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Centre for Air Power Studies (CAPS)
Forum for National Security Studies (FNSS)

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Understanding Consequences of Breakdown of Nuclear Deterrence

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No. 11 30 November 2023

It was 40 years ago, on November 20, 1983, that an American television film, 'The Day After,' was released on the ABC television network.[1] It was the peak of the Cold War, and the possibility of a nuclear war between the USA and the USSR was considered a real threat. Both had built large numbers of nuclear warheads that were routinely maintained on hair-trigger alerts, signalling readiness for use. Carl Sagan graphically described this situation as one in which two enemies were living in a room awash with gasoline; one had 9000 matches, and the other had 7000.[2] While both would die in case a matchstick lit up, each was constantly worried about the other gaining an advantage of pre-emption by being the first to set the room on fire, even though neither could escape the consequences!

However, to deal with the perceived risks of nuclear use, the populace, at least in the USA, was acquainted with the idea of nuclear war from the second grade onwards. Building public and private bomb shelters was the norm. Drills were regularly conducted. As sirens went off, people practised rushing into shelters, which were equipped as per set guidelines to ensure survival for a reasonable period.

While, thankfully, none of these were put to a real test, 'The Day After' did build a story around a fictional nuclear exchange between the US and USSR. The plot depicted rising tensions between the two countries leading up to the imminence of a nuclear exchange. Even before the actual detonation happens, however, the local situation can be seen quickly slipping out of control as

people panic to evacuate to buy essentials, leading to a breakdown of law and order. Once the nuclear detonations take place, the electromagnetic pulse plays havoc with all electronics. So, cars don't start. TV sets don't work. Electricity and all related facilities of water, banking, hospital services, etc, come to a halt. In the movie, the city loses all communication with the outside world. All internal systems collapse. Ironically, though, some weeks after the disaster, when the radio crackles to life, the voice of the US President booms, "America has survived. We have not surrendered. Our values remain undaunted. The country is counting on your strength, will and courage to rebuild our great country." Certainly, nations can rebuild themselves, but at what cost? As a commentator on the movie summed up, "Humanity survives but it does not look good for humankind."

The subject of the consequence of the breakdown of nuclear deterrence with the use of nuclear weapons requires a revisit today because, even at nearly 80 years of age, nuclear weapons are going strong, immune to all efforts at dislodging them. The world has learnt to live with them in a delicate balance of terror and by building some forms of strategic stability. Mutual vulnerability is supposed to keep nuclear war at bay, and there is a fair bit of confidence that signalling well-considered plans of nuclear retaliation would avert possibility of nuclear use. Even in the movie, as tensions are building up, the view of some American citizens is, "They are crazy; but not that crazy." There is a sense of confidence that the unthinkable will not happen.

This remains the predominant belief across the multiple nuclear dyads existing today. It is ironical that while nations make worst-case assumptions about their adversaries, there is nevertheless a tendency to accept a certain level of rationality on their part when it comes to nuclear use. After all, what political objective could be worth the cost of imposing and suffering so much damage, each reasons? But, for this question to elicit the answer 'nothing', there should be an adequate understanding of the nature and scale of damage that a nuclear exchange could cause. The visualisation of this damage can become fuzzy when militaries think of nuclear weapons in the same vein as conventional ones. Approaches that believe that nuclear deterrence is predicated on parity in warhead numbers and that nuclear warfighting can be conducted to achieve victory reflect a sub-optimal understanding of the effects of multiple nuclear detonations.

Meanwhile, even those that put their faith in the belief that rational, cool-headed thinking may be able to avert the possibility of deliberate nuclear use must nevertheless be mindful of other pathways to deterrence breakdown. The highest probability is that of inadvertent escalation because

of miscalculation or misperception. In fact, many factors are exacerbating these risks today, such as stressed nuclear dyads where nations are refusing to hold strategic dialogues with one another, unchecked modernisation of nuclear capabilities, the collapse of arms control, the rise of hedging strategies, and the emergence of new technologies whose intersection with nuclear deterrence is not yet clear. What is even more worrisome is that there is no sense of shared risks among the countries. What we see instead is a swagger that escalation can somehow be controlled and managed.

All of the above developments do not give confidence that nuclear deterrence could not break down at some point. And if that happens, multiple socio-political, environmental and humanitarian crises can be expected.

Effects of Nuclear Use

In theory, the effects of a nuclear explosion are scientifically well understood. Of course, the yield of the warhead, height of detonation, weather, geographical conditions, the time of day or night when the detonation takes place, the amount of material available at ground zero that could fuel the fire, etc., would have a bearing on the extent of the impact. But some things are certain to happen. There will be a blast that will generate immense heat, firestorms, thermal radiation, blast overpressure, and immediate as well as long-term release of radioactivity. Besides, there will be secondary damage from the black soot that gets thrown up into the atmosphere blocks the sun and leads to cooling and variations of nuclear winter. We also know from Hiroshima and Nagasaki that nearly 150,000 people instantaneously vaporised. This happened with the use of only one 12-20 kiloton on each city. Any future nuclear use is unlikely to be restricted to such a singular use.

Military strategists have, of course, propagated the idea that the number of casualties can be reduced by conducting strikes on military targets, especially the adversary's nuclear forces. But a recent study conducted by Princeton University's Program on Science and Global Security has found that even if strategic launch bases were hit, "most of the Midwest would be bathed in a more than lethal dose of radiation, with a worst-case scenario seeing most of the US and Canada becoming uninhabitable. Even after four days of hitting the silos, between 340,000 and 4.6 million people would die—though the average death toll would be 1.4 million. They predicted that 300 million people would be at risk of a fatal dose of fallout." [3]

Other scientific studies have highlighted many other consequences. These include the "significant economic disruption of the aggressor nation and acute food insecurity for a significant fraction of the population," leading to the destabilisation of society.[4] Another report shows the possibility of 'synchronous failure' owing to the increase in the scale and speed of connectivity between human technological, economic, and social systems that have increased the size of the overall systems, leading to the "emergence of a single, tightly coupled human social-ecological global system for the first time in human history."[5] So, irrespective of where the nuclear use takes place, the impact, direct and indirect, would transcend the immediate area.

Meanwhile, a renewed focus of research since 2007 on the nuclear winter scenarios has been possible with far more powerful modelling tools than were available in the 1980s when the first such studies were undertaken. Recent studies have shown how the firestorms caused by detonations in cities would generate an enormous amount of soot and particulates. Advanced climate science models developed to study the effects of global warming, volcanic eruptions, and massive wildfires have been used to model the effects of the soot, as it rises into the upper atmosphere and blocks sunlight. Of course, the scale of a possible nuclear winter will be determined by the scale of the nuclear war, the extent of firestorms generated, the amount of material that burns, the amount of soot injected into the atmosphere, global geographic variations, etc. However, some studies have concluded that the smoke in the case of a regional war between India and Pakistan that sees the detonation of even 100 Hiroshima-sized 15kt weapons would remain suspended in the upper atmosphere for years, block the sunlight, and cool the earth.

Moreover, once the smoke rises to the upper levels of the troposphere and lower levels of the stratosphere, it is expected to remain suspended there in the absence of precipitation, whose chances would be decreased because reduced sunlight would reduce evaporation and weaken the water cycle. Models showed a 10 per cent reduction in precipitation worldwide, drought in the lower latitudes, and a reduction in Asian monsoon rainfall by up to 40 per cent. There is expected to be a global average cooling of about 1.25°C lasting for several years, and even after ten years, the temperature is expected to be 0.5°C colder than normal. Less sunlight and precipitation, cold spells, shorter growing seasons and more ultraviolet radiation from ozone loss would all reduce or eliminate agricultural production.[6] So, human life will be affected in more than one way.

National and international capabilities to deal with the destruction of this scale and nature are difficult to envision. Coordinating a humanitarian response to nuclear weapon detonation scenarios would require providing assistance in areas of residual radiation. Requisite training of an adequate number of responders and customised equipment for such radiological environments in situations that are likely to have suffered widespread destruction of infrastructure cannot be an easy task for national disaster relief teams, which usually attend to a limited region in cases of natural calamities.

Nations tend to dismiss studies that bring up such uncomfortable findings to the realm of the hypothetical. It makes them double down on steps that they believe will make deterrence even more robust. Many of these steps, however, can create further security dilemmas by causing misperceptions and pulling countries into offence-defence spirals.

The fact remains that the possibility of nuclear deterrence breakdown cannot go away as long as nuclear weapons exist. Be that as it may, the risks of nuclear deterrence breakdown should be part of national and international discussions. In fact, knowledge of the humanitarian disaster that a nuclear exchange of even modest-sized yields and numbers of nuclear warheads would cause should enhance the desire to prevent such an event from happening. Knowledge of the impact of nuclear use should make nations realise the folly of building large numbers, touting the ideas of easy nuclear use, and notions of victory through nuclear war fighting. At the same time, it should underscore the sagacity of nuclear restraint in action and behaviour. Till such time as the elimination of nuclear weapons becomes possible, steps towards nuclear risk reduction must include mandatory education on the effects of the breakdown of nuclear deterrence. This would be in the interest of nuclear deterrence in the near term, and hopefully enable the possibility of universal nuclear disarmament in the long term.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

Notes:

[1] Nicholas Meyer, *The Day After*, ABC Circle Films, 1983

[2] "Carl Sagan Quote", *LibQuotes*, https://libquotes.com/carl-sagan/quote/lbk4o5c. Accessed on November 22, 2023.

[3] David Pavlak, "SPIA Global Science and Security Program Reveals Devastation Linked to US Policy on Nuclear Missiles in Silos in Mid-West", *Princeton School of Public and International Affairs*, November 14, 2023. https://spia.princeton.edu/news/spia-science-and-global-security-program-reveals-devastation-linked-us-policy-nuclear-missiles. Accessed on November 24, 2023.

[4] Pearce, J. & Denkenberger D. (2018). A National Pragmatic Safety Limit for Nuclear Weapon Quantities. Available at https://doi.org/10.3390/safety4020025

[5] T Homer-Dixon, B Walker, R Biggs, et al. "Synchronous failure: the emerging causal architecture of global crisis", *Ecology and Society*, vol. 20, no. 3, 2015. https://www.jstor.org/stable/26270255. Accessed on November 23, 2023.

[6] A Robock, & OB Toon, "Local nuclear war, global suffering", *Scientific American*. Vol. 302, no. 1, 2010, pp 74-81. https://www.scientificamerican.com/article/localnuclear-war. Accessed on October 12, 2023.

Recommended Readings:

- RECNA-Nagasaki University, Asia Pacific Leadership Network, Nautilus Institute, "Humanitarian Impacts of Nuclear Weapons Use in Northeast Asia: Implications for Reducing Nuclear Risk", March 2023, at APLN: https://www.apln.network/projects/nuclear-weapon-use-risk-reduction/humanitarian-impacts-of-nuclear-use-cases-in-northeast-asia.
- Pearce, J. & Denkenberger D. (2018). A National Pragmatic Safety Limit for Nuclear Weapon Quantities. Available at https://doi.org/10.3390/safety4020025.
- Robock, A., Xia, L., Harrison, C. S., Coupe, J., Toon, O. B., and Bardeen, C. G.(2023). Opinion: How fear of nuclear winter has helped save the world, so far. *Atmospheric Chemistry and Physics*. 23, 6691–6701. Link: https://doi.org/10.5194/acp-23-6691-2023.