Fabs in Flames: The KN-09 Threat to South Korea's Economic Security

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Abstract

South Korea's economic security is anchored in its semiconductor industry, which in 2024 generated over $140 billion in exports—more than 20 percent of national trade. This critical infrastructure is concentrated in 16 fabrication facilities (fabs), operated by Samsung Electronics, SK Hynix, and DB HiTek. All are within range of North Korea's KN-09 300-mm multiple-launch rocket system (MLRS). While the KN-09 has typically been assessed in battlefield contexts, this paper evaluates its effectiveness as a single-use weapon against semiconductor fabs, as the semiconductor manufacturing ecosystem is the backbone of South Korea's economy. Using probability modeling, structural engineering data, and blast overpressure calculations, the study finds that a single salvo of 288 rockets could deliver 10-18 direct hits per fab, with sufficient force to cause partial or total structural collapse. Such an attack would not only halt production for months or years but also devastate South Korea's economy by eliminating nearly one-fifth of its exports, crippling global supply chains, and undermining investor confidence. The analysis concludes that the KN-09 represents a potential game changer for South Korean economic security, warranting urgent reconsideration of protective strategies and infrastructure designations.

Keywords: Economic Security, KN-09, North Korea, South Korea, Semiconductor Foundries

Introduction

In July 2025, the *Korea JoongAng Daily* posted an obituary of sorts:

For decades, semiconductors and automobiles have dominated Korea's exports, driving growth and defining its global trade identity. But as shifting global dynamics and mounting uncertainties over U.S. tariffs unsettle traditional trade patterns, a new industrial order is taking shape. Sectors such as shipbuilding and defense are emerging as the next engines of growth (Cho 2025).

The article went on to discuss how the market for autonomous naval vessels would grow from approximately $1.65 billion to an estimated $4.09 billion by 2034. Though these numbers seem impressive for one segment of the shipbuilding and defense sectors, they pale in comparison to the growth projections for the global AI chip segment of the semiconductor sector—a 2025 market value estimated at $94.44 billion growing to an estimated $927.78 billion by 2034 (Precedence Research 2024). It is highly likely that the traditional growth engine of semiconductors will vastly outpace, in value, any new growth engine South Korea may foster.

The semiconductor manufacturing ecosystem is the backbone of South Korea's economy. This ecosystem relies primarily on 16 integrated circuit fabrication facilities, referred to generally as fabs or foundries. Each of these foundries is built within striking distance of artillery fire from the Democratic People's Republic of Korea (hereafter North Korea), particularly its KN-09[*] 300-mm Multiple Launch Rocket System (MLRS). This paper explores the potential damage that a single salvo of KN-09 artillery fire can have on South Korea's semiconductor foundries, as buildings, and the potential consequences this may have on the South Korean economy. The effectiveness of the KN-09 system has been analyzed in the literature on North Korea's artillery capabilities but seemingly not as a single-use weapon against critical infrastructure, as is presented here. If deployed effectively, KN-09 strikes could cripple South Korea's economy, inflicting damage so severe that recovery might take years—if it is possible at all. In this way of thinking, the weapon becomes a game changer in terms of South Korean economic security.

The following analysis focuses on two elements of argument: 1) the importance of the semiconductor industry, particularly fabrication facilities, to the South Korean economy, and 2) the potential damage to fabrication facilities by KN-09 systems. The first component draws on a qualitative assessment of South Korea's semiconductor ecosystem, supported by descriptive data, while the second employs probability modeling and the Blast Parameter Calculator to estimate structural damage to fabrication facilities. The findings indicate that even a single KN-09 salvo carries a high likelihood of collapsing all major fabrication plants, an outcome that would impose profound and lasting economic hardship on South Korea.

The Importance of the Semiconductor Industry to South Korea

According to Statistics Korea's "National Business Survey (based on 1 or more employees)", there were 4,848 semiconductor companies in South Korea in 2021. These companies combined to employ 154,480 people, 50 percent of whom work in large integrated semiconductor companies such as Samsung Electronics and SK Hynix (Kim, et al. 2023, 2). In 2024, South Korean semiconductor exports amounted to $141.9 billion, approximately 20.7 percent of South Korea's unprecedented $683.8 billion in exports that year (Y.H. Jeong 2024). South Korean Customs Service data show that semiconductor industry exports from 2019-2023 averaged $140.9 billion for an average share of exports measuring 23.38 percent, with its highest export share of 25.0 percent in 2021 (H.G. Jeong 2024, 2). It should be noted that H.G. Jeong (2024, 1) divided South Korea's semiconductor industry "into six main categories and 33 subcategories, based on an analysis of 381 semiconductor-related items categorized under the Harmonized System at the 10-digit level." These six main categories were system semiconductors, memory

* The designation KN-09 is a U.S. intelligence and military designation adopted by numerous agencies and many in the media, as the official North Korean name is unknown.

semiconductors, optoelectronic components and discrete devices, materials and parts, semiconductor manufacturing equipment, and silicon wafers.

Although there are thousands of companies contributing to the semiconductor ecosystem in South Korea, only three of these can be considered pillars of the domestic industry, due to their share of labor and export volumes—Samsung Electronics, SK Hynix, and DB HiTek. These three companies operate the country's 16 foundries. It is these large manufacturing facilities that produce the semiconductor chips that most people likely associate with the semiconductor industry. According to H.G. Jeong's analysis (2024, 3), semiconductors—comprised of the three main categories labeled system semiconductors, memory semiconductors, optoelectronic components and discrete devices—accounted for 66.4 percent of total semiconductor industry trade (exports and imports) and 74.5 percent of export trade in 2023. This means fabs, which produce such devices, account for the vast majority of South Korea's trade volume in the semiconductor sector and, in 2023 at least, approximately 15.4 percent of South Korea's total export trade. These numbers alone indicate the importance of fabs to the South Korean economy, but these are simply some of the relatively current numbers.

For years now, the semiconductor industry, particularly fabs, have been central to government innovation and growth plans. In May 2021, the Moon Jae In administration released the "K-Semiconductor Strategy" report outlining the vision for "constructing the world's best semiconductor supply network by the year 2030." Arguably, the most referenced aspect of this plan was the proposed strategy, strategy number one, "the stabilization of the semiconductor supply network by creating a 'K-Semiconductor Belt'" (K-Semiconductor Strategy 2021, 5). The plan called for utilizing memory production bases in Pyeongtaek, Hwaseong, Icheon, and Cheongju as technology-leading fabs (referred to jointly as a Mother Fab), where the latest technologies could be first applied and mass-produced; it also called for the construction of four new fabs in Yongin, referred to as the "Yongin cluster." The utilization of existing foundries and the creation of four more would be integral to the completion of the K-Semiconductor Belt, which would help South Korea leap forward to become the "world's largest semiconductor nation" (ibid., 6-7). In all, the government called on companies to invest 510 trillion won, approximately $450 billion at the time of the announcement (Lim, Lee, and Kim 2021).

Less than three years later, the Yoon Suk Yeol administration announced a plan to build the world's biggest semiconductor cluster with its "Semiconductor Mega Cluster Construction Plan." The plan called for an investment of 622 trillion won, approximately $471 billion at the time, and the construction of 16 new fabs, 13 production fabs and three research fabs, in Gyeonggi Province (Semiconductor Mega Cluster Construction Plan 2024, 2; Ko 2024). To be completed by 2047, the plan called for creating three million new jobs, the production of cutting-edge memory chips, and capturing 10 percent of the global system semiconductor market. At the time, Minister of Science and ICT Lee Jong Ho called semiconductors the "backbone of the country's economy" (Ko 2024).

Eighteen months afterward, the Lee Jae Myung administration succeeded Yoon's, and it was time for campaign pledges to get a closer look. As a candidate, the new president had promised a one hundred trillion won fund to catapult South Korea to a top three artificial intelligence (AI) power. He pledged 50,000 new graphic processing units (GPUs) for a new K-cloud initiative. His technology plans included a 10 percent tax cut for domestic chip production and an easing of the 52-hour work week limit, in order to heighten competitiveness (Hwang and Choi 2025; Lee 2025).

Given the semiconductor ecosystem's sweeping contributions to South Korea's economy—spanning employment, exports, investment, and technological innovation—the importance of semiconductor manufacturing to the nation's sustained growth and economic security cannot be overstated. Nonetheless, every ecosystem must have a core, and this backbone of the economy relies on fabs. Table 1 provides a list of South

Korea's most important active foundries and their locations.

Table 1: Active foundries and their locations in South Korea

Fab Name (English)	Fab Name (Korean)	Address (Korean)	Address (English)
Samsung Line 6 Samsung S1-Line	삼성6 라인 삼성 S1 라인	경기도 용인시 기흥구 삼성로 129 (삼성전자 기흥캠퍼스)	129, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea
Samsung S3-Line Samsung S4-Line Samsung V1-Line	삼성 S3 라인 삼성 S4 라인 삼성 V1 라인	경기도 화성시 삼성로 1 (삼성전자 화성캠퍼스)	1, Samsung-ro, Hwaseong-si, Gyeonggi-do, Korea
Samsung P1 Samsung P2 Samsung V2 Samsung P3	삼성 P1 삼성 P2 (삼성 S5 라인) 삼성 V2 삼성 P3 (삼성 S6 라인)	경기도 평택시 삼성로 1 (삼성전자 평택캠퍼스)	1, Samsung-ro, Pyeongtaek-si, Gyeonggi-do, Korea
SK Hynix M10 SK Hynix M14 SK Hynix M16	SK hynix M10 팹 SK hynix M14 팹 SK hynix M16 팹	경기도 이천시 SK하이닉스로 1 (SK하이닉스 이천캠퍼스)	1, SK hynix-ro, Icheon-si, Gyeonggi-do, Korea
SK Hynix M15 SK Hynix M15X	SK hynix M15 팹 SK hynix M15X 팹	충청북도 청주시 흥덕구 SK하이닉스로 1 (SK하이닉스 청주캠퍼스)	1, SK hynix-ro, Heungdeok-gu, Cheongju-si, Chungcheong- buk-do, Korea
DB HiTek Fab 1	DB 하이텍 팹 1	경기도 부천시 원미구 DB하이텍로 1 (DB하이텍 부천캠퍼스)	1, DB HiTek-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea
DB HiTek Fab 2	DB 하이텍 팹 2	충청북도 음성군 음성읍 DB하이텍로 2 (DB하이텍 음성캠퍼스)	2, DB HiTek-ro, Eumseong- eup, Eumseong-gun, Chungcheongbuk-do, Korea

The Threat

As the backbone of the South Korean economy, one must assume fabs make an enticing target for an enemy's kinetic operations—relating to actions designed to produce effects using the forces and energy of moving bodies and directed energy, including physical damage to, alteration of, or destruction of targets (Salas 2021). Currently, the greatest, non-nuclear threat to these foundries may be North Korea's KN-09 300-mm MLRS. This particular weapon has eight launchers, in two rows of four each, mounted on the back of a 6x6 truck model, meaning it is a mobile system. The weapon made its debut in Pyongyang in October 2015, and North Korean leader Kim Jong Un attended test firing in March 2016 (Armyrecognition.com 2016). The system is locally made, and is likely based on the Chinese SY300, which it closely resembles (ibid.; Zimmerman 2018, 3). Some analysts suggest potential lineage to advanced foreign systems including the Russian BM-30 Smerch or China's A-100 MLRS, though the KN-09 as demonstrated represents a hybrid design with indigenous North Korean modifications (Missile Defense Advocacy Alliance 2026).

The U.S. Army considers this type of weapon a large-caliber rocket, as it is 200-mm or greater. Of this type of weapon the Department of the Army (2020, 3-4) writes:

In the past 20 years, large-caliber rockets have increased in range (some as much as 300+ kilometers) and now, with enhanced guidance packages, are morphing into close- and short-range ballistic missiles. Rockets can deliver high rates of fire and a variety of warheads, making them ideal weapon systems for fire support missions. The highly mobile launchers can rapidly move around the battlefield. This mobility, coupled with the rockets' short burn time, gives maneuver forces little warning. Their short range and salvo capability complicate engagement by current AMD [Air and Missile Defense] systems.

Specifically concerning North Korea, they note, "North Korea has a 300-mm multiple launch rocket system that can easily range Seoul and many U.S. forces stationed in South Korea, including those at Osan Air Base (ibid.)." Mazarr et al. (2018, 12) recognized the potential vulnerability of a foundry to this weapon when they wrote, "North Korea has many strategies it might select against militarily, politically, and economically sensitive targets. Samsung is building a $14.4 billion semiconductor fabrication facility in Pyeongtaek, within range of North Korea's KN-09 300-mm MRLs [multiple rocket launchers]...."

The capabilities of the KN-09 system are difficult to assess, as there is a lack of accessible information in the public sphere. Zimmerman (2018,

14) bound the number of deployed launcher systems between 10 and 100, while Mazarr et al. (2018, 8) estimated that North Korea possessed 36 launchers. If we use the number from Mazarr et al., which seems reasonable, if not on the low side in 2025, then North Korea would be capable of launching a salvo of 288 rockets. Other assumptions we can borrow from Zimmerman (2018, 4) include a rocket range of 190 km, a warhead weight of 150-190 kg of which 75 kg is high explosive (TNT), a lethal area of 1800 m2, a salvo duration of 50-60 seconds, a reload time of 45-60 minutes, and a CEP (Circular Error Probable) of 30-45 m, if satellite navigation systems are working properly. The CEP indicates the weapon system's precision, and in this case, estimates that 50 percent of rounds aimed at the same point will land within a radius of 30-45 m centered on that point (AirPra 2024).

As well, Zimmerman highlights several important aspects affecting the kinetic utility of the KN-09 system. He begins by noting "the major contribution of the KN-09 to the KPA's [Korean People's Army] combat capability is the ability to strike comparatively small-area targets with precision, not the ability to barrage soft (and mostly civilian) area targets" (Zimmerman 2018, 5). He further contends the system's "precision guidance can be readily neutralized by ROK and US forces, negating the precision attack capability. Even if the conflict begins from a standing start with no warning whatever, it is unlikely that the SATNAV guidance will be effective after the first KN-09 salvo (ibid., 3)." For these reasons, he concludes that "the KN-09 is not a game changer (ibid., 2)."

We should note the effectiveness of the KN-09 system as modeled in this analysis depends critically on functional SATNAV (satellite navigation) terminal guidance, which enables the reported CEP of 30-45 meters. However, South Korea and its allies possess significant counterspace capabilities that could substantially degrade the precision of such a KN-09 attack. The implication for a KN-09 attack scenario is significant: should South Korean or U.S. forces detect a massing of KN-09 launcher systems before or during an attack preparation phase, they could implement jamming or spoofing measures to degrade the satellite navigation signals upon which the KN-09's precision depends. If SATNAV guidance is degraded, compromised, or rendered non-functional, the system would revert to ballistic (unguided) operation, which would dramatically increase the CEP from 30-45 meters to potentially 200+ meters, a degradation that would substantially reduce hit probability on the specified targets. Thus, while the modeling presented here assumes optimal conditions for the attacker, the historical record and current force posture suggest that South Korean and allied countermeasures could significantly reduce the practical effectiveness of a KN-09 salvo against precision targets such as semiconductor fabrication facilities.

Conversely, North Korea possesses its own counterspace capabilities and has demonstrated the ability to conduct GPS jamming against South Korean and international navigation systems. U.S. military intelligence assessments indicate that North Korea is likely working with Russian and Chinese sources to procure illicit technologies (Defense Intelligence Agency 2025). A U.S. Defense Intelligence Agency report specifically warned that "North Korea has demonstrated nonkinetic counterspace capabilities, including GPS and SATCOM jamming, and probably intends to deny space-based navigation and communications during a conflict" (Defense Intelligence Agency 2022, 31-32). In fact, North Korea has demonstrated active GPS jamming and spoofing capabilities since at least 2010 and has markedly escalated these efforts in recent years. In May 2024, North Korea conducted sustained GPS jamming operations targeting the Northern Limit Line in the Yellow Sea, affecting civil aviation and maritime traffic across the region (IP Defense Forum 2024). In November 2024, the International Civil Aviation Organization (ICAO) formally condemned North Korean GPS jamming as violations of the 1944 Convention on International Civil Aviation, with the organization noting "recurring" and systematic efforts to disrupt satellite-based navigation (Sokolin 2025).

Additionally, although it does not fit his assumptions of attacks on South Korean military hardware and civilian areas, Zimmerman highlights an important point about CEP. He writes, "Because the kill probability does increase so slowly, firing multiple missiles against each target is not a useful allocation of resources unless the number of KN-09 missiles available significantly exceeds the number of targets (Zimmerman 2018, 11)." This condition of missiles significantly exceeding targets is left unexplored in the analysis by Mazarr et al. (2018), although the map on page nine of their paper indirectly links a long-range artillery salvo of 288 KN-09 rockets with the Samsung Electronics semiconductor fab in Pyeongtaek.

Currently, South Korea operates a multi-layered missile defense system to protect against aerial threats. As reported, the Korea Air and Missile Defense (KAMD) comprises several integrated tiers: at the lower tier are Patriot batteries provided by the United States, equipped with PAC 2 and PAC 3 interceptors to defend against aircraft and short-range missiles; at medium altitude (15-20 km), the M-SAM Block II (Cheongung-II) system provides extended coverage with improved radar and multi-target tracking capabilities; and at high altitude (up to 150 km), the U.S.-operated Terminal High Altitude Area Defense (THAAD) system provides upper-tier defense. Additionally, South Korea is developing the L-SAM long-range system intended to become operational in the latter part of the decade (Jung 2025; Mandal 2025; Missile Threat CSIS 2021). However, with current deployed technologies, it would be difficult to intercept a surprise KN-09 salvo, if the interceptor battery crews were not on high alert and expecting a launch.

Of course, a more comprehensive threat scenario would consider the potential coordination of a KN-09 salvo with unmanned aerial systems or low-cost decoys designed to overwhelm or distract South Korea's layered air defense network. North Korea has previously demonstrated willingness to employ unorthodox delivery systems; in 2024, it deployed hundreds of balloon-borne payloads carrying waste materials into South Korean territory, a provocative act that, while non-lethal, exposed gaps in air defense responsiveness and radar discrimination capabilities (Yun 2024).

The proliferation of low-cost unmanned systems globally has demonstrated the vulnerability of even advanced air defense networks to saturation attacks. A mixed attack scenario combining manned aircraft decoys (such as UAVs carrying radar signatures similar to high-value targets), large-caliber rocket salvos, and possibly coordinated ballistic missile strikes would present a complex engagement challenge for KAMD operators. Research on drone swarm tactics indicates that swarms of inexpensive decoys can overwhelm air defense radars by forcing defensive engagement decisions and exhausting interceptor magazines before actual strike assets arrive (Bridley and Pastor 2022; War Wings Daily 2025). In such a scenario, air defense units would face difficult priority decisions: whether to expend precious interceptors on decoys or reserve them for confirmed kinetic threats.

Moreover, North Korea could employ low-cost reconnaissance UAVs or reconnaissance balloons to conduct post-strike battle damage assessment (BDA) and determine whether follow-up strikes were necessary, a capability that would enhance the military utility of any initial KN-09 salvo. This UAV-enabled BDA function would be particularly valuable in an economic security context, where inflicting partial damage to production lines might be sufficient to achieve strategic goals without committing additional resources. These considerations suggest that the threat posed by a KN-09 attack need not be analyzed in isolation but rather as a potential component of a more complex, multi-domain attack scenario incorporating deception, saturation, and reconnaissance capabilities.

While South Korea has invested heavily in developing a multi-layered air and missile defense system, defense analysts and military planners acknowledge fundamental limitations when defending against a sustained salvo of large-caliber rocket artillery such as the KN-09. The KAMD is architected around the assumption of discrete, detectable threats arriving at intervals that allow for sequential engagement. However, large-caliber MLRS systems are specifically designed to overcome this assumption: they deliver multiple rounds in rapid succession (a salvo of 288 rockets from 36 launchers requires approximately 50-60 seconds to complete), presenting defending air defense units with a compressed engagement window and a saturation problem.

According to Hong Min, a senior researcher at the Korea Institute for National Unification, "even with a multi-layered defense in place, many experts, including myself, believe that the system on its own would struggle to withstand a mixed, simultaneous strike from North Korea" (Jung 2025). The fundamental constraint is not technological sophistication but rather interceptor magazine capacity and radar bandwidth. Each layer of KAMD maintains a finite number of ready interceptors and a fixed rate of fire. Against a slew of decoys and a salvo of 288 rockets, each of which requires a successful intercept, the mathematics of saturation becomes decisive. A single Patriot battery, for example, may have up to eight launchers with four to sixteen missiles per launcher, depending on configuration and armament (see Armyrecognition.com 2025), so even with multiple batteries, intercepting a majority of a 288-rocket salvo would require either: (1) unprecedented pre-positioning of air defense assets in direct proximity to the target; (2) long-range early warning and interceptor employment at maximum ranges (reducing accuracy); or (3) acceptance of significant leakage through the air defense system.

The time constraint is particularly acute for large-caliber rockets. With flight times to South Korean fab locations ranging from ~60 seconds to ~140 seconds—as presented in Table 2 of this analysis—air defense crews would have less than 2.5 minutes from initial detection to engagement. In contrast, ballistic missiles with longer flight times afford more engagement opportunity. This compressed timeline, combined with the salvo's sheer volume, creates a "peacetime surprise" scenario in which even optimal air defense performance may permit significant leakage. One South Korean defense ministry official remarked: "If North Korea knew the prioritization [of air defense targets], it could adapt its attack strategy to exploit gaps, such as targeting unprotected assets" (Jung 2025).

The implication is that South Korea's KAMD, while formidable as an air defense system, is not designed to provide near-perfect defense against a sudden, large-scale salvo of unguided or semi-guided rocket artillery targeting dispersed civilian infrastructure, such as fabrication facilities, rather than concentrated military assets. The system performs best against discrete, sequential threats and against adversaries attempting to penetrate defended airspace with aircraft or limited numbers of ballistic missiles. Against a saturation attack designed specifically to exploit air defense limitations, such as a KN-09 salvo, the system's effectiveness is substantially reduced, and significant numbers of rockets would likely impact their intended targets.

Such short flight times become particularly worrisome when considering the potential for chaos and confusion accompanying the various aforementioned attack scenarios.

Table 2: Estimated flight times of a KN-09 rocket to varying target distances

Target Distance	Minimum Time	Maximum Time
57 km	~59.8 sec	~84.9 sec
95 km	~75.7 sec	~107.5 sec
109 km	~81.2 sec	~114.2 sec
114 km	~82.3 sec	~115.2 sec
165 km	~95.3 sec	~137.3 sec

Note: Estimated minimum and maximum flight times of KN 09 rockets at varying target distances. Calculations assume a maximum altitude below 40 km, shallow launch angles of 30-45 degrees, feasible initial velocities consistent with engineering constraints, and full atmospheric drag within the bounds of estimated velocity ranges. Results were generated using ChatGPT-4o.

Complementing this fairly short flight time, other operational capabilities of the KN-09 seem more than enough to do significant damage to a foundry. Foundries come in different sizes, however, to provide some perspective “the Pyeongtaek Samsung Electronics P2 Project was aimed at adding a large-scale semiconductor production line with a gross area of 128,999 m2 to the P1 Line in Godeok Industrial Complex in Pyeongtaek (Samsung E&A).” In simple comparative terms, this means the building complex is the approximate size of 18 international football pitches, or perhaps a rectangular shape of 175 x 735 m. SK Hynix’s M16 fab is reportedly “336 m long, 163 m wide and 105 m high with a foot print of about 55,000 square meters” (Clarke 2021), while Samsung Electronics’ S1 line in Giheung is reportedly 13,000 pyeong, approximately

42,975 m2 (Kang 2021).

With only 16 primary fabrication facilities in South Korea, a single salvo of 288 rockets allows for 19 rockets to be directed at each target—the number of projectiles exceeds the number of targets, perhaps making the KN-09 a game changer in a critical infrastructure scenario. If we consider the frequently cited artillery dud rate of 25 percent for North Korean artillery (Anderson and Press 2025; Zimmerman 2018, 11), consider a CEP of 38 m, and provide the location of each fab building in latitude and longitude degrees, minutes, seconds (DMS) from Google Earth, a statistical analysis concludes an estimated strike probability of approximately 14.25 of 19 rockets, while 10 to 18 rockets are possible as they fall within a 95 percent interval. These calculations accommodate the independence of each rocket's failure or dud rate. They also consider that latitude and longitude DMS, with no decimal seconds, may lack accuracy of approximately 33.3 m give or take. The calculations were performed on square target areas of 128,999 m2, 60,000 m2, and 42,975 m2, as well as the rectangular SK Hynix M16 foundry, with each analysis drawing the same conclusions of 10-18 effective rounds in a salvo of 19 rockets (see tables 3 and 4).

Table 3: General hit probability calculations on a square target of varying fab sizes

Target area (m^2)	Side length (m)	CEP (m)	P(within target)	Per-shot hit probability	Expected hits (n=19)
128999	359.16	38	0.9999859	0.749989	14.25
60000	244.95	38	0.9944497	0.745837	14.17
42975	207.3	38	0.9757693	0.731827	13.9

Notes: 1) P(within target) is computed from the circular normal model using $P(r < R) = 1 - e^{-R^2/(2 CEP^2)}$, where R is half the side length of a square target; 2) Per-shot hit probability multiplies P(within target) by the non-failure probability 1 - 0.25 = 0.75. Computations completed by Perplexity, Sonar LLM using a binomial probability model, combined with the circular normal (Rayleigh) distribution to estimate hit probability based on Circular Error Probability (CEP).

Table 4: Hit probability calculations on the relatively small SK Hynix M16 foundry

Item	Value
Target shape	Rectangle
Dimensions (m)	336 × 163
Target area (m^2)	54768
Latitude (DMS)	37°15′01″
Longitude (DMS)	127°28′59″
Arcsecond scale (m)	lat ≒30.83, lon ≒24.64
Max rounding bias (m)	X ±12.32, Y ±15.41
CEP (m)	38
Fail rate	25%
P(within target)	0.98503
Per-shot hit probability	0.73877
Expected hits (n = 19)	14.04
Mode hits (probability)	14 (≒0.2041)

Notes: 1) Calculations per Perplexity, Sonar LLM; 2) Whole-second DMS rounding adds a uniform bias up to roughly 15 m north-south and 12 m east-west, slightly reducing hit probability versus the non-quantized case in Table 2; 3) with CEP 38 m and a 25 percent fail rate, the expected hits remain close to 14 under these quantization conditions.

The point here, to be clear, is that fabs are very large facilities and may be difficult to miss with an artillery salvo. Table 5 shows the location of each fab in latitude and longitude DMS and its distance from a hypothetical "Kaesong MLRS Cluster"—a location approximately 11 km northeast of Kaesong, North Korea and 5.8 km north of the military demarcation line in the demilitarized zone (DMZ). All fabs fall well within the reported estimated range of KN-09 rockets. Currently, South Korean officials argue against supplying Alphabet, the parent company of Google, with domestic mapping layers at a 1:5000 scale, due to security concerns of exporting data that can accurately pinpoint military facilities and critical infrastructure to foreign data servers (Byun 2025; Jacobs 2025). However, the truth is two-fold when it comes to fabs. Firstly, they are so large that a GPS location in DMS is more than enough information for artillery to hit the target, and secondly, any person with an off-the-shelf handheld

GPS locator can drive around a foundry with a laser rangefinder and calculate the GPS location in DMS seconds to two decimal places, shrinking inaccuracy from approximately 33.3 m to about 1 m. However, hitting the target is not the only aspect to be considered. Even if the shot is accurate, will it do considerable damage to the structure of a fab built with reinforced concrete walls?

Table 5: Fab locations in South Korea and their distances from the Kaesong MLRS cluster

Fab Name	Address	Latitude (DMS)	Longitude (DMS)	Distance from Kaesong MLRS Cluster
Samsung Line 6	129, Samsung-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea	37.13'45"N	127.05'09"E	94 km
Samsung S1-Line		37.13'35"N	127.05'08"E	94 km
Samsung S3-Line	1, Samsung-ro, Hwaseong-si, Gyeonggi-do, Korea	37.12'54"N	127.04'22"E	95 km
Samsung S4-Line		37.13'01"N	127.04'01"E	94 km
Samsung V1-Line		37.12'54"N	127.04'22"E	95 km
Samsung P1	1, Samsung-ro, Pyeongtaek-si, Gyeonggi-do, Korea	37.02'06"N	127.03'26"E	114 km
Samsung P2		37.02'06"N	127.03'26"E	114 km
Samsung V2		37.02'06"N	127.03'26"E	114 km
Samsung P3		37.02'06"N	127.03'26"E	114 km
SK Hynix M10	1, SK hynix-ro, Icheon-si, Gyeonggi-do, Korea	37.15'01"N	127.28'59"E	109 km
SK Hynix M14		37.14'55"N	127.28'50"E	109 km
SK Hynix M16		37.15'01"N	127.28'59"E	109 km
SK Hynix M15	1, SK hynix-ro, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, Korea	36.39'17"N	127.26'01"E	165 km
SK Hynix M15X		36.39'17"N	127.26'01"E	165 km
DB HiTek Fab 1	1, DB HiTek-ro, Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea	37.30'47"N	126.46'41"E	57 km
DB HiTek Fab 2	2, DB HiTek-ro, Eumseong-eup, Eumseong-gun, Chungcheongbuk-do, Korea	37.07'35"N	127.39'24"E	130 km

Notes: 1) Coordinates in DMS and distance ranges from Google Earth; 2) the Kaesong MLRS Cluster is based on a cluster of HARTS (hardened artillery sites) at the same location, as identified by the Google Earth mapping data of North Korean artillery positions known as 809291.kmz.

Fabs are impressive buildings. They are built to exacting specifications in order to create an environment where billions of transistors only a few nanometers across, an essential component of semiconductor chips, can be manufactured accurately with no impurities. According to Brian Potter (2024), with such exacting specifications in mind, "A modern semiconductor fab must thus create a world of incredible precision and predictability. Every possible effect that might disrupt the manufacturing process, no matter how small, must be screened off, any subtle deviation hunted down and eliminated." This is difficult to achieve in a cleanroom environment that must be cleaner than a hospital's surgical theater.

The cleanroom of a modern fab, where manufacturing of the wafers and chips takes place, may have more than one thousand tools. Major pieces of processing equipment may cost tens of millions of dollars (ibid.). For producing cutting-edge chips, ASML's advanced photolithography machines, also known as extreme ultraviolet (EUV) machines, are necessary and reportedly cost between $150 million and $380 million; ASML plans to produce only about 20 annually up to 2028 (AleksandarK 2024; Hivelr Business Review 2024). In 2024, ASML reportedly had the capacity to produce only five or six of their High NA EUV chipmaking machines, which are necessary to produce the most cutting edge chips available, and in that year, Intel had seemingly purchased the entire stock (Trueman 2024). Fortunately for Samsung Electronics, they were able to introduce the technology to their Hwaseong Campus in March 2025 (Nenni 2025), and SK Hynix acquired their machine for the M16 fab in September 2025 (Park 2025). SK Hynix CTO Cha Seon Yong remarked at the time of acquisition, "This installation provides critical infrastructure to realize our future technology vision (ibid.)."

From a threat perspective, it is the cleanroom with its exacting specifications and very expensive manufacturing tools that must be protected from any disruption, but these rooms are quite vulnerable to a large-caliber rocket attack. Generally, modern fabs have four levels. From bottom to top, these are the utility level, the clean subfab level, the cleanroom level, and the interstitial and fan deck level (Potter 2024). The cleanroom level is separated from the interstitial and fan deck level by the cleanroom ceiling, which in most cases is composed of High Efficiency Particulate Air (HEPA) filters that provide one hundred percent coverage (Bhatia n.d., 9), though Ultra Low Particulate Air (ULPA) filters may be used as well. These filters are simply microfibers in a frame that may be a fairly large modular panel. The ceiling also has lighting fixtures, a rail system for front opening unified pods that safely transport wafers between tools, and other lightweight equipment. This type of ceiling would provide little resistance to an artillery rocket. The interstitial level, with its HVAC equipment and ducting, is separated from the outside world by the foundry's roof. A foundry's roof is often made of a thin concrete or steel layer supported by large steel trusses (Potter 2024) that can provide support over a wide area without requiring pillars to be built throughout the interior of the foundry. The roof is different from the foundry's foundations and walls, which are generally reinforced concrete to minimize vibration. The lack of reinforced concrete roofing makes the fab more susceptible to damage from a large-caliber rocket attack landing on a downward trajectory.

In order to estimate general structural damage from an artillery blast, a necessary variable is overpressure. Overpressure, or blast overpressure, is defined as the sharp, instantaneous rise above ambient atmospheric pressure resulting from an explosion (Navy and Marine Corps Force Health Protection Command). Zimmerman (2018, 14-15) calculates the overpressure in psi (pounds per square inch) for 75 kg TNT equivalent to estimate the damage a KN-09 rocket may cause. Here we can use calculations from the Blast Parameter Calculator to estimate structural damage to fabs in the case of a KN-09 attack (see Appendix A for limitations and caveats of Blast Parameter Calculations). Table 6 provides a reference table for overpressure and structural damage.

Table 6: Structural damage caused by various measures of overpressure

Overpressure (psi)	Structural Damage
0.15	Typical threshold for window glass breakage. Shattered glass is one of the most common damage sources even at distant ranges.
0.5 - 1	Light damage; most windows crack or blow in. Doors, weak frames, and some roof tiles may be dislodged.
1 - 2	Moderate damage; unreinforced masonry walls begin to crack, siding or light cladding can be torn off. Houses may be left structurally unsafe.
2 - 3	Serious structural damage; partial collapse of lighter buildings. Some references indicate unreinforced masonry failure around 2-3 psi, leading to heavy debris.
4 - 5	Near or complete collapse of typical homes (wood-frame). Internal walls fail, roofs lifted. Occupants at high risk of entrapment.
5 - 7	Severe destruction of residences; significant damage to steel or concrete frames (distortion, partial collapse). Utility poles snap; vehicles may be overturned.
8 - 10	Total or near-total destruction of most conventional structures. Reinforced concrete buildings heavily damaged or partially collapsed.
>10	Practically all non-hardened buildings are demolished. Large-scale structural failures, with few walls standing.
20+	Even heavily built reinforced concrete installations can be shattered or collapsed. Near-complete infrastructure devastation.

Note: From Blast Effects Information, the Blast Parameter Calculator, at eodtech.com.

The blast overpressure ranges presented in Table 6 provide structural engineers with reference points for assessing physical damage, but for purposes of assessing economic security impact, it is essential to distinguish among three qualitatively different damage outcomes: (1) temporary disruption requiring days to weeks of downtime; (2) mission kill rendering the facility inoperable for months; and (3) structural failure resulting in prolonged or permanent loss of production capacity.

Temporary Disruption (Overpressure Range: 1-3 psi): At overpressure levels between 1 and 3 psi, reinforced masonry and light steel-frame structures begin to show cracking, and some roof tiles or cladding may be dislodged (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). In the context of a semiconductor fab, temporary disruption would involve damage to non-critical structural elements, the cleanroom ceiling (composed of HEPA filters and modular panels), and utility connections. The HVAC system, electrical distribution, and water/chemical delivery systems, all of which run through the interstitial spaces above the cleanroom, would be vulnerable to disruption at these overpressure levels. A fab experiencing temporary disruption would require days if not weeks for rapid assessment and repair of utility systems and cleanroom restoration (see Stratton 2025 for likely effects). However, the facility's core structural integrity would remain intact, allowing for return to production once utilities are restored.

Mission Kill (Overpressure Range: 3-8 psi): At overpressure levels between 3 and 8 psi, significant structural damage occurs (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). Unreinforced masonry begins to fail completely, light steel structures experience permanent deformation, roofs may be partially or completely lifted, and internal walls fail. In a semiconductor fab context, mission kill represents damage severe enough to require 2-6 months of reconstruction work. At this level, the reinforced concrete foundation and primary load-bearing walls (designed to minimize vibration) would likely survive, but the roof structure, typically composed of thinner concrete or steel supported by large steel trusses, would be severely damaged or partially collapsed. The equipment within the facility, including multi-hundred-million-dollar lithography machines and process tools, would likely experience secondary damage from falling debris, water intrusion, and loss of climate and vibration control. Recovery would require not only reconstruction of the roof and interstitial spaces but also extensive tool refurbishment, recalibration, and validation before production could resume. This category of damage is often irreversible within a 2-3 year timeframe and may trigger permanent relocation of production lines to facilities outside South Korea (see Asianometry 2025 for fab construction timeline).

Structural Failure/Total Destruction (Overpressure >8 psi): At overpressure levels exceeding 8 psi, total or near-total destruction of conventional structures occurs. Heavily built reinforced concrete buildings experience partial to complete structural collapse, and at levels exceeding 10 psi, practically all non-hardened buildings are demolished with few walls standing (Office of Response Restoration 2019; Olayebi and Ayanleke 2022, 32-33). At overpressure levels of 20+ psi, even heavily reinforced concrete installations can be shattered or collapsed. In a fab context, structural failure at these levels would destroy the facility beyond economic repair. The reinforced concrete foundation and walls might survive, but the interconnected infrastructure, thousands of square meters of cleanrooms, utility networks, process tool alignments, would be demolished. The cost of reconstruction would exceed the cost of building a new facility at a greenfield site. Just as critically, the specialized workforce trained on particular equipment types would be displaced, and the loss of institutional knowledge about process optimization and quality control may prove irreversible. Recovery timelines for such damage may extend to 5+ years (see Asianometry 2025 for fab construction timeline).

The analysis presented in this paper focuses on the probability of achieving overpressure levels in the 8-20+ psi range, which would correspond to structural failure or total destruction. However, it is important to note that even lower overpressure levels (3-8 psi, corresponding to mission kill) would produce economically devastating effects on South Korea's semiconductor capacity, as the 2-6 month production outage would disrupt global supply chains and incur losses vastly exceeding the direct reconstruction costs.

Keeping the above references for physical damage in mind, we can now consider the potential for damage from a KN-09 attack. According to the Blast Parameter Calculator (eodtech.com), a 75 kg payload on a KN-09 rocket would have an incident pressure (or peak overpressure) of 1.92 psi, if it landed approximately 46 m off target. If it missed the fab by 20 m, it would have an incident pressure of 6.87 psi. If it missed the fab by 10 m, it would have an incident pressure of 27.95 psi. If it missed by

3 m, there would be an incident pressure of 389.58 psi. A direct hit would result in an incident pressure of 2,262.40 psi. This may sound a bit abstract, and Zimmerman (2018, 15 and note 35) reminds us that the force of pressure is not hitting a single square inch and therefore must be calculated for the entire wall. So, if we use the simple formula of F = P x A (where F is force, P is pressure, and A is area), and apply this to SK Hynix's M16 fab, which we previously noted is reportedly 336 m long, 163 m wide and 105 m high, then the total force on the long wall under an incident pressure of 27.95 psi would equal 764,025 U.S. tons (or short tons). Quite obviously, the wall is so large that not every part of it is within a 10 m radius of the initial blast. However, we have already concluded that the statistical probability favors an average of 14 rockets hitting a foundry, as they are such large targets, and it is highly probable that any number of rockets between 10 and 18 will hit the target. Zimmerman (2018, 15), drawing on Cross et al., observes that the blast pressure may be localized to one side of the building and the resulting asymmetry may undermine structural integrity potentially leading to collapse.

Now imagine a direct hit, or 14 of them, on the steel or thin concrete roof of a fab, where the direct hit incident pressure is 2,262.40 psi. If the building somehow remained standing, which is highly doubtful, it is nearly certain the force of the blast would cause catastrophic damage to the interstitial level and the clean room. Certainly the vibrations and overpressure would collapse the HVAC structures in the interstitial space above the cleanroom and bring utility equipment crashing down upon the manufacturing equipment in the cleanroom. It would likely take years to reinforce or rebuild the structure of the foundry, and if the cleanroom housed ASML EUV equipment, it may take a year or more on a waiting list to replace it. Either way, it is a safe assumption that a fab being hit with such force would take a minimum of many months to recover, if not years to rebuild. It is likely the structure would collapse.

The Scenario

Before presenting possible scenarios, we should recognize that South Korea's fabs are not considered critical infrastructure by the state, though some of their components are considered strategic technologies. The designation of strategic technologies has a firm foundation in an economic security framework. Lee (2022) states that a shift has occurred in state perspectives of economy and security in the post-2000 international order: "the importance of national security interests has been given more attention than the existing economic efficiency, and the concept of economic security has changed to focus on 'economy for security' rather than 'security for economy'." In a complementary vein, Park (2023, 3), writing for the Korea Institute for International Economic Policy, observes that although the concept of economic security remains imprecisely defined, it can be characterized by three key features: "1) resilience to business cycle shocks, 2) the ability to produce the goods and services needed if the global trade and financial system fails, or 3) resilience to embargoes." Arguably, a key element of economic security today is technological sovereignty, something South Korea's Ministry of Science and ICT (2025) seems to recognize as it begins exploring public-private partnerships for "sovereign science and technology." Therefore, it is not surprising that the Korea Institute of Industrial Technology Planning and Evaluation (2025) lists 33 strategic technologies related to semiconductors. However, quite surprisingly, despite their importance to the economy, semiconductor fabs are not designated as national core infrastructure facilities in South Korea (Ministry of Interior and Safety 2025). In other words, they are not considered critical infrastructure, and as such, they are not provided the same consideration of protection by policymakers as designated critical facilities.

This apparent gap between protected technologies and protected facilities is particularly important here, as unlike some previous analyses of KN-09 effectiveness and utility on the battlefield, this paper assumes a surprise, first strike, single strike, salvo of 288 KN-09 rockets on semiconductor foundries as economic infrastructure. It is likely these structures will have little in the way of dedicated protection from the state, should a strike occur. It also assumes no follow-up troop movements or other indications of an impending invasion from North Korea. Under this scenario, no U.S. or South Korean military forces are targeted. Likely, no U.S. or South Korean military forces are killed or wounded, unless visiting a fab. This can be compared to the shelling by North Korean forces of Yeonpyeong Island, South Korea in November 2010. In that incident, it is reported that the Korean People's Army's 122 mm MRL batteries fired approximately 170 artillery rounds, though perhaps some rounds were from smaller 76.2 mm batteries. This fire targeted civilian and military structures and positions on the island. In response, South Korean military forces fired 80 K-9 artillery rounds in a counter-battery operation (Bermudez, Jr. 2011, 6). South Korea's was a reasoned, proportional response that did not escalate the situation. North Korea was obviously willing to absorb the retaliatory strikes.

Critics may complain that North Korea, as a rational actor, has no reason to launch an unprovoked, surprise, limited strike against South Korean infrastructure. It would be difficult to argue this point. However, there are a couple of scenarios under which a North Korean KN-09 limited strike might be conducted. The first would be a retaliatory strike for provocations by the United States or South Korea. According to reports published in September 2025, U.S. Navy SEAL Team 6 was said to have infiltrated North Korea in 2019 to plant surveillance equipment. During the failed mission, the military team reportedly killed two or three North Korean civilians that posed a danger to the covert nature of the mission (Philipps and Cole 2025). As well, alleged drone incursions into North Korea ordered by former President Yoon Suk Yeol (Shin 2025) and undertaken by South Korean civilians (Kang 2026) have been under investigation by special prosecutors in South Korea. Such provocations, with or without the loss of civilian life, may push North Korea to respond with a kinetic operation of its own. The second scenario may be a coordinated or opportunistic strike should China invade Taiwan. This author can envision the possibility of a KN-09 strike against foundries as a tactic to delay U.S. forces should China strike or invade Taiwan. The bonus of such a coordinated or opportunistic attack in conjunction with a Chinese invasion of Taiwan is that China would come out of it with the largest chip manufacturing capacity globally, and they would owe North Korea for the help provided. Likely, if a simultaneous, or near simultaneous, attack on Taiwan and South Korea occurred by Chinese and North Korean forces respectively, U.S. policymakers would tread carefully, worried about a two-front conflict. If no military personnel of the United States or South Korea were wounded in attacks on civilian infrastructure, and no further North Korean movements were detected, it is probable a proportional response would be recommended and carried out. After all, North Korea is a nuclear armed state and South Korea has much more to lose than North Korea in an escalated conflagration, at least from a social welfare development perspective.

A flexible and proportional response from South Korea seems probable based on reported plans in place. Due to the Yeonpyeong Island shelling incident in November 2010, the United States and South Korea signed the Combined Counter-Provocation Plan in 2013 (DVIDS 2025). According to General Curtis M. Scaparrotti (2016, 10), the plan "improves our ability to respond to North Korean provocations as an Alliance, while managing the risks of miscalculation and escalation," while calling for "strong, yet measured responses [to] set the conditions for diplomatic efforts to work." In 2015, U.S. and South Korean military leaders signed OPLAN 5015. Although the plan reportedly "called for a prompt response to a North Korean attack with a preventive strike on the North's core military facilities and weapons as well as its top leaders," it seemingly "focused not on a full-blown war but on limited warfare" and is also known "to encompass plans against asymmetric aggression such as TBM/WMD [theater ballistic missiles/weapons of mass destruction] and cyber warfare" (Globalsecurity.org 2016). Regarding OPLAN 5015, David Maxwell, a retired U.S. Army Special Forces colonel, remarked to the National Interest (Peck 2019), "My recommendation is not to try to read too much into the plans." He added:

Military planners are by nature worst case planners but they also plan to provide multiple options to national decision makers for responding to crisis based on the mostly likely enemy course of action to the most dangerous enemy course of action. While there is likely Option A, B and C for every contingency, often what gets executed is Option D that is developed from A, B and C and the actual assessment of enemy actions (ibid.).

OPLAN 5015 is classified and both sides agreed in 2022 to update the plan when they signed a Strategic Planning Directive (Song 2022). Nonetheless, one can deduce that a response from the Combined Forces Command of South Korean and U.S. forces would be flexible and proportional, thereby avoiding escalation and reducing the risk of a full scale war. Therefore, if North Korea were willing to absorb counter-battery or other proportional retaliatory measures, the asymmetry of economic losses would clearly favor North Korea.

Should a limited strike of KN-09 large-caliber rockets decimate South Korea's 16 foundries, the economic losses would likely be catastrophic. Nearly 20 percent and slightly more than $100 billion of exports would be wiped away instantly. The loss of foundries would ripple through the entire semiconductor industry affecting its nearly 150,000 workers. South Korea's trade balance would rapidly deteriorate and the foreign exchange rate would likely be volatile. The big three of Korean foundries—Samsung Electronics, SK Hynix, and DB HiTek—may not survive. Investors would likely flee, as the companies would need years to rebuild, with no guarantee another strike would not have the same outcome. Manufacturing competitors like TSMC, Micron, and Intel would likely absorb displaced clients and capture additional market share. A contraction of South Korean GDP would be inevitable. Capital investment from the government and private sector in the hundreds of billions of dollars would be necessary for immediate demolition and cleanup costs and longer term rebuilding costs. Table 7 provides estimates of some potential economic losses.

Table 7: Estimates of potential economic losses

Impact Area	Short-Term Effect	Medium to Long-Term Effect
GDP	contraction	Slow recovery over 3-5 years
Exports	Collapse of $100B+ in semiconductor exports	Permanent market share loss
Employment	Massive layoffs and income shock	Structural unemployment risks
Capital Investment	Immediate destruction costs (tens of billions USD)	Rebuilding costs and debt burden
Global Competitiveness	Severe disruption	Competitors gain market share
Investor Confidence	Sharp decline	Possible downgrade and slower FDI
Technological Leadership	Innovation delays	Risk of erosion of high-tech leadership

Note: Author's analysis of potential outcomes.

Conclusion

Even if one does not believe that North Korea will launch a surprise, limited artillery attack on South Korea, the KN-09 300 mm MLRS provides capabilities that must be assessed on their ability to decimate the country's critical infrastructure, in this case, the country's semiconductor foundries. With 36 mobile launch systems being able to fire a coordinated salvo of 288 rockets a distance of 190 km with a payload of 75 kg equivalent of TNT, the KN-09 has the capability to fire 19 rockets at each of South Korea's 16 fabs. Of the 19 rockets directed at each facility, statistical analysis suggests that between 10 and 18 are likely to achieve direct impact, with a mean of approximately 14. Such impacts would be sufficient to destroy the entire structure, or at minimum cause severe structural damage requiring months or even years to repair. If such an action were to occur, significant economic damage would result, including a major loss of export revenue, a likely contraction of GDP, the loss of competitiveness in the semiconductor global marketplace for Samsung Electronics, SK Hynix, and the country of South Korea more generally. It is likely such a salvo would usher in a sharp decline in investor confidence and drive away potential investment in the country from overseas.

The greatest single suggestion to counteract a single-salvo scenario is quite simple: stop building fabs in the range of artillery that cannot be intercepted by anti-missile systems currently deployed in South Korea. While this represents a long term strategic outlook, the fabs already built cannot be relocated, leaving them vulnerable until an effective anti artillery defense is established. Another possible solution is to place soldiers in harm's way and deploy some U.S. and South Korean military personnel at each fab, so any attack on a foundry is also an attack on a military position. This did not stop North Korea from firing on Yeonpyeong Island in 2010, but if U.S. military personnel are included, it may make a difference to North Korea's calculations regarding retaliation. At a bare minimum, South Korea should add semiconductor fabs to their list of designated critical facilities. No matter the outcome, the analysis does suggest that the KN-09 300 mm MLRS is a game changer in economic security and critical infrastructure terms, and for this reason, appropriate countermeasures should be considered and devised.

Declaration of Generative AI and AI-assisted technologies in the writing process: During the preparation of this work the author used Sonar LLM of Perplexity and ChatGPT4o of OpenAI in order to perform mathematical calculations, as noted in the text, and to enhance the author's understanding of structural engineering. After using these tools, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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Appendix A: Limitations and Caveats of Blast Parameter Calculations

The Kingery-Bulmash blast parameter model, upon which the overpressure calculations in this analysis are based via the Blast Parameter Calculator, has well-documented limitations that warrant explicit discussion. According to the foundational technical report by Kingery and Bulmash (1984), the empirical equations employed were developed from explosive test data ranging from less than 1 kg to over 400,000 kg of TNT equivalent charge weights. However, these equations exhibit reduced accuracy in the near-field region, specifically at scaled distances below Z < 0.4 m/kg1/3, where the extreme pressures and temperatures generated at the moment of detonation present measurement challenges (Joint Research Centre 2017, 6). Recent scholarship examining the applicability of these equations has revealed that at scaled distances approaching the explosion, the Kingery-Bulmash model may underestimate peak overpressure values compared to finite element simulations, with some studies documenting differences exceeding 27 percent (see Hussein 2025, 22).

Beyond the inherent mathematical limitations of the model itself, real-world blast environments introduce variables not fully captured by hemispherical surface-burst assumptions. Atmospheric conditions, particularly wind speed, wind direction, humidity, temperature gradients, and atmospheric stability, can significantly alter blast wave propagation. Wind effects can asymmetrically amplify or attenuate blast waves downwind of the detonation, while temperature inversions and humidity can affect sound speed and thus the effective pressure transmission. Additionally, the Kingery-Bulmash equations were developed assuming free-field conditions in open terrain; the presence of surrounding structures, topography, and other environmental features can create complex wave interactions including reflections, diffraction, and channeling effects that amplify or reduce local overpressures in ways difficult to predict analytically (see Catovic and Kljuno 2021).

The calculations presented in this paper assume optimal SATNAV terminal guidance accuracy (CEP of 30-45 meters) and a 25 percent dud rate derived from assessments of North Korean artillery performance. However, these assumptions represent baseline conditions and do not account for dynamic countermeasures that adversaries might employ, which are addressed in "The Threat" section of this paper. Weather conditions during any hypothetical attack, particularly high winds or atmospheric instability, could reduce the precision of unguided rocket falls or jam GPS signals, potentially degrading accuracy beyond the assumed CEP parameters.

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