**LGM 30 Minuteman**

From Wikipedia, the free encyclopedia

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| **LGM-30 Minuteman** |
|  |
| **Type** | Intercontinental ballistic missile |
| **Service history** |
| **In service** | 1962 (Minuteman I), 1965 (Minuteman II), 1970 (Minuteman III) |
| **Used by** | United States |
| **Production history** |
| **Manufacturer** | Boeing |
| **Unit cost** | $7,000,000 |
| **Specifications** |
| **Weight** | 78,000 lb (35,300 kg) |
| **Length** | 59 ft 9.5 in (18.2 m) |
| **Diameter** | 5 ft 6 in (1.7 m) (1st stage) |
|  |
| **Warhead** | Nuclear W62, W78, or (2006–) W87 |
|  |
| **Engine** | Three solid-propellant rocket motors; first stage – Thiokol TU-122 (M-55); second stage – Aerojet-General SR-19-AJ-1; third stage – Aerojet/Thiokol SR73-AJ/TC-1 |
| **Operationalrange** | 8,100 (Exact is Classified) miles (13,000 km) |
| **Flight altitude** | 700 miles (1,120 kilometers) |
| **Speed** | Approximately 15,000 mph (Mach 23, or 24,100 km/h, or 7 km/s) (terminal phase) |
| **Guidancesystem** | Inertial |
| **Accuracy** | 150 m CEP |
| **Launchplatform** | Missile Silo |

The LGM-30 Minuteman is a U.S. nuclear missile, a land-based intercontinental ballistic missile (ICBM). As of 2010, the version LGM-30G Minuteman-III is the only land-based ICBM in service in the United States. It is one component of a nuclear triad, which is complemented by the Trident submarine-launched ballistic missile (SLBM) and by nuclear weapons carried by long-range strategic bombers.

The letter “L” in “LGM” indicates that the missile is silo-launched; the “G” indicates that it is designed to attack ground targets; the “M” indicates that it is a guided missile.

The name “Minuteman” comes from the Revolutionary War’s Minutemen. It also refers to its quick reaction time; the missile can be launched in about 1 minute. The Air Force plans to keep the missile in service until at least 2030.

The current US force consists of 450 Minuteman-III missiles in missile silos around F.E. Warren AFB, Wyoming; Malmstrom AFB, Montana; and Minot AFB, North Dakota.

**History**



Minuteman I missile

The previous versions, Minuteman-I and Minuteman-II, were in service from 1962 until 1997. The Minuteman had two innovations that gave it a long practical service life: a solid rocket booster, and a digital flight computer. This computer was one of the very first recognizably modern embedded systems. The solid rocket booster made the Minuteman faster to launch than earlier ICBMs, which used liquid rocket propellants.

A reprogrammable inertial guidance system was a major risk in the original program. When first proposed, no one had built a digital computer that would fit in a missile. One program, the SM-64 Navaho, had already failed to produce such a system. A digital computer was essential to obtain the accuracy gains that kept this weapon effective throughout the Cold War. As the Defense Mapping Agency (now part of National Geospatial-Intelligence Agency) more accurately mapped mass concentrations in the Earth, the inertial guidance software could be updated and loaded into the missiles to make them ever more accurate by having them compensate for these sources of gravity. Another gain that persuaded program managers to accept the risk of the computer was that the computer could also be used to test the missile. This saved a large amount of weight in cables and connectors.

**Minuteman-I (LGM-30A/B or SM-80/HSM-80A)**



Autonetics D-17 guidance computer from a Minuteman I missile.

**Deployment**

The LGM-30A Minuteman-I was first test-fired on 1 February 1961,[5] and entered into the Strategic Air Command’s arsenal in 1962, at Malmstrom Air Force Base, Montana; the “improved” LGM-30B became operational at Ellsworth Air Force Base, South Dakota, Minot Air Force Base, North Dakota, F.E. Warren Air Force Base, Wyoming, and Whiteman Air Force Base, Missouri in 1963. All 800 Minuteman-I missiles were delivered by June 1965. Each of the bases had 150 missiles emplaced. F.E. Warren AFB had 200 of the Minuteman 1B's. Malmstrom AFB had 150 of the Minuteman I and about five years later added 50 of the Minuteman II similar to those installed at Grand Forks AFB, ND.

**Guidance**

The Minuteman-I Autonetics D-17 flight computer used a rotating air bearing magnetic disk holding 2,560 “cold-stored” words in 20 tracks (write heads disabled after program fill) of 24 bits each and one alterable track of 128 words. The time for a D-17 disk revolution was 10 ms. The D-17 also used a number of short loops for faster access of intermediate results storage. The D-17 computational minor cycle was three disk revolutions or 30 ms. During that time all recurring computations were performed. For ground operations the inertial platform was aligned and gyro correction rates updated. During flight, filtered command outputs were sent each minor cycle to the engine nozzles. Unlike modern computers, which use descendants of that technology for secondary storage on hard disk, the disk was the active computer memory. The disk storage was considered hardened to radiation from nearby nuclear explosions, making it an ideal storage medium. To improve computational speed, the D-17 borrowed an instruction look-ahead feature from the Autonetics-built Field Artillery Data Computer (M18 FADAC) that permitted simple instruction execution every word time.

The D-17B and the D-37C guidance and control computers were integral components of the Minuteman I and II missiles, respectively, which formed a part of the United States ICBM arsenal. The Minuteman III missiles, which use D-37D computers, complete the 1000 missile deployment of this system. The initial cost of these computers ranges from about $139,000 (D-37C) to $250,000 (D-17B).

**Minuteman-II (LGM-30F)**

The LGM-30F Minuteman-II was an improved version of the Minuteman-I missile. Development on the Minuteman-II began in 1962 as the Minuteman-Is entered the Strategic Air Command’s nuclear force. Minuteman-II production and deployment began in 1965 and completed in 1967. It had an increased range, a greater throw weight and guidance system with better azimuthal coverage, providing military planners with better accuracy and a wider range of targets. Some missiles also carried penetration aids, allowing higher probability of kill against Moscow’s anti-ballistic missile system. The payload consisted of a single Mk-11C reentry vehicle containing a W56 nuclear warhead with a yield of 1.2 megatons of TNT (5 PJ).

The major new features provided by Minuteman-II were:

* An improved first-stage motor to increase reliability.
* A novel, single, fixed nozzle with liquid injection thrust vector control (TVC) on a larger second stage motor to increase missile range. Additional motor improvements to increase reliability.
* An improved guidance system, incorporating semiconductor integrated circuits and miniaturized discrete electronic parts. Minuteman-II was the first program to make a major commitment to these new devices. Their use made possible multiple target selection, greater accuracy and reliability, a reduction in the overall size and weight of the guidance system, and an increase in the survivability of the guidance system in a nuclear environment.
* A penetration aids system to camouflage the warhead during its reentry into an enemy environment. In addition, the Mk-11C reentry vehicle incorporated stealth features to reduce its radar signature and make it more difficult to distinguish from decoys.
* A larger warhead in the reentry vehicle (RV) to increase kill probability.

System modernization was concentrated on launch facilities and command and control facilities. This provided decreased reaction time and increased survivability when under nuclear attack. Final changes to the system were performed to increase compatibility with the expected LGM-118A Peacekeeper. These newer missiles were later deployed into modified Minuteman silos.

The Minuteman-II program was economically important to the development of integrated circuits. It was the first mass-produced system to use a computer constructed from integrated circuits (the Autonetics D-37C), and used most of the production of such circuits from 1962 through 1967. The Minuteman-II integrated circuits were diode-transistor logic and diode logic made by Texas Instruments. The other major customer of early integrated circuits was the Apollo Guidance Computer, which had similar weight and ruggedness constraints. The Apollo integrated circuits were resistor-transistor logic made by Fairchild Semiconductor. The Minuteman-II flight computer continued to use rotating magnetic disk for primary storage.

**Minuteman-III (LGM-30G): the current model**





Side view of Minuteman-III ICBM



Airmen work on a Minuteman III’s Multiple Independently-targetable Re-entry Vehicle (MIRV) system. Current missiles carry a single warhead.

The LGM-30G Minuteman-III program started in 1966, and included several improvements over the previous versions. It was first deployed in 1970. Most modifications related to the final stage and reentry system (RS). The final (third) stage was improved with a new fluid-injected motor, giving finer control than the previous four-nozzle system. Performance improvements realized in Minuteman-III include increased flexibility in reentry vehicle (RV) and penetration aids deployment, increased survivability after a nuclear attack, and increased payload capacity. The missile retains a gimballed inertial guidance system.

Minuteman-III originally contained the following distinguishing features:

* Armed with W62 warhead, having a yield of only 170 kilotons TNT, instead of previous W56's yield of 1.2 megatons
* It was the firstmissile in the world that employed multiple independently targetable reentry vehicle (MIRV). The Minuteman III was originally designed with the capability of carrying three separate warheads, 330 kt.each. A single missile was then able to target 3 separate locations. This was an improvement from the Minuteman I and II models, which were only able to carry one large warhead.
	+ An RS capable of deploying, in addition to the warheads, penetration aids such as chaff and decoys.
	+ Minuteman-III still being a missile with three solid-fuel stages, introduced in the post-boost stage (“bus”) an additional liquid-fuel propulsion system rocket engine (PSRE) that is used to slightly adjust the trajectory. This enables to dispense decoys or – in the past case of MIRV – dispense individual RVs to separate targets. For the PSRE it uses the bipropellant Rocketdyne RS-14 engine.
* The Hercules M57 third stage of Minuteman I & II had thrust termination ports on the sides. These ports, when opened by detonation of shaped charges, reduced the chamber pressure so abruptly that the interior flame was blown out. This allowed a precisely timed termination of thrust for targeting accuracy. The larger Minuteman III third stage motor also has thrust termination ports although the final velocity is determined by PSRE.
* A fixed nozzle with a liquid injection TVC system on the new third-stage motor (similar to the second-stage Minuteman-II nozzle) additionally increased range.
* A flight computer (Autonetics D37D) with larger disk memory and enhanced capability.
	+ A Honeywell HDC-701 flight computer which employed non-destructive read out (NDRO) plated wire memory instead of rotating magnetic disk for primary storage was developed as a backup for the D37D, but was never adopted.
	+ The Guidance Replacement Program (GRP), initiated in 1993, replaced the disk-based D37D flight computer with a new one that uses radiation-resistant semiconductor RAM.



Minuteman-III MIRV launch sequence :

1. The missile launches out of its silo by firing its 1st stage boost motor (*A*).
2. About 60 seconds after launch, the 1st stage drops off and the 2nd stage motor (*B*) ignites. The missile shroud (*E*) is ejected.
3. About 120 seconds after launch, the 3rd stage motor (*C*) ignites and separates from the 2nd stage.
4. About 180 seconds after launch, 3rd stage thrust terminates and the Post-Boost Vehicle (*D*) separates from the rocket.
5. The Post-Boost Vehicle maneuvers itself and prepares for re-entry vehicle (RV) deployment.
6. The RVs, as well as decoys and chaff, are deployed during back-away.
7. The RVs and chaff re-enter the atmosphere at high speeds and are armed in flight.
8. The nuclear warheads detonate, either as air bursts or ground bursts.

CGI videos of the Minuteman III Flight Profile are available.





A Minuteman III missile in its silo

The existing Minuteman III have been further improved over the decades in service.

**Guidance Replacement Program (GRP)**

The Guidance Replacement Program (GRP) replaces the NS20A Missile Guidance Set with the NS50A Missile Guidance Set. The newer system extends the service life of the Minuteman missile beyond the year 2030 by replacing aging parts and assemblies with current, high reliability technology while maintaining the current accuracy performance. The replacement program was completed 25 February 2008.



Inspection of missile guidance set in a payload transporter

**Propulsion Replacement Program (PRP)**

Beginning in 1998 and continuing through 2009,[7] the Propulsion Replacement Program extends the life and maintains the performance by replacing the old solid propellant boosters (downstages).

**Single Reentry Vehicle (SRV)**

The Single Reentry Vehicle (SRV) modification enabled the United States ICBM force to abide by the now-vacated START II treaty requirements by reconfiguring Minuteman-III missiles from three reentry vehicles down to one. Though it was eventually ratified by both parties, START II never entered into force and was essentially superseded by follow-on agreements such as SORT and New START, which do not limit MIRV capability.

**Safety Enhanced Reentry Vehicle (SERV)**

Beginning in 2005, Mk-21/W87 RVs from the deactivated Peacekeeper missile will be placed on the Minuteman-III force under the Safety Enhanced Reentry Vehicle (SERV) program. The older W78 currently used is not equipped with important safety features. In addition to adding additional safety features into at least a portion of the future Minuteman-III force, the decision to transfer W87s onto the missile is based on two features that will improve the targeting capabilities of the weapon: more fusing options which will allow for greater targeting flexibility and the most accurate reentry vehicle available which provides a greater probability of damage to the designated targets. The first SERV Minuteman III was put on alert status at FE Warren AFB, Wyoming, in 2006.

**Current and future deployment**

The Minuteman III missile entered service in 1970, with weapon systems upgrades included during the production run from 1970 to 1978 to increase accuracy and payload capacity. As of 2008[update], the USAF plans to operate it until at least 2030.

The LGM-118A Peacekeeper (MX) ICBM, which was to have replaced the Minuteman, was retired in 2005 as part of START II.

A total of 450 LGM-30G missiles are emplaced at F.E. Warren Air Force Base, Wyoming (90th Missile Wing), Minot Air Force Base, North Dakota (91st Missile Wing), and Malmstrom Air Force Base, Montana (341st Missile Wing). All Minuteman I and II have been retired. The United States prefers to keep its MIRV deterrent on submarine-launched Trident Nuclear Missiles.

**Testing**

Minuteman III missiles are regularly tested with launches from Vandenberg Air Force Base. The most recent launch was of an unarmed Minuteman III missile from Vandenberg Air Force Base, Calif., which was safely terminated in flight over the Pacific Ocean in the early morning hours of July 28th, 2011.

Controllers observed an anomaly during the last portion of the mission, prompting them to terminate the test early for safety reasons. An anomaly is any unexpected event during the test.

A launch analysis group was formed to investigate. The LAG included members from the 576th Flight Test Squadron, 30th Space Wing safety office, Air Force Nuclear Weapons Center and Northrop Grumman, among other organizations.

The current Minuteman III configuration has a reliable test and evaluation track record, with 22 of 24 fully successful flight tests. The last test to be terminated by mission controllers occurred in 1998.

The 576th FLTS, at Vandenberg AFB, Calif., is responsible for planning, preparing, conducting and assessing ICBM ground and flight tests.

Prior to the July test flight, the most recent was just before 6:40 AM on June 22, 2011. The unarmed missile traveled 4,200 miles meeting its target in the Marshall Islands. Defense officials will use the data collected from the launch to ensure the readiness and capability of the Intercontinental Ballistic Missile Fleet.

Previous to that, the most recent launch from California's Vandenberg Air Force Base was on September 17, 2010, sent a single re-entry test vehicle into suborbital space on a flight that soared some 5,300 miles (8,530 km) across the Pacific Ocean, successfully landing on target about 200 miles (322 km) southwest of Guam.

**Related programs**

* Remote Visual Assessment (RVA) – provides real-time video to ICBM security forces. This video allows forces to respond to threats more quickly, and with appropriate force and situational awareness. RVA will also cut down on “wear and tear” of equipment and personnel, often caused from responding to false alarm threats.
* Rivet MILE – Minuteman Integrated Life Extension. Included IMPSS security system upgrade.
* Rivet ADD – Modification of Minuteman-II launch facilities to hold MM III missiles
* Missile Defense – Kinetic Energy Interceptor (KEI, “space bullet”)
* LONG LIFE – launch of Minuteman from 'live' launch facility w/7 sec of fuel
* BUSY SENTRY – Strategic Air Command exercise for intercontinental ballistic missile units.
* BUSY SURVEY II – Strategic Air Command Single Integrated Operational Plan (SIOP) 4D missile training assistance program
* BUSY USHER – Strategic Air Command launch of No. 13 LF-02 missile MK-1 Minuteman II
* BUTTON UP – Strategic Air Command security system reset procedures used during Minuteman facility wind down
* DUST HARDNESS – A modification improvement to Minuteman III approved for service use in 1972
* GIANT PATRIOT – The code name describes an operational base launch program of test flights of Minuteman II missiles. The program was terminated by Congress in July 1974
* GIANT PLOW – An Air Force Minuteman launcher closure test program
* GIANT PROFIT – A Minuteman modified operational missile test plan
* GIGANTIC CHARGE – Program to notify NORAD of all or part of strategic integrated operational plan (SIOP) targeting for Minuteman
* GIN PLAYER – Strategic Air Command tests of Minuteman missile for identification and execution
* HAVE LEAP – A Space and Missile Test Center support of Minuteman III program
* MIDDLE GUST – An Air Force test conducted at Crowley, CO involving a simulated nuclear over blast of a Minuteman silo
* OLD FOX – Minuteman III flight tests
* OLYMPIC ARENA III – Strategic Air Command missile competition of all nine operational missile units
* OLYMPIC EVENT – A Minuteman III nuclear operational systems test
* OLYMPIC PLAY – A Strategic Air Command missiles and operational ground equipment program for EWO missions
* OLYMPIC TRIALS – A program to represent a series of launches having common objectives
* PACER GALAXY – Support of Minuteman force modification program
* PAVE PEPPER – An Air Force SAMSO (Space & Missile Systems Organization) project to decrease the size of the Minuteman III warheads and allow for more to be launched by one Minuteman.
* RIVET SAVE – A Minuteman crew sleep program modification to reduce personnel number
* SABER SAFE – Minuteman pre-launch survivability program
* SABER SECURE – A Minuteman rebasing program
* SENTINEL ALLOY – Land gravity surveys in support of the Minuteman system, cancelled
* UPGRADE SILO – A modification improvement program for Minuteman III

**Influences**





Recreation Room, Launch Control Facility, F. E. Warren Air Force Base near Raymer, Colorado

The Minuteman Missile National Historic Site in South Dakota preserves a Launch Control Facility (D-01) and a launch facility (D-09) under the control of the National Park Service.

**Appearances in media**

Footage of Minuteman III ICBM test launches have been featured in several theatrical films and television movies where missile launch footage is needed. The Department of Defense film released for use was mainly drawn from Vandenberg Air Force Base test shots in 1966, including from a "salvo launch" (more than one ICBM launched simultaneously).

Theatrically released films using the footage include (most notably), the 1978 film *Superman* (which features the "twin shot"), and more extensively, the 1977 nuclear war film *Damnation Alley.* The made for TV film *The Day After* also features the same footage, although the first stage of flight is completed via special effects. *Terminator 3* uses computer generated images of Minuteman missiles launching from the Plains on Judgment Day. Also features in *Eagle Strike*, by Anthony Horowitz, in which fictional power-crazed multimillionaire Damian Cray orders their release from Air Force One. In the film *WarGames* a failed Minuteman launch simulation exercise caused by a conflicted launch control officer is the impetus for the conversion of the missiles to fully automatic control by the computer system that Mathew Broderick's character later hacks into.

**Other roles**

**Mobile Minuteman program**



Mobile Minuteman Artist Conception

While the silo-based Minuteman was in development, the United States Air Force released details about a rail-based counterpart. On October 12, 1959, details on the system, called the “Mobile Minuteman,” were released to the public. The system used the United States railroad network to help increase the system's survivability during nuclear attack. A performance test, code named Operation Big Star, was conducted from June 20 to August 27, 1960 at Hill Air Force Base, Utah. The United States Air Force then activated the 4062nd Mobile Missile Wing on December 1, 1960. The wing was to have three missile train squadrons, each with ten trains and each train carrying three missiles (30 missiles per squadron). Lack of support by the Kennedy Administration killed the Mobile Minuteman Program; on December 1, 1961, the Department of Defense deleted the three mobile missile squadrons from its budget. The USAF officially deactivated the 4062nd Mobile Missile Wing on February 20, 1962.

The dreams of a rail-based missile system were kept alive through the LGM-118A Peacekeeper Rail Garrison and the Soviet Union’s SS-24 Scalpel rail-based ICBM.



Air Mobile Feasibility Demonstration – 24 Oct 1974

On 24 Oct 1974, the Space and Missile Systems Organization successfully conducted an Air Mobile Feasibility Test where a C-5A Galaxy aircraft air dropped the 86,000-pound missile from 20,000 feet over the Pacific Ocean. The missile descended to 8,000 feet before its rocket engine fired. The 10-second engine burn carried the missile to 20,000 feet again before it dropped into the ocean. The test proved the feasibility of launching an intercontinental ballistic missile from the air. Operational deployment was discarded due to engineering and security difficulties, though the capability was used as a negotiating point in the Strategic Arms Limitation Talks.

**Emergency Rocket Communications System (ERCS)**

See also: Emergency Rocket Communications System

An additional part of the National Command Authority communication relay system was called the Emergency Rocket Communication System (ERCS). Specially designed rockets called BLUE SCOUT carried radio-transmitting payloads high above the continental United States, to relay messages to units within line-of-sight. In the event of a nuclear attack, ERCS payloads would relay preprogrammed messages giving the “go-order” to SAC units. BLUE SCOUT launch sites were located at Wisner, West Point and Tekamah, Nebraska. These locations were vital for ERCS effectiveness due to their centralized position in the US, within range of all missile complexes. Later ERCS configurations were placed on the top of modified Minuteman-II ICBMs (LGM-30Fs) under the control of the 510th Strategic Missile Squadron located at Whiteman Air Force Base, Missouri.

The Minuteman ERCS may have been assigned the designation **LEM-70A**.

**Satellite launching role**

See also: Minotaur (rocket) and Conestoga (rocket)

The U.S. Air Force has considered using some decommissioned Minuteman missiles in a satellite launching role. These missiles would be stored in silos, for launch upon short notice. The payload would be variable, and would have the ability to be replaced quickly. This would allow a surge capability in times of emergency.

During the 1980s, surplus Minuteman missiles were used to power the Conestoga rocket produced by Space Services Inc. of America. It was the first privately developed rocket, but only saw three flights and was discontinued due to a lack of business. More recently, converted Minuteman missiles have been used to power the Minotaur line of rockets produced by Orbital Sciences.

**Ground and air launch targets**

L-3 Communications is currently using SR-19 SRBs, Minuteman II Second Stage Solid Rocket Boosters, as delivery vehicles for a range of different re-entry vehicles as targets for the THAAD and ASIP interceptor missile programs as well as radar testing.

**Operator**



Connectivity of 91st SW Missile Field

United States: The United States Air Force has been the only operator of the Minuteman ICBM weapons system, currently with three operational wings and one test squadron operating the LGM-30G. The active inventory in FY 2009 is 450 missiles and 45 Missile Alert Facilities (MAF)

**Operational units**

The basic tactical unit of a Minuteman wing is the squadron, consisting of five flights. Each flight consists of ten unmanned launch facilities (LFs) which are remotely controlled by a manned launch control center (LCC). The five flights are interconnected and status from any LF may be monitored by any of the five LCCs. Each LF is located at least three nautical miles (5.6 km) from any LCC. Control does not extend outside the squadron (thus the 319th Missile Squadron’s five LCCs cannot control the 320th Missile Squadron’s 50 LFs even though they are part of the same Space Launch Wing). Each Minuteman wing is assisted logistically by a nearby Missile Support Base (MSB).

**Active**



Active LGM-30 Minuteman deployment, 2010

* 90th Missile Wing

150 Missiles, 15 MAF

Francis E. Warren AFB, Wyoming, (1 July 1963 – present)

LGM-30B Minuteman I, 1964–1974

LGM-30G Minuteman III, 1973–present

319th Missile Squadron "Screaming Eagles"

320th Missile Squadron "G.N.I."

321st Missile Squadron "Frontier Warriors"

90th Missile Wing LGM-30 Minuteman Missile Launch Sites

* 91st Missile Wing "Roughriders"

150 Missiles, 15 MAF

Minot AFB, North Dakota (25 June 1968-Present)

LGM-30B Minuteman I, 1968–1972

LGM-30G Minuteman III, 1972-Present

740th Missile Squadron "Vulgar Vultures"

741st Missile Squadron "Gravelhaulers"

742d Missile Squadron "Wolf Pack"

91st Missile Wing LGM-30 Minuteman Missile Launch Sites

* 341st Missile Wing

150 Missiles, 15 MAF

Malmstrom AFB, Montana (15 July 1961 – present)

LGM-30A Minuteman I, 1962–1969

LGM-30F Minuteman II, 1967–1994

LGM-30G Minuteman III, 1975-Present

10th Missile Squadron "First Aces"

12th Missile Squadron "Red Dawgs"

490th Missile Squadron "Farsiders"

341st Missile Wing LGM-30 Minuteman Missile Launch Sites

**Historical**

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| --- | --- |
| * 44th Strategic Missile (later Missile) Wing "Black Hills Bandits"
* 341st Missile Wing
	+ - 564th Missile Squadron (Inactivated 2008, Minutemen retired.)
* 351st Strategic Missile (later Missile) Wing
* 455th Strategic Missile Wing

Whiteman AFB, Missouri (1 February 1963 – 31 July 1995)LGM-30B Minuteman I, 1963–1965LGM-30F Minuteman II, 1965–1995508th Missile Squadron509th Missile Squadron510th Missile Squadron351st Missile Wing LGM-30 Minuteman Missile Launch SitesInactivated under START-I. The first silo was imploded on December 8, 1993 and the last on December 15, 1997.Minot AFB, North Dakota (28 June 1962 – 25 June 1968)LGM-30B Minuteman I, 1962–1968Replaced by the 91st Strategic Missile Wing in June 1968Ellsworth AFB, South Dakota (24 November 1961 – 5 July 1994)LGM-30B Minuteman I, 1963–1973LGM-30F Minuteman II, 1971–199466th Missile Squadron67th Missile Squadron68th Missile Squadron44th Missile Wing LGM-30 Minuteman Missile Launch SitesInactivated 1994 when Minuteman II phased out of inventory. All retired between December 3, 1991 and April 1994, with destruction of silos and alert facilities finishing in 1996.* 90th Missile Wing

400th Missile Squadron (Converted to LGM-118A Peacekeeper in 1987. Inactivated 2005. Peacekeepers retired.)* 321st Strategic Missile (later Missile) Wing (later Group)

Grand Forks AFB, North Dakota (14 August 1964 – 30 September 1998)LGM-30F Minuteman II, 1965–1973LGM-30G Minuteman III, 1972–1998446th Missile Squadron447th Missile Squadron448th Missile Squadron321st Missile Wing LGM-30 Minuteman Missile Launch SitesInactivated by BRAC 1995; missiles reassigned to 341st SMW, however in 1995 it was decided to retire the Grand Forks missiles; the last missile was pulled from its silo in June 1998. Destruction of silos and control facilities began in October 1999; the last silo (H-22) was imploded August 24, 2001 (the last US silo destroyed per the 1991 START-I treaty). |  |

**Support**

* 532d Training Squadron – Vandenberg AFB, California (Missile Maintenance: "the most important piece of the pie")
* 392d Training Squadron – Vandenberg AFB, California (Missile Initial Qualification Course)
* 328th Weapons Squadron – Nellis AFB, Nevada (ICBM Weapons Instructor Course)
* 526th ICBM Systems Wing – Hill Air Force Base, Utah
* 576th Flight Test Squadron – Vandenberg Air Force Base, California – "Top Hand"
* 625th Strategic Operations Squadron – Offutt AFB, Nebraska – Strategic Nuclear Targeting

**Minuteman chronology**

**Photo gallery**

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Family of Minuteman missiles

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Minuteman-I Line Drawing

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Minuteman III Line Drawing

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Minuteman-II launch

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Mark 5 Re-entry vehicle for Minuteman IA

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Color Photo of MM I

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Mockup MM on test stand

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Static firing of downstage

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Inspection of MM I

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Test Sequence

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Test Silo

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Silos at Edwards AFB

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MM I being transported by rail

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Mobile Minuteman Train