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MINUTEMAN-3 ICBMs:
STATE-OF-THE-ART FIRST-STRIKE WEAPONS

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When the Pentagon wants to minimize the importance of Minuteman-3 intercontinental ballistic missiles (ICBMs) they will describe them in such terms as "an aging weapons system," or missiles "deployed over 30 years ago," or "1960s vintage missiles." To detract from the aggressive potential of the Minuteman-3 system, it is called "a defensive system," or "a deterrent." Minuteman-3 ICBMs are neither antiquated nor benign. They are state-of-the-art, first-strike weapons. First I will discuss the modern technology of this missile system and then I'll go into its aggressive capability.

MINUTEMAN-3: A STATE-OF-THE-ART WEAPON

It is true that the first Minuteman-3 missiles were deployed in 1970 -- over 30 years ago. They were the first missiles in the world to enter service with multiple independently-targeted reentry vehicles (MIRVs). Each Minuteman-3 originally carried three MIRVs which could be sent to separate targets. That meant, instead of one missile attacking one target, one missile could attack many targets -- three in the case of Minuteman-3. The first warheads deployed on this new ICBM were 170-kiloton W62 bombs encased in Mark-12 reentry vehicles. A reentry vehicle carries the bomb back down through the atmosphere without it burning up from air friction at extreme velocities reaching 23 times the speed of sound.

The Minuteman-3 was a huge leap in technology at the time it entered service. But the Minuteman-3s of the 1970s came nowhere near approximating the Minuteman-3s of today. The current missile system has gone through a continuous remodeling to keep it up to the latest technology. Components and parts of the missile have been updated or replaced. Support systems and missile facilities have been constantly upgraded. Command & Control systems has been continuously tweaked to top performance including retargeting the missiles and the length of time to do that. Just nine years after deployment, penetration aids (chaff and decoys) were added to help overcome enemy defenses during the missile's flight. Also during the late 1970s, 300 of the missiles had their W62 warheads replaced by 335-kiloton W78 nuclear bombs encased in Mark-12A reentry vehicles. Shortly after that, the ability to quickly and remotely retarget the missiles was provided. Below is a summary of the most recent key programs.

Minuteman-3 Improvement Programs.

Rivet MILE (Minuteman Integrated Life Extension) program, initiated during the 1980s, is a modification program for missile support systems and ICBM facilities. This includes replacement of standby power systems and repair of launch facilities.

The Rapid Execution and Combat Targeting (REACT) equipment modification for Launch Control Centers became operational in mid-1996. It cuts the re-targeting time in half – from 20 hours for the entire force to 10 hours, but single missiles can be retargeted almost instantly. REACT also integrates the command of Launch Control Centers with that of Higher Authority through updated, survivable communications and new command and control consoles which enhance instantaneous communication. Other improvements are automation of routine functions, improving crew survivability, and implementing better maintenance.

The Minuteman-3 Guidance Replacement Program (GRP), started in 1993, is a hardware and software modification program that upgrades the NS-20 guidance packages to extend their service lives through 2020. It replaces the guidance computers, the signal converters, and the power distribution components. The inertial measurements units (gyros and accelerometers) remain the same. The GRP will also remanufacture the inter-stage hardware and pyrotechnic devices. Software upgrades will modified the Operational Targeting Program and the Flight Program Constants Tape. The new guidance systems will be designated NS-50. 652 units are to be built.

The Minuteman Propulsion Replacement Program (PRP) entered the acquisition stage in December 1995. PRP will remanufacture all three solid rocket motor stages -- presumably including installation of the latest propellant -- to extend the missiles' service lives through 2020. 607 booster motor sets are to be remanufactured.

The fourth, liquid-fueled stages of the Minuteman-3s -- the motors that maneuver the post-boost control systems which drop off the MIRVs for their specific targets -- are also undergoing refurbishment to extend their life cycles until 2020. Seven key components of these engines will be replaced.

GPS Fixes for Minuteman-3.

There has apparently been a small loss of accuracy with the new guidance system. The Air Force does not seem much bothered by that. That is probably because the accuracy can be improved immensely by using Global Positioning System (GPS) course corrections from NAVSTAR satellites. The full constellation of 24 satellites are currently in orbit giving global coverage for navigation fixes along with speed and direction. The military is installing GPS receivers in many key weapons. The Tomahawk cruise missiles, only 21 inches diameter, have all been equipped with GPS receivers to provide extreme precision in delivering their bomb. Even 155 millimeter artillery shells, a mere 6 inches in diameter, have been equipped with GPS receivers. Minuteman-3s are 5½ feet in diameter. There is plenty of room to install a GPS receiver, which is no larger than a cigarette package. It is not reasonable to believe that the Pentagon has not installed these very precise, very reliable, very cheap, and very available navigation systems on Minuteman-3 missiles.

MX Warheads Transferred To Minuteman-3.

The START-2 Treaty required that the US remove all but one warhead from each Minuteman-3 missile, and remove all fifty MX missiles (considered a heavy ICBM) from service. The Pentagon started downloading Minuteman-3 warheads and, to date, 150 missiles carrying the W62 warhead have been downloaded to only one warhead. The original plan was to eventually download the entire Minuteman-3 force. Then, after MX missiles are retired their W87 warheads in the Mark-21 reentry vehicles were to become the one warhead on each of the 500 Minuteman-3s. The W87 bombs are more powerful than W62s and about the same power as W78s, but they have additional safety features.

Then the US and Russia signed the Strategic Offensive Reductions Treaty (SORT) on 24 May 2002 which resulted in START-2 being discarded. Some warhead reduction is still needed to satisfy the total warhead mix the US desires under START-1, and the MX missiles will probably still be dismantled. But the specific numbers of warheads on Minuteman-3 missiles, and how they will be mixed, has not been publicly announced. One thing is certain, however. They will eventually all be large warheads in the 330-kiloton range installed on missiles with precision accuracy.

MARVs and Penetrators for Minuteman-3.

Maneuvering reentry vehicles (MARVs), when available, could be installed on Minuteman-3 missiles. When I was a design engineering group leader in the late 1960s and early 1970s at Lockheed Missiles & Space Company (now Lockheed Martin Space Systems Company), I had charge of designing a MARV which was flight tested in the early 1970s. Other companies were investigating other types of MARVs. They were a secret project then and they are likely a secret project now. MARVs could also carry GPS receivers which would guide them right down to earth within a dozen steps of their targets.

Another type of warhead which may soon be available is the deep penetrator. Some sources say that US interests in earth-penetrating warheads dates back to the 1950s. As a design specialist at Lockheed, I investigated them in the early 1970s. The concept was eventually dropped at that time because of size and weight. But interest picked up again later. On 28 September 1988 a Genie rocket tested a penetrating warhead which contained a full scale bomb with mock nuclear components. The warhead burrowed 22 feet deep and was recovered with the bomb in good condition. The kinetic energy KE2 warhead for the Tactical Tomahawk Penetrator variant -- designed to plow through layers of steel-reinforced concrete before exploding -- has been tested on rocket sleds since 1999. Neither should we forget the B61, Mod-11 bomb designed as an earth penetrator, which is now operational.

In 2001, the Pentagon and the Energy Department began studies on a new, low-yield nuclear warhead that could be used in regional wars to penetrate deeply-buried command bunkers. A 1994 law currently forbids research and development on nuclear weapons of less than 5 kilotons yield because they blur the distinction between nuclear and conventional war. That law would have to be overturned before low-yield bombs can progress beyond the study stage. Nevertheless, in compliance with the Bush administration's Nuclear Posture Review, the national laboratories have been ordered to perform a $45 million feasibility study on low-yield, earth-penetrating nuclear weapons. Called the "Robust Nuclear Earth Penetrator," Lawrence Livermore National Laboratory is looking at a modified B-83 hydrogen bomb. Los Alamos National Laboratory is investigating further modifications to the B-61 bomb.

For fiscal year 2003, which began 1 October 2002, the House approved $15 million to continue studies of the Robust Nuclear Earth Penetrator. The Senate approved nothing. Status as of 6 September 2002 was that the House-Senate conferees will try to reach a compromise. At any rate, the next Congress will undoubtedly pass supplemental funding for this study and could well make development and production of earth penetrators legal.

With Minuteman-3 carrying only one warhead, that warhead could be large and very heavy. The missile's tremendous reentry velocity is capable of providing the deepest penetration which would wreak the most destruction to underground emplacements.

Summary.

In summary, the Air Force's fact sheet succinctly describes the evolution of today's Minuteman-3 ICBM force: "Through state-of-the-art improvements, the Minuteman system has evolved to meet new challenges and assume new missions. Modernization programs have resulted in new versions of the missile, expanded targeting options, improved accuracy and survivability. Today's Minuteman weapons system is the product of almost 40 years of continuous enhancement."[1]

MINUTEMAN-3: A FIRST-STRIKE WEAPON

Thirty years ago I left my engineering position at Lockheed because I could not in good conscience continue to design weapons systems which I saw were becoming more aggressive. Since then I have been studying US weaponry -- particularly US nuclear weaponry -- and the military ambitions implied by the type of weaponry being pursued. Although the US has never announced a nuclear first strike policy, except perhaps recently in very cautious terms regarding Iraq, it has most certainly aspired to the ultimate in military supremacy -- that is, a disarming and unanswerable first strike capability. My research has resulted in defining five elements of such a capability, all of which have been vigorously pursued by the Pentagon. Those five elements are: 1) anti-satellite warfare to destroy an opponent's early warning and communications spacecraft, thus enhancing the surprise of a first strike; 2) long-range missiles with the correct combination of accuracy and explosive power to destroy an opponent's silo-based missiles and command posts; 3) an anti-submarine warfare force capable of instantly and simultaneously destroying the opponent's missile-launching submarines; 4) a missile defense capable of intercepting any of the opponent's missiles that survived the US first strike and were launched in retaliation; and 5) the command, control, communications, computer, and intelligence network to support, coordinate and integrate all of the first four elements. With the exception of missile defense, all of these elements were in at least a rudimentary working form when the Soviet union broke up.

Minuteman-3 comes under the second element -- a precise, long-range missile force. Using the NAVSTAR global positioning system discussed above, each missile could place its 330-kiloton warheads some 300 feet from their targets (one-tenth of that if MARVs were used). In what is called two-on-one cross targeting (two warheads, from different missiles, sent to the same target in case one of them doesn't work) the probability of destroying an underground target is about 95 percent. That is a choice first-strike weapon.

With the demise of the Soviet Union, the US remains the world's lone superpower. Chances of a nuclear confrontation with Russia seem remote. Nevertheless, without US superpower status being backed by a modern and efficient nuclear force, this country could not have its way in the world as has been done so many times in recent history -- such as moving NATO into Bosnia to supplant the UN, conducting a war on Yugoslavia, numerous cruise missile attacks against sovereign nations, coercing the Russians into signing the SORT after abrogating the ABM Treaty, and recently pressuring the UN Security Council into a resolution against Iraq. Minuteman-3 still plays a critical and coercive role in Washington's foreign policy.

In the future, when penetrating reentry vehicles carrying low-yield nuclear bombs are available, Minuteman-3s could very well introduce the use of tactical nuclear weapons in a regional war. They could play a first-strike role against such countries as Iraq, Syria, Iran, Yemen, Sudan, or Libya. Minuteman-3s are lethal weapons too dangerous to possess, mainly because of the temptation to use them.

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[1]Air Force Fact Sheet, page 2.

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GLOSSARY

FY	Fiscal Year (October 1st through September 30th for US government.)
GPS	Global Positioning System.
GRP	Guidance Replacement Program.
ICBM	Intercontinental Ballistic Missile.
kiloton	The explosive power equivalent to 1,000 tons of conventional explosives.
knot	One nautical mile per hour.
MARV	MAneuvering Reentry Vehicle.
MILE	Minuteman Integrated Life Extension. Referred to as Rivet Mile.
MIRV	Multiple independently-targeted reentry vehicle.
mph	Miles per hour.
MX	Missile-X, a US large ICBM. Also called "Peacekeeper."
NAVSTAR	NAVigation System Timing And Ranging. Satellites now in orbit to give precise GPS fixes.
PRP	Propulsion Replacement Program.
REACT	Rapid Execution and Combat Targeting.
SORT	Strategic Offensive Reductions Treaty.
START	STrategic Arms Reduction Talks.
UN	United Nations.
US	United States.

APPENDIX - A

FACT SHEET ON MINUTEMAN-3

Designation	LGM-30 Minuteman-3
Year First Deployed	1970
Quantity	500 active
Power Plant	Three solid-propellant rocket motors (Liquid-fueled Post Boost Control System)
Length	59.9 feet (18 meters)
Diameter	5.5 feet (1.67 meters)
Weight	79,432 pounds (32,158 kilograms)
Range	8,000+ miles (6,942+ nautical miles or 12,872+ kilometers)
Altitude	700 miles (1,120 kilometers)
Speed	Approx. 15,000 mph (Mach 23 or 13,026 knots) at burnout
Thrust	1st stage: 202,600 pounds 2nd stage: 60,600 pounds 3rd stage: 34,000 pounds
Payload	1 Mark-12/W62 or Mark-21/W87 warhead (150 missiles) 3 Mark-12/W62 MIRVs (50 missiles) 3 Mark-12A/W78 MIRVs (300 missiles)
Guidance System	Inertial (likely upgraded by GPS fixes)

Sources: Air Force Fact Sheet
US Air Force Museum Fact Sheet
Author's additions in parentheses