Propellant Replacement for the 105-mm M67 Propelling Charge

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ITEM DESCRIPTION

105mm M1 Cartridge
with M67 Propelling Charge

BACKGROUND

- **HAZARDOUS MATERIALS IN M67 CHARGE**
  - ✓**Toxic lead decoppering agent**
  - ✓**M1 propellant ingredients (DNT, DBP, DPA) hazardous to health & environment**

BACKGROUND (CON'T)

- **FOREIGN SOLE SOURCE**
  - ✓**Dinitrotoluene from a foreign country**
- **PROPELLANT INVENTORY: M1 MP DEPLETED BY FY03; M1 SP BY FY07**

OBJECTIVES

- Replace hazardous M1 propellant with environmentally compliant PAP7993 propellant
- Replace toxic lead decoppering agent with nontoxic decoppering agent

PROJECT PLAN

- **PROPELLANT IMPROVEMENT**
  - ✓ **Reformulate PAP7993 with**
    - ➢ **More effective stabilizer to reduce propellant out-gassing**
    - ➢ **Nontoxic decoppering agent**
  - ✓ **Preliminary safety/sensitivity, accelerated aging and closed bomb tests**
  - ✓ **Producibility**
    - ➢ **SP webs: 0.011”, 0.014”, 0.017”**
    - ➢ **MP webs: 0.021”, 0.025”, 0.029”**

PROJECT PLAN (CON'T)

- **PROPELLANT IMPROVEMENT (CON'T)**
  - ✓ **Initial ballistic evaluation**
    - ➢ **SP webs: 0.015", 0.017"**
    - ➢ **MP webs: 0.025", 0.029"**
    - ➢ **Charge weight assessments**
    - ➢ **Uniformity at cold, ambient, hot**
    - ➢ **IBHVG2 computer simulation & modeling**

PROJECT PLAN (CON'T)

- **PROPELLANT QUALIFICATION**
  - ✓ Thermal Stability
  - ✓ Impact Sensitivity
  - ✓ Friction Sensitivity
  - ✓ Shock Sensitivity
  - ✓ Electrostatic Sensitivity
  - ✓ Fast & Slow Cook-off
  - ✓ Material Compatibility
  - ✓ Variation of Properties with Age
  - ✓ Others

PROJECT PLAN (CON'T)

- **M67 PROP CHARGE QUALIFICATION**
  - ✓ **Ballistic performance**
    - ➢ **Final SP and MP granulations**
    - ➢ **Charge weight assessment**
    - ➢ **Uniformity at cold, ambient & hot**
  - ✓ **Sequential environmental/rough-handling**
    - ➢ **Vibration, loose cargo, temperature soak, drops, ballistic firings at hot and cold**

PROJECT PLAN (CON'T)

- ✓ **Final hazard classification**
  - ➢ **Confined & unconfined stacks, bonfire, thermal stability, 12-m drop**
- ✓ **Propellant and propellant bags shelf lives**

ACCEPTANCE CRITERIA

- **Propellant to meet Energetic Materials Qualification Board requirements**
- **Muzzle velocity variations equal/better than M1 propellant**
- **Low zone minimum pressure equal/better than M1 at cold temperature**
- **Top zone maximum pressure less than Permissible Individual Maximum Pressure (PIMP)**

ACCEPTANCE CRITERIA (CON'T)

- Temperature sensitivity comparable to M1
- PAP7993 propellant and acrylic bags shelf lives equal/better than those of M1 and acrylic bags
- M67 prop charge to pass all safety hazard tests

ACCOMPLISHMENTS

- Propellant improvement efforts completed
- Successful production of initial propellant lots at RAAP
- First ballistic evaluation completed at YPG with satisfactory results
- Propellant qualification near completion
- Successful production of second propellant lots at RAAP
- Potential cost saving by elimination of lead foil

PLANNED ACTIONS

- Complete propellant qualification
- Complete M67 qualification
- Submit technical reports & Engineering Change Proposal

ACKNOWLEDGEMENTS

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  - ✓ **Office of Project Manager for Combat Ammunition Systems**
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- **ENGINEERING & PROJECT MANAGEMENT**
  - ✓ **US Army Armament Research, Development and Engineering Center at Picatinny (ARDEC)**

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