The History of the U.S. Nuclear Stockpile 1945-2013

By Robert S. Norris

Editor's Note: The following text was prepared by Dr. Norris for a presentation at the Woodrow Wilson Center's 2013 Summer Institute on the International History of Nuclear Weapons (SHARF) in Washington, DC.

The primary goal of my presentation today is to reconstruct the nuclear order of battle of the Cold War, to see how nuclear weapons were integrated into military forces, to assess what influence they had, and finally with all of that as a backdrop, revisit some crucial events and decisions that may make more sense when viewed with this additional information and perspective.

Growth and Evolution of the U.S. Nuclear Stockpile

By my estimation, the United States has produced approximately 66,500 nuclear weapons from 1945 to mid-2013, of approximately 100 types.[1] New production of U.S. nuclear weapons ceased in 1990, twenty-three years ago, though modifications and life-extension programs continue. The historic high of the U.S. stockpile was reached in 1967 with 31,255 nuclear warheads. This stockpile, beginning in the mid-1950s, has been characterized by great dynamism and turnover. We now have official figures for the number of nuclear warheads in the stockpile from 1946 to 2009: In 1993, Secretary of Energy Hazel O'Leary released figures for the years 1946-1961, and on May 3, 2010 the Pentagon released a fact sheet with stockpile numbers for years 1962-2009.

All U.S. warheads were developed at one of two nuclear design laboratories, Los Alamos or Lawrence Livermore, both supported by Sandia National Laboratories to weaponize the warheads. Los Alamos has designed 77 types and Livermore 23. All four military services have had nuclear weapons: The Air Force adopted 52 warhead types, the Navy 35 types, the Army 26 and the Marines 15.

Many of the cancelled programs make interesting stories by themselves in capturing the thinking of the day. Some warhead types have had wide applicability, used in one configuration as a bomb and

[1] Robert S. Norris and Hans M. Kristensen, "Nuclear Notebook: U.S. Nuclear Warheads, 1945- 2009," *Bulletin of the Atomic Scientists*, July 2009, vol. 65, no 4, pp. 72-81. "

in another as a warhead for one or perhaps several kinds of missiles, an early example of this is the Mark 7. The profusion is even more extensive when modifications and yield options are added: the B-61 bomb has come in eleven modifications (soon to be twelve) and a variety of yields.

If we break down the stockpile by delivery system the Air Force has made use of 42 types of nuclear weapons, the Navy and Marine Corps 34 types, and the Army 21 types. As technological advances were made in reducing warhead weight and volume the military services adopted nuclear weapons for almost every conceivable military mission.

The first delivery system was an airplane dropping a bomb: specifically the B-29 carrying a single Little Boy or Fat Man type bomb. Soon after the war, a great profusion of new types of aircraft appeared offering greater range and capable of carrying many bombs. There have been more than 40 different types of aircraft that the U.S. military has used to carry nuclear weapons: 11 varieties of Air Force bombers, a dozen types of Air Force fighters, 13 types of Navy/Marine corps fighters, three types of helicopters, and three maritime patrol aircraft. There are also several types of allied non-American aircraft that were certified to carry U.S. nuclear weapons including the Canadian Argus, German and Italian Tornados, the British Shackleton and Nimrod and the Italian Atlantiques.

An almost equal technological marvel to the atomic bomb is the development of the missile, specifically the ballistic missile. It did not take a great leap of imagination to see that missiles might eventually be mated to an atomic bomb and flown (either in the atmosphere or out of it) great distances to a target. Eventually missiles would come in every conceivable size, shape, and range for every mission: air-to-surface missiles like the Hound Dog, SRAM, Walleye and Bullpup, and air-to-air missiles like the Genie and the Falcon. One cancelled program, Skybolt, was to have been an air-launched ballistic missile, quite a concept when you think of it. Complementing ballistic missiles were cruise missiles of every sort: the Matador (and later the Mace), and sea-based Regulus. For intercontinental distances there was for a very short time the notorious Snark. After improvements in ballistic missiles by the late 1950s and early 1960s, the United States had a wide variety of ICBMs, SLBMs, IRBMs, and short-range ballistic missiles. These included Corporal, Sergeant, Lacrosse, Redstone, Little John, Honest John, Thor, Jupiter, Atlas, Titan, and Polaris. Later they would be replaced by Minuteman and MX, Poseidon, Trident, Pershing and by air-sea and ground launched cruise missiles. Anti-ballistic missile missiles like the Sprint and Spartan were developed and deployed as well.

Not to be outdone, the army proposed a full range of weapons for the nuclear battlefield. This included several calibers of artillery, short range missiles, air defense missiles like the Nike Hercules, and atomic land mines. A particular favorite in this category was the Davy Crockett, a jeep- or tripod-

mounted bazooka-type weapon able to deliver a very low-yield W54 nuclear warhead (20 tons yield) to a range of between 600-4000 meters. It is said that the probability of kill lethal radius for the Davy Crockett exceeded its range, which is not a good thing.

The Navy had many non-strategic types for the anti-submarine mission (ASW), including the Betty, Lulu, and B57 depth charges; the ASTOR torpedo; and ASROC and SUBROC missiles. For the anti-air warfare mission the TALOS and Terrier missiles were deployed on a host of ships to defend the carrier battle group.

Each one of these systems is deserving of its own history. The historical record will only be complete when we know and understand why they were proposed in the first place, how much was spent on them, how many were produced, where were they deployed, and when they were retired. These stories constitute the reality of the nuclear arms race: the research and development, the procuring, the transporting, deploying, training and maintaining and retiring of all of this weaponry. Even weapons that were not deployed merit at least a footnote as they give expression to the mentality of the day.

After almost seventy years, we now estimate that the United States built 66,500 nuclear warheads, but we should recognize that along the way there were other expectations and possibilities. For example, here are two contrary views: Bill Moyers made a TV program on the 40th anniversary of Los Alamos; in one scene he is riding in a car with I.I. Rabi (an adviser to Robert Oppenheimer during the Manhattan Project), and as they drive through Los Alamos Rabi looks out the window at the laboratories and building after building and says that, from the vantage point of the Manhattan Project (at least in his mind), we never intended this: meaning this gigantic ongoing complex that ended up mass producing nuclear weapons by the tens of thousands.

At the other extreme we have certain military figures such as Army Lt. General James M. Gavin, Deputy Chief of Staff for R&D under Maxwell Taylor, who said in hearings to the Joint Committee on Atomic Energy in 1956 and 1957 that the Army's total requirement would be 151,000 nuclear weapons, 106,000 for tactical battlefield use, 25,000 for air defense, and 20,000 for support of our allies. He estimated that a typical field army might use a total of 423 atomic warheads in one day of intense combat, not including surface to air weapons. Some Navy officers in early 1958 spoke of a Polaris fleet of 100 SSBNs. This goal later dropped to between 40 and 50 and 41 were originally bought, with eighteen more Ohio-class submarines since purchased.

The Air Force never proposed an exact goal for the size of its ICBM arsenal, but there were statements in the late-1950s of several hundred to many thousands. At the high end was General Thomas S.

Power, CINCSAC from 1957-1964, who spoke of a requirement of 10,000 Minuteman ICBMs and is known to have personally suggested that figure to President Kennedy. Many Air Force officers were not very enthusiastic about missiles, a diversion and drain on resources for what really mattered -- that is, manned bombers. The Air Force has never been shy about asking for new planes, and in large numbers. Since 1945 they have purchased close to 5,000 bombers of 11 types whose primary mission was nuclear weapon delivery (385 B-36s, 142 B-45s, 370 B-50s, 2,041 B-47s, 403 B-57s, 116 B-58s, 744 B-52s, 294 B-66s). The original goal would have been higher than what was finally purchased, given finite budgets. This is true with the two recent bombers - the original program for the B-1 was 244 (the air force bought 100), and 132 B-2s (only 21 purchased).

Even with the Air Force's lukewarm attitude towards ICBMs they still managed to purchase a total of 3,234 ICBMS: Atlas (381), Titan (286), Minuteman (2,433), and MX (134). The Navy bought 2,783 SLBMs: Polaris (1,092), Poseidon (640), and Trident (595 and 456) their SSBN fleet. In total over 6,000 strategic ballistic missiles were purchased.

One concluding point needs to be made about all of these numbers. Whatever they were--large, medium or small -- I contend they were arbitrary. It is often made to seem, especially in Secretary of Defense Annual Reports or Congressional testimony, that civilian officials and military brass knew exactly what the number of bombers or missiles was that would deter the Soviets. In 1979 and 1980 it was said that 200 MX missiles, to be shuttled around and hidden amidst 4,600 shelters in a 40,000 square mile area of the Great Basin in eastern Nevada and western Utah, was absolutely essential to the security of the United States. Anything less just would not do. The effort and money that went into trying to come up with a survivable basing scheme to solve the problem of the so-called "window of vulnerability" is astonishing.

Stimulants to Growth and Diversity

There are three factors that sustained the nuclear arms race and led to its growth and diversity:

1) The inter-service rivalry that existed (and exists) between the branches of U.S. armed forces. These clashes over roles and missions are not aberrations; they are only the more visible skirmishes of an ongoing and eternal war. Its daily manifestations need to be tracked better than they have been. This competition was a main driver in the proliferation of missiles. At the time, nuclear weapons were the things to have. All sectors of the military became enraptured with them and tried their very best to integrate them into the various combat commands. They developed elaborate war plans, had

extensive military exercises, and some may have even believed that one could actually fight wars with them. The love affair eventually ended, disillusionment set in, the bloom was off the rose, and nuclear mission after nuclear mission was terminated.

Because of their inordinate destructive power these weapons prevented good soldiering rather than advancing it. Many general and admirals felt that in the end, the weapons weren't usable. They took away from other things that commanders would rather have had. Nuclear weapons require inordinate amounts of security and many special procedures and were not worth all of the care and feeding they required. Twenty years ago, the Army got out of the nuclear business and the non-strategic navy abandoned the nuclear anti-submarine warfare mission. In a similar development, the Navy and Marine Corps abandoned the carrier strike mission with nuclear bombs, a mission that began in the late 1940s. For a time the non-strategic Navy retained only the nuclear Tomahawk cruise missile (stored ashore in weapons depots), but that too has now recently been retired. Many or most of the missions we once had have been abandoned, and we are in the process of trying to figure out how many and what to do with the ones we have left. The answers are still not in: Can we continue to afford three legs of the triad or will two be enough?

2) A second factor which sustained and perpetuated the arms race was *the belief that our nation could attain security through technical superiority in nuclear weaponry,* in 1950 Chester Barnard termed this, "a most deadly illusion" - but it was one we continued to pursue year after year. Technological imperative drove the United States forward; this edge would make the difference, we could gain the upper hand, we must have this new missile or that new plane. Each of these milestones- whether it was 'boosting', the hydrogen bomb, improved yield-to-weight ratios, miniaturization, longer range missiles and planes, or greater accuracy - these were all eventually matched by the Soviet Union and the vaunted superiority could never be sustained or taken advantage of. Each of the accomplishments by our adversary then drove the United States forward to try and find a fix for the new dilemma it put us in.

3) The third factor is what I call a *hyperactive definition of deterrence*. This definition equated the prevention of a Soviet attack with just achieving very high degrees of readiness on the American side. The Soviets were portrayed as ready to pounce the moment the United States let down its guard: the Red Army was ever ready to surge through the Fulda Gap. The Bolsheviks were global in their march and thus we had to be everywhere to deter them. Because warning times had shrunk so much in the missile age we needed to put bombers on 24 hour airborne alert, carrying nuclear weapons and patrolling the borders of the Soviet Union. Very high patrol rates were established for U.S. ballistic missile submarines - a practice that still continues today, by the way. After airborne alert was stopped

in 1968 due to two serious accidents in Spain and Greenland, strategic bombers were put on 15-minute ground alert. Until the early 1990s about one-third of U.S. strategic bombers were configured in this way, with their crews in ready-rooms waiting for the klaxon to sound. If and when it did they would be airborne before the first nuclear detonations destroyed the base.

The image of a coiled spring is an appropriate metaphor to describe the way the United States deployed and postured its forces. It is very fortunate that the Soviets did not follow the United States in this regard, as two coiled springs would have been extremely dangerous. When crises did develop we saw both springs get tighter and tighter, there is a literature on how those coupled systems could have cascaded us into nuclear war. We can count ourselves lucky that something like the Cuban Missile Crisis did not happen later on when both sides, rather than just the United States had mature nuclear forces.

At the time, but even more so now, we can see that this coiled spring was very dangerous, costly, arbitrary, and basically unnecessary for the purposes for which it was said to be needed. The concept of deterrence was a perfect one for the arms race as it could be used for any purpose; it was elastic enough to cover everything, the perfect rationale for anything anyone wanted. The mantra of deterrence was invoked thousands of times; it was the automatic litany that prefaced Pentagon officials' presentations before Congress at budget time. In one of its more recent incarnations, during the Reagan years, we were told that to adequately deter the Soviet Union we needed to be able to fight and win a nuclear war since our opponent, it was claimed, believed that they could do so. This is just one of many examples showing that it was quite easy to get lost in a `wilderness of mirrors'.

Basic knowledge of the growth and evolution of the U.S. nuclear stockpile is essential for undertaking research in the nuclear security field. However, there is still much to be learned regarding the history of the stockpiles of the eight other countries which possess nuclear weapons: the Soviet Union/Russia, Britain, France, China, Israel, India and Pakistan.

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