

Raytheon Missile Systems  
Experimental License Renewal Application  
Call Sign: KI2XDD  
File Number: 0496-EX-CR-2019

### **Explanation of Need for License Renewal**

Raytheon Missile Systems (Raytheon) is a US defense contractor that develops innovative technologies, in particular for the US military. This division of Raytheon is primarily responsible for the development of advanced missile technologies, including the integrated command and control systems and radar technologies. Raytheon is seeking to renew its license, KI2XDD, to extend authorization to test some of the integrated radio frequency systems on its missile platforms.

#### **Technical Synopsis:**

- Spectrum Needed: 8500-9000, 9200-10500, 10500-10680, 10700-12200, 31000-31300, 31800-32000, and 32000-36000 MHz
- Location of Operations: airborne and mobile operations around the RMS plant in Tucson
- Directional Antennas: mobile operations are captive carry using directional antennas; ground locations are highly directional as well
- Systems used for missile guidance, precision, and target acquisition
- Testing is IRAD

#### **Background:**

The missile systems under development include advancements in missile guidance, precision, and target acquisition. These systems need to be used in the lab, and then they need to be tested in test flights to ensure that all elements are working properly. As a result, Raytheon is seeking renewed authorization to use the radio systems on this application as it continues to refine the command and control systems and radar technologies.

This application seeks renewed authorization to use the frequencies at several locations on the Raytheon plant in Tucson, Arizona. This license covers both the fixed and airborne operations, both at the Raytheon plant site and airborne, mobile operations for use of the frequencies in a 120 km radius around the Raytheon facility.

#### **Purpose of Experimentation:**

Raytheon continues these tests to experiment with new ways to use radar to achieve goals set by the Department of Defense. It is experimenting with various emission types to determine how to optimize the operation of the radio or radar. Further, it is enhancing the use of various spectrum

bands at medium and long distances to deliver higher performance radar systems. The experimentation will result in greater understanding of how different signal types are able to perform radar functions with variables for distance, altitude, and frequency to provide information on the optimal configuration.

#### Description of the Operations – Fixed locations:

There are five fixed locations scattered around the Raytheon plant site in Tucson, AZ.

Site 1 is the aircraft hangar. At this location, the operations are limited to occasional, momentary radio use, when a missile is loaded onto an aircraft for a test flight, and the missile radio systems are turned on, briefly, prior to leaving the hangar to ensure that the radio systems are functioning properly before take-off. This radio operation is highly directionalized, oriented at 134 degrees (southeast), with very brief and sporadic use. Flight tests could be as frequent as two or three times a day. However, flights are generally much less frequent.

Sites 2 through 5 are various test facilities (towers) located in the southwestern portion of the Raytheon facility. From these locations, Raytheon will operate its radio frequency systems to develop and test enhanced radar detection systems.

#### Description of Operations – Mobile Area of Use

Raytheon has its main missile development plant site in Tucson, AZ. Here, it does most of its development and experimentation with the systems integrated into its missiles. To determine whether the research and development of new technologies is effective, the new technologies need to be tested in real-life situations, in this case, allowing radio systems on the missiles to function as if they were operating in a real-world, deployed environment. The missiles are loaded onto aircraft for test flights. The aircraft take off, and then the radio systems are engaged, in conjunction with a number of simulated factors that fool the missiles into believing that they are in real operation. The radio systems actually need to be tested in the real-world environment to determine how those radio systems perform in their position tracking, target acquisition, and responsiveness to command signals, among other factors. Operations on the ground track the radio signals and performance to see if the radio systems are operating as predicted in the laboratory. Information from the airborne tests allows Raytheon to make further advancements in the radio technologies to improve performance.

The center point of the radius of the operations is the aircraft hangar from which the test flights originate. Flight tests can be as frequent as two or three times a day. However, after a series of flight tests, the data collected is then analyzed by the program and the next round of technological development moves back to the lab, which results in gaps between the days of flight tests.

Time of Spectrum Use:

Fixed Operations: The radio frequency and radar systems are in use all day long at sites 2 through 5, almost every day, with several radios/radars being on in multiple directions at the same time. In order to keep interference to a minimum, the spectrum management office keeps an on-line scheduling database which is used to slot spectrum use by different programs. All transmissions on and off times are logged, and the spectrum management office monitors the spectrum use.

Mobile Operations: The radio frequency and radar systems are in use during all test flights. There can be as many as two to three test flights per day, although, as explained above, there are not test flights every day. All transmissions on and off times are logged, and the spectrum management office monitors the spectrum use.

Fixed Location Transmissions are highly directional:

The antennas at the sites 2 through 5 locations are highly directional, and fixed in orientation. Each of the sites points between 180 degrees and 270 degrees, so only in the south to west quadrant of the compass.

Mobile operations, which are far more limited in scope and time, are contained as much as possible, but it is not as easy to limit the direction of the transmissions.

Conclusion:

The experimentation and testing proposed is essential to the advancement of radar technologies incorporated into Raytheon's products. The Stop Buzzer point of contact for these operations is:

Jim Ortega  
Spectrum Manager  
Raytheon Missile Systems  
520-794-0227 – office  
[James.e.ortega@raytheon.com](mailto:James.e.ortega@raytheon.com)

If any additional explanation or information is needed, or if there are questions regarding this application, please contact Anne Linton Cortez, 520-344-8525 or [alc@conspecinternational.com](mailto:alc@conspecinternational.com).