Modeling Working Group Presentation

Overview of Grand Canyon Noise Analysis Results

Presented to: 7th Meeting of the Grand Canyon Working Group
Of the National Parks Overflights Advisory Group

By: FAA/NPS Technical Working Group

Date: September 27 – 28, 2006
Commercial High-Altitude Aircraft Operations

Time Audible Uncapped

Commercial (Daytime)
25% Time Audible in 97.6% of the park

Commercial (Daytime)
(0-125% Time Audible)
All Aircraft Operations

Time Audible Uncapped

All Aircraft (Daytime)
(25% Time Audible in 99.4% of the park)

All Aircraft (Daytime)
(0-250% Time Audible)
Predicting Audibility Overlap

- Develop a theoretically-based empirical algorithm to estimate overlapping audible sounds from multiple aircraft of all types.

- Perform a reasonableness check on this algorithm by comparing its performance with that of INM’s compression algorithm for “Commercial Air Tours,” which was based on extensive field measurements in GCNP.

  - If the agreement is reasonable, then
    - Apply this algorithm to the “Commercial” high-altitude aircraft scenarios and compare results with limited field measurements in GCNP.
    - Apply this algorithm to the “All Aircraft” scenario.
  
  - Else, develop a more robust algorithm and validate the results with possible additional field measurements at sites in GCNP.
Comparison of Current and Proposed Algorithms

\[ y = 100 - 128.39 \log_{10} \left( 10^{(100 - 9.30x)/1400} \right) + 1 \]

\[ y = N \left( 1 - e^{-\frac{(N+1)x}{N}} \right) \]

- **Current**
- **Proposed (10 ops)**
- **Proposed (100 ops)**
- **Proposed (infinite ops)**

N = Number of Ops

Cumulative % Time Audible (uncapped |NM|), x

"Compressed" % Time Audible, y
GCNP Sound Level Measurements of Air Tours
(September 1999 - 39 Sites)
Comparison of Algorithm Performance for Air Tours
(September 1999 - 39 Sites)
GCNP Sound Level Measurements of Commercial High-Altitude Jet Aircraft
(July 2004 - 1 Site)
## Comparison of Algorithm Performance for Commercial High-Altitude Jet Aircraft

(July 2004 - 1 Site)

<table>
<thead>
<tr>
<th>Date</th>
<th>Measured Time Audible</th>
<th>Modeled Time Audible</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>No Time Compression</strong></td>
<td><strong>Current Algorithm</strong></td>
</tr>
<tr>
<td>7/16/2004</td>
<td>27%</td>
<td>32.0%</td>
<td>30.1%</td>
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<tr>
<td>7/17/2004a</td>
<td>36%</td>
<td>79.2%</td>
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<tr>
<td>7/17/2004b</td>
<td>39%</td>
<td>74.2%</td>
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<td>65.1%</td>
<td>53.6%</td>
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<tr>
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<tr>
<td>7/19/2004</td>
<td>53%</td>
<td>71.2%</td>
<td>57.1%</td>
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</tbody>
</table>

**Median Delta**

- **27.8%**
- **16.6%**
- **10.3%**
Next Steps

✓ Apply this algorithm to the “Commercial” high-altitude aircraft scenarios and compare results with limited field measurements in GCNP
  • Model additional scenarios from NPS field measurements in GCNP
  • Investigate better performance parameters for cruise conditions, e.g., EUROCONTROL’s Base of Aircraft Data (BADA)
• Apply this algorithm to the “All Aircraft” scenario
• Else, develop a more robust algorithm and validate the results with possible additional field measurements at sites in GCNP