Boooom!
Supersonic Commercial Aircraft

What is their market potential?

Version 1.0

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This case study was written by Rainer Michaeli from the Institute for Competitive Intelligence (ICI). It was prepared solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

The term to describe flying faster than the speed of sound is supersonic. Sound travels at some 330 meters per second, or around 1200 km/h.

During the second world war, military planes first broke through the sound barrier. The availability of reliable, strong jet engines, structural improvements to aircraft, and new materials made it possible: the characteristic noisy “boom” accompanies planes whenever they go supersonic.

While military doctrines called for extremely fast fighter jets, civil planes stayed below this barrier for economic reasons. It took until 1973 when the Concorde made its appearance… and remained an exotic aircraft until it was withdrawn from operation on October 16, 2003 when the last British Airways Concorde flew to Heathrow airport in London. /1/

Jump forward to 2022 and the revival of supersonic and even hypersonic (faster than Mach 5 speed) is now being discussed. Several manufacturers claim that they have developed concepts that could enable civil aviation to break the sound barrier by 2030!

However, what is the market potential for such supersonic birds?

1 Concorde – the first supersonic commercial airplane

The British Aircraft Corporation and Aérospatiale (nowadays part of Airbus Industries) teamed up to develop the high-speed jet that could fly up to twice the speed of sound, e.g. Mach 2. The development costs were high, but cutting flight times in half was thought to open up a highly attractive market segment of wealthy passengers. Initial plans indicated there would be 200 or so Concordes – with airlines willing to consider such a differentiating flight experience for their customers.

In reality, however, only a dozen Concordes were manufactured. Only Air France and British Airways operated the Concorde connecting just a few hubs: London, New York, Paris, Washington, Rio de Janeiro (via Dakar, Senegal), and Bahrain. /3/

With only 100 passengers per flight, ticket prices were top notch – costing the equivalent of around EUR 8,000 per ticket, comparable to today’s first class luxury service. Although the Concorde flight experience was considered to be “unique”, not everybody appreciated the limited seating space, tiny windows, and shaky flight as the aircraft broke through the sound barrier. Some passengers said they felt as though they were sitting in a tube. Still, a Concorde boarding pass served as an entry ticket to an elite club of VIPs, celebrities and businessmen. However, over time, the jet proved to be too expensive and too noisy to maintain. /3/

109 people died in the summer of 2000 in a fatal crash: during lift-off, the Concorde’s engines were hit by metal debris from the tarmac. From that moment onwards, demand for Concorde flights wound down, generating ever-increasing losses for the final airlines operating Concorde planes.

Tupolew

The Russian version of the Concorde, Tupolew's TU-144, was dubbed the "Concordsky", of which 16 were built. Tupolew had been successfully designing supersonic bombers, but had never created passenger airplanes before. The first TU-144s were delivered in 1975 in the freight version, followed by the version designed for transporting passengers.

However, serious technical issues and several crashes forced Aeroflot to stop passenger flights in 1978 after only 56 regular passenger flights. The remaining TU-144s were used as post and freight planes, but with more problems affecting operations, the TU-144 was finally grounded in 1982. Initially, Aeroflot placed orders for 30 planes, with an option to purchase a total of 75 planes later on. /6/

2 New contenders

2.1 Boom Supersonic

Colorado-based Boom Supersonic, which is developing a Concorde-like plane known as the Overture, is the only startup that reports having orders on its books.

Overture's operational costs allow for ticket prices that are considerably lower than those of Concorde, /1/ and are expected to cost around the same as a business class ticket. /5/ The projected speed is Mach 1.7, which will provide a range in excess of 7,850 km. /4/ Boom estimates that some 600 routes globally could be served with the Overture. /5/

According to Black Scholl, CEO of Boom, he expects to build around 2,000 of his planes by 2035. The first test flights are scheduled for 2023 at the earliest. /1/

Boom's production is scheduled to start by 2024/5 and the first test flights will take place by 2026. /4/ By 2029, they should be ready for operational use. /5/

An agreement with Northrop Grumman was concluded to supply Overtures for military and emergency response missions.

In 2022, United Airlines purchased 20 of the high-speed Overture aircraft for an undisclosed amount /4/. A nonrefundable deposit was agreed upon. United Airlines has an option to purchase an additional 40 airplanes. /4/ The jet is scheduled to enter commercial service with the airline in 2029. Jets will be built and tested in North Carolina. /3/

The US$200 million jet will connect cities like Newark, New Jersey, and Frankfurt, Germany, in four hours. United estimates it will carry 65-88 passengers in an all-business cabin. If United's plan stays on track, the airline will become the first commercial carrier to fly a supersonic plane in a regularly scheduled passenger service since the Concorde. /3/

In 2021, American Airlines purchased 15 airplanes in a deal worth US$3 billion, /3/ Virgin Atlantic purchased jets in 2016, and Japan Airlines has already expressed interest in this plane. /1/

Japan Airlines also invested US$10 million in Boom as part of a preorder for 20 Overture jets in 2017. The company plans to carry 45-55 business-class passengers and originally expected it to enter service in the mid-2020s, but there has been no update since. /3/

2.2 Spike Aerospace

Spike Aerospace, Boston, plans to create an 18-seater supersonic plane.

2.3 Boeing

In 2018, Boeing presented a concept study for a hypersonic passenger plane. Traveling at Mach 5 – twice the maximum speed of the Concorde – New York to London would be a two-hour flight. /2/

As Boeing's plane will fly at a height of 27,000 meters, higher than Concorde's 18,000 meters, there will be less turbulence and less air friction, leading to reduced heating of metal and lower fuel consumption. The Boeing concept is designed to transport 150 passengers. /2/

2.4 Venus Aerospace

Texas-based startup Venus Aerospace is the most recent manufacturer to unveil a new hypersonic jet, designed to travel at Mach 9 speed. The aircraft called Stargazer will connect any two cities on Earth in one hour or less by flying along the edge of space. Seats are limited to just 12 passengers. /3/

2.5 Beijing Lingkong Tianxing

China's Space Transportation company, also known as Beijing Lingkong Tianxing, is developing a 12-passenger jet that can fly at Mach 6 speed, hence connecting New York and Beijing in one hour. The ultra-high-speed jet concept is scheduled to begin flight testing in 2023. /3/

2.6 NASA / Lockheed Martin

NASA and Lockheed Martin have partnered to develop the X-59 supersonic aircraft, which is part of the Quesst mission. While not a passenger concept, the supersonic jet will help minimize sonic booms over land. This will allow commercial supersonic planes to travel faster than the speed of sound over populated areas, which the Concorde was not permitted to do in the US. Lockheed Martin is planning to build on top of its testbed by creating a 40-seater ultra-fast commercial aircraft, which it calls the Quiet Supersonic Technology Airliner (QSTA). The plane is planned to fly at Mach 1.8 speed, or about 2,200 km per hour. /3/

2.7 Japan Aerospace Exploration Agency (JAXA)

Japan Aerospace Exploration Agency (JAXA), the country's national space agency, is developing an unnamed supersonic jet that will carry 50 passengers and have a sonic boom 50% smaller than that of the Concorde. The agency is developing the aircraft in partnership with Mitsubishi Heavy Industries, Kawasaki Heavy Industries, and Subaru. JAXA has also partnered with NASA on the X-59 Quesst project that will help the agency reduce its own jet's sonic boom. /3/

2.8 Exosonic

US-based Exosonic is also developing a quiet, low-boom supersonic passenger plane. The 70-seater jet is planned to fly at Mach 1.8 speed, with tickets costing the same as a regular business-class seat. In 2020, Exosonic was awarded a grant from the US Air Force to build a supersonic plane that could serve as the future Air Force One. The Air Force's Life Cycle Management Center said the deal will push the development of a "low-boom supersonic executive transport aircraft that will allow key decision makers and teams to travel around the world in half the time it takes now." /3/

2.9 EON Aerospace

South African billionaire Priven Reddy's company, EON Aerospace, is also trying to get into the supersonic market with the EON nxt-01, an environmentally friendly ultra-fast jet.

The plane would fly at Mach 1.9 speed and have up to 88 seats, with the goal of running on sustainable aviation fuel and operating with net-zero carbon emissions. EON hopes to get the jet into service by 2029. /3/

3 New opportunities or the same problems again?

Scientists from the International Council of Clean Transportation (ICCT) warned about the revival of supersonic planes in their 2019 report. /1/

- Fuel consumption per passenger for supersonic planes is five to seven times higher than for subsonic planes.
- ICCT expects disturbing noise from airplanes when breaking through the sound barriers. In Western Europe and the Arab peninsula especially, where many supersonic flights are expected, supersonic booms might be heard every five minutes. (Based on Scholl’s estimation of 2,000 active supersonic planes).

Since 1973, the US has banned any civil supersonic flights over US territory due to this noise dissemination. A ban that might be lifted once noise reduction can be achieved. /1/

4 Sources

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