



New Radar Technology Can Increase Tornado Warning Lead Times

Navy's phased array radar being adapted for weather use

A National Weather Radar Testbed has been established at the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory to provide the meteorological research community with the first surveillance phased array radar facility available on a full-time basis. Norman is already known as a national center for weather radar research and development. NSSL's research in Doppler radar led to one of the most successful and significant technology advancements since the launching of the first weather satellite. Nearly 30 years ago, NSSL was a major participant in the development of Doppler technology that became the heart of the WSR-88D radar, or NEXRAD. The deployment of a system of 120 NEXRAD radars across the United States was the cornerstone of the modernization of the National Weather Service.

Phased array radar technology may help forecasters of the future provide earlier warnings for tornadoes and other types of severe and hazardous weather. Researchers are adapting the SPY-1 radar technology, developed by Lockheed Martin to support tactical operations aboard Navy ships, to weather detection. The phased array radar project has begun a new stage in NSSL's leadership in the research and development of future generations of weather radar.



Installation of the SPY-1A antenna and radome on the NWRT



Phased array radar is currently used on Navy ships to support tactical operations.

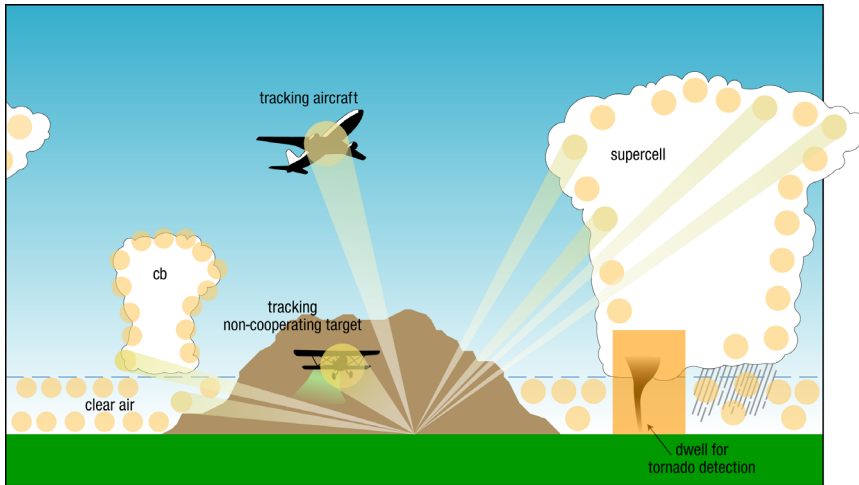
- **Research Partnerships**

A unique federal, private, state and academic partnership is developing the phased array radar technology. Participants include NOAA's National Severe Storms Laboratory and National Weather Service Radar Operations Center, Lockheed Martin, U.S. Navy, University of Oklahoma's School of Meteorology and School of Electrical and Computer Engineering, Oklahoma State Regents for Higher Education, the Federal Aviation Administration, and Basic Commerce and Industries. The project - from research and development to technology transfer and deployment throughout the U.S. - is expected to take 10 to 15 years at an initial cost of approximately \$25 million for the facility in Norman.

- **Promising New Radar Technology**

Early tests of the phased array radar system show that the technology has the potential to vastly improve upon the capabilities of the national NEXRAD radar network for all weather radar applications. Using multiple beams and frequencies, phased array radar reduces the scan time of weather from five or six minutes for NEXRAD radar to less than one minute, producing fast updates of weather data.

The National Weather Radar Testbed allows NSSL and other meteorologists to determine if phased array radar will become the next significant technology advancement to improve our nation's weather services.



The rapid scanning ability of the phased array radar gives it the potential to be a multi-use, adaptively scanning radar.

- **Improved Warning Lead Time**

In addition to faster updates, the new system can scan the atmosphere with more detail at lower elevations than current radar allows. It can also re-scan areas of severe weather very quickly, potentially increasing forecasters' warning lead times as storms rapidly transition to severe modes.

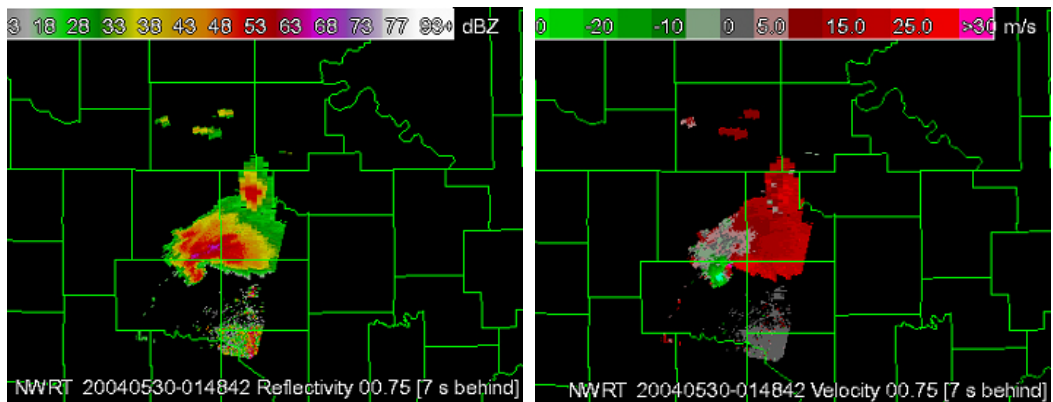
PAYOFF: This technology has the potential to increase the average lead time for tornado warnings well beyond the current average of 11 minutes. Other technology being developed at NSSL will extend lead times even farther.

- **Improved Understanding and Forecasts**

The new technology will gather storm information not currently available, such as rapid changes in wind fields, to provide more thorough understanding of storm evolution. Researchers and forecasters can then improve conceptual storm models and use that knowledge to evaluate and improve stormscale computer models. The data will also be used to initialize computer models and improve forecasts.

PAYOFF: Phased array technology will increase fundamental understanding of storm evolution, in turn leading to improved computer models, more accurate forecasts and earlier warnings.

Reflectivity and velocity displays of the first tornadic storm captured with the NWRT



For more information contact:
 Doug Forsyth, douglas.forsyth@noaa.gov
<http://www.nssl.noaa.gov/par>
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