
# APPLICATION NOTE

## TDWR – Terminal Doppler Weather Radar From MicroMet –ADC

Stormy weather, wind shear, and microburst are critical issues for the safety of flying Aircraft landing and taking off at various airports around the world.


Wind Shear and stormy weather can cause fatal air accidents resulting loss of life and a huge financial loss. As a result almost all major airports around the world are installing Terminal Doppler Weather Radars to monitor the weather for several hundreds of kilometers around the airports.

As the name suggests, the Terminal Doppler Weather Radar (TDWR) was purposely built to serve the terminal area of the airport. Its mission is to detect wind-shear and microburst associated with convective storms, so as to enhance the safety of aircraft landing and taking off from airports –either civilian or military. The radar is strategically located so that it has a clear view of the runways, airport approach and departure zones. The MicroMet TDWR is specially designed to operate in a high clutter environment normally present in the vicinity of airports. It makes use of a variety of methods to minimize clutter and to eliminate the influence of such moving targets as birds, aircraft and automobiles. In this way the MicroMet TDWR can accurately measure the radial wind speed and its fluctuation from which low level wind-shear can be computed. Equipped with sophisticated computer programs, the MicroMet TDWR is able to automatically detect thunderstorm-induced wind-shear phenomena.

### Wind Shear:

Wind shear in the lowest few hundred meters of the atmosphere has been responsible for a number of aircraft accidents (Fujita, 1980, National Research Council 1983; NTSB 1983). The most dangerous situation is when an aircraft encounters a microburst when landing or taking off. The aircraft

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will experience a sudden increase in head wind, quickly followed by a strong tailwind and possible catastrophic loss of air speed. Doppler radar has been found to be a very effective means for identifying micro-bursts (Wilson et al. 1984). In fact, the TDWR Doppler radars are presently being installed in the vicinity of major airports within the U.S. to warn aircraft of dangerous wind shear conditions.

The presence of a negative velocity gradient with increasing range is an indication of divergence. The signature for a microburst is typically closed Doppler velocity contours of opposite sign, spaced in range along the same azimuth.

The display of a Doppler radar, is used by FAA supervisors to plan airport operations. This display which is updated at 1-5 min intervals provides information on precipitation location and movement, hazardous wind-shear locations and intensities, and wind-shift line locations and forecast locations. It is also used by controllers to provide pilots with wind-shear advisories, for example the top line would be read to a pilot on approach to a runway as microburst alert and threshold winds alert.

Wind-shift Forecasts:

Particularly important to the efficient operation of airports is the anticipation of wind changes that require reconfiguration of landing and takeoff patterns. Forecasts of wind-shifts with lead times of about 20 min can greatly improve efficiency. Operational computer algorithms have been prepared which search Doppler radar data for wind shift lines based on thin-line reflectivity echoes as observed in Figs. 2.5 and 2.7 and Doppler velocity convergent features like shown in Fig 2.4. By monitoring and linearly extrapolating these features, accurate wind-shift forecasts are automatically made and provided to the controllers. The arching line northeast of the airport in Fig. 2.12a is an example of a computer detected wind-shift line; the dashed lines north of the detected position is its forecast position every 15 min.

Weather-impacted Airspace:

An additional product is under development for traffic controllers which is called weather impacted airspace. It will be based primarily on Doppler radar data from both the TDWR and WSR-88D's. The product will be used by

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controllers and pilots to determine which airspace would be hazardous to aircraft operations. Input to the product would include radar detection of

tornadoes, super-cell storms, hail, heavy rain and strong wind-shears.

Backed by specially designed signal processing and graphics algorithms the MicroMet TDWR has become an indispensable tool for the safety of aircrafts. The MicroMet TDWR is a fully solid state radar unlike its competition which uses a high power 1940s tube technology. The MicroMet TDWR has a low acquisition cost and a very low maintenance cost.

Main Features of the MicroMet Doppler Weather Radar Include:

- Low Acquisition Cost & Low Maintenance Cost
- Full Feature Radar Range – From a Portable Model to a Large 12ft Dish Radar
- Fully Solid State Radar – Unlike Tube Radars No Interference with other equipment on site
- Most Widely Used Doppler Weather Radar – More of our Doppler Weather Radars in Use compared to any other Manufacturer

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