

Comprehensive Descriptive Exhibit

The following engineering statement and attached exhibits have been prepared for **The Board of Trustees of the University of Illinois**, and are in support of their application for an experimental license. This statement and exhibits will address the questions posed on FCC Form 442 as well as provide supplementary technical information pertinent to the proposal. This statement pertains to Form 442 File Number **0600-EX-PL-2006**.

Information Pertinent to Administrative Section of Form 442

The applicant is a publicly elected agency of the State of Illinois. The Board of Trustees of the University of Illinois are the governing body for the University of Illinois system, which includes the University of Illinois at Urbana-Champaign, The University of Illinois at Chicago, and the University of Illinois at Springfield. The applicant is therefore not a representative of a foreign government, but is a representative body of the people of the State of Illinois.

The Board of Trustees of the University of Illinois is a licensee under other bureaus of the Federal Communications Commission. Neither the applicant, nor any party to this application has had any FCC station license of permit revoked. In addition, no application for permit, license, or renewal filed by the Board of Trustees of the University of Illinois has been denied. The applicant certifies that it is in compliance with the other certification items listed on FCC Form 442.

The applicant is not only a governmental entity, but is also the board overseeing an educational institution. As a result, the applicant is exempt from paying fees for this application.

The requested authorization pertains to research being performed at the University of Illinois RADAR range near Bondville, IL, Seattle-Tacoma International Airport, Whidbey Island Naval Air Station in Washington State, Cherry Point Marine Corps Air Station in North Carolina, and John F. Kennedy International Airport. The project for which this authorization is sought is Bird RADAR Deployment and Testing in the National Bird Strike Advisory System. The research being performed by the University of Illinois is part of the Federal Aviation Administration Research and Development Program AAR 411. The grant for this work is A5778 DOT 05-C-AT-UIUC Center of Excellence for Airport Technology. The University will own and operate the station authorized under this request.

This project is a component of developing the National Bird Strike Hazard Advisory System. The efforts by the Center of Excellence for Airport Technology are directed to the development and evaluation of bird detection RADAR units. This effort includes coordination with a Department of Defense Program led by the SPAWAR Systems Division of the United States Navy. The SPAWAR

Systems Division has previously deployed bird detection RADAR units at a number of Navy and Marine Corps installations.

This research is being funded under a grant from the Department of Transportation. As a result, the University of Illinois has a contract with the United States Government to fulfill the described portions of research related to the project. This project is not, however, involved in development of radio equipment for the exclusive purpose of exportation to stations under the jurisdiction of foreign states. The research will be used within the United States for the development of systems to aid both civilian and military aircraft and other relevant assets.

The authorization sought is to be used for providing communications essential to the research project. The communications utilized are not the research project themselves. It is estimated that the research involved with this authorization will last approximately 36 months.

The proposed research will involve the deployment of two Furuno FR8252 marine RADAR units. These units are authorized by the Commission for use on navigable waterways, but currently are not approved for use in land based applications. This application seeks an authorization for these units to be utilized at various land based locations during the period of research. Since the units are

currently approved for use on navigable waterways and are commercially available, they are not considered experimental in nature. This particular application of their use, however, is how the experimental nature becomes relevant. The Furuno FR8252 is not capable of station identification pursuant to Section 5.115 of the Commission's Rules.

Information Pertinent to the Technical Portion of Form 442

The proposed systems will utilize two different antennas. The antennas proposed are summarized as follows.

Antenna #1:

- 6-foot open array.
- Elevation 3 dB beamwidth is 22 degrees.
- Azimuth 3 dB beamwidth is 1.35 degrees.
- Antenna gain is 29 dBi.

Antenna #2:

- 2 foot dish.
- Elevation 3 dB beamwidth is 3.8 degrees.
- Azimuth 3 dB beamwidth is 3.8 degrees.
- Antenna gain is 32 dBi.

It should also be noted that the power specifications listed on the technical portion of the form pages are the peak power for the proposed operation.

Specifically the peak power output of the FR8252 units is 25 kW. The average power is, however, considerably lower since the RADAR pulses are extremely short in duration.

Since the antennae employed are RADAR antennas and have a high gain relative to isotropic, the effective radiated power values of 39.62 MW and 19.86 MW result. These values *appear* quite high, but as previously mentioned result from the short duration of the RADAR pulses utilized. The average power of the units is considerably lower. No directional antennas other than RADAR are to be employed in this project.

The average power of the units is based on the range setting employed. The values for the average transmitter power output ranges are 4.2, 9, and 12 Watts. These settings therefore result in the average effective radiated power specified in the table below.

Average Power	Antenna #1		Antenna #2	
	ERP (isotropic)		ERP (isotropic)	
4.2 Watts	35.23 dBW	3.334 kW	38.23 dBW	6.653 kW
9 Watts	38.54 dBW	7.145 kW	41.54 dBW	14.26 kW
12 Watts	39.79 dBW	9.528 kW	42.79 dBW	19.01 kW

The proposed operation would utilize the RADAR units in a "mobile" configuration. Mobile has been used as the description since various locations within the proposed area of operation will be utilized for the purposes of research. The proposed area of operation at each facility is a 30 km radius centered on the facility in question. The antennas will not extend more than 6 meters above ground or when mounted on existing buildings will not extend more than 6 meters above the building. In addition, the antennas will not be mounted on existing permanent structures other than buildings.

At the University of Illinois RADAR range near Bondville, IL, the closest public aircraft landing area is the University of Illinois Willard Airport (CMI), which is located 9.2 kilometers away. In the case of the remaining proposed locations, the coordinates specified as the center of the area of operations include an aircraft area. Specifically these areas are the Seattle-Tacoma International Airport, Whidbey Island Naval Air Station, Cherry Point Marine Corps Air Station, and the John F. Kennedy International Airport.

The frequencies of operation for the proposed authorization are 9380-9440 MHz. This places the proposed operation in the X RADAR band. Under the FCC table of allocations, this range is allocated for radio navigation. Within this section of allocations, there are several footnotes. The footnotes, which are 5.427, 5.474, 5.476, US51, US66, US67, US71, and G56 do not appear to be applicable to this case as they pertain either to different services, or in frequency ranges outside those proposed for use.

The proposed operation, as previously discussed, would utilize commercial RADAR units. The emission type for these units is 60M0P0N. The bandwidth of operation is 60 MHz. The transmitted signal is a sequence of unmodulated pulses with no encoded information, hence the P0N emission designator.

Request for Expedited Processing

It is respectfully requested that the Commission process this application expeditiously. While the proposed operation is for a research and development project, it has not only life-safety ramifications, but also national security ramifications. The timely development of the Bird Strike Advisory System will help alleviate these concerns and mitigate potential damage.

A strike by a bird to aircraft engines typically causes significant damage ultimately rendering them unusable. At airports and military installations, such a strike, especially during take-off and landings will cause an unsafe condition jeopardizing human life and/or the operation of military assets. For these reasons, it is believed that both life safety and national security issues are real concerns in the timely development of this system.

**Additional Modulation Information
Concerning Pulse Duration and Repetition Rate**

This additional exhibit is being submitted to provide additional information concerning the pulse length and pulse repetition rate utilized by the Furuno FR8252 RADAR units proposed for operation under the requested Special Temporary Authority. The table below lists the pulse length and pulse repetition rate relative to the three range settings available to the FR8252 unit.

Range Setting in nautical miles	Pulse Length in microseconds (μ s)	Pulse Repetition Rate Hz. Approximate
0.125 to 1.5	0.08	2100
1.5 to 3	0.3	1200
3.0 to 96.0	0.8	600

The information contained in the table above was acquired from the unit specifications. Specifically this information may be found on page SP-1 of the FR8252 Operator's Manual. This manual is available on the web site of Furuno at www.furuno.com. Portions of the manual have not been included with this exhibit since written permission from the manufacturer has not yet been obtained to reproduce the manual.

Description of Antennas and ERP

The proposed systems will utilize two different antennas. In addition, although the peak power has been specified on the technical portion of the forms, three different average power settings may also be utilized. This exhibit contains the additional information required.

Antenna #1:

- 6-foot open array.
- Elevation 3 dB beamwidth is 22 degrees.
- Azimuth 3 dB beamwidth is 1.35 degrees.
- Antenna gain is 29 dBi.

Antenna #2:

- 2 foot dish.
- Elevation 3 dB beamwidth is 3.8 degrees.
- Azimuth 3 dB beamwidth is 3.8 degrees.
- Antenna gain is 32 dBi.

Average Power Operation:

Depending on the range setting utilized, three different average power outputs may occur. The power specified on the technical section of the form represents the maximum peak power proposed for the operation. The three average power settings are 4.2, 9, and 12 Watts. These settings result in the average effective radiated powers specified in the table below. Although the peak power values appear high, the average power is quite low due to the brevity of the RADAR pulses.

Average Power	Antenna #1		Antenna #2	
	ERP (isotropic)		ERP (isotropic)	
4.2 Watts	35.23 dBW	3.334 kW	38.23 dBW	6.653 kW
9 Watts	38.54 dBW	7.145 kW	41.54 dBW	14.26 kW
12 Watts	39.79 dBW	9.528 kW	42.79 dBW	19.01 kW

Request for Expedited Processing

A request for expedited processing is respectfully requested. As detailed in the application explanation, this experiment is being performed by the University of Illinois in conjunction with the Federal Aviation Administration. Specifically the FAA program works with the Department of Defense in a program led by the United States Navy SPAWAR Systems Division. The project is critical to the continued enhancement of aviation safety, which has the potential to impact national security. As described, this project is critical to the development of the National bird Strike Advisory System. Specifically this is part of the Federal Aviation Administration Research and Development Program AAR 411. The grant for this program from the FAA is A5778 DOT 05-C-AT-UIUC for the Center of Excellence for Airport Technology.

The effects on national security and life safety are twofold. In the case of commercial and/or private aircraft, the timely development of this system will limit the number of aircraft struck by birds. Birds striking aircraft significantly damages or destroys jet engines. The loss of one or more jet engines during takeoff and/or landing substantially increases the probability of a plane crash. Such a crash, especially in the vicinity of urban airports, could result in significant loss of life both on the aircraft and also on the ground. In the case of military installations, a strike by birds to military assets would render them unusable, which would have an effect of national security and the protection of the nation.

Justification for Non-Fee Application

The applicant for this special temporary authority is exempt from paying FCC filing fees. The applicant is the Board of Trustees of the University of Illinois, which is a public university. As a result, no fee is required with the submission of this application.

Modulation Information

The transceivers to be utilized in this installation are Furuno Model FR8252 X-Band units. Their frequency range of operation is 9.410 GHz +/- 30 MHz. The emission type for the units is 60M0P0N. Specifically it is a sequence of unmodulated pulses with no encoded information of a 60 MHz bandwidth.