**Launch On Warning History**

Prior to the introduction of intercontinental ballistic missiles (ICBMs), the Strategic Air Command, and probably its Soviet counterpart, had multiple bombers flying at any given time. In the event of a nuclear strike upon one of the nations, the other nation would order their bombers to fly to the other country and drop their nuclear payload on predetermined targets. In the United States, these bombers were typically either B-47 Stratojets or B-52 Strato-fortresses, and there were three major flight routes. With bombers already in the air, there was an assurance that a retaliatory strike would be feasible, even if the country that was attacked could do very little otherwise. At the height of the Cold War, the United States had special Boeing E-4B airplanes equipped as control centers for the nuclear arsenal. This airplane included a military official who was authorized to order a retaliatory strike in the event that the President could not be contacted.

"Launch on warning" has its roots in U.S. President Dwight Eisenhower's "Positive Control" strategy, but really took shape with the introduction of the Minuteman missile. Since many ICBMs (including the Minuteman) were launched from underground silos, the concern arose that a first strike by one nation could destroy the ground launch facilities of the retaliating nation.

**Launch on warning**

Once an ICBM is launched, it cannot be recalled by the launching party, so a different strategy had to be created by both the U.S. and U.S.S.R. This led to two primary options. One option, "retaliation after ride-out" would require the second-strike nation to wait until after they were attacked to launch their missiles. Some portion of the nuclear arsenal would inevitably be destroyed in such an attack. This led to both superpowers investing heavily in survivable basing modes for their nuclear forces, including hardened underground missile silos for ICBMs, and submarine-launched ballistic missiles.

The other choice was "launch on warning" - launching nuclear missiles before the other side's missiles could destroy them. With the invention of the Ballistic Missile Early Warning System in the early 1960s, the possibility of America detecting launches of Soviet missiles became real. In the 1970's, this technology came to fruition after the deployment of space-based launch detection technology on both sides.

Once both countries had the ability to detect ballistic missile launches, both countries could at least theoretically implement a "launch on warning" strategy. It is a popular misconception that either or both superpowers actually adopted this as a standing policy. While neither country would publicly confirm or deny that they had a launch on warning policy in effect, it is likely that they did not. There are practical reasons why this policy was not feasible. The primary concern was that a false warning could easily lead to a global nuclear war. There were several false alarms on each side during the Cold War, and none of them led to a nuclear exchange.

Even if the false alarm problem were to be set aside, a practical launch on warning policy would still be too difficult to implement. Although it takes about 30 minutes for a wave of ICBMs to reach their targets, that does not mean the President of the targeted country has 30 minutes to decide what to do about the attack, for the following reasons.

The side that launches a well-coordinated first strike can pin down the retaliatory forces of the other country by launching a barrage of submarine based missiles from close range, in a fast "depressed trajectory" mode, and exploding the warheads every minute or so at high altitudes over the ICBM fields of the targeted country, using a technique called X-ray pin-down. This makes it impossible to launch the ICBMs without damaging their navigation systems for as long as the high-altitude detonations continue. This buys extra time for the wave of first strike ICBMs to complete their flights and hit their targets, which are the ICBMs that have been pinned down in their silos.

This greatly shortens the effective warning time for the President to make his decision to launch a retaliatory strike while still under attack. It takes a few minutes to confirm launch detection from early warning systems, and another few minutes for ICBMs to complete their launch procedures, and then a bit more for them to clear the region of X-ray pin-down, and that squeezes the decision time from both ends of the schedule. It means that even if all of the command and control systems are working perfectly in the targeted country, the President of that country still has only about five minutes after being shaken awake in the middle of the night to decide what to do. Five minutes to decide whether to launch thousands of nuclear warheads.

This means that launch on warning was regarded as an extremely dangerous policy with enormous practical problems to implement. That's why both superpowers deployed their nuclear forces in survivable basing modes, to maintain a credible deterrent of residual retaliatory forces that would survive a first strike. This gives military leaders the more realistic option of riding out the attack, assessing which forces remain operational, and deciding what range of retaliatory options are available.

There are nuclear strategies that fall short of massive retaliation. One of these is the proportional response. If one country launches one missile (accidentally or otherwise), a proportional response of one missile may be chosen. While this proportional response approach might have worked on paper, a real-world limited nuclear exchange would have likely climbed the escalation ladder to an all-out nuclear war.

**Game theory**

The principle behind "launch on warning" is an element of game theory and has been studied extensively by game theorists. The nuclear arms race would best be described as a non-zero-sum game. As long as neither side launches, both countries survive. If one country launches a first strike, the other country launches a retaliatory strike (second strike), and both sides lose. The only way for either side to win is for neither side to launch a first strike. This is also known as nuclear deterrence.

The MAD doctrine between the Soviet Union and the United States throughout the Cold War represents a Nash equilibrium, where neither side is willing to escalate the confrontation due to fear of all-out nuclear war. Anti-ballistic missile systems have been criticized by some as having the potential to upset this balance of power. If one nation develops technology capable of destroying incoming missiles, that country then has the ability to launch a first-strike without having to endure a retaliatory strike. Thus, the deployment of anti-ballistic missiles by either side is likely to destabilize the Nash Equilibrium for the conflict, with unknown results. While it seems to work well for symmetrical conflicts such as the Cold War, this strategy would not be useful against an asymmetric threat such as terrorism.