Program Goals:
• Fill critical operational needs
• Revolutionize weapons and ammunition
• Mature technologies for transition
• Maintain affordability of current systems
• Alleviate logistics burdens

Approach:
• “Clean Slate” design
• Trade studies - reduced weight is priority
• Extensive modeling & simulation
• Incorporate User feedback
Operational Problem

- Inability to sustain operations at high tempo without significant fatigue, affecting warfighter effectiveness
- Inability to execute missions in difficult terrain or at high elevations without reducing combat load
- Inability to maneuver effectively around obstacles, in buildings or vehicles
- Weapons and ammunition are 2 out of the 5 heaviest items warfighters carry
LSAT Advantages

• Significant weight and size reductions for small arms systems, with improvements to key system capabilities
  – Lighter weight weapons
  – Lighter weight ammunition
  – Reduced ammunition size/volume
  – Compatible with full range of ancillary devices
  – Improved system accuracy
  – Improved system reliability
  – Reduced system maintenance and training requirements
### Ammunition Weight/Size Reduction

<table>
<thead>
<tr>
<th></th>
<th>M855 Brass Cased Ammo</th>
<th>Cased Telescoped Ammo</th>
<th>Caseless Ammo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight (600 rounds)</strong></td>
<td>20.8 lbs</td>
<td>12.7 lbs</td>
<td>10.1 lbs</td>
</tr>
<tr>
<td><strong>Cartridge</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propellant</td>
<td>Ball Powder</td>
<td>Ball Powder – Flash Reduced</td>
<td>HMX Based</td>
</tr>
<tr>
<td>Case</td>
<td>Brass</td>
<td>Polymer</td>
<td>None</td>
</tr>
<tr>
<td>Weight</td>
<td>12.2 grams</td>
<td>8.3 grams</td>
<td>6.3 grams</td>
</tr>
<tr>
<td>Volume</td>
<td>0.247 in³</td>
<td>0.215 in³</td>
<td>0.152 in³</td>
</tr>
<tr>
<td><strong>Links</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2.0 grams each</td>
<td>0.5 grams each</td>
<td>0.5 grams each</td>
</tr>
<tr>
<td>Material</td>
<td>Steel</td>
<td>Polymer</td>
<td>Polymer</td>
</tr>
<tr>
<td>Configuration</td>
<td>Open link</td>
<td>Full circumferential</td>
<td>Full circumferential</td>
</tr>
<tr>
<td><strong>Ammunition Pouch</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>0.25 lbs</td>
<td>0.28 lbs</td>
<td>0.28 lbs</td>
</tr>
<tr>
<td>Capacity</td>
<td>100 rounds</td>
<td>150 rounds</td>
<td>150 rounds</td>
</tr>
<tr>
<td>Quantity Carried</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
**Ammunition:**

- Develop technologies that can be applied across various platforms
- Demonstrate in 5.56mm

**Weapon:**

- Light Machine Gun (SAW) designs for both Cased Telescoped and Caseless Ammunition

More than 16 pounds of weight savings!
Key Technologies

- Use of telescoped ammo: Cased or Caseless
- Structural configuration & lightweight materials
- Thermal management
- Caseless chamber sealing
- Human factors
- Integration of electronics

M855 ball rounds provide lethality equivalent to M249

Rotating Chamber allows push through feed and eject

Long stroke, soft recoil improves controllability

Quick change barrel (handle not shown)

Vented Foregrip

Top mounted flip open feed tray

Muzzle Compensator

Picatinny Rails

Full Loop Polymer Links

150 Round Ammo Soft Pouch

Semi-Auto or Full-Auto Fire @ 600 rpm

Adjustable, collapsible buttstock

Both cased telescoped and caseless configurations
Cased Telescoped Rifle:
- Aft feed, rising chamber design
- Same overall weight and length as M4, with 4" longer barrel
- 24.75" with buttstock folded
- 42 round magazine
- Weapon action testing started March 2010
Caseless LMG Technologies

• Unique features:
  – Two piece sealing chamber
  – Sealed firing pin
  – Gas expansion volume

• Test Status:
  – Firings in semi and full auto modes
  – Muzzle velocity, dispersion, etc.
  – Fired almost 500 rounds of caseless ammo
  – Two VIP demos conducted

• Future testing activities
  – Safety testing
  – Shoulder firing and demos
  – Wear, erosion, and reliability
  – TRL 5 demo
Caseless Ammunition Technologies

- Spiral 2 development completed:
  - Same basic formulation as HITP
  - Small pilot plant set up for fabrication
  - Over 1,000 rounds made, 500 tested
  - 50% weight reduction, 38% size reduction

- Spiral 3 development underway:
  - Replacement of legacy energetic binder (PNP)
  - One "quick-look" formulation using polyethylene glycol (PEG)
    - Mixing/molding studies completed
    - Testing showing promising results
  - Alternate binder formulation
    - Matrix of materials vs. key characteristics established
    - Includes non-energetic and energetic binders
    - Energetic binder selected (9-DT-NIDA)
  - Manufacturing process/facility study ongoing
Maturity of CT Light Machine Guns

- **CT LMG SN1:**
  - Fired over 8,600 rounds (300 last week!)
  - Conducted numerous live fire demos
  - Analyzed system characteristics
  - Weight: 9.97 lbs

- **CT LMG SN2:**
  - Fired over 2,200 rounds
  - Converted to fire Spiral 3 CT Ammo
  - Weight: 9.81 lbs

- **CT LMG SN3:**
  - *Weight reduced to 9.21 lbs*
  - Designed to incorporate lessons learned
  - Includes barrel handle, new bipod, new buttstock, updated housing, etc.
  - Over 250 rounds fired on weapon action
  - Integrated weapon testing to start in May
Maturity of CT Ammunition

• Spiral 2: Over 10,000 rounds fired
  – Mann Barrels and machine guns
  – Temperatures from -65F to +160F
  – 35% weight reduction

• Spiral 3: Over 1,600 rounds fired
  – 400+ fired from Mann barrel
  – Also fired from LMG's SN2 and SN3
  – Compacted propellant
  – 13% volume reduction
  – 41% weight reduction
  – Pilot production being established
Demonstration and Assessment

- Conducted multiple high-level demonstrations
  - Sergeant Majors, General Officers, Senior Executive Service
  - Reps from all US Armed Forces, Canada, and the UK have fired CT LMG
  - Available for User demo by request

- Planning for Military Assessment:
  - Demonstrate military utility of lighter weight weapons and ammunition
  - Hardware available in May 2011
    - 8 Light Machine Guns and 100,000 rounds of CT Ammunition
  - Demo ties in to ICD and roadmap for future small arms
• Initial Capabilities Document: (aka Battle AXE)
  – Draft version 0.6 dated 16 April 2010, final draft planned for May
  – Joint document, with input from all services
  – Based on capability gaps identified in Capabilities Based Analysis (CBA)
  – Timeframe is 2015-2025

• Timeline:
  – Transition/Milestone B dependent on approval of requirements and funding
  – Once transitioned, 2-3 years for EMD, 1-3 years for Production & Deployment
  – Potential first unit equipped as early as 2016 (depends on final configuration)
Technology Maturity

• Ammunition:
  – 5.56mm Cased Telescoped (TRL 5 now, TRL 7 in Apr 2011)
  – 5.56mm Spiral 3 Caseless (TRL 5 scheduled for Dec 2010)
  – Alternative projectiles possible in either CT or Caseless

• Weapons:
  – 5.56mm CT Light Machine Gun (TRL 6 now, TRL 7 in Apr 2011)
  – 5.56mm Caseless Light Machine Gun (TRL 5 scheduled for Sep 2011)
  – 5.56mm CT Rifle (TRL 5 planned for Jul 2011)
  – 5.56mm Caseless Rifle (basic design exists)

• Scalable design provides significant modularity and commonality
• Weapon:
  – Current weapon costs used as baseline
  – Optimized for manufacturing and maintenance
  – Uses readily available materials

• Cased Telescoped Ammunition:
  – Uses conventional molding process
  – Can be outsourced to multiple suppliers
  – Adaptable to current assembly line

• Caseless Ammunition:
  – Previous efforts proved feasibility
  – Current efforts focused on reducing cost
  – No reliance on price of brass
Flexible/modular technologies can be applied to:

- Ammunition calibers/configurations
  - "Intermediate" calibers
  - Integration of LFS/SOST

- Weapon configurations
  - Rifle (in work)
  - Medium Machine Gun
  - Sniper Rifle

- Platforms:
Reduced Logistics Burden

- Reduced weight and volume improves storage and handling

- Decreased need for resupply reduces fuel costs and associated hazards
• Improves Reliability
  – Fewer stoppages as a result of simplified feed & extraction
  – Reduces cook-off as chamber is thermally isolated
  – Reduces weapon powering requirement with lighter belt pull loads

• Improves Maintainability
  – Reduces maintenance intervals with low friction coatings
  – Simplifies field stripping with modular assemblies
  – Spares support levels consistent with current systems

• Durable Construction
  – No sacrifice of durability for weight reduction
  – Optimal mix of conventional metals/composite materials
  – Will undergo full spectrum of qualification tests
• Program Goals:
  – Fill critical operational needs
  – Revolutionize weapons and ammunition
  – Mature technologies for transition
  – Maintain affordability of current systems
  – Alleviate logistics burden

"Weight is the currency with which we buy capability"

LTC Glenn Dean, US Army