Raytheon Missile Systems
Experimental License Application
File Number: 0519-EX-CN-2019

Explanation of Experiment

Overview:

Raytheon Missile Systems (Raytheon) develops, tests, and builds a number of advanced technology systems that are sold to the US government and selected foreign governments. This application seeks authorization for the testing of such a system before delivery to an approved foreign customer. In January 2019, Raytheon sought authorization for testing to integrate an optical system with a radar system. Those operations were authorized under WN9XVR.

Originally, the testing was strictly for demonstration to a foreign government. The demonstration went well, and there is now new interest in developing the technology for additional customers. For that reason, Raytheon is filing this application to extend its testing.

Technical Synopsis:

Spectrum Requested:	10175-10500 MHz
Time of use:	less than 4 hours daily, during business days
Power:	80 W, with 27 dBi gain
Operations:	Indoors, in hangar and adjacent to hangar

Description of Operations:

Raytheon is seeking to test the integration of the airport radar with an optical tracking system to advance the functionality of Raytheon's products.

The radar system has three operating modes:

Mode one: is a 1 kHz wide signal that is used for TX F1 CW. This mode help to send out TX transmit frequency. It will be in use off and on throughout the entire day.

Mode two: is a 4 MHz wide signal that is used for TX F2 CW. This mode helps to send out TX transmit frequency (along with the 1 kHz simultaneously). It will be in use off and on throughout the entire day.

Mode three: is a 300 MHz wide signal that is used for TX FM-CW modulation. This mode helps as the alternate from mode two proving a FM-CW modulation. It will be in use off and on throughout the entire day.

The goal of the experimentation, testing, and integration is to integrate a COTS radar system with an optical scanning system to be able to detect threats at airports. The radio system is not experimental, but the work being done will involve testing various configurations to optimize performance of the integrated system.

The radar system will have its directional antenna oriented down. The image below is a generic version of the proposed testing vehicle.

Figure 1. Quadcopter with testing technology mounted underneath

Power Levels, no interference likely:

The nominal power level is 80 W with an ERP of 24.4 kW. The beamwidth of the antenna is approximately 7 degrees.

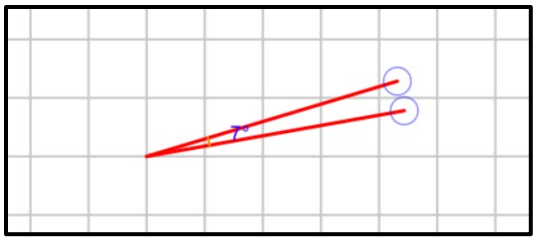

Figure 2. Approximate beamwidth of antenna

This is a highly directionalized antenna which operates above 10 GHz with the antenna directed downward. Because signals at this high frequency are subject to significant attenuation, it is unlikely that any of the proposed operations would cause harmful interference to any other operations.

Area of Operations:

The area of operations is limited to a discrete portion of the Moriarty Municipal airport. Moriarty is a town 35 miles east of Albuquerque with a population of about 2,000 people. The location was selected because it is close to the Raytheon facilities in Albuquerque but protected from operations in the city. Because of the nature of the project, the radio will be incorporated onto a quadcopter drone to allow for very limited mobility, to simulate actual operating parameters that would be used by the Australian government. The quadcopter, in keeping with FAA regulations, will be flown by a licensed pilot and remain below 400 feet in elevation.

The area is less than 1 km in diameter. Below is an aerial view of the area of operations.

Figure 2. Moriarty Airport – area of operations is circled, radius of about 300 ft.

Natural terrain features will prevent the signal from propagating very far from the area of operations, because of building attenuation, the downward directionality of the antenna, and natural features such as the Sandia Mountains, which have an average elevation over 7,000 feet. The Sandia Mountains will protect Albuquerque Sunport, New Mexico's largest commercial airport, which is about 35 miles away.

Figure 3. Mountains between Moriarty Airport and Albuquerque SunPort

New Mexico has very mountainous terrain. The Santa Fe Mountains, to the north and rising to over 8000 feet, will prevent signal propagation that direction. While the area to the east of the airport is predominantly flat and sloped downwards, the nearest major airport is over 200 miles away in Amarillo, Texas.

Time of Use:

The time of use is limited each day. The quadcopter on which the radar will be mounted is battery-powered as is the radio. Thus, operations are limited to the duration of the battery. Then, the systems will be recharged, and possibly run again during the day. This means that testing is expected to last no more than 4 hours per day. Should Raytheon need to coordinate these operations with others, it is possible to set up a schedule.

Stop Buzzer Point of Contact:

Jim Ortega, Spectrum Manager
(520) 794-0227
James.e.ortega@raytheon.com

Conclusion:

Raytheon is seeking authority to continue testing the installation and operation of a commercial off-the-shelf radar system with an optical tracking system for threat detection. The operations will be contained at the Moriarty airport. The time of use of the radios is limited. Should there be any questions about the proposed operations, please contact Anne E. Cortez, 520-360-0925 or alc@conspecinternational.com.