Sonic Boom Testing Performed in NASA Glenn Research Center's 10- by 10-Foot Supersonic Wind Tunnel

Business jet concept model installed in Glenn's 10¥10 SWT test section.

One of the current impediments to the establishment of supersonic transports as a viable part of the commercial aviation fleet is the sonic boom effect. This effect is created when a vehicle achieves supersonic speeds and creates a shock wave (an immediate pressure change) that impinges on the ground. The resulting sonic boom can be both heard and felt on the ground, and it traverses the ground along the flight path of the vehicle. The environmental impact of this sonic boom effect is currently regulated by only allowing supersonic flight on over-water flight paths. The ability to measure the pressure signature of an aircraft configuration would allow researchers to identify the sources and the relative magnitude of that source on the aircraft pressure signature. It would also allow for the development and validation of computer codes to predict the sonic boom effects of an aircraft configuration.

Sonic boom pressure signature data generated by two business jet concept wind tunnel models were recorded in a test conducted in NASA Glenn Research Center's 10- by 10-Foot Supersonic Wind Tunnel (10×10 SWT) in April 2001. A static pressure survey probe

was translated axially through the test section to measure the pressure signature of the model. The data were collected with two different model nacelle configurations and at various angles of attack and separation distances. The sonic boom test was a cooperative effort by Glenn and the NASA Langley Research Center to expand the sonic boom pressure signature database and to validate the pressure signature prediction codes.

During testing, over 7300 data points were collected. Glenn's 10×10 SWT near-field pressure signature data showed the same features and pressure levels as near-field data recorded previously in Langley's 4- by 4-Foot Unitary Plan Wind Tunnel. In addition, the test provided non-far-field data for the same model configurations and attitudes. The data are being used to develop and validate pressure signature prediction codes. The codes also will be used to determine if pressure signatures can be credibly extrapolated from cruise altitude to the ground.

Business jet concept model and survey probe installation in Glenn's 10×10 SWT test section.

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