Some Practical Considerations in Nuclear Deterrence of North Korea

Bruce Bennett
November 10, 2011

Asan Institute for policy Studies
National Defense Research institute
Some Practical Considerations in Nuclear Deterrence of North Korea

Bruce Bennett
November 2011

This material represents the author’s views and not those of RAND or DoD
Outline

- The North Korean nuclear weapon threat
- Deterring North Korean nuclear weapon use
- Contemplating US nuclear responses
Assumption: Perhaps 40-60% of TBMs/warheads are delivered, reliable

5-10 wpns, 2-6 reliable
North Korean Nuclear Weapons Over Time

Potential NK Nuclear Weapons

- Independent
- Observations
- Outside help

Assumption: Perhaps 40-60% of TBMs/warheads are delivered, reliable

- 5-27 wpns, 2-16 reliable
- 5-10 wpns, 2-6 reliable
- As few as 0 wpns?

More details at www.rand.org/pubs/documented_briefings/DB589
How Could North Korea Use Nuclear Weapons?

**When**

- Early deterrence of US nuclear weapon use
- Warfighting
- Deterrence at the DMZ
- Deterrence before Pyongyang
- Revenge

**Attacking What**

- Atmospheric test
- Airfields
- Command/control
- Ground forces
- Cities

**Must deter all, not just best estimate**
Approximate Nuclear Effects on ROK, Japanese Cities*

<table>
<thead>
<tr>
<th>City</th>
<th>10 Kt</th>
<th>50 Kt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fatalities</td>
<td>Casualties</td>
</tr>
<tr>
<td>Seoul</td>
<td>180,000</td>
<td>340,000</td>
</tr>
<tr>
<td>Pusan</td>
<td>150,000</td>
<td>260,000</td>
</tr>
<tr>
<td>Taegu</td>
<td>125,000</td>
<td>220,000</td>
</tr>
<tr>
<td>Kwangju</td>
<td>170,000</td>
<td>290,000</td>
</tr>
<tr>
<td>Taejon</td>
<td>110,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Tokyo</td>
<td>170,000</td>
<td>320,000</td>
</tr>
<tr>
<td>Osaka</td>
<td>160,000</td>
<td>280,000</td>
</tr>
</tbody>
</table>

*Maximum casualties, assuming weapon detonates in the worst location.

*Ground burst
Outline

- The North Korean nuclear weapon threat
- Deterring North Korean nuclear weapon use
- Contemplating US nuclear responses
Deterrence: Adversary Balancing Between Perceived Benefits and Costs

- **Benefits of action**: \( \sum (B_n \times P_n) \)
- **Punishment**: \( \sum (C_i \times P_i) \)

Don’t Deter

Deter
Cold War: Denial Not Feasible?

- Even a small city attack would be devastating
- Marginal cost of more warheads less than marginal defense cost
Deterrence: Adversary Balancing Between Perceived Benefits and Costs

Benefits of action: \( \sum (B_n \times P_n) \)

Costs of action: \( \sum (C_i \times P_i) \)

US nuclear attack options vs. North Korea

1. Counterforce
2. Counter-leadership
3. Counter-military
4. EMP?

1. Counter-leadership
2. Counterforce
3. Counter-military
4. Demo
Outline

- The North Korean nuclear weapon threat
- Deterring North Korean nuclear weapon use
- Contemplating US nuclear responses
## US Nuclear Forces Under New START

<table>
<thead>
<tr>
<th>Weapon Type</th>
<th>Warhead Yield (Kt)</th>
<th>Accuracy (CEP, m)</th>
<th>Delivery Prob.</th>
<th>Availability (Day/War)</th>
<th>Deployed Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBM Minuteman III</td>
<td>335/300</td>
<td>183</td>
<td>85%</td>
<td>95%/99%</td>
<td>400/420</td>
</tr>
<tr>
<td>SLBM Trident D5</td>
<td>100/475</td>
<td>130-183</td>
<td>85%</td>
<td>50%/78%</td>
<td>240/280</td>
</tr>
<tr>
<td>Bomber B-2</td>
<td>≤1,200</td>
<td>Small b</td>
<td>85%</td>
<td>0%/90%</td>
<td>16/20</td>
</tr>
<tr>
<td>Bomber B-52</td>
<td>150</td>
<td>Small b</td>
<td>80%</td>
<td>0%/90%</td>
<td>44/50</td>
</tr>
<tr>
<td>Strategic total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>700/770</td>
</tr>
<tr>
<td>Tactical bombs</td>
<td>≤170</td>
<td></td>
<td>0%/90%</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>TLAM-N</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>—/2,256</td>
</tr>
</tbody>
</table>

*aDelivery vehicles or warheads: Allowed/total.

bAt risk to GPS jamming

Blast Effects Area Covered at Varying Hardness*

Some Key Issues in Planning Nuclear Responses

- **Intelligence**
  - Does the United States know target locations?
  - Can the United States follow dispersal, mobility?

- **Attribution**: Was North Korea responsible for the attack?

- **Doctrine, strategy, and C2**
  - How should the US respond to NK threats?
    - Can conventional forces handle all targets?
    - How will the US respond to chem/bio use?
    - Will the US rely less on nuclear weapons?
    - Would proportional response suffice?
    - How long will a US response decision take?
Sample Strategic Targeting

- Likely regime locations
  - Assume about 5
  - Buildings with UGFs
    - Need 2 warheads (or 3 ALCMs) per location to achieve 90% overall damage

- Missile complexes
  - 10 complexes
    - Multiple UGFs/complex

- Nuclear facility
  - 1 main—Yongbyon
    - Covers a large land area
The Challenges of Using an ICBM

- 30 minute flight
  - No recall option
- Boosters falling on friendly territory
- Overflight—Risk ICBM failure
- Overflight—Will Russia mistake an attack?

Source: http://www.gcmap.com/
The Challenges of Using an SLBM

- Overflight—Risk SLBM failure
- Overflight—Russia mistake attack?
- Using multiple warheads
- 15-20 minute flight
  - No recall option

Source: http://www.gcmap.com/
The Challenges of Using a Bomber

- 4 hour flight
  - Recall option
- Overflight—Risk bomber/tanker failure
- Stationing
  - Limited time
  - Allowed over West Sea?

Source: http://www.gcmap.com/
Other Constraints: Altitude, Collateral Damage, Fallout

- **Altitude**
  - Bombers, fighters fly too low for EMP delivery

- **Collateral damage**
  - Problem with larger warhead yields
  - Lower yield weapons on fighters, bombers preferred?
    - Must deal with GPS jamming?

- **Fallout (mainly for 100+ Kt yields)**
  - Significant for attacks on hardened, underground targets
  - Lower to near zero for standard airbursts
  - Can cause casualties tens of kilometers downwind
  - Measurable hundreds of kilometers downwind
Possible Fallout Patterns

- Would affect N Korea
  - Expect large casualty levels
  - Deaths occur over time
- Could affect the ROK, Japan
  - Depends on wind direction, height of burst
  - Radiation detectable, could be many times Fukushima levels
- Could affect China
- Could affect ships at sea
Conclusions

- North Korea poses a serious nuclear weapon threat
- The United States hopes to deter that threat
- But US efforts will be constrained by
  - Intelligence and attribution
  - Strategy
  - Overflight
  - Collateral damage/fallout
  - Force reduction
Questions?