

World View
Experimental STA Application
File No: 0705-EX-ST-2017

Explanation of Experiment and Need for STA

Company Description/Overview:

World View, a Tucson, Arizona based company, was founded to build and launch stratospheric, lighter-than-air balloons carrying a range of payloads. World View's customers range from the US Department of Defense to private citizens to commercial enterprises looking to take advantage of a platform that can bring them to the edge of space.

World View is seeking this STA for authorization to operate a number of radio systems that will carry telemetry data from its stratospheric balloon and deliver command and control signals to the balloon during its mission. To prepare properly for a safe launch and operation, this application also seeks authorization for ground-based testing prior to the launch.

Need for an STA:

An STA is appropriate when the proposed program of experimentation will last less than six months. World View is proposing to test from June 18, 2017 through July 16, 2017. This timeframe will cover the actual launch and flight of the balloon for the designated mission. This STA is filed to add a location to the operations already authorized under WL9XGO. World View's original plan was to launch from Benson, Arizona, but weather concerns require World View to request an additional potential launch site from Page, Arizona. Operations requested in this STA are identical to those authorized under WL9XGO.

Technical Synopsis:

- Spectrum requested: Command and Control up link only: 902-928 MHz; Telemetry 2.402-2.478 GHz (downlink) and command uplink also
- Power levels: C&C – 1 watt, with high gain yagi antenna, telemetry: 10 W downlink
- Limited time of use: testing will take place for approximately 3 hours per day
- Limited area of operation: airborne operations within 200 miles of Page, Arizona, limited to US operations, and the flight will avoid military installations

Description of Project:

On April 14, 2017, World View was approached-to assist the iconic American company Kentucky Fried Chicken (KFC). KFC is in the midst of the introduction of a new product:

the Zinger Sandwich. KFC's Zinger product launch plan included taking the sandwich literally to the edge of space as part of the artistic concept. The original company KFC had hired to assist with that portion of the product launch backed out of the project, leading KFC to reach out to World View.

In the past days, World View has been working with KFC to put together a stratospheric balloon launch to take the Zinger to the edge of space. See Figure 1 below for an image of World View's stratospheric balloons. World View has been selecting technology, working to integrate the concept of operations into the World View platform, and planning for a successful mission on time, starting in June 2017. This is a short timeframe, but it is required by World View's customer.



Figure 1. World View Stratospheric Balloon

When the mission is underway in June, the balloon will be launched from Arizona. This application seeks to add a backup launch site in Page, Arizona. The backup site will be used if the already-licensed site in Benson is unavailable due to weather concerns.

Once the balloon is launched, it will ascend to and operate between 65,000 and 80,000 feet. If the launch takes place in Page, the command and control links will maneuver the balloon

on a path south, so that the key operations will take place when the balloon is floating over the surrounding Tucson region.

The ground control station will accompany the balloon while it is in flight within the authorized radius of operations. The plan is for any other operations on the ground to be based out of the World View headquarters in Tucson, AZ. From there, when the balloon is in flight, the ground stations will drive to stay as nearly below the balloon as possible to ensure the success of the operation. Experimentation with the balloon and communication systems technology, is subject to stratospheric wind conditions which require a 200 mile radius of operations, and a flight duration of up to 10 days. During that time, the cameras on the balloon will be engaged to video key aspects of an innovative advertising campaign, taking KFC's product to the edge of space. Being in the stratosphere is essential to showing the product at the edge of space.

Stratospheric flight will keep the balloon out of any detrimental weather conditions on the ground in Tucson that might prompt a launch in Page, Arizona.

The high resolution digital images will be transmitted down to the ground station at World View's headquarters. The overall system will use compression to optimize the use of spectrum for these transmissions.

Ground testing:

The ground testing will take place in Tucson, under the auspices of WL9XGO. This application does not seek that authority.

Operational Mission - 10 days of balloon flight:

Downlink: After the balloon launch (on or after June 18, 2017), the downlink will be in use for up to 10 days, during the desired transmission periods. These are around Sunrise, mid-day, and Sunset for approximately 1 hour each. During those periods, the downlink will be used to transmit high-resolution imagery from the balloon to the ground station, where it will be used as part of the product advertising. The downlink will use the 2.4 GHz radio system to transmit at 10 watts, with an ERP of 20.2 watts. Given the altitude of the balloon, which will be 13 miles or more from earth, the signal at ground level will be very low

Command and control uplinks: Command and control instructions will be transmitted to the balloon over both the 902-928 MHz link and over the 2.4 GHz link. Both of these radio systems are modified off the shelf systems. The 900 MHz link employs a Yagi antenna with 14 dBi of gain to communicate with the balloon to provide reliable communications for the safety of operations. The 2.4 GHz radio on the ground will use the higher gain tracking dish antenna to reach the balloon payload. This uplink will have an ERP of 3.7 kW, using a highly-directed antenna. While normally each radio system would operate under the provisions of Part 15 Section 15.247 of the Commission's Rules, with the addition of the higher gain antennas, the systems exceed the limited ERP and the radio

links need to be licensed for this use. Because the systems use a high gain antennas, pointed upward to the stratospheric balloon, and the radios are listen-before-transmit, the chances of interference to other users of radios in this band are very low.

Area of operations:

While the project has three areas of operation, **this application is only for operations in Page, AZ and the surrounding radius.** The currently licensed operational area is shown in Figure 3 below. The proposed area of operation is shown in Figure 4 below.

The areas overlap. This is by design, since World View intends to operate as close to its headquarters as weather conditions will allow.

Figure 2 below shows Spaceport Tucson adjacent to the World View facility.



Figure 2. Spaceport Tucson & World View's Facility

To maximize the effectiveness of the limited launch window, World View is seeking a 200 mile radius of operations (See Figures 3 and 4 below) in which to operate. This will allow for sufficient flexibility during transmission activities. This will also ensure that the

flight provides the successful telemetry that has prompted World View's customer to seek this solution.

To optimize the functioning of the radio systems, World View has built a mobile command center that helps it to communicate with the balloon when it is in flight. The mobile command center carries both the command and control uplink and the telemetry link radio systems. World View is planning to send the command center out to track the balloon during the operational phase of this project. While the mobile command center will stay on major US roadways, it will be aim to be as close as possible to operating directly below the balloon as possible. This helps to ensure that the communications links using directional antennas perform at their best. The antennas on the balloon are not steerable, making it important for the mobile command center to be as close to below the balloon as possible.

During this phase, there will be airborne operations within the area of operations and there will be ground-based operating within the area shown below.

Because of the nature of this project, the radius of operations describes where the operations could be. It is important to note that within that radius, the radios will be in use in a very localized spot for an hour, and then turned off. The radios will never be in use across the whole area at the same time. The spectrum use is only local.

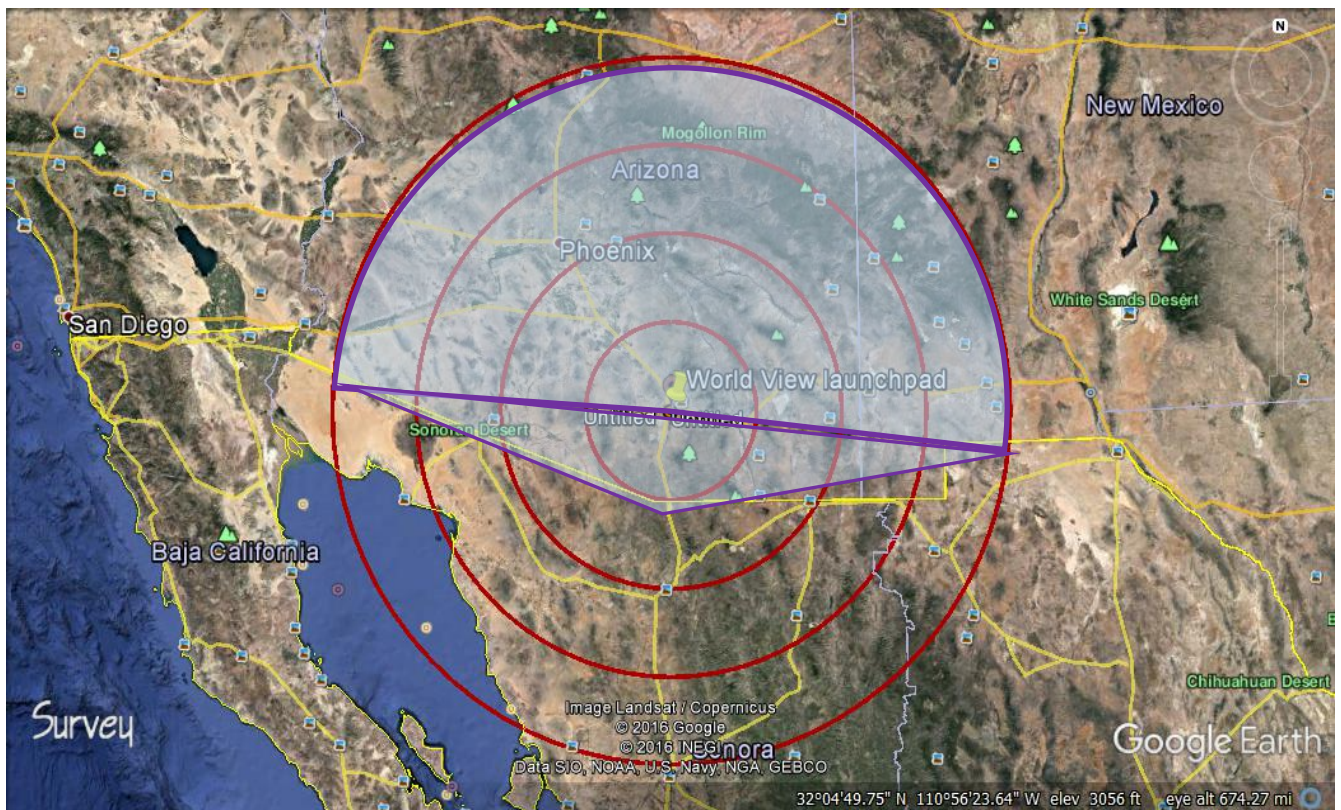


Figure 3. Area of operations, showing 50, 100, 150, and 200 mile radii from World View (the shaded areas, outlined in purple, are the proposed area of operations)

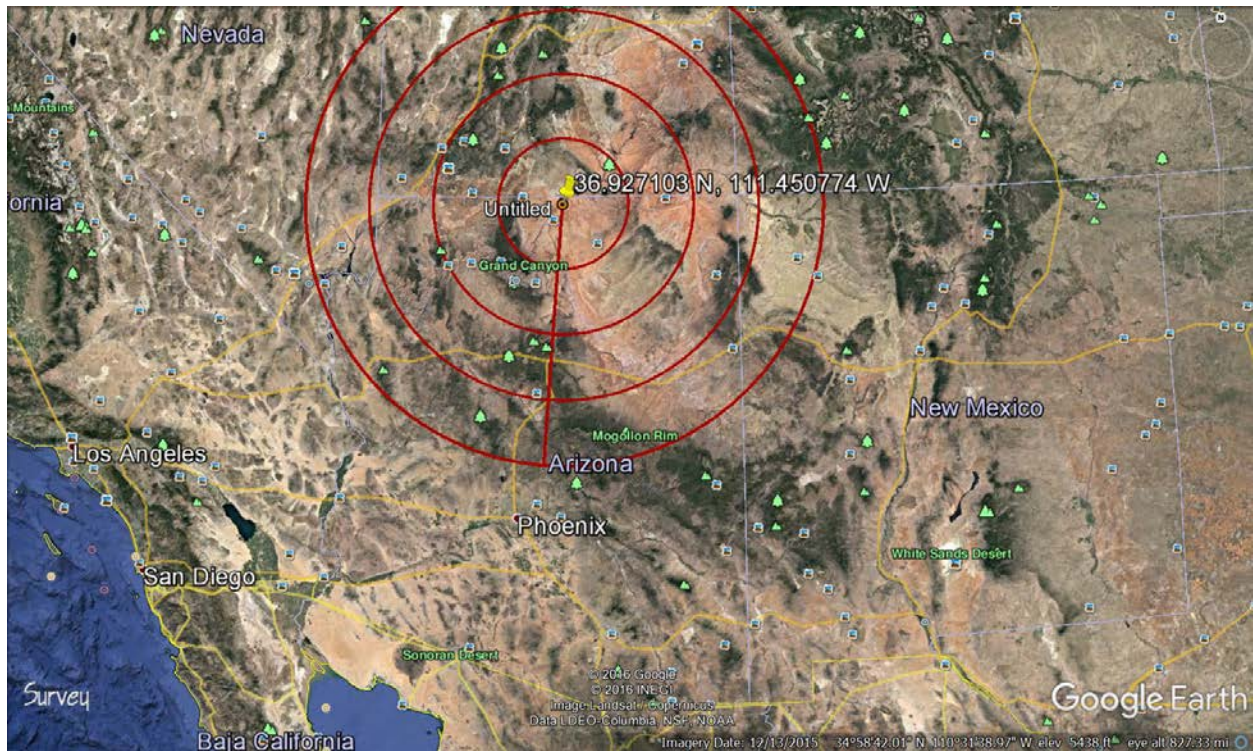


Figure 4. Area of operations, showing 50, 100, 150, and 200 mile radii from Page, AZ (operations will be contained primarily in the corridor from Page to Tucson, AZ)

During the operational phase, the radio on the balloon will be transmitting telemetry information down to the tracking antenna at World View. Given the elevation of the transmitter on the balloon, the received signal on the ground is expected to drop to a negligible level, and should be perceived only by the high gain receive antenna that World View will be using.

Minimization of risk of interference:

To minimize any potential interference, World View has worked to design a system that puts the most gain into the receive antenna rather than adding power to the transmitter. Additionally, these radios are all listen-before-transmit. They will find a clear channel before sending information, mitigating any potential interference to other users of the spectrum.

Stop Buzzer Point of Contact:

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Summary and Conclusion:

World View was approached by KFC on April 14 to assist with the edge-of-space aspect of KFC's new Zinger sandwich product launch. World View is seeking a temporary experimental authorization for use of its radio system during the testing and operational phases of this project. The STA is needed from June 18 to July 16, 2017. The radios will not be in use constantly during that time. The STA is needed for a backup launch site: Page, Arizona. This site will not be used if weather conditions allow for the launch in Benson, AZ, but this application is filed to ensure that there is a backup site available, should the weather prove hazardous for launch in Benson. World View's proposed operations are limited in geographic scope. The communications links are designed to use low powered transmitters and high gain receive antennas to ensure that the telemetry data will be effectively transmitted, while minimizing the possibility of interference to others in the area.

For additional information or if there are any questions regarding this application, please contact Travis Palmer or Anne Cortez at alc@conspecinternational.com or 520-360-0925.