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Ahead of the curve

CASA radar offers high-resolution imagery

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Benjamin Franklin once said, “Time is money.” But when it comes to tornado season in North Texas, time is safety. And time is one of the main advantages of the new Collaborative Adaptive Sensing of Atmosphere weather radar system emergency management officials hope to bring to Johnson County.

Johnson County residents depend on the National Weather Service to stay apprised of severe weather threats. And the National Weather Service depends on images provided by the NEXRAD Doppler radar system — a system of 159 high-powered, long-range radars sitting on top of towers positioned about 200 miles apart to cover the country. The closest tower is at Spinks Airport in Burleson.

Doppler radar takes at least five minutes to make a complete 360-degree circular scan and provide updated information and images, said Amanda Everly, emergency preparedness information analyst with the North Central Texas Council of Government. That means a fast-moving storm miles away in one Doppler scan could be right on top of you by the time the radar is able to offer new information.

Everly said the new CASA weather radar can give updated information in about a minute.

And when it comes to tracking a killer tornado, those four minutes between Doppler and CASA can mean the difference between life and death.

“That extra three or four minutes of heads up we could get with CASA, that could save peoples’ lives,” said Jamie Moore, emergency management coordinator for Johnson County. “With CASA, we could see the weather happening in real time. That can be critical for those planning for and responding to emergency situations.”

That’s why Moore and other emergency management officials are working to bring the CASA weather radar system to Johnson County.

Eight CASA units will be installed at strategic locations in an overlapping pattern around the 16-county region encompassed by NCTCOG. Eventually, officials want to have a total of 22 of the new radar units.

The first four locations are already determined. One is at the University of Texas at Arlington. Everly said the second CASA unit should be installed at the University of North Texas in Denton

by the end of March. A third unit is destined for Addison, and a fourth for a site near Eagle Mountain Lake, northwest of Fort Worth.

Four more have already been paid for, and NCTCOG officials are trying to decide where each will go. Emergency management officials in Johnson County hope one ends up here.

What is CASA?

About 10 years ago, the National Science Foundation awarded a grant to a group of about 20 partner institutions, led by the University of Massachusetts, to develop a new, more efficient weather radar system. The long-range, high-powered Doppler radars are limited by the curvature of the earth when it comes to “seeing” weather conditions in the lower regions of the atmosphere. The further away from the unit you move, the greater the depth of the lower atmosphere becomes “invisible” to the radar, which means that “meteorological conditions in the lower troposphere are under-sampled, leaving us with precious little predicting and detecting capability where most weather forms,” according to the CASA website, hosted by the University of Massachusetts.

To combat that, the CASA team developed a system that uses a network of low-cost, short-range Doppler radar units that can be installed on rooftops and existing cell towers within a few miles of each other so they can “communicate with one another and adjust their sensing modes in response to quickly changing weather and user needs,” according to the website.

According to the website, it will be “a dramatic change from current technologies. Up-to-the-second radar information will then be transmitted to the people and organizations that make critical decisions about the weather.”

They call it Distributed Collaborative Adaptive Sensing.

The group built the first four DCAS weather radar units and installed them in rural Oklahoma in January 2006 in a test run.

After a successful five-year trial, Everly said the research team started looking for an urban environment to test the system. They chose the Dallas-Fort Worth Metroplex, and then came the task of deciding where to put them to get optimal coverage — a decision being made through the NCTCOG’s Emergency Preparedness Program.

Where should they go?

The DFW area will be covered first with the four DCAS units that were originally installed in Oklahoma for the test run, then four more — the cost of which has been donated — will be installed.

Because DCAS are short-range units intended to work in concert with each other, Everly said they need to be installed within 25 miles of each other, in an overlapping pattern. The already-established locations for the first four cover the center of the 16-county region.

One of the second group of DCAS units is likely to be installed in Parker County and one in McKinney in Collin County. Midlothian in Ellis County has also been suggested as a site for one of the four, as has Southeast Dallas in Dallas County.

Everly said she believes Johnson County would be a logical location for the last of the second group of four DCAS units. Moore agreed.

“Usually, the storms move from the southwest to the northeast, so having one of the radar units here in Johnson County would make more sense than having it in Southeast Dallas,” Moore said. He noted that the Midlothian site is “pretty well fixed” as the location of one of the DCAS units, and that while it offers some coverage to Johnson County, “it only covers about half our county.”

Why Johnson County needs DCAS

While Johnson County has the long-range NEXRAD Doppler radar at Spinks Airport, Moore said the CASA radar system would give a clearer and more accurate picture of weather events as they happen. The DCAS radar units feed data into a closed-loop system with software that uses algorithms to detect trouble spots and can put the units in a sector scan mode to focus on specific areas. That means the DCAS radar can provide updated information quicker.

DCAS produces images at a higher resolution than those produced by the long-range Doppler radars. Images that on long-range Doppler radar look like blobs of color on the new DCAS radar are detailed and precise. Moore said that the older Doppler radars often can’t differentiate between heavy rain and hail; the new DCAS radar can.

“Having better weather data means we can get earlier warnings on storms, potentially up to 10 minutes earlier than what we have now. That advanced warning, that extra time equals saving lives. It is absolutely significant,” Moore said. “That gives us as public safety officials a better indication of what will happen. Better data means we can make better decisions for the public safety.”

Cleburne Fire Chief No. 2 Randy Jenkins, emergency management coordinator for the city, said he also believes Johnson County residents would benefit for having the DCAS radar located here.

“When you think about what it can do for us, I am definitely in favor of it,” Jenkins said. “The more weather information we can get, and the more accurate information we can get, the better. The earlier the warning we get, the more prepared we can be.”

Jenkins said he plans to present the idea to the Cleburne City Council when the local committee working on the project has a more concrete plan on where in the county the unit would be located and what the cost would be to each city within the county.

Burleson Fire Chief Gary Wisdom gave a presentation on March 4 about the project to Burleson City Council, and Mayor Ken Shetter and Mayor Pro Tem Stuart Gillaspie said they think it would be beneficial to have the radar located in the county.

Moore said Keene, Godley, Joshua and Alvarado also have representatives in the group working to get the CASA radar unit in Johnson County.

What does it cost, and where will it go?

Moore said that each DCAS unit weighs about 1,200 pounds and needs to be installed at least 20 feet off the ground. The units cost about \$500,000 each, but the eight available units have already been paid for. The cost to install a unit — which Johnson County and the cities here would have to pay — ranges from \$35,000 to \$50,000, Everly said.

Moore said the cost includes a site study, along with infrastructure that includes a building or tower to place the unit on, power to run it and the fiber optic network needed to transmit the data. Finding a suitable site where the necessary infrastructure exists would help keep costs down.

But the site, he said, has to fall within the 25 mile radius established by the already situated units — in this case, the units expected to be installed in Midlothian and Parker County and the one already installed at UT Arlington. He said the radio tower site at the Cleburne landfill already has the necessary infrastructure, “but the tower there may be too big; it may interfere with the radar.”

Joshua has identified a possible site, Moore said, and Keene is topographically the highest point in the county, which would be an advantage.

The expense, Moore said, would also include the ongoing maintenance of the unit, and there is a subscription fee that each governmental agency would pay to receive the data at the same time as the National Weather Service. He said that estimated costs to maintain the system overall — all of the units throughout the North Texas region — is about \$600,000. Johnson County would pay about \$3,000 a year to subscribe to the data, and the municipalities in the county would likely pay between \$2,000 and \$3,000 a year.

Everly said the subscription fee is based on population and money paid to maintain the unit could be used to offset the cost of the subscription.

“Without the local communities paying to install and maintain these units, this isn’t going to happen. The National Weather Service has no way to fund the system, otherwise,” Moore said. “It has to be a very collaborative effort to make it work.”

Moore said he is “seeing a lot of support” from county and city officials for the idea of getting one of CASA’s DCAS radar units in Johnson County, “but we’re still really early on in the process. We’re still kind of in the research phase.”

Moore said that city and county officials will have to measure the cost of installing and maintaining the new radar unit against it’s potential benefit.

“I am not speaking for the county here, but I do see great potential with this radar,” Moore said. “It has other uses than just the weather-related ones. We can use it to determine very detailed wind patterns, and we could definitely use data like that in the event of a chemical spill or a wildfire.

“The question is, would this improve public safety enough to warrant the cost? Personally, I think it would,” he said.

For information, visit nctcog.org/ep/Special_Projects/CASAWX/Index.asp or www.casa.umass.edu/index.php.