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Precision and Posture

Defense Spending Trends and the FY23 Budget Request

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Executive Summary

This report examines the fiscal year (FY) 2023 defense budget request and assesses whether it sufficiently resources what was known of the Biden administration's national defense strategy when the budget was released. Because of the delay of the full, unclassified version of the strategy, the analysis focuses on two factors—high-end munitions stockpiles and overseas posture—that past studies have indicated are critical for strengthening deterrence against China and Russia in the near term. This report concludes that while the FY23 request makes some strides on both issues, more must be done today to improve the United States' chances of deterring and, if necessary, defeating the adversary tomorrow.

The ongoing war in Ukraine has elevated the issue of munitions stockpiles to front-page news as both Ukrainian and Russian forces continue to consume high volumes of key weapons. We examine the sufficiency of existing critical conventional munitions stockpiles and the future procurement plans to meet the threats posed by China and Russia. We find that while the services have shifted to investing in longer-range weapons, they are still underinvesting in the specific capabilities, in particular anti-ship and area-effects weapons, that would be needed to counter China in a variety of scenarios. Moreover, the Department of Defense (DoD) is not buying enough of these weapons to blunt and defeat an initial invasion, and it certainly is not stockpiling enough precision-guided munitions (PGMs) for a protracted war.

Through an assessment of munitions procurement over the past 15 years, comparing buys year over year and planned vs. actual buys, we conclude that munitions procurement is volatile and that projections vary widely in their reliability. Thus, the DoD's procurement practices have contributed to the weakness of the PGM industrial base. Stabilizing U.S. and allied and partner nation demand and increasing predictability by improving consistency and follow-through will support a healthier industrial base. Viewing munitions as "bill payers" or as lesser priorities that can be cut from the budget when funds are tight runs in the face of these objectives. Employing multiyear munitions buys and improving pathways for co-production and co-development with allies and partners are two additional potential stabilizing solutions being discussed. Each potential co-development or co-production opportunity needs to be examined for its risks and merits individually, but in general this seems like a

promising way to strengthen the PGM defense industrial base, shore up supply chains, and potentially create shared stockpiles of critical PGMs in priority theaters. We also recommend that the DoD examine the viability of multiyear procurement contracts and alternatives to traditional full funding to determine whether deviations from default funding and contracting practices could strengthen the munitions and missiles industrial base and meet the combined U.S. and allied military demand.

Investing in a distributed and resilient posture will be another critical piece in this puzzle. To deter China, U.S. forces in the Indo-Pacific must be able to effectively project power while under attack. In assessing investments in posture in the Indo-Pacific region since the 2011 pivot to Asia, we find again that the services have not been doing enough. While U.S. military construction in the Pacific does exceed that in Europe in the FY23 request, the portion of that spending going toward improving the survivability of U.S. forces is insufficient.

In the event of a war with China, deep stockpiles of the right munitions and a distributed and resilient posture will be necessary to deny a quick victory and to then sustain combat operations should the war become protracted. On both accounts, the Department of Defense has urgent work to do.

While the services have shifted to investing in longer-range weapons, they are still underinvesting in the specific capabilities that would be needed to counter China in a variety of scenarios.

Introduction

The Department of Defense (DoD) submitted its fiscal year (FY) 2023 budget request to Congress in March 2022, asking for \$773 billion.¹ Although this is President Joe Biden's second defense budget, it is the first budget this administration built that includes the Future Years Defense Program (FYDP), which projects spending for the next five years (through FY27).

Most of the debate about the DoD's FY23 budget request has revolved around whether the top line is sufficient to support the defense strategy, given inflation and the war in Ukraine.² Additionally, the delay of the full, unclassified version of the 2022 National Defense Strategy (NDS) made the task of evaluating the budget's alignment with the DoD's concept of "integrated deterrence"³ even more difficult.⁴ The NDS released in October 2022 presents China as the "most comprehensive and serious challenge to U.S. national security," while Russia remains an "acute threat."⁵ According to Deputy Secretary of Defense Kathleen Hicks, "the cornerstone of integrated deterrence" and the key to achieving these goals is "combat credibility" or the ability of "the U.S. military to fight and win."⁶

Our analysis of the FY23 budget request focuses on two factors—high-end munitions stockpiles and overseas posture—that past studies have indicated are critical for strengthening deterrence against China and Russia in the near term.⁷ The war in Ukraine has highlighted how quickly key munitions can be consumed, outstripping existing stockpiles and the ability of the defense industrial base to meet surges in demand.⁸ To supply Ukrainian forces, the American military has depleted its own weapons caches, leading House authorizers to insert a provision in their version of the National Defense Authorization Act (NDAA) obliging the Pentagon to establish a critical munitions reserve.⁹ Meanwhile, long-running calls to bolster the resilience of American military posture in the Indo-Pacific region remain unanswered. Some have decried the amount of American funding used to reinforce the U.S. military's posture in Europe through the European Reassurance and then Deterrence initiatives while the Pacific Deterrence Initiative (PDI), only established in 2020, still lacks dedicated appropriations.¹⁰

Our analysis develops tailored metrics to supplement those the DoD uses to paint a fuller picture of high-end munitions procurement and overseas posture in the two priority regions. The DoD's "missiles and munitions" reporting category consists of all weapons, ranging from individual bullets fired by handguns to nuclear-armed intercontinental ballistic missiles.¹¹ To better assess whether the Pentagon is buying enough of the right types of conventional weapons that it would need to defeat China and Russia in a war, we created the metric key conventional precision-guided munitions (PGMs) and further differentiated these PGMs by their range. We also developed two metrics—consistency and follow-through—to assess whether the DoD has been buying a stable and predictable number of PGMs over time.

Similarly, under the rubric of the European Deterrence Initiative (EDI) and the PDI, the Pentagon reports funding for a wide range of activities, including security cooperation, presence, exercises, new capabilities, and infrastructure improvements. Although all of these can

contribute to posture, which is defined as forces, footprint, and agreements,¹² to enable comparison, we collapse the existing categories into either funding for forces or funding for facilities. Because the PDI was created in 2020, the data are quite limited and likely exclude infrastructural investments that could have been made since then—President Barack Obama announced

If the goal is to create a combat credible posture to defeat great-power aggression (that is, deterrence by denial), American forces need a distributed and hardened network of bases to support operations in a highly contested environment.

that the United States was pivoting or rebalancing toward the Pacific in the fall of 2011.¹³ To supplement the PDI and EDI data, we compiled spending on military construction for infrastructure to support military operations in Europe and the Pacific from FY12–FY23.¹⁴ We focused on military construction in part due to practicality and in part due to its importance. Practically, military construction funds are one of the few items in the defense budget differentiated by region, making them amenable to regionally focused comparisons. But we also focused on military construction because it is the part of the posture that requires the longest lead times and that critics have argued has been the most neglected.¹⁵ Temporarily rotating forces overseas for exercises, for security cooperation activities, or on a presence mission can be changed annually as a part of the Pentagon's global force management process and thus can be relatively quickly adapted. But if the goal is to create a combat credible posture to defeat great-power aggression (that is, deterrence by denial), American forces need a

distributed and hardened network of bases to support operations in a highly contested environment.

The remainder of this report is divided into four sections. The first section provides an overview of the defense budget top line and how those resources are allocated across the major accounts. The second section focuses on historical and projected trends in precision-guided weapons investment. The third section examines posture investments in the two major theaters—the Indo-Pacific and Europe—since the pivot to the Pacific. The final section offers conclusions.

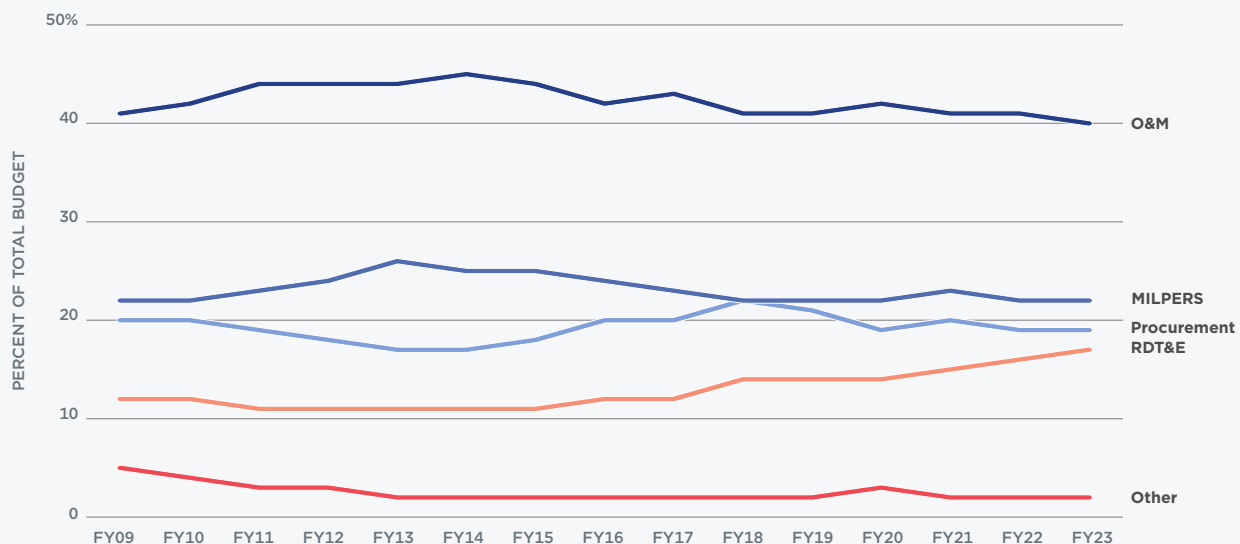
Budget Overview

President Biden requested \$773 billion for the DoD in FY23, which continues the generally upward trend in defense spending and represents a real increase of 4 percent from the base FY22 enacted budget.¹⁶ Congress is still working on the FY23 National Defense Authorization Act, but three of the four key committees have added \$66 billion to \$77 billion, which would increase the president's requested top line by 8.5 percent to 10 percent.¹⁷ These increases were often attributed to rising inflation, which has already exceeded the 2.7 percent¹⁸ projection the DoD made using the gross domestic product chain-type

price index when its budget request was finalized.¹⁹ As Mike McCord, the under secretary of defense (comptroller), explained, “projecting inflation remains a difficult task,” particularly as “the world kept changing after we finished the budget” and we cannot know “at this point if the conditions, such as fuel prices, that pertain today will persist into FY 2023.”²⁰ Given the uncertainty surrounding inflation, it is difficult to assess how much real growth—percentage change after adjusting for inflation—these options represent.²¹ For our analysis, we adjusted costs using DoD-published deflators. We report all spending in terms of FY23 dollars.

Within the president's budget request, several recent trends continue. Most notably, the military personnel account and the operations and maintenance account continue to eat up significant shares of the overall budget, 22 percent and 40 percent respectively, as the size of the U.S. military by most measures and the number of large operations decrease.²² The procurement account and the research, development, test, and evaluation (RDT&E) account, which together make up the DoD “investment budget,” continued to converge as procurement's share of funding decreased slightly but remained at 19 percent, while RDT&E increased slightly to 17 percent.

FIGURE 1: DOD BUDGET BY TITLE²³



The operations and maintenance (O&M) account makes up the largest share of the defense budget, followed by military personnel (MILPERS) costs. Spending between procurement and research, development, test, and evaluation (RDT&E) is nearly even.

The Rise of Precision Strike

The weapons that destroy enemy forces often get less attention than the ships, submarines, aircraft, and tanks that fire them. In defense budget battles, large, expensive platforms dominate debates and are prioritized, while, as former Air Force Assistant Secretary for Acquisition, Technology, and Logistics Will Roper noted, “munitions ... often become the bill payer in program review” because while one cannot buy half a ship or airplane, one can halve the planned buy of bullets and missiles.²⁴ This remains true even after the U.S. military has showcased the utility of its unparalleled precision-strike capabilities over the last three decades. When armed with precision munitions and connected to advanced battle networks that spot enemy targets and relay this information to shooters, U.S. forces can fire weapons, even from great distances, and have a high probability of destroying the target while minimizing collateral damage.²⁵ Recently, Russia’s 2022 invasion of Ukraine highlighted the importance of munitions stores and galvanized debates about whether the U.S. military has sufficient reserves of key weapons.

In 1968, Navy and Marine aircraft first employed a limited number of PGMs during the Vietnam War.²⁶ Later in the war, U.S. air forces fired a larger number of laser-guided bombs (LGBs) as a part of Operation Linebacker I. Between February and December 1972, U.S. Air Force aircraft employed 9,094 LGBs as a part of the interdiction campaign against bridges and North Vietnamese lines of communication, with approximately half of these weapons directly hitting their targets.²⁷

Almost 20 years later, in 1991, the success of PGMs in the 43-day air campaign of Operation Desert Storm fueled ideas that a revolution in military affairs was underway.²⁸ American cruisers, battleships, and B-52 bombers fired guided cruise missiles at the Iraqi electrical grid and other fixed targets, while fighters “plinked” Iraqi tanks with LGBs, and stealthy F-117 aircraft armed with precise bunker-busting bombs focused on destroying hardened targets in heavily defended areas, including shelters, command bunkers, surface-to-air missiles (SAMs), and weapons of mass destruction facilities.²⁹ Although the impact and efficacy of these new technologies may have been overstated,³⁰ and ultimately of the 227,822 weapons employed, only 17,644 or about 7 percent were guided or “smart” weapons, Desert Storm showcased the potential of precision strike and made PGMs the preferred American weapon.³¹

In Operation Allied Force, the 1999 air war over Kosovo, PGMs constituted 29 percent of weapons

used by American aircraft.³² As the only country with precision strike capabilities, the United States quickly expended its high-end PGM stockpiles. After a week of operations, the U.S. Air Force had fired a third of its long-range cruise missiles. A month into operations, it had approximately 600 GPS-guided “smart” bombs left because recent Air Force budgets had prioritized other procurement needs over PGMs.³³

In the 2001 initial phase of Operation Enduring Freedom, the war in Afghanistan, 57 percent of American weapons used were PGMs, while in the initial phase of the 2003 invasion of Iraq, which only lasted a month and was called Operation Iraqi Freedom, 68 percent of the American munitions employed were PGMs.³⁴ By 2011, almost all coalition bombs and missiles in Operation Odyssey Dawn, NATO’s short air war over Libya, were PGMs. Although NATO allied aircraft could conduct precise strikes, their PGM stockpiles quickly ran low, and the United States had to backfill their supplies.³⁵

FIGURE 2: PGMS EMPLOYED IN RECENT OPERATIONS³⁶

	Total Munitions Employed	Percent Precision-Guided Munitions
Desert Storm 1991	227,822	7%
Deliberate Force 1995	1,000	69%
Allied Force 1999	23,300	29%
Enduring Freedom Oct-Dec 2001	17,500	57%
Iraqi Freedom March-April 2003	29,199	68%
Odyssey Dawn 2011	7,642	100%
Inherent Resolve 2014-2019	115,983	Analysis suggests vast majority were precision-guided munitions

Operation Inherent Resolve (OIR), the war against the Islamic State of Iraq and Syria (ISIS), is technically still ongoing at a low level, but most of the American strikes occurred between 2014 and 2019.³⁷ This extended war stressed U.S. weapons supplies and the ability of the defense industry to meet unexpected and prolonged demand for PGMs.³⁸ In December 2015, former Air Force Chief of Staff General Mark Welsh said that the Air Force was using PGMs “faster than they can replenish them.”³⁹ The DoD has not released unclassified information on the percentage of guided versus unguided munitions that it used in its war against ISIS, but two pieces of evidence suggest the coalition air forces nearly exclusively employed precision weapons. First, for much of the war the coalition had strict rules of engagement to avoid civilian casualties.⁴⁰ U.S. Central Command had imposed a very low civilian casualty threshold, which stipulated that if a strike might kill one civilian, it required a more senior leader’s approval, and early in the war a general officer was required to authorize every use of a weapon.⁴¹ Even after the rules of engagement were relaxed, the coalition emphasized minimizing civilian harm, which does not mean that it was successful at doing so, but does suggest that PGMs were preferred to unguided weapons. Second, during the four years when most OIR combat operations occurred, the coalition expended 115,983 total weapons and the DoD nearly ran out of short-range PGMs, including Joint Direct Attack Munitions (JDAMs) and Hellfire missiles.⁴² From FY15 to FY21 the DoD purchased more than 300,000 short- and medium-range PGMs, including nearly 191,000 JDAMs to support the war and replenish its stockpiles.⁴³ Given these two facts, it is reasonable to assume that most of the weapons employed in OIR by coalition air forces were PGMs.

“Missiles and Munitions” versus Key Conventional PGMs

The DoD’s FY23 budget documents do not include an aggregate measure of investment in precision munitions. Instead, the documents report allocating \$24.7 billion to a category called “missiles and munitions,” which accounts for 9 percent of the investment budget and 3 percent of the overall budget request.⁴⁴ With the exception of FY22, the DoD has continued to invest more in this category since a recent nadir in FY15. But the category of “munitions and missiles” is very broad, encompassing conventional and nuclear weapons, lumping together basic bullets and mortars used by ground forces with the Sentinel intercontinental ballistic missile, the Trident II D5 submarine-launched ballistic missile, and the nuclear-armed cruise missile, the Long Range Standoff Weapon.⁴⁵ Reporting these weapons together obscures important investment trends. Nuclear weapons are

incredibly important for deterrence,⁴⁶ but these are not the weapons that the United States will employ in great numbers to deter and defeat conventional aggression. Instead, American forces would need enough conventionally armed PGMs to penetrate air defenses and accurately hit enemy targets.

The DoD defines a PGM as “a guided weapon intended to destroy a point target and minimize collateral damage,” which it does by correcting for aiming errors and steering toward its target.

To assess trends in this critical component of the larger “Missiles and Munitions” category, we created a new categorization, key conventional PGMs, detailed in Figure 3. The DoD defines a PGM as “a guided weapon intended to destroy a point target and minimize collateral damage,” which it does by correcting for aiming errors and steering toward its target.⁴⁷ These include air-launched, ground-launched, and sea-launched weapons that are being procured and in the case of some of the new systems still in the research and development stage (indicated in bold).⁴⁸ Our analysis excludes surface-to-air missiles and torpedoes.

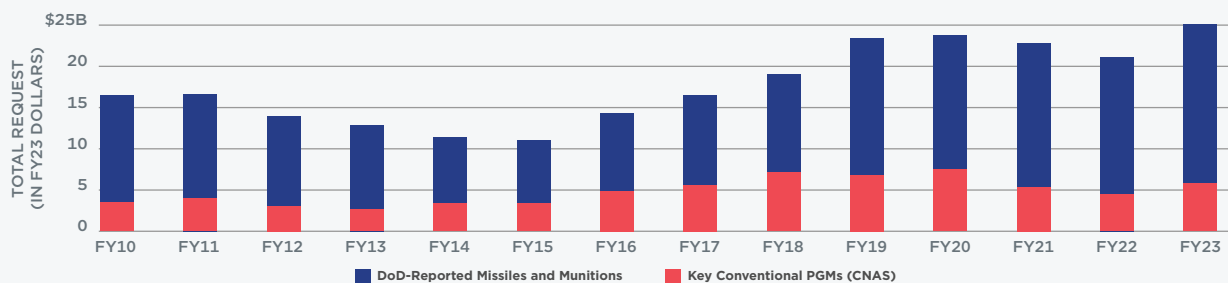
Each service should procure the right types of weapons in sufficient quantities to execute joint warfighting concepts against a great-power adversary. Range is a key attribute that differentiates weapons that are useful for operations in a permissive versus a contested environment. In a high-end fight against China or Russia, American forces would need long-range precision-guided munitions that allow them to stay outside of the worst danger and to accurately hit key targets, such as ships, tanks, or invasion forces. Thus, we distinguished PGMs by the military department procuring each system and by each system’s range to target, with short-range systems at less than 50 km, medium range between 50 and 350 km, and long range beyond 350 km.

Figure 4 shows the generally upward trajectory in the DoD-reported “missiles and munitions” category and key conventional PGMs, as outlined in Figure 3. PGMs have not received the same overall increase over the last eight years as the larger category of “missiles and munitions.” Moreover, despite the focus on deterring great-power war in the 2018 NDS, the amount requested for key conventional PGMs declined to \$5.3 billion in FY21 and \$4.4 billion in FY22. The FY23 budget asked for \$5.7 billion for conventional PGMs, representing an almost 30 percent increase, but remains below the \$7.4 billion requested in FY20.

FIGURE 3: THE KEY CONVENTIONAL PGM PORTFOLIO

	Department of the Air Force	Department of the Army	Department of the Navy
Long (>350km)	<ul style="list-style-type: none"> Joint Air-to-Surface Standoff Missile (JASSM) Long-Range Anti-Ship Missile (LRASM) Air-Launched Rapid Response Weapon (ARRW) Hypersonic Attack Cruise Missile (HACM) Hypersonic Air-Breathing Weapon Concept (HAWC)/ MoHAWC Tactical Boost Glide (TBG) 	<ul style="list-style-type: none"> Precision Strike Missile (PrSM) Long-Range Hypersonic Weapon (LRHW) Mid-Range Capability 	<ul style="list-style-type: none"> Joint Air-to-Surface Standoff Missile (JASSM) Long-Range Anti-Ship Missile (LRASM) Standard Missile-6 (SM-6) Tomahawk Conventional Prompt Strike (CPS) Hypersonic Air-Launch OASuW (HALO)
Medium (50–350km)	<ul style="list-style-type: none"> Stand-in Attack Weapon (SiAW) Small-Diameter Bomb I (SDB I) Small-Diameter Bomb II (SDB II) AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM) AIM-260 Joint Advanced Tactical Missile (JATM) 	<ul style="list-style-type: none"> Army Tactical Missile System (ATACMS) Guided Multiple Launch Rocket System (GMLRS) 	<ul style="list-style-type: none"> Advanced Anti-Radiation Guided Missile/Extended Range (AARGM/AARGM-ER) Small-Diameter Bomb II (SDB II) Joint Standoff Weapon (JSOW) Naval Strike Missile (NSM) AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM) Guided Multiple Launch Rocket System (GMLRS) AIM-260 Joint Advanced Tactical Missile (JATM)
Short (<50km)	<ul style="list-style-type: none"> Joint Direct Attack Munition (JDAM) AGM 114 Hellfire Joint Air-to-Ground Missile (JAGM) AIM-9X Sidewinder 	<ul style="list-style-type: none"> AGM 114 Hellfire Joint Air-to-Ground Missile (JAGM) M982 Excalibur FGM-148 Javelin 	<ul style="list-style-type: none"> Joint Direct Attack Munition (JDAM) AIM-9X Sidewinder FGM-148 Javelin

The authors identified key conventional precision-guided munitions to better assess whether the Department of Defense is investing in the right weapons to achieve its strategy. Systems listed in bold represent programs still in research and development.

FIGURE 4: DOD-REPORTED SPENDING ON “MISSILES AND MUNITIONS” VS. SPENDING ON KEY CONVENTIONAL PGMs⁴⁹

The “missiles and munitions” categorization that the Department of Defense (DoD) uses to report investment is so broad that it makes it difficult to discern if the DoD is buying the right conventional weapons for a high-end conflict.⁵⁰ The authors call out precision-guided munitions (PGM) procurement, a subset of this larger missiles and munitions category, over the same period. Key conventional PGMs includes procurement dollars only.

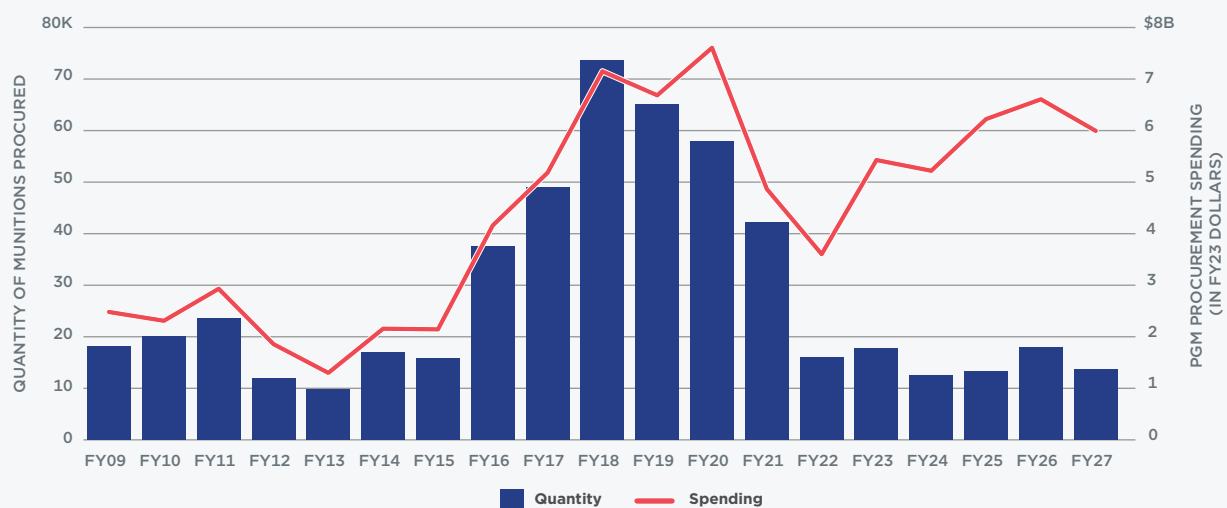
Purchasing Precision

For years, the DoD underinvested in weapons and purchased insufficient quantities of PGMs before procurement spiked from FY16 to FY21 to likely replenish the stockpiles rapidly exhausted by OIR. As seen in Figure 5, from FY09–FY14, the DoD bought more than 100,000 precision strike weapons with an average of 16,760 a year for a total of \$19.7 billion in real dollars and an average cost of \$3.3 billion a year. As then–Under Secretary of Defense Acquisition, Technology, and Logistics Frank Kendall noted, the Pentagon did not predict the “usage rates” of OIR. Returning to an often-heard phrase in the Pentagon, Kendall concluded that it is “probably fair to say that traditionally and historically, munitions have tended to be a bill payer in that [budget] process.”⁵¹ Thus, when demand suddenly spiked, the defense industry did not have the capacity to immediately surge and keep pace. Existing munitions production lines are often nearly at capacity, so expansion can require making cuts to another munition produced on the same line or opening another line, which in turn means that new facilities may need to be constructed, additional machines and tooling fabricated, more components and raw materials purchased, and additional workers hired. Significantly expanding munitions production capacity, therefore, is usually a

several-year process. After a reportedly “herculean effort,” by 2018 Boeing had more than doubled its JDAM production lines and was producing 45,000 JDAM kits a year.⁵² The DoD also sought to rapidly acquire more AGM-114 Hellfire laser-guided missiles for drones and helicopters, 250-pound satellite-guided small-diameter bombs (SDBs), and a laser-guided 70 mm Hydra rocket with about a 10-pound warhead called Advanced Precision Kill Weapon System (APKWS) that can be carried by fixed or rotary wing aircraft.⁵³ Between FY09 and FY27, the DoD will have only procured on average 28,061 precision strike weapons a year. Excluding FY15–FY21 and excluding projected buys, the DoD has averaged a buy of 16,800 PGMs a year at the cost of approximately \$3.7 billion FY23 dollars total.

Looking forward to the projections in the FYDP and excluding the OIR surge, the average number of munitions goes down to 15,996 a year, but this may be due to buying larger quantities of more expensive standoff missiles. The FYDP projects an increase in spending akin to OIR levels while quantities produced remain low, less than a third of their peak during OIR. According to these projections, over the coming five years, the department plans to spend on average \$6.1 billion per year (OIR average was \$5.7 billion) to procure an average of 15,075 PGMs a year (OIR average was 48,745).

FIGURE 5: DOD PGM PROCUREMENT⁵⁴



Procurement of PGMs spiked during Operation Inherent Resolve (OIR) to replace weapons being consumed at a high rate. In the wake of the FY15–FY21 OIR procurement surge, the cost for PGM procurement remains high, but the number of weapons purchased declines significantly.

Pivoting the Weapons Portfolio for High-End Conflict: What Types of Weapons Are Needed and How Much Is Enough?

The Pentagon has identified multidomain long-range fires—lethal offensive weapons—as a necessary component of integrated deterrence.⁵⁵ Testifying before the Senate Committee on Appropriations, General Mark Milley, the chairman of the Joint Chiefs of Staff, argued that “investments in long-range missiles are a cost-effective strategy that improves our ability to compete with the PRC.” Multidomain standoff attacks reduce “the risk to critical U.S. assets,” increase “the defensive burden imposed upon the enemy,” and provide a “strike capability without having to also maintain air superiority.”⁵⁶

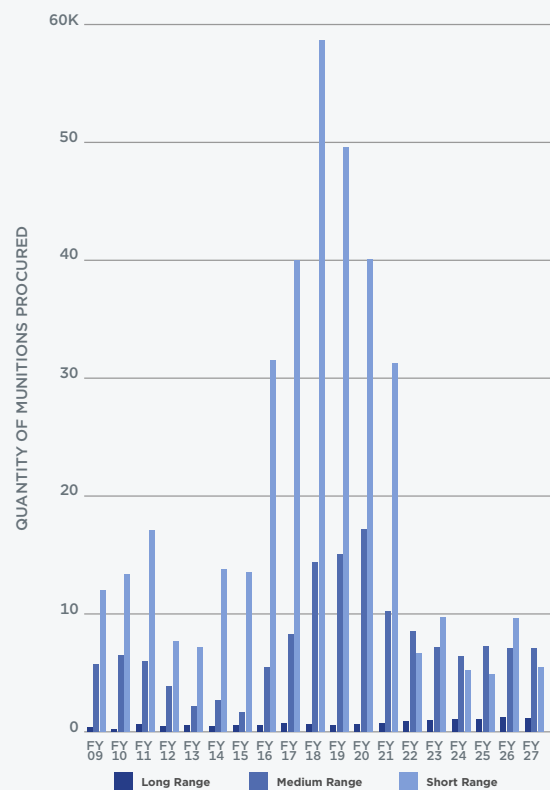
This raises questions about how many and what types of conventional weapons are needed for a high-end fight. The type of weapons needed to fight a terrorist organization or weak state that lacks sophisticated air defenses is different from one used to fight a near-peer adversary. China and Russia both have advanced anti-access area-denial capabilities that include a dense system of integrated air defenses that can attrite American aircraft and incoming munitions and long-range precision missiles that can hold at risk bases and forces in the theater.⁵⁷ Since the end of the Cold War, the U.S. military has conducted operations by deploying forces to bases and waters near the area of operations because adversaries could not effectively attack U.S. forces outside of those that were on the ground in their territory.⁵⁸ American aircraft quickly gained air superiority by destroying any air defenses that existed, allowing long-range missiles fired by bombers to reach their targets and aircraft to patrol the skies unmolested hunting for ground targets;⁵⁹ meanwhile, the U.S. Navy maintained command of the seas, enabling it to station its large warships in nearby waters so their short-range fighter aircraft and land attack cruise missiles could conduct ground strikes.

In a war against China, and to a lesser extent Russia, the enemy could reach out and attack close-in American ground- and sea-based forces that operate inside of its conventional weapons’ range, which extends hundreds, if not thousands, of kilometers. Fixed ground-based targets, such as air bases and ports, would be particularly vulnerable, but both countries also have long-range anti-ship and anti-air missiles. This puts a premium on longer-range weapons that enable American forces to fire from safety.

American forces also need advanced weapons that evade air defenses or sufficient missiles to overwhelm air defenses. It is important to emphasize that required size of munitions stocks is directly related to the density of enemy air defenses, which can intercept many of the incoming American fires.⁶⁰

The quantity of weapons needed is difficult to estimate at an unclassified level because we do not have a good sense of the starting inventories for many American weapons, nor the number and type of targets that would need to be engaged. Questions of sufficiency also are quite sensitive to assumptions about how long such a war would last. If defense planners assume that the United States can defeat an enemy invasion with a denial strategy in several weeks or months, fewer weapons are needed than if the conflict turns into a stalemate or protracted war. Recent experience suggests that short-war assumptions often prove untrue.

FIGURE 6: DOD PGM PROCUREMENT BY RANGE⁶¹



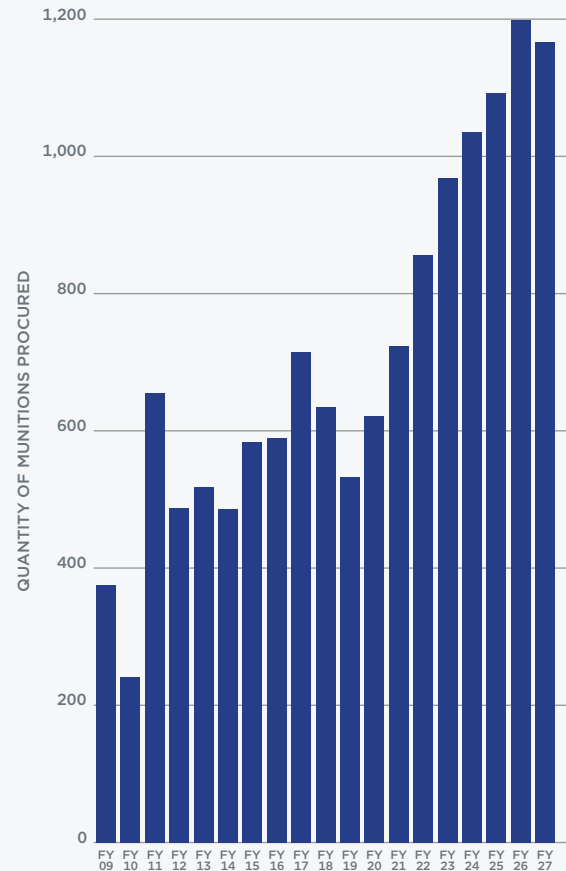
Munitions buys have comprised largely less expensive shorter-range munitions until the last few years as services began shifting to investments in longer-range systems. This trend is projected to continue.

Between FY09 and FY21, short-range munitions represent the majority in quantity produced in every year. This is not surprising as for nearly 30 years the Pentagon has conducted operations in permissive environments where American forces had air and sea superiority and thus did not need standoff weapons. On paper, the 2018 NDS prioritized “inter-state strategic competition” against China and Russia and “not terrorism,”⁶² but under the Trump administration the Pentagon continued to buy tens of thousands of short-range weapons to replenish the stocks of PGMs suitable for counterterrorist operations or less capable threats. It was not until 2022 that medium-range PGMs overtook short-range weapons production, due in part to the time lag associated with expanding long-range weapons production capacity. In FY26 long-range weapons buys are expected to surpass short- and medium-range weapons buys.

While the buy of long-range PGMs has steadily increased since 2019, annual buys have never exceeded 1,000 weapons and are not projected to exceed this threshold until 2024. Historically, the DoD has bought fewer long-range PGMs because of their higher per unit cost.⁶³ For instance, each JDAM guidance kit costs about \$41,000 and through FY22 the Air Force had acquired more than 370,000 of these short-range guidance systems.⁶⁴ To fly farther, missiles must be larger to accommodate an engine, fuel, and navigation systems that stay on course and enable them to find targets after their long flight, and all of these components drive up the cost. Thus, each of the Navy’s long-range multimode SM-6 missiles costs approximately \$4.4 million; through FY22, the service has bought only 1,056 of these missiles.⁶⁵

As threats and defense strategies have changed, the services have adjusted their weapons portfolios to meet the evolving security environment and policy guidance. Looking at the services’ PGM investments helps illuminate whether each is individually buying enough of the right types of weapons for China and Russia and collectively whether they have sufficient stockpiles of the weapons needed for a high-end conflict. Over the last 15 years, the Department of the Air Force has procured on average 20,634 PGMs a year, far outstripping both the Department of the Army (8,097) and the Department of the Navy (2,977). Air Force procurement peaked during OIR in FY18 when it bought 48,606 PGMs for \$2.97 billion, although 40,574 or 83 percent were short-range weapons, with JDAMs making up 72 percent of the total buy. 2022 marked the first year that the Air Force emphasized longer-range systems, specifically the long-range Joint Air-to-Surface Standoff Missile (JASSM), while

FIGURE 7: DOD LONG-RANGE PGM PROCUREMENT⁶⁶



Long-range precision-guided munitions procurement has steadily increased over the last 15 years.

decreasing JDAM buys from an average of 26,524 per year between FY16 and FY21 to 1,180 in 2022. JASSM is a stealthy cruise missile with a range of at least 370 km, costing on average more than \$1 million per missile.⁶⁸ The Air Force has already purchased 4,969 JASSMs, requested funds to buy 550 more in FY23, and planned to buy about 500 more missiles each remaining year of the FYDP, taking the total number of JASSMs to 7,547 by FY27.⁶⁹ One analysis concluded that if half of the Air Force’s nonstealthy bombers were flying the maximum number of standoff cruise missile strikes possible against a peer adversary, then fully loaded bombers would exhaust the Air Force’s long-range PGM stockpiles in about a week.⁷⁰

The situation with the long-range anti-ship missile (LRASM)—the anti-ship cruise missile that would be needed to sink a Chinese invasion fleet in a war over Taiwan—is even bleaker. The Air Force has purchased 56 LRASM missiles and did not buy any last year. It will buy 28 LRASMs in FY23 and plans to purchase another 95 missiles by FY27, leaving it with a total inventory of 179 LRASMs in FY27. A stockpile of that size is only enough for nine B-52s or seven B-1s to fly one sortie or mission in a war over Taiwan.⁷¹ Since China has numerous cruisers and destroyers with sophisticated surface-to-air missiles, one must assume that some of the LRASMs would be intercepted by these air defenses; in addition, some would hit decoys or other ships, and some would miss and fail, leaving a very small number of the 179 to penetrate defenses and hit Chinese amphibious ships.⁷² Lockheed Martin builds both JASSM and LRASM missiles on the same production line, meaning that there are total capacity limits and tradeoffs between the amount of ground attack and anti-ship cruise missiles that the DoD can procure. In 2015 and 2019, Lockheed Martin began expanding its capacity to produce JASSMs and LRASMs, but these improvements took several years to complete, with the most recent expansion yielding increased long-range cruise missile production in FY23.⁷³

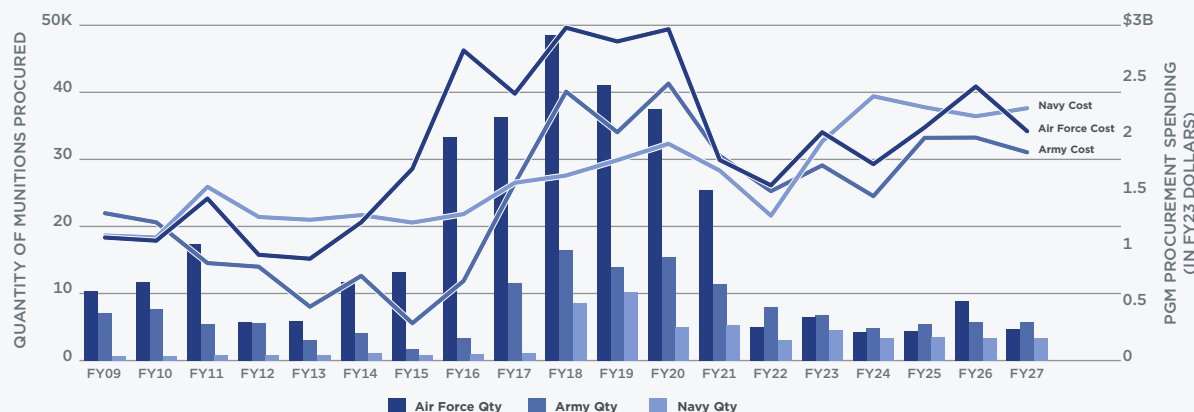
As the Army has transitioned from its counterterrorism and counterinsurgency role of the 2000s and 2010s to conducting multidomain operations against a great-power competitor, it has increased investment in PGMs. In the six years before OIR, the Army procured an annual average of 5,464 PGMs; since the OIR surge

began in FY15 through FY23, the service has procured an average of 9,853. Army procurement quantity peaked in FY18, with 16,456 PGMs for \$2.4 billion. Of that, the midrange Guided Multiple Launch Rocket System (GMLRS) accounted for 40 percent and the short-range Hellfire missile accounted for 32 percent. Because the Army has identified long-range precision fires as its top acquisition priority, it is not entirely surprising that in 2022, it surpassed the Air Force procurement counts.⁷⁴

Army procurement of GMLRS—which can be fired by Multiple Launch Rocket System (MLRS) or High Mobility Artillery Rocket System (HIMARS)—surged after FY15 and reached a peak of 7,878 rockets in FY20, presumably to replenish the rockets used in the war against ISIS. The Army has procured fewer GMLRS rockets each subsequent year and plans to buy 4,674 GMLRS in FY23 at a cost of about \$168,000 per rocket. Across the FYDP, the Army plans a fairly consistent buy of on average 4,000 GMLRS a year for a total of about 20,000 additional rockets by FY27. Combined with the prior GMLRS buys and depending on prior usage, that leaves a total Army inventory of approximately 50,000 to 80,000 GMLRS.⁷⁵ This figure also does not account for the unspecified number of GMLRS rockets that have been provided to arm the 38 HIMARS launchers provided to Ukraine.⁷⁶ Assuming that there is a war where 100 MLRS and 200 HIMARS each are firing two full salvos a day for a total of 4,800 rockets used each day, the Army would go through 50,000 to 80,000 GMLRS in as few as 10 days and at most 17 days.⁷⁷

In 2023, the Army plans to field its Army Tactical

FIGURE 8: DOD PGM PROCUREMENT BY MILITARY DEPARTMENT⁶⁷



The Air Force has long been the leader in precision-guided munitions procurement quantity but was overtaken by the Army in 2022 as the Army increased its focus on precision fires and the Air Force focused on long-range precision.

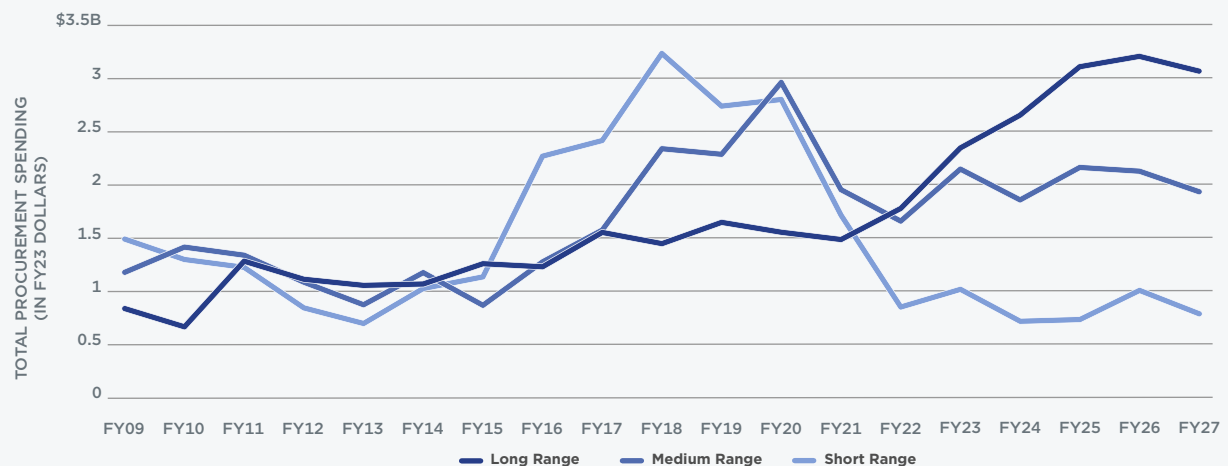
Missile System (ATACMS) replacement and its first long-range PGM, the Precision Strike Missile (PrSM), which in FY23 will cost about \$1.8 million per missile. By FY27, the Army plans to have bought 1,202 PrSM missiles, leaving it needing to buy another 2,784 PrSMs to hit its acquisition objective.⁷⁸ In the next PrSM increment procured, the Army is planning to make several improvements, including increasing the missile's range and providing a guidance system so it can hit mobile targets, such as enemy ships and missile launchers.⁷⁹ Additionally, in FY23 the Army is investing \$173,000 of RDT&E dollars in its Long-Range Hypersonic Weapon (LRHW) and \$404 million to develop ground-launched variants of the Navy Tomahawk and SM-6 missiles (collectively called midrange capability (MRC)).⁸⁰ LRHW reportedly may cost as much as \$106 million per missile, which will likely significantly limit the number of missiles that the service buys.⁸¹ As PrSM, LRHW, and MRC enter procurement in the next few years, the service is planning on increasing the amount that it spends on PGMs over the FYDP.

Of the three departments, the Navy purchased the fewest PGMs in the last 15 years but has more consistently invested in and prioritized long-range precision, historically through the Tomahawk and SM-6 and more recently through the JASSM and LRASM. For instance, in FY17, the 321 SM-6 and Tomahawk missiles accounted for 27 percent of PGMs procured for \$908.9 million. In the FY23 budget, the Navy plans to buy 4,523 missiles at a cost of \$2 billion, including 269 long-range missiles, which cost \$976.8 million. In FY23, the Marines are

purchasing the first 115 of the midrange Naval Strike Missile (NSM) and plan to buy another 381 NSMs by 2027 as a part of their Force Design 2030.⁸² Additionally, to enhance the reach of marine littoral regiments, the Marines are buying the first 13 Tomahawk Block V cruise missiles and through FY27 plan to buy another 231.⁸³ As the stand-in force in the Indo-Pacific region, the Marines focus missile procurement on longer-range anti-ship systems to support naval distributed operations rather than anti-armor weapons, such as Javelin.⁸⁴ Previously the Marines had purchased 2,129 Javelins, but the annual buy of this anti-tank system has declined significantly since FY17, with the Corps only planning to buy four or five Javelins a year between FY23 and FY27.⁸⁵

A breakdown of the amount spent by missile range helps illustrate how the shift toward long-range PGMs is likely to increase the cost even as the number of weapons procured declines. One can see that the amount spent on long-range PGMs moved on a fairly gradual upward trajectory after 2014, but only began to really climb in 2022 and is expected to grow even significantly more than that over the next five years. Short-range PGM procurement declined precipitously in 2022 and is expected to remain relatively low, while medium-range PGMs will continue to climb up just below the long-range munitions. There is a question, however, given the cost of this shift to longer-range weapons whether the DoD can buy as many standoff weapons as would be needed for a high-end conflict against China or Russia.

FIGURE 9: DOD PGM PROCUREMENT BY RANGE⁸⁶



The Department of Defense has seen a recent shift in procurement toward longer-range systems, with long range surpassing short and medium range in terms of procurement dollars in the 2021-2022 time frame.

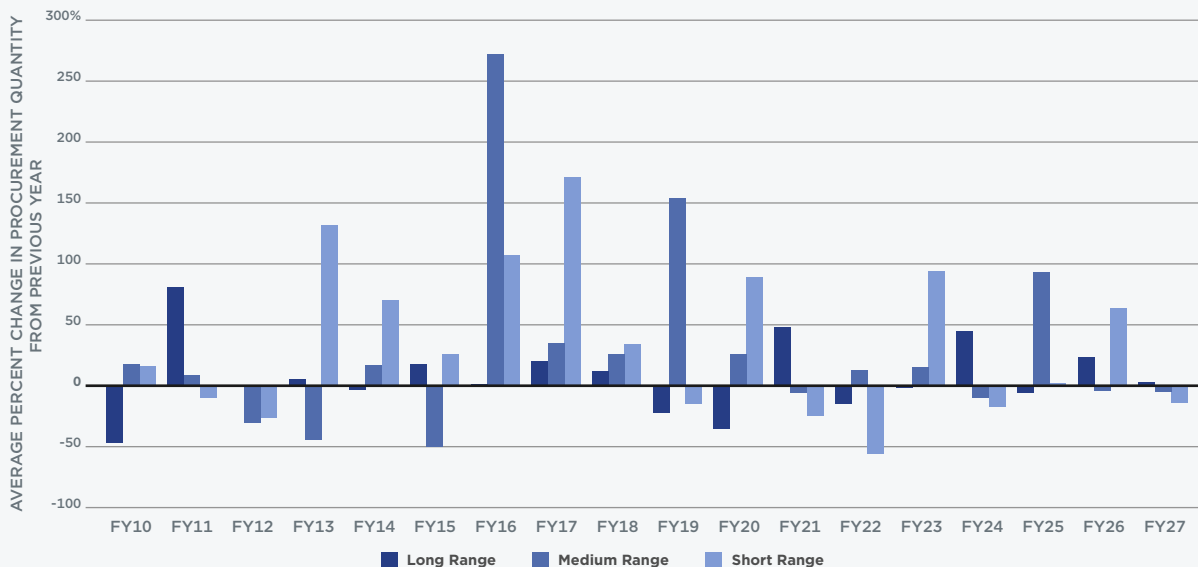
PGM Procurement Consistency and Follow-Through

Services weigh a number of factors, including changing unit costs, inflation, shifts in strategy and operational concepts, the development of new technologies, and the compromises needed to balance the budget, when deciding how many of each type of PGM to buy each year. Some fluctuations in procurement are inevitable as needs change; others are the result of poor prioritization and planning or a process that does not incentivize consistent weapons buys. In all cases, volatility in procurement quantities can make it difficult for the defense industrial base to meet the military's requirements and to quickly surge production when needed. To examine this issue, we looked at the percent change in PGM buys from year to year.

Over the last 15 years, procurement quantities of key PGMs have varied significantly year to year. Procurement in one year is not often indicative of procurement in the next year (for full breakout of individual weapons, see Appendix A). This trend affects medium- and short-range PGMs more so than long-range missiles, perhaps because of the FY15–FY21 OIR procurement bump and because these weapons

are procured in higher quantities overall. The Air Force procurement of the midrange SDB I systems, for example, went from 2,785 in 2011 to zero from 2013–2014, then shot back up to 3,494 in 2016, after which it rose at a steady rate through the remainder of OIR. Likewise, the Army procured Hellfire missiles at varying rates—from 2,106 in 2011 to 133 in 2013 up to 4,478 in 2017. The demand surged during OIR as drones armed with Hellfire missiles had the endurance to search for and find ISIS targets and then to close the kill chain by engaging the target, making them one of the most in-demand capabilities during the war.⁸⁸ Because the inventory of Hellfire missiles was being so rapidly depleted, the Army announced in 2017 that it intended to increase production of the short-range PGM by 50 percent in two years.⁸⁹ Lockheed Martin expanded its production line so it could meet the urgent demand for Hellfires, enabling the Army and the Air Force to acquire more than 10,000 missiles in FY18.⁹⁰ By FY22, however, Hellfire stockpiles had been replenished and the services were not interested in continuing to buy at the previous rate, as collectively they purchased around 2,000 Hellfires, leaving the contractor with excess production capacity and the need to find international clients for the missile.⁹¹

FIGURE 10: DOD PGM PROCUREMENT VOLATILITY BY RANGE⁸⁷



The Department of Defense has not sent a consistent demand signal for conventional precision-guided munitions, with procurement quantities varying widely from year to year, most significantly among short- and medium-range systems.

While long-range PGM procurement is more consistent in terms of quantity, the greater cost of long-range missiles means that even minimal volatility in quantity can represent significant volatility in spending. The Navy procurement of the Tomahawk was highly variable year to year, with buys ricocheting from 196 units (\$343 million) to 100 (\$211 million) to zero (\$109 million) to back up to 90 (\$415 million) between FY17 and FY20. While each department is culpable in perpetuating this trend, the Navy and Army are slightly worse offenders. This makes sense, considering the Air Force emphasis on long-range systems. The Air Force LRASM procurement quantities varied, from 15 units (\$60 million) to zero to six (\$21 million) to zero up to 28 (\$114 million) between FY19 and FY23.

Because past buys are not the best indicator for future buys, industry and other stakeholders look to the FYDP projections for insights into future procurement, but these numbers are also not uniformly reliable.⁹² Inside the DoD, building the FYDP helps stakeholders identify priorities and debate tradeoffs, while externally the FYDP provides a roadmap laying out where the Pentagon plans to invest its resources, helping Congress with its oversight role, industry to develop its business strategy and make investments needed to support the DoD's plan, and other external audiences to understand how the Pentagon is spending its money. Past research has shown that the FYDP does tend to predict the direction (increase or decrease) in spending for a line item.⁹³ Yet this analysis was not focused on missiles and munitions, which observers tend to agree are often cut during budget battles and prone to more volatility, which in turn makes it difficult to sustain a PGM defense industrial base that can surge when needed.⁹⁴ By calculating the percent change from the most recent projection for a given year (usually a projection from one year prior) to the actual buy, we could see how well each system adhered to projections—that is to say, whether the DoD followed through on its advertised plans.

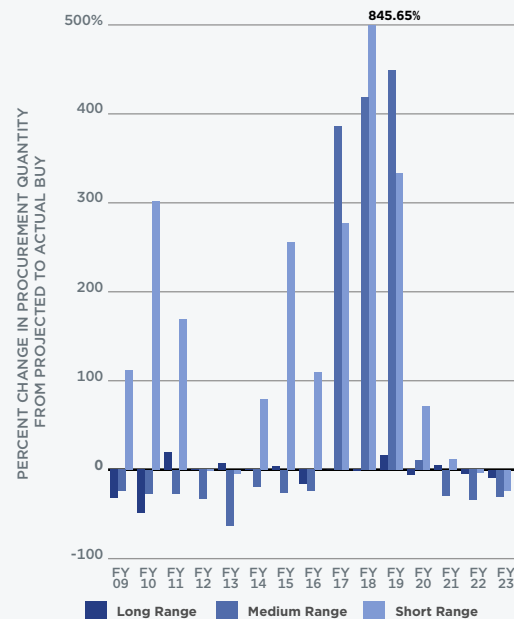
As with procurement consistency, medium- and short-range systems saw the highest variation from projections, predictably most egregiously in the middle of the OIR PGM procurement surge (FY17–FY19).

Even in long-range system follow-through, which appears negligible in Figure 11, the Air Force and Navy have failed to provide reliable projections, with the Air Force JASSM and Navy SM-6 providing two examples.

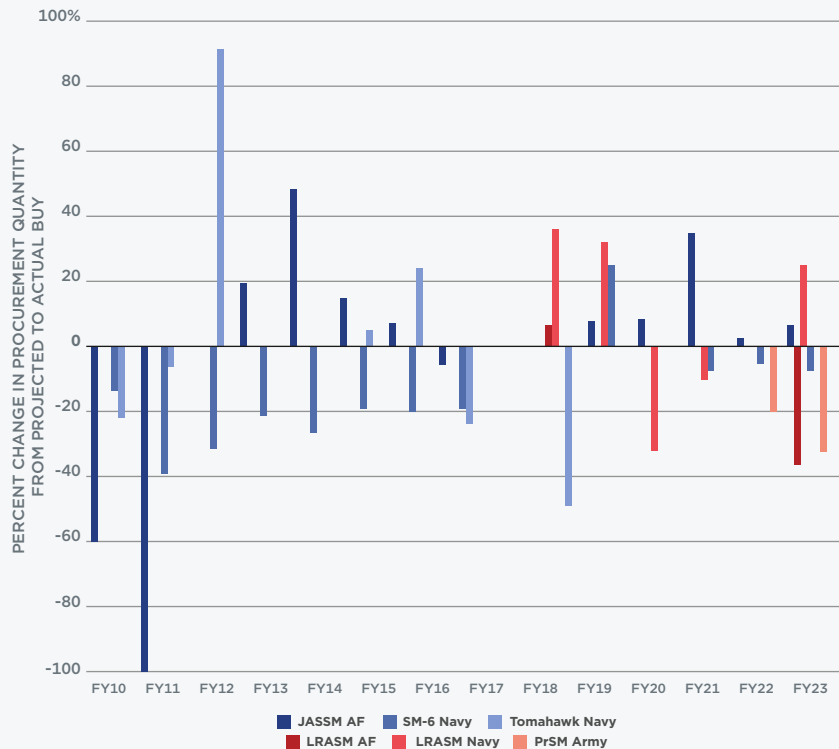
Although munitions FYDPs have proven unreliable, weapons manufacturers have no real alternatives for forecasting demand. Foreign military sales (FMS) can occasionally fill gaps and allow U.S. weapons manufacturers to hedge against volatile DoD demand, stabilizing the market, but unpredictability in more expensive, longer-range systems that have no foreign buyers can pose significant problems. Moreover, FMS can be unpredictable because they require interested foreign buyers who are willing to go through a complicated and long process that is subject to State Department and congressional approval.⁹⁷ If companies cannot count on certain revenue, they cannot plan. And this costs the DoD more in the long run. It also can cost the nation and the rules-based international order, as the United States is often looked to as the “arsenal of democracy” that will supply allies and partners that are resisting aggression.

Ideally, the DoD and allies and partners would purchase PGMs in consistent and stable quantities, which would keep costs down and enable the Pentagon to build a robust conventional weapons stockpile

FIGURE 11: DOD PGM PROCUREMENT FOLLOW-THROUGH BY RANGE⁹⁵



The Department of Defense annual budget request typically includes the Future Years Defense Program, which projects spending five years into the future. The projections for procurement of precision-guided munitions are often unreliable.

FIGURE 12: DOD LONG-RANGE PGM PROCUREMENT FOLLOW-THROUGH⁹⁶

The Department of Defense has not provided reliable projections for procurement of long-range conventional precision-guided munitions. With such expensive systems, even minor unpredictability in quantity can represent significant unpredictability in spending.

make sense to co-produce weapons with close allies who are interested in acquiring a particular PGM. This could add redundancy to production lines, place weapons closer to where they would likely be employed, and encourage more predictable buys. Stabilizing U.S. and allied and partner nation demand and increasing predictability by improving consistency and follow-through will support a healthier industrial base. Viewing munitions as “bill payers” to be cut when needed runs in the face of these objectives. Employing multiyear munitions buys and improving pathways for FMS are two additional potential stabilizing solutions being discussed.¹⁰¹

sufficient for its projected warfighting needs and those of its allies and partners.⁹⁸ In practice, “procurement ramps up during wartime and declines when conflict ends,” and because PGMs are a defense-unique sector, this volatility makes it an unattractive market to enter.⁹⁹ The DoD has reduced its stockpiles of munitions and missiles since the 1970s and has not consistently purchased key conventional weapons, leaving a consolidated and brittle industrial base with little flexibility.¹⁰⁰ This is a dangerous vulnerability that could weaken deterrence because adversaries recognize that the Pentagon does not have sufficient PGMs to prevail or the ability to rapidly expand its stockpiles.

To strengthen deterrence, the United States needs to demonstrate that it has the capability to defeat aggression. This means enough of the right type of weapons to win. The Pentagon may need to invest in additional PGM industrial base capacity so that it has a more diversified and resilient industry capable of surging production when needed. As a part of the DoD’s strategy of integrated deterrence, it may

Pivoting Posture to the Pacific

Since 2011, the Pentagon has been “pivoting” or “rebalancing” to the Indo-Pacific region to strengthen deterrence against China.¹⁰² Critics have decried the lack of concrete changes to the U.S. military posture—forces, facilities, and agreements—in the Indo-Pacific.¹⁰³ There has not been a significant and sustained uptick in the number of American bases or forces in the region to counter China’s growing military power. Moreover, relatively few steps have been taken to make existing bases more resilient and capable of weathering a first strike. In 2020, Congress created the Pacific Deterrence Initiative to jump-start efforts to strengthen U.S. military posture in the Indo-Pacific and to track spending and progress in this area.¹⁰⁴ PDI was modeled after a similar program created for Europe—initially called the European Reassurance Initiative and later renamed the European Deterrence Initiative after Russia’s 2014 invasion of Ukraine and annexation of Crimea. Unlike its European counterpart, PDI does not have its own appropriations account or resources; instead, funds come out of the military services’ and other agencies’ accounts.

Because the DoD does not program most of its money by region, it is difficult to assess whether PDI is being sufficiently resourced and what progress is being made. Taking a simple tally of EDI versus PDI reveals that over the nine years of EDI, \$37.7 billion has been devoted to European deterrence, while over the two years of PDI, \$11.3 billion has been earmarked as contributing to Pacific deterrence.¹⁰⁵ On average, therefore, \$4.19 billion has been invested annually in EDI compared with \$5.7 billion in PDI. From this vantage point, it appears that the DoD has taken seriously its charge to invest in the Indo-Pacific. But PDI has not matched EDI's peak funding of \$7.27 billion, which was allocated in FY19, nor has it received eight years of sustained investment. Moreover, in FY22, members of Congress alleged that the "vast majority of funding" categorized as PDI in the DoD's FY22 budget request was "unrelated" to the requirements of the Indo-Pacific Command (INDOPACOM).¹⁰⁶ Instead, the FY22 PDI request focused on platforms and included in it funds to procure a new destroyer as well as to upgrade F-35 fighter jets.¹⁰⁷ Although these are unquestionably important capabilities that could help to deter China, there was little indication that these weapons systems were actually being allocated to the Pacific theater. Even more tellingly, the

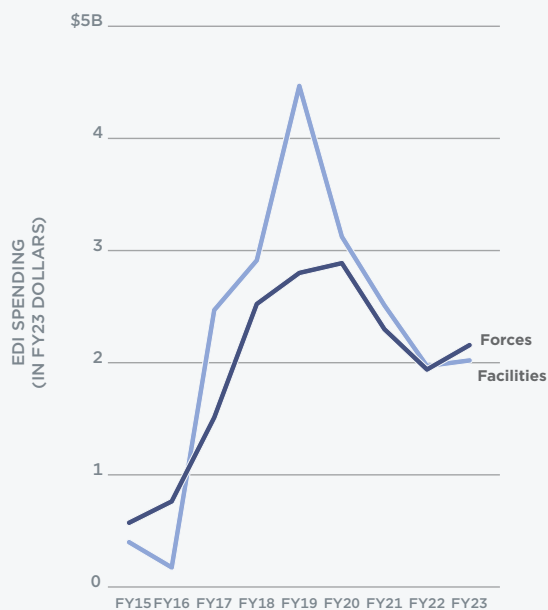
FY22 PDI request did not include any military construction (MILCON) funding and its "force design and posture" category, which aimed to create "a lethal and resilient force," amounted to less than half a percent of the total PDI request, while joint force lethality accounted for a whopping 96 percent.¹⁰⁸ In contrast, 53 percent of EDI's funding has been spent on infrastructure or pre-positioned equipment.

To ease the process of comparing across EDI and PDI, we aggregated the more granular categories that each initiative reports into larger categories of forces or facilities, which are two of the key elements of posture.¹¹⁰ As a general rule, we reported pre-positioned equipment, which typically requires facilities to store it, and infrastructure enhancements under the category of facilities. Everything else, which tended to involve capability development or the temporary forward positioning of troops, was categorized as forces. In FY23, the Pentagon requested \$302.8 million for improved logistics, maintenance capabilities, and pre-positioning of equipment, munitions, fuel, and materiel and \$1.2 billion for infrastructure improvements to enhance the responsiveness and resiliency of U.S. forces in the Indo-Pacific region.¹¹¹ Thus, 25 percent of the FY23 PDI request would resource improvements to facilities.

The first two years of EDI focused on expanding the presence of American forces in Europe, which makes sense given the crisis atmosphere after Russia's 2014 invasions of Crimea and the Donbas. But by FY17, EDI spending shifted, with more resources going to funding improvements to facilities that could facilitate and support quickly deploying American reinforcements during a crisis and transition to warfighting if deterrence failed. Funding for facilities declined after the FY19 peak at \$4.47 billion but has remained relatively equal to investments in supporting the activities of American forces in Europe.

Because there are only two years of PDI data, we compiled FY12–FY23 MILCON data on overseas territories in Europe and the Indo-Pacific.¹¹² As Figure 14 shows, the amount of military construction funds invested in each region has fluctuated significantly. Over this period, the Indo-Pacific has received approximately \$1.1 billion less than Europe, and on average \$647.3 million has been invested in construction in Europe annually, compared to \$557 million in the Pacific. Moreover, between FY21 and FY22 there was a 116 percent increase in MILCON in INDOPACOM, although FY23 MILCON dollars decreased by 39 percent from this FY22 peak. Additionally, it is worth noting that the bulk of these MILCON dollars are earmarked to refurbish aging infrastructure at existing

FIGURE 13: EUROPEAN DETERRENCE INITIATIVE (EDI) SPENDING ON FORCES AND FACILITIES¹⁰⁹



The Department of Defense consistently spends more on facilities than forces in funding the European Deterrence Initiative.

overseas bases instead of building new bases or expanding the infrastructure at existing locations. In the FY23 request, for instance, there are only four line items for upgrades to relatively new locations.¹¹³ Despite the sustained funding in military construction in INDOPACOM since 2012, many of these resources have been to maintain current capabilities and posture or to implement legacy posture initiatives. For instance, 83 percent of this money annually was invested in improvements in long-standing bases in South Korea, Japan, or Guam.

Looking forward, the Pentagon projects that over the FYDP, PDI funding will peak in FY2024 at \$6.7 billion and then decline slightly, with an average of \$4.4 billion being spent annually for the remaining three years.¹¹⁵ By examining our categories of forces and facilities, one discovers that PDI is planning to continually invest more in military personnel operating in the theater versus making improvements to infrastructure, logistics, or pre-positioned equipment.

Resources planned over the FYDP, however, have not yet been programmed and could change. Historically, the DoD has not fully implemented planned overseas military construction. For instance, in the late 1960s, the Air Force sought to enhance its posture in Europe by building 45 collocated operating bases (COBs) that were going to be used by reinforcements deployed to the theater during a crisis or war. The COB program was U.S. Air Forces in Europe's highest priority during the 1970s. Despite this, by 1980 only five of the 45 COBs had the minimum infrastructure improvements in place necessary to support Air Force operations and could only support 11 percent of the reinforcements that were supposed to deploy to Europe. At this pace, the COB construction program was not expected to be done until the late 1990s. A related effort to harden bases to enhance the survivability of the forces fared slightly better as 215 of 693 planned hardened aircraft shelters were funded through 1983.¹¹⁷

In sum, an examination of EDI, PDI, and MILCON funds in the European and Pacific theaters suggests that Indo-Pacific posture has been underfunded compared with Europe. Moreover, the bulk of the requested and planned funds for PDI have been for forces, not facilities. Planned PDI funding out to FY27 could significantly bolster the American military posture in the Pacific, but given historic tendencies to underfund overseas installations, this initiative could result in an unbalanced posture that expands the temporary U.S. military presence but fails to invest sufficient resources to build the dispersed and hardened base infrastructure with the caches of pre-positioned equipment needed to strengthen deterrence and support American military operations should deterrence fail.

FIGURE 14: DOD MILITARY CONSTRUCTION (MILCON) SPENDING¹¹⁴



For the past three years, requests for military construction in the Pacific theater have exceeded that of the European theater.

FIGURE 15: PLANNED PACIFIC DETERRENCE INITIATIVE SPENDING ON FORCES AND FACILITIES¹¹⁶



In contrast to historical trends in European Deterrence Initiative spending, Pacific Deterrence Initiative spending emphasizes investment in forces over facilities.

Conclusion

The war in Ukraine has elevated munitions stockpiles to front-page news as both Ukrainian and Russian forces consume high volumes of key weapons.¹¹⁸ As Under Secretary of Defense for Acquisition and Sustainment William LaPlante observed, “the demand for munitions and weapons systems” in Ukraine “really outpaces anything we’ve seen in recent memory.”¹¹⁹ Russian supplies of long-range precision-guided munitions have dwindled, leading Russian forces to rely on dumb bombs¹²⁰ while the United States and the international community have rushed to provide Ukraine with standoff weapons and to resupply Ukrainian munitions stockpiles.¹²¹ Highly motivated Ukrainian defenders armed with foreign weapons, especially air defenses, drones, and anti-tank weapons, repelled the ill-conceived¹²² Russian attack on Kyiv.¹²³ As the war has evolved into a protracted war of attrition in the east and south, the challenge has been to provide Ukrainian forces with sufficient shells, rockets, and long-range precision-guided fires, which they are reportedly expending at a rate of 5,000 to 6,000 a day, to prevail against Russian artillery, which has much deeper supplies.¹²⁴

As of November 4, 2022, the United States has committed to Ukraine \$18.9 billion in security assistance since the war began, including more than 1,400 Stinger man-portable air defenses (MANPADs), 8,500 Javelin anti-tank weapons, over 700 Switchblade loitering munitions, and 38 HIMARS launchers armed with long-range precision GMLRS rockets.¹²⁵ To assist Ukraine, the United States has run down its own stockpiles of critical weapons.¹²⁶ While the administration has assured that American military stores are not dangerously low and that weapons will generally be replaced on a one-for-one basis, members of Congress have questioned the defense industry’s ability to rapidly replenish stocks.¹²⁷ The PGMs that the United States is supplying to Ukraine are sophisticated weapons that are reliant on complicated and often fragile supply chains. One Javelin anti-tank missile, for instance, includes more than 250 semiconductor chips and industry currently can only build 2,100 Javelins a year.¹²⁸ That means that the United States has sent Ukraine approximately four years of Javelin procurement at current production rates.

Given usage rates of PGMs in Ukraine and in other recent conflicts, is the DoD buying enough of the right conventional strike weapons for a war against China or Russia? This analysis of the FY23 presidential budget

request offers good and bad news. The Pentagon is rebalancing its portfolio of PGMs away from short-range weapons used for counterterrorism operations toward long-range weapons that can be fired from standoff ranges, which would be needed to project power against China or Russia. Yet it is doubtful that the DoD is buying enough of these weapons to blunt and defeat an initial invasion, and it certainly is not stockpiling enough PGMs for a protracted war. The trend in its conventional strike purchases mirrors that of DoD procurement overall: the Pentagon is buying fewer weapons at greater cost. More alarmingly, these trends raise questions about whether the DoD is buying the right mix of weapons and whether it will be able to afford large quantities of long-range weapons. The Pentagon needs to find a cost-effective mix of weapons¹²⁹ so that it has enough PGMs to deny an enemy a quick victory and then enough stamina to prevail in a long war.

It is doubtful that the DoD is buying enough of these weapons to blunt and defeat an initial invasion, and it certainly is not stockpiling enough PGMs for a protracted war.

The current portfolio of PGMs favors ground attack versus anti-ship weapons, the latter of which would be critical in a Taiwan scenario. In the next few years, the Navy and Army will be acquiring more anti-ship weapons with Block V Tomahawks, NSMs, and SM-6s, but the Air Force is buying a shockingly small number of long-range anti-ship weapons—not even enough for one fully loaded bomber squadron to fly one mission against a Chinese invasion fleet. The planned number of LRASMs is wholly inadequate, and the Air Force does not have an effective midrange anti-ship weapon that fifth-generation fighter jets can carry internally.¹³⁰ Given challenges finding countries willing to host Army and Marine units armed with missiles in the Indo-Pacific and the fact that the surface fleet is likely to be outside of the range of the Taiwan Strait in the initial phases of a war, sinking the invasion fleet relies on an adequate number of attack submarines, bombers armed with LRASMs, and short-range fighters armed with anti-ship weapons. Currently, American bombers and fifth-generation fighters will not be able to effectively attrite Chinese ships because of insufficient numbers of standoff anti-ship weapons.¹³¹

Furthermore, most of the ground-attack weapons in the current portfolio are ill-suited for striking enemy

ground forces but are optimized for large-scale attacks against fixed land-based targets.¹³² U.S. aircraft and ships are primarily armed with large unitary weapons (JASSM or Tomahawk) or relatively small medium-range glide weapons (SDB I or II), neither of which is particularly effective against large maneuver formations, which would be critical in the event that Chinese forces established a lodgment on Taiwan. American aircraft need at least a medium-range PGM with a reasonably sized Oslo-compliant sensor fuzed weapon to attack ground-based forces from the air, which likely would be important in a Taiwan scenario and a Russian attack on NATO.¹³³

More generally, the war in Ukraine points to weaknesses in the U.S. defense industrial base, which for decades has sought to economize and create efficiencies, leaving little ability to quickly surge and boost weapons production.¹³⁴ The highly consolidated missiles and munitions industrial base suffers from vulnerable supply chains for key components, including energetics (i.e., the explosives and propellant) and semiconductors; a shortage of skilled labor; and the obsolescence of some parts and tools.¹³⁵ The DoD's procurement practices have contributed to the weakness of the PGM industrial base. There has been considerable volatility in the size of the buys of key weapons over time and the services have often deviated from the planned buys that they outline in the FYDP. The Pentagon needs to provide a consistent demand signal for the number of weapons it plans to buy over time to allow defense industry to build sufficient production capacity to meet this demand and have some excess to surge if needed. Predictability and stability in terms of the number of weapons procured annually would also enable industry to drive per-unit prices down.¹³⁶ Additionally, the United States needs to encourage its allies and partners to also expand their PGM stores instead of planning to draw from American stocks in the event of a contingency.¹³⁷

Currently, several ideas are being discussed that could help to stabilize PGM buys, including co-production and co-development with close allies and multiyear buys. Cooperating with allies in the development of new technologies or the production of existing weapons programs could enhance interoperability, reduce costs, improve supply chain resiliency, and facilitate innovation.¹³⁸ While co-development may include basic science and technology research, co-production is a more limited form of integration in which the U.S. government provides a foreign government or company with the technical data and instructions on how to manufacture part or all of a weapon.¹³⁹ Examples

of the latter include Poland's request to purchase 500 HIMARS vehicles with some production in Poland, while the agreement among Australia, the United Kingdom, and the United States (AUKUS) is an example of a deeper form of integration in which the three allies plan to jointly develop and produce nuclear-powered submarines and other advanced capabilities, including hypersonic weapons.¹⁴⁰ Poland's current request focuses on the HIMARS rocket launchers, but it could extend to co-producing the GMLRS rockets too. Manufacturing GMLRS rockets in Poland could reduce the burden on American production lines, add redundancy and resiliency to current supply chains, and create stores of the in-demand rocket closer to the battlefields where they likely might be employed, thereby reducing the transportation and logistical demands that would fall on overstretched U.S. mobility and support forces were a conflict to occur.

Cooperating with allies in the development of new technologies or the production of existing weapons programs could enhance interoperability, reduce costs, improve supply chain resiliency, and facilitate innovation.

In addition to AUKUS, Australia is pursuing a "sovereign" guided weapons and explosive ordnance enterprise to ensure that Australian forces have access to the weapons they need.¹⁴¹ To achieve this, Australia is seeking to deepen cooperation with like-minded countries and companies and is particularly focused on integrating with the United States.¹⁴² Australia has selected Raytheon and Lockheed Martin as its strategic partners in this endeavor.¹⁴³ Additionally, Australian defense forces are accelerating their acquisition of Joint Air-to-Surface Standoff Missiles-Extended Range (JASSM-ERs), NSMs, and maritime mines.¹⁴⁴ There are, therefore, multiple different opportunities with Australia to co-develop or co-produce critical conventional PGMs, but pursuing these will require overcoming significant barriers to defense technology and industrial cooperation.¹⁴⁵ Each potential co-development or co-production opportunity should be examined for its risks and merits individually, but in general this seems like a promising way to strengthen the PGM defense industrial base, shore up supply chains, and potentially create shared

stockpiles of critical PGMs in priority theaters. In other words, co-development and co-production of PGMs offers a critical way for the Pentagon to truly integrate with close allies and to strengthen deterrence.

The DoD is also exploring whether longer-term procurement contracts could expand the PGM industrial base by creating a predictable requirement and enabling industry to surge to fill the demand of Ukraine and other allies and partners. By default, the DoD approach is to use one contract to procure each item annually, which creates opportunities for variability from year to year. With multiyear contracts, the DoD uses a single contract to specify how many of a single item it will procure for two to five years. Cancellation penalties in multiyear contracts make it difficult for the DoD to terminate a contract, locking in a buy for its duration. But multiyear contracts also require congressional approval.¹⁴⁶ In September 2022, LaPlante, the under secretary of defense for acquisition and sustainment, observed that the DoD has “multiyear contracts for ships [and] airplanes,” but not for munitions. LaPlante argued that multiyear contracts would “signal to industry” that the DoD is “in it for the long haul and we can make the commitment.”¹⁴⁷ Multiyear contracts can have the added benefit of reducing the cost of the item being procured, but these contracts often take a long time to be realized and may be particularly difficult to negotiate in a period of volatile and high inflation.¹⁴⁸ Given these concerns, the DoD may also want to examine other possible funding solutions to help the PGM industry to surge, such as advance procurement funding for long-lead components.¹⁴⁹ We recommend that the DoD examine the viability of multiyear procurement contracts and alternatives to traditional full funding to determine if deviations from default funding and contracting practices could strengthen the munitions and missiles industrial base and meet the combined U.S. and allied military demand.

The picture is similarly mixed on the issue of posture investments in the Indo-Pacific region. The FY23 PDI request is larger than this year’s request for EDI and is more focused on posture improvements than last year’s request. More generally over the last decade, the DoD has been consistently investing in infrastructure in the INDOPACOM region. Yet the number of new posture enhancements in INDOPACOM or those focused on improving the survivability of U.S. forces are a relatively small portion of this picture. Most of these MILCON investments have been to refurbish existing bases in Northeast Asia or to complete implementation of

prior posture initiatives that were aimed at making the American military presence more politically sustainable. More needs to be done to improve the resiliency of the U.S. posture by distributing American forces across more bases and implementing more passive defenses to improve survivability. Some have argued that the only way to ensure that these enhancements to the American military posture in the Indo-Pacific happen is for Congress to shift PDI from a transparency and accounting measure to an independent appropriations account.¹⁵⁰ Although we agree that PDI has not resulted in more resources being devoted to expanding and strengthening Indo-Pacific military facilities and infrastructure, it is not clear that converting PDI into a dedicated appropriations account would solve this issue because the PDI request is developed by the INDOPACOM commander, whose responsibilities as a regional combatant commander dictate a focus on near-term solutions. INDOPACOM, therefore, is likely to privilege forces for presence, which can be augmented quickly, over longer-term changes to facilities.¹⁵¹ Moreover, there are signs that many members of Congress who tend to oppose funding overseas military construction also favor forces over facilities.¹⁵² Thus, instead of making PDI a dedicated appropriation account, we recommend that the DoD and INDOPACOM better distinguish which investments are resiliency measures from legacy military construction improvements and efforts to generally expand the American military presence.

In the event of a war with China, U.S. forces in the Indo-Pacific must be able to effectively project power while under attack, which requires a distributed and hardened posture and sufficient munitions stockpiles. More progress is necessary to improve the resiliency of American posture so its forces can take a first punch and not only survive but effectively defeat aggression. Additionally, the Pentagon would need deep supplies of critical conventional munitions to deny China a quick victory and then sustain combat operations if the war becomes protracted.¹⁵³ It is doubtful that the DoD has procured sufficient weapons today to achieve either goal. If the United States were to run out of conventional PGMs, it could find itself in the position of losing or having to rely more heavily on nuclear weapons and deterrence by punishment or cost imposition to end a war on favorable terms.¹⁵⁴ The FY23 budget request makes some strides on both these issues, but more needs to be done today to improve the United States’ chances of winning tomorrow.

Appendix A: Consistency for Individual Systems

These graphs show the extent to which individual weapons system buys remain consistent from year to year.

FIGURE A1: LONG-RANGE PGM PROCUREMENT VOLATILITY¹⁵⁵

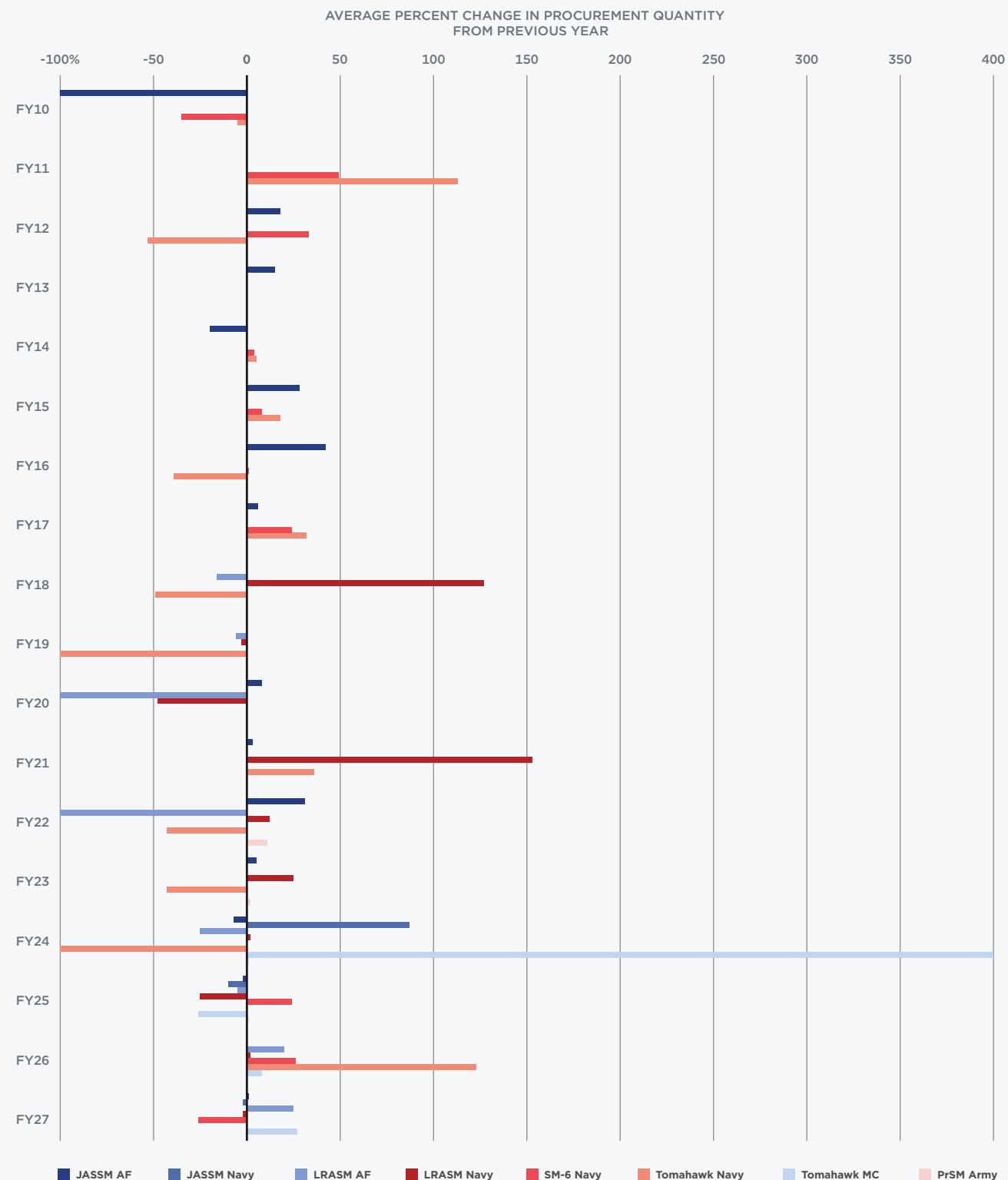


FIGURE A2: MEDIUM-RANGE PGM PROCUREMENT VOLATILITY¹⁵⁶

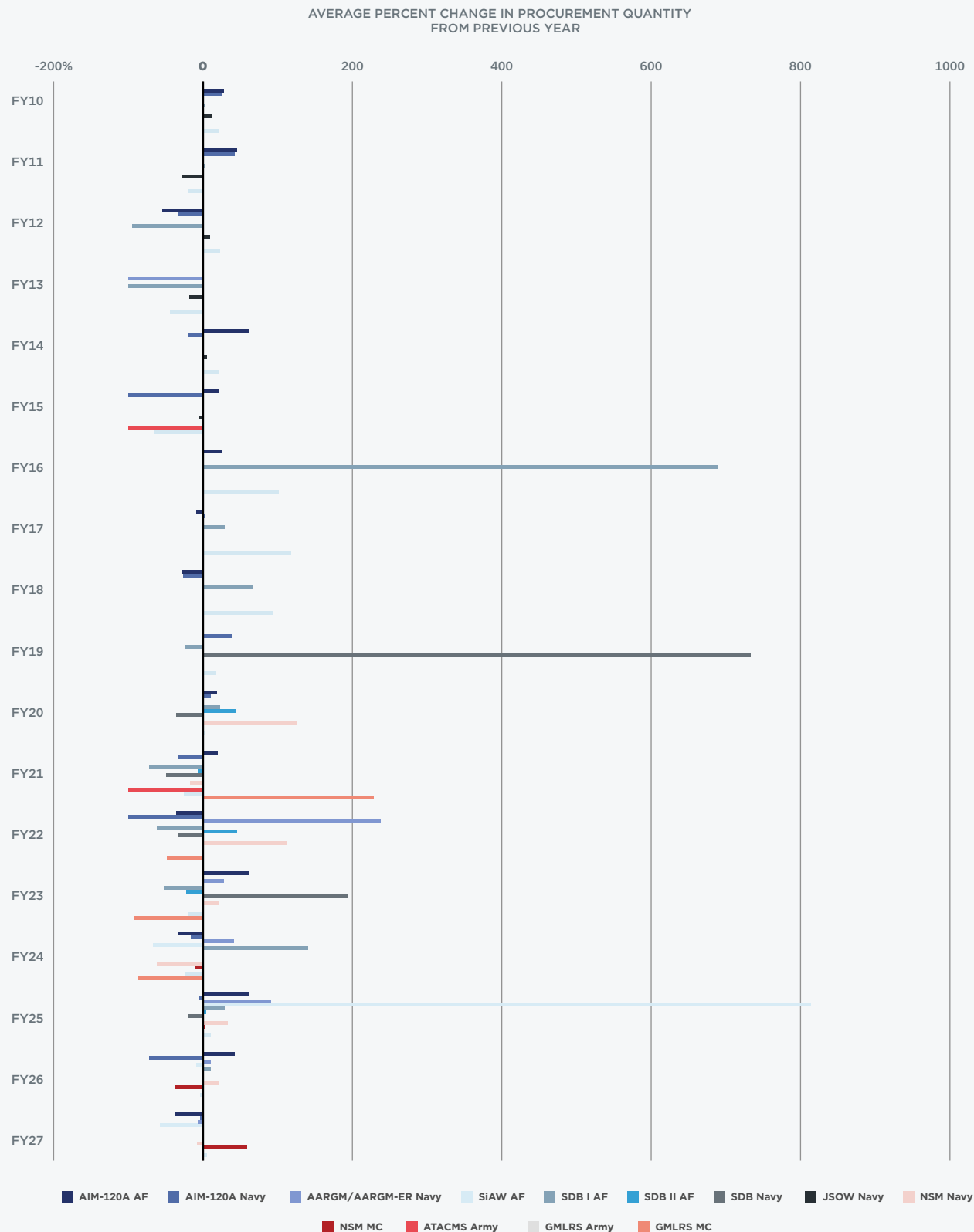
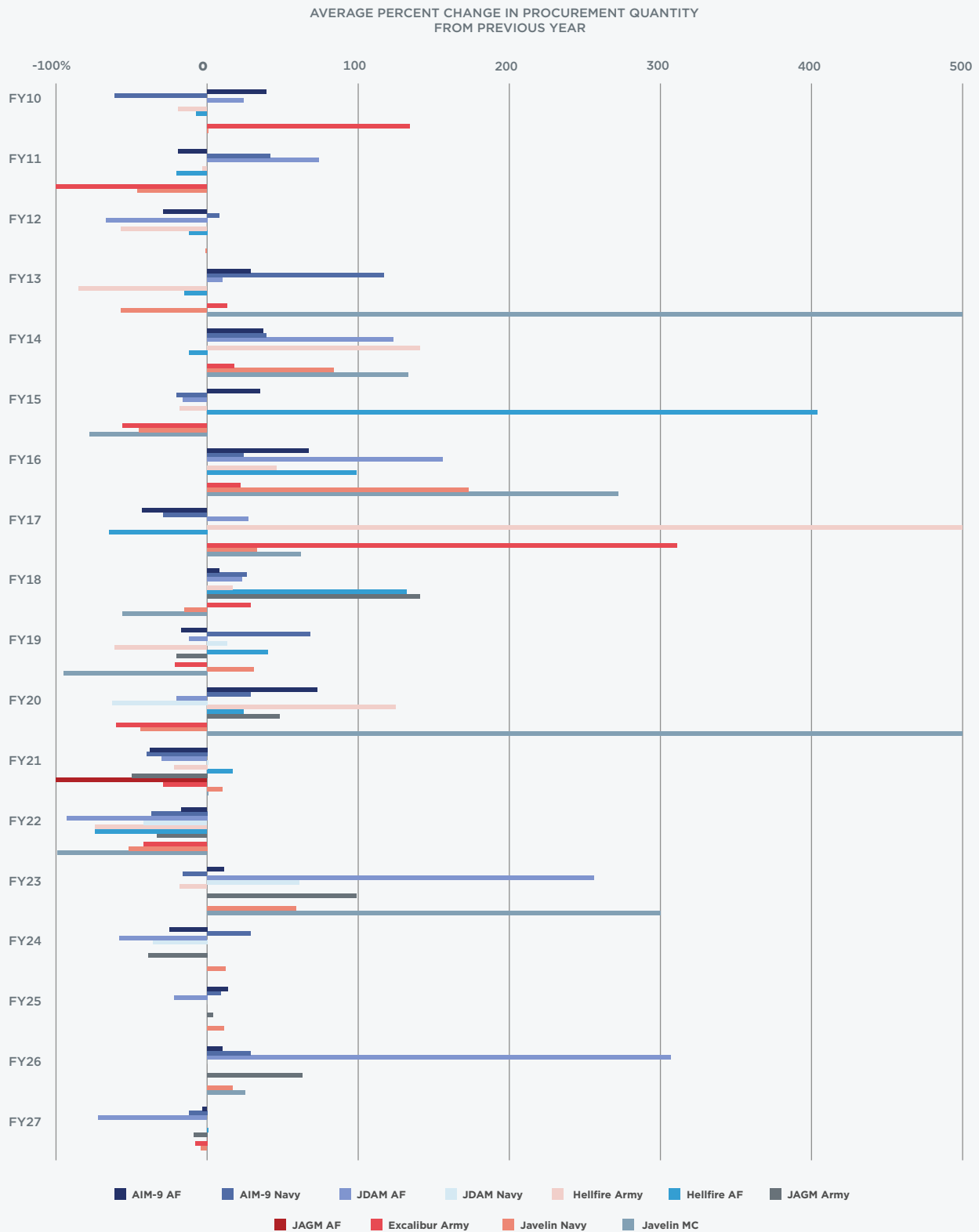


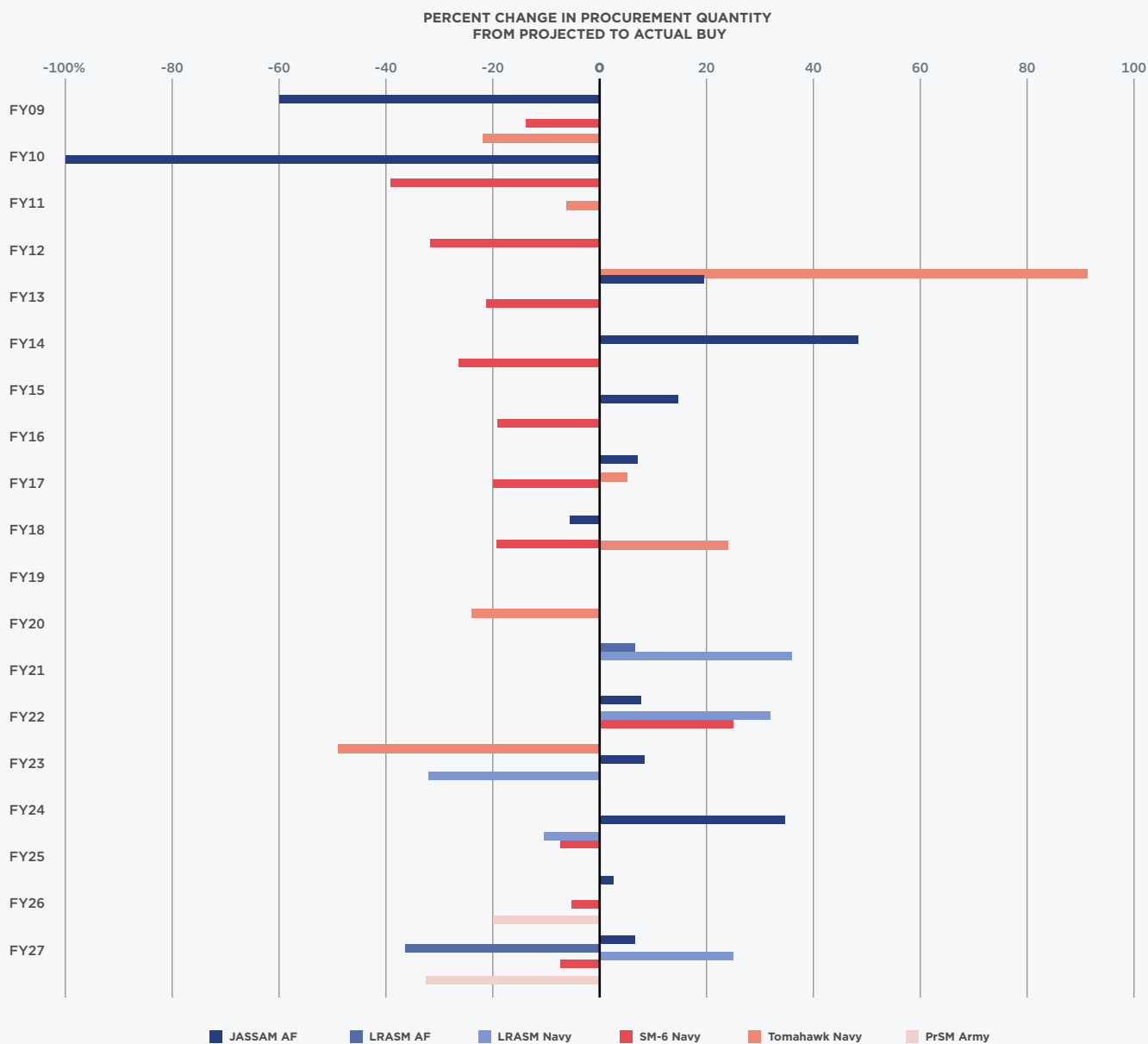
FIGURE A3: SHORT-RANGE PGM PROCUREMENT VOLATILITY¹⁵⁷



Appendix B: Follow-Through for Individual Systems

These graphs compare actual weapons buys to planned weapons buys, by showing percent change from the most recent projection (usually from one year prior) to the actual buy.

FIGURE B1: LONG-RANGE PGM PROCUREMENT FOLLOW-THROUGH¹⁵⁸



There was no Future Years Defense Program (FYDP) for FY15–22 for the Tomahawk, so there was no procurement projected for fiscal year (FY) 2019–2023, but 322 missiles were procured during that time.

FIGURE B2: MEDIUM-RANGE PGM PROCUREMENT FOLLOW-THROUGH¹⁵⁹

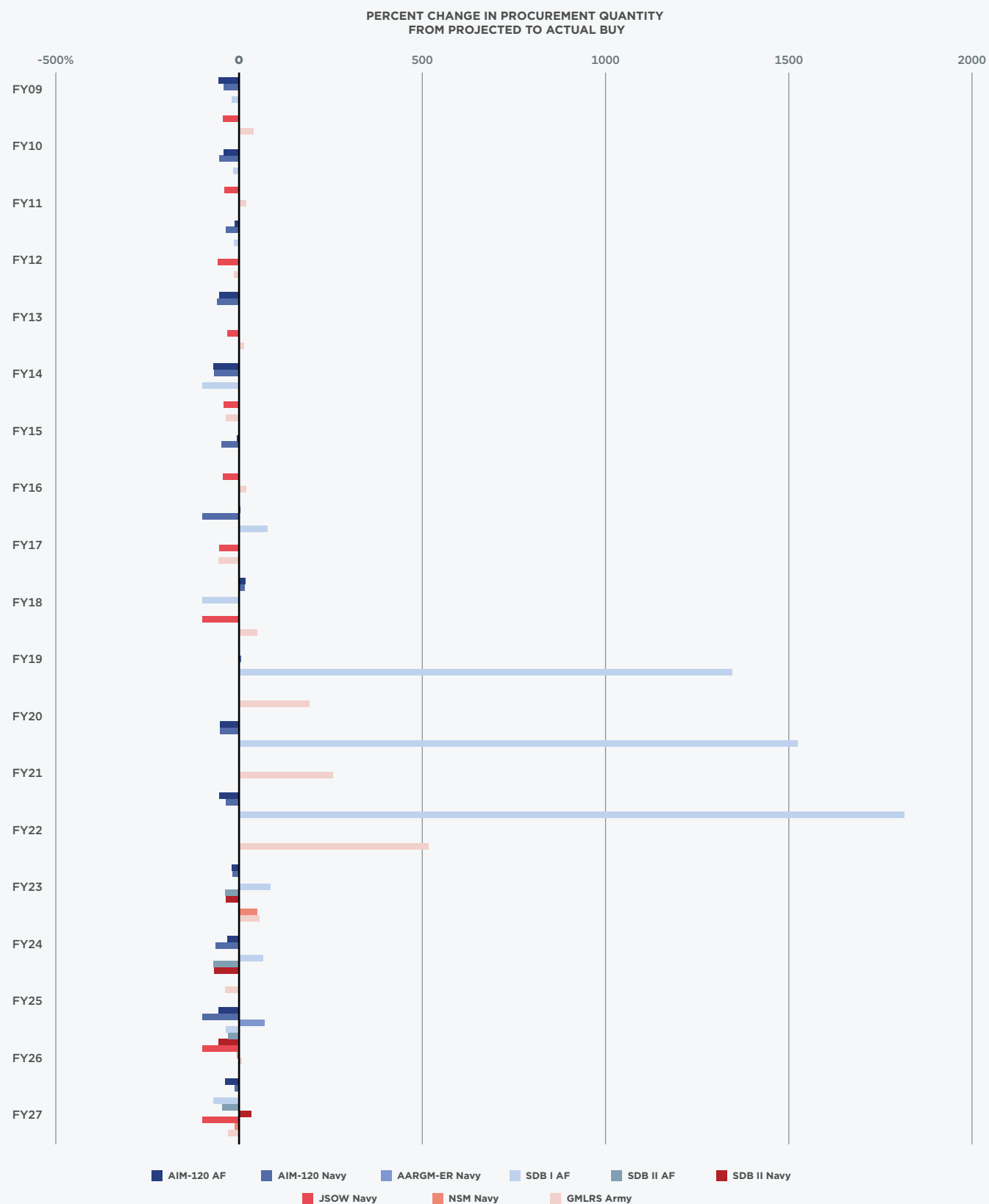
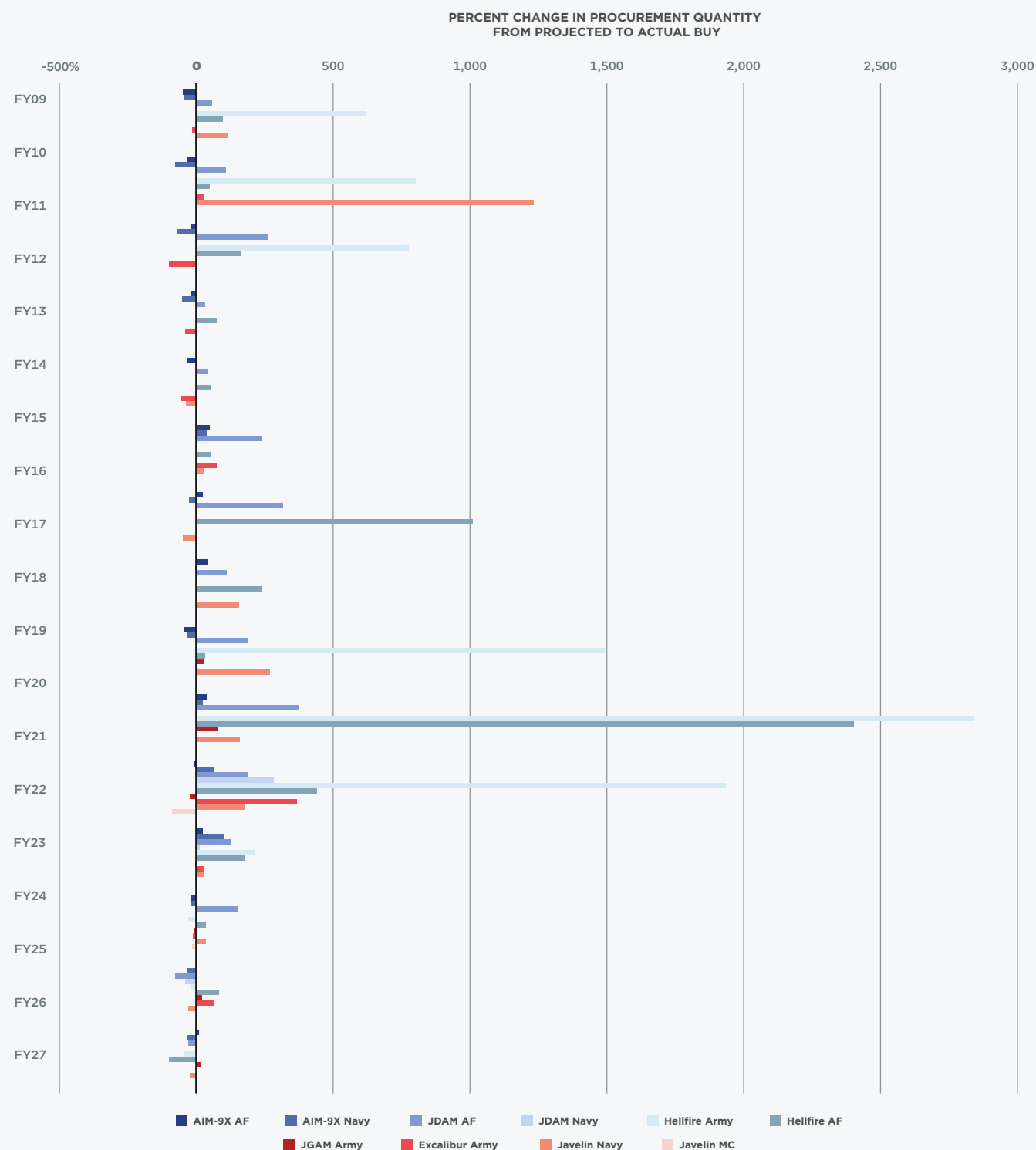


FIGURE B3: SHORT-RANGE PGM PROCUREMENT FOLLOW-THROUGH¹⁶⁰



The Army had no Hellfire projections from FY11-15, but buys between FY12-16 totaled 2,006 weapons. The Army did not have Excalibur projections from FY13-17 but buys from FY2015-2018 totaled 6,030. The Marine Corps had no FYDP from FY08-17 for the Javelin, but procured 1,767 between FY09-18.

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 70. This analysis was based on a smaller projected Air Force inventory of JASSMs, JASSM-ERs and LRASMs from the FY21 budget, but the numbers have not increased very much. It assumes that half of the Air Force’s nonstealthy bombers (41 aircraft) were launching these cruise missiles, which the authors considered to be a modest pace of operations. If one were to include other aircraft, such as F-15E and F/A-18s, that would be also employing these weapons, the stocks would be depleted even faster. Gunzinger, “Affordable Mass: The Need for a Cost-Effective PGM Mix for Great Power Competition,” 19.
 71. Fully loaded B-52s can carry 20 LRASMs, while B-1s can carry 24. Thus, nine B-52s can carry 180 LRASMs, one more than the planned 2027 U.S. Air Force inventory. Seven B-1s can 168 LRASMs, which would leave U.S. Air Force stocks with 11 LRASMs if the Air Force purchased 179 by 2027 as planned. Thus, if the Air Force follows through on its planned buy of LRASMs, by 2027 it will have approximately enough for one single bomber squadron’s mission worth of weapons.
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