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THESIS

PLANT EQUIPMENT PACKAGES: ARE THEY A CREDIBLE DETERRENT TO WAR?

by

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The purpose of this thesis is to determine if plant equipment packages are a viable resource for industrial surge and mobilization. A plant equipment package is a Department of Defense term used to describe an approved complement of different pieces of controlled industrial plant equipment including special tools, special test equipment, and other plant equipment. These items are put together at a predetermined facility to form a production line to manufacture critical war material. Differences between Army and Navy plant equipment management were identified, and condition assessments of industrial plant equipment were examined through the study of Acme-Gridley lathes in Army plant equipment packages.

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ABSTRACT

The purpose of this thesis is to determine if plant equipment packages are a viable resource for industrial surge and mobilization. A plant equipment package is a Department of Defense term used to describe an approved complement of different pieces of controlled industrial plant equipment including special tools, special test equipment, and other plant equipment. These items are put together at a predetermined facility to form a production line to manufacture critical war material. Differences between Army and Navy plant equipment management were identified, and condition assessments of industrial plant equipment were examined through the study of Acme-Gridley lathes in Army plant equipment packages.

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I. INTRODUCTION

This thesis is a study of plant equipment packages (PEPs) which are designed for use in times of national emergency (i.e., surge or mobilization). This study will investigate whether PEPs are a viable resource in times of industrial surge and mobilization. In order to draw conclusions on PEPs, assessments of the condition of inactive government-owned industrial plant equipment (IPE) in PEPs will be the focus of this study.

In August 1990, President Bush ordered United States troops into Saudi Arabia in response to the overthrow of Kuwait by Iraq and the massing of Iraqi troops along the Saudi Arabian border. Appropriately dubbed "Operation Desert Shield," American troops took up defensive positions in Saudi Arabia to prevent a possible invasion by the Iraqi military. Americans prepared for a "long campaign," triggering concern in the press and the nation that United States forces could get involved in another Vietnam style conflict. In addition, there was concern over the ability to sustain military forces in the event of prolonged conventional conflict.

Today's rapidly changing environment is decreasing the possibility of nuclear war between the United States and the Soviet Union (i.e. Glasnost, Perestroika), while increasing the threat of low intensity conventional conflicts with third world nations. Recent events in the Persian Gulf (Iran/Iraq war, Kuwait invasion, hostage incidents, terrorism, etc...) highlight the need to maintain a defense industrial base for the manufacture of critical war material. Furthermore, sustainability of military forces in a threatening environment is the quintessential goal of our industrial base.

Sustainability, in military terms, is the capability to maintain the necessary level and duration of combat activity to achieve national objectives [Ref. 1]. Industrial base surge and mobilization capability directly affect military sustainability. Without a responsive industrial base to meet increased demand during wartime, sustainable operations are unrealistic. This concept was illustrated early in World War II (1943) when...

> ...the availability of shipping was dictating the date of desired operations. The availability of landing craft and landing craft engines was controlling the timing of amphibious operations. The availability of steel plate was controlling new increases in shipping and landing craft....Without accurate and timely knowledge of what the homefront would make available to the military on a certain date, military planning was lacking in reality. Logistical considerations were controlling the extent of operations and timing. [Ref. 2]

If war broke out in the Persian Gulf between the United States and Iraq, our forces must be prepared to sustain a long term military conflict or escalate to nuclear weapons. The use of nuclear weapons on a third world country (not directly threatening our nation) does not appear to be a viable option to the United States for many, mostly political reasons (i.e. distance from Soviet Union, political outcry in the U.S., world reaction). Sustainability in a long war therefore would entail activating some of our plant equipment packages (PEPs). PEPs manufacture critical war material (i.e., munitions) in the event of surge/mobilization.

The importance of munitions in modern warfare has been noted by strategists and logisticians alike. For instance, while serving as the Director of Supply Operations and Readiness, on the staff of the Commander-in-Chief United States Atlantic Fleet, Rear Admiral Miller wrote:

> First, while we have many material shortfalls, none are as important as munitions. Munitions, especially threat oriented, are the most critical and time sensitive commodities in the heat of battle. It is still the single most critical war stopper. The lead time for "smart weapons" compared to World War II vintage is so long that production surge will not immediately affect the outcome of an intense global conflict. It will be a "come as you are" war. [Ref. 3]

Since many of our Allies depend upon the United States to supply some war material to sustain their operations, activation of PEPs might be necessary whether United States forces engage Iraqi troops or not.

Many military experts considered that victory in World War II was the result of massed material rather than military skill [Ref. 4]. It was our industrial base which provided the material necessary for victory. In one sense, PEPs act as deterrents to forces contemplating war with the United States due to their capacity to produce critical war material before the depletion of war reserve stocks.

This thesis is divided into six chapters. The following is a synopsis of each chapter:

Chapter II provides a definition and illustration of a PEP. It explains the purpose and provides a brief history on PEP evolution. Chapter II concludes with a thought on the future challenge of PEPs in light of their expense and the National debt facing the government.

Chapter III explores PEP management in the Army and Navy. It illustrates the key levels of PEP management and policy for each service, beginning with the Office of the Assistant Secretary of Defense for Production and Logistics, and ending at the planned producer of the PEP. The most important management instructions are reviewed and some problems facing PEP management are explored.

Chapter IV defines condition assessments and discusses evidence that indicates that these assessments do not accurately reflect the actual operating condition of inactive government-owned industrial plant equipment (IPE) in a PEP. The investigation suggests that most condition assessments may be overstated. If correct, this brings into doubt the effectiveness of our surge/mobilization plans, and PEP usefulness in general.

Chapter V reviews procedures for condition assessments of inactive government-owned IPE. It shows that condition assessments of inactive government-owned IPE are done by visual inspections and suggests an alternative way to perform assessments that would be more accurate. A cost analysis was done on the visual condition assessment method and the more reliable alternative method.

Chapter VI contains conclusions and recommendations. It draws upon chapters II through V and makes suggestions to improve PEP readiness or to eliminate PEPs that are not connected to power in the event they cannot be accurately assessed.

II. BACKGROUND/HISTORY

A. INTRODUCTION

Much has been written about the deterioration of the United States' defense industrial base, including government-owned and privately-owned production facilities. Two examples of the literature on this topic include a 1980 House of Representatives report entitled "The Ailing Defense Industrial Base: Unready for Crisis," [Ref. 5], and a 1988 book entitled Mobilizing U. S. Industry: A Vanishing Option for National Security?" [Ref. 6]. The first highlighted the deterioration of our defense industrial base and its effect on our defense capabilities, while the second addressed the need to maintain an adequate defense industrial mobilization base and the problems involved with maintaining it.

Little, however, has been written about the plant equipment packages (PEPs) which are an important part of the defense industrial base. This chapter will examine the history of PEPs: what they are, why they are important, and where they originated.

B. PLANT EQUIPMENT PACKAGE

PEP is a Department of Defense (DOD) term used to describe an approved complement of different pieces of controlled industrial plant equipment, including special tools, special test equipment, and other plant equipment. This equipment can be put together at a predetermined facility to form one or more production lines to manufacture critical war material [Ref. 7]. The production line may or may not be augmented with contractor-owned equipment. One or more types of war material can be manufactured under one PEP. For example, PEP #0224 which is located at the government-owned contractor-operated (GOCO) Riverbank Army Ammunition Plant in California, contains eight production lines capable of manufacturing 11 different items. (See Appendix A for the listing of current PEPs and their related end items.) The total acquisition cost and number of special tools (ST), special test equipment (STE), industrial plant equipment (IPE), and other plant equipment (OPE), which make up PEP #0224 are identified in Table 2.1.

TABLE 2.1

ACQUISITION COST OF PEP #0224

	NUMBER OF PIECES	ACQUISITION COST
IPE	489	$31,164,807.00
OPE	662	6,754,737.00
ST/STE	0	0.00
TOTAL	1151	$37,919,544.00

Production line #8 in PEP #0224 at Riverbank Army Ammunition Plant has 34 pieces of IPE and is capable of manufacturing the M42, M46, and M77 metal grenade bodies. These grenades are basically manufactured the same way except for modifications on the M77 (an improvement over the original M42) which allows better fragmentation and use in extremely cold weather.

Many operations are required in the manufacturing process to turn a piece of raw metal into a grenade body capable of being fitted into a rocket or artillery round. The process starts by heating a metal ingot to a high temperature in a blast furnace. The ingot is then forged by a cupping and drawing process on a 500 ton press which punches the ingot into the basic shape of the grenade body. The body then goes through 44 additional processing steps which include pickling, coin shouldering, grinding, additional pressing, piercing, washing, and testing for conformity to military specifications. Finally, the grenade body is packed and shipped to another facility to be filled with explosive, armed and fitted into a rocket or artillery round. (Figure 2.1 illustrates the various steps in this production line that are needed to manufacture a finished grenade body from a piece of steel.) It takes about three weeks (assuming work shifts of 40 hours per week) from the time a piece of steel begins the manufacturing process until it is transformed into a grenade body ready for shipment to the loading facility.

PEPs were designed to provide a specific level of output to meet surge or mobilization requirements. Until surge or mobilization occurs, PEPs usually remain inactive (i.e., not in use). In some cases however, (such as Navy managed PEPs) one or more production lines in a PEP may be actively running at a level below the surge/mobilization production rate. A clearer explanation of this will be discussed in Chapter III.

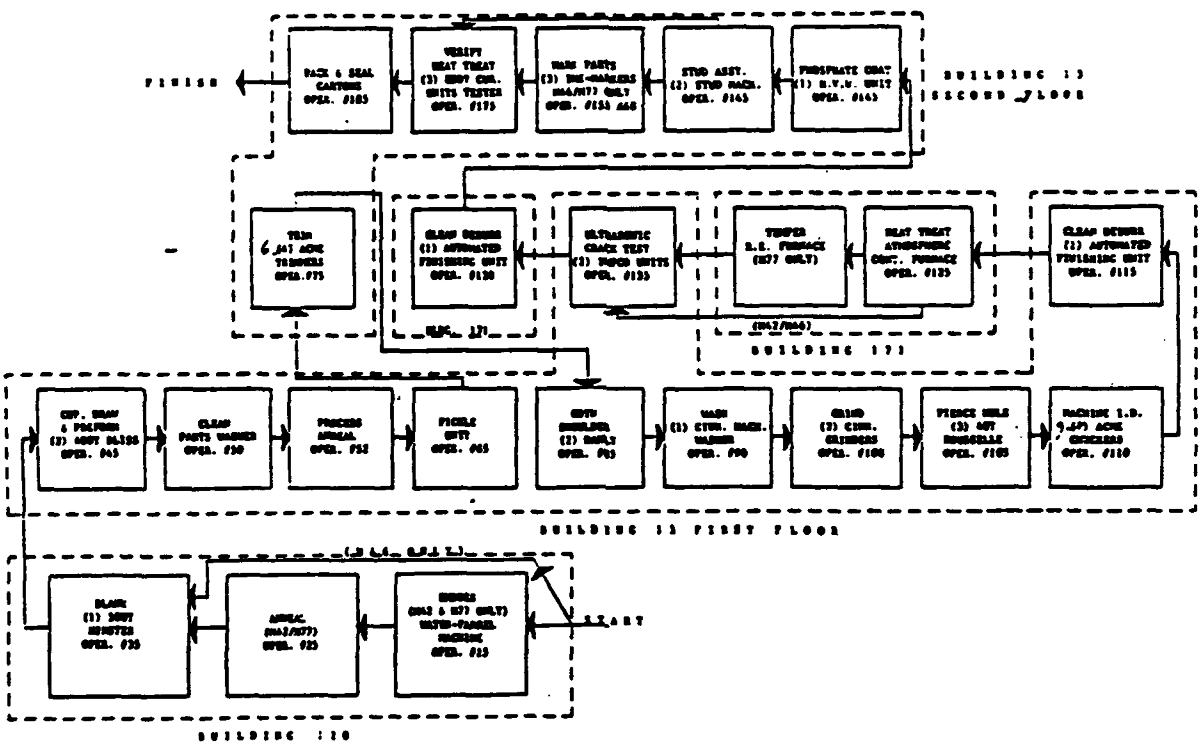


Figure 2.1: M42/M46/M77 Grenade Body Flow Chart

IPE which makes up a specific PEP may or may not be stored together and may be inactive or active at one or more locations in the United States [Ref. 7]. Depending upon the priority of the end item manufactured, production lines can be assembled and operating between two and 12 months after the start of the surge/mobilization process.

C. INDUSTRIAL BASE

Our industrial base consists of a number of government and privately-owned industrial production facilities in the United States and Canada, including depot-level equipment and maintenance facilities that would be available in a crisis [Ref. 8]. Production facilities can be either contractor owned/contractor operated (COCO), government owned/contractor operated (GOCO), government owned/government operated (GOGO), or state owned. Our industrial base gives the nation the capability to sustain the surge or mobilization production rates needed to support military actions. PEPs are part of our industrial base which produce critical war material during surge/mobilization.

As seen in Table 2.2, over 97% of our surge/mobilization facilities are COCO facilities or private industry [Ref 8]. Although PEPs account for only about 1% of our total defense industrial capability, they produce material, such as ammunition, which is vital in wartime. Furthermore, PEP manufacturing capability either cannot be found anywhere else in the United States or exists in plants with a production output too small to be adequate in any major conflict.

TABLE 2.2

IDENTIFIED DEFENSE INDUSTRIAL BASE FACILITIES

FACILITY	NUMBER
COCO	9050
GOCO	79
GOGO	39
CANADIAN	139
STATE (OWNED BY STATE RATHER THAN FEDERAL GOVERNMENT)	24
TOTAL	9331

D. SURGE

Surge is a term used to describe accelerated industrial base production of selected material to meet demand during emergencies. The emergency may be a limited war, disaster, economic crisis, demonstration of national will, replacement of war losses, reaction to warnings from aggressive nations, enemy technological breakthrough, enemy production surge, or defense preparations [Ref. 9]. Depending on the emergency, surge may affect one or more industries.

In the Vietnam conflict and the United States troop movement into Saudi Arabia (August 1990), operations were supported with industrial base surge. During "Operation Desert Shield" for instance, the Army had to substantially increase the production of several items in the early weeks of deployment. These items are listed in Table 2.3.

TABLE 2.3

SURGE ITEMS REQUIRED BY THE

ARMY IN OPERATION DESERT SHIELD

Ultra-light Camouflage Net System
Chemical Boots
M17A2 Protective Mask
3000 Gal. Flexible Tank
5000 Gal. Tanker Truck
Flameless Ration Heater
Patriot (PAC 2) Missile
Advanced Tactile
  Missile System (ATACMS)
M43 Aviators Chemical Mask
Chemical Gloves
Nuclear, Biological, Chemical,
  Reconnaissance System (NBCRS)
400 Gal. Water Tank
Type II Remains Bag
Laundry Water Recycler
AN/TSC 93 Tac Satellite
  Communication System

Private industry participation in surge production is on a voluntary basis. As long as money is available and increased production capacity is feasible to satisfy the increased demand as well as regular customer business, private industry will accept orders under surge conditions.

Private industry can increase production surge by adding extra shifts, using overtime, subcontracting work, or using material previously laid away. For example, material previously obtained for future production can be used immediately to increase surge output. New orders are then placed to restock material taken from inventory. Assuming these latter orders arrive in a timely manner, the end result is that both surge and future job requirements are satisfied.

Material available from private industry that is required during surge operations can be obtained by using conventional contracts, letter contracts, basic ordering agreements, or exercising a surge option clause in an existing contract. The surge option clause is preferred by DOD personnel responsible for contract administration because it saves procurement and administrative lead time. If such a clause is exercised, production can begin before a price is negotiated. The government benefits from quick industry response while companies benefit from increased business.

Many Federal Acquisition Regulations (FAR) and Defense Federal Acquisition Regulations (DFAR) can be waived under emergency conditions. For example, the requirement to advertise for procurement of supplies or services in the Commerce Business Daily 30 days prior to the award of the contract can be waived if there is an "unusual and compelling urgency," or if disclosure of needs could compromise national security [Ref. 8:p. F-2]. Appendix F in the DOD "A Guide for Industrial Mobilization," March 1989, identifies several additional FAR/DFAR surge/mobilization relief measures.

E. MOBILIZATION

Unlike surge, mobilization is a term used to describe the complete transformation of a country's resources (public and private) to the support of national objectives in wartime or other emergency. These resources include labor, material, production facilities, transportation, fuel and capital.

> Wars are fought and won-or lost-on the land, on the water, in the air, and on those battle lines behind the front where the civilian forces stand. It is not enough to mobilize the Nation's military strength. There must be a mobilization of her full economic resources-industrial, agricultural and financial. These must be organized, coordinated, and directed with the same strategy that governs the operations of the purely military arms of the service. [Ref. 10]

Mobilization can be divided into four levels: selective, partial, full, and total. Each level is determined by the degree of threat. The higher the level, the greater the commitment of the country's resources. When total mobilization (the highest level) is reached, the nation's resources are employed to their maximum limits.

Mobilization is initiated by the President's declaration of a national emergency. Unlike surge, mobilization is not voluntary. It is a legal and government directed conversion of a country's resources toward war production. The National Defense Act of 1916 gave the President broad powers to do this. In time of war, or when war is imminent, the President has the authority to place priority orders with any firm, take possession of any plant whose owner refuses to accept or give preference to a priority order, and to operate seized plants [Ref. 11]. The United States has mobilized twice during its history, first during World War I and then again in World War II.

F. WORLD WAR I MOBILIZATION

Mobilization was unique in World War I because there were no previous examples to follow. Problems were solved on a trial and error basis. One of the most difficult problems the government faced was how to organize and convert its industrial base from peacetime production to war production. A lack of priorities for goods and services, raw materials, and transportation caused confusion and delays early in the war:

> Unimportant goods were being made before essentials, commodities were being produced that could not find transportation facilities to take them to their destinations, while other articles were carried to embarkation points by the railroads only to find no ships available to take them to France. [Ref. 12]

The establishment of the War Industries Board in 1917 created a structure to ensure change in our industrial base priorities to meet the military requirements of our Government and Allies. Through the use of priorities (including price fixing and conservation), the industrial base was diverted from individual needs to national needs. Just as war production began to peak however, the fighting stopped. [Ref. 10:p. 6] Our industrial base then converted back to a peacetime economy and the United States slipped back into isolationism.

As a result of these experiences with mobilization of the industrial base in World War I, Congress passed the National Defense Act of 1920. This act centralized procurement and planning responsibilities for mobilization under the Assistant Secretary of War. As a result of this act, Industrial Mobilization Plans (M-DAY Plans) were developed in 1931 and revised in 1933, 1936 and 1939. Although it was often referred to as the Industrial Mobilization Plan, it was actually three separate plans: the Protective Mobilization plan (which addressed mobilization of the nation's manpower), the Procurement plan (which pertained to the procurement of equipment for the military), and the Industrial Mobilization plan (which concerned the administrative mechanisms for directing industrial mobilization, and operational procedures to carry it out) [Ref. 13].

G. WORLD WAR II MOBILIZATION

Although the United States had been slowly increasing its war production capacity to support its Allies, it was not until after Japan attacked Pearl Harbor that the United States had the full support of the nation to move toward total mobilization. The War Production Board, established in January 1942, was responsible for mobilization of our industrial resources by assuring "the most effective prosecution of war procurement and production" [Ref. 13:p. 207]. A year later, in May 1943, the Office of War Mobilization was established. With strong presidential backing, the Office of War Mobilization was given some of the functions of the War Production Board that had not been managed properly, in addition to authority over manpower not in the Armed Forces [Ref. 13:p. 554]. Creation of the Office of War Production was a reaction to the need for more centralized authority from the president, something noticeably absent in the War Production Board.

Munitions production in World War II peaked around 1944. To put this production rate in perspective, we "...built one plane every five minutes; produced 150 tons of steel every sixty seconds; turned out 8 aircraft carriers a month, and launched 50 merchant ships a day;..." [Ref. 4:p. 540]. Figure 2.2 (from "Industrial Mobilization For War," Volume I, 1947) illustrates munitions production from July 1940 to August 1945 in billions of standard 1945 dollars.

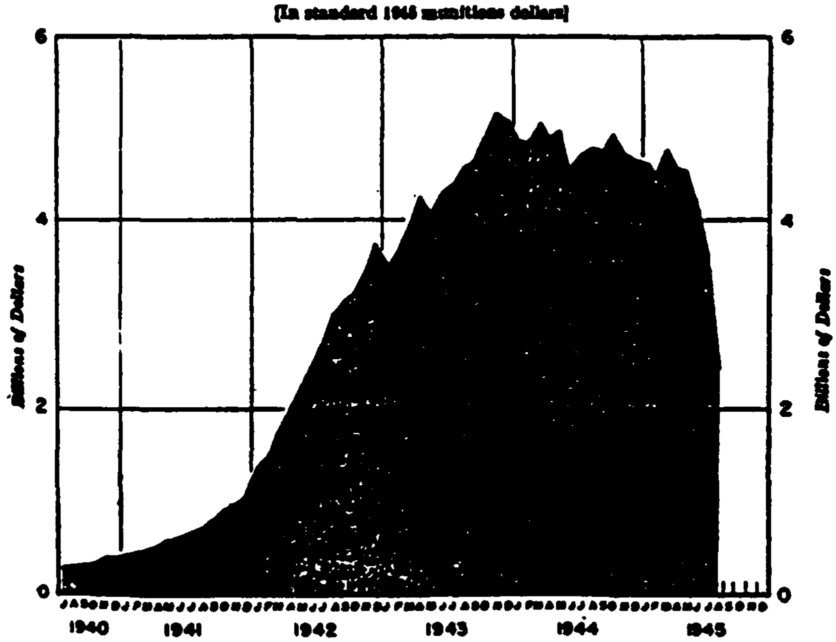


Figure 2.2: U. S. Munitions Production

The job of reconversion to a peacetime economy fell to the War Production Board. They had five tasks that were spelled out in a August 1945 letter from the President of the United States: 1) expand production of materials in short supply, 2) limit manufacture of products that use scarce materials, 3) control inventories, 4) break bottlenecks, and 5) allocate scarce materials for production of low priced essential items [Ref. 12:p. 945]. Within weeks, the War Production Board canceled thousands of government contracts, revoked hundreds of controls on consumer goods and relaxed construction limitations. Reconversion to a civilian economy was both rapid and successful.

H. EVOLUTION OF PLANT EQUIPMENT PACKAGES

Our country was fortunate in the first and second world wars to have the time to build up our industrial base. Today, technology has increased the speed of warfare to an extent never seen in the first or second world wars. During the next war, there may not be time to build up our industrial base in the same ways we have done in the past.

In a research paper entitled "Comparative Industrial Capabilities of Major Combatants during World War II" (April 1982) the authors concluded that, like World War II, mobilization to a wartime economy today may still require two to four years due to the advancing technology of our weapon systems. Furthermore, it has been estimated that even in emergency conditions (mobilization), it takes about 18 months (at the earliest) to construct new plants for production. [Ref. 14] With today's military technology, a war could be over in 18 months.

War material that is not readily available from private industry or that is beyond their capability to produce at the necessary rates could create a serious problem for a military force engaged in war if initial stocks were limited and the conflict lasted long enough. The military needs a rapid and continuous supply of critical war materials (i.e. munitions) to sustain combat operations. This is the main reason for the creation of plant equipment packages.

I. MACHINE TOOLS

Most businesses converted their production plants back to more profitable enterprises after World War I and II. There simply was not enough profit in manufacturing munitions at the end of the war. Along with this conversion, machine tools, which consisted of the different types of metalworking industrial plant equipment shown in Table 2.4, were sold, leased, returned to the government, or used on new production lines. Due to reconversion efforts, priorities for machine tools went to the civilian economy first. Afterward, the military services could acquire the remaining equipment to meet their immediate peacetime needs.

TABLE 2.4

INDUSTRIAL PLANT EQUIPMENT-METAL WORKING MACHINES

LATHES	MACHINING CENTER & WAY TYPE
BORING MACHINES	DRILLING & TAPPING MACHINES
BROACHING MACHINES	GEAR CUTTING & FINISHING MACHINES
GRINDING MACHINES	SAWS & FILING MACHINES
MISC MACHINE TOOLS	ELECTRICAL & ULTRASONIC EROSION MACHINES
MILLING MACHINES	BENDING & FORMING MACHINES
PLANERS & SHAPERS	MISC SECONDARY METAL FORMING & CUTTING MACHINES

In World War II and the Korean War, a shortage of machine tools affected the Nation's ability to meet material requirements [Ref. 15]. Machine tools were in demand during wartime because they were used in the manufacture of most of the hard implements of war (i.e.

tanks, planes, ships, vehicles, guns, ammunition, etc...). In addition, they were also used to manufacture items essential for the civilian population.

Immediately following World War II, the War department pressured Congress to maintain a reserve of industrial plant (and other) equipment for future contingencies. As a result, Congress passed Public Law 364 in August 1947. It authorized the War Department or Secretary of the Navy, to assure the "continued availability" of the "industrial capacity of shipyards, plants, and equipment" by use of "terms, conditions, restrictions and reservations in disposition" (i.e., to withhold from disposal or sale) if it is in the interest of national defense. [Ref. 16] This was the first successful effort to retain industrial plant equipment (machine tools) for future contingencies.

Passage of the National Industrial Reserve Act in 1948 went one step further. It called for:

> ...a comprehensive and continuous program for the future safety and for the defense of the United States by providing adequate measures whereby an essential nucleus of Government-owned industrial plants and a national reserve of machine tools and industrial manufacturing equipment may be assured for immediate use to supply the needs of the armed forces in time of national emergency or in anticipation thereof; [Ref. 17]

This act gave the Secretary of Defense (the overall National Industrial Reserve coordinator) authority to establish general policies for the care, maintenance, use, security of and recording of data for property in the National

Industrial Reserve. This was just one step away from the concept of DOD PEPs.

J. PACKAGE PLANT TOOLS

Although the National Industrial Reserve Act of 1948 was designed to prevent a shortage of machine tools in the future, it was unfortunately too late to prevent shortages from occurring during the Korean War. A lack of machine tools caused delays in meeting production quotas for ammunition, tanks, and other military supplies. In a letter to the Chief of Ordnance, the Commanding General of the Ordnance Tank Center wrote:

> ...contractors were having difficulty in securing the machine tools needed to support their production schedule...Chrysler, Fisher Body and Ford plants would be delayed six to seven months in starting production on the T-48 Tank and would be delayed eight to nine months in reaching the scheduled production... [Ref. 18]

There were three ways the government tried to resolve these shortage problems. To meet immediate needs, machine tools were purchased in large quantities in the United States and abroad. Second, machine tools were recalled from loans to activities not providing essential war production (i.e. schools). Third, the M-Day Pool Order Program (referred to now as the Machine Tool Trigger Order Program) was set up using standby agreements with machine tool manufacturers to provide equipment during mobilization. (Vawter, Roderick, 1983, p. 29)

Sometime during the Korean conflict, a program for retention and storage of industrial equipment essential to the manufacture of critical war material was developed by the United States Army [Ref. 18:pp. 21-24]. Unlike the National Industrial Reserve program established in 1948 however, this equipment would be retained under Army management. In the event of an emergency like the Korean War, the Army would not be caught short in the production of critical material. Sometime between December 1951 when the Army developed their plan for equipment retention and September 1952, they began using the term "Package Plant Tools." In Army Special Regulation 715-5-20 of 12 September 1952, concerning inventory of production equipment, it states that:

> Package plant tools...is that equipment maintained intact in reserve condition and when activated is capable of producing a complete military end item or major component at a specific rate of production. Future activation is planned as a unit. This equipment may be in plants under the custody of one of the military departments or in National Reserve Plants...[Ref. 18:p. 74]

Package plant tools were required to have mobilization and Assistant Secretary of Defense (ASOD) numbers assigned to each piece of equipment. An ASOD number was a code which identified the unique package the equipment belonged to, and the planned producer of the end item (i.e. what production facility). Equipment assigned to the same planned producer had the same ASOD number. The ASOD number evolved into the PEP number currently used today. [Ref. 19]

A mobilization number was a code signifying the maximum production rate per month (at mobilization) of the end item or items produced by the production line the equipment was on. If more than one production facility made the same end item, the mobilization numbers could be different for each facility.

In July 1953, the individual Services were granted layaway authority with the passage of Public Law 130, 83rd Congress. It gave the services broad authority to...

> provide for the acquisition, construction, establishment, expansion, rehabilitation, conversion, and installation, on land or at plants privately or publicly owned, of such industrial type plants, buildings, facilities, equipment, machine tools, utilities, and...as may be necessary for defense production or mobilization reserve purposes, and to provide for the maintenance, storage and operation thereof... [Ref. 20]

However, overall approval authority for retention and recertification of industrial plant equipment still rested with the Assistant Secretary of Defense. It was not until July 1978 that this authority was officially delegated to the individual military services.

K. PLANT EQUIPMENT PACKAGES

On November 16, 1973, Public Law 93-155 (amendment to the National Industrial Reserve Act of 1948) was passed.

This was the first time the term plant equipment package was defined in a law. It stated that:

> ...machine tools and other industrial manufacturing equipment may be held in plant equipment packages or in a general reserve to maintain a high state of readiness for production of critical items of defense material, to provide production capacity not available in private industry for defense material, or to assist private industry in time of national disaster.
> [Ref. 21]

A significant change in the PEP approval process occurred in 1978. In Department of Defense Directive (DODD) 4275.5 of 13 July 1978, authority for approving and recertifying plant equipment packages was delegated to the Assistant Secretaries of the Military Departments and the Director of the Defense Logistic Agency (DLA). In addition, the Services were to establish management guidelines for proper disposal of industrial plant equipment deleted from a PEP and to maintain PEPs under their management in a high state of readiness.

L. CONCLUSION

PEPs evolved from the United States military's need to have a rapid and continuous supply of critical war materials (i.e. munitions) to sustain combat operations. To ensure availability of this critical material, complete packages of industrial plant equipment, other plant equipment, special tools, and special test equipment were laid away under individual military service management. PEPs were designed to retain a critical manufacturing capability to complement private industry or provide for a capability that did not exist in private industry.

Today, there is still a need to maintain the capability to produce munitions and sustain forces in the event of conventional war. However, the high cost of replacement and maintenance of industrial plant equipment, the increasing National debt and questions on PEP viability to meet surge/mobilization requirements have resulted in challenges to the whole concept of PEPs. These challenges will determine whether the United States retains or loses its defense production capability in the form of PEPs.

III. PEP MANAGEMENT

A. INTRODUCTION

The changing political climate around the world (glasnost, German unification) and the increasing United States national debt (almost four trillion dollars) are forcing the United States to reevaluate the costs of its military infrastructure. The current administration's goal is to reduce military spending without compromising military readiness. To this end, military programs and policies are facing increased pressure from Congress to justify missions and expenditures. One area receiving increased attention involves the management of plant equipment packages (PEPs). This chapter will examine PEPs in DOD.

B. PEP TRENDS

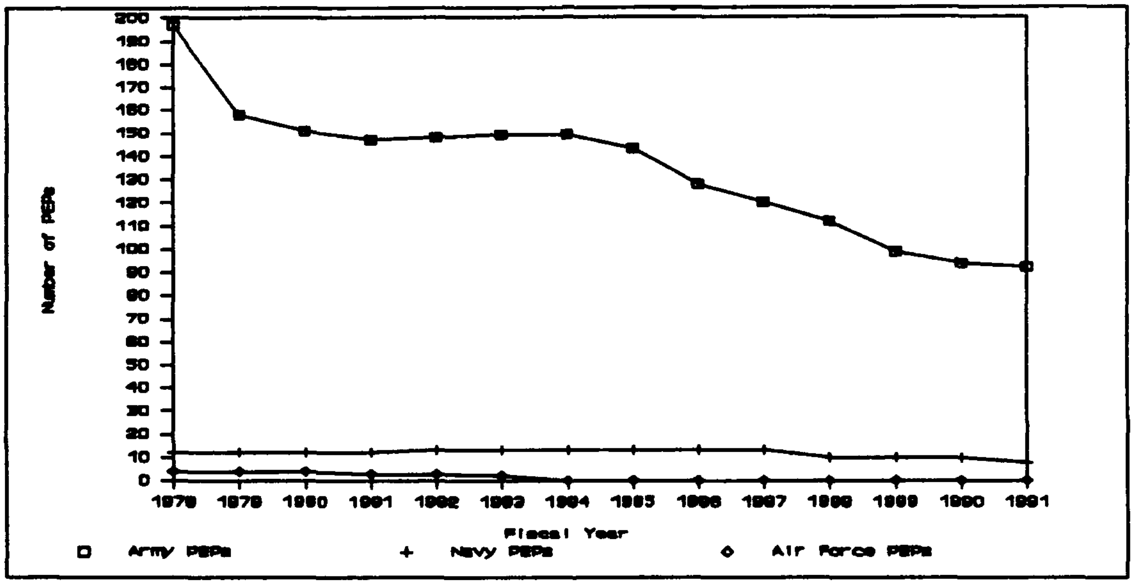
The Army established its first PEPs in 1956, the Navy in 1966, and the Air Force in 1971 [Ref. 22]. Even though the Navy and Air Force established their PEPS about 10 to 15 years later than the Army, PEPs have been decreasing in numbers (disestablished) among all the Services since the late 1970's. Figure 3.1 shows the PEP trend for the Services over the last several years. As of

15 October 1990, there are only 100 PEPs left in DOD. They are distributed between the following Services:

- The Army owns 92 PEPs (92%)
- The Navy owns eight PEPs (8%)
- The Air Force owns none (all disestablished by 1984)

[Ref. 23]

Figure 3.1



PEP Trends Since 1978[1]

PEPs have been disestablished for some of the following reasons: a commercial source was identified that could manufacture the same item as the PEP in the required time frame, advances in weapons technology, or changes in United States defense policy.

[1] See Appendix B for the actual number of PEPs by Service and year. Defense Logistic Agency (DLA) PEPs were not included in this graph due to the absence of data at DLA.

The M-1 tank is an example where a technologically superior weapon system replaced an older system (M-60 tank) resulting in the disestablishment of a PEP. As a consequence of the introduction of the M-1 tanks, the mobilization requirement for the M-60 Tanks became obsolete. In 1987, PEP #0438, which manufactured the M-60 tank at the Detroit Arsenal Tank Plant, was disestablished [Ref. 24]. To this date, there has not been a PEP established for the M-1 tank.

In addition to technology, changes in defense policy affect the number of PEPs. A recent example is the Godwin Memorandum. In November 1986, the Assistant Secretary of Defense for Acquisition and Logistics promulgated the Godwin Memorandum. As related to PEPs, this document stated that:

> The continued storage and maintenance of inactive plants, industrial plant equipment (IPE) and other plant equipment (OPE) shall be reviewed in detail and all but the most essential property removed from the DOD inventory. All such inactive property should be included in this review and be considered a candidate for disposal unless retention is fully justified. Examples of property to be included in this review include: All inactive property (IPE, OPE, ST, and STE) in plant equipment packages (PEPs). This includes contractor owned property that DOD is funding to retain in storage. Plans must be established for reducing PEPs to the very minimum by November 1988. Retained PEPs must be upgraded to an immediate use condition within current budget constraints...
>
> Inactive GOCO plants...having a marginal surge or mobilization potential should be turned over to the private sector. [Ref. 25]

In effect, the Godwin memorandum ordered the military to clean house. A moratorium on PEPs was imposed until certain specifications were met (i.e. upgrade those PEPs that are retained), and a plan for disposition of non-essential facilities was to be drawn up by the Military Services for presentation to the Assistant Secretary for Defense Acquisition and Logistics.

C. MANAGEMENT OVERVIEW

PEP management policy and guidance comes from four organizational levels in the Navy and five levels in the Army. Figure 3.2 shows the general PEP organizational management chain from the DOD level to the planned producer.

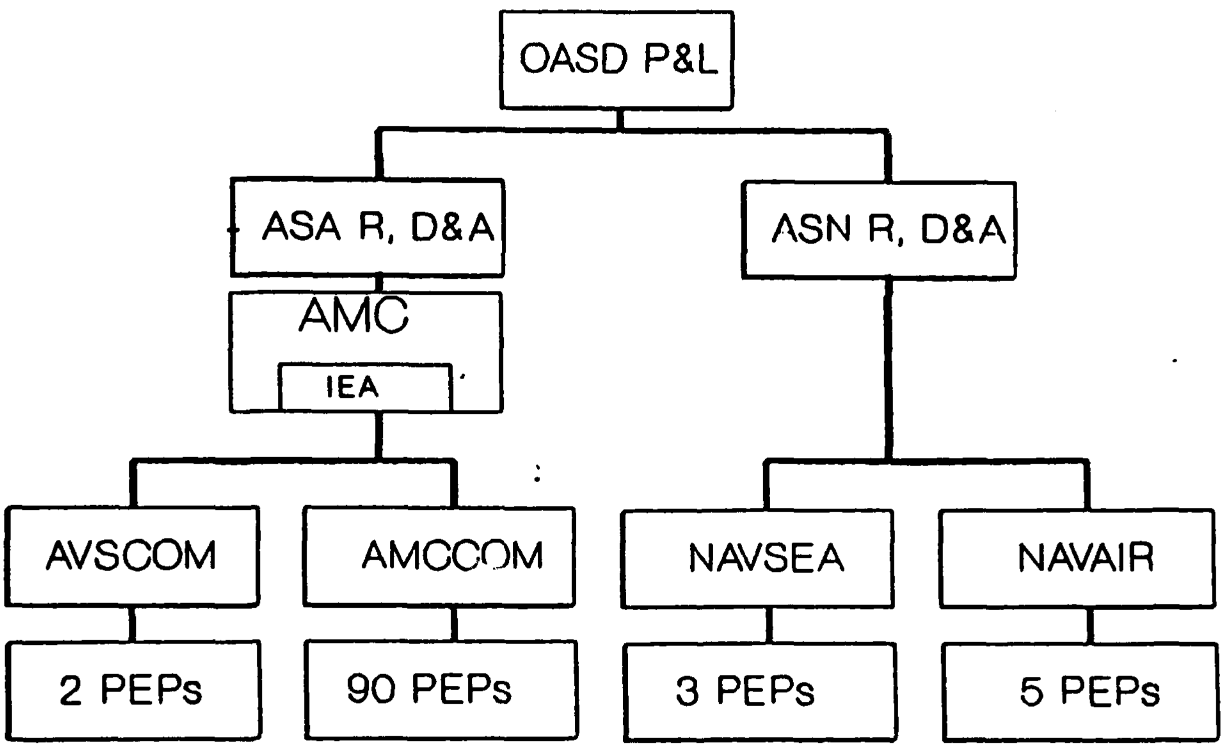


Figure 3.2: PEP Management Chain

Overall PEP management policy and guidance for the Military Services originates in DOD at the Undersecretary of Defense for Acquisition and is delegated to the Office of Assistant Secretary of Defense for Production and Logistics (OASD P&L). The OASD P&L, is responsible for publishing DOD Directive (DODD) 4275.5, containing broad management policy for the acquisition and management of industrial resources. Below the OASD P&L, PEP management guidance is refined at the Service level.

PEP management and policy guidance for the Army is formulated by the Assistant Secretary of the Army for Research, Development and Acquisition (ASA RD&A) while this function is performed in the Navy by the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN RD&A). The Air Force disestablished their PEPs in 1984. Each Service publishes and implements their own instructions on PEP management in accordance with DODD 4275.5. These instructions are:

- Army Industrial Preparedness Program (AR 700-90) Chapter 5, titled "Management of the PEPs and Industrial Reserve Facilities"
- Secretary of the Navy Instruction (SECNAVINST) 4862.8A, titled "Acquisition and Management of Industrial Resources"

The third level in the PEP management chain is at the Systems Command (SYSCOM) level for the Navy and the Army Material Command (AMC) level for the Army. There are two

SYSCOMs at the Navy level which publish standard operating procedures on PEP management: the Naval Sea Systems Command (NAVSEA), and Naval Air Systems Command (NAVAIR). At the AMC, most PEP management responsibility is delegated to the Industrial Engineering Activity (IEA), a staff organization attached to the AMC [Ref. 26]. IEA publishes the Army's basic PEP instruction, AR 700-90.

The individual planned producer is the final link in the chain for the Navy. These are producers and repair facilities that have voluntarily committed themselves to manufacture critical items during surge/mobilization [Ref. 8:p. D-9]. In the Army however, PEP management policy and guidance is further refined by another level of management at two of the Army's major subordinate commands: the Army Armament, Munitions and Chemical Command (AMCCOM), and the Army Aviation Systems Command (AVSCOM).

The responsibility at the planned producer level is the same, regardless of what Service owns the facility or whether the facility is GOGO, GOCO, or COCO. The planned end item must be made in the right quantity and available in the required time frame to meet surge/mobilization requirements. Depending on the type of facility (i.e. GOGO, GOCO, COCO) and contract specifications however, meeting the requirements for materials, manpower, or equipment needed to produce the end item for surge/mobilization could be a government or commercial responsibility.

D. MANAGEMENT INSTRUCTIONS

Th(are a handful of instructions and publications related to PEP management. Some of these are:

- DOD Directive (DODD) 4215.18, Management of Defense-Owned Industrial Plant Equipment (IPE).
- DODD 4005.1, Industrial Preparedness Program.
- DODD 4275.5, Acquisition and Management of Industrial Resources.
- DOD Instruction 4155.4, Inspection and Reporting of Departmental Industrial Reserve Plants/Maintenance Facilities.
- DOD Instruction 4005.3, Industrial Preparedness Planning.
- DOD Manual 4005.3, Industrial Preparedness Planning Manual.
- DLA Manual (DLAM) 4215.1, Management of Defense-Owned Industrial Plant Equipment (IPE).
- DLA Regulation 4215.4, Acquisition and Management of Industrial Resources.

Three of the most important ones used by the Military Services to manage their PEPs are: DODD 4275.5, DODD 4215.18, and DLAM 4215.1.

DODD 4275.5 is a broad directive with three purposes:

- Establish uniform policy for the acquisition and management of facilities, special tooling, and special test equipment, whether acquired by and used solely within DOD or operated and used by a contractor.
- Assign responsibilities for reviewing the use, maintenance, expansion, modernization, replacement, and disposal of industrial resources, with their related programming, budgeting, and financing procedures.

* Authorize publication of DLAM 4215.1, "Management of Defense-Owned Industrial Plant Equipment."

According to DODD 4275.5, the Undersecretary of Defense for Research and Engineering has overall authority to develop and issue policy, procedures, and guidance on PEP management. Today, due to realignment of the DOD, this overall authority is the responsibility of the Undersecretary of Defense for Acquisition.

The provisions of DODD 4275.5 cover the retention, maintenance, and modernization of DOD-owned plant equipment and PEPs. In accordance with DODD 4275.5, machine tools and other industrial manufacturing equipment may be held in PEPs or in a general reserve to:

* Maintain a high state of readiness for production of critical items of defense material.
* Provide production capacity for defense material not available in private industry.
* Assist private industry in time of national disaster.

Furthermore, each military service must establish management guidelines to ensure that government-owned equipment is immediately released from a PEP when it is no longer needed, and that required PEPs are maintained in a state of readiness. [Ref. 27]

In addition to DODD 4275.5, the Military Departments are responsible for implementing DODD 4215.18 which establishes policy and assigns responsibilities for managing DOD-owned

IPE (the most important ingredient in a PEP). The key feature of this directive is the assignment of DLA as the DOD central organization responsible for the following IPE management practices:

- Developing and maintaining records covering description, location, and utilization status of all DOD IPE located on DOD installations and contractor plants worldwide.
- Acting as a clearinghouse for all DOD Component requirements for IPE to assure optimum reutilization or disposal.
- Providing technical direction over central IPE storage sites to include preservation, testing and repair, overhaul or rebuild of equipment.
- Developing uniform equipment coding, recording, and reporting of IPE.
- Developing and maintaining a General Reserve of IPE at a level sufficient to provide a DOD industrial preparedness capability adequate to meet mobilization production plans of the Armed Forces.

[Ref. 28]

In accordance with DODD 4215.18, DOD Components are responsible for a number of functions. The most important of these functions are:

- Managing and controlling all active IPE and PEPs in their custody.
- Assisting the Director DLA, in developing, publishing, implementing and improving systems and procedures for identification, recording, reporting, storage, maintenance, redistribution, and disposal of IPE, including IPE in the possession of contractors.
- Developing, publishing, and maintaining such other implementing instructions as are necessary in support of the policy in DODD 4215.18.

- Providing forecasts for unusual requirements to augment or amend retention level objectives for the General Reserve.
- Screening with the Defense Industrial Plant Equipment Center (DIPEC) prior to repair, overhaul, or procurement of IPE.

[Ref. 29]

The third document providing PEP management guidance to the Military Services is DLAM 4215.1, Management of Defence-Owned Industrial Plant Equipment (IPE). Authorized by DODD 4275.5 and DODD 4215.18, the purpose of DLAM 4215.1 is to establish procedures for the control and redistribution of idle IPE within DOD and for providing other management services to the Military Departments and DOD Components [Ref. 30]. DLAM 4215.1 is identified by a unique code for each Service: Army - AR 700-43, Navy - NAVSUP PUB 5009, Air Force - AFM 78-9. This manual incorporates detailed as well as broad information and procedures for the management of IPE. The most important chapters of DLAM 4215.1 cover policy and procedures for:

- Inventory, accounting, recording and reporting of DOD owned IPE.
- Plant equipment management.
- Storage and transportation of IPE.
- Development, publication and maintenance of an IPE classification and identification system.
- Equipment maintenance, repair and rebuild/overhaul of IPE.

- DIPEC IPE field services (i.e., technical assistance, quality assurance, field liaison visits, seminars and conferences.

- IPE procurement.

- IPE quality deficiency reporting.

- Reporting and reutilization of military supply system IPE.

E. ARMY MANAGEMENT

In accordance with DODD 4275.5, DODD 4215.18, and DLAM 4215.1, the United States Army documented PEP management policy, responsibility, and procedures in chapter 5 of AR 700-90 (Army Industrial Preparedness Program). This chapter provides guidance and policy on layaway, retention, maintenance, modernization, and disposal of Army-owned industrial equipment and facilities *in PEPs*. The Assistant Secretary of the Army for Research, Development, and Acquisition (ASA RD&A) has final approval authority over establishment and recertification of PEPs in the Army [Ref. 31]. Establishment and recertification recommendations are provided up to the ASA RD&A by the Commanding General, Army Material Command (CG AMC). Per AR 700-90, there are 16 requirements the CG AMC is responsible for in the PEP management area. The most important of these include:

- Maintain PEPs in a high state of readiness for immediate use by the Armed Forces.

- Maintain a current information system to provide data needed to measure the effectiveness of meeting the critical objective of retaining production lines for immediate use. Verify data annually.

- Develop a plan to modernize inactive industrial equipment in PEPs, and implement the plan as resources permit.

- Develop a transportation/storage plan for PEPs to assure all equipment is delivered to the planned producer when needed.

- Annually inspect Defense industrial reserve plants on a fiscal year basis, and report findings for presentation to Congress and for us by the executive departments.

Many responsibilities of the CG AMC are delegated to the United States Army Industrial Engineering Activity (IEA), Rock Island, Illinois. IEA is a staff organization underneath the AMC. Their responsibilities can be summarized in three parts:

- IEA provides engineering support and technical assistance to the Headquarters AMC, Major Subordinate Commands (MSC) and other activities on actions within the Industrial Preparedness Program.

- Develop guidance, procedures and administrative controls for PEP management.

- Perform the daily management and monitor execution of actions and programs related to layaway of facilities, PEPs, equipment upgrading and other programs.

As of 15 October 1990, the Army owned 92 PEPs: five were GOGO facilities, 22 GOCO facilities, and 65 COCO facilities. Out of these 92 facilities, 83% were ammunition related manufacturing PEPs, 15% weapons related, and 2%

aviation related. (See Appendix A for a complete listing of PEPs and end items produced.)

While the Army does not classify its PEPs as active or inactive, it classifies the IPE in the PEP as either active, inactive or in a laid away status. Inactive IPE is equipment that is currently not in operation, while laid away IPE is equipment that is not operational and stored until needed for use during surge/mobilization. IPE is described as:

> ...that part of plant equipment with an acquisition cost of $5000 or more used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heat treating, or otherwise altering the physical, electrical, or chemical properties of material, components, or end item entailed in manufacturing, maintenance, supply, processing, assembly, or research and development operations. [Ref. 30:p. 1-3]

Even though PEPs are made up of ST, STE, OPE and IPE, management attention is focused on IPE in the PEPs. Three reasons for this are:

- IPE has a long procurement lead time
- IPE is vital to the manufacturing process
- IPE is expensive.

IPE has a long procurement lead time. It takes about six to 21 months to determine defense requirements and execute contract procedures for machine tools [Ref. 32]. In order to help shorten the administrative and production lead time, the government set up the machine tool trigger program

(MTTOP) in the 1950's (See Chapter II History). "The program provides for standby contracts with certain machine tool producers so that, in the event of an emergency..., these contractors immediately will begin manufacturing and delivering the type and quantities of machine tools specified in the standby contracts" [Ref. 14:p. 127]. The program is the responsibility of the Federal Emergency Management Agency (FEMA) which provides guidance on implementation procedures.

Another reason PEP managers focus on IPE rather than OPE, ST, and STE, is that it is vital to manufacturing. IPE is simply the basic component of manufacturing. As engineer, writer and historian of the machine tool industry, Anderson Ashburn noted:

> ...virtually every man-made device is produced either by machine tools or by machines and equipment produced by machine tools. Thus an automobile is an assembly of metal parts made by machine tools, plastic parts produced by machines made by machine tools, fabric produced on textile machines made by machine tools, rubber processed and molded by equipment made on machine tools, and glass processed by equipment produced by machine tools. The assembly is achieved with the aid of a variety of devices produced by machine tools. The assembled automobile is fueled by petroleum that was drilled for, pumped, piped, and refined with equipment produced by machine tools and is finally driven over highways surveyed, graded, and paved by instruments and machinery built with machine tools. [Ref. 33]

As noted in Table 3.1, there are presently 21,483 pieces of government-owned IPE in Army PEPs. The acquisition cost of this IPE was 1.2 billion dollars. It would take about three times this amount, (3.7 billion dollars) to replace all of the Army's IPE today.

TABLE 3.1

COSTS/QUANTITY OF ARMY IPE IN PEPS

	QUANTITY	ACQUISITION COST	REPLACEMENT COST[2]
IN-ACTIVE IPE	10,434	$363,697,949.00	$1,871,432,640.00
ACTIVE IPE	11,049	$837,871,355.00	$1,867,470,945.00
TOTAL	21,483	$1,201,568,304.00	$3,738,903,585.00

Use of IPE replacement costs however, can be misleading. One reason is that there is no standard way replacement

[2] Replacement cost is determined by multiplying the original acquisition cost by a replacement cost factor. The replacement cost factor is a figure (percent) that takes into consideration changes in inflation over a past number of years and adjusts it to present value. For example, a piece of 1980 metal working IPE with an acquisition cost of 100,000 dollars would be multiplied by a replacement cost factor of 1.27 to obtain its' present value replacement cost. The 1.27 factor takes into account all the inflation that has occurred from 1980 to present. The factor is adjusted annually to reflect changes in inflation. Replacement cost factors are obtained from the Finished Goods Price Index, Bureau of Labor Statistics, under the category metal working machinery and equipment. [Ref. 24]

costs are determined. The Army and DLA for instance, use two different methods to determine replacement costs of IPE. Another reason replacement costs can be misleading is that some older IPE has no basis of comparison today. In other words, that equipment is so unique or outdated that no company makes it or could make it.

F. PROBLEMS WITH IPE AGE

As seen in Table 3.2, the majority of Army IPE (52.9%) is over 30 years old. This is due to the fact that most of this IPE was purchased during the Korean War [Ref. 34]. There are several problems associated with maintaining 30 year old IPE that can negatively affect the readiness condition of PEPs.

First, in the event IPE over 30 years old breaks down on a PEP production line, the spare parts to repair it may not be available. The lack of replacement parts for old IPE is due to machine tool companies phasing out support for older models of IPE and manufacturers going out of business. These things are indicative of the whole decline in the United States machine tool industry (an industry which dominated the world until the late 1960's). Some of the factors which caused the decline in the United States machine tool industry were the existence of cheaper foreign imports of IPE and the faster diffusion of technology outside the United States. [Ref. 33:pp. 77-81]

The second problem in maintaining IPE over 30 years old is the shrinking source of manpower. Since the "...current generation of machinists is being trained on state-of-the-art numerically controlled (computerized) equipment," [Ref. 35] the availability of skilled labor required to operate outdated IPE decreases as people relocate or retire.

Another problem in maintaining IPE over 30 years old, is that this IPE may not be technically accurate enough to manufacture modern munitions. This idea was expressed in a 1959 article addressing the danger of not modernizing machine tools for defense purposes. Titled, "Can we Prevent a Production Pearl Harbor," the article tried to clearly show that "you cannot have modern weapons without modern means of production [Ref. 35:p. 33]."

TABLE 3.2

AGE OF ARMY IPE

YEAR	PERCENT
1981 - 1990	12.2%
1971 - 1980	18.3%
1961 - 1970	16.6%
(?) - 1960	52.9%

G. AUDIT OF PEP READINESS

IPE is the primary component of a PEP. As such, much of PEP readiness can be evaluated by looking at the readiness condition of the IPE within the PEP (discussed in more detail in Chapters IV and V) [Ref. 34:p. 1]. This is one thing an Inspector General audit on PEPs evaluated in 1983.

The audit focused on "whether plant equipment packages were capable of fulfilling their assigned mobilization production requirements for critical defense items" [Ref. 35:p. 1]. The key audit findings were that:

- Active equipment assigned to PEPs was maintained in immediate use condition.
- Inactive equipment assigned to Army PEPs was not maintained in immediate use condition.

The DOD Inspector General concluded that "...PEPs used in mobilization planning for critical defense items will require an extended period of time and a large sum of money before being able to meet mobilization production requirements" [Ref. 35:p. i].

One of the recommendations from the audit was that all plant equipment assigned to a PEP should be retained at the site of the planned producer. This recommendation came about from the auditors' evaluation of the way the Navy managed their plant equipment in PEPs (i.e., at the site of the planned producer and in a ready to use condition). Because of this, Navy PEPs are in a ready to use condition.

H. NAVY MANAGEMENT

In accordance with DODD 4275.5, DODD 4215.18, and DLAM 4215.1, the United States Navy documented PEP management policy, responsibility and procedures in the Secretary of the Navy (SECNAV) Instruction 4862.8A and Naval Material Command Instruction (NAVMAT) 4870.23B. SECNAV Instruction 4862.8A is a broad instruction encompassing policy for the acquisition and management of industrial resources. NAVMAT 4870.23B implements the broad policy of SECNAV 4862.8A as it relates to plant equipment in PEPs.

Specifically, NAVMAT 4862.23B provides procedures for selection, retention, and maintenance of Navy-owned plant equipment (IPE and OPE), special tooling and special test equipment in PEPs [Ref. 36]. Although the Naval Material Command no longer exists, their instruction is still used by the SYSCOMS for program execution and guidance. [Ref. 37]

There 10 general provisions in NAVMAT 4862.23B which pertain to PEP retention and maintenance. Some of the most important provisions of NAVMAT 4862.23B, addressing condition assessments and maintenance of IPE, are more explicit than the Army's PEP instruction (AR 700-90). Two examples are:

- To the maximum extent possible, efforts will be made to obtain an accurate condition code and the operating capability of all IPE held in mobilization reserves. Metal-working...IPE should be analytically or operationally tested whenever it is economically feasible...In all instances, equipment will be cycled under power or manually through all of its design functions, by the last user...

- Plant equipment held in an idle status will be subject to regular surveillance to assure that an acceptable level of equipment maintenance is being performed and that the equipment can be reactivated with a minimum of preparation.

The Assistant Secretary of the Navy for Research, Development and Acquisition (ASN RD&A) has final approval authority over establishment, recertification and disestablishment of PEPs. Recommendations for establishment, recertification or disestablishment are provided by the SYSCOMS directly to the ASN RD&A.

As of 15 October 1990 the Navy owned eight PEPs. Six were GOCO facilities and two were COCO facilities. All Navy PEPs are weapon system related production facilities.

Unlike the Army, the Navy classifies its PEPs as operating on a warm base. This means that the entire PEP is hooked to power and operational to the extent that it regularly produces end items, but at a rate well below the surge/mobilization rate. Presently, NAVSEA PEPs are operated 40 hours a week [Ref. 38] and NAVAIR PEPs are operated at different times throughout the year. A PEP could be operational (40 hours a week) the first week of each month and shut down the rest of the month. For instance, NAVAIR PEP #731, located at Bristol, TN, operates according to the demand for the commodity produced. The hours of operation at the plant can vary from 25% to 50% of a normal 40 hour work week. Production requirements for a month can sometimes be completed in one week. During the other three weeks in the month, the PEP is inactive. The Navy classifies its IPE in PEPs like the Army, active or inactive.

TABLE 3.3

COSTS/QUANTITY OF NAVY IPE IN PEPS

	QUANTITY	ACQUISITION COST	REPLACEMENT COST[3]
INACTIVE	403	$37,818,348.00	$186,469,336.00
ACTIVE	843	$22,566,755.00	$135,398,476.00
TOTAL	1246	$60,385,103.00	$321,867,812.00

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[3] The following is how DIPEC determines replacement cost for IPE:

$$\frac{\text{(Growth rate factor) (Age of IPE)}}{100} = X$$

e^x = Replacement cost factor (RCF)

(RCF) (Acquisition Cost of IPE) = Replacement Cost of IPE

Note: Maximum age of IPE is 39 years. The growth rate factor is 6.4 for machine tools, 3.02 for other IPE.

As noted in Table 3.3, there are 1246 pieces of government-owned IPE in Navy PEPs, at an acquisition cost of more than 60 million dollars. It would take more than five times the acquisition cost, or about 321 million dollars, to replace all the Navy's IPE today.

As noted in the explanation of how the Army determines replacement costs for its IPE, this figure can be misleading. Furthermore, a comparison between Army and Navy IPE based on their replacement costs would be inappropriate because they use two different formulas to arrive at their replacement costs.

I. AGE OF NAVY IPE

As seen in Table 3.4, the majority of Navy owned IPE (75.8%), is more than 30 years old. Since the Inspector General (IG) audit of PEPs in 1983 identified age of the Army's inactive IPE (assigned to PEPs) as one aspect contributing to their poor readiness condition, it was surprising to discover that over two thirds of the Navy's IPE in PEPs was more than 30 years old. If the age of IPE was a factor in PEP readiness, as the IG audit noted, why are Nay PEPs considered to be mission ready when Army PEPs were not? The answer to this question lies in the major difference between Army and Navy managed PEPs. Navy PEPs are all connected to power and operational at some varying time and production level while Army PEPs are not.

TABLE 3.4

AGE OF NAVY IPE IN PEPS

YEAR	PERCENT
1981 - 1990	5%
1971 - 1980	8.6%
1961 - 1970	10.6%
? - 1960	75.8%
TOTAL	100%

J. CONCLUSIONS

Three differences in Navy PEP management versus Army PEP management which might account for the observed differences in their respective readiness conditions are:

- IPE in Navy PEPs were connected to power at the planned producer.
- Navy policy and responsibility for PEP maintenance and readiness was clearer than Army policy.
- There are fewer layers of organization in the Navy PEP management chain (i.e., the Army had their PEP policy refined by AMC, while the Navy Material Command was disestablished years ago).

The skilled labor required to run outdated IPE is disappearing. As companies in the United States close down, labor relocates. There is no system in existence or planned which tracks critical skills by individual. In the event of mobilization, PEP planned producers will be competing with the military and civilian business for a shrinking reserve of manpower. If one takes the age of IPE into consideration, PEP contractors may be searching for the skilled employees who know how to use this old equipment (many of whom will be 60-70 years old).

In addition to government-owned IPE, PEPs may be augmented by contractor-owned IPE or consist entirely of contractor-owned IPE. Contractor-owned IPE is not subject to government monitoring. As such, unless the equipment is active (operating), its readiness condition is known only to the contractor.

Due to high cost, long procurement lead time and criticality, management has historically focused on IPE within a PEP. This has resulted in little or no emphasis being placed on the other 3 parts of a PEP (i.e. ST, STE, OPE). Although responsibility for these items varies depending on type of facility (i.e. GOGO, GOCO, COCO), there is little evidence to suggest that we know the true operating condition of ST, STE, and OPE or that our machinists' will know how to use them when needed.

IV. CONDITION ASSESSMENT OF INACTIVE INDUSTRIAL PLANT EQUIPMENT

This chapter defines condition assessments and addresses whether condition assessments of inactive industrial plant equipment accurately reflect the operation of the equipment. This examination is based upon the outcome of three factors:

- An operational test of two inactive lathes by the plant engineers at the Riverbank Army Ammunition Plan (PEP #0224), Riverbank, California, in September, 1990.
- A partial reactivation of PEP #669 for the production of M16 rifle bolts at Rock Island Arsenal, Rock Island, Illinois, in April, 1986 by the United States Army Armament, Munitions and Chemical Command, Rock Island, Illinois.
- United State Army Audit Agency, Audit Report: HQ 87-202 on the management of PEPs, published in May 1987.

Two plant equipment package sites were also visited to gather data: the Riverbank Army Ammunition Plant in Riverbank, California, which holds 480 pieces of industrial plant equipment, and NI Industries, Incorporated, Norris Division in Vernon, California, which holds 434 pieces of industrial plant equipment [Ref. 39]. Additional sources for data were the Seneca Army Depot in Seneca, New York, the Industrial Engineering Activity in Rock Island, Illinois, the Defense Industrial Plant Equipment Center (DIPEC) in Memphis, Tennessee, and the National Acme Company, Cleveland, Ohio. Gathered data includes:

- Rock Island Arsenal and Seneca Army Depot operational literature.
- Riverbank Army Ammunition Plant inventory of IPE.
- IEA inventory of the Army IPE for lathes.
- Literature on Acme-Gridley Lathes from National Acme Company.
- DIPEC information on condition assessments and condition codes.

A. CONDITION ASSESSMENT

A condition assessment of industrial plant equipment within the Army and Navy includes an evaluation of the operational ability of the equipment. A two digit alpha-numeric condition code is assigned to each piece of industrial plant equipment. This condition code signifies the readiness status of the equipment for use in the production process. The first letter of the code is a supply condition code, indicating whether or not the machine is serviceable and the degree of serviceability. The second character is the disposal code, indicating the general condition of the machine and what, if any, repairs would be needed for the equipment to be functional (see Appendix D for the specific definitions of the condition codes). [Ref. 40]

These condition codes have been the Department of Defense standard for condition assessments of industrial plant equipment since 1984. Prior to their implementation another condition code system was used. The Defense Industrial Plant Equipment Center (DIPEC) issued a conversion table in 1984 to the Industrial Engineering Activity. Condition reassessments done since 1985 have been under the new standard. Table 4.1 shows the 1984 DIPEC conversion table. [Ref. 41]

TABLE 4.1

DIPEC CONDITION CODE CONVERSION TABLE

Prior 1984 Condition Codes	1984 To Present Condition Codes
N-1,2	A1
N-3	A2
N-4	A3
E-1,2	A4
O-1,2	A4
E-3, O-3	A5
E-4, O-4	A6
R-1,2	F7
R-3	F8
R-4	F9
X	HX
S	HS

[Ref. 42]

A problem with the current condition codes is that several different variables have been grouped together. The current coding scheme is trying to simultaneously measure the:

- Degree to which the equipment can successfully do it job or jobs.
- Amount of money needed to repair the equipment.

- Amount of time needed to repair the equipment.
- Salvage value of the equipment.
- Estimated remaining life of the equipment.
- Need for parts to repair the equipment.

The condition codes are supposed to correctly capture the values of these six variables. A scheme that incorporates more digits (perhaps one for each variable) would be more descriptive and cover the six variables more thoroughly.

B. ACME-GRIDLEY LATHES

An inventory listing of active and inactive lathes in Army PEPs was obtained from the Industrial Engineering Activity (IEA), Rock Island, Illinois, the central industrial plant equipment inventory control point for the Army. This listing also showed the location and condition code of each lathe. From this listing, the Acme-Gridley eight spindle, 8" chuck, high speed automatic lathe located at the Riverbank Army Ammunition Plant was chosen for study. This lathe was critical to the 81 mm mortar casing production line which was inactivated and laid away in 1976. According to Riverbank Army Ammunition plant engineers, the line cannot manufacture mortar casings without the Acme-Gridley lathe or a suitable substitute. The lathe was originally produced by National Acme in Cleveland, Ohio, a manufacturer of lathes for over 80 years. These lathes are advertised as being able to perform numerous operations in short time spans while maintaining exact tolerances, having low downtime for maintenance, short set up times, and short tool change times. [Ref. 43] The years of manufacture of the Acme-Gridley lathes in this study (see Appendix E) are shown in Table 4.2.

TABLE 4.2

ACTIVE ACME-GRIDLEY LATHES

	Army Total		Riverbank AAP	
Year of Manufacture	six spindle	eight spindle	six spindle	eight spindle
1941	4	0	0	0
1942	18	0	0	0
1951	1	0	0	0
1952	3	0	1	0
1954	4	0	0	0
1961	1	0	0	0
1962	0	1	0	0
1967	1	0	0	0
1975	0	5	0	5
1976	4	3	4	3
1977	10	0	10	0
1978	4	0	4	0
1986	1	0	1	0
Total	51	9	20	8
Total active lathes		60		28

TABLE 4.2

INACTIVE ACME-GRIDLEY LATHES

Year of Manufacture	Army Total six spindle	Army Total eight spindle	Riverbank AAP six spindle	Riverbank AAP eight spindle
1941	18	0	0	0
1942	20	0	0	0
1943	6	0	0	0
1944	2	0	0	0
1945	1	1	0	0
1950	1	2	0	1
1951	18	4	1	0
1952	25	3	2	0
1953	3	7	0	0
1954	10	3	5	1
1957	0	1	0	0
1961	4	0	0	0
1962	0	1	0	0
1963	0	3	0	0
1966	4	0	0	0
1973	0	4	0	4
1978	0	1	0	0
1980	0	4	0	0
1981	2	0	0	0
Total	114	34	8	6

Year of Manufacture	Army Total four spindle	Riverbank AAP four spindle
1952	1	0
1953	1	0
Total	2	0
Total inactive lathes	150	14

[Ref. 44]

National Acme produces four, six, and eight spindle bar and chucking lathes with capacities (bar diameters) ranging from 7/16" to 8". Bar lathes are so called because of the bar stock used to produce parts. Bar stock generally comes in 20 foot lengths and is available in round, square, hexagonal, or other regular polygonal cross sections. A bar diameter refers to the maximum diameter size of bar stock the lathe can work on. [Ref. 45] For example, a 7/16" capacity bar lathe would be able to work on a piece of bar stock up to and including 7/16" maximum diameter.

Chucking lathes (chuckers) are different from bar lathes only in the way the working part is held by the lathe. Chucking lathes are equipped with devices (called chucks) that can hold a wider range of pieces to be worked (castings, forgings, and odd shaped items). The chuck capacity is the maximum diameter of the widest part that the chuck can hold. [Ref. 43:p. 2] Table 4.3 shows the number of Acme-Gridley 8" chucking lathes owned by the Army.

TABLE 4.3

ARMY ACME-GRIDLEY 8" CHUCK LATHE INVENTORY

Number of spindles	Army Total		Riverbank AAP	
	active	inactive	active	inactive
eight	8	9	8	6
six	5	10	5	8
four	0	0	0	0
Total	13	19	13	14

[Ref. 46]

The Acme-Gridley multiple spindle lathes use a process to manufacture parts which performs different machining operations at sequential spindle work stations without removing the part from the lathe. The part is usually machined to within minute tolerances of given specifications. Multiple spindle lathes work several pieces of stock at a time, one per spindle. Once the part is loaded on a lathe spindle, it is rotated or indexed through different work stations on the lathe. The time it takes to produce a part on multiple spindle lathes is less than the time required for the same operations on a single spindle lathe. For instance, on a single spindle lathe the machine has to be stopped, setup, and restarted for each of the three operations that a multiple spindle lathe could perform without stopping. Multiple spindle lathes are more efficient due to a faster production time per part [Ref. 43:p. 2].

Acme-Gridley lathes at Riverbank Army Ammunition Plant are used for the manufacture of 81 mm and 60 mm mortar casings. Roughly forged casings are machined to exacting tolerances on the eight and six spindle Acme-Gridley chuck lathes. The casings are then shipped to another manufacturer for the loading of explosives and final manufacturing processes.

Machining operations by the Acme-Gridley eight spindle chuck lathes on the 81 mm and 60 mm mortar casings are performed in two stages. The first stage consists of loading the casing, turning the conical nose, facing or making the head of the casing flush, drilling a center hole in the head, and unloading. The second stage, performed on another lathe in the production line, consists of loading, turning the open end, facing the open end, chamfering, and unloading (see Appendix F). There are three ammunition lines at Riverbank Army Ammunition Plant which have Acme-Gridley lathes. The Acme-Gridley lathes on line one in the Riverbank Plant are active, and are currently able to produce 1000 81 mm or 60 mm mortar casings an hour. The Acme-Gridley lathes on line 7 have been inactive since 1976, and line 13 since April, 1990. [Ref. 47]

C. CONDITION ASSESSMENTS OF ACME-GRIDLEY LATHES

The condition assessments that were done in 1985-1989 for the Acme-Gridley lathes in the Army's and Riverbank Ammunition Plant's industrial plant equipment inventories all fell into one of the categories listed in Table 4.4.

TABLE 4.4

NUMBER OF LATHES IN EACH CATEGORY

Army		Riverbank
A6 -	18	1
A5 -	128	30
A4 -	42	10
A1 -	1	1
F9 -	4	0
F8 -	15	0
F7 -	2	0
Total	210	42

[Ref. 48]

In the course of this study, it was found that the Riverbank Army Ammunition Plant lathes were assessed only by visual means during the last condition reassessment in 1985. The actual working condition of the lathes on inactivated line seven is thus unknown. They haven't been started for approximately 15 years. Therefore, the condition assessments of these inactive lathes may be substantially inaccurate.

Table 4.5 lists the condition codes for the 60 active and 150 inactive Army Acme-Gridley lathes. Note that 90% (134) of the inactive lathes and 88% (53) of the active lathes are estimated to be in serviceable condition. Also, all the Acme-Gridley lathes at Riverbank Army Ammunition Plant are in serviceable condition (i.e. may be used without repair). This condition assessment of the inactive lathes is questionable because the inactive equipment assessments are done without actually operating the equipment.

TABLE 4.5

CONDITION CODES
OF SIX AND EIGHT SPINDLE ACME-GRIDLEY LATHES

Army:

Active	A6	A5	A4	A1	F9	F8	F7	
eight spindle	0	9	0	0	0	0	0	
six spindle	1	30	12	1	0	7	0	
four spindle	0	0	0	0	0	0	0	
Total	1	39	12	1	0	7	0	60

Inactive	A6	A5	A4	A1	F9	F8	F7	
eight spindle	2	25	3	0	1	2	1	
six spindle	13	65	26	0	3	6	1	
four spindle	2	0	0	0	0	0	0	
Total	17	90	29	0	4	8	2	150

Riverbank AAP:

Active	A6	A5	A4	A1	F9	F8	F7	
eight spindle	0	8	0	0	0	0	0	
six spindle	1	8	10	1	0	0	0	
four spindle	0	0	0	0	0	0	0	
Total	1	16	10	1	0	0	0	28

Inactive	A6	A5	A4	A1	F9	F8	F7	
eight spindle	0	6	0	0	0	0	0	
six spindle	0	8	0	0	0	0	0	
four spindle	0	0	0	0	0	0	0	
Total	0	14	0	0	0	0	0	14

[Ref. 46]

The cost of connecting the inactive equipment to electrical power and turning it on is considered to be too high by the assessment teams. Therefore, alternative, visual inspections are performed. In essence then, the evaluation of the equipments' ability to operate is based solely upon external appearances. [Ref. 47]

D. TESTS BY RIVERBANK ARMY AMMUNITION PLANT

A test of two inactive Acme-Gridley eight spindle, 8" chucking lathes was conducted by the industrial engineering manager for Norris Industries at the Riverbank Army Ammunition Plant in September 1990. The test consisted of starting the lathes and machining 81 mm mortar case forgings to within the specified engineering tolerances. After machining, the mortar casings were checked to see if the government tolerances were met.

These inactive lathes are part of the inactivated 81 mm and 60 mm mortar casing production line (line 7). This inactivated line has 5 eight spindle and 7 six spindle Acme-Gridley lathes. The lathes were preserved and laid away in 1976 and were assigned condition codes of A5 (may be used without repair) after the last condition reassessment in 1985. As seen in Table 4.5, all inactive Acme-Gridley lathes at Riverbank Army Ammunition Plant are rated in ready to use (A5) condition. According to the engineering manager, these lathes were last operated in 1973 when

Riverbank AAP conducted a full power mobilization test run, soon after Vietnam war production ceased.

E. MACHINE CAPABILITY

A progression of activities was required to start the first Acme-Gridley lathe (serial number 341636898). These activities including cleaning the lathe, checking the lubrication levels in the automatic lubrication device, and connecting power to the machine's circuits. This process took approximately 32 man hours to accomplish (Kumar, 1990, Personal Interview). [Ref. 49] The lathe started and three machining tests were run. The tests and specifications were:

- Max TIR (total indicator reading) - this indicator measures the amount of imperfection in the roundness of the hole drilled in the boss head. The engineering specification is 0.000 to 0.020 inches.
- Boss height - the height of the boss end after being machined into the body of the mortar casing (see Appendix E). The engineering specification is 0.877 +/- 0.007 inches.
- Bulkhead thickness - This measures the thickness of the mortar casing wall. The engineering specification is 0.165 +/- 0.005 inches.

Each test produced an indication of the ability of the lathe to produce parts within the given tolerances. This indicator is called the machine capability (CpK) and measures how closely the lathe can match the process capability (Cp). The process capability measures the production capability within the specified tolerances. Process capability is defined as:

Cp = USL - LSL / 6S

where, USL is the upper engineering specification limit
LSL is the lower engineering specification limit
6S is 6 times the process standard deviation.

The engineering specifications are the given upper and lower limits of the required measurement. An example of the engineering specification for the boss height is a target measurement of 0.877 inches for each mortar casing with an upper limit of 0.884 inches, and a lower limit of 0.870 inches. The natural specification is the average sample standard deviation, which is denoted as S, times 6. Due to the small size of the sample, the average standard deviation was used as an estimator for each test instead of the standard deviation that would have been obtained if a much larger sample, say several hundred, had been taken. The process is considered capable of producing parts within the given specifications if the Cp indicator is equal to or greater than 1.0.

The machine capability, CpK, indicates whether the lathe at its current settings can produce enough parts within the upper and lower limits of a given specific measurement to warrant using it in a production cycle. The performance of an individual lathe depends upon the performance of its worst spindle. Therefore, a determination of the lathe's capability for consistently producing parts within the engineering specifications is made by computing two CpK values using the highest spindle mean for one, and the lowest spindle mean for the other. Table 4.6 lists the test results from which the CpK calculations were made.

TABLE 4.6

LATHE TEST RESULTS FROM RIVERBANK AMMUNITION PLANT

Max Total Indicator Reading (TIR):

Spindle number	Sample size	Average (X)	Standard deviation
1	12	0.01500	0.00481
2	14	0.00829	0.00287
3	12	0.00717	0.00422
4	14	0.01321	0.00396
5	12	0.00925	0.00439
6	14	0.00721	0.00389
7	11	0.00727	0.00347
8	14	0.00936	0.00295
		Sample Average Standard Deviation	0.00382

Boss Height:

Spindle number	Sample size	Average (X)	Standard deviation
1	14	0.87639	0.00312
2	14	0.87429	0.00091
3	14	0.87650	0.00259
4	14	0.87550	0.00109
5	14	0.87643	0.00224
6	14	0.87729	0.00149
7	14	0.87743	0.00206
8	14	0.87507	0.00223
		Sample Average Standard Deviation	0.00197

Bulkhead Thickness:

Spindle number	Sample size	Average (X)	Standard deviation
1	12	0.16146	0.00086
2	12	0.16279	0.00096
3	11	0.16091	0.00120
4	12	0.16354	0.00114
5	12	0.16104	0.00127
6	12	0.16563	0.00064
7	12	0.16254	0.00110
8	12	0.16467	0.00117
	Sample Average Standard Deviation		0.00100

An example of the X_H and X_L used for computing the CpK for the boss height test is spindle number seven, with the high average of 0.87743 inches, and spindle number two, with the low average of 0.87429. Two CpK values were computed using these two means separately. The underlying assumption that the plant engineers follow is that the lathe produces parts in a stable and controlled manner with all the measurements falling within the engineering specification limits. Additionally, the engineers assume that the average of the observations for a spindle (X) approximately follows a normal distribution; this is due to the central limit theorem. The formulas are as:

CpK = Min (A, B), where

A = (Upper Engineering Specification Limit (USL) - X_H) / 3S

where X_H denotes the largest average spindle mean

and

B = (X_L - Lower Engineering Specification Limit (LSL)) / 3S

where X_L denotes the lowest average spindle mean.

CpK is the smallest of A and B and indicates the lathe's capability of producing parts within the given tolerances. The measurements used to determine the machines production capability are:

CpK >= 1.33,	good
1.0 <= CpK < 1.33,	marginal
CpK < 1.0,	unsatisfactory

F. TEST RESULTS

The first lathe tested (serial number 341636898) started, but the mortar casings it produced failed to meet government specifications by having CpK indicators below 1.0 for all three tests. The CpK indicators for the three tests were as:

Max Total Indicator Reading (TIR):

The Max TIR reading cannot go below 0.00 because negative values are infeasible. Therefore, only the upper limit of the specification is considered; thus

$$CpK' = \frac{USL - X_H}{3S}$$

For Max TIR data from table 4.7, the CpK' is:

$$CpK' = \frac{0.020 - 0.01500}{(3)\ (0.00382)} = 0.4363$$

Boss Height:

$X_H = 0.87743$, $X_L = 0.87429$, $S = 0.00197$

$$A = \frac{0.884 - 0.87743}{(3)\ (0.00197)} = 1.11$$

$$B = \frac{0.87429 - 0.870}{(3)\ (0.00197)} = 0.726$$

CpK = 0.726

Bulkhead Thickness:

$X_H = 0.16563$, $X_L = 0.16091$, $S = 0.001$

$$A = \frac{0.170 - 0.16563}{(3)\ (0.001)} = 1.45$$

$$B = \frac{0.16091 - 0.160}{(3)\ (0.001)} = 0.30$$

CpK = 0.30

The test results show that all three CpK values are below 1.0. These unsatisfactory CpK values indicated that the machine process would not be capable of producing enough parts within the given tolerances to warrant using the lathe in production. A closer examination revealed that two of the lathe spindles needed bearing replacements. The lathe was not in serviceable condition, while its A5 condition code indicated it was. Presently this lathe is still inoperative and extensive repairs are needed before this particular lathe can operate within specifications.

The second lathe (serial number 341630305) did not start at all. After diagnosis and disassembly, all the bearings were found to need replacement. Clearly this lathe was also in unserviceable condition, again contrary to the assessed condition code.

The engineer in charge of the tests at Riverbank stated that the bearing problems were probably due to the absence of lubrication over the long storage periods without operation.

These lathes have an automatic lubrication system that operates only when the lathe is in operation. No alternative lubrication system was put into place during storage. Evidently, the weight of the spindles resting on the bearings, combined with the lack of adequate lubrication over time, caused the bearings to form pressure scratches and also lose their spherical shape (flatten). [Ref. 47] This bearing problem could occur with all similar inactive lathes in the Army inventory.

However, the assessed condition codes of both lathes tested at Riverbank Army Ammunition Plant indicated that the equipment should have been in usable condition (A5). The engineering manager conducting the operating tests stated that the assigned condition codes do not have much meaning as the codes do not reflect the current actual working condition of the equipment, only the working condition at the time it was last used.

G. REACTIVATION OF PEP-669

A similar bearing problem was found on a 1.25" bar diameter Acme-Gridley eight spindle chucker during the partial reactivation of plant equipment package (PEP) 669 in May 1986. This PEP is located at the Rock Island Arsenal, Rock Island, Illinois, and manufactures M16 rifle bolt assemblies. Reactivation showed four of twenty nine pieces of inactive equipment, including one Acme-Gridley eight spindle 1.25" chucking lathe, to have major spindle bearing problems due to corrosion. This problem delayed the PEP reactivation until repairs could be made.
[Ref. 50]

Table 4.7 shows the Army's inventory of Acme-Gridley six and eight spindle bar/chucking lathes (similar to the ones at Rock Island Arsenal). Although smaller than the two lathes tested at Riverbank Army Ammunition Plant, the chucking lathes in PEP-669 had the same type of problem during reactivation; the bearings had gone bad over time. Based on these observations, it is reasonable to hypothesize that similar inactive lathes under similar storage and environmental conditions could have similar bearing problems. These bearing problems would therefore cause delays in reactivating plant equipment packages for emergency mobilization requirements.

TABLE 4.7

ARMY ACME-GRIDLEY SIX AND EIGHT SPINDLE LATHES IN THE 1.25" TO 8" BAR/CHUCK DIAMETER RANGE

Number spindles	Active	Inactive
eight	9	34
six	26	47
	--	--
Total	35	81

[Ref. 46]

H. ARMY AUDIT OF PLANT EQUIPMENT PACKAGES

The U.S. Army Audit Agency published an audit report on the management of plant equipment packages in May 1987. The audit was performed to evaluate the actions taken by Army management to eliminate previously identified problems that related to monitoring the maintenance and controlling the deterioration of inactive industrial plant equipment in storage. The audit, performed from October 1986 through February 1987, was made in accordance with generally accepted government auditing standards. However, information related to the analytical methods used, the methodology, or how the auditors defined deterioration was not given in the audit report.

The report stated that the data base used for the Army's industrial plant equipment inventory is not adequate to identify problems related to the deterioration of industrial plant equipment in plant equipment packages. It found that

no method had been established to identify the effects of equipment age, length of inactivity due to storage, and maintenance procedures on industrial plant equipment held in PEPs. The Army audit analysis, performed by the Industrial Engineering Activity and the Seneca Army Depot for the years 1985 to 1987, found that many of the recorded condition codes of the 4152 pieces of industrial plant equipment were inaccurate, and that plans for rebuilding or replacing equipment will be outdated before execution.
[Ref. 51] Again, a discussion as to what this analysis entailed was not given in the audit report.

The audit report cited a previous DOD Inspector General report which estimated that 80% of inactive industrial plant equipment would require overhaul or repair before use. This estimate came from a 1978 study made by the Industrial Base Engineering Activity (now Industrial Engineering Activity). The Industrial Base Engineering Activity study was based on data accumulated for 2,447 pieces of industrial plant equipment assigned to 5 PEPs brought into DoD industrial plant equipment maintenance facilities for inspection and test. The statistical data compiled showed that 1,984 of the total number of items were recorded in ready to use without repair condition (A1 through A6). However, condition assessment tests confirmed that only 463 of the 2,447 items (about 20%) required no repair.

[Ref. 52] The remainder required repair despite their condition code indicating otherwise.

The DoD Inspector General further stated that industrial plant equipment assigned to Army-managed plant equipment packages, "was not generally being maintained in a condition capable of providing the additional production capability that will be needed to fulfill mobilization requirements." [Ref. 51:p. 3]

I. ARMY AUDIT REPORT CONCLUSION

The audit report contends that the actual condition of inactive industrial plant equipment is probably worse than the condition codes indicate. [Ref. 51:p. 2] If the Army Audit Agency report is correct, between 80% to 100% of inactive Acme-Gridley lathes (120 to 150) will need repair before use. Mobilization planning, however, does not allow the time necessary for these repairs. This report is compared to table 4.5 which shows that only 10% of the Army's inactive Acme-Gridley lathes have condition codes indicating a need for repair or overhaul.

J. CONCLUSION

Based on testing and audit reports, it is felt that the condition codes of the industrial plant equipment examined in this thesis were overstated. The codes do not accurately indicate the actual operability of the equipment nor the degree to which inactive industrial plant equipment can be readily used to meet surge and mobilization requirements. As the Riverbank Army Ammunition Plant tests, the reactivation of PEP-669, and the Army audit report show, condition codes do not necessarily indicate the actual working state of the equipment. The results of these three factors are summarized in Table 4.8.

TABLE 4.8

SUMMARY OF THE RESULTS FOR THE CONDITION CODE FACTORS

Audit/Test	Sample size	Number in A1-A6 condition before before audit/test	Number actually in A1-A6 condition
Riverbank AAP Test	2	2	0
PEP 669 Reactivation	29	29	25
1987 Army Audit	2,447	1,984	463

Documentation, from the additional sources noted above, combine to support the hypothesis that similar inactive lathes under similar conditions will have the same bearing problems, from lack of lubrication and lack of operation. As a result, inactive Acme-Gridley inactive six and eight spindle lathes will have problems operating on short notice and will not be able to meet mobilization and surge requirements for increased production of critically needed war material in a timely manner.

V. CONDITION ASSESSMENT PROCEDURES

This chapter examines the procedure used for condition assessments of inactive Army IPE and estimates the costs associated with an alternative procedure that may lead to more accurate assessments. This examination is based upon six factors:

- Operational test of inactive Acme-Gridley lathes at Riverbank Army Ammunition Plant.
- Army PEP examinations.
- Personal Interviews.
- Industrial Engineering Activity briefing.
- Command Review of Industrial Base (CRIB) Survey of the Riverbank Army Ammunition Plant, Riverbank, California.
- CRIB survey of NI Industries, Vernon, California.

A. PURPOSE OF CONDITION ASSESSMENTS

The purpose of a condition assessment is to determine the operating condition of IPE so that appropriate maintenance actions can be taken to insure that PEPs are in ready to use condition (DoDD 4275.5 and other management directives). Equipment that is not in working condition can affect a PEP's ability to meet surge/ mobilization requirements. Information about non-working IPE can be used to make critical management decisions affecting PEP

operations. Management decisions concerning IPE typically involve choosing from alternatives such as:
[Ref. 53]

- Retain the equipment in its current condition.
- Make minor repairs.
- Retrofit the equipment with state-of-the-art features.
- Rebuild or purchase new equipment.

B. ARMY COMMANDS THAT DO CONDITION ASSESSMENTS

Several Army Commands can update the condition codes of inactive IPE. The codes can be updated at any time to reflect changes in the operational condition of the IPE. Changes are submitted to the Defense Industrial Plant Equipment Center for inclusion in the IPE data base. The commands that do condition assessments on IPE are:

- United States Army Industrial Engineering Activity (IEA) at the Rock Island Arsenal Island Illinois.
- The Industrial Readiness Directorate (IRD) also at the Rock Island Arsenal.
- The Seneca Army Depot at Seneca, New York.
- The Defense Industrial Plant Equipment Center (DIPEC), Memphis, Tennessee. [Ref. 54]
- The IPE storage activity.

[Ref. 55]

C. BACKGROUND

The condition assessment program for inactive IPE began in early 1985 following the DoD inspector general's determination that Army PEPs were not in adequate condition to meet immediate mobilization/surge requirements. [Ref. 53:p. 18] The Defense Industrial Reserve Act of 1973 stated that PEP IPE will be in a ready to use condition. Funding was made available for the condition assessment of the Army's IPE. Once the condition assessments were made, the information was entered into the Army's IPE data base. [Ref. 53:p. 19]

The condition assessments of the Army's central IPE storage sites were completed in May, 1988. The condition assessments of contractor owned and operated PEPs are currently being conducted, with expected completion in fiscal year 1991. Industrial Engineering Activity condition assessment trips to date are described in Table 5.1. [Ref. 53:p. 12]

TABLE 5.1

INDUSTRIAL ENGINEERING ACTIVITY ASSESSMENT TRIPS

	FY85	FY86	FY87	FY88	FY89	Total
No. of trips:	17	20	12	13	14	76
Items assessed:	3944	4498	1516	3328	2382	15,668
No. of mandays:	165	157	80	86	95	583

D. CONDITION ASSESSMENTS OF ARMY EQUIPMENT

The Army's inactive IPE in PEPs is not operationally tested unless power is connected to it. Inactive equipment is not usually connected to power. The reason for this policy is that there is not adequate funding available to connect the equipment to power, operationally test, disconnect from power, and preserve the equipment for storage (i.e. place it in a condition that prevents environmental deterioration). Other reasons are as:

- Lack of technical expertise in the operation of the inactive equipment.
- Time requirements for the assessment team to operationally test the equipment.
- Contract modifications.

[Ref. 56]

The check-off list used by the Industrial Engineering Activity to grade the condition of inactive IPE is shown in Appendix F. Several of the listed systems can not be adequately checked by visual means. Those systems are as:

- Electrical System.
- Coolant System.
- Lubrication System.
- Hydraulic, Pneumatic Systems.
- Spindle Driving Heads.
- Transmission Systems.

E. CRIB SURVEYS AT NI INDUSTRIES AND RIVERBANK AMMUNITION PLANT

Recertification of PEPs to meet mobilization requirements is periodically done by a Command Review of Industrial Base (CRIB), or CRIB survey. CRIB surveys are performed by the Industrial Readiness Directorate Headquarters, United States Army Armament, Munitions and Chemical Command, Rock Island, Illinois.

CRIB surveys were completed on PEP 0224 located at the Riverbank Army Ammunition Plant in May, 1985, and on PEP 0098 located at NI Industries in December, 1989. A written report was furnished for each survey. The reports included some condition code updates for the inactive IPE located at each site.

Operational tests of the inactive equipment at both sites were not performed. The reason for not operationally testing the equipment was not given in the reports. The plant property manager at NI, and the engineering manager at Riverbank stated that time constraints on the survey teams and the added expense of cleaning and operating the equipment were the reason that operational testing was not done. [Ref. 57]

The purpose and scope of the NI Industries CRIB survey were:

* Purpose - NI Industries, Inc., was surveyed to determine their readiness posture in the event of mobilization and to verify whether the contractor is capable of producing the planned items at the planned rates within the required time frame.

* Scope - To investigate the company's production capability by reviewing each Description of Manufacture (DOM) and inspecting the production equipment, production line voids, subcontractor planning, and personnel availability.

[Ref. 58]

The NI Industries CRIB survey stated that a visual inspection was done on the government-owned equipment located on site, and that the majority of the equipment appeared to be maintained in accordance with current maintenance procedures. [Ref. 58, p.7]

An example of how some CRIB teams update and change condition codes can be derived from this survey. NI Industries was directed by their procurement contracting officer (Industrial Engineering Activity, Rock Island, Illinois) to return six items for disposal due to poor condition. However, according to the contractor, the equipment was either being used in production or was capable of being used. These items are shown in Table 5.2.

TABLE 5.2

NI INDUSTRIES CRIB SURVEY CONDITION CODE CHANGES

	Equipment	Old Condition Code	New Condition Code	Serial Number
1.	Phosphate Coat, Lefort.	A6	A5	342600416
2.	Press, Hyd., 100T.	F8	A4	344200386
3.	Press, Hyd., 700T.	A6	A5	344205692
4.	Press, Hyd., 125T.	F9	A4	344205694
5.	Trim, machine, CTG, Case.	A6	A4	344901223
6.	Blaster, Pangborn.	F8	A5	358500871

[Ref. 58: pp. 210-218]

The procurement contracting officer's decision to remove these six pieces of equipment from the plant was based solely on the then current condition codes [Ref. 59]. According to the survey report, the upgrades were done based only on visual inspections. The report stated that the equipment appeared to be in better operating condition than the existing codes indicated and recommended the equipment disposal action be rescinded. [Ref. 58: p. 8] However, this could mean that the assessed condition codes assigned by other condition assessment teams do not reflect the actual operating condition of the equipment due to the Army's visual assessment policy.

The purpose and scope of the Riverbank Army Ammunition Plant CRIB survey were as:

* <u>Purpose</u> - To determine the readiness posture in the event of mobilization and to determine if the facility is capable of producing the planned items at the planned rates within the required time frames.

* <u>Scope</u> - To review the plant's capability by an on site inspection of the production facility, methods and techniques of operation, and the latest plant layout.

[Ref. 60]

The test of the operability of the two inactive Acme-Gridley lathes at Riverbank Ammunition Plant discussed in chapter IV proved that the two lathes were not in the serviceable condition that their assigned condition codes indicated. The visual condition assessments of the inactive IPE at Riverbank done by the Industrial Readiness Directorate did not change the lathes' assigned condition codes. The lathes' condition codes indicated that they were operational when they were not. A power test of the two Acme-gridley lathes, which were later tested for operability by NI Industry personnel, would have found that they were inoperable and repair could have been scheduled. Not power testing the two lathes gave misleading information to decision makers about the operability of the lathes, and the readiness of the inactivated mortar line to be reactivated. Decisions relating to the nation's ability to meet its planned mobilization requirements may not adequately account for PEP reactivation delays caused by inoperable IPE without prior operational testing.

F. ACME-GRIDLEY LATHES CONDITION ASSESSMENT COST

IPE condition assessment costs to the United States government largely consist of the travel expenses incurred for sending an assessment team from the team's home office to the IPE site. Travel expenses per individual consist of the airline round trip ticket, meals, lodging, and one rental car per team. [Ref. 61]

The CRIB survey teams at Riverbank Ammunition Plant and NI Industries consisted of government general schedule (GS) employees. The 1990 per diem rates for the PEP sites that were visited are shown in Table 5.3.

TABLE 5.3

1990 PER DIEM RATES

	Los Angeles, California (NI Industries)	Modesto, California (Riverbank AAP)
Lodging	$86.00 per day	$54.00 per day
Meals	$34.00 per day	$26.00 per day
	------	------
Total	$120.00	$80.00

The approximate cost of the CRIB surveys at Riverbank and NI Industries included the salaries of the GS employees who conducted the survey plus the travel expenses shown in Table 5.4.

TABLE 5.4

CRIB SURVEY COSTS

	NI Industries (3 man team)	Riverbank (2 man team)
Airline tickets at $200.00 each.	$600.00	$400.00
Per diem for 12 days at survey site.	$4,320.00	$1,920.00
Rental car for 12 days at $20.00 per day.	$240.00	$240.00
Total	$5,160.00	$2,760.00

The cost to the United States Government of the condition assessment of the Acme-Gridley lathes at Riverbank was the cost of the trip. However, as shown in chapter IV, these visual assessments were inaccurate. A power operating test of the lathes would be necessary to determine the lathes true operating capabilities.

G. COST OF OPERATIONAL TESTING THE ACME-GRIDLEY LATHES

The costs involved in operationally testing the Acme-Gridley lathes at the Riverbank ammunition plant would be the costs of travel, labor and material. The labor costs would entail two contractor employees working two eight hour shifts (32 hours total) to clean and prepare the both lathes for a power test. Table 4.1 shows that there are 6 inactive eight spindle Acme-Gridley lathes and 8 inactive six spindle lathes at the Riverbank plant. Table 5.5 shows the estimated cost to prepare these lathes for a power test. [Ref. 49]

TABLE 5.5

COST TO PREPARE INACTIVE LATHES FOR A POWER TEST

$50.00/hour x 32 hours = $1,600.00 per lathe
14 inactive lathes x $1,600.00 per lathe = $22,400.00

Total = $22,400.00

The material cost includes lubrication, oil, and electricity and would be less than $50.00 per lathe [Ref. 49]. The plant engineer recommends cycling each lathe once a month to lubricate the bearings and prevent bearing damage from reoccurring. Once the lathes were proven to be operaticnal, a monthly operation of 20 minutes with 40 minutes preparation time would keep the lathes in ready to use condition. Table 5.6 shows the estimated labor costs for this monthly maintenance:

TABLE 5.6

MONTHLY LATHE MAINTENANCE COST

$50.00/hour x 1 man hour labor = $50.00 per lathe
14 lathes x $50.00 per lathe = $700.00 a month

Total = $700.00 per month

H. CURRENT CONDITION ASSESSMENT PROCEDURES

Visual condition assessments are the least cost method for assessing the condition of IPE, but are also the least accurate. [Ref. 52] The cost of the visual inspection of the inactive IPE at the Riverbank AAP by the CRIB survey team was approximately $2,760.00 as shown in table 5.4. The savings to the Army of using visual condition assessments for the Acme-Gridley lathes at Riverbank was the $22,400.00 cost of operationally testing the lathes as shown in table 5.5. Other costs associated with visually assessments of IPE are as:

- Lathes won't work when called upon.
- Cost of expedited repairs during national emergency.

Operationally testing the Acme-Gridley lathes at Riverbank have several beneficial outcomes. The outcomes are as:

- Condition codes of the lathes would be accurate.
- The lathes are proven to perform.
- Needed repairs can be scheduled and budgeted for gradually, as needed.

The scheduling of repairs found during operational tests of inactive IPE is one of the biggest advantages of this alternative condition assessment procedure. Repairs accomplished in a peacetime environment do not have the increased costs of repair that they would have during a national emergency. Mobilization time requirements dictate expediting the repair effort for IPE needed to increase the production of critical war material. Extra shifts at the production site, over-time, and the expedited shipment of parts are some of the costs that can be avoided with early detection of needed IPE repairs. Additionally, this alternative procedure would allow time to order and receive hard to get repair parts, if necessary, to accomplish repair. This alone avoids delay from ordering repair parts with long lead times.

I. COST OF REPAIR

The costs to repair the two unserviceable inactive Acme-Gridley lathes at Riverbank are shown in Table 5.7.

TABLE 5.7

COST OF REPAIR OF THE ACME-GRIDLEY LATHES

Labor:
- Teardown:
  - 40 man hours per lathe x 2 lathes = 80 hrs
- Build up:
  - 80 man hours per lathe x 2 lathes = 160 hrs
- Total labor cost:
  - 240 hrs x $50.00/hr = $12,000.00

Material:
- New bearings = $16,000.00 per lathe
  - Total = $32,000.00

Grand Total = $44,000.00.

[Ref. 47]

The cost of expediting the repair of these lathes if discovered to be inoperable during the reactivation of line 7 during mobilization would require the same amount of manhours per lathe. However, overtime costs would most likely be incurred for work done beyond a normal work day. Delay in reactivation of line 7 would be another problem. The plant engineering manager at Riverbank estimated that the repair of the lathes would take at least ten calendar days to accomplish. The assumption for this time estimate is that needed parts are available at the manufacturer, that the parts can be expeditiously shipped to the plant, and that repair efforts are adequate to repair the lathes. Table 5.8 lists the order of repair activities. [Ref. 49]

TABLE 5.8

PROGRESSION OF LATHE REPAIR ACTIVITIES DURING MOBILIZATION

Start up	Check out	Order parts	Receive parts	Install	test
1 day	1 day	1 day	3 days	3 days	1 day

Total of 10 days.

The availability of repair parts is the factor that is least certain in the progression of lathe repair activities. Currently, the manufacturer of the Acme-Gridley eight spindle lathe tested and repaired at Riverbank AAP, National Acme, has a limited supply of the spindle roller bearings needed to make that repair. Table 5.9 shows the current manufacturer availability of these bearings.

TABLE 5.9

CURRENT AVAILABILITY OF SPINDLE ROLLER BEARINGS

Bearing	On hand at manufacturer	On order at manufacturer
front, matching set	0	0
front, individual	78	0
rear, individual	22	48

[Ref. 62]

The repair of the Acme-Gridley lathes at Riverbank AAP required one front set (a set consists of eight bearings), eight front individual, and eight rear bearings for each lathe. At present, the bearing supply shown in Table 5.9 would only repair nine Acme-Gridley eight spindle lathes if all eight front individual bearings needed replacement, two if all eight rear individual bearings needed replacement, and none if the front bearing set needed replacement. The lead time for replacement orders placed by National Acme with the bearing manufacturer could take up to six months. [Ref. 62] The administrative lead time would not be a critical factor in ordering the repair parts because the facilities contract that NI Industries has with the government to operate the Riverbank AAP allows direct ordering of repair parts from the manufacturer for repair of government owned IPE. However, IEA approval is necessary before any order can be place. During mobilization, approval from IEA would be forthcoming for the repair of critically needed IPE. [Ref. 63]

The lathes are one component of line 7 at Riverbank. The other inactive IPE on the line could face similar reactivation problems, further delaying the reactivation. Current mobilization planning does not take into account these time delays for the mobilization plan is based upon condition assessments of PEP IPE that indicate the equipment is ready to use without delay. The Acme-Gridley lathes were not in serviceable condition and this could indicate that there will be reactivation problems if line 7 at Riverbank is reactivated.

J. COMPARISON

A cost comparison of the current (visual) and alternative (power testing) procedures of condition assessing IPE are shown in Table 5.10. This comparison of testing procedures is for the Riverbank AAP only. A similar type of analysis done for all the IPE the Army owns would be necessary to determine the Army wide cost of power testing inactive IPE.

TABLE 5.10

COST COMPARISON OF CONDITION ASSESSMENT PROCEDURES

Costs	Current Procedure	Alternative Procedure
One-time:		
Set up labor	$0.00	$22,400.00
Total	$0.00	$22,400.00
Annual recurring (assumming annual inspection and testing is done):		
TDY	$2,760.00	$2,760.00
Maintenance labor	0.00	8,400.00
labor to machine test casings	0.00	400.00
Total	$2,760.00	$11,560.00

The cost of repair of the lathes ($44.000.00) would be the same under both procedures (Table 5.7) if the PEP is activated. However, the possibility of additional costs for expedited repair of the lathes during mobilization would be avoided, as would a delay in the production of critical war material, by using the alternative procedure due to earlier detection of IPE repair needs. The TDY cost for the two man assessment team and for the IPE storage space is the same for both procedures. The cost to machine and measure test casings is one manday at $50.00 per hour for eight hours.

Under the assumption that the inactive lathes would never be needed the best alternative for assessing the condition of inactive IPE is the current procedure. However, the Riverbank AAP mobilization plan calls for the full PEP production of war material within three to nine months of full mobilization. Condition assessments of PEP IPE using the alternative (power testing) procedure will give decision makers more accurate information on the capability of the PEP to meet these mobilization time requirements then the current (visual) procedures.

K. CONCLUSION

The current condition assessment procedures used by the Army do not accurately test the operational ability of inactive IPE in Army PEPs. The practice of visually inspecting equipment may be the least cost method for doing condition assessments of IPE, but it is also the least accurate. Army PEP readiness based on the assessed condition of the PEP's inactive IPE leaves much uncertainty about the ability of the PEP to be reactivated in the planned time frames during surge/mobilization.

VI. CONCLUSIONS AND RECOMMENDATIONS

The primary research question of this thesis was whether inactive PEPs are a viable resource for industrial mobilization. Use of the terminology inactive PEP is incorrect. Thus, the real primary research question should be whether all PEPs are a viable option for meeting surge/mobilization production requirements.

After studying PEP management by the Services, we found that the primary research question was stated incorrectly due to the different way each service (i.e. Army and Navy) classify PEPs. For example, the Navy classifies the IPE in PEPs as active or inactive, and considers Navy owned PEPs to be active (i.e. hooked to power and operated at various times and production rates below the surge/mobilization rates). The Army, on the other hand, classifies only the IPE in PEPs as either active, inactive, or laid away. The Army does not refer to its PEPs as active or inactive. Neither the Army or Navy PEP/IPE terminology is incorrect. The Army's original intent, back in the 1950's (see Chapter 2), was to retain the capability to manufacture critical defense items under Service cognizance in the event of surge/mobilization. There is no law or instruction found which indicates that PEPs or IPE must be inactive or active. As long as there is a mobilization requirement for PEPs to satisfy and money to support them, PEPs will remain a part of our defense industrial capability. However, as funding becomes harder to obtain, the viability and cost effectiveness of PEPs will be more carefully scrutinized by Congress.

A. CONCLUSIONS

Based on our analysis and prior audits, the following conclusions are submitted.

Conclusion 1: PEPs that are connected to power and tested (either cycled or used at some level of production) on a regular basis, are viable options for surge/mobilization. These PEPs have already demonstrated that the four critical elements of a PEP (i.e., IPE, ST, STE, OPE) are in a working condition and that there is at least some of the required skilled labor available to train new personnel in the event of surge/mobilization. Two potential problems this type of PEP operation may face in the event of reactivation, however, are: the availability of an adequate supply of personnel; and finding sources of repair parts for PEP equipment maintenance.

Conclusion 2: PEPs that are not connected to power and tested (either cycled or at some level of production) on a regular basis, are not viable option for surge/mobilization. These PEPs will most likely not be able to meet mobilization time requirements. PEP mobilization plans are based on the presumption that all the elements in a PEP will be available and in working condition when surge/mobilization occurs. Unless the PEP has been run through complete power tests, this presumption may be incorrect and could lead to inactive PEP reactivation delays which mobilization planning does not foresee.

Conclusion 3: Visual condition assessments of inactive IPE in PEPs do not give a good indication of the equipments' true working condition.

The condition codes for the IPE examined in this thesis were overstated. The codes do not indicate the actual operability of the equipment, nor the degree to which inactive IPE can be readily used to meet surge and mobilization requirements. This is based on the following studies: 1) the Riverbank Army Ammunition Plant tests on IPE in 1990; 2) the reactivation of PEP-669 in 1987; 3) the Army audit report on the management of PEPs published in 1987; and 4) the DOD Inspector General audit on PEPs in 1984. The practice of visually inspecting equipment may be the least cost method of condition assessment, but it is also the least accurate. PEP readiness based on the visually assessed condition of its inactive IPE, leaves much doubt about the ability of the PEP to be reactivated in the planned time frames during surge/mobilization. Inoperable (broken, out of calibration) IPE could delay PEP reactivation.

Conclusion 4: Similar inactive lathes under similar conditions will have the same bearing flattening problem caused by a lack of lubrication and operation as the inactive Acme-Gridley lathes tested at Riverbank Army Ammunition Plant.

The Riverbank Army Ammunition Plant tests on IPE indicated that bearings in the Acme-Gridley lathes were deteriorating from the lack of lubrication. This was caused by extended periods of equipment inoperability. A statement by the Engineering manager at Riverbank Army Ammunition Plant indicated that similar inactive lathes under the same conditions would have the same problems. The reactivation of PEP-669 tended to support this hypothesis.

Conclusion 5: There is little information available on the condition of inactive special tools, special test equipment, and other plant equipment which are three of the four components of a PEP.

Responsibility for ST, and STE, and OPE, is delegated to the planned producer of the PEP. Although an inventory is kept on these items, condition assessments are not performed. Unless the PEP has been recently assembled, connected to power and tested, the condition of ST and STE is suspect. In the event of surge/mobilization, inoperable (i.e. broken, out of calibration) ST and STE could delay PEP reactivation if repairs are not made to this equipment.

Conclusion 6: There are no condition assessments performed on contractor-owned IPE or equipment in a PEP.

Contractor-owned equipment validation/identification (in PEPs) are the only inspection activity that government assessment teams may perform. The actual condition of contractor-owned equipment remains unknown unless one of the following occurs: 1) the government is willing to pay the contractor for privileged equipment information; 2) equipment information is provided free to the government or; 3) the PEP is or has recently been operational. The first and second options have not been viable for either the government or the contractor for different reasons. Consequently, unless PEPs are or have been recently operational (option 3), the readiness condition of contractor-owned equipment is questionable. The inability of the government to determine the actual condition of contractor-owned equipment is a potential source of contractor negligence. Furthermore, in the event of surge/mobilization, inoperable contractor equipment could delay reactivation of PEPs.

Conclusion 7: There is a shrinking source of critical labor skills for IPE which is more than 30 years old.

The majority of IPE owned by the Services' is over 30 years old. Today's machinists however, are trained on state of the art equipment. Unless new machinists are trained to operate old IPE, the skilled labor needed to operate old equipment may not be available due to death, retirement, or relocation. In the event of PEP reactivation during surge/mobilization, PEP contractors will be competing with the military and with each other for a shrinking reserve of manpower. PEP reactivation will be delayed if the skilled labor to operate 30 year old IPE cannot be found. Currently, there is no system in existence or planned which tracks critical skills and specific people in the civilian population. This manpower issue has not recently had a thorough examination and is a worthy thesis topic in itself.

Conclusion 8: Parts support for the majority of IPE over 30 years old is disappearing.

The lack of replacement parts for old IPE is due to the fact that machine tool companies are phasing out support for older models of IPE and some parts manufacturers are going out of business. If new sources of replacement parts for old IPE cannot be identified, PEP reactivation could be delayed.

Conclusions 3 through 8 highlighted significant potential problems with the operation of PEPs in the event of reactivation during surge/mobilization. Until these potential problems are solved, mobilization of inactive PEPs may be very difficult. Furthermore, we found no solid evidence to suggest that PEPs could be reactivated and in production within the mobilization time requirements.

B. RECOMMENDATIONS

Recommendation 1: Conditionally assess all inactive PEPs by connecting them to power and operating them.

Recommendation 2: Adjust mobilization plans to incorporate any new information found in the condition assessment of PEPs noted above (i.e. time delays in PEP reactivation).

Recommendation 3: Repair or replace the ST, STE, OPE, and IPE in PEPs as needed so that all PEPs will function.

Recommendation 4: Eliminate (disestablish) all inactive PEPs.

C. SUMMARY

This thesis is a study of plant equipment packages which are designed for use in times of national emergency. Our research found that PEPs not connected to power and operated (inactive) were not a viable resource for surge/mobilization while PEPs connected to power and operated were. During times when budgets are limited, maintaining PEPs that cannot function in their intended manner (i.e., produce critically needed war material when needed) is an unnecessary drain on DOD funding. Inactive PEPs that cannot be reactivated and in production within the mobilization time requirements should be disestablished.

APPENDIX A: PEPS

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0059	COCO	BMY INC	BAIR PA
0059	RECOVERY VEHICLE, FT, LT, M578		
0059	HOWITZER, MED, SP, 155MM, M109A2		
0059	HOWITZER, HEAVY, SP, 8", M110A2		
0065	COCO	DYN AMERICA IN	MUNCIE IN
0065	LINK CTG M13 7.62MM MB		
0065	LINK M27 F/CTG 5.56MM		
0069	COCO	OLIN CORP	EAST ALTON IL
0069	CTG CAL.50 BLANK M1 LKD X/M2/9		
0069	CTG 5.56MM 4 BALL M855 1 TR M856 LKD (SAW)		
0069	CTG 5.56MM BALL M193 10RD CLIP		
0069	CUP CTG CASE 5.56MM		
0069	CUP JACKET GM 5.56MM BALL		
0069	CUP CTG CASE 7.62MM		
0069	CUP BULLET JACKET BM 7.62MM		
0098	COCO	NI IND-VERNON	LOS ANGELES CA
0098	CASE CTG MK 9 3/50 ALL MODS		
0098	CASE CTG MK 9 5/54 ALL MODS		
0098	CASE CTG 76MM (STEEL)		
0098	CASE CTG MK10-1.		
0098	CASE CTG M115B1 105MM		
0098	CASE CTG M150B1 105MM		
0098	CASE CTG BASE & SEAL (PN 12524833)		
0098	CASE CTG M148A1B1 105MM		
0098	SHELL SMK WP M416 105MM		
0098	SHELL AP 155MM M731/M692 FASCAM		
0098	SHELL HEP M123 165MM		
0098	MOTOR BODY F/155MM PROJ M549 HE RAP		
0098	SHELL, HE, M509A1 8 INCH MPTS		
0098	WARHEAD AFT ASSY F/PROJ 8 INCH HE M650 RA		
0098	SHELL ILLUM M485 155MM		
0098	SHELL HE M483 155MM		
0098	SHELL AT 155MM M718/M741 FASCAM		
0098	MOTOR ROCKET BODY F/PROJ 8 INCH HE M650 RA		
0098	PROJ SHIP ASSEMBLY 5/54 HI-FRAG (FWD/AFT)		
0098	MOTOR ROCKET M54 66MM		
0098	SHELL HE M549 W/O MOTOR BODY 155MM		
0109	GOCO	INDIANA AAP ICI	CHARLESTOWN IN
0109	CHARGE BAG LOADING ASSY M36A1 F/4.2 IN		
0109	CHARGE BAG LOADING ASSY M36A1 F/4.2 IN		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0109	CHARGE INCREMENT ASSY M90A1	
0109	CHARGE INCREMENT ASSY M185 F/81MM	
0109	CHARGE PROP 105MM M67	
0109	CHARGE PROP 105MM M67	
0109	CHARGE PROP 105MM M67	
0109	CHARGE INCREMENT ASSY M205 F/81MM	
0109	CHARGE BAG LOADING ASSY M36A2 F/4.2 IN	
0109	CHARGE BAG LOADING ASSY M36A2 F/4.2 IN	
0109	CHARGE BAG LOADING ASSY M36A2 F/4.2 IN	
0109	CHARGE PROP 8 IN M1 GB F/HOW M2,M2A1 +	
0109	CHARGE PROP 8 IN M1 GB F/HOW M2,M2A1 +	
0109	CHARGE PROP 8 IN M2 WB F/HOW M2	
0109	CHARGE PROP 8 IN M2 WB F/HOW M2	
0109	REDUCER FLASH M3 F/8IN HOW. M2 M2A1 &	
0109	CHARGE PROP 155MM M3A1 GB F/HOW	
0109	CHARGE PROP 155MM M3A1 GB F/HOW	
0109	CHARGE PROP 155MM M3A1 GB F/HOW	
0109	CHARGE PROP 155MM M4A2 WB F/HOW	
0109	CHARGE PROP 155MM M4A2 WB F/HOW	
0109	CHARGE PROP 155MM M4A2 WB F/HOW	
0109	CHARGE PROP 8 IN WB M188A1	
0109	CHARGE PROP 155MM M119A2	
0109	CHARGE PROP 155MM M119A2	
0109	CHARGE PROP 155MM M119A2	
0109	CHARGE PROP 155MM M203A1	
0109	CHARGE PROP 155MM M203A1	
0109	PROPELLANT SB M1 SP	
0109	PROPELLANT SB M1 SP	
0109	COMPOSITION A-5	
0109	BLACK POWDER POTASSIUM NITRATE	
0109	PROPELLANT SB M6	
0109	PROPELLANT SB M6	
0109	PROPELLANT SB M6	
0109	PROPELLANT SB M6	
0109	PROPELLANT SB M1 MP	
0109	PROPELLANT SB M1 MP	
0109	PROPELLANT SB M1 MP	
0109	PROPELLANT SB M1 MP	
0109	PROPELLANT SB M1 MP	
0112	GOCO	IOWA AAP-M&H MIDDLETOWN IA
0112	CTG 105MM HERA XM913	
0112	PROJ 155MM HE M107 W/O/F WSC TNT LOADED	
0112	PROJ 155MM HE RAP M549 TNT LOADED	
0112	PROJ 155MM HE M718 RAAM (FASCAM) W/O FZ	
0112	PROJ 155MM HE M741 RAAM (FASCAM) W/O FZ	
0112	PROJ 8 IN HE RAP M650	
0112	GRENADE HAND OFFENSIVE MK 3a2 W/F M206A2	
0112	WARHEAD HAWK MISSILE LDD	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0112	WARHEAD CHAPARRAL M250	
0112	WARHEAD HELFIRE MISSILE SYSTEM	
0112	WARHEAD HE M225 LAP (DRAGON)	
0112	WARHEAD PATRIOT M248	
0112	WARHEAD STINGER M258 (W/HTA-3)	
0112	WARHEAD SECTION LAP W/O FZ F/155M PROJ M712	
0112	WARHEAD SEC HE M207E5 LAP F/TOW-2A	
0112	FUZE MINE M603 W/BOOSTER M120	
0112	FUZE MINE M605 (T1203)	
0112	MINE AP M74 F/GEMSS DWG 9292600 F/M128 SYSTEM	
0112	MINE AT M75 F/GEMSS DWG 9292600 F/M128 SYSTEM	
0112	MINE AT M75 F/GEMSS DWG 9292600 F/M128 SYSTEM	
0112	DISPENSER & BOMB AIRCRAFT CBU/78 (NAVY SUU-58/B)	
0112	MINE CANISTER XM87 W/MINES BLU-91&92B (VOLCANO)	
0112	DEMOLITION KIT CRATERING M180	
0112	DETONATOR M17	
0112	DETONATOR PERC M2A1 8 SEC DELAY	
0112	DETONATOR PERC M1A2	
0112	CHARGE DEMO BLOCK TNT 1/4 LB	
0112	CHARGE DEMO BLOCK TNT 1 LB	
0112	DETONATOR M24	
0112	DETONATOR M55	
0112	DETONATOR M55	
0112	PBX O-280	
0113	GOCO	JOLIET AAP-U/ROYAL JOLIET IL
0113	CTG 105MM HE M1 WSC W/O/F TNT LOADED	
0113	PROJ 8 IN HE M106 W/O/F WSC TNT LOADED	
0113	CHARGE SUPPLEMENTARY	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	TRINITROTOLUENE (TNT)	
0113	CYCLOTOL 70/30	
0113	TETRYL	
0113	DINITROTOLUENE (DNT)	
0113	DINITROTOLUENE (DNT)	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0113	DINITROTOLUENE (DNT)		
0113	DINITROTOLUENE (DNT)		
0113	DINITROTOLUENE (DNT)		
0114	GOCO	KANSAS AAP-D&Z	PARSONS KS
0114	CTG 105MM HE HI WSC W/O/F TNT LOADED		
0114	CTG 81MM HE M374A3 W/F M567		
0114	PROJ 155MM HE DP (ICM) M483A1		
0114	CHARGE EXPULSION F/155MM M483A1.		
0114	LEAD CUP ASSY DWG 8833562		
0114	DISPENSER & BOMB ACFT CBU-87/B GEM		
0114	DISPENSER & BOMB ACFT CBU-87/B GEM		
0114	GRENADE MPTS F/M42 & M46 GRENADES		
0114	GRENADE GP M77 (HE-TACTICAL) F/MLRS		
0114	LEAD CUP ASSY DWG 9215330		
0114	DETONATOR M41		
0114	DETONATOR M55		
0114	DETONATOR M18		
0114	DETONATOR M47		
0114	SPECIAL PURPOSE LEAD AZIDE		
0114	PRIMER PERC M55		
0114	PRIMER PERC M1B1A2		
0114	LEAD CUP ASSY DWG 8876218		
0116	GOCO	LAKE CITY AAP-OLIN	INDEPENDENCE MO
0116	CUP BULLET JACKET GMCS BALL 7.62MM		
0116	DETONATOR M57 (T92E1)		
0116	CTG CAL. 50 4 BALL M33 1 TR M17 W/M9 LINK		
0116	CTG CAL. 50 LKD 4 API M8 1 API-T M20 W/M9 BELT		
0116	CTG 7.62MM SPECIAL BALL M118 CARTON		
0116	CTG 20MM HEI M56A3 TP-T M220 LKD 4-1 F/COBRA		
0116	CTG 20MM HEI M56A3 TP-T M220 ELEC 7-1 W/M14 LK		
0116	CTG 20MM TP LKD 4 TP M55A2 1 TPT M220 W/M14A2		
0116	CTG 7.62MM BALL M39 F/AK 47		
0116	CTG 20MM TP M55 MLB MK 7 MOD 0		
0116	CTG 5.56MM BLANK M200 CARTON		
0116	CTG CAL. 50 LKD 4 API M8 1 API-T M20 W/BELT M15A2		
0116	CTG 7.62MM BLANK M82 W/M13 LINK PRACTICE		
0116	CTG CAL. 50 LKD 4 BALL M33 1 TR M17 W/M15A2 LK		
0116	CTG 7.62MM 4BALL,M80-1TR,M62 F/OHF		
0116	CTG 7.62MM LKD 4BALL M80-1 TR M62 W/M13 LINK		
0116	CTG 7.62MM BALL M80 W/M13 LINK		
0116	CTG 7.62MM TRACER M62 W/M13 LINK		
0116	CTG 7.62MM BALL M80 5RD CLIP		
0116	CTG 5.56MM TRACER M196 IN CTN F/M16 RIFLE		
0116	CTG 5.56MM TRACER M196 10RD CLIP		
0116	CTG 7.62MM LKD 4BALL M80-1 TR M62 (F/MG GAU2B/A		
0116	CTG 7.62MM TRACER M62 CARTON		
0116	CTG CAL. 50 4-API MS 1-TR M17 W/M15 LINK		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0116	CTG 5.56MM 4 BALL M193 1 TR M196 F/STONER MG	
0116	CTG 20MM HEI M56A3 ELEC W/M14 LINK	
0116	CTG 7.62MM BALL M80 8RD CLIP	
0116	CTG 20MM HEI M56A3 W/M22 LINK	
0116	CASE CTG M103 20MM	
0116	FUZE PD M505A3 DWG 7258863	
0116	FUZE PD M505A3	
0116	CTG 25MM HEI-T M792 W/F M758 PDSD W/M28 LINK	
0116	CTG 30MM 5-API PGU-14A/B 1-HEI PGU-13A/B GAU-8	
0116	CTG 20MM HEI M56A3 W/FUZE M505A3 LINKLESS	
0116	CTG 20MM TP M55A2 BULK	
0116	CTG 20MM TPT M220 BULK	
0116	CTG 5.56MM TRACER (SAW) M856	
0116	CTG 5.56MM BALL (SAW) M855	
0116	CTG 5.56MM 4 BALL M855 1 TR M856 LKD (SAW)	
0116	CTG 20MM DUMMY M51A1E1 W/MK 7 LNK	
0116	CTG 5.56MM BALL M193 10RD CLIP	
0116	CTG 5.56MM GRENADE M195 CARTON	
0116	PRIMER PERC M36A1	
0116	PRIMER ELEC M52A3B1	
0116	PRIMER PERC M115	
0116	CUP CTG CASE 5.56MM	
0116	CUP BULLET JACKET GM 7.62MM	
0117	GOCO	LONE STAR AAP-D&Z TEXARKANA TX
0117	RELAY M4	
0117	CHARGE BURSTER M19	
0117	CHARGE BURSTER F/XM722 60MM	
0117	CTG 4.2 IN HE M329A2 W/O/F COMP-B LOADED	
0117	TRACER M13	
0117	CHARGE BURSTER M53	
0117	INITIATOR BURSTER M13 (T7)	
0117	CHARGE BURSTER M35	
0117	TRACER M5A1B1	
0117	CHARGE BURSTER M47	
0117	TRACER M12	
0117	PROJ 155MM HE DP (ICM) M483A1	
0117	CHG SPOTTING PROJ (155MM/8IN)	
0117	CHARGE BURSTER M54A1	
0117	PROJ 155MM HE M107 W/O/F WSC TNT LOADED	
0117	CHARGE SUPPLEMENTARY	
0117	DELAY DETONATOR F/155MM M692/M731	
0117	LEAD CUP ASSY DWG 9298456	
0117	DELAY ASSY F/M549 PART NO 9235983	
0117	PROJ 8 IN HE M509A1 W/O/FZ	
0117	PROJ 16/50 HE-ICM MK146-1	
0117	DELAY ELEMENT FUZE BOMB M9 NON-DELAY	
0117	LEAD CUP ASSY DWG 8833562	
0117	DETONATOR MK 25 MOD 1	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0117	GRENADE HAND FRAG M67 W/F M213	
0117	GRENADE HAND FRAG M67 W/F M213	
0117	GRENADE GP M77 (HE-TACTICAL) F/MLRS	
0117	LEAD CUP ASSY DWG 9215330	
0117	MOTOR ROCKET M54 F/66MM	
0117	FUZE ROCKET M427	
0117	CHARGE BURSTER F/2.75 IN RKT	
0117	PRIMER IGN MINE FZ F/M10A2	
0117	LEAD ASSY DWG 9287609	
0117	DISPENSER & BOMB AIRCRAFT CBU/78 (NAVY SUU-58/B)	
0117	MINE CANISTER XM87 W/MINES BLU-91&92B (VOLCANO)	
0117	DETONATOR MK 50 MOD 0	
0117	DETONATOR M62	
0117	DETONATOR M49	
0117	DETONATOR ASSY DWG 8796342	
0117	DETONATOR STAB M98	
0117	DELAY ELEMENT M 53	
0117	PRIMER PERC M54	
0117	DETONATOR M61E2	
0117	DETONATOR M86	
0117	DETONATOR M35	
0117	PRIMER PERC MK 125 MOD 1	
0117	DETONATOR MK 23-1	
0117	DETONATOR M36A1	
0117	DETONATOR MK 44 MOD 1	
0117	DETONATOR ELEC KM- F/SLUFAE	
0117	COMPOSITION C-4	
0117	DETONATOR M45	
0117	DETONATOR M55	
0117	DETONATOR MK 29 MOD 0	
0117	COMPOSITION A-5	
0117	DETONATOR ELEC M48 (T18E4)	
0117	DETONATOR M58	
0117	DETONATOR STAB M76	
0117	DETONATOR M44E1	
0117	DETONATOR M99	
0117	DETONATOR M31A1	
0117	DETONATOR STAB M94	
0117	DETONATOR STAB M50 (T36)	
0117	DETONATOR M46	
0117	DETONATOR STAB M59	
0117	PRIMER PERC MK 102 MOD 1	
0117	RELAY XM9	
0117	DETONATOR MK 71	
0117	PRIMER PERC MK 157 MOD 0	
0117	PRIMER MK 22	
0117	DELAY PLUNGER M1	
0117	FUZE PD M567	
0117	PRIMER ELEC M86	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0117	RELAY M7	
0117	FUZE BD M534A1	
0117	FUZE PI-BD M509A2	
0117	PRIMER ELEC M80A1	
0117	PRIMER PERC XM90E1	
0117	BOOSTER AUXILIARY M122	
0117	FUZE PD M521 (T247)	
0117	PRIMER PERC/ELEC MK 15-2 LOADING	
0117	PRIMER PERC M82	
0117	PRIMER PERC M28B2	
0117	PRIMER PERC M82	
0117	FUZE PD M557	
0117	PRIMER ELEC M83E3	
0117	PRIMER PERC MK 2A4	
0117	PRIMER STAB M96	
0117	FUZE PROX M732	
0117	PRIMER PERC M61	
0117	RELAY M11	
0117	PRIMER STAB M26	
0117	PRIMER M104	
0117	PRIMER ELEC M120	
0117	DELAY M2	
0117	PRIMER PERC MK 104 MOD 0	
0117	DELAY DET F/FUZE M536	
0119	GOCO	LOUISIANA AAP-THIOK SHREVEPORT LA
0119	CTG 4.2 IN HE M329A2 W/O/F COMP-B LOADED	
0119	PROJ 155MM HE M731 ADAM (FASCAM) W/O FZ	
0119	PROJ 155MM HE M107 W/O/F WSC TNT LOADED	
0119	PROJ 155MM HE M107 W/O/F WSC TNT LOADED	
0119	CHARGE SUPPLEMENTARY	
0119	SHELL HE M107 155MM	
0119	SHELL ILLUM M485 155MM	
0119	SHELL HE M483 155MM	
0119	SHELL HE M483 155MM	
0119	SHELL SMK 155MM M825 BE	
0119	GRENADE MPTS F/M42 & M46 GRENADES	
0119	GRENADE M73 LDD F/M261 HYDRA 70 ROCKET MPSM	
0119	PROJ 155MM HE M692 ADAM (FASCAM) W/O FZ	
0119	FUZE ROCKET M433	
0119	FUZE ROCKET M423	
0119	ROCKET 2.75 IN HE M151 W/FZ M433 (HYDRA 70)	
0119	RKT 2.75IN HYDRA 70 HE M151 W/F M423 MK66 MTR	
0119	MINE NON-BOUNDING AP M18A1 CLAYMORE W/ACCESORIES	
0119	MINE AT HEAVY HE M21 METALLIC	
0119	MINE AT M24 E1 W/F M404A2	
0119	CHARGE DEMO BLOCK M112 1.25LB COMP C-4	
0119	CHARGE ASSY DEMO M183	
0119	CHARGE LINEAR HE (C4) M59	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0119	CHARGE DEMO FLEX LINEAR M58A3	
0119	COMPOSITION C-4	
0120	GOCO	MILAN AAP-MART MARI MILAN TN
0120	CTG 60MM HE M49A4 W/F M525	
0120	CTG 40MM AP M576 (BULK) F/GREN LAUNCHER M79	
0120	CTG 40MM PRAC M407A1 W/F M551	
0120	CTG 40MM HE DP M433 W/F PIBD M550	
0120	CTG 60MM HE M720 W/F M734 (LWCMS)	
0120	IGNITION CTG 60MM M702E3	
0120	CHARGE INCREMENT ASSY M204 F/60MM	
0120	CHARGE INCREMENT ASSY M204 F/60MM	
0120	CTG 60MM HE M888 W/F M935	
0120	CTG 40MM PRAC M385 W/LK M16A1 F/LAUNCHER M75	
0120	CTG 40MM TP M918 F/MK 19 MG	
0120	CTG 4.2 IN HE M329A2 W/O/F COMP-B LOADED	
0120	CTG 105MM M456A2 HEAT-T W/F M509A2	
0120	CTG 105MM M735 APFSDS-T W/O/F	
0120	CTG 105MM TPDS-T M724A1 F/GUN M68 W/O/F	
0120	CHARGE INCREMENT ASSY M205 F/81MM	
0120	CHARGE INCREMENT ASSY M205 F/81MM	
0120	IGNITION CTG 81MM M299	
0120	CTG 105MM M774 (DU) APFSDS-T W/O/F	
0120	CTG 105MM TP-T M490A1 F/GUN M68 (TNG ONLY)	
0120	CTG 105MM M833 (DU) APFSDS-T	
0120	CTG 81MM HE M821 (UK-I-81) W/F MO M734	
0120	CTG 81MM HE M889 W/F PD M935 (UKI81)	
0120	CHARGE PROP M219 F/81MM	
0120	CHARGE PROP M219 F/81MM	
0120	CHARGE PROP M218 F/81MM	
0120	CHARGE PROP M218 F/81MM	
0120	IGNITER M752 F/81MM	
0120	PROJ 155MM HE DP (ICM) M483A1	
0120	PROJ 155MM HE DP (ICM) M483A1	
0120	CASE CTG 40MM M118 DWG 8844609	
0120	PROJ 155MM HE XM864 DPICM	
0120	LEAD CUP ASSY DWG 9215330	
0120	CHARGE LINEAR HE (C4) M59	
0122	GOCO	RAVENNA AAP-RAVENNA RAVENNA OH
0122	PROJ 155MM M107 W/O/F WSC TNT LOADED	
0122	PROJ 8 IN HE M106 W/O/F WSC TNT LOADED	
0122	PROJ 155MM HE RAP M549 TNT LOADED	
0122	DETONATOR MK 50 MOD 0	
0122	DETONATOR MK 23-1	
0122	DETONATOR M55	
0122	DETONATOR MK 71	
0122	FUZE PD M739A1	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0125	GOCO	TCAAP-FED CTG NEW BRIGHTON MN
0125	CTG 7.62MM LKD 4BALL M80-1 TR M62 W/M13 LINK	
0125	CTG 7.62MM LKD 4BALL M80-1 TR M62 F/MG GAU2B/A	
0125	CTG 5.56MM BALL M193 10RD CLIP	
0149	GOGO	PINE BLUFF ARSENAL PINE BLUFF AR
0149	CTG 81MM SMK WP M375A2 W/F M567	
0149	CTG 81MM SMK WP M375A3 W/F M567	
0149	CTG 81MM SMK WP M375A3 W/F M567	
0149	CTG 4.2 IN SMK WP M328A1 W/F M521	
0149	CTG 105MM SMK HC-BE M84 SERIES W/F M577A1	
0149	CTG 105MM TP-T M490A1 F/GUN M68 (TNG ONLY)	
0149	CTG 81MM SMK SCREENING RP M819 W/FZ M84A1E1	
0149	PROJ 155MM SMOKE WP M110A2 W/O/F	
0149	CANISTER SMK WP MK 14 F/5 IN 54 CAL PR	
0149	CANISTER SMK WP MS F/5 IN 38 CAL PROJ	
0149	PROJ 155MM SMK YELLOW BE M116 W/O/F	
0149	PROJ 155MM SMK GREEN BE M116 W/O/F	
0149	PROJ 155MM SMK RED BE M116 W/O/F	
0149	PROJ 155MM SMK HC BE M116A1 W/O/F	
0149	PROJ 155MM SMK WP M825 W/O FZ	
0149	GRENADE HAND SMK NC ABC AN-M8 W/F M201A1.	
0149	GRENADE HAND INC TH3 AN-M14 W/F M201A1.	
0149	GRENADE HAND VIOLET SMK M18 W/F M201A1.	
0149	GRENADE HAND YELLOW SMK M18 W/FZ M201A1.	
0149	GRENADE HAND RC CS M47E3 W/F M227.	
0149	GRENADE HAND RED SMK RIOT SIN M48E3 W/F M227	
0149	GRENADE HAND RIOT CS1 ABC-M25A2 (COMPLETE)	
0149	GRENADE HAND/RIFLE SMK WP M34 W/F M206A2.	
0149	GRENADE HAND RIOT CS ABC-M7A3 W/FZ M201A1	
0149	GRENADE SMK SCRN RP UKL8A3 F/M250 LAUNCHER	
0149	ROCKET 66MM INCEND TPA 4RD CLIP M74	
0149	WARHEAD RKT 2.75IN SMK WP M156 W/FZ PD M427	
0149	ROCKET 2.75 IN SMK WP M259	
0149	SMK POT FLOATING SGF2 M7A1 W/F M208	
0149	SMK POT GRND MK 6 MOD 1	
0149	SMK POT GRND HC MS 10-20 MIN BURN	
0149	CTG 81MM SMK WP M375A2 W/F M567	
0149	CTG 81MM SMK WP M375A3 W/F M567	
0149	CTG 81MM SMK WP M375A3 W/F M567	
0149	CTG 4.2 IN SMK WP M328A1 W/F M521	
0149	CTG 105MM SMK HC-BE M84 SERIES W/F M577A1	
0149	CTG 105MM TP-T M490A1 F/GUN M68 (TNG ONLY)	
0149	CTG 81MM SMK SCREENING RP M819 W/FZ M84A1E1	
0149	PROJ 155MM SMOKE WP M110A2 W/O/F	
0149	CANISTER SMK WP MK 14 F/5 IN 54 CAL PR	
0149	CANISTER SMK WP MS F/5 IN 38 CAL PROJ	
0149	PROJ 155MM SMK YELLOW BE M116 W/O/F	
0149	PROJ 15SMM SMK RED BE M116 W/O/F	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0149	PROJ 155MM SMK HC BE M116A1 W/O/F		
0149	PROJ 155MM SMK WP M825 W/O FZ		
0149	GRENADE HAND SMK HC ABC AN-M8 W/F M201A1.		
0149	GRENADE HAND INC TH3 AN-M14 W/F M201A1.		
0149	GRENADE HAND VIOLET SMK M18 W/F M201A1.		
0149	GRENADE HAND YELLOW SMK M18 W/FZ M201A1.		
0149	GRENADE HAND RC CS M47E3 W/F M227.		
0149	GRENADE HAND RED SMK RIOT SIN M48E3 W/F M227		
0149	GRENADE HAND RIOT CS1 ABC-M25A2 (COMPLETE)		
0149	GRENADE HAND/RIFLE SMK WP M34 W/F M206A2.		
0149	GRENADE HAND RIOT CS ABC-M7A3 W/FZ M201A1		
0149	GRENADE SMK SCRN RP UKL8A3 F/M250 LAUNCHER		
0149	ROCKET 66MM INCEND TPA 4RD CLIP M74		
0149	WARHEAD RKT 2.75IN SMK WP M156 W/FZ PD M427		
0149	ROCKET 2.75 IN SMK WP M259		
0149	SMK POT FLOATING SGF2 M7A1 W/F M208		
0149	SMK POT GRND MK 6 MOD 1		
0149	SMK POT GRND HC MS 10-20 MIN BURN		
0149	SMK POT FLOATING HC M4A2		
0149	MASK,CBR,PROTECTIVE TANK, M25A1		
0158	COCO	COVERT MFG CO	GALION OH
0158	SHELL HE M329A2 4.2 IN (FORGED)		
0209	GOCO	SCRANTON AAP-CHAMB	SCRANTON PA
0209	SHELL SMOKE M110 155MM		
0209	SHELL HE M107 155MM		
0209	SHELL, HE, M509A1 8 INCH MPTS		
0211	COCO	ANDERSON MTLS INDS	CONCORD ONT CN
0211	SHELL HE M107 155MM		
0219	COCO	ASTRA PREC PROD	ELK GROVE VLG IL
0219	CTG 20MM APDS MK149 (CIWS) PHALANX		
0219	SHELL ILLUM M314A3 105MM		
0219	FUZE M223 PROCURED LOADED		
0219	FUZE PD MK 352 MOD 2		
0224	GOCO	RIVERBANK AAP-NORRI	RIVERBANK CA
0224	SHELL HE F/M720 60MM		
0224	SHELL HE M49A3 60MM		
0224	SHELL SMK M302A1 60MM		
0224	SHELL SMK BODY ASY MPTS		
0224	CASE CTG 105MM M14B4 (M14 SERIES)		
0224	SHELL HE M374A1 F/81MM MORTAR		
0224	SHELL SMK M375A1 81MM		
0224	SHELL HE M329A2 4.2 IN (FORGED)		
0224	SHELL HE F/M821 81MM (UK-I)		
0224	GRENADE MPTS F/M42 & M46 GRENADES		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0224	GRENADE MPTS F/M77 GRENADE (MLRS)		
0227	COCO	TEMTEX PRODUCTS INC	NASHVILLE TN
0227	BOMBLET BLU 73A/B		
0227	FIN ASSEMBLY BOMB BSU-86 F/MK82 SERIES		
0230	COCO	REEDER & KLINE MACH	CARMEL IN
0230	SHELL HE M483 155MM		
0234	COCO	NATIONAL FORGE	IRVINE PA
0234	TUBE, 105MM, M68A1		
0234	BREECH MECHANISM ASSEMBLY, 105MM, M68		
0234	CANNON, 105MM, M68		
0242	COCO	REMCO HYD ABEX CORP	WILLITS CA
0242	TUBE, 155MM, M185		
0242	CANNON, 155MM, M185 (WO/GFM)		
0242	CANNON, 155MM, M185 (W/GFM)		
0253	GOCO	BADGER AAP-OLIN COR	BARABOO WI
0253	PROPELLING ASSY M36A2 LESS CHARGE BAG F/4.2 IN		
0253	ROCKET GRAIN MK 82 F/RAP 5/38		
0253	CHARGE PROP 155MM M119A2		
0253	PROP GRAIN FWD EXTRUDED F/155MM HE RAP M549		
0253	PROP GRAIN AFT EXTRUDED F/155MM HE RAP M549		
0253	CHARGE PROP 155MM M203A1		
0253	PROPELLANT N-34 F/RAP 5/38 5/54 GUN AMMO		
0253	PROP MORTAR INCREMENT M8		
0253	PROPELLANT WC 895/HPC/CR F/GAU-8		
0253	PROPELLANT SPHEROIDAL PROP IGNITER (SPI)		
0253	PROPELLANT SPHEROIDAL PROP IGNITER (SPI)		
0253	PROPELLANT DB WC 846		
0253	PROPELLANT DB WC 846		
0253	PROPELLANT SB M6		
0253	PROPELLANT SB M6		
0253	PROPELLANT SB M6		
0253	PROPELLANT SB M6		
0253	PROPELLANT SB M6		
0253	PROPELLANT WC 860		
0253	PROPELLANT WC 860		
0253	PROPELLANT DB WC 844		
0253	PROPELLANT DB WC 844		
0253	PROPELLANT SB NACO NAVY		
0253	PBX 0-280		
0253	PROPELLANT DB WC 872		
0253	PROPELLANT DB WC 872		
0253	PROPELLANT SOLVENTLESS M37		
0253	PROPELLANT SLOTTED STICK M31A1E1.080 WEB		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0254	GOCO	HOLSTON AAP-GOLSTON KINGSPORT TN
0254	COMPOSITION C-4	
0254	OCTOL 70/30	
0254	OCTOL 75/25	
0254	COMPOSITION B (FLAKED)	
0254	COMPOSITION A-5	
0254	CYCLOTOL 70/30	
0254	COMPOSITION CH-6	
0254	HMX BULK (NOT USED IN COMPOSITIONS)	
0254	COMPOSITION A-4	
0254	PBX 0-280	
0254	RDX BULK (NOT USED IN COMPOSITIONS)	
0254	PBX TYPE I	
0254	PBX N-5	
0254	COMPOSITION A-3	
0254	LX-14	
0257	GOCO	LONGHORN AAP-THIOK MARSHALL TX
0257	CTG 60MM ILLUM M83A3 W/F M65A1	
0257	CTG 40MM GREEN STAR PARA . 61 (BULK)	
0257	CTG 40MM RED STAR PARA M662	
0257	CTG 60MM ILLUM M721 (LWCMS) W/F M766 (OFF-SHORE)	
0257	CTG 81MM M301A3 ILLUM W/F M84A1	
0257	CHARGE EXPELLING F/105MM M84 BE	
0257	CTG 105MM ILLUM M314A3 W/F M577A1	
0257	CHARGE EXPELLING F/105MM M314 ILL	
0257	CTG 4.2 IN ILLUM M335A2 W/F M577A1	
0257	CTG 4.2 IN ILLUM M335A2 W/F M577A1	
0257	CTG 81MM ILLUM M853	
0257	PROJ 155MM ILLUM M485A2 W/O/F F/HOW	
0257	CHARGE EXPELLING SECONDARY F/M485 ILL	
0257	CHARGE EXPELLING PRIMARY F/M485 ILL	
0257	CHARGE EXPELLING F/155MM M116 BE	
0257	CHARGE EXPELLING F/155MM M825 WP SMK	
0257	BURSTER INCENDIARY FIELD M4	
0257	SIGNAL SMK GRD M128A1 GREEN PARACHUTE	
0257	SIGNAL SMK GRD M129A1 RED PARACHUTE	
0257	FLARE AN/ALA 17/A	
0257	SIGNAL ILLUM GRD M125A1 GREEN STAR	
0257	SIGNAL ILLUM GRD M126A1 RED STAR	
0257	FLARE SURFACE TRIP PARA M49A1	
0257	SIGNAL ILLUM GRD M127A1 WHITE STAR	
0257	SIGNAL ILLUM GRD M159 WS CLUSTER	
0257	SIGNAL ILLUM GRD M158 CLUSTER RED STAR	
0257	SIGNAL SMOKE AND ILLUMINATION MK 124 MOD 0	
0257	FLARE IR COUNTER MEASURE MJU-7/B	
0257	FLARE AIRCRAFT IR COUNTERMEASURE M206	
0257	FLARE INFRA CNTR MSR RR-119-B/AL	
0257	FLARE IR ACFT MJU-8A/B (NAVY)	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0257	PBX N-5		
0257	FUZE TIME (VT) M84A1		
0257	FUZE TIME M65A1		
0260	GOCO	RADFORD AAP-HERCUL	RADFORD VA
0260	CHARGE INCREMENT 60MM M182		
0260	CHARGE INCREMENT 60MM M181		
0260	PROPELLING ASSY M36A1 LESS CHARGE BAG F/4.2 IN		
0260	PROPELLING ASSY M36A2 LESS CHARGE BAG F/4.2 IN		
0260	PROPELLANT GRAIN F/8 IN HE RA M650		
0260	PROP GRAIN FWD EXTRUDED F/155MM HE RAP M549		
0260	PROP GRAIN AFT EXTRUDED F/155MM HE RAP M549		
0260	MOTOR LAUNCHER M114 (P/N 9225166)		
0260	PROPELLANT SOLVENT ROCKET M7 (MODIFIED)		
0260	CHARGE PROP ASSY F/66MM ROCKET		
0260	CHARGE PROP ASSY M7 F/35MM RKT PRAC M73		
0260	PROPELLANT SOLVENT ROCKET M7		
0260	MOTOR RKT ASSY F/M180 DEMO CRATE RING CHG		
0260	ROCKET GRAIN MK 90		
0260	CASTING PDR F/DB CAST AHH		
0260	PROP MORTAR INCREMENT M8		
0260	PROPELLANT SB AS1052 NAVY 20MM		
0260	PROPELLANT SB M1 SP		
0260	TRINITROTOLUENE (TNT)		
0260	TRINITROTOLUENE (TNT)		
0260	BENITE		
0260	PROPELLANT SB IMR 5010		
0260	PROPELLANT SB IMR 4895		
0260	POWDER CLEAN BURNING IGNITION (CBI)		
0260	PROPELLANT SB M6		
0260	PROPELLANT SB M6		
0260	PROPELLANT SB M1 MP		
0260	PROPELLANT SB M1 MP		
0260	PROPELLANT DB NOS1H AA2		
0260	SHEET PROPELLANT (MIS-18654)		
0260	STICK PROPELLANT (MIS-18629)		
0260	PROPELLANT SB M6+2		
0260	PROPELLANT SB NACO NAVY		
0260	PROPELLANT PYRO M6 SB		
0260	PROPELLANT SB M10		
0260	PROPELLANT TRIPLE BASE M31A1		
0260	GRAIN IGNITER F/FLIGHT MTR M114 F/TOW-2		
0260	PROPELLANT TB M30		
0260	PROPELLANT SOLVENTLESS M37		
0260	PROPELLANT SOLVENTLESS JA-2 F/120MM		
0260	PROPELLANT SOLVENTLESS STK DIGL-RP 14" F/120MM		
0260	PROPELLANT SOLVENTLESS STICK DIGL-RP 4" F/120MM		
0260	PROPELLANT SOLVENTLESS DIGL-RP FLK F/120MM		
0260	PROPELLANT SB LKL F/120MM TANK		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0260	PROPELLANT SOLVENTLESS SUPPORT PROFILER	
0260	PROPELLANT SB M14	
0260	PROPELLANT SLOTTED STICK M31A1E1.080 WEB	
0260	DINITROTOLUENE (DNT)	
0261	GOCO	SUNFLOWER AAP-HERC DESOTO KS
0261	CHARGE PROP 8 IN WB M188A1	
0261	PROP GRAIN FWD EXTRUDED F/155MM HE RAP M549	
0261	PROP GRAIN AFT EXTRUDED F/155MM HE RAP M549	
0261	CHARGE PROP 155MM M203A1	
0261	ROCKET GRAIN MK 49 & MODS	
0261	MOTOR RKT ASSY F/M180 DEMO CRATE RING CHG	
0261	ROCKET GRAIN MK 43	
0261	ROCKET PROP GRAIN MK88-0 F/MK71 ZUNI	
0261	COMPOSITION C-4	
0261	NITROGUANIDINE	
0261	NITROGUANIDINE	
0261	PROPELLANT SOLVENTLESS ROCKET N5	
0261	PBX 0-280	
0261	PROPELLANT TRIPLE BASE M31A1	
0261	PROPELLANT NOSIH-AA-6	
0261	PROPELLANT SOLVENTLESS M37	
0261	PROPELLANT SOLVENTLESS JA-2 F/120MM	
0261	PROPELLANT SOLVENTLESS STK DIGL-RP 14" 120MM	
0261	PROPELLANT SOLVENTLESS STICK DIGL-RP 4" F/120MM	
0261	PROPELLANT SOLVENTLESS DIGL-RP FLK F/120MM	
0261	PROPELLANT SOLVENTLESS SUPPORT PROFILER	
0261	PROPELLANT SLOTTED STICK M31A1E1.080 WEB	
0261	PROPELLANT SLOTTED STICK M31A1E1.080 WEB	
0262	GOCO	VOLUNTEER AAP ICI CHATTANOOGA TN
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0262	TRINITROTOLUENE (TNT)	
0263	GOCO	NEWPORT AAP-UNIROYL NEWPORT IN
0263	COMPOSITION C-4	
0263	COMPOSITION B (FLAKED)	
0263	TRINITROTOLUENE (TNT)	
0263	TRINITROTOLUENE (TNT)	
0263	TRINITROTOLUENE (TNT)	
0263	TRINITROTOLUENE (TNT)	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0263	TRINITROTOLUENE (TNT)		
0399	COCO	HAMILTON TECHNOLOGY	LANCASTER PA
0399	FUZE MT MK 339 MOD 1		
0399	FUZE BOMB MK 1 MOD 0		
0399	FUZE PD M739		
0399	FUZE MTSQ M577		
0399	FUZE MT M571E3 PROCURED LOADED		
0399	FUZE MTSQ M577A1/M582A1 MPTS (PROCURED LOADED)		
0420	COCO	MERRITT TOOL CO	KILGORE TX
0420	SHELL HE M107 155MM		
0420	MOTOR BODY F/155MM PROJ M549 HE RAP		
0422	COCO	CHAMBERLAIN MFG COR	NEW BEDFORD MA
0422	SHELL HEAT&T M456A1 105MM		
0422	SHELL SMOKE M110 155MM		
0422	PROJ BODY MK 61 F/5/54		
0422	PROJ BODY MK 64 F/5/54		
0422	SHELL AP 155MM M731/M692 FASCAM		
0422	SHELL HE M107 155MM		
0422	SHELL ILLUM M485 155MM		
0422	SHELL HE M483 155MM		
0422	SHELL AT 155MM M718/M741 FASCAM		
0428	COCO	PITTSBURGH FORGINGS	CORAOPOLIS PA
0428	SHELL HE M1 105MM		
0428	MOTOR BODY F/155MM PROJ M549 HE RAP		
0437	COCO	POHLMAN (VALENTEC)	MARYLAND HTS MO
0437	FUZE PD M505A3		
0437	SHELL 20MM HEI M56A3/4/5		
0437	SHELL HE DP M430 40MM		
0443	COCO	IRI INTERNATIONAL	PAMPA TX
0443	FORGING, TUBE, 105MM, M2A2		
0443	FORGING, TUBE, 105MM, M137A1		
0443	FORGING, TUBE, 155MM, M185		
0443	FORGING, TUBE, 8", M201		
0444	COCO	IRI INTERNATIONAL	PAMPA TX
0444	TUBE, 105MM, M2A2		
0444	CANNON, 105MM, M2A2		
0444	CANNON, 105MM, M137A1		
0444	TUBE, 105MM, M137A1		
0455	COCO	CHAMBERLAIN MFG COR	WATERLOO IA
0455	PROJECTILE MPTS ASSY F/M830		
0455	SHELL HE M329A2 4.2 IN (FORGED)		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0455	SHELL SMK WP M60 105MM		
0455	SHELL ILLUM M314A3 105MM		
0455	SHELL BE M84E1 105MM		
0455	SHELL ILLUM M335A2 4.2 IN		
0455	PROJ M833		
0455	WARHEAD XM912 F/XM913 105MM		
0459	COCO	NATL DEFENSE CORP	EAU CLAIRE WI
0459	SHELL HE M1 105MM		
0459	SHELL APERS XM603E1 105MM		
0459	SHELL HE M106 8 IN		
0463	COCO	ALINABAL	MILFORD CT
0463	GRENADE MPTS F/M42/M46		
0463	CUP CTG CASE 5.56MM		
0465	COCO	WELLS (VALENTEC)	COSTA MESA CA
0465	LINK CTG MK 7 20MM		
0465	LINK CTG M9 CAL. 50 MB		
0465	LINK BELT & END MK2 ALL MODS 20MM		
0465	LINK CTG M13 7.62MM MB		
0465	LINK METAL BELT M14A2 F/20MM		
0465	FUZE PD M505A3		
0465	SHOT 20MM TP M55A2		
0465	SHELL 20MM HEIT-SD M246		
0465	SHELL 20MM HEI M56A3/4/5		
0465	SHELL 20MM TPT M221		
0465	LINK CTG M22 F/20MM		
0465	LINK M27 F/CTG 5.56MM		
0465	LINK CTG M15A2 CAL. 50 MB		
0472	GOGO	WATERVLIET ARSENAL	WATERVLIET NY
0472	BASE PLATE, MORTAR, MS F/60MM M19		
0472	MORTAR, INFANTRY, 60MM, W/E, M19		
0472	CANNON, 60MM, M2/M19		
0472	MORTAR, 60MM,W/E, M224 (LWCMS)		
0472	BASE PLATE, MORTAR, M8 F/60MM M224		
0472	BASE PLATE, MORTAR, M7 F/60MM M224		
0472	CANNON160MM1 M225 F/M224 MORTAR		
0472	CANNON, 120MM, M256		
0472	BASE PLATE, MORTAR, M3		
0472	CANNON, 81MM, M29A1		
0472	TUBE, 105MM, M2A2		
0472	CANNON, 105MM1 M2A2		
0472	MORTAR, 4.2", W/E1 M30		
0472	CANNON, 4.2", M30		
0472	CANNON, 105MM, M137A1		
0472	TUBE, 105MM, M137A1		
0472	MORTAR, INFANTRY, 81MM 1W/E M29A1 (W/M23A1 MT)		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0472	TUBE, 105MM, M68A1		
0472	BREECH MECHANISM ASSEMBLY, 105MM, M68		
0472	CANNON, 105MM, M68		
0472	MORTAR, 81MM, M252		
0472	BREECH MECHANISM ASSEMBLY, 120MM, M256		
0472	TUBE, FINISH MACHINED, 120MM		
0472	CANNON, 81MM, M253		
0472	CANNON, 105MM F/M119 HOWITZER		
0472	TUBE, 105MM F/M119 HOWITZER		
0472	CANNON, 155MM, M199 (GFM)		
0472	TUBE, 155MM, M185		
0472	CANNON, 155MM, M185 (WO/GFM)		
0472	CANNON, 8", M201A1 W/O MUZZLE BRAKE		
0472	CANNON, 155MM, M1A2		
0472	MUZZLE BRAKE, 155MM, M198 HOW		
0472	TUBE, 155MM, M199		
0472	BREECH MECHANISM ASSEMBLY, 155MM, M199		
0472	CANNON, 8", M201A1		
0472	LINER, 8" MK16		
0472	BARREL, GUN, MOD MK16		
0472	RELINING, GUN BARREL 16"		
0472	CANNON, 155MM, M185 (W/GFM)		
0489	COCO	ACTION MFG COOPLT 6	PHILADELPHIA PA
0489	BURSTER1 CANNISTER F/155MM M825		
0489	FUZE BOMB NOSE MECH M904 SERIES		
0489	FUZE BOMB M904E4 NOSE IMPACT		
0489	FUZE HAND GRENADE M227		
0489	FUZE GRENADE M227		
0489	FUZE ROCKET M412E1		
0489	S&A ASSY DWG 9278015 F/M70/M73 MINE		
0489	FUZE AUX DET MK 384 MOD 0		
0489	FUZE TIME M65A1		
0489	FUZE AUY DET MK 379-1.		
0489	FUZE TIME (VT) M84A1		
0489	FUZE PD MK 407 MOD 1		
0489	DELAY PLUNGER M1		
0489	FUZE PD M567		
0489	FUZE PI BD M509A2		
0489	FUZE BD M62A2		
0489	FUZE PD M935 & XM936 MPTS		
0515	COCO	CHAMBERLAIN MGF COR	NEW BIGHTON MN
0515	SHELL HE M107 155MM		
0561	COCO	SACO DEFENSE INC	SACO ME
0561	MACHINE GUN, CAL 50, FLEX M2 W/E SP BBL		
0561	BARREL EXTENSION		
0561	MACHINE GUN, 7.62MM, W/E, M60 W/SP BBL		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION	
0561	BARREL ASSEMBLY		
0561	BOLT, SUB-ASSEMBLY		
0561	BARREL ASSEMBLY		
0561	MACHINE GUN, 7.62MM, M60D W/SP BBL		
0561	MACHINE GUN, CAL 50, FIXED, M2 W/SP BBL		
0561	MACHINE GUN, 7.62MM, M60E3		
0561	MACHINE GUN, 40MM, MK19		
0574	COCO	PEERLESS OF AMERICA	CHICAGO IL
0574	SHELL HE M374A1 F/81MM MORTAR		
0581	COCO	MODERN MACH WORKS	CUDAHY WI
0581	SHELL SMK WP M328 4.2 IN		
0581	SHELL HE M329A2 4.2 IN (FORGED)		
0600	COCO	HONEYWELL INC-TCAAP	NEW BRIGHTON MN
0600	DISPENSER MK 7 MOD 3		
0600	CTG 30MM HEDP M789		
0600	CTG 30MM TP M788		
0600	CTG 25MM APDS-T M791 W/M28 LINK		
0600	CTG 25MM TP-T M793 W/M28 LINK		
0600	CTG 30MM TP PGU-15/B (GAU-8)		
0600	CTG 25MM HEI-T M792 W/F M758 PDSD W/M28 LINK		
0600	CTG 30MM HEI (GAU-8) PGU-13/B		
0600	CTG 30MM 5-API PGU-14A/B 1-HEI PGU-13A/B GAU-8		
0600	CTG 25MM DUMMY PGU-24/U		
0600	CTG 25MM TP PGU-23/U W/O TR		
0600	CTG 25MM API PGU-20 W/O LINK (NAVY)		
0600	CTG 25MM HEI PGU-22 W/O LINK (NAVY)		
0600	CTG 25MM HEI PGU-25		
0600	SHOT API 30MM (GAU-8)		
0600	CTG 25MM HEIT MK210 MOD 2		
0600	CTG 25MM TPDS-T M910		
0600	FUZE PDSD M761D F/40MM DIVADS		
0600	MINE M67/M72 (HOUSE/TIMER) F/155MM M692/M731		
0600	FUZE FMU-95/B		
0600	BOMBLET MK118 SERIES F/DISP MK7 MODS 3/6		
0600	FUZE BOMB MK 1 MOD 0		
0600	DISPENSER & BOMB ACFT CBU-87/B CEM		
0600	MINE AT MPTS (DWG 9281613) F/M56 SUBSYSTEM		
0600	LENS ASSY ELEC F/M70/M73 MINE.		
0600	LENS ASSY F/M75 AT MINE F/GEMSS (FASCAM)		
0600	TRIP LINE SENSOR F/M74 AP MINE AND BLU-92/B		
0600	LENS ASSY F/BLU-91/B AT MINE F/GATOR (FASCAM)		
0600	FUZE PD M550		
0600	FUZE PD M758 PDSD F/CTG 25MM (BUSHMASTER)		
0600	BATTERY SINGLE CELL PRIMARY (FASCAM) P/N9275567		
0602	COCO	FLINCHBAUGH PRODUCT	RED LION PA

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0602	MOTOR BODY F/XM913 105MM HERA CTG		
0602	CASE CTG BASE & SEAL (PN 12524833)		
0602	PROJECTILE MPTS ASSY F/M830		
0602	PROJ APDS-T-TP M737E1 105MM (TRAINING ONLY)		
0602	PROJ ASSY F/105MM M774 APFSDS-T (DU)		
0602	PROJ ASSY F/105MM M735 APFSDS-T		
0602	PROJ M833		
0602	SHELL ILLUM M485 155MM		
0602	MOTOR ROCKET BODY F/PROJ 8 INCH HE M650 RA		
0611	COCO	O F MOSSBERG	NORTH HAVEN CT
0611	MORTAR, 4.2", W/E, M30		
0611	CANNON, 4.2", M30		
0652	COCO	BERWICK FORGE & FAB	BERWICK PA
0652	SHELL HE M106 8 IN		
0654	COCO	BETHLEHEM STEEL CO	BETHLEHEM PA
0654	FORGING, TUBE, 105MM, M68		
0654	TUBE, FORGING, ROTARY FORGED, 120MM		
0654	TUBE, FORGING, ROUGH FORGED, 120MM		
0654	FORGING, TUBE, 155MM, M1A2		
0654	FORGING, TUBE, 175MM, M113A1 (M107)		
0654	FORGING, TUBE, 8", M201		
0669	COCO	F N MFG INC	COLUMBIA SC
0669	RIFLE, 5.56MM, M16A2		
0670	COCO	AVCO CORP	WILMINGTON MA
0670	FUZE M223		
0670	FUZE PD M550		
0721	COCO	GREENE INTL WEST	OCEANSIDE CA
0721	LINK METAL BELT M10 20MM		
0721	LINK CTG MK 7 20MM		
0721	LINK CTG M9 CAL. 50 MB		
0721	LINK CTG M13 7.62MM MB		
0721	LINK METAL BELT M14A2 F/20MM		
0721	LINK CTG M22 F/20MM		
0721	LINK M27 F/CTG 5.56MM		
0721	LINK METAL BELT M16A2 40MM		
0721	LINK CTG M15A2 CAL. 50 MB		
0727	GOGO	ROCK ISLAND ARSENAL	ROCK ISLAND IL
0727	MACHINE GUN, CAL 50, FLEX M2 W/E SP BBL		
0727	MACHINE GUN, CAL 50, M85		
0727	GUN, AUTO, 25MM, W/BII, M242 (BUSHMASTER)		
0727	MOUNT, GUN, 120MM, M1A1		
0727	RECOIL, MECHANISM, M37 (OH&RB)		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0727	HOWITZER, LT, TOWED, 105MM, M102		
0727	RECOIL, MECHANISM, M2A5 (OH&RB)		
0727	RECOIL, MECHANISM, M2A5		
0727	SLEEVE, TUBE SUPPORT		
0727	RECOIL, MECHANISM, M37		
0727	HOWITZER, LT, TOWED, 105MM, M101A1		
0727	HOWITZER, LT, TOWED, 105MM, M119A1		
0727	EQUILIBRATOR		
0727	RECOIL, MECHANISM, M6A2 (OH&RB)		
0727	RECOIL, MECHANISM, M6A2		
0727	CARRIAGE, HOWITZER, 155MM, M39		
0727	HOWITZER, MED, TOWED, 155MM, M198		
0727	HOWITZER, MED, TOWED, 155MM, M198 (OH & RB)		
0727	MOUNT, GUN, 8 IN., M174		
0727	MOUNT, GUN, 8 IN., M174 (OH&RB)		
0727	RECOIL, MECHANISM, M45 (OH&RB)		
0727	LUG SUSPENSION MK 3 MOD 0		
0727	MOUNT, GUN, 165MM, M150		
0727	MOUNT, GUN, 155MM, M178		
0727	MOUNT, GUN, 155MM, M178 (OH&RB)		
0728	GIGI	FNC BSD	MINNEAPOLIS, MN
0728	MK-41 MOD 0, 1 VERTICAL LAUNCH SYSTEM		
0728	MK-13 MOD 4 GUIDED MISSILE LAUNCH SYSTEM		
0728	MK-26 GUIDED MISSILE LAUNCH SYSTEM		
0728	76MM MK75 GUN MOUNT		
0728	5"/54 MK45 GUN MOUNT		
0728	5"/54 MK6 AMMUNITION HOIST		
0731	GOCO	RAYTHEON	BRISTOL, TN
0731	MISSILE: MAVERICK		
0731	MISSILE: PATRIOT		
0731	MISSILE: HAWK		
0731	MISSILE: STANDARD 2		
0731	MISSILE COMPONENTS		
0731	NATO SEA SPARROW LAUNCHER		
0731	SPARROW F14 ALUNCHER		
0732	COCO	FED CARTRIDGE CORP	ANOKA MN
0732	CTG 5.56MM BALL M193 10RD CLIP		
0737	COCO	AMRON CORP	ANTIGO WI
0737	CASE CTG M103 20MM		
0737	CASE CTG M21A1 20MM		
0737	CASE CTG M195 40MM		
0737	CASE CTG M118 40MM		
0737	CASE CTG M169 40MM		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
0738	GOCO	EASTMAN KODAK CO ROCHESTER, NY
0738	MK-71 MOD 1-5 VARIABLE TIME FUZE (VT) 5"/38	
0738	MK-404 INFRARED FUZE (IR) 3"/50, 76MM, 5"/54	
0738	MK-417 INFRARED FUZE (IR) 76MM, 3"/50	
0738	MK-418 PROXIMITY FUZE (POINT DET.) 5"/54	
0743	COCO	AMER INTL MFG CORP FT WORTH TX
0743	PROJ BODY MK 33-2	
0743	PROJ BODY MK 56 F/5/38	
0743	WARHEAD 5/38 MK 74	
0743	PROJ BODY MK 61 F/5/54	
0743	PROJ BODY MK 64 F/5/54	
0743	PROJ BODY MK 51 F/5/38	
0743	PROJ BODY MK 52 F/5/38	
0743	PROJ BODY MK 48-1	
0743	PROJ BODY MK 50 F/5/38	
0743	SHELL HE M107 155MM	
0748	COCO	AMRON CORP WAUKESHA WI
0748	SHELL 20MM HEI M56A3/4/5	
0748	SHELL HE DP M430 40MM	
0748	SHELL HE DP M433 40MM	
0748	GRENADE MPTS F/M42 & M46 GRENADES	
0748	BODY GRENADE HAND FRAG M67/M33.	
0748	GRENADE MPTS F/M77 GRENADE (MLRS)	
0748	CASE CTG MK 5 20MM ALL MODS	
0759	COCO	DAYRON (VALENTEC) ORLANDO FL
0759	FUZE M223 PROCURED LOADED	
0759	FUZE PD M567	
0759	FUZE PD M551 (T359E1)	
0759	FUZE PD M550	
0759	FUZE PD M549	
0759	FUZE PD M758 PDSD F/CTG 25MM (BUSHMASTER)	
0759	FUZE PD M935 & XM936 MPTS	
0759	ESCAPEMENT ASSEMBLY F/M550 FUZE	
0762	COCO	GALION (VALENTEC) GALION OH
0762	FUZE PD M505A3	
0762	CASE CTG M169 40MM	
0763	COCO	BULOVA SYSTEMS CORP VALLEY STREAM NY
0763	FUZE MT MK 339 MOD 1	
0763	FUZE MTSQ M577	
0763	FUZE PD M567	
0763	FUZE PD M551 (T359E1)	
0763	FUZE PD M550	
0763	FUZE PD M549	
0763	FUZE PD M758 PDSD F/CTG 25MM (BUSHMASTER)	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0763	FUZE MTSQ M577A1/M582A1 MPTS (PROCURED LOADED)		
0763	FUZE PD M935 & XM936 MPTS		
0763	ESCAPEMENT ASSEMBLY F/M550 FUZE		
0764	GOCO	STRATFORD ARMY ENG	STRATFORD CT
0764	TURBINE ENGINES AIRCRAFT AND TANK		
0766	COCO	MEDICO INDUSTRIES	WILKES BARRE PA
0766	SHELL HE F/M720 60MM		
0766	SHELL HE M49A3 60MM		
0766	SHELL HE M374A1 F/81MM MORTAR		
0766	SHELL SMK M375A1 81MM		
0766	PLUG SOLID NOSE FUZE MXU 735/B		
0766	WARHEAD M151 2.75 IN		
0768	COCO	KISCO (VALENTEC)	ST LOUIS MO
0768	CASE CTG 105MM M14B4 (M14 SERIES)		
0768	CASE CTG BASE & SEAL (PN 12524833)		
0768	CASE CTG M104 165MM		
0768	GRENADE MPTS F/M42 & M46 GRENADES		
0768	GRENADE MPTS F/M77 GRENADE (MLRS)		
0773	COCO	EMCO INC	GADSDEN AL
0773	SHELL HE DP M430 40MM		
0773	BOOSTER M125A1		
0773	GRENADE MPTS F/M42 & M46 GRENADES		
0773	FUZE M223 PROCURED LOADED		
0773	GRENADE MPTS F/M77 GRENADE (MLRS)		
0773	FUZE PD M52 BODY F/M525/M527		
0773	FUZE PART S&A DEVICE F/FUZE M732		
0780	COCO	REXON TECHNOLOGY	WAYNE NJ
0780	FUZE M223 PROCURED LOADED		
0780	FUZE BODY M48A3 MPT F/M557 PD FUZE		
0780	HEAD ASSY T336E7		
0780	FUZE PD MK 29 MOD 5 NOSE NON-DELAY		
0780	FUZE PD M739		
0780	FUZE PD M567		
0780	FUZE PD M551 (T359E1)		
0780	FUZE PD M550		
0780	FUZE PD M549		
0780	FUZE PD M758 PDSD F/CTG 25MM (BUSHMASTER)		
0780	S&A MODULE F/155MM M825 SMK		
0780	FUZE PD M935 & XM936 MPTS		
0780	ESCAPEMENT ASSEMBLY F/M550 FUZE		
0783	COCO	RAYTHEON-NIRP 469	BRISTOL TN
0783	FUZE SHORT INTRUSION PROX M732		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0801	COCO	OLIN CORP	MARION IL
0801	CTG 30MM TP M788		
0801	CTG 20MM HEI M56A3 W/M22 LINK		
0801	CTG 20MM TP M55A2 BULK		
0801	CTG 25MM API PGU-20 W/O LINK (NAVY)		
0801	CTG 20MM AP HEI PGU-28/B		
0801	CTG 20MM MPT-SD XM940		
0801	CTG 20MM APDS MK149 (CIWS) PHALANX		
0805	COCO	AMERICAN BRASS DIV	BUFFALO NY
0805	CUP CTG CASE 5.56MM		
0805	CUP CTG CASE 7.62MM		
0810	COCO	EVEREADY BATTERY CO	BENNINGTON VT
0810	ENERGIZER RESERVE MK 38		
0810	POWER SUPPLY PS-115		
0810	ENERGIZER RESERVE MK 40		
0810	ENERGIZER RESERVE MK 43 MOD 0		
0815	COCO	BELL HELICOPTER	FT WORTH TX
0815	HELICOPTERS UH-1B/D/H, OH-58C, AH-IS		
0817	COCO	MARQUARDT CORP	VAN NUYS CA
0817	DISPENSER MK 7 MOD 3		
0817	BOMBLET MK118 SERIES F/DISP MK7 MODS 3/6		
0818	COCO	TEXAS INSTRUMENTS	ATTLEBORO MA
0818	CUP BULLET JACKET TRACER GMCS 5.56MM		
0818	CUP BULLET JACKET GMCS BALL 7.62MM		
0818	CUP BULLET JACKET GMCS CAL. 50		
0827	GOCO	HERCULES	MCGREGOR, TX
0827	MK-25 JATO		
0827	HARM ASSEMBLY		
0827	SPARROW ROCKET MOTOR CASE		
0827	SIDEWINDER ROCKET MOTORS		
0827	PHOENIX ROCKET MOTORS		
0827	HARM ROCKET MOTORS		
0843	COCO	KDI PREC PRODS INC	CINCINNATI OH
0843	DETONATOR FLASH WOX 80A		
0843	DETONATOR MK 156 MOD 0		
0843	S&A DEVICE M118		
0843	FUZE ROCKET M427		
0843	FUZE ROCKET M423		
0843	DETONATOR W0X-87A		
0843	DETONATOR MK 29 MOD 2		
0843	FUZE MT/PD MK 403-0.		
0843	FUZE MT MK 342 MOD 1		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
0843	FUZE MT/PD MK 393 MOD 0		
0843	FUZE AUXILIARY DETONATING MK 54 MOD 2		
0843	FUZE SHORT INTRUSION PROX M732		
0843	FUZE PART S&A DEVICE F/FUZE M732		
0843	FUZE BD M534A1		
0846	COCO	COLT INDUSTRIES INC	HARTFORD CT
0846	BARREL REPLACEMT & FR SIGHT ASSY (M16A1)		
0846	BARREL (M1911A1 CAL 45 PISTOL)		
0846	PISTOL, CAL 45, AUTO, M1911A1		
0846	BOLT ASSEMBLY		
0846	SUB-MACHINE GUN, FIRING PORT, 5.56MM, M231		
0846	RIFLE, 5.56MM, M16A2		
0846	RECEIVER, UPPER		
0846	BARREL & FR SIGHT ASSEMBLY		
0846	LAUNCHER, GRENADE, 40MM, M203		
0846	BARREL ASSEMBLY		
0853	COCO	GENERAL ELECTRIC CO	BURLINGTON VT
0853	GUN,AUTO, 20MM, M197 (GATLING GUN)		
0853	CANNON, 20MM, M168		
0853	GUN, AIR DEF, TOW, 20MM, M167A1		
0853	TURRET, UNIVERSAL, M97E1		
0853	GUN, AIR DEF ART, SP, 20MM, M163A1		
0855	COCO	SINGER/LIBRASCOPE CORP	GLENDALE, CA
0855	MK113 MOD9 FCS		
0855	MK117 FCS		
0855	MK113 MOD 10 FCS		
0855	MK113 MOD 6-8 FCS		
0855	MK116 MODS 1-4 FCS		
0855	MK117 ATTACK CONTROL CONSOLE		
0857	COCO	HARLEY-DAVIDSON	YORK PA
0857	BOMB BODY 500 LB MK 82		
0866	COCO	HECKETHORN MFG	DYERSBURG TN
0866	SHELL HE DP M433 40MM		
0866	GRENADE MPTS F/M42 & M46 GRENADES		
0866	GRENADE MPTS F/M77 GRENADE (MLRS)		
1000	GOCO	HAWTHORNE AAP-D&Z	HAWTHORNE NV
1000	BOMB GP MK 83 MOD 4 INERT W/CABLE ASSY & LUGS		
1000	DISPENSER & BOMB ACFT CBU-55/B FAE		
1000	DISPENSER & BOMB ACFT CBU-55A/B FUEL AIR EXP		
1000	BOMB GP 500 LB MK 82 MODS LOW DRAG TRITONAL		
1000	BOMB GP 500 LB GP MK 82 MOD 1 LOW DRAG TRITONAL		
1000	BOMB GP MK 82-1 EMPTY W/O HARNESS W/LUGS (AF)		
1000	BOOSTER FZU-2/B DWG 63C56569		

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
1000	DISPENSER & BOMB CBU-72/B	
1000	BOMB GP 2000 LB MK 84 MOD 4 TRITONAL FILLED	
1000	BOMB INERT MK84 TP AND NTP (NAVY)	
1000	BOMB GP 2000 LB MK 84-6 H-6 FILLED W/HARNESS	
1000	BOMB BDU-45/B INERT 500LB PRAC W/SPOTTING CHG	
1000	BOMB GP 2000 LB MK 84 EMPTY W/O HARNESS (AF)	
1000	BOMB GP EMPTY MK84 MOD4 (AIR FORCE)	
1000	BOMB BDU-50/B INERT 500 LB PRACTICE	
1000	WARHEAD 5 IN RKT HE MK 63 MOD 1	
1000	CHARGE DEMO BLOCK 4-LB MK36 MOD-1	
1001	GOGO	MCALESTER AAP-GOGO MCALESTER OK
1001	BOMB GP 500 LB BLU-111/B PBX FILL (MK82)	
1001	CTG 20MM HE-T	
1001	CTG 20MM AP-T M95 BULK PACK	
1001	CTG 20MM TP MK-105 MOD 0	
1001	CTG 20MM LKD 4 TP M204 1 APT M95 W/M10 LK	
1001	CTG 20MM TP M55 MLB MK 7 MOD 0	
1001	CTG 20MM ELEC HEI MK 106 MOD 2 SC MK 5	
1001	CTG 20MM ELEC APT MK 108 MOD 1 SC MK 5	
1001	CTG 20MM ELEC API MK 107 MOD 1 SC MK 5	
1001	CTG 20MM TP TEST CTG MK 109	
1001	CTG 20MM ELEC API MK 107 MOD 1 SC MK 5	
1001	CTG 20MM ELEC HEI MK 106 MOD 2 SC MK 5	
1001	CTG 20MM HEI M56A3 ELEC W/M14 LINK	
1001	CTG 20MM LKD 4 HEI M210 I APT M95 W/M10 LK	
1001	CTG 20MM HEI M56A3 W/M22 LINK	
1001	CTG 20MM HEI M56A3 W/FUZE M505A3 LINKLESS	
1001	CTG 20MM HEIR M242A1 W/FZ PD M505A3	
1001	CTG 40MM HEIT-SD MK 11/MK 2 W/F MK 27	
1001	PROJ 16/50 CAL AP	
1001	PROJ 5/38 CAL MK 51 W/F VT-NSD	
1001	CHARGE PROP 5/38 CAL FULL W/CASE MK 10/MK 11	
1001	CTG 165MM HEP M123A1 W/F M62A2	
1001	PROJ 16/50 CAL HC MK13 BDF MK21	
1001	PROJ 5/38 HE-CVT	
1001	CHARGE PROP 5/54 CAL MK 67 MOD 3 W/CASE FULL	
1001	PROJ 5/54 HE-MT/PD MK115	
1001	CHARGE PROP 5/54 CAL REDUCED MK68-2 W/STEEL CS	
1001	PROJ 5/54 CAL HE-CVT MK127-0 W/F M732 PROX	
1001	CHARGE PROP 155MM M119A2	
1001	PROJ 5/38 CAL HE-PD W/MK 52 BODY & MK 29 FZ	
1001	PROJ 16/50 CAL HIGH CAPACITY	
1001	CHARGE PROP 5/38 CAL REDUCED W/CASE MK 10	
1001	PROJ 16/50 BL&P MK141-0	
1001	PROJ 5/38 CAL VT NF MK 51 MOD 0	
1001	PROJ 16/50 HE-CVT MK143-1	
1001	PROJ 5/54 VT-NF MK100-1	
1001	BOMB GP 500 LB MK 82 MOD 2 LOW DRAG H-6 LOADED	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
1001	BOMB GP 500 LB MK 82 MODS LOW DRAG TRITONAL	
1001	BOMB GP 500 LB GP MK 82 MOD 1 LOW DRAG TRITONAL	
1001	BOMB GP 1000 LB MK 83 (NTP) LOW DRAG H-6 LOADED	
1001	BOMB GP 2000 LB MK 84 MOD 4 TRITONAL FILLED	
1001	BOMB BDU-45/B INERT 500LB PRAC W/SPOTTING CHG	
1001	BOMB GP 500 LB MK82-4 H-6 FILLED W/HARNESS/LUGS	
1001	BOMB GP 2000 LB MK 84 EMPTY W/O HARNESS (AF)	
1001	BOMB GP EMPTY MK84 MOD4 (AIR FORCE)	
1001	BOMB BDU-50/B INERT 500 LB PRACTICE	
1001	BOMB GP 1000 LB BLU-110/B PBX FILL (MK83)	
1001	MOTOR RKT ZUNI MK71/MODS 5 IN W/PROP GRAIN MK88	
1001	MOTOR RKT SIN MK 22 MOD 4	
1001	COMPOSITION A-5	
1002	GOGO	CRANE ARMY AMMO ACT CRANE IN
1002	PRIMERS DETONATORS RELAYS ALL TYPES (NAVY)	
1002	CTG 3/50 BL&P MK177 NFL RF	
1002	CTG 3/50 CAL MK 33 ALL MODS W/F VT MK 72	
1002	CTG 3/50 AP FL RF	
1002	CTG 3/50 HC FL SF	
1002	CTG 3/50 AA FL SF	
1002	CTG 3/50 HE-VT NFL RF	
1002	CTG 3/50 HE-IR MK 175 NFL RF	
1002	CTG 3/50 HC FL RF	
1002	CTG 3/50 VT-RF NON-FRAG MK31 W/F MK72-17	
1002	CTG 3/50 VT FL SF	
1002	CTG 3/50 HE VT NSD NFL RF	
1002	CTG 3/50 CAL AP FL SF	
1002	CTG 3/50 BL&P FL SF MK 185-0	
1002	CTG 3/50 ILLUM FL-RF	
1002	CTG 76MM HE-IR MK 199-1	
1002	CTG 76MM HE-PD MK200-1 W/F MK407-1	
1002	CTG 76MM BL&P MK201-1	
1002	CTG 76MM HE-VT MK 208-0	
1002	CTG 3/50 ILLUM FL SF MK 25	
1002	CTG 76MM VT NF	
1002	PROJ LOAD MK 12 F/3/50	
1002	PROP CHARGE ASSY F/16/50 CAL GUN AMMO (FULL)	
1002	PROP CHARGE ASSY F/16/50 CAL GUN AMMO FLASHLESS	
1002	PROP CHARGE ASSY F/16/50 CAL GUN AMMO REDUCED	
1002	PROJ 5/38 BL&P MK110-3	
1002	PROJ 5/38 MT/PD TP SMK PUFF MK138-0	
1002	PROJ 5/38 HE-IR MK119-0	
1002	PROJ 5/38 CAL HE-CVT RAP	
1002	PROJ 5/54 CAL BL&P MK 92 MOD 1	
1002	PROJ 5/54 WP SMK MK89-0	
1002	CTG 165MM HEP M123A1 W/F M62A2	
1002	PROJ 5/38 WP	
1002	PROJ 5/54 HE-IR MK107	

PEP#	TYPE	CONTRACTOR/FACILITY NAME LOCATION
1002	PROJ 5/38 HE MT/PD MK99-4	
1002	PROJ 5/38 ILLUM MK87-3 W/FZ MK403	
1002	PROJ 5/54 HE-MT/PD MK115	
1002	PROJ 5/54 HE-VT (PROX) MK116	
1002	BEAKER EXP LOADED PBXN-106	
1002	PROJ 5/54 HE-MT/PD HI-FRAG MK82	
1002	PROJ 5/54 CAL HE-CVT MK127-0 W/F M732 PROX	
1002	PROJ 5/54 CAL TP PUFF W/MT FUZE MK342	
1002	PROJ 5/54 CAL MK97 PUFF-PD W/FCLMK2	
1002	PROJ 5/54 ILLUM MK91-0	
1002	PROJ 5/38 CAL AAC	
1002	PROJ 5/54 HC HE-PD MK108	
1002	CHG PROP F/16/50 FULL CHG/45	
1002	BOMB GP 500 LB GP MK 82 MOD 1 LOW DRAG TRITONAL	
1002	BOMB GP 500 LB MK 82 MODS LOW DRAG TRITONAL	
1002	BOMB GP 2000 LB MK 84 MOD 4 TRITONAL FILLED	
1002	DISPENSER & BOMB ACFT CBU-MK 20 TP W/DISP MK 7	
1002	BOMB GP 500 LB MK82-4 H-6 FILLED W/HARNESS/LUGS	
1002	BOMB PRACTICE ROCKEYE II MK20 MOD 8	
1002	WARHEAD 5 IN RKT SMK WP MK 34 MOD 1 (ZUNI)	
1002	IGNITER MK 282 F/5 IN RKT MTR MK 71	
1002	MARKER STD LOCATION A/C GROUND-MARINE LUU-10/B	
1002	SIGNAL ILLUM MK2 MOD 1 GREEN STAR	
1002	SIGNAL ILLUM MARINE RED COMET MK 1 MOD 0	
1002	SIGNAL ILLUM MARINE GREEN COMET MK 1 MOD 0	
1002	SIGNAL ILLUM MARINE YELLOW COMET	
1002	FLARE AIRCRAFT DECOY MK 50	
1002	SIGNAL SMK & ILLUM MARINE MK 99 MOD 3 YELLOW	
1002	MARKER LOCATION MARINE MK25 MOD 3	
1002	CTG PHOTOFLASH M123A1	
1002	SIGNAL SMK & ILLUM MK 66 RED	
1002	SIGNAL SMOKE AND ILLUMINATION MK 124 MOD 0	
1002	MARKER LOCATION MARINE YELLOW MK58	
1002	SIGNAL SMK & ILLUM MK 117 GREEN PARA	
1002	SIGNAL SMK & ILLUM MK 118 YELLOW PARA	
1002	CHARGE ASSY DEMO MK 133 MOD 2	
1002	DETONATOR MK 43 MOD 1	
1002	DETONATOR MK 18 MOD 0	
1002	DETONATOR MK 56 MOD 0	
1002	DETONATOR MK 59 MOD 0	
1002	DETONATOR DWG AF 755107	
1002	DETONATOR MK 95 MOD 0	
1002	DETONATOR MK 37 MOD 0	
1002	CTG IMPULSE CAL .50 ELEC INIT	
1002	PRIMER PERC MK 134 MOD 0	
1002	PRIMER PERC MK 101 MOD 3	
1002	DISPENSER & BOMB ACFT CBU-MK 20NTP W/DISP MK7	

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
1005	COCO	INTERCONTINENTAL	GARLAND TX
1005	BOMB BODY 1000 LB MK 83		
1005	BOMB BODY 500 LB MK 82		
1005	BOMB BODY MK 84 EMPTY		
1009	COCO	ACTION MFG CO PLT 1	PHILADELPHIA PA
1009	MOUNT, TELESCOPE, M134A1		
1009	MOUNT, TELESCOPE, M21A1		
1009	MOUNT, TELESCOPE, M146		
1009	MOUNT, TELESCOPE, M145		
1009	LINKAGE ASSEMBLY (FOR M145 MNT TELESCOPE)		
1009	MOUNT, TELESCOPE & QUADRANT, M172		
1009	MOUNT, TELESCOPE & QUADRANT, M171		
1009	SIGHT UNIT, W/COVER M64		
1009	MOUNT, TELESCOPE, M64A1 SIGHT		
1009	TELESCOPE, ELBOW, M64A1 SIGHT		
1009	QUADRANT, FIRE CONTROL, M15		
1013	GOCO	MISSISSIPPI AAP-M&C	PICAYUNE MS
1013	PROJ 155MM HE DP (ICM) M483A1		
1013	PROJ 155MM HE DP (ICM) M483A1		
1013	SHELL HE M483 155MM		
1013	SHELL HE M483 155MM		
1013	CHARGE EXPULSION F/155MM M483A1		
1013	GRENADE MPTS F/M42 & M46 GRENADES		
1013	GRENADE MPTS F/M42 & M46 GRENADES		
1013	LEAD CUP ASSY DWG 9215330		
1014	COCO	T N NUC SP(AEROJET)	JONESBORO TN
1014	CTG 25MM API PGU-20 W/O LINK (NAVY)		
1014	SHOT API 30MM (GAU-8)		
1015	COCO	AEROJET ORD&MFG CO	DOWNEY CA
1015	CTG 25MM APDS-T M791 W/M28 LINK		
1015	CTG 25MM TP-T M793 W/M28 LINK		
1015	CTG 25MM HEI-T M792 W/F M758 PDSD W/M28 LINK		
1015	CTG 30MM 5-API PGU-14A/B 1-HEI PGU-13A/B GAU-8		
1015	CTG 25MM DUMMY PGU-24/U		
1015	CTG 25MM TP PGU-23/U W/O TR		
1015	CTG 25MM HEI PGU-22 W/O LINK (NAVY)		
1015	CTG 25MM HEI PGU-25		
1015	CTG 25MM HEIT MK210 MOD 2		
1015	CTG 25MM TPDS-T M910		
1016	COCO	AEROJET ORD&MFG CO	CHINO CA
1016	CTG 30MM TP PGU-15/B (GAU-8)		
1016	CTG 30MM HEI (GAU-8) PGU-13/B		

PEP#	TYPE	CONTRACTOR/FACILITY NAME	LOCATION
1017	COCO	US NAVY RESERVE PLT	ROCHESTER NY
1017	FUZE MULTI-OPTION M734		
1018	COCO	ACCUDYNE CORP	JANESVILLE WI
1018	FUZE MULTI-OPTION M734		
1018	FUZE SHORT INTRUSION PROX M732		
1018	POWER SUPPLY PS-115		
1018	FUZE PART S&A DEVICE F/FUZE M732		
2000	GOCO	GRUMMAN	BETHPAGE, NY
2000	A-6E		
2000	EA-6B		
2000	F-14D		
2000	E-2C		
2003	COCO	KAMAN	BLOOMFIELD, CT
2003	NAVY HELICOPTER COMPONENTS FOR SH2		
2003	AH1 BLADES		
2003	F14 SURFACES (SKIN)		
2003	A6E DOORS AND FAIRINGS		
2003	EA6B DOORS AND FAIRINGS		
2003	C5B FLAPS AND SPOILDRS AND TRUST REVERSAL		
2004	GOCO	TELEDYNE	TOLEDO, OH
2004	J402-CA-400 ENGINES FOR HARPOON		
2004	T-37-J69-T-25		
2004	AIRCRAFT ENGINES		

APPENDIX B: NUMBER OF PLANT EQUIPMENT PACKAGES

FISCAL YEAR	ARMY	NAVY	AIR FORCE
1978	197	12	4
1979	158	12	4
1980	151	12	4
1981	147	12	3
1982	148	13	3
1983	149	13	2
1984	149	13	0
1985	143	13	0
1986	128	13	0
1987	120	13	0
1988	112	10	0
1989	99	10	0
1990	94	10	0
1991	92	8	0

APPENDIX C: CONDITION CODE DEFINITIONS

Federal Property Management Regulation
41CFR, 101-43.4801

CONDITION CODES AND EXPANDED DEFINITIONS

For the purpose of indicating condition of the property, the following codes should be used. Use a combination of a letter and number or two letters (when salvage or scrap is indicated).

Supply Condition Code	Expanded Definitions

A. Serviceable - Issuable without qualification/new, used, repaired, or reconditioned material which is serviceable and issuable to all customers without limitations or restrictions. Includes material with more that 6 months shelf-life remaining.

B. Serviceable - Issuable with qualification/new, used, repaired, or reconditioned material which is serviceable and issuable for its intended purpose but which is restricted from issue to specific units, activities, or geographical areas by reason of its limited usefulness or short service-life expectancy. Includes material with 3 through 6 months shelf-life remaining.

C. Serviceable - Priority issue less than 3 month shelf-life/items which are serviceable and issuable to selected customers, but must be issued before condition A and B material to avoid loss as a usable asset. Includes material with less than 3 months shelf-life remaining.

D. Serviceable - Test/modification/serviceable material requires test, alternation, modification, conversion or disassembly (This does not include items which must be inspected or tested immediately prior to issue).

E. Unserviceable - Minor repairs/material which involves only limited expenses or effort to restore to serviceable condition and which is accomplished in the storage activity where the stock is located.

F. Unserviceable - Repairable/economically reparable material which requires repair, overhaul, or reconditioning (includes reparable items which are radioactively contaminated).

G. Unserviceable - Incomplete/material requiring additional parts or components to complete the end item prior to issue.

H. Unserviceable - Condemned/material which has been determined to be unserviceable and does not meet repair criteria.

S. Unserviceable - Scrap/material that has no value except for its basic material content.

EXPANDED DEFINITIONS

Disposal Condition Code	Expanded Definitions

1. Unused - good/unused property that is usable without repairs and identical or interchangeable with new items from normal supply sources.

2. Unused - Fair/unused property that is usable without repairs but is deteriorated or damaged to the extent that utility is somewhat impaired.

3. Unused - Poor/unused property that is usable without repairs but is considerably deteriorated or damaged. Enough utility remains to classify the property better than salvage.

4. Used - Good/used property that is usable without repairs and most of its useful life remains.

5. Used - Fair/used property that is usable without repairs, but is somewhat worn or deteriorated and may soon require repairs.

6. Used - Poor/used property that may be used without repairs, but is considerably worn or deteriorated to the degree that remaining utility is limited or major repairs will soon be required.

7. Repairs required/under 16% of acquisition cost. Required repairs are minor and should not exceed 15% of original acquisition cost.

8. Repairs required/16-40% of acquisition cost. Required repairs are considerable and are from 16% to 40% of original acquisition cost.

9. Repairs required/41-65% of acquisition cost. Required repairs are major because the property is badly damage, worn, or deteriorated, and are estimated to range from 41% to 65% of original acquisition cost.

X. Salvage/property has some value in excess of its basic material content, but repair or rehabilitation to use for the originally intended purpose is clearly impractical. Repair for any use would exceed 65% of the original acquisition cost.

S. Scrap/material that has no value except for its basic material content.

APPENDIX D: ACME-GRIDLEY LATHES

KEY

Amron:	Amron Corp., Antigo, WI
Avco:	Avco Corp., Wilmington, MA
Covert:	Covert MFG Co., Galion, OH
F N MFG:	F N MFG Inc., Ind Park, Columbia, SCRiver:
Galion:	Galion (Valentec), Galion, OH
Hamilton:	Hamilton Technology, Lancaster, PA
Harley:	Harley-Davidson, York, PA
Honey:	Honeywell Inc.- TCAAP, New Britan, MN
KDI PPI:	KDI Precious Productss Inc., Cincinnati, OH
Kisco:	Kisco (Valentec), St. Louis, MO
Lake C:	Lake City AAP-Olin, Independence, MO
Pohlman:	Pohlman (Valentec), Maryland Heights, MO
Reader:	Reader & Kline Co., Carmel, IN
Rexon:	Rexon Technology, Wayne, NJ
River:	Riverbank Army Ammunition Plant, Riverbank, CA
SACO:	SACO Defense Inc., Saco, MA
X-FAC:	X-FAC-Poloron, Bloomsburg, PA

SIX SPINDLE ACME-GRIDLEY LATHES
ACTIVE
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
River	341607246	A5	8" chk	1952
Amron	341610626	F8	0.563"	1941
Amron	341610678	F8	0.563"	1942
Amron	341614069	F8	0.563"	1941
Amron	341614082	F8	0.563"	1941
None	341614088	F8	0.563"	1941
None	341615413	A5	1.625"	1952
Amron	341617105	F8	0.563"	1942
Lake C	341618846	A5	0.563"	1942
Lake C	341618852	A5	0.563"	1942
Lake C	341618853	A5	0.563"	1942
Lake C	341618854	A5	0.563"	1942

Subtotal = 12

SIX SPINDLE ACME-GRIDLEY LATHES
ACTIVE CONTINUED
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
Lake C	341618856	A5	0.563"	1942
Lake C	341618869	A5	0.563"	1942
Lake C	341618871	A5	0.563"	1942
Lake C	341618874	A5	0.563"	1942
Lake C	341618876	A5	0.563"	1942
Lake C	341619064	A5	0.563"	1942
Lake C	341619066	A5	0.563"	1942
Lake C	341619072	A5	0.563"	1942
Lake C	341619074	A5	0.563"	1942
Lake C	341619075	A5	0.563"	1942
Lake C	341619087	A5	0.563"	1942
Lake C	341619090	A5	0.563"	1942
Honey	341630228	A5	0.438"	1961
Kisco	341630806	A5	1.25"	1954
Kisco	341631029	A5	1.25"	1954
Kisco	341632493	A5	1.25"	1954
Kisco	341632831	A5	1.25"	1954
Galio	341632891	A4	1.0"	1951
Galio	341632892	A4	1.0"	1952
Amron	341634177	F8	2-3/8"chk	1967
River	341637291	A4	8" chk	1976
River	341637292	A4	8" chk	1976
River	341637293	A4	8" chk	1976
River	341637294	A4	8" chk	1976
River	341637547	A6	2-3/8"chk	1977
River	341637548	A5	2-3/8"chk	1977
River	341637549	A4	2-3/8"chk	1977
River	341637560	A5	2-3/8"chk	1977
River	341637561	A5	2-3/8"chk	1977
River	341637757	A5	2-3/8"chk	1977
River	341637758	A4	2-3/8"chk	1977
River	341637759	A5	2-3/8"chk	1977
River	341637760	A5	2-3/8"chk	1977
River	341637761	A5	2-3/8"chk	1977
River	341638314	A4	2-3/8"chk	1978
River	341638317	A4	2-3/8"chk	1978
River	341638315	A4	2-3/8"chk	1978
River	341638320	A4	2-3/8"chk	1978
River	341639476	A1	2-3/8"chk	1986

Subtotal = 39

Grand Total = 51

SIX SPINDLE ACME-GRIDLEY LATHES
INACTIVE
UNITED STATES ARMY INDUSTRIAL ENGINEERINT ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
River	341600940	A5	8"chk	1952
Kisco	341602457	A5	1.625"	1952
Lake C	341602477	A5	0.563"	1951
Rexon	341602485	A4	1.25"	1951
Dayron	341602557	A6	2.00"	1951
Pohlman	341602569	A5	1.25"	1951
Dayron	341602599	A6	2.00"	1951
Dayron	341602601	A6	2.00"	1951
Saco	341602608	A4	1.25"	1951
Pohlman	341602615	A4	1.25"	1951
Pohlman	341602633	A5	1.25"	1951
Galion	341602636	A5	1.00"	1952
Pohlman	341602639	A6	1.25"	1951
Pohlman	341602640	A5	1.25"	1951
Pohlman	341602641	A5	1.25"	1951
Kisco	341604138	F9	1.625"	1952
Rexon	341606530	F7	2.625"	1951
X-FAC-T	341606531	A4	2.625"	1944
Lake C	341607801	A4	0.563"	1952
Lake C	341610272	A5	1.00"	1952
Lake C	341610273	A5	1.00"	1952
Lake C	341610274	A5	1.00"	1952
Lake C	341610275	A5	1.00"	1952
Lake C	341610276	A5	1.00"	1952
Lake C	341610277	A5	1.00"	1952
Lake C	341610279	A5	1.00"	1952
Lake C	341610280	A5	1.00"	1952
Lake C	341610281	A5	1.00"	1952
Amron	341610494	F8	0.563"	1942
Pohlman	341610495	A5	0.563"	1942
Pohlman	341610496	A5	0.563"	1942
Pohlman	341610499	A5	0.563"	1943
Pohlman	341610500	A5	0.563"	1942
Lake C	341610507	A4	0.563"	1942
Lake C	341610605	A5	0.563"	1942
Amron	341610616	A4	0.563"	1941
Amron	341610620	F8	0.563"	1941
Amron	341610621	F8	0.563"	1941
Amron	341610630	A4	0.563"	1941
Amron	341610633	A4	0.563"	1941
Amron	341610634	A4	0.563"	1941
Amron	341610636	A4	0.563"	1941

Subtotal = 42

SIX SPINDLE ACME-GRIDLEY LATHES
INACTIVE CONTINUED
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
Amron	341610641	F8	0.563"	1941
Lake C	341610648	A5	0.563"	1941
Lake C	341610651	A5	0.563"	1941
Lake C	341610652	A5	0.563"	1941
Lake C	341610653	A5	0.563"	1941
Lake C	341610654	A5	0.563"	1941
Lake C	341610655	A5	0.563"	1941
KDI PPI	341611285	A6	1.25"	1944
Kisco	341611300	A5	5.25"chk	1952
Kisco	341611302	F9	5.25"chk	1951
Lake C	341611597	A4	0.563"	1941
Pohlman	341612197	A4	1.25"	1952
Amron	341612735	F8	0.563"	1941
Honey	341612771	A5	0.563"	1942
Lake C	341613819	A5	0.563"	1942
Lake C	341613822	A6	0.563"	1942
Lake C	341613826	A5	0.563"	1942
Lake C	341613829	A6	0.563"	1942
Amron	341614080	F8	0.563"	1941
Lake C	341614687	A5	0.563"	1943
Lake C	341614690	A5	0.563"	1943
Lake C	341618857	A4	0.563"	1942
Lake C	341618873	A4	0.563"	1942
Lake C	341618903	F9	0.563"	1943
Lake C	341618913	A5	0.563"	1943
Lake C	341618914	A6	0.563"	1942
Lake C	341618917	A6	0.563"	1943
Lake C	341619089	A5	0.563"	1942
Honey	341619378	A5	0.563"	1953
Kisco	341620634	A5	1.625"	1954
Amron	341620953	A4	0.563"	1942
Lake C	341621721	A5	0.563"	1942
Lake C	341622566	A5	1.25"	1954
Lake C	341622719	A5	0.563"	1941
Lake C	341622720	A5	0.563"	1942
Lake C	341622722	A5	0.563"	1942
River	341623000	A5	8"chk	1954
River	341623002	A5	8"chk	1954
River	341623003	A5	8"chk	1954
River	341623007	A5	8"chk	1954
River	341623009	A5	8"chk	1954
X-FAC	341623211	A4	8"chk	1945

Subtotal = 42

SIX SPINDLE ACME-GRIDLEY LATHES
INACTIVE CONTINUED
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
X-FAC	341626810	A5	8"chk	1952
Honey	341630017	A5	0.438"	1961
Honey	341630018	A5	0.438"	1961
Honey	341630019	A5	0.438"	1961
Honey	341630227	A5	0.438"	1961
Pohlman	341630796	A5	1.25"	1951
Pohlman	341630802	A5	1.25"	1954
River	341632450	A5	8"chk	1951
Pohlman	341632491	A5	1.25"	1951
Honey	341632657	A6	2.625"	1942
Avco	341632671	A5	1.25"	1952
Avco	341632672	A5	1.25"	1952
Galion	341632883	A4	1.0"	1954
Galion	341632887	A4	1.0'	1954
River	341633181	A5	8"chk	1952
Rexon	341633405	A4	1.25"	1966
Pohlman	341633407	A6	1.25"	1966
Pohlman	341633408	A6	1.25"	1966
Lake C	341633453	A5	0.438	1966
Action	341634004	A4	0.563"	1952
F N MFG	341634579	A5	1.0"	1953
F N MFG	341634613	A4	1.25"	1951
F N MFG	341634616	A5	0.563"	1952
Rexon	341635277	A4	1.25"	1950
Lake C	341635522	A4	0.563"	1952
Avco	341636661	A5	1.25"	1952
Avco	341636662	A5	1.25"	1952
Harley-D	341637983	A6	10"chk	1953
Honey	341638817	A4	5.25"	1981
Honey	341638818	A4	5.25"	1981

Subtotal = 30

Grand Total = 114

EIGHT SPINDLE ACME-GRIDLEY LATHES
INACTIVE
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
Kisco	341600948	A5	6"chk	1945
Kisco	341610380	F8	8"chk	1950
Kisco	341615158	A4	6"chk	1952
Kisco	341615158	F7	6"chk	1952
Kisco	341617559	A5	6"chk	1953
Honey	341617554	A5	6"chk	1953
Reader	341617611	F9	8"chk	1953
Saco	341620657	A5	1.625"	1954
F N Mfg	341627077	A5	1.625"	1952
Honey	341629905	A5	6"chk	1951
Honey	341629915	A5	6"chk	1951
Honey	341629918	A5	6"chk	1951
F N MFG	341630295	A5	1.25"	1962
River	341630305	A5	8"chk	1950
Kisco	341630544	A5	8"chk	1954
Honey	341630774	A5	6"chk	1953
Honey	341630775	A5	6"chk	1951
Honey	341631978	A5	6"chk	1963
Honey	341631979	A5	6"chk	1963
Honey	341631980	A4	6"chk	1963
River	341632207	A5	8"chk	1954
Honey	341633208	A6	6"chk	1953
Honey	341633209	A6	6"chk	1953
Kisco	341633849	A5	6"chk	1953
Covert	341634564	A6	6"chk	1957
River	341636883	A5	8"chk	1973
River	341636894	A5	8"chk	1973
River	341636897	A5	8"chk	1973
River	341636898	A5	8"chk	1973
Amron	341638190	F8	1.625"	1978
Hamilton	341638900	A5	2.625"	1980
Hamilton	341638901	A5	2.625"	1980
Hamilton	341638902	A5	1.25"	1980
Hamilton	341638903	A5	1.25"	1980

Total = 34

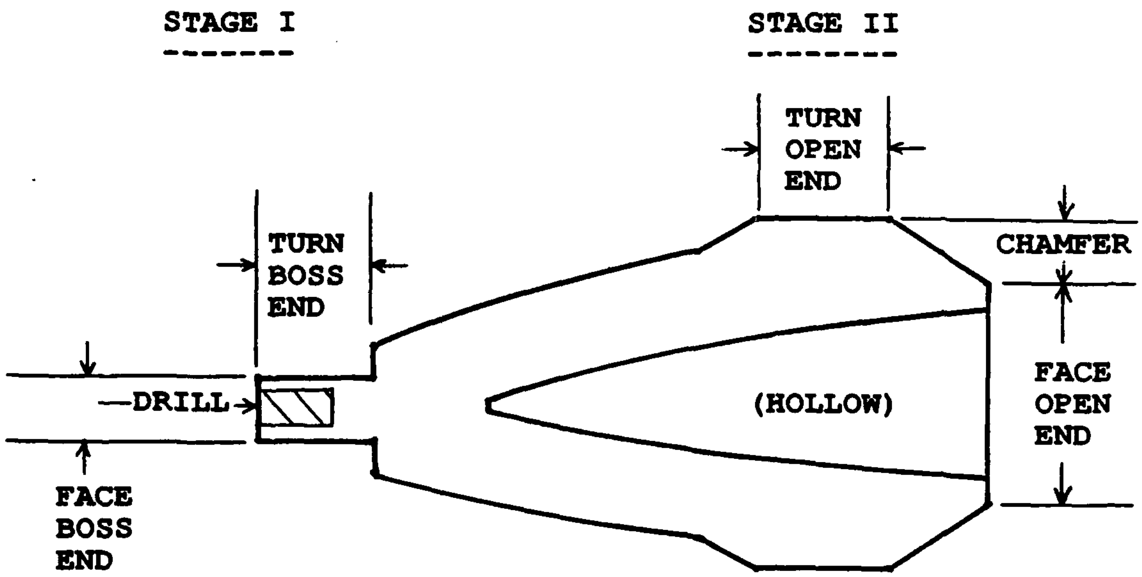
EIGHT SPINDLE ACME-GRIDLEY LATHES
ACTIVE
UNITED STATES ARMY INDUSTRIAL ENGINEERING ACTIVITY

Location	Serial Number	Condition Code	Bar/Chuck Diameter	Year Manufactered
F N MFG	341630296	A5	1.25"	1962
River	341637183	A5	8"chk	1975
River	341637253	A5	8"chk	1975
River	341637260	A5	8"chk	1975
River	341637261	A5	8"chk	1975
River	341637262	A5	8"chk	1975
River	341637307	A5	8"chk	1976
River	341637308	A5	8"chk	1976
River	341637309	A5	8"ck	1976

Total = 9

APPENDIX E: 81 mm MORTAR CASING

81 mm MORTAR CASING MACHINING OPERATION
PERFORMED BY AN ACME-GRIDLEY 8 SPINDLE, 8" CHUCKING LATHE
RIVERBANK ARMY AMMUNITION PLANT, RIVERBANK, CALIFORNIA



NOT TO SCALE

APPENDIX F: VISUAL CHECK-OFF SHEET

VISUAL CHECK-OFF SHEET FOR INDUSTRIAL PLANT EQUIPMENT CONDITION ASSESSMENTS USED BY: INDUSTRIAL ENGINEERING ACTIVITY

ITEM # 2
ID 00341103817 PEP 0727
PEC 341111321796 CATEGORY IPE
LOCATION IS ROCK ISLAND ARSENAL
PIN NO. 999099 STATUS CODE 18
MFG AMCA INTL CORP. YEAR MFG 43
NOMENCLATURE -
BORING-DRILLING-MILLING MACHINE, HORIZON
LENGTH 26 WIDTH 14
HEIGHT 23 WEIGHT 150,000
MODEL NO. 570F
SERIAL NO. 8734
COND CODE A4 COMPANY ID NO. __________
TAG NO. PIA 20291
ACQ COST 116,055 REPL COST 1,397,586

****

TYPE ASSESSMENT--VISUAL______ ANALYTICAL______

CONDITION CODE: ____________________

	REH/C2	REB/E1
EST MANHOURS	____________	____________
EST LABOR COST	____________	____________
EST PARTS COST	____________	____________
EST TOTAL COST	____________	____________

PCB (PPM): _______ PCB TEST DATE: __________
PCB REMARKS: ______________________________
PERFORMED BY: ______________________________
DATE: ______________________

ID NO. 00341103817 CHECK POINTS	APPEARANCE E	G	F	P
1. PHYSICAL APPEARANCE A. IDENT, OPERATING PLATES B. PAINT, RUST, DUST				
2. CASTINGS A. CRACKED, BROKEN B. DEFORMED				
3. ELECTRICAL SYSTEMS A. MOTORS, GENERATORS B. WIRING, CONTROLS, PANELS				
4. COOLANT SYSTEM A. MOTORS, PUMPS, TANKS B. PIPING, HOSE, FILTERS				
5. LUBRICATION SYSTEM A. CUPS, SIGHT GAUGES B. GREASE FITTINGS				
6. HYDRAULIC, PNEUMATIC SYSTEMS A. MOTORS (ELEC & HYDR) B. PUMPS, RESERVOIRS, FILTERS C. VALVES, CYLINDERS, PIPING				
7. FEED MECHANISMS A. GEARING, SHAFTS, BEARINGS B. DIALS, STOPS				
8. SPINDLE DRIVING HEADS A. GEARING, SHAFTS B. SPINDLES, BEARINGS, SEALS				
9. TRANSMISSION SYSTEMS A. CLUTCHES, PULLEYS, BELTS B. SPROCKETS, CHAINS C. SHAFTS, BEARINGS, GEARS				
10. FINISHED SURFACES A. WAYS, GIBS, WIPERS, B. WORK BEARING SURFACES				
11. CONTROLS A. HANDWHEELS, LEVERS, DETENTS B. YOKES, FORKS AND CLEVICES				
12. SAFETY DEVICES A. GUARDS B. CLAMPING, FASTENING COMP. C. MISSING COMPONENTS				
13. ATTACHMENTS, ACCESSORIES A. B.				

LEGEND: E - EXCELLENT, G - GOOD, F - FAIR, P - POOR

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