

The Importance of the Nuclear Triad

The Triad Has Stood the Test of Time

For more than six decades, the United States has emphasized the need for a nuclear force that credibly deters adversaries, assures allies and partners, achieves U.S. objectives should deterrence fail, and hedges against uncertain threats. Since the 1960s, these objectives have been met by the U.S. nuclear Triad through forces operating at sea, on land, and in the air.

“The nuclear Triad has kept the peace since nuclear weapons were introduced and has sustained the test of time.”
– General Mark A. Milley,
Chairman of the Joint Chiefs of Staff

Today’s nuclear Triad consists of:

- ▶ 14 ballistic missile submarines (SSBNs) armed with 240 submarine-launched ballistic missiles
- ▶ 400 land-based intercontinental ballistic missiles (ICBMs)
- ▶ 60 nuclear-capable heavy bomber aircraft capable of delivering gravity bombs and cruise missiles

These strategic forces are enabled by a secure nuclear command and control system and supplemented by a small number of non-strategic nuclear forces that provide an ability to forward-deploy.

Complementary Attributes for Robust Deterrence

Each leg of the Triad provides unique and complementary attributes. Collectively, the Triad is intended to ensure that no adversary believes it could launch a strategic attack under any circumstances that eliminates the U.S. ability to respond and inflict unacceptable damage.

SSBNS ARE SURVIVABLE

A portion of the SSBN fleet is always on patrol, making it very difficult for potential adversaries to track all of them, contributing to their survivability.

ICBMS ARE RESPONSIVE

ICBMs are deployed in hundreds of silos and can be launched and reach targets within minutes, creating a nearly insurmountable targeting problem for adversaries.

BOMBERS ARE FLEXIBLE

Bombers are a clear and visible signal of U.S. intent and resolve during a crisis and provide a variety of deployment and yield options when placed on alert.

Eliminating a leg of the Triad would weaken the combined strength of the force and simplify adversary attack planning. For example, without ICBMs, a conventional-only attack on the limited number of submarine and bomber bases could significantly degrade the U.S. nuclear arsenal without rising to the level of nuclear use. This significantly lowers the threshold for an attack against the U.S. homeland. Also, the Triad’s diversity enables mitigation of risk if a particular leg of the Triad is degraded or unavailable.

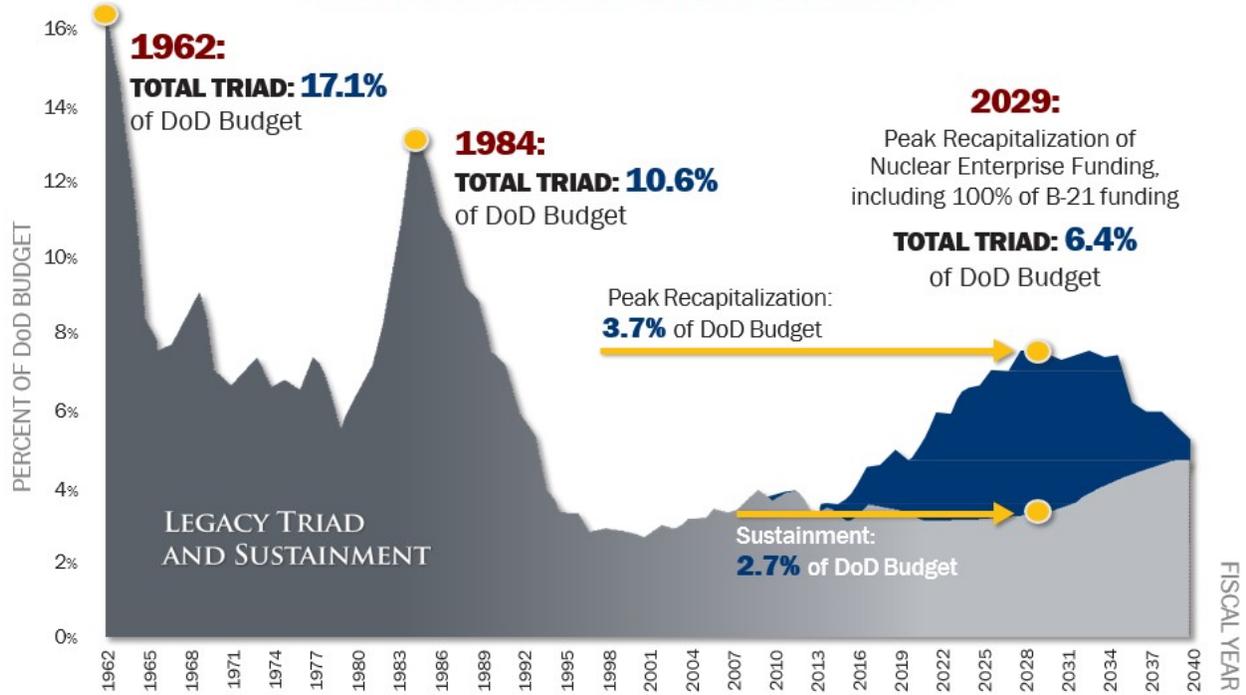
Most of the systems that compose the Triad are operating well beyond their original design lives—they must be modernized or they will be lost. With foreign nuclear threats growing, the importance of the Triad endures.

“The Department will modernize the nuclear triad – including nuclear command, control, and communications, and supporting infrastructure. Modernization of the nuclear force includes developing options to counter competitors’ coercive strategies, predicated on the threatened use of nuclear or strategic non-nuclear attacks.”

– 2018 National Defense Strategy

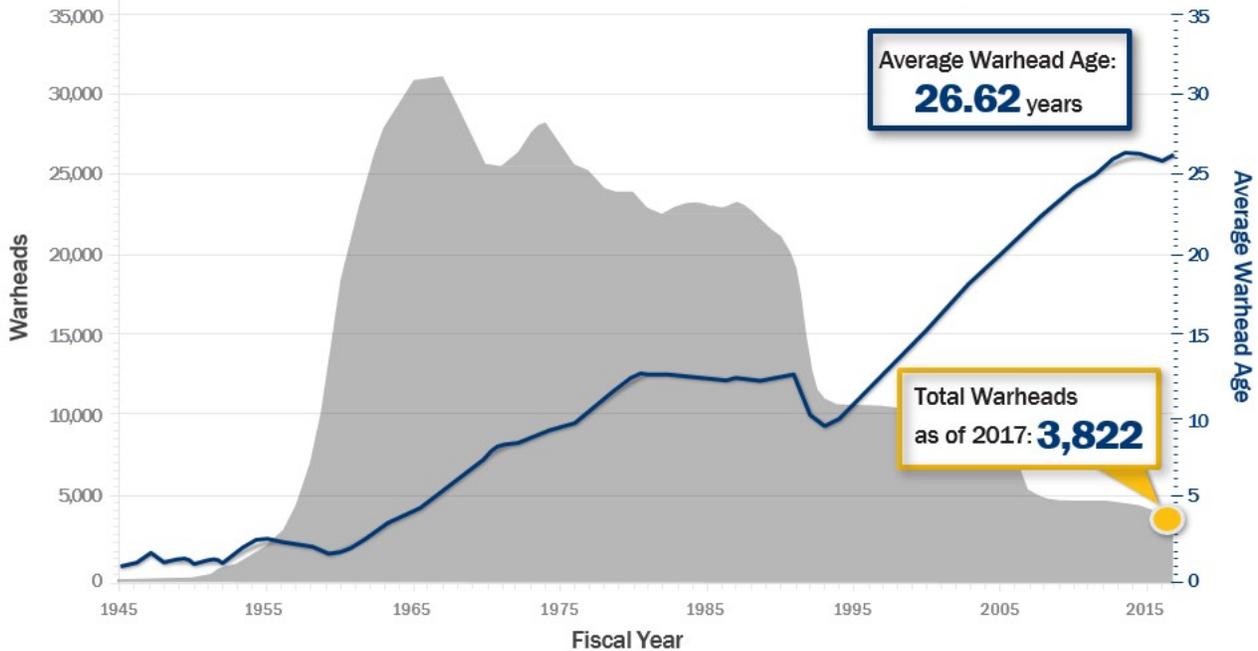


DoD NUCLEAR ENTERPRISE FUNDING



REPLACING THE TRIAD WILL COST 3.7% OF THE DOD BUDGET AT ITS PEAK

SIZE and AGE of the U.S. NUCLEAR WEAPONS STOCKPILE, 1945-2017



U.S. NUCLEAR ARSENAL REDUCED BY 85% SINCE END OF COLD WAR

*Latest publicly-available figures





THE IMPORTANCE OF MODERNIZING LAND-BASED NUCLEAR WEAPONS

First deployed in 1970, with an expected 10 year service life, Minuteman III (MM III) intercontinental ballistic missiles (ICBMs) have been operating for 50 years from bases deep in the American heartland. Having undergone multiple life extensions, the Minuteman III will be replaced by a new, more survivable, and more cost-effective weapon system: the Ground Based Strategic Deterrent (GBSD).

Modernizing U.S. ICBMs

- ▶ After conducting an analysis of alternatives, the Air Force determined that a replacement ICBM would be similar in cost to a Minuteman III life extension program over FY2016-2075, would meet future requirements, and lower sustainment costs over its lifecycle.
- ▶ For the MM III to be usefully life extended, the United States would need to replace a number of major components – which, even if accomplished at cost and on time, would still fall short of the Department’s requirements – including accommodating modern safety and security features and technologies.
- ▶ GBSD will incorporate low risk, technically mature components; feature a modular architecture that can incorporate emerging technology to adapt to rapidly evolving threat environments; and will be easier to maintain than the MM III – all of which will save on costs and provide great value as GBSD operates well into the 2070s.
- ▶ Finally, the GBSD program will not only replace the MM III missile, but also modernize the launch facilities, improve command and control, and increase safety and security.

The Importance of U.S. ICBMs

- ▶ U.S. ICBMs are the most responsive leg of the Triad, on day-to-day alert 24/7/365, and controlled by iron-clad nuclear command, control, and communications (NC3).
- ▶ U.S. ICBMs are spread out in 400 hardened, underground silos – with another 50 silos kept in “warm” status – assigned to three separate military bases, presenting an intractable targeting problem for any potential adversary.
- ▶ The hardened and dispersed nature of U.S. ICBMs requires a potential adversary to commit to a massive attack on the U.S. homeland to even have a chance of disabling all U.S. ICBMs – thus enhancing deterrence of an attack.
 - A massive first strike – when confirmed by multiple ground and space-based sensors – would send an unambiguous signal of the adversary’s unlimited aims and virtually ensure massive U.S. response.
 - U.S. nuclear planners have specifically built in options to either absorb an initial first strike and respond effectively later, or to launch ICBMs while under a confirmed attack to preclude being disabled in a massive first strike.
 - While it is not U.S. policy to rely on launch under attack tactics, retaining this option forces the adversary to consider the likelihood its first strike could potentially result in 900 or more warheads being used on empty silos.
- ▶ Should the United States need to respond quickly to an emerging attack, U.S. ICBMs provide the most rapid response option with assured connectivity to the President through national command authorities.
- ▶ Although the MM III can carry up to three nuclear warheads, each is currently loaded with only one – providing the United States targeting flexibility, especially for some scenarios of an adversary’s limited use.
- ▶ ICBMs also provide the ability to upload additional warheads which can hedge against technical failure in one of the other legs of the Triad or respond to adverse geopolitical developments.
- ▶ Finally, the day-to-day alert of ICBMs takes the burden of a daily alert posture off the bomber force – freeing up many bombers from continuous nuclear alert to concentrate on potential conventional missions.
 - Without U.S. ICBMs, more bombers would likely need to be purchased, beyond the number already planned, to maintain a secure nuclear strike capability while maintaining conventional roles.
 - At least some portion of the bomber force would then have to be placed on day-to-day alert to ensure survivability, which would reduce the serviceable lifetime of the airframe and add greater cost.



Answering Questions

Are U.S. ICBMs on “hair trigger” alert? Isn’t this dangerous?

- ▶ No, the term “hair trigger” is misleading, meant to evoke an image of ICBMs dangerously close to being launched at the first sign of attack, without safeguards or oversight.
- ▶ In reality, ICBM operators are incapable of launching an ICBM without first receiving and confirming a number of criteria to verify and process a valid launch order from the President. Furthermore, to prevent unauthorized or accidental launches, ICBMs are locked day-to-day and cannot be enabled for launch without a code received in the valid launch order. In addition, a missile squadron is interconnected, meaning the five launch control centers (LCCs) monitor the status of all 50 ICBMs in that squadron and each other, and any one LCC will initiate “inhibit launch” commands in the event of unauthorized launch indications.
- ▶ Although the President can order the launch of ICBMs quickly during an adversary’s confirmed strike, the dispersed and survivable nature of the overall nuclear Triad, along with the redundant and secure nature of U.S. missile warning sensors, offers the President viable options to not rely on launch-under-attack tactics.

Does the United States have a launch-on-warning policy? What about false warnings of attack?

- ▶ No, the United States rejects launch-on-warning policies and postures and will not launch its ICBMs based only on one sensor’s data.
- ▶ The United States maintains and is modernizing an overlapping network of space- and ground-based sensors that jointly validate the indications, and determine the severity, of a missile launch against the United States.
- ▶ The United States takes every precaution to ensure it does not rely on only one sensor’s data for missile warning and assessment. Before a notification is sent to U.S. senior leadership, data concerning a potential missile attack are confirmed using dual-phenomenology – matching the data from both ground- and space-based sensors.
- ▶ The Department of Defense also considers the broader political-military context in which it receives the data concerning a possible missile launch. Data that indicate a massive missile attack against the United States, when received in peacetime, will be given an extra level of scrutiny and confirmation to prevent mischaracterization.

Why can’t we rely on submarines and bombers by themselves?

- ▶ A dyad of submarines and bombers alone would not provide sufficient deterrence and assurance effect.
- ▶ Without ICBMs, a conventional-only attack on the limited number of submarine and bomber bases could significantly degrade the U.S. nuclear arsenal without rising to the level of nuclear use. This significantly lowers the threshold for an attack against the U.S. homeland.
- ▶ Adversaries would have enormous incentives to invest even more in anti-submarine warfare capabilities while reinforcing their already substantial air and missile defenses.

Will the GBSD cause an arms race?

- ▶ No, Russia and China are already increasing the capability and number of their ICBMs respectively, while the United States is transparently replacing ICBMs on a one-for-one basis.
- ▶ Eliminating U.S. ICBMs unilaterally would in fact remove leverage from diplomats seeking to avoid an arms race and reduce the leverage needed to persuade other nations to decrease their nuclear arsenals.

Would eliminating ICBMs save a lot of money in the defense budget?

- ▶ No, even assuming a vastly reduced future defense budget, according to the Congressional Budget Office (CBO), eliminating ICBMs would account for less than one percent of the defense dollars spent over the next 30 years.
- ▶ Additionally, calls for eliminating ICBMs rarely account for the increased costs that would result.
- ▶ Eliminating ICBMs would only transfer the responsibility of nuclear deterrence and assurance missions onto the other legs of the nuclear Triad – bombers and submarines – which would require force posture and capability changes.
- ▶ These changes could potentially include procurement of additional submarines and bombers, and then placing bombers on strategic day-to-day alert to maintain current capabilities and effectiveness – both of which would increase costs.





THE IMPORTANCE OF MODERNIZING SEA-BASED NUCLEAR WEAPONS

The current Ohio-class ballistic missile submarines (SSBNs) began patrolling the world's oceans in 1982 and, although originally designed for a 30-year service life, have been life extended for a 42-year service life – with the newest SSBN having entered service in 1997. Ohio-class SSBNs currently carry 20 Trident II D5 submarine-launched ballistic missiles (SLBMs). The Trident II D5 SLBM can carry multiple nuclear warheads and is used on both U.S. and U.K. nuclear-powered SSBNs. As the 14 Ohio-class SSBNs reach the end of their service lives, the U.S. Navy will replace them with the Columbia-class SSBNs, with the first patrol scheduled for 2030.

Modernizing Sea-Based Weapons

- ▶ Ohio-class SSBNs will serve longer than any other U.S. nuclear submarine.
- ▶ The United States will replace the 14 Ohio-class SSBNs with at least 12 Columbia-class SSBNs.
- ▶ The Columbia-class SSBNs will be able to carry 16 Trident II D5 SLBMs and feature a nuclear reactor that does not need to be refueled midlife – reducing operational and program costs while still meeting operational requirements.
- ▶ The Columbia-class SSBNs are designed to be survivable and operate well into the 2080s.
- ▶ The Trident II D5 SLBM fleet will operate into the 2040s.
- ▶ The United States has supplemented its sea-based nuclear capability with the W76-2 by modifying a small number of Trident II D5 nuclear warheads to provide a responsive and survivable low-yield capability to enhance deterrence.
- ▶ The Department of Defense plans to develop a nuclear-armed sea-launched cruise missile (SLCM-N) – providing a mobile, survivable, and dispersed capability for deterrence and assurance missions.
- ▶ The United States is also pursuing the W93 warhead to improve operational effectiveness and mitigate risk.

The Value of Sea-Based Weapons

Ballistic Missile Submarines

- ▶ SSBNs are the most survivable leg of the nuclear Triad because they are extremely difficult to detect while on deterrent patrol – with no foreseeable threats to their survivability in the near- to mid-term.
- ▶ Given their carrying capacity, SSBNs provide a range of nuclear response options that are available for a significant period of time while at sea.
- ▶ SSBNs are highly mobile, allowing them to move to a variety of launch points to avoid SLBM overflight concerns, increase operational flexibility, and provide assurance to allies.
- ▶ U.S. SSBNs maintain a continuous presence while at sea, with each SSBN often on patrol for months at a time, providing a reliable and responsive asset during an evolving crisis or conflict.
- ▶ U.S. SSBNs have reliable and redundant connectivity with the President through national command authorities.

Submarine-Launched Ballistic Missiles

- ▶ U.S. SLBM warheads are very accurate and reliable, and when combined with the Trident II D5's approximate +7,000 km range, allow the United States to hold at risk any adversary's hardened and valued assets.
- ▶ The Trident II D5's low-yield W76-2 warhead provides a prompt and survivable capability – a deterrent against any adversary's potential misperception regarding the possible gains from a limited or regional nuclear strike.

Nuclear-Armed Sea-Launched Cruise Missiles

- ▶ SLCM-Ns will be dispersed across a highly mobile force, posing an intractable targeting problem for adversaries, providing assurance to allies, and allowing the United States to surge forces during a crisis if needed.
- ▶ The maneuverability of the cruise missile launching platforms forces the adversary to plan against multiple azimuths of attack, stressing defensive planning.



Answering Questions

If SSBNs are very difficult to detect, why does the United States need 12? Can it reduce to eight?

- ▶ The primary mission of SSBNs is to deter strategic attack on the United States, its allies, and partners. To meet operational requirements and provide credible deterrence, U.S. SSBNs must maintain a high level of availability, survivability, and responsiveness that is only achievable with 12 SSBNs.
- ▶ Fewer than 12 SSBNs would limit our ability to meet operational requirements and conduct at-sea training, exercises, maintenance, and certification – including the operating of nuclear weapons, the nuclear reactor, and the submarine – all eroding U.S. credibility.
- ▶ Although SSBNs are indeed the most survivable leg of the nuclear Triad, the United States cannot assume that the current balance of technology will remain in the U.S. favor indefinitely.
- ▶ Reducing SSBNs to eight in number, for example, would greatly increase the strategic value of each individual submarine – increasing the incentives for adversaries to invest in anti-submarine warfare capabilities.
- ▶ A notional force posture of eight submarines, assuming the current level of nuclear warheads, would restrict targeting flexibility, reduce the size of the patrol area, and increase the predictability of submarine deployments and transit – reducing survivability.

Does the low-yield W76-2 warhead increase the risk of nuclear war by making it appear more usable?

- ▶ No, a nuclear weapon's yield is not determinative of its "usability" – any decision to employ nuclear weapons, even of the lowest yield, would be one of the most important decisions a President could make.
- ▶ The W76-2 is a limited and prudent modification of existing weapons – such adjustments do not increase the risk of nuclear war and, in fact, enhance deterrence by addressing a perceived gap in U.S. capabilities.
- ▶ A potential adversary must not perceive a gap between stated U.S. national interests, U.S. political will to defend those interests, and the appropriate U.S. capabilities needed and available to defend those interests.
- ▶ The W76-2's primary purpose is to deter, not fight, a nuclear war.

Since the United States already has air-launched cruise missiles, what would SLCM-N add?

- ▶ The SLCM-N will provide a regional-based nuclear capability to deter strategic attacks, including an adversary's limited nuclear strikes – thus increasing the credibility of U.S. deterrence and assurance efforts.
- ▶ While air-launched cruise missiles stress an adversary's air defenses, U.S. sea-launched cruise missiles will stress the adversary's air defenses and naval forces that seek out the U.S. naval launch platform.

Is the United States trying to match Russia's non-strategic nuclear force, system by system?

- ▶ No, the United States does not see a need to match Russia's approximately 2,000 non-strategic nuclear weapons.
- ▶ Although the United States followed through on its commitments after the Cold War to retire sea-based nuclear cruise missiles from its forces, Russia did not follow suit and not only retained them, but modernized them.
- ▶ The Russian non-strategic nuclear force contains a number of systems that have no U.S. equivalent, including nuclear torpedoes, anti-ship missiles, depth charges, short-range ballistic missiles, and anti-aircraft missiles.
- ▶ Given this threat, the SLCM-N can fill a number of deterrence and assurance roles by broadening response options across a mobile and dispersed force, an important capability especially in regional crisis scenarios involving allies.

Why does the United States need the W93/Mk7? It already has two warheads for naval use.

- ▶ USSTRATCOM identified operational requirements for the W93/Mk7 to ensure the survivable, sea-based leg of the Triad can deter and survive against evolving threats in 2040 and beyond.
- ▶ The United States has not delivered an integrated nuclear reentry body system since the 1980s—required skills and industrial base have atrophied.
- ▶ The W93 warhead will not require nuclear testing or increase the size of the U.S. stockpile.
- ▶ The W93/Mk7 effort will also support our Ally, the United Kingdom, in their Replacement Warhead program.





THE IMPORTANCE OF MODERNIZING AIR-BASED NUCLEAR WEAPONS

The United States has a diverse set of air-based nuclear delivery systems – the B-52H heavy bomber, B-2 bomber, and the F-15E dual capable aircraft (DCA); as well as weapon systems – the air-launched cruise missile (ALCM), the B83-1, and the B61 family of gravity bombs. In the future the United States will deploy the B-21 Raider beginning in the mid-2020s; the nuclear-certified version of F-35 in 2024; the B61-12 in the 2020s; and the Long-Range Standoff Weapon (LRSO) in the early 2030s.

Modernizing Air-Based Nuclear Weapons

- ▶ The B-52H Stratofortress, originally deployed in 1961, has undergone a number of life extensions and upgrades, with the latest potential upgrade being an assessment of engine options and cybersecurity enhancements.
- ▶ The B-2 Spirit has been the Nation's only low-observable bomber since it was first deployed in 1997, and has received numerous software and hardware upgrades to remain capable in the most challenging environments.
- ▶ The B-21 Raider is a next generation low-observable bomber, scheduled to replace the B-2 beginning in the late 2020s, with a planned minimum inventory of 100 aircraft.
- ▶ The AGM-86B ALCM, which was first deployed in 1982, and designed to defeat Soviet threats, will be replaced by the LRSO – a low-observable, long-range, and survivable cruise missile.
- ▶ The B61-12 nuclear gravity bomb replaces four previous variants (Mods 3, 4, 7, and 10) – resulting in a single variant that balances greater accuracy and controlled yield – while meeting military requirements.
- ▶ The nuclear-certified F-35 DCA will gradually replace F-15E fighter aircraft as the primary dual-capable platform.

The Value of Air-Based Nuclear Weapons

- ▶ U.S. bombers are the most flexible leg of the Triad, allowing the United States to signal adversaries through force posturing – tangible reminders of U.S. commitments to its security and the security of its allies and partners.
- ▶ U.S. bombers have nearly unlimited range given their mid-air refueling capability, and, when combined with the range of their air-launched cruise missiles, can threaten a large percentage of targets in an adversary's territory.
- ▶ U.S. bombers can carry a number of nuclear and conventional weapons, tailored to the mission. These weapons can also be loaded or unloaded under condensed timelines, providing more flexibility than ICBMs or SLBMs.
- ▶ U.S. bombers and DCA can be forward deployed in allied or partner nations during peacetime, a crisis, or a conflict.
- ▶ Bombers can also be uploaded with additional weapons and/or placed on alert during a crisis as a deterrent signal.
- ▶ B61-12 and LRSO will have improved capabilities, accuracy, and reliability that will maintain their military effectiveness and reduce the probability of unintended consequences.
- ▶ The availability of low-yield options on the B61-12 and LRSO provides U.S. leadership better-tailored deterrence effects, flexibility in targeting, and less possibility of collateral damage.
- ▶ U.S. bombers and DCA are able to be recalled once airborne, unlike other components of the nuclear Triad, providing U.S. leadership more time for decision-making during an unfolding crisis.
- ▶ Air-launched cruise missiles greatly expand the capability of each individual bomber. For example, a single B-52 can carry 20 ALCMs, allowing one bomber to threaten 20 geographically separated targets.
- ▶ Advanced standoff weapons like the LRSO can impose significant costs on adversaries' air defenses, requiring large investments and advances in detection, tracking, C2, and area defenses to challenge a single LRSO.
 - Adversaries would have to detect both a low-observable bomber, if a B-21, and each low-observable LRSO.
 - Adversary investments in air and missile defense limit the amount of money they can invest in offensive forces.
- ▶ Without the LRSO, U.S. air-based nuclear deterrence capabilities would be significantly restricted, as delivery platforms would be forced to overfly each individual target – decreasing the probability of mission success and increasing the risk to aircrew safety.
- ▶ A significantly reduced U.S. bomber force could not credibly deter aggression nor assure allies and partners.



Answering Questions

With advances in potential adversaries' air defenses, are new bombers a worthwhile investment?

- ▶ Yes, the B-21 is designed to overcome even an advanced adversary's air defenses – but it is important to note that not all bomber missions will require direct penetration through the most concentrated air defense forces.
- ▶ Many of the B-21 bomber's prospective weapons will be able to launch at a standoff distance, allowing the bomber to either continue forward towards other targets or return safely for other missions.
- ▶ The B-21 will impose significant costs on potential adversaries, requiring significant investment in their integrated air and missile defense capabilities.

Why is the low-observable LRSO needed when the low-observable B-21 can carry gravity bombs?

- ▶ The LRSO's unique characteristics will augment the capabilities of nuclear gravity bombs, providing U.S. leadership with a broader range of options.
- ▶ While the B-21 will provide a significant capability improvement over other low-observable aircraft, the LRSO extends the range at which the United States can hold targets at risk within an adversary's territory – even when defended by modern integrated air defense systems.
- ▶ LRSO allows the B-21 to penetrate and launch the missile to fly the remainder of the mission, thereby denying an adversary geographic sanctuaries.
- ▶ If only carrying nuclear gravity bombs, a B-21 bomber would have to fly near or directly over each target. Whereas by employing LRSOs the B-21 could release multiple munitions at optimal points in the flight plan, allowing each cruise missile to maneuver and avoid air defenses. This enables one bomber to strike multiple targets while reducing time in or near an adversary's contested airspace.
- ▶ The deterrent effect of holding at risk what the adversary values both from standoff distance with cruise missiles or directly with gravity bombs is significantly greater than the deterrent effect of having only gravity bombs available.

Why can't conventional long-range cruise missiles substitute for the LRSO?

- ▶ While the operational effectiveness of LRSO in comparison to conventional cruise missiles is important, it is of secondary importance to the LRSO's primary purpose – deterrence – a purpose conventional cruise missiles can only supplement, not replace.
- ▶ The LRSO's greater range, low-observable signature, and nuclear yield will outpace any similar capabilities provided by conventional cruise missiles.
- ▶ In addition, if employed against hardened or mobile targets, the United States would need to launch far more conventional cruise missiles on more missions to – if possible – achieve the same likelihood of effectiveness.

If potential adversaries cannot determine whether a cruise missile is conventional or nuclear, will the LRSO increase the risk of nuclear war?

- ▶ No, the United States has deployed nuclear and conventional air-launched cruise missiles for decades.
- ▶ The United States has launched more than 350 conventional cruise missiles in combat since 1987, and none have been mischaracterized by potential adversaries as nuclear strikes.
- ▶ U.S. planning accounts for many possible adversary perceptions across a number of scenarios and seeks to minimize the chance of mischaracterization – including what weapons it employs, when, and for what targets.

Are bombers major contributors to the cost of the Department of Defense's nuclear modernization budget?

- ▶ No, the latest CBO projections estimate the total costs of bombers at around \$40 billion over the next 10 years, averaging about four billion a year, or less than one percent of the entire annual defense budget.
- ▶ Of the four billion per year, however, CBO attributes only a quarter of the total cost to the nuclear mission.
- ▶ Even if U.S. bombers did not have a nuclear mission, the United States would still need to purchase the same number of bombers to accomplish conventional missions.

