

OPINION

THE WEEKEND INTERVIEW with Tom Vice | By Tunku Varadarajan

A Private Jet May Break the Sound Barrier

Reno, Nev.

Operating out of rental offices near a cluster of gaudy casinos is a quiet little company that's making the most audacious bet in contemporary aviation. Aerion, founded only 15 years ago, is poised to build the world's first civilian supersonic aircraft since the Concorde—whose first flight took place 50 years ago last month.

Although it was built in the slide-rule era, the Concorde was "an amazing technological accomplishment," says Tom Vice, Aerion's chairman and CEO. "It gives Aerion a source of inspiration, and also of lessons learned. It was a noble experiment, but not a sustainable one."

In Mr. Vice's telling, Aerion is building a supersonic anti-Concorde. Its aircraft, the AS2, is not a behemoth but a 12-seat business jet, expected to be flight-ready in 2023 and delivered to customers by 2026—assuming the Federal Aviation Administration will relax its blanket ban on civilian supersonic flights over U.S. territory.

The Concorde last flew in 2003. Aerion plans a new 12-seat plane that can travel at Mach 1.4.

The plane will fly at a speed of up to Mach 1.4—40% faster than the speed of sound, or a bit more than 1,000 miles an hour. Aerion has already presold 24 aircraft at \$120 million each: 22 to Flexjet—a company that provides fractional ownership of private jets—and two to "high-net-worth individuals" whom Mr. Vice declines to name.

The Franco-British Concorde was a massive government-funded project executed by state-owned companies. Only 14 planes were ever put into service, and the last one was retired in October 2003, too polluting and noisy for 21st-century regulators. "The Concorde, when it flew into either JFK or Heathrow, was really loud," Mr. Vice says, grimacing. "Ear-piercing, bone-shattering! It had four after-burning engines! That noise level would not be tolerated by the public today." If a Concorde were "landing at Reno Airport—four miles away—while we were having this conversation, we'd probably have to pause."

Concorde also made no money for Air France and British Airways, which had the aircraft foisted on them by their governments. And its emissions were risibly high by today's standards. For all its mechanical magic, the plane was raucous, dirty and money-losing—the last because of its high development cost, limited market and lack of profitable routes.

In contrast, Aerion is privately held, without a trace of government on its ledgers. Boeing recently purchased a significant stake, acquiring two seats on the five-person board. Robert Bass, the Texan billionaire who first seeded Aerion in 2003, is still the largest investor.

Aerion "seeks no favors from the FAA," Mr. Vice adds. It is de-

termined to ensure that the AS2 complies with existing environmental regulations, which are onerous. "We have to build an aircraft that doesn't just meet the need of speed," he says, "but also the needs of market economics, and those of the regulators." He is adamant that his craft must meet the FAA's latest noise standard, known as Stage 5—"the most strict standard out there."

An improbable green streak runs through Aerion. The AS2 will be designed to fly "100% on biofuels, since we're committed to a significant reduction in emissions," Mr. Vice says. Aerion has selected a fuel called SPK, a bio-derived synthetic paraffinic kerosene that isn't yet mass-produced. It's currently available only "in small quantities, from a refinery out of Los Angeles."

Mr. Vice, 56, went to work in 1986 for Northrup Corp. while still an undergraduate in aerospace engineering at the University of Southern California. "I was the lowest of the low engineers," he says. "Bottom rung. And I would work 10- to 12-hour days and then drive to the campus to attend classes." Northrup assigned him to work on the B-2 Stealth Bomber even before he'd graduated. "I must have been viewed as pretty bright," he says, not quite coyly. Mr. Vice eventually became head of Northrup's Aerospace Systems—overseeing an \$11 billion business with 23,000 employees—before moving to Aerion in March 2018.

His parents separated before he was born, so for a time "I was raised by a single mother," says Mr. Vice, whose surname is his mother's maiden name. She married a U.S. Air Force officer, and young Tom lived on bases in Hawaii, Korea and the Philippines. Guiding a supersonic plane to market is the culmination of a decades-long love affair with aircraft. His stepfather was "a mechanic in electronics and weapons, and so I was around airplanes even when I was in 11th and 12th grade."

I have had to squeeze these biographical details out of Mr. Vice, who is much more comfortable discussing airplanes than his personal life. A tall, lean man, dressed in Nevada-casual jeans and a blue shirt, he becomes animated when talking about the history of civilian flight.

"The greatest leap in speed on the civil side occurred in 1958," he says, "with the Boeing 707, which created a series of high-speed flights that hadn't been accomplished before." After that came a long period of stagnation. "It took 55 years to go from the Wright Flyer to the 707. That's 7 miles per hour at ground speed in 1903 to 550 miles per hour in 1958. But it's been 61 years since the flight of the first 707, and we're still stuck at pretty much that speed."

Speed has accelerated greatly "in almost every area," says Mr. Vice, "except civilian flight." That he finds difficult to explain. "There was a period of just incredible acceleration with the Concorde," he



says, but civil aviation has fallen back to its languorous 1950s pace since that craft was grounded. The focus in flight is on endurance, not speed.

This brings out the philosopher in Mr. Vice, even as it makes him indignant. "We're disrupting the future of mobility with our supersonic AS2," he says with a wonky earnestness. "Time is humanity's most precious resource." He recently spent 12 hours going from Los Angeles to Tokyo for a four-hour meeting, then took 10 hours to come back. It must have been a tedious flight, for he recalls the food he ate: "Airlines think about what these long flights do to us. They think about the menu, what's good and what's bad. Nonstarchy food like cauliflower is perfect for a long-haul. But I don't like cauliflower. I don't think cauliflower is the answer to global mobility," he says, unamused.

Had he flown to Tokyo on Aerion's AS2, he'd have shaved a couple of hours off his airborne time each way (even though that distance is at the limit of the plane's range, which would mean flying subsonic part of the way). Aerion's own calculator tells us that its craft would make a flight from New York to London two hours shorter, and one from New York to Los Angeles quicker by an hour. From London, you'd save three hours on a flight to Sydney and 90 minutes to Dubai.

Mr. Vice invites me to reckon the number of hours I've wasted on planes in the past 20 years, before bemoaning the sacrifices he's made by "spending time on planes instead of being with my colleagues, or growing my business, or watching my daughters' piano recitals..." His voice trails off, then rises to express a bombastic statement: "We're going to build a machine that gives back time to humanity."

So why build a business jet? Why not a big, fast commercial airliner? "I'll go back to Concorde as a guiding lesson," Mr. Vice answers. "We asked ourselves: Was there a market for a large plane? What market was it? What are the economics, the cost of developing it, and the return?" Aerion concluded such a craft wouldn't make

economic sense in the current climate. A business jet is easier to put together and caters to customers who are relatively insensitive to fluctuations in fuel prices.

The market appears to bear out the decision. "We don't start delivering airplanes until 2026," Mr. Vice says, "and yet we're already seeing demand for the aircraft. We have a \$4 billion development cost, so we have the economics to pay back the development cost." He does not rule out bigger planes "down the road."

Aerion's most fundamental challenges are technical. Foremost was finding a suitable engine that would enable the AS2 to fly supersonically over water and at very high subsonic speeds over land. "An engine did not exist," says Mr. Vice. "We looked at every single engine in the U.S. and overseas, and there just wasn't one."

The past 60 years have seen "tremendous R&D and new technology for subsonic engines," he continues. "But what's required for an efficient subsonic engine is almost the opposite of what's required for an efficient supersonic one." For the AS2's precursor, the AS1, Aerion used "a military engine that we were trying to modify for the commercial space." But the project was a flop. "Not all of the things worked the way we wanted them to," Mr. Vice sighs.

Aerion resolved the engine problem in the only way it could—by getting a new one, "the first supersonic engine in 55 years." It is called the Affinity and was developed by General Electric. Mr. Vice argues that the engine could be one of the most significant breakthroughs in the history of aerodynamics: "We've built an engine that provides the level of efficiency, the low emissions and the thrust for supersonic speed." Without getting into specifics, he makes clear Aerion's deal with GE is exclusive: "We have ensured that our competitors cannot gain access to our engine for a very long period of time."

There are two other entrants in the supersonic civilian field, but Mr. Vice professes to be unruffled. Denver-based Boom Supersonic is working on a 50-seat Mach 2.2 plane, and Boston-based Spike Aerospace plans a Mach 1.6 busi-

ness jet with a capacity of 18 passengers. Neither has Aerion's range of partners—which include Honeywell as well as GE and Boeing—nor an engine. And Boom has an FAA problem, suggested by the name:

"The challenge they have is that if you fly at 2.2, you have to try to get the regulations changed to allow for that kind of noise," Mr. Vice says. "I don't think the regulators will ever get there."

Aerion faced a similar problem when it tried to adapt military supersonic engines for the AS1. "The military engines are very sophisticated and efficient," Mr. Vice says, "but they're operating in military corridors." They couldn't be used for "flying in and out of airports that people live around—JFK, Teterboro, Charles de Gaulle, LAX."

Anyway, for national-security reasons, a military engine wouldn't be exportable.

Noise is a major issue with all aircraft. A partial solution is bypass fans, which distribute air to make engines quieter and increase fuel efficiency at subsonic speeds. But while they can also reduce the noise of supersonic engines, it comes at the cost of reducing thrust and cruise speed. The Affinity offers a compromise—a moderate-bypass engine. The bypass ratio is large enough to help the AS2 meet FAA noise standards, but not so large as to hinder supersonic speed.

The bypass ratios do limit maximum speed to Mach 1.4, but the AS2 would still be "the fastest subsonic airplane in history and the only supersonic business jet ever," says Mr. Vice. What's more, the AS2 will be able to fly over land at Mach 1.2—20% faster than sound—without producing a boom on the ground.

"That would be a first," he says. Mach 1.2 is also known as "Mach cutoff, the fastest airspeed at which a sonic boom will dissipate before reaching the ground." Aerion has trademarked the capability to fly at Mach cutoff speed as Boomless Cruise. He credits the achievement to a "convergence of technology": "aerodynamics, an understanding of atmospheric phenomenology, real-time satellite information, and exquisite new sensors on the airplane."

Even if the AS2 can fly over land with no sonic boom, the company must reckon with FAA regulations that prohibit supersonic overflight of the U.S. The FAA "is starting to look at the permissibility of overflight again," Mr. Vice says. "So we're going to be building this technology and showing it to them, proving that we can fly this reliably, at this speed, with no boom on the ground."

Is he confident the FAA will change the regulation? "Absolutely." Then, he promises, "we'll be the first aircraft in history to fly at supersonic speed over the United States."

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