

**KELLEY DRYE & WARREN LLP**

A LIMITED LIABILITY PARTNERSHIP

**WASHINGTON HARBOUR, SUITE 400**

**3050 K STREET, NW**

**WASHINGTON, D.C. 20007-5108**

(202) 342-8400

NEW YORK, NY  
CHICAGO, IL  
STAMFORD, CT  
PARSIPPANY, NJ

BRUSSELS, BELGIUM

AFFILIATE OFFICES  
MUMBAI, INDIA

FACSIMILE

(202) 342-8451

www.kelleydrye.com

RANDALL W. SIFERS

DIRECT LINE: (202) 342-8601

EMAIL: rsifers@kelleydrye.com

**FILED/ACCEPTED**

November 3, 2010

**NOV - 3 2010**

*Federal Communications Commission  
Office of the Secretary*

Marlene H. Dortch, Secretary  
Federal Communications Commission  
Office of the Secretary  
445 12th Street, SW  
Room TW-A325  
Washington, DC 20554

Re: Trex Enterprises Corporation  
Request for Waiver of Section 90.103(b) of the Commission's Rules to  
Provide for Operation of a Radiolocation Service in the 78-81 GHz Band

Dear Ms. Dortch:

Pursuant to Sections 1.3 and 1.925 of the Commission's Rules, Trex Enterprises Corporation, by its attorneys, hereby requests a waiver of Section 90.103(b) of the Rules to permit it to certify its new FOD Finder™ radar detection equipment and allow eligible users to license the device as a Radiolocation Service in the 78-81 GHz band.

Sincerely,

Kelley Drye & Warren LLP

*Randall W. Sifers*

Randall W. Sifers

Counsel to

Trex Enterprises Corporation

Attachment

cc (via email): Scot Stone, Deputy Chief, Mobility Division,  
Wireless Telecommunications Bureau

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

FILED/ACCEPTED

NOV - 3 2010

Federal Communications Commission  
Office of the Secretary

In the Matter of )  
)  
Trex Enterprises Corporation, )  
Request for Waiver of Section 90.103(b) of ) No. \_\_\_\_\_  
the Commission's Rules to Provide for )  
Operation of a Radiolocation Service in the )  
78-81 GHz Band )

TO: Chief, Wireless Telecommunications Bureau

***WAIVER – EXPEDITED ACTION REQUESTED***

**WAIVER REQUEST**

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  
(202) 342-8601 (telephone)  
(202) 342-8451 (facsimile)

Attorneys for  
Trex Enterprises Corporation

November 3, 2010

## SUMMARY

Trex Enterprises Corporation (Trex) requests a waiver of Section 90.103(b) of the Commission's Rules to permit it to certify its new FOD Finder™ radar detection equipment and allow eligible users to license the device as a Radiolocation Service in the 78-81 GHz band. The Bureau currently is considering a petition for rulemaking filed by Trex asking the Bureau to amend 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. All comments and reply comments filed in that proceeding support Trex's request.

One of the most critical issues faced by airfield operations is the hazard caused by foreign object debris (FOD). FOD is any substance, debris, or article located in an inappropriate location in the airport environment that has the capacity to injure airport or airline personnel and damage aircraft. The FAA has determined that Trex's FOD radar detection system is viable for use at any FAA certificated U.S. airport and will make grants available through certain programs to airports to procure FOD detection equipment. But Trex's radar detection system cannot be certified under Part 2 of the Rules or licensed for operation because Section 90.103(b) does not contain an entry for the 78-81 GHz band. Granting the waiver will allow the new radar detection technology to be utilized in the near term while the Bureau considers amending its Part 90 rules in accordance with Trex's rulemaking petition.

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**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
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Operation of a Radiolocation Service in the )  
78-81 GHz Band )

TO: Chief, Wireless Telecommunications Bureau  
***WAIVER – EXPEDITED ACTION REQUESTED***

**WAIVER REQUEST**

Trex Enterprises Corporation (Trex),<sup>1</sup> by its attorneys, pursuant to Sections 1.3 and 1.925 of the Commission's Rules, requests a waiver of Section 90.103(b) of the Commission's Rules, subject to the conditions and limitations specified herein, to permit certification and customer licensing of its new FOD Finder™ radar detection technology as a Radiolocation Service in the 78-81 GHz band. The Bureau currently is considering a petition for rulemaking filed by Trex asking the Bureau 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.<sup>2</sup> All comments and reply comments filed in that proceeding support Trex's request.

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<sup>1</sup> 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, applied optics and materials. Trex's fundamental business strategy is the development of dual-use technologies. Trex is a privately-held company, with headquarters in San Diego, California and facilities in New Mexico, Hawaii and Massachusetts.

<sup>2</sup> See *Public Notice*, Wireless Telecommunications Bureau Seeks Comment on Petition for Rulemaking Filed by Trex Enterprises Corporation to Make the 78-81 GHz Band Available to Part 90 Radiolocation Service Stations, RM-11612, DA 10-1750 (rel. September 16, 2010).

Trex requests the Commission grant a waiver that permits it to certify its new FOD Finder™ radar technology equipment and allows an eligible user to license the device without further proceedings. Such action will allow the new radar detection technology – which is used to detect Foreign Object Debris (FOD) in the airport environment – to be utilized in the near term while the Bureau considers amending its Part 90 rules in accordance with Trex’s rule-making petition.

## I. BACKGROUND

One of the most critical issues faced by airfield operations is the hazard caused by FOD. FOD at airports includes any object found in an inappropriate location that can damage aircraft or equipment, injure airport personnel and passengers, and affect logistics and airport operations. FOD can vary in both size and form, and includes a wide range of material such as parts fallen from aircraft, misplaced tools and equipment, pavement fragments, catering supplies, building materials, rocks, pieces of luggage, and even wildlife.

FOD can cause damage anywhere in areas of aircraft movement on the airfield. This includes damages to aircraft, personnel, and passengers, as well as lost revenues resulting from cancelled or delayed flights and closed runways. FOD causes damage through direct contact with airplanes, such as by cutting airplane tires or being ingested into engines, or as a result of being thrown by jet blast and damaging airplanes or injuring people. Damage from foreign objects is a major concern of engine manufacturers and users. Damaged fan, compressor and turbine blades in an engine can result in catastrophic failure or a loss of operating efficiency. It has been reported that aircraft incidents from FOD cost the aviation industry an estimated \$4 billion on aircraft repairs and maintenance annually.<sup>3</sup>

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<sup>3</sup> See “The economic cost of FOD to airlines,” Insight SRI Ltd., 2008 at 9, available at: [http://www.fodnews.com/cost\\_of\\_fod.pdf](http://www.fodnews.com/cost_of_fod.pdf). (Insight Report). The Insight Report finds

At worst FOD can lead to loss of life as seen in the Concorde accident of July 2000, where all 109 people on board and four people on the ground were killed. The Concorde crash was caused by a metal strip which dropped on the departure runway from another aircraft and created a tire blowout which led to the tragic accident.<sup>4</sup>

The Federal Aviation Administration's (FAA) recent Advisory Circular 15/5220-24 (Advisory Circular), which recommends guidance and specifications for procuring FOD detection equipment, sums up the concern with FOD and the need for airports to address this problem:

The presence of FOD on airport runways, taxiways, aprons and ramps poses a significant threat to safety of air travel. FOD has the potential to damage aircraft during critical phases of flight, which can lead to catastrophic loss of life and airframe, and increased maintenance and operating costs. FOD hazards can be reduced, however, by the use of FOD detection equipment.<sup>5</sup>

The Advisory Circular includes detailed performance specifications for FOD detection equipment, as well as design, construction, installation and maintenance standards.<sup>6</sup> The FAA considers solving the FOD problem a priority and will make grants available to airports through the Airport Improvement Program or the Passenger Facility Charge Program to procure FOD detection equipment.

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that at just the largest 300 airports the direct cost of FOD is \$1.1 billion annually and that the indirect cost from flight delays, plane changes, fuel inefficiencies, and related items is approximately \$12 billion annually.

<sup>4</sup> Information about the fatal accident involving the Concorde aircraft can be found at: <http://fodnews.com/article-lead-old.html> and <http://www.concordesst.com/accident/accidentindex.html>.

<sup>5</sup> Advisory Circular No. 15/5220-24, Airport Foreign Object Debris (FOD) Detection Equipment, Federal Aviation Administration, U.S. Department of Transportation, Sept. 30, 2009, at ¶ 2.1 (Advisory Circular).

<sup>6</sup> *Id.*, Chapter 3, FOD Detection Equipment.

At most airports, identification of FOD requires regular unaided visual observation of airport surfaces by airport personnel or by chance unaided visual recognition by airport pilots operating on airport pavement. Removal of such FOD is only triggered by those actual unaided visual observations.

On January 7, 2008, Trex was granted an experimental license (FCC File No. 0556-EX-ST-2007) to enable it to participate in the FAA's demonstration and technology evaluation project to examine the performance of several new FOD detection technologies, including Trex's FOD radar detection system. The experimental license was extended in 2008 (FCC File No. 0268-EX-PL-2008) to continue FAA testing. Results of the FAA's evaluation of Trex's system were highly successful. The FAA subsequently issued the aforementioned Advisory Circular that makes Trex's FOD radar detection system viable for use at any FAA Part-139 Certificated U.S. Airport. However, Trex's FOD radar detection system cannot be certified or licensed for use until Section 90.103(b) is amended to add the 78-81 GHz band as an entry in the table specifying frequencies available for assignment. On August 10, 2010, Trex filed a petition for rulemaking asking the Bureau 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. As indicated above, on September 16, 2010, the Bureau placed Trex's petition on public notice. All comments and replies filed in response to the public notice support Trex's petition.

**A. Trex's FOD Finder™ Radar Detection System**

Trex's FOD Finder™ radar detection system uses a low-power, 3-D imaging, frequency-modulated continuous wave (FMCW) radar system mounted on a vehicle to provide mobility. The technology is designed to detect and classify the presence of FOD in the airport environment. The radar detection system incorporates a 78-81 GHz sensor mounted on a

reciprocating platform that allows scanning a field of approximately 80° in front of the vehicle. The antenna tilt is fixed in relation to the vehicle, scanning at the rate of 30 scans per minute and providing a detection distance in front of the vehicle of approximately 200 meters with a detection “cell” of approximately 1 meter by 1 meter.

The radar detection system sweeps the frequency range between 78 and 81 GHz to affect an electronic scan in elevation, along with a rotary stage to produce an azimuth scan, which together detects, classifies and logs the location of small debris items against the flat surface of the airport runway, taxiways, hangar and gate environments. The radar scans an area 600 feet by 600 feet to detect FOD items.

**B. Specifications for Operations**

The FOD Finder™ transmitter emissions specifications are set forth in the table below.

|                                      |                           |
|--------------------------------------|---------------------------|
| Transmit power                       | 100 mW                    |
| Antenna gain                         | 45 dBi                    |
| System EIRP                          | 35 dBW                    |
| Transmit polarization                | Vertical                  |
| Transmit beamwidth (3 dB)            | 1 deg (el) x 0.2 deg (az) |
| Scanned area                         | 75 deg (az) x 4 deg (el)  |
| FMCW Chirp (el scan) repetition rate | 139.5 Hz                  |

The specifications in the table above conform to the technical parameters applicable to Radiolocation Services set forth in Part 90 of the Rules. Trex submits that because its FOD Finder™ radar detection service is intended to operate under the current technical parameters applicable to Radiolocation Services, no other modifications of the Rules regarding technical parameters are needed. Trex also submits that other Part 90 rule provisions applicable to Radiolocation Services outside the technical parameters – summarized in the table below – should also apply to Radiolocation Services operations in the 78-81 GHz band.

| <b>Rule</b>  | <b>Provision</b>   |
|--------------|--|
| 90.135(a)(2) | Radiolocation Service licensees may change the number of mobile units operated without obtaining prior Commission approval                   |
| 90.175(j)(6) | Applications in the Radiolocation Services are exempt from frequency coordination requirements   |
| 90.203(d)    | Radiolocation transmitters for use in public safety and land transportation application are subject to certification under Part 2, Subpart J |
| 90.207(k)    | Any type of emission may be authorized for radiolocation operations upon a satisfactory showing of need                                      |
| 90.425(c)(1) | Stations operating in Radiolocation Service are not required to transmit station identification  |

## **II. WAIVER REQUEST**

Section 90.103(b) of the Rules, which specifies the frequencies available for assignment by license to stations operating in the Radiolocation Services, does not contain an entry for the 78-81 GHz band. For that reason, pursuant to Sections 1.3 and 1.925 of the Commission's Rules, Trex is requesting a waiver of Section 90.103(b), subject to certain conditions, to allow eligible entities to obtain licenses to operate Trex's new radar technology in the airport environment as a Radiolocation Service in the 78-81 GHz band. Waiver also is sought to permit Trex's FOD Finder™ radar detection system to be certified for operation by the Commission under Part 2 of its Rules. Trex requests the Commission grant this waiver request that permits it to certify its new FOD Finder™ radar technology equipment and allows an eligible user to license the device without further proceedings.

The FAA's recent Advisory Circular contains information that airports can use to procure FOD detection equipment, including FOD detection equipment operating as a Radiolocation Service in the 78-81 GHz band.<sup>7</sup> The Advisory Circular does not limit the technology that airports may use for FOD detection, but provides performance characteristics the

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<sup>7</sup> See *supra* n. 5.

systems must meet. Meeting the performance requirements of the Advisory Circular makes Trex's FOD Finder™ radar detection system viable for use at any FAA Part-139 Certificated U.S. Airport. The FAA intends to make federal funding available to airports to purchase FOD detection equipment systems, including equipment such as the FOD Finder™ developed by Trex. But until Section 90.103(b) is amended to add the 78-81 GHz band as an entry in the table specifying frequencies available for assignment, or this waiver is granted, Trex's FOD Finder™ radar detection system cannot be certified by the Commission or licensed for use in this nation's airports. Grant of this waiver request will allow the new radar technology to be utilized in the near term while the Bureau considers amending its Part 90 rules in accordance with Trex's petition for rulemaking.

**A. Proposed Waiver Conditions**

The U.S. Table of Allocations currently includes an allocation for Radiolocation Service on a co-primary basis in the 78-81 GHz band. But Section 90.103(b) of the Rules, which specifies the frequencies available for assignment by license to stations operating in the Radiolocation Service, does not contain an entry for the 78-81 GHz band. Trex notes that in the United States, the U.S. table allocates the 76-86 GHz band (except 77.5-78 GHz) on a co-primary basis with Radio Astronomy and that Footnote US342 of the U.S. Table states that anyone operating a station in the 76-86 GHz band shall take all practicable steps to protect radio astronomy service from harmful interference.<sup>8</sup>

To that end, Trex proposes that the requested waiver impose the following conditions:

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<sup>8</sup> Note US342 to the U.S. Table of Allocations states that "all practicable steps shall be taken to protect the radio astronomy service from harmful interference" in specified bands, including 76-86 GHz. See 47 C.F.R. § 2.106 n.US342.

- Operations of services in the 78-81 GHz frequency band in the vicinity of radio astronomy service (RAS) observatories observing in the 78-81 GHz band are subject to coordination with the National Science Foundation (NSF). The appropriate NSF contact point to initiate coordination is Electromagnetic Spectrum Manager, NSF, 4201 Wilson Blvd., Suite 1045, Arlington VA 22203, fax 703-292-9034, e-mail esm@nsf.gov. Licensees shall notify the Wireless Telecommunications Bureau once they have completed coordination. Upon receipt of the coordination agreement from a licensee, the Wireless Telecommunications Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations.

- Table 1 below provides a list of each applicable RAS site, its location, and the applicable coordination zone.<sup>9</sup>

Table 1 – Applicable Radio Astronomy Service (RAS) Facilities and Associated Coordination Distances

| Observatory                               | Latitude (North) | Longitude (West) | Radius (km) of Coordination Zone |
|---|------------------|------------------|----------------------------------|
| Green Bank, WV                            | 38° 25' 59"      | 79° 50' 23"      | 160                              |
| Very Long Baseline Array (VLBA) stations: |                  |                  |                                  |
| Kitt Peak, AZ                             | 31° 57' 12"      | 111° 36' 53"     | 50                               |
| CARMA Cedar Flat, CA                      | 37° 16' 50"      | 118° 08' 30"     | 50                               |
| Owens Valley, CA                          | 37° 13' 54"      | 118° 16' 37"     | 160                              |
| Mauna Kea, HI                             | 19° 48' 05"      | 155° 27' 20"     | 50                               |
| Brewster, WA                              | 48° 07' 52"      | 119° 41' 00"     |                                  |
| Kitt Peak, AZ                             | 31° 57' 23"      | 111° 36' 45"     |                                  |
| Pie Town, NM                              | 34° 18' 04"      | 108° 07' 09"     |                                  |
| Los Alamos, NM                            | 35° 46' 30"      | 106° 14' 44"     |                                  |
| Fort Davis, TX                            | 30° 38' 06"      | 103° 56' 41"     |                                  |
| North Liberty, IA                         | 41° 46' 17"      | 91° 34' 27"      |                                  |

\* Owens Valley, CA operates both a VLBA station and single-dish telescopes.

- When NTIA seeks to provide similar protection to future RAS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission’s Wireless Telecommunications Bureau that the site is nearing operational status. Upon public notice from the Wireless Telecommunications Bureau, all

<sup>9</sup> Note that this coordination condition incorporates the recommendations made by the National Radio Astronomy Observatory (NRAO) in comments, dated October 7, 2010, filed by in the pending Trex rulemaking proceeding, RM-11612.

radiolocation licensees shall cease operations in the 78-81 GHz band within the relevant geographic zone (160 km for single-dish radio observatories and Very Large Array antenna systems and 50 km for Very Long Baseline Array antenna systems) of the new RAS site until the licensees complete coordination for the new RAS facility. Licensees shall notify the Wireless Telecommunications Bureau once they have completed coordination for the new RAS site and shall submit the coordination agreement to the Commission. Upon receipt of such notification from a licensee, the Wireless Telecommunications Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. The radiolocation licensee then will be permitted to commence operations in the 78-81 GHz band within the relevant coordination distance around the new RAS site, subject to any operational constraints developed in the coordination process.

- Radiolocation licensees shall use Global Positioning Satellite-related or other similar position location technology to ensure compliance with this paragraph.
- The radar detection service must conform to the technical parameters and other provisions applicable to Radiolocation Services set forth in Part 90 of the Rules.
- Applications for which the radar detection service may be employed and the manner in which they may be operated is limited to FOD detection in the airport environment.

**B. Justification for Waiver**

Section 1.3 provides that a provision of any rule may be waived for good cause shown.<sup>10</sup> Likewise, Section 1.925 of the Commission's Rules provides that a waiver may be granted if it shown that (a) the underlying purpose of the rule(s) would not be served or would be frustrated by application to the instant case, and grant of the requested waiver would be in the public interest; or (b) in light of unique or unusual circumstances, application of the rule(s)

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<sup>10</sup> 47 C.F.R. § 1.3.

would be inequitable, unduly burdensome, or contrary to the public interest, or the applicant has no reasonable alternative.<sup>11</sup>

Good cause exists in this case to grant the waiver under Section 1.3 and under the first prong of Section 1.925. First, grant of the requested waiver would not frustrate the underlying purpose of Section 90.103. Section 90.103(b) was adopted to establish rules for the Radiolocation Service as to frequencies available for assignment and attendant assignment limitations. Grant of the waiver will continue to serve the underlying purpose of the rule. Licenses are granted to use frequencies for purposes defined by the rules applicable to the particular radio service. Trex's FOD Finder™ radar detection system falls under the definition of "radiolocation" as set forth in the Commission's Rules.<sup>12</sup> Because the U.S. Table of Allocations already includes a co-primary allocation for Radiolocation Services in the 78-81 GHz band,<sup>13</sup> the FOD Finder™ radar detection system would be eligible for licensing as a Radiolocation Service under Part 90, Subpart F, of the Rules, if Section 90.103(b) is amended to add the 78-81 GHz band as an entry in the table specifying frequencies available for assignment. Moreover, because the 76-81 GHz band (except 77.5-78 GHz) is allocated in the U.S. Table on a

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<sup>11</sup> 47 C.F.R. 1.925(b)(3); *see also WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

<sup>12</sup> The definition of "radiolocation" in Sections 2.1(c) and 90.7 of the Rules is the same – "[r]adiodetermination used for purposes other than those of radionavigation." Section 2.1(c) of the Rules defines "Radiodetermination" more broadly as "[t]he determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves." Section 90.7 sets forth a narrower definition of "Radiodetermination": "[t]he determination of position, or the obtaining of information relating to position, by means of the propagation of radio waves." Although the two definitions for "radiodetermination" are slightly different, Section 2.1(a) plainly states that "[w]here a term or definition appears in this part of the Commission's Rules, it shall be the definitive term or definition and shall prevail throughout the Commission's Rules." Accordingly, under the broader definition of 2.1(a) Radiolocation Services may be used to determine not only the location or position of an object, but may also be used to determine other characteristics of an object, such as its classification, as the Trex FOD Finder™ does.

<sup>13</sup> 47 C.F.R. § 2.106.

co-primary basis with Radio Astronomy and Footnote US342 of the U.S. Table requires anyone operating a station in the 76-86 GHz band to take all practicable steps to protect radio astronomy service from harmful interference,<sup>14</sup> Trex proposes that the waiver include a condition imposing an assignment limitation to protect the radio astronomy service that requires operations of radiolocation services in the 78-81 GHz frequency band in the vicinity of radio astronomy service observatories observing in the 78-81 GHz band be made subject to coordination with the National Science Foundation (NSF). The waiver therefore is consistent with the purpose of Section 90.103(b) in that it does not seek to add any frequencies not already allocated for the designated service and it imposes an assignment limitation to protect from harmful interference a co-primary allocated service.

Second, grant of the waiver, subject to the proposed conditions, is in the public interest in that it will permit new FOD detection equipment to operate in the airport environment, improving FOD detection and significantly reducing FOD hazards. Grant of the waiver will allow Trex's new radar detection technology to be used in the near term and provide a safety function at the airport, alerting airport operations staff if FOD is present in the airport movement areas and allowing them to take actions necessary to ensure safe flight conditions.

### **III. CONCLUSION**

By tracking and removing debris that can damage aircraft, use of a FOD detection system, such as Trex's FOD Finder™, operating in the 78-81 GHz band is important to the public interest. The potential havoc caused by FOD, including harm to human life, and the significant cost to airlines and airports makes it crucial to have viable systems that can rapidly

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<sup>14</sup> 47 C.F.R. § 2.106 n.US342.

detect and remove FOD. There is a critical need today for FOD detection that will enable airport operators to maintain and improve their provision of safe and efficient runway operations.

As noted above, the FAA considers solving the FOD problem a priority and is making grants available to airports through the Airport Improvement Program or the Passenger Facility Charge Program to procure FOD detection equipment, such as the FOD Finder™ developed by Trex. But such radiolocation equipment operating in the 78-81 GHz band cannot be certified under Part 2 of the Commission's Rules or licensed for operation because Section 90.103(b) does not contain an entry for the 78-81 GHz band. Trex therefore submits this waiver request to allow the new radar detection technology to be utilized in the near term while the Bureau considers amending its Part 90 rules in accordance with Trex's pending rulemaking petition.

In the interest of public safety, Trex respectfully requests the Bureau to promptly grant this waiver request.

Respectfully submitted,

Trex Enterprises Corporation

By: 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  
(202) 342-8601 (telephone)  
(202) 342-8451 (facsimile)

Date: November 3, 2010

Attorneys for  
Trex Enterprises Corporation