

# DAY ONE PROJECT

## **Saving Billions on the US Nuclear Deterrent**

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September 2021

## Summary

The United States Air Force has initiated a program to replace its current arsenal of intercontinental ballistic missiles (ICBMs) with an entirely new missile force known as the Ground-Based Strategic Deterrent (GBSD). The GBSD's price tag continues to grow beyond initial expectations, with the program on track to become one of the country's most expensive nuclear-related budgetary items over the next decade.

The GBSD is risky, draws funding away from more urgent priorities, and will exacerbate the Pentagon's budget crisis. A better approach would be to extend the life of the current ICBM force (the Minuteman III) in the near term, while spreading the costs of nuclear modernization out over the longer term. This approach will ensure that the United States can field a capable ICBM force on a continuous basis without compromising other critical security priorities.

## Challenge and Opportunity

For over a decade, the United States Air Force has planned to replace its current arsenal of intercontinental ballistic missiles (ICBMs) with an entirely new missile force known as the Ground-Based Strategic Deterrent (GBSD).

The planned GBSD involves (1) a like-for-like replacement of the 400 Minuteman III currently deployed across Colorado, Montana, Nebraska, North Dakota, and Wyoming, (2) the creation of a full set of test-launch missiles, and (3) upgrades to launch facilities, launch control centers, and other supporting infrastructure. The GBSD would keep ICBMs in the United States' nuclear arsenal until at least 2075.

Unfortunately, the GBSD program is riddled with challenges and flawed assumptions that will significantly increase both its cost and risk over the coming years, as described below.

### **The GBSD program's price tag continues to grow beyond initial expectations.**

The GBSD program's ever-increasing price tag indicates that the program is not nearly as cost-effective as initially projected. In 2015, the Air Force issued a preliminary estimate that the GBSD would cost \$62.3 billion to acquire.<sup>1</sup> One year later, the Pentagon's Cost Analysis & Program Evaluation (CAPE) office projected that the GBSD could actually cost \$85 billion, a 37% increase from the Air Force's estimate.<sup>2</sup> In August 2020, CAPE's projected GBSD acquisition cost jumped again to \$95.8 billion, with total life-cycle costs reaching as high as \$263.9 billion.<sup>3</sup> In October 2020, the Pentagon reported that CAPE's latest life-cycle estimate was \$1.9 billion greater than its 2016 estimate, but did not explain why the estimate had grown.<sup>4</sup> As the GBSD matures over

<sup>1</sup> Bradley, B. (2015). Air Force: GBSD Currently Estimated to Cost \$62B. Nuclear Security & Deterrence Monitor, June 5

<sup>2</sup> Reif, K. (2016). Price Tag Rising for Planned ICBMs. Arms Control Today, October.

<sup>3</sup> U.S. Department of Defense. (2020). (U) Ground Based Strategic Deterrent Milestone B Summary: Report to Congress. September. Report accessed via Freedom of Information Act request 21-F-0065 on November 24, 2020; numbers reported in then-year dollars.

<sup>4</sup> Capaccio, A. (2020). New U.S. ICBMs Could Cost Up To \$264 Billion Over Decades. Bloomberg, October 3.

the coming years, its funding is expected to increase even further. The GBSD is on track to become one of the country's most expensive nuclear-related line items over the next decade.<sup>5</sup>

### **The GBSD program draws funding away from more urgent priorities.**

By its own admission, the Pentagon cannot afford all the weapons it wants to buy. In July 2020, the then-Air Force Chief of Staff, General Dave Goldfein, remarked that the GBSD program represents “the first time that the nation has tried to simultaneously modernize the nuclear enterprise while it’s trying to modernize an aging conventional enterprise,” and added that “[t]he current budget does not allow you to do both.”<sup>6</sup>

Funding tradeoffs at the Pentagon have already become apparent. In early 2020, for example, a decision to dramatically increase the budget of the National Nuclear Security Administration directly led to a Virginia-class submarine being cut from the Navy’s budget plan.<sup>7</sup> Compounding the problem is the fact that the Pentagon is currently facing a “bow wave” of major expenditures. The bills for several big-ticket procurement projects — including the GBSD, the Long-Range Standoff Weapon, the F-35 fighter, the B-21 bomber, the Columbia-class ballistic missile submarine, and the KC-46A tanker — will all come due over the next decade. With growing recognition that the Pentagon simply cannot afford to foot so many major bills simultaneously, these large procurement projects have been characterized as “fiscal time bombs”<sup>8,9</sup>

With these funding issues in mind, it is imperative to think carefully about whether spending nearly \$100 billion to acquire the GBSD right now makes sense. It may well be a better use of funds to focus on pressing security objectives — such as strengthening pandemic response and relief capabilities or hardening U.S. command-and-control systems against cyber threats.

### **GBSD will likely be delayed.**

The GBSD program is being administered by the Air Force Global Strike Command (AFGSC), which RAND described in a 2019 report as “a relatively young command with a relatively small staff that has limited experience in fielding new systems.”<sup>10</sup> Having only reached full operational capability in September 2010, AFGSC has no prior experience fielding a major weapons system — let alone multiple, ambitious, and simultaneous programs like the GBSD, the B-21 bomber, and the Long-Range Standoff Weapon. The Pentagon is already anticipating delays to the GBSD program. An Air Force report to Congress in May 2020 noted “that the GBSD Program carries a ‘high-risk’ schedule due to challenges imposed by the conventional MILCON process

<sup>5</sup> Congressional Budget Office. (2021). Projected Costs of U.S. Nuclear Forces, 2021 to 2030. May.

<sup>6</sup> Weisgerber, M. (2020). We Don’t Have Enough Cash to Build New Nuclear Weapons, Says Air Force Chief. Defense One, July 1.

<sup>7</sup> Tiron, R.; Tritten, T.J. (2020). Pentagon Budget Plan to Pit Ships Against Nuclear Arms, Aircraft. Bloomberg Government, February 25.

<sup>8</sup> Reif, K.; Eaglen, M. (2018). The Ticking Nuclear Budget Time Bomb. War on the Rocks, October 25.

<sup>9</sup> Freedberg Jr., S.J. (2016). Bow Wave Time Bomb: B-21, Ohio Replacement Costs Likely to Grow. Breaking Defense, August 4.

<sup>10</sup> Snyder, D.; et al. (2019). Managing Nuclear Modernization Challenges for the U.S. Air Force. RAND Corporation. RR3178.

for the required construction and conversion of GBSD-related infrastructure.”<sup>11</sup> Additionally, the GBSD’s associated warhead (the W87-1) is already on an inexecutable timeline; as such the Air Force is planning to initially deploy the GBSD with legacy warheads.<sup>12</sup> Overall, the GBSD program is likely to be delayed — and a significant delay to the program could unintentionally trigger an eventual depletion of the U.S. ICBM force below New START levels.

Life-extending the Minuteman III ICBM force — instead of moving to acquire GBSD as quickly as possible — would constitute a cheaper and less risky option for the United States to field a viable ICBM force at New START levels for at least the next two decades. The Pentagon’s primary justification for pursuing the GBSD program was the assumption that building an entirely new missile force from scratch would be cheaper than life-extending the Minuteman III force. This assumption stands in stark contrast to an Air Force-sponsored analysis that “[a]ny new ICBM alternative will very likely cost almost two times — and perhaps even three times — more than incremental modernization of the current Minuteman III system.”<sup>13</sup>

The Pentagon’s assumption also does not match historical precedent. In 2012, after the completion of a comprehensive round of Minuteman III life-extension programs, the Air Force admitted that it cost only \$7 billion to turn the Minuteman III ICBMs into “basically new missiles except for the shell.”<sup>14</sup> There is little public evidence to suggest that a similar round of life-extension programs would cost significantly more. Even if the programs were more expensive, the added expense is unlikely to come anywhere close to the GBSD’s projected \$95.8 billion acquisition fee; tripling the previous \$7 billion price tag for Minuteman III upgrades would still amount to less than one-quarter of the acquisition price of the GBSD.<sup>15</sup>

If a life-extension option were pursued in lieu of GBSD, it is likely that the Minuteman III’s critical subsystems would eventually need to be replaced. Replacement appears to be technologically feasible. Lieutenant General Richard Clark, the Air Force’s deputy chief of staff for strategic deterrence and nuclear integration, testified to the House Armed Services Committee in March 2019 that it would be possible to extend the lives of the Minuteman III’s propulsion and guidance systems one more time, despite his stated preference for proceeding with the GBSD.<sup>16</sup> Furthermore, a 2014 RAND report commissioned by Air Force Global Strike Command found “no evidence that would necessarily preclude the possibility of long-term sustainment.” In fact, the report noted, “we found many who believed the default approach for the future is incremental modernization, that is, updating the sustainability and capability of the Minuteman III system as needed and in perpetuity.”<sup>17</sup>

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<sup>11</sup> U.S. Air Force. (2020). Report on Development of Ground-Based Strategic Deterrent Weapon. Report to Congressional Committees, May.

<sup>12</sup> Ibid.

<sup>13</sup> Caston, L.; et al. (2014). The Future of the U.S. Intercontinental Ballistic Missile Force. RAND Corporation. MG-1210-AF.

<sup>14</sup> Pampe, C. (2012). Life Extension Programs Modernize ICBMs. Air Force Global Strike Command, October 25.

<sup>15</sup> U.S. Department of Defense. (2020). (U) Ground Based Strategic Deterrent Milestone B Summary.

<sup>16</sup> U.S. House Armed Services Subcommittee on Strategic Forces. (2019). Hearing on Fiscal 2020 Budget Request for Defense Nuclear Activities. United States House of Representatives, March 28. Transcript available via U.S. Strategic Command at <https://www.stratcom.mil/Media/Speeches/Article/1800469/house-armed-services-subcommittee-on-strategic-forces-holds-hearing-on-fiscal-2/>.

<sup>17</sup> Caston, L.; et al. (2014). The Future of the U.S. Intercontinental Ballistic Missile Force.

## **Plan of Action**

**The Biden Administration should revise its nuclear employment guidance to accept a slightly higher threshold for risk with regard to its ICBM force.** This action is critical for enabling a life-extended Minuteman III force because the Pentagon's interest in pursuing the GBSD is largely driven by its own interpretation of presidential nuclear-employment guidance. If the Air Force believes that the Minuteman III might dip below a preset reliability threshold, then the service will push for GBSD in order to meet the current nuclear-employment guidance.

Revising the guidance to accept a slightly higher threshold for risk would reduce the need to pursue GBSD immediately. This revision would first be reflected in the Biden Administration's upcoming Nuclear Posture Review and would then be translated into policy by the Pentagon.

It is important to emphasize that (1) presidential revisions to the nuclear-employment guidance are not unusual, and (2) revising the nuclear-employment guidance would have little bearing on strategic stability. In a nuclear first strike, an adversary would still be forced to target every silo. This means that a life-extended Minuteman III force would theoretically produce the same deterrence effect as a brand-new GBSD force.

To provide additional support for the guidance revision, the Biden Administration could launch a National Security Council-led review of the role of ICBMs in U.S. nuclear strategy. This review would assess the feasibility and cost of a Minuteman III life-extension program. The review would also consider whether such a program could be further enabled by reducing the number of deployed ICBMs or the number of annual flight tests, or by pursuing new forms of nondestructive booster reliability testing (see FAQ for more details).

## **Conclusion**

Life-extending the nation's existing arsenal of Minuteman III missiles instead of immediately pursuing the GBSD program is the best way to ensure that the United States can continue to field a capable ICBM force without sacrificing funding for other critical national-security priorities.

This course of action could buy the United States as much as twenty years of additional time to decide whether to pursue or cancel a follow-on GBSD program. If the United States chose to pursue GBSD at that point, then the Congressional Budget Office estimates that approximately \$42 billion (in 2017 dollars) of the cost of replacing the Minuteman IIIs would be pushed beyond 2046. Spreading the costs of nuclear modernization out over several decades would reduce the likelihood that the

aforementioned “fiscal time bombs” would explode over the coming years.<sup>18</sup> It is also possible that 20 years from now, the national-security environment will have changed to the extent that ICBMs are no longer strategically important. In that case, GBSD could simply be cancelled — saving an additional \$120 billion (in 2017 dollars).<sup>19</sup>

## Frequently Asked Questions

### 1. Are there any concerns with accepting a higher threshold for risk with the ICBM force?

While accepting a higher threshold for risk with the ICBM force may sound politically difficult, in reality it has little bearing on strategic stability. The Air Force projects that a 30-year-old missile core has an estimated failure probability of 1.3%, which increases exponentially each year.<sup>20,21</sup> As long as the expected failure rate did not climb too high, though, an adversary conducting a nuclear first strike would still have to target every silo because there would be no way of knowing which missiles were functional and which were duds. This means that a life-extended Minuteman III force would theoretically produce the same deterrence effect as a brand-new GBSD force. Additionally, it is extremely unlikely that the United States would ever elect to launch only a small number of ICBMs in a crisis. As a result, even a 10% failure rate across all 400 launched ICBMs would still enable approximately 360 fully functional missiles to reach their targets.

### 2. What is the most significant technical obstacle to conducting a Minuteman III life-extension?

Testing is critical to ensure that the Minuteman III missiles continue to function as designed if they are life-extended. However, there is a limited quantity of Minuteman III boosters that can be used as test assets. This problem was identified early in the GBSD acquisition process by both internal and external analysts, who noted that increasing the average ICBM test rate from three to four and a half test firings per year — as was done in 2017 — would inevitably exhaust the surplus boosters and lead to a depletion of the currently-deployed ICBM force around 2040.<sup>22,23</sup> There are several ways to overcome this obstacle without building a brand-new missile force.

One option would be to lower the average test rate from four and a half tests per year back down to three. If the Air Force was prepared to accept a slight additional risk of booster failure — given the fact that, as discussed above, doing so would have no discernible effect on strategic stability — then the number of tests per year could

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<sup>18</sup> Congressional Budget Office. (2017). Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046. October.

<sup>19</sup> Ibid.

<sup>20</sup> Air Force Nuclear Weapons Center Intercontinental Ballistic Missile (ICBM) Systems Directorate, “Minuteman III Propulsion Replacement Program,” p. 11.

<sup>21</sup> Harrison, T. (2017). Options for Ground-Based Leg of the Nuclear Triad. Center for Strategic & International Studies, September.

<sup>22</sup> Ibid.

<sup>23</sup> U.S. Air Force. (2016). Cost Comparison of Extending the Life of the Minuteman III Intercontinental Ballistic Missile to Replacing it with a Ground-Based Strategic Deterrent. July.

realistically be decreased. To that end, a 2017 Center for Strategic and International Studies report estimated that if the United States chose to re-core its ICBMs and move the firing rate back to three tests per year, then it would be possible to maintain the Minuteman III force at New START levels (400 deployed ICBMs) until 2050.<sup>24</sup>

Another option would be to reduce the number of deployed ICBMs. Again, doing so would not meaningfully affect deterrence but would make a significant quantity of additional missiles available for testing purposes. For example, if the Pentagon reduced its deployed ICBM force from 400 to 300 missiles, it could maintain the current testing rate of four and a half tests per year without the missile inventory dropping below 300 until approximately 2060.<sup>25</sup> A portion of the missiles used for testing could also be converted into commercial or governmental space launch vehicles, thus eliminating the requirement to eventually “re-core” them to ICBM standards.

A third option would be for the Air Force to explore nondestructive methods for testing the reliability of their solid rocket motors. George Perkovich and Pranay Vaddi suggest in their recent “Model Nuclear Posture Review” that this could be achieved through technological advances in ultrasound and computed tomography.<sup>26</sup> The Air Force could also consider adapting the Navy’s nondestructive-testing techniques — which involve sending a probe into the bore to measure the elasticity of the propellant — to evaluate the reliability of the Minuteman III force.<sup>27,28</sup> As Steve Fetter and Kingston Reif noted in 2019, these types of nondestructive testing methodologies “would permit the lifetime of each motor to be estimated on an individual basis. Rather than retire all motors at an age when a small percentage are believed to be no longer reliable, only those particular motors with measurements indicating unacceptable aging could be retired.”<sup>29</sup> Nondestructive testing may be the most effective option, because if successful it would eliminate the attrition problem altogether.

### **3. Is the Minuteman III ICBM simply “too old?”**

Despite the Pentagon’s repeated claims that the Minuteman III ICBM will become “unviable” after 2030, the Minuteman III’s critical subsystems remain highly reliable with age. There is little evidence to suggest that this will change within the next decade. The Minuteman III’s guidance and propulsion modules were modernized during the 2000s and continue to perform successfully during tests.<sup>30</sup>

A March 2020 Air Force Nuclear Weapons Center briefing to industry partners also acknowledged that the useful life of the Minuteman III force could be extended with “better NS-50 [guidance module] failure data,” because “current age-out on guidance

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<sup>24</sup> Harrison, T. (2017). Options for Ground-Based Leg of the Nuclear Triad.

<sup>25</sup> Ibid.

<sup>26</sup> Perkovich, G.; Vaddi, P. (2021). Proportionate Deterrence: A Model Nuclear Posture Review. Carnegie Endowment for International Peace.

<sup>27</sup> Ibid.

<sup>28</sup> Steve Fetter, personal communication, 27 February 2021.

<sup>29</sup> Fetter, S.; Reif, K. (2019). A Cheaper Nuclear Sponge. War on the Rocks, October 18.

<sup>30</sup> Ibid.

is an engineering ‘best guess’ with no current data.”<sup>31</sup> This suggests that the Air Force’s prediction about the post-2030 “unviability” of these subsystems is based on little actual evidence.

Importantly, the 2030 benchmark for the Minuteman III’s “unviability” appears to have been selected by Congress, not by the Air Force. A consequential amendment inserted into the FY 2007 National Defense Authorization Act directed the Secretary of the Air Force to “modernize Minuteman III intercontinental ballistic missiles in the United States inventory as required to maintain a sufficient supply of launch test assets and spares to sustain the deployed force of such missiles through 2030.”<sup>32</sup> This amendment ultimately had a significant impact on the timeline of the Ground-Based Strategic Deterrent because, as Air Force historian David N. Spires describes, “Although Air Force leaders had asserted that incremental upgrades, as prescribed in the analysis of land-based strategic deterrent alternatives, could extend the Minuteman’s life span to 2040, the congressionally mandated target year of 2030 became the new standard.”<sup>33</sup>

#### **4. How is the Navy’s strategy of dealing with its aging nuclear systems different than the Air Force’s strategy?**

It is telling that the Navy is not currently contemplating the purchase of a brand-new missile to replace its current arsenal of Trident submarine-launched ballistic missiles, and instead plans to conduct a second life-extension to keep them in service until 2084.<sup>34</sup> This life-extension is enabled in large part by the Navy’s unique nondestructive method of testing its boosters, described above.<sup>35</sup> In January 2021, Vice Admiral Johnny Wolfe Jr., the Navy’s Director for Strategic Systems Programs, remarked that “solid rocket motors, the age of those we can extend quite a while, we understand that very well.”<sup>36</sup>

To demonstrate this fact, in 2015 the Navy conducted a successful Trident SLBM flight test using the oldest 1<sup>st</sup>-stage solid rocket motor flown to date (over 26 years old), as well as 2<sup>nd</sup>- and 3<sup>rd</sup>-stage motors that were 22 years old.<sup>37</sup> Rather than replace these missiles as they exceed the planned design life of 25 years, the Navy stated in 2015 that they “are carefully monitoring the effects of age on our strategic weapons system and continue to perform life extension and maintenance efforts to ensure reliability.”<sup>38</sup>

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<sup>31</sup> Air Force Nuclear Weapons Center. (2020). Integration Support Contract (ISC) 2.0: Industry Day #3. Briefing, March 12.

<sup>32</sup> H.R. 5122.

<sup>33</sup> Spires, D.N. (2019). *On Alert: An Operational History of the United States Intercontinental Ballistic Missile Program, 1945–2011* [2<sup>nd</sup> edition]. Barksdale Air Force Base, Louisiana: Air Force Global Strike Command. This 2030 target year has since been extended to 2036, when the transition from Minuteman III to GBSD is expected to be completed. This reference demonstrates how the initial timeline for the transition was arbitrarily influenced by Congress—despite the reassurances by Air Force leaders that a longer-term incremental upgrade was possible.

<sup>34</sup> Eckstein, M. (2019). Navy Beginning Tech Study to Extend Trident Nuclear Missile Into the 2080s. USNI News, November 17.

<sup>35</sup> Steve Fetter, personal communication, 27 February 2021.

<sup>36</sup> Remarks by Vice Admiral Johnny Wolfe, Jr. at the Mitchell Institute for Aerospace Studies’ Nuclear Deterrence Forum (14–28 January 2021).

<sup>37</sup> U.S. Department of Defense. (2015). *Compendium of Annual Program 29 Manager Assessments for 2015*.

<sup>38</sup> *Ibid*.



Rather than conduct similar life-extension operations, the Air Force has elected to completely replace its Minuteman III force with the brand-new, highly expensive GBSD.

## **5. Why does the Air Force claim that pursuing GBSD is cheaper than life-extending Minuteman III?**

A 2016 report to Congress reveals that the Air Force baked multiple flawed assumptions into its cost-assessment process, the most influential of which was the presumption that the United States would continue deploying 400 ICBMs until 2075. However, as researchers from the Carnegie Endowment for International Peace explained in a January 2021 report, “Basing analysis on a straight-line requirement projected all the way to 2075 practically predetermines the outcome.”<sup>39</sup> Rather than prematurely selecting these benchmarks, the Pentagon’s analysis could have considered which options were most cost-effective under a variety of circumstances.

In reality, ICBM force posture is neither sacred nor immutable, and there is little security rationale behind the Pentagon’s selections of the number 400 and the year 2075. The year 2075 is a relatively arbitrary timeframe that is not codified in either the Nuclear Posture Review or in other key strategic documents. Moreover, a 2013 inter-agency review — featuring the participation of the Department of State, the Department of Defense, the National Security Council, the intelligence community, the Joint Chiefs of Staff, U.S. Strategic Command, and then-Vice President Joe Biden’s office — ultimately found that U.S. deterrence requirements could be met by reducing U.S. nuclear forces by up to one-third.<sup>40</sup>

Yet despite their lack of strategic rationale, these pre-selected force requirements and exaggerated timelines heavily bias the Pentagon’s cost-assessment process in favor of GBSD. In particular, if the Pentagon had selected a different ICBM retention timeline — 2050, for example, or even 2100 — then a revised cost assessment would have suggested that life-extending the Minuteman III force would be significantly more cost-effective than building an entirely new GBSD missile force from scratch.<sup>41</sup>

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<sup>39</sup> Perkovich, G.; Vaddi, P. (2021). Proportionate Deterrence.

<sup>40</sup> The White House. (2013). Fact Sheet: Nuclear Weapons Employment Strategy of the United States. June 19.

<sup>41</sup> Korda, M. (2021). Siloed Thinking: A Closer Look at the Ground-Based Strategic Deterrent. Federation of American Scientists, March.

## About the Author



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