

# Appendix to “Upload Pending? Tradeoffs, Uncertainty, and Damage-Limitation in a Multipolar Nuclear World”

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## A Describing the Strategic Forces Exchange Model

The counterforce model used in this paper has three parts. The first part models a strike on China’s ICBM silos. China is projected to have 48 DF-5 ICBM silos and 320 silos that could be filled with DF-41 ICBM’s, DF-31AG ICBM’s, or a mix of the two. To simulate attacks on those silos, I use functions for simulating the kill probability (PK) of attacking an ICBM silo that are used in (Lieber and Press 2006) and derived from (Davis and Schilling 1973). I then simulate that strike 320 times on the new silos and 48 times on the DF-5 silos to generate a countersilo attack plan. I then run this attack plan 100,000 times.

The first step in calculating a warhead’s kill probability against a particular ICBM silo is to calculate the warhead’s lethal radius. I use the following equation to estimate the lethal radius of a given warhead against a given ICBM silo.

$$LR = 2.62 * Y^{1/3} * H^{1/3}$$

where Y is the yield of the warhead in megatons and H is target hardness in pounds per square inch (psi). I assume a hardness of 2000 psi for China’s silos. The resulting lethal radius is in nautical miles (nm), and one nautical is equal to 1852 meters. Because a warhead’s circular error probable (CEP) is reported in meters, I convert the lethal radius into meters using the following equation:

$$LRm = LR * 1852$$

Calculating the single-shot kill probability (SSKP) for an SLBM in the U.S. arsenal is complicated because they are reported to employ burst-height compensating fuzes. These fuzes use an altimeter to measure the actual versus expected trajectory of the warhead and provide any adjustments to the height of burst (Lieber and Press 2017; Kristensen et al. 2017). W76-1 warheads also cannot be set to detonate at surface level. This means that instead of a two-dimensional circle on the ground that a warhead needs to land within to generate overpressure lethal to the silo, it needs to detonate within a three-dimensional cylinder around the silo. Finding the single-shot kill probability (SSKP) against a silo with that type of targeting is given by the following equation:

$$SSKP = (1 - 0.5^{(1/\pi)*(W/CEP)^2})^{1/2} * (1 - 0.5^{(1/\pi)*(L/CEP)^2})^{1/2}$$

L is partly a function of the height of the cylinder. To calculate the height of this cylinder, I take the maximum height at which an airburst directly over the target would generate 2000 psi, which I get from Figure 3.73a in (Glasstone and Dolan 1977). It is about 269 meters above the surface for a 100-kiloton W76-1 warhead, and 445 meters for a W-88 warhead.<sup>1</sup> The other part of L is the angle that the reentry vehicle is traveling, which I assume to be 30 degrees. I calculate L using the following equation:

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<sup>1</sup>This is still close enough to the ground to generate significant fallout.

$$L = (hob/\sin(90 - 30) + LRm * \cos(90 - 30))$$

W is just the lethal radius in meters times 2, or the diameter of the cylinder. For a 100-kt W76-1 warhead, the lethal radius in meters against a 2000-psi target is about 178 meters. It is around 296 meters for a 455-kt warhead.

Finally, I calculate the “terminal kill probability” (TKP) by multiplying the SSKP by the missile’s reliability (R).

$$TKP = SSKP * R$$

I get the “kill probability” (PK) by taking into account the number of warheads fired at the silo.

$$PK = 1 - (1 - TKP)^n$$

where  $n$  represents the number of warheads fired at the target.

The next part of the model simulates an attack against China’s mobile ICBM’s. To do this, I share the assumption in Wu 2020 that a mobile ICBM dispersed to a forward site is only able to retaliate if its forward site survives an attack, it is not detected and successfully attacked during movement, it is not detected and successfully attacked during launch preparation, and, for the DF-31A ICBM’s, one of its launchpads survives. To calculate how many mobile ICBM’s are able to survive a counterforce strike, I simulate each part of this chain.

I first simulate an attack on the forward sites, and I use the (Riqiang 2020) assumption that the United States has a 75 percent chance to detect a mobile ICBM’s forward site. This parameter does not change because it is part of “intelligence preparation of the battlefield” (IPB) operations in peacetime or the early stages of a crisis. I simulate a random draw from the binomial distribution. For those that are detected, I simulate the success of an attack on the forward site. Because forward sites are hardened underground facilities, I use the equations for calculating ICBM silo kill probability given above.

The mobile ICBM’s that survive an attack, have undetected forward sites, or that are already on patrol are the ones in movement to a launch location. To simulate an attack against a mobile ICBM in movement, I first estimate the number of DF-41 versus DF-31A and DF-31AG mobile ICBM’s remaining. I do so because there is a different detection probability of each while in movement.

I then use the value for the ability to detect each type of mobile ICBM that is relevant to the more favorable, baseline, less favorable, and least favorable scenario. If a mobile ICBM is detected, I simulate a “barrage” attack against it. This barrage is meant to cover the entire area with lethal radii large enough to destroy the transport-erector-launcher. To do that, I assumed that the TEL could be disabled with 5 psi of overpressure and assumed an airburst. To determine the lethal radius of a warhead against a 5 psi target, I first used (Glasstone and Dolan 1977) Figure 3.73c to estimate the lethal radius of a 1kt warhead against a 5 psi target at an “optimal height of burst.” That was 2250 feet. I then scaled that using the following equation:

$$LR_{airburst} = 2250 * w^{1/3}$$

I multiplied that by 0.3048 to get the lethal radius of the warhead in meters. This can be put into the equations for figuring out the single-shot kill probability and terminal kill probability used in the countersilo simulations. Because U.S. warheads are so accurate and their lethal radius is so large, the probability of them killing a mobile TEL in a barrage attack where one warhead is targeted against one “area” within which to create lethal damage converges to the reliability of the missile, which is assumed to be 0.9.

Where the lethal radius is relevant is estimating the number of warheads needed in a barrage attack. The lethal radius of a W88 warhead detonated at an optimal height of burst is 5274.7 meters. The lethal radius of a W76-1 warhead detonated at an optimal height of burst is 3183.2 meters. When traveling on a road, the speed of a Chinese mobile ICBM (DF-41 or DF-31A/AG) is assumed to be 45 kilometers per hour

(Riqiang 2020). The flight time of an SLBM targeting the TEL is assumed to be 20 minutes. This means the TEL can travel 15 kilometers during the time in which the SLBM is traveling to the target (Riqiang 2020). For the W88 warhead, only three warheads need to be in the barrage attack against the mobile TEL that travels only on a road. Five W76 warheads should be in the barrage attack.

Against the DF-31A launchpads, I assume in the non-uploaded strikes that the United States attacks with Minuteman III ICBM’s. Because these are soft targets and the Minuteman III is quite accurate, I assume that the main limiting factor in whether a launchpad is destroyed is the missile’s reliability. I assume that to be 0.8. I assume the launchpads are targeted in a 1:1 attack with retargeting, making the total probability that launchpad is destroyed to be 96 percent in the non-uploaded simulations. When targeted with W88 warheads, I assume this total kill probability is 0.99. (Riqiang 2020) assigns a 0.65 probability of detecting a DF-31A launchpad. Using this value, the probability of destroying all three launchpads assigned to a DF-31A mobile ICBM is the following:

$$(0.65 * (TKP))^3$$

For TEL’s detected during launch, I assume the United States attacks it with two warheads, either the W88 or the W76-1 depending on the scenario. The lethal radius of those warheads is calculated using the airburst lethal radius formula given above. That is used along with the CEP, the missile’s reliability, and the number of strikes to generate the total kill probability. Lastly, I use Wu 2020’s parameters not because they are “correct” and unassailable. Rather, they provide a useful benchmark from which to see how improvements in the ability of China to conceal and deceive the United States about the location of its mobile ICBM’s affects U.S. damage-limitation efforts.

The third and final part of the model is a simulation of a ballistic missile defense (BMD) effort against the warheads that China is able to launch in retaliation against the U.S. homeland. The total probability that an interceptor kills a reentry vehicle with a warhead is a product of its reliability and its target discrimination probability. The latter is the probability that the BMD system as a whole will pick out the warhead from the surrounding “threat cloud” of decoy, chaff, and debris. The former is the probability that, once the target is identified, the interceptor’s kill vehicle will actually disable the reentry vehicle. This is summarized in the following equation:

$$P_{intercept} = P_{discrim} * R$$

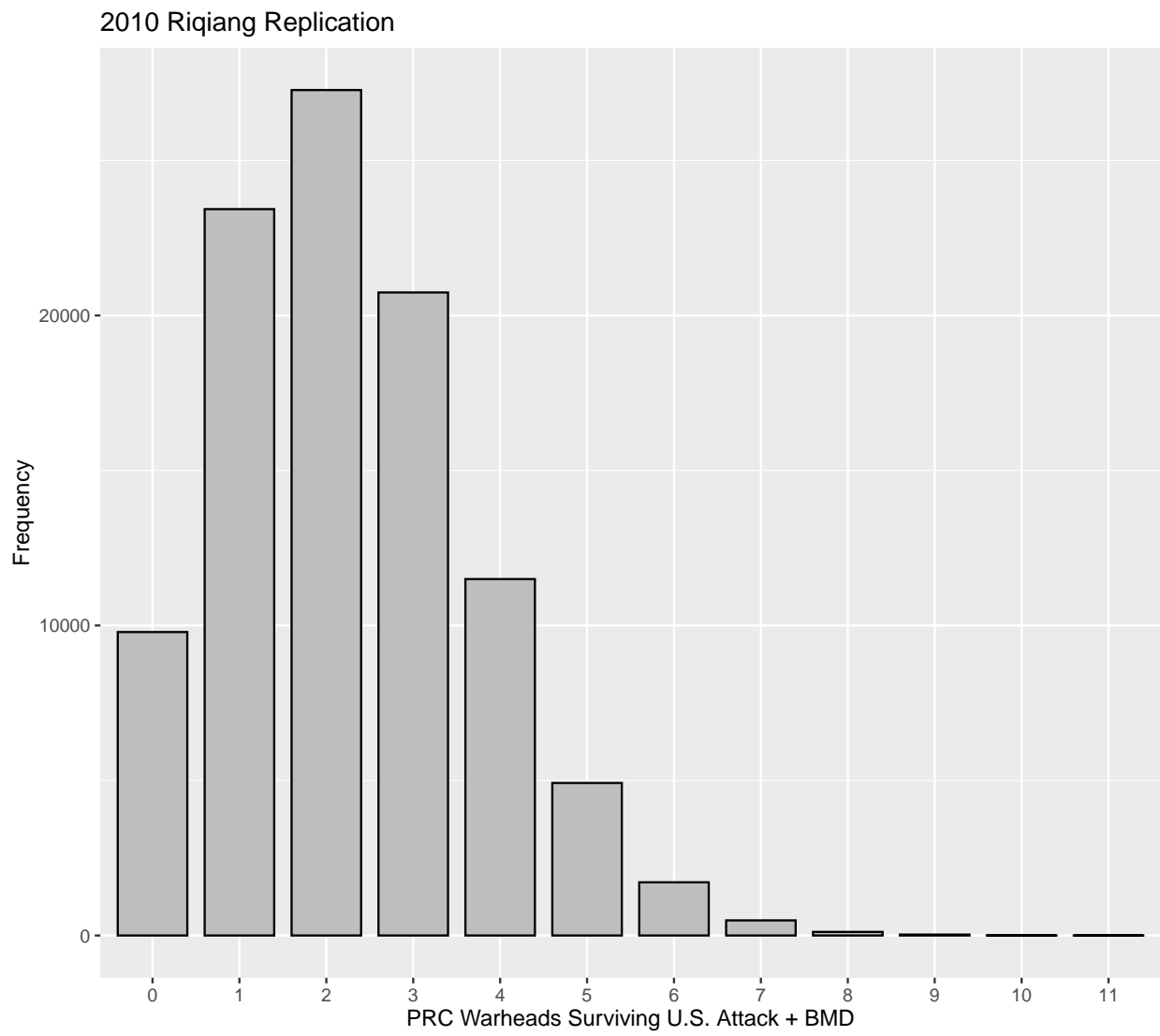
Once the probability of intercept is set, I put this into a function that assumes a 4:1 interceptor attack. I also assume that the attack happens in a “shoot twice-look-shoot two more” fashion, where the defender shoots two interceptors, assesses whether there was a kill, and shoots two more if there was not. This bakes in some favorable assumptions about U.S. BMD, since the current Ground-based Midcourse Defense system has yet to be tested in a “shoot-look-shoot” mode, and I assume that even in that mode, the probability of a successful assessment is 1 (Grego 2025). I simulate this attack on each returning warhead until either all warheads have been attempted to be killed or the United States runs out of interceptors.

## B Replicating Wu 2020

To validate my reconstruction and modification of Wu 2020’s model, I decided to replicate its simulation of a U.S. counterforce strike on China’s land-based ICBM’s in 2010. In his analysis of a counterforce strike in 2010, Wu did not include any undersea component to China’s nuclear arsenal or U.S. counterforce efforts, similar to my model. Do the results of my model applied to the 2010 Chinese force posture closely match that of Wu’s?

There is a 90 percent chance that China is able to hit the United States with at least one warhead in retaliation, which is the same as Wu’s finding. There is a 7 percent chance that five or more warheads hit the United States in retaliation, which is very close to Wu’s calculation of 6 percent.

Figure B.1: Replicating Riqiang 2020



## C Cloud Stem Radii

Table C.1: Cloud Stem Radii (in km) of U.S. Warheads

	W88	W76-1	W78	W87	W80
Radii	3.07	2.17	2.89	2.82	2.41

## D Attack Laydowns in Different Scenarios

Table D.1: Attack Laydowns in Main Scenarios

Scenario	Laydown
More Favorable and Baseline	DF-41 silos - W88 (2:1 with retargeting); Mobile ICBM's - forward sites, in movement, and during launch - W76-1, either (2:1) or in area "barrage" if moving; DF-31A launchpads - Minuteman III ICBM's (1:1 with retargeting); DF-5 silos - ALCM's with W80 (2:1).
Less and Least Favorable Scenarios	DF-41 silos - 12 with ALCM's with W80, 308 with W76-1 in 2:1 attack; Mobile ICBM's - forward sites, in movement, and during launch - W88 in 2:1 or area barrage if moving; DF-31A - Minuteman III ICBM's; DF-5 silos - ALCM's with W80 (2:1).

## E Summary of Parameters in Different Scenarios

Table E.1: Parameters for Different Scenarios

Scenario	Area Fratricide Effects	Mobile ICBM Detection Probabilities	BMD Probabilities
More Favorable	None	DF-31AG – 65 percent while moving, 30 percent in launch prep; DF-41 – 35 percent while moving, 20 percent in launch prep	90 percent reliability, 30 percent target discrimination, 36 SM-3 IIA interceptors
Baseline	None	DF-31AG – 50 percent while moving, 20 percent in launch prep; DF-41 – 25 percent while moving, 10 percent in launch prep	90 percent reliability, 30 percent target discrimination
Less Favorable	Precludes retargeting; forces use of W76-1	DF-31AG – 35 percent while moving, 15 percent in launch prep; DF-41 – 15 percent while moving, 7.5 percent in launch prep	70 percent reliability, 20 percent target discrimination
Least Favorable	50 percent increase in CEP; affects RV’s in last quarter of attack	DF-31AG – 35 percent while moving, 15 percent in launch prep; DF-41 – 15 percent while moving, 7.5 percent in launch prep; 12 mobile ICBM’s on patrol	50 percent reliability, 10 percent target discrimination

## F Uploaded Arsenal

One proposal for uploading would entail increasing the number of warheads on the Trident II SLBM to its full complement of 8 warheads as well as filling the four launch tubes that were “neutered” under New START (Williams and et. al. 2023, 42). It would also mean increasing the Minuteman III ICBM from one to two or three warheads and increase the number of ALCM’s deployed on each strategic bomber. If each Minuteman III ICBM was fitted with two warheads each, all Ohio-class SSBN’s were fitted with a maximum loadout, and the United States doubled the number of deployed ALCM’s and gravity bombs, that would increase the U.S. deployed arsenal to just over 3700 warheads, with 2300 of those being SLBM’s. F.1 summarizes the details of the uploaded arsenal.

Table F.1: Uploaded Arsenal

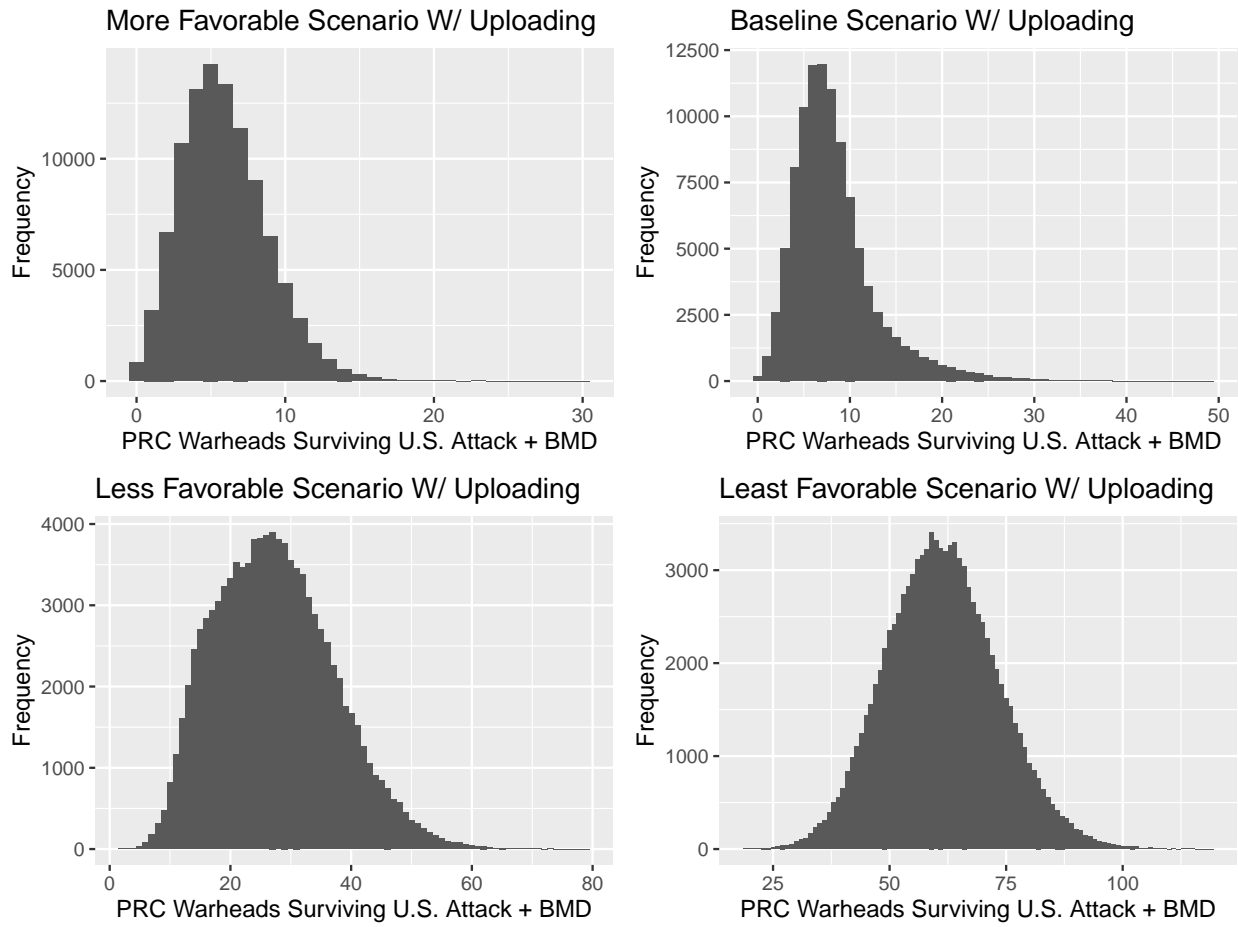
Weapon/Warhead	Count
Trident II D5 SLBM, W88	884
Trident II D5 SLBM, W76-1	1420
Minuteman III ICBM, W78 and W87	800
AGM 86-B ALCM, W80	400
B61 gravity bombs	200
Total	3704

Table F.2: Attack Laydowns in Uploaded Arsenal Scenarios

Scenario	Laydown
Very Optimistic	DF-41 silos - W88 (2:1 with retargeting); Mobile ICBM's - forward sites, in movement, and during launch - W76-1 in area "barrage;" DF-31A launchpads - W76-1; DF-5 silos - W88 (2:1 with retargeting).
All Other Scenarios	DF-41 silos - 320 with W76-1 in 2:1 attack; Mobile ICBM's - forward sites, in movement, and during launch - W88 in area barrage; DF-31A launchpads - W88; DF-5 silos - W88.

## F.1 Distribution of Attack Outcomes with U.S. Uploaded Arsenal

Figure F.1: Attack Outcomes by Scenario: Uploaded Arsenal



## G Tracking U.S. Warheads Used in the Attack and Warheads Remaining

For each simulation, I tracked the number of warheads expended in the attack. For the countersilo attacks, this was straightforward. It is twice the number of silos plus any retargeting that needed to occur in case two missiles failed in the boost phase. Keeping a tally of warheads used in a counter-TEL attack was more complex, but for each detected missile in movement, I counted the size of the barrage used to attack it. I then added this to any warheads expended in attacking hardened underground facilities, detected launchpads, and detected mobile ICBM's during launch preparation.

I kept track of each type of warhead expended and subtracted the total number from what was available at the beginning of the attack. Below is the "post-attack balance of power" for the uploaded arsenal after a counterforce strike in the baseline scenario compared to a counterforce strike using the current arsenal in the baseline scenario.

Table G.1: Post-Attack Balance of Power for Different Arsenals

Scenario	Warheads Used (current)	Warheads Remaining (current)	Warheads Used (uploaded)	Warheads Remaining (uploaded)
Baseline	1054	646	1054	2646

Table G.1 shows that uploading more warheads onto existing launchers would address the damage-limitation tradeoff issue, though it does not address the damage-limitation uncertainty issue. Table G.2 below keeps track of the individual warheads expended in the attack. Under the uploaded arsenal, the United States would have more SLBM warheads remaining and all of its ICBM's and ALCM's.

Table G.2: Post-Attack Stock of Different Warheads

Warhead Type	Warheads Used (current)	Warheads Remaining (current)	Warheads Used (uploaded)	Warheads Remaining (uploaded)
W88	380	4	739	145
W76	522	94	315	1105
W78/W87	56	344	0	800
W80	96	104	0	400

## H What Matters Most?

To determine if changes in any one of the parameters was affecting the results more than others, I decided to vary only the assumptions relevant to a single parameter to generate changes from the “baseline” scenario. For example, if I varied only the assumptions about the effectiveness of homeland ballistic missile defense (BMD), I kept the assumptions in place for the effects of area fratricide and the probability of detecting mobile ICBM’s in the field.

H.1 shows that all parameters matter to some extent. The parameter with the largest effect on U.S. damage-limitation is perhaps the number of mobile ICBM launchers that China puts out of a forward site on patrol. This variable provides the greatest increase in the median number of warheads that can hit the U.S in the “worst-case” scenario. This underscores the potential, mentioned in the manuscript, that U.S. decision-makers may feel that they are in a “damage-limitation window” as the extent to which they can limit damage in a nuclear exchange is likely to grow worse over the course of a conventional war as the PRC increases the alert level of its nuclear forces (Acton 2018).

Table H.1: Effect of Varying Only One Parameter

Parameter	Least Favorable Outcome	Change from Baseline
Area Fratricide	17 (5-39)	+9 (+3, +18)
TEL Detection	27 (9-49)	+19 (+7, +28)
BMD	22 (10-39)	+14 (+8, +18)

The following figures show the distribution of outcomes for simulations that vary only one set of parameters.

Figure H.1: Varying Area Fratricide Effects

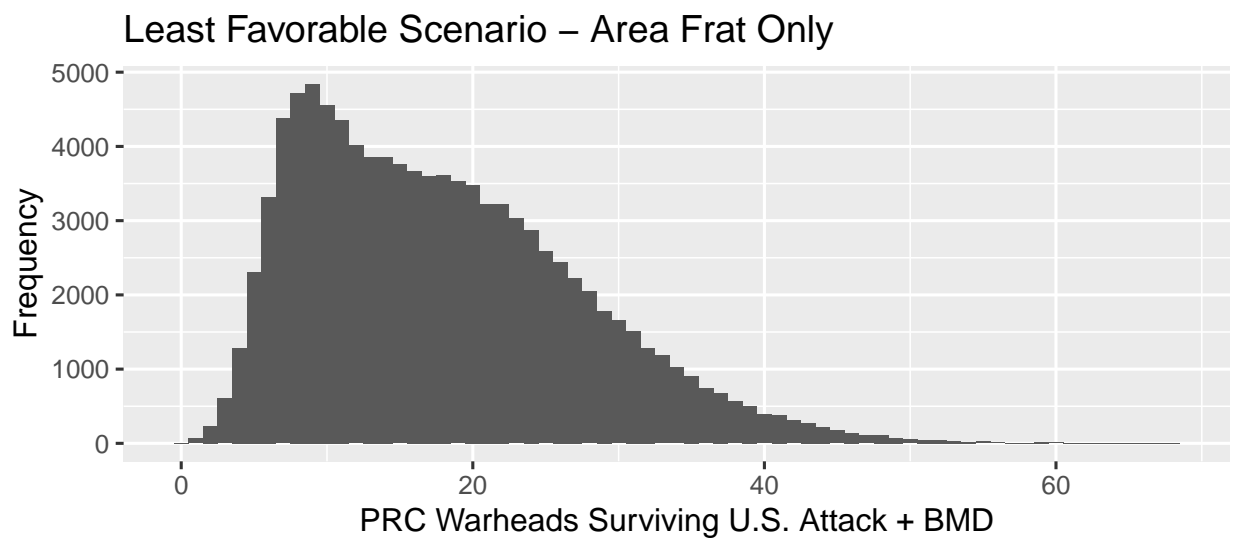
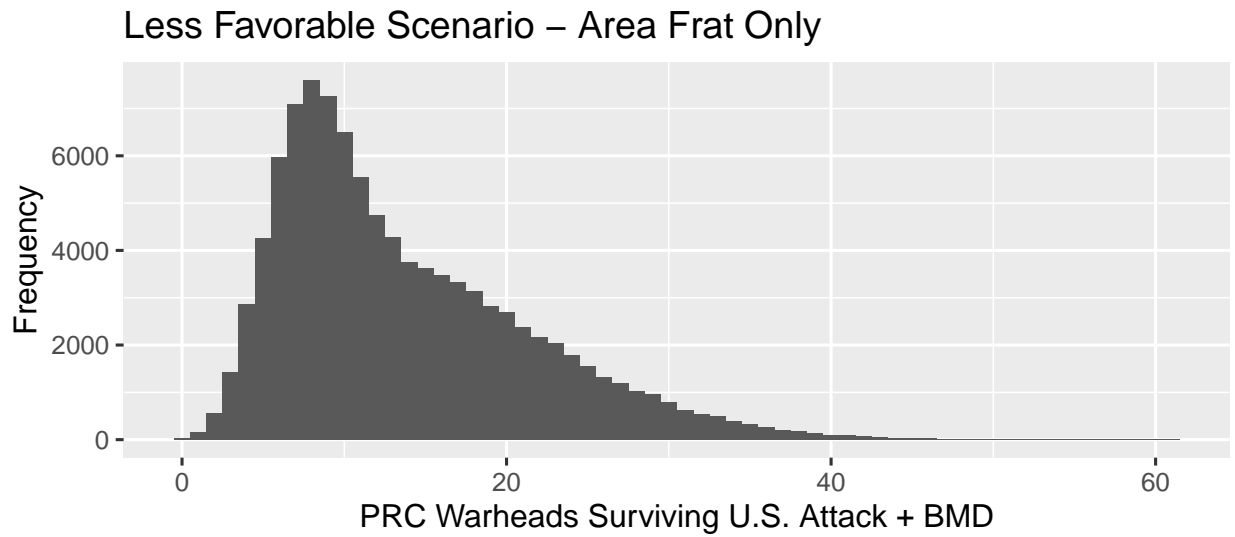
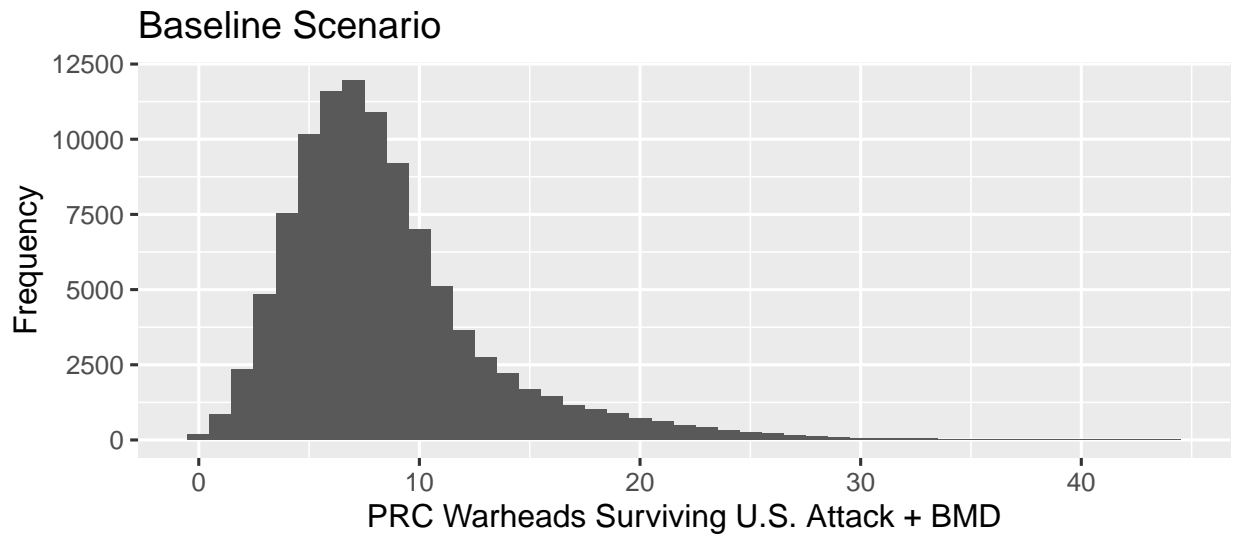


Figure H.2: Varying TEL Detection Probabilities and TEL Patrol

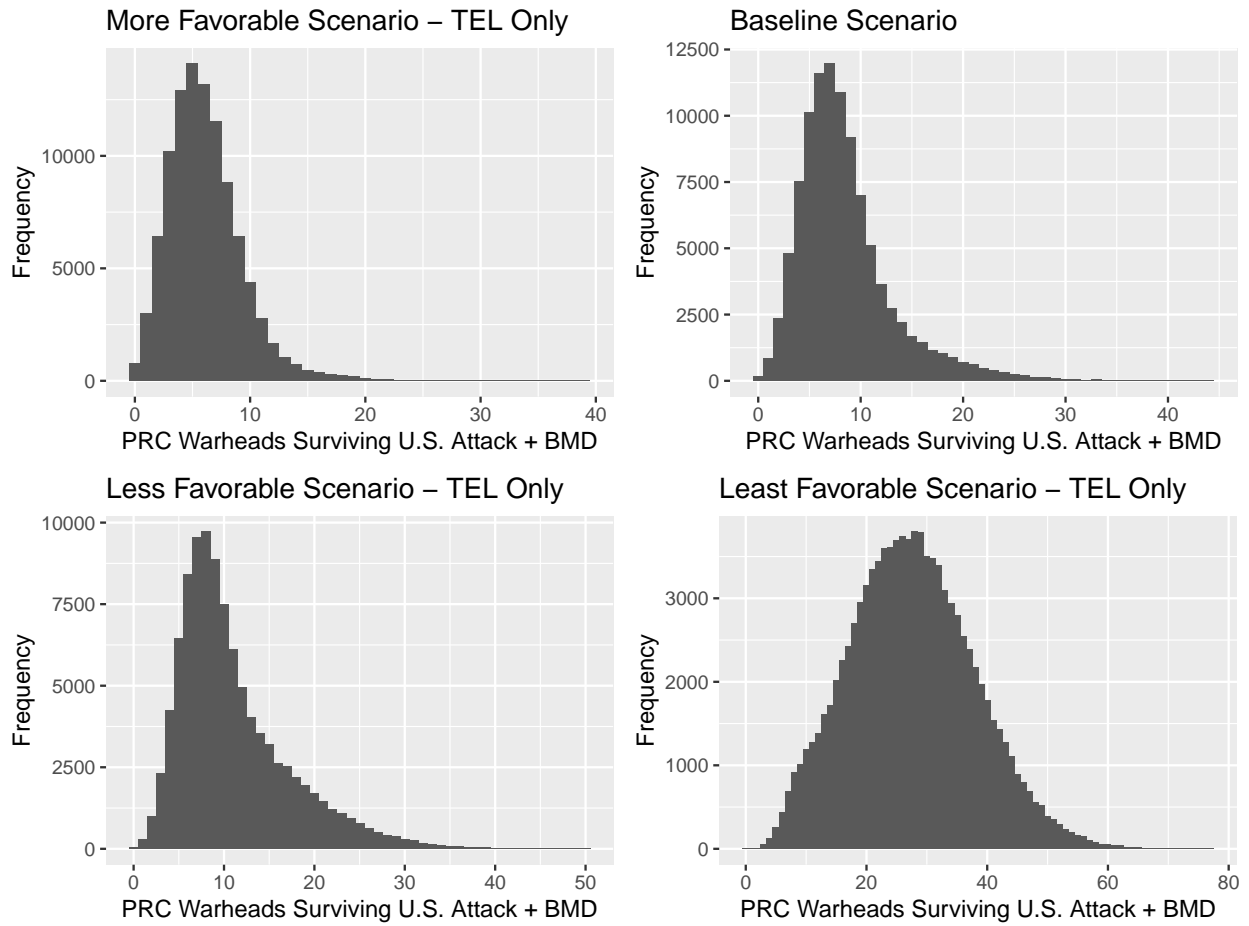
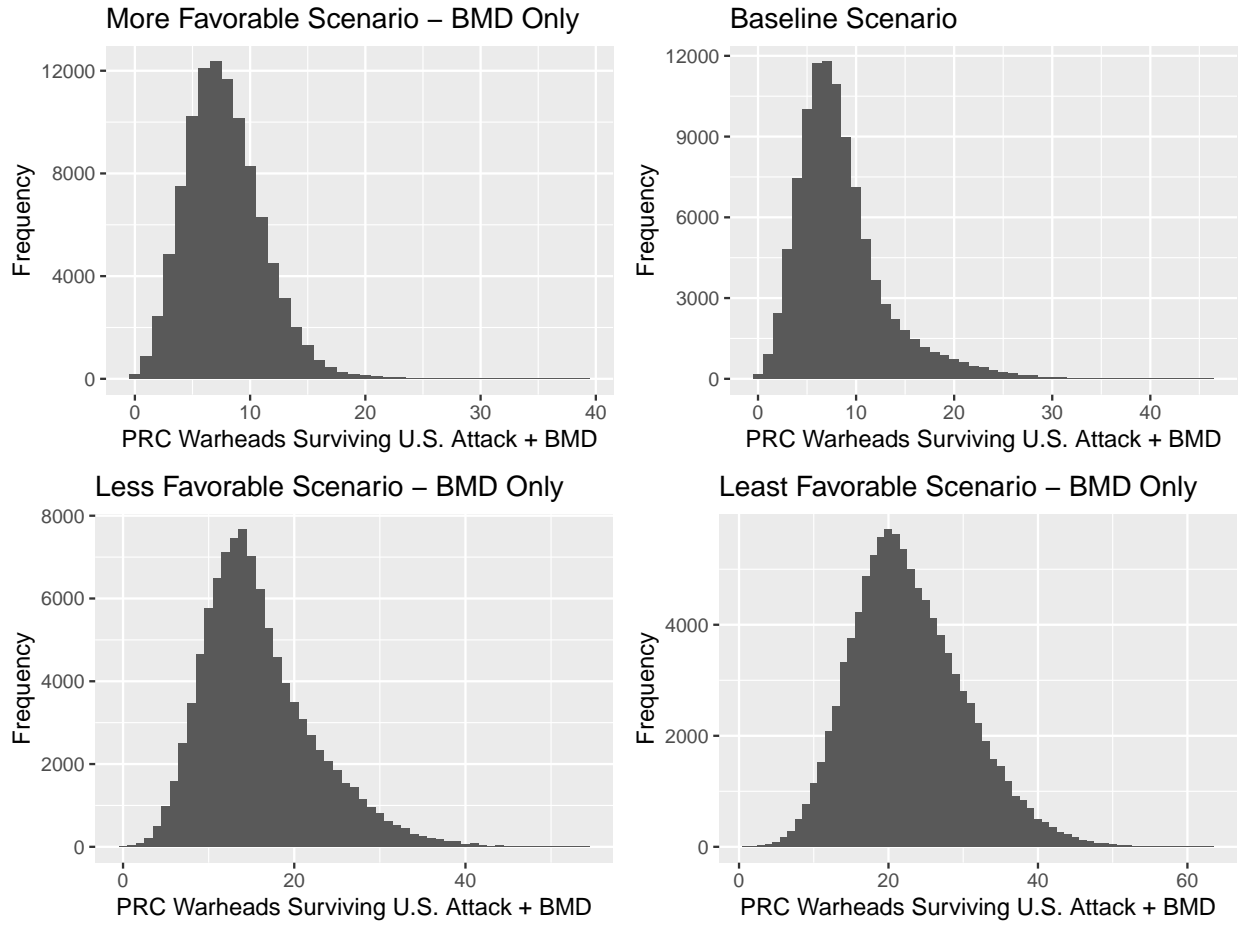


Figure H.3: Varying BMD Effectiveness



## I Alternate Chinese Force Postures

It is possible that China does not put an ICBM in all its silos. Vipin Narang pointed out in 2021 that China “can move them around” (Broad and Sanger 2021). Does this mean that the United States would need to strike all the silos in a counterforce attack? Or could it spare some of them knowing that they are empty? That depends on how good the U.S. means for catching “uploading in the act” would be. Monitoring missile silos for uploading missiles has been part of arms control verification regimes for START I and START II (Edenburn and Trost 2000). Those verification regimes did make use of satellites, or national technical means, mostly because putting a missile into a silo would take time and require special equipment that leaves a distinct signature that satellites could pick up (Edenburn and Trost 2000). However, it may be possible for China could make use of underground facilities to upload missiles into silos while their doors are still closed, which would make it much more difficult for the United States to detect whether a missile is in a silo using satellite or aerial imagery. This is feasible for China, since it has developed a so-called “underground Great Wall” with over 3,000 miles of tunnels, and this was a topic of controversy in the early 2010’s (Karber 2011; Zhang 2012). Thus, it is plausible that China could play a “shell game,” and the United States might be uncertain about which silos had a missile in them and which did not, giving it reason to strike every silo in the missile fields. Even if China did not put a missile in every silo, it would still impose a “sponge” problem onto U.S. nuclear planning.

This raises a question: how would an alternate force posture in which China deployed fewer warheads and/or missile than expected affect U.S. damage-limitation capabilities? To answer that, I consider five conditions. The first is that China fills all the new silos, but fills only half of them with the MIRV’d DF-41. The second is that China fills all its silos but only with the single-warhead DF-31A/AG. The third is that China plays a “shell game” where it fills one quarter of its silos, and the silos that are filled are equipped with the DF-41. The fourth is the same “shell game” but with only half the silos having MIRV’d ICBM’s. The fifth is a shell game with only single-warhead ICBM in the filled silos.

The results for each scenario are below. Particularly in the “shell game” scenario, what these alternate force postures do is improve the median outcome of a damage-limitation strike for the United States in the less and least favorable scenarios. However, the basic pattern from the main scenario remains the same. Damage-limitation is possible, but only when one assumes optimistic values for variables whose true value is hard to know ahead of time. As one moves into the less favorable conditions, which could happen over the course of a conventional war as China puts more of its mobile ICBM’s out on patrol and/or attacks U.S. satellites, that damage-limitation capability becomes worse. Plus, even though the median outcome is better in almost all scenarios, there is still a good chance that China is able to inflict damage above a certain “meaningful” threshold, especially at more stringent standards of what constitutes “meaningful” damage-limitation.

Figure I.1: All Silos Filled - Half DF-41

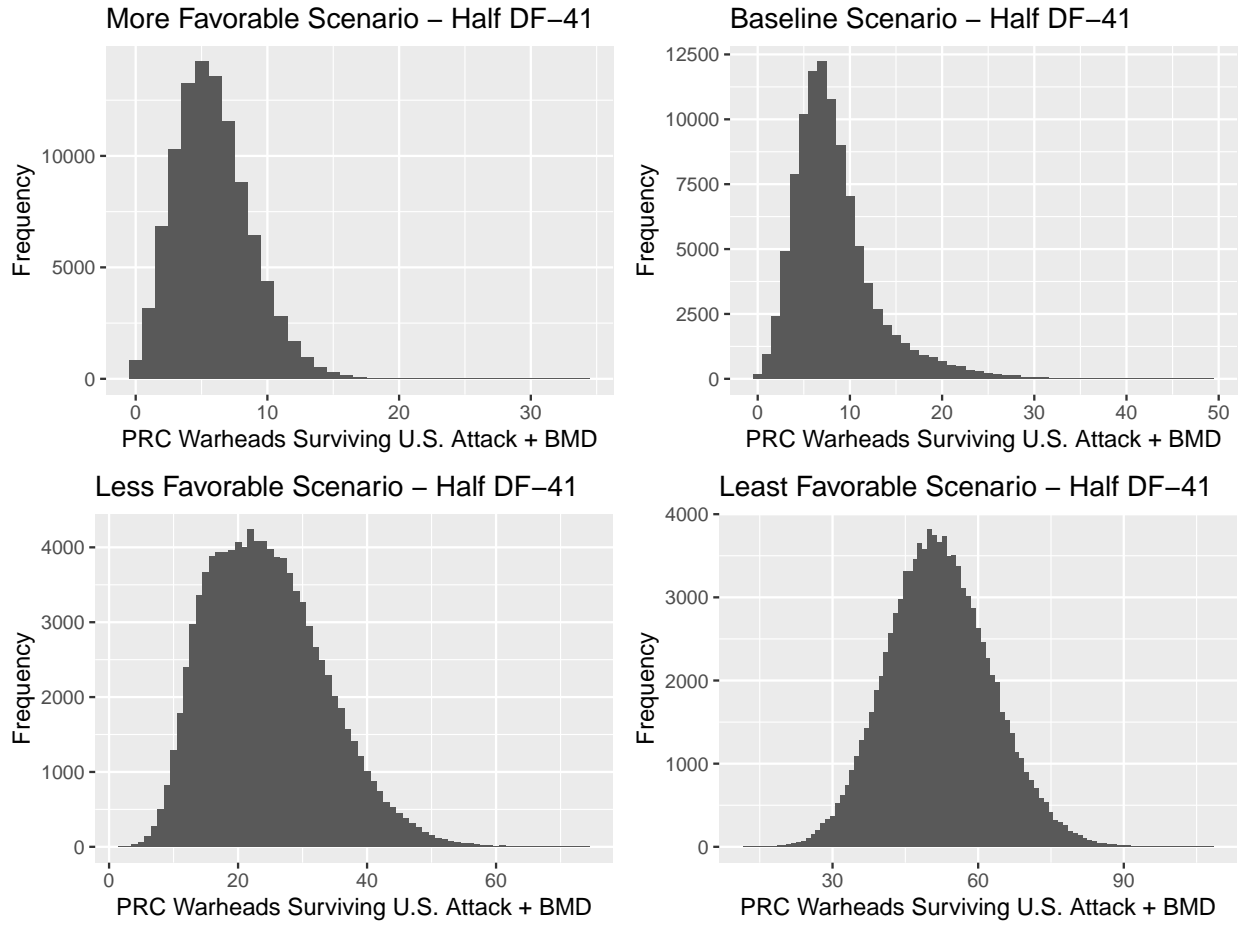


Figure I.2: All Silos Filled - None with DF-41

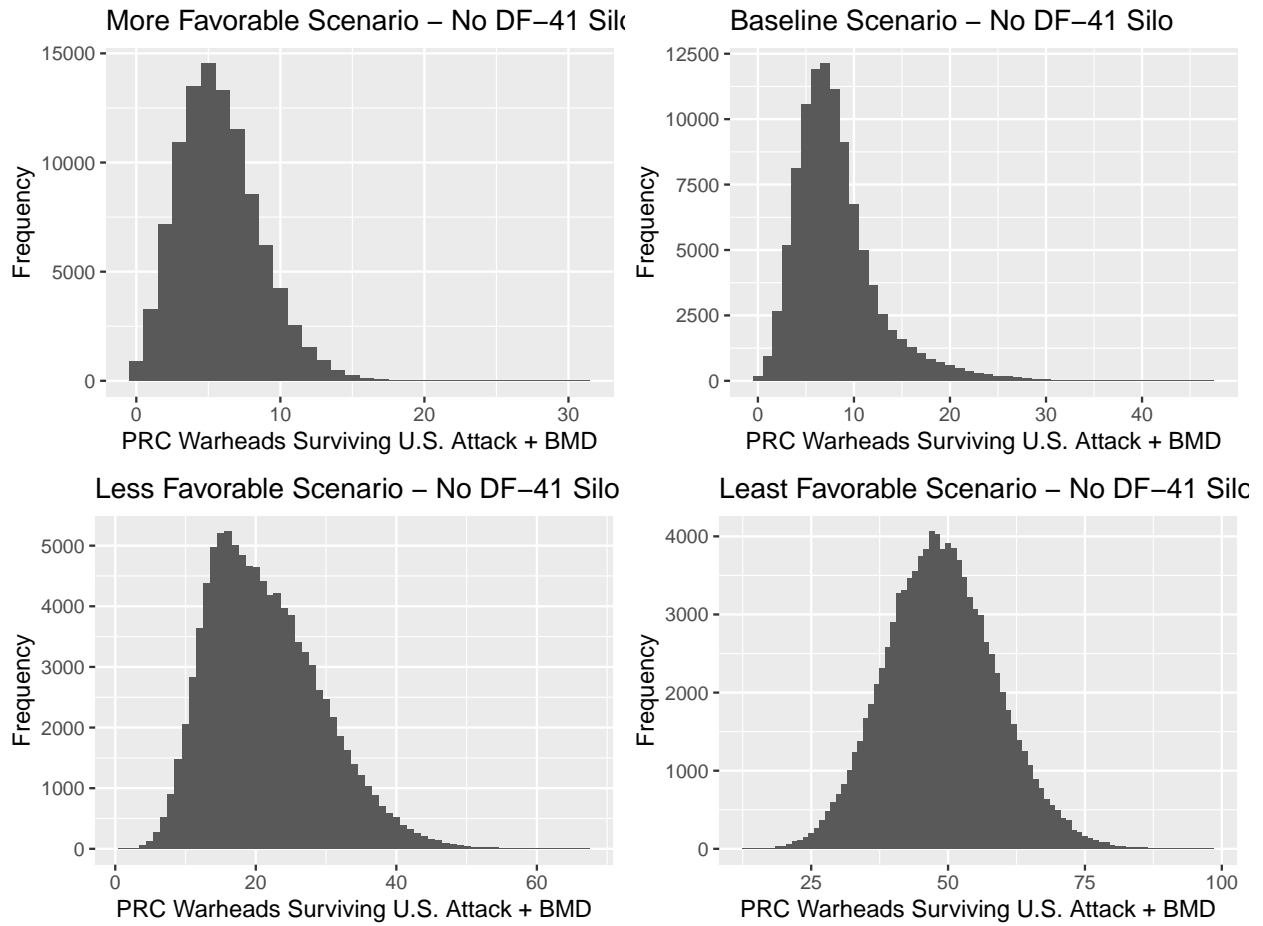


Figure I.3: Quarter of Silos Filled - All DF-41

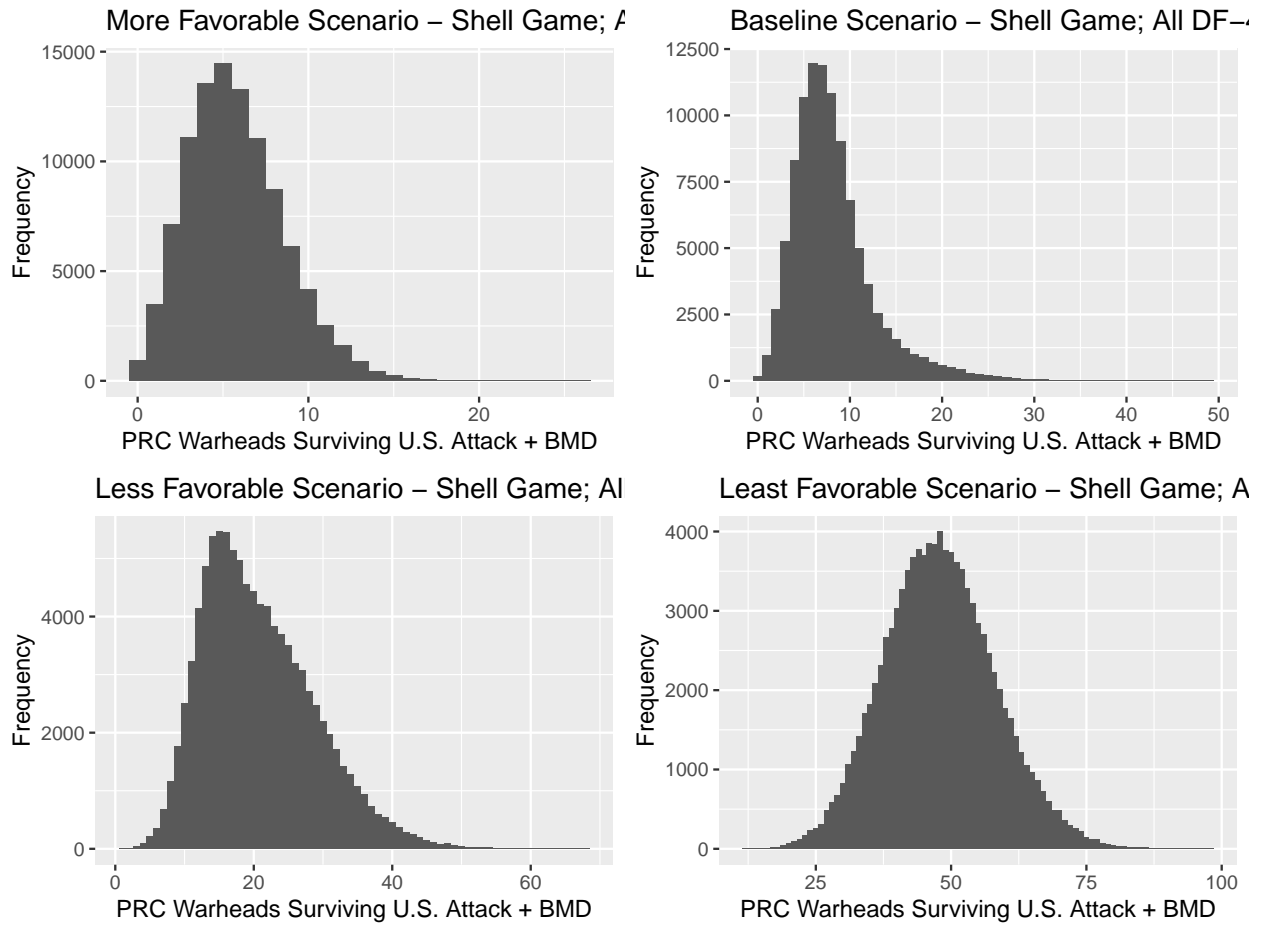


Figure I.4: Quarter of Silos Filled - Half DF-41

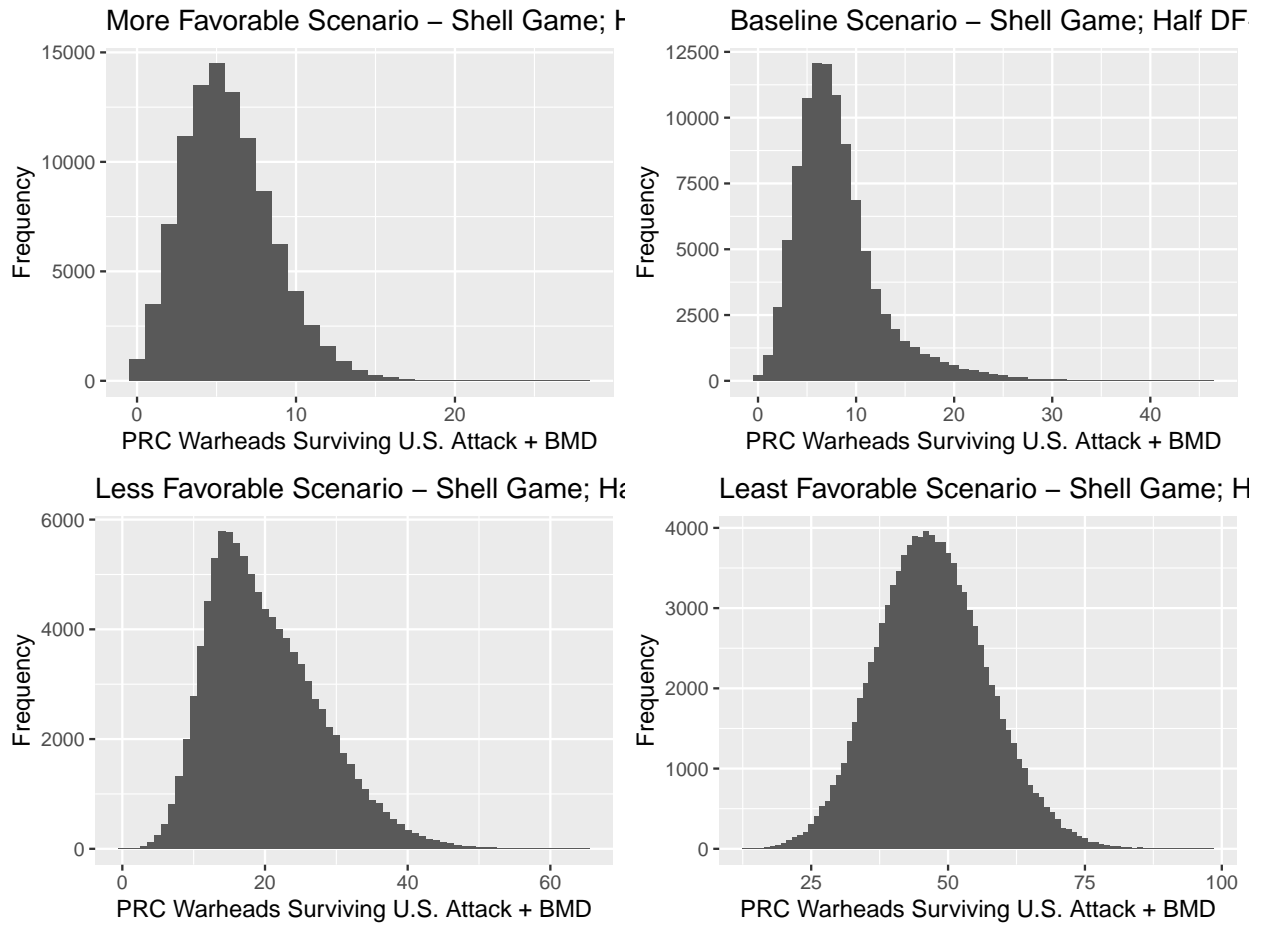
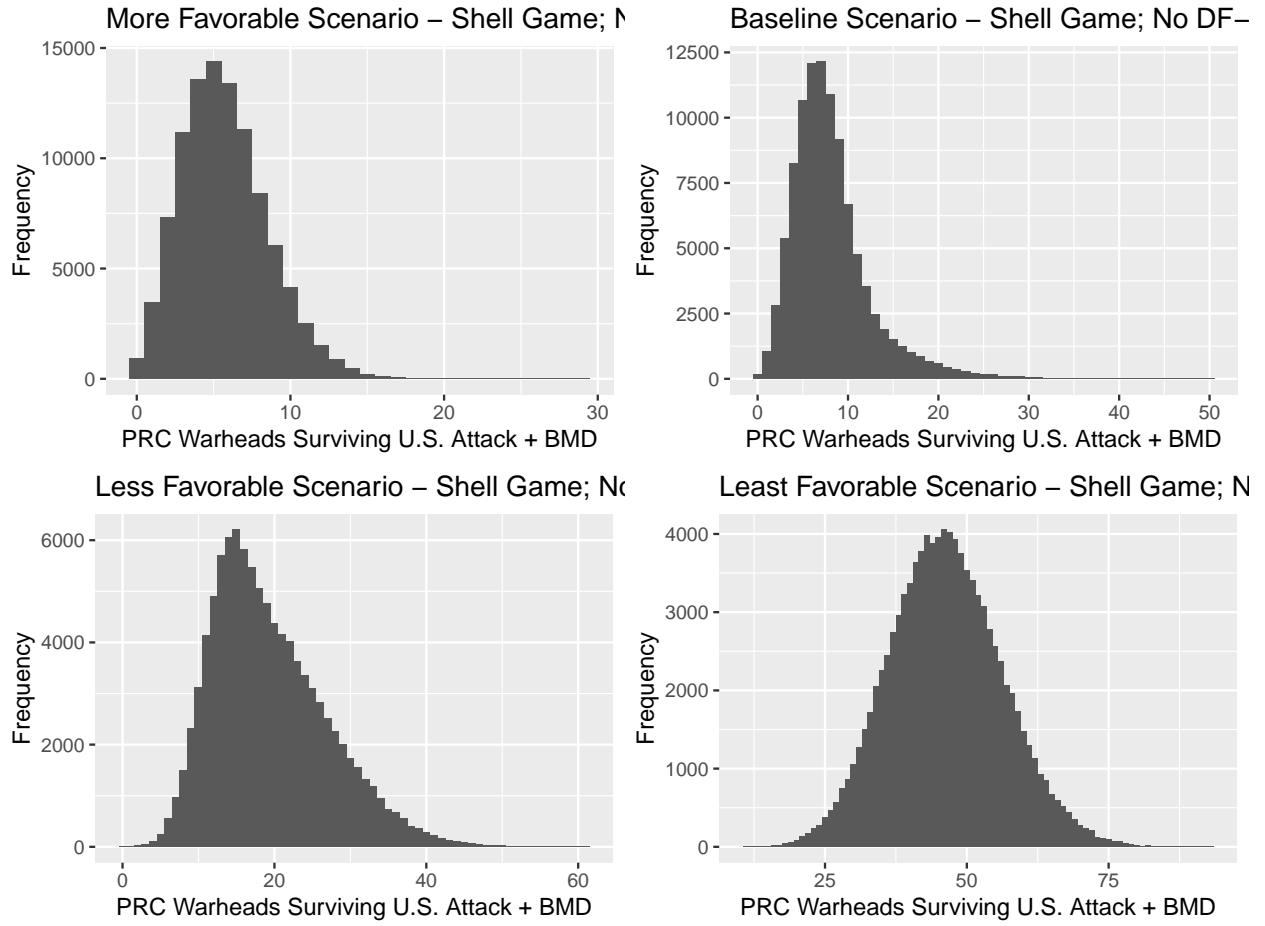


Figure I.5: Quarter of Silos Filled - None with DF-41





## K U.S. Second-Strike and Limited Nuclear Options

China’s nuclear expansion does not imperil the United States’ second-strike capability. The United States’ most survivable nuclear weapons, and the majority of them, are carried on its SSBN fleet. Due to the quietness of Ohio-class SSBN’s and the United States’ favorable maritime geography, deployed SSBN’s should remain survivable, and new Chinese warheads will not change that (Cote Jr. 2019). The new electric-drive propulsion on the Columbia-class SSBN’s should further improve quietness (*Columbia-Class Ballistic Missile Submarines, US N.d.*). There are worries that underwater “quantum sensors” or surface-wave detection from satellites will render the oceans visible and undermine the survivability of SSBN’s (Gottemoeller 2021). However, by one estimate, any SSBN attacker would need over 100,000 quantum sensors (with a detection range of 5 km) in the ocean to reliably detect a Columbia-class SSBN (Stefanick N.d.). In addition, submarines submerged to a sufficient depth (100 meters) and traveling at a sufficiently slow speed (5 knots or less) would produce no surface waves that space-based sensors could detect (Fetter and Sankaran 2025).

Scholars also argue that China’s deployment of more DF-26 intermediate-range ballistic missiles means that the United States needs to increase the size of its own “tactical,” low-yield arsenal to counter potential regional nuclear aggression (Balzer and Blumenthal 2024). If one agrees with the logic that the United States needs more “limited” nuclear options, then the main problem presented by China’s regional nuclear arsenal is not the size of its IRBM force but the United States’ relative lack of low-yield nuclear weapons that can be stationed in East Asia (Metrick et al. 2024; Narang and Vaddi 2025). Plus, as I note in the manuscript, making damage-limitation more difficult to achieve may sharpen the dilemma of how to deter and respond to potential Chinese limited nuclear use.

## References

- Acton, James M. 2018. “Escalation through Entanglement: How the Vulnerability of Command-and-Control Systems Raises the Risks of an Inadvertent Nuclear War.” *International Security* 43(1):56–99.  
**URL:** [https://doi.org/10.1162/isec\\_a00320](https://doi.org/10.1162/isec_a00320)
- Balzer, Kyle and Dan Blumenthal. 2024. “The True Aims of China’s Nuclear Buildup: Beijing’s Growing Arsenal Is Meant to Dissolve America’s Alliance System in Asia.”  
**URL:** <https://www.foreignaffairs.com/china/true-aims-chinas-nuclear-buildup>
- Broad, William J. and David E. Sanger. 2021. “A 2nd New Nuclear Missile Base for China, and Many Questions About Strategy.” *The New York Times* .  
**URL:** <https://www.nytimes.com/2021/07/26/us/politics/china-nuclear-weapons.html>
- Columbia-Class Ballistic Missile Submarines, US. N.d.*  
**URL:** <https://www.naval-technology.com/projects/columbia-class-ballistic-missile-submarines/>
- Cote Jr., Owen. 2019. “Are Ballistic Missile Submarines Still the Best Deterrent for the United States?” *Bulletin of the Atomic Scientists* 75(1):30–35.
- Davis, Lynn Etheridge and Warner R. Schilling. 1973. “All You Ever Wanted To Know About MIRV and ICBM Calculations But Were Not Cleared To Ask.” *Journal of Conflict Resolution* 17(2):207–242. Publisher: SAGE Publications Inc.  
**URL:** <https://doi.org/10.1177/002200277301700203>
- Edenburn, Michael W. and Lawrence C. Trost. 2000. Ballistic Missile Silo Door Monitoring Analysis. Technical Report SAND99-3173 Sandia National Lab. (SNL-NM), Albuquerque, NM (United States); Sandia National Lab. (SNL-CA), Livermore, CA (United States).  
**URL:** <https://www.osti.gov/biblio/750347>
- Fetter, Steve and Jaganath Sankaran. 2025. “Emerging technologies and challenges to nuclear stability.” *Journal of Strategic Studies* 48(2):252–296. Publisher: Routledge .eprint: <https://doi.org/10.1080/01402390.2024.2433766>.  
**URL:** <https://doi.org/10.1080/01402390.2024.2433766>

- Glasstone, S. and P. J. Dolan. 1977. The Effects of Nuclear Weapons. Third edition. Technical Report TID-28061 Department of Defense, Washington, D.C. (USA); Department of Energy, Washington, D.C. (USA).  
**URL:** <https://www.osti.gov/biblio/6852629>
- Gottemoeller, Rose. 2021. “The Standstill Conundrum: The Advent of Second-Strike Vulnerability and Options to Address It - Texas National Security Review.” *Texas National Security Review* 4(4):115–124.  
**URL:** <https://tnsr.org/2021/10/the-standstill-conundrum-the-advent-of-second-strike-vulnerability-and-options-to-address-it/>
- Grego, Laura. 2025. “Do technology advances allow missile defences to make up ground?” *Journal of Strategic Studies* 48(2):465–509. Publisher: Routledge eprint: <https://doi.org/10.1080/01402390.2024.2447306>.  
**URL:** <https://doi.org/10.1080/01402390.2024.2447306>
- Karber, Philip. 2011. Strategic Implications of China’s Underground Great Wall. Technical report Georgetown University Asian Arms Control Project.
- Kristensen, Hans, Matthew McKinzie and Theodore Postol. 2017. “How US Nuclear Force Modernization is Undermining Strategic Stability: The Burst-Height Compensating Super-Fuze.” *Bulletin of the Atomic Scientists* .  
**URL:** <https://thebulletin.org/2017/03/how-us-nuclear-force-modernization-is-undermining-strategic-stability-the-burst-height-compensating-super-fuze/>
- Lieber, Keir A. and Daryl G. Press. 2006. “The End of MAD? The Nuclear Dimension of U.S. Primacy.” *International Security* 30(4):7–44. Publisher: The MIT Press.  
**URL:** <https://www.jstor.org/stable/4137528>
- Lieber, Keir A. and Daryl G. Press. 2017. “The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence.” *International security* 41(4):9–49. Place: One Rogers Street, Cambridge, MA 02142-1209, USA Publisher: MIT Press.
- Metrick, Andrew, Philip Sheers and Stacie Pettyjohn. 2024. Over the Brink: Escalation Management in the Taiwan Strait. Technical report Center for a New American Security Washington, D.C.: .  
**URL:** <https://www.cnas.org/publications/reports/over-the-brink>
- Narang, Vipin and Pranay Vaddi. 2025. “How to Survive the New Nuclear Age.” *Foreign Affairs* 104(4). Volume Title: July/August 2025.  
**URL:** <https://www.foreignaffairs.com/united-states/how-survive-new-nuclear-age-narang-vaddi>
- Riqiang, Wu. 2020. “Living with Uncertainty: Modeling China’s Nuclear Survivability.” *International Security* 44(4):84–118.  
**URL:** [https://doi.org/10.1162/isec\\_a00376](https://doi.org/10.1162/isec_a00376)
- Stefanick, Tom A. N.d. “Undersea nuclear forces: Survivability of Chinese, Russian, and US SSBNS.” *Journal of Strategic Studies*. Forthcoming. Publisher: Routledge eprint: <https://doi.org/10.1080/01402390.2025.2454644>.  
**URL:** <https://doi.org/10.1080/01402390.2025.2454644>
- Williams, Heather and et. al. 2023. Project Atom 2023: A Competitive Strategies Approach for U.S. Nuclear Posture through 2035. Technical report Center for Strategic and International Studies Washington, D.C.: .  
**URL:** <https://www.csis.org/analysis/project-atom-2023>
- Zhang, Hui. 2012. “The defensive nature of China’s ”underground great wall” .”.  
**URL:** <https://thebulletin.org/2012/01/the-defensive-nature-of-chinas-underground-great-wall/>