Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	WT Docket No. 11-202
to Permit Radiolocation Operations in	)	
the 78-81 GHz Band	)	

COMMENTS OF
TREX ENTERPRISES CORPORATION

Respectfully submitted,

Trex Enterprises Corporation

Thomas Cohen
Randall W. Sifers
KELLEY DRYE & WARREN LLP
3050 K Street, NW
Suite 400
Washington, DC 20007
tcohen@kelleydrye.com
rsifers@kelleydrye.com
t: (202) 342-8601
f: (202) 342-8451

Counsel to
Trex Enterprises Corporation

February 10, 2012

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	WT Docket No. 11-202
to Permit Radiolocation Operations in	)	
the 78-81 GHz Band	)	

COMMENTS OF
TREX ENTERPRISES CORPORATION

Trex Enterprises Corporation (Trex),[1] by its attorneys, submits these comments in response to the *Notice of Proposed Rulemaking* (*NPRM*) issued by the Commission in the above-captioned proceeding.[2] As indicated in Trex's original Petition for Rulemaking (Trex Petition), foreign object debris (FOD) at airports is one of the most critical issues faced today by airfield operations, presenting substantial safety, as well as economic, concerns.[3] Trex thus supports the aims of the *NPRM* and urges the Commission to issue a decision as soon as possible.

The Trex Petition asked the Commission to amend section 90.103(b) of the rules to add the 78-81 GHz band to the table of frequencies available for assignment to stations operating in the Radiolocation Service to enable entities to obtain licenses to operate its newly-

---

1 Trex is a diversified high-technology company specializing in cutting-edge technological solutions and products to improve performance across the electromagnetic spectrum. Trex has developed a strong base of proprietary technologies in microwave sensing, high resolution imaging, digital signal processing, and applied optics and materials. Trex is a privately-held company, with headquarters in San Diego, California and facilities in New Mexico, Hawaii (Honolulu, and Maui), and Massachusetts.

2 *Amendment of the Commission's Rules to Permit Radiolocation Operations in the 78-81 GHz Band*, Notice of Proposed Rulemaking and Order, WT Docket No. 11-202, FCC 11-185 (released Dec. 20, 2011).

3 *Amendment of the Commission's Rules to Permit Radiolocation Operations in the 78-81 GHz Band*, Notice of Proposed Rulemaking and Order, WT Docket No. 11-202, FCC 11-185 (released Dec. 20, 2011).

developed radar technology to detect FOD. Trex's comments herein are directed at enabling the best use of this new safety-related technology while increasing the efficiency, flexibility and utilization of the 78-81 GHz band.

I. THE PART 90 RULES SHOULD BE AMENDED TO PERMIT USE OF THE 78-81 GHz BAND FOR FOD DETECTION RADAR DEVICES WHILE OTHER CONFORMING RADIOLOCATION USES OF THE BAND SHOULD BE PERMITTED UNDER PART 15

The *NPRM* seeks comment on three options for permitting use of the 78-81 GHz band for radiolocation operations: (1) whether the Part 90 rules should be amended to permit radiolocation use of the band for FOD radar detection and any other conforming radiolocation use;[4] (2) whether the Part 90 rules should be amended to permit use of the 78-81 GHz band by FOD detection devices at airports on a licensed basis, while permitting other uses on an unlicensed basis under Part 15 of the rules;[5] or (3) whether the Part 15 rules should be amended to open the 78-81 GHz band to non-Federal uses (including operating FOD detection radar devices) on an unlicensed basis.[6]

Trex urges the Commission to adopt rules to amend the Part 90 rules to permit FOD detection radar systems to operate at airports on a licensed basis, while permitting other conforming radiolocation uses to operate on an unlicensed basis under Part 15. Trex explains below why sound spectrum policy mandates that use of the 78-81 GHz band should not be restricted to a single dedicated use or to use only on a licensed basis.

First, Trex notes that its FOD detection radar system is fully capable of operating on a licensed or unlicensed basis. Consequently, Trex is not opposed to an authorization framework that would authorize use of its device on an unlicensed basis. But, as explained in the

---

4 *NPRM* ¶ 6.

5 *NPRM* ¶ 8.

6 *NPRM* ¶ 8.

Trex Petition, Trex believes that licensing it under Part 90 would be more appropriate because the intended application for its FOD detection radar operations in the 78-81 GHz band is for critical civil safety and non-Federal government applications, and the necessary bandwidth for operation at 2.97 GHz does not conform to the under 1 GHz bandwidth limitation under the existing allocation at 76-77 GHz in Part 15.[7] The wider bandwidth is needed for Trex's FOD detection radar system because it provides a faster sweep, better range resolution, and therefore better sensitivity for detecting small objects that can be dangerous to aircraft.

Second, the 78-81 GHz band is far too valuable to restrict its use solely to the single specialized operation of FOD detection equipment at airports. The continued growth of wireless networks and services depends on the availability of adequate spectrum resources and the need to ensure that decisions involving spectrum use account for the most efficient and flexible bandwidth usage. Adopting rules that permit exclusive access to the 78-81 GHz band by FOD detection devices would be an incredibly inefficient use of this spectrum. Given that FOD detection equipment will operate only at airports, a significant amount of spectrum would sit idle across the country if other uses are not allowed. And, as explained in Section II, other devices and services should be able to operate in the 78-81 GHz band without causing harmful interference to or adversely impacting the operations of FOD radar detection devices.

In addition, as noted in the *NPRM*, limiting use of the 78-81 GHz band to operations of FOD detection devices at airports and potentially other conforming radiolocation uses solely on a licensed basis could frustrate future opportunities for additional systems with safety-related applications to use the band.[8] For example, the *NPRM* notes that the 78-81 GHz band is used in Europe for Short Range Radar (SRR) equipment for collision avoidance

---

[7] 47 C.F.R. § 15.253.

[8] *NPRM* ¶ 7.

applications. Such equipment is also expected to be used in the United States and authorized on an unlicensed basis.[9] The *NPRM* further notes that NTIA already has committed to work with the Commission to ensure that an adequate frequency allocation in the 77-81 GHz band is available for the operation of vehicular collision avoidance systems.[10] The Commission also has a pending rulemaking proceeding in which it has proposed to amend its rules to permit use of the 77-81 GHz band for tank level probing radar devices, which is expected to be authorized on an unlicensed basis.[11]

Finally, the *National Broadband Plan* (*NBP*) found that the Commission's historic approach of formulating spectrum policy on a band-by-band, service-by-service basis was outdated because it was overly prescriptive and unresponsive to changing market needs.[12] Going forward, the *NBP* proposed that any changes made to spectrum utilization should reflect expectations about how the wireless world would look 10 years from now. To that end, in adopting rules to govern use of the 78-81 GHz band for the operation of FOD detection radar systems, the Commission should be guided by the *NBP's* principle that any reform ensures flexibility to accommodate growing demand and evolving technologies, including for unlicensed and opportunistic uses.[13] Accordingly, the Commission should permit FOD detection radar systems to operate at airports on a licensed basis, while permitting other conforming radiolocation uses to operate on an unlicensed basis under Part 15

---

9 *Id.*

10 *NPRM* n.12 (citing comments filed by NTIA in ET Docket No. 98-153, at 22-23 (filed Jan. 15, 2004)).

11 *NPRM* ¶ 7.

12 Federal Communications Commission, *Connecting America: The National Broadband Plan* (*NBP*) (released Mar. 16, 2010) at 75.

13 *National Broadband Plan* at 75.

II. FOD DETECTION RADAR SYSTEMS SHOULD BE ABLE TO SHARE THE 78-81 GHz BAND WITH OTHER USES WITHOUT CONCERN ABOUT HARMFUL INTERFERENCE OR OTHER ADVERSE IMPACT

Given that other uses are and will be permitted in the 78-81 GHz band and operating on an unlicensed basis (including, as discussed above for example, for automotive collision avoidance safety applications and for tank level probing radar devices), the *NPRM* asks whether FOD detection systems are capable of sharing the 78-81 GHz band with other uses.[14] As explained below, FOD detection radar equipment can share the 78-81 GHz band with other uses. More specifically, due to its design, operation of Trex's FOD radar detection system is not susceptible to harmful interference from other radar devices operating in the same band, whether such devices operate at similar or significantly higher power levels.

Trex's FOD radar detection system is similar in nature to the vehicle collision avoidance radar systems operating at 76-77 GHz. Section 15.253 of the rules restricts operation within the 76–77 GHz band to vehicle-mounted field disturbance sensors used as vehicle radar systems.[15] For such systems, while the host vehicle is in motion, the rule provides that emitted power density cannot exceed 60 $\mu W/cm^2$ in the forward direction, or 30 $\mu W/cm^2$ in the side or rearward directions, at a distance of 3 meters from the antenna radome.[16] Likewise, while the vehicle is stationary, emitted power density cannot exceed 200 nW/cm^2, in any direction, at the same distance.[17]

The power density has been measured directly at the radome of Trex's FOD Finder radar antenna, and the highest power density measured at any point is 40 $\mu W/cm^2$.

---

14 *See NPRM* ¶ 8.& n.16.

15 47 C.F.R. § 15.253(a).

16 47 C.F.R. § 15.253(b)(2) & (3).

17 47 C.F.R. § 15.253(b)(1).

Consequently, the FOD Finder emitted power limits fall within the Part 15 limits specified for 76-77 GHz vehicular radar systems. In addition, spurious emissions, performance over specified temperature and voltage ranges, and all other specifications for the FOD Finder radar are consistent with the Part 15 operating parameters for 76-77 GHz, except that the radar power density of Trex's FOD Finder does not drop the requisite 25 dB when the vehicle comes to a stop. While this last provision could in principle be accommodated, it is not necessary and would be inconvenient based on the intended application to provide continuous airport surface screening during FOD detection and cleanup operations.

The fact that Trex's FOD Finder radar is so similar in nature to existing 76-77 GHz vehicle radar provides strong evidence that its operation is not susceptible to interference from other similar-powered radar devices operating in the same band. Indeed, vehicle collision avoidance radar is intended to and in fact does work on highly congested roads with other vehicles sharing the same technology, and the cost of device failure on the highway has an obvious impact on driver safety.

However, it can also be shown that due to the details of its design, Trex's FOD Finder radar is not susceptible to interference from transmitting devices of significantly higher power levels. The Trex FOD Finder radar is a Frequency-Modulated Continuous Wave device, for which the transmitted frequency changes on a continuous basis, sweeping from 78 to 81 GHz over a period of about 7 milliseconds and then repeating continuously. During this sweep, its transmitted beam changes elevation direction every 2 milliseconds electronically and azimuth direction every 7 milliseconds mechanically. Only sources within the radar's instantaneous beam direction and transmitting within about 1 MHz (FOD radar baseband bandwidth) of the instantaneous frequency of the FOD transmitter can be detected. Consequently, due to the need

to match a narrow scanning direction and a narrow transmitting frequency bandwidth at the same time, the probability of detecting a radiating source with sufficient power exceeding the FOD radar detection threshold at any time is extremely low. To roughly quantify this probability, a single 1 MHz frequency bin and 0.3-degree beam direction represents about a one-5,000,000th fraction of the total FOD radar sweep. A very powerful source (kilowatt-class transmitter, for example) could conceivably enter over a greater angular beamwidth range due to finite sidelobe levels of the Trex FOD Finder radar antenna, but even then interference is highly unlikely. Moreover, and most importantly, the impact of any FOD radar interference event, however unlikely, would be to register a false positive, rather than a false negative – a FOD item is registered where no FOD exists, resulting in a completely inconsequential extra stop between collections of real FOD items.

For these reasons, Trex does not favor the adoption of any rule provision for the 78-81 GHz band that would restrict additional and future use of the band in any way not already restricted under the existing band allocation. Authorizing FOD detection radar systems to operate on an unlicensed basis under Part 15, similar to how vehicle crash avoidance systems operate in the 76-77 GHz band, but without the requirement for reducing transmit power at rest, would provide sufficient flexibility for initiating this new airport safety capability, while not restricting possible future uses of the same band under Part 90. Likewise, adoption of a general Part 90 provision allowing broader use of the 78-81 GHz band for conforming radiolocation use applications would not threaten the viability of FOD detection radar systems at our nation's airports.

III. THE DESIGN AND IMPLMENTATION OF TREX'S FOD DETECTION SYSTEM DEMONSTRATES THERE SHOULD BE NO NEED TO ADOPT ADDITIONAL TECHNICAL RULES TO PERMIT FOD OPERATION

The *NPRM* seeks comment on whether limitations should be placed on radiolocation equipment in general or FOD detection equipment in particular.[18] As noted in the *NPRM*, Part 90 contains no specific power limit, bandwidth limitation, or frequency stability requirements for the 78-81 GHz band and applications are considered and authorized on a case-by-case basis.[19] Trex submits that if the Commission decides to authorize FOD detection radar equipment under Part 90 on a licensed basis, then applications to operate FOD detection radar equipment should be considered and authorized on case-by-case basis under the current technical parameters applicable to Radiolocation Services under the Part 90 rules as set forth in the table below. The benefit of this approach is that it will ensure that the Commission does not inadvertently adopt technical regulations that could limit potential opportunistic uses of the 78-81 GHz band on a licensed basis.

Category	Rule	Comments
Power and antenna height limits	90.205(r)&(s)	covered under existing provisions
Types of emissions	90.207(n)	covered under existing provisions
Bandwidth limitations	90.209(b)(5)	covered under existing provisions
Emission masks	90.210(b)	covered under existing provisions
Frequency stability	90.213	covered under existing provisions

For unlicensed operations, as discussed above in Section II, Trex's FOD detection radar equipment is consistent with current Section 15.253 regulations applicable to vehicle radar systems operating at 76-77 GHz, except that the radar power density does not drop the requisite 25 dB when the vehicle stops moving.[20] While this provision could be accommodated, it is not

---

18 *NPRM* ¶ 14.

19 *NPRM* ¶ 14.

20 47 C.F.R. § 15.253(b)(1).

necessary and would be inconvenient based on the intended application to provide continuous airport surface screening during FOD detection and cleanup operations.

For conforming uses, Trex urges the Commission to avoid adopting any technical regulations that could limit potential opportunistic uses of the 78-81 GHz band. Adoption of Trex's recommended approach will enable the best use of this new safety-related technology while increasing the efficiency, flexibility and utilization of the 78-81 GHz band.

IV. CONCLUSION

For the foregoing reasons, Trex respectfully requests that the Commission adopt the proposals presented herein in connection with any rules and procedures that apply to this proceeding.

Respectfully submitted,

Randall W. Sifers

Thomas Cohen
Randall W. Sifers
KELLEY DRYE & WARREN LLP
3050 K Street, NW
Suite 400
Washington, DC 20007
tcohen@kelleydrye.com
rsifers@kelleydrye.com
t: (202) 342-8601
f: (202) 342-8451

Counsel to
Trex Enterprises Corporation

February 10, 2012