

2013 NDAA Small Arms and Small Caliber Ammunition Project— Summary Brief



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2014

Background

- The 2013 National Defense Authorization Act (NDAA) required the Office of the Secretary of Defense (OSD) to select a federally funded research and development center (FFRDC) to conduct a study on the requirements analysis and determination processes and capabilities of the Department of Defense (DOD) with respect to small arms and small-caliber ammunition.
- Deputy Director, Land Warfare and Munitions (LW&M) awarded the task to CNA.
- We delivered our final report to OSD in January 2014.*

Study Goals

1. Conduct a comparative evaluation of small arms (SA) (military and commercial equivalents)
 2. Conduct a comparative evaluation of small caliber ammunition (military and commercial equivalents)
 3. Assess DOD's current plans to modernize SA and ammunition
 4. Assess how DOD decides what to acquire
- We were also asked to consider numerous related factors. These factors include operational environment, industrial base, total life-cycle costs, and recent modifications.

Overall Approach

- Review past studies and assessments
 - Conduct stakeholder interviews
 - Conduct comparative assessments
 - Additional analyses
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- In conducting our research, we reviewed documentation on SA and ammunition, looking specifically at performance, requirement development, and modernization plans. We also talked with stakeholders in the SA and ammunition community (including many outside DOD).

Weapon Systems Data and Analysis

- In our search for relevant data, we examined information from many entities that test SA, including government agencies, vendors, and enthusiasts.*
- We evaluated the information using four criteria to ensure that any data we used would lead to a scientifically sound comparative evaluation. The four criteria follow:
 1. Clearly defined methodology
 2. Took place in a controlled environment
 3. Could not be perceived to have a conflict of interest
 4. Focused on weapon performance
- Data that met these criteria and were comparable were included in our analyses.

Weapon System Families and Criteria

	Characteristics	Reliability	Durability	Costs
Military Pistol				
Pistol Equivalents				
Military Submachine Gun				
Submachine Gun Equivalents				
Military Shotgun				
Shotgun Equivalents				
Military Sniper Rifle				
Sniper Rifle Equivalents				
Military Rifle/Carbine				
Rifle/Carbine Equivalents				
Military Light Machine Gun				
Light Machine Gun Equivalents				

Findings: Weapon Systems

- The way that weapons are currently **tested** prevents DOD from conducting comparative assessments.
- Comparisons within weapon families (e.g., pistols) did not reveal significant variations in **basic characteristics** (weight, length, etc.).
- We did not find significant differences in **performance**, but the data on performance were limited and mostly related to reliability and durability.*
 - With regard to **accuracy**, subject matter experts (SMEs) told us that performance is most improved through training and the use of accessories (e.g., optics).

* Our analyses included results from the Individual Carbine Competition.

Ammunition Data and Analyses

- We compared data on ammunition performance using physical tests conducted by the Army (ARL) and Marine Corps.*
- The factors we considered included dispersion, velocity, range, caliber, weight, cost, terminal effects (lethality), and barrier penetration.
- Much of our analyses and findings relate to 5.56 rifle/carbine ammunition, but we were able to generalize to other calibers.

Rifle/Carbine Ammunition Key Dynamic Properties

Property*	M855	M855A1	Mk 318 Mod 0
Limited dispersion	Yes	Yes	Yes
Yaw independent damage to target	No	Yes	Yes
Early yaw movement within the target	No	Yes	Yes
Wide fragment cone angle	Yes	Yes	No Data
Rarely passes through the target	No	Yes	Yes
No undue damage to weapon	Yes	No	Yes
	Old military 5.56 round	New Army 5.56 round	New Marine Corps 5.56 round

* The best ammunition types for the U.S. military allow for the highest probability of hit and, subsequent to a hit, the highest probability of incapacitation. Based on our analysis of the available data, these properties are necessary to meet these performance goals.

Findings: Ammunition

- The tests show significant variation in overall performance (target impact) across different types of ammunition—generalizable to different calibers.
- Improvements made to ammunition will yield the largest overall SA performance improvement.
- Although higher caliber ammunition has more knock-down power and a greater radial impact, new applications implemented by the military have produced a smaller caliber round that has a greater degree of immediate target incapacitation above and beyond current higher caliber alternatives.

Modernization

- The M4A1 and 5.56 round are the primary weapon and ammo .cal for conventional U.S. ground forces. We found a significant amount of information relating to their modernization.
- At the start of this project, the Army had three draft “Modernization Plans,” which we reviewed:
 - An overarching SA strategy developed by G3 (containing no specific objectives)
 - Soldier Modernization Synchronization Effort
 - Combat Lightweight Automatic Weapon System
- All three plans rely on capability gaps uncovered by a single Capabilities-Based Assessment (CBA) conducted in 2008.

Findings: Modernization

- Efforts to develop an SA strategy began in earnest only in early 2013, so it was difficult to assess current DOD modernization plans.
- We are concerned that the main modernization efforts all rely on the 2008 CBA.
 - Although our review found that the CBA was conducted with sound methodology, this formal CBA development process should be updated every few years to identify capability gaps relating to SA.

Findings: Requirements and Acquisition

- Based on numerous reports, studies, and SME inputs, we found that the Army process for requirement development and acquisition is not functioning in a timely or efficient manner. For example:
 - Numerous entities are involved in the requirement development process in SA and ammunition across the services, but they do not effectively coordinate. Surveys of soldier experiences with SA are not adequately reported or used by requirement developers.
 - There is no standard for prioritizing requirements, leading to delays in all requirements.
- Given the problems with the standard acquisition process—systemic to all services and not unique to the Army—changing a current weapon system for a new one that is only marginally better may not be worth the time, money, and risk involved.

Recommendations

- SA weapon systems
 - Standardize testing procedures to allow for performance comparisons.
- Small caliber ammunition
 - Continue research and innovation to maximize theater performance.
- SA and ammunition modernization plans
 - Standardize and document efforts to ensure that all Army entities are coordinating effectively.
- Requirement development
 - Streamline the requirement development processes to remove redundancy, establish a prioritization formula, and eliminate unnecessary oversight.