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The Ammunition Production Base--Past, Present, and Future

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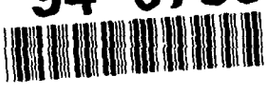

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ABSTRACT

This paper explores the decisions, problems, and policies that have and will affect the ammunition production base. The paper contains a sector analysis, explores base history from World War I through the Gulf War, discusses unique base background information, details the current base and initiatives affecting it, and probes the future possibilities that can and will affect the ammunition production base.

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THE AMMUNITION PRODUCTION BASE -

PAST, PRESENT, AND FUTURE

INTRODUCTION

> **A nation such as the United States cannot afford to scrap that production capacity over and over again. This time these plants ought to remain in stand-by for years to come and, most important, plant and equipment should be rehabilitated and renovated periodically. 1**
>
> - Leo A. Codd
> Army Ordnance Assoc.
> Eve of World War II

PURPOSE

This paper is written to explore the decisions and policies, that have affected the ammunition production base in the past, and will affect the base in the future. In years gone by we invested heavily, and then, over time, divested ourselves of the ammunition base complex. Decisions are being made today that will affect the size and shape of the base that will be available to fight the next war.

This paper contains a sector analysis, addresses the base's history, explores unique base background information, discusses current initiatives, explores future trends and problems, and concludes with recommendations. This paper is written to explore the current course that decisionmakers are charting for the future ammunition production base. If this paper causes decisionmakers to pause and reflect on the current selected course, to question if that course is the best one, then my purpose for this paper has been fulfilled.

The ammunition base must be technologically ready and sized

correctly, to provide our forces with the required ammunition to fight not only the next conflict, but the potential conflicts of the future. This is the challenge for the decisionmaker, to ensure that the downsized base provides not only for regional conflict victory, but hedges against reconstitution requirements of potential future global conflict.

OPENING REMARKS

Political and economic decisions after each conflict since World War II have caused the divesture, plant by plant, of a large and diverse ammunition industrial complex built during the war years. I find it difficult to find fault with the idea that our national survival is directly linked to having a technologically advanced, correctly sized, and warm ammunition production base. The basic questions that must be addressed by decisionmakers are:

- What part of the production base should be saved?
- What part will be eliminated?
- What is the correct base size and mix between private and government producers?

Currently, and for the foreseeable future, the United States is faced with a world in which we have no major adversary and an internal economic situation that public opinion has indicated requires massive defense budget reductions. Public and government consensus, under the new world order, appears to be that military power alone will not ensure survival; deficit reduction, rapid enlargement of the national economy, and improving industrial competitiveness are the leading issues that must be addressed.

With the above issues defined, it is a forgone conclusion that

the military must learn to survive with a vastly reduced budget in the future. DoD must adjust basic defense planning to fit these downsizing constraints. The ammunition production base size must decrease to conform to the threat requirements and economic realities of the world as it will remain for the near future. Current defense strategic emphasis has moved from a global, Cold War focus, with long duration and extended lead times, to a regional, short duration, "come as you are" conflict.

My concern is that we must ensure that the downsized base permits the United States to hedge against future threat uncertainty. The outcome of the next major conflict will certainly depend upon how well we plan today to protect our national interests. As R.J. Hammond states,

> ammunition and water are the only two items that you can not do without when locked in combat; other necessities can be provided later, if you survive. **2**

Mr. Hammond's statement on ammunition necessity points to the difficulty in determining the correct base size. Should the base, private and government, be based on the rates of expenditure of the regional Desert Storm type scenario, or the past expenditures of World War II, Korea, and Vietnam? Our current National Military Strategy is outlined below, but the question of base mix, size, and depth needed to fight a regional conflict versus a global conflict, requiring a national reconstitution, remains unclear.

TODAY'S NATIONAL MILITARY STRATEGY

Today our National Military Strategy is based on a two Major Regional Contingencies (MRC) scenario, fought primarily with CONUS

based (swing) stocks. [3] Emphasis is on forces that strike hard and fast in response to crisis, with high technology and lethal weapons systems. Munitions have become critical force multipliers.

National Military Strategy has changed drastically since the fall of the Soviet Union. The following strategy changes now determine how the ammunition production base is to be sized and what part it will play in the next conflict:

- global war --- regional conflict
- contain the Soviet Threat --- to crisis response
- fight outnumbered and win --- decisive victory
- long duration --- short duration
- large regional ammunition stocks --- swing stocks
- more is better --- enough to do the job.
- clear global threat --- no potential threat for the foreseeable future [4]

In today's constrained budget environment, the goal for planners and decisionmakers is to balance how much and what part of the production base to keep. The current burning questions for the decisionmaker is how much ammunition production base is enough, what skills, technologies, and structure should be saved, and what investments are needed for the future.

To support the MRC scenario, the ammunition production base must have flexible capability, produce critical ammunition requirements, and then be able to surge to replenish used stockpiles - the base is not expected to play a significant role in a regional conflict scenario. Simply put, there is no potential enemy threat, in the near future, that can match our current or near future military potential.

I believe that it is prudent for the United States to follow a course that history proves is difficult for us - we must plan now

and invest while in a state of peace, to keep the ammunition production base modern and technologically superior for future conflicts. I do not propose to argue that we keep our current sized base, but I do suggest we move logically and quickly toward a downsized and efficient base. Prudent planning is required to maintain a dynamic, rapidly expandable, diversified, and technologically advanced ammunition production base. The United States must keep and invest in processes and equipment necessary to bridge from the current MRC scenario to a potential future reconstitution requirement. This bridge from regional conflict to reconstitution is necessary. If the past is a prologue, a world power, or a group of powers, will once again rise to challenge our way of life and national interest. We must be prepared for that challenge.

SECTOR ANALYSIS

> **Ironically in our history we have quickly eliminated the industrial base after the conflict, and then shortly thereafter had to reestablish the base at great sacrifice** 5
>
> - Dr. Edward C. Ezell
> Smithsonian Institute

SECTOR DESCRIPTION

The ammunition production base consists of both government and contractor owned equipment and facilities. The base structure can be broken down into three separate and unique areas.

Government-Owned Government-Operated (GOGO) Facilities. In GOGO facilities the Government owns the land, buildings,

and equipment; the government establishes the work schedule for the facility and the workers are government employees.

Government-Owned Contractor-Operated (GOCO) Facilities. In GOCO facilities the Government owns the land, buildings, and equipment. A civilian contractor runs the facility providing labor, management, explosive expertise, and critical skills. The Government provides the work schedule and funding for the facility and provides a cadre of government employees to over watch plant operations to protect government interests in such areas as safety, security, environment, administration, engineering, quality control, and production.

Contractor-Owned Contractor-Operated (COCO) Facilities. The civilian sector COCO facilities are further identified as those with Plant Equipment Packages (PEP) and those without. COCOs with PEPs have government ammunition production equipment stored on their facility; the government pays for storage and maintenance of this equipment. COCOs without PEPs own the ammunition related equipment on their facility and are usually in current production of ammunition or components that supports current ammunition production requirements or in private or government related production that will be available in times of national emergency.

REQUIREMENTS FOR A RESPONSIVE BASE

A responsive ammunition production base has always required a responsible team effort between private industry and the government. [6] Much of the government owned base was built in the early 1940s as temporary structures in response the massive

ammunition requirements of World War II. Since then, the Government has attempted to modernize and maintain the facilities, equipment, and the critical skills to operate them. Government owned base modernization and repair has been cyclical. In time of conflict, the ammunition base has received increased resources to modernize and expand which resulted in increased readiness. However, during peace, budgets have traditionally fallen, resulting in reduced maintenance and readiness throughout the base. For the most part, the processes and equipment in the government owned plants are not on the cutting edge of technology. The very nature of the government established base, mass production requirements driven, has created the basic problems facing the base today - large overhead cost and production quantities that are not economical due to decreasing budgets.

The contractor owned portion of the base, for the most part, has kept pace with technology. Most contractor operations are high technology and item or type specific in their function. In most cases these small operations are cost effective but cannot manufacture the mass production quantities of ammunition required for the types of conflicts seen in the past. As defense budgets decrease and profits decline, these high technology contractors will leave defense related production and move into more profitable private sector ventures. The strength and size of the contractor owned portion of the base is directly tied to the Defense budgets and the ability of the contractor to remain profitable.

CHANGING PERSPECTIVES

The lessons of Operation Desert Storm and the breakup of the former Soviet Union has changed war planners' perspectives on what the next war will be like. The Desert Storm scenario is the expected norm. Unlike past conflicts, the inactive ammunition production base did not contribute to the Desert Storm victory - the stockpile won the war. 7 This stockpile had been built over a period of years in anticipation of a major conflict between the United States and the former Soviet Union. The future focus and challenge of the ammunition production base is to be able to replenish the stockpile and respond, in a timely manner, during any future conflict when the stockpile of key items is insufficient.

THE BASE IS UNIQUE

The uniqueness of the ammunition base requires that certain critical skills within the base be protected and preserved. Valid restrictions have been placed on ammunition procurement to keep ammunition production from becoming foreign dependent. Ammunition sector production and explosive work skills cannot generally be adapted to commercial applications, nor can the existing private commercial industrial base skills be readily converted to ammunition production. Preservation of critical ammunition skills is critical if future reconstitution scenarios are to be fulfilled.

The current ammunition industrial base cannot be sustained with existing commercial, DoD, or foreign military sales. The base requires sufficient warning time to respond or contribute to high intensity national emergencies. To contribute quickly to any

national emergencies, the base must be warm, i.e., active in production, even if at reduced uneconomical production levels. If the base is to remain an option for reconstitution and critical war replenishment, a standard level of production must be maintained across the spectrum of critical war fighter end items and components. Keeping a warm base, private and government, provides essential response capability and builds strategic stockpiles which are absolutely essential to the success of a short, "come as you are" military action.

In summary, the ammunition production base is an unique sector of the defense industry for several basic reasons:

- ammunition is a critically essential war item.
- there are few sources.
- no civilian use except small caliber hunting.
- manufacture is dangerous.
- plant start up is extremely expensive.

For a complete list of the unique factors of the ammunition base see Appendix A. [8]

SECTOR HEALTH

At best, the ammunition sector situation is troubling. The current budget projections, which do not include President Bill Clinton's expected decreases, significantly reduces the procurement quantities in the areas of propellants, small caliber Load Assemble and Pack (LAP), fuzes, and large caliber metal parts. This reduction is spread across the base in a combination of government owned manufacturing plants and arsenals, and private contractors

who support DoD RDT&E requirements and high technology, item specific production.

Downsizing will shrink the active government ammunition manufacturing base by over sixty percent by the late 1990s. The COCO portion of the base will decline by at least forty-five percent during this same period. As the COCO base declines there will be a very limited number, and very likely not enough, contractors to surge the base, to replenish stockpiles, and reconstitute base structure if a conflict widens. The high technology, item, or process dependent private producers will be squeezed out of the market place as they are forced to compete with the GOCO base. As consolidation occurs and the base moves toward group technology centers, the small job shop, high technology private industries will become starved for defense dollars and move out of ammunition related work.

AMMUNITION PRODUCTION BASE HISTORY

Praise the Lord, and pass the ammunition [9]

- Popular WW II song title

INTRODUCTION

History is read, studied, and analyzed to try and prevent us from falling into the "pitfalls" of the past. There is an old axiom that comes to mind on why we study history:

> **those who fail to remember or profit by experience are doomed to relive them all over again.**

We must ensure that we do not ignore, without prudent analysis, the historical ammunition production base lessons generated throughout most of the twentieth century. Political differences and power struggles for the purpose of conquest and military intervention will not disappear from the world scene. Therefore, a strong and robust military industrial complex tailored to our current needs and future possibilities continues to be a deterrent to those who would wage war against the United States and her national interests. It is true that the past will never be again, but it is essential that assessment of past is required and absolutely indispensable if we are to learn from, correct, and not repeat, past deficiencies.

Today the ammunition production base, built at the cost of billions of dollars during World War II, is all but gone. In 1945 the base consisted of eighty-four active ammunition production plants, thirteen small caliber plants, and a robust arsenal system. By the mid to late 1990s we will have six active plants remaining and a vastly reduced arsenal system in place. **10** The following is a brief history of the ammunition production base.

WORLD WAR I

Prior to World War I the United States depended largely upon a combination of foreign companies and private suppliers to meet its minimal ammunition needs. At the onset of hostilities in 1917, it took nineteen months for full-scale production to start. **11** World War I lessons learned did bring about important changes in procurement of ammunition and how we viewed a "global war"

scenario. The worldwide scope of the war, and the national mobilization requirements, eventually lead to the establishment of a War Industries Board (WIB) for the overall regulation of civilian and military mobilization for procurement and production. By the end of World War I, the WIB had constructed thirty-two ammunition plants, sixteen for manufacture of powder and explosives and a similar number of loading plants for shells, bombs, grenades, boosters, and fuzes. **12** At the end of the war most of the base was dismantled.

WORLD WAR II

The United States was again faced with the requirement to reestablish an ammunition production base. There were only six-GOGO arsenals which had not been upgraded since World War I. Only one arsenal remained that could manufacture anything except small arms ammunition. **13** Except for a small sporting use capacity, no private ammunition sector industry existed that could be converted to produce military small caliber ammunition. Existing civilian goods manufacturing capability was not adequate for conversion to military ammunition products. In 1939, the Congress authorized $3.0 billion to begin building explosives and propellant capability. At the time, there were only six companies in the United States with experienced personnel able to manufacture explosives and propellants. In 1941, fifty additional plants were authorized for construction due to the worsening world situation; twenty-three plants for load, assemble, and pack (bombs and shells); twelve for manufacture of ammonia, magnesium, olieum, and

ammonium picrite; nine for manufacturing TNT; two for RDX, and four for manufacture of smokeless powder. **14**

A total of one hundred-twelve plants were authorized for construction by the Congress, eight-four were subsequently built, and all were contractor operated. Additional capacity was established in various arsenals and thirteen small arms plants. In 1943, the war year of peak employment, over twelve million people were employed in the basic war industries. In 1945 the government started upon a program of diverting and disposing of the bulk of the munitions capacity that it had just spend five years and billions of dollars to establish. The focus of the nation turned to revitalization of the civilian sector. This caused the virtual collapse of the "Arsenal of Democracy." **15**

KOREAN WAR

At the start of the Korean conflict, June 1950, the base was in disrepair due to the austere budgets, lack of planning, and maintenance policies that followed World War II de-mobilization. Mobilization for the Korean War was very different from the total mobilization effort of World War II. The mobilization policy for the Korean war was one of "creeping mobilization" - gradual industrial buildup without disruption of the economy. The expansion of the base was accomplished in stages. The ammunition base failed to provide needed support, in the early stages of the war. It took over nine months and $448 million dollars to get the ammunition base back on line. The concept of a U.S. mobilization base, maintained at a state of readiness during peace, was one of

the lessons learned from the Korean War.

VIETNAM WAR

Unlike the periods after both world wars, the international political climate at the end of the Korean conflict precluded massive demobilization and deactivation of the reestablished ammunition production base. An eleven plant GOCO complex had been maintained on a reduced scale, producing mainly peacetime requirements for training and a few new sophisticated items phasing into the inventory. Full activation of the required twenty-six plants required an average of seven months each and cost approximately $300 million.

The plants in standby or inactive status had been seen a continuous reduction in maintenance dollars to where they were in a protective custody status - minimal maintenance funded. As the war began to build in intensity, six additional plants were added to the original eleven by 1966, and eight more plants were brought back on line by 1968. By 1969 it became apparent to industrial base managers that it was essential to maintain the base capacity that had been reclaimed, and that modernization of the ammunition production base was needed. **16** Vietnam ammunition production nearly saturated the existing ammunition base capability for producing the "bread and butter" items necessary to support our troops in combat. The production capacity usage rates for the war were:

- LAP: 96% capacity
- Metal Parts: 94% capacity
- Explosives: 89% of capacity
- Propellants: 70% of capacity **17**

Industrial base managers began to champion the cause that production of modern, qualitatively superior ammunition, on a timely basis, was significantly influenced by availability of advanced manufacturing processes, techniques, and newer equipment. The continued advancement of the state-of-the-art had become an integral part of the efforts to retain and build a responsive production base. However, following the Vietnam War, the production base again was poorly maintained due to low maintenance budgets.

GRENADA, PANAMA, AND THE GULF WAR

From the end of the Vietnam War to 1990 the ammunition base decreased to seventeen active and seven inactive plants. The regionalization and short time period of these conflicts precluded the ammunition production base from playing a major mobilization or surge role.

CONCLUSION

Since World War I post war planners appear to have consistently ignored history and planned away the necessity to maintain a warm and viable base. Rationalizations for decreasing the base hinge on such concepts as: warning time will always be adequate, the President will recognize threat capabilities and intentions, Congress will authorize reconstitution in time to make a difference, scenarios devised to fit budget constraints, and the reliance on our superior technology to outclass the enemy. Wars are won by well trained, lead, and equipped soldiers, with plentiful and superior munitions. Soldiers must have the

confidence that their nation will provide the necessary tools needed to win the conflict. Production of qualitatively and quantitatively superior ammunition, on a timely basis, is dependent upon: advanced manufacturing processes and techniques, modern production equipment, and a correctly sized and warm production base. Continued advancement of the state-of-the-art equipment must become an integral part of our efforts to respond to future military contingencies.

BACKGROUND INFORMATION

> **There are moments when everything goes well; don't be frightened, it won't last** [18]
>
> - Jules Renard

REQUIREMENTS FORMULATION

At the heart of the question of what is the appropriate size of the ammunition production base is the question of rates of fire and requirements formulation. If planners knew exactly how many rounds of ammunition it would take to defeat the enemy, determining the size of the base and how much ammunition to produce would be easy. A study of past wars and rates of fire do not provide solid estimates for the next conflict. Research on consumption of ammunition by land forces from World War II through Vietnam reveals that past rates of fire have not been helpful determining the size of the base needed for the next conflict. Each conflict is to some extent characterized by one-time secondary conditions. [19]

To overcome this problem of only using previous wars to determine rates, a computerized war fight simulation model has been

developed. The model pits different sized enemy and friendly forces and their weapons against each other, in simulated combat, to determine numbers of rounds fired to destroy enemy targets.

The amount of ammunition required to prosecute the different war fighting scenarios is compiled by the Concepts Analysis Agency (CAA) using the Warfight Simulation Model, run on a Cray supercomputer. To determine projected wartime expenditure rates, CAA uses a complicated formula dependent on scenario, forces, doctrine, technical data, and deployment times; then factors in suspect targets, zero functions checks, weapon registration, rear area security requirements, on board losses, and logistical losses to determine Projected Wartime Expenditures (PWE). **20** The computation of total wartime combat consumption by CAA results in the expected consumption rate by each piece of equipment and weapon, by time period. When added together this data permits the expected number of rounds needed by our forces to defeat the enemy. The basic methodology for requirements determination hasn't changed under the new regional scenario concept, but numerous enhancements have been made in the last four years. Under the old global conflict strategy, requirements were compiled for each theaters and then were added together to get the total requirement. The new strategy focuses on fighting no more than two regional contingencies, but not concurrently. The requirement process determines the ammunition needed to fight and win.

The basic problem, for the ammunition base planner, that has surfaced from the CAA studies is that our current ammunition

stockpile defeats any foe and the production base is not used. Therefore, if we rely entirely on the model we need only give each combat vehicle its combat load to win the war. PWE concept does not consider that: kills are unevenly distributed among shooters, poor distribution of assets occur, and that the scenarios are uncertain at best. To overcome the shortfalls of only using the PWE for ammunition requirements, DCSOPS has developed the Minimum Distribution-System Quantity (MDSQ) which gives each combat vehicle it's basic load plus additional amounts of ammunition to resource the logistic system. MDSQ offsets uncertainty and gives flexibility to the combat forces. MDSQ and PWE are both used when determining requirements. **21** If PWE quantity is larger than MDSQ, one combat load is added to the PWE to get the total requirement. Using the larger quantity leaves some capability at the end of the conflict and provides some degree of confidence for dealing with scenario uncertainty since PWE assumes that at the end of the warfight you have zero munitions left.

FY 94-99 POM

The share of the Program Objective Memorandum (POM) earmarked for ammunition production, RDT&E, layaway and maintenance, and ammunition base construction continues to decline. The four ammunition objectives of the POM are to:

- provide high quality conventional ammunition to all services and be the ammunition of choice for Foreign Military Sales
- provide the ability to surge production during warning period before the conflict so war reserve drawdown is minimized

- permit recovery from war reserve drawdown after a conflict to minimize the period of vulnerability
- retain idle capacity that is unique and long lead time so that the nation can reconstitute its force structure in a reasonable time frame where economically feasible **22**

The current POM total ammunition budget for FY 93 is approximately $1,094 million. This sum is divided between ammunition production ($700 million) and the production base ($393 million) - the production base dollars include $200 million for the Armaments Retooling and Manufacturing Support (ARMS) initiative, which will be addressed later in the paper. **23** This figure is considerably less than the $2.0 to $3.0 billion annual ammunition production budgets of the mid-80s.

SINGLE MANAGER FOR CONVENTIONAL AMMUNITION (SMCA)

Ammunition lessons learned, after each major conflict, indicated the need for the services to integrate conventional ammunition management to provide a cheaper, less redundant, and more efficient management system for providing ammunition to the war effort. Finally, after the Vietnam War this idea came to fruition. In 1975 the Deputy Secretary of Defense assigned to the Secretary of the Army the responsibility to act as the single manager for conventional ammunition for all services. The Secretary of the Army has delegated the operational authority for SMCA to the Commanding General of the Army Materiel Command (AMC). To carry out the single manager function, the U.S. Army Armaments, Munitions, and Chemical Command (AMCCOM) has been delegated as the field operating agency for the procurement, production, financial management, storage, supply, maintenance, and transportation of

conventional ammunition for the Department of Defense. [24]

THE CURRENT AMMUNITION PRODUCTION BASE

> **He, therefore, who desires peace, should prepare for war [25]**
>
> - Vegetius, 4th Century AD

CURRENT BASE STRUCTURE

By the end of FY 93 only nine plants are expected to remain active and four additional plants will be run under facility contracts. Eight plants will be placed into inactive status, three will be kept in modified caretaker status, and six will be declared excess and will be sold if possible. [26] Inactive plants are maintained to the best extent possible, utilities kept on line and up graded, buildings repaired when needed, and improvement projects funded to upgrade the facilities, buildings, or infrastructure. Modified caretaker status for a plant indicates that there is no known production assignment, maintenance is discontinued, and the plant is left to fall into disrepair.

BASE RESHAPING

The current base restructuring plan, the Ammunition Industrial Base Reshaping Plan, was developed by AMCCOM. The plan uses the evolving regional threat strategy, latest strategic deployment concepts, force structure downsizing, and the declining defense budgets as a basis to determine the size of the base. Meetings are currently under way by all services to determine the correct size of the Critical Items List (CIL). The CIL contains the critical service related ammunition items, and quantities of each, that the

stockpile must contain to permit the combat forces to win. Plans are to produce to the CIL requirement with a small warm base that will be able to replenish the stockpile after the conflict.

The current base reshaping plan is a direct movement away from the past cold war mobilization focus of:

- all items being produced simultaneously
- large quantity of items produced over the long haul
- unlimited resources available to maintain and activate the base
- production quantities keyed to the activation of the inactive base
- mobilization not economy of scale sizing of facilities
- retention of plants and lines based on capacity

This evolutionary policy of ammunition base management and change is based on an evolving threat - downsized Russian threat and longer warning times versus a growing regional threat with shorter warning times. It is safe to say that the ammunition production base is evolving with the threat, current defense planning, and economical and political realities. Consolidations will enhance management control and reduce costs, while making plants more economical and efficient. Current and future plants must be structured for flexibility and hardware developers must be encouraged to use the base for ammunition requirements where possible.

CURRENT AMMUNITION BASE INITIATIVES

Ammunition Base Restructuring and AMMO-FAST 21

The vision to provide for the smart downsizing and reshaping of the base is being done by AMCCOM. The strategy envisioned by Major General Paul Greenberg, the AMCCOM commander, is known as AMMO-FAST-21, Ammunition Industrial Base Reshaping. AMCCOM's overall vision seeks to:

- minimize producers and competition to gain price competitiveness
- evolve the base into group technology centers and structure facilities and workload over a range of products
- contract for peacetime production and surge response simultaneously migrate new products into common processes
- minimize overall operating costs
- provide the maximum base flexibility
- keep technologies current
- keep man power for new technologies available
- keep government owned land available for mobilization requirements at little cost
- avoid massive dollars for environmental cleanup of caretaker status plants while maintaining public safety
- avoid past mistakes identified by history **27**

Procedures for Layaway of Facilities

Procedures for layaway of equipment in non-use status, maintenance and preservation, and building climate control (heating in the winter months) is quite detailed and costly. Normally, equipment is laidaway with all maintenance performed, painting done where necessary, protective preservative covering sprayed on all

surfaces to protect the machinery, and then covered or wrapped in plastic. A study of laidaway equipment was done at Twin Cities Army Ammunition Plant to determine if the equipment, that was laidaway in 1970 by only spraying with P-2 preservative, and then subsequently placed into cold storage in 1989, was still in condition to be used if the plant was mobilized. The study found that: spraying with P-2 protected the surfaces from corrosion and deteriorating, electrical costs to activate buildings and equipment was higher that anticipated, humidity appears to harm machinery that has been properly laidaway, and that cold storage effects could not yet be measured. **28** However, cold storage did appear to negatively affect preservative removal, and more minor maintenance was needed to electrical motors and belts. The significance of this study is that as production base dollars shrink, many buildings will be placed in storage status. If it can be proven that properly preserved equipment can be placed into cold storage, and survive for mobilization purposes, significant dollars can be saved from heating laidaway buildings.

ARMS Act of 1992

The Armament Retooling and Manufacturing Support (ARMS) Act of 1992 was passed as part of the FY 93 appropriations bill of the defense budget. **29** The purpose of the ARMS Act is an initiative set into law to encourage reutilization of the GOCO Ammunition Base for commercial as well as other government work. The idea behind the act is that with declining defense dollars, other methods of utilization of the defense base must be found to help finance and

maintain the equipment, facilities and land, and the highly skilled work force. Also, ARMS Act is a jobs program that provides incentives for local, minority, and small businesses to expand and create jobs, and provides incentives for larger businesses to relocate from overseas operations back to the United States.

Congress established the program as a cooperative, prototype partnership with industry to increase base utilization and limit the bureaucracy to encourage business growth. This pilot program, if successful, could be expanded to other segments of the industrial base. The Congress provided $200 million for the program to provide financial incentives and assistance to contractors to encourage them to take advantage of the ARMS Act. There is a current Government/Industry Task Force working on the exact implementation instructions to provide guidelines to the program.

The following initiatives were established in the ARMS Act to encourage commercial firms to take advantage of this pilot program:

- rent free use of the facility, equipment, and buildings, for commercial use.
- identification of the facilities as free trade zones to provide tax incentives.
- funds, out of the $200 million, are available for contractors as low interest loans.
- the government will fund the initial Environmental Baseline to protect both the government and the contractor.
- equipment utilization practices have been modified to enhance usage by changing the replacement, sale of excess, consolidation, upgrade, and layaway/re-layaway regulations.

- funds are available for building alterations to make the base more viable for commercial use. 30

Specific advantages identified for businesses that locate production at one of the government facilities are the availability of: a skilled work force; sewer, water, gas, and electrical systems; computer and communication capability; transportation systems; space, buildings and equipment; environmental permits in place and operating; and incentive programs under the ARMS Act.

Overall, the ARMS Act will offer many opportunities previously not available to contractors, making plant reutilization more attractive. This Act is geared to keep part of the base warm, equipment in the best condition possible, and the skills and infrastructure in place, in case we need all or part of the ammunition production base's mass production capacity in the future.

Facilities Contracting

The idea behind this new contracting concept is to permit the operating contractors to use the inactive plants as much like private commercial facilities as possible. 31 Contractors will be required to obtain contracts through the normal competitive bidding process, and will be able to bid on both commercial and government contracts. The plants placed in inactive status will not be work loaded by the government, but the contractor will be permitted rent free use of the facility for government contracts they win, and will pay rent IAW the FAR for commercial work. The operating contractor will be able to subcontract parts of the plant for production while providing services such as maintenance, security,

janitorial, fire protection, etc., to the subcontractor.

To accomplish this new type of facilities contracting each plant will negotiate two contracts with the government, a no cost facility contract and a Capital Type Rehabilitation (CTR) contract.

Facility Use Contract. The Facility Use Contract is a no cost to the government contract. The contractor must identify equipment and buildings he will use for the period of the contract, usually one year, and identifies the maintenance that will be performed at the plant. The contract also requires the contractor to return the plant to its original configuration for mobilization purposes at his expense within a certain time frame if the government so directs. The maintenance plan defines in detail what is to be done by the contractor at the contractors expense. This maintenance plan includes all equipment used in the production and possible some maintenance on inactive portions of the plant as well. The Facility Use Contract also includes an environmental plan, safety plan, security plan and fire control plan.

Capital Type Rehabilitation Contract. Since the government cannot pass money to the facility contractor via the Facility Use Contract, to do government work, the CTR contract becomes necessary. The CTR contract contains all the required work that the contractor will be paid by the government for completing. This scope of work includes all government modernization projects, maintenance of laidaway facilities, scopes of work for specific projects, and major plant and building maintenance and renovation. To reduce the risk to the government, CTR contracts are usually

firm fixed price which is a major change from the current way of doing bus ness.

Government and Contractor Benefits. The government will benefit from facilities contracting as the plant base remains warm, maintenance requirements and costs are reduced, i.e., part of the expenses for maintaining the inactive facility are shared with the operating contractor. Any maintenance the contractor does on production equipment or any costs that are absorbed by the production contracts are a cost avoidance. Also, equipment in use is repaired and does not have to be laidaway and if equipment is needed currently in laidaway status it must be returned to the same condition. Qualified and skilled personnel will be at the plant working with the equipment which avoids the slow training process if mobilization is required - it is difficult to quantify this higher degree of readiness state that the facility is in due to constant use and skilled personnel available. **32**

First and foremost, to most operating contractors, is that they survive as a producer with the ability to make a profit in relationship with other contractors at the plant, and survive as a profit making entity. Other advantages to the contractor are indemnification, less oversight and regulation, and the opportunity to use equipment without heavy investment.

Group Technology Centers

Group Technology Centers (GTC) are being formed to match similar private industrial process technologies; these plants will be formed into a working cell to share information and technology.

The facilities will be modified to incorporate a wide range of products, within the technology band, to incorporate flexibility. Advantages of GTCs are standardized best processes with reduced planning, less duplication and base redundancy, better plant utilization, lower overhead cost due to economical production quantities, warm base will be maintained by production of similar items, and focused investments will be able to support the best processes. 33

However, during the downsizing move to GTC concept, great care must be taken to ensure that the current high technology COCOs are not driven out of business by unfair competition practices. The COCOs provide great flexibility, job shop performance, necessary redundant capacity, and low overhead production costs that must be preserved to enhance reconstitution requirements as the government base shrinks.

Other Initiatives

The managers of the industrial base are continuing to look for new and unique ways of doing business to preserve the base and reduce costs. Initiatives are currently underway in the areas of Foreign Military Sales, environment, safety, security, regulation and policy change, and government staff changes and downsizing.

THE AMMUNITION PRODUCTION BASE OF THE FUTURE BASE

> **Today in the United States there exists no creditable ammunition research and development base 34**
>
> - Dr. Edward C. Ezell
> Smithsonian

THE FUTURE BASE SHAPE

The future focus of the ammunition production base will continue to move toward peacetime surge capacity with the active base as the key producer. Output will be maximized for selected war stopper items and processes will be changed and developed to be in compliance with environmental requirements and laws. Production quantities will be geared to rapid mass production with available peacetime resources put to best efficient use. Production decisions will be based on efficient economical peacetime production runs with facility retention based upon responsiveness and need. Consolidation will be the order of the day. Facilities will become more economical and efficient, and new investment will be in flexible production lines and facilities.

GOVERNMENT AMMUNITION BASE RESHAPING METHODOLOGY

The methodology for future base identification is to determine the critical ammunition families, identify the cost efficient producers, and ensure that the current critical and developing future technologies are available for development and relevant requirements. The ammunition production base of the twenty first century will:

- shrink to at least six active plants
- have four active specified mission centers (depots/support)
- have eleven plants inactive or under facility contracts
- have three plants under modified caretaker status
- have six plants in excess status **35**

COCO AMMUNITION BASE RESHAPING METHODOLOGY

The methodology for reshaping the COCO base is: determine the commodities needed to support the future government base, identify the base's most flexible producers for those commodities, and down select through competition to the maximum extent possible. The future COCO base is expected to consist of approximately forty-one COCO PEPs and one hundred fourteen COCO W/O PEPs. Supporting sub-tier contractors will decline as business opportunities are reduced. 36

PROBLEMS AND CONSTRAINTS

> **Ammunition, a very critical commodity for national defense, is a little discussed item by top management which is concerned mainly with acquiring major defense weapon systems. In the final analysis, however, these more glamorous systems, such as aircraft, ships, and tanks, are really only complementary delivery platforms designed to direct ammunition to enemy targets. 37**
>
> - Jacques S. Gansler

MAJOR PROBLEMS

There is a vast array of problems facing the ammunition production base sector:

- tightening environmental legislation and increasing restoration costs
- regulation burden, production constraints, and rising costs
- equitable cost sharing among services
- quality GOCO and COCO contractors and subcontractors declining DoD work
- indecision on what items to produce

- an aging work force with disappearing critical skills

The following is a discussion of the critical issues facing the future ammunition production base.

Environmental Restoration and Protection

The cost of repairing the past environmental sins committed in the ammunition production base is enormous. Estimates for restoration range from thirty to forty billion dollars. A multi-service budget line is required to accelerate the clean up the plant base. It is imperative that all services share in the burden of the base cleanup so that restoration does not become neglected as defense dollars grow scarce.

Massive Regulation and Facility Use

Current initiatives involving facilities contracting and the ARMS Act must not be derailed. Tight budgets and strategy changes require new techniques and different methods if the base is to survive in a viable structure. The current philosophy of keeping contractors at arms length, with low profit margins, and constant close government supervision need to be revisited. A true partnership with business is now necessary and smart if the base is to remain viable. The current base initiatives, in all areas, that AMCCOM has begun must be expanded. Regulations, laws, policy, and congressional directives must be revisited and changed to permit smart business practices to replace over regulation and stifling government control.

Equitable Sharing of Ammunition Costs

As the Single Manager, the Army is responsible for funding the

cost of the ammunition program to include common ammunition item production, demilitarization, environmental cleanup, new construction, maintenance of facilities, etc. As the defense budget continues to decline it will become more difficult for the Army to fund required base programs at the expense of Army unique requirements. To illustrate the growing problem, ammunition stocks currently awaiting demil would fill 7,280 railcars covering sixty nine miles, and this problem is expected to grow. **38** It is time that the other services share ammunition base costs. Cost sharing will ensure programs such as demilitarization, environmental cleanup, and facilities maintenance are funded and that the base does not deteriorate further. It is not only an Army problem if the base is neglected and deteriorates to the point where surge or mobilization can not be accomplished in time of crisis.

Shrinking Second and Third Subcontractor Base

Surge capability over time is determined by the second and third tier subcontractor base. From personal experience during Desert Shield and Desert Storm it is impossible, with the current sub-tier base, to fully reach and sustain surge requirements. The main constraint for prolonged surge capacity is the lack of capacity in second and third tier contractors supplying materials and components to the base - surge potential must consider the sub-tier contractor base availability. It may become necessary to stockpile some critical components if we are to be able to surge even the most critical war sensitive items.

Critical Item List (CIL) Reduction

The current CIL has over 769 items that the services consider critical for the warfight. **39** In order to correctly size the ammunition production base, the war planners and fighters must decide what limited number of items are required to prosecute the conflict. As funding declines it becomes more critical to determine what the minimum requirements are and which ammunition item is preferred. Defense planners of all services must concur upon targets allotted to each type of weapon system and service, and what is the preferred ammunition item to destroy that target. As budgets decline, it will become increasingly more difficult to continue to produce all peacetime CIL required items. It must be determine what limited production capability will be used to surge the most critical items during the next conflict.

Critical Skill Loss

Much of the plant work force came to work in the base after the Korean and Vietnam Wars. The current work force has aged to the point where unless steps are taken to preserve the unique and critical skills needed for ammunition and explosive production, we may find ourselves in a situation where when needed, these skills will be gone. Again from experience, I know that as base layoffs occur, the work force is aging due to seniority rights. This older work force will not be available ten years from now. A program should be established to identify those unique and critical skills that should be taught, or cross-trained, to younger employees if we

are to be able to rely on the plant base for future surge or mobilization.

RECOMMENDATIONS

> **Adequate preparation for war has never yet in history been made after the beginning of hostilities without unnecessary slaughter, unjustifiable expense, and national peril. It is only in the years of peace that a nation can be ready to fight. 40**
>
> - Huidekoper, The Military Unpreparedness of the United States

CONCLUSION

The current ammunition base restructuring plan appears to be sound. Concerns that six ammunition plants will be insufficient for a prolonged conflict are not justified with current threat analysis. While no current enemy exists that can give us a good "run for the money" it does not take much imagination to predict that within five to ten years a new global power or partnership will threaten. Our current regional scenario strategy may be good for this point in time, but we must find ways to prepared for an extended operation or the next future global threat. Production base engineers estimate that to develop new plants to mobilization production, even under minimal constraints, would require three to five years. While technology is a force multiplier for us, it is also a constraint. It is becoming increasingly difficult to prove out and eliminate the "bugs" from new production systems. The base must be reduced, but prudent steps must be taken to keep a minimal

warm base aimed at critical item production, and healthy technology growth.

RECOMMENDATIONS

The following recommendations are made:

- accelerate implementation of the AMMO-FAST 21 plan
- fund the ammunition program to keep the technology centers warm, and reduce the active ammunition base no further than the current six active plants and four specified mission centers
- keep investing in the COCO base; reduce the current number of COCO PEPs but identify and keep facilities necessary to produce critical future requirements
- reduce the current CIL to concentrate future production facilities and budgets
- further reduce the plants in inactive status and place more into the modified caretaker status
- spend money on plants that contribute to the war fight
- keep the land, but invest no more money in those plants in modified caretaker status
- for inactive status plants, that have identified equipment needed for future production, we must determine the long term results of cold storage by funding the Twin City Cold Storage Layaway Study
- identify critical skills and ensure they are kept within the base structure
- ensure equitable sharing of the cost of base maintenance, demil, and environmental restoration among services
- seek ways to strengthen second and third party subcontractor tiers.
- continue to explore facility contracting changes, try new ideas on trial basis, and then change regulations to incorporate good ideas
- continue to press for regulation and policy changes to permit managers to manage change smartly

- keep investment high in new technology R&D for government and private producers
- encourage high technology COCO firms to remain in defense industry by funding production runs and R&D

APPENDIX A

AMMUNITION BASE IS UNIQUE

The following factors describe why the ammunition base sector is unique:

1. Ammunition is one of the few critically essential items necessary for successful prosecution of the war effort.

2. There are very few sources for the critical energetic materials and components necessary for production of high quality ammunition.

3. Individual item cost to produce is increasing and technology advances are reducing quantitative requirements, thus requiring more reinvestment and larger budgets to produce less and less ammunition.

4. Many production operations involve processing of both energetic and carcinogenic materials. These operations result in stringent personnel safety requirements, large land acreage usage to meet Quantity-Distance needs, and large dollar expenditures on accident prevention to make work areas and processes safe.

5. The base consists of a combination of Government-Owned Government Operated (GOGO), Government-Owned Contractor-Operated (GOCO), and Contractor Owned Contractor Operated (COCO) facilities; each with a large variance in management, facility size, and contractual requirements.

6. Technology advancements are usually developed in the base. Improvements from non-developmental items and commercial technologies are rarely compatible with ammunition.

7. Ammunition production is specific to defense needs and no commercial markets exist for the vast majority of items produced by the ammunition production base; offshore markets are insufficient alone to sustain a viable base.

8. Production operations involve machine tools, processes, and materials unique to ammunition production. Many operations require critical one-of-a-kind personal and production engineering skills and unique process operating expertise, which are impossible to retain without continuous production.

9. Extreme usage environments, high precision technical competence, and total quality machined products, require finely tuned and in many cases, one-of-a-kind machines.

10. Very large proving ground sites are required to test ammunition reliability and functioning, as well as final lot acceptance testing of ammunition end items and components.

11. Large acreage, unique construction, and stringent security, safety, and transportation requirements are needed for ammunition storage.

12. Environmental requirements to properly treat waste by products from many processes create large facility capital requirements, unique disposal methods and requirements, and significant decontamination and land reclamation programs resulting from past practices and increasingly stringent environmental laws.

13. Demilitarization of obsolete and nonconforming ammunition and components requires unique facilities with commensurate safety, security, and environmental requirements.

14. Shelf life problems and safety requirements require special, stringent, and frequent testing.

15. All Service's standard ammunition requirements - procurement, production, supply, storage, maintenance, renovation, and demilitarization - are handled by the Single Manager for Conventional Ammunition (SMCA). 7

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