

STATEMENT ACCOMPANYING REQUEST TO MODIFY EXPERIMENTAL AUTHORIZATION WG2XVN OF AEROVIRONMENT, INC.

1. Introduction

By this application, AeroVironment, Inc. (AeroVironment), requests that the Commission grant a modification to call sign WG2XVN. The following changes are requested:

1. We ask the Commission to delete four sites: a) Sites 53 and 54, referred to as Lost Hills, CA at North Latitude 35-36-20; West Longitude 119-42-20 and b) Sites 57 and 58, referred as Kern River, CA at North Latitude 35-26-56; West Longitude 118-59-21.
2. We ask the Commission to delete sites 75 and 76, referred to as Big Creek, CA. In its place we ask the Commission to authorize an increased radius of operations to 45 km around two new locations centered at North Latitude 37-11-44; West Longitude 119-18-12. These new locations are placed in Form 442
3. We ask the Commission to permit operations at four additional sites in the Santa Barbara Channel for purposes of testing capability to assist in spill response incidents. The sites, referred to as Santa Barbara Channel West and East, will be located at North Latitude 34-10-51; West Longitude 120-14-46 and North Latitude 34-11-43; West Longitude 119-33-39.

There are no modifications to the technical elements of the technology. In this statement, we explain the purpose of the modification, the technical elements and why this application is within the Commission's experimental authorization rules.

2. Purpose

Background

The purpose of these experiments is providing analysis and information to further aerial surveillance in support of oil spill incident response and monitoring hydropower facilities. The ability of real-time full motion video via small unmanned aircraft system (SUAS) technologies can contribute to closer scrutiny and cost efficiencies. Real time information and imagery allows more informed assessment and faster corrective action. Data captured by cameras is typically far more accurate than the human eye and provides lengthier opportunity to scrutinize the challenge. For nighttime operations, a SUAS can be fitted with an infrared (IR) camera to enhance visibility.

Santa Barbara Channel

The Santa Barbara Channel, located in the Pacific Ocean, is south of Santa Barbara and west of Ventura. Within the channel are numerous oil fields, many of which have substantial reserves. Oil exploration and production activities continue in the Santa Barbara Channel. The testing

proposed seeks to evaluate the SUAS' capability to conduct aerial surveillance of a spill incident in this ocean environment. The testing is part of formal contingency plans determining assets best able to discern the degree of the spill, damages that have accrued and recovery progress on land and sea.

How meteorological and physical elements in an ocean environment affect radio wave propagation is poorly understood. At the core of the testing is how varied elements impact propagation loss, particularly since the antenna height in the SUAS varies above the water. Several environments will be tested. The tests will examine the ability of the transmitted video technology to discern variations and changes over short and longer time increments.

The tests will evaluate how the SUAS sensors and transmitted video can discern from where a spill flows, the breadth and pace of its direction and degree of impact on human health, wildlife, ecological material and infrastructure. The tests will also gauge how effectively the information can be integrated into real time mapping tools.

Big Creek, California

The Big Creek hydroelectric project in the Sierra Nevada Mountains in central California is a unique mix of facilities including power plants, reservoirs, dams, transmission lines, and pipelines. Terrain is the key challenge in this area. In many cases there are no roads to the locations that require inspection, which creates challenges for SUAS operators as to access, line of sight, multipath, range and potential interference from an existing network of sensor communication links.

Some of the most challenging operations involve operating along penstocks with thousands of feet of vertical drop. We do not have data on how our digital radios will operate in a near vertical ascent along a mountain side with multiple parallel metal pipelines. Additionally we are asked to operate along the sides of various types of dams that vary from earthen, traditional concrete and arched. The arched dams are an exceptionally unique shape and there is little or no experience with operating SUAS's in close proximity to their unique concave and convex shapes.

As detailed in the attachments, the range of transmission infrastructure and generating facilities extends beyond our initial request and current authority. To bring a more comprehensive analysis of the technology's capability, we ask that the contour of operations be broadened. These initial operations will provide us with the data to develop safe operational procedures for subsequent work. Based on the results of these test operations we expect to examine modifying the antenna configurations in our systems to ensure maximal signal integrity through all flight configurations.

Maps of each site, including the parameters of operations are provided in the Contour Attachment.

Research from these Tests is provided to the FAA

As we have noted previously, the research and information resulting from this work is provided to the Federal Aviation Administration (FAA) and is critical to the FAA's congressionally mandated project to integrate SUAS into civilian airspace. 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.

The experiments at the proposed sites contribute to the research portfolio surrounding SUAS radio technology. A critical facet of this research is the effectiveness of the SUAS datalink behavior and performance in varied environments while engaging in representative mission sets. The work is an important facet of AeroVironment's investment in a platform of SUAS commercial uses and upon which future investment relies. The detailed results from AeroVironment's experiments are documented and submitted for FAA review on a monthly basis.

3. Technology Use

The experiments embrace a model using a band segment aligning with technology and equipment currently available. AeroVironment reiterates its commitment to operations respecting other users of the band and those in adjacent segments. The limited power levels proposed are part of this commitment. The 1670-1675 MHz channels provide SUAS control and video and telemetry transmission from the SUAS to the ground. Slots are dedicated for uplink data and a downlink.

4. Nature of Operations

Surface Based and Airborne Transmission

As noted in our original application, AeroVironment's communications module, Digital Data Link (DDL), will use the 1670-1675 MHz band segment for purposes of sending ground based command and control data to and from the SUAS and to transmit video and telemetry to the ground control station. The technology, capable of operating within 1625-2390 MHz, requires 4 MHz for full motion video and a 1 MHz channel for video at 15 frames per second. Emission Designators are 4M68G7W and 1M56G7W, respectively, with a transmit power at 10W. Transmission control will be from the surface control station to the SUAS via a laptop or console. AeroVironment's DDL system has been adopted by the US Army as the standard communications architecture for all small unmanned systems, including ground robots.

5. Stop Buzzer

Andy Thurling, Chief Test Pilot, Director, Product Safety and Mission Assurance, will be available by telephone at 805.581.2198, extension 1892, Cell Phone 805.368.6351 and will act as a "stop buzzer" if any matters involving interference arise during the testing.

6. Transmitting Equipment

The transmitting equipment is unchanged. It is AeroVironment Transreceiver Model 50280, with 2 units at each location. It is not experimental.

7. Antenna

The Antenna details have not changed from the current authorization and are as follows:

Antenna	Gain (Nominal)	Polarization	Orientation in Vertical Plane	Oriental in Horizontal Plane
GCU Antenna ASY AeroVironment Stack Patch	9dbi*	Vertical	30	85
1670-1675 MHz Tailboom ASSY AeroVironment Dipole	2dbi	Vertical	78	360

*Major Side Lobe

- E-Plane
 - Gain: -2 dbi
 - 120 deg
- H- Plane
 - Gain: -2 dbi
 - 179 deg

8. Restrictions on Operations and Interference Protection

AeroVironment understands that experimental operations must not cause harmful interference to authorized facilities. Should any interference occur, AeroVironment will take immediate steps to resolve the interference, including, if necessary, discontinuing operations.

9. Waiver of Station Identification Requirements

AeroVironment requests a waiver of the station identification requirements stated in Section 5.115 of the Commission's rules.

11. Federal Aviation Administration (FAA) Certificate of Waiver Authorization (COA)

AeroVironment has or will file applications for a Certificate of Waiver or Authorization with the FAA detailing the areas where the SUAS will be flying during the proposed operations. AeroVironment understands that no operations will be pursued until FAA approval of the COA and that any operations will be within the COA parameters.

11. Diagram

A diagram and referenced maps of the proposed operations are provided in the Attachment.

Conclusion

AeroVironment believes the compelling purpose of bringing these advanced services to spill response and hydroelectric power facilities serves the public interest. We appreciate very much the Commission's consideration of this modification application for an Experimental Authorization. Please call upon us if we can respond to any questions.

Attachment

Operations Diagram



Small Unmanned Aircraft-

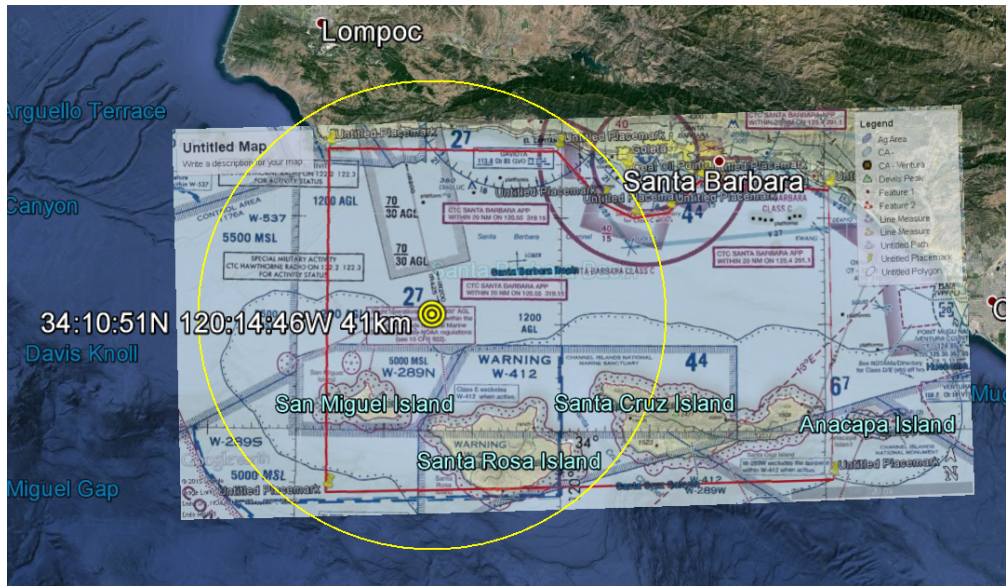
Video and Telemetry
1670-1675 MHz

Aircraft Command and Control Main and
1670-1675 MHz

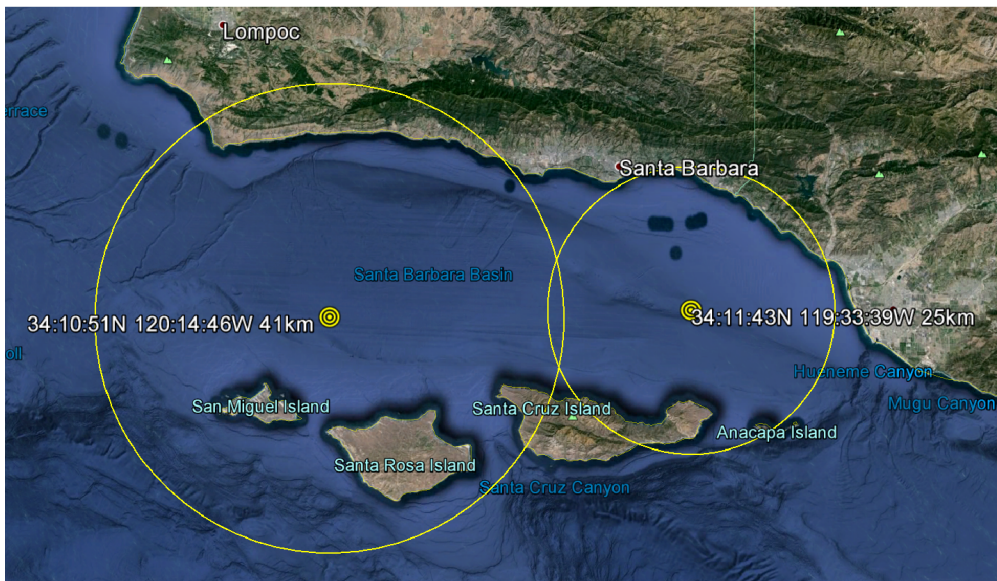
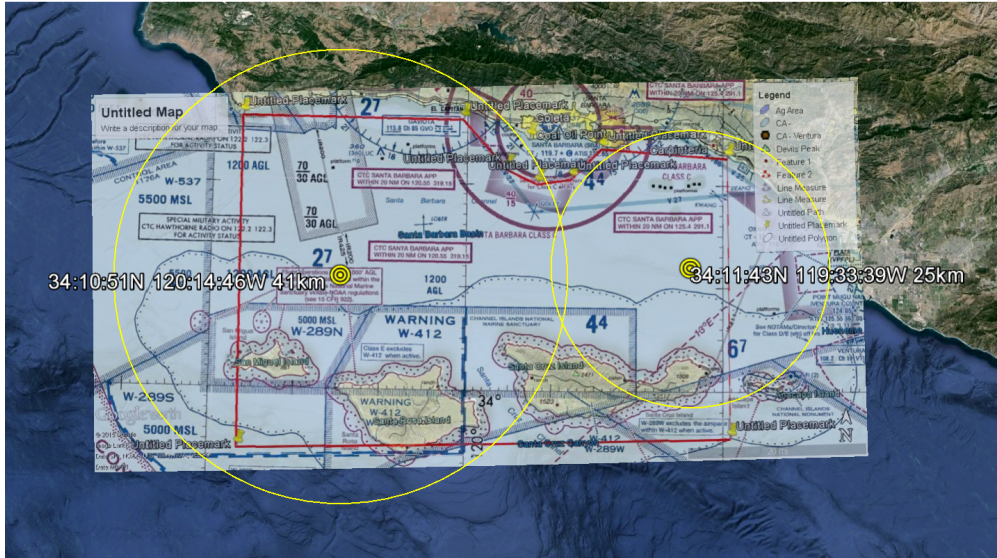


Add - Santa Barbara Channel West, CA

Site Name	Santa Barbara Channel West, CA
Latitude	34:10:51N
Longitude	120:14:46W
Radius (km)	41 km
Customer	MSRC
Justification	
KMZ File	SB Channel West.kmz

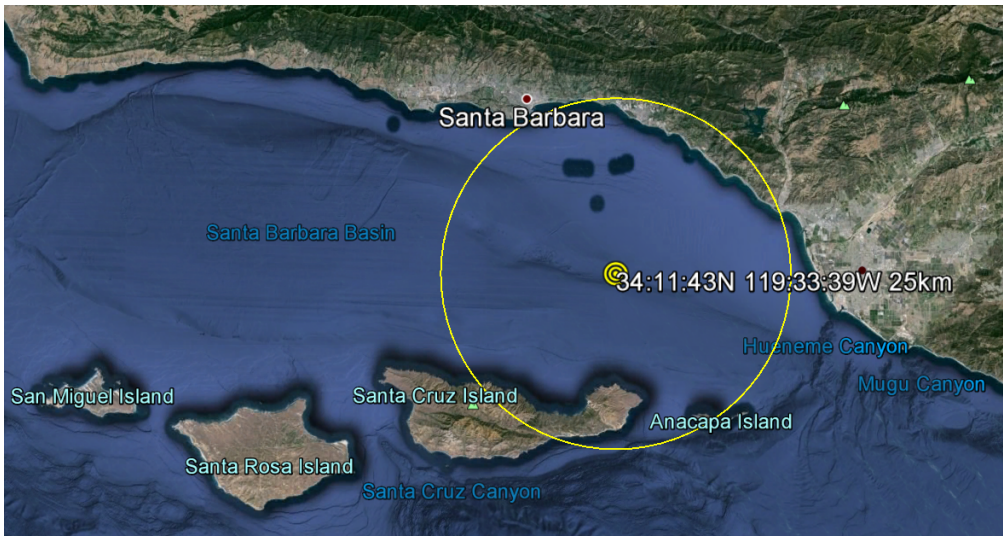
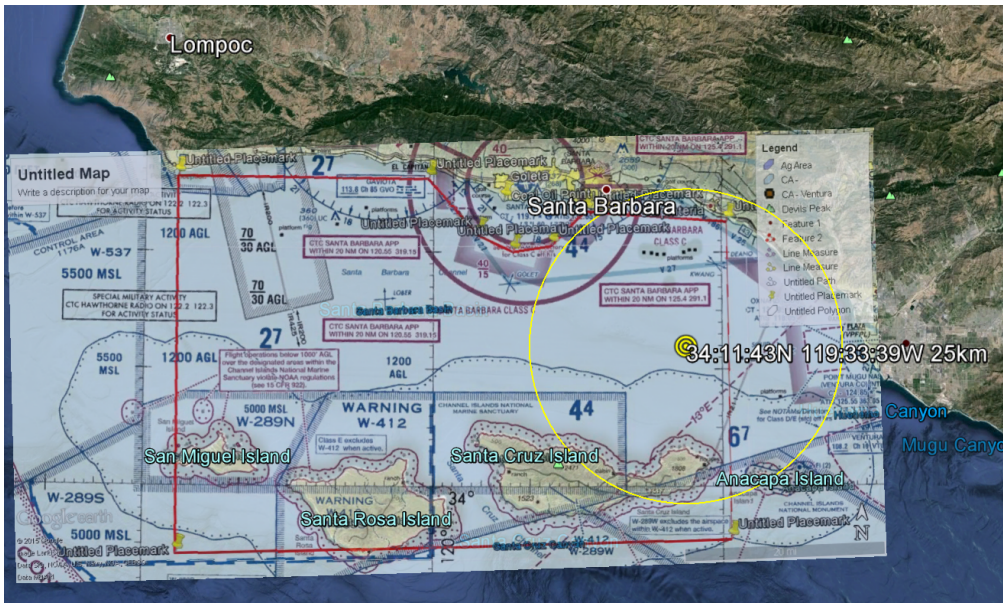


East and West

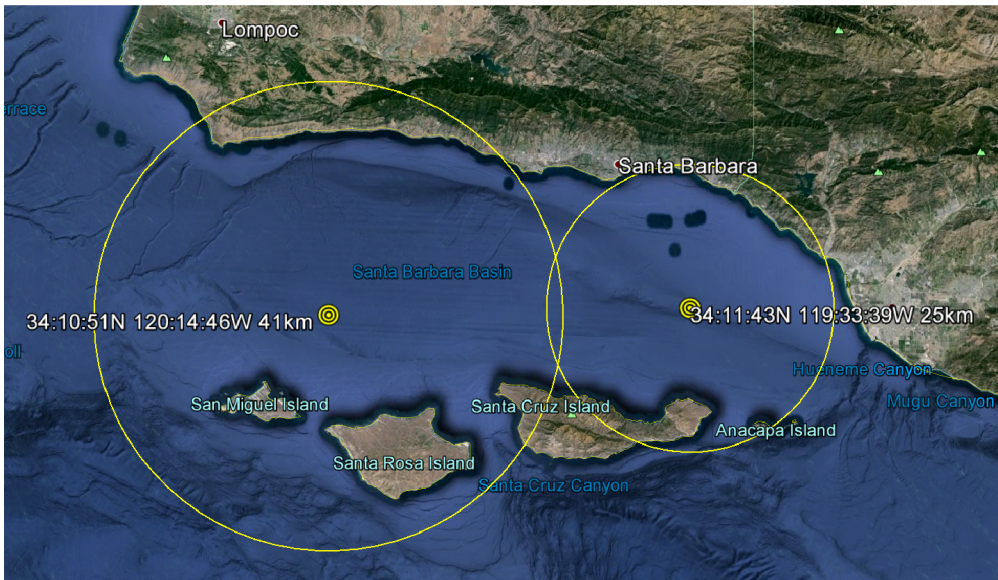
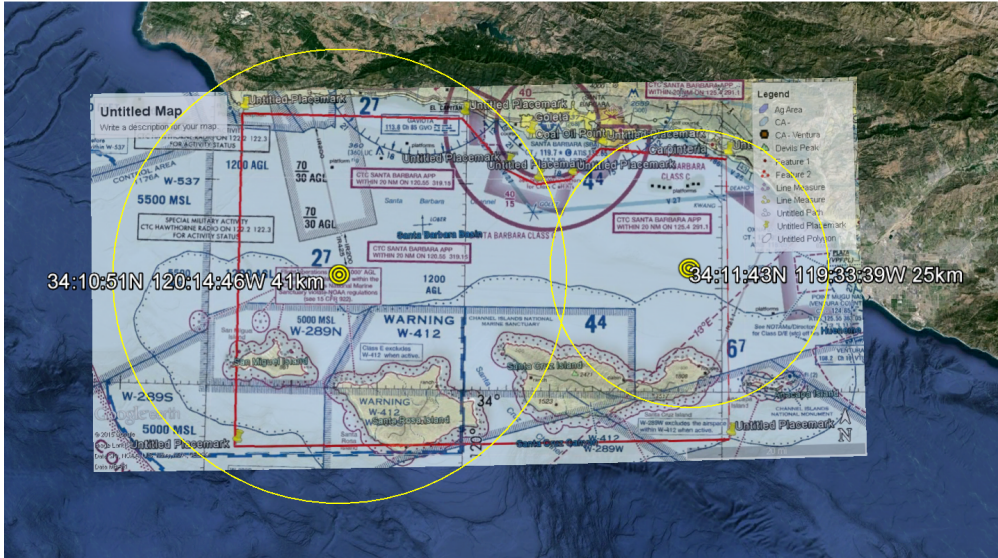


Add - Santa Barbara Channel East, CA

Site Name	Santa Barbara Channel East, CA
Latitude	34:11:43N
Longitude	119:33:39W
Radius (km)	25 km
Customer	MSRC
Justification	
KMZ File	SB Channel East.kmz



West and East



Modify - Big Creek, CA

Site Name	Big Creek, CA (75/76 on the license dated 1 DEC 2015)
Latitude	37:11:44N
Longitude	119:18:12W
Radius (km)	45 km
Customer	SCE
Justification	The Big Creek hydroelectric project region in the Sierra Nevada mountains of central California is a unique mix of facilities including power plants, reservoirs, dams, transmission lines, and pipelines. Terrain is a key challenge in this area. In many cases there are no roads to the locations that require inspection which creates challenges for our UAV system operators in terms of access, line of sight, multipath, range and potential interference from an existing network of sensor communication links. Some of the most challenging operations involve operating along penstocks with thousands of feet of vertical drop. We do not have data on how our digital radios will operate in a near vertical ascent along a mountain side with multiple parallel metal pipelines. Additionally we are asked to operate along the sides of various types of dams that vary from earthen, traditional concrete and arched. The arched dams are an exceptionally unique shape and there is little or no experience with operating UAVs in close proximity to their unique concave and convex shapes. Our initial operations in these locations will provide us with the data to develop safe operational procedures for subsequent work. Base on the results of these test operations we would potentially modify the antenna configurations in our systems to ensure maximal signal integrity through all flight configurations.
KMZ File	Big Creek - SCE.kmz

