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SPACE FORCE BUDGET BRIEF: NEW PRIORITIES AND LONG-TERM DEVELOPMENTS TOWARD A NEW ARCHITECTURE

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For fiscal year (FY) 2024, the administration requested $30.3 billion for the Space Force. The amount would represent a 15 percent increase from last year's appropriations and a near doubling of the service's budget since its first budget request four years ago. The increase supports growth in next-generation nuclear command and control spacecraft, which will look much different than their predecessors, and reflects the administration's push toward more space assets in lower orbits. The request highlights new priorities and long-term developments for how the department is approaching many of its defense space missions.

Introduction

The United States Space Force continues to grow for fiscal year (FY) 2024. The administration requested $30.3 billion for the Space Force in FY 2024, making up about 3.6 percent of the Department of Defense's total budget request.[1] Consistent with prior years, the bulk (over 60 percent) of the requested Space Force budget lies in the research, development, testing, and evaluation (RDTE) appropriation. The heavy focus on RDTE, which is distinct from the other services, speaks to the unique hardware-centric nature of space operations.[*]

The requested amount for the Space Force would represent a 15 percent increase (not adjusted for inflation) from the enacted FY 2023 appropriations.[†] This is the fourth budget request since the establishment of the newest military service, and in that span, its budget has nearly doubled (see Figure 1).

The increase in the budget over time reflects both growth in defense space spending and the consolidation of defense space activity under the Space Force. In the fiscal year's 2022 budget request, for example, the Department of Defense transferred over $900 million from the other services into the Space Force, including the Mobile User Objective System, a narrowband satellite constellation that had been funded through the Navy.[2] In last year's budget

[*] This is a much higher percentage than the other services spend on RDTE (Army – 9 percent, Navy – 11 percent, and Air Force – 18 percent), which allot a relatively higher share of their funding toward paying for their military personnel and operations and maintenance.

[†] Adjusting for inflation, the request would represent a 12 percent increase from last year's appropriations. The rest of this paper uses "current dollar" figures, which are not adjusted for inflation. See "National Defense Budget Estimates for FY 2024," Office of the Under Secretary of Defense (Comptroller), (May 2023).

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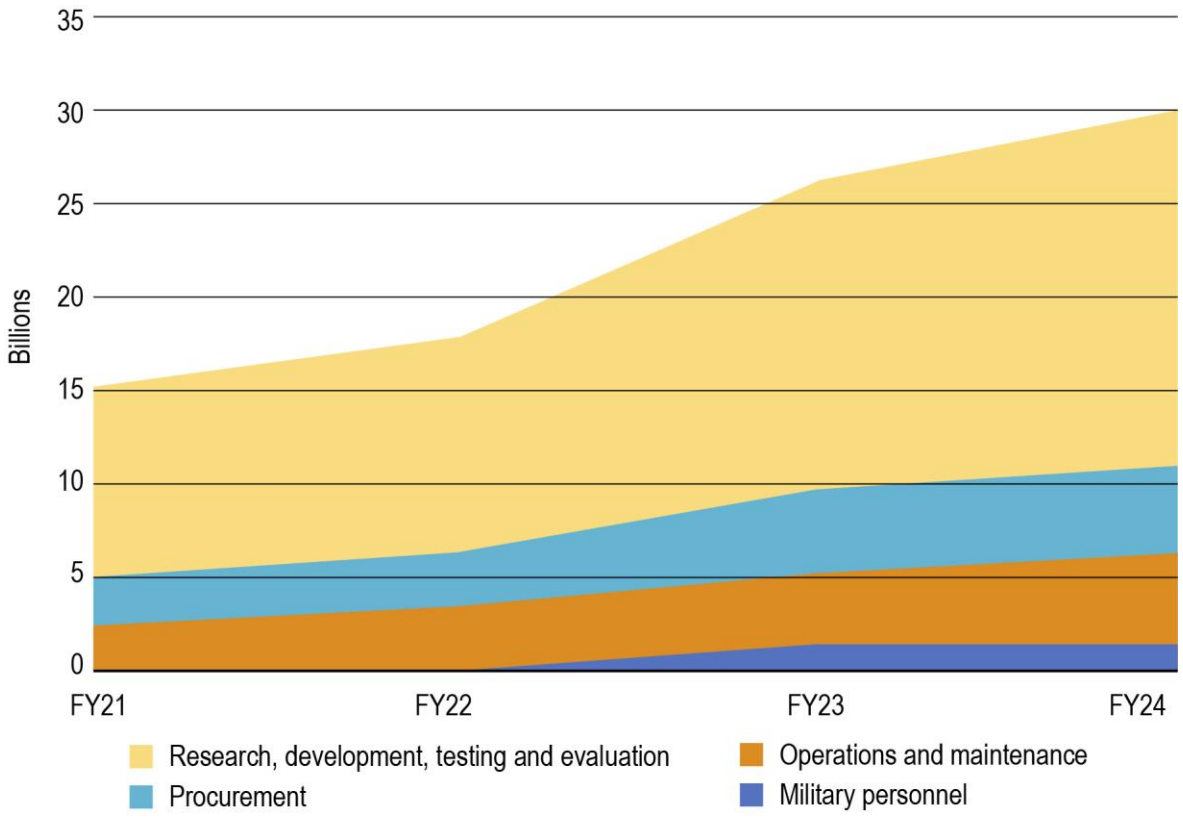

Figure note: FY 2024 refers to a requested amount; FY 2021-2023 refer to enacted amounts.

Figure 1: Space Force budget, by appropriation, over time.

request, funding for Space Force military personnel and the Space Development Agency transferred to the Space Force budget; collectively, these two transfers accounted for over $4 billion in the final appropriations.[3] With the major planned transfers already completed, this year's requested bump mostly reflects growth in preexisting Space Force budget lines.

The increase in this year's request and planned growth for future years highlights long-term changes and new priorities for how the department is approaching many of its defense space missions. The budget documents detail the progress of critical next-generation defense space systems, such as nuclear command and control satellites, which will consume a significant portion of the Space Force budget in the years to come. Next-generation nuclear command and control systems will look much different than their predecessors, with the number of some of the satellites increasing and the roles of some of the spacecraft splintering. Also shown in the budget, the department is advocating for more spacecraft in lower orbits: while it will continue to rely on higher orbit systems for many missions, it is looking to exploit more satellites in lower orbits to a much greater degree. Collectively, these insights from the budget capture central developments in the department's transition toward a new architecture.

New Capabilities for Missile Warning and Strategic Satcom

Space-based nuclear command and control has comprised two main elements: assets that can detect and provide warning (missile warning satellites) and assets that can transmit messages to and from nuclear forces and between senior leaders even in a nuclear war (strategic communications satellites). As captured in the budget materials, next-generation missile warning and strategic communications satellites make up some of the highest dollar programs and projects this year and in the outyears of the budget. In fact, as shown in Figure 2, three of the five biggest RDTE projects and programs through fiscal

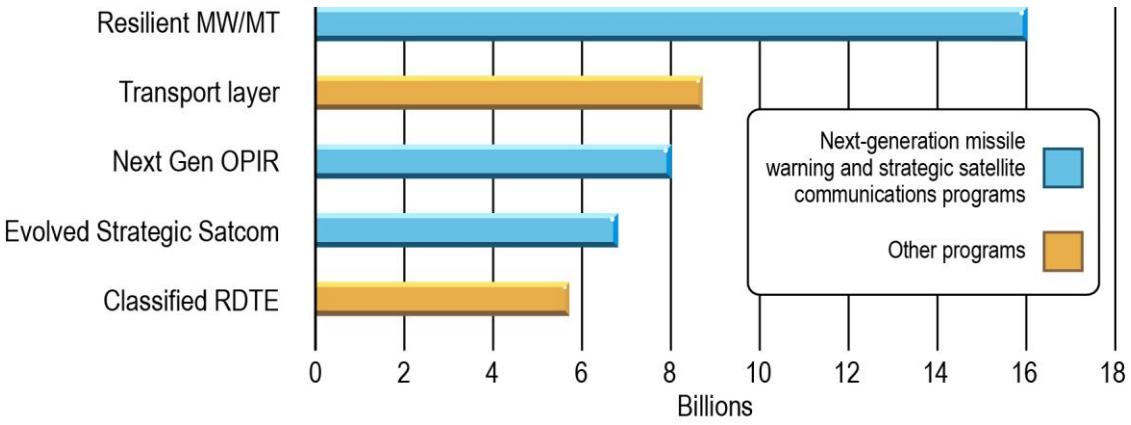

Figure note: The budget request does not include outyear projections for classified RDTE; therefore, the amount in Figure 2 for classified RDTE only reflects the amounted requested for FY 2024.

Figure 2: Biggest RDTE programs and projects through FY 2028.

year 2028 are for next-generation missile warning and strategic communications satellites.[4] These budget lines tie to one satellite communications program, Evolved Strategic Satcom, and to two families of missile warning programs—Next Generation Overhead Persistent Infrared and Resilient Missile Warning and Tracking. Collectively, these programs make up nearly half of the entire RDTE budget for the Space Force through fiscal year 2028.[5] As well as showing the large dollar figures associated with the programs, the budget materials detail how they represent a fundamental departure from how DOD has historically carried out these critical missions.

Strategic (and Tactical) Satellite Communications.

For 40 years, DOD has used individual satellites for both strategic communications and tactical communications. In 1982, the United States launched the first Defense Satellite Communications Systems (DSCS) III satellite, which, hardened against nuclear effects, provided strategic communications to nuclear forces and tactical communications to nonnuclear forces.[6] From 1994 to 2003, the United States launched the Milstar satellite constellation, which again could communicate with both nuclear and nonnuclear forces.[7] To augment and eventually replace Milstar, the department launched six Advanced Extremely High Frequency (AEHF) satellites from 2010 to 2020.[8] Like its predecessors, AEHF was designed to provide assured strategic communications, such as for intercontinental ballistic missile forces, and tactical communications, such as for conventionally armed ships.[9]

With the next-generation systems, this dual function of the satellites will go away: DOD is splitting the strategic and tactical communications into different programs and different spacecraft. Evolved Strategic Satcom (ESS) will serve as the strategic satcom replacement to AEHF, and Protected Tactical Satcom (PTS) will serve as the tactical satcom replacement to AEHF. ESS and PTS terminals will have different cryptology requirements, and the systems will use different frequencies. In discussing PTS, the budget documents note that DOD initiated the program to address global threats and pursue "precise solutions for disaggregated strategic and tactical SATCOM."[10] ESS will be the first U.S. strategic communications satellite system not designed to carry out tactical communications.

The budget requests $630 million in FY 2024 for ESS, a 20 percent increase from FY 2023 and nearly four-fold jump from FY 2022. For ESS satellites, the budget justification documents specify that the program will support a need-date of 2032 for next-generation strategic communications.[11] The request for PTS, the tactical program, is $360 million, a 40 percent increase from

FY 2023.[‡] For PTS, the documents note that the space segment will be a mix of hostable payloads and free-flying satellites, and DOD expects prototypes of both to be available for launch in 2025.[12] Both ESS and PTS will grow in the outyears: from FY 2024 to FY 2028, ESS is projected to cost $6.8 billion and PTS $2 billion.

Missile Warning and Tracking. Like the next-generation programs for strategic satellite communications, the plans for next-generation missile warning programs—the other core element of space-based nuclear command and control—represent a fundamental shift for the department. For several decades, DOD has used a small number of systems in high orbit for missile warning. The United States currently deploys the Space-Based Infrared System (SBIRS), which consists of six satellites in geostationary Earth orbit (GEO) and payloads on four host satellites in highly elliptical Earth orbits (HEO) to cover the polar regions.[13] SBIRS serves as the replacement to the Defense Support Program, the first satellites of which were launched over five decades ago.[14] For the next generation of programs, the department is beginning to pivot to an architecture with a larger number of assets in lower orbit.[15]

The two next-generation missile warning programs are (1) Next Generation Overhead Persistent Infrared (Next Gen OPIR) and (2) Resilient Missile Warning and Missile Tracking (MW/MT). Collectively, these programs total nearly $5 billion as part of the FY 2024 request, comprising over 15 percent of the entire Space Force budget request.[16] Like its predecessors, Next Gen OPIR would constitute a small number of systems in GEO and HEO with a ground architecture. The primary mission of the program would be to "provide initial missile warning of a ballistic missile attack on the US, its deployed forces, and its allies."[17]

As its name suggests, Resilient MW/MT reflects an expansion of the mission of missile warning to include missile tracking. Although higher orbit systems have included tracking to some degree, Resilient MW/MT would aim to ensure custody of "evolved dim and maneuvering threats through all phases of flight to provide required missile warning attack characterization."[18] The program would include a layer of missile warning and tracking satellites in low Earth orbit (LEO) developed by the Space Development Agency, a layer of missile warning and tracking satellites in medium Earth orbit (MEO) developed by the Space Systems Command, and an integrated ground architecture for both the LEO and MEO layers. Last year's budget unveiled that the Space Warfighting Analysis Center had recommended 135 satellites in LEO and 16 satellites in MEO for missile warning and tracking, although neither the total number of satellites for the program nor the time frame for the complete architecture has been publicly disclosed.[19]

Next Gen OPIR would replace SBIRS and serve as the next-generation nuclear command and control system for missile warning. Unlike Next Gen OPIR, Resilient MW/MT is not designated in the budget as an official nuclear command, control, and communications (NC3) program, but Derek Tournear, the director of the Space Development Agency, said in November 2022 that the tracking data from the satellites will be integrated into the Pentagon's NC3 network.[20] Further, officials have noted that the department is eventually transitioning the missile warning mission to Resilient MW/MT with Next Gen OPIR providing overlap during the transition. As explained by Space Force Chief General B. Chance Saltzman, Next Gen OPIR would help ensure that "the mission did not have any gaps" and would serve as a "hedge against technical risk associated with the pivot" to the new architecture.[21]

This year's budget request would hasten this pivot.[22] Based on prior budget requests, Next Gen OPIR was to include three satellites in GEO and two in HEO. This year's request, in contrast, cut one of the planned GEO satellites, requesting $2.6 billion for the program, $330 million less than what the department had planned to spend as of last year's request. The budget justification documents note that the department "assessed the third satellite vehicle is not required as a result of continued positive performance of the SBIRS constellation and the

[‡] PTS is part of the Protected Anti-Jam Tactical Satcom (PATS) family of programs, which also includes Protected Tactical Enterprise Service (PTES). DOD is developing PTES to establish a foundational ground system for the family of programs. PTES also includes a project for using the department's developed "protected tactical waveform" on commercial satellites. PTES adds another layer of depth to the protected anti-jam tactical satcom architecture. Through FY 2028, the budget projects $330 million for PTES.

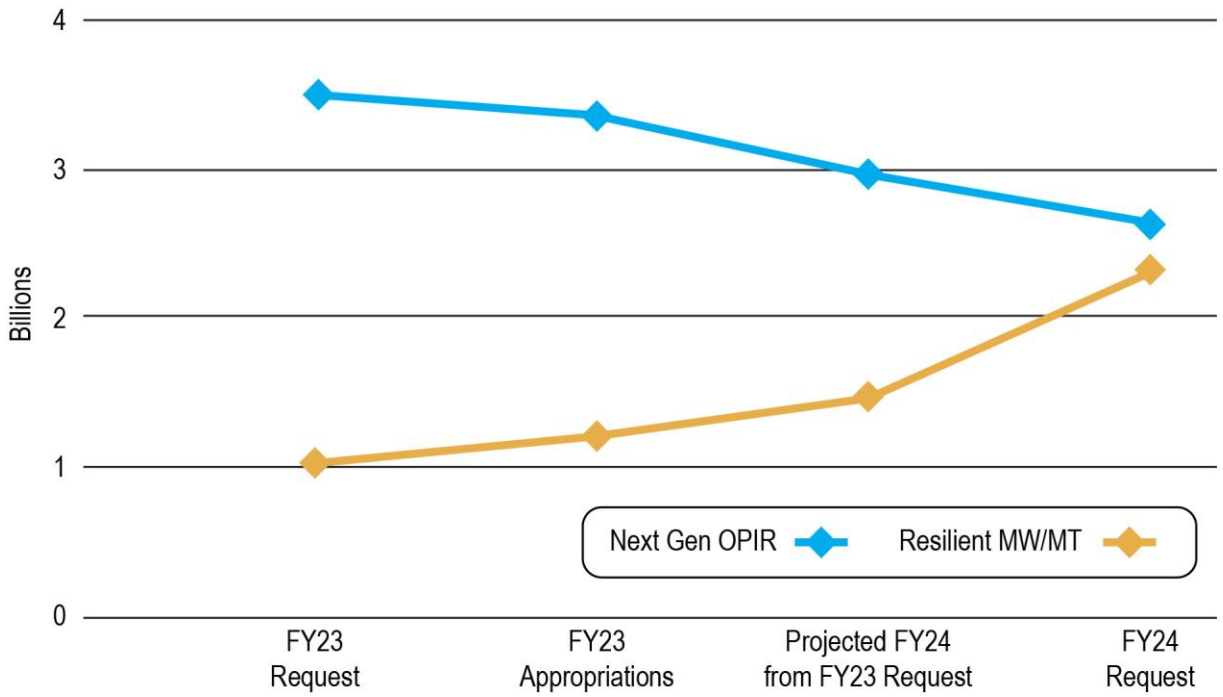

Figure 3: Comparison of Next Gen OPIR and Resilient MW/MT.

anticipated full operational capability" of the MEO and LEO missile warning and tracking layers.[23] In addition to cutting funding for GEO, this year's requested budget would increase Resilient MW/MT from $1.2 billion in last year's appropriations—which was itself a 16 percent increase from last year's request—to $2.3 billion.[24] Figure 3 shows how the congressional and budgetary action over the last year has accelerated the transition to lower orbits.

More Spacecraft in Lower Orbits

The ascendancy of low-orbit missile warning and tracking projects is telling, not just in the makeup of future nuclear command and control, but also as part of a trend reflected in this year's request: a push to more systems in lower orbits. The budget materials stress the importance of proliferation and diversification to achieve "resiliency," a term mentioned over 300 times in the RDTE justification book.[25]

Space Force and Air Force leadership have contrasted the vulnerability of constellations with few satellites with the resiliency of constellations with large numbers of satellites. In January, General Saltzman remarked that the ability to "deny single satellite capabilities became very obvious very early" in the Russian invasion of Ukraine.[26] In a similar vein, Frank Calvelli, Assistant Secretary of the Air Force for Space Acquisition and Integration, referenced the "'big juicy targets' of the past," and noted that the Department of the Air Force is transforming to a "more proliferated and more resilient architecture that can be counted on during times of crisis and conflict."[27] In March, General Saltzman highlighted how proliferation in lower orbits could complicate an adversary's decision to attack: "By going to low Earth orbit, we're buying smaller satellites and more of them. More satellites create a targeting problem."[28]

Programs that seek to deploy higher numbers of satellites at low altitudes fared well in this year's budget request. Figure 4 shows the six budget or project lines for FY 2024 that rose or fell the most from last year's projections for FY 2024. These are instances in which the administration determined within the last year to add or subtract funding, more indicative of shifting priorities and focus than

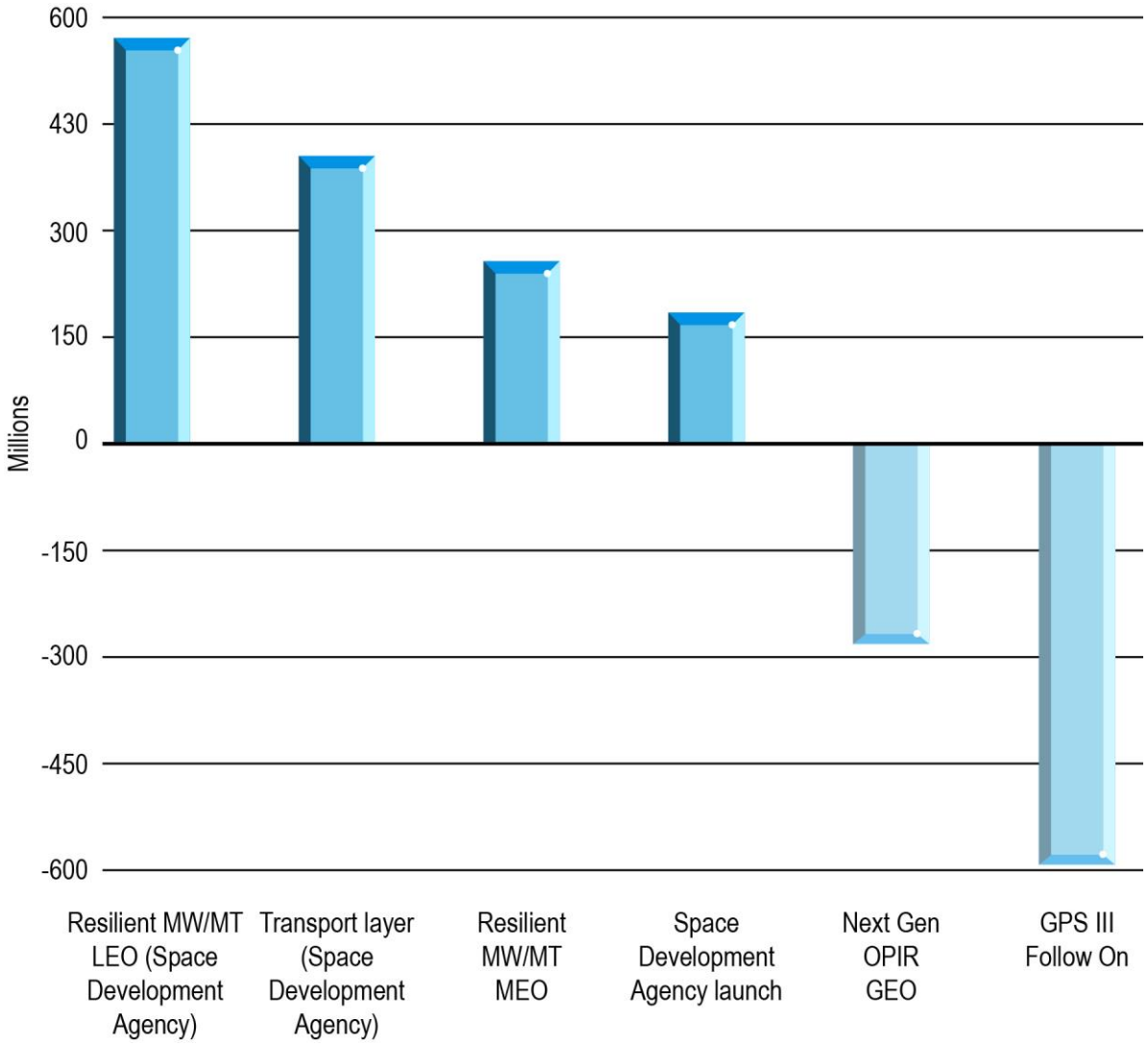

Figure note: The budget documents indicate that DOD will forgo production for the GPS III Follow On program in FY 2024, but that the space vehicle procurement for the program will still be complete in FY 2030, as originally planned.

Figure 4: Biggest changes between FY 2023 projection for FY 2024 and FY 2024 request.

increases or decreases that were planned years ahead as part of the natural progression of programs. The four budget or project lines that increased the most from last year's projections are efforts aiming to deploy new architectures at lower orbits. The budget lines that fell the most from last year's projections are next-generation systems part of, or continuations of, traditional defense space programs.

Growth of the Space Development Agency. The budgetary success of the Space Development Agency highlights the push for deploying many systems in low orbits. The agency, responsible for three of the four budget lines that grew the most from last year's projections, has the aim of developing a proliferated LEO satellite constellation consisting of several related layers. Started in 2019, the agency's first enacted budget was $125 million. From the FY 2020 enacted amount, this year's request would signify budget growth by a factor of 35 in just five fiscal years (see Figure 5).[29]

In addition to the Resilient MW/MT LEO layer, the two biggest increases in the Space Development Agency's budget were for its transport layer and its launch budget line. The transport layer is a space communications mesh network, which is planned to total several hundred

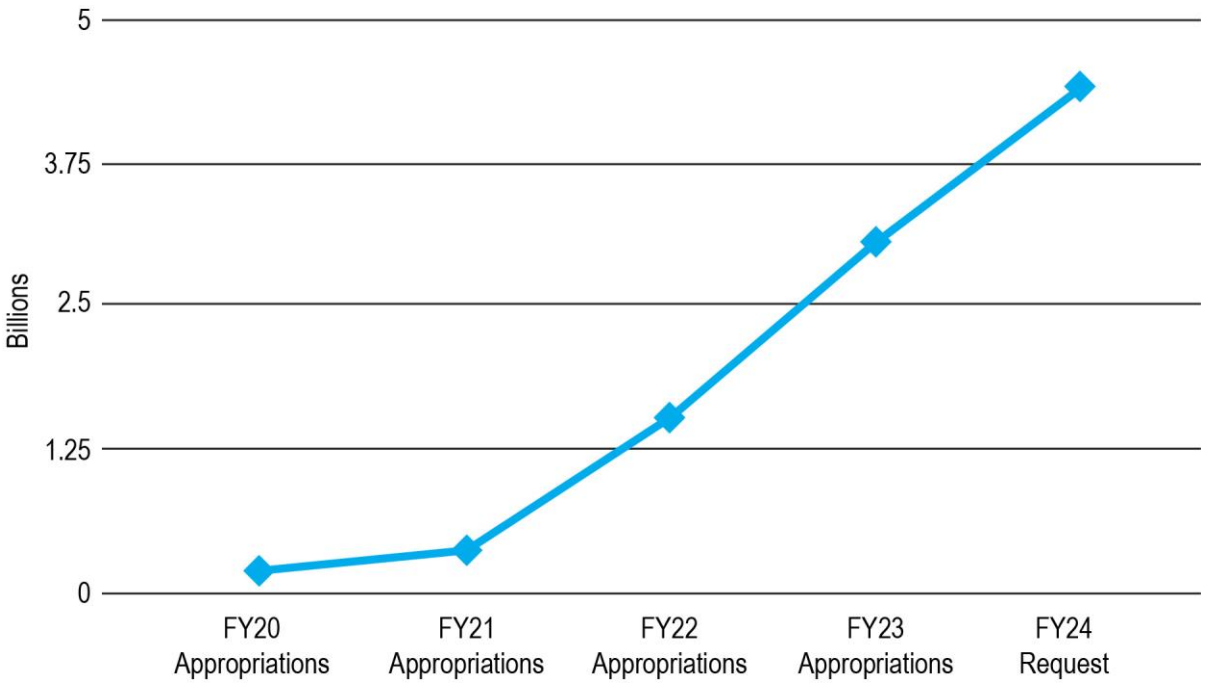

Figure 5: Space Development Agency's budget over time.

satellites and is the agency's "primary initial focus within the proliferated warfighter space architecture."[30] The budget documents also note that the transport layer will "provide the space-based connectivity backbone for Joint All-Domain Command and Control (JADC2)," a broader priority for DOD.[31] Regarding launch, in April 2023, the Space Development Agency sent its first 10 satellites into orbit and is scheduled for an additional launch in June.[32] The budget also requests roughly $130 million for integration and battle management for the agency. Although it does not specify funding for other layers, the budget documents mention the agency's plans for developing "global surveillance and surface moving target custody, and enhanced space domain awareness and deterrence capabilities."[33]

Congressional Support…with Reservations.

Congress has played an important role in the push toward more spacecraft in lower orbits. In the last two full budget cycles (FY 2022 and FY 2023), Congress funded the budget lines aiming to proliferate at lower altitudes at levels higher than the administration requested, which were themselves increases from the prior year. For example, for FY 2022, the administration requested about $935 million for the Space Development Agency, which would have tripled its budget from the prior year.[34] Ten months later, in the FY 2022 appropriations act, Congress provided the Space Development Agency $580 million more than what the administration had requested.[35] Most of this increase supported a missile tracking demonstration capability for the Indo-Pacific. In the FY 2023 budget submission, the administration requested $2.3 billion for the Space Development Agency and received $730 million more than what the administration had requested.[36] This increase went toward Resilient MW/MT, launch, and the transport layer.

Despite the significant adds, Congress has raised concerns about the costs of some of the lower orbit architectures in report and appropriations language. On Resilient MW/MT, the FY 2023 appropriations act notes that while it "strongly supports the pivot to a more proliferated and diverse architecture of smaller satellites," it also criticizes the Space Force for not providing "sufficient information on the expected life-cycle cost of the new architecture; the cost to recapitalize a proliferated architecture every three to five years; potential risks and challenges in the supply chain," and "the ability of the Space Force to scale up

capabilities to command and control a much larger number of satellites."[37] Although, in this case, these critiques were specific to Resilient MW/MT, they would seemingly apply to developing proliferated low orbit architectures in general. The FY 2022 House Appropriations Committee report also warned of the increasing costs of the Space Force, questioning: "whether any serious analysis or long-term planning has been done to assess the realism and affordability of the entire portfolio of programs."[38] The programs and projects focused on proliferated and diversified architectures will likely continue to grow, but—as some of the primary beneficiaries of the increasing budget for the Space Force—they will also likely be subject to heightened scrutiny as they mature and other priorities emerge.

The recent congressional bill on the debt ceiling could affect the growth of programs focused on proliferated low orbit architectures, as well as the broader Space Force budget. In May 2023, Congress passed the Fiscal Responsibility Act of 2023, which—in addition to increasing the debt ceiling—set limits for DOD's top-line.[39] The Act caps DOD's FY 2024 budget to $886 billion and authorizes $895 billion for the department for FY 2025. Limited top-line growth could constrain Space Force's funding, creating more competition for the service's resources.

Conclusion

The FY 2023 request highlights notable programs and trends as part of the transition to a new defense space architecture. Recent changes in the budget reflect the department's push toward more spacecraft in lower orbits, which, along with next-generation systems for nuclear command and control, make up the bulk of the Space Force research and development investments for this year and projected outyears. The support for proliferated and diversified architectures in missile warning and tracking and satellite communications could serve as a forerunner for other missions, which the Space Force will have to balance as current research and development programs mature and convert to significant procurement efforts. More generally, the requested near doubling of the Space Force's budget in just five years reinforces the growing consensus in the administration and Congress on the role and importance of national security space.

Acknowledgments

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