

Raytheon Missile Systems  
Experimental STA Application  
File Number: 0385-EX-ST-2020

## **Explanation of Experiment and Need for STA**

### **Overview:**

Raytheon Missile Systems (Raytheon) is the primary missile manufacturer in the US, supplying ordinance ready to operate to the US military. Raytheon's experience with missiles has led its customers to seek UAV technology based on some of its existing platforms and knowledge. This has led Raytheon to the development of advanced UAV technology as well. This application seeks authorization for the use of a variety of radio systems that are used in the development and testing of its advanced UAVs. The radios incorporated into the UAVs support the mission of the UAV testing.

### **Need for an STA:**

Raytheon has a contract with the US Army for the advanced development of the UAV systems. The contract number is: HQ 0727-18-F-1632. To meet the milestones in the contract, Raytheon has been requested to conduct demonstrations on its plant site starting in April 2020. Those demonstrations will be conducted at ground level, showing the performance of the UAVs. This STA request is filed for operations at Raytheon's facilities in Tucson at locations that were not previously included for laboratory product development.

### **Technical Synopsis:**

Spectrum requested: 430-450 MHz, 1357.5-1387.5 MHz, 2377, 2392, 2382 & 2387 MHz,  
4435-4940 MHz, 4950-4990 MHz, 6750-8000 MHz

Limited time of use: 1-2 hours per day of radio use

Limited area of operations: 1 km radius around each location, no flight operations

Power levels are low: 430 MHz 10 W, L band 5.5 W, S Band 5.4 W, C band 6 W, 6750 10 W

### **Description of Operations:**

This application seeks authorization to transmit across the various frequencies incorporated into its UAV platform for demonstrations on its plant site in Tucson. The purpose of the demonstrations is to show that the UAV can track and target moving objects, even as it is in motion itself.

For some portion of the demonstrations, the UAV will be positioned on top of one or another of the buildings on the plant site, and it will be activated to track selected targets that will be moving in the vicinity of the UAV. For other tests, the UAV will be placed on a vehicle that will be in motion while the target is in motion. This will demonstrate that the UAV can operate under a range of circumstances, performing a complex set of tasks that are required by the customer.

The customer has requested that the demonstrations start in early April 2020, and Raytheon needs to add these sites to those that it already uses for indoor system development.

### Spectrum Use by Band:

**430-450 MHz band:** This band is used for flight terminate transmissions. The radio uses a listen-before-transmit protocol. The radio is not in use most of the time that the UAV is in flight. It is very limited to the time that a flight terminate message needs to be transmitted. The power level used is only 10 W, with 9 dBi of gain. The flight terminate link must be robust.

**L/S/C band frequencies 1357.5-1387.5; 2377, 2382, 2387 & 2392 MHz; 4435-4940; 4950-4990 MHz bands:** These frequencies are used as datalinks to transmit data while the UAVs are in flight. These radios use a specifically configured frequency within the band. Most of the spectrum will be unused. The radios are programmed for the flights. L band power level is 5.5 W, with 5 dBi of gain to improve signal throughput. S band power level is 5.4 W, with 4 dBi of gain. The C band power level is 6 W with 7.38 dBi of gain to ensure signal reliability.

**6750-8000 MHz band:** This band is used for terminal guidance seeker operations. The radios step to various channels within the band. They are not listen-before-transmit radios. Only part of the band will be in use at any time. And, the frequencies to be used will change. The 6750-8000 MHz link uses 25 W of power with 7 dBi of gain. The signal is not in use for the entirety of the flight, at this frequency, the signal attenuates quickly.

**Local deconfliction:** the program will work with local spectrum managers prior to any flight operations to deconflict radio operations that are local to the area. The operations requested on this application are local to Tucson, and most operations will be indoors in the lab, as the program works on advanced development of the UAV platform.

### Areas of Operations are very limited:

Raytheon has been asked to conduct a series of demonstrations of its UAV platform. The area of operations is limited to several discrete portions of its headquarters plant site. All operations will be limited to discrete areas around the designated locations. These locations are shown below:

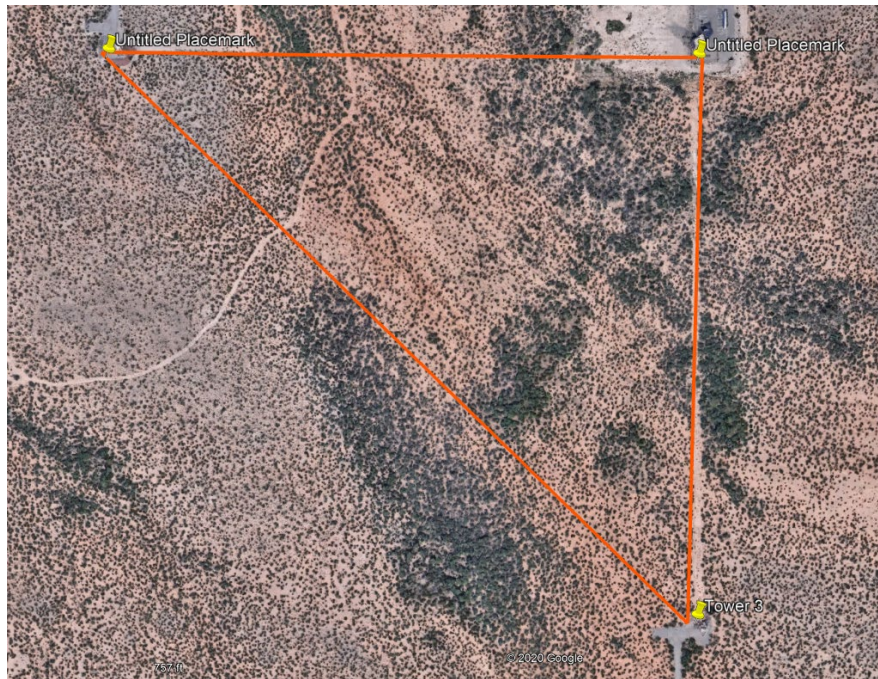
Area 1: Raytheon building



*Figure 1. Raytheon plant building*

The UAV will be positioned atop one of the buildings on the Raytheon plant, and the target will be driven around in the area to the south of the building.

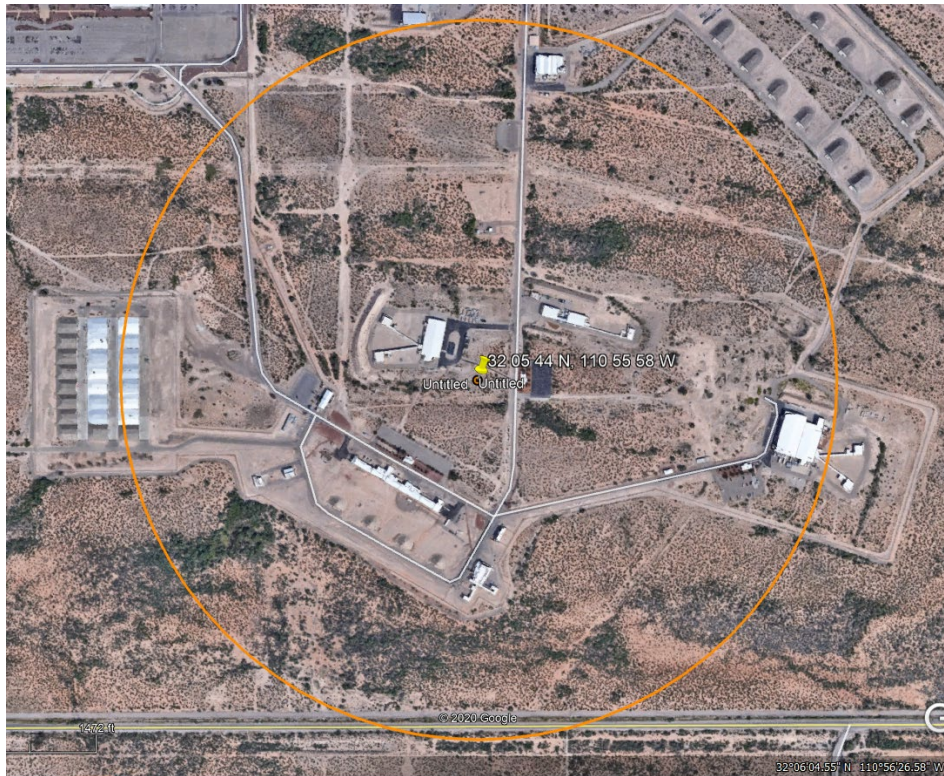
#### Area 2 – Towers



*Figure 2. Towers Operations*

The towers operations will take place with the UAV placed atop one of the towers shown at the points of the triangle above. The targets will be driven around the central area among the towers. There could be some operations where both the UAV and target will be driven in the area shown above.

#### Area 3 – eastern area on Raytheon plant



*Figure 3. Area of operations is among the buildings show above.*

The operations will be among the buildings shown in the circle above. This area of operations provides additional challenges for the operations, and it will be used to demonstrate advanced performance by the UAVs. There are no plans for operations south of the road shown at the bottom of the image above. All operations will remain on the Raytheon plant site.

**Time of Use:**

Only one location will be in use at any time. It is likely that demonstrations will be limited to 2 days per week, although 3 days may be needed occasionally. As a result, the spectrum is not expected to be in use very much.

**Stop Buzzer Point of Contact:**

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**Conclusion:**

Raytheon is seeking an STA for demonstrations of the capabilities of its UAV system. These demonstrations are scheduled to start in April 2020, with customers visiting the plant to see how the

UAV system identifies, tracks, and reacts to selected targets. These operations are limited to areas of the plant site. The spectrum use will be very limited.

If there are any questions regarding the proposed operations, please contact Anne Cortez, Esq., Washington Federal Strategies, [alc@conspecinternational.com](mailto:alc@conspecinternational.com) or 520-360-0925.