CORPORATE CONCORDE COMES EVEN CLOSER

When Concorde took its final commercial flight in October 2003, aviation pundits predicted that the supersonic era was over for good. They were wrong. By Christian Sylt

As EuroBusiness exclusively revealed in March 2003, Concorde will have a successor. Concorde's former chief pilot, Mike Bannister, told the magazine that the follow-up will have between 250 and 300 seats and a transpacific range – twice that of Concorde. And in November 2003 the largest aerospace company in Europe, EADS, announced that it is in discussion with Japanese manufacturers and its trade ministry to build the plane, which will also cruise at twice Concorde's speed. But there's still a long way to go.

Concorde was prohibited from flying over land at supersonic speed because of the loudness of the sonic boom produced as the plane broke the sound barrier. Being restricted to a handful of routes severely diminished its financial success and ultimately sealed its demise. But the problem of how to suppress sonic booms still hasn't been solved and this is essential to make a viable business model for a new supersonic plane whether commercial or corporate.

But with aerospace giant EADS backing the construction of Concorde's successor, regulators will be put under increased pressure to relax noise restrictions – unless sonic boom suppression technology is developed. So although EADS doesn't have a firm timescale in place for its project, government investment into sonic boom suppression has started to step up whilst aviation administrations have begun to fast-track research regarding rule-making on sonic booms.

In November 2003 the US Federal Aviation Administration hosted a technical workshop on the creation of civil supersonic aircraft, paying particular attention to manufacturers' opinions on the conditions constraining overland supersonic flight. Even the military currently requires a waiver to fly at supersonic speeds over land in the US and Europe. The FAA requested information about the latest research on mitigating sonic booms and Frank Cappuccio, general manager of US aircraft manufacturer Lockheed Martin's advanced development programmes unit, expresses the commonly-held view that the regulatory hurdles are more daunting than the technical challenges.

"Development of supersonic civil aircraft cannot continue until the criteria and processes to certify these vehicles for supersonic overland flight are established," says Cappuccio. Aircraft manufacturing behemoth Boeing echoes this, saying more work needs to be done to establish the criteria under which the FAA might allow supersonic flight. "Human subject testing in acoustic chambers needs to proceed in order to determine reaction to low booms of various shapes in the presence of other sounds," Boeing says in its submission to the FAA. "Of equal importance is the study of public opinion on the future success of overland supersonic flight."

But even if overland supersonic flight is permitted once the regulatory wrangling is over, the colossal cost of developing a plane that can cruise at supersonic speeds will still be a stumbling block in the current economic climate. Planes passing through the sound barrier have to contend with extreme heat and must be constructed from materials far more durable than those used in sub-sonic aircraft. And this is before investment into suppressing sonic booms is even considered.

Concorde stretched by as much as seven inches at its top speed of Mach two. Making materials that managed this contributed to its €11.25 billion development cost, which was ultimately footed by the French and UK governments. And although the research into supersonic flight that led to Concorde's birth doesn't need to be paid for again, aerospace technology has improved incredibly since the supersonic pioneer took its first commercial flight in 1976 so development costs for its successor will still run into tens of billions of euros. And these prohibitive costs claimed their first victim when Boeing announced in 2002 that its proposed 225-seat 'sonic cruiser' which would fly close to the speed of sound was being canned because so few airlines had expressed interest.

However, the development costs for a smaller supersonic plane would be easier to manage – estimated to be between €3 and €4 billion. And the business model is more attractive to manufacturers than the commercial alternative because the development costs can be passed on quicker to the select few high-net-worth individuals for whom speed is so important. So it's much more likely that a corporate Concorde will fly before the commercial one does.

"There's always somebody saying 'I'm willing to pay X million dollars for a supersonic airplane' and I say 'not if you can't fly it from New York to home'. It's the whole question of boom suppression and the regulatory environment," says Gulfstream Aerospace president Bryan Moss.

But efforts to beat the boom were boosted last year when the US defence advanced research projects agency (DARPA) awarded US$35 million for Gulfstream, Lockheed Martin and other aircraft manufacturers to study sonic boom suppression methods. And at the same time, DARPA, Nasa and defence contractor Northrop Grumman carried out tests on their own jointly-developed ›

aircraft and announced that the rifle-crack sound of the sonic boom could be minimised to a low growl. The secret is changing the shape of the aircraft.

In eight test runs over the same Californian desert site, Edwards Air Force Base, where Chuck Yeager first broke the sound barrier in 1947, the boom of a standard F-5E fighter was compared with an F-5E kitted out with a specially-shaped 'nose glove' and a composite skin on its underside. Sensors on the ground and in other aircraft measured the sonic booms produced by both aircraft and Charles Boccadoro, manager of Northrop Grumman's arm of the programme says, "our objective is to show that by modifying the shape of an aircraft, the shape and behaviour of shock waves – and therefore the intensity of a sonic boom – can be significantly altered. This technology could eventually enable unrestricted supersonic flight over land."

In flight, aircraft produce waves of air similar to those created by the bow of a ship and when the aircraft exceeds the speed of sound – about 750mph at sea level – the pressure waves merge to form shock waves. Those are heard as a sonic boom when they reach the ground. Nasa's experiment showed that an aircraft's design can keep the pressure waves from merging. When the weaker waves reach the ground, the noise of the boom is greatly reduced, according to Nasa.

It is hoped that the project will pave the way for an aircraft to create a sonic boom with an air pressure no greater than 0.3 pounds per square foot. By comparison, Concorde, flying at an altitude of 50,000ft, creates a sonic boom of 1.94 pounds per square foot.

For the military, the technologies could lead to a small, stealthy supersonic strike aircraft that would provide a rapid, long-range response capability. As bases are pushed further and further away from warzones, a premium will be placed on speed to cover greater distances whilst maintaining sortie rates.

Gulfstream's research goes even further. The company has recently completed windtunnel tests at Nasa Langley on its quiet supersonic jet (QSJ) which has variable-geometry – the ability for its wings to alter their shape in-flight via flaps and slats. The design concepts, involving airframe shaping, show promising signature characteristics, says Pres Henne, Gulfstream's senior vice-president of programmes, engineering and test. But the company isn't in the clear yet.

The magnitude of a sonic boom is also a function of a plane's weight and fuselage length. And Gulfstream faces a challenge in achieving its 45,000kg takeoff gross weight target for the QSJ, the limit for meeting the sonic boom and field length requirements. An aircraft with a cabin cross-section similar to the Gulfstream G550 long-range jet results in a gross-weight of over 68,000kg, while a configuration meeting the 45,000kg gross-weight limit has a smaller cabin cross-section that wouldn't meet the usual comfort requirements for five-hour flights.

In fact, Gulfstream, like most manufacturers, is still unsure of the most efficient way to marry performance with muffling the boom. But although the QSJ is still in the early design stage, Gulfstream's goals for the plane include a cruise speed of around Mach 1.8 and range of 8,900km, with insiders predicting potential sales of 180-350 aircraft.

Moss says that when the boom suppression problem is surmounted and the regulatory mess is untangled, "that's when you would do test marketing and say, 'here's a proposal, here's a configuration, here's estimated performance and here's cost'. And that's what I see as a good distance away."

Pierre Rodocanachi, senior vice-president at avionic consultancy company Booz-Allen & Hamilton in Paris, sheds more light on a likely timeframe. "There surely is a need for airplanes that are fast," he says, but adds that because of the myriad of anomalous factors affecting the aviation industry in recent years, "credible studies of the market can't be done before two years from now."

The new dawn of supersonic aviation may be sooner than we expect.

A PLANE FOR THE PEOPLE

Japanese automotive giant Honda has never built a private jet, but that is due to change in 2004. The company is set to fly a prototype of its four-to-six passenger light twinjet in the next few months and Honda says that design, fabrication and major structural tests have been completed. Windtunnel tests have produced "promising results" it claims.

The HondaJet is being designed in the US and is powered by Honda-developed HF-118 turbofans. The jet is distinguishable by its unconventional over-wing engine configuration, which gives its cabin an overall length of 4.6 metres – larger than comparable business jets. The HondaJet is larger than Cessna's Mustang, but smaller than the Citation CJ1.

Honda is joining the light jet craze, which can trace its origins back to Cessna's 1989 launch of the CitationJet. David Macdonald, head of sales and marketing at Air Partner, Europe's largest aircraft charter broker, says that in Europe, Honda's main market may be a replacement to Citation I and King Air planes. "It will appeal to people who own turboprops as it gives them a low-cost alternative," he explains, but adds that the biggest market will still be in the US, where there is a bigger base of owner-pilots. However, he stresses that for owners who don't want to fly themselves, whilst the plane may be relatively affordable, the cost of a pilot is an added expense that must also be taken into consideration.