HEADLINES
TODAY'S NEWS AT A GLANCE

SPACE: Next launch: A commercial Atlas rocket with a communications satellite from Cape Canaveral Air Force Station on Aug. 20. Launch windows extend from 6:39 to 7:54 p.m.; 8:26 to 8:39 p.m.; and 9:10 to 10:20 p.m.


Shuttle update: Florida Today's hot line can help you keep up with the latest developments in the Shuttle program. Call 255-3244 in South and Central Brevard or 632-1555 from North Brevard. Using a touch-tone phone, enter code 6800.
NASA tackles wind shear dangers head-on

The threat of thunderstorms

NASA research pilots are flying through Central Florida thunderstorms this month in search of "microbursts," which can produce dangerous wind shears causing airliners to crash on take-off and landing. About 500 people have been killed and 200 injured in these types of crashes since 1964.

1. When an airliner making a final approach to a runway encounters a microburst, a strong headwind causes the plane to lift away from its intended path of descent.

2. A pilot's natural reaction is to reduce engine power to return the aircraft to its intended path of descent.

3. The plane then encounters a strong downdraft followed by a tailwind. These rapidly reduce the plane's airspeed, and combined with the earlier cut in engine power, can cause the plane to crash.

NASA tests warning systems

Three systems that measure factors used to predict wind shear are being tested by NASA and might give pilots 20 to 40 seconds warning of a microburst — enough time to avoid a deadly crash. They are:

- A laser system that measures the movement of aerosols and dust particles in the atmosphere.
- A microwave radar system that measures the direction and speed of raindrops.
- An infrared sensor system that measures changes in air temperature.

Anatomy of a microburst

A microburst develops when a mass of air rapidly cools, becomes dense, and falls — creating a severe downdraft. The downdraft spreads out in all directions when it hits the ground, like turning a firehose on a wall. Above is a simulated cross section of a microburst that caused a Delta jetliner to crash at Dallas-Fort Worth airport in 1985, killing 130 people.

Warning systems should increase airport safety

By Todd Halvorson
FLORIDA TODAY

Put yourself in the pilot's seat.

You are making your final approach to the runway in a raging thunderstorm, with lightning flashing and cracking around the aircraft.

Heavy turbulence is rocking the jumbo jet and its 150 passengers when you hit a strong, fast headwind that suddenly increases your aircraft's lift — speeding it forward and lifting it away from your path of descent.

A pilot's natural reaction is to reduce engine power to slow the aircraft and get back on course. Cutting power at this crucial moment, however, can be a deadly mistake. You might be in the midst of a "microburst," which can produce a perilous type of wind shear. It can cause aircraft to crash on takeoff or landing.

"It can be very dangerous," said Fred Farrar, a spokesman for the Federal Aviation Administration in Washington, D.C. "What you have is a sudden shift in wind speed and wind direction that can literally cause the airplane to fall out of the sky."

NASA research pilots this month are flying through Central Florida thunderstorms in an effort to develop sensors that can provide advanced warning of microbursts. The test flight program is being conducted with a NASA-owned Boeing 737 now stationed at Orlando.

Source: NASA
P. Scott Harper, FLORIDA TODAY

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International Airport.

“Central Florida is probably one of the most thunderstorm-prone areas in the United States and in the world,” said Michael Lewis, deputy program manager at NASA’s Langley Research Center in Hampton, Va. “And these thunderstorm conditions tend to produce the microbursts that we’re looking for.”

A microburst is a column of air that rapidly cools because of evaporation of rain, snow or ice at high altitude, Lewis said. When the column of air begins to cool, it becomes denser than the surrounding air and plunges toward the ground.

“It can fall to the ground at reasonably rapid speeds, and then when it hits the ground, it spreads out in all directions. It’s like a firehose against a wall,” Lewis said.

The strong downdrafts produced by a microburst easily can top 50 mph and cover an area of one to four miles in diameter.

An aircraft that plunges into a microburst first encounters a strong headwind, which increases the plane’s lift and airspeed. A strong downdraft and a tailwind follow, rapidly reducing the plane’s speed.

Combined with an earlier cut in engine power, the factors can add up to a deadly crash.

Three airline crashes between 1975 and 1985 — which claimed the lives of 390 people — prompted NASA and the FAA to begin tests on a trio of advanced microburst warning systems.

They include:

- A microwave radar system that measures the direction and speed of raindrops. The system emits radio waves that are reflected back by raindrops. The return signals are used to calculate the direction and speed of the raindrops, which in turn can be used to measure rapid or severe changes in wind speed, the key indicator of wind shear.
- A laser system that measures the movement of aerosols and dust particles in the atmosphere. The system — dubbed LIDAR for Light Detecting and Ranging — uses laser beams much in the same way that the radar system uses radio waves. But instead of measuring raindrops, this system measures the speed of aerosols and dust particles in the atmosphere to detect changes in the wind.
- An infrared sensor system that measures changes in temperature. The system can detect the cool temperature signature of a microburst.

The systems are designed to give pilots 20 to 40 seconds warning of a dangerous wind shear. That time, Lewis said, would be enough for a pilot to take life-saving action.

“A good 20 seconds is pretty much enough to cover any condition. It’s that little time that is critical to allow the pilot to add power and get the airplane going faster and higher before it enters the shear,” he said.

Forty seconds warning probably is enough for the pilot to avoid the deadly wind shear completely, Lewis said.

“If you get a little bit more advanced warning, you don’t necessarily have to fly through the shear. You can perhaps maneuver around it.”

These three systems are proving much better than the so-called “reactive system” now used on aircraft.

The reactive system uses standard aircraft instrumentation to measure temperature and wind conditions around the aircraft. Such systems, however, provide no advance warning of microburst conditions.

“The NASA program is looking at these advanced warning sensors because we think there is a big payoff in getting the advanced warning rather than a warning a little late,” Lewis said.

NASA and the FAA have spent about $28 million on the research since their program began in 1986. And Lewis said the microwave and laser systems — made by Rockwell International’s Collins Divisions and Lockheed Palo Alto Research Laboratories, respectively — show the most promise.

“Both of them certainly seem to be able to detect hazardous shear ahead of the aircraft,” Lewis said. “The question of exactly how well and whether it’s good enough in all conditions remains to be seen.”

The NASA 737 will fly through Central Florida skies for the remainder of the month, and the advanced warning technology then will be transferred to aircraft instrument manufacturers. The private companies, in turn, will build warning systems that meet FAA specifications.

All of this will enable commercial airliners — as mandated by the FAA — to select and install approved microburst detection systems on their aircraft by the end of 1993. And the skies will be safer as a result.

“NASA is using advanced technology to rapidly bring these sorts of devices to the market,” Lewis said. “On into the future, they will be commonplace on commercial airliners, and the airliners will be significantly safer as a result.”