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OUR FILE NO.
1049-101-63

June 15, 1993

Ms. Donna R. Searcy, Secretary
Federal Communications Commission
Washington, D.C. 20554

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SUMMARY

Radian Corporation, a Dallas-based scientific research and consulting firm, supports the allocation of spectrum for Wind Profiler Radar Systems ("Wind Profilers") at both 449 and 915 MHz. Wind Profilers, an outgrowth of Doppler radar studies of the ionosphere, have many beneficial uses, the most significant of which appear to be weather forecasting and environmental assessment.

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JUN 15 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before The

Federal Communications Commission

Washington, D.C. 20554

In The Matter Of	)	
	)	
Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum for Wind Profiler Radar Systems	))))	ET Docket No. 93-59 RM-8092

TO: The Commission

COMMENTS OF RADIAN CORPORATION

Radian Corporation ("Radian"), by its attorneys and pursuant to 1.415 of the FCC's Rules, 47 C.F.R. § 1.415, hereby files its Comments in the above-referenced proceeding. In support of its Comments, Radian Corporation submits as follows:

I. INTRODUCTION AND BACKGROUND

A. Procedural History

This docket combines in a single proceeding two separate frequency allocation matters concerning Wind Profiler Radar Systems ("Wind Profilers"). The first stems from NTIA's request, dated January 17, 1992, that the FCC allocate frequencies in the 449 MHz band for Wind Profiler operation.

The second facet of this proceeding stems from Radian's Petition for Rule Making ("Petition"), dated August 13, 1992. Radian, a scientific research and consulting firm based in Austin, Texas, filed a Petition requesting the allocation of frequencies in the 915 MHz range for the use

of lower-atmosphere Wind Profilers. The Commission issued Public Notice of Radian's petition on October 1, 1992 (Report No. 1909 (Oct. 1, 1992)), requesting comments.[1]

The Commission chose to address both allocation requests in a single proceeding and released the above-referenced Notice of Proposed Rule Making and Notice of Inquiry ("NPRM/NOI") on April 1, 1993 (FCC Document 93-136), setting the deadline for comments at June 15, 1993, and reply comments at July 15, 1993.

B. The Development of Wind Profilers

Wind Profilers developed as an outgrowth of Doppler radar studies of the ionosphere in the late sixties and early seventies (Petition, Appendix A at 6). Wind, temperature, pressure, humidity and other environmental phenomena create refractive irregularities in the atmosphere which "scatter" RF electromagnetic pulses sent from the ground. Receiving equipment records scattered energy returned to earth, which can then be analyzed (*id.* at 7), providing highly accurate meteorological data on a real-time basis.

As described in Radian's Petition, the basic components of a Wind Profiler include a transmitter, antenna array, receiver and processor (*id.* at 19). The antenna array emits pulsed signals vertically in three or five narrow beams, with one beam at zenith and the remaining

[1]EnScan, Inc. ("EnScan") and Telxon Corporation ("Telxon") filed formal oppositions to Radian's Petition, and the American Radio Relay League, Inc. ("ARRL") and AMTECH Corporation ("AMTECH") filed comments. On December 17, 1992, Radian filed its Reply Comments and Amended Petition for Rule Making ("Radian Reply"), and on December 18, 1992 filed an Erratum to its Reply Comments and Amended Petition for Rule Making ("Radian Erratum"). Hughes Aircraft Company also filed reply comments on December 18, 1992.

beams at 15°-20° from zenith (Petition at 3). Wind Profilers operating at lower frequencies (i.e., 449 MHz), provide profiles of upper-altitude conditions; conversely, high frequency profilers (such as Radian's LAP™-3000 Lower Atmosphere Profiler, operating at 915 MHz) are primarily used for high-resolution lower-altitude readings (Petition at 3-4; NPRM/NOI at 2-3).

C. Radian's Development of the LAP™-3000 Lower Atmosphere Profiler

Through a Cooperative Research and Development Agreement ("CRDA") with the United States National Oceanic and Aeronautic Administration ("NOAA"), Radian and Sonoma Technology, Inc. have developed the LAP™-3000 Lower Atmosphere Profiler, a small, portable, PC-based Wind Profiler which operates continuously at low power levels and a high level of accuracy (Petition at 3; Petition, Appendix D at 3-4). The LAP™-3000 operates at 915 MHz. Since 1989, Radian has operated the LAP™-3000 at 915 MHz under experimental authorizations at numerous locations in the United States, which include many highly populated urban areas in Texas, Wisconsin, Georgia, Alabama, Idaho, Utah, Colorado, Tennessee, Oklahoma, Michigan, New York, Texas and California (Radian Erratum, Engineering Statement of John Neuschaefer at 1).

II. RADIAN SUPPORTS ALLOCATION OF SPECTRUM FOR WIND PROFILER RADAR SYSTEMS

For the reasons set forth herein, and such further reasons as are described in its Petition and Reply Comments, Radian supports the allocation of spectrum for Wind Profilers in *both* the 449 MHz and 908.75-921.25 MHz bands. The many beneficial meteorological, environmental, scientific and safety-related uses for Wind Profilers in each band amply justifies the allocation of both high and low frequency spectrum for government and non-government users, and far outweighs the minimal risk of interference to other users sharing the frequencies.

What the Commission must realize, however, is that merely allocating frequencies in the 449 MHz range will not satisfy the need for Wind Profilers. An allocation is necessary in two separate bands because of the markedly different uses of 449 MHz and 915 MHz Wind Profilers, as described more fully below. Radian's support of the NPRM should not, therefore, be interpreted as a justification for not allocating spectrum in the 915 MHz band.

III. ADDITIONAL SPECTRUM IS REQUIRED IN THE 900 MHz REGION OF THE BAND

A. 900 MHz and 400 MHz Wind Profilers Perform Distinct Functions

Wind Profilers operating at 449 MHz are ideal for National Weather Service applications and other uses requiring measurements of the troposphere. (Supplemental Engineering Statement of John Neuschaefer, attached hereto as Exhibit 1). 915 MHz systems cannot

perform these tropospheric monitoring functions. Conversely, 449 MHz

- The Lake Michigan Ozone Study (Petition, Appendix D);
- A study of the effect of the Salt River Project's Navaho Generating Station in Northern Arizona on visibility in the Grand Canyon (Petition, Appendices E, G);
- The San Joaquin Valley Air Quality Study (Appendices F, G);
- The 1990 Rural Ozone in the Southern Environment (ROSE I) study in Alabama (Petition, Appendix G); and
- Study of large-scale drainage winds for the Department of Energy along the Colorado Front Range (Petition, Appendix G).

Radian continues to receive orders for 915 MHz Wind Profilers at a rate exceeding one per month, virtually all of which are to be used in air-quality and atmospheric pollution studies (Exhibit 1 at 2).

Because lower-atmosphere readings require less transmitting power and a smaller antenna, high frequency Wind Profilers such as the LAP™-3000 system are cost-effective and have the added benefit of being transportable (*see* Petition, Appendix D at 3, Appendix E at 1, Appendix G at 1; Radian Reply, Appendix C, *passim*). Further, the environmental projects for which high-frequency Wind Profilers are so exclusively suited often require high precision and range resolution, which is a function of both frequency and, therefore, bandwidth (Exhibit 1, *passim*). The lower frequencies such as 449 MHz are simply too crowded to allocate more than two or at most four MHz (*id.*). As concluded by NOAA's National Environmental Satellite, Data, and Information Service, the 915 MHz band is the best place to locate lower-atmosphere Wind Profilers (Petition, Appendix I; Radian Reply, Appendix C).

B. The Environmental Functions of High-Frequency Lower Atmosphere Profilers Address Critical Needs

Vice-President Gore has long recognized the paramount importance of cleaning and preserving the environment, and the pivotal role technology must play in the process. In his book *Earth in the Balance*, then-Senator Gore concluded that a comprehensive response to the environmental crisis would include "establishment of a comprehensive program for researching and monitoring the changes now under way in the environment . . ." Gore, *Earth in the Balance,* 306 (Plume, 1992). This would include, at an international level, "[t]he establishment of rigorous and sophisticated technology assessment procedures, paying close attention to all of the costs and benefits -- both monetary and ecological -- of . . . new proposed substitute technologies," (*id.* at 320). In short, technologies capable of *assessing* the impact of other technologies on the environments -- in just the way 915 MHz Wind Profilers were used to measure the effect of the Navaho Generating Station on visibility in the Grand Canyon, *supra*, are fundamental to future efforts to reverse the effects of toxic air pollution.

C. 900 MHz Wind Profiler Radar Systems Can Co-Exist with Existing and Planned Uses of This Band

1. Other Users of the 900 MHz Band

If granted an allocation, 915 MHz Wind Profilers will share spectrum with:

- Industrial, Scientific and Medical equipment, which are the designated primary users of the band pursuant to Part 18 of the Commission's Rules;
- The Amateur Radio Service, which uses the band on a secondary basis;

- Unlicensed Part 15 devices, which must accept interference from licensed devices and must cease operations causing interference to licensed devices, 47 C.F.R. §15.5(a); and

- If allocated pursuant to the Notice of Proposed Rule Making, PR Docket 93-61, released April 9, 1993 (FCC 92-141), Automatic Vehicle Monitoring Systems (or, if renamed as proposed by the Commission, Location and Monitoring Service).[2]

Radian proposes that Wind Profilers be licensed on a co-secondary basis to ISM equipment and, if appropriate, with AVMS systems. In the unlikely event that interference issues arise between Wind Profilers and AVMS systems or Amateur operators, such issues can be resolved by cooperation between the users involved.

2. <u>900 MHz Wind Profiler Systems Have A Ten-Year Record of Interference-Free Use</u>

As Radian described in both its Petition and its Reply Comments, 915 MHz Wind Profilers have more than a ten-year record of interference-free operation,[3] in several cases at populated urban areas where ISM devices, Amateur Radio and even developmental AVMS systems were likely to be operating. For example, a 915 MHz Wind

developer of 915 MHz Wind Profilers, has enjoyed similar interference-

D. 900 MHz Wind Profiler Radar Systems Are Ready for Commercial Implementation

The 915 MHz Wind Profiler is a prime example of technology developed by the joint efforts of government and private industry. The new administration has expressed as one of its prime goals to "directly [support] the development, *commercialization and deployment* of new technology" (emphasis supplied), and to ensure that "agencies will make it a priority to remove obstacles to Cooperative R&D Agreements (CRADAs) and to facilitate industry-lab cooperation through other means." Clinton-Gore Policy Statement on "Technology for America's Economic Growth, A New Direction to Build Economic Strength (February 22, 1993), at 7, 9.

915 MHz Wind Profiler technology is fully developed and ready to be launched into the commercial market. The system's original specifications have been tested and refined through the joint efforts of NOAA, Radian and Sonoma Technology, Inc. over the past ten years. The burgeoning demand reflects both the sophistication and the critical need for the technology, and the confidence placed in the technology by the scientific community. Additionally, 915 MHz Wind Profiler technology will likely have a beneficial impact on the U.S. trade balance since Radian is developing substantial international business with its LAP™-3000 systems.

Governed by the specific rules proposed in Radian's Reply Comments and December 18, 1992 Erratum (incorporated herein by reference), 915 MHz Wind Profilers can be deployed and operated to the benefit of all, with little or no inconvenience to other users of the spectrum. Indeed, the proposed rules submitted by Radian in its

December, 1992, submissions are far more specific than those contained in the NPRM/NOI for 449 MHz Wind Profiler operation. The proposed new section 90.248 contains the current operating parameters for existing 915 MHz systems, including maximum peak power of 500 watts (100 watts average), use of side lobe suppression fences attenuating the horizontal lobe at least 45 dB, and requirements to investigate and eliminate harmful interference. These proposed technical rules are consistent with those found for other Part 90 devices.

E. Required Bandwidth

The NPRM/NOI seeks comment on the necessary occupied bandwidth for 915 MHz Wind Profilers. NPRM/NOI at ¶ 19. Because 915 MHz Wind Profilers are designed to take measurements having finer

IV. CONCLUSION

For these reasons, and those set forth in Radian's Petition and Reply Comments, Radian respectfully requests that the Commission move with all diligence to allocate 12.5 MHz in the 908.75 - 921.25 band for the use of Radar Wind Profilers, and adopt the rules set forth in Radian's December 18, 1992 Erratum.

Respectfully submitted,

Radian Corporation

James E. Dunstan

Susan H. Rosenau

HALEY, BADER & POTTS
Suite 900
4350 North Fairfax Drive
Arlington, VA 22203-1633
703/841-0606

June 15, 1993

Exhibit 1

SUPPLEMENTAL ENGINEERING STATEMENT OF JOHN NEUSCHAEFER

John Neuschaefer, under penalty of perjury, states as follows:

1. I am a Staff Engineer at Radian Corporation ("Radian"). My qualifications, employment history, duties and expertise in the area of Wind Profilers are described in full in the Engineering Statement submitted in support of Radian's Reply Comments as Appendix A thereto.

2. I have reviewed the Comments Radian has prepared in response to the Notice of Inquiry issued by the Federal Communications Commission on April 1, 1993 (FCC Document 93-136), and to the best of my knowledge and belief, the statements contained therein are true and correct.

3. Wind Profilers operating and 449 MHz and Wind Profilers operating at 915 MHz serve distinct important functions. Wind Profilers operating at 449 MHz are highly suitable for National Weather Service applications and other uses requiring measurements of the troposphere. 915 MHz systems cannot perform these tropospheric monitoring functions.

4. Conversely, 449 MHz systems cannot measure the boundary layer of the atmosphere with the same range resolution as 915 MHz systems, which is essential to most air-quality and environmental research projects such as the Lake Michigan Ozone Study, for which Radian provided 915 MHz Wind Profilers under experimental authorizations.

Exhibit 1

5. The demand for 915 MHz Wind Profilers for environmental uses is growing. Radian continues to receive orders for 915 MHz Wind Profilers at a rate exceeding one per month, virtually all of which are to be used in air-quality and atmospheric pollution studies.

6. The environmental projects for which high-frequency Wind Profilers are so exclusively suited often require high precision and range resolution, which is a function of both pulse duration and, therefore, occupied bandwidth. The Wind Profiler operating at 915 MHz requires additional occupied bandwidth because it is intended to make measurements having finer range resolution than the 449 MHz wind profiler. The radar range resolution is determined by the duration of the transmitted pulse (~150 meters/μS). The Wind Profiler Network Profilers (ata 404.37 MHz) have a minimum range resolution of ~380 meters (~ 2.55 μS pulse). A similar system is envisioned for 449 MHz. the 915 MHz profiler uses a minimum range resolution of 60 meters (0.4 μS pulse). The difference in occupied bandwidth required for the two frequencies (449 vs. 915 MHz) is created by the difference in pulse duration. In Radian's judgment, the lower frequencies such as 449 MHz are simply too crowded to accommodate the bandwidth required for environmental uses of Wind Profilers.

Signed under penalty of perjury this 15 day of June, 1993.

John Nudschaefer

Exhibit 2

South Coast
AIR QUALITY MANAGEMENT DISTRICT
21865 E. Copley Drive, Diamond Bar, CA 91765-4182 (909) 396-2000

May 4, 1993

Mr. Carl Huie
Federal Communications Commission
Office of Engineering and Technology
1919 M Street, NW
Washington, D.C. 20554

Dear Mr Huie, Re: Notice of Inquiry FCC 93-136

The South Coast Air Quality Management District (District) has recently completed a 5-month field demonstration of the Radian/STI 915 Mhz radar wind profiler and radio acoustic sounding system (RASS) at Los Angeles International Airport. The profiler and RASS system, operating at the 915 Mhz frequency, accurately provided data characterizing the structure of the lower tropospheric winds and temperature over the coastal Los Angeles area. The reliability of the system, and its minimum requirements for continuous operation have made the 915 Mhz profiler and RASS an attractive, cost effective alternative to our current daily airsonde program. The District believes that the 915 Mhz wind profiler and RASS system will provide the data needed to accurately forecast daily air quality, and enhance the ability to model regional air pollution as a function of the development of our strategic plan to clean the air in the South Coast Air Basin. This will enable us to better address our federal mandate to clean the air in the Los Angeles area.

The District is evaluating the possibility of either purchasing or entering into a multiple year leasing agreement for one or more of these systems. The utility of these systems has been discussed with the California Air Resources Board and the local National Weather

Exhibit 3

NCAR

Office of the Director
National Center for Atmospheric Research
P.O. Box 3000, Boulder, CO 80307-3000
Tel: (303) 497-1111

Robert J. Serafin

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Filed
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JUN 0 4 1993

June 2, 1993

Russ Peterman/Radian
FYI!

Mr. Carl Hine
Federal Communications Commission
1919 M Street NW
Washington, DC 20554

Re: FCC Notice of Inquiry DC-2358 ET Docket 93-59

Dear Mr. Hine:

The National Center for Atmospheric Research (NCAR) currently operates four 915 MHz wind profilers. Each wind profiler is a crucial part of NCAR's Integrated Sounding System (ISS) which combines various state-of-the-art remote and *in situ* sensors into single transportable units. NCAR plans to eventually have 8-10 ISS.

The current ISS/wind profiling systems serve two primary functions. One system is dedicated to climate studies and the other three systems primarily serve the research needs of the university atmospheric and ocean science communities. These systems are deployed throughout the U.S. and abroad. The data from the ISS/wind profilers is used to study many research topics of national importance, including climate change, cloud-climate interactions, data assimilation (the incorporation of data into numerical prediction models), boundary layer meteorology and mesoscale processes (including severe weather prediction). The ability of the ISS to provide data for these studies would be well served by a dedicated frequency for wind profilers at 915 MHz.

Sincerely yours,

Robert J. Serafin
Director

bcc: W. Dabberdt
J. Hack
R. Carbone