LIGHTWEIGHT AMMUNITION DESIGN - 8550

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Introduction

• NSAC Contract Award
• Colt / BML teaming relationship
  – Colt Defense is a leading designer, developer and manufacturer of small arms and weapons systems for the U.S. Military, its allies and federal, state and local law enforcement agencies.
  – B.M.L. Tool & Mfg. Corp. has been serving the Metal Stamping industry for over thirty years with critical application tooling and parts and offers full engineering services for all needs including tool & die design as well as product design.
• Introduction of nontraditional suppliers
• Introduction of speaker
Overview

• Purpose of presentation
• Modular case concept
• Prior art
• Patents pending
• Development of alternatives
• Project growth
• Future efforts
Agenda

- Problems with current ammo
- Casing technology improvements
  - Modular case
  - Spiral case
- Benefits
- Next steps
Change is needed in ammo manufacturing

- Develop sub component to fast assembly systems and process
- Target goal:
  - 80% sub component
  - 20% live ammunition
- Dramatic culture change required to modernize current ammunition manufacturing activities.
- New Standards and Specifications need to be developed.
Design & development objectives

- Create manufacturing systems to allow JIT manufacturing.
- Partial mitigation of yearly “LIVE AMMO” supply through sub-component stock pile and “AS NEEDED” assembly.
- Consider GREEN components in both casing and Projectile materials.
- Reduce weight! Ammo is in top 4 of items (by weight) carried by the individual soldier/Marine.
- Scale: develop manufacturing systems for small arms through mid cannon caliber ammunition (5.56mm – 40mm).
- Need to recognize fiscal realities, costs need to deflate while capabilities inflate.
Specific problems with casings

- Brass has many positive aspects:
  - Heat transfer/extraction
  - Elasticity
  - Strength
- But there are negatives:
  - Weight (firepower)
  - Cost
  - Corrosion
Two design solutions to casing problems

• MODULAR CASE
  – Hybrid Steel/Polymer System for 50BMG and larger munitions.
  – Can replace any conventional steel or brass bottle neck case.

• SPIRAL CASE
  – All-polymer molded case in two parts Case Body and Rim Base.
  – Primary use for 5.56 through 50BMG small arms ammunition
Modular case

- Variant Polymer/Steel design for 50CAL through 40MM.
- Skeleton Case Metal stamping with insert molded charge vessel.
- Good weight savings in large cases.
- Very strong hoop strength.
- Modular Manufacturing for JIT or SCAMP.
Separate the case from the powder!

- **Skelton case portion**
  - A determined progressive metal stamping of two drawn target areas rotated to a common centerline.

- **Charge vessel**
  - Propellant storage to charge weight, purged, covered.
  - Stored as sub-component.

- **Assembly of Charge Vessel**
  - Dynamically inserted into the “Skeleton Case” followed by Primer for a “Live Round”.

*Patent pending*
2nd variant, insert molded

- Second mode of manufacturing with “CHARGE VESSEL” as integral insert molded operation.
- The insert molded “Charge Vessel” allows the variant case to be assembled in conventional manner.
Spiral polymer case

- **Benefits**
  - Spiral Ribbing enhances “hoop strength”
  - eliminates “heat transfer”
  - reduces “extraction friction by 70%.
- Manufacturing process allows for conventional bullet insertion in the SCAMP line or can be insert molded with the case.
Benefits at the prototype stage

- Charge weight measurement within 5% of conventional 50BMG.
- Case weight savings of 47% over Brass.
- .091 lbs per round weight savings in 50BMG.
Other spiral case features

- **RIM/BASE COMPONENT**
  - This is a molded component with an insert stamping internal in the shape of an “H”, the bottom houses the primer with the flash hole pierced out and the top portion acts as a blast tray for ignition.

- **ASSEMBLY & BONDING**
  - Ribbed Perimeter adds approximately 50% more perimeter for bonding and joint strength.
  - Helical Twist of ribbing mitigates pressure force line at ignition. Also aids in the extraction sequence from the weapon.
Manufacturing benefits

- Can be manufactured as a conventional case by bonding the rim/base to the case for conventional processes.
- Projectile can be insert molded to the case for a back fill technique.
- Modularity allows JIT and stock pile of components.
- NOT “LIVE” Ammunition.
Summary of attributes/benefits

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<thead>
<tr>
<th></th>
<th>Modular Case</th>
<th>Spiral Case</th>
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<tbody>
<tr>
<td>Best application</td>
<td>50 BMG – 40 mm</td>
<td>5.56mm – 50 BMG</td>
</tr>
<tr>
<td>Case weight saving</td>
<td>20-25%</td>
<td>40-47%</td>
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<tr>
<td>Strength</td>
<td>Equivalent</td>
<td>Equivalent</td>
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<tr>
<td>Modular manufacturing</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>Case cost reduction</td>
<td>~15%</td>
<td>0-8%</td>
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Next steps

- Complete all product and process designs.
  - Tool design and prototyping ongoing in early phases.
- Establish commercial partnerships with critical path vendors.
- Live fire testing at earliest opportunity.
Thank you!

Patent pending