Insights into the DPRK Military Threat Gained From Commercial Satellite Imagery

by

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NRDC Geo-Spatial Database of North Korea

*a new research tool to analyze security and human rights issues*

- High resolution commercial satellite imagery – first available to non-governmental researchers in 1999
- Ikonos (Space Imaging) – sun-synchronous, 98-minute orbit – produces a color photo at one-meter resolution
- QuickBird (DigitalGlobe) – can achieve 61-centimeter resolution under some conditions.
- Today’s commercially available imagery is comparable to U.S. intelligence community of early 1970s
- Computing power – current laptops have speed and memory comparable to the Cray II that went to LLNL in 1985
- New research can refine military estimates, provide additional verification by the public

In Red: NRDC Database Records

NRDC’s Database of Military and Other Features in the DPRK (about 3,700 Records).
Democratic Peoples Republic of Korea

Basic Facts

- Occupies 120,000 sq km – slightly smaller than Mississippi or Fujian province
- Population 22,700,000
- Coastline – 2,495 km
- Borders - Russia (19 km), China (1,416 km), ROK (238 km DMZ)
- DMZ – extends 2 km on either side of a military demarcation line for 238 km from the Yellow Sea to the Sea of Japan

LandSat7 Image of the DPRK Capital, P’yongyang, built along the Taedong River.
DPRK Military Facts

Most militaristic state in the world...

- 23% of GDP for military ($5.2 billion in 2002) (ROK 4%)
- 40 of 1,000 are in uniform (ROK 14 of 1,000)
- 1,200,000 active forces, 5,000,000 reserve, 4th largest in the world
- Army, Air Force, Navy and Special Operations Force (SOF)
- Military strategy – 1) reunify Korean Peninsula under North Korean control within 30 days of the beginning of hostilities 2) defend North Korea
- Most important facilities underground
- DPRK Steadily Building a Nuclear Weapons Capability

DPRK: an Underground Nation and Military

After the Korean War experience, Kim Il Sung said: “The entire nation must be made into a fortress.”

- The degree to which the DPRK military is based underground is unique in the world – takes advantage of mountainous topography;
- Virtually everything of military significance is underground – several hundred large facilities, more than 10,000 smaller facilities;
- It is reported that thousands of artillery pieces are at underground sites; four tunnels have been discovered under the DMZ;
- Concealment of their military infrastructure from satellites and aerial reconnaissance make it an intelligence challenge;
- A verification nightmare for agreements limiting nuclear or other military developments in the DPRK.

Red: Airbases where NRDC has Observed Underground Hangers in Satphotos
Blue: Navy Bases where NRDC has Observed Waterfront Caves/Tunnels in Satphotos
Underground Air Force

Nineteen air bases that have associated underground aircraft hangers

<table>
<thead>
<tr>
<th>Airfield Name</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changjin-up Air Base</td>
<td>40 21 51.9 127 15 50.1</td>
</tr>
<tr>
<td>Hwangju Air Base</td>
<td>38 39 13.3 125 47 17.3</td>
</tr>
<tr>
<td>Hwangsuwon Air Base</td>
<td>40 40 56.0 128 08 55.5</td>
</tr>
<tr>
<td>Hyon-ri Air Base</td>
<td>38 36 47.8 127 27 04.5</td>
</tr>
<tr>
<td>Iwon Air Base</td>
<td>40 21 37.9 128 43 08.4</td>
</tr>
<tr>
<td>Koksan Air Base</td>
<td>38 41 19.5 126 36 08.4</td>
</tr>
<tr>
<td>Kuum-ni Air Base</td>
<td>38 51 55.1 127 54 12.6</td>
</tr>
<tr>
<td>Kwail Air Base</td>
<td>38 25 32.2 125 01 09.4</td>
</tr>
<tr>
<td>Nuchon-ni Air Base</td>
<td>38 14 16.7 126 07 13.4</td>
</tr>
<tr>
<td>Onch'on Air Base Auxiliary Airstrip</td>
<td>38 53 14.0 125 16 49.9</td>
</tr>
<tr>
<td>Orang Air Base</td>
<td>41 25 45.3 129 38 52.7</td>
</tr>
<tr>
<td>Panghyon Air Base</td>
<td>39 55 38.4 125 12 28.1</td>
</tr>
<tr>
<td>Pukch’ang Air Base</td>
<td>39 30 16.5 125 57 52.9</td>
</tr>
<tr>
<td>Sunan Air Base/International Airport</td>
<td>39 12 25.7 125 40 09.8</td>
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<tr>
<td>Sunch’on Air Base</td>
<td>39 24 41.8 125 53 27.5</td>
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<tr>
<td>Taet’an Air Base</td>
<td>38 07 50.4 125 14 43.1</td>
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<tr>
<td>Toksan Air Base</td>
<td>39 59 47.8 127 36 43.3</td>
</tr>
<tr>
<td>U’iju Air Base</td>
<td>40 09 00.4 124 29 50.9</td>
</tr>
<tr>
<td>Wonsan Air Base</td>
<td>39 09 56.4 127 29 06.9</td>
</tr>
</tbody>
</table>
# Underground Navy

Navy Bases with Submarine Caves

<table>
<thead>
<tr>
<th>Navy Base</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ch'aho-nodongjagu Navy Base</strong></td>
<td>Entrance (1)  40 12 15N 128 39 00E</td>
</tr>
<tr>
<td></td>
<td>Entrance (2)  40 12 06N 128 39 03E</td>
</tr>
<tr>
<td><strong>Kosong Naval Facility</strong></td>
<td>Entrance (1)  38 44 04N 128 12 45E</td>
</tr>
<tr>
<td></td>
<td>Entrance (2)  38 44 00N 128 12 44E</td>
</tr>
<tr>
<td><strong>Namae-ri Navy Base</strong></td>
<td>Entrance  38 48 12N 128 08 17E</td>
</tr>
<tr>
<td><strong>Puam-dong Navy Base</strong></td>
<td>Entrance (1)  41 19 18N 129 46 05E</td>
</tr>
<tr>
<td></td>
<td>Entrance (2)  41 19 30N 129 46 12E</td>
</tr>
<tr>
<td><strong>Songjin pando Navy Base</strong></td>
<td>Entrance  39 22 18N 127 26 18E</td>
</tr>
<tr>
<td><strong>Yoho’ri Naval Facility</strong></td>
<td>Entrance (1)  39 52 33N 127 47 39E</td>
</tr>
<tr>
<td></td>
<td>Entrance (2)  39 52 39N 128 47 17E</td>
</tr>
</tbody>
</table>
Other Underground Facilities
(Purpose Unknown)

- Haqap 40 04 54N; 126 11 22E
- Kumchang-ni 40 06 43N; 125 07 47E (under construction)
- Other suspect underground facilities, whose locations are not publicly known, are cited in the literature
Selected NRDC Imagery & Data

*Database Feature Categories*

- Nuclear Facilities
- Missile Sites
- Air Bases and Defense
- Navy Bases and Commercial Ports
- National & Military Leadership
- Political Prisons and Prison Camps (Forced Labor)

*Satphoto: Hamhung, DPRK.* NRDC has acquired images and highly detailed map data for nearly all major North Korean cities (database in red).
Key DPRK Nuclear Sites

- Yongbyon Nuclear Research Center
- T’aech’on 200 MWe Graphite Nuclear Reactor (Unfinished)
- P’yongsan Uranium Concentrate Plant
- Pakch’on Uranium Concentrate Plant
Yongbyon Nuclear Research Center

1. Fuel Fabrication Plant/Area
2. Radiochemical Separation Plant
3. Graphite Reactor
4. Older Laboratory Buildings
5. Residential Housing for Workers
6. Yongbyon Town
7. Kaechon Air Base

Kuryong River
Yongbyon Graphite Reactor
Image Acquired: 13 August 2002 (IKONOS)
Yongbyon Radiochemical Separation Building
Image Acquired: 13 August 2002 (IKONOS)
T’aech’on Nuclear Reactor
(200 MWe Graphite, Unfinished)
P’yongsan Uranium Concentrate Plant
Image Acquired: 10 March 2003

Nam-ch’on River
DPRK
Missile Sites

Many missile bases are cited in the literature, but only the Musudan test facility has been identified in satellite imagery.
Musudan Missile Test Center

1. Launch Pad (1) with Gantry
2. Launch Pad (2) with Remains of a Gantry
3. Missile Assembly Building
4. Pipeline From Storage Bunker to Launch Pad
5. Possibly Support Area
6. Probable Range Control Center
7. Rocket Engine Test Stand
8. Storage Bunker, Possibly for Fuel
Musudan Missile Test Center
1. Launch Pad with Remains of a Gantry
2. Launch Pad with Gantry
3. Pipeline From Storage Bunker to Launch Pad
4. Storage Bunker, Possibly for Fuel
DPRK Airbases and Air Defense

Major DPRK Airbases in Red; Minor Airfields in Yellow**

**Numerous highway landing strips and heliports excluded.
Pukch'ang Air Base
Image Source: DigitalGlobe
Photographed March 10, 2002

- Hillside
- Underground Hanger
- Underground Hanger
- MiG-23 Floggers (12 Visible)
- Underground Hanger
Wonsan Air Base

Image Acquired: 22 November 2002

Entrances to Underground Hangars
An Extensive Air Defense Network

Haeju, DPRK
Image Acquired: 02 February 2003
DRPK Navy Bases

- Mayang-do Navy Base (23 Subs Observed in Satellite Imagery)
- Ch’aho-nodongjagu Navy Base (14 Subs)
- Pip’a-got Navy Base (9 Subs)
Mayang-do Navy Base
Image Acquired: 06 September 2002
Mayang-do Navy Base
Image Acquired: 06 September 2002

Romeo or Whiskey Class Diesel-Powered Submarines
Puam-dong Navy Base

1. Shore Facilities
2. Entrance (2) to Underground Naval Facility
3. Entrance (1) to Underground Naval Facility
4. Boat Ramp
5. Boat Ramp

Image Source: DigitalGlobe Photographed February 3, 2004
Entrance (1) to Underground Navy Facility
Ch’aho-nodongjagu Navy Base
Image Acquired: 29 June 2002

Coastal Sang-O Class Diesel-Powered Submarines

Romeo Diesel-Powered Submarines
National and Provincial Government and Leadership Sites

People’s Study Palace
Foreign Ministry and Cabinet Offices
Korean Workers’ Party Complex
People’s Study Palace (left); Foreign Ministry and Cabinet Offices (right)
P’yongyang, DPRK
Image Acquired: 28 January 2002
DPRK Political Prisons and Prison Camps (Forced Labor)
We have found this tool very useful and we would be interested in collaborating with other institutions;

Arms control, energy and humanitarian issues.