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## Sky's the Limit - Universal Avionics: Paul DeHerrera

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Photo: Chris Mooney

A plane flies straight at the Catalina Mountains, far too low to clear the range, before safely veering away at pretty much the last minute.

Time after time after time, two Universal Avionics Beechcraft airplanes – a King Air 350 and King Air F90 – challenge the mountains, testing the company's Terrain Awareness and Warning System.

TAWS warns a pilot of the topography by drawing an electronic envelope around the plane that gets punctured if you get too close to danger.

"We had to fly right at the mountain," said Paul DeHerrera, Universal's chief operating officer. "We're flying all the time. We may fly every day for a while."

The bread-and-butter for Universal Avionics, however, is its Wide Area Augmentation System. This is a flight management system that gives pilots the lay of the land to an accuracy of 3 feet. GPS is good to only about 100 feet, and navigation equipment from the 1980s could be more than 10 miles off.

Universal Avionics Systems Corp., just off Valencia Road near Tucson International Airport, develops and produces flight management systems widely found in business jets and the cockpits of the Horizon Air and American Eagle fleets. "Business aviation includes the Border Patrol, air ambulances, and Evergreen uses them for firefighting," DeHerrera said. "We're on a lot of helicopters for North Sea oil rigs or the Gulf of Mexico."

Universal is also acclaimed for its voice and data recorders, better known as "black boxes," which are aboard some 6,000 aircraft, ranging from major commercial airlines to business jets.

The Wide Area Augmentation System (WAAS) earned Universal Avionics the Innovator of the Year Award and the Pioneering Innovation Award at the Governor's Celebration of Innovation ceremony in November. Also in 2009, the company was named the Outstanding Small Manufacturer of the Year by the Arizona Manufacturing Council.

Universal Avionics was started in 1981 as Universal Navigation Systems in an era when cockpits had several navigation components providing different location readings, which was like having four watches, none with the right time. Company founder Hubert Naimer developed a computer that crunched all that data to give pilots a single answer. Later Global Positioning Systems provided even more reliable navigation details.

Today Universal Avionics has a total of 470 employees at its Tucson headquarters, manufacturing and marketing facilities, its research and development center in Redmond, Wash. and its instrument division in Duluth, Ga. The Tucson complex has 275 employees.

DeHerrera said Universal was the first company to make use of the roughly three dozen federal ground-based reference stations installed around the country. He said the government was "ahead of industry" with these reference stations, which beam precise location signals to GPS satellites to fine-tune accuracy from about 100 feet to 3 feet.

"WAAS was a huge innovation," DeHerrera said. "When the government came up with the ground-based reference stations, a lot of people took a wait-and-see attitude. We decided to jump in and built the airborne computer to support it."

GPS provides pilots en route navigation, DeHerrera said, but doesn't help with runway approaches, where they rely on airport instrument landing systems. WAAS gives pilots an on-board instrument landing system, which is vital for the many smaller airports that don't have instrument landing systems. WAAS can line up a pilot to a runway as low as 200 feet above the ground.

WAAS is the brains for a plane's autopilot as well as the real-life pilot.

Universal outfits about 1,000 business jets a year with WAAS. DeHerrera estimates the company has about a 60 to 70 percent market share. This domination limits growth potential so Universal has expanded into the regional jet and military markets.

WAAS is an after-market item that aircraft owners buy to replace the stock flight management systems. DeHerrera said technology improves so quickly that even new aircraft often have dated technology.

Innovation has also come into play for Universal's black boxes – the voice and data recorders. Universal Avionics has found a unique way to implement the Federal Transportation Safety Board's mandate that black boxes have a Recorder Independent Power Supply so that the recorders continue working even if the aircraft's power supply fails.

"Our competition does it with batteries," DeHerrera said. "We have an energy management system – high energy cells like capacitors that are charged and recharged as needed." These cells do not have to be replaced like batteries, he said.

The manufacturing center in Tucson produces all the Universal Avionics products. These 100 employees build the circuit boards, assemble the boards and finish the components as they move along a self-propelled moving shuttle before undergoing environmental testing, said Steve Pagnucco, general manager of the manufacturing division.

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