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A Ferrari for the Skies

Aerion's engineers have devised a radical new design for a high-flying, luxury supersonic business jet. Now, they just need a partner to make it

by Matt Vella

The scenarios for supersonic travel are by now well-worn: Jet from New York to Los Angeles with barely time enough to finish a feature-length film, hopscotch the globe to morning, midday, and early-evening meetings on separate continents, etc. But the tangle of technological, legal, and economic factors that led to the demise of the Concorde five years ago has so far kept such itineraries grounded.

Now, Aerion, a small Reno, Nev. aeronautical engineering company, is developing the world's first supersonic business jet, the SBJ. Over the past three months the company has booked nearly $1.5 billion worth of preliminary orders for the $80 million private aircraft it says should take to the skies within the next decade. The most eager would-be customers have put down $250,000 deposits to be first in line. The innovative design, Aerion hopes, will circumvent the nest of problems that doomed the Concorde and ultimately convinced mainline commercial manufacturers Boeing (BA) and Airbus (ABOS) to focus on developing large, long-range jets rather than supersonic aircraft.

In contrast to those commercial planes, the SBJ is aimed at the red-hot market for private business jets fueled by decades-long growth in the number of billionaires as well as a global rise in corporate profits. According to Ray Jaworowski, a senior aerospace analyst with the Newtown, Conn. research firm Forecast International, business-jet production will be worth some $191 billion over the next decade. He expects the market to grow 62% through 2015.

EMERGING MARKET DEMAND

"But, it is still too early to predict how much market share private supersonics might take up on their own," Jaworowski says. Aerion's new plane would likely compete with large and long-range subsonic private jets—such as the tony Gulfstream (GIA) G550—a lucrative segment that currently makes up about 45% of the overall market's value. And because top-of-the-line subsonics cost between $45 million and $60 million, the SBJ would be a premium-priced aircraft, a Ferrari for the skies.

Even a looming U.S. recession and the global economic ripples it could cause have done little to diminish overall demand for private jets. Over the last decade, orders for subsonics from emerging markets such as Brazil, China, and Russia have taken off, picking up any potential slack created by softening Western economies. If anything, some analysts say, the chronic devolution of commercial air travel has only bolstered the case for private service. Aerion, for its part, expects to sell 300 supersonics in the first decade of production, global economic conditions notwithstanding.

What at first blush might seem like a would-be Concorde mini is markedly different from its commercial predecessor. A combination of off-the-shelf parts—it uses a common Pratt & Whitney engine, for example—and a revolutionary wing design allows the plane to fly nearly as efficiently at subsonic speeds as at a supersonic clip. At supersonic speeds the SBJ costs about $10 per nautical mile to operate; subsonic costs increase to about $11 per nautical mile. The minimal disparity in operating costs, something the Concorde lacked, is vital for flying without adding expense over areas such as the U.S. where civilian supersonic travel is illegal.

REDUCING DRAG

For flights over the U.S., the jet will cruise efficiently at Mach 0.98, or 0.98 times the speed of sound. In other parts of the

world—designated routes in remote areas such as Northern Canada, Siberia, and Australia—regulations are less stringent, requiring only that a sonic boom not reach the ground. There, the SBJ will cruise at Mach 1.1. Over oceans the plane can cruise at up to Mach 1.6, or 1,050 mph. The ability to fly efficiently in these variable scenarios is one of the plane's chief strengths, making it competitive with similarly-sized subsonic private jets. The long-range, subsonic Bombardier Global Express XRS' operating costs are also about $11 per nautical mile, but the SBJ travels much faster.

Aerion's key innovation? The plane's so-called "laminar airflow" wing, the result of decades of work by Richard Tracy, the company's chief technology officer. The design helps reduce drag at high speeds. As opposed to the triangular-shaped "delta" wings of supersonics such as the Concorde, the shape is more like a traditional wing and gives the plane a remarkably different profile. Aerion has flight-tested the wing design at NASA's Dryden facility in Edwards, Calif., using F-15s equipped with infrared cameras that capture test data during flight, notably shifts in wing temperature and air flow.

Tracy, a leading scientist in the field of hypersonic aerodynamics, has long worked in both military and civilian aviation, helping to develop such high-profile aircraft as the Global Hawk, a version of the unmanned aerial vehicles patrolling modern battlefields. Before forming Aerion with Brian Barents, the former chief executive of Learjet, and equity investor Robert Bass in 2002, Tracy received numerous grants from the Defense Advanced Research Projects Agency (DARPA)—the Defense Dept. unit charged with developing new technology—to further his research. "The basic equations for the work go back into the 1800s," says Tracy of supersonic science.

TARGET: THE PRIVATE SECTOR

In contrast to military projects and the civilian Concorde, Tracey's SBJ design is aimed squarely at the private sector. To make the idea feasible, Tracy and company avoided numerous technical and cost-adding obstacles by compromising. "We explicitly designed this plane to meet market requirements," says Tracy of the myriad design decisions involved.

For instance, though faster speeds are possible, the SBJ flies at a maximum of Mach 1.6 to reduce the need for costly high-temperature materials. The plane will also fly at a maximum of 51,000 feet, the same altitude as other business jets, thus bypassing the regulatory requirements for high-altitude certification. (By comparison, the Concorde flew at some 60,000 feet.)

And rather than relying on a risky prototype or an expensive, highly specialized engine, Aerion is working with Pratt & Whitney to adapt the widely used JT8D engine. That model is currently used in about a third of the world's airliners, including such well-known planes as McDonnell Douglas' DC-9, and has logged some half-billion hours of flight time. That should help reduce maintenance costs and improve the SBJ's reliability. "From a maintenance standpoint, this airplane will be much like any other large business jet," says Tracy.

DELIVERIES BY 2014?

Aerion, which is investing some $2.2 billion in the SBJ project, expects to announce a manufacturing partner to produce the new design later this year. That could lead to initial deliveries by 2014. "It's tempting to think of Aerion manufacturing the SBJ itself," says Tracy, given the advanced state of the design and engineering, but the company's plans to partner with an experienced manufacturer are firm. Besides the commonly used JT8D, Tracy says most of the new plane's electronic systems and manufacturing components will be similar, if not identical, to other large business jets, making the process of fabricating the supersonic similar to existing subsonics. However, with global demand for all kinds of aircraft soaring, finding a partner with excess capacity could be tricky.

If the company fails to ink a deal with a manufacturer, its order book full of eager prospective customers won't mean much. Aviation industry history is littered with grand, innovative plans that fail to take off for one reason or another. Even if the SBJ makes it to market, it could find itself with stiff competition—other manufacturers, including industry heavyweight Lockheed Martin (LMT), have expressed interest in building similar types of aircraft.

What's more, if regulations for overland supersonic flight are relaxed, something some analysts believe is not out of the question in the long-term, the SBJ's chief advantages could be eclipsed. Still, Tracy is upbeat. "By striking a balance

between speed and efficiency, we really think we've hit a home run," he says.

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