

Raytheon Missile Systems  
WF2XLZ Renewal Application  
File No: 0205-EX-RR-2015

### **Explanation of Need for Radio Spectrum**

#### **Background:**

Raytheon Missile Systems (Raytheon) has been experimenting with the development of unmanned aerial systems (UASs) for several years. Those experiments were both for government customers, on contracts, and for its own technology development. Currently, the research program is funded internally by Raytheon. Raytheon was granted experimental license WF2XLZ to continue its research and development. Raytheon is seeking to renew its authorization to continue operating under its current license for UAS testing.

Advancement of UAVs is essential to the US government, and the proposed ongoing experimentation is expected to lead to the development of advanced technologies that will be highly valuable to various branches of the military and other departments in the US government.

#### **Synopsis:**

- Frequencies in use on this license were reviewed and approved by the MAG prior to the grant of the authorization, and this renewal does not request any changes. See chart attached.
- Proposed radio use will facilitate essential experimentation with unmanned aerial systems
- Operations are low powered, because testing is localized
- Altitude of operations is below 2000 feet to avoid interference with other UAS operations
- No changes are requested to existing authorization

#### **Description of radio use:**

The ongoing operations proposed will use various radio systems in the development of the UAV, including FreeWave radios for command and control functions. Ongoing experimentation is intended to optimize its operational capabilities and expand its potential use. The radio use is not the experiment itself, but the use of the radios is essential in the development of the underlying UAV technology.

Development of UASs is part of the DOD mission for the use of advanced technologies. These technologies are essential for video surveillance, to protect soldiers, and as delivery vehicles for key payloads, when appropriate.

The development of the Cobra2 system is focusing on advanced video surveillance, to maximize the data capture and speed the real-time transmission of data to command centers needing to act on the information.

As the technology incorporated into each UAS becomes more complicated, and the amount of data collected increases, the importance of having complete control over the aircraft grows. This ensures the availability of essential data, and it adds maneuverability to the aircraft, enhancing its surveillance performance. Further, this experimentation is aimed at improving the security of the data communications and ability of the radios to resist hacking or interference which will improve the reliability and security of the UAS use. Renewal of the experimental license is essential to the ongoing experimentation.

Additional information regarding importance of technology development to US Department of Defense:

Federal budget cuts, at a time of high federal budget deficits, have led to budget cuts in numerous federal departments. As a result, the Department of Defense is trying to do more with less. Part of the DOD strategy, going forward, is to rely on the use of advanced technologies that can help deliver performance, without significantly adding to manpower. One reason that technology can assist in achieving cost-effectiveness is that higher manpower counts require larger medical staff, administration, personnel, management, and numerous other support functions all of which combine to increase the DOD budget. UASs do not require the same sort of support. So, DOD has made a determination to use more UASs in pursuit of its missions going forward.

The systems under development by Raytheon will help address DOD's need for advanced UASs. These new UASs are focused on increasing surveillance capacity, improving the reliability of communications systems, and the throughput of those communications systems, to ensure that data captured by the UAS is transmitted rapidly and completely to the DOD personnel who need the information. Raytheon's testing and development of this technology is directly in line with the reshaped DOD mission to include more advanced technology. The new platform incorporates additional still and video cameras, and it also has adapted new communications systems that allow the transfer of the video and still imagery in seconds. This new capability helps to provide up-to-the minute information for the UAS controller to use in real-time, to address an unfolding situation. This is more than just static surveillance; it is like having a live scouting report. The technologies included on the UAS require significant testing and development to ensure their reliable operation in the field. For that reason, Raytheon is seeking to renew its experimental license to ensure that the UASs it is developing will deliver excellent performance to meet the needs of DOD and other federal agencies faced with the same challenges.

Additional information regarding the operations under this license are available in filings made with the FCC supplementing application 0243-EX-ML-2011; those filings were made in response to questions that the FCC forwarded to Raytheon from various federal reviewers.

Freewave Radio Frequency Use:

After consultation and coordination with the MAG, the following frequencies were granted, on an experimental, secondary basis, to Raytheon for use in this experimentation:

225.7920 MHz  
226.2528 MHz  
226.9440 MHz  
227.8656 MHz  
228.0960 MHz  
228.3264 MHz  
233.1648 MHz  
234.5472 MHz  
236.3904 MHz  
236.6208 MHz  
237.0816 MHz  
237.3120 MHz  
237.5424 MHz  
237.7728 MHz  
238.2336 MHz  
239.6160 MHz  
240.9984 MHz  
241.4592 MHz  
246.2976 MHz  
251.5968 MHz  
262.1952 MHz

These frequencies were selected because: they are available for use in the area without causing problems to federal users. Furthermore, the frequencies are available at both the Tucson and Whetstone locations, which makes experimentation much more efficient across both locations. And, Raytheon's experimentation requires the use of 21 channels. Raytheon respectfully requests continued experimental, secondary use of these frequencies for its UAV testing.

Operations are low-powered:

These experiments use the minimum power required to communicate effectively. The command and control frequencies use merely 4.8 W ERP. The ability to move large amounts of data over radio links

using low powered communications is an essential component to the technology that Raytheon is developing to incorporate into a UAV platform.

#### Area of Operations:

The radio use is airborne, but only at altitudes of 2000 feet or less. There are two locations specified on the license, one in Tucson, AZ, and another in Whetstone, AZ. The airborne operations will take place within a 25 kilometer radius of the specified locations.

#### Time of Use:

Operations are sporadic. In fact, the program has been grounded for several months during the current license term because the program did not have a pilot available to command the UAV operations. Flights can be coordinated, as need be, with other local DOD operations.

#### Stop Buzzer:

Stop Buzzer point of contact: Thomas J. Fagan, Spectrum Manager, Raytheon Missile Systems, 520-794-0227 or [tjfagan@raytheon.com](mailto:tjfagan@raytheon.com).

#### Conclusion:

Raytheon is seeking to renew its experimental license to continue its ongoing development of experimental unmanned aerial systems. In the several years since this technology development and testing have begun, there have been no reports of any interference.

If there are any questions regarding this application or the proposed radio use, they should be directed to Thomas J. Fagan, Raytheon Missile Systems Spectrum Manager, 520-794-0227, [tjfagan@raytheon.com](mailto:tjfagan@raytheon.com) or to Anne Linton Cortez, Washington Federal Strategies, 520-360-0925, [alc@conspecinternational.com](mailto:alc@conspecinternational.com).