MAKING THE SKIES SAFE FROM WINDSHEAR
Langley To Flight-Test Advance-Warning Sensors

Langley's 737 research aircraft will be in Orlando, Fla., in August, flight-testing three sensor systems designed to give airline pilots advance warning of a sometimes-fatal weather condition known as windshear.

The Florida deployment follows two weeks in Denver, Colo., where similar flight tests were conducted as part of a joint NASA and Federal Aviation Administration (FAA) effort to put windshear sensors on all commercial aircraft by the end of 1995. The Orlando deployment, operating from Orlando International Airport, will run for two to three weeks beginning August 10.

"Our major role is to provide the industry with the design guidelines and data bases that relate to these instruments so they can go out and design, manufacture and certify a commercially viable product," said Dr. Roland L. Bowles, manager of Langley's Wind Shear Program Office, Flight Systems Directorate.
Windshear, a hazard particularly during takeoff and landing, can force a plane to lose airspeed and altitude and has been blamed for hundreds of airline deaths. Putting advance-warning sensors on planes will give pilots time to avoid the treacherous downdrafts and wind changes. Under strict safety criteria, flight tests will carry Langley's 737 research plane at low altitude directly into thunderstorms and other severe weather conditions to seek out the violent windshear "microbursts."

During the deployments, the 737 research plane is being directed toward microbursts using experimental ground-based Doppler radar.

The flight tests are part of a more than $20-million research agreement signed in 1986 between NASA and the FAA. The agreement calls for the development of technology for airborne windshear detection and avoidance; the 737 flights are the final phase of the joint program.

**Looking forward**

Under a 1988 FAA directive, windshear detection devices are being installed on airplanes to meet a year-end 1993 deadline. But those systems do not detect windshear until a plane already has entered it—possibly too late to prevent a crash.

By contrast, the forward-looking remote sensor systems being test-flown by Langley can detect windshear from 20 to 40 seconds in advance, allowing time for avoidance maneuvers. Airlines that elect a predictive sensor system must install them on aircraft by December 1995, according to the FAA directive.

"If you and your family are flying on a commercial airliner after 1995, there will be windshear detection technology aboard as a result of this NASA program," Bowles said. "I think with this technology we will put this problem behind us."
Langley is testing three types of forward-looking systems:

• The laser-based system, called Doppler "LIDAR" (light detecting and ranging) measures the speed of aerosols—minute particles in the air, such as dust—as an indicator of changes in the wind. Langley is flight-testing this system for the first time this summer.

• Another system uses microwave radar to locate microbursts by measuring sudden, large changes in the speed of raindrops in storm cells ahead of the airplane.

• Another system uses an infrared light sensor, which detects microbursts by measuring air temperature differences ahead of the aircraft.

The flights also will test a Langley-developed data link between ground weather radar and the 737. Researchers are developing a system for automatically transmitting windshear data from ground radar to a display in airplane cockpits. Currently, warnings from ground weather radar usually are relayed by voice—a slower and less precise method.
COLOR PHOTOS & VIDEO AVAILABLE

• The video (VHS or broadcast-quality Beta) is a compilation that includes time-lapse footage of a windshear microburst forming and hitting the ground; footage of NASA's 737 research aircraft flying through two windshear events; filler footage of the 737 taking off, landing, cockpit chatter and instrument closeups; and a 10-minute documentary.

• For glossy color prints of the photos in the fact sheets, order by "L" number:

  Four-page fact sheet:
  Page 1 - L-90-1643
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  Back page: L-92 - L-92-6965

  One-page fact sheet:
  Page 1 - L-91-10089
  Back page - L-92-6965

• Other photos also are available and show: thunderstorm from airplane window; NASA's 737 research aircraft on runway with thunderstorm sky; and colorful computational fluid dynamics (computer-generated images) of windshear microbursts.

• To order photos or video, call (804) 864-6126 or 6120.

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