Gulfstream/Sukhoi SSBJ ‘challenges’ identified

BY GRAHAM WARWICK

Gulfstream Aerospace and Sukhoi have agreed a twin-engined configuration for their planned supersonic business jet (SSBJ). A model of the twin-engined SSBJ will be displayed in the Soviet pavilion at the Paris air show in June.

When Gulfstream and Sukhoi announced their teaming arrangement in September 1989, they planned a first flight of a prototype three-engined SSBJ as early as 1993. Now they believe a twin-engined aircraft could fly early next century, provided certain technical challenges are overcome.

“The issue is technical readiness,” says Gulfstream senior vice-president engineering and technology Charles Coppi, adding: “We could put an SSBJ into the air today and it would be just a little bit better than Concorde.” By waiting until aerodynamic, propulsion and materials technology has advanced sufficiently, the team believes it can meet the demanding specification which has emerged from Gulfstream’s market studies.

The SSBJ is envisaged as an $40 million-50 million, eight- to 18-passenger aircraft with Mach 2 cruise speed, 7,400km (4,000nm) range and 6,500ft (2,000m) take-off distance at a 45,400kg gross weight. These requirements cannot be met using existing technology, Gulfstream admits. “An SSBJ based on today’s technology appears to be too big and too costly to be commercially viable,” it says.

A three-engined aircraft weighing over 68,000kg was Sukhoi’s first solution, designed using Concorde-level technology, says Coppi. Sukhoi is responsible for configuration definition and Gulfstream for design requirements under the terms of their agreement.

The latest Soviet twin-engined design weighs in at 48,000kg and, by the year 2000, take-off weight will be down to around 44,000kg. To reach that goal, the SSBJ team hopes to capitalise on technical and political advances necessary if a next-generation supersonic airliner is to fly early next century.

Where Boeing has forecast lift:drag ratios of about 8.8 for its High Speed Civil Transport (HSCT), Gulfstream/Sukhoi studies suggest the smaller SSBJ will achieve only around 7.3 because of its much lower fuselage finesse (length:diameter) ratio. With a 1% reduction in supersonic drag yielding a 2% lower take-off weight, Gulfstream is pinning its hopes on NASA work on supersonic laminar flow as a means of reducing cruise drag.

Improved engine technology is another key area, says Gulfstream. Each 1% reduction in specific fuel consumption will yield a 2% lower take-off weight. Airport noise is a critical issue as the SSBJ must be able to operate supersonically at 45,000ft. Gulfstream says. The team’s major concern is reducing sonic boom; the SSBJ must be able to operate supersonically over land otherwise the market for such an aircraft is unlikely to exist, says Gulfstream. Here, the team hopes to benefit from the multinational HSCT effort to define an acceptable sonic-boom signature and to have restrictions on civilian overland supersonic flight removed.

Mooney introduces exclusive MSE

Mooney Aircraft has introduced a limited-edition MSE light aircraft aimed at encouraging more owner/pilots to move up to high-performance singles. At $144,900, the IFR-equipped MSE Limited is claimed by Mooney to undercut its main rivals.

The 149kw (200hp) aircraft has the 73kg increase in useful load, to 533kg, introduced on all MSEs built since April, says Mooney. The dual-control MSE Limited comes equipped with a Bendix/King IFR avionics suite, including DME.

Mooney, which recently terminated its partnership with Aerospatiale subsidiary Socata on the TB700 turboprop single, currently produces the 168kt-cruise (310km/h) MSE, 220kt-cruise turbocharged TLS and IFR-equipped ATS advanced trainer.

It has also proposed the aero­batic Mooney EFS for the US Air Force’s Enhanced Flight Screening trainer programme.

Gulfstream/Sukhoi studies suggest every kilogramme saved results in a 6kg reduction in take-off weight.

Safety considerations include crew visibility. A traditional windshield entails a significant penalty in supersonic-cruise drag, says Gulfstream. The US/Soviet team has rejected a sharply raked windshield and Concorde-type hinged nose — the former because of internal reflections, the latter because of weight — and is pursuing both synthetic vision, combining television and infra-red sensors, and an indirect optical viewing (periscope) system.

Another safety concern is protecting digital avionics from high-intensity electromagnetic fields, such as those around high-power radio transmitters. Traditional metal shielding places an unacceptable weight burden on the SSBJ, says Gulfstream. Fibre-optics meet the requirement but need further development. Present connector technology prevents the design of an avionics architecture with line-replaceable units for ease of maintenance.

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