• Marine Corps Ammunition Budget Trends
• Quality Assurance
• Surveillance Feedback
• Additive Manufacturing
• Lightweight Ammo
FY19 PRESBUD Marine Corps Ground Ammunition Breakout, $K

- Mortars: $30,284
- Direct Fire Munitions
- Infantry Weapons Ammunition
- Combat Support Munitions
- Artillery Munitions

Marine Corps Ground Ammunition FY19 PRESBUD Budget, $K

- Mortars
- Direct Fire Munitions
- Infantry Weapons Ammunition
- Combat Support Munitions
- Artillery Munitions

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
The Burning Platform:

- Safety, reliability, and service life risks are realized decades later.
- Can significantly affect warfighters and operational capabilities.
- Challenging and unique boundary conditions of munitions:
  - Variable portfolio from small arms through guided projectiles
  - Long life-cycle
  - Deployed globally
  - Large inventories
  - Velocity of the supply and logistics chain
  - Single use items
  - Diverse industrial base
  - Federal Law
The Approach:

- Prevention based strategy to mitigate risks prior to acceptance or fielding.
- Adoption of industry best practices into the supplier quality requirements.
- Flexibility/scalability within requirements to align with risk.
The Solution:

- Requirements collaboration through initiatives of the military munitions community, while engaging the supplier base through industry days.

Examples:

<table>
<thead>
<tr>
<th>Risk to</th>
<th>Mitigating Requirements</th>
<th>Aligned to Industry Practice</th>
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</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Critical Characteristics Control</td>
<td>- LEAN/Six Sigma</td>
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<td>- FMEA (Automotive/Aerospace)</td>
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<tr>
<td>Reliability</td>
<td>Process Capability, Control, &amp; Improvement (PCCI)</td>
<td>- AS9100 (Aerospace)</td>
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<td>- FMEA (Automotive/Aerospace)</td>
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<td></td>
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<td>- AIAG APQP (Automotive)</td>
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<td></td>
<td></td>
<td>- Statistical Process Control (ANSI/ISO)</td>
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<tr>
<td>MIL-STD-1916</td>
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<td>- ISO 9001 Quality Management System</td>
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<tr>
<td></td>
<td></td>
<td>- ISO 28594:2017 (industry counterpart of 1916)</td>
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<td></td>
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<td>- Preferred acceptance by contractor provisions, SPC, or tables</td>
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<tr>
<td>Measurement System Evaluation (MSE)</td>
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<td>- ISO 10012</td>
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<tr>
<td></td>
<td></td>
<td>- ANSI, ASTM, ASME, etc.</td>
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<tr>
<td>Service Life</td>
<td>- Energetic Materials Traceability</td>
<td>- LEAN; transparency in the supply/logistics chain</td>
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<td>- Ammunition Data Cards</td>
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<td></td>
<td>- Lot Acceptance Test data</td>
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The USMC Service Life and Accelerated Age Test (SLAAT) Program is a methodical, process-oriented T&E program that monitors and assesses the health and reliability of 300+ USMC DODICs.

SLAAT reports are made available on the Defense Technical Information Center (DTIC) www.dtic.mil

Examples of SLAAT findings that identify opportunities to improve design, update specifications, renovate parts, etc.:

- FY17 C869 IST indicated that for select strata, fuze renovation/replacement could eliminate excessive duds
- FY17 C870 GAMs SI resulted in recommending replacement of GAMs over 6 years of age
- FY17 LA45 IST resulted in recommending that the specification review/update may be necessary
- FY18 ML82 SI resulted in recommending process improvements to eliminate residual debris from the solder process
AM is a rapidly progressing manufacturing technical capability

USMC is identifying the means to apply this technology.

Working within the DoD community to assess value proposition to the ammunition enterprise.
Duplicate Existing Item
   Use existing DoD capability to print J143 rocket motor cap.

Design Enhancement
   Improve fragmentation of warhead or grenade.
   Decrease weight through incorporation of AM techniques.

Manufacturing Simplification
   Identify items that exhibit low manufacturability and use AM to produce small quantity.

New Design
   Shape charge utilizing copper impregnated filament.
   Design for additive manufacturability as a consideration.

Distributed Printing
   Use existing ASP technology to print mortar obturator rings.
   Use existing depot technology to print SMAW endcaps.
   Identify additional end items that could benefit from increased supply chain and begin small batch printing.
Mk22 Rocket Motor for MICLIC

Utilize additive manufacturing to produce rocket motor cap and nozzle
- Reduce Cost
- Increase Supplier Base
- Improve Manufacturability
Mortar Obturator Ring
Utilize additive manufacturing to replace obturator in ASP or field
-Increase Availability
SMAW End Cap
Utilize additive manufacturing for end cap during maintenance at depot
-Increase Availability
Legacy Round / Links
- Brass Cartridge Case
- Steel links

Lightweight Round / Links
- Polymer Cartridge Case
- Lightweight links

Cartridge Case = 4 lb. savings per 100 rd. can
Link Material = 3 lb. savings per 100 rd. can

Legacy Packaging
- Steel Can

Lightweight Packaging
- Lightweight Can = ~ 3 lb. weight savings

Transportation Impacts
Inter-Theater Air Resupply – Lightweight Ammo/Can = 3,840 lbs less per 463L Pallet
Intra-Theater Air Resupply – Example via C-130 with 10 pallets covering 3100 miles (EUCOM to Afghanistan)
- Legacy ammo/can = $35,837 fuel cost and refueling necessary enroute
- Lightweight ammo/can = $26,759 fuel cost and no refueling necessary
- Bottom Line - ~$9,000 in fuel savings and no need to refuel enroute

CONUS delivery (manufacturer to depot & depot to ASP)
- Legacy ammo/can = 10 pallets per truck
- Lightweight ammo/can = 14 pallets per truck
- Bottom Line = Every 4th truck is eliminated (Significant SDT Savings)

Shipment of 20" ISO Container from CONUS to EUCOM
- Legacy ammo/can = 8 pallets per container
- Lightweight ammo/can = 12 pallets per container
- Every third container is eliminated
- Bottom Line - Cost savings per eliminated container = ~$22K

Operational Impacts
- Aircraft can stay “on station” longer
- Marines will have more stamina / can carry more ammo
- Supports future UAS deliveries
- Reduces aircraft fuel costs
- Reduces commercial/tactical vehicle fuel costs
- Reduces MHE “wear & tear”

Future packaging configuration for DODIC A576 (.50 Cal 4&1 Linked) w/ (Lightweight rounds, links and container)

Weight Comparison

Current packaging configuration for DODIC A576 (.50 Cal 4&1 Linked), NSN 1305-00-028-6603
- 1 can = 100 rds. (35 Lbs.)
- 1 Box = 2 cans = 200 rds. (78 Lbs.)
- 1 Pallet = 48 Boxes = 96 cans = 9,000 rds. (3,790 Lbs.)

Future packaging configuration for DODIC A576 (.50 Cal 4&1 Linked)
- Ammo – 4 Lbs. less
- Links – 3 Lbs. less
- Can – 3 Lbs. less

(25 Lbs.) 29% Reduction
(58 Lbs.) 29% Reduction
(2,030 Lbs.) 25% Reduction
QUESTIONS