Wind noise reduction in a non-porous subsurface windscreen

Allan J. Zuckerwar
Analytical Services and Materials, Hampton, VA 23666

and

Qamar A. Shams and H. Keith Knight
NASA Langley Research Center, Hampton, VA 23681

164th Meeting of the Acoustical Society of America
October 22, 2012
Profile of horizontal wind

$U_{10} = 10 \text{ m/s}$

Scale length = 0.01 m

Test configurations
Wind noise levels: 8 lb foam

Wind speed 3 m/s

Wind speed 5 m/s

Wind speed 7 m/s
Wind noise reduction: 8 lb foam

Wind speed 3 m/s

Wind speed 5 m/s

Wind speed 7 m/s
Wind noise reduction: 4 lb foam

- Wind speed 3 m/s
- Wind speed 5 m/s
- Wind speed 7 m/s
Wind noise reduction: 15 lb foam

- Wind speed 3 m/s
- Wind speed 5 m/s
- Wind speed 7 m/s
Wind Noise Reduction: Chaparral Physics
Helmericks, Marriott, & Olson 2008

Power Spectral Density of Wind Noise with Various Filters, Wind speeds between 1 and 2 m/s

- Open Sensor
- Foam Doughnut
- 4-50' Soaker Hoses
- 2-3' Soaker Hoses
Wind noise reduction: Chaparral Physics
4 x 50 ft soaker hoses

![Graph showing wind noise reduction in dB vs. frequency in Hz. The graph has a peak around 0.5 Hz with a maximum reduction of approximately 15 dB.](image-url)
Transmission test: 8 lb foam

Frequency: 8.55 Hz
SPL @ 1 m: 101 dB
Distance to WS: 21.3 m (70 ft)

Net gain 1.0 dB
Transmission test

4 lb foam

15 lb foam

Net gain -0.5 dB

Net gain 2.7 dB
## Summary: wind noise reduction

<table>
<thead>
<tr>
<th>Wind speed m/s</th>
<th>Wind noise reduction, dB (mean 0.1-10 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 lb foam</td>
</tr>
<tr>
<td>1-2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>5</td>
<td>16.4</td>
</tr>
<tr>
<td>7</td>
<td>12.7</td>
</tr>
</tbody>
</table>
Summary: transmission thru windscreen @ 8.55 Hz

<table>
<thead>
<tr>
<th>Transmission gain, dB</th>
<th>4 lb foam</th>
<th>8 lb foam</th>
<th>15 lb foam</th>
<th>4 x 50-ft soaker hose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.5</td>
<td>+1.0</td>
<td>+2.7</td>
<td>?</td>
</tr>
</tbody>
</table>