Wind Shear Technologies Have Ancillary Benefits

By DEBRA WERNER
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SAN FRANCISCO — Two technologies with potential to detect wind shear in dry air also hold promise for improving airport efficiency and making airplanes more fuel efficient.

Lockheed Corp.'s Palo Alto, Calif., research laboratory is working under a contract with NASA to use pulses of laser light to detect atmospheric particles and wind currents. This technology, called lidar, may require additional development over three to four years before it is sold for use in commercial aircraft.

Once available, it will help pilots identify dangerous wind conditions ranging from storms to the swirling air created around another aircraft's wing tips, said Lockheed scientist Russell Targ.

To prevent an aircraft from encountering this swirling air generated by another plane, pilots are told to remain three to six miles apart. That generous spacing would not always be necessary if airborne sensors could show the pilot in the trailing aircraft whether the wind current ahead had subsided.

If that wind current were easy to detect, airplanes could fly closer together and land more frequently, improving scheduling at airports.

Next winter, NASA is scheduled to conduct flight tests of a new Lockheed solid-state lidar called Airborne Laser Turbulence Observation System (ALTOS). If those tests confirm ALTOS' ability to detect dangerous wind currents, Lockheed plans to develop a more powerful version of the system that will also allow it to survey nearby flight paths.

For example, the powerful lidar would tell a pilot flying at 35,000 feet whether the aircraft could pick up a tail wind or reduce its head wind if it moved to 37,000 feet. "That would be very advantageous to airlines in terms of reducing fuel costs," Targ said.

Lockheed is eager to demonstrate potential fuel savings because they would offset the high price of lidar systems. Lockheed's goal is to offer advanced airborne lidars for $100,000.

Another technology designed to detect wind shear as well as turbulence in dry air is being developed by Turbulence Prediction Systems of Boulder, Colo. The device, known as an infrared radiometer, measures the changing air temperature associated with wind shear and other turbulence.

The infrared sensor has received little attention in recent years due to concerns about its performance. Those concerns will be alleviated in September when new evidence is presented at a NASA wind shear symposium, said Donald Rogers, Turbulence Prediction Systems general partner.

Rogers also hopes to continue development of the infrared device to provide pilots with a picture of the weather ahead of the aircraft. The current model simply warns pilots of dangerous air currents.
Wind Shear Radar Market Is Not a Blip on the Screen

By DEBRA WERNER
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SAN FRANCISCO — Continental Airlines' plan to equip 483 jets with weather radars, designed to help pilots detect and avoid dangerous wind shear, marks a multimillion-dollar victory for AlliedSignal Air Transport Avionics.

With that order, however, AlliedSignal has claimed only a small portion of the market for radars and sensors designed to help pilots steer clear of wind shear, the rapidly changing air currents that can send an aircraft into a stall or cause it to crash.

The wind shear market, which includes an estimated 600 aircraft per year, is expected to bring tens of millions of dollars annually to manufacturers of radars and other airborne sensors.

Initially, large U.S. carriers are likely to buy most of the advanced radars. U.S. airlines are required by the U.S. Federal Aviation Administration (FAA) to install wind shear detection devices in all planes by the end of the year.

To meet that requirement, the majority of U.S. airlines are equipping their fleets with currently available devices that alert pilots when their aircraft encounters wind shear. Continental, American Airlines and Northwest Airlines received FAA approval to delay installation of that equipment for two years while the airlines test more advanced sensors that provide pilots with 45 to 90-second warnings of wind shear.

"Wind shear has been one of the most severe weather hazards for the flying community," said Gary Frederick, marketing manager for Rockwell International's Collins Air Transport Division, Cedar Rapids, Iowa. "These radars give you time to react so it becomes a non-hazardous event."

The market for radars designed to alert pilots to wind shear conditions is developing more slowly outside the United States. Nevertheless, foreign government and airline officials are beginning to show serious interest in the technology, said Frank Tighe Jr., commercial avionics department manager for Westinghouse Electric Corp. of Baltimore. "More and more is the rest of the world recognizing how frequent and serious a hazard is wind shear," Tighe said.

Three new radar systems designed to help airline pilots avoid wind shear are moving rapidly into production. AlliedSignal plans to begin producing its forward-looking wind shear detector, a modified version of the company's RDR-4A weather radar, in August. FAA certification is expected in October, said Steven Grasley, radar product line manager for AlliedSignal Air Transport Avionics, Fort Lauderdale, Fla.

Eventually, Grasley hopes to phase out production of the older radar and produce only the more capable weather radar, called the RDR-4B. Grasley declined to discuss the price of the weather radars, but confirmed that the new system offering wind shear detection is more expensive than its predecessor.

"The ultimate goal will be to offer predictive wind shear systems that do not cost more than today's radars," he said. "That is in line with what financially strapped airlines want us to do."

Any radar searching for wind shear requires some moisture in the air to function. Radar signals cannot detect wind shear in completely dry air. That condition rarely occurs, however, Grasley said.

AlliedSignal executives are confident they can capture a large portion of the market for forward-looking wind shear detectors.

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Strapped airlines want us to do." Any radar searching for wind shear requires some moisture in the air to function. Radar signals cannot detect wind shear in completely dry air. That condition rarely occurs, however, Grasley said. The Collins radar is expected to receive FAA certification later this year. Once that is accomplished, Collins will begin working with airframe manufacturers to certify it for use in various airplanes.

In contrast to Collins and Allied Signal, Westinghouse is just beginning to establish itself in the commercial market for airborne weather radars. Since Westinghouse has not sold thousands of radars that can be upgraded to detect wind shear, the company will have to work harder to sell its MR-3000 modular avionics radar.

Nevertheless, Tighe said he is confident Westinghouse can succeed because it offers a product that can detect wind shear reliably in relatively dry conditions and find multiple storms.