Supersonic business jet

The QSST-X program

"Why is supersonic flight necessary?" asks J.Michael Paulson. "Time is virtually the only nonrenewable resource we have, so supersonic flight saves us this precious commodity by providing double the opportunity to achieve optimum productivity. QSST-X is the next logical step to advance aviation in the 21st century."

As we met for lunch during NBAA2013 in Las Vegas, Nevada resident J. Michael Paulson, CEO Supersonic Aerospace Intl, (SAI), explained how his program is moving forward again, with a new enhanced project, the QSST-X. "My late father, Allen Paulson, former owner and CEO of Gulfstream, made it his passion to find a path that would lead the market to a truly revolutionary supersonic aircraft." From the late 1980s until his passing in July 2000, Allen Paulson tirelessly advocated research to see if it was possible to build a supersonic business jet that was quiet enough, "essentially getting rid of the sonic boom", to fly over continental land areas. In theory it could be done.

SKUNK WORKS

In his final years, Paulson began talks with the design team at the famed Lockheed Martin 'Skunk Works'. The team had great aviation engineering expertise, notably with over five decades of work on revolutionary supersonic aircraft, including the SR71 Blackbird, F104 Starfighter, and the F117 stealth fighter. "Unfortunately my father passed away in July 2000, and never got to see the fruition of his early work to get a quiet supersonic business jet built," deplores Michael Paulson. "He passed me the baton before he passed away: "I want you to get this project done" and I promised him I would. So I continued to engage Lockheed Martin on establishing a program and founded Supersonic Aerospace International. In May 2001 we finalized our contract for the critical Phase 1 feasibility study, which used the Skunk Works facilities and staff at Palmdale, California.

NBAA2004 ANNOUNCEMENTS

SAI's QSST, or Quiet Supersonic Transport capable of 'virtually boomless' supersonic flight was announced in October 2004 at NBAA in Las Vegas, at the same time Aerion announced their program. These were exciting times in business aviation!

The design had to be exceptionally quiet, so the team concluded that the maximum acceptable sonic overpressure could not exceed .5psf to achieve a 'low boom' design.

The QSST design put a "Q" into supersonic flight with a patented design capable of supersonic flight at only 0.3-0.5 psf overpressure, which makes the QSST over 100 times quieter than the now-retired French-British Concorde supersonic airliner.

To date SAI and Lockheed Martin have invested over US$70 million in research and development on the QSST and 'quiet supersonic' technology

"After the public announcement I hired a management team and some financial advisers to find funds for the next phase," pursues Michael Paulson. "We had to bring in partners, and also engage the engine manufacturers, Pratt & Whitney, Rolls-Royce and General Electric to see if there were an engine they could design for this aircraft. All three came back with very viable designs, advance technology engines. At that time I was also engaging with airframe OEMs. We went through a couple of long negotiation periods and we came very close to putting a program together." Manufacturers were interested, but at the time they all were developing their own projects. Dassault for example was busy producing the 7X, while Gulfs-

By Sylvie Péron

"We need to be bold and committed to aviation progress in our second century of flight, and the QSST-X accomplishes this endeavor."

tream was developing the G650 and G280, to mention only those two. In 2009, the patents and intellectual property had been licensed with a prominent aviation and investment capital group for 18 months. To date SAI and Lockheed Martin declare to have invested over US$70 million in research and development on the QSST and "quiet supersonic" technology. Although the 2008 global economic meltdown put a damper on progress towards production of the QSST, market studies by SAI and the licensee had shown there was a niche for a larger 'quiet" supersonic aircraft that could also be used as a 20-plus-passenger all first class airliner.

ALL FIRST CLASS QSST-X

Dubbed QSST-X for extended range and extra passenger cabin size, this newer, larger variant of the original supersonic business jet is designed to fly twice as fast as current subsonic aircraft with a range of over 5000 nm.

"The QSST-X, configured as a 20 to 30-passenger airliner is quite a larger aircraft than the one we originally designed, which carried no more than 12 business passengers. However, it gave us a good basis to make a larger QSST-X. Thus we can tap into the "first-class" airliner market as well as the large business jet market." By 2009 the licensing agreement was completed and Lockheed Martin was engaged again "to see if utilizing the original design we could make it larger, increase the range and keep the "Q" in the larger variant." While initial design, market studies and financial prospects of this larger variant of the QSST looked both promising and viable, the project unfortunately did not move forward with the licensee. "This was primarily due to internal factors and disputes among the partners and the global economic outlook at the time was also a factor. However, I believe that both the aviation industry and the global economy have weathered the storm and I'm hopeful that the time is ripe for getting this exciting project back on course and fully underway."

Based on preliminary study and business case model, the QSST-X would be viable at US$ 130-140 million

Some significant advances in engine design and airframe manufacturing

have been achieved over the past few years. These can now be applied to the QSST-X, with the potential to give the aircraft more range and efficiency through better specific fuel consumption (SFC) and substantial weight savings with advanced composites and aerodynamics.

INVERTED V-TAIL

The first task now, says Paulson, is to find an aviation OEM and to assemble a US/International consortium to build the aircraft and to secure the necessary funding for the project. "I currently have some agents working for me on the international market. Also, I'm in discussions with several parties, and hopeful I'll get the funding in place or a partner to come onboard within the next six months to get the project fully underway."

The new-improved model 'X' is quite larger than the original QSST, with a cabin actually larger than that of the Gulfstream 650. And it is a totally different design than that of the Aerion, which is not a "low-boom" design. "The QSST-X features an advanced Delta wing design, which Concorde had, but what is unique to our design is the inverted V-tail. No other aircraft in production has it and we have it patented. Lockheed Martin found that the inverted V-tail was very beneficial and conducive to achieving the "virtually boomless" design as it changes the sonic signature coming off of the back of the aircraft, among many other design benefits."

Based on SAI's preliminary study and business case model for the QSST-X, the aircraft would be viable at US$130-140 million. Five different market segments have been identified. The largest market would probably be the airlines and then business aviation, where large bizjets have been very popular over the past years and forecasters are predicting a business jet market up to 24,000 aircraft over the next 20 years. High net-worth individuals, fractional business aviation companies and worldwide governments complete the list. "The QSST-X would be an amazing tool for governments worldwide to send diplomats and high level people around the world in half the time!"

The QSST-X is designed to fly twice as fast as current subsonic aircraft with a range of over 5000 nm

Low-boom solution

The Inverted 'V'-Tail configuration provides a unique solution to low-boom, low supersonic drag, and structure design imperatives.

Permits aft-mounting engine on wing
- **Aft c.g. crucial for low-boom trim**
- **Favorable Wing/Inlet interference**
- **Bending relief due to engine mass**

Provides lift 'high and aft' for tailoiring low-boom distribution

Solves structural dynamics issues
- **Wing and empennage flutter**
- **Flex-to-rigid ratios**
- **Permits aft body area**

'Pinch' drag

Reduces weight
- **Externally braced wing**
- **Simply supported empennage**
- **Reduced stiffness requirements**

Increases flight control redundancy