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# **The North Korean Air Force: A Declining or Evolving Threat?**

Noam Hartoch and Alon Levkowitz



**Mideast Security and Policy Studies No. 156**

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Cover image: North Korean Air Force J-6 on display at the War Memorial of Korea in Seoul, photo via Wikimedia Commons

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# The North Korean Air Force: A Declining or Evolving Threat?

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## EXECUTIVE SUMMARY

North Korea's nuclear weapons and ballistic missile tests during the Kim Jong-un era have strengthened the country's military power, deterring South Korea, Japan, and, in particular, the United States. While North Korea's nuclear and missile capabilities are rapidly improving, parallel developments are not occurring in the traditionally technical air and air defense forces. Plagued with aging airframes, technical problems, part shortages, and budget shortfalls, the North Korean Air Force no longer challenges the South Korean and American air forces.

This paper examines the North Korean Air Force, analyzing its organization and deployment, aircraft and air defense systems acquisition, air defense and early warning capabilities, and aircraft production. Shortfalls in each of these areas have caused Pyongyang to develop, test, and operate an increasingly sophisticated drone fleet. While North Korea will not be able to build its own state-of-the-art aircraft industry, it will nonetheless find creative ways to strengthen its air force capabilities.<sup>1</sup>

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# The North Korean Air Force: A Declining or Evolving Threat?

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## INTRODUCTION

The Korean People's Army Air and Anti-Air Force (KPAF) celebrated its 70th anniversary on August 20, 2017. Other services that are similarly based on technology—the armored corps, the navy, and the missile force—have evolved to challenge potential adversaries on the Korean Peninsula and in Northeast Asia. However, the KPAF has deteriorated to a point where it can no longer contend with its neighbors' modern air arms. This disparity is particularly acute when compared with the capabilities of the Republic of Korea Air Force (ROKAF) and the US Air Force Korea/Seventh Air Force arrayed on the southern half of the peninsula.

The KPAF's deficiencies are well-documented and frequently reported in international media, aerospace publications, and defense journals. Its combat power is based on a collection of obsolete fighters of Soviet and Chinese origin. Most of the KPAF's estimated 447 aircraft were procured during the 1960s. They include Soviet fighters fielded in the 1940s and 50s, such as the Ilyushin IL-28, Sukhoi SU-7, and Miyokan-Gurevich MiG-17 and MiG-21 aircraft, as well as their Chinese derivatives.

The KPAF's MiG-23, Mig-29, and Su-25 aircraft are certainly more capable than their predecessors, but even that category of airframes has an average lifespan of 25 and 27 years.<sup>2</sup> North Korea's rotary wing aircraft face similar problems, with the most modern helicopters having entered service in the mid-1980s. The KPAF's aging transport aircraft reportedly limited locations for the summit between President Donald

Trump and Chairman Kim Jong-un, underscoring deficiencies in that sector.<sup>3</sup> When the two leaders met in Singapore, the supreme leader traveled aboard an Air China Boeing 747 that had been formerly used by Chinese leaders.<sup>4</sup>

Limited pilot training exacerbates the problems with aging airframes. While most fighter pilots in western air forces fly a minimum of 180 hours each year, KPAF pilots are limited to 20 to 40 flight hours annually in an effort to preserve aging airframes and conserve limited stocks of aviation fuel.<sup>5</sup> Consequently, North Korean pilots struggle to maintain proficiency in the most basic skills—takeoffs and landings—while their adversaries train for the most complex air combat scenarios in state-of-the-art aircraft.<sup>6</sup>

Analyzing changes in the KPAF is not only essential to assessing the threat posed by North Korean aircraft, but key to understanding changes in other services and branches. This paper examines the KPAF and assesses its ability to perform its assigned roles and missions.

The five-part analysis begins with an overview of the KPAF's organization and deployment. The second section describes the air defense and early warning systems. The third and fourth sections provide an overview of aircraft and air defense acquisition and domestic production activities, respectively. The final section analyzes North Korea's offsetting strategies given the shortages and the country's inability to address them via foreign purchases or domestic production. These strategies include shifts in deterrent strategies and the deployment of drones.

While the KPAF will be unable to directly confront the combined air forces on the southern half of the peninsula, its new strategies and technologies will nonetheless pose challenges for American and South Korean defense planners.

## **AIR FORCE ORGANIZATION AND DEPLOYMENT**

Beginning as an aviation division within the Korean People's Army, the KPAF has operated as an independent service since 1948. A separate Air Defense Command was responsible for air defense until the KPAF assumed that mission and accompanying personnel in the late 1980s.



The KPAF's primary mission is to provide air defense of the homeland. Its secondary missions include tactical air support, transportation, and insertion of Special Operations Forces.<sup>7</sup> The KPAF Commander is a member of the Central Military Commission of the Central Committee of the Workers' Party of Korea. That role is currently filled by Colonel General Kim Kwang-hyok.<sup>8</sup>

The KPAF Supreme Headquarters is located in Pyongyang. It oversees 92,000 officers and airmen operating an estimated 1,300 aircraft, air defense systems, logistics and support units, as well as maintenance, repair, overhaul, and upgrade facilities. The Supreme Headquarters is organized into a command element and air staff. The principal operational units include six aviation divisions, an unknown number of surface-to-air missile (SAM) brigades and anti-aircraft regiments, as well as independent operational, maintenance, logistics, and communications units. While it is not the focus of this article, the KPAF also has three sniper brigades responsible for strategic reconnaissance, raids, assassinations, and sabotage. The 11th, 16th, and 21st Sniper Brigades are each estimated to have approximately 3,500 personnel organized into seven to 10 battalions.<sup>9</sup>

The KPAF's responsibility within the DPRK's military establishment runs along the orthodox lines of world air forces. Its roles and missions include offensive air operations (tactical ground support and bombing), air defense, offensive air operations, transport and liaison, reconnaissance, and training. The KPAF is organized along the classic Soviet air force structure of divisions, regiments, and squadrons. In some cases, divisions are referred to as bases or wings, and squadrons are known as units. The air division is the highest operational echelon within the KPAF. There are six air divisions: three air combat divisions, two transport divisions, and one training division.

The 1st Air Combat Division commands five regiments from its headquarters at Kaechon. Its area of responsibility (AOR) covers the northwest region of North Korea, extending from the country's border with China to Pyongyang. The 35th Attack Regiment also operates from Kaechon, flying the MiG-23 and F-6 aircraft. (The F-series aircraft cited in this article are export versions of Chinese aircraft; the F-5, 6, and 7 are based on designs of the MiG-17, 19, and 21, respectively). The

Uiju-based 24th Regiment operates Chinese-built H-5 light bombers, which are copies of the Ilyushin Il-28 aircraft. The 24th Air Regiment's missions are believed to be aerial reconnaissance and target towing. The 55th and 57th Air Regiments operate from Sunchon Air Base. The 55th is equipped with the Su-25K, the export version of the light attack Su-25 aircraft; while pilots in the 57th fly the MiG-29 to perform air defense and intercept missions. The Pukchang-based 60th Air Regiment is the 1st Air Combat Division's training unit, flying MiG-23U, F-7, and the nearly obsolete MiG-15UTI aircraft.

Headquartered at Toksan, the 2nd Air Combat Division oversees six regiments. This division's AOR covers northeastern North Korea. The 56th Air Regiment also operates from the Toksan Air Base, flying MiG-21, F-5, F-6, and F-7 aircraft. The 25th Air Regiment operates Il-28 and H-5 aircraft from Changin Air Base. The Wonsan-based 46th Air Regiment is equipped with MiG-21 and F-5 fighter aircraft. The 71st and 72nd Air Regiments fly the MiG-21 PFM fighter aircraft from Kuum-ni and Hwangsuwon Air Bases, respectively.

The Hwangju-based 3rd Air Combat Division's AOR covers the southern portion of the country, including the area adjacent to the Demilitarized Zone. Its five regiments fly fighter-bomber and attack aircraft and attack helicopters. The 86th Regiment is collocated with its higher headquarters. Its pilots fly the Q-5A, the export version of the Chinese A-5 ground attack aircraft. The 4th Air Regiment is based in Taetan and flies a mixture of MiG-21 and F-5 fighter-bombers. The 32nd and 33rd Air Regiments both fly the F-5 aircraft, operating from Nuchon-ni and Kwail Air Bases, respectively. An unidentified unit of the 33rd Air Regiment is believed to fly F-6 and F-7. A regiment formerly located at Hyon-ni is reported to have been disbanded in recent years.<sup>10</sup>

The 5th and 6th Air Transport Divisions provide fixed- and rotary-wing transportation. Headquartered at Taechon Air Base, the 5th Air Transport Division is composed of five regiments. Each is equipped with approximately 45 light transport aircraft, primarily the Antonov An-2 and its Chinese derivative, the Y-5. These regiments are located at air bases at Taechon, Kukdong, Sondok, and Yongro-Ri. The 6th Air Transport Division has a single regiment of Mil Mi-2 helicopters that flies from two

helipads at the Mirim heliport (Pyongyang East Airport).<sup>11</sup> The division is also responsible for the Air Koryo fleet based at Pyongyang International Airport, as well as some Mil Mi-8 and Mil Mi-17 helicopters. Distinctively painted white, these helicopters are used for VIP flights.

The 6th Air Transport Division is headquartered at Cheagun-Dong Air Base. Its units operate a variety of helicopters. A composite squadron operates Mi-8 and Mi-17 helicopters at Kowon. There are two regiments at Packhon, one operating Mil Mi-2 helicopters, and a second operating Mi-8 and Mi-17 helicopters. Another Mi-2 squadron is based at Samjangkol, and two regiments at the same base each have some ten Mi-24 combat helicopters, the only dedicated assault helicopters in the KPAF's inventory. The 64th regiment is the only unit to operate the remaining Hughes 369D/E helicopters.

The KPAF's Civil Aviation Bureau operates the Air Koryo, North Korea's state airline. Air Koryo's fleet consists of a variety of passenger aircraft primarily acquired from the former Soviet Union. Although the national carrier has four Ilyushin Il-62M long-range passenger jets, only two are used for scheduled passenger service. Of the two remaining aircraft, a 38-year old model is reserved for Kim Jong-un's personal use. The second aircraft was acquired from Cuba in 2012 but has been used solely for spare parts to support the other three jets. Beginning in 2007, Air Koryo introduced the Tupolov Tu-204 and Antonov An-148 aircraft to replace several aging passenger airframes including the Tu-154 and An-24. Air Koryo's cargo fleet consists of three Ilyushin Il-76 aircraft that have been in service since 1990. Although the trio of aircraft primarily transport civilian cargo while bearing Air Koryo's livery, the aircraft are often pressed into military service. For air shows and paradrops, the KPAF repaints the aircraft in a camouflage pattern.<sup>12</sup> Each aircraft is capable of inserting 125 fully equipped paratroopers.<sup>13</sup>

The 8th Aviation Training Division is responsible for training all KPAF aviators, as well as air defense of the country's northeast area. The division's headquarters is located at Chongjin Air Base, which also hosts the Kimchaek Air Force Academy. All cadets begin basic flight training in the Nanchang CJ-6, the Chinese variant of the Yakovlev Yak-18/18A two-seat primary trainer. Fixed-wing pilots slated for service in fighter or

attack aircraft complete advanced instruction in the training variant of the MiG-15, the MiG-15 UTI trainer. Cadets pursuing careers in rotary-wing aircraft begin training in the CJ-6 trainer, followed by basic helicopter training in the Mi-2 helicopter.

The 8th Aviation Training Division is composed of six regiments, each flying a different model of aircraft. Primary flight training is conducted at the regiment collocated with the 8th Aviation Training Division using the Nanchang CJ-5/6 trainer, as well as a Kangdon-based regiment equipped with the same aircraft. The aviation training regiments at Irhygang-dong and Samiyon Air Bases fly MiG-15 UTI aircraft that first entered service in the 1950s. Future cargo and passenger plane pilots train at Hyesan Air Base on the Antonov An-2 and its Chinese variant, the Shijiazhuang Y-5. Upon completion of this training, pilots are assigned to Air Koryo, where they begin training as Antonov An-24 co-pilots before assuming pilot-in-command duties on more advanced aircraft. Helicopter training is done at the aviation training regiment at Kilchu Air Base using the Mi-2.

The lack of long-range aircraft and in-flight refueling capability affects the KPAF's deployment, organization, and tactics. Offensive air operations are limited to those targets within countries bordering North Korea, with an obvious focus on US and ROK forces deployed in the South. Reflecting a bygone offensive doctrine, more than two-thirds of KPAF air bases are located south of the Sondok-Kwaksan line. While the proximity to the DMZ was originally designed to preserve the element of surprise, it now denies the KPAF advanced warning in the event of hostilities. The more advanced combat aircraft—such as the MiG-29 and Su-25 fighter aircraft—are housed in aboveground or underground Hardened Aircraft Shelters (HAS). The use of HAS reflects lessons learned from foreign conflicts, including the 1967 Arab-Israeli War in which a preemptive Israeli Air Force attack destroyed the majority of Arab air power.<sup>14</sup> However, the majority of the KPAF's aircraft are parked in the open.

Fuel shortages and aging airframes limit KPAF aviators' flight hours to the point where pilots are only proficient in basic tasks. It is worth noting that from the 1960s to the 1980s, the KPAF dispatched pilots and mechanics to conflicts across the globe to better understand modern air combat tactics. From the winter of 1967 to the spring of 1969, "Group Z" flew MiG-17B

and MiG-17C from Kep Air Base northeast of Hanoi.<sup>15</sup> An estimated 384 KPAF personnel served in Vietnam. Of the 96 pilots, 87 are believed to have flown in combat.<sup>16</sup> North Korean pilots participated in Middle East wars against Israel. Pyongyang dispatched 25 pilots to Syria during the 1967 Arab-Israeli War and 30 to Syria and Egypt during the 1973 conflict; 40 pilots and 75 KPAF instructors served in Syria in 1975 and 1976.<sup>18</sup> As late as 1981, North Korea maintained a contingent of 20 KPAF personnel, including pilots, in Libya.<sup>19</sup> Since then, no other country has accepted North Korean aviators, denying KPAF personnel air combat experience.

## **AIR DEFENSE AND EARLY WARNING**

Pyongyang air bases and major military installations are protected by a wide array of anti-aircraft guns, surface-to-air (SAM) missiles, and man-portable air defense missiles (MANPADs). The Soviet 14.5mm ZPU-4 anti-aircraft system is the most commonly used. First deployed by North Korean and Chinese forces during the Korean War, the towed system is locally produced in large quantities. It is used to protect key targets from American and South Korean helicopters and light transport planes. The ZPU-4 is linked to the MR-104 'Drum Tilt' fire-control radar. In recent years, the KPAF has partially replaced the ZPU-4 with an indigenous 7.62mm x 54mm and 30mm rotary cannon gun system. Because these manually operated systems lack radar guidance, they are highly inaccurate and of questionable effectiveness.<sup>20</sup>

The KPAF operates an estimated 19 SAM batteries throughout the country to provide high and medium altitude air defense capabilities. The SAM batteries are equipped with old Soviet and Chinese designs. The KPAF has 15 S-75 SAM batteries (NATO designation SA-2) and two S-200 SAM batteries (NATO designation SA-5) to provide high altitude air defense capabilities. Two S-125 medium altitude air defense systems (NATO designation SA-3 GOA) complement the aforementioned low and high altitude air defense systems.

Like other major weapons systems, many of the KPAF's SAMs have been in service since the late 1950s and early 1960s. However, a few modern systems have appeared over the past decade. At the October 2010 military parade commemorating the 65th anniversary of the Workers' Party of Korea, the KPAF revealed a missile system known locally as the

Pongae-5.<sup>21</sup> The ROK Ministry of National Defense reported that the North Koreans had successfully fired the missile, now known as the KN-06, in June 2011.<sup>22</sup> The KN-06 is similar to the Russian S-300 missile system or its Chinese derivative, the HQ-9. The KPAF also modified the S-75 and S-200 systems, mounting the missiles on MAZ-630308-224 and KrAZ-255B trucks, respectively. The upgraded systems' enhanced mobility provides more flexibility in deployment and better concealment from air attack.<sup>23</sup> The enhanced systems were first seen in 2012.

The SAMs' fire control and command centers still rely on antiquated Soviet radar. The S-75 SAMs use the ST-68 (NATO designation Tin Shield), a radar that was first fielded in the 1950s. North Korea's other high-altitude SAM system, the S-200, uses the 5N-69 radar (NATO designation Big Back). Other Soviet radars in the KPAF's inventory include the P-3 (NATO designation Dumbo) and the P-8/10 (NATO designation Knife Rest).<sup>24</sup> The KPAF's more modern systems include the P-35/37 (NATO designation Bar Lock). However, the term is relative, as this system was first fielded in the late 1960s. The S-300/Pongae-5 systems operate with the 5N-63 (NATO designation Flap Lid). The China Precision Machinery Import and Export Cooperation (CPMIEC) exported the 2FA radar (NATO designation Gin Sling) to North Korea and other countries.<sup>25</sup>

There are more than 3,000 MANPADs distributed among North Korean People's Army infantry units. The common systems include the 9M-32 Strela-1 (NATO designation SA-7 Grail) and the follow-on 9M-34/36, Strela 2/3 (NATO designation SA-14 Gremlin). North Korean soldiers also use 9M-313 Igla MANPADS (NATO designation SA-16 Grouse). Although North Korea has produced many of these versions since the 1980s, systems imported from the former Soviet Union remain in the field. North Korean engineers have also improved more modern Soviet-designed systems, fielding the 9K-38 (NATO designation SA-18 Igla) and 9K-338 (NATO designation SA-24 Igla-S). Some sources believe Pyongyang has reverse-engineered a version of the US Stinger missile.<sup>26</sup>

The KPAF's Airborne Early Warning (AEW) capability is limited to two modified transport aircraft. In the 1990s, one of the three remaining Antonov An-24 aircraft was rumored to have been converted to a rudimentary

AEW aircraft by mounting a MiG-29 pulse Doppler radar on its fuselage. However, recently released photos of the aircraft in question don't show any external additions such as "humps" or antennae on the original airframe.<sup>27</sup> It is possible that it never matured beyond the experimental stage.<sup>28</sup> Separately, one of two Tupolev Tu-134B aircraft delivered in 1984 has been reported as equipped for reconnaissance, electronic intelligence, and signals intelligence collection. However, no photo of aircraft in that configuration has surfaced to date.<sup>29</sup>

## **AIRCRAFT AND AIR DEFENSE SYSTEMS ACQUISITION**

The KPAF relied heavily on China and Russia to acquire its aircraft and air defense systems. Approximately 85% of the current fleet and 50% of combat aircraft come from those countries. The KPAF now relies on those countries, as well as former allies who also purchased aircraft and air defense systems from China and Russia, for the spare parts and technical support needed to keep the fleet airworthy.

The KPAF's last large-scale modernization drive took place during the 1980s. The KPAF took delivery of Soviet MiG-21MF and MiG-23ML fighters, Sukhoi Su-25BK attack aircraft, and Mi-2 light- and Mi-26 heavy helicopters.<sup>30</sup> The KPAF received approximately 40 Nanchang A-5 attack aircraft, a Chinese version of the MiG-19. They also acquired an estimated 150 Polish built Mi-2 light helicopters to augment and partially replace older Mi-4 helicopters.<sup>31</sup> Lastly, the KPAF obtained nearly 90 Hughes 369D/E light utility helicopters through Delta Avia Fluggeraete, a West-German company that acted as a Hughes Helicopters European distributor. The company declared the helicopters to be "machinery" and declined to reveal the helicopter's destination, contrary to the US Trading with the Enemy Act. Lastly, the KPAF took delivery of 14 Sukhoi Su-25BK Frogfoots (including a pair of two-seat UBK trainers) arrived from the Soviet Union in 1987, followed by 26 additional aircraft in 1988.

Few of these aircraft remain in service. Although a pair of the Hughes helicopters appeared during the military parade marking the 60th Anniversary of the end of the Korean War in 2013—armed with Soviet AT-3 Sagger anti-tank guided missiles—fewer than 50 are believed to be in service.<sup>32</sup> Few of the Nanchang A-5 aircraft are believed to be operational.

The KPAF's acquisition efforts continued in the 1990s. Following Kim Il-song's visit to Moscow in 1990, the KPAF began taking delivery of approximately 30 MiG-20 fighters in 1992; this included four two-seater trainer models. The KPAF sought to purchase 133 surplus MiG-21 aircraft from Kazakhstan in 1996, but the US government intervened to block the sale. However, North Korea successfully acquired 30 MiG-21B aircraft in 1999; the majority of these aircraft are still in use.<sup>33</sup> At the same time, Pyongyang attempted to strike deals with Moscow for Sukhoi Su-30MK fourth-generation fighters and Beijing for the Xian JH-7 fighter-bomber. Neither deal materialized.<sup>34</sup> Since then no new deals are known to have been negotiated for combat aircraft. The KPAF also acquired rotary-wing aircraft from Russia during the 1990s, including four heavy-lift Mil Mi-26 helicopters and an estimated 60 Mil Mi-8/17 helicopters.

As noted, the KPAF acquired an obsolete Ilyushin Il-62 transport aircraft from Cuba in 2012. At North Korea's first air show in October 2016, the KPAF revealed a Pacific Aerospace PAC-750 Extremely Short Take-Off and Landing utility aircraft. The PAC-750 is manufactured in New Zealand and the aircraft were sold to the DPRK through a Chinese company, Shendong General Aviation Services, in violation of UN sanctions.<sup>35</sup> Although the PAC-750 is an ideal replacement for the An-2/Y-5 aircraft, it is doubtful the KPAF will be able to procure more than the three aircraft and spare parts delivered. Pacific Aerospace pleaded guilty in August 2017 to three violations of UN sanctions and one violation of the New Zealand's Customs and Excise Act.<sup>36</sup>

## **AIRCRAFT PRODUCTION**

Despite having limited capabilities for indigenous aircraft production, the KPAF has nonetheless assembled both rotary- and fixed-wing aircraft of foreign origin. Beginning in 1979, the KPAF began assembling the Polish variant of the Mi-2 helicopter. Using components and parts supplied by Poland, North Korean engineers assembled approximately 150 PZL-Swidnik light utility helicopters. Although primarily used for training and transport, some helicopters were armed with 57mm rocket tubes and a 23mm cannon.

The ubiquitous Antonov An-2 light transport aircraft is another example of the KPAF's production efforts. Some of the aircraft are believed to



have been modified to insert Special Operations Forces. Others are known to have been armed with air to ground rockets, possibly the same 57mm projectiles used by the armed Mi-2.<sup>37</sup>

The most ambitious local production effort was the assembly of MiG-29 aircraft using “knocked down” parts. The KPAF established dedicated facilities near the Panghyon Air Base to support the arrival of the first aircraft in 1988. Over the next decade, North Korean engineers reportedly produced Mig-29B single-seat fighters and MiG29 UB dual-seat trainers. By the time production ended in 1999, approximately 35 aircraft had been assembled.<sup>38</sup> However, operational losses and spare parts shortages have reduced the number of indigenously produced Mig-29s to fewer than 30.

## OFFSETTING STRATEGIES

Faced with challenges ranging from aging air frames to a limited number of suppliers, the KPAF has developed and implemented new technologies to offset declines in traditional air force capabilities. North Korea’s increasingly sophisticated unmanned aerial systems (UAS) highlight the regime’s ability to field new systems, and to do so amidst growing international sanctions. However, it is not apparent if the KPAF is the sole operators of these drones, or whether they were fielded to offset declines in conventional air force capabilities. North Korea’s intelligence agencies, as well as artillery and infantry units, may operate the UAS.<sup>39</sup>

Pyongyang’s drone program reflects three decades of foreign acquisition and domestic engineering and production efforts. In the late 1980s, North Korea acquired its first UAS from China, the Xian ASN-104.<sup>40</sup> In the mid-1990s, Syria began providing North Korea access to its drone programs, which included the Russian DR-3 Reys; the Korean People’s Army (KPA) used this system. By the end of the decade, Pyongyang had acquired systems directly from Moscow.<sup>41</sup> In addition to acquiring drones, North Korean engineers were producing indigenous drones based on various foreign designs.

On August 9, 2010, the ROK Joint Chiefs of Staff first reported a North Korean drone monitoring KPA artillery exercises near Yeonpyeong Island. Drones first appeared at the April 15th Military Parade in 2012, confirming earlier reports that North Korean engineers were building attack drones in addition to reconnaissance platforms. From October 2013 to September

2014, South Korean civilians found drones on four locations across the peninsula, ranging from Paengyoung Island along the Northern Limit Line to Samcheok City nearly 200 kilometers south of Seoul.<sup>42</sup>

North Korea has drastically increased the size and capability of its drone fleet. Although estimates vary greatly on the number of zones, most analysts believe North Korea has at least 300 drones.<sup>43</sup> Pyongyang is known to have fielded reconnaissance drones and is reported to have developed UAS capable of dispersing chemical and radiological materials. In June 2017, the ROK Ministry of National Defense announced the discovery of a suspected North Korean drone that had captured images of the US Terminal High-Altitude Area Defense site in Seongju.<sup>44</sup> The single-engine drone was equipped with a Sony Single Lens Translucent camera and flew a pre-programmed route nearly the length of the peninsula before crashing near the DMZ.<sup>45</sup>

Reports of drones that can disperse chemical, biological, and radiological materials are more disturbing. In May 2017, a former North Korean diplomat to Pyongyang who uses the alias Han Jin-myeong stated that the KPAF had developed 300 to 400 drones capable of dispersing chemical and biological agents. According to Han, who served over a decade with the KPAF prior to entering the foreign service, the drones can strike Seoul within an hour.<sup>46</sup> Kim Heung-kwang, a former computer science professor who founded the dissident group North Korea Intellectuals Solidarity following his defection, said that Pyongyang engineers had developed a drone capable of spreading radioactivity. The Banghyun-5 drone reportedly carries a payload of enriched uranium to be detonated with conventional explosives, dispersing lethal radioactivity over a large area.<sup>47</sup> In March 2017, the state-run Korea Institute for National Unification (KINU) released a report estimating that North Korea possessed approximately 1,000 drones. The report noted that the drones were being developed to compensate for deficiencies in the KPAF, as well as to bridge gaps in reconnaissance.

The nation's flag carrier has pursued a different tack to support its operations. Capitalizing on the regime's tolerance of some entrepreneurial activities, its status as one of the country's most recognizable brands, and a newly renovated Pyongyang-Sunan International Airport, Air Koryo sells a variety of products and services to supplement its core transportation business:

Air Koryo runs at least one gas station and car wash in Pyongyang, has its own fleet of taxis, and operates several retail shops, including a boutique at the airport. At the relatively upscale Potonggang Department Store in central Pyongyang, whole aisles are devoted to Air Koryo brand products, from crates of liquor to row after row of Coke-like sodas and a half dozen varieties of canned goods, including pheasant soup and canned peaches.<sup>48</sup>

Like its drone program, Air Koryo's retail operations highlight the KPAF's ability to adapt to changing conditions and overcome obstacles.

## **CONCLUSION**

The KPAF faces significant challenges as it begins its eighth decade of service. Aging airframes, an inability to procure spare parts, and fuel shortages lead to fewer flight hours, decreased pilot proficiency, and reduced readiness. Limited suppliers and economic sanctions are further obstacles to reversing a decades-long decline. In the event of hostilities, KPAF aviation assets are incapable of overpowering the ROK and US Air Forces, though its air defense systems remain formidable challenges to military operations.

One should not, however, underestimate the KPAF's desire to overcome these disadvantages. North Korea's increasingly capable and growing drone fleet has the potential to offset many lost capabilities. Pyongyang has already flown drones against a variety of targets in the ROK, gaining critical insight into American and South Korean abilities to detect and respond to this new system. While North Korea won't be able to develop an indigenous aviation industry, it will nonetheless find creative ways to strengthen its air force capabilities.

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