



## North Korea's Suspect, Former Small-Scale Enrichment Plant

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*Recent information suggests that an early centrifuge research and development (R&D) facility was located at the Panghyon Aircraft Plant, at or near the Panghyon Air Base, which is located about 45 kilometers west of the Yongbyon nuclear site. This is a preliminary site identification and requires additional confirmation.*

*An exclusive story by Reuters covers this report [here](#).*

Determining the exact location of sites associated with North Korea's gas centrifuge enrichment program has been a persistent challenge over the years. However, geo-locating these sites is critical to any future nuclear agreements with North Korea. If negotiations resume and are successful, it will be critical to include all the major North Korean centrifuge plants in any plan for freezing, monitoring, and dismantling North Korea's nuclear weapons programs.

After more than a decade of denying the existence of a gas centrifuge enrichment program, in November 2010 North Korea revealed the existence of a production-scale gas centrifuge plant at the Yongbyon site. However, at the time, it denied that there were other centrifuge plants, despite information to the contrary.<sup>2</sup> It is widely assessed that North Korea's Yongbyon centrifuge plant is part of a larger gas centrifuge complex and that other facilities are located elsewhere. However, the location and nature of other sites have so far remained publicly unknown.

Although unable to identify another production-scale centrifuge plant, the Institute may have identified the location of one of North Korea's early small-scale centrifuge enrichment plants. This plant would have served as an important facility in the development of North Korea's gas centrifuge program in the 1990s and early 2000s.

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<sup>1</sup> Former staff member Serena Kelleher-Vergantini contributed importantly to this report.

<sup>2</sup> David Albright and Paul Brannan, *Taking Stock: North Korea's Uranium Enrichment Program*, Institute for Science and International Security Report, October 8, 2010. [http://isis-online.org/uploads/isis-reports/documents/ISIS DPRK UEP.pdf](http://isis-online.org/uploads/isis-reports/documents/ISIS_DPRK_UEP.pdf); Albright, *North Korean Plutonium and Weapon-Grade Uranium Inventories*, ISIS Report, January 8, 2015 (revised October 7, 2015). [http://isis-online.org/uploads/isis-reports/documents/North\\_Korean\\_Fissile\\_Material\\_Stocks\\_Jan\\_30\\_2015\\_revised\\_Oct\\_5\\_2015-Final.pdf](http://isis-online.org/uploads/isis-reports/documents/North_Korean_Fissile_Material_Stocks_Jan_30_2015_revised_Oct_5_2015-Final.pdf)

The early stages of a gas centrifuge program typically involve relatively small research and development facilities to test individual centrifuges and a limited number of centrifuges connected together by pipes into cascades. Information about such a plant in North Korea emerged publicly on June 9, 2000, when the Japanese newspaper *Sankei Shimbun* reported that Chinese sources had indicated there was an enrichment plant located inside a mountain, listed in the article as Mount Chonma.

For some time, the Institute was unable to confirm this information. However, it recently obtained additional information from knowledgeable government officials suggesting that this centrifuge development plant had existed and was associated with an underground aircraft spare parts manufacturing and assembly facility. We have learned from knowledgeable government officials, and found with the assistance of Joseph Bermudez of [AllSource Analysis](#), that the most likely site of this facility is the Panghyon Aircraft Plant, near or part of North Korea's Panghyon Air Base, which is located about 45 kilometers west of Yongbyon (see figure 1). The underground aircraft manufacturing plant was first developed in the 1960s to manufacture spare parts for Soviet-supplied MIG fighter jets, according to government experts.

Based on analyzing commercial satellite imagery, the most likely site of the aircraft manufacturing plant and thus the centrifuge R&D facility is the underground complex located southeast of the air strip (see figures 1 and 2). Adding to the credibility of this determination, this plant is inside the Changgun-dae Mountain, which is part of the larger Ch'onma-gun mountain range. As figure 2 shows, the mountain has at least two tunnel entrances, one of which is wide enough for military aircraft (parked outside in figure 3). There are also likely hidden entrances into the mountain.

There is another identifiable underground site adjacent to the airstrip. However, this one appears sized and oriented to store aircraft underground.

The suspect site could have held up to 200-300 centrifuges, according to a knowledgeable official. We have no information suggesting that this site continues to function as a centrifuge plant.

One government expert familiar with North Korea's nuclear program concurred that this underground site is a credible suspect centrifuge site. We are seeking additional confirmation.

## **Early North Korean Centrifuge Efforts**

Centrifuge research and development activities in North Korea, and possibly at this site, would date back to the late 1990s and early 2000s after North Korea received centrifuge aid from Pakistan. In the late 1990s and early 2000s, North Korea secretly developed its gas centrifuge enrichment program in parallel to its plutonium production program then frozen under the 1994 US/North Korean Agreed Framework. To do so, North Korea received significant centrifuge assistance from centrifuge experts at Pakistan's A.Q. Khan Research Laboratory, the headquarters of Pakistan's secret weapon-grade uranium centrifuge program near Islamabad.

Under a joint military cooperation agreement, North Korean missile experts were training Pakistanis in the centrifuge workshops of the Khan Research Laboratory on how to build sensitive components of the Nodong ballistic missile. While working in these centrifuge workshops, the North Korean missile experts asked to learn about gas centrifuges. Pakistan subsequently agreed to transfer a significant amount of centrifuge assistance to North Korea, in essence providing the North Korean missile experts with a centrifuge starter kit.<sup>3</sup>

Based on this information, it is realistic that North Korean missile experts were the ones first in control of the development of centrifuges in North Korea. They would have had the direct experience in Pakistan building and operating centrifuges. The North Korean missile group would have already mastered several technologies similar to those needed in a centrifuge program. Aerospace and centrifuge technologies often overlap. For example, the missile program would have expertise in high strength metals which are needed in gas centrifuges. Thus, locating a centrifuge research and development plant inside a fighter aircraft manufacturing facility would make sense or at least be plausible. Moreover, the facility would already house machines and employ experts that could be more easily transferred to centrifuge efforts than Yongbyon nuclear reactor or uranium conversion equipment and experts. In addition, military control of the centrifuge technology at an existing underground military site could also better hide the program by isolating it from known nuclear-related sites, which were being monitored by the International Atomic Energy Agency (IAEA) under the Agreed Framework and subject to greater attention by foreign intelligence services.

## Other Indicators of a Nuclear Site

The identification of the air force manufacturing site as a potential past nuclear site is also consistent with information provided by a North Korean general who defected to China. In August 2001, a *Shin-Dong-A* article published the statements of General Chun Sun Lee who made claims about the location of a nuclear production site in North Korea. Although it is very difficult to corroborate most of the information provided by General Lee, it is significant that he stated that the location housed a facility dedicated to refining uranium. Although not a typical way to refer to a centrifuge research and development site, a non-expert may refer to such a site in this way. For example, when the Iranian opposition group first identified the secret nuclear Natanz site in Iran in August 2002, it identified it as related to processing uranium fuel. A few months later our Institute determined that it was indeed a gas centrifuge plant.<sup>4</sup>

The North Korean defector further claimed that the facility was not located in Kumchang-ri, a location that had attracted considerable attention in 1998 when some in US intelligence claimed this site to be the location of an underground nuclear reactor or reprocessing plant

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<sup>3</sup> David Albright, *Peddling Peril* (New York: Free Press, 2010); and *Taking Stock: North Korea's Uranium Enrichment Program*, op. cit.

<sup>4</sup> David Albright and Corey Hinderstein, *Iran Building Nuclear Fuel Cycle Facilities: International Transparency Needed*, Institute for Science and International Security Report, December 12, 2002. <http://isis-online.org/isis-reports/detail/iran-building-nuclear-fuel-cycle-facilities-international-transparency-need/8>

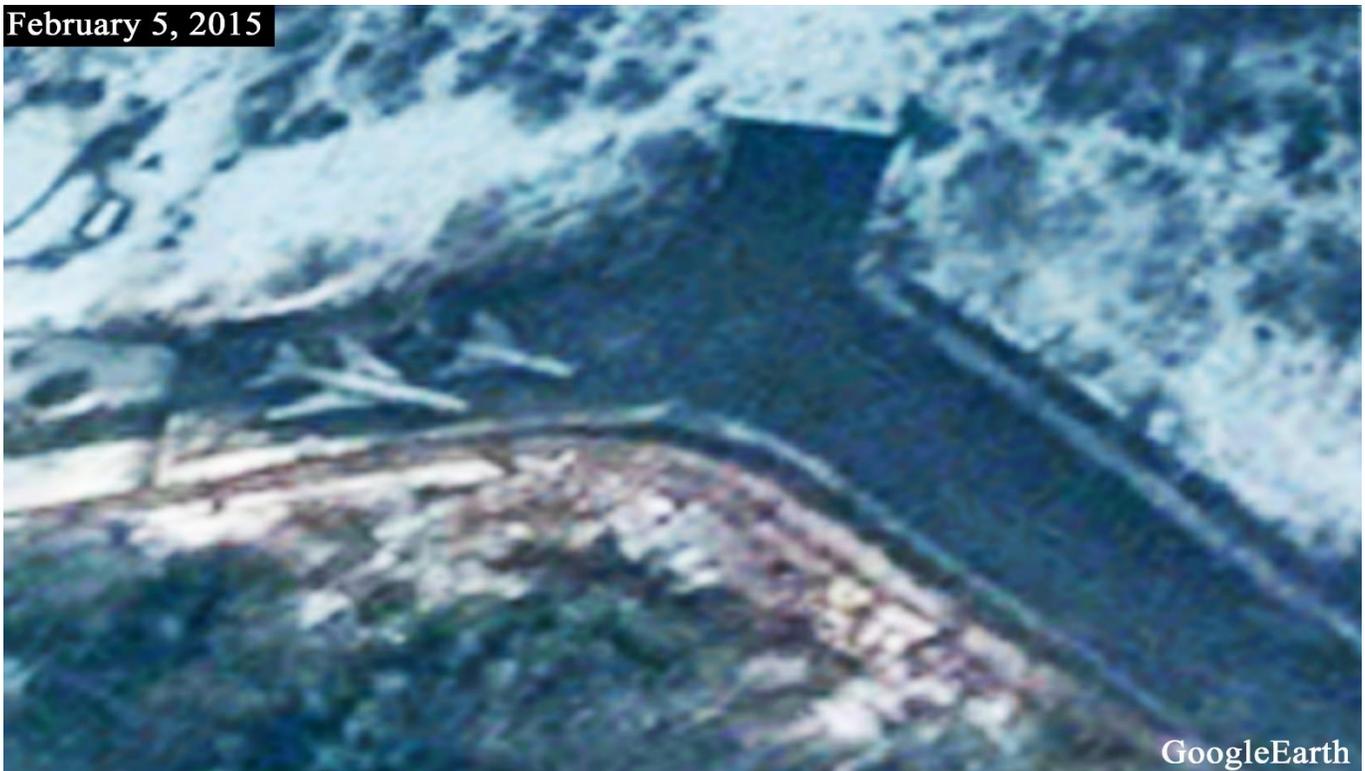
(claims that turned out to be false based on a 1999 visit by US officials). Instead, the North Korean defector claimed that the nuclear site was 25 to 30 kilometers away under Mt. Chun Ma, near the Pyungahnbuk province. In fact, the Panghyon air force base is 27 km south of Kumchang-ri and is located in the North Pyongan Province, also known as Phyönganbukto. Although the matches in names and nuclear technologies are not exact, they are close enough to be suggestive.



**Figure 1.** Google Earth imagery showing North Korea's Panghyon Airforce Base and the Panghyon Aircraft Plant.



**Figure 2.** Google Earth imagery showing the location of the early suspect centrifuge R&D plant under the Changgun-dae Mountain at the Panghyon Aircraft Plant.



**Figure 3.** Google Earth imagery showing one of the tunnel entrances to the underground site under the Changgun-dae Mountain suspected of earlier housing a centrifuge R&D plant.