Weapon Noise Assessment

Why routine dosimetry doesn’t work

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Is our job only to document hearing loss???
Overview

- Objective
- Background
- The Team
- Types of Noise
- Characteristics of Weapon Fire
- Data Comparison
- Future Studies
- References
- Questions
Objective

- Raise awareness to the limitations of personal noise dosimeters
NIOSH and other health researchers have documented the inadequacy of using personal noise dosimeters to measure impulse noise during weapons firing.

Our study is in the process of characterizing impulse noise from a variety of military issue firearms at indoor and outdoor firing ranges.
The Team

- Scott McFeeters, Industrial Hygienist
- Jane Nowell, MS, CIH
- Leif Olsen, MPH, CIH
- Tom Hartsog, Industrial Hygiene Technician
- Michelle Dewitt, Industrial Hygiene Technician

- Impulse, impact, peak are often used interchangeably
  - Short
  - High frequency
- Less than 1 sec in duration
  - May repeat after delay of 1 sec
Continuous vs. Impulse Noise

- Continuous noise: industrial machinery, aircraft and auto engines, landscaping equipment, etc.
- Impulse noise: door slamming, automobile backfire, weapon firing, riveting, drop forging, etc.
Weapon Fire Characteristics

- Rapid
- Short duration
- Large change in instantaneous sound pressure level
  - Rapid expansion of gas
- Impulsive Noise
i. Measure impulse noise levels using calibrated SLMs that:
   ◦ (1) Meet or exceed specifications in Reference (i).
   ◦ (2) Have a peak hold circuit.
   ◦ (3) Have a rise time not exceeding 35 microseconds.
   ◦ (4) Are capable of measuring peak SPLs in excess of 140 dB peak SPL.
### Weapon Noise Profile

- 130–175 dB
- Duration of few usec
- Decay of 10 msec or more

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Maximum SPL</th>
<th>Peak Response Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Dosimeter</td>
<td>140 dBP</td>
<td>50 µsec</td>
</tr>
<tr>
<td>Type I SLM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quest Sound Pro</td>
<td>&gt;165 dBP</td>
<td>12–18 µsec</td>
</tr>
<tr>
<td>Larson Davis LXT</td>
<td>&gt;165 dBP</td>
<td>30 µsec</td>
</tr>
<tr>
<td>Larson Davis 824</td>
<td>&gt;165 dBP</td>
<td>50 µsec</td>
</tr>
</tbody>
</table>
141.20dBP

**Personal Noise Dosimeter**

**M16-A4 Rifle**

Single Shot Peak Pressure Clipping
M16–A4 Rifle

Single Shot Peaks
Future Work

- Collect peak data
- Multiple shooters
- Sample in personal hearing zone
- Control booth noise attenuation
- Document noise reduction from the application of acoustical material


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Questions??