BOEING FRONTIERS

Airplanes should be SEEN not HEARD

Boeing is making strides in reducing the acoustic footprint of jet airplanes

BY KATHLEEN HANSER

An airplane's engines generate much of its sound, and advancements in technology have had significant success in making engines quieter on all Boeing airplanes, including the 757.

Today there are four and one-half times as many commercial airplanes flying the skies across the globe as the approximately 3,800 that flew in 1970.

Yet according to the Federal Aviation Administration, the number of people worldwide disturbed by the sound of airplanes flying over their neighborhoods has dropped from 19 million in 1970 to less than 800,000 today. That's a remarkable 95 percent reduction.

"We think the best airplanes are seen, not heard," said Bill Glover, director of Airplane Environmental Performance Strategy for Boeing Commercial Airplanes. "For instance, two miles is the typical distance between airplanes taking off and people on the ground. The sound during takeoff of a new Boeing 737 at that distance would register about 70 dBA (decibels adjusted for the human ear). That's about as quiet as the average household vacuum cleaner."

Compare that to the noise of a highspeed train. "The distance between the train and the people along the way is typically about 200 feet," Glover said. "The sound created by a passing train 200 feet away is 15 to 30 dBA louder than the 737. Furthermore, most airplane sound is limited to the vicinity of the airport, whereas train noise occurs all along the route."

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"We've made tremendous strides in the past 20 years to lower noise and emissions in jet engines," said Mike Benzakein, general manager of Advanced Engine Programs at GE Aircraft Engines. "In the past, we have been able to significantly reduce noise through advances in our fan and jet technology. However, we are getting to the point where we can no longer concentrate on one area. Every part of the engine plays a role—the fan, booster, compressor, combustor, turbine section and exhaust area. So, in order to tackle noise, we are reviewing every section of an engine."

GE is one of four engine makers that supply engines for Boeing. The others are CFMI, Pratt & Whitney and Rolls-Royce. All four have made great strides in technological improvements to their engines that affect the environment.

Mary Goetz, director of Environmental Marketing for Boeing Commercial Airplanes, can rattle off a host of statistics to demonstrate that the sound of airplanes has dramatically decreased over the years. "The 747-400 built today affects an airport area 47 percent smaller than that of a 747-100 manufactured in 1969," she said. "The acoustic footprint made by the Boeing 717-200 is 12 times

smaller than that of its predecessor, the DC-9. And the 757 freighter is so quiet that it's allowed to operate without night restrictions at even the world's most noise-sensitive airports."

These dramatic reductions result from improved design of both engines and airframes.

Airframe noise is produced by airflow over the airplane's flight control and lift-producing surfaces such as the wing leading edge slats and the trailing edge flaps and ailerons. Airflow around the landing gear also contributes to airframe noise. During landing approach as much as one-half the sound from an airplane can come from these sources—the rest coming from the engines.

"We designed new low-noise flap and slat systems for our newest models, the 777 and the Next-Generation 737, and plan to install this technology on all new airplanes," said Larry Craig, chief engineer of Noise Engineering at Boeing Commercial Airplanes. "Landing gear noise reduction is in the research stage, and we have demonstrated noise reduction concepts. Using this knowledge, we are working with landing gear noise design engineers to produce quieter designs."

Another reduction in airplane sound resulted from the introduction of advanced technology wing devices such as winglets (upswept tips attached to the end of an airplane wing) and raked wingtips (highly backswept wingtip extensions). Both are either standard or options on certain Boeing airplane models and provide many operating advantages, among them quieter flight.

Goetz pointed out one additional reason for quieter skies, "Disturbance from airplane operations will continue to decline dramatically as earlier-model airplanes are removed from service or modified for quieter operation," she said.

Very few airplanes that utilize older, less-effective sound-dampening technology are still flying in countries where the overwhelming majority of the world's fleet is located.

"Since the beginning of commercial aviation, making airplanes quieter has been a major goal of Boeing and its aerospace partners," said Alan Mulally, president and CEO of Boeing Commercial Airplanes. "And because of this, airplanes built today are one of the quietest forms of mass transportation."

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