Bullet Traps – Evaluations with Multiple Demonstrations/Validations

Gino Spinos, NDCEE

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Technology Transfer–Supporting DoD Readiness, Sustainability, and Transformation
**Report Documentation Page**

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Background

- The DoD has an environmental requirement to maintain compliance with local, state, and federal regulations as well as DoD directives and initiatives to minimize environmental impacts from military training activities.

- The U.S. military operates more than 1,800 small arms firing ranges, the majority of which utilize soil/sand as a berm or impact area for fired rounds.

- A single 5.56mm (M855) bullet contains 2.07 grams of lead.
  - RCRA-eligible waste materials with lead concentrations greater than 5mg/L or generating a TCLP leachate greater than 5mg/L are to be handled and disposed of as a hazardous material.
NDCEE Bullet Trap Efforts

- **NDCEE Task 319**: Demonstrated 4 lanes of the STAPP Bullet Catcher at a small arms firing range (Ft. A.P. Hill).

- **NDCEE Task 414**: On-going effort to further demonstrate and validate the STAPP Bullet Catcher, including a prototype design for .50 cal, at small arms firing ranges (Ft. A.P. Hill, Massachusetts Military Reservation, a cold climate site – Ft. Drum, and a hot climate site – Yuma Proving Ground).

- **NDCEE Task 407, Subtask 2**: Identified and analyzed 20 bullet trap technologies to produce a summary report of the state-of-the-art as an information tool for DoD procurement. Demonstrated 4 down-selected bullet trap technologies.
STAPP Bullet Catcher 2003 - 2004

- **Conducted a 6-month limited dem/val:** The bullet traps were installed at Ft. A.P. Hill and evaluated per the test plan. The systems operated as claimed by the manufacturer for small arms ammunition up to and including 9mm.

- **Transferred technology to a DoD installation:** A Bullet Catcher was installed on two separate ranges (Range 4 and Range 5). Three firing points were covered on Range 4 and one firing point was covered on Range 5.

- **Demonstrated total bullet containment:** The top rubber cover of each Bullet Catcher received more than 15,000 various small-arms rounds including tracer rounds.

- **Performed beyond design parameters:** The top rubber cover accommodated .50 caliber rounds *plus* tracers. Both exceed the design capability with *no* sympathetic ignition from tracers.
Technology Overview

1. Original Berm
2. Berm Grading
3. Berm Grading Complete
4. Adding Granular Rubber
5. Applying Top Cover
6. Installation Complete
Granular Rubber

The granular rubber is approximately the size of a BB.
Results/Summary of Findings

Troops firing .50 cal rounds at Ft. A.P. Hill.
Results/Summary of Findings

Due to the top rubber cover’s elasticity, openings that are caused by impacting bullets “seal” and prevent precipitation from entering the Bullet Catcher.

Marks and entry points on the top rubber cover caused by .50 cal rounds

Marks and entry points on the top rubber cover caused by 5.56mm rounds
Results/Summary of Findings

Marks and entry points on the top rubber cover caused by .50 cal rounds

Due to the top rubber cover’s elasticity, openings that are caused by bullets will “seal” and prevent precipitation from entering the Bullet Catcher.
Results/Summary of Findings

- **Range 4**
  - Total rounds fired 17,057 (14,357 5.56mm, 2,700 9mm)
  - Approximately 10 tracer rounds
  - No armor piercing rounds

- **Range 5**
  - Total rounds fired 16,177 (8,277 5.56mm, 2,470 7.62mm, 5,430 .50 cal)
  - Approximately 2,380 tracer rounds
  - 2,500 armor piercing rounds
Results/Summary of Findings

Range 4
- Bullets were sifted from a hot spot measuring approximately 70” x 50” from each lane (52, 53, 54).
- 67 lbs. of bullets were removed from the three hot spots.
- Approximately 11–12 gallons of water were removed from the water collection reservoir for analysis of lead concentration.
- There were no holes/tears in the bottom rubber liner.
- Two range vegetation fires occurred while no threats of fire occurred with the Bullet Catcher.

Range 5
- Bullets were sifted from a hot spot measuring approximately 80” x 55”.
- 15 lbs. of bullets were removed from the hot spot.
- Approximately 6 gallons of water were removed from the water collection reservoir for analysis of lead concentration.
- There were several holes/tears in the bottom rubber liner due to .50 caliber rounds.
No holes or tears were found upon visual inspection of the bottom rubber liner.
Range 5 Bottom Rubber Liner

- Multiple holes/tears were observed during visual inspection of the bottom rubber liner. The vendor states that the depth of the granular rubber (2 ft.) was not sufficient and can be adjusted to properly decelerate .50 cal rounds.

- .50 cal rounds are slightly larger than the Bullet Catcher’s performance limitation of 12mm.

Range 5 (holes/tears circled, some with bullets protruding)
STAPP Bullet Catcher 2005 - 2007

- Build upon previous efforts to conduct a more robust demonstration/validation of the STAPP Bullet Catcher as an alternative to soil backstops by performing technical, economical, and environmental evaluations at Ft. A.P. Hill, the Massachusetts Military Reservation (MMR), a cold climate site (Ft. Drum, NY), and a hot climate site (Yuma Proving Ground, AZ)
- Decrease the threat to the environment by verification of vendor claims and technology performance
- Test a .50 caliber-rated prototype Bullet Catcher design
- Perform controlled condition testing of the STAPP Bullet Catcher to determine if it can perform effectively and up to vendor claims in a cold and hot climate area under extreme rates of fire
Bullet Catchers Installed at Ft. A.P. Hill, VA in December 2005

- **Above** – 20-lane Bullet Catcher installed on Range 4, a 25m – zero range

- **Top Right** – Front view of the one-lane .50 caliber rated Bullet Catcher prototype installed on Range 5

- **Bottom Right** – Side view of the one-lane .50 caliber rated Bullet Catcher prototype installed on Range 5 (Note that the trap is buried into the ground to prevent low flying or off-target rounds from penetrating the front or sides of the trap)
Ft. A.P. Hill Data

- More than 117,000 rounds were fired upon the Range 4 Bullet Catcher at Ft. A.P. Hill during the 12-month firing phase, while 2,010 rounds were fired upon the .50 caliber-rated prototype. Note: Of the 2,010 rounds fired on Range 5, 1,500 were .50 caliber loaded with tracer rounds.
- The overall trap condition, including the top rubber cover and water collection reservoir, was inspected quarterly.
- Maintenance was required to re-glue sections of the top rubber cover seams on Range 4. No significant water, other than that from snowfall during installation (~10 gallons), had been visible in the water collection reservoir during the 12-month dem/val.

Snow on open Bullet Catcher  The same area a few hours later
Ft. A.P. Hill Data (cont’d)

- Maintenance costs to re-glue loose seams
  - Labor, based at $12/man-hour - $72 (6 man-hours)
  - Materials (sandpaper, rags, rubbing alcohol, glue) - $0, materials were included with the bullet trap
  - **TOTAL COST - $72.00**

Loose top rubber cover seam
Bullet Catcher Installed at the MMR in June 2006

15-lane Bullet Catcher installed on Range T at the MMR. Dem/val to occur in Summer 2007, though seam maintenance and water collection has been occurring.
Hot Climate Testing – Yuma Proving Ground, AZ

- Fired more than 30,000 5.56mm rounds (M855), including 1,401 5.56mm tracer rounds (M856), in a 2’ x 4’ impact area over a two day period.

- Fired 2 squad automatic weapons (SAWs) simultaneously at the same impact area at a rate of 5-10 round bursts.

- Documented air temperatures reached 110ºF.

Above: Marines simultaneously firing upon the STAPP Bullet Catcher at the YPG.
YPG Data

Powder material escaping the trap via blown out seams.

Tears in the top rubber cover caused by tumbling rounds.

Close-up of tears caused by tumbling rounds compared to normal entry marks.
YPG Data (cont’d)

- The 2’ x 4’ impact area had 31,005 5.56mm rounds fired upon it and did not require bullet sifting.
- The ignition temperature of tracer rounds is much higher than the flash point of the granular rubber (380°F), yet the trap did not catch fire.
- The lead concentration of the powdery material that exited the trap via blown out seams and/or holes made by tumbling rounds was ~5.5% (54,700 mg/Kg).
## Bullet Sifting Results

<table>
<thead>
<tr>
<th>Size/Caliber</th>
<th>Total Number of Rounds Fired</th>
<th>Weight of Lead per Bullet (gm/lbs.)</th>
<th>Weight per Bullet (gm/lbs.)</th>
<th>Total Lead Weight (gm/lbs.)</th>
<th>Total Bullet Weight (gm/lbs.)</th>
<th>Total Weight of Sifted Bullets (gm/lbs.)</th>
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</thead>
<tbody>
<tr>
<td>5.56mm (M855)</td>
<td>29,604</td>
<td>2.07 gm</td>
<td>4.02gm</td>
<td>61,280 gm or 135.1 lbs.</td>
<td>119,008 gm or 262.4 lbs.</td>
<td>190 lbs.</td>
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<tr>
<td>5.56mm (M856)</td>
<td>1,401</td>
<td>2.07 gm</td>
<td>4.13gm</td>
<td>2,900 gm or 6.4 lbs.</td>
<td>5,786 gm or 12.8 lbs.</td>
<td></td>
</tr>
</tbody>
</table>

The bullet weight captured during bullet sifting was 69% of the total bullet weight fired upon the trap. The 31% of bullet weight not recovered may be attributed to the fact that not all rounds impacted the target area and that some bullets may have fragmented and/or pulverized due to repeated bullet impacts and were too small to be collected in the accumulation pail. Some small particles bypass the accumulation pail and are captured in a HEPA filtration system.
YPG Conclusions

- The Bullet Catcher vendor claim that the trap can accept no less than 30,000 small arms rounds in a 2’ x 4’ impact without requiring bullet sifting to be performed is valid.
- The Bullet Catcher can accept tracer rounds in a hot and arid environment and under extreme firing conditions without evidence of fire, smoldering, or smoke generation.
- The assumption can be made that if a Bullet Catcher were installed upon a clean, lead-free range, the amount of lead introduced to the environment would be significantly less than the amount introduced into the environment using a soil berm.
Cold Climate Testing – Ft. Drum, NY

- Fired 4,800 5.56mm rounds (M855) in a 2’ x 4’ impact area in a 1hr. 10 min.
- Fired 2 squad automatic weapons (SAWs) simultaneously at the same impact area at a rate of 5-10 round bursts.
- Documented air temperatures were as low as 18.5°F during the firing phase.
Ft. Drum Data

Firing upon the Bullet Catcher

Condition after firing 2,400 rounds

Condition after firing 4,800 rounds
Ft. Drum Data (cont’d)

<table>
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<tr>
<th>Size/Caliber</th>
<th>Total Number of Rounds Fired</th>
<th>Weight of Lead per Bullet (gm/lbs.)</th>
<th>Weight per Bullet (gm/lbs.)</th>
<th>Total Lead Weight (gm/lbs.)</th>
<th>Total Bullet Weight (gm/lbs.)</th>
<th>Total Weight of Sifted Bullets (gm/lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.56mm (M855)</td>
<td>4,800</td>
<td>2.07 gm</td>
<td>4.02gm</td>
<td>9,936 gm or 21.9 lbs.</td>
<td>19,296 gm or 42.5 lbs</td>
<td>TBD</td>
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</table>

Bullet sifting occurred on May 9, 2007.
Ft. Drum Conclusions

- The Bullet Catcher vendor claims of being able to accept small arms rounds (M855) in a 2’ x 4’ impact effectively and reliably in a cold climate environment is valid.
- The Bullet Catcher can accept 5.56mm (M855) rounds in a cold climate environment and under extreme firing conditions and without causing excessive damage to the top rubber cover.
Path Forward

- Conduct bullet sifting at Ft. Drum (May 2007)
- Conduct bullet sifting at Ft. A.P. Hill (May 2007)
- Conduct MMR dem/val (2007)
Benefits

- The MMR has recently called a voluntary cease fire of all tungsten-nylon rounds due to preliminary data from groundwater testing indicating the presence of significant amounts of tungsten. The Bullet Catcher may be a solution to allow the MMR to return to firing lead ammunition.

- The use of a bullet trap decreases the amount of small arms ammunition constituents being introduced directly into the soil and reduces soil erosion and range vegetation fires.

- Ranges previously unusable because of safety issues evolving from the saturation of a soil berm will be deemed usable following the installation of a bullet trap.
State-of-the-Art Technology Assessment

- Conducted national and international searches
- Solicited facility feedback to confirm or rebut vendor information
- Populated over 400 data points of information
  - Bullet stopping capabilities
  - Fire retardant capabilities
  - Lead containment capabilities
  - Ricochet and angle of acceptance
  - Disposal costs
- Evaluated 20 bullet trap technologies in a down-selection process using the data points gathered.
  - Down-selection points breakdown:
    - 24% for basic capabilities
    - 47% for environmental and health hazards
    - 27% for cost and maintenance factors
    - 2% for procurement time
Technology Down-Selection and Dem/Val

- Reviewed the NDCEE down-selection results with the task stakeholders to determine the four technologies to demonstrate (listed in descending order of total point results)
  - Ballistics Research Inc. – Advanced Anti-Ballistic Composite (AABC)
  - Action Target Inc. – Total Containment Trap (TCT3)
  - Meggitt Defense Systems-Caswell – Reclining GranTrap
  - Savage Range Systems (SRS) – Snail Trap (wet)

- Note: The STAPP Bullet Catcher scored highly but was not selected because was selected for evaluation under another effort.

- Conducted demonstration activities at DoD host sites
  - Barksdale AFB, LA – Snail Trap (wet)
  - Fort Campbell, KY – Reclining GranTrap
  - Fort Indiantown Gap, PA – TCT3
  - Fort Jackson, SC - AABC
Down-Selected Bullet Traps for Dem/Val

- Savage Snail “Wet” system at Barksdale AFB, LA
- Action Target TCT3 at Ft. Indiantown Gap, PA
- MDS-Caswell Reclining GranTrap at Ft. Campbell, KY
- Ballistic Research Inc. AABC at Ft. Jackson, SC
Savage Snail “Wet” Trap Capital Costs

- SRS estimated capital costs for a Model 855 Snail Trap, similar to the model at Barksdale AFB, at $175,000 to $200,000 for 8 firing lanes. This estimate was for materials only and did not include:
  - Delivery
  - Installation
  - On-site design, engineering, and supervision
  - Commission
  - Installation and training
  - An extended 5-year Warranty (approximately $14,767 additional)
# Snail Trap Noise and Dust Testing

## Noise Monitoring

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<th>Training Cycle</th>
<th>Run Time</th>
<th>Maximum Reading (decibels)</th>
<th>Average Reading (decibels)</th>
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<td>Cycle 1</td>
<td>2 hours 50 min.</td>
<td>133.0 decibels</td>
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<td>Cycle 2</td>
<td>2 hours 15 minutes</td>
<td>133.7 decibels</td>
<td>110.3 decibels</td>
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## Dust Monitoring

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<td>Dust – Total Nuisance</td>
<td>NIOSH 0500</td>
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<td>Lead</td>
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### Snail Trap Dem/Val Results

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<th>Total Lead (grams)</th>
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<td>7.62-mm</td>
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<td>6.28</td>
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<td>9-mm</td>
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<td>TOTAL</td>
<td>122,483*</td>
<td>NA</td>
<td>391,847</td>
<td>863.96</td>
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*Firing primarily occurred on lanes 2 and 5*
Snail Trap Dem/Val Results (cont’d)

- Maintenance Activities
  - The water/Snail Oil recirculation pump needed to be replaced because it burned out due to low fluid levels. Fluid levels decreased because of faulty welds, which allowed the water/Snail Oil solution to escape.
  - Several deflector plates were ground or replaced to maintain the correct angle of deflection.
  - Multiple seams needed to be re-welded because of leaks at the original welds. The leaks resulted in the release of water/Snail Oil solution, which had to be refilled. A gutter system was designed and installed to correct this issue.
  - Daily and Monthly Maintenance Activities
    - Check the water level of the tank
    - Check the Snail Oil concentration
    - Remove any debris from the front trough
    - Inspect the trap for signs of damage or excessive wear
    - Inspect the conveyor belt and motor
Snail Trap Dem/Val Results (cont’d)

Collected rounds are transported on a conveyor system to an accumulation pail

View of exit point and collected rounds in the accumulation pail
Reclining GranTrap Capital Costs and Installation Photos

Capital costs for a 56 linear foot (approximately 4 firing lanes) Reclining GranTrap, including a concrete foundation - $106,000
Reclining GranTrap TCLP Testing of the Chunk Rubber

A sample of the chunk rubber was gathered from the far left firing lane hot spot for TCLP metals analysis. The TCLP results are shown below.

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Reclining GranTrap TCLP Testing of the Chunk Rubber (cont’d)

A representative sample of the chunk rubber was gathered for TCLP metals analysis. The Sample Plan utilized the 80/20 sampling method as shown below.
Reclining GranTrap TCLP Testing of the Chunk Rubber (cont’d)

TCLP results for the representative chunk rubber sample

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<td>W846 1311/7470</td>
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</tr>
<tr>
<td>selenium</td>
<td>ND</td>
<td></td>
<td>mg/L</td>
<td>0.100</td>
<td>1</td>
<td>01/25/06 19:09</td>
<td>W846 1311/6010</td>
<td>6014072</td>
</tr>
<tr>
<td>silver</td>
<td>ND</td>
<td></td>
<td>mg/L</td>
<td>0.0500</td>
<td>1</td>
<td>01/25/06 19:09</td>
<td>W846 1311/6010</td>
<td>6014072</td>
</tr>
</tbody>
</table>
Reclining GranTrap Dem/Val Results

<table>
<thead>
<tr>
<th>Round Type</th>
<th>Number of Rounds Fired</th>
<th>Lead/Round (grams)</th>
<th>Total Lead (grams)</th>
<th>Total Lead (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.56-mm ball rounds</td>
<td>44,676</td>
<td>2.07</td>
<td>92,479</td>
<td>203.88</td>
</tr>
<tr>
<td>7.62-mm ball rounds</td>
<td>13,900</td>
<td>6.28</td>
<td>87,292</td>
<td>192.45</td>
</tr>
<tr>
<td>7.62-mm armor piercing rounds</td>
<td>480</td>
<td>6.28</td>
<td>3,014</td>
<td>6.64</td>
</tr>
<tr>
<td>TOTAL</td>
<td>59,056 (14,764/lane)</td>
<td>NA</td>
<td>182,785</td>
<td>402.97</td>
</tr>
</tbody>
</table>

Note: Of the 480 7.62mm AP rounds fired from 10 meters in single fire and burst mode, none penetrated through the depth of the trap
Reclining GranTrap Dem/Val Results (cont’d)

A mostly intact lead bullet found in front of the bullet trap at Ft. Campbell KY

Degradation of the bullet trap, including the forward kick out of rubber and bullets

Chunk rubber and bullets
Reclining GranTrap Dem/Val Results (cont’d)

- Maintenance Activities
  - The plastic mesh that retains the chunk rubber requires zip-tying new mesh sections after a 1' x 1' section is compromised by bullet impact. This was accomplished monthly as part of maintenance inspections.

- Bullet Trap Disposal
  - Three contractors provided quotes for disposing of the 56 linear feet of Reclining GranTrap. The quoted costs ranged from $24K to $31K.
  - Disposal charges are directly affected by lead concentrations.
  - The NDCEE and the Ft. Campbell Environmental Office were able to coordinate the recycling of the concrete and 55,000 lbs of rubber.
Advanced Anti-Ballistic Composite (AABC) Capital Costs

- The capital costs of the equipment, including shipping and installation, for four firing lanes was $3,545/AABC block. Block dimensions were 40"L x 32"W x ~14"D.

- The vendor has stated that due to changes in the manufacturing process, the selling price has increased to greater than $14K per block of the same dimensions.
AABC Installation Photos
## AABC Noise and Dust Testing

### Noise Monitoring

<table>
<thead>
<tr>
<th>Firing Lane</th>
<th>Run Time</th>
<th>Maximum Reading (decibels)</th>
<th>Average Reading (decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane 45 (AABC equipped)</td>
<td>4 hrs., 4 min.</td>
<td>116.7 decibels</td>
<td>87.9 decibels</td>
</tr>
<tr>
<td>Lane 46 (Not AABC equipped)</td>
<td>5 hrs., 22 min.</td>
<td>116.2 decibels</td>
<td>88.4 decibels</td>
</tr>
</tbody>
</table>

### Dust Monitoring

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Method</th>
<th>Reporting Limit</th>
<th>Total</th>
<th>Air Concentration</th>
<th>OSHA Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust – Total Nuisance</td>
<td>NIOSH 0500</td>
<td>0.01 mg</td>
<td>0.06 mg</td>
<td>0.093 mg/m3</td>
<td>15 mg/m3</td>
</tr>
<tr>
<td>Lead</td>
<td>NIOSH 7300</td>
<td>0.0025 mg</td>
<td>&lt; 0.0025 mg</td>
<td>&lt; 0.0039 mg/m3</td>
<td>0.05 mg/m3</td>
</tr>
</tbody>
</table>
AABC Dem/Val Results

<table>
<thead>
<tr>
<th>Round Type</th>
<th>Number of Rounds Fired</th>
<th>Lead/Round (grams)</th>
<th>Total Lead (grams)</th>
<th>Total Lead (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.56-mm ball rounds</td>
<td>13,203</td>
<td>2.07</td>
<td>27,330</td>
<td>60.25</td>
</tr>
<tr>
<td>5.56-mm armor piercing rounds</td>
<td>4,618</td>
<td>2.07</td>
<td>9,559</td>
<td>21.07</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>17,821</strong></td>
<td><strong>NA</strong></td>
<td><strong>36,881</strong></td>
<td><strong>81.32</strong></td>
</tr>
</tbody>
</table>

(4,400 - 4,500 per lane)
AABC Dem/Val Results (cont’d)

Close up shot of the AABC on firing lane 42 on October 13, 2005

Regrowth of the vegetation behind the AABC-equipped firing lanes 76 days after installation.
AABC Dem/Val Results (cont’d)

Photographs showing the effects that approximately 4,500 rounds had on the AABC.

Note the slight bulge on the front side of the block (side view).
AABC Dem/Val Results (cont’d)

- Maintenance Activities
  - No maintenance activities were required during the Dem/Val effort

- Disposal Costs
  - The disposal cost for an AABC block containing lead bullets at Fort Jackson is $425/block ($1,700 for all four blocks)
Total Containment Trap (TCT3) Capital Costs

- Capital Costs
  - Cost of 40-linear feet of the TCT3 was $164,000 (or $41,000/lane) for materials and installation
  - This amount does not include the cost of the required concrete foundation pad, which was $18,750
  - Total Capital Costs---$182,750
TCT3 Installation at Ft. Indiantown Gap
# TCT3 Noise and Dust Testing

## Noise Monitoring

<table>
<thead>
<tr>
<th>Firing Lane</th>
<th>Duration</th>
<th>Maximum Reading (Decibels)</th>
<th>Equivalent Continuous Level (Decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane 3 (TCT3 equipped)</td>
<td>2 hrs., 10 mins</td>
<td>133.1 decibels</td>
<td>80 decibels</td>
</tr>
<tr>
<td>Lane 9 (not TCT3 equipped)</td>
<td>1 hr., 20 mins</td>
<td>109 decibels</td>
<td>80 decibels</td>
</tr>
</tbody>
</table>

## Dust Monitoring

<table>
<thead>
<tr>
<th>Test</th>
<th>Method</th>
<th>OSHA Limits</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Air Concentration</td>
</tr>
<tr>
<td>Dust (Total Nuisance)</td>
<td>NIOSH 0500</td>
<td>15 mg/m3</td>
<td>0.13 mg</td>
</tr>
<tr>
<td>Lead</td>
<td>NIOSH 7300</td>
<td>0.05 µg/m3</td>
<td>2.9 µg</td>
</tr>
</tbody>
</table>
TCT3 Dem/Val Results

- The TCT3 requires electricity for proper operation. A 30 kW generator was provided by FTIG to conduct this dem/val.
- 2,304 5.56mm rounds were fired upon the trap during the dem/val.
# Dem/Val Results (cont.)

<table>
<thead>
<tr>
<th>Range 9Z</th>
<th>Size/Cal</th>
<th>Number of Rounds Fired</th>
<th>Lead/Round (grams)</th>
<th>Total Lead (grams)</th>
<th>Total Lead (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2006</td>
<td>5.56 mm ball</td>
<td>1,728</td>
<td>2.07</td>
<td>3,577</td>
<td>7.86</td>
</tr>
<tr>
<td>April 2006</td>
<td>5.56 mm ball</td>
<td>0</td>
<td>2.07</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>May 2006</td>
<td>5.56 mm ball</td>
<td>0</td>
<td>2.07</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>June 2006</td>
<td>5.56 mm ball</td>
<td>576</td>
<td>2.07</td>
<td>1,192</td>
<td>2.63</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>2,304</strong></td>
<td><strong>NA</strong></td>
<td><strong>4,769</strong></td>
<td><strong>10.49</strong></td>
</tr>
</tbody>
</table>
Dem/Val Results (cont.)

- No maintenance was required during the dem/val.
- The TCT3 has not been removed from FTIG, therefore disposal costs cannot be calculated.

Status of the trap prior to last firing cycle
Summary/Conclusions of State-of-the-Art Technology Assessment

- There were not enough rounds fired on any of the bullet traps to determine their saturation points. It would be important to use every trap to its saturation point, perform the required lead removal, maintenance, and repair activities to return the trap to usability multiple times to fully assess the trap.

- Tracer ammunition is an important part of training. As documented at Ft. Campbell, any trap that cannot handle tracer rounds will become a potential fire hazard at most DoD installations. Controls such as SOPs, ASP issues, and Range Control scheduling are insufficient to eliminate the risk of possible tracer firing upon a bullet trap.

- With regard to rubber media used in granular rubber-based traps, it has been found that after bullet sifting and removal, the remaining rubber media may not be a hazardous waste.

- Weather conditions were typically non-factors in the evaluation of these traps. A defined weather testing would produce complete data regarding weather influences and how the traps perform in different climates.
Project Stakeholders

- Office of the Deputy Assistant Secretary of the Army - Environment, Safety, and Occupational Health
- U.S. Army Environmental Command (USAEC)
- Barksdale Air Force Base
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- NDCEE Program Manager
  Dr. Charles Lechner, ODASA (ESOH)

- NDCEE Contracting Officer’s Representative
  Mr. Thomas Moran, ODASA (ESOH)

- Government Technical Monitors
  Task 319 Commercialization of Technologies to Lower Defense Costs
  Mr. Hany Zaghloul - CERL

  Task 407 Unexploded Ordnance, Subtask 2
  Mr. Thomas Guinivan, USAEC
  Mr. George Robitaille, USAEC
  Dr. Bonnie Packer, USAEC

  Task 414 FY05 STAPP Bullet Catcher
  Mr. James Gleason, ODASA (ESOH)