NUCLEAR STRATEGY OF THE DPRK: DOCTRINE EVOLUTION AND FUTURE PROSPECTS



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I. INTRODUCTION

In this essay, Anastasia Barannikova analyses the DPRK's hybrid nuclear weapons strategy and argues that its impressive progress was the result of clear strategic planning and a vision of the role of nuclear weapons in the DPRK's defense strategy.

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Banner image: Photo by SUKHBAATAR Tsegmid, 2003, at DPRK-Russia-China border at Tuman River, from Russian side with Chinese viewing tower in foreground and DPRK mountains across the Tuman River.

III. NAPSNET SPECIAL REPORT BY ANASTASIA BARANNIKOVA

NUCLEAR STRATEGY OF THE DPRK: DOCTRINE EVOLUTION AND FUTURE PROSPECTS

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Abstract

Over the past decade, the DPRK has demonstrated impressive progress in the development of nuclear and missile technologies. Such progress would have been impossible without clear strategic nuclear planning and a vision of the role and place of nuclear weapons in the country's defense system and ways of their use. To understand the role and ways of nuclear weapon use by the DPRK, an analysis of its nuclear strategy is necessary. At the same time, any assumptions about how the DPRK's nuclear strategy and nuclear and missile program will evolve must be based rather on analysis of its real strategy than of declarative documents serving propaganda means. For this purpose, the most acceptable doctrine for the DPRK was identified, which, together with an analysis of technical capabilities, made it possible to substantiate the acceptability of a hybrid nuclear strategy and suggest its development for the near future.

Introduction

After Kim Jong Un came to power in the DPRK at the end of 2011, the development of North Korean nuclear and missile program has significantly accelerated and become more streamlined. Four more nuclear tests were carried out and missile launches became more frequent. Already in 2013, the country successfully tested a solid-propellant SLBM, in 2017 - an ICBM with a liquid-propellant rocket engine and a hydrogen bomb. Finally, in 2023 the DPRK overcame another milestone in the development of strategic nuclear forces by testing a solid-propellant ICBM.

Such progress would have been impossible without a clearly articulated nuclear strategy. In turn, the development of new nuclear and missile technologies could also influence the evolution of strategic planning of the country' leadership and its doctrinal thought.

Researchers distinguish between declaratory and operational nuclear doctrines (Kippe 2019). While any doctrine is a set of principles, rules and instructions for the use or non-use of nuclear weapons, a declarative doctrine is a set of rules and conditions for the use of nuclear weapons, enshrined in a document that can be published to the general public. It can be called an external nuclear doctrine. The operational, or, internal nuclear doctrine is an actual set of rules and principles for the use of nuclear weapons and conducting warfare. For obvious reasons, such documents are classified and are available only to the top military-political leadership of the country. The difference between declaratory and operational doctrines is determined by the extent to which the state seeks to underestimate or exaggerate the size and capabilities of its nuclear forces and the readiness to use them.

On the one hand, it may seem that so many nuclear states, so many doctrines. On the other hand, declaratory doctrines of nuclear countries have more similarities than differences in their essence, since can be considered a kind of tribute to nuclear ethics and unspoken rules of decency that are the same for all countries. As a result, such concepts as no first use (or NW use in "extreme situation" only), credible minimum deterrent, retaliatory strike can be found in doctrines of many nuclear states with some variations like mutual assured destruction, massive retaliation, flexible response etc. At various stages of development of national nuclear programs, nuclear states could borrow different concepts and provisions of the doctrines of their allies and adversaries. The DPRK is no exception (Barannikova 2021). In this article, the analysis of the specific features of North Korean doctrine, both declaratory and alleged operational, is subordinated to the goals of identifying nuclear strategy, which, unlike doctrines, is unique because it serves the purposes of national strategy and policy goals of a particular country.

Researchers have already made attempts to identify the nuclear strategy of the regional nuclear powers in general and, of the DPRK in particular. Vipin Narang distinguishes between three regional power nuclear postures: the catalytic, assured retaliation and asymmetric escalation posture (Narang 2014). Based on these three postures Shane Smith (Smith 2015) considers four alternative North Korean nuclear strategies: 1) political/diplomatic—a strategy aimed at extracting international, political or diplomatic concessions; 2) catalytic strategy, aimed at internationalizing crises on the Korean peninsula in a way that triggers U.S. and/or Chinese intermediation; 3) assured strategic retaliation —a retaliatory strategy to deter regime-threatening attacks; and 4) a nuclear war fighting strategy to offset conventional weaknesses *vis-à-vis* South Korea and the United States. The author points out that North Korea demonstrates elements from all four strategies and may adopt a hybrid one in the future.

By analogy with the doctrine, we can assume that the strategy can also be declaratory and «operational», or, external and internal. External nuclear strategy serves not only the purposes of deterrence, but is also an instrument of foreign and domestic propaganda, foreign policy and diplomacy. However, it is internal strategy, not external, that determines the practical use of nuclear weapon in hypothetical conflict and the role of NW in domestic and foreign policy of the state. In this

regard, it makes sense to single out the peculiar features of the real, internal nuclear strategy of the DPRK (including the doctrine and plans for the development and use of nuclear weapons) and attempt to forecast its further development.

This paper considers the period from 2013 for a number of reasons: despite the already available achievements in the nuclear and missile sphere by the start of Kim Jong Un rule, the first law related to nuclear weapons was published by the DPRK only in 2013, and starting from the same year nuclear and missile activity has acquired consistency and tests became regular. Researchers note that until 2013, little attention was paid to the nuclear strategy of the DPRK since the country was perceived as “backward, unserious and incompetent” by scholars and its nuclear activity was not taken seriously (Smith 2015). Only after the third nuclear test conducted by the DPRK in 2013 that tendency changed and the nuclear planning of the country became the focus of attention of the expert community.

Doctrinal peculiarities

For a long time since the first nuclear test in 2006, the DPRK did not publish a nuclear doctrine and did not announce its existence, although it can be assumed that work on such document started after the country's leadership decided to transfer its nuclear program to “military footing“. Only on April 1, 2013 the “Law on Consolidating the Position of Nuclear Weapons State” (hereafter the Law of 2013) was adopted by the Supreme People’s Assembly and made public. This document is considered the first published nuclear doctrine of the DPRK. On September 8, 2022, the Law “On the state policy on the nuclear forces” (hereafter the Law of 2022) was adopted at the 7th Session of the 14th SPA of the DPRK to replace the Law of 2013. In addition to these two documents, some insight into the country's doctrine is given by the statements of representatives of the military and political leadership, policy documents, speeches, articles and bulletins published in media or spread by overseas institutions of the DPRK. At the same time, due to the centralization and secrecy of information in the DPRK, any published commentary in connection with the nuclear and missile program should be perceived as external signal and thus may give an idea of the declaratory nuclear doctrine only. As for the operational doctrine, some of its peculiar features can be revealed through analysis of the trends in the development of the nuclear and missile program, potential theater of operations and the surrounding military and political context.

The DPRK, whose nuclear capabilities are inferior to those of the most likely adversary, may prefer to maintain uncertainty and opacity, both in the quantity and quality of nuclear weapons, and in doctrine. Major nuclear powers like Russia and US, having capabilities of mutual assured destruction, prefer to demonstrate these capabilities and publish doctrines that are as close to reality as possible. Whereas regional nuclear states like the DPRK may prefer to compensate for its inferiority through uncertainty. Based on this, it can be assumed that its declaratory and operational doctrines have fundamental differences. A comparative analysis of the two doctrines is difficult, since even the declaratory doctrine, some of the provisions of which are enshrined in the Laws of 2013 and 2022, is characterized by vague wording, which, among other things, contradicts the statements of the top leadership, the materials of the WPK congresses and other published documents. The provisions of the operational doctrine are completely inaccessible for study. Nevertheless, it is possible to try to make out its outlines in the fog of the information war, to single out similarities and contradictions in the declaratory and alleged operational doctrines and to draw a conclusion about how this or that doctrine is acceptable to the DPRK.

First strike uncertainty

Until recently, there was every reason to suggest that the DPRK might adopt a first strike concept in its nuclear doctrine. Though the Law of 2013 clearly provided for the retaliatory strikes (KCNA 201

3), Kim Jong Un at the beginning of March 2016 announced a revision of the country's military doctrine and the possibility of “preemptive attack” (KCNA 2016a). During the 7th Congress of the WPK, the state leader said that the DPRK: “will not use nuclear weapons first, unless the forces of aggression that are hostile to us violate our sovereignty with their own nuclear weapons” (KCNA 2016c). The statement made in 2018 was more vague: “DPRK, as a peace-loving and responsible nuclear power, would not use nuclear weapons unless the hostile aggression forces encroach upon the sovereignty and interests of our state” (KCNA 2018). Thus, the list of conditions for a first nuclear strike outlined in the Law of 2013 was gradually expanded: the conditions for the use of nuclear weapons, in addition to nuclear and conventional attacks, were supplemented by non-military threats. Indeed, comprehensive sanctions, naval or economic blockades, infringement on life and dignity of the country’s supreme leadership (including notorious balloon propaganda campaigns of ROK and “decapitation strikes” exercises by the US and allies) can also be considered by the DPRK as an encroachment on the security, sovereignty and interests of the state.

The Law of 2022 largely retained this ambiguity. On the one hand, its Article 1 states that the nuclear forces of the DPRK serve “to deter a war”, “to repulse hostile forces' aggression” or “achieve decisive victory of war in case its deterrence fails” (KCNA 2022a). On the other hand, unlike the Law of 2013, where the wording of the conditions for the use of nuclear weapons was rather vague, forcing observers to read between the lines and correlate the provisions of the law with the statements of the leadership, the new law contains a detailed list of conditions under which the DPRK can use nuclear weapons first. In addition to the use of nuclear weapons against non-nuclear countries if “they join aggression or attack against the DPRK in collusion with other nuclear weapons states” (Article 5), the Law provides for nuclear retaliation in response to “non-nuclear attack by hostile forces on the state leadership and the command organization of the state's nuclear forces”, “fatal military attack against important strategic objects of the state”, as well as “for preventing the expansion and protraction of a war” and “to correspond with catastrophic crisis to the existence of the state and safety of the people” (KCNA 2022a). Thus, the list of conditions under which the DPRK can launch a first strike has expanded and supplemented by threats of a non-military nature previously voiced in the official statements.

In some sense, new doctrine demonstrates less ambiguity and more commitment to the first strike concept. Moreover, the choice in favor of a first nuclear strike seems logical and even vital for the DPRK as a “smaller” nuclear power, primarily due to the relative weakness of conventional weapons compared to a technologically advanced enemy and a small number of nuclear weapons, which may not be sufficient for the second, retaliatory nuclear strike.

At the same time, in a real conflict, the first strike makes sense only if it is able to deprive the enemy of the possibility to retaliate. Taking into account the difference in nuclear potentials, the DPRK will not be able to deprive its most likely adversary, the United States, of its retaliatory capabilities. If the DPRK had many times more nuclear weapons, an effective first strike would require perfect reconnaissance means and information about the location of enemy nuclear weapons.

It should also be noted that with the coming to power of Kim Jong Un, not only nuclear but also conventional weapons and all branches of the armed forces are being actively modernized, which makes it possible to use them at least in a regional conflict without resorting to nuclear weapons. As for the long-range deterrence, the analysis of the development of the nuclear and missile capabilities and nuclear strategy given in the next parts of the present paper shows that the DPRK, despite the rhetoric and first strike uncertainty in its declaratory doctrine, is more prone to retaliatory strike in its operational doctrine. In contrast to achieving parity with the United States, this goal is quite realistic provided that the problem of the dispersal of nuclear weapons is resolved, for example, by creating a nuclear dyad.

Dyad or non-traditional triad

It should be noted that the question of the intentions of the DPRK to create nuclear dyad or triad remains open. On the one hand, Kim Jong Un stressed the need for the DPRK: “to get ready to make nuclear strikes at the enemies from anywhere on the ground, in the air, at sea and underwater” (KCNA 2016b). This statement may indicate the intention of the DPRK to create a classic triad consisting of land, sea and air components. On the other hand, there was no single mention of the air component of nuclear triad in the 8th Congress report, which focused on the land- and sea components of nuclear forces (KCNA 2021).

An analysis of the weapon systems demonstrated in recent years, which will be discussed in the next parts of the paper, also suggests that the DPRK has focused on a nuclear dyad, consisting of land and sea components. One of the possible explanations is that the air component of the nuclear triad is considered the most expensive and technologically complex. Theoretically, the DPRK could equip its available aircraft with nuclear bombs. However, it should be taken into account that the most likely adversary of the DPRK – the United States – has an advanced missile defense system including components deployed on the territories of allies in Northeast Asia. Thus, relying on nuclear bombers would be technically inexpedient for the DPRK. At the same time, "nuclear strikes in the air" can also mean the delivery of nuclear weapons to high altitudes in order to produce High-Altitude Electromagnetic Pulse (HEMP) capable of disabling communications systems and life support of infrastructure facilities in enemy territory. Given the efforts of North Korea to develop a space program, possession of hydrogen bombs and demand for a weapon to deter both nuclear and conventional attacks, HEMP seems the most efficient and technically feasible option. Finally, the DPRK may focus on development of heavy strike unmanned aerial vehicles (UAVs) instead of expensive and vulnerable aircraft (Barannikova 2024). It is also possible that the DPRK will build non-traditional triad that is different from the classical one. This could be a triad combining nuclear and non-nuclear weapons (similar concept was discussed, particularly, in the US during the Bush administration), a triad including tactical nuclear weapons, triad including cyber troops assigned to disrupt command and control systems of the enemy etc. Although the DPRK borrows the experience of other countries and follows the same path in developing nuclear weapons, this does not necessarily mean that it will adhere to the same concepts and structures that are relied upon by the major nuclear powers. Big powers created their strategic nuclear potentials many decades ago and were influenced by the limitations and concepts of the time, geopolitical ambitions and the need to disperse huge stocks of nuclear weapons. The conditions for the DPRK are different and the preferred way of distributing nuclear weapons may differ accordingly.

Universal nuclear potential

Credible nuclear potential should be sufficient for inflicting unacceptable damage in retaliatory strike or disabling nuclear forces in the first strike, depending on the concept the nuclear country adopts. At the same time, the size of the DPRK's territory and its limited resources make achieving parity in terms of the number of nuclear weapons with the United States and another major nuclear power practically impossible. On one hand, North Korean retaliation does not necessarily have to be massive considering the psychology of the most likely adversary—the United States. Experts argue that the low damage tolerance and unacceptability of single nuclear detonation on American soil would make the United States avoid the risk of a nuclear attack (Boyd 2019). And there is dominant opinion that the DPRK already has ICBMs capable of overwhelming US missile defense (Ward 2023). On the other hand, the U.S. plans that have been voiced for a long time to deploy more GBIs can be one day implemented. Moreover, given the volatility of the global and regional security environment, the DPRK has to take into account potential threats that can emerge in distant future, including those from the currently friendly and neutral countries. In order to compensate for its quantitative

inferiority, the DPRK relies on flexibility and diversity of its nuclear potential.

Since 2013, the articles were published by North Korean official media KCNA and Rodong Sinmun, stressing the need to diversification of nuclear weapons and practically setting the tasks for the nuclear weapon program of the DPRK. The article “Miniaturized, light weight, diversified, precise nuclear weapons” published by the media in 2016, among other things listed diverse delivery vehicles such as “nuclear warheads, nuclear bomb, nuclear torpedoes, nuclear mines etc.” (Allard et al. 2017). The need to diversification was reiterated in statements by the state supreme leadership. Particularly, Kim Jong Un said in report to the 7th Congress of WPK in 2016 that: "We will…further strengthen our self-defensive nuclear forces in terms of both quality and quantity" (KCNA 2016c).

Many of the tasks of nuclear potential diversification have already been successfully solved, and over the past years the DPRK has demonstrated a wide variety of nuclear weapons carriers from railroad combat complexes to nuclear torpedoes.

The nuclear doctrine, which is evolving in parallel with the nuclear program, also reflects the idea of flexibility. The Article 9 of the Law of 2022 states that:

> “1) The DPRK shall constantly assess outside nuclear threats and the change in the posture of international nuclear forces and correspondingly upgrade and beef up its nuclear forces in a qualitative and quantitative way in response to it.
>
> 2) The DPRK shall regularly update its strategy of using nuclear weapons according to different situations to enable its nuclear forces to reliably perform their mission.” (KCNA 2022a).

Thus, the DPRK seeks to create universal, flexible and rational nuclear potential that could be used for deterring not only imminent but also potential threats emerging in the distant future. A vivid example is the regional potential of the DPRK, which is currently deterring the US through its Asian allies, and may deter other regional powers in the case of drastic changes in international situation in NEA. Unlike other nuclear countries, the DPRK has an advantage – it is not yet a party to any arms controls treaties and mechanisms, which means that it can create any classes and types of nuclear weapons in any quantity and opaque manner.

Technical capabilities

The North Korean leadership has repeatedly made it clear in its statements that it would develop the capabilities of both the first and retaliatory nuclear strikes. Particularly, these plans were voiced during the 8th congress of the WPK. In this regard, it makes sense to analyze the current state of the nuclear potential of the DPRK and to find out, to what extent it meets the goals and objectives of the doctrines providing for a first and a retaliatory nuclear strike.

Regional capabilities

At the moment, the DPRK has ballistic missiles with various ranges. These are, first of all, repeatedly tested liquid-propellant SRBMs Hwasong-5 (300 km) and Hwasong-6 (500 km), MRBM Hwasong-7 (1200-1500 km) and Hwasong-9 (800-1000 km). These systems can deliver a nuclear charge to the territory of the ROK and Japan and serve as a regional first strike potential. Multiplicity and mobility of these systems also suggests that at least some of them will survive an enemy first strike and can be used for “residual retaliation”.

Since 2014, the DPRK began testing the Pukguksong-1 solid-propellant SLBM, which was crowned with success in 2016. The range of this SLBM is estimated at 1200 km. Its ground modification

Pukguksong-2 (up to 2000 km) was successfully tested in 2017. In October 2019, the Pukguksong-3 SLBM with a range of 1200 km was also tested.

At the end of 2018, the DPRK conducted a test of "ultramodern tactical weapon", which was personally attended by the head of state and thus was of high importance. Since 2019, the tests of systems called "tactical" in the official DPRK media have become more frequent. In 2019, the DPRK conducted a series of solid-propellant SRBMs tests: Hwasongpho-11Ga (KN-23), reminiscent of the Russian Iskander, with a range of over 600 km; Hwasongpho-11Na (KN-24), which has similarities with the American ATACMS, with a range of 410 km and the KN-25 MLRS with a range of 380 km. In September 2021, the DPRK launched the KN-23 from the rail-mobile launcher (range was estimated 800 km), and in October fired the missile from the experimental GORAE / SINPO class submarine (range was estimated 600 km). Also, the DPRK tested new intermediate-range cruise missile (1500 km), and Hwasong-12Na (Hwasong-8) with a hypersonic gliding warhead (over 1000 km). During the 8th Congress Kim Jong Un announced the development of “ultra-modern tactical nuclear weapons including new-type tactical rockets” and set the task to further “develop tactical nuclear weapons to be used as various means according to the purposes of operational duty and targets of strike in modern warfare”. Already in April 2022, official sources of the DPRK for the first time referred to tested tactical systems as to “tactical nuclear weapons.” And although the number of new systems and plans for their production and deployment are not known for certain, experiments with launching missiles from various launchers suggest that systems like the KN-23 are considered effective and proved capability by North Korean leadership. They are likely being mass-produced and can consist regional nuclear potential. Most of the weapons systems that can be attributed to TNW are dual-capable, i.e. can be equipped with both nuclear and conventional warheads, misleading the most likely adversary about the actual number of nuclear weapons in the DPRK. TNW can be easily dispersed throughout the country, and control over it can be delegated to different departments and military officials. This ensures the survivability of systems in the enemy first strike and guarantees a regional retaliatory strike.

In March 2023 "Hwasal-1" and "Hwasal-2" strategic cruise missiles drills were conducted for "carrying out the tactical nuclear attack missions". They covered the 1500km-1800km distance during the flight (KCNA 2023a).

In March 2023, North Korea tested the underwater nuclear attack drone Haeil-1, which traveled a distance of 600 km and stayed 41 hours underwater prior to firing the warhead (KCNA 2023e). According to the state media, "the mission of the underwater nuclear strategic weapon is to stealthily infiltrate into operational waters and make a super-scale radioactive tsunami through underwater explosion to destroy naval striker groups and major operational ports of the enemy" (KCNA 2023a). In April, the underwater nuclear attack drone "Haeil-2" was tested. This system cruised 1000 km underwater in 71 hours (KCNA 2023f). These systems were named "advantageous and prospective military potential of the armed forces of the DPRK" and Kim Jong Un is reported to personally guide 29 tests. Finally, in January 2024, the KCNA reported the testing of the unmanned underwater strike system "Haeil-5-23".

On September 6 2023 the launching ceremony of the first tactical nuclear attack submarine No. 841 "Hero Kim Kun Ok" was held. This submarine is not nuclear-powered but can carry nuclear weapon. Experts point, basing on the sub construction, that it can carry 10 missiles - probably Pukguksong series SLBMs and Hwasal cruise missiles (Sutton 2023b). Though it is the modification of Romeo class submarine, it is different from the Sinpo-C submarine under construction shown in July 2019. That submarine can carry 3 missiles and is considered a strategic submarine project (Sutton 2023a).

In connection with the launching tactical nuclear attack submarine Kim Jong Un called "to convert the existing medium-sized submarines … into an attack type" (KCNA 2023d). While tests are yet

needed to make this submarine a proved capability, nuclear attack drones can already be considered reliable regional sea-based capabilities given their multiple testing since 2012.

Long-range capabilities

In addition to missiles capable of reaching targets in Japan and South Korea, the DPRK has developed and tested ballistic missiles capable of striking Guam (about 3,400 km), Pearl Harbor (about 7,000 km) and the US mainland (10,000-15,000 km).

In May 2017, the Hwasong-12 intermediate-range ballistic missile (3700 km) capable of reaching Guam was successfully tested in Kusong test-site. During the sixth test (the third successful) of the IRBM in September 2017, its range was already estimated at 4500 km. In July 2017, the Hwasong-14 ICBM (10,000 km), and in November of the same year, the Hwasong-15 ICBM (13,000 km) were also tested. These ICBMs with liquid-propellant rocket engines are already capable of reaching the continental United States.

During the military parade celebrating the 75th anniversary of the WPK in October 2020 the DPRK displayed a liquid-propellant Hwasong-17 or Hwasongpho-17 as referred to by North Korean official media (then called Hwasong-16 by observers), which was tested later, in March 2023. The range of the ICBM, which observers dubbed the "monster missile" for its impressive dimensions, was estimated at 15,000 km. At the moment, this is the latest demonstrated modification of the Hwasong liquid-propellant ICBM. On the one hand, such systems are considered first strike weapons. On the other hand, an ICBM with such huge dimensions is too noticeable, slow and vulnerable, since the satellite of the most likely enemy can easily detect its movement and destroy the missile by a preemptive strike. In this regard, the question arises about the purpose of the Hwasong-17 ICBM development and deployment. Moreover, prior to development of Hwasong-17, the DPRK already had Hwasong-12, Hwasong-14 and Hwasong-15 ICBMs, capable of reaching the territory of the most likely enemy – the US. From this point, the new ICBM did not add much to the threats to the United States, which were already threatened by previous Hwasong modifications. However, in connection with the tests, the country's top leadership called the missile "a reliable new major strategic weapon system" and "the most powerful and absolute nuclear deterrence", which implies its role as a key component of the DPRK's strategic nuclear forces (KCNA 2022b).

It should be noted that the DPRK is working to solve the problems associated with liquid propellant rocket engines. When testing the Hwasong-15 ICBM in February 2023, the DPRK media mentioned the use of a “fuel ampoule” (KCNA 2023b). Two years earlier, the DPRK reported successful test of this technology in hypersonic missile Hwasong-8 and stressed "significance of turning all missile fuel systems into ampoules". The use of ampoule fuel storage would reduce the launch time of ICBMs with liquid propellant engines to 3–5 minutes, which is comparable to solid fuel ICBMs. So it should not be ruled out that the DPRK would try to equip its Hwasong-17 with this technology as well.

So far, it seems that the Hwasong-17, due to its size and visibility, can be used for escalation-d--escalation purposes and for distraction of the enemy's attention from other nuclear forces. For example, during a conflict, the DPRK can “slough off the cicada's golden shell” (Von Senger, 408) and defiantly move the Hwasong-17 around its territory, diverting enemy’s means of surveillance and allowing other North Korean nuclear forces to prepare for a strike. The DPRK can also use mock-ups of this missile as a dummy target for the first strike of the enemy, while keeping alive its potential for a retaliatory strike.

In May 2023, the DPRK for the first time tested the Hwasong-18 (Hwasongpho-18) solid-propellant ICBM with a range of 15,000 km, which means it solved the problem of increasing the diameter of solid propellant rocket engine, which is considered one of the most difficult tasks in rocket science.

From a doctrinal point of view, the DPRK has come one more step closer to the ultimate goal of any nuclear program - the creation of a capability to deliver a guaranteed retaliatory strike against the enemy.

On the one hand, prior to the development of Hwasong-18, the DPRK already possessed a certain nuclear potential capable of surviving a massive first nuclear strike. Its liquid-fueled ICBMs, including the Hwasong-17, are mobile, unlike silo-based ICBMs, and the country's terrain is ideal for camouflaging missile systems. The country also has a network of underground facilities and shelters that allow hiding both weapons systems and production facilities and complicates the work of enemy surveillance equipment and satellites. As a result, neither the location nor the number of carriers of nuclear weapons (and warheads) in possession of the DPRK is known for certain.

On the other hand, an ICBM with a solid-propellant engine has a number of advantages over a liquid-propellant one. Its operation is easier and safer, it is less vulnerable to preventive strikes, since it does not require a long time to prepare for launch and escort of auxiliary vehicles, which means that it attracts less attention of the enemy reconnaissance assets and the probability of destruction by a preventive strike tends to zero. The active part of the trajectory of solid-propellant missiles is two to four times shorter, which improves the missile’s ability to overcome missile defense of the enemy. The probability of intercepting ICBMs with solid propellant rocket engines in the active phase of the flight is extremely low.

However, in terms of the reliability of North Korean ICBMs, the question of the payload survival during re-entry into the atmosphere remains open. The DPRK did not test its ICBMs on a "normal" trajectory, and accordingly, could not check the stability of the warheads under the thermal and mechanical loads, which are significantly different from those emerging during the missile flight on a high lofted trajectory.

At the same time, the DPRK may already have the ability to build re-entry vehicles. Since March 2016, North Korean state media report on conducting atmospheric re-entry simulations. In 2017, the US government sources and experts suggested that the North Korean Hwasong-14 ICBM reentry vehicles would perform adequately if flown on a normal trajectory to continental U.S. targets (Panda 2017). As for the choice of lofted trajectory, it may be explained by geographical and military-political factors. Particularly, this explanation is given in KCNA article devoted to the test of Hwasongpho-18: “In consideration of the security of the neighboring countries and the safety of the multi-stage-separation of the missile during its flight in the territorial air, the test fire was conducted in the way of applying the standard trajectory flying mode to its first stage and the vertical mode to the second and third stages, and of confirming the technological features of all the components of the weapon system by restricting the maximum speed of the missile through delayed stage separation and motor reactivation.” (KCNA 2023c).

The question of whether the DPRK has multiple independent reentry vehicle (MIRV) technology for ICBMs remains, however, open. Kim Jong Un mentioned “conducting research into perfecting the guidance technology for multi-warhead rocket” in his report to the 8th Congress. However, there has been no demonstration of MIRV capability by the DPRK by the moment. At the same time, the dimensions of the Hwasongpho-17 and Hwasongpho-18 ICBMs suggest that North Korea would try to equip them with MIRVs. As for the doubts in the ICBM guidance accuracy, it is only known that the DPRK is actively involved in solving this issue. Efforts of the DPRK in its space program activated in 2021 may evidence among other things, the ambitions of creation satellite network. Among other things, satellite navigation-aiding would improve the accuracy of North Korean ballistic and cruise missiles.

Ideally, credible retaliation capabilities also require solid-fueled SLBMs with long and

intercontinental range and the submarines capable to carry these missiles. The DPRK paraded several modifications of SLBMs in recent years. In October of 2020 the DPRK displayed Pukguksong-4ㅅ SLBM, however, there is no information on its test so far. The Pukguksong-5ㅅ, displayed in January 2021 and larger SLBM (probably, Pukguksong-6), shown in April 2022 have also been untested. The range of these SLBMs is unknown though observers basing on the dimensions of the latest modification, do not rule out intercontinental range (Xu 2022). While the DPRK demonstrated tactical submarine capable of carrying NW, there is no information about progress in the construction of strategic submarine, despite the increased activity in the Sinpo Shipyard in October 2022. Nor the "nuclear-powered submarine" mentioned during the Congress of 2021 was revealed. So, there is no evidence that the DPRK has credible long-range sea-component by the moment.

Number of carriers and warheads

Due to the secrecy of the country, analyzing the number of nuclear weapons carriers it has is a difficult task. However, it appears that the DPRK already has massive regional capabilities. After all, it includes "older" Hwasong-5, -6 and -7 ballistic missiles, estimated from several hundreds to a thousand. These systems are likely gradually replaced by new solid-fuel SRBMs. There is no doubt that the DPRK has begun mass production of all new tactical systems like KN-23, -24, -25 that have been successfully tested. From this point, the report of the Swiss Federal Intelligence Service (FIS) of 2023 is interesting, which states that the DPRK has over 28 batteries of new solid-fuel missiles (probably referring to new tactical systems) (FIS 2023). The report does not cite any sources, and this information is difficult to double-check. However, if to assume that the figure is correct, then based on the fact that the missile or MLRS battery may include 1-2 squads, and be armed with 1-2 missile systems, the number of tactical systems can be estimated at 28-112 units.

South Korean military sources reported back in 2013 that the DPRK had up to 200 TELs, including 100 for short-range Scud missiles, 50 for medium-range Nodong missiles and 50 for long-range Musudan missiles (The Korea Times 2013). In 2020 the US Air Force's National Air and Space Intelligence Center estimated that the DPRK had less than 100 TELs for the Hwasong-5 and Hwasong-6 missiles, the same assessment was made for Hwasong-7 missiles (Kristensen and Korda 2022). As for the longer-range missiles, the number of available TELs is unknown, however, based on open sources and observations of military parades, it can be suggested that the DPRK currently has dozens of Hwasong-12, -14, and -15 ICBMs, at least 12 Hwasong-17 (the number shown at the parade in February 2023), at least 5 solid-propellant Hwasong-18.

Several years ago, a small number of TELs was considered a serious limitation on the number of North Korean long-range and intercontinental ballistic missiles. For example, in 2018 the number of TELs (probably imported from China) for North Korean ICBMs was estimated at only 6-8 (Kippe 2019). However, military parades and demonstrations of recent years evidence that the DPRK could solve the problem of number of TELs. Some sources reported in December of 2019 that the DPRK started mass production of TELs (Associated Press 2019; Inoue 2019). During the parades in 2020-2023 new ICBM TELs, probably indigenous, were displayed. An interesting observation that could shed light on the number of North Korean missiles, was made by the experts of the International Institute for Strategic Studies (IISS): the TELs carrying Hwasong-17 during the April 2022 military parade were numbered 321, 327, 328 и 329, while in October 2020 TELs numbered 322, 323 и 324 were displayed. This observation suggests that the DPRK may have at least 9 TELs for Hwasongpho-17 ICBMs (Dempsey 2022). At the same time, these numerical designations may indicate the number of all TELs available to the DPRK – from those for SRBMs to ICBMs, which is basically consistent with the figures given above.

In any case, even if we take the lowest threshold for estimating the number of nuclear weapons

carriers, the number of warheads the DPRK has available is much smaller. According to various estimates, North Korea could produce enough fissile materials to create 45 to 100 nuclear weapons by 2021, and could produce at least 6-7 nuclear weapons every year (38 North 2021; Bennet et al. 2021). Conclusions were made based on 5 kg of plutonium or 25 kg of uranium per weapon. Given the extension of uranium enrichment plant in Yongbyon (Heinonen et al. 2021), the production of weapons-grade nuclear materials may increase by 25%. Thus, even according to the most conservative estimates, by the end of the decade the DPRK will be able to possess 100 nuclear weapons and more. According to the estimates of South Korean Korea Institute for Defense Analyses, the DPRK already has 80-90 warheads, will have 166 warheads by 2030 and is planning to increase their number to 300 (Park and Lee 2023).

The actual number of warheads will be largely determined by the choice of design and material. The DPRK may combine fissile materials to create various warheads with different yields: simple fission weapons, weapons, made only with plutonium or weapon-grade uranium, ones composed of both plutonium and WGU, a “composite” nuclear weapon and thermonuclear weapons (Albright 2023), which, in principle, corresponds to its tendency towards diversification of nuclear weapons.

However, the pace and volume of production of missiles of different kind is expected to remain the same, as well as the difference in the number of means of delivery and warheads. This suggests that some of the missiles will be equipped with nuclear warheads, and some with conventional warheads. This is especially true for new tactical systems. The 8th Congress stated that the DPRK could "miniaturize, lighten and standardize nuclear weapons and to make them tactical ones", which means that, theoretically, any (but not every) of the tactical systems tested after January 2021 can be equipped with nuclear weapons. However, these systems can be dual-capable (i.e., can carry either nuclear or conventional warheads). A hint of the dual purpose of tactical systems is contained, in particular, in the report of the 8th Congress: “The national defence science sector…proceeded to develop ultra-modern tactical nuclear weapons including new-type tactical rockets and intermediate-range cruise missiles whose conventional warheads are the most powerful in the world.” (KCNA 2021) This statement indicates the likelihood of equipping systems developed as tactical nuclear weapons with conventional warheads. Conversely, initially conventional systems can be equipped with nuclear warheads. This is entirely consistent with North Korea's nuclear strategy, which relies on deterrence through uncertainty.

Based on the above, it can be concluded that the DPRK has already acquired minimum qualitative regional potential for both first and retaliatory strikes. Apart from the newest demonstrated systems, particularly, tactical submarines with ballistic missiles, which still need to be tested, the DPRK can move on to a quantitative increase in this potential. At the same time, long-range potential cannot yet be considered as reliable. Most of the DPRK's ICBMs are liquid-propelled, require lengthy preparation for launch, can be detected by the enemy by satellite reconnaissance, and are vulnerable to a preemptive strike. In this case, the essence of the very concept of the first strike, which implies delivering a sudden strike on the enemy, is lost. It will take time to replace liquid-propellant missiles with more advanced solid-fuel ICBMs. And no matter how many ICBMs the DPRK produces, a huge difference in potential with the most potential enemy will remain in the foreseeable future. On the one hand, North Korea even now has enough ICBMs to saturate the US missile defense system in Alaska and California. The development of MIRV technologies will improve this ability. On the other hand, in the case of a first strike from the DPRK, the United States will respond by a retaliatory (probably massive) strike. Taking into account the difference in the size of its nuclear potentials and technological levels, the DPRK will not be able to neutralize strategic nuclear forces of the US and deprive it of retaliatory strike capabilities, but it will risk losing a significant part of its ICBMs. This also defeats the purpose of the first strike and threatens the very existence of the DPRK. Some strategic and tactical nuclear weapons of the DPRK will likely survive

retaliation, but the environmental, humanitarian and international political consequences will be fatal for its regime.

The same can be said about regional first strikes. The DPRK's existing potential, in principle, allows launching first strikes on the ROK and Japan, with relatively low risk of nuclear retaliation from the United States. However, the US may respond with conventional massive strikes, which will force the DPRK to resort to a nuclear strike with its residual nuclear forces and face the consequences listed in the previous paragraph.

In such conditions, the concept of a retaliatory strike appears to be the most acceptable for the DPRK. The focus on diversification, mobility and survivability of systems, the emphasis on tactical nuclear weapons, solid-fuel ICBMs and ballistic missiles on submarines - all this improves the quality of North Korean nuclear potential and significantly increases its capability of a retaliatory strike, both regional and intercontinental. When quantitative restrictions begin to apply to nuclear potential, then strategy comes into play.

Nuclear posture and strategy

Alternative North Korean nuclear strategies proposed by Shane Smith (Smith 2015) - political/diplomatic approach, catalytic strategy, assured strategic retaliation and a nuclear war fighting strategy - seem quite reasonable and comprehensive, as well as the author’s point that the DPRK demonstrates elements from all four strategies. However, in order to achieve the goals of the present article it is important to understand which strategy is declaratory and which one is internal. For this purpose, it is necessary to analyze the extent to which this or that approach is applicable to the DPRK, taking into account its geographical location, relations with neighboring countries, mentality and historical background.

Political/diplomatic

For many years, the nuclear weapons of the DPRK have served as an instrument of diplomatic and foreign policy pressure. It can be stated that this approach is used by the DPRK at the present time, though, in more sophisticated manner. Demonstrations and tests of nuclear weapon systems, statements by the state leadership and even publication of doctrinal documents have become a kind of missile diplomacy. In the absence of adequate dialogue with opponents missile diplomacy is becoming the only tool of interaction and signalling intentions and reactions of the DPRK to other countries. While demonstrations and tests of ICBMs can be regarded as a direct signal to the United States, then TNW is ideal for putting pressure on US allies in Northeast Asia - the ROK and Japan and trilateral alliance itself.

Beyond their obvious military advantages, both strategic and tactical NW serve the tool of psychological warfare. TNW is an efficient intimidation tool due to the relatively low threshold for its use, which, combined with the "madman's tactics" and the stratagem thinking of North Korean leadership, makes it perfect psychological weapon against the regional powers. Powerful H-bombs, having more destructive power than other nuclear devices, can be considered an effective psychological weapon deterring the adversary with low damage tolerance. The same are solid-fueled ICBMs which start is irreversible and can only be interrupted by missile defense systems, especially if they are deployed in numbers sufficient for overwhelming these systems. Despite some doubts in re-entry capabilities, accuracy and MIRV technology, the possession of these technologies by the DPRK alone could not but impress the opponents. The pace of development of new nuclear weapons systems and the continued uncertainty of the first strike in the doctrine amplify these effects.

While the US may feel relatively safe due to its military superiority and remoteness from the DPRK,

the same cannot be said of its Asian allies. Being in close proximity to the North Korean nuclear potential, these countries tend to take the threats more seriously. The question of the readiness and ability of the United States is already being raised in these countries (International Politics and Society 2023; Rich and Hida 2022). There are also obvious trends towards active military modernization both in ROK and Japan. If the United States continues to fail to solve the "North Korean nuclear problem" and loses its image as a strong and reliable ally, then in the future this may push its allies in Asia towards greater military independence and even the "nuclear path". On the other hand, missile diplomacy can, on the contrary, open up new prospects for a return to the DPRK-US dialogue and at least a temporary normalization of the situation in Northeast Asia.

So, despite the quantitative and qualitative growth of the DPRK nuclear potential, the diplomatic approach will one way or another continue to be inherent in its nuclear strategy. Naturally, the nuclear status of the DPRK will no longer be considered a bargaining chip (if it ever sincerely was), but the transparency of the nuclear potential and intentions may well be discussed. For example, the DPRK may in the future agree to negotiate or join strategic arms control/limitation mechanisms in exchange for reintegration into the global trade and economic system.

Catalytic strategy

This approach is predetermined by the very geographical position of the DPRK. For decades, the DPRK successfully balanced between the USSR and China, especially when contradictions and competition arose in the relations of two big neighbors. The DPRK alternately came closer to one or another neighbor, receiving certain benefits while keeping distance and demonstrating independence in the military-political sphere. At present, the balance of powers has changed: the main actors in NEA are China (with the active support of Russia) and the United States. Although the recent intensification of cooperation between the DPRK and Russia can be regarded as an attempt to balance the influence of China, at the moment there are no obvious contradictions between Russia and China that the DPRK could play on. So, the DPRK rather deters the US by demonstrating military cooperation with both neighbors. China and Russia, both having problems in relations with the United States, are interested in supporting this position of the DPRK. Neighboring states that have friendly relations with the DPRK and are interested in maintaining stability on their borders and protecting their interests in the region, will not stand aside in the event of a conflict between the DPRK and the United States, which means that the United States may face a force that exceeds its own potential. Thus, it can be said that by the moment, the geographical position serves the most effective nuclear deterrent for the DPRK, as it strengthens its own relatively small nuclear potential.

The DPRK is also catalyzing the US, using a dialogue and prospect of normalization to prevent China’s attempts to abuse its influence. During the past talks, including the high-level U.S.-DPRK talks in 1992 and Inter-Korean Summit in 2000, the DPRK has made it quite clear that it could potentially accept a long-term US presence on the Korean peninsula (Denyer 2019; Yang 2007). This position remained unchanged in 2018 (McKirdy 2018; Wertz 2018). The DPRK is fully aware that US bases are primarily aimed at deterring China and Russia and in its turn uses U.S. troop presence as a hedge against excessive influence of its neighbors or threats should this arise in the future. The North Korean leadership's understanding of the variability and volatility of international relations and regional security is evidenced by one important change in its nuclear doctrine. While the Law of 2013 refers to the “hostile policy of the United States and nuclear threat,” the Law of 2022 does not specify the enemy. Indeed, anything can happen in the future - from changes in the internal political situation in China and Russia to a change in their relations with the DPRK. And then the DPRK may face the need to contain threats from its current partners - Russia and China. In order to deter these big nuclear powers, the DPRK may “befriend a distant enemy to attack an enemy nearby” (Von

Senger 2004, 478), in other words, to catalyze the US.

The DPRK catalyzes not only major nuclear powers but also US allies in Northeast Asia, for example, by putting pressure on them by demonstrations of regional nuclear potential. There may be an expectation that the ROK and Japan, in turn, will put pressure on the United States to make them settle the so-called “North Korean nuclear threat,” which will result either in the collapse of the alliance or in the normalization of US relations with the DPRK (the most favorable option).

At the same time, the key feature of the catalytic posture, according to V. Narang, is that the state does not have survivable second-strike forces or tactical nuclear weapons. It contradicts to the current state and tendencies of the DPRK nuclear and missile program.

Assured strategic retaliation

The DPRK already has regional second-strike (systems capable of delivering a nuclear charge to the territory of the ROK and Japan) capabilities and is perfecting its solid-propellant ICBMs. For any nuclear-weapon state, credible nuclear deterrence presupposes a capability sufficient to inflict unacceptable damage on an adversary in a retaliatory strike. The size of the DPRK's territory and the limitations of its resources make achieving parity in the number of nuclear weapons with the United States and another major nuclear power almost impossible. However, in the case of the United States, North Korea’s nuclear retaliation does not have to be massive, given the United States’ unacceptability of a single nuclear strike on their territory. This unacceptability may compensate for the DPRK's limited retaliatory capabilities. Moreover, if American military bases on the territory of the ROK and Japan can be considered the territory of the US, then the DPRK already has guaranteed capabilities to retaliate against the United States. As for the US mainland, given the secrecy of the location and number of ICBMs in the DPRK, there is always a possibility that some of them will survive the first strike and will be used for residual retaliation against the continental United States.

In the context of a volatile global and regional situation, the DPRK must take into account other threats, including those from currently friendly and neutral countries. The regional capabilities that North Korea is developing now to deter the United States through its Asian allies could be beneficial in the future if relations with neighboring countries change for some reason.

The emphasis on developing systems considered ideal second-strike weapons suggests that the country is seeking guaranteed retaliation in its nuclear strategy.

Nuclear war fighting strategy

Although the DPRK doctrines and statements by the leadership signal its readiness to launch a first strike, one should keep in mind that these documents and other public sources are primarily declaratory. They are aimed at the external environment and serve as a way to prevent enemy attacks. At the same time, North Korean nuclear potential may not survive a retaliatory strike, not to mention the international political consequences and the future of the country’s sovereignty. In the event of a first strike, the DPRK can hardly rely on the support of friendly countries, not least because these countries - Russia and China - bear a certain responsibility as members of the NPT and the UNSC. The DPRK has signed the Treaty of Friendship, Cooperation and Mutual Assistance with PRC in 1961, however, the Treaty's Section II stipulates that aid will be provided to DPRK only if it "is invaded by" a third country (Treaty 1961). In the past, Beijing has made it clear that if North Korea initiated an attack, China wouldn't help DPRK. On the contrary, in the event of even a conventional attack by the US or any other country that would threaten the territorial integrity of the DPRK and, in general, stability on the Korean Peninsula, as has already been said, its neighbors

will in any case be involved in the conflict to protect their interests, and a nuclear strike by the DPRK in this case will not be needed. So, the demonstration of readiness to launch a first nuclear strike and ambiguous statements of North Korean leadership can be attributed to the successfully proven “madman” tactics. "Feigning madness without losing the balance" (Von Senger 2004, 587) is part of preventive deterrence. At the same time, despite the uncertainty of the first strike and the demonstration of readiness to use nuclear weapons, the DPRK’s nuclear strategy is more defensive than war fighting, although the DPRK may demonstrate commitment to such a posture.

Thus, the DPRK demonstrates a war-fighting approach in its declaratory strategy, but its real nuclear strategy rather combines the traits of such approaches as catalytic, diplomatic and assured retaliation. These approaches complement each other, compensating for the current weaknesses of the nuclear program. For example, the lack of long-range retaliatory capabilities is compensated by catalyzing / cooperating with Russia and China, which deters the US threat. The diplomatic approach, in turn, helps to deter neighboring countries in case they try to interfere in the internal affairs of the DPRK. As for assured retaliation, this strategy is universal, i.e., can help to deter both adversaries and friendly countries. It is expected that the DPRK will continue to combine all three nuclear strategies, which have already proven effective and contribute to achieving the political goals of the nuclear program.

Conclusion

Over the decade both the nuclear and missile program and the doctrinal thinking of the DPRK leadership have undergone significant evolution. However, while the DPRK began to more openly share information about its weapons systems through articles in official media, military parades and exhibitions, ambiguity of its intentions has remained unchanged. This ambiguity is manifested both in the country's nuclear doctrine, in particular, adherence to the first strike uncertainty, and in the nuclear strategy, which combines features of various strategies including those contradicting each other. This ambiguity is largely determined by the geographic location of the DPRK, the mentality of its leadership, and possibly, the current level of nuclear and missile development.

The types of nuclear weapons demonstrated and tested in recent years, as well as statements by the country's leadership, indicate that the DPRK will continue to demonstrate capabilities and readiness for both a first and second strike in the foreseeable future. At the same time, despite the commitment to the concept of both a first and a second strike in declaratory doctrine, it would be more appropriate for the DRRK to adhere to the concept of a retaliatory strike, which, most likely, is provided for by the country’s operational nuclear doctrine. While the available regional retaliatory strike potential can be considered quite reliable, in order to demonstrate the capabilities of a guaranteed retaliatory strike against the most likely enemy - the US - the DPRK should demonstrate MIRV technology, put an end to disputes about the re-entry capabilities and test SLBMs with long and intercontinental ranges. And, although in theory a retaliatory strike involves a massive strike against the aggressor, there is a possibility that the US will avoid a smaller number of nuclear warheads delivered to its territory, and therefore refrain from a first strike on the DPRK.

The same can be said about the country’s nuclear strategy. Despite the fact that the DPRK demonstrates commitment to war-fighting nuclear strategy, the views of its leadership are rather defensive, and its operational strategy rather combines the features of diplomatic and catalytic approaches, as well as assured retaliation. The complementarity of these approaches serves as a system of reliable deterrence at this point, by creating strategic balance between the DPRK and its most likely enemy and reducing the likelihood of a nuclear conflict to zero. This strategy will also be effective in the event of a change in the international political situation and the emergence of threats from other countries, now neutral and friendly. It will only require adjustment. To support this strategy, the DPRK is already creating universal nuclear potential that is capable of neutralizing not

only current threats, but also those that may arise in the future.

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III. NAUTILUS INVITES YOUR RESPONSE

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