New Boeing plane may be marvel of jet age

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Boeing's engineers on the new Sonic Cruiser aren't ready to tell secrets just yet.

But aviation experts say that if the company is right in its claim to be able to produce an efficient jetliner that can cruise just under the speed of sound, they have conquered a problem that has baffled airplane designers since the dawn of the jet age. "There has to be something very clever here and they are just not releasing it yet", said John Hansman, head of the aeronautics and astronautics department at the Massachusetts Institute of Technology. "Those guys are smart and they understand this issue very well," he added. "They would not move forward with this plane unless they are confident they have some means to make it competitive." Boeing executives announced Thursday they will develop an all-new jetliner, known for now as the Sonic Cruiser that will be able to fly between Mach.95 and Mach .98, or nearly the speed of sound. That's about 20 percent faster than today's commercial jetliners. Other than the supersonic Concord, the fastest commercial jetliner for the past 30 years has been Boeing's 747, the latest version of which cruises at Mach .85 (Mach 1 is the speed of sound, or about 740 miles per hour at sea level and 32 degrees Fahrenheit). Pilots will sometimes push the 747-400 above Mach .90. But for only short bursts. The jet's four engines gulp too much fuel at the higher speeds. And there's the rub. Fuel costs airlines big bucks. The bigger the fuel bill, the less cost-effective the plane. For the Sonic Cruiser, the obstacle that must be overcome to make the plane fuel efficient is drag, Hansman said.

Air flowing over an aircraft wing actually moves faster than the plane, Hansman explained. And when that air hits supersonic speeds it produces small shock waves that create drag.

"So as I get closer and closer to the speed of sound, the drag goes up dramatically," Hansman said.

There are ways to minimize that drag, such as sweeping the wings, he said. Boeing has done that with the Sonic Cruiser, which has a delta-wing shape.

Another way to push the plane through that higher drag is to use more powerful engines, he said.

Boeing has done that, too.

The Sonic Cruiser will be powered by two 777-type engines. Those engines are the most powerful ever built for a subsonic commercial airplane. "They are using big engines to cruise fast, and you can do that if you are willing to pay a fuel penalty," Hansman said.

Fuel efficiency is determined by the lift-to-drag ratio at cruising speed, he said. As drag goes up the lift-to-drag ratio goes down. And so does the fuel efficiency.

Airbus was quick to say that it studied the concept of a plane that could fly at near sonic speeds and determined it would burn 40 percent more fuel at cruising speed.

But Mike Bair, vice president for business strategy and development for Boeing's commercial airplanes, said the Sonic Cruiser will pay only a "small" fuel penalty. Even that, he said, will be offset by the jet's higher cruise speed. "Everything we have looked at says this plane will be cost competitive with today's airplanes," he said.

There is no magical technology on the Sonic Cruiser that allows it do that other jets have not -- fly efficiently at transonic speeds. "The design itself is what is revolutionary," Bair said. Boeing said yesterday its top engineers on the Sonic Cruiser are not available for interviews. Until they are willing to talk in detail, aviation experts can only speculate about the new design. Hansman said Boeing's engineers are probably using a technique called advanced computational fluid dynamics modeling to develop a design that minimizes drag at high Mach numbers. Such fluid dynamics modeling allows the design to be studied on computer models.

Another challenge Boeing faces, he said, is how to make the jet stable at the higher speeds.

As a jet approaches the speed of sound, he said, the center of pressure moves around, which makes the plane less stable. Aircraft stability was the main challenge when the sound barrier was finally broken in 1947, he said.

In announcing the Sonic Cruiser development program, Alan Mulally, chief executive of Boeing's commercial airplanes, said the jet would be even more stable than current commercial planes. That stability, he said, comes from the small wing-like canards near the plane's nose.

The canards essentially perform the same function as the horizontal stabilizer at the rear of today's jets. The stabilizer can be moved in flight to trim the plane. The canards on the Sonic Cruiser also move.

Boeing will be working with about a dozen airlines from the United States, Europe and Asia as the development program goes forward. That's what Boeing also did with the 777 program.

So far, the response from airlines to the Sonic Cruiser announcement has been enthusiastic -- assuming Boeing can do what it claims.

Typical of the comments was one from Air Canada Chief Executive Robert Milton, who was quoted by Dow Jones News Service as saying, "It's a tactically brilliant move, if the jet is cost-effective and the price is right."

-- James Wallace