

## MIRACLE ENERGY MACHINE

How to Turn Toxic Waste into Clean Power **P.56**

## BUTTERFLIES BATTLE TERRORISM **P.38**

# POPULAR SCIENCE

THE  
FUTURE  
NOW

## 33 HOT PRODUCTS



Is This  
Your Next  
Remote?

**P.15**

# SUPERSONIC REBORN

This Silent  
Luxury Jet  
Flies Coast-to-  
Coast in 2 Hours **P.64**

THANK  
GOD IT'S  
MONDAY!  
YOUR JOB  
IN 2017  
**P.40**



## CONCEPTS & PROTOTYPES

### INNOVATION BEGINS HERE

#### QUIET SUPERSONIC TRANSPORT (Q5ST)

**PURPOSE:** High-speed private flights over land and sea  
**MANUFACTURER:** Lockheed Martin and Supersonic Aerospace International  
**RANGE:** 4,600 miles  
**SPEED:** Mach 1.6 to 1.8 (approx. 1,056 mph to 1,188 mph)  
**DIMENSIONS:** 132.1 ft. length, 63 ft. wingspan  
**CAPACITY:** 12 passengers, 3 crew  
**COST (PROJECTED):** \$2.5 billion development cost; \$80 million per aircraft  
**FIRST FLIGHT (PROJECTED):** 2011

► **SKY ROCKET** Sophisticated aerodynamic shaping muffles sardum-blistering sonic booms, permitting the Q5ST to fly over land at supersonic speed.

# ALL SONIC, NO BOOM

Long hampered because the planes were too loud to fly over land, supersonic air travel is now on its way back—without the big bang  
BY ERIC HABERMAN ILLUSTRATION BY NICK KALOTERAKIS

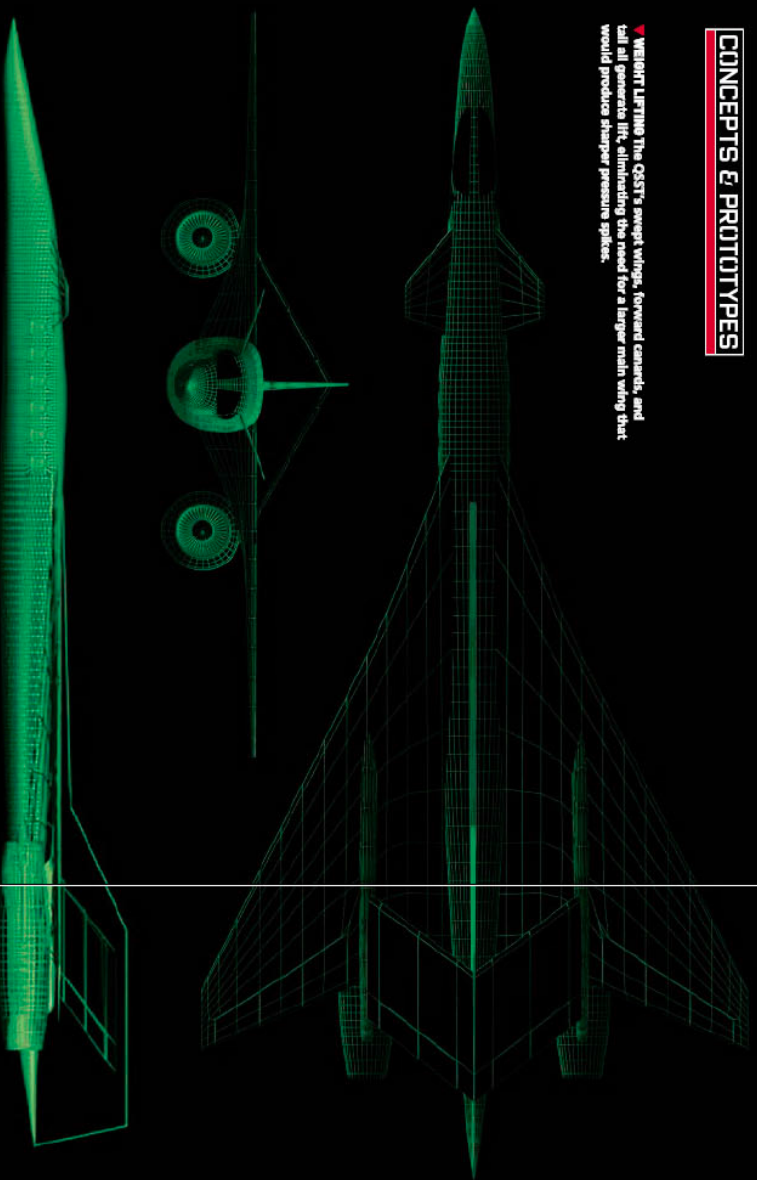
**IF YOU'RE EVER LUCKY ENOUGH** to fly a Quiet Supersonic Transport between New York and Los Angeles, you'll have just enough time to get through a movie—a short one. Instead of the usual six hours, it will be a 1,100mph, two-hour hop. The Q5ST, as the proposed luxury private jet is known, could be the first civilian supersonic plane approved for overland routes, thanks to aerodynamics designed to muzzle its sonic boom. Lockheed Martin's Skunk Works has been developing the project for six years under a \$25-million contract from Supersonic Aerospace International (SAI), founded by Michael Paulson, son of Gulfstream founder Allen Paulson. The 12-passenger Q5ST would fly at between





## CONCEPTS & PROTOTYPES

► **WEIGHT LIFTING** The QJST's swept wings, forward canards, and tail all generate lift, eliminating the need for a larger main wing that would produce stronger pressure spikes.



**POPSCI** See more pictures at [popsci.com/qjst](http://popsci.com/qjst).

47,000 and 57,000 feet with a range of 4,600 miles (Chicago to Rome, for example), and it doesn't need an extended runway. Configured with 12 club chairs, a spacious bathroom and a sweet A/V system, the QJST is aimed at diplomats or executives with plenty of money—but little time—to spare.

Designed to fly between Mach 1.6 and 1.8 (1,056 to 1,188 mph), the two-engine quill-wing aircraft would leave a sonic wake that's only one hundredth the strength of the Mach 2-capable

Concorde, the 100-seat speed demon that wound up permanently grounded following a fatal accident in 2000. (High maintenance costs for the aging fleet and a struggling airline industry also contributed to its demise.)

Eliminating bone-rattling sonic booms is a major feat of aerodynamic hocus-focus. When an aircraft travels faster than the speed of sound, it creates pressure waves in the air that collide with one another faster than they can dissipate, resulting in a loud

crack, or sonic boom. The QJST, though, it shares its general shape with the Concorde, it's less than half the size and uses fine-tuned aerodynamics to control the pressure generated as the plane displaces air at supersonic speeds. With air disturbances along the craft evened out, the QJST generates more shockwaves of smaller magnitude rather than two explosive reports. Tom Hartmann, the program manager at Lockheed, expects the boom to be imperceptible—quieter than a kite flying overhead.

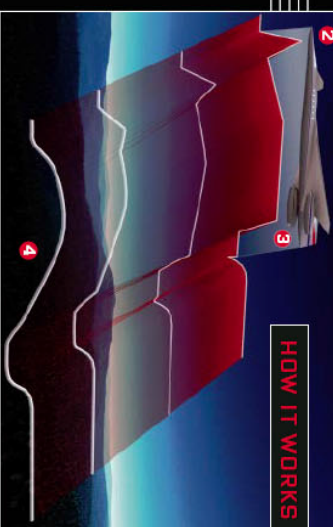
Another key to quiet flight is its broad distribution of lift-generating surfaces. The QJST's canards—the small wings near the front of the fuselage—and swept-V tail provide substantial lift, preventing the sharp, loud-boom-generating pressure change typical of larger, wider wings. Hartmann says the QJST is so sleek that it can fly 10 percent farther on its fuel supply supersonically than it can at subsonic speeds. "We could easily design a low-sonic-boom aircraft if it didn't have to

fly anywhere," he says—that is, if the design didn't have to take fuel efficiency into consideration. "The challenge is to fly a long way. The hard part of this was to develop a low-drag design."

The inverted-V tail also allows the two engines to be mounted far aft—a design feature that further separates the pressure waves and keeps them from crashing into one another. Normally, this engine placement would require extra material to support the cantilevered weight, but the inherent strength of the V tail's truss shape compensates.

The Federal Aviation Administration restricted the Concorde to transonic flights because that craft created sonic booms strong enough to rattle dishes on the ground below. Paulson says the QJST will meet the FAA's stringent new noise regulations, which took effect at the beginning of

## HOW IT WORKS



**WAVE FORM** Sonic booms happen when pressure builds up too fast around wings and engines. In a conventional boom flight, the pressure migrates forward and backward. That movement generates two pressure spikes at the front and rear, creating a classic M-shaped wave [1], and the result is a loud double bang. To soften the boom, QJST aerodynamicists sought to spread out the pressure points along the fuselage itself. The new aircraft (above) generates only moderate shocks at the nose [2] and tail [3] with no spike in the middle. The stretched nose creates a small but distinct pressure spike at the front, as does the rear engine placement. These two small spikes counter the tendency of the wave to travel forward and backward. By the time the sound reaches the ground [4], the N-wave has diffused into a barely audible poof.

2006, and he's hopeful that the quiet design will prompt a lifting of the ban on overland supersonic flights.

SAI is evaluating engine designs from General Electric, Pratt & Whitney and Rolls-Royce for a unit that produces 33,000 pounds of thrust (on par with a midsize airliner), for 66,000 pounds of total thrust from two engines. Paulson plans to settle on a design in the next year, assemble an international consortium to manufacture the jet, and put it on the market by 2014 for about \$80 million. He'd like to roll out a fleet of 300 to 400 in the next 20 years. "The Concorde was a magnificent aircraft," Paulson says, "but basically, it was 1960s technology. This is an idea whose time is overdue."

*Eric Hagerman is working on a book about exercise and the brain for Little, Brown.*