

# Masterpiece Theater

## *Missed Opportunities for Missile Defense in the 2020 Budget*

By Thomas Karako and Wes Rumbaugh

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### THE ISSUE

- The Trump administration's proposed 2020 budget is not a masterpiece for missile defense. Its actions are inadequate to the challenge of complex and integrated air and missile attack from major powers and therefore insufficiently aligned with the National Defense Strategy.
- The budget's principal shortcoming is the failure to prioritize a space sensor layer, a critical capability for the birth-to-death tracking of hypersonic glide vehicles and ballistic missile threats.
- The modest funding for space sensors is largely confined to the repetition of studies and analysis that have already been done. Further delays are likely by transferring the payload development to the nascent Space Development Agency.
- Both the top line for the Missile Defense Agency and the percent of funds for research and development of advanced technology continue to decline.
- Army and Navy budgets included several important investments to bolster air and missile defense.

Just over a year ago, then-Deputy Secretary of Defense Patrick Shanahan announced that the 2020 defense budget would be the “masterpiece” that would finally align Pentagon spending with the new direction of the National Defense Strategy.<sup>1</sup> The release of the new budget follows the January 2019 release of the Missile Defense Review, which laid out the administration's vision of how U.S. missile defense policy, programs, and posture should be adapted to contend with more challenging missile threats in an era of great power competition.<sup>2</sup>

At the review's release, President Trump declared the “beginning of a new era in our missile defense program,” setting a goal to “detect and destroy any missile launched against the United States—anywhere, anytime, anyplace.”<sup>3</sup> Unfortunately, neither the modest language of the Missile

Defense Review nor the activities and funding levels in the proposed 2020 budget come anywhere close to achieving that goal. They specifically lack the programmatic and budgetary muscle movements to contribute meaningfully to overall U.S. deterrence and defense goals in relation to Russia and China.

The Missile Defense Review nominally widens the scope of missile defense policy from a focus on ballistic missiles to countering the full spectrum of missile threats. Yet these new policy and budget proposals remain remarkably consistent with the program of record that preexisted the National Defense Strategy. Apart from steps within the services for incremental improvements to air defenses and some studies on countering hypersonic glide vehicles, the focus remains on the limited ballistic missile threats posed by otherwise weak rogue regimes. Too little attention

is given to the threat of complex and integrated missile attacks from major powers like Russia and China.

Shortcomings of the 2020 proposal include:

- Low funding levels for a space-based sensor layer, primarily confined to the repetition of past studies, and its relocation to the Space Development Agency;
- A declining topline for the Missile Defense Agency (MDA);
- Insufficient research and development of advanced technology, with continued decline in future years;
- Nearly nonexistent adaptation of the current interceptor families or new interceptor development to counter more advanced missile threats; and
- The apparent decision to significantly delay development of volume kill capability.

The 2020 request also includes a number of salutary investments. Eight new and continuing items deserving praise include:

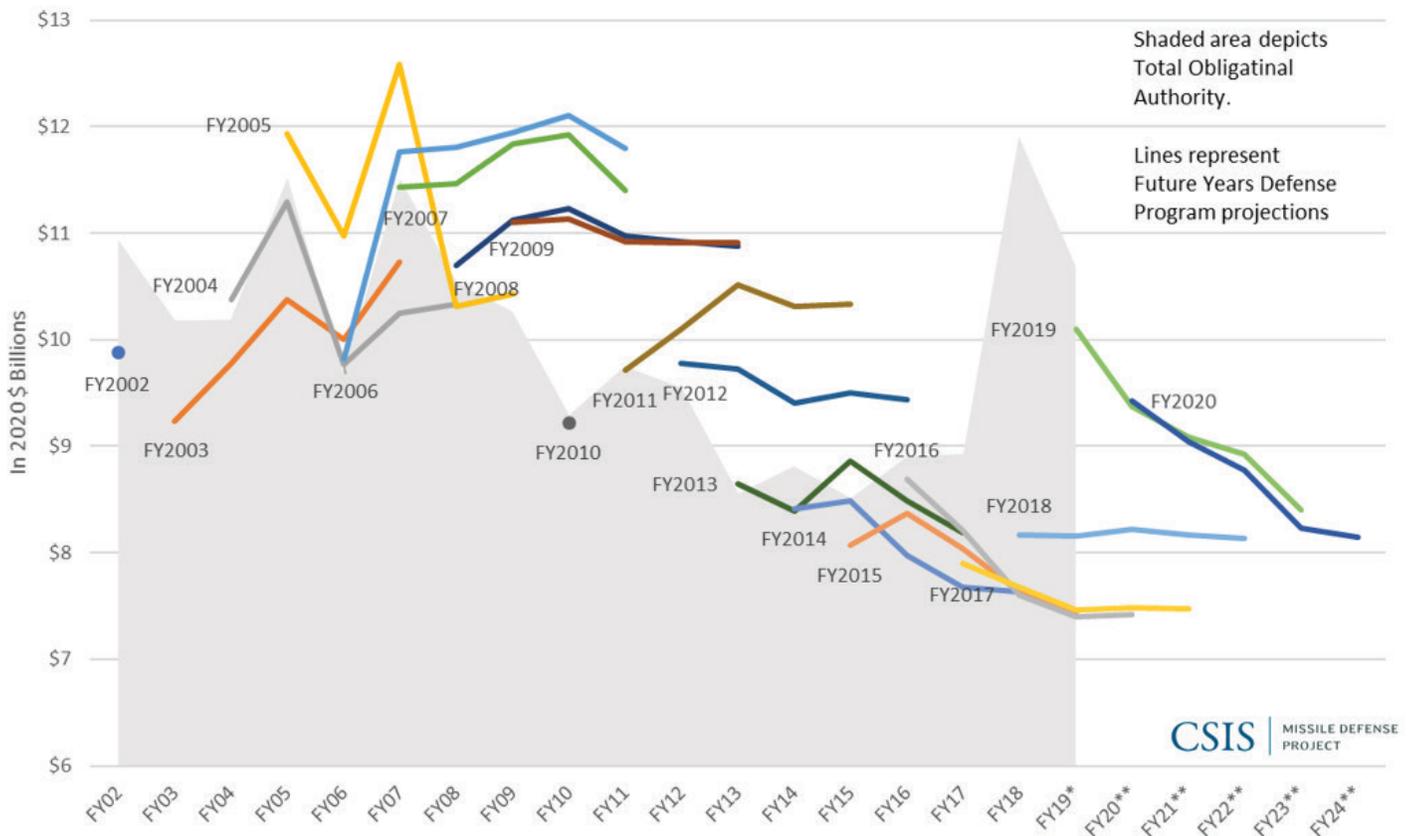
- Accelerated funding for the Army’s new Patriot radar;
- Initial procurement of Maneuver Short-Range Air Defense (M-SHORAD);

- New interceptor development for the Army to counter future ballistic missile threats;
- A larger and faster airframe for the multi-mission Standard Missile-6 (SM-6);
- Rapid acquisition of Iron Dome for near-term cruise missile defense and the restructuring of the Indirect Fires Protection Capability (IFPC);
- A new directed energy program, the Neutral Particle Beam, and continued focus on laser scaling;
- Continued interoperability improvements for THAAD and Patriot; and
- Upgrades to the Command and Control, Battle Management, and Communication (C2BMC) network.

Of these latter eight items, three are within MDA, and five are being pursued by the Army and Navy budgets.

Even the sum of these activities, however, is insufficient to deal with the high-end threat of complex, integrated, and structured air and missile attacks from Russia and China. The actions of both the Missile Defense Review and the 2020 budget are insufficiently aligned to what the National Defense Strategy calls the central challenge of our time: the return of long-term strategic competition.

Figure 1: MDA Budget and FYDP Trends, 2022–2024



Note: \*Appropriated dollars. \*\*Based on 2020 President’s Budget.

## MDA FUNDING DOWN

Across Defense Department accounts, this year’s budget request contains a total missile defense and defeat budget of \$13.6 billion, a slight increase from \$13.1 billion last year (all figures in constant 2020 dollars). Included in that figure, however, are various programs designed to negate or “defeat” missile threats prior to launch. Within the more traditional definition of “missile defense” as active measures to defeat missiles after launch, the Pentagon requests \$9.4 billion for MDA, with additional air and missile defense-related funding found in the new Space Development Agency (SDA), the Defense Advanced Research Projects Agency (DARPA), military service budgets, and elsewhere.

Table 1: MDA’s 2020 Budget Request

	FY20	FY21	FY22	FY23	FY24
Then-year Dollars	\$9.4	\$9.2	\$9.1	\$8.7	\$8.8
2020 Dollars	\$9.4	\$9.0	\$8.8	\$8.2	\$8.1

The \$9.4 billion budget request for MDA represents a 12 percent decline from the 2019 appropriation and a 21 percent decline from 2018 spending levels. It is nevertheless \$63 million more than the previous fiscal year’s projection. This level is about in line with MDA appropriations in the 2011-2012 period (Figure 1).

MDA’s overall funding is expected to decline from 2021-2024, a trend consistent with the 2019 submission. According to the 2020 projections, MDA funding will fall to \$8.1 billion in 2024, lower than anytime in MDA’s history. Potential budgetary pressures in the Future Years Defense Program (FYDP) projections also raise questions about whether these efforts could be sustained.

## MDA BUDGET FOLLOWING WIDER PENTAGON TRENDS

The overall trend for missile defense funding tracks some broader trends within the Pentagon’s budget. The 2020 presidential budget request includes \$750 billion for defense, of which \$718 billion is for the Department of Defense. Within that figure, DOD-wide procurement

Table 2: MDA Appropriations Over Time

	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19
Then-year Dollars	\$7.8	\$7.4	\$7.6	\$8.8	\$7.7	\$9.4	\$8.8	\$8.6	\$7.9	\$8.4	\$8.4	\$7.7	\$8.0	\$7.9	\$8.3	\$8.5	\$11.5	\$10.5
2020 Dollars	\$10.9	\$10.2	\$10.2	\$11.5	\$9.7	\$11.5	\$10.5	\$10.3	\$9.3	\$9.8	\$9.5	\$8.6	\$8.8	\$8.5	\$8.9	\$8.9	\$11.9	\$10.7

## MDA funding will fall to \$8.1 billion in 2024, lower than anytime since the Clinton administration.

accounts shrink relative to the past two years, a trend that continues into the FYDP after adjusting for inflation. The Pentagon’s overall Research, Development, Test, and Evaluation (RDT&E) account rises to \$104 billion in the 2020 request but then declines by 18 percent, after inflation, over the course of the FYDP. MDA’s RDT&E line declines about 25 percent over the same period.

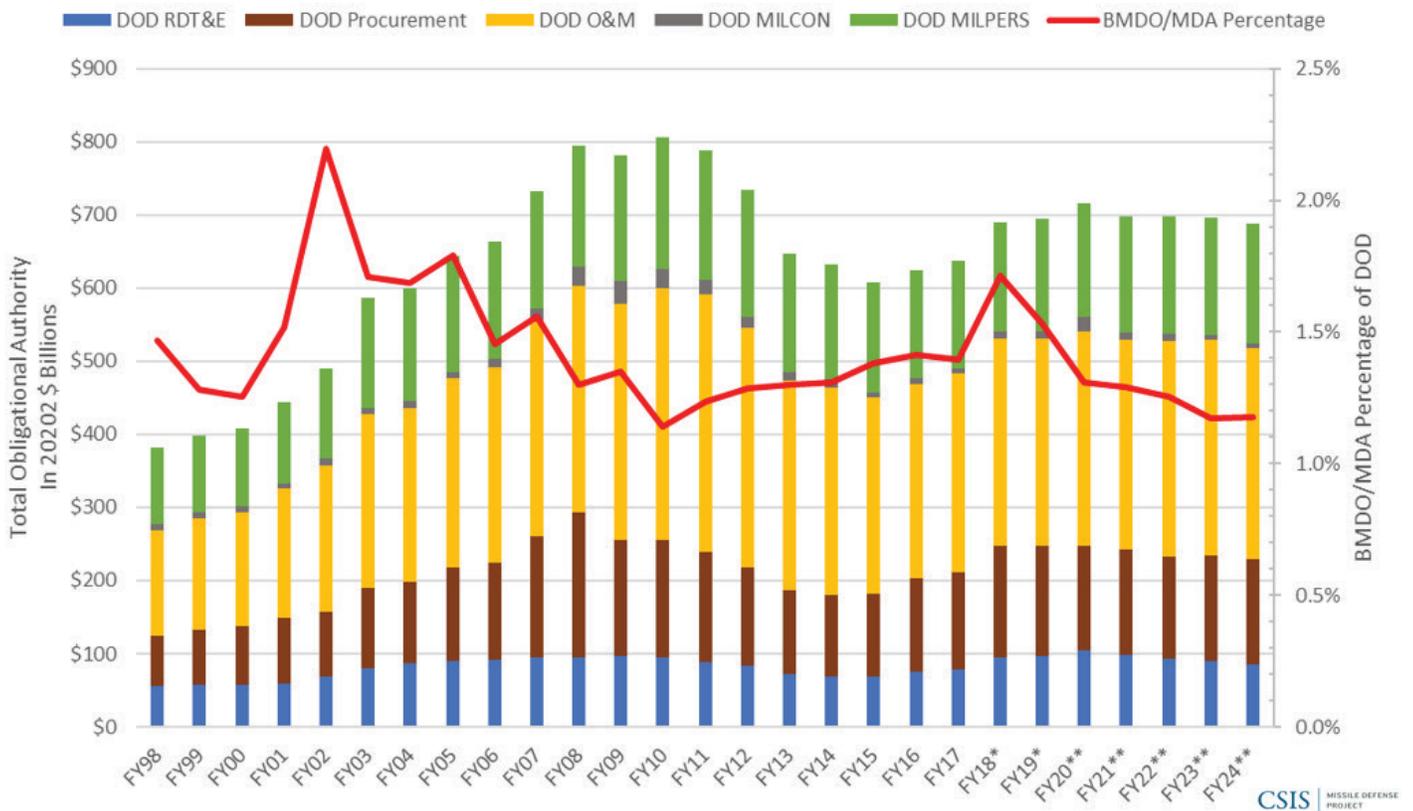
Like other entities, MDA may face increased pressure to be a bill payer amid the so-called “bow wave” of nuclear and conventional modernization in the broader Department of Defense.<sup>4</sup> As a percentage of overall Pentagon spending, MDA’s projections decline from a recent peak of 1.7 percent in 2018 to 1.3 percent in 2020, shrinking to 1.2 percent by 2024 (Figure 2). The Congressional Budget Office has previously criticized the Pentagon’s FYDP projections for failing to sufficiently anticipate likely future costs, in addition to future growth in personnel compensation and operations and maintenance.<sup>5</sup>

## RESEARCH AND DEVELOPMENT AT GREATEST RISK

Other internal MDA budget trends do not bode well for the development of new technologies to defeat new and emerging missile threats. The combination of a declining top line and increased procurement is renewing a squeeze on research and development. The RDT&E account falls from 75 percent of planned MDA expenditures in 2020 to 67 percent by 2024 (Figure 3).

The total of RDT&E funding understates the real decline in MDA’s research and development of advanced technology. Given MDA’s acquisition authorities, a significant portion of procurement-like and even some operations-like activities appear within the RDT&E line. The recurrence of the squeeze on research and development appears to repeat the pattern seen between 2012-2017 (Figure 3).<sup>6</sup>

Figure 2: DOD Appropriations by Title and MDA Percentage of DOD Appropriations, 1998–2024



Note: \*FY 2018–2024 use Discretionary Budget Authority rather than Total Obligational Authority. \*\*FY 2020–2024 represents the Future Year Defense Program projections.

MDA reached its recent top line highs due to a surge in the procurement of legacy systems. MDA’s procurement account rose above \$3 billion in 2018 and stayed above \$2.6 billion in 2019. The 2020 budget requests only \$1.5 billion for procurement accounts, a number that stays relatively flat in the FYDP, peaking at about \$1.9 billion in 2023 (Figure 4). This parallel decrease in procurement could be a reflection of the surge in purchases in 2018 and 2019; the next wave in procurement may first require a new generation of technology.

### FAILURE TO PRIORITIZE THE SPACE SENSOR LAYER

The most important recommendation of the Missile Defense Review was its endorsement of a Space Sensor Layer (SSL), a critical capability for the birth-to-death tracking and discrimination of both ballistic missiles and the emerging threat from hypersonic glide vehicles. The review and numerous statements by senior defense officials have suggested that developing SSL would be a high priority.<sup>7</sup>

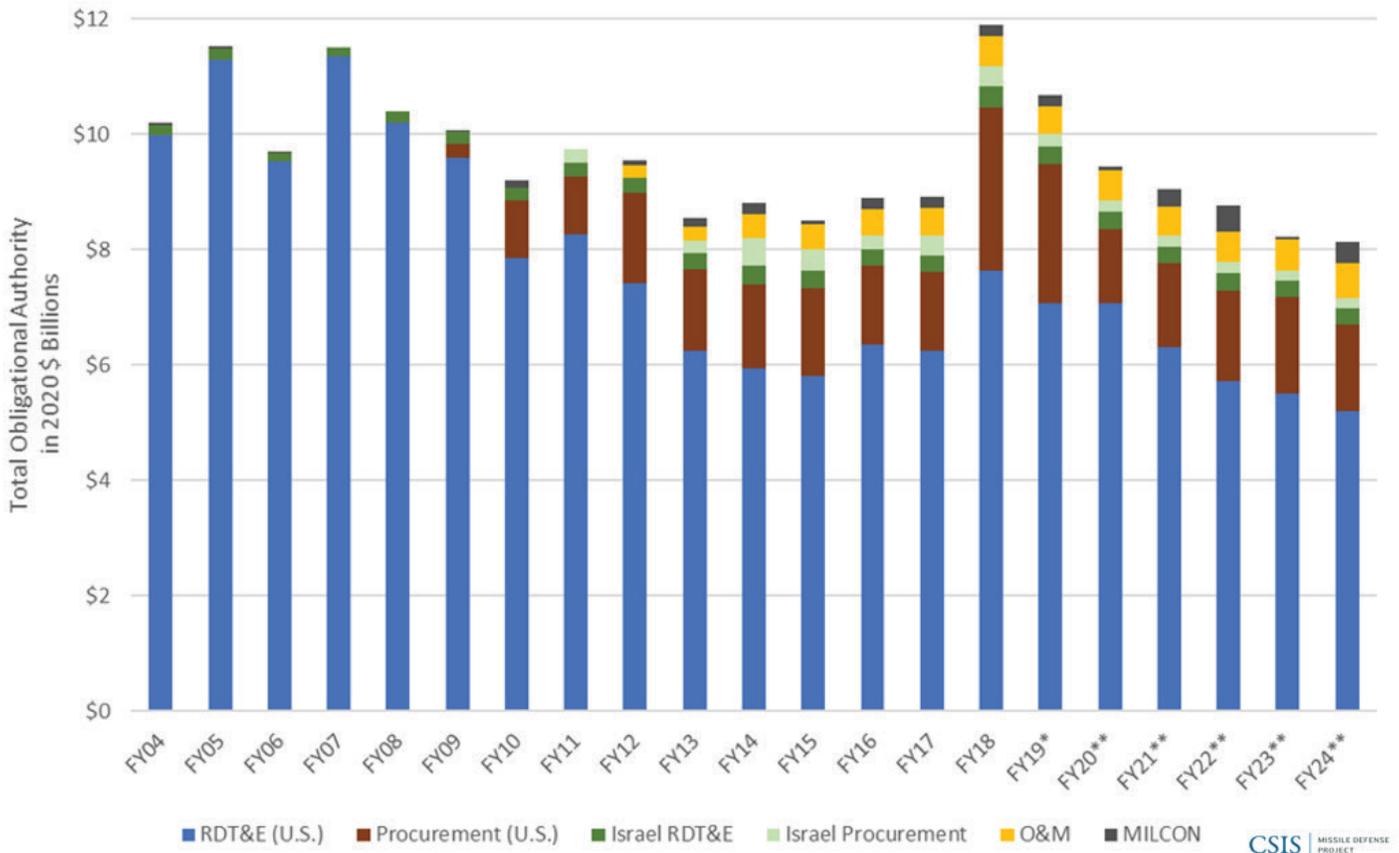
Unfortunately, the 2020 budget’s pace, level, and location of funding is inadequate to develop and field space sensors

anytime in the foreseeable future. Instead of building upon the \$73 million Congress appropriated last year for MDA to begin SSL development, the 2020 budget does little more than shift the responsibility for developing SSL to the new Space Development Agency (SDA), which is still in the process of being created.

In total, the Pentagon requested \$151 million for space sensor-related activities, but this figure includes \$36 million to support ongoing Space Tracking and Surveillance System (STSS) operations and \$25 million for DARPA’s Blackjack program, none of which goes to developing the sensor or payload for the new SSL. As much as \$90 million of the 2020 request could be counted as contributing indirectly to developing or fielding SSL within SDA. Much of this figure goes to redoing studies and analyses of alternatives that have previously been done by MDA. Only \$15 million within SDA goes directly towards space-based missile discrimination. These levels are just enough to buy paper satellites, not to test prototypes or move toward fielding.

Transferring payload and sensor capability development from MDA to SDA is an invitation to lack of focus, further delay, and requirements creep. The logic in transferring SSL

Figure 3: MDA Budget Categories, 2004–2024



Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget.

from MDA to SDA is rather unclear. MDA has already done architecture and sensor studies, as well as demonstrated success leveraging commercial launch with the Space-based Kill Assessment (SKA) program.<sup>8</sup> Acting Defense Secretary Shanahan has furthermore indicated that the Army and Navy will retain their space programs until a Space Force is finalized. MDA could likewise retain SSL payload development.<sup>9</sup>

Undersecretary of Defense for Research & Engineering Dr. Michael Griffin has been relentless in calls for faster acquisition reform. MDA Director Lieutenant General Samuel Greaves has likewise frequently said that “the time for studies is over.” In terms of a space sensor layer, the 2020 budget is full of time and studies.

Given past congressional direction that the SSL and hypersonic glide vehicle defense should be led by MDA, Congress should critically evaluate the administration’s decision to move SSL to SDA. SDA might be the right place to manage new transport layers and reduced launch costs, but the requirement-setting and sensor development should belong to the Pentagon entity focused on missile defense. The path toward an architecture for tracking

both ballistic and hypersonic glide vehicles has already been paved. MDA identifies \$108 million for space sensor development as its highest unfunded priority.<sup>10</sup>

The proposed levels of funding for SSL are also remarkably modest compared to the previous levels for the STSS satellites (Figure 5). Despite higher initial investments, the STSS program only deployed two demonstrator satellites, both of which are reaching the end of their service lives. In contrast with STSS, however, SSL hopes to leverage advances in small satellite technology, lower launch costs, and an architecture of proliferated constellation in low Earth orbit.<sup>11</sup>

Developing SSL in SDA could also create further developmental problems. The cost of standing up the new agency will reduce the capacity for SDA to begin work on the SSL this year, as it first must tackle basic organizational issues like setting up a headquarters and starting program offices. SDA may give comparatively more weight to non-missile defense requirements like space situational awareness for SSL than MDA would, potentially degrading the capability of the system. Requirements added by other agencies for non-missile defense missions could also drive

up the cost of the program, a problem that has plagued previous space sensor programs.<sup>12</sup> Moving SSL from MDA to SDA is probably not a good way to field space sensors at what the National Defense Strategy calls the speed of relevance.

Congress should consider returning the SSL payload and sensor programs back to MDA—where Congress put them in the first place.

## PROGRAMMATIC CHANGES: RKV DELAYED, MOKV ON LIFE SUPPORT

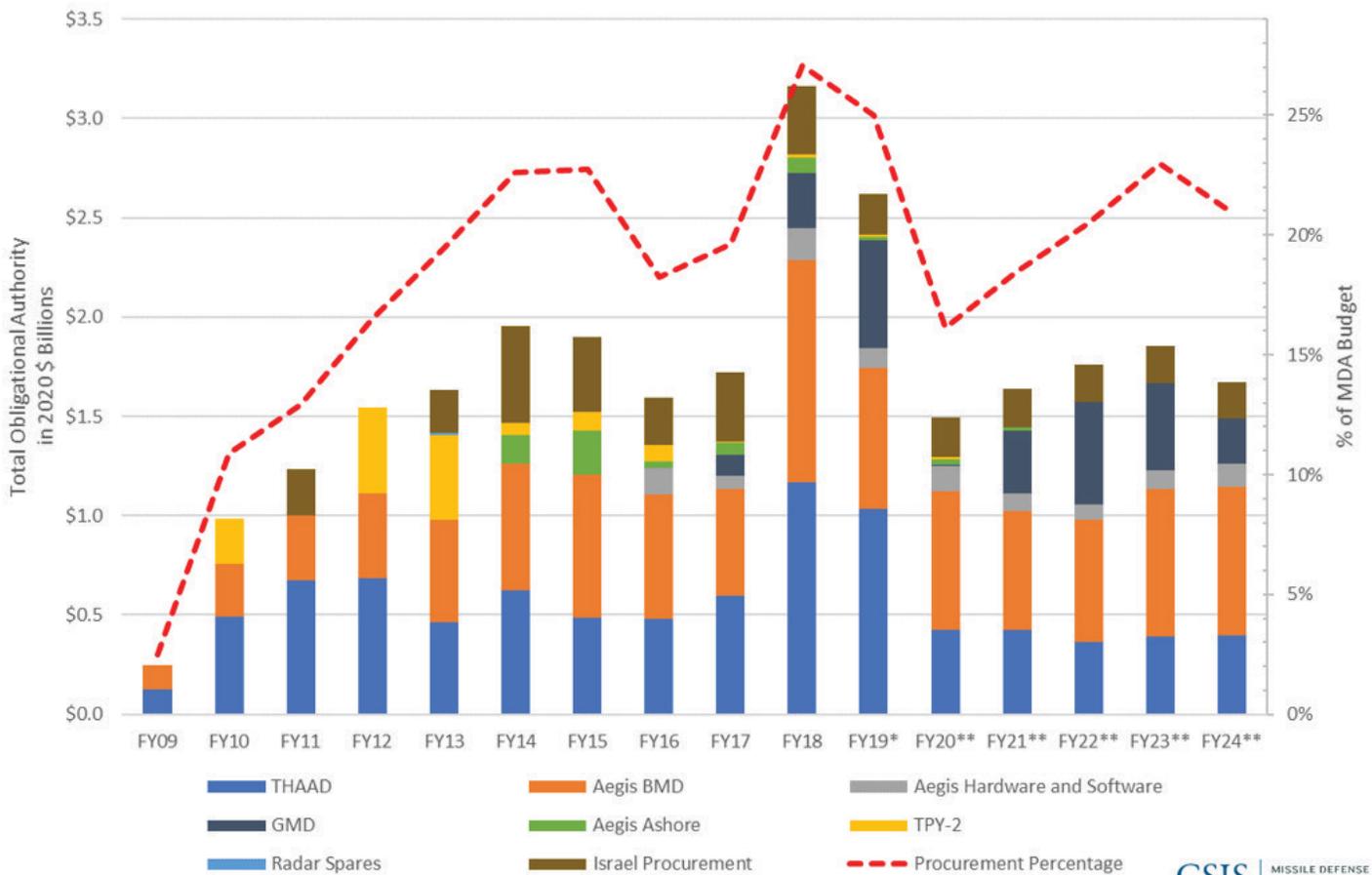
The biggest program changes in the 2020 MDA budget relate to the Ground-based Midcourse Defense (GMD) program for homeland defense. On March 12, MDA Deputy Director Rear Admiral Jon Hill announced a two-year delay of the Redesigned Kill Vehicle (RKV) program, from 2023 to 2025.<sup>13</sup> The 2020 budget continues to expand the missile fields at Fort Greely, Alaska, but the RKV delay pushes out the deployment of the 20 additional Ground-Based Interceptors (GBIs). The delay also explains the \$70 million reduction in the RKV effort compared to last year’s projection. The delay to

RKV heightens the importance of the successful GMD intercept test on March 25, 2019, which demonstrated the capability of two existing GBI configurations to intercept a warhead in a salvo launch.<sup>14</sup>

Another major change related to GMD is the reduced request for the Common Kill Vehicle (CKV) and Multiple Object Kill Vehicle (MOKV). The budget request nearly closes out the MOKV program, much as the Obama administration did with the Multiple Kill Vehicle (MKV) in 2010. Early concept development for volume kill capability will continue in the CKV program, but congressional appropriators seem to be winning after repeatedly cutting requested appropriations for MOKV. It remains to be seen if MDA will give up entirely on volume kill or merely delay its development. MDA includes \$49 million for MOKV in its unfunded priorities list.

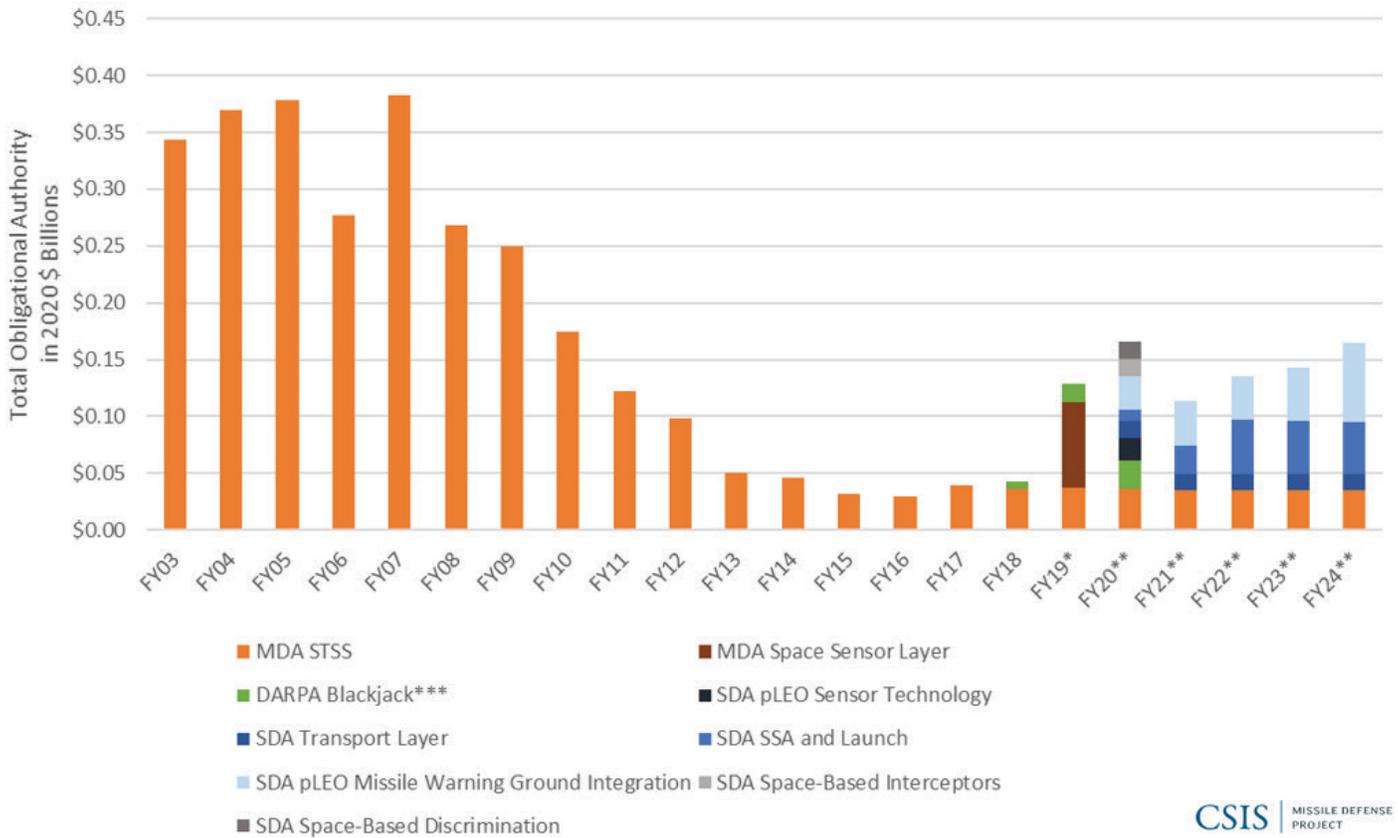
A third issue for homeland missile defense relates to multiple programs for enhanced sensors. The Long Range Discrimination Radar (LRDR) remains on track for a 2020 initial operating capability, but its budget this year grew about \$45 million above the previous projection. The 2020

Figure 4: MDA Procurement Appropriations, 2009–2024

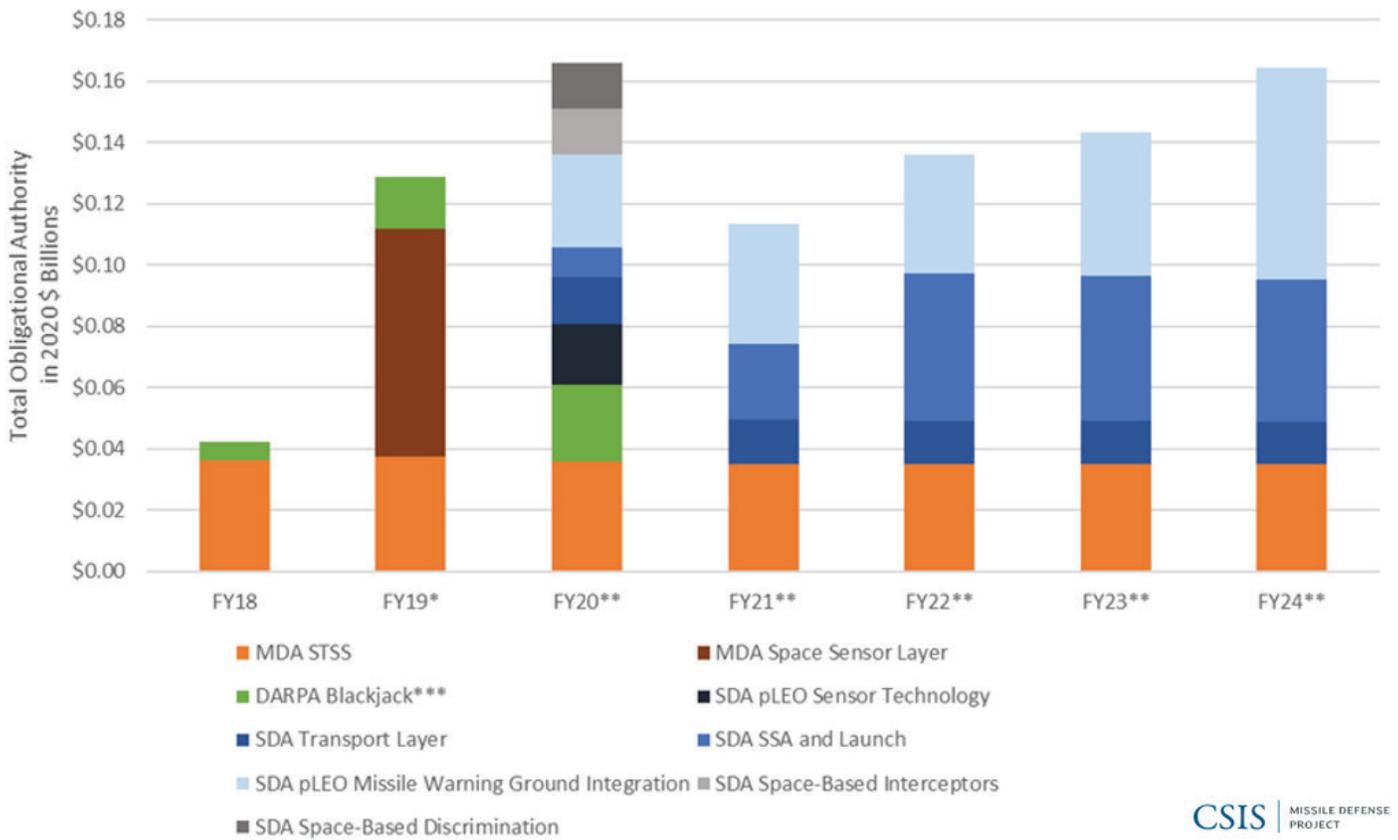


Note: \*Appropriated dollars. \*\*Based on 2020 President’s Budget.

Figure 5: Selected DOD Missile Defense Space Sensor Layer Programs, 2003–2024



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Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget. \*\*\*No FYDP information for DARPA Blackjack program was released in the 2020 budget submission.

budget also reorients resources for the two Homeland Defense Radars, of which one will be in Hawaii (HDR-H) and another at an unnamed Pacific location (HDR-P). In total, the HDR-H and HDR-P request is about \$120 million above the 2019 budget projection. The funding profile of the radars changed within the FYDP, as the HDR-H request went up to \$275 million while the HDR-P request declined to \$7 million. This could suggest a shift in development strategy, focusing first on the completion of HDR-H and later shifting to the HDR-P, as well as hedging for the possible operationalization of the Kauai Aegis Ashore test site with SM-3s or the return of a THAAD battery to Hawaii as an underlay.<sup>15</sup>

Outside of the changes to procurement budgets, the 2020 budget includes relatively little movement in the THAAD and Aegis accounts, with one exception. MDA requested nearly \$170 million for the Aegis BMD Test budget, almost double the 2019 appropriated amount. MDA justification documents attribute this increase to changes to the Integrated Master Test Plan (IMTP), likely a result of the congressional mandate to test an SM-3 IIA against an ICBM-class target. A successful test could set the stage for MDA to deploy Aegis assets, either ashore or afloat, to

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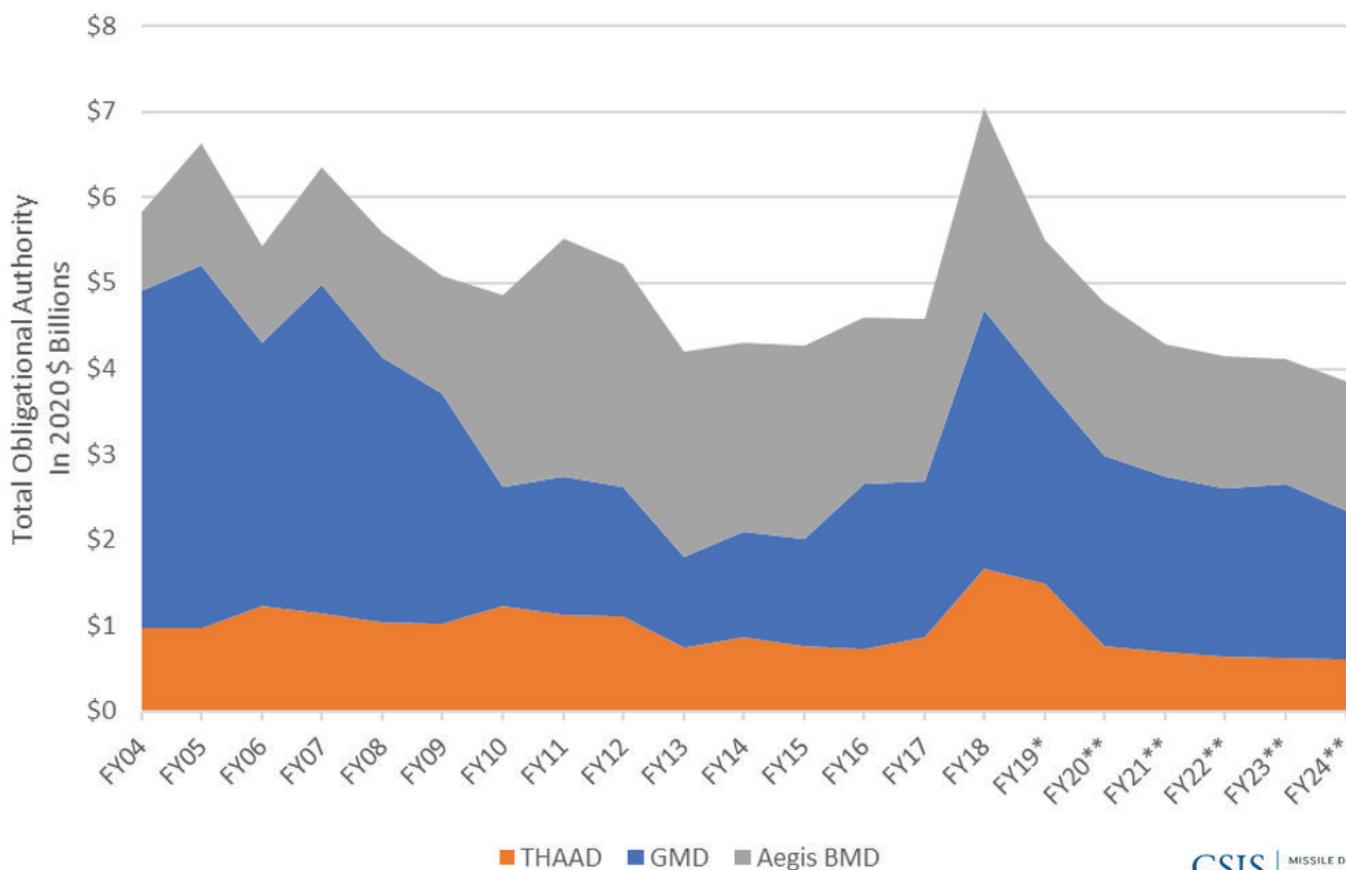
provide an underlay to support homeland missile defense. Previous MDA slides suggested that an Aegis underlay could be deployed around 2025.<sup>16</sup> MDA's unfunded priorities list does, however, include an additional \$546 million for THAAD interceptor procurement.

### THE QUEST FOR INTEGRATION

The Missile Defense Review emphasized the importance of integration, which includes synchronized offensive and defensive operations, a combined arms approach to active and passive air and missile defense, and improved interoperability and even integrated fire control between and among active defense systems. Several improvements to integration and interoperability are found in MDA's 2020 budget request.

One such activity continues to fulfill a Joint Emergent Operational Need (JEON) to integrate the THAAD and

Figure 6: MDA Selected Program Modernization Budgets, 2002–2024



Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget.

Patriot fire control systems, a requirement of U.S. commanders in South Korea.<sup>17</sup> The RDT&E line for the THAAD program also includes software upgrades to permit the remote launch—permitting a launcher to be separate rather than co-located from the battery, thereby increasing the defended area. The software upgrades also include an effort to use the TPY-2 radar attached to THAAD batteries to report hypersonic glide vehicles to the Ballistic Missile Defense System (BMDS) should such missiles fly within a TPY-2's sector field of view. Other improvements include a \$50 million increase for the C2BMC system to integrate the Space-Based Kill Assessment (SKA) satellites and the Army's Integrated Air and Missile Defense Battle Command System (IBCS).

### HYPERSONIC GLIDE VEHICLES

Although the 2020 budget substantially delays the space sensor layer, it includes some modest efforts aimed at countering hypersonic glide vehicles, both in interceptor studies and with command and control. Over the past year, MDA commissioned about a dozen small studies and has been doing an analysis of alternatives. The Hypersonic Defense line now contains \$157 million to begin to move from concept development to technology risk reduction,

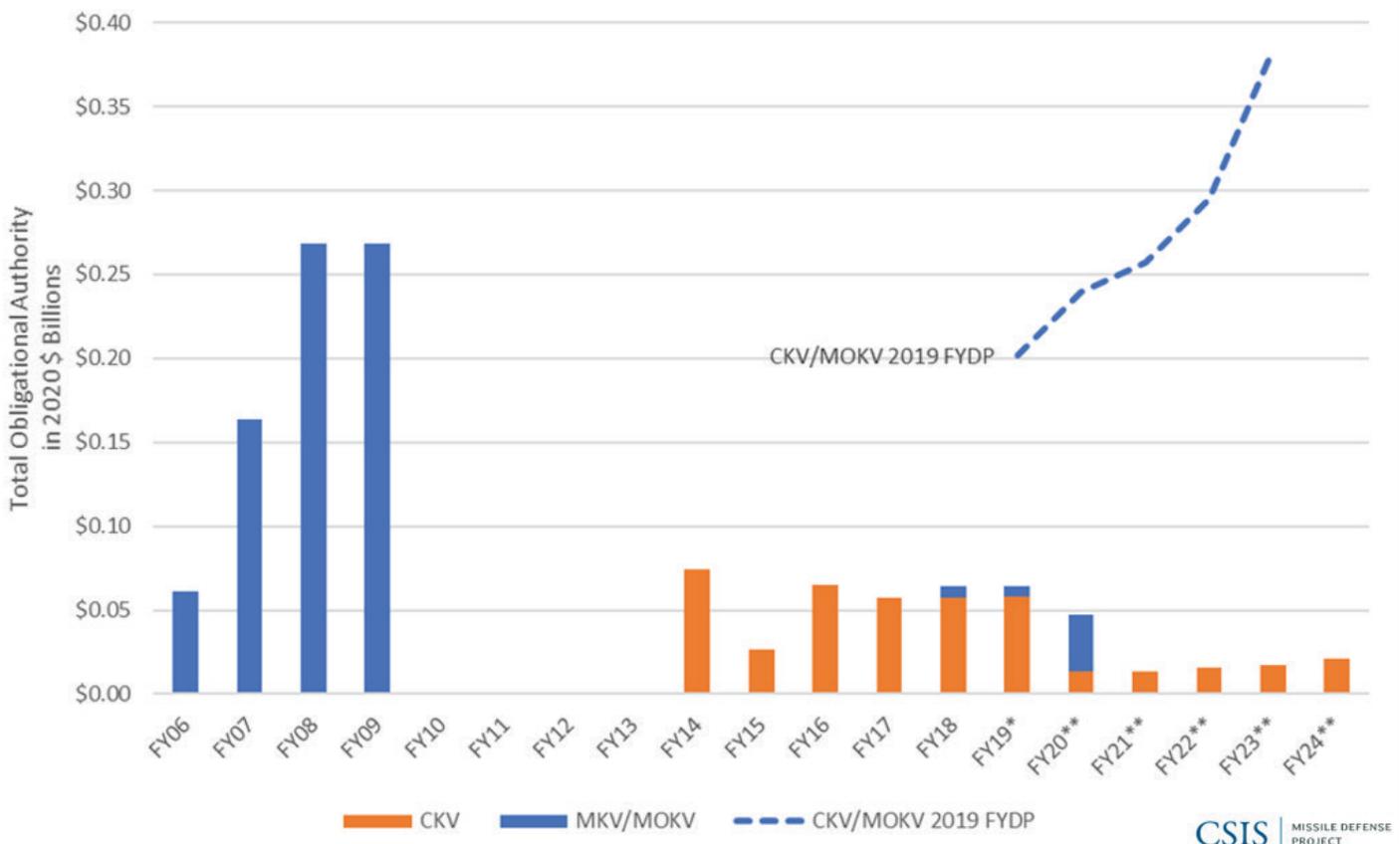
a modest increase of about \$25 million relative to 2019 appropriations. As one of its highest unfunded priorities, MDA identifies \$720 million for hypersonic defense work, to move beyond studies to development of an interceptor.

Since hypersonic glide vehicles are far more maneuverable and less predictable than ballistic missiles, tracking them will likely require the fusion of terrestrial and space-based sensors. Other modest investments to improve the C2BMC network and the BMDS more broadly demonstrate the need to evolve current systems substantially to contend with this more challenging mission.

### BOOST PHASE

One of the few new starts in the MDA budget, MDA requested \$34 million for a Neutral Particle Beam (NPB) program that would seek to develop a “space-based, directed energy capability for homeland defense, providing a defense for boost phase and mid-course phase.”<sup>18</sup> During the budget rollout, Rear Admiral Jon Hill stated that MDA plans to deploy an on-orbit demonstration of the platform by 2023.<sup>19</sup> The \$369 million allocated between fiscal years 2020-2023 suggest, however, that this is merely a prototype development.

Figure 7: MDA Volume Kill Programs, 2006–2024



Note: \* FY19 bar represents appropriated dollars. Dashed line reflects 2019 PB submission over the FYDP. \*\*Based on 2020 President's Budget.

MDA also continues work on laser scaling to develop a boost phase directed energy weapon mounted on an aerial platform. While MDA funding for directed energy has grown in recent years, it represents a fraction of earlier appropriations for the Airborne Laser (ABL) (Figure 8). The more recent acquisition strategy has been different from that of the ABL, however, focused on the gradual increases in power and reductions in weight of solid state lasers to fit aboard smaller platforms. MDA's unfunded priorities list includes \$78 million for laser scaling programs to produce a 500 kilowatt laser demonstrator by 2025.

The Missile Defense Review also announced work on a new boost phase initiative for a kinetic interceptor mounted on an unmanned aerial vehicle.<sup>20</sup> The MDA budget does not contain an apparent line for such a program, although it could be advanced elsewhere. The Air Force is developing an Extended Range Weapon (ERWn), with "prototype development of an advanced multi-role interceptor."<sup>21</sup> Involving collaboration with MDA, a boost phase interceptor like ERWn could potentially be put on either manned or unmanned platforms.

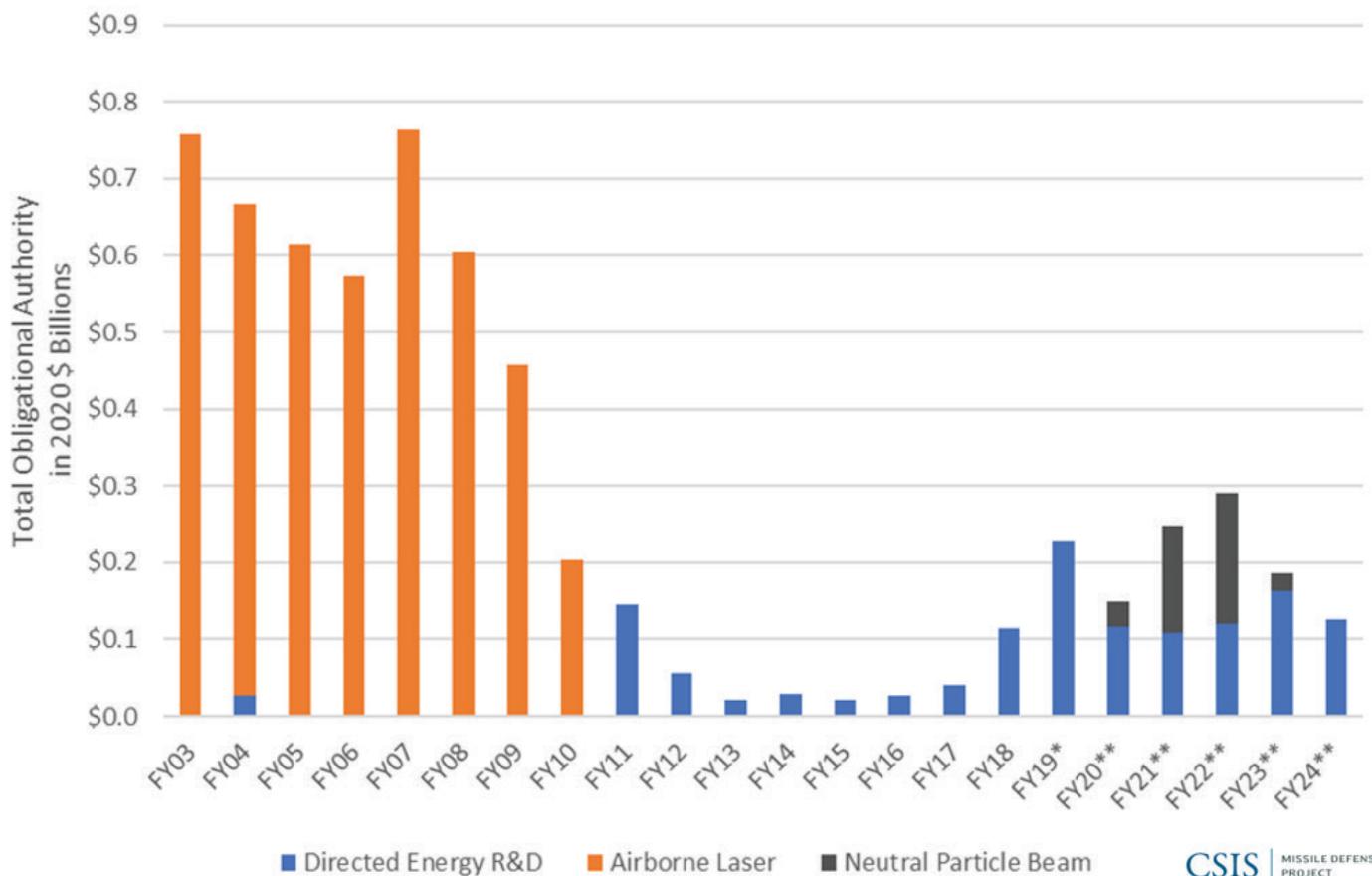
## SERVICE BUDGETS

While MDA is focused mostly on ballistic missile defense, the military services play an important role in both

air defense and shorter-range rockets and missiles. In particular, the Army and Navy budgets for 2020 include significant proposed investment in air defense platforms for defense against emerging cruise missile threats and short-range air defense (SHORAD). Both military services are attempting to catch up in addressing cruise missile threats to make up for previous underinvestment.

The Navy's 2020 budget proposal continues significant investment in air and missile defense systems from the 2019 appropriation (Figure 9). The 2020 request includes slightly less procurement, particularly for the Aegis Weapon System (AWS) and Standard Missile-6 (SM-6), in favor of increased RDT&E for SM-6 and the Air and Missile Defense Radar (AMDR). The SM-6 RDT&E budget includes initial funding for developing a new Block IB interceptor with a uniform 21-inch airframe similar to the SM-3 Block IIA, which would extend the range of the current system. That increased range would enhance SM-6 capabilities across its multiple missions, including air defense, ballistic missile defense, and antiship strike. The Navy requested \$116 million to begin the program and slated the SM-6 Block IB for rapid prototyping and development, aiming to accelerate its acquisition.

Figure 8: MDA Directed Energy RDT&E, 2003–2024



Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget.

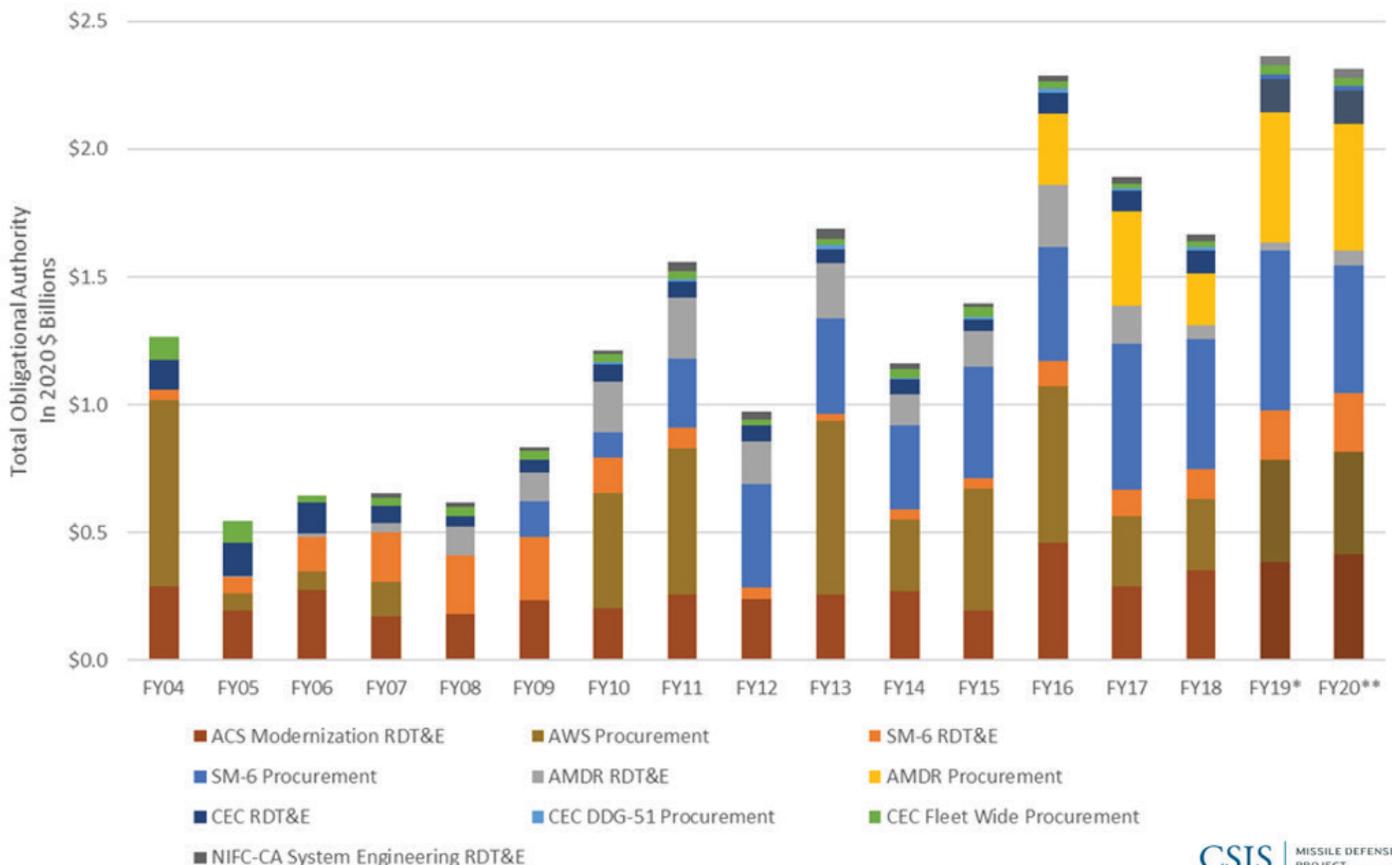
The AMDR RDT&E request includes new funding for both a program to backfit older Arleigh Burke-class destroyers with a smaller version of the radar and to develop a new Advanced Distributed Radar (ADR) capability. The backfit program will need to shrink the AMDR design, which is slated for the larger Flight III destroyers, to fit on the smaller Flight IIA ships. The ADR project seeks to enhance AMDR performance against ballistic missiles and add the ability for AMDR to operate in passive receive-only modes in cooperating with other radars to increase the survivability of ships in contested environments.

The Army budget for air and missile defense programs stays relatively flat in comparison to the past two years, with a modest decrease due mostly to reduced Patriot procurement. The Army's 2020 budget does, however, change the composition of air and missile defense spending, with an important acceleration of the Lower Tier Air and Missile Defense Sensor (LTAMDS) and procurement of both Iron Dome and the Maneuver-Short Range Air Defense (M-SHORAD). Each of these three elements serve critical functions to improve, or in some cases create, defense against a variety of lower-tier air and missile threats.

The Army requests \$428 million in 2020 for LTAMDS, a \$300 million increase over last year's projection. This spike will accelerate its development to hopefully meet the congressional requirement to reach initial operating capability before December 2023. The accelerated timeline and improved capability will significantly improve the capability of today's Patriot radars. But the decision could also allow the Army to redefine the requirements for the program, potentially even eliminating the 360-degree coverage requirement.<sup>22</sup> A decision to remove LTAMDS' omnidirectional requirement could be at odds with the statutory requirement to field a 360-degree radar by 2023, direction given by Congress that would better suit U.S. (and allied) Patriot defenses in challenging conflicts with near-peers.<sup>23</sup>

The Army budget submission reflects its ongoing reinvigoration of the air defense portfolio under the Air and Missile Defense Cross-Functional Team and now Army Futures Command. The Army initiatives include several programs to bolster air and cruise missile defenses other than Patriot. The 2020 request includes the first procurement request of \$262 million for the M-SHORAD system that mounts multiple different air defense interceptors on a modified Stryker combat vehicle.

Figure 9: Select Navy Air and Missile Defense Modernization, 2004–2024



Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget.

The M-SHORAD request notably falls in the Overseas Contingency Operations (OCO) account, which could invite scrutiny from Congress.<sup>24</sup>

The 2020 budget also reflects the long-anticipated realignment of the Army's Indirect Fire Protection Capability (IFPC) program. Largely using advance procurement funds appropriated to IFPC during previous budget cycles, the Army also plans to field Iron Dome for cruise missile defense. The Army intends to acquire two Iron Dome batteries as an interim IFPC capability until it can field its own IFPC launchers along with IBCS in 2023.<sup>25</sup> The nature of the IFPC launcher changed substantially with this budget request, with the Army seeming to scrap its truck-mounted Multi Mission Launcher (MML) in favor of some other componentized, and possibly less-mobile, approach.<sup>26</sup> In another new program start, the Army requested \$8 million to begin research on a future air and missile defense interceptor, which might have applications for either IFPC or Patriot.

### THE NEW ERA WILL HAVE TO WAIT

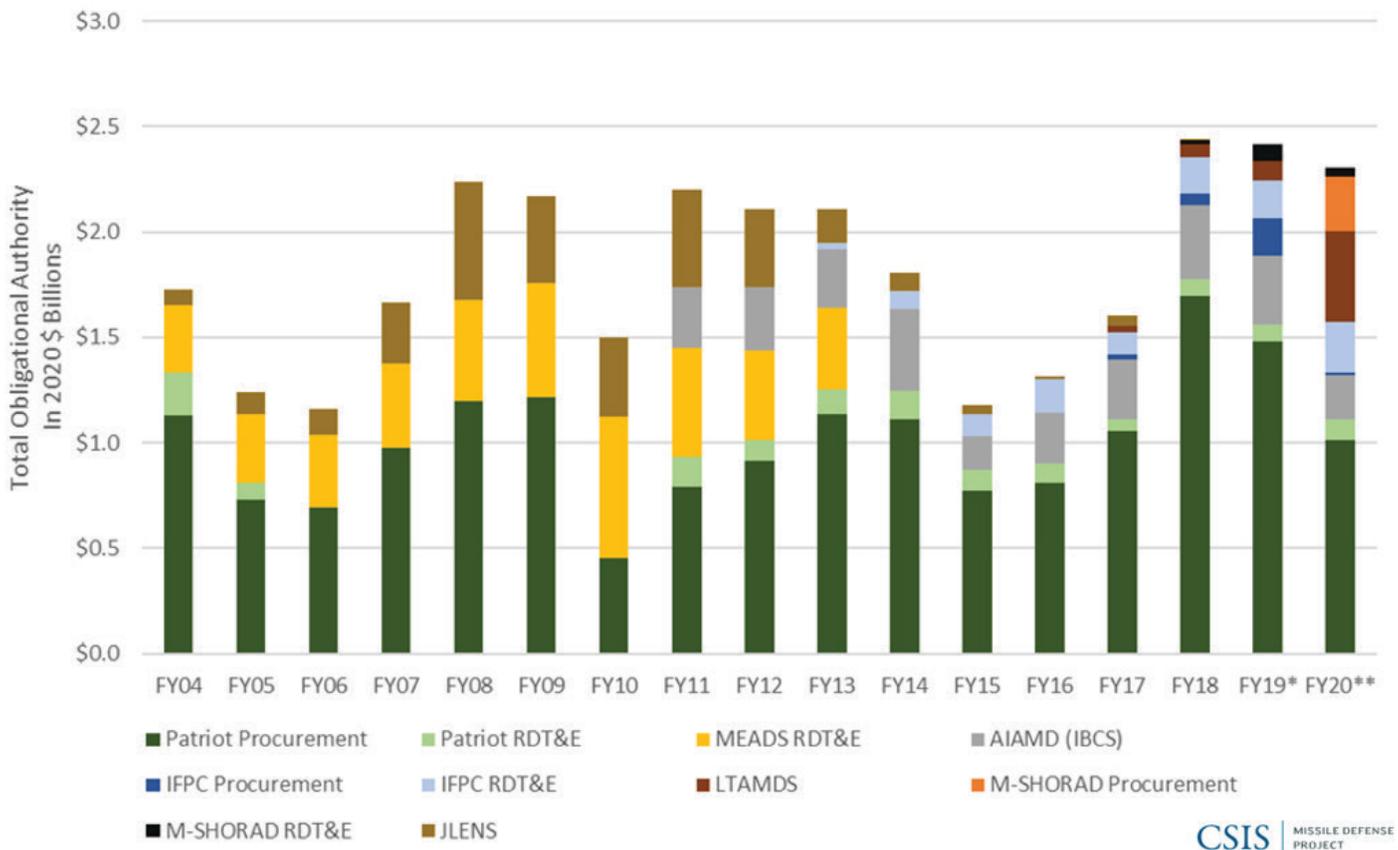
Acting Secretary of Defense Patrick Shanahan has written that the “scale and urgency of change to restore

conventional and missile defense overmatch must not be underestimated.”<sup>27</sup> Unfortunately, the actions in the 2020 budget submission reflect an inadequate scale and urgency relative to the threat.

*The 2020 budget is not a masterpiece for missile defense, it is masterpiece theater.*

To be sure, the budget request proposes several important new investments for air and missile defense, but it contains significant disappointments. The budget fails to prioritize SSL and invites further delay by transferring its sensor development from MDA to SDA before SDA is even up and running. Although the development of new interceptors to counter hypersonic glide vehicles is present, the inability to move quickly enough on an analysis of alternatives will likely result in another year's delay. Overall research and development is down and continuing to decline. To be sure, MDA and the services propose important investments to integrate existing BMDS platforms and a handful of new program starts, but the budget overall largely remains too

Figure 10: Select Army Air and Missile Defense Modernization, 2004–2020



Note: \*Appropriated dollars. \*\*Based on 2020 President's Budget.

tethered to the past program of record focused on limited ballistic missile threats.

Promises of a “masterpiece” and “a new era of missile defense” are as yet unfulfilled. Like the Missile Defense Review, the activities described in the 2020 budget submission do not break china. Instead, the administration’s third budget request signals that President Trump does not intend to undertake the meaningful adaptations necessary to align U.S. missile defenses with his own National Security Strategy and National Defense Strategy, at least not in this term.

The 2020 budget is not a masterpiece for missile defense, it is masterpiece theater. In the absence of significant correction by Congress, the new era for missile defense will apparently have to wait. ■

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Figure 11: Fiscal Year 2020 Missile Defense Agency Budget Tracker

Appropriations	Program	FY18 Actual	FY19 Appropriation	FY19 Request for FY20	FY20 Request
Operations and Maintenance	AEGIS BMD	74.208	78.074	87.258	75.237
	THAAD	70.044	87.560	98.370	99.819
	TPY-2 Radars	208.176	167.635	179.639	194.255
	Midcourse	138.751	139.204	137.396	153.218
Total O&M		491.179	472.473	502.663	522.529
Procurement	AEGIS Ashore Phase III	74.739	15.000	-	25.659
	AEGIS BMD	1,083.353	700.490	673.210	600.773
	Aegis BMD Advance Procurement	-	-	-	96.995
	AEGIS BMD Hardware and Software	157.070	97.057	125.755	124.986
	BMD AN/TPY-2 Radars	11.947	13.185	9.785	10.046
	Iron Dome	92.000	70.000	95.000	95.000
	Arrow Upper Tier	120.000	80.000	55.000	55.000
	DAVID'S SLING	120.000	50.000	50.000	50.000
	THAAD	1,125.732	1,014.068	416.343	425.863
	Ground-based Midcourse Defense	180.000	417.600	520.000	9.471
GMD Defense Advance Procurement	88.000	115.000	-	-	
Total Procurement		3,052.841	2,572.400	1,945.093	1,493.793
RDT&E	Cyber Security	0.964	0.985	1.140	1.138
	Advanced Concepts and Performance	17.683	13.017	14.267	14.208
	Weapons Technology	28.894	13.400	-	10.000
	Advanced Research	23.765	42.565	20.778	20.674
	Pacific Discriminating Radar	-	15.926	57.797	6.711
	Homeland Defense Radar-Hawaii	59.564	62.221	106.370	274.714
	BMD Terminal Defense	454.147	388.273	199.399	302.761
	BMD Midcourse Defense	1,153.263	803.359	1,046.235	1,156.506
	BMD Sensors	290.289	385.375	250.238	283.487
	BMD Enabling Programs	533.993	620.831	542.326	571.507
	Special Programs	356.560	422.348	406.779	377.098
	BMD AEGIS	798.395	741.076	780.085	727.479
	STSS	35.008	36.955	37.134	35.849
	BMD Space Program	45.123	94.484	19.555	27.565
	BMD C2BMC	449.985	507.817	515.239	564.206
	BMD Joint Warfighter	48.574	48.767	53.418	51.532
	MDIOC	51.905	58.125	58.498	56.161
	Regarding Trench	8.898	16.916	18.712	22.424
	Sea Based X-Band Radar	173.988	136.715	175.013	128.156
	Israeli Cooperative Programs	373.800	300.000	300.000	300.000
	BMD Test	406.806	515.897	349.388	395.924
	BMD Targets	512.838	561.352	441.827	554.171
	Hypersonic Defense	63.032	130.944	157.672	157.425
	Technology Maturation Initiatives	163.947	316.822	172.423	303.458
	Long Range Discrimination Radar (LRDR)	370.516	166.543	91.603	136.423
	Improved Homeland Defense Interceptors	742.842	421.820	485.755	412.363
	BMD Terminal Defense Segment Test	35.738	61.017	16.917	25.137
	AEGIS BMD Test	128.757	92.160	80.684	169.822
	BMD Sensor Test	88.840	77.405	77.654	105.530
	Land-Based SM-3	29.652	27.692	29.263	38.352
	Aegis SM-3 Blk IIA	9.531	-	-	-
	BMD Midcourse Segment Test	85.030	72.634	95.458	98.139
	Multi-Object Kill Vehicle	6.347	6.500	33.935	-
Small Business Innovation Research- MDA	115.278	-	-	-	
Management Headquarters	29.947	28.626	27.276	27.065	
Assessments and Evaluations Cyber	-	3.400	-	-	
Common Kill Vehicle	55.562	56.753	205.645	13.600	
Total RDT&E		7,749.461	7,248.720	6,868.483	7,369.585
MILCON	Unspecified Minor Construction	3.000	10.000	2.729	10.000
	Fort Greely Missile Field 4	200.000	-	-	-
	Fort Greely Missile Field 1 Expansion	-	8.000	-	-
	Planning and Design	-	6.184	49.482	35.472
	Long Range Discrimination Radar (LRDR)	-	174.000	-	-
Total MILCON		203.000	198.184	52.211	45.472
Total MDA		11,496.481	10,491.777	9,368.450	9,431.379

Note: \*Based on MDA Budget Figures.

## ENDNOTES

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