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Always a Step Ahead

ARDEC ARMAMENTS

Small Caliber Multiplex Technology

Abstract #20232

Presented by:
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UNPARALLELED COMMITMENT & SOLUTIONS

Act like someone's life depends on what we do.

U.S. ARMY RDECOM®

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT & ENGINEERING CENTER

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DEFINITIONS

Small Caliber:

.22 up to .50

Multiplex:

Cartridge contains more than one projectile or bullet

HISTORY

Multiplex cartridge technology is not a new concept

1862 – Patent composed for “Improvement in Compound Bullets for Small Arms”

1879 – Government proposal for triplex (three-bullet) rifle round was put together but subsequently rejected

1945 – Nazis had designed a duplex (two-bullet) rifle round as part of an SS project

1952 – Government technical memorandum concluded that the current infantry weapon and ammunition at that time had an undesirably low Probability of Hit ($P_{(h)}$) on man-sized targets

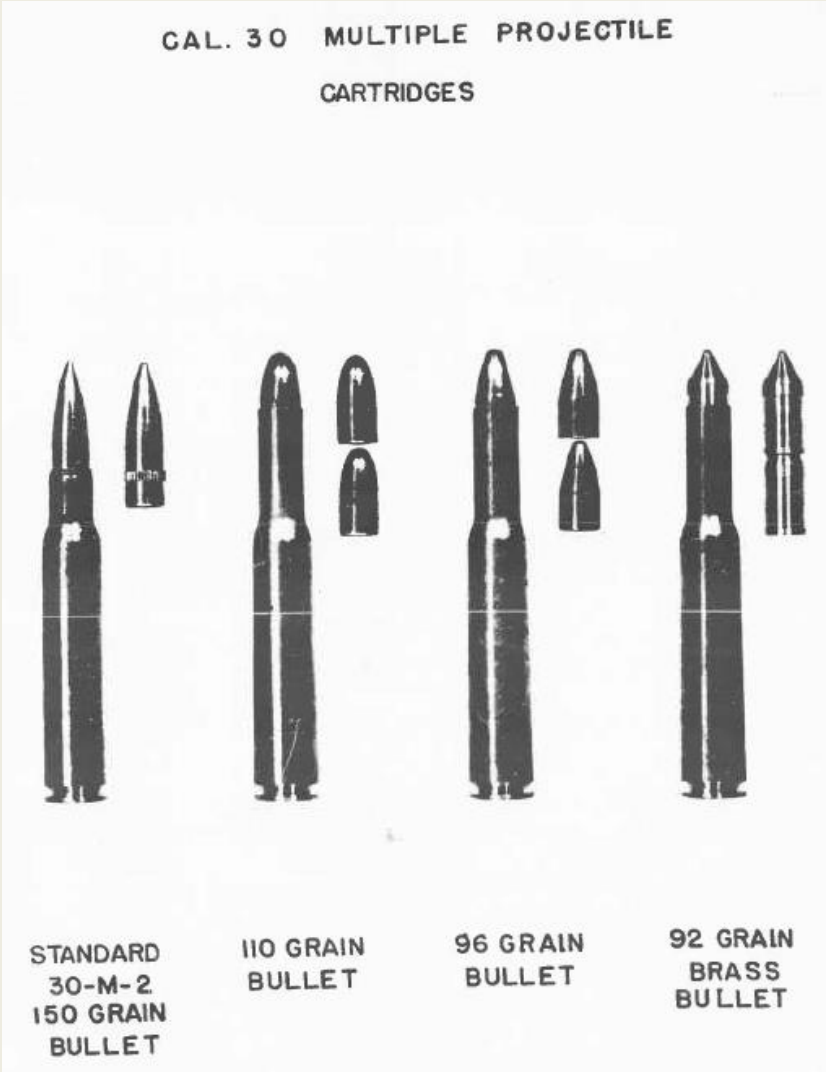
HISTORY

Project Salvo

Initiated February 4, 1952 by Olin Mathieson Chemical Corp

Phase I:

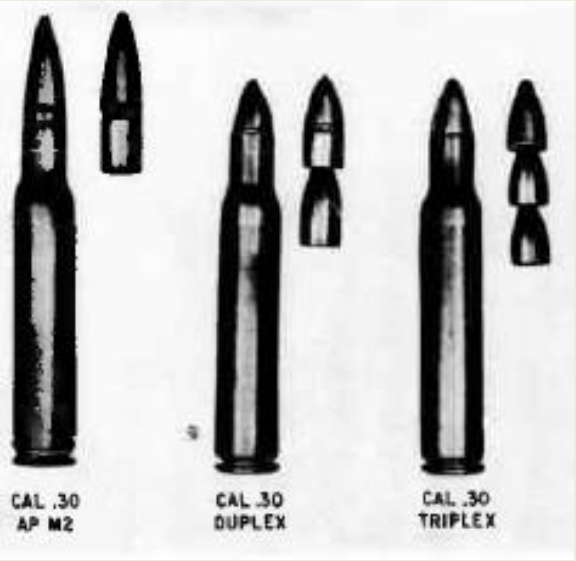
- Perform extensive $P_{(h)}$ studies and analytics to prove performance benefits of multiplex cartridges over conventional single-bullet technology
- Address M1 rifle $P_{(h)}$ via a .30 caliber duplex cartridge with dispersion less than 40” @ 300yds
- Modify weapon chamber to accept cartridge case with a longer neck

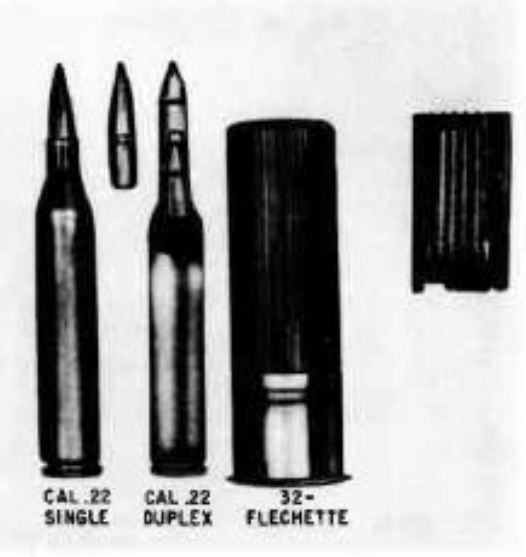


Project Salvo

Phase II:

- Design multiplex cartridges that would operate without modifying M14 weapon chambers or cartridge cases
- Minimize sacrifices in soft tissue damage, hard target penetration
- Increase effective range to 500yds
- Experiment with flechette shot shells
- Perform sensitivity analyses with automatic and burst fire
- Conduct extensive live-fire testing (paper targets, gelatin, soldier helmets)
- Design for cost-effective manufacturability

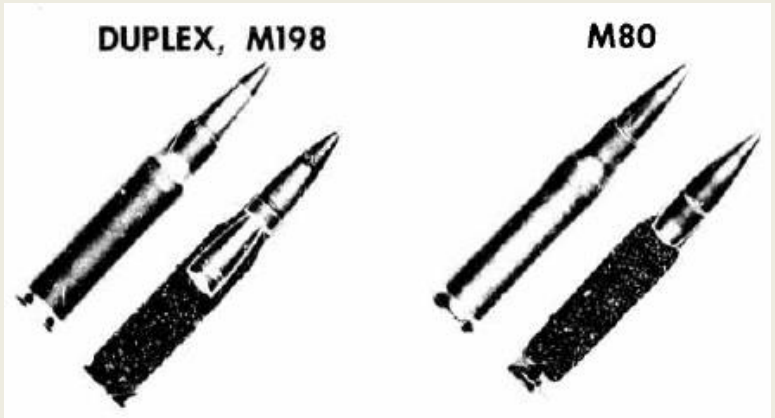




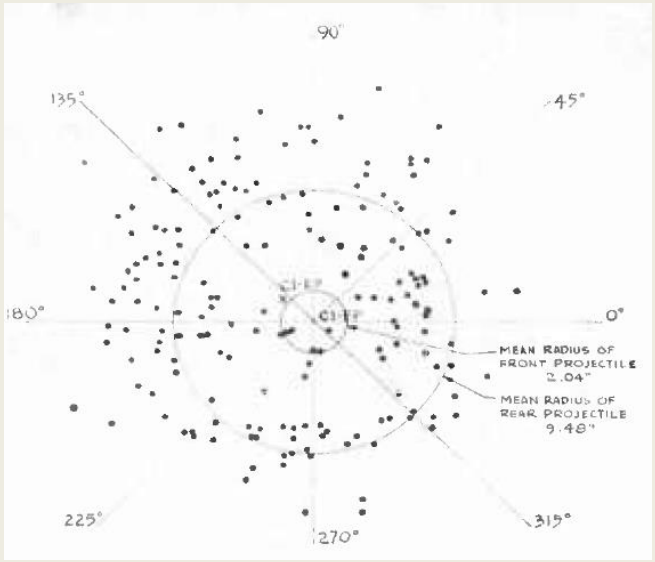
Project Salvo

Lessons Learned:

- Multiplex cartridges yielded a 74% increase in $P_{(h)}$ over single-bullet cartridges out to 500yds range and still offered viable penetration and performance across the intended target set
- Smaller calibers than .30 yielded favorable results but could not produce the same benefits at longer ranges, so .30 caliber was chosen going forward



Dispersion @ 100yds



Helmet penetration @ 500yds

HISTORY

Cartridge, 7.62mm Ball, Duplex, M198

- USG Type-Classified 7.62mm cartridge
- Interoperable with unmodified M14 rifle
- Tighter dispersion than all previous multiplex cartridges
- Penetrated helmets and helmet liners at 500yds
- Similar lethality characteristics to conventional ammo
- Produced at Frankford Arsenal

*However, in 1965 the M198 Duplex was considered **not suitable** for Army use due to the fact that it did not offer a ***substantial*** combat advantage over the standard ball cartridge.

PROBLEM

Enemy Forces are becoming:

- Faster
- More agile
- Harder to defeat
- More capable

OBJECTIVE

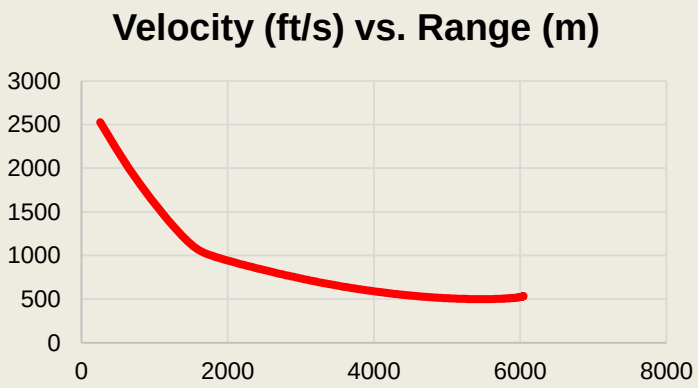
ARDEC must remain a step ahead of the emerging/evolving threat spectrum through ***superior armament design***

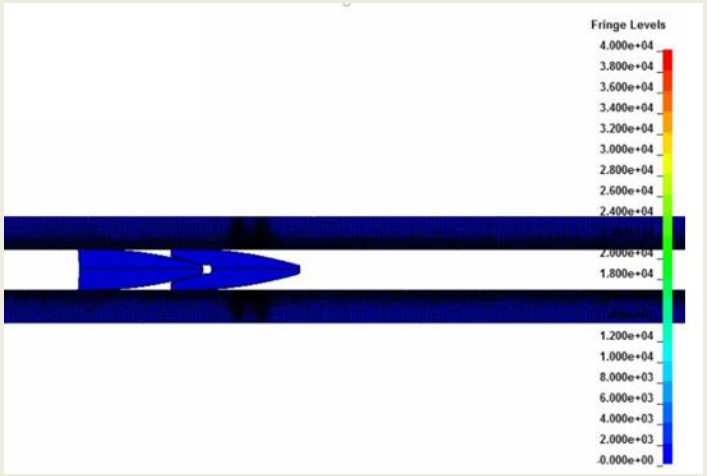
ARDEC Armament Evolution

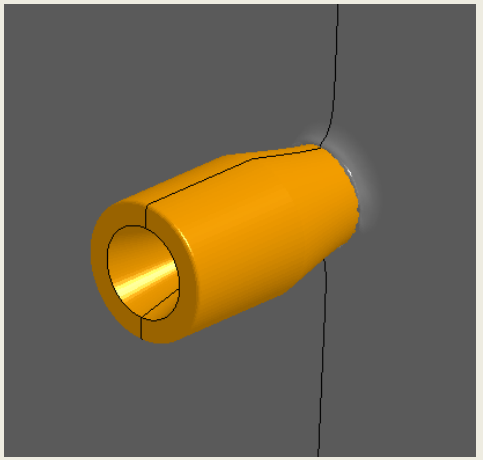
- Leverage of historical data and concepts
- Iterative design process
  - Cutting edge modeling & simulation
  - Extensive testing, state-of-the-art data acquisition equipment

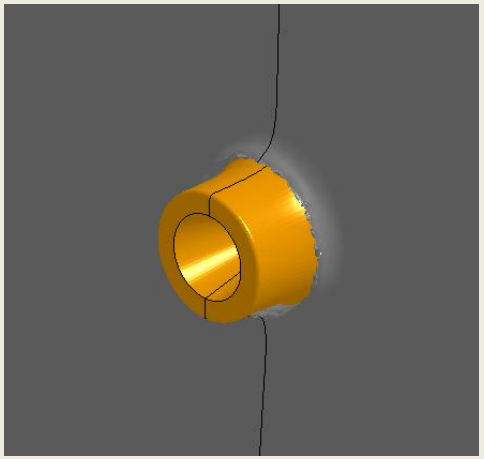
Modeling & Simulation

- Aeroballistics
- In-Bore
- Terminal



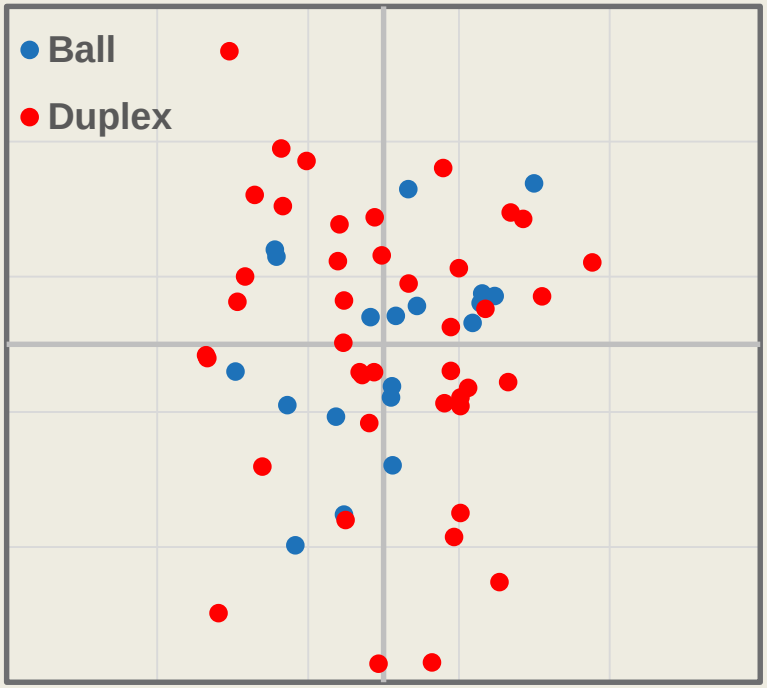






Testing

- EPVAT
- High-Speed Video
- Radar
- Electronic Accuracy Scoring



ARDEC Armament Evolution

→ Scalable multiplex cartridge technology

→ Proven performance benefits

ARDEC Armament Evolution

Performance Benefits:

- Increased $P_{(h)}$ → Increased $P_{(i)}$
- Lower collateral damage
- Increased threat suppression
- Smaller Surface Danger Zone (SDZ)
  - Enhances useable battlespace
  - Allows for more training range options
- Scalable technology allows for use in various weapon systems
- Reconfigurable technology allows for mission adaption

QUESTIONS?

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