LCAAP Modernization
LMCM’s Program to Reduce Risk of Interrupted Supply

Presented to:
NDIA Armaments Conference
Karen Davies
ATK Lake City Ammunition

13 June 2007
Lake City Delivered Its First Round 65 Years Ago

- Senator Harry Truman broke ground Dec. 1940.
- Started production Sept. 1941.

And most of the equipment is in use today!
Ammunition Demand History is Cyclical

LCAAP Production History

- WWII 1941-1945
- KOREA 1950-1953
- VIETNAM 1966-1975

Remington Arms

Rounds in Millions

USA

Olin

ATK

LCAAP

PRODUCTION
“Investment” During 1990s Reduced Capacity

- **5.56mm Lines Closed (Bldg 4)**
- **20mm Lines Closed (Bldg 65)**
- **5.56mm Lines Open (Bldg 2)**
- **7.62mm lines Closed (Bldg 2)**
- **Added People/Refurbed Equipment**
- **Links Supply Base Collapse**
- **Capacity Expansion 1.5B-1.6B available**
- Few new people added

**Production at Vietnam Era levels with smaller footprint**
5.56mm High-Speed Production--SCAMP
• 1970s Electronics and Mechanical Parts

7.62mm and .50 Cal. Production
• 1940s Equipment - No Feedback to Operators
• Complicated Process Flow
• Capacity Consolidation in 1990s

“Anti-Lean”
• No Flexible Manufacturing Capability
• Cumbersome Material Handling
• Batch and Cue Operations
LCMC Created Modernization Program to Address Supply Risk

- Maintain capability to deliver 1.2 billion rounds per year
- Maintain deliveries during modernization execution
- Reduce single-point failures
- Increase reliability / availability / maintainability, productivity and quality
- Incorporate “Lean Thinking”
- Incorporate in-process inspection consistent with MIL-STD-1916
- Integrate improvements with ROI < 5 years
- Increase production flexibility between and within calibers
- Reduce potential for injuries & environmental emissions

<table>
<thead>
<tr>
<th>Modernization Program</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
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<tbody>
<tr>
<td>Initiated</td>
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<td>Completed to Date</td>
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<tr>
<td>Funding Ends</td>
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<td>Complete</td>
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</table>
Strong Team Using Disciplined Systems

Systematic project planning and execution
Modernization Project Life Cycle

- Wide range of potential solutions
- Consistent criteria required to analyze alternatives

Overarching tactical plan plus systematic project life cycle process = disciplined program
Quality Function Deployment (QFD)

- Interactive process led by PM MAS
- Criteria taken from Modernization objectives
- Criteria weighted against objectives
- Agreement on scoring weights and standards
- Mod IPT scored current and anticipated projects

Structured process used to rank projects
<table>
<thead>
<tr>
<th>System Level Requirements</th>
<th>Weight</th>
<th>B1 SCAMP Loading P&amp;A</th>
<th>B1 556mm Bandoleer Replacement Program</th>
<th>B1 556mm Commercial Pack Improvements</th>
<th>B1 556mm Pallet Strapping System Replacement</th>
<th>B1 SCAMP Priming Mech &amp; Elec Upgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustain 5.56mm production Capacity @ 997 million (long term readiness)</td>
<td>10</td>
<td>9</td>
<td>90</td>
<td>1</td>
<td>10</td>
<td>3</td>
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<tr>
<td>Sustain 7.62mm production Capacity @ 160 million (long term readiness)</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Sustain 50 Cal production Capacity @ 60 million (long term readiness)</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Risk of Single Point Failures</td>
<td>8</td>
<td>3</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>9</td>
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<tr>
<td>Improve production reliability through improvements in equipment Operational Availability</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>18</td>
<td>0</td>
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<tr>
<td>Improvement in process efficiency (lean)</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>45</td>
<td>3</td>
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<tr>
<td>Increase product quality (six sigma) (ex. Acceptance testing)</td>
<td>7</td>
<td>3</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>9</td>
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<tr>
<td>Decrease inherent scrap rate (Machine Scrap)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>Increase production flexibility (type)</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Reduce incremental staffing demands for changes in production requirements and reliance on special skills (scalability)</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Improvement in ROI ($)</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>15</td>
<td>1</td>
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<tr>
<td>Reduction or elimination of safety and environmental hazards</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>72</td>
<td>0</td>
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<td><strong>Score Totals</strong></td>
<td><strong>146</strong></td>
<td><strong>164</strong></td>
<td><strong>105</strong></td>
<td><strong>180</strong></td>
<td><strong>180</strong></td>
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<tr>
<td><strong>Additional Factor</strong></td>
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<td><strong>1</strong></td>
<td><strong>1</strong></td>
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<tr>
<td><strong>Overall Scoring</strong></td>
<td><strong>146</strong></td>
<td><strong>164</strong></td>
<td><strong>105</strong></td>
<td><strong>180</strong></td>
<td><strong>180</strong></td>
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<tr>
<td><strong>Ranking Within Family</strong></td>
<td><strong>11</strong></td>
<td><strong>9</strong></td>
<td><strong>14</strong></td>
<td><strong>6</strong></td>
<td><strong>6</strong></td>
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<tr>
<td><strong>Overall Ranking</strong></td>
<td><strong>28</strong></td>
<td><strong>24</strong></td>
<td><strong>33</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
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</tr>
</tbody>
</table>

Result = Prioritized List for Modernization Projects
Modernization Upgrade
5.56mm SCAMP Equipment

- Upgrade to new electronic controls
- Foundation reconstruction
- Mechanical refurbishment

• Completed first of 5 priming lines

• Demonstrates upgrade capabilities
Caliber .50 and 7.62mm Modernization

- Manufacturing modernization for 7.62mm & Caliber .50
  - 60% new equipment
  - 40% refurbished equipment
- Following Lean/Six Sigma principles
- Significant improvements to material handling
### Lean/Six Sigma Principles

Driving Process Redesign

<table>
<thead>
<tr>
<th>Current</th>
<th>Reset Equip.</th>
<th>COTS Systems</th>
<th>Team Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance moved (feet)</td>
<td>1,758</td>
<td>495</td>
<td>107</td>
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<tr>
<td>Cups/Cases in process</td>
<td>4,579,050</td>
<td>375,000</td>
<td>43,000</td>
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<tr>
<td>Operations</td>
<td>24</td>
<td>16</td>
<td>10</td>
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<tr>
<td>Handling</td>
<td>4</td>
<td>17</td>
<td>1</td>
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<tr>
<td>Transport</td>
<td>77</td>
<td>7</td>
<td>16</td>
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<tr>
<td>Inspection</td>
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<tr>
<td>Delay</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Storage</td>
<td>16</td>
<td>8</td>
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<tr>
<td>Variation Paths</td>
<td>1,290,240</td>
<td>36</td>
<td>2</td>
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<td>Cycle time (minutes)</td>
<td>6,185</td>
<td>1,562</td>
<td>179</td>
</tr>
<tr>
<td>Changeover time (hours)</td>
<td>NA</td>
<td>NA</td>
<td>16</td>
</tr>
</tbody>
</table>

New lines give greatest impact for long-term process, efficiency & quality improvement, and manufacturing agility.

4.3 Days

3 Hours
Case Equipment--Taper/Final Trim

Before

After
Adding Key New Equipment

New 7.62mm/Caliber .50 Palletizer/Bander Machine

New Caliber .50 Final Wash System

Objective 4.1.a: Increase manufacturing and logistics readiness to meet current and future requirements.

Lake City will be positioned for several decades