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# Analysis of North Korea's Third Military Spy Satellite

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On November 22, North Korea announced through *Korean Central News Agency* and *Rodong Sinmun*, that it launched the spy satellite 'Malligyong-1' satellite mounted on the Chollima-I rocket from the Sohae satellite launch facility in Cholsan County of North Pyongan Province at 10:43 PM (13:42 GMT) on November 21, and successfully placed it into the orbit under the supervision of Kim, Jong-un. The launch was performed after 5 months and 20 days since the first launch attempt on May 31. Spy satellite launch was emphasized at the 6<sup>th</sup> Plenary Session of the 8<sup>th</sup> Central Committee of the Workers' Party as one of the key objectives that must be accomplished in 2023. In addition to its military and technological intentions to improve the operational capabilities of nuclear weapons, North Korea's launch of the spy satellite can be interpreted as a political projection of its intentions to demonstrate its deterrence against the United States and its domestic achievements as well as to assert itself as an irreversible global nuclear power. This paper will examine North Korea's 3<sup>rd</sup> spy satellite launch technology, strategic implications of the technological cooperation for spy satellites with Russia, internal and external political intentions, and future prospects.

## **Intentions behind the Surprise Rocket Launch before the Announced Period**

North Korea went ahead with its surprise military satellite launch before the period that it had previously announced (November 22, 00:00 to December 1, 00:00). The actual launch time was 22:42 on November 21, which is 1 hour and 17 minutes earlier than the announced period. By extrapolation, this could be due to the weather conditions. Satellite launches are highly dependent on weather conditions such as humidity, rain, cloud, and wind and therefore, in general, they are performed when rain, cloud or wind can be avoided as much as possible. The morning of November 22, which is the beginning of the announced launch period, was forecasted to be sunny and therefore, it was highly likely that North Korea would perform the launch. However, the night of November 21, when the launch actually took place, Cholsan was generally cloudy with a sprinkle of rain at around 21:00. Considering the fact that the weather conditions were relatively unfavorable and that North Korea still went ahead with the launch before the announced period, it is possible to view this as North Korea having a different intention.

South Korea expected that the launch would take place at dawn on November 22, based on the patterns North Korea displayed in the past. The surprise launch was totally unexpected and therefore, can be seen as having the intentions to evade and deceive the ROK-US-Japan's real-time surveillance and prediction. Two days after the announcement of the launch date for both the first and the second launch, North Korea intentionally changed its pattern of performing the launch on the first day of the announced period. Given the technology exposure after the failure of the first launch resulting from South Korea salvaging of the launch vehicle and the use of self-destruction upon failure for the second launch to avoid such exposure, it seems like an attempt to avoid prior exposure to the greatest extent. The presence of Kim, Jong-un, who has been quiet in public lately, suggests that considerable attention and efforts have been put into the launch. It is possible that they have already planned the surprise launch before the announced period in advance.

On the other hand, the launch time was scheduled to coincide with South Korea's launch of spy satellites. South Korea planned to launch its first spy satellite into orbit



on November 30 from Vandenberg Space Force Base using SpaceX's Falcon 9 rocket. South Korea is currently developing five high-resolution military spy satellites. It plans to activate four synthetic aperture radar (SAR) satellites and one electro-optical (EO) satellite by 2024. North Korea has been competitively pursuing satellite-related activities in the past year to South Korea's test flight of a solid-fuel rocket (March), the second Nuri rocket launch (June 21), another test flight of a solid-fuel rocket (December), and the third 'Nuri' rocket launch (May 25, 2023). It appears there is an intentional effort to highlight the development competition between South and North Korea and secure justification for the advancement of its nuclear and missile capabilities.

### **Partial Resolution of the Instability of the Launch Vehicle, the Possibility of Entry into Orbit**

As with the first launch, the newly constructed launch facility in the Sohae satellite launch facility was used for the third launch. The facilities and equipment at the launch site appear to be the same as the first launch. As the appearance of the launch vehicle and the satellite is almost the same in length and diameter when compared to those of the debris salvaged and the photographs of the first launch, no design changes seem to be made to their appearance. Therefore, it appears that improvements were made to the engine performance, stage separation and control capabilities while maintaining the basic design and appearance of the launch vehicles. If there were technical consultations with Russia, cooperation might have been made in securing the stability of the launch vehicles such as improving engine performance, which was a technical challenge, the precision of stage separation and control capabilities upon stage separation.

The success of a spy satellite launch can be divided into two: the launch vehicle and the satellite itself. As for the launch vehicle, success depends on stable ignition of the engine in each stage, precise stage separation, attitude control and control for the satellite's stable entry into orbit. The cause of failure for the first and the second launch was the launch vehicle. It seems they were highly unstable for normal flight and entry into orbit because of second-stage and third-stage engine malfunction. In

order to resolve second-stage engine malfunction, which was the cause of the first launch failure, North Korea has been conducting intensive engine ignition tests since July to verify the reliability of its launch vehicles<sup>1)</sup>. North Korea stated that the second launch exploded due to an error in the flight termination system but it appears there was abnormal flight involved in the second-stage propulsion system. Based on the photographs North Korea disclosed and the flight trajectory observed by the ROK, US, and Japan, the instability issues of the first and the second launch have been partially addressed.

### **The Key Lies in Advanced Operational Technologies such as Optical Camera Directional Control Capabilities, Digital Video Processing, Data Transmission and Reception**

However, it is too early to determine the success of the satellite part. Based on the information available so far, it cannot be confirmed whether controlling for orbit entry after the separation of the satellite in the third stage was stable or whether normal communication with the satellite control center was possible. For a reconnaissance satellite to maneuver in low-earth orbit (500–600m), transmit and receive images, not only camera performance but also satellite adjustment capabilities (positioning for capturing images), digital image processing technology and communication systems are required. Low-earth orbiting reconnaissance satellites need to frequently adjust their trajectory without falling out of the thin atmosphere at low altitudes and thus, durability is determined based on the fuel used for orbit correction. Their lifespan is short, ranging from a few months to two to three years.

Based on the size of the satellite and the optical camera North Korea disclosed when Kim, Jong-un's National Aerospace Development Administration (current National Aerospace Technology Administration) reported the local map, it was estimated to be at a rudimentary level in terms of camera resolution, the ability to transmit encrypted digital signals of captured images to the ground, communication systems, durability

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<sup>1)</sup> August 17, 2023 Report made to the Intelligence Committee of the National Assembly by the National Intelligence Service

and lifespan. After the retrieval of North Korea's first launch vehicle, a joint ROK-US analysis reported that it had no military utility. Since the technology level is the same as the debris collected from the launch of 'Kwangmyongsong' in 2016, no significant technological advancement has been made. For the satellite to function as a spy satellite, the minimal resolution should be around 1m. However, based on the satellite and the optical camera disclosed, 'Malligyong-1' satellite's resolution is estimated to be around 3m. It is unlikely that North Korea was able to improve such limitations with its own technologies in a short period of time. Therefore, although the stability of the launch vehicle has been partially improved, the success of North Korea's spy satellite launch will depend on whether it can demonstrate the capabilities of a reconnaissance satellite.

### **Limited Technological Cooperation but Evidence of Strategic Alignment between North Korea and Russia if Continued over the Long Term**

It is difficult to rule out the possibility that Russia's technological support was reflected in the recent reconnaissance satellite launch. Considering the close relationship between North Korea and Russia and the schedule for North Korea's satellite development, there is a possibility that limited but significant technological support was provided. After the second failure on August 24, Russian President Putin made a statement regarding cooperation with Kim, Jong-un's space development project, which is his top priority, during the mid-September North Korea-Russia Summit, and North Korea made preparations for the launch until November, which is much later than the announced date in October. Within the short period of time, it is highly likely that Russia provided advices related to the launch vehicle to increase the success rate<sup>2)</sup>. Since securing stability of the launch vehicle was of the utmost importance, it is possible that Russia provided technical advice to improve engine performance and increase the accuracy of stage separation. As for the satellite, it

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<sup>2)</sup> "Blinken when visiting South Korea 'Russia is providing technology for North Korea's military programs'." *Dong-a Ilbo*, November 10, 2023. <<https://www.donga.com/news/article/all/20231110/122112017/1>> (search date: November 22, 2023).

may be challenging to provide technical assistance in a short period of time. In addition, the likelihood of providing new components, parts and equipment, such as optical cameras, communication systems, digital encryption, and control capabilities, seems low due to the potential change in weight from the original design when new equipment is installed. Even if Russia's technical support for North Korea's spy satellite is limited, it holds significant strategic importance. Collaboration on spy satellites suggests a probability of long-term strategic alignment between North Korea and Russia, extending beyond short-term interests. North Korea needs to have and operate five or more satellites in the orbit, which means this is a project that will take the next few years for development, testing, and deployment. If North Korea's launch of its first spy satellite and subsequent launches of multiple satellites are achieved through technological cooperation with Russia, it could serve as evidence of a strengthened strategic alignment between North Korea and Russia. From 2019 to 2021, Russia deployed a total of 19 military satellites into orbit. The sharing of reconnaissance satellite technologies between North Korea and Russia implies the creation of strategic alignment in Northeast Asia against the US. Russia not only shares a common understanding in deterring the combined power of the ROK, US and Japan in the East Sea but also holds a strategic interest in countering the increased US presence in Northeast Asia, and maintaining stability of the route for expansion into the Pacific.

**Pressure to prove the normal functioning of the spy satellite, the key lies in the demonstration of deterrence against the US as an irreversible global nuclear power**

For North Korea, military reconnaissance satellites are crucial both technologically and politically in terms of deterring US forces deployed on the Korean Peninsula and in Japan, as well as showcasing its status as an irreversible nuclear weapons state. The objective is to convey to the US and the international community the ability to counter the US by demonstrating its highly advanced nuclear and missile technologies. Since North Korea set forth the 'five-year plan for the development of the defense science and weapon systems', at the 8th Party Congress in 2021, North Korea has been pursuing the 'North Korean version of three axis'. The purpose is to establish



a three axis platform consisting of tactical nuclear weapons, strategic nuclear weapons and spy satellites. The operability of nuclear weapons will serve as deterrence against the Korean peninsula and Japan (the US forces stationed in Japan), and intercontinental ballistic missiles (ICBMs) and medium-range missiles as deterrence against reception, staging, onward movement, and integration (RSO) because they are capable of striking the US mainland. The development of military spy satellites is aimed at increasing the operability of nuclear and missile weapons against US forces on the Korean peninsula, in Japan and Guam military bases<sup>3)</sup>. North Korea has stated that it is “indispensable to strengthen military preparedness to track, monitor, discern, prepare and preemptively counteract the dangerous military acts of the US and its vassal forces.” It also asserted that the spy satellite would help improve the North’s war preparedness in the face of “the enemies’ dangerous military moves.”

Ultimately, North Korea must prove the actual reconnaissance capabilities in order to demonstrate the practicality of deterrence through reconnaissance satellites. Kim, Yo-jong’s expression of frustration through a speech earlier this year to external underestimation of North Korea’s satellite capabilities indicates that she is very conscious of the disparity between the North’s desire to showcase its capabilities and external trust. Securing external trust in North Korea’s nuclear and missiles capabilities including spy satellites is crucial for demonstrating deterrence against the US and asserting its irreversible status as a nuclear weapons state. Therefore, proving the normal functioning of the satellite after entering orbit is essential. If optical communication results demonstrating normal satellite operation are not provided within the next 2-3 days, North Korea’s reconnaissance satellite capabilities will continue to be underestimated as incomplete. In this regard, North Korea may invest more efforts in the reconnaissance satellite technology cooperation with Russia.

## **Military and Political Background and Future Prospects of**

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<sup>3)</sup> On November 22, Korean Central News Agency of North Korea reported Kim, Jong-un’s visit to Pyongyang General Control Center, stating “to oversee the progress of aerial and space photography.” It also mentioned that he saw the aerial images taken over the Pacific region, specifically capturing major US military areas such as Anderson Air Force Base and Apra Harbor, and disclosed photographs that marked the satellite orbit passing over Guam on the status screen inside the General Control Center.

## Reconnaissance Satellite Development

Then why is Kim, Jong-un fixated on military reconnaissance satellites? It might appear as an obsession that is difficult to understand in the context of North Korea's underdeveloped economy. However, there is a strong sense of urgency in terms of military, political and domestic governance. First and foremost, reconnaissance satellites are crucial for the advancement of nuclear weapons. Reconnaissance satellites contribute by, firstly, strategically and tactically targeting the adversary's military bases and facilities, and monitoring military trends related to operations and training. Secondly, they enhance precision to maximize the impact of missile launches against the adversary. Thirdly, they accumulate reconnaissance information to improve the ability to simulate nuclear and missile operations. China, combining atomic and hydrogen bombs (or ICBMs) with an artificial satellite, referred to this as 'Two Bombs, One Satellite,' and used it as a measure for judging nuclear capabilities.

There are also political objectives involved. Reconnaissance satellite development typically require long-term investment and experimentation and thus, conducting consecutive tests for the first, second and the third launch with short intervals despite the many technological challenges is driven mostly by 'political objectives' than technological considerations. In the short term, this serves the political purpose of asserting its strong will to enhance nuclear capabilities and justify weapons development under the pretext of strengthening the deterrence extension of the US and South Korea, as well as the security threat posed by the trilateral alliance of the US, Japan and South Korea. On another note, this also serves its political objectives domestically, of showcasing the achievements of General Secretary Kim, Jong-un. North Korea has been attributing significance to reconnaissance satellites, describing them as 'remarkable achievements made in core space science and technology research projects,' 'comprehensive demonstration of national power,' 'secured the status as a science and technology powerhouse,' and 'construction of a space industry that drives economic development.' This demonstrates the achievements and legitimacy of Kim, Jong-un's policies, which focused on the advancement of nuclear weapons.

North Korea plans to outline key objects for 2024 through the 9<sup>th</sup> Plenary Session of the 8<sup>th</sup> Central Committee of the Workers' Party at the end of the year. As indicated





through the reconnaissance satellite report, it appears that North Korea will implement plans to launch additional spy satellites and to secure surveillance capabilities for South Korea and “operationally significant areas” through the session. ©KINU 2023

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