across the recovery technologies.

- Lost Hills, Kern County, California

The Lost Hills fields in eastern Kern County underlie a low range of southeast-to-northwest hills adjacent to the San Joaquin Valley. The hills rise only about 61 meters above the Valley. The environment presents a more level surveillance plateau than other sites. The Lost Hills fields contain both oil and natural gas. Also unique to Lost Hills is the subsiding of the ground surface when collapsing into the area vacated by the petroleum. Waterflood technology is used to improve recovery.

The testing seeks to demonstrate the viability of SUAS surveillance of both oil and gas operations and to monitor wildlife activity; the area is surrounded by the Kern National Wildlife Refuge. Whether adjustments to the radio technology must be made to better discern waterflood technology or more fundamentally, surface conditions indicating the ground surface subsiding, will also be examined.

- McKittrick, Kern County, California

The oil fields are in the McKittrick Valley in southwestern Kern County and encompass the rising foothills of the Temblor range. Elevations in the field escalate fairly rapidly to approximately 1,000 to 1,500 feet, 300 to 460 m. The ability of the aircraft's technology to function effectively and transition to the higher altitude while transmitting information without interruption will be examined.

- Kern River, Bakersfield, Kern County

The Kern River Oil Field is northeast of Bakersfield in the lower Sierra foothills. The field covers an area of 10,750 acres in a rough oval. The area is the densest operational oil development in California. Unlike most of the other oil fields which contain numerous pools, the Kern River field has one large pool, named for the field itself (the Kern River) and two smaller pools. Enhanced production technologies are in use, such as steam flooding. The Kern River facility also distributes water to area farmers in the area.

Kern River fields also represent almost a decade of investment in infrastructure and instrumentation in digital technology, referenced as the *digital oil field*. The solutions developed at Kern River are now being deployed globally and contribute meaningfully to safer and more efficient operations.

The density of the oil fields provides opportunity to test radio technology and video transmissions to discern the intense infrastructure and operations with focused surveillance. The additional water provisioning to area farmers lends a discrete sector of infrastructure and monitoring challenges. Integrating SUAS surveillance technology into the *digital oil field* is also a critical element of the experiments and resulting research.

This Kern River Field is also located in “Class D” airspace of the Bakersfield airport. The Class D environment is much more challenging from a real-time communication and control perspective than experiments conducted to date in “uncontrolled” airspace, thus experiments in this particular area are relevant data for the FAA regarding SUAS use outside of “uncontrolled” Class G airspace.

- Church Rock, McKinley County, New Mexico

Testing surveillance capability of uranium mineral holdings across a wide expanse in the western mountains is the purpose of the experiments. The area presents an environment of temperature extremes- hot summers against nights of snowfall during the winter. As it is the Mountain West region, the height above sea level is 7,092 feet (2162 meters).

A substantial amount of the area is unexplored or has insufficient data to estimate mineral potential. In other parts, there is data to support analysis of potential resources. The purpose of the surveillance will be to gather initial data as well as to verify current analysis. The objective is to determine how best to contribute to assessing the mineral recovery and economic potential of projects within the geographic area.

- Boquillas Ranch, Coconino County, Arizona

Boquillas Ranch, approximately 730,000 acres in size, is the largest in Arizona and one of the largest ranches in the US. It is located 80 miles west of Flagstaff. The terrain can be arduous and rugged. At 6191 feet, 1887 m elevation, the site has distinct seasons of cold and snowy winter with extended dry periods, a dry and windy spring; dry and hot

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early summer ending with a wet and humid monsoon period, and a dry fall. The combination of high elevation and changing weather will contribute to meaningful test results.

- A correction should be noted that the site is in Coconino County.
- Kayenta, Navajo County, Arizona

Kayenta is a highland plateau, 6522 feet, 1988 m elevation, in the Black Mesa region in Northeast Arizona surrounded by desert. Prevailing climate entails little rainfall. Mining operations involve complex geological conditions, with coal extracted from multiple seams and splits of seams. Coal is crushed then carried via conveyor approximately 17 miles to storage silos, where it is loaded and transported 80 miles to an electrical generating station.

Surveillance of the mining operations and transport facilities during the experiments will determine how best to integrate the aircraft into current monitoring to improve performance and what if any adjustments are needed.

Conclusion

The transition of small unmanned aircraft system technology to civilian use is at a critical point. Significant investment is now being directed to a range of sectors. Petroleum, mining, agriculture and public safety/emergency response are areas where the aircraft will make meaningful improvements to how work is performed at significant cost savings while maintaining or improving flight safety. The experiments proposed by AeroVironment are an integral element of this investment and the broad commercial use that awaits. Most fundamentally, the experiments will provide research and information to the Federal Aviation Administration as it moves to integrate the technology into civilian airspace. AeroVironment urges the Commission to act favorably and grant its pending application.