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TECHNICAL REPORT

# Characterizing the North Korean Nuclear Missile Threat

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## Summary

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The security community generally believes that North Korea acquired Soviet guided ballistic missiles from Egypt, reverse engineered them, and indigenously produced and deployed in North Korea perhaps 1,000 ballistic missiles of various types. Because North Korea is a self-declared nuclear weapon power, there are serious concerns that some of these missiles might be armed with nuclear warheads. North Korea is also believed to have exported perhaps 500 ballistic missiles over the past two decades.

However, upon closer examination, North Korea is not behaving like a developer and producer of large numbers of relatively sophisticated missile systems. Its lack of a realistic missile test program, in particular, raises significant issues about the quality of its products.

This report questions the current common view of the North Korean missile program and seeks to better characterize the North Korean missile threat.<sup>2</sup> North Korea is doing a unique job of hiding its program, such that much of the analysis has to be done indirectly. Nonetheless, the insights that result from this approach are extremely helpful.

## Background

For those who study North Korea, ballistic missiles are generally seen as the primary means of nuclear weapon delivery against the territory of the Republic of Korea (ROK) or Japan,<sup>3</sup> thus making operational missile systems a prerequisite for a serious North Korean nuclear threat. In open source literature,<sup>4</sup> North Korea is characterized as a key player in the global missile market, with successful indigenous development, operation, and export of numerous types of capable guided ballistic missile systems that meet the criteria of strategic significance, especially if combined with a nuclear warhead. Since North Korea already claims to be in possession of operational nuclear weapons, U.S. and regional policy and strategy toward North Korea always has to take this threat into account.

However, there are strong indications that North Korea's missiles may not pose such a serious threat. Compared with known missile programs, not only those of the former Soviet Union and the United States but also smaller efforts in Iraq, Egypt, and Libya, the North Korean program has been different. Most notably, from an engineering perspective, the North Korean test program shows several inconsistencies. The low number and low failure rate of

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<sup>2</sup> Unless stated otherwise, in this document the word *missile* refers only to guided ballistic missiles.

<sup>3</sup> North Korean use of combat aircraft to deliver nuclear weapons seems unlikely because of the serious inferiority of those aircraft—they would be unlikely to reach their targets.

<sup>4</sup> My survey of the open source literature is documented in the appendix.

its missile flight tests are one obvious aspect. I therefore examine other hypotheses about the North Korean program that might better explain the known evidence than the hypothesis that is commonly accepted in open source literature.

## Research Questions

I consider the following research questions:

- What is the most plausible hypothesis to explain the nature of the North Korean missile program?
- What consequences might these findings have for U.S. and ROK policy and strategy toward North Korea?
- What data would be most valuable for better understanding the nature of the North Korean missile program?

## Methodology and Approach

In this report, I assess the North Korean missile threat using a broad approach that includes political considerations, engineering aspects, and economic realities. I define five different hypotheses about the origin and status of the North Korean missile program. First is the “Reverse Engineering” hypothesis, which is based on the consensus in the open source literature. Second is a contrasting “Buy” hypothesis that assumes total North Korean dependence on missiles produced by foreign entities. In between the two extremes of North Korean independence and reliance on foreign support are three other scenarios: a “Licensed Production” hypothesis, a hypothesis that assumes reliance on “Mixed Sources” for the missile program, and a “Bluff” hypothesis that assumes that creating the *impression* of a serious missile threat is the main objective of the North Korean program.

To test the hypotheses, I present and evaluate available data that are directly or indirectly related to the missile program. I sort the data into three categories and mark them according to three levels of confidence. Data categories are the *missile* (directly related to the specific delivery systems and their associated warheads), the *program* (generally related to missile development, production, and deployment), and the *country* (related to North Korea in a general way). Confidence levels are *high* (predominantly dealing with technical aspects that are derived from imagery, other firsthand observations, and the laws of nature), *medium* (cannot be verified firsthand but seems plausible and is, for the most part, commonly accepted in open source literature), and *low* (predominantly based on a single source and cannot be verified—weak evidence, but might still be true).

I checked all data points for their consistency with each of the previously defined hypotheses. These results are presented in an evaluation matrix. Inconsistencies or discrepancies with high-confidence data significantly decrease a hypothesis’s plausibility. I then rate the hypotheses with an “Inconsistency Score”; the lower the inconsistency score, the more plausible the hypothesis/scenario.

Finally, I present a set of policy suggestions based on these findings.

## Assumptions

I assume that the North Korean missile program is subject to engineering realities and limitations in the same way as any other engineering program in the world: Operational program success depends on a lot more aspects than political will alone. This assumption is based on other well-known missile programs—for example, the Iraqi experiences in the 1980s and 1990s, the Iraqi/Argentine/Egyptian Condor joint venture, and Soviet/Russian and U.S. programs from the 1950s up to the present. Knowledge about other defense and space programs also contributed to this assumption. Furthermore, since there is growing consensus in the open source literature, I assume that North Korea possesses nuclear weapons that can now or soon be mated to ballistic missiles for delivery.<sup>5</sup>

## Findings

The common view—that North Korea possesses a sophisticated missile program and is capable of indigenous reverse engineering, production, and deployment of numerous missile systems—has the highest inconsistency score and thus is the least supported hypothesis.

My analysis suggests that the North Korean guided missile program was set up in the 1980s and 1990s with significant support from the Soviet Union,<sup>6</sup> though it is uncertain to what extent the Soviet authorities provided or sanctioned this assistance. The extent to which this support is still ongoing is unknown.

The best-supported hypothesis (i.e., the one with the lowest inconsistency score) is the “Bluff” hypothesis. According to this hypothesis, in its testing, North Korea has launched Soviet/Russian-made missiles (that are proven but old designs) to maximize the appearance of performance, but may never have tested missiles from its own production—any such indigenous missiles cannot have noteworthy reliability or accuracy. This hypothesis further supposes that the North Korean government sought to conceal North Korean re-exports of Soviet missiles to other countries. According to the “Bluff” hypothesis, the main purpose of the North Korean missile program is to deter U.S. and ROK action against the North Korean regime and to gain strategic leverage in foreign politics. Domestic policy reasons have probably also played a role: The impression of a successful missile program is useful to bolster the regime’s apparent strength. If the “Bluff” hypothesis is true, it remains unknown which members of the North Korean elite are actually aware of the North Korean deception program.

Open source literature frequently claims that North Korea has operationally deployed about 800 to 1,000 missiles.<sup>7</sup> If this number is true, for each of the five hypotheses the missiles would show varying degrees of reliability and accuracy. Figure S.1 shows the degree of reliability and accuracy we would expect to see in North Korea’s arsenal under each of the five hypotheses (the figure also shows the inconsistency scores for each of the hypotheses). Even if

<sup>5</sup> North Korea’s nuclear weapon capability is not the subject of this study, but it is certainly worth investigating in the future, potentially using the same methodical approach presented in this report.

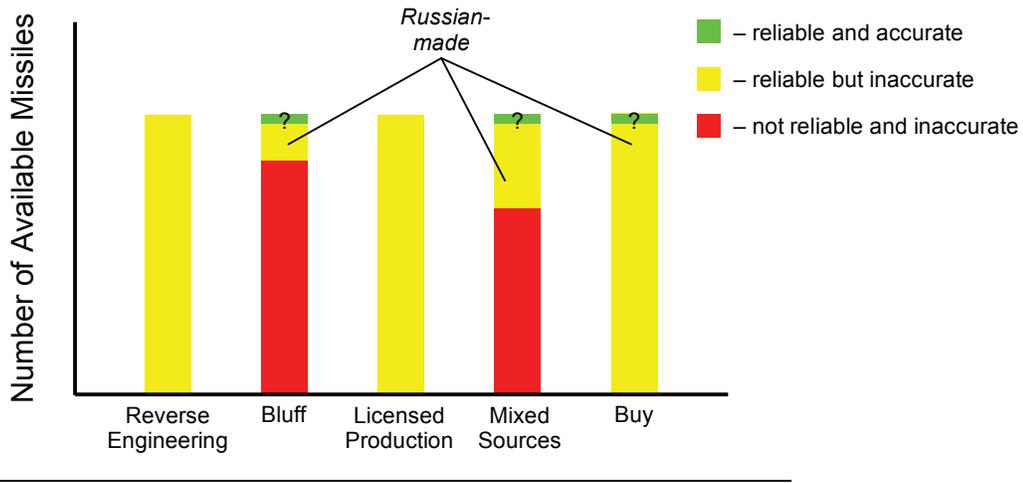
<sup>6</sup> See for example SIPRI, 1989, p. 256, according to which 240 Scud B were transferred from the Soviet Union to North Korea in the late 1980s. There is little evidence of later transfers.

<sup>7</sup> Again, sources for claims such as this that are made in the open literature are documented in the appendix. I doubt the 800–1,000 estimate; I have been unable to find evidence for it or to determine where or how it first came into being.

North Korea had reverse engineered or bought old Soviet missiles, these missile types are not known for their accuracy, and the majority of North Korean launch crews have never fired a missile. Thus, the missiles might be sufficiently reliable, but not very accurate. In any case, only a few launch crews can be well trained and potentially equipped with reliable and accurate modern missile systems, marked green. Figure S.1 also shows the inconsistency scores for each of the various hypotheses.

It seems likely that the North Korean missile threat is limited to the range of its Nodong missile, which is roughly 1,000 km.<sup>8</sup> Missiles beyond this range seem not to be operationally deployed or sufficiently reliable. North Korea likely purchased a small number of Nodong missiles from the Soviet Union (there is evidence that the Nodong is a Soviet/Russian design). The operational status of North Korea’s indigenously produced missiles is questionable due to a very low number of test and training launches. Beyond 1,000 km, the available North Korean missiles are likely of low reliability.<sup>9</sup> The expected number of precise missiles (shown in green in Figure S.1) is very low, if they exist at all,<sup>10</sup> and the launch crews probably lack sufficient training. It cannot be ruled out that North Korea has nuclear warhead designs for its missiles, but without actual testing, the reliability of these warheads has to be assumed to be low.

**Figure S.1**  
**North Korean Missile Program Scenarios**



| Inconsistency Score | 858 | 87 | 264 | 131 | 255 |
|---------------------|-----|----|-----|-----|-----|
|                     |     |    |     |     |     |

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<sup>8</sup> Several references (documented in the appendix) cite longer ranges, but the technical characteristics as I understand them limit the missile’s range to roughly 1,000 km, beyond which the missile has not been tested.

<sup>9</sup> Even if rumors of transfers of longer-range SS-N-6 missiles in the 1990s are true, these SS-N-6 missiles would have far outrun their service life and are likely not operational anymore. (Contrary to other Soviet missiles, SS-N-6 missiles were fueled in the factory and sealed, resulting in limited service life.)

<sup>10</sup> Russia has developed tactical ballistic missiles with terminal guidance and may have sold some to North Korea. But North Korea does not appear to have appropriately tested such a capability on its own, having not fired missiles at an instrumented target range where the guidance could be tested (almost all of North Korea’s missile tests are fired into the ocean).

Strong indicators for these findings, among others, are as follows:

- North Korea has conducted a very low number of test and training launches.
- The missiles used in these few launches have shown a high level of reliability.
- Launches take place only at politically significant dates and are therefore not dictated by engineering development or training needs.
- Known missile parts of North Korean production are reportedly of poor quality.
- Soviet Scud missiles and the North Korean Scud missiles that have been observed look exactly the same, up to the smallest details.
- Cyrillic lettering has been observed on North Korean Scuds and Nodongs.
- The Nodong engine is an old Soviet design.
- The Scud C is an old Soviet design.

### Policy Implications

If the “Bluff” hypothesis is correct, increased nonproliferation pressure on Russia and other countries is essential to keep the North Korean missile threat low and cut any existing proliferation ties.

If these findings about the program’s status can be verified, further steps are suggested. First, the policy of the United States and its allies toward North Korea should be reconsidered in the light of a North Korean missile force that is less capable and differently composed than is widely assumed. For example, a lower North Korean missile threat should be incorporated into the defense planning of the United States and the ROK. Specifically, the policy of launch moratoriums should be reconsidered, since a launch moratorium plays into the hands of the North Korean regime—it has only a limited number of Soviet/Russian-made missiles, and every launch depletes this arsenal.

Several bits of information could further strengthen or weaken the “Bluff” hypothesis:

- Details of North Korean Scuds in the United Arab Emirates and those taken from Libya.
- Detailed information about North Korean launches and their trajectories.
- Telemetry data that may have been transmitted as part of these launches. If such data were not transmitted—as appears to be the case—then there cannot be a serious operational development program in North Korea.
- Information on North Korean troop training. If no intensive drills analogous to those of Warsaw Pact countries are observed, the North Korean army is not as capable of using its missiles effectively under wartime conditions.
- Details about old Soviet missile prototypes and how they compare to the North Korean systems. This would involve determining the whereabouts of these prototypes and other decommissioned Soviet missile systems, as well as the status of the old Soviet Scud and SS-N-6 production lines.
- North Korean defectors at key positions might hold valuable information. Their not knowing certain details might be as revealing as their knowing them.

The apparently extensive foreign support for North Korea’s missile program also suggests the necessity of strong external support for other countries’ missile programs: If North Korea

had to rely on Soviet/Russian help and still has no truly reliable indigenous missile program, it is highly unlikely that the current status of other countries' programs is better.

This research approach can be applied to other countries of interest. There are indications, for example, that common hypotheses about the Pakistani and Iranian missile programs might not be the most plausible ones. This research approach can also be extended beyond missiles to other defense-related areas.