U.S. Keeping the Door Ajar On Second-Generation SST

By Thomas Love
Washington Star Staff Writer

The United States is quietly in the midst of a modest — but still multimillion-dollar — program to develop the technology necessary to produce a second-generation supersonic transport plane.

A final decision on whether to proceed with such a project is still several years off, but even today may be too late for the nation's aerospace industry.

By the time the first American advanced supersonic transport (AST) could roll off the assembly line — eight to 10 years at the earliest — the limited market for such a plane may have been preempted by the British and French.

Although the European version — a sort of Concorde II — would not be as advanced a plane as the U.S. version, it could be a case like Gen. Nathan Forrest’s getting there "fastest with the mostest."

But the single bright spot for the United States in such a scenario is that one of the American companies in the AST race just might be a partner in the European consortium producing the plane.

WHEN CONGRESS decided to scrap development of the Boeing-General Electric SST in 1971 after long and acrimonious nationwide debate which caused some still-unhealed wounds, the resulting vacuum was filled by a British-French company which had flown the first Concorde in 1969. The only other SST is the ill-fated Soviet TU144, which remains grounded because of serious operational problems.

At first the Concorde was seen by everyone but its most rabid backers as much of a white elephant. But the plane — despite all its major drawbacks — has proved popular with the flying public and may even be approaching an operational break-even point.

But perhaps most important for its producers, British Aircraft and Aerospatiale, production of the plane provided practical experience and knowledge which give the companies a lead toward production of a more sophisticated second-generation plane.

Richard Fitzsimmons, director of advanced program planning for McDonnell-Douglas, estimates that the British and French are $4 billion and several years ahead of the Americans.

AND ALTHOUGH he won't say so in so many words, he obviously views this as an almost insurmountable obstacle in the race to produce an AST.

With views like this, it’s not surprising that McDonnell-Douglas is the single American company actively courting a deal for joint development — and possible production — with the Europeans.

The company has already signed a "white paper" with the two Concorde producers for a joint research and development program. And the firm is already in a joint engine development and test program with Rolls Royce — the British producer of the Concorde power plant.

But Fitzsimmons and his company are seen as the mavericks in the field.

His counterpart at Boeing, Vaughn Blumenthal, comes as close to ruling out such an arrangement as could be done at this point.

"It has been discussed, but I don’t see it as a possibility, myself," he said. "It’s not very practical."

Lockheed’s chief engineer for advanced design and technology, takes a more neutral stand. "I would guess (that) because of the development costs, we will be looking for a partnership," he said. "It would make sense for (them) to come to us. Lockheed would be receptive, but we’ve made no overtures."

THE U.S. EFFORT toward an AST has been very modest in terms of aircraft development.

After the 1971 congressional decision, about $17 million was spent by the government to close down the SST project and continue with already-underway experiments.

Then, in 1973, the Advanced SST Technical Program was initiated under the direction of the National Aeronautics and Space Administration.

This year, according to Jack Sudrith, program manager for the NASA program, the government will spend $9.7 million on the AST in general, plus an additional $5 million on continuing development of the variable-cycle engine.

The five private companies involved in the program — airframe manufacturers McDonnell-Douglas, Boeing and Lockheed and engine makers General Electric and Pratt & Whitney — have invested a larger amount of their own money but won’t say just how much.

THE VARIABLE-CYCLE engine could be considered the cornerstone of the U.S. effort to develop the AST.

As explained by Robert J. Payzer, General Electric’s manager of pre-
SST

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tonary design, the engine would convert in flight from the standard subsonic turbofan to a turbojet for supersonic operations.

With this engine, he explained, most of the noise problems of the Concorde will be eliminated and fuel efficiency — a major problem with the British-French plane — would be improved.

But, in the view of Pratt & Whitney's Nigel Muir, it would take five years of all-out effort to get the engine into production. And no one expects anything close to an all-out effort.

There's another possible way around the noise problems — the route being explored by Rolls Royce and McDonnell-Douglas. A mechanical noise suppressor is attached to the rear of a supersonic engine.

In this particular case, the low frequency sound is changed to a high frequency sound which can then be absorbed.

While this will not help the engine's fuel efficiency, it could be ready years before the variable cycle engine.

The airframe of an American AST would be at least twice as large as that of the present Concorde and probably larger than a "Concorde II."

THE NASA PROGRAM is aimed at a plane which would carry about 250 passengers some 5,100 miles compared to the 100 the Concorde can carry 3,350 miles. The plane would be 35 percent more efficient aerodynamically than the Concorde, 7 percent quieter and cost 56 percent less to operate per seat-mile.

But, of course, these parameters are not chiseled in stone. Fitzsimmons, for instance, said that if he were starting with a new design today, he would aim at about 300 passengers.

In the view of most people involved in the development process, there probably would be a market for 400 to 600 planes, depending on a very large number of factors. This market probably would not support more than a single plane — or family of planes.

The family concept is one developed by Boeing, which is seen as a major breakthrough.

Subsonic planes are frequently produced in different-sized versions for different markets — for instance, the Boeing 747SP, shorter version for extra-long hauls, and the stretch DC-8.

But to be aerodynamically efficient, supersonic planes must maintain a specific ratio between body length and width.

UNDER BOEING'S scheme, a single plane would be built in such a way that larger and smaller bodies could be attached to the same wing. This would be accomplished by making the body with load-bearing surfaces on top and bottom so the cross-section of the body could be changed without changing anything else.

Frank Neumann, deputy to the director of Boeing's SST program, said the company was thinking about three planes in the family, carrying from 200 to 320 people.

But whatever the eventual design of an American AST, it will take years of expensive development before even a decision to produce can be made.

Just proving the technology necessary would probably take three to four years, it is estimated.

Although one might think U.S. manufacturers would have an easy time with an AST because of their extensive experience with supersonic military aircraft, this is not true. For instance, an AST must be designed to fly 70,000 hours at supersonic speeds with skin temperatures above 250 degrees fahrenheit. For comparison, the B-1 bomber was being designed for 380 hours at those temperatures.

After technology verification, it would probably take another five to six years before the first production model came off the assembly line.

But who would use the AST and what would they use it for, if it is built?

THE CONSENSUS is that the planes could be utilized at supersonic speeds in over-water routes only — particularly in the Pacific basin. A McDonnell-Douglas computer has identified the routes between some 1,000 city pairs as reasonable for an AST.

But there is no thought that the AST will replace the subsonic jet in the way the jet replaced the piston-prop airplane. They will be just too expensive.

As the future is generally viewed, the AST will replace the subsonic plane for full-fare coach and first class service, while subsonic craft will stay in service for the pleasure traveler on a "14- to 45-day" discount fare.

And, in contrast to the Concorde, the AST will probably not have a surcharged fare.
Engineer readies model of McDonnell Douglas jet plane for testing in trans-sonic wind tunnel.

MAXIMUM TAKEOFF WEIGHT = 705,000 LB
53,500-LB THRUST ENGINES
WING AREA = 9400 SQ FT

SPAN
131.4 FT

OVERALL LENGTH
291.7 FT

HEIGHT
54.8 FT