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Initial Stage of North Korea's Nuclear Program Development

Lack of information and the secretive nature of the North Korean regime have led many people to conclude that North Korean leader Kim Jong Il is a crazy or irrational leader whose miscalculations are likely to lead the Korean Peninsula into a devastating war (Goodman, 2003, 1; Halloran, 2003, 17). There are widespread fears that North Korean brinksmanship could backfire and extinguish any hope for a peaceful resolution of the current nuclear crisis. However, most Korea specialists believe the North Korean regime is neither irrational nor crazy, but rather has a distorted worldview and warped expectations about how other countries will respond to its actions[1].

Knowledge of the XXth-century history of Korea is essential to understanding North Korean national interests and goals. Korea was surrounded by major powers, and the peninsula has been subject to numerous invasions over past centuries. Colonialism and war during the XXth century still resonate with policymakers in Pyongyang, and these experiences continue to influence the perceptions of the ruling elite and their supporters. A strong military posture and advanced weapons systems not only help the leadership deal with external threats, but they are also popular among nationalistic citizens who are constantly reminded of the potential external threats to North Korea.

Until the end of World War II in 1945, Korea had remained a single, ethnically and culturally homogenous country for over a thousand years. By 1948, two governments, each claiming sovereignty over the entire peninsula, had been established: the Soviet supported Democratic People's Republic of Korea in the north and the

[1] *Pinkston D., Saunders P.* Seeing North Korea Clearly // Survival. 2003. Vol. 45 (3). P. 80; Research, 1994. P. 80.

US-backed Republic of Korea in the south[2]. The national policies of both Koreas have been shaped by the underlying aim of eventual reunification.

The all-encompassing impact on North Korea of the character, personality, life experiences, and thinking of its founder and first leader, Kim Il Sung, is probably unique among modern nations. The past and current history, nature, and direction of the country cannot be understood apart from Kim Il Sung[3]. Kim's perspective on the world and his view of the purpose of political power and the state were defined by his early education in Chinese schools and ideological training in China, his experience as a guerrilla fighter against the Japanese in Manchuria, and his military training and further political education in the Soviet Union during World War II. The wartime Soviet state became the model on which the North Korean regime was created by Kim Il Sung.

As a key element of his ideological models, «militarism» had a defining impact on Kim's thinking in his early formative years. The experience of the Korean War further strengthened this view. Kim, reflecting Maoist strategic thought, saw contradictory elements as driving history. Conflict did not require a solution; it was the solution to political problems. Hence, politics and international relations were processes by which contradictions were resolved through conflict, and the nature of that conflict was zero-sum. Accordingly to Kim, the purpose of the state, like the anti-Japanese guerrilla unit, was to wage war effectively. In his view, economic activity produced the means to wage war, education produced soldiers to wage war, and ideology convinced the people of the sociological and historical inevitability of war[4].

In analyzing the nuclear intentions of the DPRK, one can determine three main factors that brought about and shaped Kim Il Sung's nuclear ambitions. First, the American atomic bombardment of Japan made an indelible impression on 33-year old Kim Il Sung. He and his guerrillas had been fighting the Japanese troops for almost 15 years and yet had lost almost every battle. However, the United States dropped two atomic bombs and ostensibly, almighty Japan surrendered overnight. These two unrelated facts were connected for Kim Il Sung and he came to admire the atomic bomb, believing in the power of nuclear weapons to overcome even the most formidable foes swiftly[5].

The second crucial experience occurred after the Korean War. Initially, Kim Il Sung discounted the threat of U.S. military intervention in the Korean civil war.

[2] *MacDonald D.* The Role of the Major Powers in the Reunification of Korea // The Washington Quarterly. 1992. Vol. 15 (Summer 1992). P. 53.

[3] *Buzo A.* The Guerrilla Dynasty: Politics and Leadership in North Korea. Boulder: Westview Press, 1999; *Ferrell R.* Harry S. Truman — A Life. Columbia, MO: University of Missouri Press, 1994. P. 1.

[4] *Bradner S.* North Korea's Strategy // Planning for a Peaceful Korea. Carlisle, Pa.: US Army War College, Strategic Studies Institute, 2001. P. 24.

[5] *Mansourov A.* The Origins, Evolution, and Current Politics of the North Korean Nuclear Program // Nonproliferation Review. 1995. Vol. 31. P. 28.

He did not believe that the United States would use an atomic bomb against Korea. However, later, after the Korean war was over and some American war documents were made public in the late 1950-s, he was shocked to discover that the Truman administration did consider very seriously the possibility of using nuclear weapons against the North Korean troops in order to break the North's rapid advance at the beginning[6].

Indeed, soon after beginning of the Korean War, on August 1, 1950, the decision was made to send the 9th Bomb Wing to Guam as an atomic task force. Ten B-29s, loaded with unarmed atomic bombs, set out for the Pacific. On August 5, one of the planes crashed during takeoff from Fairfield-Suisun Air Force base near San Francisco, killing a dozen people and scattering the mildly radioactive uranium of the bomb's tamper around the airfield. The other planes reached Guam where they went on standby duty. At a press conference on November 30, 1950, President Truman was asked if the United States would consider using the atomic bomb in Korea, and he replied, «There has always been active consideration of its use. I do not want to see it used. It is a terrible weapon, and it should not be used on innocent men, women and children who have nothing to do with this military aggression — that happens when it's used». The statement was very controversial, and drew strong international criticism, even from US allies[7]. British Prime Minister Clement Attlee rushed to Washington to express his concern. Truman reluctantly reassured him that the U.S. had «no intention» of using atomic weapons in Korea except to prevent a «major military disaster»[8].

Later, General Douglas MacArthur, one time commander of United Nations armed forces during the Korean War, in a 1954 interview stated that he had wanted to drop «between thirty and fifty atomic bombs» on enemy bases before laying radioactive waste material across the northern edge of North Korea during the war[9]. So, Kim Il Sung realized that the DPRK was on the U.S. «black list» of countries against which it might consider and use nuclear weapons should the need arise. This could well be one of the reasons why Kim Il Sung rushed to sign Alliance Treaties on Friendship, Cooperation, and Mutual Assistance with the Soviet Union and China in 1961, thereby acquiring the protection of their nuclear umbrellas[10].

Third, given Pyongyang's threat perception and security needs, North Korea has sought to strengthen its military capabilities by forming security alliances and by allocating a tremendous amount of resources to the military sector, but Kim Il Sung had been dissatisfied with its alliance partners on several occasions. For example,

[6] Ibid.

[7] *Hayes P.* Pacific Powderkeg: American Nuclear Dilemmas in Korea. Lexington: Lexington Books, 1991. P. 11.

[8] *Truman H.* Memoirs: Years of Decision. Garden City, NY: Doubleday, 1955. P. 108.

[9] *Ferrell R.* Harry S. Truman — A Life. Columbia, MO: University of Missouri Press, 1994. P. 59.

[10] *Mansourov A.* The Origins, Evolution, and Current Politics of the North Korean Nuclear Program // Nonproliferation Review. 1995. Vol. 31. P. 28.

even though China and the USSR provided assistance during the Korean War, Kim Il Sung desired more support than he received. Kim was disappointed that Stalin did not provide ground forces and other resources to expel the Americans from Korea, and following Soviet acquiescence during the Cuban missile crisis; North Korea quickly implemented an import substitution policy in the arms sector to reduce dependence upon foreign weapons suppliers.

Actually, in the last years of Stalin's life, the specter of World War III never loomed larger or more corporeal than it did in 1950, in connection with Soviet support for North Korea's attempt to gain control over South Korea by military means. In the spring of that year, as Stalin and his foreign policy team decided whether to give the final go-ahead for Kim Il Sung's attack on the South, they calculated the likelihood that a Soviet-backed assault on America's client state in Korea might prompt the United States to intervene, expanding the conflict into a global war. In the end, Stalin's fears materialized as the United States did enter the conflict, along with fifteen other states fighting under the United Nations banner. The two pivotal moments in Stalin's decision-making about the war in Korea — the deliberations in early 1950 over whether to launch it and the communications with Beijing in October 1950 over how to avoid its ending in defeat — are therefore particularly important for understanding the Soviet leader's approach to the danger that Cold War tensions might lead to another world war before the Soviet Union was capable of winning it[11]. The large collection of Korean War documents from the Presidential Archive in Moscow shed considerable light on this formerly obscure decision-making process.

In December 1962, the Central Committee of the Korean Workers Party (KWP) adopted «four policy lines» to: 1) improve political and technical discipline in the military, 2) modernize the military, 3) «arm» all the people with «class conscientiousness and military technology», and 4) fortify the whole country. Many analysts argue that inter-Korean rivalry has also motivated Pyongyang to acquire nuclear weapons. It is unclear how North Korea would use a nuclear bomb against South Korea, except for deterrence and/or for coercive diplomacy. Eliminating the South Korean government and reunifying the country on Pyongyang's terms would certainly resolve North Korea's main security problem. North Korea claims to be the sole legitimate government for all the Korean people and all of the territory on the Korean peninsula. According to North Korea's Socialist Constitution, «all state activities shall be conducted under the leadership of the Korean Workers Party, and the North Korean state will complete the revolution based on Chuch'e under the leadership of the KWP». The constitution also declares that the North Korean government represents the interests of all the Korean people[12].

[11] *Weathersby K.* «Should We Fear This?» Stalin and the Danger of War with America // Cold War International History Project, Working Paper (39). Washington, D.C.: Woodrow Wilson International Center for Scholars, 2002. P. 1.

[12] The DPRK Socialist Constitution. Pyongyang: The Administrative Council of the Democratic People's Republic of Korea, 1950. P. 1.

All North Korean government activities are guided by the KWP, which is also committed to revising the status quo on the Korean peninsula. The KWP bylaws state that the party is to «liberate all the people on the peninsula, complete the revolution, and establish communism and Chuch'e ideology throughout all of Korean society». Furthermore, the KWP is to «continually strengthen unification solidarity based on Chuch'e ideology»[13]. The basis of early North Korean development closely resembled the Socialist model originated in the Soviet Union. The principal characteristics of this development model are no private ownership, state-directed allocation of factors of production, cultivation of a military-oriented heavy industry, self-sufficiency, and the creation of trade barriers to shelter the economy from foreign influence. Accordingly, articles 20 and 21 of North Korean's Socialist Constitution were rewritten to reflect the new orientation of the economy.

The primary vehicle for wealth in the Soviet development model is a series of state-headed economic programs that systematically allocated factors of production across each sector of the economy, the most prominent example being Stalin's Economic Plans, implemented in Russia from 1929–1937. Moreover, the division of the Korean Peninsula following the World War II resulted in around 65% of the heavy industrial capability and infrastructure in the North, but the majority of the population in the largely agrarian South. In an effort to duplicate the NEP in North Korea, Kim Il Sung implemented a series of economic programs that proved tremendously successful during the initial rebuilding period. Prewar levels of output were attained by around 1955 or 1956. In particular, the Three-Year Plan from 1954–1956 and the Five-Year Plan from 1957–1960 were rated as the most successful of all economic plans undertaken by North Korea, as GNP grew at unprecedented annual rates of 17 and 22%, respectively. These growth rates eclipsed the benchmark 13% annual growth rate of the Soviet Union's NEP. Consequently, beginning in the early 1960-s, virtually all of North Korea's resources were directed toward military production. Chuch'e entered all walks of life, most notably the military and the economy. Military expenditure in the 1960-s had risen from 6% of GDP to approximately 30%. Eventually stabilizing at this level in the 1970-s, it effectively neglected other sectors of the economy, creating the basis for future economic failures.

As was the case in the Stalinist Soviet Union, North Korea's early economic success was driven by extreme political authority to forcibly motivate workers and consolidate the ownership of resources under state control. Actually, a socialist economy is not more efficient than a capitalist one, but the forced incentives of a command economy have an immediate effect than the implied profit and consumption incentives of a capitalist economy.

The International Atomic Energy Agency (IAEA) notes two distinct phases in the development of the DPRK's nuclear program — an assisted phase and an indigenous development stage. The first stage commenced with an agreement between the

[13] Ibid.

Soviet Union and the DPRK for cooperation in nuclear research in 1956. However, actually, the first indications of nuclear-related activities in the DPRK stem from reports, dated 1948, that the Soviet Union was conducting surveys of North Korea's monazite mines[14]. The case is that monazite contains both thorium and uranium-oxide, materials that were part of the Soviet nuclear-energy program[15]. Soon thereafter, North Korea evidently arranged the large-scale export of monazite ore to the USSR in partial payment for military equipment and arms delivered to Pyongyang in 1949 to 1950[16].

In addition, in 1948 the Pyongyang Engineering College was established. In January 1951, the name is changed to «Kim Chaek University of Technology». The school later established departments in nuclear engineering, precision machinery, and nuclear electronics. Research academy and graduate schools were established at the university in 1956. In 1952, when the Chinese People's Volunteers were holding the battle line along the 38th parallel, China sent Dr. Wang Gao Chang to North Korea to search for and collect radioactive materials[17]. Later this year North Korea established the Atomic Energy Research Institute under the Academy of Sciences. The institute began to conduct research on radioactive isotopes for use in industry, agriculture, and medicine. The institute was placed under the administrative control of the Cabinet's Atomic Energy Bureau in January 1974.

After the Korean War, on February 5, 1955, the Soviet Union and the DPRK signed a five-year agreement on science and technology cooperation, providing for the exchange of technical experiences and data, transfer of technical documentation, exchange of technical specialists, and other forms of technical assistance in all fields of the economy. However, a final key for obtaining a nuclear technology by North Korea was the agreement the North signed with Moscow in March 1956 on joint research in nuclear technology for peaceful uses. At the time, North Korea also became one of 11 states to join the Joint Institute for Nuclear Research at Dubna, 120 kilometers, or 75 miles, north of Moscow on the Volga River[18].

In 1956, Pyongyang began sending a new generation of promising scientists and technicians to work and study at Dubna. Many of them filled key positions in the North's nuclear program. This group includes Lee Sung Ki, a Japanese-trained chemist famed for inventing a nylon-like fabric known as Vinalon. He was widely regarded as a towering figure in the North Korean nuclear program, one of the few

[14] Letter from Soviet Ambassador T. Shtykov to I. V. Stalin dated March 12, 1949 // Archives of the Foreign Policy of the Russian Federation. F. 07. Op. 22a:1.

[15] U. S. Army FEC Intelligence Digest 1951. 12.

[16] Memorandum from A. A. Gromyko to I. V. Stalin dated October 31, 1949 // Archives of the Foreign Policy of the Russian Federation. F. 07. Op. 22a: 7.

[17] *Bermudez J.* North Korean Nuclear Infrastructure // Asia-Pacific Defense Review. 1993. Vol. 7. P. 9.

[18] *Zhebin A.* Political History of Soviet-North Korean Nuclear Cooperation // The North Korean Nuclear Program: Security, Strategy, and New Perspectives from Russia / Ed. J. Moltz and A. Mansourov. New York: Routledge, 2000. P. 28.

nuclear scientists with a public profile. He was twice given North Korea's highest honor, the Kim Il Sung Award. In 1965, he was appointed head of the Atomic Energy Research Institute and later headed the Hamhung branch of the Academy of Sciences, which is said to be focused on chemical weapons research and development. He was 91 when he died in 1996[19].

The other notable North Korean specialist passed through Dubna was Choi Hak Geun, a physicist who in 1986 became the minister for the atomic energy industry of the DPRK. Yet this might have been a reward for diplomatic work rather than for his contribution to nuclear science. Choi twice attended the general conference of the International Atomic Energy Agency in Vienna in the late 1970-s. Reportedly about 100 North Koreans had passed through the institute since 1956. About five to eight North Koreans attend each year. Many of these scientists were placed in charge of the Scientific Research Center on Atomic Energy in Yongbyon (Dr. Paek Kwan Oh), the Pakch'on branch of the Institute of Atomic Energy (established in 1962), the Yongbyon Radiochemistry Laboratory (Dr. Lee Sang Gun), the Department of Nuclear Physics at the Kim Il Sung University (since 1973) and Departments of Nuclear and Electrical Engineering, of Nuclear Fuel Engineering, and of Atomic Reactor Engineering at the Kim Chaek University of Technology, the Kim Il Sung High Physics Academy in Ryanggang Province (since 1963 also known as the Nuclear Engineering Department at the National Defense College in Hyesan, Ryanggang), P'yongsong Institute of Science (a course in nuclear physics since 1963), and Nanam Branch of the Institute of Atomic Energy in Nanamkuyok in Ch'ongjin (since 1965)[20]. Augmented by those trained in China, and possibly also by East German- and Romanian-trained engineers and scientists, and leavened by some who had attended American (for example, Kyong Won Ha, nuclear engineer who worked at Los Alamos National Laboratories in the United States) and Japanese institutes, the North is believed to now field a 3000-man nuclear establishment, including up to 35 Ph.D.'s[21].

In addition, over a period of forty years the Soviet Union trained more than 300 North Korean nuclear specialists at various Soviet institutions of higher education such as the Moscow Engineering Physics Institute (MEPHI), the Bauman Higher Technical School (Bauman VTU), the Moscow Energy Institute (MEI), and others. All these people constituted the backbone of the DPRK's nuclear establishment and became one of the driving forces in the evolution of the national nuclear program, especially in various joint collaborative projects between their respective institutions and the Joint Institute for Nuclear Research at Dubna in a number of key areas of theoretical and experimental nuclear research[22].

[19] *Greenlees D.* How North Korea fulfilled its nuclear dream // International Herald Tribune. 2006. October 23.

[20] Obyedinenniy Institut Yadernykh issledovanii. 1994. 4.

[21] *Young Sun Song.* The Korean Nuclear Issue // Korea and World Affairs. 1991. Vol. XV (3). P. 476.

[22] *Kaurov G.* A Technical History of Soviet-North Korean Nuclear Relations // The North Korean

This fact is interesting, because at the end of 1956 the DPRK recalled most of its students from the «fraternal» countries, even though they had not yet completed their studies, but not from the Joint Institute for Nuclear Research at Dubna. Since their experiences abroad made several students critical of North Korean conditions, in 1957–1958 many former students were neither allowed to correspond with foreigners nor appointed to positions worthy of their qualifications. Those who could participate in production often lacked practical experience. Although the leadership did its best to prolong the stay of the foreign specialists, the shortage of skilled labor proved an insuperable obstacle. On September 7, 1959, the Soviet Union and the DPRK sign a nuclear cooperation treaty whereby the USSR agrees to provide technical assistance in the establishment of a nuclear research center in North Korea. Later this year the DPRK signed an additional protocol with the Soviet Union on the peaceful use of nuclear energy. This protocol authorized the transfer of a small research type nuclear reactor and other complex nuclear equipment to Pyongyang[23].

When the first generation of the North Korean nuclear specialists completed their term of study and practical training at the Soviet Dubna facility and returned to the DPRK in the early 1960s, the North Korean government decided to build a similar complex for them about 90 kilometers northeast of Pyongyang[24]. This was the beginning of the Yongbyon Nuclear Research Complex under the auspices of the DPRK Academy of Sciences. The Yongbyon area was designated as a «special district» directly subordinate to the Administrative Council, with access being severely restricted and controlled by the troops of the Ministry of the Public Security[25]. The Soviet government dispatched thirty Soviet nuclear specialists led by the well-known Soviet nuclear scientist Vladislav Kotlov to assist the DPRK government in establishing the Yongbyon Complex. The USSR supplied the required Soviet engineering blueprints, nuclear equipment, and nuclear fuel, and contributed the bulk of the $500 million (in 1962 prices) required to finance the total start-up costs of the Yongbyon core facilities. The construction of the Yongbyon Nuclear Scientific Research Complex was completed in October 1964.

Initially, the principal facilities housed at Yongbyon comprised a small Soviet-supplied research reactor, the IRT-2000, designed to conduct basic nuclear research and to produce only small quantities of medical and industrial isotopes, and an adjacent radiochemical laboratory for extracting isotopes from «targets» irradiated in the IRT-2000. The IRT-2000 is a «pool-type» research reactor fuelled by a mixture of fuel elements of 10, 36 and 80% enriched uranium, moderated and cooled by «light» (i.e. ordinary) water. Construction of the IRT-2000 began in 1963.

Nuclear Program: Security, Strategy, and New Perspectives from Russia / Ed. J. Moltz and A. Mansourov. New York: Routledge, 2000. P. 17.

[23] *Shabshina F.* Socialist Korea. Moscow: Publishing House of the Oriental Literature, 1963. P. 179.

[24] *Semyonova N.* The DPRK's Economy. M.: MGIMO, 1986. P. 109.

[25] *Bermudez J.* North Korean Nuclear Infrastructure // Asia-Pacific Defense Review. 1993. Vol. 7. P. 6.

It became operational in 1965 at a power rating of 2MW (th), which was upgraded to 4MW (th) in 1974, and to 8MW (th) in 1987.

We should empathized here that this type of reactors useless for military goals. Actually, civil nuclear programs focused on the use of radiation in medical, industrial, and agricultural applications are not well known. However, the medical profession relies extensively on radiation, particularly from radioactive isotopes, for identifying and treating disease. Radioactive materials are also used extensively to test new drugs and conduct research into cures for diseases. As well, radiation is used in pest control and to increase agricultural output. Radiation is also used to determine plant uptake of water and nutrients from the soil, enabling farmers to reduce overwatering and the over-application of fertilizers. Radioisotopes are used in a wide variety of manufacturing processes to provide measurement, density, and other information; to ensure quality control of processes; and enhance properties, such as hardness, strength, and density of certain materials. The main industrial applications of radiation are based on the penetration and scattering of radioactivity, in particular the property that radiation loses energy as it moves through materials. As a result, industry has developed highly sensitive gauges to measure the thickness and density of many materials and imaging devices to inspect finished goods for weaknesses and flaws. Industry also uses radioactive tracers to observe the velocity of materials flowing through pipes and track leakage in buried pipes[26].

However, some analysts argue that ideological and geopolitical confrontation between the DPRK's two great power benefactors, the USSR and PRC, opened room for a diplomatic maneuver by Pyongyang. Indeed, from the Cuban missile crisis to Khrushchev's fall, Soviet-DPRK relations steadily worsened, while Sino — North Korean contacts grew stronger. On 23 October, 1962, one day after the outbreak of the Caribbean crisis, Kim declared that no Communist country had the right to impose its will on others. He probably meant that the Kremlin had subordinated Havana's interests to its own, exposing Cuba to a potential nuclear attack. Therefore, the Yongbyon Complex was born as a product of Kim's skillful manipulation of Moscow's sensitivities and Beijing's excesses in his nascent quest for greater self-reliance and more powerful self-defensive capabilities. In other words, a geopolitical crisis in Northeast Asia created another nuclear opportunity for Kim Il Sung in 1959, and he rushed to exploit it to his advantage[27].

As mentioned by Mansourov, it is clear that Kim Il Sung was not guided by any economic rationale or energy requirement when he conceived of and commissioned the North Korean nuclear program in the second half of the 1950-s. The underdeveloped agrarian North Korean economy and predominantly rural society had just completed the post-war rehabilitation and only began to embark on the path of in-

[26] *Albright D.* Phased International Cooperation with North Korea's Civil Nuclear Programs [Brochure]. Washington D.C.: Institute for Science and International Security, 2007. P. 3.

[27] *Mansourov A.* North Korea's Road to the Atomic Bomb // International Journal of Korean Unification Studies. 2004. Vol. 13 (1). P. 34.

dustrialization and urbanization. The largely pre-modern country neither needed nor could afford very sophisticated and tremendously expensive nuclear energy for its embryonic economic development and meager public consumption. Instead, from the very beginning, Kim Il Sung apparently sought the power of the atom in order to secure the survival of his own regime and to gain more international prestige for his nation[28].

Actually, during his lifetime, Kim Il Sung thoroughly repressed consideration of an autonomous nuclear program within the North Korean military. Furthermore, he could not tolerate the decision of even secondary military matters related to the nuclear program without his knowledge and prior approval. He considered the military nuclear program his exclusive concern and guarded it fiercely. Kim Il Sung personally controlled the execution of the nuclear program. It is likely that the DPRK's nuclear intentions were never written in any DPRK military regulations or explicitly developed in any of Kim Il Sung works on military matters. Therefore, the DPRK's nuclear doctrine may well have been something intangible for the KPA. Hence, precise tasks for the KPA could not be formulated on the basis thereof. Nonetheless, this is not to say that the senior North Korean military officials had no training on what to expect and how to wage war in a nuclear age or about the country's nuclear capabilities. In late 1955, the KPA initiated a series of national level nuclear defense exercises. By 1958, the DPRK, with Soviet assistance, had established the KPA's «Atomic Weapons Training Center» located near Kilchu, on the east coast north of Kimchaek[29]. Since 1959, as part of their standard curriculum, North Korean graduates of the Soviet General Staff Academy have been exposed to Soviet military thinking on the possibilities and ramifications of the use of nuclear weapons in a future war. Since 1965, as part of their field training, they have been able to witness the organizational and technical changes made in the Soviet Armed Forces to meet the challenges of the nuclear age[30].

In conclusion we can say, that the North Korean nuclear program is more than fifty years old. Its *de facto* inception after the establishment of the independent North Korean state in the late 1940-s long precedes international negotiations over the nuclear non-proliferation treaty and formation of the nuclear non-proliferation regime in the mid-1960-s, as well as the establishment of the International Atomic Energy Agency and its safeguards regime in the early 1970-s. Noteworthy by international standards is how slow the nuclear program has progressed and how relatively little it has accomplished since its formal initiation in the mid-1950-s. Despite the devotion of considerable national resources to decades worth of nuclear pursuit, North Korea appears to be close to making only several atomic devices of the 1945 vintage. Profound dearth of indigenous expertise in fundamental science and nuclear technology,

[28] Ibid. P. 35.

[29] *Bermudez J.* North Korean Nuclear Infrastructure // Asia-Pacific Defense Review. 1993. Vol. 7. P. 5.

[30] *Babakov A.* The Armed Forces of the USSR after the War. M.: Voennaya Literatura, 1985. P. 210.

perennial shortage of financing, and vacillating political will may have hampered a more rapid and successful expansion in the DPRK's nuclear capabilities.

The scientific-experimental infrastructure in the nuclear field was created in the DPRK until the middle of 1960-s with the help of the Soviet Union. At this point, a number of specialized scientific and research institutes continue to operate in the country, including the scientific-research institute at the Yongbyon Nuclear Scientific Research Complex. The DPRK has the necessary raw material base and network of atomic industry facilities which along with the scientific-research institutes and trained in the Soviet Union scientists make up the country's nuclear complex. Initially the Yongbyon Nuclear Scientific Research Complex was created for scientific and research usage, but not for construction of nuclear weapons. But North Korea has never had a peaceful nuclear program. The DPRK's ruling regime has always been dedicated to the acquisition of nuclear weapons and making the DPRK a limited nuclear weapon state in order to guarantee the survival of the regime. From its very inception, the nuclear program was driven primarily by national security considerations, not any economic demands. Its intermittent evolution was much more closely associated with strategic bargaining between North Korea and its allies and the latter's oscillating willingness to share nuclear technology with Pyongyang, than any scientific and technical progress made by the North Korean nuclear establishment.

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