By Nathan Hughes

North Korea tested a nuclear device for the second time in two and a half years on 25th May. Although North Korea's nuclear weapons program continues to be a work in progress, the event is inherently significant. North Korea has carried out the only two nuclear detonations the world has seen in the 21st century. (The most recent tests prior to that were the spate of tests by India and Pakistan in 1998.)

Details continue to emerge through the analysis of seismographic and other data, and speculation about the precise nature of the atomic device that Pyongyang may now posses carries on, making this a good moment to examine the underlying reality of nuclear weapons. Examining their history, and the lessons that can be drawn from that history, will help us understand what it will really mean if North Korea does indeed join the nuclear club.

Nuclear weapons in the 20th Century

Even before an atomic bomb was first detonated on July 16, 1945, both the scientists and engineers of the Manhattan Project and the U.S. military struggled with the implications of the science that they pursued. But ultimately, they were driven by a profound sense of urgency to complete the program in time to affect the outcome of the war, meaning understanding the implications of the atomic bomb was largely a luxury that would have to wait. Even after World War II ended, the frantic pace of the Cold War kept pushing weapons development forward at a break-neck pace. This meant that in their early days, atomic weapons were probably more advanced than the understanding of their moral and practical utility.

But the promise of nuclear weapons was immense. If appropriate delivery systems could be designed and built, and armed with more powerful nuclear warheads, a nation could continually threaten another country's very means of existence: its people, industry, military installations and governmental institutions. Battlefield or tactical nuclear weapons would make the massing of military formations suicidal - or so military planners once thought. What seemed clear early on was that nuclear weapons had fundamentally changed everything. War was thought to have been made obsolete, simply too dangerous and too destructive to contemplate. Some of the most brilliant minds of the Manhattan Project talked of how atomic weapons made world government necessary.

But perhaps the most surprising aspect of the advent of the nuclear age is how little actually changed. Great power competition continued apace (despite a new, bilateral dynamic). The Soviets blockaded Berlin for nearly a year starting in 1948, in defiance of what was then the world's sole nuclear power: the United States. Likewise, the United States refused to use nuclear weapons in the Korean War (despite the pleas of Gen. Douglas MacArthur) even as Chinese divisions surged across the Yalu River, overwhelming U.S., South Korean and allied

forces and driving them back south, reversing the rapid gains of late 1950.

Again and again, the situations nuclear weapons were supposed to deter occurred. The military realities they would supposedly shift simply persisted. Thus, the United States lost in Vietnam. The Syrians and the Egyptians invaded Israel in 1973 (despite knowing that the Israelis had acquired nuclear weapons by that point). The Soviet Union lost in Afghanistan. India and Pakistan went to war in 1999 - and nearly went to war twice after that. In none of these cases was it judged appropriate to risk employing nuclear weapons - nor was it clear what utility they might have.

Enduring geopolitical stability

Wars of immense risk are born of desperation. In World War II, both Nazi Germany and Imperial Japan took immense geostrategic gambles - and lost - but knowingly took the risk because of untenable geopolitical circumstances. By comparison, the postwar United States and Soviet Union were geopolitically secure. Washington had come into its own as a global power secured by the buffer of two oceans, while Moscow enjoyed the greatest strategic depth it had ever known.

The U.S.-Soviet competition was, of course, intense, from the nuclear arms race to the space race to countless proxy wars. Yet underlying it was a fear that the other side would engage in a war that was on its face irrational. Western Europe promised the Soviet Union immense material wealth but would likely have been impossible to subdue. (Why should a Soviet leader expect to succeed where Napoleon and Hitler had failed?) Even without nuclear weapons in the calculus, the cost to the Soviets was too great, and fears of the Soviet invasion of Europe along the North European Plain were overblown. The desperation that caused Germany to seek control over Europe twice in the first half of the 20th century simply did not characterize either the Soviet or U.S. geopolitical position even without nuclear weapons in play. It was within this context that the concept of mutually assured destruction emerged - the idea that each side would possess sufficient retaliatory capability to inflict a devastating "second strike" in the event of even a surprise nuclear attack.

Through it all, the metrics of nuclear warfare became more intricate. Throw weights and penetration rates were calculated and recalculated. Targets were assigned and reassigned. A single city would begin to have multiple target points, each with multiple strategic warheads allocated to its destruction. Theorists and strategists would talk of successful scenarios for first strikes. But only in the Cuban Missile Crisis did the two sides really threaten one another's fundamental national interests. There were certainly other moments when the world inched toward the nuclear brink. But each time, the global system found its balance, and there was little cause or incentive for political leaders on either side of the Iron Curtain to so fundamentally alter the status quo as to risk direct military confrontation - much less nuclear war.

So through it all, the world carried on, its fundamental dynamics unchanged by the ever-present threat of nuclear war. Indeed, history has shown that once a country has acquired nuclear weapons, the weapons fail to have any real impact on the country's regional standing or pursuit of power in the international system.

Thus, not only were nuclear weapons never used in even desperate combat situations, their acquisition failed to entail any meaningful shift in geopolitical position. Even as the United Kingdom acquired nuclear weapons in the 1950s, its colonial empire crumbled. The Soviet Union was behaving aggressively all along its periphery before it acquired nuclear weapons. And the Soviet Union had the largest nuclear arsenal in the world when it collapsed - not only despite its arsenal, but in part because the economic burden of creating and maintaining it was unsustainable. Today, nuclear-armed France and non-nuclear armed Germany vie for dominance on the Continent with no regard for France's small nuclear arsenal.

The intersection of weapons, strategy and politics

This August will mark 64 years since any nation used a nuclear weapon in combat. What was supposed to be the ultimate weapon has proved too risky and too inappropriate as a weapon ever to see the light of day again. Though nuclear weapons certainly played a role in the strategic calculus of the Cold War, they had no relation to a military strategy that anyone could seriously contemplate. Militaries, of course, had war plans and scenarios and target sets. But outside this world of role-play Armageddon, neither side was about to precipitate a global nuclear war.

Clausewitz long ago detailed the inescapable connection between national political objectives and military force and strategy. Under this thinking, if nuclear weapons had no relation to practical military strategy, then they were necessarily disconnected (at least in the Clausewitzian sense) from - and could not be integrated with - national and political objectives in a coherent fashion. True to the theory, despite ebbs and flows in the nuclear arms race, for 64 years, no one has found a good reason to detonate a nuclear bomb.

By this line of reasoning, STRATFOR is not suggesting that complete nuclear disarmament - or "getting to zero" - is either possible or likely. The nuclear genie can never be put back in the bottle. The idea that the world could ever remain nuclear-free is untenable. The potential for clandestine and crash nuclear programs will remain a reality of the international system, and the world's nuclear powers are unlikely ever to trust the rest of the system enough to completely surrender their own strategic deterrents.

Legacy, peer and bargaining programs

The countries in the world today with nuclear weapons programs can be divided into three main categories.

Legacy programs: This category comprises countries like the United Kingdom and France that maintain small arsenals even after the end of the threat they acquired them for; in this case, to stave off a Soviet invasion of Western Europe. In the last few years, both London and Paris have decided to sustain their small arsenals in some form for the foreseeable future. This category is also important for highlighting the unlikelihood that a country will surrender its weapons after it has acquired them (the only exceptions being South Africa and several Soviet Republics that repatriated their weapons back to Russia after the Soviet collapse).

Peer programs: The original peer program belonged to the Soviet Union, which aggressively and ruthlessly pursued a nuclear weapons capacity following the bombing of Hiroshima and Nagasaki in 1945 because its peer competitor, the United States, had them. The Pakistani and Indian nuclear programs also can be understood as peer programs.

Bargaining programs: These programs are about the threat of developing nuclear weapons, a strategy that involves quite a bit of tightrope walking to make the threat of acquiring nuclear weapons appear real and credible while at the same time not making it appear so urgent as to require military intervention. Pyongyang pioneered this strategy, and has wielded it deftly over the years. As North Korea continues to progress with its efforts, however, it will shift from a bargaining chip to an actual program - one it will be unlikely to surrender once it acquires weapons, like London and Paris. Iran also falls into this category, though it could also progress to a more substantial program if it gets far enough along. Though parts of its program are indeed clandestine, other parts are actually highly publicized and celebrated as milestones, both to continue to highlight progress internationally and for purposes of domestic consumption. Indeed, manipulating the international community with a nuclear weapon - or even a civilian nuclear program - has proved to be a rare instance of the utility of nuclear weapons beyond simple deterrence.

The challenges of a nuclear weapons program

Pursuing a nuclear weapons program is not without its risks. Another important distinction is that between a crude nuclear device and an actual weapon. The former requires only that a country demonstrate the capability to initiate an uncontrolled nuclear chain reaction, creating a rather large hole in the ground. That device may be crude, fragile or otherwise temperamental. But this does not automatically imply the capability to mount a rugged and reliable nuclear warhead on a delivery vehicle and send it flying to the other side of the earth. In other words, it does not immediately translate into a meaningful deterrent.

For that, a ruggedized, reliable nuclear weapon must be mated with some manner of reliable delivery vehicle to have real military meaning. After the end of World War II, the B-29's limited range and the few nuclear weapons the United States had on hand meant that its vaunted nuclear arsenal was initially extremely difficult to bring to bear against the Soviet heartland. The United States would spend untold resources to overcome this obstacle in the decade that followed.

The modern nuclear weapon is not just a product of physics, but of decades of design work and full-scale nuclear testing. It combines expertise not just in nuclear physics, but materials science, rocketry, missile guidance and the like. A nuclear device does not come easy. A nuclear weapon is one of the most advanced syntheses of complex technologies ever achieved by man.

Many dangers exist for an aspiring nuclear power. Many of the facilities associated with a clandestine nuclear weapons program are large, fixed and complex. They are vulnerable to airstrikes - as Syria found in 2007. (And though history shows that nuclear weapons are unlikely to be employed, it is still in the interests of other powers to deny that capability to a potential

adversary.)

The history of proliferation shows that few countries actually ever decide to pursue nuclear weapons. Obtaining them requires immense investment (and the more clandestine the attempt, the more costly the program becomes), and the ability to focus and coordinate a major national undertaking over time. It is not something a leader like Venezuela's Hugo Chavez could decide to pursue on a whim. A national government must have cohesion over the long span of time necessary to go from the foundations of a weapons program to a meaningful deterrent capability.

The exceptions

In addition to this sustained commitment must be the willingness to be suspected by the international community and endure pariah status and isolation - in and of themselves significant risks for even moderately integrated economies. One must also have reasonable means of deterring a pre-emptive strike by a competing power. A Venezuelan weapons program is therefore unlikely because the United States would act decisively the moment one was discovered, and there is little Venezuela could do to deter such action.

North Korea, on the other hand, has held downtown Seoul (just across the demilitarized zone) at risk for generations with one of the highest concentrations of deployed artillery, artillery rockets and short-range ballistic missiles on the planet. From the outside, Pyongyang is perceived as unpredictable enough that any potential pre-emptive strike on its nuclear facilities is too risky not because of some newfound nuclear capability, but because of Pyongyang's capability to turn the South Korean capital city into a proverbial "sea of fire" via conventional means. A nuclear North Korea, the world has now seen, is not sufficient alone to risk renewed war on the Korean Peninsula.

Iran is similarly defended. It can threaten to close the Strait of Hormuz, to launch a barrage of medium-range ballistic missiles at Israel, and to use its proxies in Lebanon and elsewhere to respond with a new campaign of artillery rocket fire, guerrilla warfare and terrorism. But the biggest deterrent to a strike on Iran is Tehran's ability to seriously interfere in ongoing U.S. efforts in Iraq and Afghanistan - efforts already tenuous enough without direct Iranian opposition.

In other words, some other deterrent (be it conventional or unconventional) against attack is a prerequisite for a nuclear program, since powerful potential adversaries can otherwise move to halt such efforts. North Korea and Iran have such deterrents. Most other countries widely considered major proliferation dangers - Iraq before 2003, Syria or Venezuela, for example - do not. And that fundamental deterrent remains in place after the country acquires nuclear weapons.

In short, no one was going to invade North Korea - or even launch limited military strikes against it - before its first nuclear test in 2006. And no one will do so now, nor will they do so after its next test. So North Korea - with or without nuclear weapons - remains secure from invasion. With or without nuclear weapons, North Korea remains a pariah state, isolated from the

international community. And with or without them, the world will go on.

The global nuclear dynamic

Despite how frantic the pace of nuclear proliferation may seem at the moment, the true pace of the global nuclear dynamic is slowing profoundly. With the Comprehensive Test Ban Treaty already effectively in place (though it has not been ratified), the pace of nuclear weapons development has already slowed and stabilized dramatically. The world's current nuclear powers are reliant to some degree on the generation of weapons that were validated and certified before testing was banned. They are currently working toward weapons and force structures that will provide them with a stable, sustainable deterrent for the foreseeable future rooted largely in this pre-existing weapons architecture.

New additions to the nuclear club are always cause for concern. But though North Korea's nuclear program continues apace, it hardly threatens to shift underlying geopolitical realities. It may encourage the United States to retain a slightly larger arsenal to reassure Japan and South Korea about the credibility of its nuclear umbrella. It also could encourage Tokyo and Seoul to pursue their own weapons. But none of these shifts, though significant, is likely to alter the defining military, economic and political dynamics of the region fundamentally.

Nuclear arms are better understood as an insurance policy, one that no potential aggressor has any intention of steering afoul of. Without practical military or political use, they remain held in reserve - where in all likelihood they will remain for the foreseeable future.