Quiet Supersonic Platform (QSP)

Shaped Sonic Boom Demonstrator (SSBD) Program

FAA Civil Supersonic Aircraft Workshop

13 November 2003
Shaped Sonic Boom Demonstrator (SSBD) Program Objective

In-Flight Demonstration of Shaped Sonic Boom Persistence Through Real Atmosphere Using Aircraft Shaping Techniques First Proposed By Seabass and George In 1960s

Baseline F-5E

Modified F-5E

\[ \Delta p \sim 1.3 \text{ psf} \]

Ground Level Boom Overpressure

\[ \sim 70 \text{ ms} \]

Overpressure Reduced

\[ \sim 20 \text{ ms} \]

Mach = 1.4, Alt = 32kft, H/L \sim 700

Back-to-Back Approach

White Paper: Mar 01
Proposal: Apr 01
Award: Jul 01
SSBD Predicted Solution

Predicted Pressure Signature Behavior as it Propagates from Aircraft to Ground

Predicted Ground Signature With Atmospheric Smoothing

Shock Thickening Adjusted Ground Boom Signature Comparisons

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Build-Up Approach To Development & Validation

Extensive CFD

Inlet Shock Flight Test

NASA Dryden
Feb 02

Boom Tunnel Tests

NASA Glenn
Mar & May 02

Correlations Completed

S&C Tunnel Test

NGC LSWT
Aug 02

Force Tunnel Test

AEDC 4T
Oct 02

Mod Shape Defined Jan 02

Along Track (Model) - inches

Euler - 24b WTM-2 @ MFR = 0.75
24b4 WT Data @ MFR = 0.76 - 0.8 - Rdg. 143 (P3)
24b4 WT Data @ MFR = 0.76 - 0.8 - Rdg. 157 (P4)

IDRs - 12/01 & 2/02

PDR - 3/02

CDR - 7/02

Pre-FRR - 1/03

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Fabrication & Flight Operations

USN F-5E Arrives NGSA

Mod Nose Attached

Fairings Attached

Flight Ops Prep

First Taxi

First Flight

Feb 03

Mar 03

Apr 03

Envelope Expansion & Ferry Flights

Back-to-Back & Probe Flights

17 Flawless Flights Over 1 Month!

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Back-to-Back Data Flight
27 August 2003

USN Fallon F-5E
With F-5 SSBD
During Palmdale
Flight Prep

F-5 SSBD Aircraft
Takes-Off Followed
By Baseline F-5E
45-Seconds Later
First-Ever Shaped Sonic Boom Recorded 27 August 2003

Signatures recorded during SSBD back-to-back data flights in the Edwards AFB supersonic flight corridor early morning.

Estimated conditions:
Mach 1.36*,
Altitude 32,000 ft

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First Measurement of Shaped Sonic Boom

<table>
<thead>
<tr>
<th>SSBD</th>
<th>Baseline F-5E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overpressure, psf</td>
<td></td>
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<tr>
<td>Time, milliseconds</td>
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</tbody>
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SSBD Flight 9
August 27, 2003
06:46:32.7602 PDT
NASA Dryden
BADS West

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