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RS 3434/31
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HISTORY OF THE MK 50 WARHEAD (u)

SC-M-67-682



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RS-3434/31

Weapon Systems

01/68

Redacted Version

Information Research Division, 3434

Sandia Systematic Declassification

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A.J. Duff 2/6/97
Reviewer

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MK 50 MOD 0 WARHEAD

Mk 50 Mod 0 Warhead
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MK 50 MOD 1

Mk 50 Mod 1 Warhead

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Timetable of Mk 50 Events

Early 1955 Army Ordnance Corps requests Bell Telephone Laboratories to evaluate 1960-1970 air-defense problems. NIKE ZEUS antimissile missile proposed.

4/9/57 Assistant Secretary of Defense requests United States Atomic Energy Commission to study feasibility of nuclear warhead for NIKE ZEUS.

(b)(1), (b)(3)

1/21/58 Discussion of warhead for PERSHING, a surface-to-surface ballistic missile. Both Los Alamos Scientific Laboratory and University of California Radiation Laboratory propose warhead designs for PERSHING.

2/6/58 Feasibility study of PERSHING warhead issued. Two warhead yields and weights proposed.

2/10/58 Division of Military Application suggests that responsibility for development of NIKE ZEUS warhead be assigned to Los Alamos, due to number of programs assigned to the Radiation Laboratory.

3/3/58 Assistant Secretary of Defense requests Atomic Energy Commission to develop warhead for NIKE ZEUS.

4/4/58 Assistant Secretary of Defense requests Atomic Energy Commission to develop warhead for MINUTEMAN, an intercontinental ballistic missile.

5/6/58 Albuquerque Operations Office reports completion of MINUTEMAN warhead study to Division of Military Application.

(b)(1), (b)(3)

~~NIKE ZEUS suggested.~~ Application of same warhead to

5/21/58 Assistant Secretary of Defense requests Atomic Energy Commission to conduct further feasibility study of warheads for PERSHING in two weight classes, 300 and 600 pounds.

(b)(1), (b)(3)

6/4/58 Military Liaison Committee accepts proposal of Division of Military Application that one warhead be developed for NIKE ZEUS, MINUTEMAN, PERSHING and HOPI missiles, with weight of 350 pounds.

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3/63 Initial production of Mk 50 Mod 1 Warhead for PERSHING achieved.

4/15/63 Addendum to interim development report, covering Mk 50 Mod 1, accepted by Field Command.

9/26/63 Field Command accepts Final Development Report of Mk 50 Mod 1 Warhead.

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On March 28, 1958, another missile program was proposed when the Military Liaison Committee requested the Atomic Energy Commission to develop a suitable warhead for MINUTEMAN. This was a three-stage, solid-propellant, intercontinental ballistic missile, the upper two stages of which could be used as an intermediate-range missile and the top stage as a short-range missile. The missile could carry either a 300- or 550-pound warhead, and it was anticipated that the missile system would be operational in mid-1962, with warheads being required in large numbers.¹³ This program was subsequently authorized by the Assistant Secretary of Defense.¹⁴

Albuquerque Operations Office sent a teletype to the Division of Military Application May 6, 1958, reporting completion of the MINUTEMAN warhead study.

(b)(1), (b)(3)

The Assistant Secretary of Defense, May 21, 1958, requested the Atomic Energy Commission to cooperate in another feasibility study of warheads for the PERSHING missile system. Two warhead weight classes would be considered; 300 and 600 pounds. For the 300-pound design, the diameter would be less than 15 inches and the length about 40 inches. The 600-pound weapon would be about 18 inches in diameter and the length less than 50 inches.

(b)(1), (b)(3)

Availability date for both warheads would be compatible with missile development in late 1962, and both designs would be required in relatively large numbers.¹⁶

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The Division of Military Application had suggested that a single warhead be developed for the NIKE ZEUS, MINUTEMAN, PERSHING and HOPI missile systems, and this proposal was accepted by the Military Liaison Committee June 4, 1958. The Services felt that the diameter of this universal warhead should be from 12 to 14 inches, length 38 to 44 inches, and weight about 350 pounds.¹⁷

The Division of Military Application forwarded the request for a feasibility study of two warheads for the PERSHING missile to Albuquerque Operations Office June 24, 1958. It was noted that activities in Operation Hardtack were directly related to this study, and that any report should be deferred until test results had been analyzed.¹⁸

Military characteristics for the NIKE ZEUS missile warhead were released by the Military Liaison Committee July 15, 1958. These noted that the warhead should be rugged, reliable and simple in design; easy and safe to test, monitor, inspect, store, transport and handle; be designed to minimize possibility of human error; and require a minimum of operational tests and maintenance.

(b)(1), (b)(3)

The warhead would be capable of remaining in alert condition on the launcher, ready to fire within 15 seconds, for a period of at least 4 years.¹⁹

These characteristics were forwarded by the Division of Military Application to Albuquerque Operations Office, August 6, 1958. It was requested that advice concerning warhead parameters be issued as soon as possible, together with information as to whether a single warhead could be designed for all four missiles.²⁰

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desired weights and yields could be developed on time scales compatible with the missile. The 650-pound warhead would be provided by minor rework of the XW-47 Warhead, and the 350-pound warhead would be furnished by the XW-50.²⁶

(b)(1), (b)(3)

It was felt that the NIKE ZEUS could accept a warhead weighing up to 400 pounds, and it was requested that the Military be queried whether the XW-50 weight could be increased to this figure.

(b)(1), (b)(3)

Subsequently, the Air Force noted that MINUTEMAN could carry a 600-pound warhead, and it was decided to apply the XW-56 Warhead to this missile.²⁸ The HOPI missile was eventually dropped from consideration.

(b)(1), (b)(3)

The Director of Defense Research and Engineering notified the Military Liaison Committee June 19, 1959 that a review had been made of possible nuclear devices to be used in the XW-50 Warhead.

(b)(1), (b)(3)

The foregoing was followed by a letter from the Director of Defense Research and Engineering to the Atomic Energy Commission June 24, 1959, noting that the Joint Chiefs of Staff had determined that an operational requirement existed for

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Field Command notified Sandia September 14, 1960 that design of the XW-50 and XW-50-X1 was acceptable. This included a slight increase in mounting-flange diameter and a warhead length of 45 inches.³⁹ These changes in dimensions were authorized by an amendment to the military characteristics November 2, 1960.⁴⁰

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The warhead was 14 inches in diameter, 15-3/8 inches at the mounting flange, 44 inches long and weighed about 412 pounds. Production of the XW-50-X1 was authorized in June 1961.⁴³

(b)(1), (b)(3)

The Division of Military Application had requested that a prescribed action link be provided for the Mk 50/PERSHING.⁴⁵ After considerable study, Sandia notified Albuquerque Operations Office July 30, 1962 that incorporation of such device would make the warhead electrically incompatible with NIKE ZEUS. Modification was required, since the limited internal volume of the warhead required removal of self-destruct transverters to provide enough room for the prescribed action link. The device would be included in warhead production by late 1962, and the modified design would be called the Mk 50 Mod 1. Mk 50 Mod 0 designs for the NIKE ZEUS, released in December 1961, would be maintained in active status, but no production was authorized.⁴⁶

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Sandia subsequently notified Albuquerque Operations Office that diversion of firing sets for approaching test series would delay production of Mk 50 Mod 1's to March 1963. It was felt that this would allow the Army sufficient time to meet the overseas deployment date of March 1964 for PERSHING.⁴⁷

Field Command notified Sandia September 14, 1962 that Report SC4555(WD), Interim Development Report for the Mk 50, had been reviewed in coordination with representatives of the interested Services. The review established that the design met all requirements of the approved military characteristics, except for the following: The warhead was slightly overweight, and this was acceptable. The ability of the warhead to withstand storage for 4 years was still under study. It was requested that a letter addendum be prepared to cover the Mk 50 Mod 1 design; otherwise, the report was acceptable to the Department of Defense.⁴⁸

On October 19, 1962, Albuquerque Operations Office approved nomenclature for the Mk 50 Mod 1.⁴⁹

(b)(1), (b)(3)

The firing

set in the Mk 50 Mod 1 would not have a self-destruct system, but would incorporate a prescribed action link for PERSHING application only.⁵⁰

An amendment to the military characteristics was released December 11, 1962. This required that a coded arming control device or prescribed action link be incorporated in the warhead for PERSHING application to provide an additional measure of command control.

(b)(3)

The device would

be capable of being enabled while the missile was in the ready-to-launch condition. Errors in encoding, decoding, recoding, enabling and disabling would not cause personal injury or weapon destruction.⁵¹

Early production of the Mk 50 Mod 1 Warhead was accomplished in March 1963. No production of Mk 50 Mod 0 for application to the NIKE ZEUS missile was authorized.

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Glossary of Mk 50 Terms

Adaption Kit -- Those items peculiar to the warhead installation less the warhead; namely, the arming and fuzing systems, power supply, and all hardware, adapters, and the like, required by a particular installation. Adaption-kit components are normally grouped into a complement, radars (if used), and power supply (if required).

Albuquerque Operations Office -- The local office of the Atomic Energy Commission (AEC) concerned with the operations of Sandia Corporation.

Armed Forces Special Weapons Project -- An interdepartmental agency formed to handle military functions related to atomic weapons.

Arming -- The act of arming a weapon, that is, preparing it for firing.

Army Ballistic Missile Agency -- That part of the Army concerned with the design and production of ballistic missiles.

Assistant Secretary of Defense -- Created by Department of Defense directive, June 30, 1953, as part of DOD reorganization. Handles research and development activities of the DOD.

Ballistic Missile -- Long-range missile given a high initial velocity and which travels on a ballistic course to the target.

Barometric Fuze -- Fuze incorporating a baroswitch. A pressure device actuated by increasing air pressure as the weapon descends in its trajectory.

Barometric Switch (Baroswitch) -- A switch actuated by air pressure.

Boosting -- The technique of increasing the yield of a nuclear device by introducing deuterium-tritium gas into the implosion process to increase fission activity.

Capacitor -- A condenser that accumulates and stores electrical energy until time for detonation.

Chopper-Converter -- A device for transforming steady direct current into chopped pulses of energy.

Contact Fuze -- A fuze that detonates the weapon by contact with the ground or the target.

Defense Atomic Support Agency -- An interdepartmental agency formed to handle military functions related to atomic weapons. Originally called the Armed Forces Special Weapons Project.

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Department of Defense -- The Armed Forces, i.e., the Army, Navy and Air Force.

Design Review and Acceptance Group -- A Military committee established to review the design of a specific weapon.

Director of Defense Research and Engineering -- Change of name for the Assistant Secretary of Defense.

Division of Military Application -- An AEC office that functions as liaison between the Military and weapons designers and producers.

Environmental Sensing Device -- A device that reacts to a specific environment of the weapon, such as speed, acceleration, altitude, etc.

Field Command -- The local office of the Armed Forces Special Weapons Project (Defense Atomic Support Agency), located on Sandia Base, Albuquerque, New Mexico.

Fuzing Components -- Those weapon components that form the "fuze" of the weapon. A combination of the arming components and the firing devices that detonate the weapon at the correct time or place.

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Hardtack -- A nuclear series of 72 tests. Hardtack I was held at the Pacific Proving Grounds from April 28 to August 18, 1958. The decision to declare a moratorium on testing resulted in Hardtack II, held at the Nevada Test Site between September 12 and October 30, 1958.

Inertial Switch -- A switch containing a small weight and a spring. When subjected to an external force of acceleration or deceleration, the weight compresses the spring. Generally, a metering device is added to measure the length of time the external force is applied.

Joint Chiefs of Staff -- A group composed of the Chiefs of Staff of the Army, Navy and Air Force, to determine policy and develop joint strategic objectives of the Armed Forces.

Kiloton -- A means of measuring the yield of an atomic device by comparing its output with the effect of an explosion of TNT. A 1-kiloton yield is equivalent to the detonation effect of 1000 tons of high explosive.

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Lawrence Radiation Laboratory -- A change of name for the University of California Radiation Laboratory (which see), effective October 1958.

Los Alamos Scientific Laboratory -- A nuclear design organization located at Los Alamos, New Mexico.

Mach -- A measure of speed. Mach 1.0 is the speed of sound, or 738 miles per hour at sea level.

Military Characteristics -- The attributes of a weapon that are desired by the Military.

Military Liaison Committee -- A Department of Defense committee established by the Atomic Energy Act to advise and consult with the AEC on all matters relating to military applications of atomic energy.

Millisecond -- One thousandth of a second.

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Operation Hardtack -- See Hardtack.

Operation Plumbbob -- See Plumbbob.

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Redstone Arsenal -- An Air Force arsenal, responsible for design of large rockets.

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