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Nuclear Energy and the Future of Warfare

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Introduction

In April 2020, *Atomfloat* and *The Zveda shipyard*, two Russian companies signed an agreement to build the world's most powerful nuclear icebreaker. Expected to be commissioned in 2027, the new Leader-class of nuclear icebreakers is expected to play an important role in furthering Russia's security positioning in the Arctic.[1] This is one of the many examples of the expansion of nuclear energy applications. The scope of nuclear energy has expanded significantly over the years. It extends from electricity generation to food irradiation; from space exploration to desalination among the others. Several nuclear scientists around the world are trying to further expand its application in other fields, including the military domain.

In the military domain, the focus isn't just on nuclear bombs but also on developing new kinds of nuclear-powered weapons. Several countries have already made strides in this regard. For example, the US and France have nuclear-powered aircraft carriers, while six other countries, including the US and India have nuclear-powered and armed submarines as well. These submarines provide deterrent capability as they carry nuclear missiles, which in effect enable them to have a hidden, mobile underwater nuclear deterrent capability for extended periods of time. Apart from weapons, the scope of nuclear energy also extends to logistical applications in the battlefield. The US army for example, has been exploring the possibilities of using nuclear- powered energy depots to manufacture synthetic fuels for military vehicles in combat zone.[2]

Benefits of Nuclear Power in the Military Domain

Next- generation weapons would require higher power to operate and nuclear energy has emerged as a worthwhile option because of the various benefits it offers. It does not only provide an independent energy base but also has high power density and can operate for long periods of time without needing resupplies. Thus, in battlefield operations, this could prove to be

extremely beneficial in minimising logistical problems of supplying fuel to weapons or military vehicles. In addition, rapid development in nuclear technology is promising smaller, more compact and, portable reactors at a lesser price, making it economically viable. [3]

US President Dwight Eisenhower had once said "*You will not find it difficult to prove that battles, campaigns, and even wars have been won or lost primarily because of logistics.*" [4]

Nuclear energy in this regard once again gains prominence. Nuclear power has the potential to sustain operations for a longer time, by helping in reducing the number of fuel convoys. Recognising the important role nuclear power could play in this regard, the US Army Deputy Chief of Staff's report in 2018 on mobile nuclear power plants for ground operations called this "a classic example of disruptive innovation." [5] In addition, portable nuclear reactors provide a far better option than the petroleum- based liquid fuel systems that most military troops rely on. These are usually delivered either by pipelines, trucks, or ships and often cause logistical challenges. In this regard, the Defense Science Board states that mobile, micro reactors would "fundamentally change the logistics of forward operating bases." [6]

Use of Nuclear Energy to Complement Military Operations

These concepts and ideas are being explored and developed since a long time. For example, in 1963, an Army Study proposed the use of military compact reactors (MCRs) to the US Department of Defence, as a power source for nuclear-powered energy depot to produce synthetic fuels in battlefields. Although the idea did not take off back then due to cost constraints, it is once again being discussed, considering the rapid development of technology in the last few decades. The US government has been rapidly developing nuclear power applications for military purposes. For example, the US Navy has been upgrading its nuclear powered air craft carriers. A new Ford Class aircraft carrier is being designed to produce 25% more power than the previous Nimitz class, with the help of its two A1B nuclear reactors. Commissioned in 2017, they are expected to be deployed by 2022.[7] The United States Army too has been planning to develop portable nuclear power plants to power high energy weapons.[8]

Floating nuclear power plants are also being used to power military bases and utilities which face an energy deficit. For example, the Army Corps of Engineers of the US Army had a nuclear power programme from the early 1950s to late 1970s. This programme was designed to supply electricity to remote facilities such as at Fort Belvoir, Virginia, and Fort Greely, Alaska.[9] Currently, the artificial islands built by the Chinese in the Spratly Group in the South China Sea, are meant to give it leverage in terms of deploying weapons, providing situational awareness and logistics support. [10] However,

providing electricity to these sequestered islands can be a challenge. Thus, China is building several floating nuclear power plants to power these militarised islands. [11]

Russia too has been making strides in this regard. Recently, Moscow commissioned new nuclear- powered icebreakers which would be instrumental in furthering its Arctic ambitions. Moscow is advancing its fleet to develop the Northern Sea Route, which could help in drastically shortening the shipping routes. This route would circumvent Europe, Africa and Asia, which would not only be cheaper, but also be easy for Russia to control militarily. The Arctic region is expected to be an important location for economic, military and strategic purposes. Having a strong presence here would provide Russia with beneficial positioning and leverage over other countries. Opening up of old Russian military bases and the construction of new military bases in the Arctic only goes to illustrate Russia's ambitions for this region. Russia is said to be expecting 13 icebreakers to go operational by 2035, among which nine will be powered by nuclear energy. [12] Along with their regular icebreakers, they are also developing armed icebreakers for military purposes. Named as *"Ivan Papanin",* this versatile sea vessel is being designed to have multipurpose applications: from an icebreaker to a navy warship. It is also said to have the capability to mount up to 8 missiles launchers. [13]

Conclusion

While the increasing application of nuclear power in the battlefield may change the dynamics of warfare in the near future , it also raises key policy concerns with regard to international law, rules of engagement, and laws of war-fighting. The first challenge is with respect to the ambiguity in the nature of the use of nuclear-powered weapons and vessels. Would these types of machinery qualify to be peaceful or as war machines? What would constitute a nuclear installation and will existing nuclear liability conventions apply to these apparatuses as well?

How would one classify the nuclear material used in this way – as civilian or military? There is also the concern of safety of assets. For instance, a nuclear reactor in a military forward base would also be an obvious target for the enemy. Damages extended out of this potential nuclear fallout, would prove to be another big concern.

It would not be an overstatement to say that nuclear energy could potentially revolutionize military logistics in the coming decades. As it already appears, military investment in energy technologies and innovations is likely to grow considering the efficacy and versatility of nuclear energy. However, these developments won't be easy as there are several complex policy challenges that require compelling answers. The jury on the

efficiency of such applications is still out. In addition, as rapid advance in technology poses more opportunities, it also leads to more risks and dangers and would thus require careful monitoring.

(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

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