196

843[illegible]R04
2nd Copy

HISTORY

OF

ROCKY MOUNTAIN ARSENAL

COMMERCE CITY, COLORADO

MAY 1980

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	05/00/80	

4. TITLE AND SUBTITLE
HISTORY OF ROCKY MOUNTAIN ARSENAL, COMMERCE CITY, COLORADO

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

ROCKY MOUNTAIN ARSENAL (CO.)
COMMERCE CITY, CO

8. PERFORMING ORGANIZATION REPORT NUMBER

84324R04

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

BRIEF HISTORY OF RMA FROM 1942 TO 1981. INFORMATION ON WWII AND KOREAN WAR PRODUCTION, CHEMICAL WARFARE PRODUCTS, WASTE DISPOSAL, DEMILITARIZATION POLICY, INDUSTRIAL CAPACITY.

14. SUBJECT TERMS
MUNITIONS, CHEMICAL AGENTS

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

Rocky Mountain Arsenal was established in 1942 at an estimated cost of $62,415,000 with the primary mission of manufacturing and assembling chemical and incendiary munitions.

In 1942 the Armed Forces of the United States had a critical need for chemical filled munitions, as well as an immediate urgent requirement for incendiary munitions to support worldwide operations. Based on these urgent requirements, Under Secretary of War, Robert P. Patterson, directed in a memorandum to the Plant Site Board of the War Production Board, that a site be selected and a production facility constructed as soon as possible. The Plant Site Board selected Denver as the ideal location for such a facility based on several factors. (1) the Denver location would be sufficiently far from the coastal areas, (2) it was a major transportation hub, (3) it provided an excellent labor market, (4) it had an ideal climate to facilitate the progress of outside work, and (5) the soil characteristics were ideal for construction. Final approval for construction was given on 12 May 1942 and actual construction began in June 1942. Construction of the Arsenal was rushed to completion in about six months and actual plant production began in December 1942.

During World War II, the Arsenal manufactured 87,000 tons of chemical, intermediate and toxic products; and 155,000 tons of incendiary munitions. During the period of this production, the Arsenal employed

an average of 3,000 civilians and military personnel. A breakout of the actual items produced during this period is as follows:

1. DETERRENTS

a.	Chlorine	63,360,000 lb
b.	Levinstein Mustard (H)	7,132,000 lb
c.	Distilled Mustard (HD)	316,000 lb
d.	Lewisite (L)	9,106,000 lb
e.	Arsenic Trichloride	5,360,000 lb
f.	Sulfur-Dichloride	1,578,000 lb
g.	Thionyl-Chloride	960,000 lb

2. CONVENTIONAL MUNITIONS

a.	Cluster, Aimable, 500 lb, Incendiary, E48	38,988 ea
b.	M47 Incendiary Bomb (NP)	2,626,218 ea
c.	Bomb, Incendiary, M69, Declustering, Reworking and Reclustering	21,318 ea
d.	Cluster, 500 lb, E46, AN-M69	1,583 ea
e.	Cluster, Incendiary, AN-M12	1,022 ea
f.	Cluster, Incendiary, AN-M13	1,022 ea
g.	Igniter, AN-M9 Remarked	29,207 ea 31,515 ea
h.	Shell, 4.2" CM, Rework and Water-proof	380,610 ea
i.	White Phosphorous Cups	3,360,165 ea

With the closing of hostilities in 1945, the Arsenal was placed in a standby status. It was following this date that the current complex of Rocky Mountain Arsenal began to take shape. Portions of the Arsenal were leased to private industry for the production of commercial products. The principal lessee is the Shell Chemical Company which is engagedin the manufacture of various commercial pesticides. All leases negotiated with commercial manufactures contain a facilities recapture clause in the event of a national emergency.

Rocky Mountain Arsenal was reactivated just after the beginning of the Korean emergency to produce incendiary and chemical munitions to meet the supply requirements of the Army, Navy and Air Force. With the beginning of the Korean emergency, a major new facility was constructed and placed into operation for the manufacture and filling of a new toxic agent, nerve agent GB. This second large construction phase occurred during the period between 1951 and 1953 and represented a capital investment of about 40 million dollars. The estimated current replacement cost of the Arsenal facilities is over 300 million dollars. This facility represents the only Agent GB manufacturing plant in the free world and it was in this plant that all of the current stocks of Agent GB was manufactured.

After the Korean emergency, significant changes in mission assignment occurred. Due to a change in the Department of Defense policy,

government-owned and operated arsenals began to primarily concentrate effort on pilot production, pre-production and limited production runs with mass production performed by industry wherever practical. Rocky Mountain Arsenal was assigned the additional mission of supporting research, development and engineering activities of the higher command levels, and to provide testing services and technical assistance to industry for the production of chemical, incendiary and smoke munitions. Rocky Mountain Arsenal also expended, with highly favorable results, considerable effort in the production engineering area to support research and development of new munitions. This effort resulted in new and improved methods for shell filling by welded closure methods and a circular multi-purpose filling line, the standardization of the M55 GB Rocket as a chemical munition, the development of a much improved method of demilitarizing mustard filled munitions by burning, the development of an improved M34 White Phosphorous Grenade filling method and several other improvements.

During the period 1959 through 1962, Rocky Mountain Arsenal was assigned the responsibility for production of a biological anti-crop agent which causes Wheat Rust; and in conjunction with the Air Force, developed, engineered, and built a facility for the blending of rocket fuels. The hydrazine plant, a liquid mixing facility, performs the vital task of mixing hydrazine and unsymmetrical dimethylhydrazine

(UDMH) to produce Aerozine-50, a hypergolic rocket fuel. Aerozine-50, mixed at Rocky Mountain Arsenal, has been used successfully in the Titan Missile Program to fuel both the Lunar Lander and the Command Module during the recent moon exploration shots.

During the period 1965 through 1969, the Arsenal's operations were primarily in support of Southeast Asia (SEA) requirements. The first SEA project was the emptying of M78 and M79 Cyanogen Chloride (CK) and Phosgene (CG) bombs for shipment to a commercial manufacturer for final modification and ultimate filling with high explosives. Other projects, in support of SEA, included the manufacture of M34 White Phosphorous (WP) Grenades and 105mm White Phosphorous (WP) Shells, the production of the Sandwich Button Bomb (SBB) and the Micro Gravel Mine and the renovation of CNU-80 munition shipping containers for the Air Force.

In 1968 an Ad Hoc Committee of the US Army Materiel Command staff made a decision that all excess and obsolete chemical stocks stored at Rocky Mountain Arsenal be disposed of by dump at sea. This plan was called Operation Chase, was to commence in April 1969 and was to have been completed in August of that year. Public and Congressional concern over the safety of Operation Chase resulted in the cancellation of this plan.

As a result of the cancellation of Operation Chase, the Department of the Army requested the National Academy of Sciences (NAS) to convene a special committee to review disposal methods for chemical agents and to make recommendations as to how the Army could accomplish this task with maximum safety. The NAS Committee recommended that the Army set the example by minimizing the risk to all operating personnel as well as the citizens of the surrounding communities even though this might complicate and make the disposal operations more costly. NAS recommended that wherever possible remote control operations should be utilized.

Specifically with regard to the material at Rocky Mountain Arsenal, NAS concluded that the M34 clusters should be disassembled at the Arsenal and the GB agent chemically neutralized. This conclusion was based upon the fact that the Arsenal has personnel experienced in this type of operation and facilities that would be satifactory with modification. NAS recommended that bulk mustard be disposed of my incineration at those locations where it is now being stored when local air pollution is not a problem. Should air pollution be a potential problem, a scrubber system should be used to minimize pollutants.

After publication of the NAS study, the Commanding General of the US Army Munitions Command (now Armaments Command) convened a special committee to review disposal procedures at Rocky Mountain Arsenal.

The Commanding General of US Army Munitions Command established a special group called TASK FORCE EAGLE to develop detailed plans for the disposal of the M34 clusters and the bulk mustard agent.

The basic guiding principles established by the MUCOM Committee were the absolute safety and security would be paramount over cost or time. Maximum protection had to be provided for all operating personnel. There had to be absolute assurance that any agent that might be released as a result of an accidental explosion during the demilitarization process would be totally contained within the facility. Finally, all aspects of the operation had to be justifiable from a personnel safety, security and a community safeguard point of view, and sufficient hard date developed so as to be incontrovertible in the event that the procedures, facilities, and concepts of operation are challenged in any objective evaluation of the proposed program. It should be noted that the disposal of chemical agents at Rocky Mountain Arsenal is the largest single undertaking of this nature ever conducted in the history of the United States Army.

In addition to the chemical disposal program, the US Army was directed, following a major change in National Policy, to disposal of all biological stocks in its inventory. This policy change led to the first demilitarization conducted at Rocky Mountain Arsenal, the disposal of the TX Anti-Crop Agent stored at Rocky Mountain Arsenal and

a small inventory that was stored at Beale Air Force Base in California. The destruction of both of these stockpiles of Anti-Crop Agent was carried out by Rocky Mountain Arsenal personnel. The disposal of this biological agent at Rocky Mountain Arsenal was begun in August 1971 and was completed in mid-February 1973. Due to the early completion of this program, the Army realized a savings of 300,000 dollars.

The first of the major chemical demilitarization programs to be undertaken at Rocky Mountain Arsenal was the disposal of the obsolete mustard agent stocks which began in August 1972. This program consisted of incinerating 2,457 ton containers of Levenstein mustard and 951 containers of distilled mustard agent and was completed without incident in March 1974. This was the second major undertaking that was completed ahead of schedule and the Arsenal realized a savings of 1,799,000 dollars.

In late October 1973, the demilitarization of 21,115 M34 cluster bombs containing 4,200,000 pounds of Agent GB and 900,000 pounds of tetryl explosives began. This was the largest single undertaking in the history of the Army and was completed in September 1976.

On 4 October 1973, Secretary of the Army, Howard H. Callaway, announced that the portions of the national deterrent stockpile of chemical agents and munitions stored at Rocky Mountain Arsenal need

no longer be retained. The Department of the Army was formally advised by the Office of the Secretary of Defense that those stocks were no longer necessary. This supply of Agent GB was contained in large underground storage tanks, ton containers, Weteye bombs and Honest John Warheads. In this program the Army planned to dispose of more than 2,200 tons of Nerve Agent GB. The first program to get underway was the disposal of the 378,000 pounds of Agent GB stored in underground storage tanks. This program was started in September 1974 and was successfully completed in late November of the same year. This demilitarization program was completed ahead of schedule at a savings of 445,800 dollars. Following the completion of the underground storage program, plans were made and operations began to destroy the 4,106,000 pounds of chemical agent GB stored in 2,422 ton containers. This operation got underway on 10 March 1975 and was completed in November of the same year. Engineering and construction of facilities to demilitarize the Honest John Warheads and the Weteye bombs was completed in April 1976.

At Rocky Mountain Arsenal safety has been and continues to be paramount in all phases of operation. The adequacy of an agent-handling safety program in areas and facilities at Rocky Mountain Arsenal is unequivocally reflected in the safety record associated with manufacturing and munitions operations that span a period of 38 years. During this time frame, there have only been 11 temporary disabling injuries

and one fatality. The one fatality involved an individual who violated a work procedure when handling Phosgene (CG) in 1965. From what little information there is available, it is estimated that during the period 1947 to the present, approximately 8,100,000 manhours were expended by personnel whose work effort involved direct contact with the agent or munitions process.

A major part of this creditable record involved a 22 year span of diverse operations with nerve agent GB. This agent, which is an organophosphorous compound, is recognized as one of the most toxic substances synthesized by man. Its toxic characteristics, together with the multiplicity of operations in which it was handled, indicate a safety attitude that assumes the status of greatness. Since 1953 to the present, there have only been six temporary disabling injuries and no fatalities attributed directly to the agent. No Arsenal worker has ever been retired for a disability due to GB. The last temporary disabling injury caused by GB occurred in January 1963. An on-going program involving the demilitarization of obsolete and excess agents and munitions has been in progress since 1973 without a serious incident.

Mustard was the first agent manufactured and processed into munitions in 1943. It is reputed to be the most insidious chemical warfare agent; and considering its toxicity as well as the toxicity of its intermediates, the safety record is unmatched by any other military

installation or private industry engaged in Mustard operations. In 30 years of handling this agent, only three temporary disabling injuries were attributed to Mustard. Only one person was retired for a health condition that was compound by a Mustard exposure. The most recent Mustard program was completed in January 1974 and involved the disposal of approximately 3,900 one ton containers filled with liquid agent. This program was completed three months ahead of schedule and without a significant incident.

One of the major undertakings at Rocky Mountain Arsenal in the future will be the contamination control program. This program will be conducted at the Arsenal in three phases covering a period of approximately 17 years. The plan will include clean up of all contaminated waste areas to include industrial waste ponds. Phase One of this program will consist of three distinct parts; identification where the magnitude, type and location of contamination will be determined, development of standards to which the Arsenal properties will be cleaned up, and the investigation of the technology which might be utilized. Phase Two encompases design engineering and construction of process for the clean up equipment and facilities. Phase Three is the operational phase where actual decontamination of soil, water and structures will be accomplished. This major program commenced in early Fiscal Year 1975.

ROCKY MOUNTAIN ARSENAL GENERAL INFORMATION

Today Rocky Mountain Arsenal employs 354 civilian and 50 military personnel. The total economic impact that the Arsenal has on the surrounding communities is $14,000,000 and provides 500 citizens with jobs; in addition, 700 military reserves train at the Arsenal throughout the year. A breakout of the actual payrolls and the amount of local purchases made by the various agencies located at the Arsenal follows: The military and civilian payrolls of the Arsenal is $8,000,000 and local purchases made by the Arsenal amounts to $5,000,000. This figure includes construction and equipment purchases. Other federal government agencies located at the Arsenal have an annual payroll of $5,000,000 and make local purchases of $272,000. A private tenant at the Arsenal has an annual payroll of $13,000,000 and makes local purchases of $9,000,000. In addition, this company employs 350 personnel and uses 125 contract employees. Stearns-Roger Corporation, a local engineering company under contract to Rocky Mountain Arsenal, has an annual payroll of $ 75,000 and locally procures some $2,100,000 worth of equipment and materials.

INDUSTRIAL CAPACITY

The facilities of Rocky Mountain Arsenal provide a diversified capability for the manufacture of practically any type of chemical

product by either batch or continuous process methods, or the mass assembly plants have been designed to reflect some of the latest techniques in automatic control and because of the nature of the products produced, have been equipped with the latest safety, ventilation, and protective equipment.

The installation has its own electrical and steam generating plant. The capacity for steam generation is equal to any foreseeable needs both for the Government and lessees, and the electrical capacity is equal to normal needs with a transmission system of sufficient capacity to handle any extra quantities required through purchase from the Public Service Company. At present, the generating plant is producing electricity for sale to the Public Service Company at a dump rate which results in reducing the cost of utilities to the Arsenal.

The water system for both potable and industrial water is purchased from the City of Denver, and the installation has a million gallon reservoir for emergency use. Industrial water is primarily drawn from the South Platte River through an irrigation canal and stored in three natural lakes. Supplementing this, when necessary, are three deep well pumps capable of pumping 3,000,000 gallons per day. The sewage disposal plant is capable of handling all foreseeable demands.

Of specific significance and interest among the production facilities, is the GB Manufacturing and Filling Facility. These facilities were constructed at a cost of approximately $40,000,000. The manufacturing plant, after the initial run, was completely revised to incorporate the latest technical improvements. The plant is presently capable to producing all planned mobilization requirements. With the standardization of new munitions, the filling lines have also been modernized to reflect the most effective and safest methods of filling large quantities of all types of munitions.

HYDRAZINE BLENDING FACILITY

The hydrazine plant, a liquid blending facility built in 1959 at the request of the United States Air Force, performs the vital task of mixing hydrazine and unsymmetrical dimethlhydrazine (UDMH) to produce Aerozine 50 rocket fuel, which provided the power thrust for the lunar vehicles. Aerozine 50, mixed for the US Air Force and NASA at Rocky Mountain Arsenal, has been used successfully in the Tital and Apollo Space Programs.

The liquid fuel, along with an oxidizer (nitrogen tetroxide) are hypergolic (ignite upon contact with each other), thus eliminating the need for an ignition system and providing a restart capability. Rocky Mountain Arsenal has blended 50,000,000 pounds of this fuel for the US Air Force and NASA since 1961.

COMMUNITY RELATIONS

Throughout its history Rocky Mountain Arsenal has conducted an active and aggressive Community Relations Program. This program involves large numbers of Boy Scouts, Cub Scouts, Camp Fire Girls, school children, the Sierra Club and the Audobon Society, and other interested groups.

Scouting groups from across the nation use the Arsenal camping facilities and some of the troop barracks that are not currently in use.

Throughout the year various school groups, including retarded children, are given tours of the wildlife areas; many of these children have never seen an animal in its natural state. In addition to the wildlife tours conducted for school children, the Sierra Club and the Audobon Society have done animal studies at the Arsenal. Both of these groups have been active in the Arsenal Wildlife Management Program. The Audobon Society did a large scale bird study at the Arsenal and through this study, the Society was able to identify and catalogue 92 different species of birds.

A Community Relations Program conducted by the Arsenal was a road improvement project conducted by volunteers from the Arsenal at the Campfire Girls permanent summer camp at Foxton, Colorado.

Throughout the year the military members of the Arsenal participate in various parades held in surrounding communities. During the Army Bicentenial, the National Bicentenial and the Colorado State Centennial, the Arsenal provided a 18 member Colonial Honor Guard for the various events held throughout the state.

WILDLIFE MANAGEMENT PROGRAM

The Wildlife Management Program conducted by Rocky Mountain Arsenal is considered by many to be the best program of its type in the State of Colorado. This program is conducted in cooperation with the Colorado Division of Wildlife and has made Rocky Mountain Arsenal one of the finest wildlife preserves in the nation.

Many animals that have been injured are released at Rocky Mountain Arsenal by the Colorado Division of Wildlife. There are several reasons for this; the animals have some 18,000 acres of natural habitat at the Arsenal, natural food for these animals is plentiful, and due to security programs at the Arsenal, these animals are well protected. Some of the animals released at the Arsenal in recent years include golden eagles, racoons, fox, hawks of various types, great horned owls and deer.

The animals that reside at the Arsenal are many and varied. The major ones being deer, coyotes, fox, badgers, racoons, pheasants,

doves, chuckars, geese, ducks, rabbits, both cotton tail and jack, and prairie dogs.

One of the on-going programs being conducted at the Arsenal is the periodic health checks made by the Arsenal Staff Biologist. All of these health studies that were conducted have indicated that the resident animal population at the Arsenal are in an excellent state of health.

The only significant problem that the Arsenal has had in the area of wildlife has been with domestic animals. In recent years area residents have been abandoning their household pets on the Arsenal boundaries, primarily dogs and cats. These animals revert to ther wild state and proceed to kill animals in order to survive. Most of these domestic animals are captured and turned over to the Dumb Friends League which tries to find suitable homes for them.

STATISTICAL DATA

Number of buildings on post: 134

Number of structures on post: 102

Miles of railroad on post: 35

Miles of improved roads on post: 72

Warehouse space: 693,000 square feet

Outdoor storage space: 12,800,000 square feet

Water supply: potable - 33" main (Denver)

process - 3 wells, acre rights and storage for 560,000,000 gallons (lakes)

Sewage: Capacity for population of 6,000

Electricity: Capacity: Public Service Company - 40,000 KW

Rocky Mountain Arsenal - 8,500 KW

Steam: Capacity: 400 psi - 230,000 pounds per hour

175 psi - 450,000 pounds per hour

Construction cost: $105,000,000