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High-alert nuclear weapons: the forgotten danger

Steven Starr argues that the continued maintenance of US and Russian nuclear weapons on high alert means that the threat of accidental (or deliberate) global nuclear war has not gone away.

Although the Cold War is said to have ended in 1991, the US and Russia each still operate under the assumption that the other could authorise a nuclear attack against them.[1] The failure to end their Cold War nuclear confrontation causes both nations to maintain a total of about 2,600 strategic nuclear warheads on high-alert status, which can be launched in only a few minutes,[2] and whose primary missions remain the destruction of the opposing side's nuclear forces, industrial infrastructure, and political/military leadership.[3]

High-alert nuclear weapons: a brief history

High-alert, launch-ready nuclear weapons, i.e. operational rocket-mounted nuclear warheads capable of being launched in 15 minutes or less, have been deployed in the US and the USSR/Russia for decades. The solid-fuelled US Minuteman inter-continental ballistic missile (ICBM) went on alert in October 1962[4], and by 1965, 800 Minuteman I missiles had been deployed.[5] By the mid-1970s, the USSR had deployed a variety of second generation liquid-fuelled ICBMs capable of quick launch.[6]

The Cold War created an arms race that led to the development of apocalyptically destructive weapons. Fear of a nuclear surprise attack was exacerbated by the development of ICBMs armed with multiple independently-targeted re-entry vehicles, which appeared to be ideally suited for a nuclear first-strike. Because no defence against such an attack was found to exist, the only military 'solution' seemed to require the launch of one's own ICBMs from their silos before they were destroyed.

By the early to mid-1980s, the US[7] and USSR[8] had each created automated nuclear command and control systems that worked in conjunction with a network of early warning systems[9] and their nuclear-armed ballistic missiles. Thus both nations had the capability to launch strategic missiles on tactical warning in less than 30 minutes, the nominal flight time of land-based ICBMs travelling between the US and Russia.[10]

This gave both nations the *capability* to detect the launch of an enemy nuclear attack and order a retaliatory launch of nuclear-armed missiles before the arrival of the perceived attack was confirmed by nuclear detonations (Launch-on-Warning, or LoW). It seems obvious that the only purpose in developing a LoW *capability* was – and is – to be able to implement it through a *policy* of LoW (which becomes standard operating procedure, written into warplans, and operational manuals).

Despite the apparent dangers of LoW, including the launch of a nuclear retaliatory strike based upon a

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false warning (accidental nuclear war), the US and Russia continued to shorten the time required to launch their missiles. Because both nations feared a nuclear attack would destroy their command and control systems and silo-based forces, and because they also targeted each other's nuclear weapons, this created a strong bias for them to develop ". . . extremely rapid reactions to evidence of impending attack – *in effect a launch-on-warning posture for both sides.*"[11]

Official denials

US officials have, in the past, acknowledged the US LoW capability,[12] but have never conceded that LoW is a fundamental part of US operational nuclear policy.[13] Russia also will not admit that LoW is central to its operational planning, although a former high-ranking officer who served in the Soviet General Staff has written that LoW still is a standard operating procedure in Russia's Strategic Rocket Force.[14]

Ironically, the US and Russia are also unwilling to publicly state that they will *not* employ LoW. It is arguable that a commitment by both nations to abandon LoW and substitute a policy of Retaliatory Launch Only After Detonation (RLOAD)[15] would eliminate the possibility of an accidental nuclear war based upon a false warning of attack. RLOAD would also prevent the launch of a nuclear retaliatory strike in the event of an attack with ICBMs armed with conventional warheads (that did not produce nuclear detonations).

Regardless of their refusal to admit or deny a reliance upon LoW policy (or even the possession of nuclear forces on high alert[16]), there is a clear historical record that both the US and Russia have developed and continue to maintain a LoW capability. There is expert testimony that they each can launch approximately one-third of their operational strategic nuclear weapons (most of their land-based ICBMs, along with some fraction of their submarine launched ballistic missiles) in a very few minutes.[17] Both the US and Russia also refuse to take a 'No First Use' pledge for their nuclear weapons.

Former Minuteman launch officer, Bruce Blair, states that, "*Both US and Russian intercontinental ballistic missiles remain fuelled, targeted, and waiting for a couple of computer signals to fire. They fly the instant they receive these signals, which can be sent with a few keystrokes on a launch console.*"[18] Air Force General Eugene Habiger, a former head of the Strategic Command, told the Washington Post in 2007 that, "*...the natural state of an ICBM is on alert, with its nuclear warhead on and solid-fuel engines powered up.*"[19]

Past accidents and future risks

During the Cold War, the US-Soviet nuclear standoff was a political issue familiar to most Americans. However, after the fall of the Soviet Union, a lowering of tensions between the US and Russia (which obviously inherited Soviet weaponry) led to a rather remarkable American complacency about the danger posed by the continued existence of US and Russian nuclear arsenals.

In 1994, this false sense of security was fostered by a largely symbolic agreement between the US and Russia to remove the launch coordinates from, or 'de-target', their nuclear missiles.[26] Because it takes only about 10 seconds to re-install target coordinates during the launch process, the agreement created no meaningful change in the ability to launch strategic nuclear forces in a rapid fashion.[27]

On January 24, 1995, President Clinton told Congress that "not a single Russian missile is pointed at the children of America".[28] Only hours later, a Norwegian weather rocket (Black Brant XII) was mistakenly identified by the Russian early warning system to be a hostile incoming ballistic missile.[29]

The warning apparently was passed up the entire Russian chain of command and reportedly resulted in the opening of the 'nuclear briefcases' carried by the Russian President, Defence Minister and the Chief of the General Staff. These briefcases are designed to facilitate the rapid transmission of the 'permission order' to launch Russian nuclear forces.

According to numerous published accounts, the false warning caused the President to open his briefcase for the first time. The buttons in the suitcase probably gave him a range of nuclear strike options against all strategic targets, including the US and Western Europe.[30]

The electronic display on the nuclear briefcase indicated a possible US or NATO nuclear missile launched from Norway or the Norwegian Sea. The President tracked the missile on the screen for three

Tables 1, 2 and 3 give estimates of the current size of the high-alert nuclear forces in the US and Russia. The weapons yield (explosive power) is given in megatons (MT) of TNT equivalent.

Table 1 - US high-alert forces[20]

	Missile numbers	Warhead numbers	Total yield (MT)
Land[a]	464	726	206
Sea[b]	96	576	109
Totals	*560*	*1302*	*315*

[a] ICBMs: 95% assumed alert rate[21]

[b] Submarine launched ballistic missiles (SLBMs): 4 US Trident submarines always kept at "hard-alert" (in position to fire) with 24 missiles per submarine x 6 warheads per missile (100% assumed alert rate)

Table 2 - Russian high-alert forces[22]

	Missile numbers	Warhead numbers	Total yield (MT)
Land			
SS-18s[c]	60	600	450
SS-19s[d]	67	402	302
SS-25s[e]	181	181	100
Sea[f]	32	96	18
Totals	*340*	*1279*	*870[g]*

[c] 80% assumed alert rate[23]; 10 warheads per missile; 750 kT yield per warhead

[d] 67% assumed alert rate[24]; 6 warheads per missile; 750 kT yield per warhead

[e] Assume 90% alert rate; 1 warhead per missile; 550 kT yield per warhead

[f] SLBMs: 5 Delta-III and 6 Delta-IV submarines; total of 176 SLBMs; 3 to 4 warheads per missile; 624 total warheads. Russia does not run continuous ballistic missile submarine patrols as the US does, thus most Russian submarines remain in port. Assume at least 2 submarines on alert, thus 32 missiles with (minimum) 96 warheads, and total yield of 18 MT.

[g] If all the missiles on Russian submarines were considered on high alert, then the total yield would be 938 MT.

Table 3 - Total high-alert forces

	Missile numbers	Warhead numbers	Total yield (MT)
USA	560	1302	315
Russia	340	1279	870
Total	*900*	*2581*	*1185[h]*

[h] Total yield of US and Russian operational nuclear arsenals is approximately 2657 MT[25], thus about 45% of the yield is on high alert.

to seven minutes before it became clear that the missile was not headed towards Russia.[31] Russian nuclear forces were then ordered to return to watch duty. Under Launch-on-Warning protocol, he was within a few minutes of a launch decision.

Had this incident occurred during a period of increased tensions between the US and Russia, one wonders if the outcome would have been the same. Regardless, the 1995 Russian false warning of a US/NATO nuclear attack clearly illustrates the potential danger of an accidental nuclear war made possible by the existence of hundreds of high-alert ICBMs.

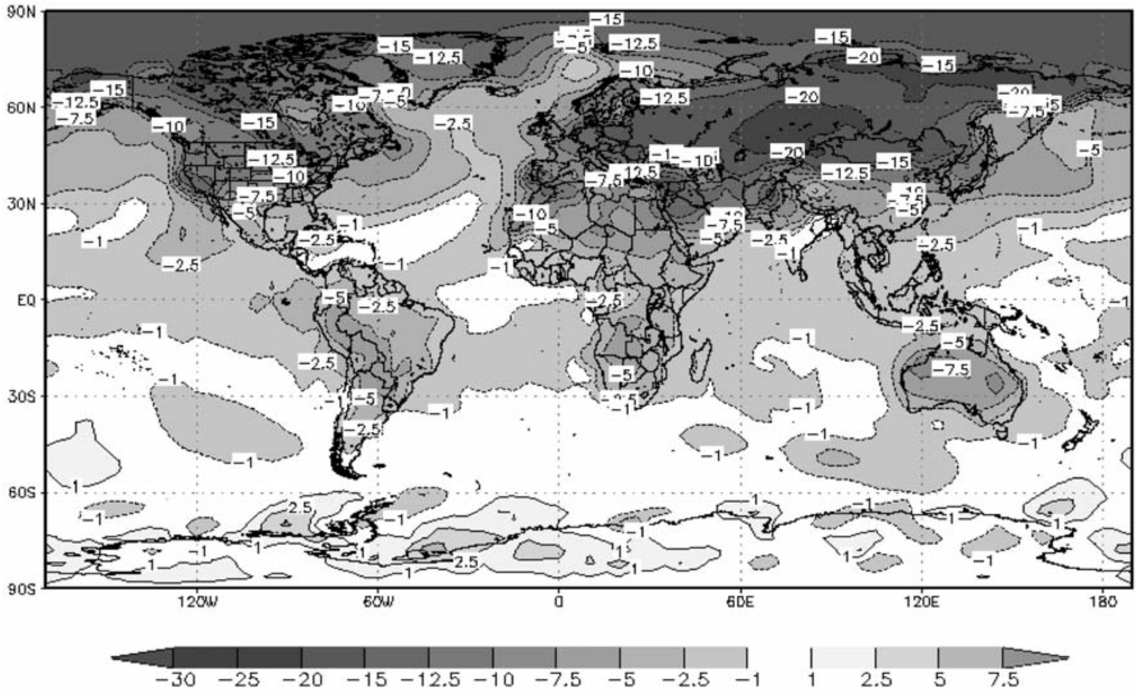

Figure 1 – Temperature changes in summer (ºC) following large nuclear war[41]
Predicted surface air temperature changes following a nuclear war that caused 50 million tons of smoke to rise into the stratosphere, above cloud level, and massively block sunlight from reaching the Earth. Temperatures are averaged for June, July, and August of the year of the smoke injection.

Neither the US nor Russia will disclose the number of false alerts experienced by their early warning systems. In 1985, the US began classifying this information, although it had previously admitted to many significant false warnings, a number of which had led to the full alert of US nuclear forces and threat assessment conferences involving the Joint Chiefs of Staff.[32]

While it is possible to cloak these events in secrecy, it is not possible to prevent the events themselves. As long as the US and Russia maintain LoW capability and a *de facto* LoW policy, the possibility remains of a false warning triggering a retaliatory nuclear attack and an accidental nuclear war. Excessive secrecy, however, does preclude informed debate and keeps the public unaware that such problems even exist.

The possible causes of a false warning are no longer restricted to failures of hardware, software or human judgement. Deliberate acts of individual or state-sponsored terrorism must now be factored into this most dangerous equation.

Such acts could include spoofing radar or satellite sensors of early warning systems, the penetration of nuclear command and control computer networks, and the introduction of viruses or software that would mimic a full-scale nuclear attack into early warning system computers.[33] Also, if terrorists obtained permission codes required to launch nuclear weapons and then obtained access to the command and control systems, or took physical control of a nuclear weapon (e.g. a road-mobile Russia SS-25), they would be able to launch the weapon(s).

The consequences of a war involving high-alert nuclear weapons

General knowledge of nuclear weapon effects is also sadly lacking. Most people have no idea that the detonation of a single average strategic nuclear weapon will ignite a gigantic firestorm over a total area of 105 to 170 square kilometres.[34] Even fewer people are aware of the predicted environmental and ecological consequences of nuclear conflict.

As discussed in the previous *SGR Newsletter*,[35] recent research using NASA climate models forecasts that even a ‘regional’ nuclear war, using 100 Hiroshima-sized nuclear weapons, would result in catastrophic disruptions of the global climate.[36] Burning cities would produce about five million of tons of smoke that would rise above cloud level to form a global stratospheric smoke layer. This would block sunlight, leading to rapid drops in global surface temperature and significant reductions in global precipitation.

Furthermore, research published in April 2008 indicated that smoke from this regional conflict would also destroy 25-40% of the protective ozone layer over the populated mid-latitudes, and 50-70% of the ozone over the more northerly latitudes.[37] Such reductions would enormously increase the amount of ultraviolet light reaching the surface and have serious consequences for humans and many other forms of life. The levels of ozone destruction predicted by this new study had previously only been expected to happen after a full-scale nuclear war.[38] Unfortunately, no new studies have been carried out using a modern climate model that could estimate the amount of ozone that would be destroyed by a major nuclear conflict, but it seems reasonable to expect that it could be significantly larger.

In 2007, US scientists predicted that a nuclear war fought with about one-third of the global nuclear arsenal[39] would cause 50 million tons of smoke to reach the stratosphere – about ten times that of a regional war. The resulting ‘nuclear darkness’ would cause average global surface temperatures to become as cold as those experienced 18,000 years ago during the coldest period of the last ice age[40] – see Figure 1.

The US and Russian strategic nuclear arsenals on high alert contain a total explosive power of nearly 1,200 MT, with the total explosive power of the operational, deployed nuclear arsenals of both countries being nearly 2,700 MT (see Table 3). Based on the new climate studies, a nuclear war between these two nations, which began with the detonation of their high-alert, launch-ready nuclear arsenals, and went on to include about another 20% of their deployed nuclear arsenals, would – at minimum – result in the extreme level of climate change shown in Figure 1.

Computer models predict that 40% of the smoke would still remain in the stratosphere 10 years after the nuclear war, causing a long-term nuclear darkness. The subsequent cooling of the Earth's surface would weaken the global hydrological cycle and lead to significant decreases in average global precipitation.[42] Growing seasons would be drastically shortened throughout the world, particularly in the large agricultural regions of the Northern Hemisphere. Under such circumstances, most people on Earth would starve.[43]

In addition to the catastrophic effects on the climate and ozone layer, a nuclear war would release enormous amounts of radioactive fallout, pyrotoxins and toxic industrial chemicals into the environment. Taken together, these would be a clear threat to the continued survival of humans and other complex forms of life.

The scientists who carried out the research on the climatic consequences of nuclear war state that a nuclear first-strike would be suicidal, and have called for a new global nuclear environmental treaty.[44]

Taking nuclear weapons off high alert

High-alert nuclear arsenals are being challenged by a number of signatories to the nuclear Non-Proliferation Treaty. In 2007, New Zealand, Sweden, Switzerland, Chile and Nigeria sponsored Resolution L29 (GA62/36) calling for the elimination of all nuclear weapons from high-alert status, which was approved by the UN General Assembly on a vote of 136 to 3. The only three nations voting against the measure were the US, the UK and France.

The United States and Russia should look upon this as an opportunity to act "in good faith"[45] to end the inexcusable danger of accidental nuclear war created by their thousands of high-alert, launch-ready nuclear weapons. Should they choose to work together with the non-nuclear weapon states and stand down their nuclear arsenals, they would finally end their Cold War nuclear confrontation and truly begin the path towards the abolition of nuclear weapons.

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Dedicated to the memory of Alan Phillips of Physicians for Global Survival, Canada.

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