Challenges driving subsonic transport technology development

Fayette Collier, Ph.D., M.B.A.
Environmentally Responsible Aviation Project Manager
Challenge: Significant Carbon Emissions Reduction

Forecasted Growth (without improvements)

- Technology Development
- Operational Improvements
- Additional Technology Advancement and Low Carbon Fuels

Baseline Reduced by 50%

Baseline

2005  2020  2050

Source = IATA/FAA/AEE 2010
Challenge: Significant Community Noise Reduction

Current Rule:
Stage 4
Baseline Area

Mid-Term Goal:
Stage 4 – 10 dB CUM
Area = 55% of Baseline

Near-Term Goal:
Area = 15% Baseline

Far-Term Goal:
Area < 2% Baseline

“Community noise is considered the NUMBER 1 constraint to air transportation system growth” - FAA
## US National Aeronautics R & D Plan
Technology Development Programs

### CORNERS OF THE TRADE SPACE

<table>
<thead>
<tr>
<th></th>
<th>N+1 2015 Timeframe</th>
<th>N+2 2020 Timeframe</th>
<th>N+3 2025 Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise (cum below Stage 4)</td>
<td>-32 dB</td>
<td>-42 dB</td>
<td>-72 dB*</td>
</tr>
<tr>
<td>LTO NO\textsubscript{x} Emissions (Below CAEP 6)</td>
<td>-60%</td>
<td>-75%</td>
<td>better than -75%</td>
</tr>
<tr>
<td>Aircraft Fuel Burn/ Energy Use</td>
<td>-33%</td>
<td>-50%</td>
<td>better than -70%</td>
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</tbody>
</table>

### Focus Areas

- **FAA CLEEN FOCUS**
- **NASA FIXED WING FOCUS**
- **NASA ERA FOCUS**
- **AFRL AEROSPACE SYSTEMS DIRECTORATE FOCUS**