Mk 30 Warhead - External View

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

RESTRICTED DATA

MK 30 MOD 0 WARHEAD
(WITH ADAPTION KIT)

Mk 30 Mod 0 Warhead - Cross Section

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

MK 30 MOD 1

Mk 30 Mod 1 Warhead - Cross Section

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

MK 30 MOD 2 WARHEAD
(WITH ADAPTION KIT)

Mk 30 Mod 2 Warhead - Cross Section

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

COMPLETE TADM

Timetable of Mk 30 Events

Late 1952	Project Heavenbound suggests use of BOMARC missile for atomic warhead carriage.
4/53	Joint Chiefs of Staff issue military requirements for adaptation of XW-12 Warhead to the Air Force BOMARC.
5/15/53	Field Command issues proposed military characteristics for an air defense weapon of 22 inches diameter.
1/5/54	Military Liaison Committee requests consideration of warhead for Navy TALOS missile.
4/13/54	AEC accepts responsibility for developing 22- and 30-inch diameter air defense atomic warheads.
5/4/54	Division of Military Application forwards approved military characteristics for 22- and 30-inch warheads to Santa Fe Operations Office.

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

3/12/55	Assistant Secretary of Defense requests AEC to develop XW-30/ TALOS-W missile warhead.
8/29/56	Sandia presents proposed ordnance characteristics report of XW-30/ TALOS-W to Special Weapons Development Board.

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

1/58	Mk 30 Mod 0 Warhead released for production.
4/4/58	Assistant Secretary of Defense requests application of Mk 30 Warhead to BOMARC missile.
6/6/58	Feasibility study reports that warhead will be compatible with BOMARC.
Early 1959	Mk 30/BOMARC Warhead program canceled.
4/15/59	Albuquerque Operations Office issues development authorization for XW-30-X1 Tactical Atomic Demolition Munition.

9/25/59	Division of Military Application requests incorporation of environmental sensing devices in Mk 30 Warhead.
11/60	Mk 30 Mod 1 Tactical Atomic Demolition Munition design released.
12/60	Mk 30 Mod 1 achieves production.
3/61	Mk 30 Mod 2 Warhead, with environmental sensing devices, design released.
6/61	Mk 30 Mod 2 Warhead achieves production.
4/64	Mk 30 Mod 3 Warhead, with 5-tumbler combination lock, design released. Later canceled.

History of the Mk 30 Warhead

The Mk 30 was one of three air-defense missile warheads designed concurrently, the others being the Mk 25 and Mk 31. As developing technology permitted the weight of nuclear devices to be reduced and their yields to be increased, it became possible to consider use of nuclear warheads for defense against mass aircraft raids. It was necessary to investigate the effects of high altitudes on operation of these warheads and in late 1952 a feasibility study of air-defense nuclear devices, called Project Heavenbound, was conducted by the Air Force Special Weapons Center. Project Heavenbound determined that BOMARC, a ground-to-air missile being developed by Boeing Aircraft Company for the Air Force, could carry an atomic warhead and, in April 1953, the Joint Chiefs of Staff issued a military requirement for the adaptation of the XW-12 Warhead to BOMARC.[1]

Field Command subsequently prepared a set of proposed military characteristics for an air-defense weapon with a diameter of 22 inches May 15, 1953.[2] These characteristics were largely written around the XW-12 Warhead, although it was evident that this design made inefficient use of nuclear material. The Bureau of Ordnance, then developing a rocket to carry the XW-12, felt that a warhead with higher performance should be chosen, and noted that the missile itself was not entirely suitable.[3]

The Los Alamos Scientific Laboratory could not guarantee an immediate improvement in the XW-12 nuclear design, and Sandia stated that components capable of operating at high altitudes would have to be devised. Sandia was developing a new X-unit which would be operationally suitable but too bulky to fit into the TALOS-W, a Navy missile also being considered for air defense use, and it was felt that any reduction in the size of this X-unit might unduly restrict its electrical characteristics. The warhead could be enclosed in a pressuretight missile compartment, or a sealed warhead provided, but either approach would require a lengthy development program.[4]

As study continued, it became apparent that the XW-12 would require major redesign before it could be used at high altitudes. The proposed military characteristics described an atomic warhead compatible with several delivery vehicles. (b)(3)

not be extended without basic redesign. The new X-unit, which might be able to operate at extremely high altitudes, was undergoing feasibility study, but cables and detonators would also have to be designed for high-altitude operation.[4]

The TALOS-W Coordination Committee met April 2, 1954, and discussed four possibilities for air-defense warheads. The first would be to use the existing XW-12 Warhead with its inherent limitations. The second would be to make minor modifications to this warhead which would improve its altitude capabilities. The third would be to design an interim 22-inch/500-pound warhead using XW-12 components. The fourth would be to design an ultimate 22-inch/350-pound warhead and provide new components.[10]

This information was forwarded to the Military Liaison Committee and, April 13, 1954, the Atomic Energy Commission accepted responsibility for developing both a 22- and a 30-inch-diameter warhead. (b)(1), (b)(3)

The Division of Military Application forwarded the approved military characteristics for 22- and 30-inch antiaircraft warheads to the Santa Fe Operations Office May 4, 1954. (b)(1), (b)(3)

This warhead was to have maximum nuclear efficiency and be compatible with the TALOS-W missile. (b)(1), (b)(3)

Doubt was expressed, however, that a 350-pound warhead could be achieved in a diameter of 22 inches.[13]

3. They would have to be easily maintained. Since personnel handling these weapons would have minimum training, the technical skill for maintenance and operation would have to be kept to a minimum.

The Board noted that the Air Force BOMARC could be used in a national perimeter defense, in conjunction with an early-warning detection system having a range of 250 to 500 miles. However, the BOMARC would not become operational until 1959, and the Navy TALOS-W would be available during the interim period. Both missiles would be capable of carrying either an XW-12 or a 22-inch air-defense warhead.[18]

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

The Assistant Secretary of Defense wrote to the Atomic Energy Commission March 12, 1955, requesting development of an XW-30/TALOS-W missile-warhead. The Navy was the cognizant agency, with normal Armed Forces Special Weapons Project relationships. Department of Defense approval of work beyond design release was withheld, pending outcome of further development work.[20]

By early May 1955, the nuclear design of the XW-30 Warhead was determined. The active material was plutonium, and would be fashioned into thin, concentric shells. The design would be boosted with deuterium-tritium gas, externally initiated, and the pit would be sealed to permit operation at high altitudes. It was felt that production could be achieved by early 1958.[21]

The Military Liaison Committee wrote to the Atomic Energy Commission June 15, 1955, stating that the Department of Defense had agreed to increase the overall weight of

the XW-30 to 500 pounds. Concerning the suggestion that the XW-25 Warhead be applied to the TALOS-W, it was noted that the missile had been designed with the XW-30 Warhead in mind, and that any change in warhead would require redesign of the missile.[22]

The Bureau of Ordnance wrote to Santa Fe Operations Office August 12, 1955, noting that development of both missile and warhead would be accelerated if some of the adaption-kit components were developed by Sandia. Sandia was requested to develop an arming and safing system, selectable contact fuze for a surface-to-surface sea capability, contact fuze for surface-to-air missiles striking a target, and a system to dispose of erratic missiles.[23] The responsibility for providing contact fuzes was later transferred to the missile development agency.[24]

By late 1955, considerable progress had been made on the XW-30 nonnuclear design. The warhead length had been fixed at 48.62 inches and the weight at 487 pounds.
(b)(1), (b)(3)

The TALOS-W Coordination Committee met December 14, 1955. Warhead design had been completed, and flight-test units would be available by July 1956. If the required 10 flights could be completed by the end of 1956, the warhead design could be released in January 1957, early production achieved in late 1957, and operational availability in July 1958.[25]

Sandia presented Report SC3842(TR), Proposed Ordnance Characteristics for the XW-30/TALOS-W Warhead Installation, to the August 29, 1956 meeting of the Special Weapons Development Board. The report noted that the TALOS-W was a rocket-launched, ramjet-propelled, supersonic, beam-riding missile designed to intercept and destroy enemy aircraft. It had a range between 2-1/2 and 100 miles, service ceiling of 70,000 feet, and maximum speed of 2400 feet per second (almost Mach 2.5). The total weight of the missile was 7700 pounds, including a solid-fuel booster that separated from the missile some 5 seconds after launch. The missile was 30 inches in diameter and 32 feet long and had a stabilizing wing with a span of 9 feet.

(b)(3)

Meanwhile, consideration had been given to applying the Mk 30 Warhead to the BOMARC and, on April 4, 1958, the Assistant Secretary of Defense suggested that savings in reactor materials could be realized if the Mk 30 were used in this application in place of the XW-40 originally proposed. It was requested that a joint feasibility study be conducted with the Air Force.[36]

The report on this study was released June 6, 1958. (b)(1), (b)(3)

Sandia notified the Division of Military Application, January 2, 1959, that a new warhead development program would be needed to provide BOMARC compatibility, and this would require 3 years before operational availability. This was due to the introduction of several new factors since issuance of the feasibility report, including an extension of armed life, provision of a dudding mechanism, and a more reliable self-destruction system.

It had also been determined that adaptation of the Mk 30 Warhead to the BOMARC was not so simple as initially believed. The lateral type of mounting required by the missile necessitated repackaging of all warhead components, redesign of sphere case, and modification to the electrical system.[38] In addition, use of internal initiation would increase the amount of tritium required[39] and, after consideration of all these factors, the program was canceled.

The Mk 30 military characteristics were amended in February 1959 to specify an unboosted version to be used in a Tactical Atomic Demolition Munition, and a development authorization was issued by Albuquerque Operations Office April 15, 1959, authorizing the XW-30-X1 TADM program. (b)(1), (b)(3)

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

A general request had been made by the Division of Military Application for replacement of 3-tumbler combination locks with 5-tumbler designs, to provide a design more resistant to saboteurs. As a result, development of the Mk 30 Mod 3 Warhead was authorized in April 1964. A study of the costs involved resulted in a later decision to cancel this modification, and the change was never incorporated.[46]

Design Review and Acceptance Group -- A Military committee that absorbed some of the functions of the Special Weapons Development Board.

Deuterium -- The hydrogen isotope of mass number 2.

Development Program Definition -- A report that describes the weapon to be designed and the steps that will be taken in its development.

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

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

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

Firing System -- The electrical system of the weapon that produces and applies a high-voltage current to the detonators.

Fuze -- A combination of the arming and firing devices of a weapon.

g -- Force equal to one unit gravity.

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

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

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.

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

Reservoir -- A container for deuterium-tritium boosting gas.

Safing -- Putting a weapon in condition such that it cannot fire.

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

Sealed Pit -- A weapon in which all the nuclear components (except the boosting gas) are permanently installed in place. Designed to eliminate the need for inflight nuclear insertion mechanisms.

Services -- The Department of Defense.

Spark Gap -- An air gap that prevents passage of electrical current. When the gap is ionized, current is conducted.

Special Weapons Development Board -- A joint Military-Sandia board at Sandia Base to provide local guidance on weapons design.

Squib -- A device containing a small powder charge. When detonated, the resulting gas pressure closes a switch or performs a similar action. A light, quick-acting, one-shot device.

Supersonic -- Any speed exceeding that of Mach 1.0, which is the speed of sound, or 738 miles per hour at sea level.

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

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

Uranium-235 -- A radioactive element, an isotope of uranium-238.

Uranium-238 -- A radioactive element, atomic number 92. Natural uranium contains about 99.3-percent uranium-238; the rest is uranium-235.

Velocity Switch -- An environmental sensing device whose action depends on the speed environment to which it is subjected.

Warhead -- A weapon carried to the target by missile.

X-Unit -- A device used to provide high voltage to the weapon detonators.

Yield -- The measure of the effect of a nuclear detonation compared to the effect of an explosion of TNT.

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(b)(3)

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(b)(3)

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(b)(3)

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(b)(3)

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37. (b)(1), (b)(3)

38.

39. (b)(1), (b)(3)

40. (b)(3)

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(b)(3)

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