



January 2022

NUCLEAR ENTERPRISE

DOD and NNSA Could Further Enhance How They Manage Risk and Prioritize Efforts

Accessible Version

GAO Highlight

Highlights of [GAO-22-104061](#), a report to congressional committees

Why GAO Did This Study

In the 2018 NPR, DOD described its commitment to planned and ongoing DOD and DOE sustainment and replacement programs to modernize the U.S. nuclear enterprise. DOD's portfolio includes a mix of delivery platforms for nuclear weapons. NNSA's Weapons Activities portfolio involves the research, development, and production infrastructure that produces and maintains nuclear weapons.

A House Armed Services Committee report includes a provision for GAO to assess DOD's and NNSA's development of risk mitigation plans for modernization efforts recommended by the 2018 NPR, and plans for prioritizing these efforts. GAO addresses the extent to which DOD and NNSA have (1) developed processes to manage risks across the U.S. nuclear enterprise and (2) prioritized the programs, projects, and activities within their respective nuclear portfolios. GAO reviewed DOD's and NNSA's guidance, documentation, and practices to assess the processes used to manage risks and how nuclear enterprise systems are prioritized.

What GAO Recommends

GAO is making four recommendations for DOD and NNSA to establish joint risk management processes and for DOD to establish prioritization criteria and then prioritize within DOD's nuclear enterprise. DOD partially concurred with the recommendations directed to it, and NNSA concurred with the intent of the recommendation to it; however, neither identified plans to implement them. GAO continues to believe that the recommendations should be fully implemented.

View [GAO-22-104061](#). For more information, contact Joseph W. Kirschbaum at (202) 512-9971 or KirschbaumJ@gao.gov, Allison Bawden at (202) 512-3841 or BawdenA@gao.gov, or Shelby S. Oakley at (202) 512-4841 or OakleyS@gao.gov.

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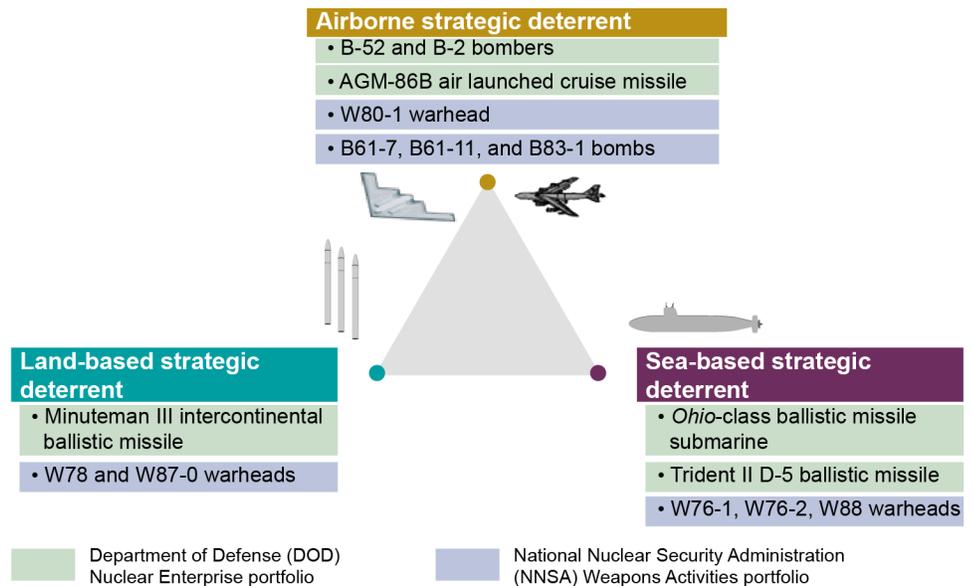
NUCLEAR ENTERPRISE

DOD AND NNSA COULD FURTHER ENHANCE HOW THEY MANAGE RISK AND PRIORITIZE EFFORTS

What GAO Found

The U.S. nuclear enterprise comprises two portfolios managed by the Department of Defense (DOD) and the Department of Energy's (DOE) National Nuclear Security Administration (NNSA). DOD and NNSA have begun implementing some processes to improve risk management within their respective nuclear portfolios. However, they have not established joint processes to periodically identify, analyze, and respond to risks that affect the joint U.S. nuclear enterprise, and report information about these risks to stakeholders. DOD and NNSA have interdependencies among their nuclear programs, including among the weapon and delivery platform systems of the strategic nuclear triad (see fig.). These interdependencies may result in additional risks to individual program schedules and costs. Absent a risk management process for the joint enterprise, senior leaders may not be able to effectively manage risks, make informed resource decisions, or accept risks.

Current Strategic Nuclear Triad Systems



Source: GAO analysis of DOD and NNSA information. | [GAO-22-104061](#)

DOD and NNSA have not prioritized efforts within their respective nuclear portfolios. DOD has identified the nuclear enterprise as one of its strategic priorities, but the department has not established criteria to prioritize among the individual programs, projects, and activities within its nuclear portfolio. By establishing and applying criteria to prioritize its nuclear efforts, DOD would be better prepared to make informed resourcing decisions and respond to changing conditions, and better positioned to develop the next Nuclear Posture Review (NPR). Additionally, by prioritizing among its nuclear efforts, DOD could provide NNSA with information about DOD's priorities for use in NNSA's own portfolio management processes. In June 2021, GAO recommended improvements to NNSA's portfolio management processes including the establishment of prioritization criteria.

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Abbreviations

DOD	Department of Defense
DOE	Department of Energy
FY	Fiscal year
NATO	North Atlantic Treaty Organization
NC3	Nuclear Command, Control, and Communications
NNSA	National Nuclear Security Administration
NPR	Nuclear Posture Review
PMI	Project Management Institute
SLCM	Sea-launched cruise missile

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January 20, 2022

Congressional Committees

In its 2018 *Nuclear Posture Review* (NPR) the Department of Defense (DOD) stated that the U.S. confronts an international security situation that is more complex and demanding than any since the end of the Cold War.¹ In the report, DOD described its commitment to planned and ongoing DOD and Department of Energy (DOE) sustainment and replacement programs to modernize the U.S. nuclear enterprise. These programs include nuclear weapons and the infrastructure to build them, which are the responsibility of DOE, as well as delivery platforms for these weapons, and nuclear command, control, and communications (NC3) capabilities, which are the responsibility of DOD. In addition, DOD identified new initiatives in the NPR to expand the flexibility of U.S. nuclear options—for example, to modify some submarine-launched ballistic missiles to provide a low-yield nuclear option and to pursue a nuclear-armed, sea-launched cruise missile. We summarize the initiatives that DOD identified in the NPR in appendix I of this report.

The U.S. nuclear enterprise can be thought of as comprising two interrelated portfolios.² Each portfolio is a set of programs, projects, and other activities, one managed by DOD and another managed by DOE’s National Nuclear Security Administration (NNSA):³

- DOD’s portfolio, referred to as the DOD Nuclear Enterprise, includes the nuclear delivery platforms comprising the following: land-based intercontinental ballistic missiles, sea-based ballistic missile submarines, airborne nuclear-capable heavy bombers, air- and sea-launched cruise missiles, submarine-launched ballistic missiles, re-entry bodies and re-entry vehicles, and nuclear-capable tactical

¹DOD, *Nuclear Posture Review* (February 2018). The NPR serves as the primary policy document of the U.S. nuclear enterprise, broadly describing the security environment, the roles and types of nuclear weapons the U.S. should field, and information about technical requirements to support the nuclear deterrent.

²A “portfolio” is a collection of projects, programs, subsidiary portfolios, and operations managed as a group to achieve strategic objectives.

³NNSA is a separately organized agency within DOE that is responsible for DOE’s nuclear weapons, nuclear nonproliferation, and naval reactor programs.

aircraft, as well as NC3 systems and the supporting infrastructure and personnel to build, maintain, and control these assets.⁴ DOD also generates the military requirements for the nuclear weapons carried on those platforms.

- NNSA's weapons portfolio, referred to as NNSA's Weapons Activities, includes the nuclear weapons carried on DOD delivery platforms; the research, development, and production infrastructure to produce and sustain these weapons; and the logistics and transportation to securely move them.

In May 2021, we reported on challenges DOD and NNSA face in meeting current and expected operational needs with selected existing nuclear systems until they are retired or replaced.⁵ For example, we reported on the extent to which new DOD and DOE triad acquisition programs face schedule risks and on the implications of any delays. We also reported on the extent to which DOD and DOE have developed strategies to mitigate current and expected challenges with existing or replacement systems. Specifically, we found that DOD will be challenged to meet some operational needs with existing systems through the end of their service lives. We also found that DOD and NNSA are working to replace systems nearing retirement but that these replacement programs face schedule risks that could exacerbate challenges with existing systems. A list of related GAO products is provided at the end of this report.

The House Armed Services Committee report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2020 included a provision for us to assess DOD's and NNSA's development of risk mitigation plans for modernization efforts recommended by the 2018 NPR, and plans for prioritizing these efforts.⁶ In our report we assess the extent to which DOD and NNSA have (1) developed processes to manage risks across the U.S. nuclear enterprise and (2) prioritized the programs, projects, and activities within their respective nuclear portfolios.

For objective one, we reviewed the agencies' respective risk management-related guidance and practices, including annual reports to Congress, to determine what risk management processes they use to

⁴A re-entry vehicle (a term used by the Air Force) or re-entry body (the term used primarily by the Navy) protects a warhead as it re-enters the atmosphere from space.

⁵GAO, *Nuclear Triad: DOD and DOE Face Challenges Mitigating Risks to U.S. Deterrence Efforts*, [GAO-21-210](#) (Washington, D.C.: May 6, 2021).

⁶See H.R. Rep. No. 116-120, at 269-70 (2019).

manage program and portfolio risks. We also interviewed officials to determine which of the agency guidance and practices that we reviewed were used to inform risk management specifically related to each agency's portion of the nuclear enterprise. From the *Standards for Internal Control in the Federal Government*, we determined that internal control components on risk management and quality information were significant to this objective, along with the underlying principles that federal managers should identify, analyze, and respond to risks, and should communicate quality information both internally and externally to achieve the entity's objectives.⁷ We assessed the applicable DOD and NNSA guidance and practices to determine whether they were consistent with these principles.

In addition, we compared the applicable DOD and NNSA guidance and practices with best practices identified from the Project Management Institute's (PMI) *The Standard for Portfolio Management*, which establishes a foundational framework for organizations to view each of their enterprise-level programs, projects, and other activities as contributing to the collective whole rather than as being independent and unrelated.⁸ We focused on the best practices we identified for risk management, which this framework considers to be a leading practice for portfolio management—specifically, that portfolio risk management evaluates risks (including opportunities and threats) at the portfolio level and considers how those risks may impact the achievement of the portfolio's strategic plan and objectives.⁹ This requires consistent monitoring for uncertainty, within both the internal and external environment of the portfolio.¹⁰ We assessed whether the guidance and

⁷GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

⁸The Project Management Institute is a not-for-profit association that, among other things, provides standards for managing various aspects of projects, programs, and portfolios.

⁹Project Management Institute, Inc., *The Standard for Portfolio Management – Fourth Edition* (2017). We summarized the standard and from it identified 13 leading practices for portfolio management. To identify these leading practices, three GAO analysts separately reviewed the standard and agreed on a set of leading practices that adequately captured the standard's portfolio management topics of strategic management, governance, capacity and capability management, stakeholder engagement, value management, and risk management—the latter of which is germane to our report.

¹⁰Risk management, as described by PMI, includes risk management planning, risk identification, risk analysis, and risk response to efficiently and effectively enable portfolio value delivery.

practices were consistent with these leading practices for portfolio management.

Finally, we interviewed officials and reviewed documentation on risk management practices. We interviewed DOD and NNSA officials regarding their risk management processes to determine the extent to which DOD and NNSA have identified, analyzed, and responded to risks that affect the nuclear enterprise as a whole, such as cost increases or schedule delays of modernization programs that may affect the nuclear deterrence mission.¹¹ We also reviewed documentation regarding the role of the Nuclear Weapons Council—a joint DOD and DOE senior-level body responsible for coordinating aspects of the U.S. nuclear enterprise—and DOD’s nuclear enterprise oversight bodies and interviewed DOD and NNSA officials to determine what role these organizations play in risk management for the nuclear enterprise across the departments.

For objective two, we reviewed DOD documentation and interviewed officials to determine how individual nuclear enterprise programs, projects, and other activities are prioritized relative to each other and to non-nuclear DOD programs, projects, and other activities with regard to resources such as funding and personnel. We also reviewed NNSA documentation and interviewed officials to determine how nuclear weapons modernization programs, production of nuclear weapons components and strategic materials, and sustainment or recapitalization of nuclear enterprise facilities are prioritized within NNSA’s portfolio of work. We compared DOD’s and NNSA’s current approaches, as reflected in agency documentation and corroborated by interviews with agency officials, for prioritization of their resources for programs, projects, and other activities in their respective interrelated portfolios with the best practices for portfolio management and portfolio prioritization identified in PMI’s *The Standard for Portfolio Management*. Specifically, leading practices in portfolio management emphasize the importance of prioritizing programs, projects, and other activities within a portfolio to inform investments and aid organizations in optimizing and balancing the portfolio components, including prioritizing programs within their portfolio, to achieve strategic objectives. Appendix II provides a complete list of offices we met with during our review.

¹¹We recently reported on a number of these risks. See [GAO-21-210](#).

We conducted this performance audit from January 2020 to January 2022 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

DOD and NNSA Plans over the Next Decade

The 2018 NPR indicates that, as a result of delaying the recapitalization of the nuclear triad repeatedly, there is now little-to-no margin for further delaying U.S. nuclear modernization programs and upgrading the nuclear weapons infrastructure without harming the nation's deterrent capabilities. In the NPR, DOD described its commitment to sustain and replace nuclear weapons delivery platforms and their infrastructure and NC3 capabilities. The majority of DOD's current nuclear weapon delivery platforms have been extended beyond their original service lives. DOD plans to replace or modernize all of its currently fielded nuclear systems. According to DOD officials, there continues to be limited flexibility in the schedule for fielding these systems without incurring risk to the nuclear deterrent. For example, the 2021 Air Force Posture Statement states that the systems are being fielded on a tight schedule that depends on stable requirements and resources to ensure that the strategic deterrence mission does not fail.¹² In May 2021, the Congressional Budget Office estimated that plans for nuclear forces specified in DOD's 2021 budget requests, submitted to the Congress in February 2020, would cost \$405 billion for the 10-year period from 2021–2030.¹³

NNSA also faces a demanding schedule for sustainment and replacement programs for nuclear weapons. For example, NNSA plans to replace or extend the life of many of its warheads and bombs and to upgrade or replace supporting infrastructure and capabilities, such as its facilities for manufacturing plutonium and uranium parts of nuclear

¹²U.S. Air Force, *United States Air Force Posture Statement Fiscal Year 2021* (2020).

¹³Congressional Budget Office, *Projected Costs of U.S. Nuclear Forces, 2021 to 2030* (May 2021).

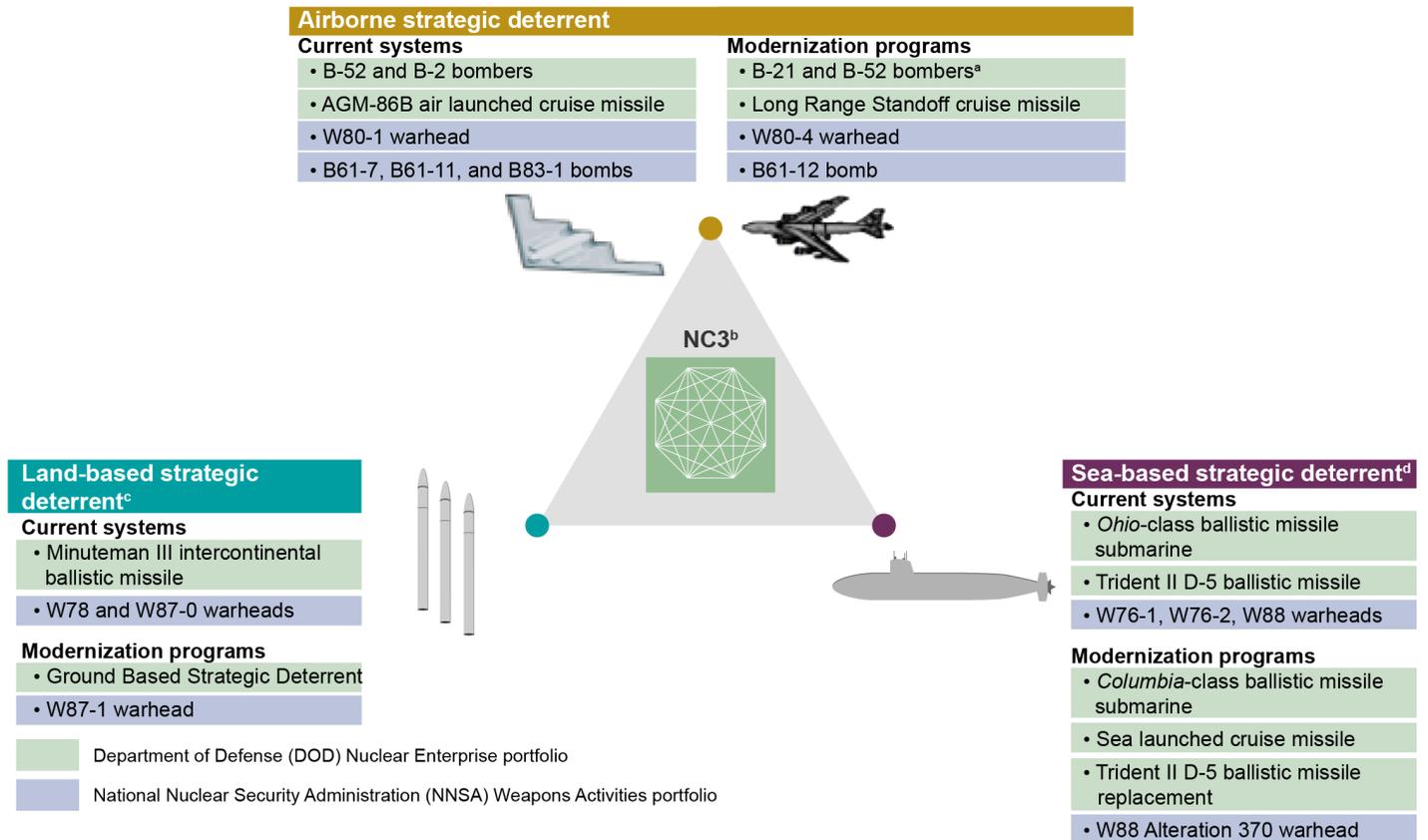
weapons.¹⁴ In May 2021, the Congressional Budget Office estimated that plans for nuclear forces specified in DOE’s 2021 budget requests, submitted to the Congress in February 2020, would cost \$229 billion for the 10-year period from 2021–2030.¹⁵

Together, the capabilities of the DOD Nuclear Enterprise portfolio and the NNSA Weapons Activities portfolio support the three legs of the strategic nuclear triad—airborne, land, and sea. Figure 1 illustrates DOD and NNSA programs that make up the strategic nuclear triad, as well as planned modernization programs to be fielded in the next decade.

¹⁴NNSA’s plans and progress are detailed annually in the Stockpile Stewardship and Management Plan, which summarizes ongoing and planned activities as well as goals and challenges.

¹⁵Congressional Budget Office, *Projected Costs of U.S. Nuclear Forces, 2021 to 2030*.

Figure 1: Current Strategic Nuclear Triad Systems and Planned Modernization Programs



Source: GAO analysis of DOD and NNSA information. | GAO-22-104061

^aThe B-21 bomber will eventually replace the B-2 bomber, but DOD will modernize and continue to operate the B-52 bomber as part of the strategic nuclear triad.

^bNuclear command, control, and communications (NC3) capabilities are used to support planning, situation monitoring, decision making, force management, and communication of force direction between the President and nuclear forces.

^cThe land-based strategic deterrent also includes re-entry vehicles that protect warheads as they re-enter the atmosphere from space.

^dThe sea-based strategic deterrent also includes re-entry bodies that protect warheads as they re-enter the atmosphere from space.

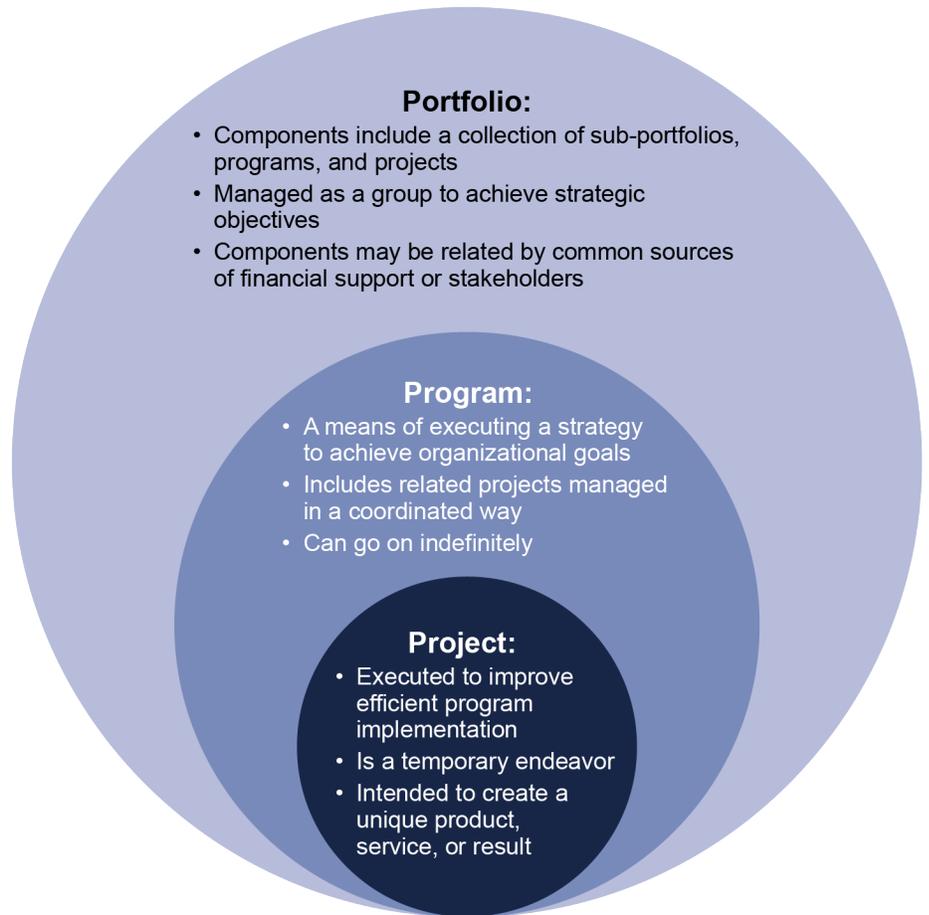
Note: In addition to the strategic nuclear triad, the U.S. maintains nonstrategic nuclear forces: forward-deployed fighters—referred to as dual-capable fighter aircraft—that are able to deliver conventional or nuclear munitions and their associated nuclear weapons. Additionally, in response to the 2018 *Nuclear Posture Review*, the Navy has also fielded a small number of submarine-launched ballistic missiles with low-yield nuclear warheads and the Navy is pursuing a nuclear-armed, sea-launched cruise missile.

Prior to DOD's new nuclear weapon delivery platforms being approved for operation, the Air Force (for the land and air legs of the strategic triad) or the Navy (for the sea leg of the triad) certify that all procedures, equipment, software, personnel, facilities, and warhead delivery platforms meet standards for safety, security, and reliability. This nuclear certification process is required for any significant modification to existing systems as well as for the fielding of new systems. Any changes in schedule that affect the availability of part of a weapon delivery platform also delay the timeline for the certification of the overall system.

Portfolio Management

Portfolio, program, and project management provide a structured means for organizations—such as companies and government agencies—to align and effectively pursue organizational strategic priorities (see fig. 2). PMI established standards that provide guidance that organizations can use to manage various aspects of portfolios, programs, and projects and how they relate to each other.

Figure 2: Relationship between a Portfolio, a Program, and a Project



Source: GAO analysis of Project Management Institute, Inc. leading practices. | GAO-22-104061

Note: In some cases, agencies may define portfolios, programs, and projects differently than the way the Project Management Institute defines these terms.

We have previously reported on the potential benefits of using portfolio management principles to manage a portfolio of projects within federal agencies, including DOD and NNSA. Most recently, in June 2021, we reported on the extent to which NNSA’s management of its Weapons Activities portfolio aligned with leading practices and recommended that NNSA establish a framework that fully defines the portfolio of weapons stockpile and infrastructure modernization programs, projects, and activities; defines its governance roles for this portfolio; and includes portfolio-level selection criteria, prioritization criteria, and performance

metrics.¹⁶ In 2019 we revalidated portfolio management best practices that we had recommended that DOD adopt in 2007 and 2015.¹⁷ Our 2019 report found that portfolio reviews can help DOD increase return on taxpayers' investments in weapon systems in a number of ways, such as by

- helping to ensure investments align with national security and military strategies,
- prioritizing the most important investments,
- selecting the optimum mix of investments,
- identifying and eliminating unwarranted duplication,
- monitoring programs' health to determine whether changes to the portfolio are warranted, and
- determining whether investments are affordable.

Other organizations have also recognized the potential benefit to DOD of implementing portfolio management. For example, section 809 of the National Defense Authorization Act for Fiscal Year 2016 required the Secretary of Defense to establish under the sponsorship of the Defense Acquisition University and the National Defense University an advisory panel on streamlining acquisition regulations (known as the Section 809

¹⁶GAO, *Nuclear Security Enterprise: NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts*, [GAO-21-398](#) (Washington, D.C.: June 9, 2021). NNSA agreed in principle with our recommendation, but stated that it believes sufficient action has already been taken to address the recommendation based on existing documents and processes. We reviewed NNSA's existing documents and processes, and disagree that they fully addressed the recommendation.

¹⁷GAO, *DOD Acquisition Reform: Leadership Attention Needed to Effectively Implement Changes to Acquisition Oversight*, [GAO-19-439](#) (Washington, D.C.: June 5, 2019). We made four recommendations to DOD, including that DOD should identify the types of information needed to select and oversee middle-tier acquisition programs consistently, and clarify the roles and responsibilities of the Office of the Secretary of Defense and the military departments for acquisition oversight. DOD concurred with GAO's recommendations and has taken actions to address three of our recommendations and taken some action to address the fourth recommendation; DOD has not yet identified the specific data needed to assess acquisition reforms, as we recommended. See also, GAO, *Weapon System Acquisition: Opportunities Exist to Improve the Department of Defense's Portfolio Management*, [GAO-15-466](#) (Washington, D.C.: Aug. 27, 2015) and *Best Practices: An Integrated Portfolio Management Approach to Weapon System Investments Could Improve DOD's Acquisition Outcomes*, [GAO-07-388](#) (Washington, D.C.: Mar. 30, 2007).

Panel).¹⁸ One of the panel's goals was to review the acquisition regulations applicable to DOD with a view toward streamlining and improving the efficiency and effectiveness of the defense acquisition process. The panel recommended that DOD implement best practices for portfolio management.¹⁹

DOD's Nuclear Enterprise Portfolio

The DOD Nuclear Enterprise comprises programs, projects, and activities related to ground-, air-, and sea-based weapon delivery platforms; the personnel to operate, maintain, and secure these platforms; associated nuclear munitions; air refueling; and NC3 capabilities.²⁰ While DOD has identified a number of capability portfolios—consistent with DOD Directive 7045.20, *Capability Portfolio Management*—that relate to capabilities that support multiple missions, DOD has not identified the DOD Nuclear Enterprise as one of these formal capability portfolios.²¹ For the purposes of this report, we determined that the DOD Nuclear Enterprise does possess the characteristics of a portfolio of programs, projects, and activities that have shared strategic objectives with a common set of financial support and stakeholders that can benefit from leading practices for portfolio management.

¹⁸Pub. L. No. 114-92, § 809(a) (2015).

¹⁹See Section 809 Panel, *Report of the Advisory Panel on Streamlining and Codifying Acquisition Regulations, Volume 3 of 3, January 2019*. The Section 809 Panel also produced an interim report and two additional volumes of its final report, issuing Volume 1 in January 2018 and Volume 2 in June 2018.

²⁰NC3 capabilities are fielded through a large and complex system comprising numerous land-, air-, and space-based components used to ensure connectivity between the President and nuclear forces. Responsibilities for managing NC3 are distributed among many DOD components including military departments, combatant commands, defense agencies, the Joint Staff, and the Office of the Secretary of Defense. NC3 capabilities provide the President with the means to authorize the use of nuclear weapons in a crisis.

²¹DOD has defined a number of capability portfolios that relate to capabilities supporting multiple missions and that support specific departmental processes. See, e.g., DOD Directive 7045.20, *Capability Portfolio Management*, encl. 2 (Sept. 25, 2008) (Incorporating Change 2, Effective June 21, 2019). Many of these capability portfolios support the DOD Nuclear Enterprise, among other mission sets—for example, Battlespace Awareness, Logistics, and Command and Control. DOD has also identified other portfolios that are not among those specifically identified in DOD Directive 7045.20, including the NC3 enterprise capability portfolio.

NNSA's Weapons Activities Portfolio

As we recently reported, NNSA is in the early stages of the process of formally establishing the various programs, projects, and activities related to the portion of the U.S. nuclear enterprise that it oversees as a formal portfolio.²² NNSA's Weapons Activities portfolio includes all nuclear weapons activities involved in maintaining and modernizing the stockpile, as well as all activities associated with modernizing and maintaining the research and production infrastructure on which stockpile programs depend. In particular, NNSA's Weapons Activities portfolio includes all programs, projects, and activities that are funded through the Weapons Activities appropriations account and managed by several of NNSA's offices, including the Office of Defense Programs; Office of Safety, Infrastructure, and Operations; Office of Defense Nuclear Security; and Office of Acquisition and Project Management.

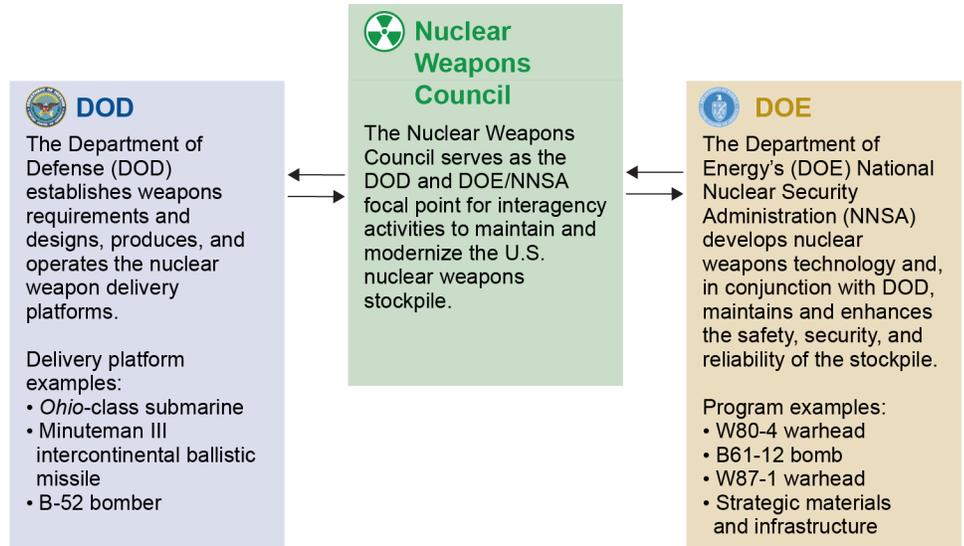
Role of the Nuclear Weapons Council

The Nuclear Weapons Council is a joint DOD and DOE senior-level body established by statute and responsible for coordinating aspects of the U.S. nuclear enterprise.²³ The Nuclear Weapons Council reviews and endorses military requirements provided by DOD and works to align DOD's nuclear weapon delivery platforms—for example, sea-launched ballistic missiles deployed on *Ohio*-class submarines or ground-based Minuteman III intercontinental ballistic missiles—and NNSA's nuclear warheads and bombs. The Nuclear Weapons Council is the focal point for interagency activities that affect the portfolios of both DOD and NNSA. Figure 3 depicts the role of the Nuclear Weapons Council relative to DOD's and DOE's respective roles.

²²[GAO-21-398](#).

²³10 U.S.C. § 179.

Figure 3: Role of the Nuclear Weapons Council Relative to DOD’s and DOE’s Respective Roles



Source: GAO analysis of DOD and NNSA information. | GAO-22-104061

The Nuclear Weapons Council regularly participates in the development and submission of reports, representing both DOD and DOE input, on individual aspects of the nuclear weapons’ safety, security, reliability, and effectiveness. The Nuclear Weapons Council currently coordinates the fulfillment of five annual reports that assess risk to some elements of the nuclear enterprise:

- The Nuclear Weapons Stockpile Memorandum and Requirements and Planning Document—provides the President a proposed stockpile plan that specifies the size and composition of the stockpile for a projected multiyear period;
- The Report on Stockpile Assessments—contains the individual assessments of the three directors of NNSA’s nuclear weapons laboratories and the Commander of U.S. Strategic Command of the safety, reliability, and performance of each warhead type in the nuclear stockpile;²⁴

²⁴The nuclear weapons laboratories are Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories. According to NNSA officials, Sandia National Laboratories also prepares the Weapon Reliability Report as one of the major deliverables for the nuclear security enterprise. The U.S. Strategic Command is the DOD combatant command responsible for planning for nuclear operations.

- The Joint Surety Report—assesses, at a minimum, nuclear weapon safety, security, control, emergency response, inspection and evaluation programs, and the impact of budget constraints on required improvement programs;
- The Budget Certification Letter—certifies whether the amounts requested for NNSA for the upcoming fiscal year, and anticipated for the following 4 fiscal years, are sufficient to meet the Nuclear Weapons Council stockpile requirements, which are based on DOD's operational requirements; and
- The Certification of the NNSA Pit Production Strategy—certifies that the plutonium pit production plan of NNSA is on track to meet military and statutory requirements as well as all milestones and deliverables described in planning documents.

The Council also has a biennial requirement to assess the NNSA long-range Stockpile Stewardship and Management Plan.

DOD and NNSA Have Begun to Improve Risk Management for Their Nuclear Portfolios but Lack Joint Processes for Managing Risks across the U.S. Nuclear Enterprise

DOD Has Begun Implementing Some Portfolio-Level Risk Management Processes

DOD has established a number of processes throughout the department that are relevant to guiding its management of risk to individual programs within the DOD Nuclear Enterprise portfolio. Among these processes, we identified the following five collections of processes as being the most relevant to the risk management of the portfolio: (1) DOD's Planning, Programming, Budgeting, and Execution Process; (2) the Chairman of the Joint Chiefs of Staff's annual risk assessment; (3) organizations within DOD that contribute their own processes to manage risk; (4) DOD's weapon system acquisition process; and (5) the Secretary of Defense Nuclear Transition Review.

First, DOD's Planning, Programming, Budgeting, and Execution Process—the annual resource allocation process for DOD—involves the assessment of program risks to aid the department in balancing

necessary warfighting capabilities with risk, affordability, and effectiveness.²⁵ Additionally, for fielded systems, DOD reports on risks as part of its regular reporting on the department's readiness.²⁶ DOD reports the readiness of its forces to meet operational requirements and accomplish assigned tasks through a variety of mechanisms, including the Defense Readiness Reporting System—which operational units use to periodically report information about their readiness to perform assigned missions and which highlights deficiencies in training, personnel, equipment, ordnance, and supply—and the *Quarterly Readiness Report to Congress*. DOD also monitors the risks associated with individual fielded weapon systems through metrics like mission capability rates, aircraft and parts availability, unscheduled maintenance rates, and maintenance delays.²⁷

Second, the Chairman of the Joint Chiefs of Staff must provide an annual risk assessment to the Secretary of Defense and to Congress about the strategic risks to national interests and military risks in executing the National Military Strategy. Specifically, the Chairman's Risk Assessment provides a risk baseline that informs the Chairman's assessment and advisory actions throughout the year. Additionally, DOD members of the Nuclear Weapons Council prepare the Annual Report on the Nuclear Weapons Stockpile of the United States (also known as the Annual Stockpile Report) and the biennial Report on Platform Assessments, which includes information on any risks to meeting mission or capability requirements for programs within the DOD Nuclear Enterprise.

Third, DOD has a number of organizations with processes to manage risk to its nuclear programs, projects, and activities, examples of which are shown in table 1.

²⁵See DOD Directive 7045.14, *The Planning, Programming, Budgeting, and Execution (PPBE) Process* (Jan. 25, 2013) (Incorporating Change 1, Aug. 29, 2017).

²⁶"Readiness" is defined as the ability of U.S. military forces to fight and meet the demands of assigned missions. The U.S. Strategic Command is responsible for developing operational plans for nuclear operations to support the national strategy, and these operational plans set the requirements for DOD's nuclear capabilities.

²⁷We have previously reported on limitations of DOD's readiness reporting with regard to nuclear forces. GAO, (U) *Nuclear Forces Readiness: Incomplete Readiness Reporting, Aging Delivery Systems, and Potential Delays in Replacement Systems Put Deterrent at Risk*, GAO-19-12C (Washington, D.C.: Mar. 20, 2019) (SECRET//FORMERLY RESTRICTED DATA//NOFORN).

Table 1: Examples of Organizations with Processes for Managing Risk to the Department of Defense (DOD) Nuclear Enterprise

Air Force	<ul style="list-style-type: none"> According to Air Force officials, Air Force Global Strike Command, Air Force Materiel Command, Air Force Nuclear Weapons Center, and Air Force Life Cycle Management Center participate in risk management by reviewing risk information and making trade-offs within the nuclear portfolio if there are issues, and determine where to mitigate or accept risk. Additionally, according to officials, the Air Force also maintains visibility over risk through multiple governance bodies.
Navy	<ul style="list-style-type: none"> The Navy Nuclear Deterrent Mission Oversight Council addresses long-term enduring issues affecting the Navy's nuclear enterprise and identifies and monitors risks associated with those issues. According to Navy officials, the Office of the Chief of Naval Operations Undersea Warfare Division and the Strategic Systems Programs office monitor risks associated with the sustainment and modernization of the Navy's ballistic missile submarines.
U.S. Strategic Command	<ul style="list-style-type: none"> U.S. Strategic Command is responsible for planning for nuclear operations and advocating for nuclear capabilities. One mechanism the command uses to discuss major risks to delivery platforms and weapons systems, according to Strategic Command officials, is an annual Nuclear Planning Factors Conference. U.S. Strategic Command's Capability and Resource Integration office identifies and prioritizes capability shortfalls and submits those priorities to the Joint Staff via the annual Comprehensive Joint Assessment to support the Chairman of the Joint Chiefs of Staff's assessment responsibilities, according to Strategic Command officials. The Commander of U.S. Strategic Command is designated as the nuclear command, control, and communications (NC3) enterprise lead with increased responsibilities for the operation and requirements of NC3 systems. In support of these responsibilities, a NC3 Enterprise Center was established; the center helps oversee NC3 operations and assess comprehensive operational and technical risk.

Source: GAO analysis of DOD information. | GAO-22-104061

Fourth, DOD has established additional policies and processes relevant to managing risks to individual new nuclear programs, such as those for delivery platform replacements, as part of its weapon system acquisition process. DOD guidance on major capability acquisition directs program managers to present top program risks and associated risk mitigation plans at, among other times, all relevant decision points and milestones during the acquisition process. Program managers are also directed to consider specific risk management techniques—such as prototyping, modeling and simulation, and independent risk assessments by outside

subject matter experts—when developing the acquisition strategy for a program.²⁸

However, we have previously reported on the shortfalls of risk management in DOD’s acquisition system, including on issues related to nuclear programs, particularly in cases where DOD may not be fully utilizing its own program acquisition practices to help inform key decisions or take steps to mitigate identified risks. For example, in January 2021 we reported on cost and schedule risks for the *Columbia*-class ballistic missile submarine.²⁹ We found that the Navy modified its design contract for the program before the completion of a key DOD oversight event intended to review program cost and schedule risks. Instead, the program established a contracting approach—including pricing and performance incentives to mitigate risk—before key information was reviewed to help inform such a decision. Additionally, the Navy submitted its budget request for fiscal year 2021 that was lower than its current estimate for the *Columbia*-class program; as a result, the program will likely need more funding in future fiscal years to meet its planned costs. To address cost and schedule risk in the program, we recommended that the Navy provide updated cost and supplier information to Congress and reassess when to seek additional inspections at supplier facilities.³⁰ DOD’s proclivity to accept risk has contributed to programs falling short of cost,

²⁸DOD Instruction 5000.85, *Major Capability Acquisition*, app 3C, para. 3C.3.d(1) (Aug. 6, 2020). See also DOD, *Risk, Issue, and Opportunity Management Guide for Defense Acquisition Programs* (Jan. 2017), which provides advice to programs on the identification, analysis, and management of risks, issues, and opportunities. See also 10 U.S.C. § 2431b. As we have previously reported, DOD’s major capability acquisition pathway is designed to support major defense acquisition programs, major systems, and other complex acquisitions. GAO, *Weapon Systems Annual Assessment: Updated Program Oversight Approach Needed*, [GAO-21-222](#) (Washington, D.C.: June 2021).

²⁹GAO, *Columbia Class Submarine: Delivery Hinges on Timely and Quality Materials from an Atrophied Supplier Base*, [GAO-21-257](#) (Washington, D.C.: Jan. 14, 2021).

³⁰The Navy concurred with these recommendations and the Navy has provided updated information to Congress addressing two of our three recommendations. The Navy has indicated its intent to complete steps to implement the final recommendation. See [GAO-21-257](#).

schedule, and performance expectations.³¹ As a result of these consistently poor outcomes, DOD weapon system acquisition has been on our high-risk list since 1990.³²

Fifth, in January 2021, the Acting Secretary of Defense created the Secretary of Defense Nuclear Transition Review to institutionalize a process of quarterly briefings on the DOD Nuclear Enterprise.³³ DOD officials told us that, since November 2019, they have provided quarterly briefings to the Secretary of Defense on risks associated with the transition of legacy nuclear enterprise systems to replacement systems in response to programmatic risks and the need for a coordinated approach for managing this transition. Officials said that the Secretary of Defense Nuclear Transition Review will assess risks associated with the DOD Nuclear Enterprise program transitions and monitor the overall health of the DOD Nuclear Enterprise.³⁴ This new organization's scope is limited to the DOD Nuclear Enterprise portfolio; however, according to DOD officials, it will maintain awareness of NNSA program status and DOD's assessment of joint integration risks. According to agency officials, the details of how the organization will operate and what processes it will use have not been finalized. We recently recommended that DOD document

³¹We have found that U.S. weapon acquisition programs often take significantly longer, cost more than promised, and deliver fewer quantities and capabilities than planned. It is not unusual for time and money to be underestimated by 20 to 50 percent. GAO, *Defense Acquisitions: Joint Action Needed by DOD and Congress to Improve Outcomes*, [GAO-16-187T](#) (Washington, D.C.: Oct. 27, 2015). For example, in reviewing Navy shipbuilding, we found that ship classes over the last 10 years have consistently not achieved cost, schedule, quality, and performance goals. GAO, *Navy Shipbuilding: Past Performance Provides Valuable Lessons for Future Investments*, [GAO-18-238SP](#) (Washington, D.C.: June 6, 2018).

³²DOD is implementing significant changes in an effort to improve weapon system outcomes. However, considerable work remains, and until it is completed DOD's ability to quickly deliver capabilities to the warfighter is hindered. GAO, *High-Risk Series: Dedicated Leadership Needed to Address Limited Progress in Most High-Risk Areas*, [GAO-21-119SP](#) (Washington, D.C.: Mar. 2, 2021).

³³Acting Secretary of Defense Memorandum, *Institutionalization of the Quarterly Secretary of Defense Nuclear Transition Review* (Jan. 14, 2021). According to DOD officials, the creation of the Secretary of Defense Nuclear Transition Review elevates the oversight of the DOD Nuclear Enterprise to the Secretary's level.

³⁴In 2014, the Secretary of Defense created the Nuclear Deterrent Enterprise Review Group to address problems resulting from the lack of comprehensive oversight of the DOD Nuclear Enterprise portfolio. According to DOD officials, the Secretary of Defense Nuclear Transition Review is assuming the responsibilities of the Nuclear Deterrent Enterprise Review Group.

and communicate to stakeholders the roles and responsibilities of the Secretary of Defense Nuclear Transition Review and its supporting organizations, and identify how this new organization will communicate with other organizations that have oversight responsibilities for portions of the nuclear enterprise.³⁵ DOD concurred with these recommendations and plans to take action to address them.

NNSA Has Begun Creating Some Portfolio-Level Risk Management Processes

We identified the following processes and efforts as being the most relevant to NNSA's risk management of its Weapons Activities portfolio: (1) NNSA's risk management processes for its individual programs and projects, including weapon modernization programs and infrastructure recapitalization projects; (2) NNSA's discussion of risk in its Stockpile Stewardship and Management Plan; (3) NNSA's efforts to establish portfolio-level risk management processes; and (4) NNSA's efforts to begin examining supply chain risks.

First, NNSA and DOE already have established processes that focus on managing risks to individual programs, projects, and activities, including those within the Weapons Activities portfolio. For example, NNSA has established processes for managing risks to life extension and modernization programs that refurbish or modernize nuclear weapons. Specifically, one NNSA instruction on program management indicates that life extension program officials are to develop a risk management plan and discusses the use of a project risk register.³⁶ In July 2020, we found that NNSA had identified a range of risks facing the W80-4 life extension program, including risks related to developing new technologies and manufacturing processes and reestablishing dormant production

³⁵GAO, *Defense Nuclear Enterprise: DOD Can Improve Processes for Monitoring Long-Standing Issues*, [GAO-21-486](#) (Washington, D.C.: Aug. 18, 2021).

³⁶NNSA, *DP Program Execution Instruction: NA-10 Program Management Tools and Processes* (revision 2, June 2019).

capabilities.³⁷ We also found that NNSA is managing these risks using a variety of processes and tools, such as the use of a classified risk database.

Similarly, DOE and NNSA have also established processes for managing risks to projects that recapitalize or replace infrastructure that supports the sustainment and modernization of nuclear weapons. Specifically, under DOE's order on project management for capital assets, project managers are required to perform risk assessments, which should identify critical technical, performance, schedule, and cost risks.³⁸ Once risks are identified and prioritized, risk mitigation strategies and actions are documented in a risk register, which should be evaluated at least on a quarterly basis.

Second, NNSA issues the Stockpile Stewardship and Management Plan annually, which discusses broad risks facing the Weapons Activities portfolio, as well as risks specific to each major program. For example, the fiscal year 2021 plan mentions several areas of overarching risks, including modernizing and recapitalizing existing infrastructure that must remain operational to support weapons modernization work, and re-establishing full-rate production capabilities for various warhead components to meet planned warhead deliveries.

Third, as we reported in June 2021, senior NNSA officials only recently identified NNSA's activities related to the nuclear enterprise as a single portfolio.³⁹ As a result, NNSA has not established formal processes at the portfolio level for managing risks, but NNSA officials said they are beginning to develop some risk management processes at a portfolio level. As part of this development, officials said that NNSA is working to better identify risk across programs in the portfolio by examining program

³⁷[GAO-20-409](#). However, we also found in that report that NNSA had introduced potential risk to the program by adopting a date (September 2025) for the delivery of the program's first production unit that is more than 1 year earlier than the date projected by the program's own schedule risk analysis process. We recommended that NNSA adopt a W80-4 program first production unit delivery date based on the program's schedule risk analysis, or document its justification for not doing so. NNSA disagreed with our recommendation.

³⁸DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets* (Nov. 29, 2010) (change 6 Jan. 12, 2021). The order generally applies to capital asset projects having a total project cost greater than \$50 million.

³⁹[GAO-21-398](#).

interfaces. This process is intended to identify risks at the interface between weapons modernization programs and programs for managing the infrastructure and strategic materials—such as uranium, plutonium, and other components—needed for these modernization programs. NNSA officials said they review these programmatic and interface risks at quarterly program reviews and send updates to the NNSA Administrator's office, at least quarterly.⁴⁰

For example, NNSA officials noted that NNSA has identified several risks to the ongoing W87-1 modernization program as a result of technical or schedule risks in other supporting programs. These include NNSA's ability to produce plutonium pits in the quantities needed for the program's schedule, NNSA's ability to process the uranium and lithium required, the supply of insensitive high explosive material, and the recapitalization of equipment and replacement or modernization of facilities needed for the production of the warheads. Although the W87-1 modernization is a modification of existing warhead designs, producing it will require the new production of components with strategic materials in facilities that are currently being recapitalized or replaced and with processes that are being reestablished after years of disuse. Synchronizing the execution of all of these efforts is an identified risk that NNSA reported on to Congress in May 2020, according to NNSA officials.

According to NNSA officials, as part of its overall risk management efforts, NNSA is also working to create a more standardized risk management process for programs, projects, and activities, which will help with managing risk at the portfolio level. NNSA officials said that the Office of Defense Programs has formed a working group comprising risk managers from the federal workforce and management and operating contractors (on whom NNSA relies to operate the national laboratories and nuclear weapons production facilities). This working group is refining and improving project and program risk management to make the process more consistent between various programs, projects, and

⁴⁰Another effort uses systems engineering software to identify and map interfaces between programs to provide an overview of the whole nuclear enterprise. NNSA officials said that, in the early stages of this effort, they are focusing on identifying interfaces between pilot areas including strategic materials. By identifying and mapping program interfaces, risks in one program that may impact other, interdependent programs can be identified, allowing a more complete understanding of potential risk to the overall enterprise. Officials said that the goal is to integrate the interface identification and mapping with the NNSA-wide enterprise risk identification and management framework being developed with support from the Risk Management Working Group.

activities within the Office of Defense Programs. The working group recently published a guide that provides a framework and general guidance for risk management called the *National Nuclear Security Administration Risk Management Guide for Defense Programs*.⁴¹ The guide notes that the processes described are equally applicable to portfolios, programs, projects, operations, and small activities, and should be tailored accordingly. Additionally, according to NNSA officials, the working group is developing a portfolio risk management process to monitor risk across multiple programs in the portfolio. According to NNSA officials, after the Office of Defense Programs has established the methodology for the process and piloted it, the office will evaluate the pilot effort and take steps to implement lessons learned into the final risk management requirements for the portfolio. Officials said that the goal is to have standardized guidelines for categorizing risk (and its likelihood of occurring) so that NNSA better understands the consequences of risks across the enterprise; however, they noted that it would take some time to develop and integrate these risk management practices throughout the portfolio.

Fourth, consistent with a provision in the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, NNSA officials said they have also begun to examine more closely supply chain risk and recently established a framework for monitoring the NNSA industrial base for nuclear weapons materials and components.⁴² This effort has begun at the program level, and, according to NNSA officials, is moving toward understanding risk across the portfolio. Ultimately, the goal of the effort is to have a portfolio-level view of supply chain and industrial base risk, and NNSA officials acknowledged that achieving this goal will take time and additional resources.

⁴¹NNSA, *National Nuclear Security Administration Risk Management Guide for Defense Programs* (Feb. 5, 2021).

⁴²Pub. L. No. 116-283, § 3113 (2021). According to officials, the industrial base monitoring framework is supported by pillars of activities—specifically supply chain, facilities and operations, transportation and logistics, and workforce. This integrated approach to monitoring is designed to illuminate cross-cutting risks.

DOD and NNSA Have Established Some Joint Risk Management Processes at the Program Level but Not at the Enterprise Level

As we have previously reported, there are many interdependencies among different DOD and NNSA nuclear programs.⁴³ For example, each leg of the strategic nuclear triad is composed of both a weapon delivery platform acquired and operated by components of DOD and nuclear warheads or bombs produced by NNSA. Any changes made to these individual programs, from changes in software or operating procedures to the fielding of new platforms, have implications for all of the related programs and components. There can be additional complications presented by resources shared across the legs of the triad. For example, for its weapon delivery platforms, the Air Force relies on the same, limited number of personnel to conduct nuclear certification.⁴⁴ Similarly, NNSA relies on the same infrastructure and personnel within its complex to produce materials and components needed for every weapon modernization program.

These interdependencies may result in additional risks to individual program schedules and costs as well as in additional risks to the nuclear enterprise's ability to effectively execute the nuclear deterrence mission. As we have previously reported, every nuclear triad replacement program faces the prospect of delays due to program-specific and DOD- and DOE-wide risk factors, including an insufficient DOD nuclear certification workforce, limited DOE infrastructure capacity, and supply-chain risks. If realized, these delays would prolong DOD's operation of existing triad systems and could result in delays to DOE programs. Further, fielding delays for replacement delivery platforms and weapons could exacerbate challenges with the existing triad systems.⁴⁵ For example, if DOD and NNSA determine a need to sustain the B83-1 beyond its current planned retirement date, NNSA may have to use its limited capacity to do so; therefore, there would be less capacity available for other weapon modernization programs, which will potentially affect their schedules.

⁴³[GAO-21-210](#).

⁴⁴According to Air Force officials, the Air Force has recognized the risks associated with nuclear certification and taken some steps to address these risks.

⁴⁵See [GAO-21-210](#).

Through the Nuclear Weapons Council, DOD and NNSA have established a joint process for managing risks at a program level for each nuclear weapon life extension program. The Nuclear Weapons Council facilitates cooperation and coordination between DOD and NNSA on nuclear weapons stockpile issues, reaches consensus on those issues, and establishes priorities between DOD and NNSA to align their efforts as they carry out their responsibilities for managing the U.S. nuclear weapons stockpile.⁴⁶ According to DOD and NNSA officials, the regular meetings of the Council, its Standing and Safety Committee, and other action officer and working group meetings aid the understanding of opportunities and challenges across programs. These officials noted that while it is always a challenge to see the broad, integrated picture across the U.S. nuclear enterprise, the various meetings at all levels provide fora for discussing these opportunities and challenges as they arise.

However, DOD and NNSA have not established a joint process at an enterprise-wide level to identify, assess, and respond to risks across the U.S. nuclear enterprise and report this information to the relevant stakeholders. Instead, existing joint DOD-NNSA processes for managing and communicating risks—such as those processes that occur in the context of the Nuclear Weapons Council—are focused primarily on program-level risks. For example:

- DOD and NNSA each have department-specific guidance for implementing the Nuclear Weapons Council’s joint process for managing nuclear weapon life extension programs.⁴⁷ As part of this process, for each nuclear warhead or bomb type, DOD and NNSA use joint groups called “project officer groups” to coordinate activities between the departments, ensure the development and assure the compatibility of warheads with their designated delivery platforms, and facilitate communication about programmatic risks throughout the life of each program. However, these project officer groups generally focus on risks affecting a particular life extension program and its

⁴⁶GAO, *Nuclear Weapons Council: Enhancing Interagency Collaboration Could Help with Implementation of Expanded Responsibilities*, [GAO-15-446](#) (Washington, D.C.: May 21, 2015).

⁴⁷Nuclear Weapons Council, *Procedural Guideline for the Phase 6.X Process* (Dec. 16, 2015); NNSA Supplemental Directive 452.3-2, *Phase 6.X Process* (Jan. 19, 2017); DOD Directive 3150.01, *Joint DOD-Department of Energy/National Nuclear Security Administration (DOD-DOE/NNSA) Nuclear Weapon Life-Cycle Activities* (Aug. 4, 2016) (incorporating change 1, Aug. 31, 2018).

associated platform rather than on risks affecting both NNSA and DOD at a larger, enterprise-wide level.

- The Nuclear Weapons Council also regularly submits reports to the President and congressional committees, on behalf of both DOD and DOE, on individual aspects of nuclear weapons safety, security, reliability, and effectiveness. These reports address elements of risk to specific aspects of the nuclear enterprise, but they are focused mainly on specific program-related risks and do not report more generally on the risks to or health of the entire enterprise.

According to *Standards for Internal Control in the Federal Government*, management should identify, analyze, and respond to risks and should communicate quality information both internally and externally to achieve the entity's objectives.⁴⁸ Additionally, PMI's standards for portfolio management identify the importance of portfolio risk management. PMI's standards note that portfolio risk management extends beyond project risk management and that portfolio risk management allows for the balancing of portfolio components through an organized risk assessment process.

Effective risk management of the U.S. nuclear enterprise as a whole requires comprehensive risk assessments that take into account all program interdependencies that exist between and within the DOD and NNSA portfolios, as well as agreement on how to manage those shared risks. For example, DOD and NNSA might have different assessments regarding the implications or relative importance of addressing any given risk; DOD or NNSA might be willing to mitigate or accept certain risks that the other cannot.⁴⁹ In the absence of a joint process for identifying and assessing risks for the U.S. nuclear enterprise—that incorporates information about risks identified within DOD's and NNSA's respective portfolios—and communicating these risks to all stakeholders, senior leaders will not be in a position to effectively manage these risks or make fully informed decisions to more efficiently resource key efforts or accept risks.

⁴⁸[GAO-14-704G](#).

⁴⁹For example, we have previously reported that if NNSA does not make sufficient W87-1 pits to sustain W87-1 warhead production, the W87-1 program's initial notional concept for mitigating the risk to production would not meet military requirements and would be costly. GAO, *Nuclear Weapons: NNSA Should Further Develop Cost, Schedule, and Risk Information for the W87-1 Warhead Program*, [GAO-20-703](#) (Washington, D.C.: Sept. 9, 2020).

Without reporting any risks and associated mitigation efforts across the enterprise internally and externally to relevant stakeholders, decision makers will not have a full understanding of these risks or of what actions might be necessary to mitigate them. For example, in May 2021 we reported that, under the current retirement schedule for the *Ohio*-class submarine, if the *Columbia*-class does not achieve the initial fielding date of fiscal year 2031 as planned—or if any of the subsequent deliveries planned through 2040 are delayed—the Navy will have insufficient submarines available to meet the U.S. Strategic Command operational requirement. If such a delay were to occur, DOD could increase its reliance on the other legs of the triad, but with all three legs of the triad undergoing major modernization efforts for nuclear weapons and delivery platforms, there are increased risks across the enterprise as we reported in May 2021.⁵⁰ *Ohio*-class sustainment program officials said that options to further extend the *Ohio*-class would be costly; however, according to DOD officials, the Navy has proposed the potential of a life extension for a limited number of *Ohio*-class submarines as of August 2021.

DOD and NNSA Have Not Prioritized Programs, Projects, and Activities within Their Respective Nuclear Portfolios

DOD has identified the DOD Nuclear Enterprise portfolio as one of its strategic priorities, but the department has not established criteria to prioritize among the individual programs, projects, and activities within this portfolio. Prioritization within its portfolio would allow DOD to be more responsive to changing conditions, such as if there are fewer resources available than currently planned, cost increases, or additional delays in the fielding of replacement programs. NNSA relies on DOD to establish overall U.S. nuclear enterprise priorities; however, NNSA does not currently have a framework for establishing priorities in its Weapons Activities portfolio, and different NNSA offices rely on different processes for prioritization of programs, projects, and activities. In June 2021, we recommended that NNSA establish such a portfolio management framework that would define prioritization criteria, among other things.

⁵⁰See [GAO-21-210](#).

DOD Has Identified the DOD Nuclear Enterprise Portfolio as One of Several Priorities but Has Not Established Criteria for Prioritizing within the Portfolio

DOD Nuclear Enterprise Portfolio Is One of Several Departmental Priorities

DOD has identified the DOD Nuclear Enterprise as one of several strategic priorities. The NPR serves as the primary policy document of the U.S. nuclear enterprise. It describes the security environment, the roles and types of nuclear weapons the U.S. should field, and technical requirements to support the nuclear deterrent. In the 2018 NPR, DOD noted that maintaining an effective nuclear deterrent is a top priority—including continuing sustainment and replacement programs to modernize the U.S. nuclear enterprise as well as pursuing the new initiatives of modifying some submarine-launched ballistic missiles to provide a low-yield nuclear option and pursuing a nuclear-armed, sea-launched cruise missile.

DOD has a variety of oversight and budgeting processes it can use to prioritize individual programs, projects, and activities—including nuclear enterprise programs, projects, and activities. For example, the Joint Requirements Oversight Council assists the Chairman of the Joint Chiefs of Staff in assessing joint military capabilities and identifying, approving, and prioritizing gaps in those capabilities to meet applicable requirements in the National Defense Strategy. In addition, DOD's Planning, Programming, Budgeting, and Execution process is designed to, among other things, provide DOD with the most effective mix of forces, equipment, manpower, and support attainable within fiscal constraints and facilitate the alignment of resources to prioritized capabilities. DOD officials said they consider the high priority of the nuclear mission when making decisions about resource tradeoffs. For example, officials from the Office of the Under Secretary of Defense (Comptroller) said they

consider the high priority of the nuclear enterprise relative to other missions when creating the department's budget submissions.⁵¹

The Navy and the Air Force have also taken some actions to prioritize the nuclear mission. For example, the Navy has taken steps to prioritize the nuclear mission within its shipyard workforce. In 2018, the DOD Office of Inspector General reported that the Secretary of the Navy and the Chief of Naval Operations had formally designated strategic nuclear deterrence as the Navy's top priority.⁵² According to the report, doing so enabled the Navy to focus efforts on increasing workforce size at shipyards, accelerating and improving shipyard workforce training, improving ballistic missile submarines' maintenance procedures and schedules, and reducing the time required for engineered refueling overhauls of ballistic missile submarines. The Navy has also prioritized the acquisition of new ballistic missile submarines over attack submarines. Similarly, since 2014, the Air Force has increased the number of personnel assigned to the nuclear mission, including adding security forces to its nuclear units and adding nuclear acquisition personnel.

However, the nuclear mission must compete with other initiatives also identified as high national security priorities in strategic guidance. DOD relies on three main strategic guidance documents:

- **National Security Strategy.** Issued by the White House, it outlines worldwide interests, goals, and objectives that are vital to the national security of the U.S. and how the administration plans to address them.
- **National Defense Strategy.** Signed by the Secretary of Defense, it is DOD's primary strategy document, a strategic framework that guides how DOD will prioritize among identified threats and missions and how DOD will make resource investments. It provides a foundation for all other strategic guidance in the department.

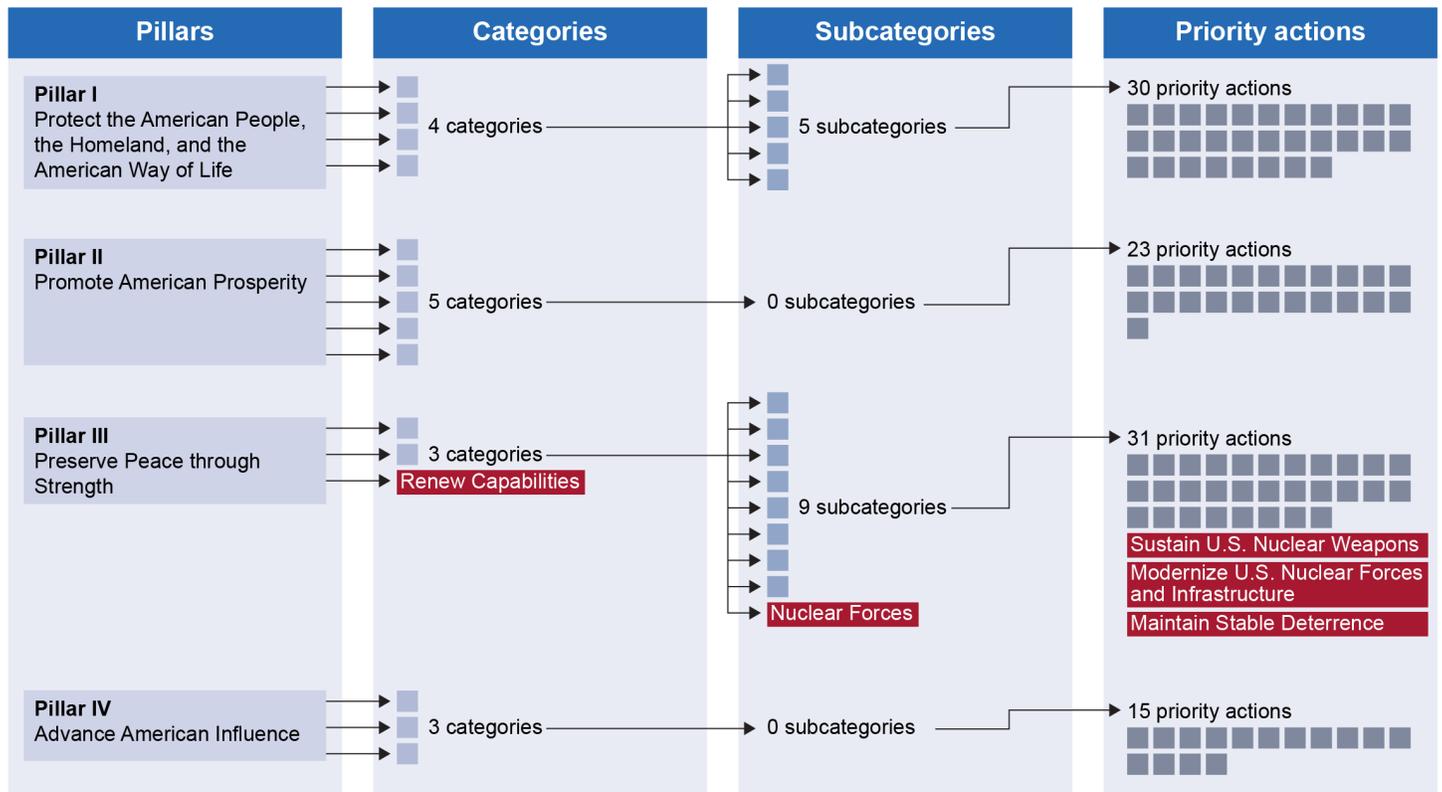
⁵¹However, according to these officials, in fiscal year 2019 DOD reprogrammed some funds that were originally intended to support the sustainment of the Minuteman III and Air-Launched Cruise Missile programs to instead support counter drug operations along the southern border, which is also considered a national priority. According to DOD officials, these funds were no longer needed for the original programs in fiscal year 2019 because of a slip in the production schedule in one case and cost savings in the other.

⁵²DOD, Office of Inspector General, *Evaluation of Nuclear Ballistic Missile Submarine (SSBN) Sustainment*, DODIG-2018-127 (June 15, 2018).

- **National Military Strategy.** Signed by the Chairman of the Joint Chiefs of Staff, it translates the National Security Strategy and National Defense Strategy into more specific military direction.

Of the almost 100 priority actions in the *2017 National Security Strategy*, three pertain directly to the DOD Nuclear Enterprise. Similarly, the DOD Nuclear Enterprise is one of many priorities included in the *2018 National Defense Strategy*.⁵³ Figure 4 shows the nuclear priorities included in the *2017 National Security Strategy*.

Figure 4: Nuclear Priorities Reflected in the 2017 National Security Strategy



Source: GAO analysis of Department of Defense information. | GAO-22-104061

⁵³In March 2021, the Biden administration issued *Interim National Security Strategic Guidance* that stated that the administration “will take steps to reduce the role of nuclear weapons in our national security strategy, while ensuring our strategic deterrent remains safe, secure, and effective and that our extended deterrence commitments to our allies remain strong and credible.” However, as of September 2021, the White House had not issued an updated National Security Strategy. See The White House, *Interim National Security Strategic Guidance* (March 2021).

While the NPR indicates that maintaining an effective nuclear deterrent is a top priority, DOD's Nuclear Enterprise must compete with other departmental strategic priorities. For example, the Navy included the \$367.2 million accelerated recapitalization of the E-6B Take Charge and Move Out aircraft, which has a NC3 mission, in its fiscal year 2022 unfunded priority list.⁵⁴ The letter to congressional committees accompanying the list indicated that the items on the list—including the accelerated recapitalization of the E-6B—do not take priority over the items included in President's fiscal year 2022 budget. Further, the interim national security strategic guidance issued in March 2021 stated that the Biden administration will take steps to reduce the role of nuclear weapons in our national security strategy, indicating that consideration of how best to prioritize the nuclear enterprise will likely be ongoing.⁵⁵

DOD Has Not Prioritized within the DOD Nuclear Enterprise Portfolio

DOD has not prioritized its nuclear enterprise portfolio programs, projects, and activities. In particular, DOD is not able to prioritize nuclear enterprise portfolio efforts as it has not established prioritization criteria for how it would prioritize the programs, projects, and activities within the DOD Nuclear Enterprise relative to each other. According to DOD officials, they have not set priorities among these programs and projects because they believe it is not necessary, as all of these should receive the highest priority among the department's planning and budgeting. According to these officials, if there is a need to re-evaluate their approach, they will work with U.S. Strategic Command to prioritize investment decisions to meet the combatant commander's requirements.

Leading practices in portfolio management emphasize the importance of prioritizing programs, projects, and activities within a portfolio to inform

⁵⁴DOD annually reports on unfunded priorities identified by certain officers, including the Chiefs of Staff of the Army and Air Force, the Chief of Naval Operations, the Chief of Space Operations, the Commandant of the Marine Corps, and the combatant commanders. An "unfunded priority" is a program, activity, or mission requirement that is not funded in the President's budget for the relevant fiscal year; is necessary to fulfill a requirement associated with an operational or contingency plan or other validated requirement; and would have been recommended for funding by the relevant officer if additional resources had been available, or the requirement has emerged since the budget was formulated. See 10 U.S.C. § 222a.

⁵⁵The White House, *Interim National Security Strategic Guidance*.

investments.⁵⁶ Portfolio management practices aid organizations in optimizing and balancing the portfolio components—including prioritizing programs, projects, and other activities within the portfolio—to achieve strategic objectives. Additionally, we have previously found that organizations that follow best practices for portfolio management use an integrated approach to prioritize needs and allocate resources in accordance with strategic goals.⁵⁷ PMI notes that organizations should establish prioritization criteria for their portfolios while the portfolio is being initiated, and then these criteria should be reviewed whenever new components are introduced or when the portfolio is reviewed during a strategic review. Changes to the portfolio are proposed and reviewed based on these prioritization criteria, needs are compared against available funding and demand, and resource capacity plans are set based on the prioritization of the portfolio.

The prioritization of DOD’s nuclear enterprise portfolio efforts is important, as the department does not always give all nuclear programs the highest priority for funding, as previously discussed. In addition, DOD’s argument that the department could re-evaluate its approach as needed does not lend itself to long-term planning. For example, such a re-evaluation could result in DOD deciding to shift resources toward sustaining some legacy programs for a longer period, modifying its plans for the acquisition of new programs, or changing the quantities of legacy or new delivery platforms it will field. As it can take many years for DOD to acquire and field new or additional nuclear weapon delivery platforms, any changes to these platforms require DOD to consider these decisions far in advance of when platforms will be operationally available. In addition to fielding new or additional delivery platforms, recruiting and training personnel to operate, maintain, and provide security for these delivery platforms also requires advance planning. Similarly, it can take years to build the facilities and infrastructure necessary to support the operation and maintenance of these systems and their associated personnel.

We have previously reported that DOD needs to improve its oversight of the DOD Nuclear Enterprise, including its approach to prioritizing its needs. In 2018, we found that there is an increased need for coordinated, holistic oversight of the DOD Nuclear Enterprise and that the NPR’s goal

⁵⁶Project Management Institute, Inc., *The Standard for Portfolio Management—Fourth Edition*.

⁵⁷[GAO-15-466](#).

of replacing legacy nuclear systems will require senior leaders from across the DOD Nuclear Enterprise to make decisions regarding resource allocation and prioritization—for both the new systems and the existing systems without planned replacements.⁵⁸ We have also previously found that involvement is needed at the enterprise-level for DOD to optimize investments collectively across the military services as the military services tend to focus on optimizing their own investments.⁵⁹

According to DOD officials, they have begun working on a new NPR. Establishing and applying prioritization criteria to inform the prioritization of programs, projects, and activities, and then evaluating their relative costs, benefits, and risks, could aid DOD in making informed resourcing decisions. Prioritization criteria would assist DOD in taking into account what equipment, infrastructure, and personnel are needed to operate, maintain, and secure its nuclear assets as well as the resources, limitations, and priorities of the interrelated NNSA Weapons Activities portfolio, to the extent that they affect DOD's own prioritization. Such prioritization, based on established criteria developed with input from all the relevant DOD and NNSA participants, would allow DOD to be more responsive to changing conditions, such as if there are fewer resources available than currently planned, cost increases, or additional delays in the fielding of replacement programs. If costs associated with nuclear programs, projects, and activities increase or DOD's budget decreases, the department may need to adjust its priorities using the criteria established to aid in its decisions of where to apply limited resources and which program should receive fewer resources than planned. For example, we reported in 2019 that the Navy would likely require additional funding for the *Columbia*-class submarine because of an optimistic cost estimate and an aggressive schedule. Then, in fiscal year 2022, the Navy requested additional funding for its lead *Columbia* submarine due to expected cost increases. The creation of the National Sea-Based Deterrence Fund allows DOD greater discretion over *Columbia's* budget, enabling DOD to prioritize the *Columbia's* funding over other Navy programs. In the likely event that *Columbia* again requires additional

⁵⁸[GAO-19-29](#).

⁵⁹[GAO-15-466](#).

funding, DOD will need an increase in its total budget or a reduction in some other program.⁶⁰

Additionally, by establishing and applying criteria to prioritize among its programs, projects, and activities in the DOD Nuclear Enterprise, DOD can provide NNSA information about DOD's priorities for use in NNSA's own portfolio management. Specifically, this information would help NNSA prioritize its own investments and provide NNSA an opportunity to inform DOD about any limitations in NNSA's capacity that DOD may not have fully taken into account. DOD, in turn, can use information from NNSA regarding the resources, limitations, and priorities of the interrelated NNSA Weapons Activities portfolio to aid in DOD's own prioritization of related programs, projects, and other activities of the DOD Nuclear Enterprise that may be in part dependent on receiving systems from NNSA. Such prioritization could also enhance the new NPR, aiding its ability to articulate nuclear policy and inform key strategic planning documents relied on by both DOD and NNSA, such as the Nuclear Weapons Council's Strategic Plan and Nuclear Weapons Stockpile Memorandum, as well as budget requests.

NNSA Relies on DOD to Set Overall Priorities for the U.S. Nuclear Enterprise but Lacks a Framework for Prioritizing Efforts in the Weapons Activities Portfolio

According to NNSA officials, NNSA relies on DOD to set the overall priorities for the U.S. nuclear enterprise that guide NNSA in establishing the priorities for the programs, projects, and activities within NNSA's Weapons Activities portfolio. Specifically, NNSA relies on DOD to set overall priorities for numbers, schedule, and operational requirements for weapons. For example, NNSA bases many of its decisions regarding its W87-1 warhead modification program on DOD military requirements related to the performance, safety, and security of the warhead. In addition, DOD may refine these requirements, with input from NNSA, as

⁶⁰In 2019, we recommended that the Navy update the lead submarine cost estimate with a cost risk analysis using current cost data, develop a realistic estimate of savings from the use of the fund's authorities, and use the resulting updated cost estimate to inform the budget request for lead submarine construction. GAO, *Columbia Class Submarine: Overly Optimistic Cost Estimate Will Likely Lead to Budget Increases*, [GAO-19-497](#) (Washington, D.C.: Apr. 8, 2019). In September 2020, the Secretary of the Navy provided Congress updated cost and schedule information, and the subsequent budget request reflects this updated cost information.

the program matures and before beginning full production of the warhead.⁶¹ This means that, in the case of the W87-1, some technical design options were removed from consideration during the program's concept assessment phase because they did not meet military requirements, as we noted in September 2020.⁶²

However, despite DOD's role in setting overall priorities and operational requirements, NNSA manages and prioritizes the resources and infrastructure needed to produce nuclear weapons required by DOD, as we have previously found.⁶³ To that end, NNSA officials said that they rely on the annual budget preparation process and the development of the Future Years Nuclear Security Program to prioritize and communicate information about Weapons Activities priorities to the Nuclear Weapons Council, DOD, and Congress.⁶⁴ Specifically, during the planning, programming, and budgeting process, NNSA requires its offices to create a priority list of programs, projects, and activities. However, according to NNSA officials, each NNSA office may use a different method for creating its priority list, which can make it difficult to compare priorities across offices. For example:

- Officials in the Office of Safety, Infrastructure, and Operations said that they engage with individual programs within their office to create a ranked list of priorities related to their office's mission goals and will adjust program priorities as needed, based in part on calculations for managing risk. In addition, they said that NNSA's Office of Defense Programs communicates priorities from DOD or other NNSA offices to their office, and the frequency of this communication depends on the status of the project. For example, a team working on short-term infrastructure improvements at NNSA's Kansas City National Security Campus meets at least biweekly, and all status updates and changes

⁶¹During this process, while DOD provides military requirements as noted above, NNSA defines technical requirements for the warhead based on its mission to improve the safety and security of the nuclear stockpile. NNSA designs and produces warheads and bombs to meet both military and technical requirements and is responsible for ensuring and verifying weapon performance against those requirements.

⁶²[GAO-20-703](#).

⁶³GAO, *National Nuclear Security Administration: Action Needed to Address Affordability of Nuclear Modernization Programs*, [GAO-17-341](#) (Washington, D.C.: Apr. 26, 2017).

⁶⁴The Future Years Nuclear Security Program is NNSA's 5-year funding plan, annually submitted to Congress, reflecting the estimated expenditures and proposed appropriations for programs for which NNSA is responsible: Weapons Activities, Defense Nuclear Nonproliferation, and Naval Reactors.

to plans are communicated across programs. Officials also said that when other NNSA or DOD programs' high priorities are low on their office's priority list and are at risk of being deferred, they ask the affected program to provide input in the reprioritization decision.

- In contrast, officials in NNSA's Office of Defense Programs said that each program develops its own priorities and the manner in which they do so varies by program. For example, some programs develop new prioritizations of all work every year while others only incorporate new demands into program priorities. The Office of Defense Programs then balances these program-level prioritizations against available funding and requirements from the Nuclear Weapons Council. Officials said that this allows them to evaluate program interdependencies and more easily make midcourse corrections with minor impacts to individual programs. For example, officials said that in 2018, when NNSA was completing production of the last quantities of W76-1 warheads, DOD requested that NNSA design, develop, and produce a low-yield variant of the submarine-launched ballistic missile warhead, consistent with the 2018 NPR recommendation. Officials said that NNSA was able to meet this requirement ahead of schedule by leveraging existing production capabilities and previous warhead testing data.

In June 2021, we reported on the need for NNSA to establish a portfolio management framework, including the establishment of prioritization criteria, for the Weapons Activities portfolio.⁶⁵ Specifically, we found that NNSA had not established a clear, enterprise-wide portfolio management framework for its weapons stockpile and infrastructure maintenance and modernization efforts that included criteria for prioritization of programs, projects, and other activities in the portfolio. As a result, we recommended that NNSA establish such a portfolio management framework and, in particular, we stated that such a framework should define prioritization criteria, among other things.⁶⁶ We noted that, by establishing prioritization criteria for the Weapons Activities portfolio, NNSA would also be better positioned to ensure activities that are supported by multiple offices under the portfolio are appropriately prioritized within each office. We will monitor NNSA's activities to address

⁶⁵[GAO-21-398](#).

⁶⁶[GAO-21-398](#). NNSA agreed in principle with our recommendation, but stated that it believes sufficient action has already been taken to address the recommendation based on existing documents and processes. We reviewed NNSA's existing documents and processes, and disagree that they fully address the recommendation.

this recommendation, focusing in particular on how it defines and applies prioritization criteria to its Weapons Activities portfolio.

Conclusions

The U.S. nuclear enterprise comprises the DOD Nuclear Enterprise portfolio and NNSA's Weapons Activities portfolio, both of which include many complex and interdependent programs, projects, and activities as demonstrated by the numerous efforts that DOD and NNSA have underway to implement the 2018 NPR and confront the complex and demanding security environment. Strong oversight and management of these portfolios is essential to assessing and managing risks—including careful consideration of what risks to accept—and ensuring that effective prioritization of programs informs investment decisions. DOD and NNSA are beginning to take some promising steps toward managing risks within their respective portfolios rather than simply at a program-by-program level.

DOD and NNSA can continue to improve their management of the U.S. nuclear enterprise as a whole by establishing joint processes that carefully identify and analyze risks that affect not just their individual programs, projects, and activities but the entirety of the U.S. nuclear enterprise. Effective risk management of the U.S. nuclear enterprise as a whole requires comprehensive risk assessment and reporting that takes into account all program interdependencies that exist between and within the DOD and NNSA portfolios, as well as agreement on how to manage those shared risks. Without the clear communication of risks across the U.S. nuclear enterprise to Congress and other important stakeholders, senior leaders may not have a full understanding of these risks or be in a position to make fully informed decisions to more efficiently resource key efforts or accept risks. DOD and NNSA may be able to leverage the existing Nuclear Weapons Council structures by expanding on its processes to include processes to identify, analyze, and respond to risks that affect the entire U.S. nuclear enterprise. Alternatively, DOD and NNSA may identify a different means to establish joint risk management processes to supplement their current efforts.

DOD can also leverage leading practices in portfolio management to help inform the new NPR, including establishing and applying criteria to carefully prioritize what programs, projects, and activities are needed within DOD's portfolio to meet the needs of the U.S. nuclear enterprise. Stakeholders across DOD, NNSA, and the Nuclear Weapons Council, as

well as senior policy makers and Congress, can use the outcomes of improved risk management and prioritization processes as they make essential budgetary and policy decisions in the face of many competing priorities, including how best to balance the many nuclear modernization programs while also preparing to deter or defeat a wide range of nuclear and non-nuclear threats faced by the U.S.

Recommendations for Executive Action

We are making a total of four recommendations—three to DOD and one to NNSA.

The Secretary of Defense, in coordination with the NNSA Administrator, should establish a joint risk management process to periodically identify, analyze, and respond to risks that affect the U.S. nuclear enterprise (including the nuclear weapons stockpile, delivery platforms, and nuclear command and control) and report, internally and externally to relevant stakeholders, those risks and any associated mitigation efforts. (Recommendation 1)

The NNSA Administrator, in coordination with the Secretary of Defense, should establish a joint risk management process to periodically identify, analyze, and respond to risks that affect the U.S. nuclear enterprise (including the nuclear weapons stockpile, delivery platforms, and nuclear command and control) and report, internally and externally to relevant stakeholders, those risks and any associated mitigation efforts. (Recommendation 2)

The Secretary of Defense should establish prioritization criteria for the programs, projects, and activities of the DOD Nuclear Enterprise—taking into account costs, benefits, and alternatives of the programs, projects, and activities within the enterprise; information from the periodic risk analyses conducted by DOD, NNSA, and the Nuclear Weapons Council; and information from NNSA regarding the resources, limitations, and priorities of the interrelated NNSA Weapons Activities portfolio—and should review these prioritization criteria whenever a new component is being introduced or during a strategic review, such as the NPR. (Recommendation 3)

After prioritization criteria for the DOD Nuclear Enterprise are established, the Secretary of Defense should apply the criteria whenever changes to the portfolio are proposed or reviewed, comparing any proposed

prioritization against operational requirements as well as available funding, and set resource capacity plans based on the prioritization of the portfolio. (Recommendation 4)

Agency Comments and Our Evaluation

We provided a draft of this report to DOD and NNSA for review and comment. DOD, in its written comments (reproduced in appendix III), partially concurred with our recommendations directed to the department, and NNSA, in its written comments (reproduced in appendix IV), concurred with the intent of the recommendation directed to NNSA. In particular, DOD and NNSA both discussed their current processes for managing risks and prioritizing programs, projects, and activities, but neither DOD nor NNSA identified specific plans to implement our recommendations. We also received technical comments from both DOD and NNSA, which we incorporated as appropriate.

DOD partially concurred with our first recommendation and NNSA concurred with the intent of our second recommendation. Both DOD and NNSA noted the existing risk management processes, such as those used by the Nuclear Weapons Council, that are already in place. NNSA stated that these processes have been proven effective. DOD stated that, moving forward, the Department will continue to execute and improve upon these processes, and evaluate new processes, as necessary, to enable both internal DOD and interagency risk mitigation. However, we reviewed DOD's and NNSA's existing processes established at the program level as part of our work, including those of the Nuclear Weapons Council, and discuss the joint risk management processes in this report. While these existing processes acknowledge risks, they do not comprehensively identify, mitigate, and address risk at an enterprise level. As we also discuss in this report, DOD and NNSA have not established joint processes at the enterprise-wide level to periodically identify, analyze, and respond to risks that affect the joint U.S. nuclear enterprise. Therefore, we continue to believe that the establishment of a joint risk management process at the enterprise-wide level that comprehensively addresses risks affecting the entire U.S. nuclear enterprise will enhance senior leaders' ability to effectively manage risks, make informed resource decisions, or accept risks concerning the joint nuclear enterprise.

DOD stated in its comments that it partially concurred with our third and fourth recommendations but that DOD already uses the department's

Planning, Programming, Budgeting, and Execution Process to prioritize resources between programs, projects, and activities across the DOD Nuclear Enterprise portfolio and other non-nuclear priorities. DOD stated that its existing processes took into consideration the costs, benefits, and alternatives; information and risk analyses from DOD organizations, NNSA, and the Nuclear Weapons Council; and information from NNSA regarding the resources, limitations, and priorities of the NNSA Weapons Activities portfolio. However, DOD did not agree that the department needs dedicated criteria to successfully prioritize the nuclear portfolio and stated that DOD maintains that the modernization programs across each leg of the nuclear triad are all important to the success of the nuclear recapitalization and essential to our nation's nuclear deterrent. Finally, DOD stated that it considers multiple factors to support the resourcing decisions for individual programs and across the nuclear portfolio, to include cross-portfolio considerations for platforms with nuclear and conventional capabilities.

We continue to believe that establishing and applying criteria to inform the prioritization of programs, projects, and activities, and then evaluating their relative costs, benefits, and risks, could aid DOD in making informed resourcing decisions as well as better communicating this information to relevant stakeholders. It could better inform DOD's existing Planning, Programming, Budgeting, and Execution Process as well as allow DOD to be more responsive to changing conditions. For example, fewer resources may be available in the future as a result of a need for additional funding for other DOD priorities; additional, unexpected cost increases; or additional delays in the fielding of replacement programs.

We are providing copies of this report to the appropriate congressional committees, and to the Secretary of Defense; the Acting Under Secretary of Defense for Acquisition and Sustainment; the Chairman of the Joint Chiefs of Staff; the Secretaries of the Army, the Navy, and the Air Force; the Commander, U.S. Strategic Command; the Secretary of Energy; and the Administrator of the National Nuclear Security Administration. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact Joseph W. Kirschbaum at (202) 512-9971 or KirschbaumJ@gao.gov, Allison Bawden at (202) 512-3841 or BawdenA@gao.gov, and Shelby S. Oakley at (202) 512-4841 or OakleyS@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on

the last page of this report. GAO staff who made key contributions to this report are listed in appendix V.



Joseph W. Kirschbaum
Director, Defense Capabilities and Management



Allison Bawden
Director, Natural Resources and Environment



Shelby S. Oakley
Director, Contracting and National Security Acquisitions

List of Committees

The Honorable Jack Reed
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Jon Tester
Chairman
The Honorable Richard Shelby
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Dianne Feinstein
Chair
The Honorable John Kennedy
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

The Honorable Adam Smith
Chairman
The Honorable Mike Rogers
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Betty McCollum
Chair
The Honorable Ken Calvert
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Letter

The Honorable Marcy Kaptur
Chairwoman
The Honorable Mike Simpson
Ranking Member
Subcommittee on Energy and Water Development, and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: Summary of 2018 *Nuclear Posture Review* Initiatives

On January 27, 2017, the President directed the Department of Defense (DOD) to conduct a Nuclear Posture Review (NPR) to ensure a safe, secure, and effective nuclear deterrent that protects the homeland, assures allies, and deters adversaries.¹ As a result, DOD released an NPR in February 2018.² The NPR stated that it confirmed the findings of previous NPRs that the nuclear triad—supported by North Atlantic Treaty Organization (NATO) dual-capable aircraft and a robust nuclear command, control, and communications (NC3) system—is the most cost-effective and strategically sound means of ensuring nuclear deterrence. Additionally, the 2018 NPR stated that it affirmed the modernization programs initiated during the previous administration to replace nuclear ballistic missile submarines, strategic bombers, nuclear air-launched cruise missiles, intercontinental ballistic missiles, associated nuclear command and control, and dual-capable fighter bombers. The 2018 review also stated that recapitalizing the nuclear weapons complex of laboratories and plants is long past due.

The majority of initiatives outlined in the 2018 NPR were already planned or underway by DOD or the Department of Energy's National Nuclear Security Administration (NNSA) prior to the issuance of the review. Key new initiatives in the 2018 review include the following:

- The U.S. will modify a small number of existing submarine-launched ballistic missile warheads to provide a low-yield option. In late 2019, the Navy began to deploy small numbers of these warheads.
- The U.S. plans to pursue a nuclear-armed sea-launched cruise missile (SLCM). The 2010 NPR announced the retirement of the United States' previous nuclear-armed SLCM. The 2018 NPR stated that DOD would immediately begin efforts toward restoration of this capability by initiating a capability study leading to an analysis of

¹Prior to this, the latest NPR was issued by the Obama administration in April 2010. DOD, *Nuclear Posture Review Report* (April 2010).

²DOD, *Nuclear Posture Review* (February 2018).

alternatives for the rapid development of a modern SLCM. The analysis of alternatives was completed by the Navy in July 2021.

- To ensure that DOD is properly organized to maintain a fully capable NC3 system to address current and future environments, the NPR stated that the Chairman of the Joint Chiefs of Staff, in consultation with key DOD stakeholders, would deliver a plan to reform NC3 governance to ensure its effective functioning and modernization. This was completed, which resulted in the identification of the Commander of U.S. Strategic Command as the NC3 enterprise lead, among other changes to improve the governance of NC3.
- Rather than moving the B83-1 warhead toward retirement, NNSA was instructed to retain it until a suitable replacement could be found.
- DOD and NNSA restarted the W87-1 weapons modernization program a year earlier than originally scheduled.³

Table 2 lists the key initiatives in the 2018 review.

Table 2: Summary of Key Ongoing and New Initiatives Identified in the 2018 Nuclear Posture Review (NPR)

Initiative	New or ongoing in the 2018 NPR
The Nuclear Triad	
Sea Leg	
Take necessary steps to ensure that <i>Ohio</i> -class ballistic missile submarines remain operationally effective and survivable until replaced by <i>Columbia</i> -class ballistic missile submarines.	Ongoing initiative before the 2018 NPR
The <i>Columbia</i> -class program will deliver ballistic missile submarines to replace the current <i>Ohio</i> -class submarines and is designed to provide required deterrence capabilities for decades.	Ongoing initiative before the 2018 NPR
Ground Leg	
The Ground-Based Strategic Deterrent program will begin the replacement of the Minuteman III intercontinental ballistic missile weapon system, including modernizing the missile launch facilities.	Ongoing initiative before the 2018 NPR
Air Leg	
The U.S. has initiated a program to develop and deploy the next-generation bomber, the B-21 Raider. It will first supplement and eventually replace elements of the conventional and nuclear-capable bomber force beginning in the mid-2020s.	Ongoing initiative before the 2018 NPR
The B83-1 and B61-11 gravity bombs can hold at risk a variety of protected targets. As a result, both will be retained in the stockpile.	Ongoing initiative before the 2018 NPR

³GAO, *Nuclear Weapons: NNSA Has Taken Steps to Prepare to Restart a Program to Replace the W78 Warhead Capability*, [GAO-19-84](#) (Washington, D.C.: Nov. 30, 2018) and *Nuclear Weapons: NNSA Should Further Develop Cost, Schedule, and Risk Information for the W87-1 Warhead Program*, [GAO-20-703](#) (Washington, D.C.: Sept. 9, 2020).

Appendix I: Summary of 2018 Nuclear Posture Review Initiatives

Initiative	New or ongoing in the 2018 NPR
The Long Range Standoff cruise missile replacement program will maintain into the future the bomber force capability to deliver stand-off weapons that can penetrate and survive advanced integrated air defense systems, thus supporting the long-term effectiveness of the bomber leg.	Ongoing initiative before the 2018 NPR
Life extension programs are underway to ensure the Air-Launched Cruise Missile can be maintained until its replacement, the Long Range Standoff cruise missile, becomes available.	Ongoing initiative before the 2018 NPR
Non-Strategic Capabilities	
The U.S. is incorporating nuclear capability onto the forward-deployable, nuclear-capable F-35 as a replacement for the current aging dual-capable aircraft.	Ongoing initiative before the 2018 NPR
Non-Strategic Capabilities	
The U.S. will consult and work cooperatively with North Atlantic Treaty Organization (NATO) allies to:	Ongoing initiative before the 2018 NPR
<ul style="list-style-type: none"> • Enhance the readiness and survivability of NATO dual-capable aircraft, improve capabilities required to increase their operational effectiveness, and account for adversary nuclear and non-nuclear capabilities; • Promote the broadest possible participation of allies in their agreed burden sharing arrangements regarding the dual-capable aircraft mission, nuclear mission support, and nuclear infrastructure; • Replace aging aircraft and weapons systems with modernized or life-extended equivalents as they age out; • Enhance the realism of training and exercise programs to ensure the alliance can effectively integrate nuclear and non-nuclear operations, if deterrence fails; and • Ensure the NATO nuclear command, control, and communications (NC3) system is modernized to enable appropriate consultations and effective nuclear operations, and improve its survivability, resilience, and flexibility in the most stressful threat environments. 	
In the near-term, the U.S. will modify a small number of existing submarine-launched ballistic missile warheads to provide a low-yield option, and in the longer term, pursue a modern nuclear-armed sea-launched cruise missile (SLCM).	New initiative in the 2018 NPR
The Department of Defense (DOD) and National Nuclear Security Administration (NNSA) will develop for deployment a low-yield submarine-launched ballistic missile warhead to ensure a prompt response option that is able to penetrate adversary defenses.	New initiative in the 2018 NPR
For the longer term, the U.S. will pursue a nuclear-armed SLCM, leveraging existing technologies to help ensure its cost effectiveness. SLCM will provide a needed non-strategic regional presence, an assured response capability.	New initiative in the 2018 NPR
In the 2010 NPR, the U.S. announced the retirement of its previous nuclear-armed SLCM, which for decades had contributed to deterrence and the assurance of allies.	
Nuclear Command, Control, and Communications (NC3) Modernization	
Strengthen protection against space-based threats: The U.S. will ensure space assets are agile and resilient, thereby deterring and if necessary overcoming attempts to extend conflict into space. The U.S. will enhance the training of operational space forces.	Ongoing initiative before the 2018 NPR
Strengthen protection against cyber threats: The U.S. will protect NC3 components against current and future cyber threats and ensure the continuing availability of U.S.-produced information technology necessary for the NC3 system.	Ongoing initiative before the 2018 NPR

Appendix I: Summary of 2018 Nuclear Posture Review Initiatives

Initiative	New or ongoing in the 2018 NPR
Enhance integrated tactical warning and attack assessment: The United States will develop a future architecture that will include modernized space-based infrared system satellites and integrate missile defense sensors to maximize warning time. The U.S. will also continue to transition the Defense Support Program system to space-based infrared system and enhance ground-based radars. Additionally, it will continue to sustain and upgrade the U.S. Nuclear Detonation Detection System to support accurate attack assessment.	Ongoing initiative before the 2018 NPR
Improve command posts and communications links: The U.S. will upgrade and modernize critical NC3 airborne systems, including the National Airborne Operations Center, the Airborne Command Post, and the Take Charge and Move Out aircraft, develop planning systems at all fixed and mobile sites to enhance command and control, and field modernized communication transmitters and terminals across the NC3 system.	Ongoing initiative before the 2018 NPR
Nuclear Command, Control, and Communications (NC3) Modernization	
Advance decision support technology: The U.S. will continue to adapt new technologies for information display and data analysis to improve support for Presidential decision making and senior leadership consultations.	Ongoing initiative before the 2018 NPR
Integrate planning and operations: The U.S. will improve the capability of its combatant commands to communicate and share information across networked command and control systems. U.S. forces will strengthen their ability to integrate nuclear and non-nuclear military operations to deter limited nuclear escalation and non-nuclear strategic attacks. Finally, combatant commands will plan, organize, train, and exercise for this mission.	Ongoing initiative before the 2018 NPR
Reform governance of the overall NC3 system: The U.S. will improve its NC3 governance to ensure DOD is properly organized to maintain a fully capable NC3 system to address current and future environments.	New initiative in the 2018 NPR
Nuclear Weapons Infrastructure	
Complete the W76-1 Life Extension Program by fiscal year (FY) 2019.	Ongoing initiative before the 2018 NPR
Complete the B61-12 Life Extension Program by FY 2024.	Ongoing initiative before the 2018 NPR
Complete the W88 alterations by FY 2024.	Ongoing initiative before the 2018 NPR
Synchronize NNSA's W80-4 life extension, with DOD's Long Range Standoff program and complete the W80-4 Life Extension Program by FY 2031.	Ongoing initiative before the 2018 NPR
Advance the W78 warhead replacement 1 year to FY 2019 to support fielding on Ground-Based Strategic Deterrent by 2030 and investigate the feasibility of fielding the nuclear explosive package in a Navy flight vehicle.	Ongoing initiative before the 2018 NPR
Sustain the B83-1 past its currently planned retirement date until a suitable replacement is identified.	New initiative in the 2018 NPR
Explore future ballistic missile warhead requirements based on the threats and vulnerabilities of potential adversaries, including the possibility of common reentry systems between Air Force and Navy systems.	Ongoing initiative before the 2018 NPR
Pursue a joint DOD and Department of Energy advanced technology development capability to ensure that efforts are appropriately integrated to meet DOD needs.	Ongoing initiative before the 2018 NPR
Provide the enduring capability and capacity to produce plutonium pits at a rate of no fewer than 80 pits per year by 2030.	Ongoing initiative before the 2018 NPR

Appendix I: Summary of 2018 Nuclear Posture Review Initiatives

Initiative	New or ongoing in the 2018 NPR
Ensure that current plans to reconstitute the U.S. capability to produce lithium compounds are sufficient to meet military requirements.	Ongoing initiative before the 2018 NPR
Fully fund the Uranium Processing Facility and ensure availability of sufficient low-enriched uranium to meet military requirements.	Ongoing initiative before the 2018 NPR
Ensure the necessary reactor capacity to produce an adequate supply of tritium to meet military requirements.	Ongoing initiative before the 2018 NPR
Ensure continuity in the U.S. capability to develop and manufacture secure, trusted strategic radiation-hardened microelectronic systems beyond 2025 to support stockpile modernization.	Ongoing initiative before the 2018 NPR
Rapidly pursue the Stockpile Responsiveness Program established by Congress to expand opportunities for young scientists and engineers to advance warhead design, development, and production skills.	Ongoing initiative before the 2018 NPR
Nuclear Weapons Infrastructure	
Develop an NNSA roadmap that sizes production capacity to modernization and hedging requirements.	Ongoing initiative before the 2018 NPR
Maintain and enhance the computational, experimental, and testing capabilities needed to annually assess nuclear weapons.	Ongoing initiative before the 2018 NPR

Source: GAO analysis of DOD information. | GAO-22-104061

Based on the above initiatives included in the 2018 NPR, DOD and NNSA developed a list of tasks.⁴ According to DOD and NNSA officials, all of the tasks have been implemented or subsumed by existing programs within their respective organizations. An example of a task that has been implemented is the modification of a small number of existing submarine-launched ballistic missile warheads to provide a low-yield option. This modification has been completed, and the low-yield submarine-launched ballistic missiles are being fielded. Alternatively, tasks associated with major recapitalization efforts such as the fielding of the *Columbia*-class ballistic missile submarines and Ground-Based Strategic Deterrent have been subsumed into those programs.

⁴DOD's NPR implementation task list was classified Secret. While NNSA's task list was unclassified, since there was some overlap with DOD's list we chose not to include details from either list in our report.

Appendix II: Offices That GAO Contacted

To obtain information for our review, we met with or obtained information from officials from the following organizations within the Department of Defense:

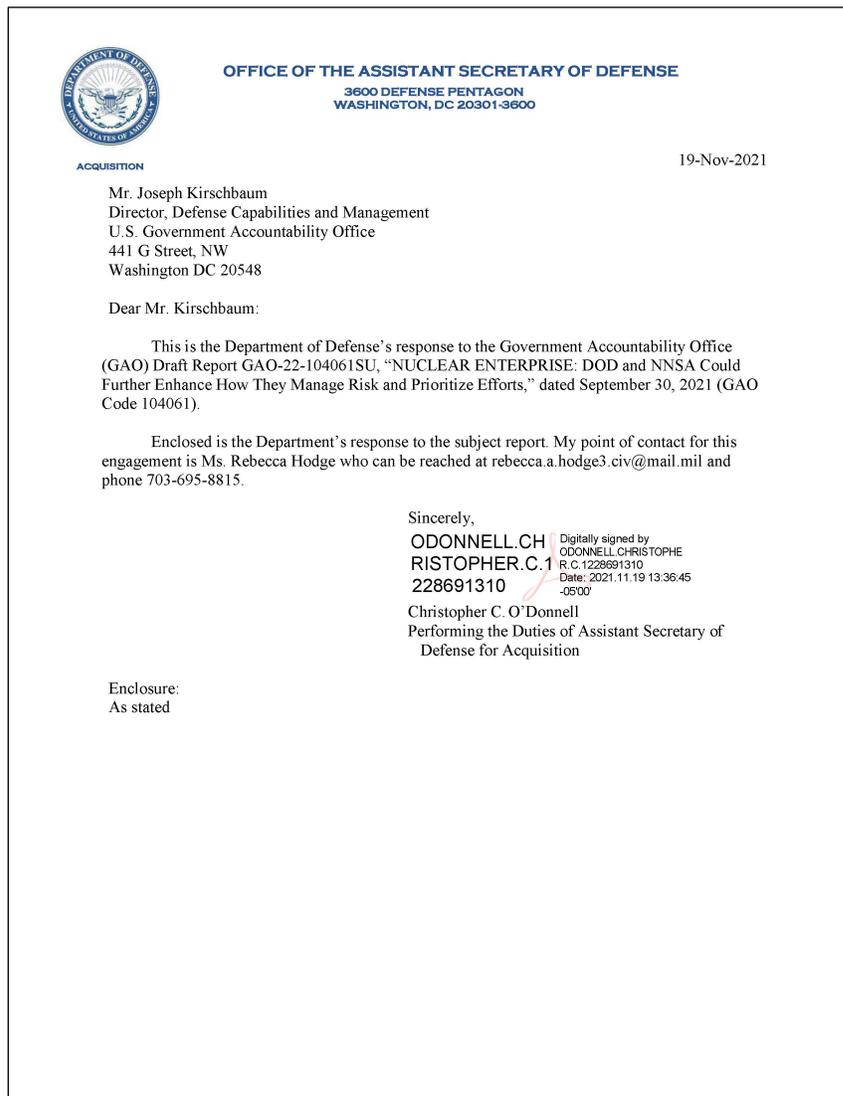
- Office of the Under Secretary of Defense for Acquisition and Sustainment
 - Office of the Deputy Assistant Secretary of Defense for Nuclear Matters (in addition to other duties, personnel within this office provide support to the Nuclear Weapons Council)
 - Office of the Deputy Assistant Secretary of Defense for Strategic, Space, and Intelligence Portfolio Management (formerly the Office of Information and Integration Portfolio Management)
- Office of the Under Secretary of Defense (Comptroller)
- Office of the Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy
- Office of Cost Assessment and Program Evaluation
- Joint Staff
- U.S. Strategic Command
- Air Force Headquarters: Strategic Deterrence and Nuclear Integration (A10)
- Air Force Global Strike Command
- Air Force Nuclear Weapons Center
- Chief of Naval Operations: Nuclear Policy (N514) and Undersea Warfare (N97)
- Navy Strategic Systems Programs
- U.S. Army Nuclear and Countering Weapons of Mass Destruction Agency

We also met with or obtained information from officials from the following organizations within the Department of Energy's National Nuclear Security Administration:

Appendix II: Offices That GAO Contacted

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- Office of Defense Programs (NA-10) and specific offices within NA-10
 - Office of Safety, Infrastructure, and Operations (NA-50)

Appendix III: Comments from the Department of Defense



GAO DRAFT REPORT DATED SEPTEMBER 30, 2021
GAO-22-104061SU (GAO CODE 104061)

“NUCLEAR ENTERPRISE: DOD AND NNSA COULD FURTHER ENHANCE HOW
THEY MANAGE RISK AND PRIORITIZE EFFORTS”

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The Secretary of Defense, in coordination with the NNSA Administrator, should establish a joint risk management process to periodically identify, analyze, and respond to risks that affect the U.S. nuclear enterprise (including the nuclear weapons stockpile, delivery platforms, and nuclear command and control) and report, internally and externally to relevant stakeholders, those risks and any associated mitigation efforts. (Recommendation 1)

DoD RESPONSE: Partially Concur - The DoD recognizes the importance of joint risk management, in coordination with the Department of Energy, to identify, analyze, and respond to risks across the U.S. nuclear enterprise and share those risks and any associated mitigation efforts with stakeholders. To that end, the DoD uses a number of existing risk management and mitigation processes (such as service and acquisition risk management processes, the Nuclear Weapons Council, and the Secretary of Defense Nuclear Transition Review or similar forum). Moving forward, the Department will continue execute and improve upon these processes, and evaluate new processes, as necessary, to enable both internal DoD and interagency risk mitigation.

RECOMMENDATION 2: The NNSA Administrator, in coordination with the Secretary of Defense, should establish a joint risk management process to periodically identify, analyze, and respond to risks that affect the U.S. nuclear enterprise (including the nuclear weapons stockpile, delivery platforms, and nuclear command and control) and report, internally and externally to relevant stakeholders, those risks and any associated mitigation efforts. (Recommendation 2)

DoD RESPONSE: N/A

RECOMMENDATION 3: The Secretary of Defense should establish prioritization criteria for the programs, projects, and activities of the DOD Nuclear Enterprise – taking into account costs, benefits, and alternatives of the programs, projects, and activities within the enterprise; information from the periodic risk analyses conducted by DOD, NNSA, and the Nuclear Weapons Council; and information from NNSA regarding the resources, limitations, and priorities of the interrelated NNSA Weapons Activities portfolio – and should review these prioritization criteria whenever a new component is being introduced or during a strategic review, such as the NPR. (Recommendation 3)

**Appendix III: Comments from the Department
of Defense**

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DoD RESPONSE: Partially Concur - Decades of deferrals have forced the DoD to pursue multiple high-priority programs to modernize each leg of the nuclear triad simultaneously. DoD already uses the Department's Planning, Programming, Budgeting and Execution (PPBE) process to prioritize resources between programs, projects, and activities across the DoD Nuclear Enterprise portfolio and other non-nuclear priorities – taking into consideration the costs, benefits, and alternatives; information and risk analyses from DoD organizations, National Nuclear Security Administration (NNSA), and the Nuclear Weapons Council; and information from NNSA regarding the resources, limitations, and priorities of the NNSA Weapons Activities portfolio.

However, we do not agree that the Department needs dedicated criteria to successfully prioritize the nuclear portfolio. The DoD maintains that the modernization programs across each leg of the Triad are all important to the success of the nuclear recapitalization and essential to our nation's nuclear deterrent. As a result, the Department has prioritized the Nuclear Enterprise portfolio. The Department considers multiple factors to support the resourcing decisions for individual programs and across the nuclear portfolio, to include cross-portfolio considerations for platforms with nuclear and conventional capabilities.

RECOMMENDATION 4: As prioritization criteria for the DOD Nuclear Enterprise are established, the Secretary of Defense should apply the criteria whenever changes to the portfolio are proposed or reviewed, comparing any proposed prioritization against operational requirements as well as available funding, and set resource capacity plans based on the prioritization of the portfolio. (Recommendation 4)

DoD RESPONSE: Partially Concur - The DoD uses the Planning, Programming, Budgeting and Execution (PPBE) process to prioritize resourcing changes for the DoD Nuclear Enterprise portfolio. The PPBE process considers multiple factors to support prioritization and resourcing decisions, including: operational requirements and risk; joint DoD/Department of Energy (DoE) acquisition activities and risk; joint DoD/DoE resource capacity limitations, including nuclear and test infrastructure; and available funding.

Agency Comment Letter

Text of Appendix III: Comments from the Department of Defense

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19-Nov-2021

Mr. Joseph Kirschbaum
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Mr. Kirschbaum:

This is the Department of Defense's response to the Government Accountability Office (GAO) Draft Report GAO-22-104061SU, "NUCLEAR ENTERPRISE: DOD and NNSA Could

Further Enhance How They Manage Risk and Prioritize Efforts," dated September 30, 2021 (GAO Code 104061).

Enclosed is the Department's response to the subject report. My point of contact for this engagement is Ms. Rebecca Hodge who can be reached at rebecca.a.hodge3.civ@mail.mil and phone 703-695-8815.

Sincerely,
Christopher C. O'Donnell
Performing the Duties of Assistant Secretary of
Defense for Acquisition

Enclosure:
As stated

Page 2

**GAO DRAFT REPORT DATED SEPTEMBER 30, 2021 GAO-22-104061SU (GAO
CODE 104061)**

**“NUCLEAR ENTERPRISE: DOD AND NNSA COULD FURTHER ENHANCE HOW
THEY MANAGE RISK AND PRIORITIZE EFFORTS”**

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

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Appendix IV: Comments from the National Nuclear Security Administration



Department of Energy
Under Secretary for Nuclear Security
Administrator, National Nuclear Security Administration
Washington, DC 20585

NNSA-2020-006923
NNSA
National Nuclear Security Administration

November 5, 2021

Ms. Allison B. Bawden
Director, Natural Resources
and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Ms. Bawden:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report "Nuclear Enterprise: DOD and NNSA Could Further Enhance How They Manage Risk and Prioritize Efforts" (GAO-22-104061SU). The National Nuclear Security Administration (NNSA) appreciates GAO's efforts and recognition of our efforts to continuously enhance portfolio risk management.

NNSA agrees there are always opportunities to enhance processes, and concurs with the intent of the report's recommendation related to joint risk management. The report and recommendation to NNSA, however, does not fully acknowledge that joint risk management processes are already in place. NNSA works cooperatively through the U.S. Strategic Command; U.S. Air Force's Global Strike Command, Nuclear Weapons Center, and Headquarters Staff; and the U.S. Navy's Strategic Systems Programs; as well as through the Nuclear Weapons Council (NWC) and its various coordination bodies to ensure cross-agency risks and requirements are effectively evaluated and integrated into planning and prioritization efforts. The results of those efforts are captured in internal and external reporting through the Stockpile Stewardship and Management Plan, the Requirements and Planning Document, the Report on Stockpile Assessments, the Report on Platform Assessment, and the Joint Surety Report. As these processes have proven effective, NNSA considers the recommendation addressed. NNSA will, however, fully evaluate the auditors' observations and work through the NWC to further document and strengthen existing risk management processes as appropriate, recognizing both the joint and severable responsibilities for risk management.

Our subject matter experts have provided technical and general comments under separate cover for your consideration to enhance the clarity and accuracy of the report. If you have any questions about this response, please contact Dean Childs, Director, Audits and Internal Affairs, at (301) 903-1341.

Sincerely,

Jill Hruby

Agency Comment Letter

Text of Appendix IV: Comments from the National Nuclear Security Administration

Page 1

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Director, Natural Resources
and Environment
U.S. Government Accountability Office
Washington, DC 20548

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**Appendix IV: Comments from the National
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Sincerely,
Jill Hruby

Appendix V: GAO Contacts and Staff Acknowledgments

GAO Contacts

Joseph W. Kirschbaum, (202) 512-9971 or KirschbaumJ@gao.gov

Allison Bawden, (202) 512-3841 or BawdenA@gao.gov

Shelby S. Oakley, (202) 512-4841 or OakleyS@gao.gov

Staff Acknowledgments

In addition to the contacts named above, key contributors to this report were Penney Harwell Caramia, Assistant Director; Jason Holliday, Assistant Director; James Madar, Assistant Director; Diana Moldafsky, Assistant Director; Marie Ahearn; Antoinette Capaccio; Alisa Carrigan; Pamela Davidson; R. Scott Fletcher; Susannah Hawthorne; Brent Helt; Mae Jones; Richard Kusman; Joanne Landesman; Amie Lesser; Michael Shaughnessy; and Roger Stoltz.

Related GAO Products

Defense Nuclear Enterprise: DOD Can Improve Processes for Monitoring Long-Standing Issues. [GAO-21-486](#). Washington, D.C.: August 18, 2021.

Nuclear Security Enterprise: NNSA Should Use Portfolio Management Leading Practices to Support Modernization Efforts. [GAO-21-398](#). Washington, D.C.: June 9, 2021.

Nuclear Triad: DOD and DOE Face Challenges Mitigating Risks to U.S. Deterrence Efforts. [GAO-21-210](#). Washington, D.C.: May 6, 2021.

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Nuclear Weapons: NNSA Should Further Develop Cost, Schedule, and Risk Information for the W87-1 Warhead Program. [GAO-20-703](#). Washington, D.C.: September 9, 2020.

Nuclear Weapons: Action Needed to Address the W80-4 Warhead Program's Schedule Constraints. [GAO-20-409](#). Washington, D.C.: July 24, 2020.

Defense Nuclear Enterprise: Systems Face Sustainment Challenges, and Actions Are Needed to Effectively Monitor Efforts to Improve the Enterprise. [GAO-20-296](#). Washington, D.C.: March 26, 2020.

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Nuclear Weapons Sustainment: Fiscal Year 2018 Nuclear Forces Budget Estimates. [GAO-19-127R](#). Washington, D.C.: November 2, 2018.

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Defense Nuclear Enterprise: DOD Continues to Address Challenges but Needs to Better Define Roles and Responsibilities and Approaches to Collaboration. [GAO-19-29](#). Washington, D.C.: November 1, 2018.

Nuclear Weapons: DOD Assessed the Need for Each Leg of the Strategic Triad and Considered Other Reductions to Nuclear Forces. [GAO-16-740](#). Washington, D.C.: September 22, 2016.

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