

BREAKING THE SOUND BARRIER

When does a simple question change an industry? We recount how a disappointing experience inspired an American doctor and his team to tear down the barriers of communication technology to become one of the aviation market's household names.

In 1978, Dr Amar Bose was on a flight home after a business trip in Europe. He was looking forward to the flight, not simply because it was taking him home, but because it would be his first opportunity to use what were then new electronic headphones. Although these types of inexpensive headphones are ubiquitous today and are included with all types of portable audio devices, they were certainly a novelty in the 1970s. Prior to their introduction, airlines used pneumatic tubes to deliver audio to their passengers, similar to how a stethoscope works.

As the flight took off and Dr Bose put the headphones on and listened to the audio, he was sorely disappointed. It is true that the headphones offered better performance than pneumatic tubes, but the designers apparently had not considered one important factor; the loud ambient noise in the aircraft's cabin. Wind noise and the drone of the aircraft's engines interfered with the audio experience, rendering these new devices only marginally better than the ones they replaced. This caused Dr Bose to ask himself a question: Why can't a headphone be developed that delivers the



▲ The ProFlight Series 2 is Bose's latest innovation in the aviation sector.

sound that people want while cancelling, or rejecting, the noise they do not want to hear? This seemingly simple question was the impetus for what would become a long and complex project at Bose that would deliver ground-breaking technology that, arguably, changed an industry.

On that flight from Europe, Dr Bose used a napkin to draw out equations that showed how a noise cancelling headphone might work. Upon his return to the company's headquarters, he assembled a team of engineers and shared his thoughts. That resulted in a research

project that would span 11 years before producing a viable commercial product.

As research continued, the lead engineers for the noise cancelling project heard about the Rutan Voyager flight, which aimed to become the first flight around the world without stopping or refuelling. It was 1986 and mission doctors had predicted that the aircraft's pilots, Dick Rutan and Jeana Yeager, would lose approximately a third of their hearing due to the noise exposure that was expected inside the Voyager.

In an effort to reduce weight a decision was made to remove insulation from the Voyager. The acoustic environment would be extremely loud and reverberant. Initially reluctant to add any additional weight, including the weight of the fairly large and heavy Bose prototypes, Dick Rutan declared the Bose prototype headsets mission-critical after experiencing them first-hand. The

THE BOSE CORPORATION

- Founded in 1964 by Dr Amar G Bose, a professor of electrical engineering at the Massachusetts Institute of Technology.
- Company mission: think of better solutions, create better products, help people enjoy the things they love.
- Bose aviation headsets are certified to FAA TSO and EASA E/TSO standards.



▲ Glenn Burack, director, aviation at Bose.

Voyager experience confirmed the team's belief that Bose's technology had real value and delivered real benefits to the user. And the work continued.

In 1989, Bose introduced the first commercially available active noise cancelling headsets. This product was so new and unique that Dr Bose wanted a clear panel on the back of each earcup so users could see that there were actually electronics in them. The success of the Series I Aviation Headset encouraged the engineers at Bose to continue their development of even better products. Alas, in 1994, the Series II Aviation Headset was introduced. It offered improved ergonomic designs and improved battery life.

Although there was really nothing else like the Series II in the market, the headset team was not satisfied to rest on their earlier successes. The desire to always do better, deliver greater benefits to customers and to lead the way with innovative technologies resulted in the

introduction of the Aviation Headset X (AHX) in 1998. The AHX offered the same noise cancelling performance as the previous, larger and heavier Bose headsets, but did so in a much lighter configuration with significantly lower clamping force. The key was TriPort Acoustic Structure, a new, unique technology developed at Bose that allowed a smaller earcup to deliver the noise cancelling performance once thought only possible through large earcups. The development meant Bose could design a smaller, lighter and more comfortable headset than before.

In 2010, Bose introduced the next and current iteration, the A20 Aviation Headset. The A20 built on the performance of the AHX, but utilised additional new technologies that were developed by Bose engineers. The A20 offered better performance in louder environments over an even broader range of frequencies. Instead of one microphone in each earcup to measure the ambient noise, Bose used two microphones, which provided a more accurate measurement. A proprietary driver (speaker) in each earcup was designed specifically for use in aviation headsets and delivered greater audio clarity and reliability than before. The A20 also offered Bluetooth connectivity for use with portable audio devices like EFB's, iPads, portable GPS systems and others.

The latest innovation from the aviation team at Bose came in just 2018 with the introduction of the ProFlight Aviation headset. The ProFlight was designed with two goals in mind: to create a very

lightweight noise cancelling headset for pilots flying turbine-powered aircraft and to create a new category in the aviation headset market. The ProFlight is the industry's lightest and, arguably, most comfortable active noise cancelling communication headset for pilots. The result of years of research, the ProFlight is a headbanded, in-ear headset that delivers three user selectable modes of noise reduction, Bluetooth connectivity and a new feature called Tap Control for Talk Through Communication. Tap Control allows the user to easily put either earbud into what is essentially a hear through mode. It is intended for temporary use on the ground or in-flight when, for example, a flight attendant or mechanic enters the flight deck and eliminates the need to remove an earbud when speaking with someone off intercom. Other innovations incorporated into the ProFlight headset include the ability to easily swap the boom microphone from side to side without a tool.

In July 2019, Bose introduced the ProFlight Series 2, which builds upon the success of the original ProFlight headset but offers some notable refinements. These include a thinner, more flexible down cable, improved tap control functionality, the availability of a non-Bluetooth version and a simplified carry case to make stowing the headset easier. Glenn Burack, director, aviation, military and broadcast headsets at Bose, notes: "We listened to good feedback from our customers and incorporated most of what they told us into the Series 2. The result is an even better headset."

In 1978, as a result of a disappointing experience, Dr Bose asked why something is the way it is and wondered why it cannot be better. That curiosity and desire to do things better, to not accept the status quo, still permeates the culture at Bose, its bosses say. There is an unwavering desire to deliver real technology that improves the user's life in some meaningful way. Although Bose just recently introduced the ProFlight Series 2, it refuses to stand still and tells the market to expect much more in the future. **AVB**



▲ Bose's HQ in Framingham, Massachusetts, is home to many of its functions and businesses.