



# Will the One Ring Hold?

## Defense AI in South Korea

Youngwook Park

DAIO Study 24|21

Ein Projekt im Rahmen von

 **dtec.bw**  
Zentrum für Digitalisierungs- und  
Technologieforschung der Bundeswehr



### **About the Defense AI Observatory**

The Defense AI Observatory (DAIO) at the Helmut Schmidt University in Hamburg monitors and analyzes the use of artificial intelligence by armed forces. DAIO comprises three interrelated work streams:

- Culture, concept development, and organizational transformation in the context of military innovation
- Current and future conflict pictures, conflict dynamics, and operational experience, especially related to the use of emerging technologies
- Defense industrial dynamics with a particular focus on the impact of emerging technologies on the nature and character of techno-industrial ecosystems

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### **About the Author**

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# 1 Summary

In South Korea, artificial intelligence (AI) stands as a pivotal instrument and a guiding philosophy within the national vision and strategy aimed at spurring economic revitalization and enhancing competitiveness. The nation's historical inclination towards robust state-led initiatives in science, technology, and industrial policies, coupled with a socio-cultural landscape underpinned by a sophisticated information infrastructure, has cultivated widespread public endorsement of AI and digitalization. This societal embrace significantly bolsters the pursuit of national AI policies.

Since the launch of the first national AI strategy in 2019, the government strives to transform the country into an "AI powerhouse," characterized by AI-driven digital services of the state and powerful digital companies. This strategic orientation considers AI as the "One Ring," from The Lord of the Rings saga, and symbolizes the government's endeavor to construct a state-led technological utopia. South Korean Ministry of National Defense (MND) and its armed forces follow through on this vision. Therefore, defense AI plays a pivotal role to prepare the armed forces for the future. Cultivating technologically advanced armed forces that integrate AI is among the government's key priorities for defense modernization. This drive by the government is strengthened by the public's general acceptance of defense AI without any doubts regarding its morality or ethics.

The Ministry's defense AI approach emphasizes a gradual approach that starts with recognition intelligence, followed by judgment intelligence to culminate with decision intelligence. In addition, the MND also aims at establishing a new National Defense AI Center in 2024 in parallel to strengthening ministry-wide governance to coordinate all relevant stakeholders and research and development (R&D) initiatives. Integral to this strategy is the fostering of a collaborative defense AI ecosystem meant to provide novel impulses to reinvigorate a sclerotic traditional defense industrial system that suffers from a bifurcated procurement apparatus, a traditional preference for hardware over software, and limited indigenous defense AI capacities. There is, however, growing consensus among the country's civil and military leadership, that this system needs to be broken up to seize the benefits of defense AI, leverage informatization and digitalization for the armed forces, and bring in top-tier civilian talents working on information and communications technology (ICT).

South Korea's government backs up its ambition with robust spending on AI development. The country's defense R&D budget stood at around KRW5.15tn (USD3.9bn) in 2023, with 56% devoted to technology development. From 2017

to 2021, the MND spent around KRW190bn (USD145M) on AI-related technology development. This amount is set to increase significantly with the MND expected to spend around KRW100bn (USD77M) alone in 2023. Given the fact that other ministries also co-fund defense AI development projects, the total amount is around KRW30bn (USD23M) per year higher than what the defense budget indicates.

Right now, the MND looks at gradually integrating defense AI into surveillance and reconnaissance systems, combat systems as well as command and control (C2) systems. These lines of effort are meant to lead to the development of complex-manned-unmanned combat system (MUM-CS) and creating a Joint All-Domain Command and Control System akin to current US initiatives. In addition, South Korea is exploring the use of defense AI for different tasks like facility perimeter security, coastal surveillance, the use of unmanned systems, as well as multi-source image fusion.

In parallel to technology development and insertion, south Korea is placing significant emphasis on education aimed at nurturing talent in defense AI and enhancing the digital proficiency of defense personnel. The MND is engaging in collaborative efforts with academic institutions to cultivate AI specialists and has initiated a range of AI and software education programs, tailored to various participant groups. To provide a sustainable framework to advance defense AI, the MND also cooperates with the Ministry of Science and ICT, which is keen in educating an AI literate South Korean military. Moreover, the military services have designated several military pilot units to advance human expertise in using defense AI.

# 2 Thinking About Defense AI



The foreign policy of President Yoon Seok-yeol, who came into office in 2022, deviates from his predecessor by underscoring the significance of a robust U.S.-Republic of Korea (ROK) alliance, positioning it as a cornerstone of the nation's foreign and security policy. Additionally, the Yoon administration has pivoted towards policies that emphasize nuclear energy and industrial rejuvenation, marking a departure from the preceding government's focus on green energy initiatives, such as solar and wind power, and its commitment to de-nuclearization.

Despite these notable shifts on foreign policy, President Yoon continues pursuing two policy priorities established by previous governments. First, the Yoon administration continues to prioritize information and communication technology (ICT), including AI, as a central pillar of the nation's strategic vision. In addition, the overarching strategy of augmenting defense capabilities through AI-driven scientific and technological advancements largely aligns with the previous government's approach, despite minor differences in emphasis and specific implementation plans. This continuity in AI-oriented policies reflects a broader historical trend, where successive South Korean governments have consistently emphasized state-led science and technology (S&T) and industrial policies as integral components of their national vision.

While attributing South Korea's rapid economic growth solely to state-driven policies may be an oversimplification, it is evident that an active role of the government is considered important for the country's prosperity. This also explains why the country's government, unlike other nations discussed in this volume, puts more emphasis on actively engaging different ministries in advancing AI to implement the national vision of economic revitalization, national competitiveness, and technologically well-equipped armed forces.

## **2.1 South Korea's National AI Strategy and Policy**

In the early 2000s, the South Korean government embarked on a strategic initiative to harness the potential of IT and digital technologies as catalysts for the nation's economic and industrial resurgence. This period marked a concerted effort by the state to capitalize on the rapid advancements in the digital domain. The conducive socio-cultural landscape, characterized by a relatively advanced information infrastructure, and a public attitude favoring the adoption of sophisticated ICT, including AI, facilitated the effective implementation of these state-led policies.

Shortly after assuming office, the Moon Jae-in administration, in November 2017, established the 4th Industrial Revolution Committee (4IRC),<sup>1</sup> a body designed to report directly to the President. This committee, integrating ministers from the Ministry of Science and ICT (MSIT) and the Ministry of Trade, Industry and Energy, along with private sector experts, was envisioned as a symbolic yet pivotal strategic entity for steering the nation's S&T policy. The Moon administration identified the data-network-AI nexus as one of the three primary innovative industries and launched the country's first national AI strategy in 2019. Led by the MSIT, this strategy marked the government's inaugural top-level AI policy guideline and action plan.<sup>2</sup>

Under the guiding vision of "Transitioning from an IT to an AI Powerhouse," the administration set ambitious targets. These included generating up to KRW455tn (USD346bn) in economic impact through AI by 2030 and elevating South Korea to rank among the top ten nations globally in terms of quality of life.<sup>3</sup> This strategy also encapsulated the government's understanding of AI as technology that replicates human intellectual capabilities in computers, encompassing the ability to recognize situations, make rational and logical judgments and actions, and execute emotional and creative functions. Furthermore, in a significant move towards implementing human-centered AI, the government unveiled ethical standards for AI.

The new Yoon government replaced the 4IRC with the new Digital Platform Government Committee to "synergize governmental data with the services of the private sector, thereby leveraging state-of-the-art technologies in AI, cloud computing, information processing, and networking".<sup>4</sup> The Digital Platform Government serves as a "control tower," envisioned to foster collaboration among citizens, businesses, and the government to address societal challenges and create new value with the help of a unified digital platform. In April 2023, the government unveiled the Implementation Plan for the Digital Platform Government. This initiative, galvanized by the emergence of hyper-scale AI technologies such as ChatGPT, aims to digitize the national administrative system and foster industrial

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1 In 2016, the World Economic Forum coined the term 4th Industrial Revolution and refers to technological innovation in seven key areas: big data analytics, AI, robotics, the Internet of Things, driverless transportation (drones, driverless cars), three-dimensional printing, and nanotechnology.

2 "Announcing the National AI Strategy." MSIT was the lead ministry. All 18 government ministries and committees, including the Ministry of Trade, Industry and Energy and the Ministry of Defense, participated in defining the strategy together with private experts from academia and industry.

3 At the 2023 World Economic Forum in Davos, President Yoon said with regard to South Korea's digital ambition: "The Republic of Korea is advancing a vision for a digital platform government, an initiative that synergizes governmental data with the services offered by the private sector. This endeavor draws upon the ingenuity of the private sector and leverages state-of-the-art technologies in AI, cloud computing, information processing, and networking. The aim is to substantially enhance the caliber of administrative services and establish a comprehensive social safety net, all through the implementation of pioneering administrative solutions." See: Yoon, "Korea will be a key partner in global supply chains."

4 Yoon, "Korea will be a key partner in global supply chain."

and economic growth by actively leveraging and applying AI technology, thereby making its benefits tangible for the population.

## 2.2 Defense AI Understanding and Strategy

In line with the government's One Ring imaginary, the defense establishment considers AI an indispensable asset in fortifying military capabilities and readiness for future conflicts. This positions AI as a central pillar in strategic planning and operational preparedness, underscoring its significance in shaping a resilient and responsive military force.

Defense AI plays a key role amid a complex threat picture consisting of the military challenges posed by North Korea, raising tensions between the United States and China, pressing socioeconomic concerns related to technological dependence and insecurity of supply as well as maritime instability that threatens the stability of the sea lanes of communication across Asia-Pacific that are vital for South Korea. Therefore, the MND is actively advocating for the integration of AI across all defense domains as a pivotal component of its national defense strategy. This strategic direction emphasizes a robust investment in AI-related technologies, identifying them as potential game changers in shaping the future battlegrounds. The Ministry is committed to building intelligent defense solutions to enable highly efficient military operations.

While these AI motives align with those of the United States and other leading global powers, South Korea's situation is distinct as the country's conscript forces grapple with a declining birth rate amid complex security dynamics. Thus, the country's military emphasizes the role of AI in advancing the technology savviness of its armed forces while at the same time compensating for shrinking personnel. As this dual approach is broadly accepted by South Korea's society, the country benefits from broad political and societal support in advancing defense AI.

In the most recent iteration of the National Defense Science and Technology Basic Plan (2023-2027), the MND has delineated its strategic framework for defense R&D investment. This comprehensive plan identifies thirty critical defense strategic technologies across ten key fields, including AI, human-computer interaction, cyber and network communications, quantum technologies, and space. These technologies have been prioritized based on criteria like strategic significance, po-

tential for innovation, urgency, and the possibility of acquiring these technologies.<sup>5</sup> The plan divides the main AI technologies into four areas:

- Intelligent battlefield situational awareness and understanding refers to AI technology based on models and analyses that fuses, learns, generates information, and makes inferences based on data and information collected from diverse battlefield assets.
- Intelligent unified command and control refers to technology that enables decision-driven warfare by suggesting optimal measures based on battlefield situation analysis and judgment results with AI for effective command decisions in tomorrow's complex battlefield environment.
- Logistical support for smart military power includes technology that is used to support scientific and efficient combat sustainment by intelligently processing vast amounts of data generated from various logistic support activities such as advanced weapon system operation, supplies, ammunition, transportation support, personnel, administration, and medical care through AI.
- Finally, there are technologies related to developing and preparing future defense AI solutions (e.g., data management, high-performance computing). These support technologies have been identified as a critical area of government investment.

The MND perceives defense AI as a dynamic and evolving concept and thus proposes to develop the respective capability in three stages.<sup>6</sup> Cognitive intelligence constitutes the first stage with AI for surveillance, reconnaissance, and early warning systems. While these systems are considered "initially autonomous," AI solutions at the second stage advance to "partially autonomous" capabilities. At the third and final stage AI solutions transition to "judgmental intelligence," which entails the use of AI for complex manned-unmanned combat systems. Most mature technologies would pave the ground for "fully autonomous" systems that encapsulate perception, judgement, and decision intelligence. Right now, however, South Korea's defense AI capabilities and capacities are nascent and mainly focus on the first stage. While it is challenging to predict the time needed to reach and operationalize the final stage effectively, R&D investments are concurrently being channeled towards the development of both the second-stage judgmental intelligence systems and the third-stage decisional intelligence systems.

In advancing this ambitious three-stage agenda, the South Korean MND faces a particular challenge that stems from the country's regulatory framework for data and information security, that is excessively rigid for historical reasons. Consensus is growing that overzealous secrecy practices and regulatory measures by the

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<sup>5</sup> National Defense Science and Technology Framework Plan, p. 31.

<sup>6</sup> MND Work Report 2022, p. 6.

military and government agencies are currently impeding the efficient management, sharing, and use of military data. This, in turn, could potentially constrain the defense application and expansion of AI, which relies on data. The lack of a well-structured and integrated military data management system has been consistently highlighted, particularly in terms of data visibility and accessibility, which are critical for effective data utilization.

The MND has initiated projects to address current problems, yet challenges persist as responsibility for data management and data sharing remain scattered across the ministry. The absence of a responsible organization for this task and the underfunding of the respective projects have raised concerns and skepticism regarding the feasibility of establishing a robust data and AI infrastructure. A key step toward ameliorating the situation was taken in 2022 with the setup of the new Defense Data Management Committee aimed at forging consensus on the need for defining a future defense data policy and advancing data-driven defense innovation. To this purpose efforts are underway to establish a data collection, sharing, and management system, as well as data quality management, by appointing data officers for each agency.<sup>7</sup>

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<sup>7</sup> "1st Defense Data Management Committee held."

# 3 Developing Defense AI

## 3.1 Evolution of South Korea's Defense AI Strategy

Since 2019, the South Korean government has embarked on the formulation of a comprehensive national AI strategy, specifically focusing on its application in the defense sector. The strategy sets out the following goals:<sup>8</sup>

- Enable efficient and reliable national security and defense by intelligentizing and advancing core defense mission and tasks based on AI and data.
- Build an intelligent platform to develop and support AI services common to the entire military services; rapidly analyze and process large-scale defense data; develop and support common services such as medical, military, and administrative enterprise.
- Establish an intelligent data center for the standardization, accumulation, and sharing of defense data and accelerate the development of intelligent technologies that support the command and control (C2) system with respect to collaboration and determination.

South Korea's defense AI strategy development process emerged bottom-up with the ROK Army as the main driver. In 2019, the ROK Army stood up the AI Research and Development Center within the Training and Doctrine Command to plan for the use of AI across C4I, intelligence, firepower, maneuver, protection, and operational sustainment.<sup>9</sup> One year later the Army unveiled the 2022-2033 Army AI Development Promotion Strategy and established an AI governance system. In parallel, the ROK Army also introduced the Army TIGER 4.0 vision to transform ground forces by using AI and digital technologies as well as pushing for experiments with a focus on manned-unmanned cooperation to create hyper-intelligent, hyper-connected, and hyper-converged ground forces.<sup>10</sup> Bold ambitions, however, were difficult to implement, among other things, because of frequent changes at the Army Chief of Staff that somewhat dampened the momentum. But despite these challenges, the Army has historically been at the forefront in leading major defense and military policies given the size of its personnel and the service's resource power.

In 2021, based on preliminary studies by the Korea Institute of Defense Technology (KIDET),<sup>11</sup> the ROK Army's initial impulse was backed up by the first formalized AI strategy and plan of the MND. In anticipation of troop reductions and to revolutionize the future battlefield, the MND formulated a strategy for the systematic

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8 ROK National Strategy for Artificial Intelligence, pp. 34-35.

9 Gook, "Artificial Intelligence Technology and Application Cases by Industry," p. 22.

10 "AI-based Future Combat System Army TIGER 4.0," "Army TIGER, a ground combat system implementing advance technology, roars as the future Army's 4th generation combat power."

11 Park et al., Research on Defense AI Development Plan.

application of AI across the defense sector. This strategy embraces innovation, the sharing and collective use of data, and collaboration via a public-private ecosystem as its three core values and lists several implementation tasks (Table 1).<sup>12</sup> With this strategy, the MND put a key emphasis on developing and operating a data platform to collect and share usable data, thereby overcoming barriers stemming from disjunct data management systems and regulations. To this purpose, the strategy foresaw a comprehensive revision of existing regulations to focus on the use of data, dismantling inter-agency silos, fostering a culture of data sharing, progressively establishing platforms including data portals, and enhancing the Defense Data Commission to establish defense data governance.

**Table 1: Korean MND Defense AI Strategy and Implementation Tasks**

Core Value	Execution Strategy	Implementation Tasks
1. Innovation (Transform the way that drive AI across the board)	Build defense AI execution system (establishment of a dedicated AI department)	<ul style="list-style-type: none"> <li>Organize Defense AI Council</li> <li>Establish dedicated AI department and establishment of roles for each agency</li> </ul>
2. Sharing (Create a new paradigm for sharing and utilizing data)	Discover & Suggest Users Requirement and turn into development programs for full-scale AI utilization (create ecosystem and promote core and pioneering projects)	<ul style="list-style-type: none"> <li>Discover large-scale military needs for comprehensive AI utilization</li> <li>Strategic commercialization around core and leading businesses</li> <li>Create a defense AI ecosystem to actively utilize civilian technologies</li> </ul>
3. Collaboration (Build a Defense AI innovation ecosystem with civilian and military partners)		<ul style="list-style-type: none"> <li>Establish customized acquisition system for rapid adoption of AI</li> <li>Improve the current acquisition and operation system</li> </ul>

Source: Strategic Plan for Defense Artificial Intelligence, p. 6.

<sup>12</sup> Strategic Plan for Defense Artificial Intelligence.



Since its inception in 2022, the current government has championed the goal of fostering robust armed forces with the help of Defense Innovation 4.0 and AI.<sup>13</sup> To further expand the use of defense AI, the MND has presented a phased approach, which encompasses the step-by-step intelligentization of surveillance and reconnaissance systems, combat systems, and C2 systems, taking into consideration current levels of AI maturity. In this regard, the MND has formulated a comprehensive defense AI governance roadmap, which includes appointing a Chief Defense AI Officer to oversee and coordinate AI tasks across all services, the Defense Acquisition Program Administration (DAPA), and the respective defense research organizations. Furthermore, the MND wants to establish a National Defense AI Center by 2024 to facilitate a robust top-down defense AI development approach. At the same time, the MND also puts significant emphasis on fostering an open and collaborative public-private defense AI ecosystem to help address the defense ecosystem's most pressing shortfalls that will be discussed below.

In view of advancing South Korea's AI-enabled military forces, MUM-CS play a pivotal role. To build these systems, the three-stage process discussed above provides the general framework.<sup>14</sup> In the first phase, the MND's roadmap proposes implementing a system centered on remote control, followed by demonstrating an autonomous system in the second phase, and expanding the deployment of systems with semi-autonomous capability, eventually transitioning to fully autonomous systems in the third phase. Moreover, the second phase aims at implementing perceptual intelligence capabilities involving the promotion of an unmanned surveillance system through pilot projects, creating an AI-enabled intelligent surveillance perimeter system using drones and robots. In the final phase, the goal is to execute the Joint All-Domain Command and Control System (JADC2), based on mature judgmental intelligence. This includes establishing an AI-based C2 system that can optimally implement joint all-domain operations on the future battlefield, integral to the third phase of Defense Innovation 4.0. This approach shall be implemented via a step-by-step plan to operate pilot units for each military service, identify the needs of future target systems, and spread AI systems to all units through evaluation, supplementation, and verification.

In sum it can be said that the current government has significantly advanced its commitment to defense AI by translating abstract propositions into specific implementation goals and frameworks. The ambition is bold and more concrete than in the past. However, developing and deploying the envisioned MUM-CS will remain challenging given current levels of maturity of defense AI available in South Korea and the need to further refine adjacent technologies for unmanned opera-

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<sup>13</sup> MND Work Report 2022, pp. 6-7.

<sup>14</sup> MND. Undated. Defense Innovation 4.0, Fostering Robust Armed Forces of AI S&T.

tions, autonomy, robust communication network infrastructures, and more general advancements in comprehensive battlefield digitization.

## 3.2 South Korea's Defense AI Ethics Policy

In February 2023, the Ministry of Foreign Affairs of Korea (MFA), in collaboration with the Ministry of Foreign Affairs of the Netherlands, hosted the inaugural Responsible AI in the Military Domain Summit (REAIM) 2023 in The Hague. The Summit's final Call to Action<sup>15</sup> (REAIM 2023) emphasized the need for responsible AI in the defense context but also raised concerns that undue emphasis on additional regulations might hinder technological progress and pose risks to advancing AI-enabled defense capabilities. This summit, initially proposed by the Netherlands during the 2022 South Korea-Netherlands Summit, marked the first international conference dedicated to the responsible use of AI in military operations and provided a platform for Park Jin, Korea's Minister of Foreign Affairs, to underline the country's ambition in shaping the international defense AI ethics agenda.

Despite South Korea's international engagement in defense AI ethics, the current government's domestic digital platform policy appears insufficient to address the ethical and regulatory challenges posed by AI. The implementation strategy largely focuses on regulatory technologies and services centered on privacy and personal data protection, seemingly neglecting the fundamental ethical questions raised by hyper-scale AI. This approach indicates a potential dilution of ethical considerations compared to the previous government's AI policy. Furthermore, South Korea's "Bill on Fostering the AI Industry and Creating a Foundation for Trust," which is poised for enactment,<sup>16</sup> adopts a permissive and post-regulatory approach rather than setting clear standards and robust oversight. This has failed to alleviate concerns among some progressive intellectuals and civil society organizations.

Inter-ministerial collaboration also presents challenges. While the MFA plays a central role in AI ethics, the lack of cohesive cooperation with the MSIT, responsible for AI technology and service promotion, and the MND, the principal defense AI entity, is apparent. Additionally, there seems to be a disconnect between academic and expert groups concerning the promotion, regulation, and ethics of AI, indicating weaknesses in South Korea's national governance concerning the accountability and regulation of defense AI.

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<sup>15</sup> "REAIM 2023 Call to Action."

<sup>16</sup> "Bill on Fostering the AI Industry and Creating a Foundation for Trust Proposal date 1 July 2021."

# 4 Organizing Defense AI

## 4.1 ROK MND, Military Services, and Adjacent Agencies

### ROK MND

Based on the MND's AI strategy, the ministry plays a key role in developing the implementation plans needed to synchronize the defense AI activities of the military services and other MND agencies. Within the Office of the Minister and its affiliated organizations, the Intelligent Information Policy Bureau, the Military Force Policy Bureau, and the recently established Advanced Forces Planning Bureau are engaged in defense AI activities, but a central organization responsible for defense AI is missing:

- The Intelligent Information Policy Bureau, tasked with overseeing intelligent information policy, is theoretically positioned to assume a central role in implementing defense AI-related policies as the designated authority on data and software policies, AI infrastructure of intelligentization platforms, and cloud solutions. However, its structural detachment from the weapon system acquisition sector poses significant challenges, undermining its potential to function as a control tower capable of coordinating and supervising all AI tasks and organizations, including the budgeting of program of records for intelligent weapon systems.
- The Military Force Policy Bureau, responsible for overseeing Defense Force Policy, including Armed Forces Augmentation for which DAPA is accountable, does not directly intersect with the work scope of the Intelligent Information Policy Bureau of MND.
- Moreover, the recently established Advanced Forces Planning Bureau, responsible for overseeing the "AI and manned & unmanned combat system project" operates independently from the other two offices.

The MND's leadership acknowledges the shortfalls of the current governance structure, but the flexibility needed for reorganization is constrained by relevant laws. Nonetheless, the MND is preparing to establish a new National Defense AI Center (NDAIC) in 2024. Based on the suggestions of KIDET, a private think tank, the center would be modeled after the US Department of Defense's Chief Digital and Artificial Intelligence Office (CDAO) and the UK Defense AI Center (DAIC).<sup>17</sup> Expected to streamline existing organizations and improving better coordination

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<sup>17</sup> Park et al., Research on How to Establish and Operate a Defense AI Center.

among different defense stakeholders, critical voices have put forward fundamental questions regarding the identity and organizational structure of the NDAIC and its roles and responsibilities.

## ROK Army

As outlined above, the ROK Army has been the frontrunner on defense AI. The Army's leadership role in Korea's AI strategy is intrinsically linked to its historical prominence as the central force in the nation's governance. This has contributed to the Army's substantial size and its influential position within the defense command system.<sup>18</sup> The Army's proactive stance led to the establishment of a dedicated unit focused on studying the incorporation of AI and big data, pivotal technologies of the Fourth Industrial Revolution. These studies culminated in the launch of the Army TIGER 4.0 initiatives.<sup>19</sup> In 2020, marking a significant milestone, the ROK Army pioneered the development of an AI promotion strategy, derived from the Army TIGER 4.0 initiative, which is a component of the broader i-Army 2030' vision.<sup>20</sup>

The action plan for Army TIGER 4.0 envisioned the creation of an army that is hyper-intelligent, hyper-connected, and hyper-converged. The initial phase of this plan advocated for combat trials and the deployment of unmanned and manned operations involving critical combat vehicles, including drones and unmanned aerial vehicles. The strategy entailed a gradual implementation and augmentation of AI-driven unmanned and manned systems across various military divisions and brigades. Many of the ROK Army's plans, particularly those focusing on unmanned and manned systems, are now integral to the MND's primary AI-related advancement initiatives.

In 2021, the Army Training and Doctrine Command released its comprehensive AI Integration Roadmap 2022-2033 in 2021.<sup>21</sup> The roadmap established incremental objectives for the Army's intelligence evolution, aligned AI concepts with the Joint Staff's long-term armament system evolution trajectory, delineated requirements

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18 While the balance and jointness orientation among the armed forces largely align with the military strategies of developed nations, efforts at the government level have been directed towards reducing the ratio and proportion of the Army's force size and number of commanders as part of defense reform initiatives. Nevertheless, this leadership role is also a natural outcome, given the current state of the ROK armed forces, where other services, including the Joint Chiefs of Staff, are still in the nascent stages of securing dedicated personnel and establishing new organizations for future-oriented tasks.

19 Army TIGER: Transformative Innovation of Ground forces Enhanced by the 4th industry Revolution technology, ROK Army

20 Army Artificial Intelligence Development Promotion Strategy. i-Army 2030 is the Army's "brand name" for military AI, a vision for advancing AI capabilities to build a Hyper-Intelligent, Hyper-Connected, and Hyper-Convergent Army. Hyperintelligence refers to AI that can think, learn, develop, and compute better than human intelligence can. Hyperconnectivity refers to different types of devices such as sensors, computers, communication devices, and robots are connected through communication. Hyperconvergence encompasses activities such as building a technology ecosystem to converge advanced AI technologies from industry, academia, and research into military capabilities. By realizing i-Army 2020, mechanical tasks are entrusted to AI, humans perform more human tasks, and the Army will be more "human-centric."

21 AI Integration Roadmap 2022-2033.

for intelligence systems, and outlined a comprehensive plan for AI platforms, AI human resources, and data.<sup>22</sup>

The establishment of the AI Research and Development Center within the Training & Doctrine Command in 2019 marked a pivotal moment for the Army. This center, which has been folded into the AI and Drone-bot Combat Development Center, was instrumental in identifying future AI-enabled system requirements, forging collaborative relationships with private industry and research institute, and establishing the AI Policy Division under the Policy Division to develop medium and long-term defense AI policies. Although the impact of these endeavors has not yet been objectively evaluated, it is evident that the ROK Army's strategic commitment to using AI as a key means for force transformation remains steadfast and unimpeded. As of the first half of 2023, the Army boasts a robust cadre of 50 specialized AI personnel working at the Headquarters and Training & Doctrine Command.<sup>23</sup>

## **ROK Air Force**

In parallel with the MND, the ROK Air Force has formulated its Air Force AI Development Plan for 2021.<sup>24</sup> Two years earlier, the Air Force Innovation Promotion Plan laid the groundwork by envisioning the Smart Air Force Power concept<sup>25</sup> to leverage emerging technologies. The service's defense AI plan is geared towards creating a mission environment that aligns with the Air Force's vision of future warfare by identifying and implementing defense AI across all Air Force activities, comprehensively embracing the management of mission data as a robust AI foundation and providing guidelines for effective human recourses development in support of defense AI.<sup>26</sup>

In line with the MND's AI strategy, the ROK Air Force is mainly interested in using defense AI in combination with space-based surveillance and reconnaissance systems, big data-driven intelligent command, and decision support systems as well as uncrewed aerial vehicles (UAVs).<sup>27</sup> Given the fact that many of the ROK Air Force's flying platforms are procured from overseas, predictive maintenance of aerial assets constitutes an additional priority, which is, at least for the moment, more pronounced than integrating AI into developing aerospace platforms. Fur-

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22 Future National Defense 2030 Technology Strategy, pp. 13-15; "Army TIGER, a ground combat system implementing advance technology, roars as the future Army's 4th generation combat power."

23 Interview, 10 March 2023.

24 Air Force Artificial Intelligence Development Plan.

25 The Air Force Innovation Promotion Plan; "Air Force completes high-tech military with smart innovation in the 4th Industrial Revolution; "The Air Force Innovation Promotion Plan."

26 Ko, "In an era where warfare cannot be conducted without space...we must secure our own reconnaissance and surveillance capabilities."

27 Air Force Artificial Intelligence Development Plan; Park, "Air Force builds kill web combining AI, drones."

thermore, the Air Force has historically managed data in the logistics domain with a high degree of systematization, leading to a more systematic and rapid adoption of AI in this area compared to other branches of the military.

While the Air Force's plans for defense AI seem clear, its organizational setup remains complex due to overlapping responsibilities among various departments: The Future Planning Center, functioning under the Policy Office, engages in foundational research on concepts and strategies. In parallel, the New Technology Policy Division is tasked with the development of pertinent policies and strategies, while the Intelligent Information Technology Division is charged with crafting data-related policies and systems. The Planning and Management General Staff plays a crucial role in pinpointing and commercializing applications for AI across the entire spectrum of the Air Force, laying the groundwork for AI, and steering the course for AI-focused human resource development and structural improvements.

Looking ahead, the Air Force envisions establishing the Air Force AI Center by 2025. Currently, the number of personnel engaged in AI-related tasks is estimated to be around 30, with a focus on software policy for technological applications, primarily centered at the headquarters. This envisaged expansion and structuring signify a concerted effort to consolidate and enhance the Air Force's capabilities in the realm of artificial intelligence.

## **ROK Navy and Marine Corps**

The Navy Vision 2045, published in 2021, presents a demanding vision for the intelligentization of the naval forces and the Marine Corps, which is part of the Navy.<sup>28</sup> In line with the sister services, the strategy emphasizes the goal of a SMART Navy that leverages emerging technologies. The vision identified five core AI capabilities alongside plans to establish a foundational infrastructure for defense AI, including expert training and data management.<sup>29</sup> SMART Navy underlines the ambition to enhance naval weapon systems, inter alia, by integrating manned-unmanned combat capabilities, using emerging technologies to operate under a shrinking number of seamen, and advancing the operation of a cost-effective naval force. The Navy envisions defense AI to play a key role across these three goals.<sup>30</sup>

On the way to become a SMART Navy, the service established the Future Innovation Research Center in 2020, dedicated to exploring the development and ap-

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28 Direction of Intelligentization of Naval Battlefield Functions.

29 Ahn, "Implementation of 'Navy Vision 2045' and 'Defense Reform 2.0 Navy Promotion Plan'."

30 Park, Research on Defense AI Development Plan, pp. 7-8.

plication of new technologies, including AI. In 2023, the Navy expanded its focus by establishing a specialized AI division within the Navy Headquarters' Intelligent Information Technology Department. Concurrently, the Marine Corps formed the Intelligence and Information Technology Division at its headquarters, tasked with developing AI policy and managing related operations. Among the military services, the Navy currently maintains the smallest AI workforce. Additionally, it is poised to establish a dedicated data organization to centralize and manage naval data, integrating existing software technology and data-related entities such as the Information System Management Corps and the Ship and Aircraft Software Support Center.

## **ROK Joint Chief of Staff**

As of today, the Joint Chief of Staff (JCS) lacks a department exclusively dedicated to AI, but two departments deal with AI-related tasks. The High-Tech Power Division outlines future warfare requirements based on advanced technologies and thus also identifies future defense AI needs. The Advanced Technology Force Test and Evaluation Division tests and evaluates technologies relevant for intelligentization and thus also looks at defense AI. As outlined above, defense AI strategy development has traditionally followed a bottom-up logic in South Korea. This contrasts with a top-down methodology promoted by the MND or the JCS. This existing dynamic continues to pose challenges to the establishment of comprehensive defense AI governance and a centralized control tower system.

## **Defense Acquisition Program Administration (DAPA)**

Under the overarching supervision of the MND, DAPA operates as an independent government ministry, as delineated by the Defense Acquisition Program Act. DAPA bears responsibility for the acquisition of weapons systems, R&D programming and budgeting, acquisition project management, and defense industrial policy. Consequently, the successful execution of the defense AI strategy is contingent upon DAPA's proactive engagement and commitment to developing AI-applied intelligentization systems within the defense R&D and acquisition process.

In 2021, DAPA unveiled its own AI strategy, designed to innovatively enhance intelligence capabilities by integrating AI technology into weapon systems.<sup>31</sup> Efforts are underway to prioritize budget allocation for AI technology development and the R&D of intelligent systems. DAPA's AI strategy is aligned with the MND AI policy direction.

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<sup>31</sup> Strategy for Application of Artificial Intelligence in Weapon Systems.



Given DAPA's independence, the military services are not directly involved in weapon system acquisition programs, which poses a specific challenge for the MND's intelligitization ambition. Should DAPA not act swiftly on allocating budgets and ensuring an adequate project management framework for each weapon system, the MND's ambitious intelligitization plans and its defense AI agenda will remain elusive. In addition, the current division of responsibilities foresees DAPA overseeing development and acquisition and the MND, together with Defense Logistics, managing acquisition policy including commercial products relevant for intelligitization. This bifurcated system hinders the full adoption of AI, that blurs the lines between traditional hardware-centric weapon systems and new software-based modifications and upgrades. Consensus is growing that this split needs to be addressed, yet specific measures and roadmaps to alleviate the situation remain to be adopted.

### **Agency for Defense Development (ADD)**

The ADD, a government-funded research entity operating under the aegis of DAPA, has historically managed R&D projects pertaining to weapon system development and technology. Although the ADD has demonstrated leadership in conventional military technology fields, its competitiveness in AI and ICT, predominantly developed in the private sector, has been perceived as relatively limited.

Noteworthy improvements have been undertaken since 2021 with the foundation of the AI Autonomy Center. The center's primary mission is to research AI core technologies essential for the development of intelligent weapon systems. This includes conducting R&D on core technologies integral to intelligent weapon systems, such as AI common architecture, situation recognition, judgment intelligence, collaborative intelligence, surveillance and reconnaissance intelligence, and the development of multi-source image fusion systems. In 2023, the scope of the center was broadened to include autonomy technology.

### **Research Institutes**

In 2023, the Korea Institute for Defense Analysis (KIDA), a government-funded research institute under the auspices of the MND, inaugurated the Defense Data Analysis Center to advance defense data analysis and support. In addition, the center conducts policy research on defense data, data construction management support, data quality management, and utilization support.

Outside the MND several government-funded research institutes contribute to defense AI. For instance, the Electronics & Telecommunications Research Institute (ETRI), an ICT technology research entity, is engaged in AI technology development and utilization projects. Similarly, the National Information Society Agency

(NIA), primarily responsible for digital and intelligentization projects in the public sector, is involved in AI development projects and infrastructure construction in the defense domain.

Despite playing an important role in South Korea's civil-military AI ecosystem, many civil research institutes lack a comprehensive understanding of the defense sector and the armed forces long-term needs. In addition, top-tier academic research institutes and experts that provide world-leading ICT expertise are reluctant to engage on defense. In their view, the defense market is unattractive because it is limited in size and intellectual property rights cannot be used freely. Overcoming these problems will be essential for civil research institutes to assume a broader role in future defense AI projects and policies.

## 4.2 Defense Industry

South Korean defense R&D predominantly operates within an insular framework, principally involving the ADD and select defense institutions. The current system is considered excessively insular, inefficient, and unappealing due to its low profitability. Consequently, there is growing consensus that the ecosystem needs to be adapted for the country's armed forces to acquire innovative technologies for future capabilities. This prompts the need to open the existing ecosystem towards fostering synergies with non-traditional partners in the private sector.

In South Korea, dominant AI technology and industry players like Naver,<sup>32</sup> Kakao,<sup>33</sup> Samsung,<sup>34</sup> LG,<sup>35</sup> and SK<sup>36</sup> show limited interest in defense projects. This, coupled with the fact that new companies and startups are still maturing, results in a relatively small pool of private AI industry groups available for participation in defense projects. Moreover, the military and ADD's requirements for defense domain expertise and system integration capabilities further narrow the field of eligible private new technology companies, constraining extensive collaboration between defense and private sectors.

Despite these challenges and although defense companies generally prefer to manage projects involving AI and autonomous technologies in-house, the engagement of private actors is on the rise. Currently, projects involving AI integration in South Korean weapons system are typically undertaken as Core Technology

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32 For more information, see: <https://www.navercorp.com/en/naver/company> (last accessed 30 January 2024).

33 For more information, see: <https://www.kakaocorp.com/ir/main> (last accessed 30 January 2024).

34 For more information, see: <https://www.samsung.com/sec/> (last accessed 30 January 2024).

35 For more information, see: <https://www.lg.com> (last accessed 30 January 2024).

36 For more information, see: <https://eng.sk.com/> (last accessed 30 January 2024).

Development or Dual-Use Technology Development projects, rather than focusing on System Integration Development Steps. To participate in these projects, AI ventures, startups, and private new technology companies are primarily contributing as lower-tier suppliers or contract research organizations to development projects initiated by the ADD or defense system companies. For example,<sup>37</sup>

- DeepX<sup>38</sup> has recently been selected as the prime to design and prototype AI semiconductors intended for use in future battlefield surveillance drones.
- SELVAS AI<sup>39</sup> is developing an AI-based military medical system.
- Human ICT<sup>40</sup> and Davio focus on computer vision for surveillance and reconnaissance.
- CTI Lab<sup>41</sup> is an important player in the cybersecurity sector.
- WiseNut<sup>42</sup> offers solutions for decision-making support along with SaltLux,<sup>43</sup> 42Maru,<sup>44</sup> and Konan Technology,<sup>45</sup> which engage in developing large language models (LLM).

Although numerous defense R&D stakeholders hope for a significant transformation of South Korea's closed defense industrial ecosystem in favor of closer public-private cooperation and easier access to defense projects by innovative companies, change will hardly materialize soon. Nevertheless, the government's firm policy intention as well as the growing interest of innovative companies to engage on defense are signs of hope for gradual change in the medium to long-term.

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37 Overview based on: Interview, 28 November 2023.

38 For more information, see: <https://deepx.ai/> (last accessed 30 January 2024).

39 For more information, see: <https://www.selvasai.com/> (last accessed 30 January 2024).

40 For more information, see: <http://www.hictc.com/eng/> (last accessed 30 January 2024).

41 For more information, see: <https://ctilab.ai/english> (last accessed 30 January 2024).

42 For more information, see: <https://www.wisenut.com/> (last accessed 30 January 2024).

43 For more information, see: <https://www.saltlux.com/en/> (last accessed 30 January 2024).

44 For more information, see: <https://www.42maru.ai/en/> (last accessed 30 January 2024).

45 For more information, see: <https://brochure.konantech.com/en/> (last accessed 30 January 2024).

# 5 Funding Defense AI

## 5.1 Korea's National R&D Budget for AI

As highlighted above, state-led science, technology, and industry policies play a key role in South Korea. The MSIT is responsible for policy formulation in S&T and plays a pivotal role in shaping and implementing the nation's comprehensive R&D budget. Moreover, the government's industrial strategies, orchestrated by the Ministry of Trade, Industry, and Energy, exert considerable influence on the market and the industry landscape. Consequently, it is not surprising that government-funded research institutes play a pivotal role in the national S&T system. This encompasses over forty state-funded research institutes in S&T and engineering fields, including entities such as ADD, in addition to thirty institutes focused on humanities and social sciences. These institutes operate predominantly on national R&D funding and fall under the oversight and supervision of relevant government ministries, chiefly the MSIT, in alignment with their respective research domains.

In 2023, the South Korean government invested a total of KRW30.7tn (USD23.5bn) in state-run research institutes and various science and technology fields.<sup>46</sup> As part of this budget, around KRW1.43tn (USD1bn) has been earmarked for R&D on ICT, with around 50% directed at AI initiatives. Furthermore, investments in cybersecurity (KRW165.3bn or USD126M) and other digital technologies such as AI-centric semiconductors, quantum technology, metaverse, 5G, and 6G are on par with the funding allocated to AI.<sup>47</sup> Defense R&D accounted for 16.6% of the KRW5.1tn (USD3.9bn) in total government R&D, ranking third after the MSIT and the Ministry of Trade, Industry & Energy.

Recently, the efficiency and competitiveness of these government-funded research institutes has been criticized. Thus, the government, for the first time, decided to bring down the 2024 R&D budget by 14% to KRW21.5tn (USD16.5bn). While the ICT budget will be cut by 21% to KRW1.1tn (USD844M), the budget on R&D for AI will be increased by 4.5% to KRW37.1bn (USD565M).

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<sup>46</sup> Key Features of the 2023 National R&D Budget, p. 3.

<sup>47</sup> ICT R&D Program: 2023 Korean Government R&D Program, p. 5; "Total investment of KRW1.429 trillion in ICT R&D in 2023."

## 5.2 South Korea's Defense Budget and Budget Trends in Defense AI

After several years of continued growth, South Korea's defense spending culminated at KRW57.1tn (USD43.4bn) in 2023.<sup>48</sup> The MND spends around 40% of the budget on personnel, 30% on force maintenance, and 30% on force modernization (MND 2023a: 4). Last year, defense R&D accounted for 9.1% of the budget or KRW5.1tn (USD3.9bn). 56% were spend to defense technology development and 21% or KRW1.4tn (USD1bn) has been earmarked for weapon systems development.

South Korea's defense R&D budget delineates priority investments across ten domains, encompassing thirty defense strategic technologies, which include AI, MUM-CS, and space. Like many other nations, the MND does not disclose an aggregate defense AI budget as spending on defense AI is part of many different program and budget lines. Scrutinizing the defense R&D budget yields the following results:

- The MND allotted KRW734.7bn (USD558M) to the defense informatization budget in 2023. This also includes unspecified spending on data handling and cloud AI infrastructure.<sup>49</sup>
- From 2017 to 2021 the MND has spent round KRW190bn (USD145M) on AI-related technology development.<sup>50</sup> This budget was set to increase with spending in 2023 alone reaching KRW100bn (USD77M).<sup>51</sup>
- As of 2022, around KRW61bn (USD47M) was invested in ten strategic defense technologies including AI as part of the defense technology development program. Of this amount, amount, around KRW30bn (USD23M) was directed towards AI technology projects.<sup>52</sup>
- In parallel the MND is committed to increase investments in AI and unmanned systems technology. To this purpose, the ministry has formulated a plan to increase the current level of R&D funding on these technologies to KRW350bn (USD268M) per year until 2025 and to KRW1tn (USD767M) per year until 2030, albeit without specifying the budget share of defense AI.<sup>53</sup>

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48 Overview of the Fiscal Year 2023 MND Budget and Funding Plan: 3. ROK MND, p. 3

49 Ibid., p. 9.

50 Defense AI Strategy Report, p. 3.

51 Overview of the Fiscal Year 2023 MND Budget and Funding Plan: 3. ROK MND, p. 9.

52 National Defense Science and Technology Framework Plan 2023-2027, pp. 50-51.

53 Chung, "AI, the game-changer of the future battlefield," p. 12.

Overall, these sums seem modest given the defense AI ambitions discussed above. But caution is at place as other ministries, primarily the MSIT, support the MND in co-funding defense AI. To this purpose, both ministries signed a memorandum of understanding in 2021 and have since engaged in funding cooperation projects. Since 2020, MSIT has allocated around KRW200-300bn (USD154-230M) per year towards the Munition and Military Supplies Acquisition Program, which focuses on non-weapon systems, namely force support systems. In addition, MSIT has contributed KRW17bn (USD13M) in 2023 for the AI-enhanced Intelligent Coastal Surveillance System and a cumulative total of KRW33bn (USD26M) to develop AI for X-ray image analysis to support doctors in remote precision diagnosis.<sup>54</sup> Given financial contributions by MSIT and other ministries, it can be assumed that the annual budget on defense AI is around KRW30bn (USD23M) higher than the amounts extracted from the defense budget.

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<sup>54</sup> DNA-based Smart Defense Strategy, pp. 3-6.

# 6 Fielding and Operating Defense AI



South Korea's armed forces are using AI for enterprise functions like human resources management, security clearance services or logistics. Technical complexities of using AI in weapon systems, likely consequences of the failure of AI on the battlefield and ethical concerns have so far limited the core military use of defense AI.

Among the military services, the ROK Army has been frontrunner in fielding defense AI applications, thereby using small-scale tests and experiments to use AI in combination with manned and unmanned systems. The Army's plans for manned-unmanned teaming strive for synergies with the strategies of the Navy and the Air Force to intelligentize their primary platforms. Against this background, the MND's strategies foresees an evolutionary path to building up defense AI capabilities in three stages:<sup>55</sup>

- **Stage 1: Recognition Intelligence**

At this stage the focus is on developing surveillance and reconnaissance systems. With the Critical Facility Perimeter System, for example, the MND wants to develop intelligent access system for key military installations such as munition depots and airfields until 2026. As indicated, the MND and the MSIT joined forces in 2020 to develop the Intelligence Coastal Surveillance System to autonomously identifying ships and targets by leveraging data from military coastal surveillance apparatus. The Multi-Source Image Fusion System will work on the real-time integration of data from satellites and reconnaissance aircraft in real-time. The three-year project started in 2019. Lastly, the Medical Image Diagnostic Reading System, which automatically analyzes chest X-ray images of soldiers to assist doctors in diagnostic processes.

- **Stage 2: Judgment Intelligence**

At this stage the MND strives for partial autonomy with projects including intelligent tanks, ships, and fighters, as well as MUM-CS, drone swarms and robots, and intelligent military logistics systems. Projects falling under this second phase are either in the preliminary stages or just starting.

- **Stage 3: Determined Intelligence**

The final phase signifies the maturity of technologies and systems capable of achieving full autonomy. This stage envisions the full deployment of AI military medical personnel and counselors, AI combat staff, intelligent command and control systems, and autonomous combat systems. Accomplishing these tasks will be a long-time endeavor.

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<sup>55</sup> MND Work Report 2022, p. 6.

To overcome existing gaps, the military services have embarked upon strategic commitments to foster new capabilities by designating military pilot units to advance human expertise in tandem with novel AI-enhanced solutions.<sup>56</sup>

- The Army will designate the Army TIGER Brigade, 70th Brigade Combat Team, 25th Division, as the pilot unit. This unit will undertake trials to assess the offensive capabilities and survivability of an integrated control system encompassing unmanned combat vehicles, attack helicopters, and drones.
- The Navy will utilize the Fifth Fleet as its pilot unit, conducting experiments to evaluate the efficacy of combined manned-unmanned demining operations, which will integrate small naval vessels and autonomous mine detection systems.
- In parallel, the Air Force has selected the 20th Fighter Wing as its pilot unit. This wing will be responsible for verifying the practicality of manned and unmanned squadron operations, integrating fighter jets with low-pitched unmanned aerial vehicles.
- Lastly, the Marine Corps will engage the 1st Marine Division as its pilot unit to validate amphibious operations capabilities, focusing on the integration of amphibious assault vehicles and obstacle-clearing robots.

While the ROK military's ultimate objective is to implement AI into complex weapon systems, the services often fail to clearly articulate their requirements. Consequently, financial resources tend to be predominantly directed towards the Technology Development Program, which focuses on technology maturation, rather than the System Integration Program aimed at developing intelligent systems. A case in point is the ongoing Command Decision Support System project, categorized as an AI core technology development initiative rather than a weapon system procurement endeavor.

Within the next four to five years, the MND and the armed forces want to explore how to identify the AI-relevant requirements to intelligentize existing and future systems. To this purpose, the development of intelligentization systems is expected to take shape via a newly initiated rapid acquisition process, diverging from the traditional, protracted weapon system procurement protocols. Overall, however, it remains difficult to assess if the public-private cooperation is effectively advancing the military use of AI. Despite the MND's continuous declarations advocating for the integration of civilian AI technology within the defense sector and the establishment of a comprehensive ecosystem, many experts posit that substantial reforms in force system acquisition and defense-related R&D are indispensable prerequisites for fostering and developing a defense AI ecosystem that delivers the defense AI capabilities South Korea is looking for.

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<sup>56</sup> Defense White Paper, p. 112; 112; Realizing Peace through Strength. MND Major Work Plan 2023: 9. ROK, p. 9.

# 7 Training for Defense AI

South Korea is placing significant emphasis on nurturing defense-specific AI expertise and bolstering the digital proficiency of its defense workforce. To foster a robust pool of experts and establish a sustainable foundation for defense AI advancement, the MND has unveiled initiatives to partner with universities to train 1,000 AI professionals who will spearhead AI integration in the military over the next five years and roll out AI and software education programs across various military training platforms for soldiers and officers, that shall be gradually expanded. But the general difficulties hampering the local defense sector described above and the current lack of the South Korean armed forces to properly understand and convey their AI requirements make it difficult for the MND to satisfy the growing demand for AI expertise.

## 7.1 Defense AI Talent Training Program of the MND

Given South Korea's priorities to establish a digital platform government with AI at its core, numerous government ministries and public institutions are engaged in general AI initiatives. The MND and the MSIT jointly drive Korea's defense AI education and training. Recognizing that most soldiers enter service during their college years and often perceive this period as a disconnect from academic and social pursuits, AI education for military personnel is envisioned not just as a means to enhance military capabilities through digitization and intelligence, but also as an essential bridge facilitating soldiers' transitioning back to academia or professional careers after discharge.

Therefore, both ministries formalized cooperation with a memorandum of understanding in 2021. According to the MND's strategy, the aim is to develop 50,000 military AI and software personnel by 2026. Right now, commissioned education for officers and mid- to short-term military-specific AI education programs is in progress. Overall, the MND acknowledges that transforming officers' perceptions of digital transformation is crucial and a prerequisite for the broader adoption and implementation of defense AI. A significant initiative involves collaboration with a private AI graduate school, entailing an investment of KRW36bn (USD27M) over five years to train approximately 1,000 specialists in AI and software and to enhance educational facilities.<sup>57</sup>

While it may be premature to assess the actual impact and efficacy of these AI education and talent development projects for the military, it is evident that policy emphasis and efforts in AI education will persist, complementing the dedication

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<sup>57</sup> Defense White Paper, p. 119; MND Work Report 2022, p. 6.

to implement the national defense AI policy. Despite criticisms that the military's AI curriculum may be overly focused on the utilization of AI technology, insufficiently incorporating AI ethics, and prioritizing quantitative achievements over the cultivation of qualitative human resources, there is broad consensus and minimal contention regarding the national initiative's direction. The prevailing view is that the success of defense AI critically hinges on the development and education of human resources.

## 7.2 Defense AI and Simulation-Based Training

Like other leading military nations, the ROK military has long incorporated war-games based on modelling and simulation (M&S) and combat experiments into its core operational conceptualization and training methodologies. With the advent and integration of technologies like Virtual Reality (VR) and Augmented Reality (AR), collectively known as Metabus, there is a shift towards developing more sophisticated simulation-based training systems.

In 2022, the MND created and allocated a new budget within it of KRW43bn (USD33M) for enhancing practical scientific training. This included KRW22.1bn (USD17M) for AR-VR equipment, such as VR setups for special forces parachute training, VR education and training centers, and VR simulated firing systems for reservists. Additionally, KRW13.3bn (USD10M) was designated for constructing four new practical scientific training centers capable of data-driven scientific training, supplementing the existing science training center at KCTC. Furthermore, KRW7.5bn (USD5.7M) was directed towards a new management system for the scientific training of reservists and trainees.<sup>58</sup>

The South Korean military has been actively considering the development of a training system akin to the Synthetic Training Environment utilized by the U.S. military. The need for such a system in the South Korean forces has been increasingly recognized. However, to date, there has not been a specific instance of a simulation-based training system project incorporating AI, nor has there been a designated budget for such an initiative. This situation stems partly from a fundamental issue within the national acquisition system: training systems are categorized as Force Support System rather than Weapons System, complicating the allocation of R&D budgets typically reserved for weapons systems. Additionally, the lack of cloud infrastructure, practical data-driven culture and AI-related foundation within the South Korean military also contributes to this challenge.

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<sup>58</sup> Kim, "MND's Defense Metaverse Utilization and Development," p. 15; "Military actively utilizes metaverse. KRW42.9 billion to strengthen safety training."

However, there has been recent development projects in South Korea focusing on incorporating AI into simulators for individual weapons system operational training. Examples include the K2 tank simulator, the Short Distance Surface to Air Missile, and the Air Force's fighter jet simulator development project. This trend is driven not only by the necessity of these projects themselves, but also by the fact that AI-based simulators are often classified as weapons system acquisition projects in the South Korean defense context. This classification facilitates the allocation of R&D budgets for these initiatives. The current state of training systems reflects the broader challenges and complexities associated with implementing and realizing full-scale AI in South Korea's defense sector.

# 8 Conclusion

South Korea's current government strives to establish a digital platform government, amalgamating government data with private sector services. This initiative is driven by the dual goals of fostering national unity and revitalizing a stagnant economy. AI is being leveraged as a key tool in this endeavor, akin to the metaphorical One Ring from *The Lord of the Rings*, symbolizing a crucial instrument for crafting a state-led technological utopia. Consequently, the MND and the armed forces consider AI instrumental in constructing a robust military, equipped to navigate the challenges of future warfare. Confronted with a demographic crisis marked by a precipitous decline in troop numbers and escalating regional security tensions, the South Korean military identifies AI as a critical catalyst for augmenting its military capabilities. Consequently, the government has prioritized the development of a "formidable, AI-enhanced military, strategically positioned to spearhead advancements on future battlefields."<sup>59</sup>

Despite a strong commitment, South Korea's journey towards integrating defense AI faces many challenges. These include fragmented defense AI governance inside the MND, the structural disconnect between DAPA's responsibility for weapon system acquisition and the MND's overall responsibility to acquire military force support systems, a predominantly hardware-centric defense industry, a yet underdeveloped defense-specific AI infrastructure, restrictive data sharing regimes, and an overall low appeal of the defense sector among top civilian talents.

Cognizant of the existing shortfalls, South Korea's military decision-makers are increasingly recognizing the pivotal role of clearly and effectively identifying and addressing challenges in AI deployment as a foundational step towards establishing an AI-enhanced military force. This growing awareness is fostering optimism about the potential acceleration in the adoption and proliferation of AI technologies within the military sphere. In addition, the public's broadly supportive stance towards the government's steadfast commitment to boosting AI and ICT investment, aligned with the national objective of nurturing a robust AI-centric science and technology sector, adds to the positive dynamics favoring the successful implementation of defense AI initiatives.

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<sup>59</sup> National Defense Science and Technology Framework Plan 2023-2027, p. 3.



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