



**STRATEGY
RESEARCH
PROJECT**

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TRANSFORMING THE ARMY'S AMMUNITION INDUSTRIAL BASE

BY

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USAWC STRATEGY RESEARCH PROJECT

Transforming the Army's Ammunition Industrial Base

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ABSTRACT

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The Chief of Staff of the Army has announced his intent to transform the Army into a lighter, more lethal land force. To be relevant, the Army must look closely at its industrial base and also transform it to meet the needs of this new force. Along these lines, the Army is making some changes in its comprehensive management of ammunition programs as suggested by the Pacific Northwest National Laboratory study. This Strategic Research Project closely examines the changes in the management of ammunition and the challenges to the modernization of the munitions production facilities. It also assesses whether the changes the Army are making adequately transform the ammunition industrial base to make it supportive for the Army's and nation's defense requirements.

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PREFACE

I spent two years commanding the Iowa Army Ammunition Plant (IAAAP), a government owned – contractor operated load-assemble-pack ammunition plant. The workforce, both government and contractor, was a highly motivated and patriotic workforce. During this command, the challenges were numerous-- produce quality ammunition at the lowest costs safely; maintain stewardship of the environment; clean up the current environment polluted from past practices; and maintain and secure the facility. The plant was over fifty years old and many of the buildings had deteriorated. Additionally, many buildings were vacant; the workload had been reduced from the cold war era levels. A visiting U.S. senator even commented that the plant appeared dilapidated.

What became apparent was that there really was no strategic plan to modernize the industrial base. The Army had other priorities, and funds programmed for operations and maintenance were often siphoned off to pay for small-scale contingency operations such as Bosnia. The challenge was to convince the operating contractor of the plant to think strategically in recapitalizing the plant. However, the contractor's strategic thinking extends only till the end of the contract, perhaps 3 – 5 years. Any significant improvements made to the facility had to be made through Program Managers during the production of ammunition for their programs. In Iowa AAP's case, the tank ammunition assembly round and the M795, 155mm artillery round melt-pour facility were new lines put in to increase efficiency and automation. The problem lies with the entire ammunition base in that no one is in charge of the entire ammunition base and the resources to make the base healthy will continue to be scarce.

I received encouragement to study the industrial base from several senior officers, notably Major General Joseph Arbuckle, commander of the Operations Support Command and Brigadier General (retired) William Holmes, now with Day & Zimmerman. In providing much of the current events regarding the Pacific Northwest National Laboratory (PNNL) study, I thank Ms. Sherryl Kool of the Operations Support Command. Her interest and dedication to the Army and the ammunition field is never-ending.

Finally, I am indebted to my wife, Susan, and my two sons, Matthew and Andrew. They make a great Army family and allowed me to work on this project even if it meant sacrificing time normally spent with them.

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TRANSFORMING THE ARMY'S AMMUNITION INDUSTRIAL BASE

"The more accurate the ammunition and fewer number of calibers used, the fewer tons of ammunition required to be manufactured, stored and moved to the battlefield to get the job done¹."

—MG Charles S. Mahan Jr.
Chief of Staff, Army Materiel Command

BACKGROUND

The ammunition production base could be characterized as one of declining workload, declining budget, and aging infrastructure. Ammunition is expensive to produce, requirements have decreased with the downsizing of the active forces, and the industrial base for ammunition production requires modernization. The nature of warfare is changing such that the demand for precision guided, "smart munitions" is increasing and as a consequence, the stockpile of "dumb" munitions is becoming obsolete. In conjunction with the Army's efforts to transform itself to be more lethal and agile on the battlefield, it must also transform its ammunition industrial base and restructure itself to become relevant and efficient while simultaneously providing economic growth and national security for the nation.

At the end of fiscal year 1994, the Department of Defense had within its stockpile over 5 million tons of conventional ammunition². However, over the past decade, the military services have been consuming its war reserve ammunition stockpile to meet its annual training requirements. Both the downsizing of the active forces and a mountainous stockpile of ammunition configured for a force designed to defeat Soviet forces made this strategy possible. Furthermore, with the retirement of several weapons systems such as the M42 self-propelled gun, the M551 Sheridan tank and the 16" navy gun, a significant amount of the stockpile became obsolete or excess to service needs. As early as mid 1996, in a response to the General Accounting Office, the Department of Defense (DOD), citing its studies of 1994 and 1995, stated that the stockpile was adequate to support two major regional conflicts and meet peacetime requirements. In addition, it said that there was no longer a requirement to surge the industrial base during conflicts because the nation's readiness philosophy change to a "come as you are" philosophy³. The war reserve stockpile used for training is now nearing critically low levels to meet strategic requirements and it is now time to replenish these stocks.

A recent RAND Corporation study concluded that the Army has significant underutilized capacity in its arsenals and government-owned ammunition plants⁴. With limited dollars

available for ammunition, an aging infrastructure, and a desire to transition the industrial base, can the Army modernize the base and efficiently produce the ammunition our defense forces need?

CHANGING REQUIREMENTS

America's experience in Viet Nam along with its strategy to defend Europe from the Soviet Union influenced policies regarding ammunition production. In 1977, the Army as the executive agent for ammunition, assumed the single manager role responsibility for storing, managing, inspecting, testing, and disposing of most of the services' ammunition. Some of the significant changes in the military ammunition planning strategy are shown below.

- Prior July 1976 – Each branch of service stocks enough ammunition to support combat consumption from the day operations begin to when production rate equals combat consumption so that expenditure does not surpass production capability.
- Following July 1976 - Services stock enough items to meet the first 6 months of combat consumption and the industrial base was to provide combat requirements. If industry could not meet combat requirements, industry using the Defense Priorities and Allocation System would take action to obtain additional funding for ammunition to respond to the necessary requirements.
- 1978 – The Program Objective Memorandum (POM) guidance permitted sizing of the base to meet total mobilization requirements.
- 1979 – POM guidance reduced the size of the facilities to support a 180-day requirement.
- 1980 – POM guidance reduced allowable sizing to a 90-day requirement. The guidance further limited sizing the new facilities in support of new munitions to that which would support production in the Five-Year Defense Plan (FYDP). This means of forecasting began the movement away from surge planning⁵.

The requirements for the stockpile changed dramatically as DOD planned for major regional conflicts as opposed to global war. The significance of surging the industrial base lost its importance because conflicts are now envisioned to be of short duration. DOD measured the

health of the industrial base in terms of how quickly it could replenish stocks after a major regional conflict.

As a result, DOD's war reserve requirements are now based on the need to fight two nearly simultaneous major theater wars (MTWs). The requirements are developed using target kill data from computer simulation models and logistics distribution figures. The key assumptions are⁶:

- Each conflict will be intense and short in duration
- Reliance will be on existing stocks for the entire conflict
- Due the short time frame of these conflicts, no significant surge in ammunition production will occur during the conflicts
- After conflict, ammunition will be replenished to designated stockpile levels within a risk based allowable period of time.

With today's current national military strategy, these assumptions remain valid today and become the basis for ammunition replenishment policy.

DECLINING BUDGETS

Consequently, as the nation's perceived need for surge capacity diminished, the budget for research, development and acquisition decreased commensurately. For all of the services, as shown in figure 1, funding fell from a peak of nearly \$4.3 billion in 1985 to roughly \$2 billion in fiscal year 1999⁷.

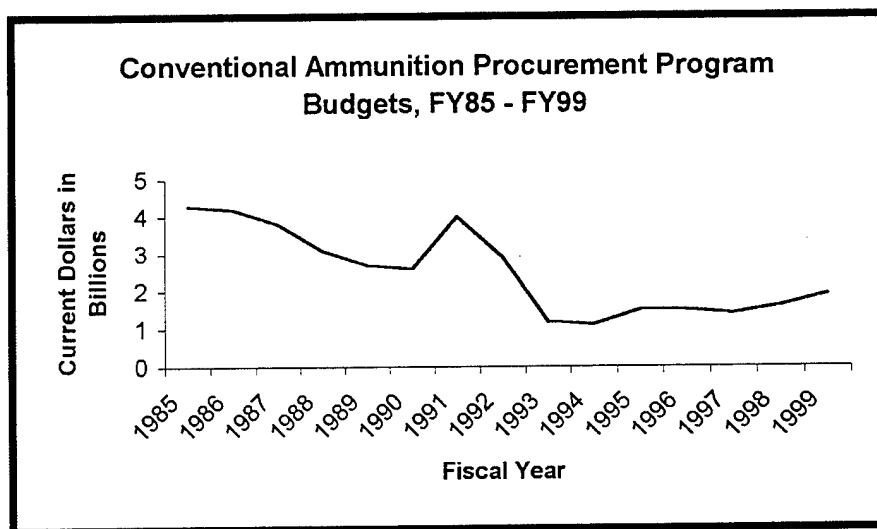


FIGURE 1. DOD CONVENTIONAL AMMUNITION PROCUREMENT.

Clearly the decreased budgets reflected the decreased reliance on conventional ammunition and increased desires for highly technical, precision munitions. The Army's budget reflects the same budget trends as DOD, particularly since the Procurement, Ammunition, Army (PAA) account is more than 50% of the total ammunition budget⁸. The Army's budget trends are shown in figure 2.

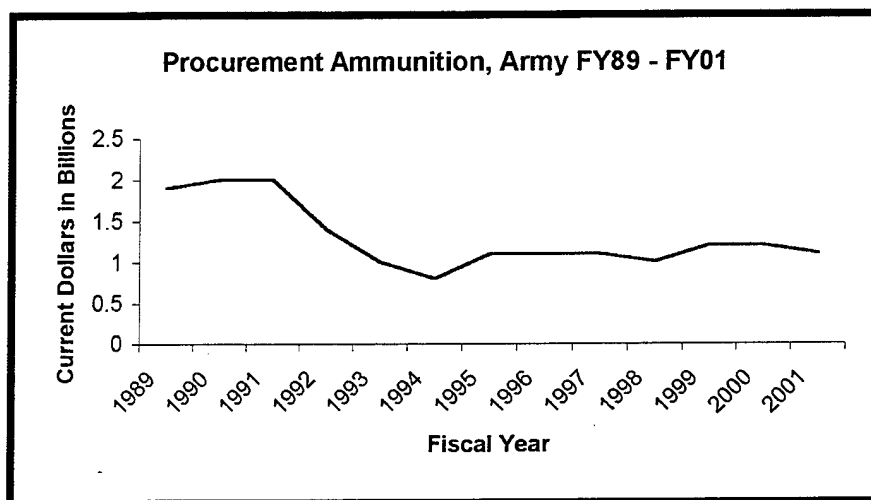


FIGURE 2. ARMY AMMUNITION FUNDING.

In the funding request for FY01, roughly 88% of the funds are for ammunition and the remaining amount is for production base support and ammunition demilitarization. Additionally, with respect to the ammunition end items purchased, over 70% of it is intended for training while the remaining amount supports war reserve stocks⁹.

With respect to the industrial base, the decreasing requirements and budgets had a significant impact on the production capacity. The total number of government owned ammunition production facilities decreased from 32 plants to 22. Of these 22 plants, eight are producing ammunition. The active government-owned government-operated (GOGO) plants are Crane Army Ammunition Activity and McAlester Army Ammunition Depot and the government-owned contractor-operated (GOCO) plants are Radford Army Ammunition Plant, Iowa Army Ammunition Plant, Lone Star Army Ammunition Plant, Lake City Army Ammunition Plant, Holston Army Ammunition Plant, and Milan Army Ammunition Plant. Of the fourteen remaining plants, four are listed as inactive and are retained for replenishment or technical capability; and ten are in the process of being disposed of and returned to commercial entrepreneurs capable of making use of the land and facilities for their business¹⁰.

PACIFIC NORTHWEST NATIONAL LABORATORY STUDY

The total changes in production policy, the decreased budgets, and the reduction of the industrial base over a relatively short period of time requires a comprehensive look at ammunition management. In the National Defense Authorization Act for fiscal year 1996, congress directed the Army to review its management of conventional ammunition for DOD. In response, the Army contracted with the Pacific Northwest National Laboratory (PNNL) to assess the configuration and management of the ammunition base. Specifically, PNNL's objectives were to perform an independent, "clean sheet of paper" assessment of the capability and capacity of the munitions industrial base and then recommend a strategy for configuring and managing the base to effectively meet the needs as defined by the Defense Planning Guidance (DPG)¹¹.

The results of this study are not overly surprising. First, the study recognizes that ammunition and ammunition production requires special knowledge, skills, and business acumen that set it apart from other commodities. This recognition is important because it distinguishes the necessity to keep this skill base a national asset and keep it intact. Hence, seeking ways to obtain ammunition cheaper from international sources to meet short-range requirements is contradictory to maintaining our nation's ammunition production capability. Three major findings of the study are:

- (1) the production base currently meets our nation's needs;
- (2) the management system is fragmented; and
- (3) the business environment needs to be stabilized.

THE PRODUCTION BASE

For now, the industrial base ability to meet the peacetime and wartime needs is still sufficient, though not efficient. The recent Kosovo crisis revealed that preferred munitions are in high demand and are difficult to replenish within short timeframes. In the Army's case, munitions such as the M829 A2 anti-tank round and the Sense and Destroy Armor Munition (SADARM) are categorized as preferred munitions, or munitions most desired by the war fighters. Unfortunately, the ammunition community's workers and facilities are getting older and less resilient. Downsizing in the industry and government and its associated personnel hiring practices has prevented the employing of youth to maintain a vigorous labor force¹². A synopsis of the issues relating to the production base is highlighted in Table 1¹³.

Primary Findings	Indicators
Production system and management structure are Cold War relics and do not match current needs.	Organic base production lines geared to single product Costs to maintain inactive and lay-away facilities are significant thereby keeping capacity in excess of current needs To activate any inactive facility requires long lead time and high costs
Government is not significantly investing in developing munitions manufacturing technology or in its organic production base.	Current production techniques result in high unit costs Old technology remains in the organic base and high risk is associated with restarting lines that have been inactive for long periods of time Lack of flexibility in the organic base such that production volume or product mix cannot be adjusted
Lack of integration and similar methodology in determining war reserve and replenishment requirements among the services.	No consistency in requirements from one cycle to the next making decisions to shed capacity difficult Budget decisions are often made without consideration of the production base and retaining critical skills
Replenishment is not directly managed nor is replenishment cost directly visible.	Lack of method to manage replenishment capacity for items/components from commercial sector Prices for current production includes costs for reserve capacity Current replenishment items can be achieved within current base; however, most newer items are produced in private sector PMs purchase items at best unit price despite the risk that total cost to government is higher

TABLE 1. PNNL FINDINGS REGARDING THE PRODUCTION BASE.

MANAGEMENT SYSTEM

Using best management practices, the study found that the management of the ammunition production base has not adopted a "centralized" management approach¹⁴. Again, this particular finding is not surprising because those who manage ammunition today often cite this decentralized management as a problem within the community. Ammunition management is fractionalized with several organizations within the Army responsible and accountable for managing ammunition. A summary of the findings is shown in Table 2.

Primary Findings	Indicators
Responsibility, authority, and accountability for munitions are divided among the Deputy Chief of Staff, Ammunition (DCS, AMMO); Operations Support Command (OSC) (previously Industrial Operations Command (IOC)); Program Executive Office, Ground Combat Support Systems (PEO, GCSS); PEO Tactical Missile (TACMIS); Armament Research, Development and Engineering Center (ARDEC); and Program Managers from other services.	Suboptimized decision making Available funds not integrated with needs and priorities Implementation of significant changes difficult Coordination and "turf protection" resource intensive Different approaches to acquisition Systems contracts using formal DOD acquisition process Direct or breakout contracts using price-driven commodity procurement process Different organizations responsible for different stages of life cycle of munitions
Ammunition community lacks a strong cohesive voice in the budget process	Ammunition procurement often used as a bill payer for unprogrammed exercises and small scale contingency operations Conventional ammunition is given low priority relative to other acquisition programs such as major weapon programs War reserve shortfalls are not addressed Requirements are adjusted to match funding <ul style="list-style-type: none"> • Little funding toward investment in improved production process

TABLE 2. PNNL FINDINGS IN THE MUNITIONS MANAGEMENT SYSTEM.

THE BUSINESS ENVIRONMENT

Clearly, stability in the business environment is critical to maintaining the viability of the industrial base. The trend of reduced funding and future diminished demand trouble many in the ammunition production community. Companies that produce mature items such as artillery and mortar munitions experience the greatest level of funding fluctuation whereas those companies focused on systems contracts are more stable due to multi-year buy contracting. To help compensate, GOGO and GOCO plants search for third party work to maintain business volume. An overview of the findings in the business environment is provided in Table 3¹⁵.

Primary Findings	Indicators
Industry invests when risk and return on investment are reasonable	Profit margins fail to cover cost of capital Life-cycle management by Program Managers and multi-year buys make select segments relatively healthy
Annual funding approach to procurement of mature items coupled with breakout contracting	Individual items are funded sporadically from year to year and out-year budget forecasts are unreliable Gaps in buys for end items cause producers to absorb idle capacity and/ or go out of business Return on Investment measured annually causing high risk with regard to major capital investment and little internal R&D <ul style="list-style-type: none"> • Producers working with breakout contracts work on the margin where changes in prices can determine profitability
Central planning/work loading not agile to level of uncertainty	Little incentive for GOCOs to improve work performance on workload items Workload is directed to organic plants to maintain the replenishment capacity GOCOs constrained in seeking 3 rd party due to designation in group technology center/special mission facility <ul style="list-style-type: none"> • COCOs perceive unequal distribution of workload is given to GOCOs

TABLE 3. PNNL FINDINGS ON THE MUNITIONS BUSINESS ENVIRONMENT.

RECOMMENDED STRATEGIES ADDRESSING FINDINGS

The findings in the production base, management system, and business environment are linked to the change in funding and requirements for conventional ammunition. PNNL's recommended specific strategies to fundamentally change the way the Army manages ammunition. The study provided the Army a realistic goal, several objectives, and outlined several strategies to improve¹⁶. These are highlighted in Table 4.

Goal	Establish and sustain an efficient and responsive munitions development and production system
Objectives	<ol style="list-style-type: none"> 1. Production base is owned by industry and maintained through industry investment. 2. The Army's munitions mission is consolidated into one organization. 3. Stable business environment allowing for sound business decisions. 4. Consistent acquisition approach for all munitions.
Strategies	<ol style="list-style-type: none"> 1. Using DOD Life-Cycle acquisition process, manage ammunition as a major program. 2. Consolidate management responsibility and financial resources for munitions in a Program Executive Office for Ammunition. 3. Acquire ammunition from the commercial sector and convert government owned production assets to commercial activities while preserving the ability to conduct operations safely using quantity distance (the safe storage distance allowed for explosive quantity) criteria. 4. Apply acquisition reform; government determines requirements; industry determines how to meet the needs.

TABLE 4. PNNL RECOMMENDED GOAL, OBJECTIVES AND STRATEGIES.

PNNL RECOMMENDATIONS

The study team recommended fourteen critical actions. These establish the various requirements necessary to fix the problems identified in the production base, management system, and business environment¹⁷. These recommendations are listed in Table 5.

Critical Actions	
1	Establish munitions Program Managers (PMs) with full life-cycle responsibility for developing, producing and replenishing items they manage.
2	Obtain long-term program/budget authority for munitions families.
3	Apply best value contracting with PMs leading the source selection process
4	Institute as the standard acquisition method, full and open competition among qualified suppliers in the U.S. and Canada.
5	Include replenishment of stocks within the program budgets and contract directly for replenishment capabilities.
6	Increase the size and interval of munitions buys by bundling the buys which use similar production techniques, buying end items, and making multi-year buys.
7	Capture overhead costs by transitioning support organizations to fee for service.
8	Start an all services integrated requirements/war reserve process that includes the industrial base.
9	Keep government ownership of sufficient sites to preserve the ability to conduct production with major quantity/distance (QD) requirements
10	Transition government-owned sites to site manager /tenant operating model using long-term contracts and incentives to maximize return on production and infrastructure assets.
11	Transition production operations at government-owned sites to commercial activities, competing for production and replenishment contracts issued by PMs and leasing space, equipment and infrastructure services from the site manager.
12	Create and conduct equitable processes for transitioning government-owned production assets to private ownership with suitable safeguards to prevent loss of essential capabilities
13	Indemnify the site manager and tenants from environmental liabilities associated with past production operations at sites.
14	Fund and implement for all services a robust munitions R&D program

TABLE 5. PNNL RECOMMENDED CRITICAL ACTIONS.

Similarly, Dr. Jacques Gansler, Under Secretary of Defense for Acquisition, Technology and Logistics (USD-A,T&L) has recommended that industrial strategy for transformation incorporate three thrusts:

- (1) governmental reduction in barriers and incentives to achieve objectives,
- (2) governmental assurance in technological leadership in critical areas by applying state-of-the-art products and manufacturing technologies; and
- (3) greater human resource development¹⁸.

With Dr. Gansler's impulse to transform the entire industrial base, it is no surprise that the recommendations suggested by PNNL are in line with the Under Secretary's transformation strategy.

Missing from the PNNL recommendations were the metrics to quantify the effectiveness of the changes. The principle goal is to achieve an efficient and responsive munitions development and production system. This is attained by measuring efficient use of the resources for each of the 14 critical actions. After establishing a suitable baseline, metrics such as dollars saved per production item, time required for production, time required for contract execution, man-hours per production item, etc., are simple measures of effectiveness.

ARMY ACTIONS IMPLEMENTING CHANGES

The PNNL study offered courses of action to consolidate the ammunition base which applied commercial business practices. Although there is no mandate by the Army to accept these recommendations, it has adopted many of the recommendations and has taken steps to implement them. Each recommendation will be discussed along with the Army's action to date¹⁹.

Critical Action Item #	Recommendation	Army Action
1	Establish munitions Program Managers (PMs) with full life-cycle responsibility for developing, producing and replenishing items they manage.	<ul style="list-style-type: none"> • Established a TRIAD-Support Command (OSC), Tank Automotive Command (TACOM), and Program Executive Office Ground Combat Support System (PEO GCSS)}. • This group institutionalized the life-cycle approach to ammunition.

- Formulated six business case families with full TRIAD representation to develop full life-cycle strategies for families of munitions.
 - Established business case families (munitions type groups such as mortar, artillery, small arms, etc.) to develop strategies in concert with business plans, acquisition plans, and industrial base plans for each family of munitions.
- 2 Obtain long-term program/budget authority for munitions families.
- Authority has not been further delegated below congressional level.
 - To mitigate the fluctuations in program buys, multi-year contracts are being used.
- 3 Apply best value contracting with PMs leading the source selection process
- Applied as the standard practice through Business Case Family structure and life cycle strategy.
 - Using Firm-Fixed Contracts for Ammo Plants
 - Applied long term contracts to reduce costs
 - Applied Acquisition Reform initiatives:
 - Reduce unnecessary government oversight
 - Eight partnering agreements to avoid disputes through contract resolution
 - Reduce contract cycle time by using oral presentations and E-commerce

- Reduction of Military Standards and specifications
- 4 Institute as the standard acquisition method, full and open competition among qualified suppliers in the U.S. and Canada.
 - Achieved significant progress by conducting full and open competition for most ammunition families
 - Recognize and program for market forces shaping the industrial base
- 5 Include replenishment of stocks within the program budgets and contract directly for replenishment capabilities.
 - Contracting for replenishment incorporated by Business Case Families
 - Incorporation of replenishment provisions in contracts
- 6 Increase the size and interval of munitions buys by bundling the buys which use similar production techniques, buying end items, and making multi-year buys.
 - Increase usage of multi-year contracts (requires Congressional approval)
 - Identify opportunities for long term contracts
- 7 Capture overhead costs by transitioning support organizations to fee for service.
 - Implementation of Activity Based Costing
- 8 Start an all services integrated requirements/war reserve process that includes the industrial base.
 - Publish Production Base plan for replenishment capacity bi-annually
 - Analyze and apply risk-based replenishment timeframes for items
- 9 Keep government ownership of sufficient sites to preserve the ability to conduct production with major quantity/distance (QD) requirements
 - Conducting Ammo Base 2025 Study
 - Review of required processes for capacity in commercial sector
 - Exceeded 12 facilities
- 10 Transition government-owned sites to site manager/tenant operating model using long-term contracts and incentives to maximize return on production and infrastructure assets.
 - Use of site-manager concept to be considered in future competitions
 - Armament Retooling and Manufacturing Support (ARMS) Initiative used where feasible.

11	Transition production operations at government-owned sites to commercial activities, competing for production and replenishment contracts issued by PMs and leasing space, equipment and infrastructure services from the site manager.	<ul style="list-style-type: none"> • Incorporated into future acquisition strategies • Integrated Product Teams (IPT) established to determine production site strategies
12	Create and conduct equitable processes for transitioning government-owned production assets to private ownership with suitable safeguards to prevent loss of essential capabilities	<ul style="list-style-type: none"> • Conducting analysis of Scranton AAP, currently a metal parts plant, to determine economics • Analyzing potential sell of Government Furnished Materiel (GFM) in exchange for maintaining capability for set (undetermined) years to reduce government ownership costs of materiel
13	Indemnify the site manager and tenants from environmental liabilities associated with past production operations at sites.	<ul style="list-style-type: none"> • Indemnification clause included in recent contracts for American Ordnance, Small Caliber, and Explosives contracts.
14	Fund and implement for all services a robust munitions R&D program	<ul style="list-style-type: none"> • Current R&D programs <ul style="list-style-type: none"> ○ MANTECH ○ Process prove-out at Iowa AAP ○ Total Integrated Munitions Enterprise (TIME), a computer networked manufacturing concept

Recommendation #1 was not fully implemented as envisioned by the study group. The study discussed a possible organization that included a PEO for Ammunition, a Deputy for Requirements and War Reserve Management and a Deputy for Program Integration. Subordinate to the PEO, are the program managers for logistics, tank ammunition, mortars, and so forth²⁰. Army reasoning for not moving to the PNNL recommendations is that while the PEO offers improvements in management, it does not solve the responsibility-accountability fragmentation among organizations such as OSC, Armament Research Development and Engineering Center (ARDEC), and PEO GCSS²¹. For example, the command and control issue

of providing the PEO funds and holding OSC accountable for operating and maintaining the health of the organic base is fundamentally flawed in that it violates commonly accepted command and management practices.

With regard to long-term contracts cited in critical action #6, this recommendation has been partially enacted. From a flexibility perspective, long-term contracts and commitments restrict Army Materiel Command and the Army from moving in directions that may enhance transformation. The time frames for suggested contracts overlap other critical decisions such as potential Base Realignment and Closure (BRAC), RAND Corporation recommendations and new administration decisions.

Otherwise, the Army has incorporated a number of the recommendations of the study. At this point, it is still too early to determine if cost savings are attained by increased efficiencies in management by incorporating best business practices. The more obvious savings in consolidation of the ammunition base is also yet to be realised.

TRANSFORMATION OR MATURATION?

The changes suggested by the PNNL study are significant measures. Are these merely natural evolution of management structure or are these truly a transformation? The answer to this question is found in the Army's responses to management, industrial base and business practices.

MANAGEMENT STRUCTURE

According to the General Accounting Office, "Management of the Army's conventional ammunition program continues to be fragmented despite internal recognition of the problem and efforts to identify alternative solutions²²." This is a strong critical statement primarily of the Army's management structure. There appears to be little confidence in the TRIAD structure because it is informal and dependent on voluntary cooperation of all parties to achieve necessary efficiencies for ammunition production and procurement. Industry certainly is supportive of the PNNL recommendation. Mr. James Hascall, Chief Executive Officer, PRIMEX, in his speech to the Munitions Executive Summit on 12 Jan 2000, stated that the creation of an Army Executive for Ammunition and vesting the authority, responsibility and accountability to a single, empowered individual is the best approach²³.

The Army's position is that the Program Executive Office for Ammunition is not the solution as described by the PNNL study. The TRIAD structure shown in Figure 3 is the Army's working solution for ammunition management²⁴.

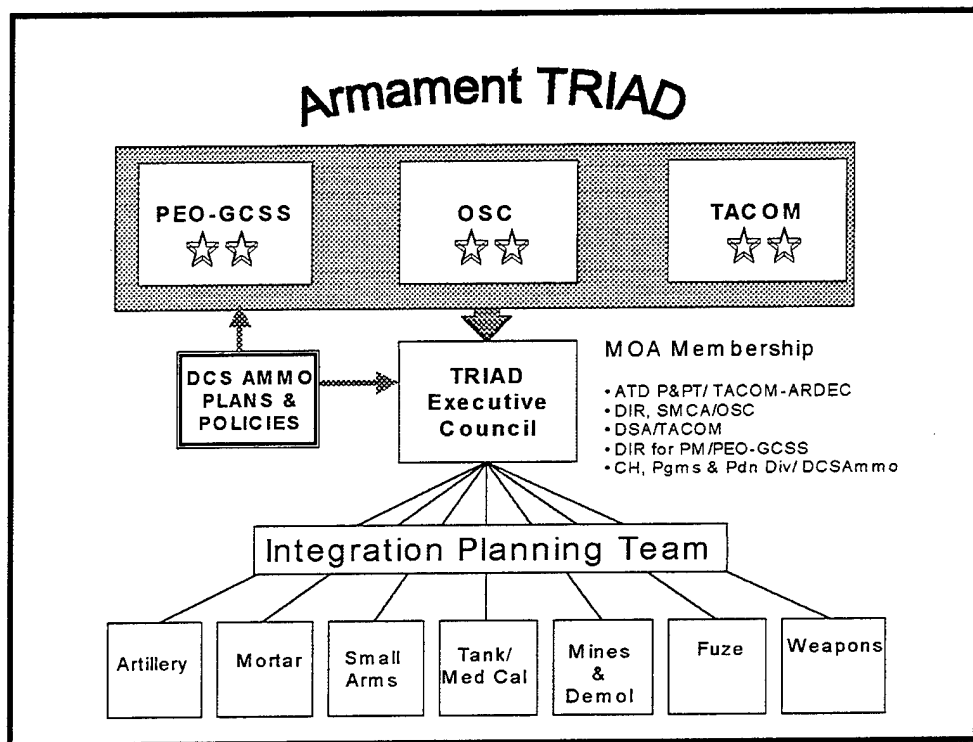


FIGURE 3. TRIAD ORGANIZATION.

Although this particular recommendation was carefully studied, it was determined that it is in the best interest of the Army to use the TRIAD process²⁵ because it avoided a mismatch of budget authority and infrastructure accountability that would occur with the PEO approach. Through communication and the use of Integrated Product Teams (IPTs) significant effort is being expended to de-fragment the ammunition procurement process. IPTs exist for each family of munitions and these convene to assist in the development of acquisition strategy in concert with the industrial base. It is important to recognize that the TRIAD is a big step in the communication and coordination of the various agencies that have a significant impact on the ammunition procurement process. An observer from the outside would probably notice little change within the management structure. However, careful observation of the process and noted gains in efficiencies reflects that managerial transformation has taken place. It is no longer "business as usual" as was the case in the late 1990s.

THE INDUSTRIAL BASE AND BUSINESS PRACTICES

Throughout the 1990s the Army has made significant reductions in its underutilized plant capacity. GAO estimates the annual cost of maintaining the Army's inactive ammunition plants is roughly 118 million dollars per year. This cost has been decreasing in part through downsizing, reducing maintenance requirements, and using the Armament Retooling and Manufacturing Support (ARMS) Act of 1992. The ARMS act provides financial incentives to ammunition plant contractors to seek reduction of idle capacity by attracting commercial tenants to their facilities. The plant contractor, acting in the role of facilities manager, leases buildings and equipment to commercial producers and the revenue generated is used to offset the plant facilities maintenance and overhead costs²⁶.

Concurrently, the number of conventional plants has been reduced significantly since 1978 with only 22 government owned plants remaining, with only eight producing ammunition. Two government owned – government operated plants, McAlester Army Ammunition Plant and Crane Army Ammunition Activity produce, load-assemble-pack, and demilitarize ammunition for all services. In addition these two are primary storage depots for DOD's contingency stocks of ammunition. These two plants remain as the government's primary ammunition production capability. There are six government owned – contractor operated plants. Three are load-assemble-pack plants; two are explosive manufacturing plants; and one is a small arms manufacturing plant. Underutilized plant capacity exists in all of these plants and possible consolidation in the areas of load-assemble-pack and explosives manufacturing should be studied.

At present, the Army's best attempt to entice industry to apply its practices to increase plant capacity is the joint venture with the Iowa and Milan Army Ammunition Plants. This is a facility-use contract with American Ordnance, a limited liability corporation comprised of Mason & Hanger Corporation and General Dynamics Ordnance Systems, to operate and maintain the two plants. The five-year contract provides the long-term stability needed to maximize facility capabilities, apply ARMS incentives, and reduce oversight costs. The potential for savings to the Army is estimated at 118 million dollars over five years. This helps generate needed money to finance the Army's transformation. The contract allows American Ordnance the flexibility to apply the business practices necessary to maximize the use of its required facilities and reduce its unneeded capacity at both ammunition plants.

The joint venture established a milestone in the Army's attempt to allow the commercial industry to define the infrastructure. If the Army continues this trend of contracting, it is conceivable that all three load-assemble-pack ammunition plants could be competed in a similar

fashion. This competition will produce a winner that will become the principle (load-assemble-pack) GOCO producer of large caliber ammunition in the nation. It also affords the commercial contractors the means to reduce underutilized infrastructure, invest in modern production lines, and simultaneously maximize the facilities owned by the government.

Another alternative is to seriously invest in recapitalizing the industrial base by building a modern load-assemble-pack plant (ammunition plant of the future) that could incorporate new technologies in manufacturing ammunition. This automated plant could be configured for several ammunition product lines, mortar, tank, artillery, etc., and simultaneously reduce infrastructure. With the decreased quantities required for DOD, it is possible that many products can be safely manufactured and temporarily stored at one plant instead of the three the Army currently maintains. Additionally, by inserting automation in quality control processes, human error is decreased. The result is that assurance of the ammunition is safer to store and more reliable when it is used.

Recent contract awards for the small arms plant and the two explosive manufacturing plants, have achieved similar benefits in reducing underutilized plant capacity. The long-term facility use contracts have also provided the operating contractors the means to function much like a site manager and seek tenants to their facilities. Finally, in all of these contracts, there is a concerted effort to reduce government oversight of the contractor and partner more with the contractor to reduce risk, achieve efficiency, modernize production, incorporate cost-savings, and apply best-business practices.

CONCLUSION

The Army has made some significant progress in transforming its ammunition base. It has made some tough decisions to reduce its facilities and change its management process. Congress, program managers, research centers, private industry, and the government industrial base all are significant players in moving the ammunition industry toward a relevant and efficient system.

The PNNL study provided the Army with a very comprehensive review of the management, business practices, and industrial capabilities. It clearly "identified the problems" in a turbulent industry. The policy shift from surge to replenishment following by the end of the Cold War, precipitated nearly a 50% reduction in ammunition budgets. The way of doing business had to change.

The Army, to varying degrees, has accepted many of the recommendations presented by the study. The most controversial recommendation that was not fully implemented was not placing ammunition management under a Program Executive Office for Ammunition. Although this recommendation was very carefully studied, it was determined that there were too many loose managerial ends to make this solution work. The TRIAD is the best alternative and has been in existence for about a year. Moreover, the incorporation of IPTs and business families with representatives from TRIAD organizations should make ammunition decisions more coherent. Clearly a set of metrics to measure the TRIAD's effectiveness is needed and this is recognized as a near term objective.

Within the industrial base, more consolidations are taking place. The contracting of ammunition plants for facility use contracts that encourage ARMS initiatives and longer-term management should decrease plant underutilization. As these plants compete for various products, it is necessary to encourage recapitalization and automation and in doing so, the ammunition base continues to transform to create the ammunition plant of the future.

Changes in other areas not addressed in this research paper are needed to make the ammunition industrial base healthy. Ammunition plants that are closed and returned to the private sector require extensive clean up. The demilitarization of excess, obsolete munitions will be a large expense to DOD because munitions declared excess become classified as hazardous materials. Although it is cheaper now to let these munitions sit in depots as war reserves, the storage costs will continue to take away scarce dollars from the overall ammunition budget. Finally, the workforce both in industry and in government must be revitalized. A significant portion of the workforce is eligible for retirement with few young workers taking their place. Producing ammunition is a critical skill that must be retained for our national security.

The PNNL study energized the Army to make many necessary changes. The TRIAD and the Army must continue to regularly examine with the same unbiased scrutiny the changes it has made and continue to propose branches and sequels to complete the transformation in other areas such as the aging work force, environmental clean-up of ammunition plants, and demilitarization of obsolete stocks. In doing so, the ammunition industrial base will remain an efficient, effective national asset.

Word Count = 5,465

ENDNOTES

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⁵ Ibid. 3.

⁶ Ibid.

⁷General Accounting Office, Army Could Achieve Efficiencies by Consolidating Ammunition Management, (Washington, D.C.: U.S. General Accounting Office, September 30, 1999), 9.

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⁹ Ibid.

¹⁰GAO, Army Could Achieve Efficiencies by Consolidating Ammunition Management, 10.

¹¹Pacific Northwest National Laboratory, Recommended Strategy for Configuring and Managing the U.S. Munitions Industrial Base, (Richland, Washington, April 1997), 5

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¹³ Ibid, 9.

¹⁴ Ibid, 10.

¹⁵ Ibid, 12.

¹⁶ Ibid, 14.

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¹⁸Jacques S. Gansler, Defense Conversion: Transforming the Arsenal of Democracy, (Cambridge, MA, 1995). 147.

¹⁹Operations Support Command, Summary Report, PNNL Recommendations and Actions to Date, (Rock Island, IL, 19 Sep 2000), 1 - 3.

²⁰Ibid, 17.

²¹Joseph Arbuckle, "Ammunition Management: Response to Congressman Frelinghuysen's Concerns" Briefing slides with scripted commentary, Rock Island, IL, U.S. Army Operations Support Command, June 8, 2000.

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