Lightweight Small Arms Technologies
(Formerly known as...Lightweight Machine Gun and Ammunition)

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**Goals:**
- 35% weapon weight reduction
- 40% ammunition weight reduction
- Reduced training & maintenance
- Maintain cost of current systems

**Approach:**
- “Clean Slate” design
- Reduced weight as the priority
- In depth trade studies
- Extensive modeling & simulation
Focus on Technology Enablers

• Ammunition design
  – Cased Telescoped
  – Caseless Telescoped
• Weapon design
  – FEA for strength
  – Thermal analysis
• Reduced training & maintenance
  – Simpler designs and reduced parts count
  – Early inclusion of supportability considerations
• Maintain cost of current systems
  – Minimize use of “exotic” materials
  – Cost included in trade offs
Program Status

• System Integration Contracts Awarded April 2004
  • AAI Corporation of Hunt Valley, MD
  • General Dynamics Armament and Technology Products of Burlington, VT

• Phase 1 – Design Phase
  • 9 months long, virtual prototyping of weapons & ammunition
  • Downselected to AAI Corp. concept in February 2005

→ Phase 2 – Develop, Fabricate & Test Phase
  • Continue development and fabricate subcomponents
  • Subcomponents and ammunition will be tested
  • System integration planning and preliminary testing

• Phase 3 – System Integration Test Phase
  • Testing will encompass all Milestone B requirements
  • Completed at end of FY07
Company Machine Gun

• Determine Feasibility of “Company Machine Gun”
  • Medium Machine Gun performance in Light Machine gun “package”
  • Initial study underway to identify optimum caliber
  • Results will be modeled to determine impact on weapon design

• Methodology
  • Compile Light and Medium Machine Gun performance data
  • Conduct analysis using empirical equations
  • Determine smallest caliber that meets penetration and KE requirements at range
  • Conduct Hydro code modeling to validate selection
AAI Team

Related Activities

- ARDEC In-House Caseless Ammunition program (H&K/DN)
- CRADA with ARDEC- H&K/DN Propellant characterization
- Johns Hopkins Applied Physics Lab- Interior Ballistics Modeling
- ARL cartridge case and barrel material programs
- JSSAP BAA Component Contracts
Parallel Cased and Caseless Technology
Select Single Concept for Phase 3

Supportability Integrated with Design/Test Activities
System Tradeoff Considerations

Key Tradeoff Parameters
- Lethality
- Supportability
- Interfaces
- Operating System
- Scalability
- Integration of Electronics
- Cased/Caseless Commonality

Virtual Design Activities
- 3D CAD Models
- Structural Analyses
- Thermal Analyses
- Kinematic Analyses
- Rapid Prototype Models
- Supportability Analyses

Selected Approach
- Telescoped Ammunition
- 5.56mm caliber, M855/856 bullets
- Rotating Chamber
- 650 rds/min, Belt Feed
- Maximize CT/CL Commonality
System Design Overview

Light Machine Gun Configuration

5.56mm Telescoped Ammunition

Cased Ammo Variant

Caseless Ammo Variant
Weapon Operating System Approach

Weapon and ammo designed as a system

- Rotating chamber
- Straight-thru feed and ejection
- Gas operated
  - Provides positive control of all motion including ejection
  - Isolates chamber from barrel heat
  - Eliminates need for extractor groove in cartridge
  - Allows common CT/CL approach
Weapon Features

- Quick change barrel
- High stiffness and heat capacity
- Folding Front Sight
- Long stroke, soft recoil
- Improves controllability
- Structural attachment points provided for accessory rail mounting
- Multifunctional Bipod
- Improves Usability
- Case ejects sideways and well clear of shooter
- Belt Feed, Full Loop Polymer Links
- 100 Round Soft Pouch
- Semi or Full Auto Fire
- Rounds Counter improves maintainability
- Maximized CT/CL Commonality
- Adjustable butt stock length
- FFW Interface reserved for future implementation
**Key Tradeoff Parameters**

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<thead>
<tr>
<th>Cartridge Configuration</th>
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<tbody>
<tr>
<td>• Full Case</td>
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<tr>
<td>• Hybrid/Combustible Case</td>
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<tr>
<td>• Full Caseless</td>
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<td>• Bullet Interface</td>
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<th>Propulsion Approach</th>
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<tr>
<td>• Propellant Chemistry</td>
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<td>• Propellant Packaging</td>
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<td>• Primer</td>
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**Virtual Design Activities**

- 3D CAD Models
- Structural/Dynamic Analyses
- Interior Ballistics Analyses
- Supportability Analyses
- Limited Firing Tests to Validate Key Models

**Selected Approach**

- **Length Based on M856 Tracer Bullet**
- **Common CT/CL Cartridge Length**
- **CT- Full Polymer Case Configuration**
- **CL- High Ignition Temperature Propellant (HITP)**
Ammunition Features

**Cased Configuration**
- Conventional technology in telescoped configuration
- Significant weight reduction
- Lower Risk

**Caseless Configuration**
- High Ignition Temperature Propellant Technology
- Higher Weight Reduction
- Higher Risk
Summary

• System design meets all program requirements and exceeds many
  – Exceeds weight goals
  – Improves lethality
  – Improves logistics
  – Improves ergonomics
  – Maintains comparable production costs
• Maintaining parallel, synergistic Cased Telescoped and Caseless development plan
  – Emphasizes commonality
  – Reduces program risk
• Scalable design provides significant modularity and commonality
• Cohesive Government/industry team ensures success in development, user acceptance, and production

Comments/Questions?