

Engineering Study for Polymer Cased Telescoped Ammunition

NDIA Joint Armaments Conference

16 MAY 2012

Christopher A. Perhala, Martin J. Hopkins, and C. Byron Tolbert
Battelle
505 King Avenue, Columbus, OH 43201

Acknowledgements

Work supported by
JSSAP, Picatinny Arsenal, New Jersey
through
National Small Arms Technology Consortium (NSATC)
under
NSAC OTA NBCH3090001-0018



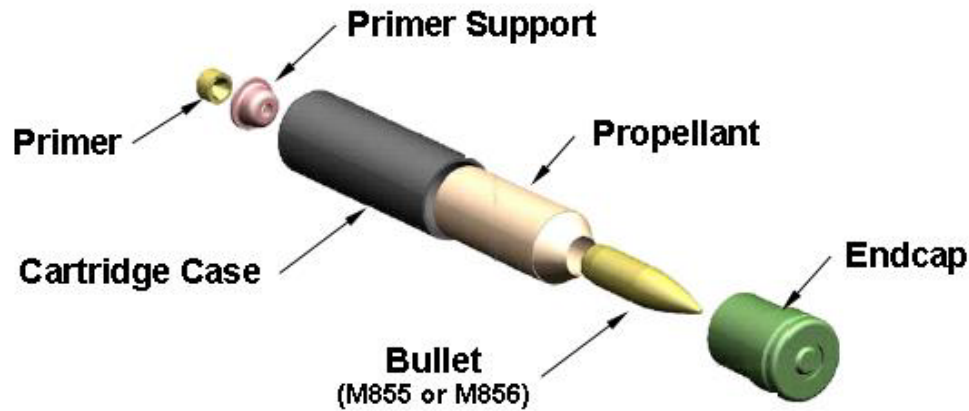
Additional technical support provided by the LSAT Program Team



Project Scope

- Develop Rough Order of Magnitude (ROM) cost estimates for production capital equipment and facilities needed to make Cased Telescoped (CT) ammunition
- Most CT components are common w/current brass-cased ammo except the cartridge case and link (polymer)
- Focus on new or unique equipment & facilities needed
- Consider three production rates:
 - 200 million rounds per year
 - 400 million rounds per year
 - 1 billion rounds per year
- Production concept developed to a level of detail sufficient to support ROM estimate

Cased Telescoped (CT) Ammunition



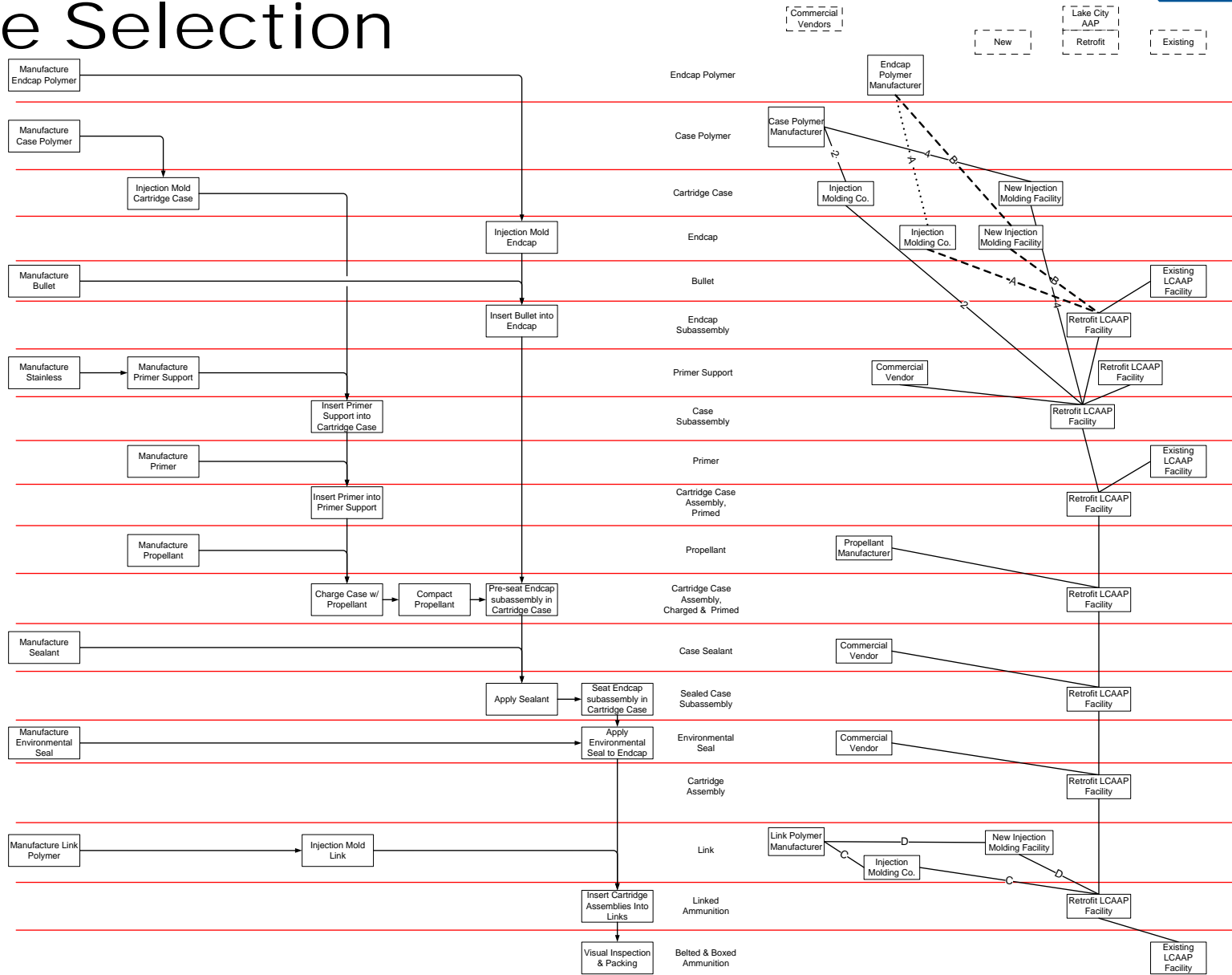
Key Technologies

- Telescoped cartridge
- Polymer cartridge case and endcap
- Compacted/consolidated propellant
- Spiral 2: 35% wt reduction
- Spiral 3: 41% wt reduction



Spiral 2 Cartridge

Site Selection

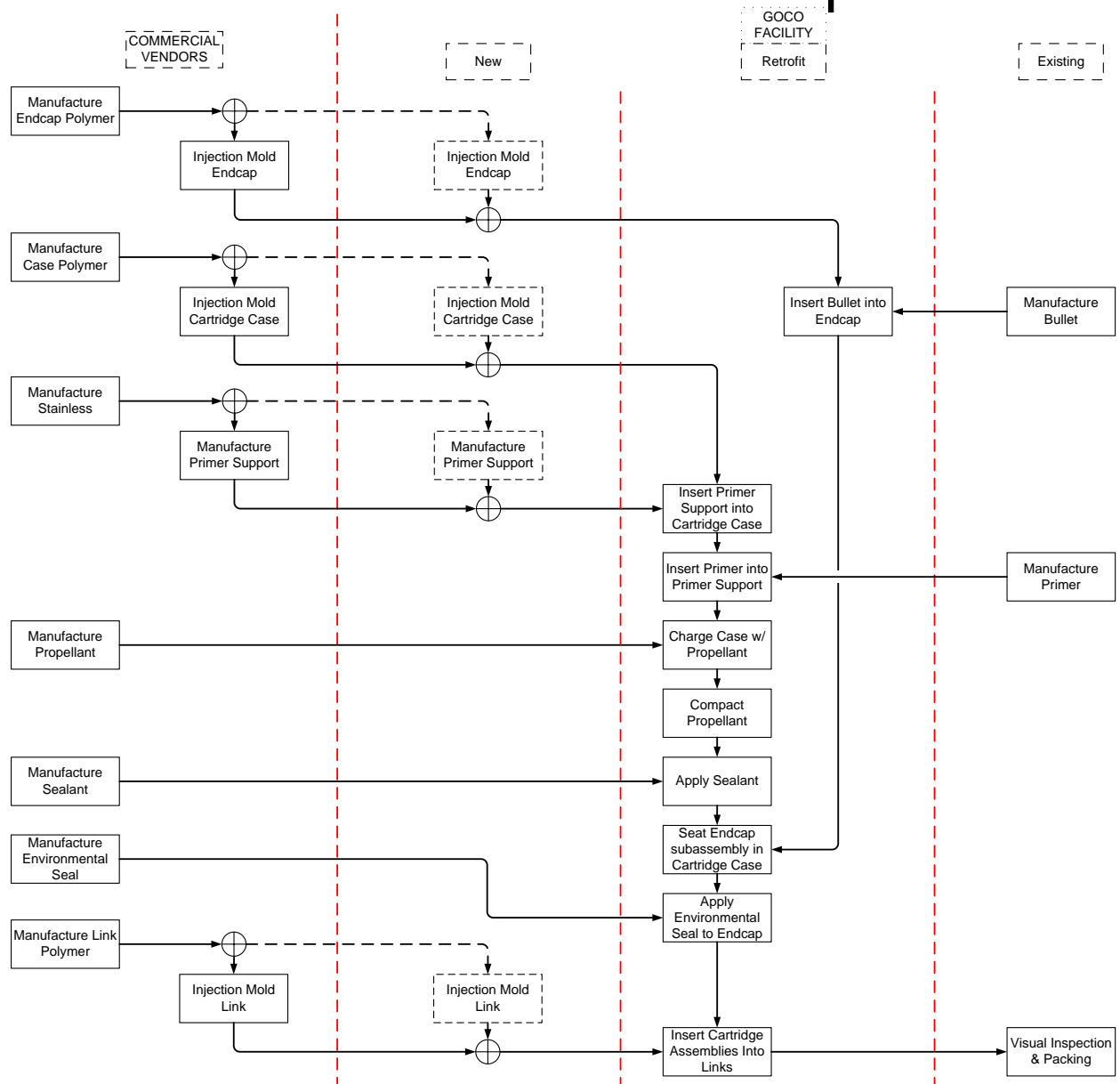


Process Overview

Part / Assy.

Potential Locations

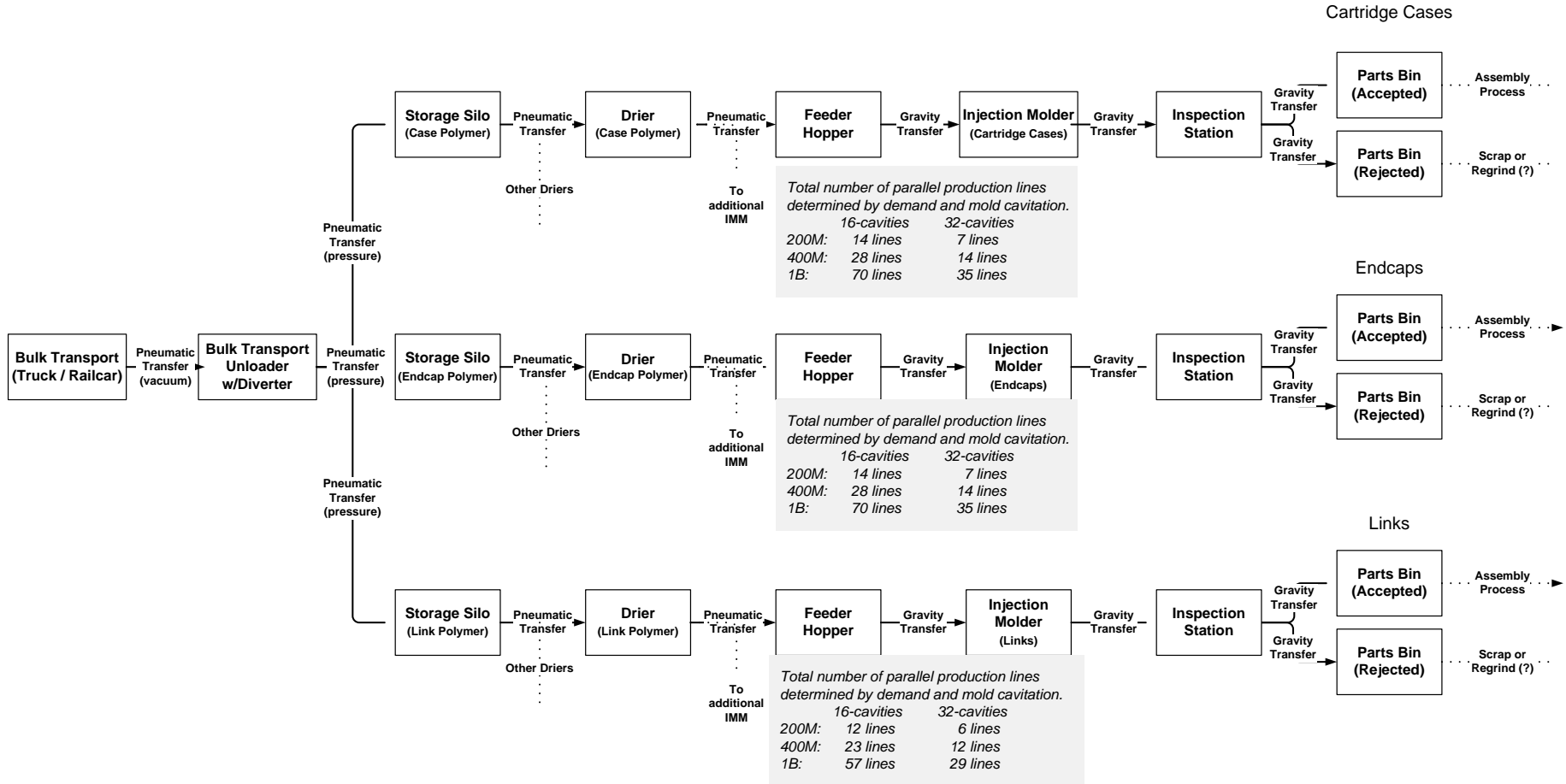
Production Network Concept



Capital Cost Estimating Process

- Define equipment
 - Each material, component, or assembly in process
- Estimate equipment cost
 - Generated both high and low estimates using input from Subject Matter Experts; many actual costs used
- Calculate throughput of selected equipment
 - Factored scrap and estimated or actual equipment availability (A_0)
- Calculate number of parallel production lines for each step
 - Based on above throughput for each machine
- Estimate facility and installation costs
 - Conservative estimate using Lang Factor
 - Lang Factor is multiple of equipment cost to account for new facility construction and equipment installation

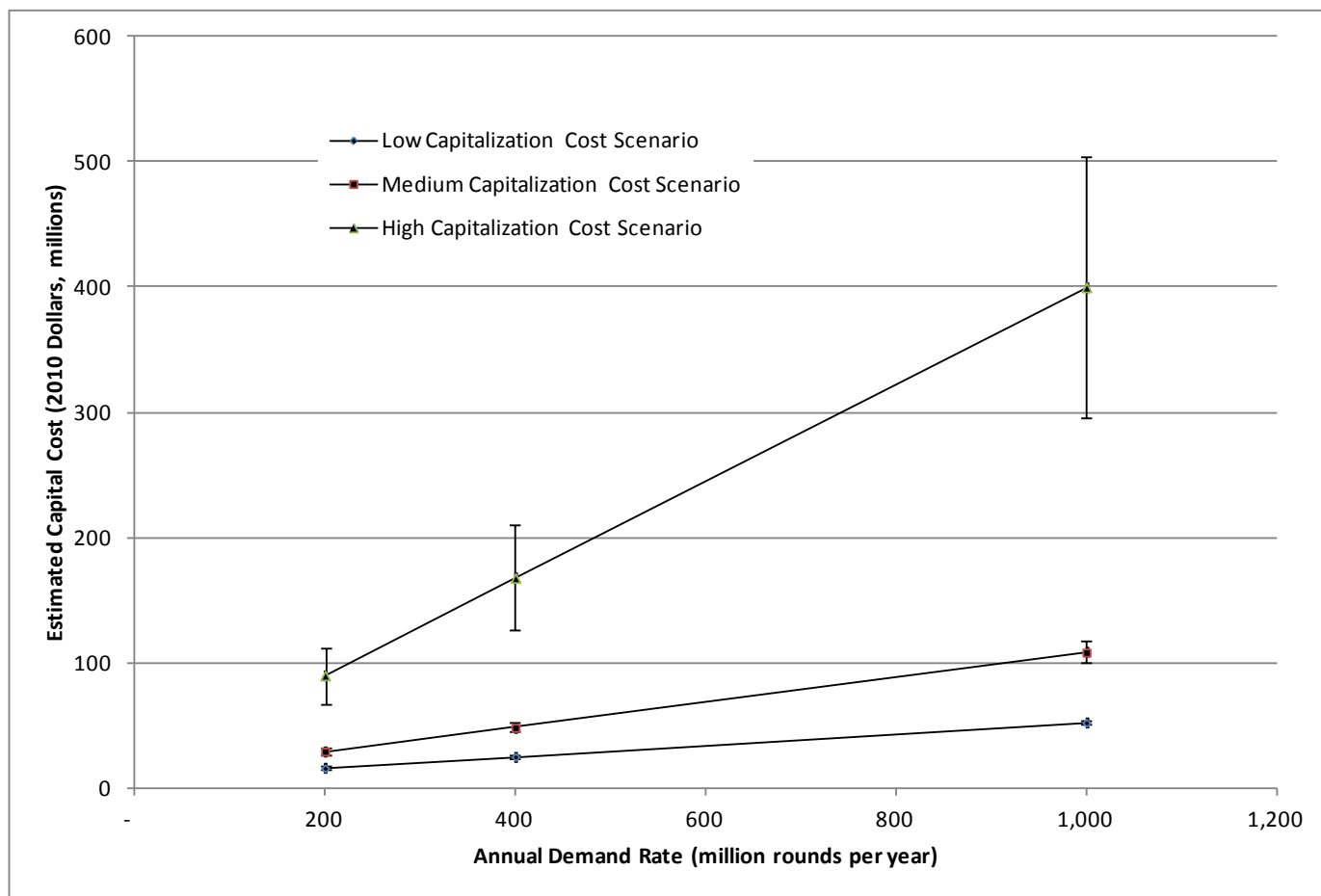
Polymer Part Processing Example



Capitalization Scenarios

- Low Cost Scenario
 - USG contracts with commercial vendors to produce all polymer parts
 - Vendors amortize mold and equipment costs over production runs
- Medium Cost Scenario
 - USG buys molds - higher degree of configuration control
 - USG contracts with commercial vendors to produce all polymer parts using USG molds
- High Cost Scenario
 - Most similar to current brass-cased ammunition production (GOCO)
 - USG establishes dedicated facility for polymer part production and buys molds and equipment for production of injection molded parts
 - Greatest uncertainty in estimates; maximum number of mold cavities possible drives number of parallel lines needed

Capital Cost Summaries



Summary

- Developed Rough Order of Magnitude (ROM) capitalization cost estimates for cased telescoped (CT) ammunition production for three production rates and three capitalization scenarios
 - Low, Medium, and High capitalization costs for production of
 - 200 million rounds per year
 - 400 million rounds per year
 - 1 billion rounds per year
- Identified new infrastructure that will be needed
 - Change from metal processing (punching, drawing, etc.) to injection molding operations
 - Facilities, equipment, and trained personnel
- Defined production line concepts and tooling to a level of detail needed to support ROM estimates