

# **Nuclear/missile timeline for North Korea (Working Draft)**

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**Center for International Security and Cooperation**  
**Stanford University**

**Nuclear Threat Initiative**  
**January 9, 2018**

# North Korea nuclear program

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Governs size of  
arsenal

Governs sophistication  
of arsenal

Governs threat  
arsenal poses

**Bomb-grade  
Pu or HEU**

**Weaponization**

**Delivery system**

- Most difficult part
- Reactors (**Pu**) or enrichment (**HEU**)

Hydrogen bombs

- **Tritium**
- **Li-6D**

- Physics, computers
- High explosives
- Detonators
- Initiators
- Machining
- Assembly
- Explosives tests
- Arming, fuzing, firing

- Plane
- Boat
- Van
- Missile**

# Estimates of DPRK nuclear program

Nuclear Capability	January 2003	September 2017 <b>Rough estimates</b>
Plutonium	0 to 10 kg	20 to 40 kg
HEU (Highly enriched U)	Likely zero	Possibly 250-500 kg <b>Possibly 150 kg/yr</b>
Nuclear tests	Zero	6
Nuclear weapons	Likely zero Pu Zero HEU	<b>Possibly material for 25-30 bombs</b>
Missiles	One failed Taepodong-1 launch (1998)	Significant progress in 2016 & 2017 HW-12, HW-14, HW-15

# Nuclear tests critical to sophistication

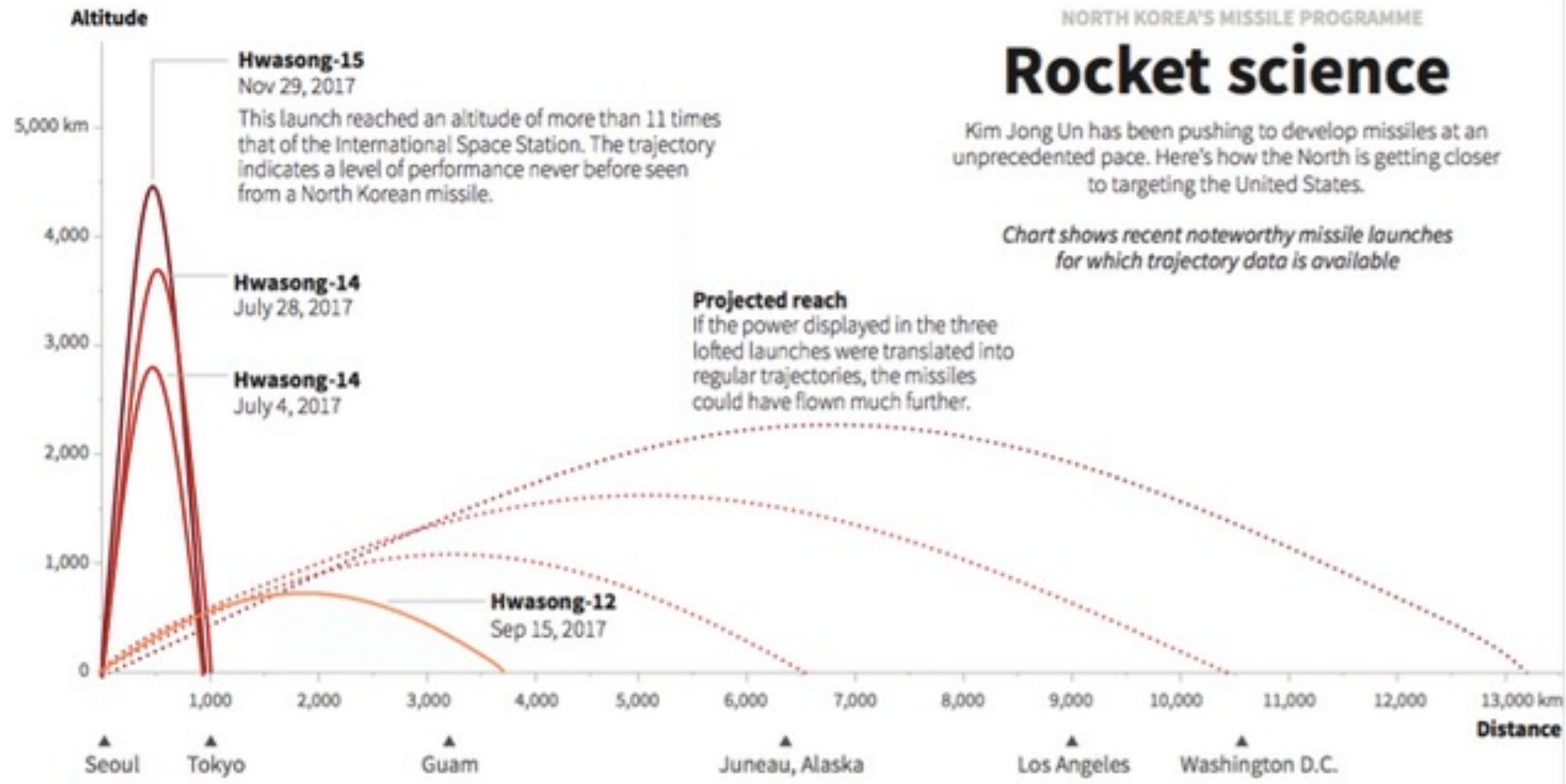
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- Oct. 9, 2006: Close to 1 kiloton
  - Likely Pu
- May 25, 2009: ~ 2 to 7 kilotons
  - Likely Pu
- Feb. 12, 2013: ~ 7 to 14 kilotons
  - Either Pu or HEU
- Jan. 6, 2016 – deeper than others, ~ 7 to 14 kilotons
  - Claim of H bomb not likely. Possible proof of principle H-bomb?
- Sept. 9, 2016 – ~ 15 to 25 kilotons
  - Likely made progress in miniaturization
- Sept. 3, 2017 > 100 kilotons, **possibly 250 kilotons**
  - Two-stage thermonuclear possible

# Rocket science

Kim Jong Un has been pushing to develop missiles at an unprecedented pace. Here's how the North is getting closer to targeting the United States.

Chart shows recent noteworthy missile launches for which trajectory data is available



Nuclear Capability	Dr. Zhu Xuhui (China)	S. S.Hecker	D. Albright (ISIS)
Plutonium	30-40 kg	20-40 kg	~30 kg
HEU	500 kg (possibly 1,000 kg)	250 - 500 kg	250 – 650 kg <b>USIC</b>
Nuclear devices (sufficient material)	30	25-30	15-32 <b>60</b>
Fit on SCUD & Nodong	Yes	Yes	Yes
Fit on HW-12 & HW-15 (ICBM) For A-bomb	No Need more tests No more NT	No Need more tests Need more tests	? ? <b>Yes</b>

# North Korea's nuclear and missile timeline Hecker/Draft (1/4/18)

(Five shades of green [good] and five shades of red [bad])

Year	Diplomacy YB presence	Plutonium	U enrich	Weaponize	Missiles	Tritium/ Lithium-6	Import	Export
91-94	G2	R2	R1	R1	R1	G2	R3	R2

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95-96	G5	G5	R1	R1	R1	G2	R3	R2



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95-96	G5	G5	R1	R1	R1	G2	R3	R2
97-98	G5	G5	R2	R1	R2	G1	R4	R2

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97-98	G5	G5	R2	R1	R2	G1	R4	R2
99-00	G5	G5	R3	R1	R1	G1	R4	R5

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97-98			R2	R1	R2	G1	R4	R2
99-00			R3	R1	R1	G1		R5
01-02			R3	R1	R1			

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01-02	G5	G5	R3	R1	R1	G1	R4	R5
03-04	R5	R5	R3	R3	R2	G1	R4	R5
05-06	R5	R5	R3	R3	R3	G1	R4	R5

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03-04	R5	R5	R3	R3	R2	G1	R4	R5
05-06	R5	R5	R3	R3	R3	G1	R4	R5
07-08	G5	G5	R3	R2	R2	R1	R2	R4

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07-08	G5	G5	R3	R2	R2	R1	R2	R4
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11-12	F5	R3	R4	R3	R3	R2	R3	R2



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15-16	F5	R5	R5	R5	R4	R4	R2	R2

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17					R5	R4	R2	R2

**Nuclear timeline for North Korea**  
**North Korea Diplomacy and Economics Charts**

**Siegfried S. Hecker**  
**Center for International Security and Cooperation**  
**Stanford University**

***Working Draft***  
***1/6/18***

**(North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)**

(Five shades of green [good] and five shades of red [bad])

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1

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Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
			*Food/fuel no KEDO					

**(North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)**

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2

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Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
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94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1

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97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1



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97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2

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94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
			*Food/fuel no KEDO	KEDO US \$0.4B	KEDO ROK \$1.45B			

## (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2

## (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2
09-10	G1	G1	\$ 28M	R2	R3	R2	R3	R3

## (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2
09-10	G1	G1	\$ 28M	R2	R3	R2	R3	R3
11-12	G1	G1	\$0.9M '11	R5	R3	G1	R3	R3

## (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2
09-10	G1	G1	\$ 28M	R2	R3	R2	R3	R3
11-12	G1	G1	\$0.9M '11	R5	R3	G1	R3	R3
13-14	R4	G1	None	R5	R4	G1	R4	R4

# (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2
09-10	G1	G1	\$ 28M	R2	R3	R2	R3	R3
11-12	G1	G1	\$0.9M '11	R5	R3	G1	R3	R3
13-14	R4	G1	None	R5	R4	G1	R4	R4
15-16	R3	G1	\$1M Obama In 2017	R5	R4	G2	R4	R4

# (North Korea Diplomacy and Economics Chart, Hecker, Carlin, Serbin 1/6/18)

(Five shades of green [good] and five shades of red [bad])

Year	Dipl. by US	Dipl. by NK	US \$ support	N/S Diplomacy	Sanctions US/UN	NK economy	Nukes	Missile
91-93	G1	G1	No data	G1	G3	R4	R1	R1
94-96	G5	G5	\$113M*	R2	G2	R5	G5	R1
97-98	G3	G3	\$200M*	G1 \$7B from 1998-2007	G2	R5	G4	R2
99-00	G5	G5	\$326M*	G5	G2	R4	G3	R1
01-02	R4	G1	\$273M*	G5	G2	R3	G2	R1
03-04	G1	G1	\$67M*	G4	R2	R2	R2	R2
05-06	G2	G2	\$ 6M*	G4	R3	R2	R3	R3
07-08	G2	G2	\$224M*	G5	R3	R2	R2	R2
09-10	G1	G1	\$ 28M	R2	R3	R2	R3	R3
11-12	G1	G1	\$0.9M '11	R5	R3	G1	R3	R3
13-14	R4	G1	None	R5	R4	G1	R4	R4
15-16	R3	G1	\$1M Obama In 2017	R5	R4	G2	R4	R4
17	R5	R5	None	R4	R5	G2	R5	R5
			*Food/fuel no KEDO	KEDO US \$0.4B	KEDO ROK \$1.45B			



# North Korea Diplomacy and Economics Chart Alt. Hecker, Carlin, Serbin 1/6/18

Year	US Adm	Yongbyon Presence	Dipl. US	Dipl. NK	N/S Dipl.	China/NK	Sanctions US/UN	Nukes	Missile
91-93	Bush/Clin t	G1	G1	G1	G1	R2	G3	R1	R1
94-96	Clinton	G5	G5	G5	R2	R1	G2	G5	R1
97-98	Clinton	G5	G3	G3	G1	G1	G2	G4	R2
99-00	Clinton	G5	G5	G5	G5	G2	G2	G3	R1
01-02	Bush II	G5	R4	G1	G5	G3	G2	G2	R1
03-04	Bush II	R5	G1	G1	G4	G3	R2	R2	R2
05-06	Bush II	R5	G2	G2	G4	G4	R3	R3	R3
07-08	Bush II	G2	G2	G2	G5	G4	R3	R2	R2
09-10	Obama	R5	G1	G1	R2	G5	R3	R3	R3
11-12	Obama	R5	G1	G1	R5	G3	R3	R3	R3
13-14	Obama	R5	R4	G1	R5	R4	R4	R4	R4
15-16	Obama	R5	R3	G1	R5	R4	R4	R4	R4
17	Trump	R5	R5	R5	R4	R5	R5	R5	R5