MEMBER PROFILE

ALTO AVIATION

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ALTO Aviation masters the art and science of sound

STORY BY CHRISTINE KNAUER

The acoustic experts at ALTO Aviation spend their days analyzing audio to give business aviation passengers rich, gorgeous, immersive sound. The team crafts sound performance at 40,000 feet that rivals the best home theater systems, but it's not an easy task, according to founders Don Hamilton and Steve Scarlata.

An aircraft cabin's shape and size leave little space for speakers and other components. The environment includes background noise registering in the mid-70s for decibel of sound pressure level, which is equivalent to a vacuum cleaner or a busy road.

ALTO Aviation starts with a premium audio entertainment system made up of speakers, subwoofers and amplifiers manufactured at the company's home base in Sterling, Massachusetts. The size and type of aircraft determines which kind and how many components comprise each individual system.

Finding the best location for speakers and subwoofers in the limited space of a cabin is challenging, especially with lighting and oxygen bottles and other systems taking up prime positions. Unlike in-home theaters, the components must be as small and light as possible.

"Usually big speakers equals big sound," said Scarlata, vice president of engineering and research and development. "When you use small speakers, it's hard to get a bigger sound. That's one of the things that we've really focused on and specialized in – how can we make the smallest possible, lightest possible components but still get that really big, high-end quality sound that you'd expect from a large system."

To help solve the challenge, ALTO Aviation's acoustic engineers separated the components by frequency range, and fine-tuned each one.

"We have developed more than 50 different models of mid-high speakers to fit all the different applications," Scarlata said. "Same with the woofers; we have more than 30 woofers. To avoid compromising the sound, often we have to design a speaker and enclosure that utilizes a very specific space under a seat or divan, against a wall or in the sidewalls. We're able to design or adapt a design to get the best possible sound."

Scarlata and Hamilton, president of ALTO Aviation, draw on their previous experience as Bose engineers, when they helped create big sound from small enclosures mostly for automobiles. As part of a special Bose project,

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FACILITIES: 44,000 square feet between its two main locations

WHAT THEY DO: ALTO Aviation designs and manufactures premium cabin audio and surround sound systems for business aircraft.

EMPLOYEES: 30

FOUNDED: 1997 by Don Hamilton and Steve Scarlata

AEA MEMBER SINCE: 2003

ALTO Aviation recently released its ACAPELLA amplifiers to add audio to smaller airframes without in-flight entertainment systems.

The ACAPELLA keypad allows passengers to control audio from their personal media devices connected to the speaker system.

the gentlemen engineered a system for Gulfstream G4 and G5 aircraft. After leaving the company, Bose contracted with ALTO to handle all of the manufacturing, engineering and customer support for the program. That system is still standard on Gulfstream 450s and 550s, according to Hamilton.

Mapping the acoustics

Today, more than 2,000 ALTO Aviation audio systems currently fly in Gulfstreams and Citations, Falcons and Embraers, even Sikorsky helicopters. Each one is custom-designed for their owner. ALTO Aviation's proprietary nVELOP Digital Surround Sound and Acoustic Mapping software helps the engineers decide which components should go where.

"Our main software is a custom package we wrote ourselves," Scarlata said. "As part of our development, we have a cabin mockup in the back of our engineering lab. When we're developing components, we can put them in the Gulfstream-sized mockup for testing and recording. We evaluate the components to make sure they're optimized for that space. Our software enables us to easily and quickly go through the measurement process.

"We can say, 'Show me the sound in seat one. Show me the sound in seat two.' For example, I can see if we're getting cancellation in the bass frequencies between seats. The software helps us look at those frequencies and alignment phases, and then we can carefully adjust those in the signal processing."

After the system is installed, ALTO Aviation's acoustic engineers visit the aircraft, inspecting and verifying that the wiring and installation is correct. They then set about the task of further customizing and fine-tuning the sound experience using the company's acoustic mapping software and specialized signal processing software.

"We check every loudspeaker and make sure it's free from buzzes or rattling or any other issues that could be caused by the installation process," Scarlata said. "With a microphone, we measure every speaker in every seat. That gives us an acoustical profile of the audio system in

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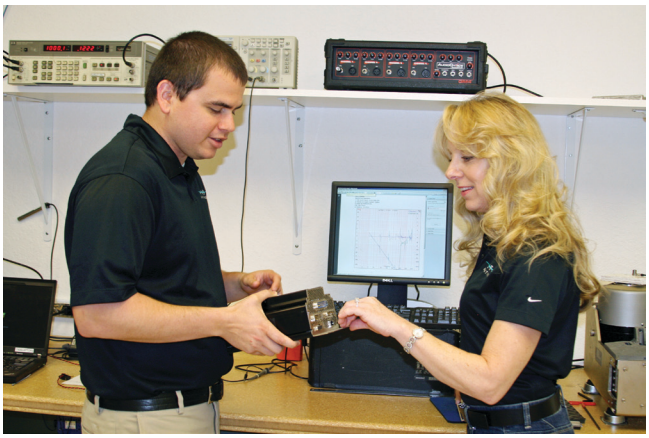
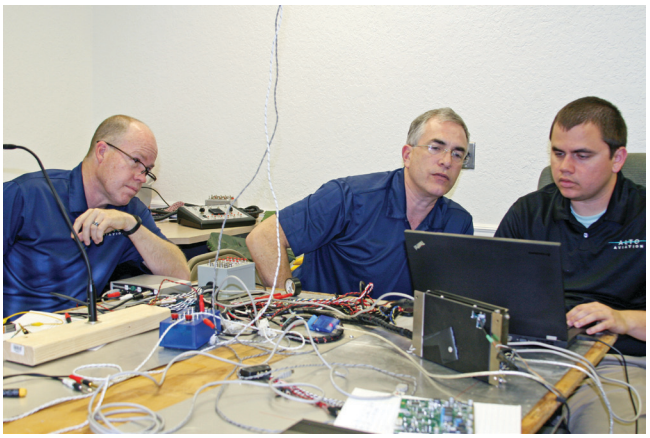


Audio systems engineer Glen Ashworth gives project manager Shannon Shelley an update.



Steve Scarlata, vice president of engineering (center) brainstorms with audio engineers Ken Shelley (left) and Glen Ashworth.

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the cabin. It takes into account the shape of the cabin, the distances between the speakers, the materials used, grill cloth covering and the position of the head. Of course, we look closely at the VIP seat to ensure the best sound. Our proprietary tools allow us to work very quickly, which is sometimes necessary because we only have a few hours to do our measurements and optimize the sound. The end step is really listening, making sure that we're achieving the optimal sound quality – our signature ALTO sound."

Expanding success

To keep up with demand, ALTO Aviation recently added an additional 2,000 square feet to its research and development facility in Florida. The space includes an improved testing lab to provide more support for in-house DO-160 and technical standard order certification testing. The company added an aircraft cabin mockup for advanced acoustic research. The facility also houses an electrical RF screen room for EMC evaluation and certification testing on new product designs.

In January, the company moved to its new headquarters in Sterling.

"We moved from a 12,000-square-foot building to our new building, which is a little more than 38,000 square feet," Hamilton said. "We needed more space, but we're also looking to vertically integrate some of our subassembly and bring all of our sheet metal fabrication in-house."

Along with more space, ALTO Aviation also added a new product recently – its ACAPELLA series of amplifiers. Announced last August, the amplifiers weigh just more than 2 pounds, and are designed for smaller airframes that do not have in-flight entertainment systems.

"It's a great way to add audio to an aircraft that doesn't have an entertainment system," said Kevin Hayes, vice president of sales. "The series is modular and very expandable, and can scale very easily to a larger aircraft if needed. Many people just want to have music from their personal media devices playing over the speakers. The ACAPELLA series is a great way to add a very simple, elegant speaker system to interface with an iPod or iPhone."

Scarlata agreed, adding, "In addition to the cabin audio, it also adds a full feature headphone system. The system switches multiple inputs so it's really more of a complete IFE system versus just an audio system."

The new ACAPELLA amplifiers are an example of ALTO Aviation's focus on creating fit-compatible solutions for aircraft.

"We're putting a strong emphasis on finding ways to make installations and upgrades much simpler by having fit-compatible devices for projects – speakers that fit in the same spots as competitive speakers, amps that fit in the same footprint, switches that fit in the same footprint, and integration with existing aircraft parts," Hayes explained. "We're committed to find ways to be innovative in our approach to solving integration issues."

However it accomplishes the task, ALTO Aviation continues to focus on its core capability – immersing all cabin passengers in amazing audio.

"Our product really is sound," Scarlata said. "We're not selling components as much as we're creating a listening experience. Sound is our focus, our passion, that's what we know how to do." ❑