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The Honorable Richard Burr
217 Russell Senate Office Building
Washington, DC 20510

Dear Senator Burr:

Thank you for your time. I want to commend Mr. Van Denton, Chief Meteorologist at WGHP-TV in High Point, NC for calling to your attention a very important public safety issue regarding the inadequate weather radar coverage currently in place across western North Carolina (NC). I am contacting you to both endorse Mr. Denton's concerns and add a few additional facts that will hopefully crystallize the gravity of the situation.

Our predicament began in the mid 1990s when the National Weather Service (NWS) modernization took place and our older WSR-74 radars were replaced by the newer WSR-88D (Doppler) radars. In doing so, Charlotte - one of the biggest cities and busiest airports in the country - lost its radar with no plans to replace it. North Carolina was allocated three new radars. The sites were, and still are Raleigh, Wilmington, and Morehead City. In other words, the three new radars were all positioned along and east of the I-95 corridor with the western 2/3rds of NC left behind. Why? My understanding is the modernization was funded by both NOAA and the DoD. Because of that, and understandably, the military was given first choice to ensure their bases were well covered. But it also used up the state's quota, and no money remained for the western side of NC.

As an example of how out of balance things are, let's take Clinton, NC as an example. Have you heard of it? I haven't prior to this, but I'm sure it is a very nice community. They are within just 40 (nautical) miles of Raleigh, 60nm from Wilmington, and 70nm from Morehead City. That's outstanding coverage from not one, but a network of three different weather radars. By contrast, using Raleigh as the nearest (and only) site available, Charlotte is 118nm away, Statesville 117nm, Hickory 139nm and Morganton 155nm!

Senator Ernest Hollings in South Carolina faced a similar situation with yet another radar installed along his coast and only one radar allocated inland, Columbia, SC. He understood that plan would leave the western region of his state poorly covered and fought for another weather radar in the Greenville-Spartanburg (GSP) area. He won. And by pure luck, that radar helped fill some of the gaping holes in western NC.

In short our region improved from virtually no adequate coverage to fringe coverage. Charlotte is now 70 (nautical) miles away from the GSP site and Statesville is 85nm away. Meanwhile Winston-Salem still remains 90nm away from Raleigh. So while tiny communities in rural eastern NC are blanketed by a network of radar coverage, larger cities in western NC still remain on the fringe, despite help from Senator Hollings.

As Mr. Denton pointed out, increased distance from a radar site results in a multiplicity of problems. Here are just a few of the basics:

1. Radar beam height increases with distance
2. Radar beam width increases with distance
3. Radar beam attenuation increases with distance

With respect to beam height, as it stands now, the beam centroid that passes over Charlotte is 7,500^[1] feet above the earth. For Statesville, it is 9,400^[1] feet and at Winston-Salem it is 10,650^[1] feet. As you can see that is over two miles of atmosphere left uncovered from the beam centroid down to the ground.

The average tornado drops from a cloud base no higher than 4,000 feet off the ground, so you can appreciate the profound difficulty here. Yes, these (supercell) thunderstorms do produce broader rotations above the tornado which allows the radar operator to infer a tornado below, but it still boils down to guesswork, and that is why, even in this day and age, we still have a 75% false alarm rate when the NWS issues tornado warnings.^[2]

Beam width is a problem. Just like a flashlight, as the beam gets farther away from the transmitter, it spreads out and becomes much wider. Therefore, because a distant storm from the radar only fills part of the (wide) radar beam, it appears weaker to the radar operator and he may underestimate the strength of the storm leaving the people affected by it vulnerable.^[3]

On the third point, if rain or storms lie between the radar transmitter and the distant storm in question, the nearby storms will attenuate the beam signal thereby leaving less energy to reach the distant storm which again will distort the final result and negatively affect the operator's ability to accurately interpret the situation.

To reiterate, all these problems are a direct result of greater distance from weather radar sites.

Finally, several years ago, the FAA did install a Terminal Doppler Weather Radar (TDWR) to help better serve the aviation community around the Charlotte Airport. It is designed to quickly capture small weather events in the terminal airspace which is a rather small useful radius. This radar, on some level, does complement the coverage of the larger NWS radars, but it offers fewer derived products, and because of its lower power and smaller wavelength, it is severely hampered by attenuation even within its smaller designated coverage area.^{[4][5]}

The tornado that struck Harrisburg, NC on 3 March 2012 at 2:30am (Mecklenburg/Cabarrus line) left 41 homes uninhabitable, six completely destroyed, four people injured, but incredibly, no deaths. The tornado was rated a strong EF2 tornado^{[6][7]}.

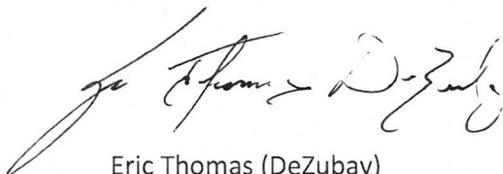
This tornado went undetected and no warning was issued for the victims in the path. **The tornado was only 13 miles from the TDWR.** This should serve to illustrate why depending on terminal doppler weather radars is not the solution.

In light of all the issues laid out, I simply wish to affirm and stand behind Mr. Denton's request for an additional NWS Doppler Radar to be installed in a location that will provide vastly improved, timely and critical weather information for the western half of North Carolina which comprises major metropolitan areas.

If you have any further questions or comments, please feel free to call or write the undersigned. Thank you again for your valuable time.

With kindest regards, I am

Sincerely yours,



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References:

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- [2] <http://fivethirtyeight.com/features/three-out-of-every-four-tornado-warnings-are-false-alarms/>
- [3] http://www.srh.noaa.gov/jetstream/doppler/beam_max.htm
- [4] <http://www.wunderground.com/blog/JeffMasters/comment.html?entrynum=1168>
- [5] <http://www.erh.noaa.gov/gsp/tdwr/info/specs.html>
- [6] <http://www.spc.noaa.gov/faq/tornado/ef-scale.html>
- [7] <http://1.usa.gov/1HP8UZ9>