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HEARING
ON
NATIONAL DEFENSE AUTHORIZATION ACT
FOR FISCAL YEAR 2023
AND
OVERSIGHT OF PREVIOUSLY AUTHORIZED
PROGRAMS
BEFORE THE
COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES
ONE HUNDRED SEVENTEENTH CONGRESS
SECOND SESSION
—
SUBCOMMITTEE ON STRATEGIC FORCES HEARING
ON
**FISCAL YEAR 2023 STRATEGIC FORCES
MISSILE DEFENSE AND MISSILE
DEFEAT PROGRAMS**

HEARING HELD
MAY 11, 2022



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**FISCAL YEAR 2023 STRATEGIC FORCES MISSILE
DEFENSE AND MISSILE DEFEAT PROGRAMS**

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON STRATEGIC FORCES,
Washington, DC, Wednesday, May 11, 2022.

The subcommittee met, pursuant to call, at 1:59 p.m., in room 2118, Rayburn House Office Building, Hon. Jim Cooper (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. JIM COOPER, A REPRESENTATIVE FROM TENNESSEE, CHAIRMAN, SUBCOMMITTEE ON STRATEGIC FORCES

Mr. COOPER. Good afternoon. The subcommittee will come to order. The purpose of today's hearing is to receive testimony on the 2023 budget request for DOD [Department of Defense] missile defense programs.

Our witnesses are Dr. John Plumb, Assistant Secretary of Defense for Space Policy; Vice Admiral Hill, Director of the Missile Defense Agency; Lieutenant General Karbler, Commander of the U.S. Army Space and Missile Defense Command and Joint Functional Component Command for Integrated Missile Defense; Lieutenant General John Shaw, Deputy Commander of the U.S. Space Command; and Mr. John Sawyer, Acting Director of Contracting and National Security Acquisitions for the Government Accountability Office.

I suggest that I forgo my brilliant opening statement and due to time pressure I would suggest that my ranking member also forgo his opening statement due to time pressure.

Unfortunately, and I want to apologize to the witnesses, we are not able to control the congressional schedule. But votes are expected to start fairly shortly and could last for hours. So ideally, we would have a very truncated public session, go immediately to closed session. And I think that is much more productive for at least the members who are here present.

Mr. LAMBORN. Mr. Chairman, I agree totally with that schedule. I'll submit mine for the record.

Mr. COOPER. Okay. We will submit our statements for the record and we will submit the witnesses' statements for the record and is it premature to suggest that we quickly go to 23—

[The prepared statements of Mr. Cooper, Mr. Lamborn, and the witnesses can be found in the Appendix beginning on page 13.]

STAFF MEMBER. Do you want to have no questions at all?

Mr. COOPER. Well, would Mr. DesJarlais like to ask a question? Okay.

Mr. Langevin, I see that—Mr. Wilson? Is that okay with you? I apologize for the truncated nature, but I don't want to keep the witnesses here until 7, 8, or 9 o'clock tonight. These are busy people.

Mr. LANGEVIN. Mr. Chairman, if I could ask one brief question.

Mr. COOPER. Okay. Go ahead. Mr. Langevin, you are recognized.

Mr. LANGEVIN. Thank you very much. I thank our witnesses for being here. So as we all know, directed energy [DE] weapons such as lasers and high-powered microwaves can effectively engage a variety of threats with speed, flexibility, precision, on a whole cost-per-shot basis.

Despite this, the FY23 [fiscal year 2023] budget request has cut all funding for a critical directed energy effort, specifically the Diode-Pumped Alkali Laser, or DPAL, despite its recent history of success and the proven value DE technologies provide to our warfighters.

So for the record, I wanted to ask can you speak more to MDA's [Missile Defense Agency's] development and pursuit of a rapid prototype and demonstration of DPAL and most importantly, please describe how valuable this asset would be in your arsenal.

Mr. COOPER. Does the gentleman want this question for the record or do you want a verbal answer to your question right now?

Mr. LANGEVIN. Well, if we could get that from Dr. Plumb, that would be great.

Mr. COOPER. Dr. Plumb.

Dr. PLUMB. Thanks, Congressman Langevin. I'll just say I fully agree that directed energy is part of our future architecture and we need to be investing in it. As for the specifics on DPALS and other laser or other directed energy systems, my understanding is those have been transferred to R&E [Under Secretary of Defense for Research and Engineering]. Admiral Hill may have some additional pieces, but as you know, I am keen on this particular issue and I do intend for that to be a part of my deep dive as I get deeper into this position.

Mr. LANGEVIN. Thank you. Well, this has got to be a priority for us and I hope that it will continue to be so.

Last question, Mr. Chairman, and I will submit this for the record, and if I can get it back in writing. So we face conventional and asymmetric threats from our adversaries around the globe on a daily basis and one of those emerging threats is hypersonics. We have seen recent tests by China and North Korea and have hypersonics in use on the battlefield by Russia against the Ukrainian people.

Here at home and in this setting, well, since you are going to get back to me, you can both probably get a classified answer on this, can you discuss our layered defense against hypersonic missiles?

I will submit that for the record, Mr. Chairman, given the constraints on time and I will yield back. Thank you.

[The information referred to can be found in the Appendix on page 97.]

Mr. COOPER. I thank the gentleman from Rhode Island. I understand that the gentleman from South Carolina, Mr. Wilson, has a question?

Mr. WILSON. Yes, I do. Thank you, Mr. Chairman. And thank you for your service. We are going to miss you in Congress and to be enterprising today facing the bizarre circumstance we have of these votes. And I want to thank all of our witnesses for being here today.

And for the record, I have got four quick questions. And for Admiral Hill, that is that Israel faces the threat of larger, more sophisticated rocket and missile arsenals in the hands of terrorists. Additionally, in the last 3 weeks, there have been a number of Hamas terrorist missile attacks from Gaza against the people of Israel. To address this mounting threat, Israel and the United States are working together to develop and deploy a multi-tiered missile defense system. The U.S.-Israel Memorandum of Understanding on the security assistance provides for \$500 million in funding for the annual defense systems in cooperation with Israel.

Admiral Hill, you recently were in Israel to view the new Elevated Sensor missile detection system. Can you update the committee on the state of the U.S.-Israel missile defense cooperation and the funding levels that are being brought forth this year to include Iron Dome, David's Sling, and Arrow?

[The information referred to can be found in the Appendix on page 97.]

Mr. WILSON. The next question, Admiral, would be in regard to missile and rocket threats from Iran and its proxies, how horrible this is across the Middle East. And we have had the most recent attacks on our valued allies, the UAE [United Arab Emirates] and Saudi Arabia. And we have seen that Iran has targeted U.S. and allied forces in Syria and Erbil in Iraq.

In the wake of this, we have the cooperation of the Abraham Accords and so what is being done of working together with our Middle East allies?

[The information referred to can be found in the Appendix on page 97.]

Mr. WILSON. And then third, I am really grateful for the extraordinary strategic and vital location of Guam and I hope that the Department will continue in every effort to invest \$892 million for integrated air and missile defense system to defend the terrific people of Guam against cruise, hypersonic, and ballistic missiles.

And a final short question. I was truly grateful to learn that our German allies are moving forward purchasing the Arrow 3 anti-missile defense shield from Israel. Assuming that Israel procures the Arrow system 3 system, how will we integrate that with our missile defense strategic and strategy in the European theater particularly to hopefully address and defend the people of Ukraine, Moldova, and Georgia? Thank you.

[The information referred to can be found in the Appendix on page 97.]

Mr. COOPER. I thank the gentleman. I appreciate his kind words about me and do any other members have questions they would like to bring up now?

It appears that there are none, but it also appears that we might have some room availability issues with the SCIF [Sensitive Compartmented Information Facility]. So would the gentleman from Tennessee like to ask something? I think it is going to be another

few minutes and they have already called a vote, so we are really running into crunch time here.

Dr. DESJARLAIS. Okay, I will take a minute or two, if that's okay.

Mr. COOPER. Okay.

Dr. DESJARLAIS. Admiral Hill, what is our current capability to defend against hypersonic threats from our adversaries, particularly threats posed to critical assets like our aircraft carriers?

Admiral HILL. Is this question for the record or do you want me to answer it now? Okay. Yes, sir.

So today, deployed with the aircraft carriers on destroyers is the Sea-Based Terminal capability which was designed to protect the carrier base against the advanced maneuvering threat. That is the hypersonic defense today that is hard kill and as you know, we are investing in PB23 [President's budget for 2023] into the Glide Phase Interceptor to add a layered defense capability.

We are leveraging all sensors available today. We are bringing that data down to the ships through our command and control battle management and communications.

Dr. DESJARLAIS. Okay. You requested additional funds for the Glide Phase Interceptor in the MDA unfunded priorities list. Can you describe how these funds would be used and would they help accelerate the timeline?

Admiral HILL. Yes, sir. So when I think of an unfunded priorities list, I think given another dollar where would I put it? And the items that you see listed there specifically to Glide Phase Interceptor is to risk-reduce key technology areas. That is a new regime up in the glide phase and so seeker work, propulsion work, the old thermal protection system issues, that will help to de-risk the program.

Dr. DESJARLAIS. You mentioned earlier, and I don't know if this was for the closed setting, so if it is, just let me know, but you mentioned the successes we have had with the THAAD [Terminal High Altitude Area Defense] deployments overseas in the Middle East and I was going to give you some time to tout some of those successes if that was for an open setting or was it for the closed?

Admiral HILL. We can talk about it in the open setting because it has made its way into the press. But the United Arab Emirates, one of our foreign military sales customers, has used the U.S.-built THAAD system effectively in June—I am sorry, in January of this year. And were successful in all those engagements. Through some work with Central Command and with my good friend General Karbler here, we now have access to that data so that we can pour through it to see if there are any improvements we need to make either to the system or to the techniques, tactics, and procedures that the soldiers employ. Thank you, sir.

Dr. DESJARLAIS. Very good. And I don't want to be greedy with my time. I didn't know, Ranking Member.

Mr. COOPER. Sadly, it is looking like we've got plenty of time now because it looks like with permission of the witnesses, we will only do a brief opening session today and we will reschedule to another day the closed session. So the witnesses will be free to leave after this.

Dr. DESJARLAIS. I will yield back and then come back if we have more time.

Mr. COOPER. Mr. Lamborn has questions?

Mr. LAMBORN. Yes, since we have a few minutes before we head over to the floor for our votes and then we will see you all, gentlemen, at another time for the classified portion.

But Admiral Hill, we discussed HBTSS [Hypersonic Ballistic Tracking Space Sensor] in our office earlier today and you said that hypersonic missile defense is one of your top three priorities. How satisfied are you with the current plan for HBTSS? And can you describe for the committee your vision of the full architecture?

Admiral HILL. Yes, sir. Ranking Member Lamborn, thanks for that question.

So the Hypersonic Ballistic Tracking Space Sensor has two major roles. The first is to pick up the dim targets that cannot be seen by the current architecture today; so from a ballistic perspective, we are seeing changes there that make that fight much more challenging. But when you get to the advanced hypersonic threat which has a global maneuver capability, we need the ability to see it from space, so global coverage and that very close proximity from space to track those sensors.

We are on track to take two interoperable prototype satellites to space in March of 2023. We will put those in an inclination where we can monitor tests in the INDOPACOM [U.S. Indo-Pacific Command] region and we will collect that data as a way to proof out the concept.

Did a lot of work on the ground to show that we can extract those hot targets over a warm earth. Now it is about getting it into space and pulling that data down. We are staying very close to the Space Force as we make decisions on the overall architecture and our vision is is that the HBTSS will be a part of the overall constellation for dealing with that global maneuvering threat.

Mr. LAMBORN. And just as kind of an update, as much as you can say here in open setting, are we getting closer to a decision where we will find a contractor or contractors who will help us with the defense against hypersonic vehicles?

Admiral HILL. Yes, sir. You are talking about defense capability—

Mr. LAMBORN. Yes.

Admiral HILL [continuing]. Beyond the terminal capability that we have today? Yes, sir. We have a Other Transaction Authority agreement in place with three separate companies that are competing now. We are evaluating those concepts for a downselect later this year; so we will go from the current three down to the two, perhaps the one, depending on the maturity of those different proposals. But it goes right back to what Congressman DesJarlais asked which is how much de-risking needs to be done?

We don't have a good sense yet, as we are going through that work now and those evaluations, but if we see areas where there are major risk areas that we want to help industry overcome, that is what those investments will be tied to.

Mr. LAMBORN. And General Shaw, lastly, what can you say as far as the Space Force's role with hypersonics? When it comes to testing and fielding we are behind our two near-peer potential adversaries. So what can you say where we stand in terms of catching up?

General SHAW. Congressman, thanks for the question. Again, probably best targeted for the Space Force, but I will give my best answer from U.S. Space Command.

We are interested in any capabilities that are going to help us with any of these threats and as MDA has pursued this particular program, HBTSS, the advantage of this is that we have a perspective from space that is invaluable and will allow us to get after a lot of these threats.

To get after the actual technologies themselves, I think that we need to pursue every possibility to hold enemy at risk from longer and longer ranges. I think that is where warfare is taking us and hypersonics will play a role in that.

Mr. LAMBORN. Thank you. Mr. Chairman, I yield back.

Mr. COOPER. I thank the gentleman from Colorado. I think the gentlelady from New York is recognized, if you have any questions you would like to ask.

Ms. STEFANIK. Thank you, Chairman Cooper. I represent Fort Drum, home to the 10th Mountain Division that has been designated the third continental interceptor site. I know that many of you have answered questions on this matter in front of this committee beforehand.

My question today goes to Lieutenant General Karbler who commands the 100th Ground Based Missile Defense Brigade, a multi-component brigade made up of soldiers from the Active Duty Army and Army National Guard forces. They are the 300 soldiers defending 300 million people.

As the designated third continental interceptor site, if Fort Drum were to receive a missile defense unit, would the force structure mirror that of the 100th GMD Brigade with a mix of Active Duty and National Guard soldiers?

General KARBLE. Congresswoman, thanks very much for the question. I would hope that it would be a total force solution to that. We have seen great success in our missile defense element, soldiers in Colorado as well as in Alaska who help man missile defense, and I see no reason why this wouldn't be a—why we would not pursue a multi-COMPO [component] soldier solution.

Ms. STEFANIK. Thank you. My followup is a broader question. So I have been very concerned that President Biden and his administration and many House Democrats have asserted that improved missile defense is provocative when unfortunately, the U.S. has not taken any moves to dramatically alter the balance of power in the nuclear and missile defense areas, yet all of our adversaries are modernizing their offensive and defensive strategic capabilities.

This question is for Dr. Plumb. How has the war in Ukraine, Russia's nuclear threats, and the strengthening of the Russia-China relationship, unfortunately, altered or updated this administration's view on missile defense?

Dr. PLUMB. Thanks, Congresswoman. I will just say that the classified Missile Defense Review has been released. There have been some unclassified talking points. I am happy to just for the record just put that we are committed to developing the Next-Generation Interceptor with MDA and so improving our missile defenses, that is both in capacity and in quality, is a thing that the administration is, in fact, dedicated to.

The Ukraine issue you point out is an excellent one because what we have seen there is that Russia is using missiles not with the precision you might expect of a modern military, but more as a broad area terror weapon in my opinion. And so the need for missile defenses is only increased, in my opinion, at least by watching that conflict play out.

Ms. STEFANIK. And is that shared by the entire administration, and by President Joe Biden? Why are we not hearing that from the President of the United States?

Dr. PLUMB. I can't speak for the President's view on this specific issue. I will note that we have I think already provided over \$4.5 billion in drawdown equipment to Ukraine. We have made very strong statements against Russia. We have declared we will defend NATO [North Atlantic Treaty Organization] every square inch. We have shipped about 1,400 Stingers, thousands and thousands of Javelins and other forms of armaments, so I think my version of that would be that there is a very strong response there and deep concern.

Ms. STEFANIK. What is this administration's position on a third continental interceptor site which has been designated in the previous National Defense Authorizations Acts on a bipartisan basis? What is the position of Joe Biden and the Department of Defense about that third site, given the changing and increasing threats around the world today?

Dr. PLUMB. Yes, Congresswoman, the position remains the same. There is no military requirement for that third site at this time.

Ms. STEFANIK. Given the increased threats from North Korea and other adversaries around the world, again, and the need that Congress has on a bipartisan basis asserted for a third site, so the administration is just going to ignore Congress' important role in making sure that we have robust missile defense?

Dr. PLUMB. Congresswoman, the United States and the Department of Defense are both absolutely committed to a robust missile defense program. That is in the Missile Defense Review. That is in our efforts to improve missile defense of the homeland through the Next-Generation Interceptor and the service life extension of the GBI [Ground-Based Interceptor]. We are buying over-the-horizon radars to work on cruise missile defense of the entire homeland, and there is literally billions in the President's budget request including nearly \$5 billion for a more robust and resilient architecture to track ballistic and hypersonic weapons.

Ms. STEFANIK. And that includes making sure——

Mr. COOPER. The gentlelady's time has expired.

Ms. STEFANIK. Right. Thank you.

Mr. COOPER. I would remind the gentlelady that I personally have tried to work with you on the third missile site. I am worried about the partisan tone of your questions. We have been given the largest missile defense budget by President Biden and his administration, I think at least in many, many years, if not in history. You have the statements from Dr. Plumb. I think that the aspersions you are trying to cast are misplaced.

I should remind you that President Trump, I think, did very little if anything to help with the third missile site while he was

President. And I recall him trying to be like the best friends, good buddies with both Vladimir Putin and Kim Jong-un.

Ms. STEFANIK. Chairman Cooper, I would like to respond to that. I would like you to give your leniency as chair to respond to that.

Mr. COOPER. You have my permission.

Ms. STEFANIK. Chairman Cooper, I appreciate the work that you and this committee have done to work with my office and other members to ensure that Fort Drum was as it should have been, designated the third continental interceptor site. That, in fact, designation happened during the Trump administration. To say that there was no movement forward on investing in robust missile defense during the Trump administration is absolutely wrong.

As a Member of Congress, I can ask panelists or witnesses any question that is pertinent to constituents in my district. I will continue to do that in the oversight capacity. This administration was clear that they do not support locating a missile defense site at Fort Drum which puts them at odds with the majority leader of the United States Senate. That would be Senator Chuck Schumer who has made this a priority. So to get that on record is an important answer for my constituents to hear.

Again, we have a strong bipartisan working relationship on this committee, but these panelists and the witnesses deserve to answer tough questions. So I would push back on that and with that, I yield back.

Mr. COOPER. Do any other members of the subcommittee have questions?

Hearing none, it looks as if this public portion of the hearing is adjourned, and we will try to reschedule—Mr. Wilson?

Mr. WILSON. One final question for the record and that is when I think of missile defense, I am so disappointed that our NATO ally, Turkey, ally of 73 years, really 100 years, that they are now dependent on Russian S-400s. And then India, the world's largest democracy, additionally, S-400s. And it could be off record, but I would like to know what we are doing to try to work with these two very important allies of the United States to do foreign military sales. Whatever can be done that America being who they work with and not Putin. Thank you very much.

Mr. COOPER. I thank the gentleman for his question. If there are no other points to be made, I suggest that the public portion of this hearing be adjourned and we try to reschedule for a later date the classified portion of the hearing. I thank the witnesses for participating, sorry for the unexpected delay.

[Whereupon, at 2:21 p.m., the subcommittee was adjourned.]

A P P E N D I X

MAY 11, 2022

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

MAY 11, 2022

Statement of Hon. Jim Cooper
Chairman, Subcommittee on Strategic Forces
Hearing on
Fiscal Year 2023 Strategic Forces Missile Defense and
Missile Defeat Programs
May 11, 2022

Good afternoon. The subcommittee will come to order. The purpose of today's hearing is to receive testimony on the 2023 budget request for DoD missile defense programs.

Our witnesses are,

- Dr. John Plumb, Assistant Secretary of Defense for Space Policy,
- Vice Admiral Hill, Director of the Missile Defense Agency,
- Lieutenant General Karbler, Commander of the United States Army Space and Missile Defense Command and Joint Functional Component Command for Integrated Missile Defense,
- Lieutenant General John Shaw, Deputy Commander of the U.S. Space Command, and
- Mr. John Sawyer, Acting Director, Contracting and National Security Acquisitions, Government Accountability Office.

Thank you all for participating in today's hearing. As Dr. Plumb mentions at the end of his testimony, missile threats are increasingly prevalent around the world. They are becoming the weapon of choice for aggressor nations. As we are seeing in Ukraine, they can devastate cities and populations. As we have learned from Israel, these threats may be intermittent, but can last for many years. As we ourselves hear regularly from North Korea, Kim Jong Un is trying to threaten us with his long-range missiles. All peaceful nations need protections from these threats.

The Biden Administration understands these threats and is fully funding missile defense again this year. Layered defenses are key, whether it is our Patriot, THAAD, Aegis, GBI system or Israel's David's Sling, Arrow, and Iron Dome. Civilian populations deserve protection.

I am thankful that the Next Generation Interceptor appears to be off to a good start and integrating best practices with regards to digital engineering and early parts testing, but we must continue to closely monitor this program to head off any problems.

We are late in defending against hypersonic weapons. Russia and China have both developed advanced capabilities. We need to make sure that the hypersonic and ballistic tracking space sensor program is fully funded. It provides the fire-control quality data needed to intercept these high-speed, highly maneuverable threats in the glide-phase.

I look forward to hearing from both Lieutenant General Karbler and Lieutenant General Shaw on how the continued stand-up of Space Command is changing how the Department manages missile defense roles, responsibilities, requirements and coordination, particularly when it comes to global sensor integration.

I hope that we are not shortchanging the chance for a directed-energy breakthrough because of the terrific promise of that technology. I look forward to discussing these and other issues, particularly in the closed session following this hearing.

Now, I turn to my Ranking Member, Mr. Lamborn for his remarks.

Statement of Ranking Member Doug Lamborn
Subcommittee on Strategic Forces
Hearing on
Fiscal Year 2023 Strategic Forces Missile Defense and
Missile Defeat Programs
May 11, 2022

Thank you, Chairman Cooper, for calling today's hearing, and thank you to our witnesses for being here today.

When tensions are high or when hostilities occur, the demand for missile defense shoots through the roof. But missile defense assets aren't spigots that can be readily or easily turned on and off when a crisis emerges. The decisions and investments we make today will determine the strength of our posture in conflicts over the next decade.

The importance of ready and comprehensive missile defense has been brought to the forefront considering Russia's invasion of Ukraine. The conflict has presented a clear need for additional missile defense systems to persistently defend U.S. and NATO assets, as well as exportable and easy to use systems that we can provide to allies or partners in need. In this case, such systems would enable Ukrainians to better stem the Russian onslaught and defend their civilian population.

We must proactively and innovatively invest in both of these needs at the same time. Stingers are excellent systems, but they are not enough to take out high-end Russian fighters. Robust homeland defense capabilities are essential for deterrence, but they are not battlefield systems.

Given the pace of the North Korean ICBM threat, the Next Generation Interceptor can't get here soon enough. Admiral Hill, you need to keep us on schedule for a successful test and we need to maintain both contractors through Critical Design Review.

And because of the timelines for a possible Chinese invasion of Taiwan as outlined by Admiral Davidson, full funding for the Guam Defense System is non-negotiable.

We must also reckon with the Chinese and Russian hypersonic threats that are no longer emerging and have rapidly arrived. We need to develop our next generation of technologies to defeat these systems.

Additionally, we need to work better with foreign defense firms on co-development and co-production to fill gaps and buy-down risk more rapidly. Our joint development of missile defense capabilities with Israel exemplifies the mutually reinforcing benefits that working with our closest allies and partners can provide in these efforts. And the statement yesterday by the Canadian Defense Minister that Ottawa is interested in joining the United States' ballistic missile defense system shows how significant these partnerships can be.

And most importantly, we need to fix our manning issues. U.S. forces working the missile defense mission are overworked with Army dwell times hovering around one-to-one. Even if we had additional Patriot batteries to deploy to Eastern Europe, I doubt we could currently man them without significantly over-taxing the force. I hope to hear from our witnesses how they are addressing these key issues, but the manning issue most of all. The demand for missile defense assets isn't going away. In fact, the demand will only increase and we need to have a force in place to support this high op-tempo.

Lieutenant General Shaw, I'm worried that we still aren't funding the Hypersonic Ballistic Tracking Space Sensor (HBTSS) sufficiently. We must be able to track these challenging targets like the hypersonic threats.

I was also disappointed to see key directed energy programs no longer funded in the Biden budget request. This seems short-sighted, and it seems likely that we in Congress will have to fix this mistake.

With that, I again thank the Chairman and our witnesses, and look forward to the forthcoming testimony.

**Written Statement of Dr. John Plumb
Assistant Secretary of Defense for Space Policy
House Armed Services Committee Strategic Forces Subcommittee
Fiscal Year 2023 Budget Request for
Missile Defeat and Defense Programs
May 11, 2022**

Introduction

Chairman Cooper, Ranking Member Lamborn, and distinguished Members of the Committee, thank you for inviting me to testify before you today on the Department's Fiscal Year (FY) 2023 Budget Request for Missile Defeat and Defense Programs.

As the Assistant Secretary of Defense for Space Policy, I am responsible for the overall supervision of Department of Defense (DoD) policy pertaining to strategic capabilities essential for integrated deterrence including space, cyber, missile defense, nuclear weapons, and countering weapons of mass destruction.

I am honored to appear alongside Vice Admiral Jon Hill from the Missile Defense Agency, Lieutenant General John Shaw from U.S. Space Command, Lieutenant General Daniel Karbler from the U.S. Army's Space and Missile Defense Command, and Mr. John Sawyer from the Government Accountability Office.

Adversary advances in missile technologies, the marked increase in deployed systems, and the documented use of missiles in conflicts around the world show that missiles have become a common and expected facet of modern warfare. This makes our missile defeat and missile defense efforts more important than ever.

In this testimony I will examine how the missile threat has evolved; provide an update on U.S. missile defense policy as informed by the 2022 Missile Defense Review (MDR); and discuss the path forward to address growing missile threats in the Department's FY 2023 budget.

Missile Threat Evolution

Offensive missiles are increasingly weapons of choice for Russia, China, North Korea, and Iran, for use in conflict and to coerce and intimidate their neighbors both in peacetime and crisis.

- **People's Republic of China (PRC):** As Secretary Austin has stated, China is the Department's pacing threat. China has dramatically advanced its development of conventional and nuclear armed ballistic and hypersonic missile technologies and capabilities over the last twenty years, through intense and focused investment, development, testing, and deployments. China is using increasingly sophisticated and proliferated space-based intelligence, surveillance, and reconnaissance (ISR) and improved command and control (C2) systems, to drive better precision and accuracy of its missiles. Many of China's systems are intended to deter and counter U.S. forward presence, force projection, and operations, especially in the Western Pacific region and give China the ability to further intimidate and threaten its neighbors, including Taiwan.
- **Russia:** Over the last ten years, Russia has prioritized modernization of its intercontinental range missile systems. Russia is developing, testing, and deploying new, diversified capabilities that pose new challenges to U.S. missile warning systems. Russia's regional missile arsenal underpins its anti-access/area-denial (A2/AD) strategies that are designed to undermine NATO's ability to project force in response to crisis or conflict. Russia has developed and fielded a suite of advanced precision-strike missiles that it has employed with devastating operational and tactical effect in conflict including in Ukraine and Syria. In Ukraine, we have witnessed Russia employ over 1,500 missiles

of all types, often targeting civilians and civilian infrastructure, as part of its unprovoked campaign that has caused the deaths of thousands of innocent men, women, and children.

- **North Korea:** North Korea continues to improve, expand, and diversify its conventional and nuclear missile capabilities, posing an increasing risk to the U.S. homeland and U.S. forces, allies, and partners in the region. Most of North Korea's ballistic missiles have an assessed capability to carry nuclear payloads. North Korea has accelerated its missile testing in recent months that included the launch of a long-range missile.
- **Iran:** Iran maintains a large and growing regional missile and UAS capability, which it leverages via its regional proxy groups to coerce and threaten its neighbors, and ensure regime survival. Iran's proxy wars in Yemen against Saudi Arabia and the United Arab Emirates (UAE), and in Gaza and Lebanon against Israel, further demonstrate its willingness to use missiles and UAS capabilities to strike targets of any type including civilian populations. Iran's nascent space program could shorten its pathway to a future long-range missile capability.
- **Non-State Actors:** Non-state actors also pose a threat to U.S. regional interests, including our allies and partners. On today's battlefields, non-state actors are employing increasingly complex offensive UAS, rocket, and missile capabilities. State sponsors are proliferating technology and weapons systems to non-state groups, which have used them indiscriminately against innocent civilians. The recent attack on an oil facility in Saudi Arabia is just one example of this emerging threat.

U.S. Missile Defense Policy Update

The Department reassessed its missile defense policy as part of the 2022 MDR, which DoD provided in full to Congress in classified format on March 28 as an integrated element of the 2022 National Defense Strategy (NDS).

It is important to underscore the fully integrated approach that DoD took to conducting the 2022 MDR as part of the development of the NDS and alongside the Nuclear Posture Review (NPR). This approach ensured tight linkages between these key elements of our strategy and our allocation of related resources. The NDS establishes four priorities for the Department:

1. Defending the homeland, paced to the growing multi-domain threat posed by the PRC.
2. Deterring strategic attacks against the United States, our allies, and our partners.
3. Deterring aggression – while being prepared to prevail in conflict when necessary – prioritizing the PRC challenge in the Indo-Pacific region, then the Russia challenge in Europe.
4. Building a resilient Joint Force and defense ecosystem.

The 2022 MDR was developed over a nearly year-long process. It incorporates inputs from civilian and military stakeholders throughout the Department and across the interagency, and takes into account viewpoints solicited during extensive consultations with our allies and partners.

Missile defenses represent a key element within an integrated deterrence framework that weaves together all instruments of national power. It does this by:

- providing resilience to our deterrence and defense posture through both active (e.g., kinetic and non-kinetic intercept systems) and passive (e.g., redundancy, hardening, dispersal) means of defense;

- complicating adversary attack plans and reducing confidence of attack success;
- raising the threshold for potential conflict;
- offering leverage for diplomatic efforts and assuring allies and partners;
- providing military options that may be less escalatory than employing offensive systems;
- and limiting damage from attacks, thus expanding the decision making space for senior leaders.

Missile defenses and nuclear capabilities remain complementary. U.S. nuclear weapons present the credible threat of a robust response and overwhelming cost imposition, while missile defenses contribute to deterrence by denial. If deterrence fails, missile defenses can potentially mitigate effects from an attack.

As the scale and complexity of the missile threat increases, the Department recognizes that to stay ahead we need to implement a comprehensive missile defeat approach which includes missile defense but is complemented by the credible threat of direct cost imposition through nuclear and non-nuclear means. Missile defeat encompasses a range of activities in all domains designed to counter the development, acquisition, proliferation, potential and actual use of adversary offensive missiles of all types, and to limit damage from such use.

Homeland Defense

Our missile defense policy guided the development of the FY 2023 Missile Defeat and Defense budget submission. In line with the NDS, our top priority is to defend the homeland and deter attacks against the United States. To achieve this strategic objective, the President's Budget requested \$2.8 billion to fully fund efforts to improve the capability and reliability of the Ground-based Midcourse Defense (GMD) system. These efforts include the development of the Next Generation Interceptor (NGI) to augment the existing the Ground-based Interceptor (GBI).

The GMD system offers an important measure of protection for the United States. GMD also contributes to reassuring our allies and partners that the United States will not be coerced by threats to the homeland from states like North Korea.

The United States of course maintains the right to defend itself against attacks from any source, but GMD is neither intended for, nor capable of, defeating the large and sophisticated intercontinental ballistic missile, air-launched ballistic missile, or sea-launched ballistic missile threats to the U.S. homeland from Russia or China. The United States relies on strategic deterrence to address these threats.

The Department is taking necessary action in our FY 2023 budget to enhance our domain awareness and warning capabilities. . The President's Budget request funds a number of defensive measures including \$278 million for new over-the-horizon radars to improve our ability to detect and decrease the risks from cruise missile strikes against U.S. critical assets. The President's Budget request also includes \$4.7 billion to fund the transition to a new, resilient missile warning and missile tracking architecture that will both improve our capability to warn against and track new types of missile threats while also improving our resilience against growing counter-space threats.

Guam, like all U.S. territories, is unequivocally part of the U.S. homeland, and a missile strike against Guam would be a direct attack against the United States. After assessing the increased missile threat to Guam, the Department requested \$892 million in its FY 2023 budget for the Missile Defense Agency, the Army, and the Navy to develop and field missile defense capabilities to augment the existing Terminal High Altitude Area Defense (THAAD) battery currently emplaced on the island. This will contribute to the overall defense of Guam and bolster U.S. military posture in the Indo-Pacific region.

Regional Defense

The Department evaluated the regional missile threat to our deployed forces and allies and partners, and concluded that we must strengthen our regional missile defenses to counter all missile threats – including hypersonic threats – regardless of origin. The United States must continue to develop defenses against regional hypersonic missile threats, to include building a persistent and resilient sensor network to characterize and track all hypersonic threats, improve attribution, and enable engagement. The President’s Budget request makes significant investments in regional ballistic, cruise, and hypersonic missile defense capabilities to accomplish these objectives. The transition to a resilient missile warning and missile tracking architecture supports missile defense of the homeland as well as regional missile defenses.

U.S. deployed forces, allies, and partners face the proliferation of lower-tier threats, such as rockets and armed UAS. Our adversaries will continue to seek ways to use these relatively inexpensive, flexible, and expendable systems. The Department is working to field technical and integrated counter-UAS solutions to ensure we can collectively meet the range of threats and appropriately hedge against future advancements.

Strengthening International Cooperation with Allies and Partners

The United States is committed to working with NATO and our other allies and partners to maintain a credible level of regional defensive capability against all missile threats from any adversary. This means we must continue to look for new ways to protect our collective forces, preserve our freedom of maneuver, and strengthen our security commitments. Over the next year, we intend to focus on:

- Identifying opportunities to coordinate on national missile defense policies;
- Aligning operational planning to maximize U.S., ally and partner capabilities;

- Capturing lessons learned from both real and simulated events such as exercises;
- Sharing information on air and missile threats;
- Developing and exchanging missile defense visions;
- Improving information protection efforts; and
- Supporting ally and partner missile defense modernization and capability development.

We view the missile defense capabilities of our allies and partners as indispensable contributions to our shared defense and integrated deterrence interests.

Conclusion

The sobering reality of the tragic events in Ukraine, in which Russia has used a broad array of missiles to attack and, in my opinion, terrorize civilian populations, highlights the extent to which adversaries are prepared to employ missiles in conflict. The centrality of missile attacks as a component of Russia's aggression in Ukraine is not an isolated occurrence – the use of missiles is becoming increasingly commonplace in conflicts worldwide.

Missile defenses are a critical capability for defending the U.S. homeland, our deployed forces, and our allies and partners. Missile defenses are also an important contribution to the Department's broader integrated deterrence framework. The United States remains committed to improving our homeland and regional missile defenses as we work to deter conflict, and to prevail in conflict if deterrence fails. I look forward to working with the Congress to advance this shared goal.

Thank you again for this opportunity to testify. I look forward to your questions.

Dr. John F. Plumb
Assistant Secretary of Defense for Space Policy

Dr. John F. Plumb was confirmed in March 2022 as the first Assistant Secretary of Defense for Space Policy. In this role he is responsible for the overall supervision of policy for the Department of Defense for space warfighting. His policy portfolio encompasses the Department's strategic capabilities for integrated deterrence: space, nuclear weapons, cyber, missile defense, electromagnetic warfare, and countering weapons of mass destruction. He also serves as the Principal Cyber Advisor to the Secretary of Defense.

Dr. Plumb has served in various national security roles both in and out of uniform for nearly three decades. As an active duty US Navy submarine officer, he served on a fast attack Los Angeles-class submarine and as an instructor at the Navy's nuclear power school. He then transitioned to the Navy reserves, commanding eight different reserve units over 20 years. As a civilian he held previous roles in the Senate, the Pentagon, and on the National Security Council staff at the White House. Prior to his confirmation he spent several years working for Federally Funded Research and Development Centers, first as a Senior Engineer at the Rand Corporation, and then as Principal Director, Chief of Government Relations for the Aerospace Corporation.

He holds a B.S. in Physics from the University of Notre Dame, and an M.S. in Physics and Ph.D. in Aerospace Engineering from the University of Colorado. His academic awards include the University of Notre Dame Student Leadership Award and an American Association for the Advancement of Science (AAAS) Congressional Science & Technology Fellowship sponsored by the Institute of Navigation. His personal military decorations include the Legion of Merit, the Meritorious Service Medal, and the Navy Commendation Medal. His civil service awards include the Office of the Secretary of Defense Exceptional Public Service Award, the Department of State Superior Honor Award, and the Secretary of Energy Achievement Award.

**Vice Admiral Jon A. Hill, USN
Director, Missile Defense Agency
Before the
House Armed Services Committee
Strategic Forces Subcommittee
May 11, 2022**

Good morning, Chairman Cooper, Ranking Member Lamborn, and distinguished Members of the subcommittee. The Missile Defense Agency (MDA) budget request of \$9.628 billion for Fiscal Year (FY) 2023 enables the continued execution of the MDA mission to design, develop and deploy a layered Missile Defense System (MDS) to defend the United States and its deployed forces, allies, and friends from increasingly diverse missile threats. MDA's proposed investments for FY 2023 reflect missile defense guidance issued in the classified 2022 *Missile Defense Review*, which was provided to Congress on March 28, 2022, along with the 2022 *National Defense Strategy*, and are aligned with the February 1, 2022 "USD(R&E) Technology Vision for an Era of Competition."

Potential U.S. adversaries are developing more advanced ballistic, hypersonic, and cruise missile systems, increasingly making them more mobile, survivable, reliable, accurate, and capable of achieving longer ranges. Current and future missile threats pose the growing technical challenges of high velocity, heavy maneuver, large numbers, and the exploitation of combination attacks involving unmanned aerial vehicles. MDA continues to collaborate with Combatant Commanders and the Services to support current and future needs for missile defense capabilities. The Department periodically re-examines missile defense roles, responsibilities and authorities. For example, the Joint Staff is implementing its Integrated Air and Missile Defense (IAMD) Capability Portfolio Management Review (CPMR) to continuously review threats, identify capability

gaps, and make cost/risk tradeoff recommendations. I support this effort. I also consider the Warfighter Involvement Process, or WIP, currently led by U.S. Strategic Command and the Joint Functional Component Commander for Integrated Missile Defense, to be essential, as it is currently constituted, to the U.S. missile defense enterprise. I believe the **existing missile defense governance process**, including the WIP, is unique and necessary for the voices of the Combatant Commands and the Services to be heard. The current governance process, combined with MDA's capabilities-based approach and unique acquisition authorities, are essential in supporting the Warfighter given the rapidly evolving threat environment.

Delivering by, through and with the Services to meet Combatant Command Requirements

MDA is developing, delivering, sustaining, and improving affordable, proven, and leading-edge capabilities to counter increasingly advanced ballistic missiles and an expanding set of hypersonic and cruise missiles.

Space and Terrestrial Sensors

We can improve sensor tracking and discrimination capabilities by leveraging the global persistence and proximity of space sensors. The Spacebased Kill Assessment (SKA) network of infrared sensors hosted on commercial satellites is planned to deliver hit and kill assessment capabilities for homeland defense. On-orbit SKA sensors have already participated successfully in a variety of flight tests and engineering activities and provide situational awareness to U.S. Northern Command (USNORTHCOM) during regular exercises. We will complete SKA hit assessment integration using a Command and Control, Battle Management and Communications (C2BMC) operational interface

into the MDS in FY 2024 and continue developing a follow-on kill assessment as part of the post-intercept assessment capability.

MDA continues to collaborate with the U.S. Space Force (USSF), including the Space Development Agency, and industry to develop a Hypersonic and Ballistic Tracking Space Sensor (HBTSS) capability to detect and track boosting ballistic missiles and hypersonic glide vehicles. In FY 2023, we will complete development and implementation of ground systems to support satellite operations and testing and deliver two prototype satellites developed by two separate companies in support of a planned FY 2023 launch to conduct on-orbit demonstrations. I also would like to recognize the critical contributions made by the two Space Tracking and Surveillance System (STSS) satellites launched in September 2009. After lasting eight years past their design life, both space vehicles were decommissioned earlier this year. STSS satellites served as an important testbed for HBTSS risk reduction activities, which included demonstrations that we can close the MDS fire control loop from space.

MDA also continues to develop, deploy, and sustain a robust, cyber-secure and networked ground- and sea-based radar architecture. We completed Long Range Discrimination Radar (LRDR) construction and Initial Fielding in 2021 at Clear Space Force Station (SFS), Alaska. The LRDR is the most advanced ground-based radar in the world. In FY 2023, we will develop software for tracking and discrimination improvements, refining space intelligence data, and enhancing modeling and simulation. Following operational acceptance in FY 2023, LRDR will support the Ground-based Midcourse Defense (GMD) capability against Pacific theater long-range

missile threats with persistent long-range midcourse discrimination and precision tracking and hit assessment. LRDR also will support Space Domain Awareness (SDA).

The Sea Based X-band (SBX) radar supports homeland defense operations, MDS testing and data collection, and it provides SDA and precision midcourse tracking and discrimination capabilities. The SBX will continue at-sea deployment into FY 2023 while conducting selected radar and vessel maintenance, software and hardware upgrades, and testing. Fabrication of the SBX replacement radome continues on schedule for installation in FY 2025.

MDA continues to support the USSF in sustaining and updating the Upgraded Early Warning Radars (UEWRs) at Clear SFS, Alaska; Cape Cod SFS, Massachusetts; Royal Air Force Fylingdales, United Kingdom; Thule Air Base, Greenland; and Beale AFB, California. UEWRs support missile defense of the Homeland and detection of ballistic missile attacks and conduct general space surveillance and satellite tracking.

MDA is providing affordable software upgrades to Aegis Integrated Air and Missile Defense (IAMD) destroyers equipped with the SPY-1 radar to support the USSF SDA mission. The Aegis SDA capability is fully compatible with deployed U.S. Navy operations and has appropriate safeguards to ensure full Aegis IAMD warfighting capability is available. In April and September 2021, we worked in partnership with the USSF, Navy, and industry to demonstrate the first-ever SDA capability from operational Navy destroyers, where the USSF tasked Aegis Baseline 9 Destroyers via C2BMC to detect, track, and report resident space objects. In FY 2023, we will continue to develop, test, and deliver this upgrade to the Navy. Twenty-nine Aegis ships are scheduled to be upgraded with this capability by FY 2024.

MDA also is working with the U.S. Navy to refurbish existing shipboard SPY-1 radar arrays to provide increased radar sensitivity and discrimination improvements. We also plan to integrate missile defense capability with delivery of the Navy's Air and Missile Defense Radar, the SPY-6, for enhanced engagement capability and increased raid capacity.

MDA is upgrading, sustaining, and supporting operation of 12 AN/TPY-2 radars, including five Forward Based Mode radars in Japan, Israel, Turkey, and U.S. Central Command. We have seven Terminal Mode radars in CONUS locations or forward-deployed with U.S. Army Terminal High Altitude Area Defense (THAAD) batteries in U.S. Indo-Pacific Command. AN/TPY-2 radar 13 production is on schedule with planned delivery as a Terminal Mode radar in second quarter FY 2025 for service with THAAD Battery 8. MDA continues supporting two THAAD Foreign Military Sales (FMS) cases that include seven AN/TPY-2 radars in production for the Kingdom of Saudi Arabia (KSA) along with two operational radars in the United Arab Emirates (UAE).

Command and Control, Battle Management and Communications

C2BMC integrates the MDS and provides Combatant Commanders with global, persistent, space-based infrared, land-, and sea-sensor acquisition, tracking, cueing, discrimination, and fire-control quality data to support U.S. and coalition-partner missile defense and SDA operations. C2BMC interfaces with Service, NATO, and international systems and provides decision makers a common operating missile defense picture. C2BMC also operates an advanced prototype processing node that tracks and reports hypersonic threats in response to U.S. Indo-Pacific Command operational need.

Funding in FY 2023 sustains the C2BMC planner, situational awareness, battle management capabilities, global missile defense network, and SDA in Combatant Command user nodes. The most recent C2BMC upgrade integrates LRDR and the updated BMDS Overhead Persistent Infrared Architecture into the MDS, providing situational awareness and tracking capability for hypersonic threats. This spiral significantly expands SDA capabilities for U.S. Space Command with LRDR, provides additional SDA coverage using the Aegis SPY-1 radar, and integrates on-orbit SKA sensors into the MDS. It also integrates the U.S. Army's IAMD Battle Command System into the MDS.

Homeland Defense

The GMD system protects the U.S. Homeland from rogue state ballistic missile attacks, and we are focused on delivering new capabilities to address the limited but increasingly advanced North Korean Intercontinental Ballistic Missile (ICBM) threat. In September 2021, we demonstrated the capability to select a 2-stage or 3-stage burn of a Ground Based Interceptor (GBI) booster, which enables an earlier release of the kill vehicle to greatly expand the engagement area and time to counter the inbound threat. In FY 2023, we will execute an intercept flight test demonstrating this capability and the latest incremental improvements of the entire kill chain to defeat an advanced threat-representative ICBM target equipped with countermeasures.

MDA continues to upgrade the ground system infrastructure, communications network, fire control system, and missile fields to improve the reliability, capability, and cybersecurity resiliency of the GMD weapon system and support acceptance of the Next Generation Interceptor (NGI). The entire GMD weapon system is currently

undergoing a Service Life Extension Program to improve GBI reliability and availability. With these ongoing efforts, we anticipate the existing GBI fleet will be extended beyond 2030.

NGI development and fielding will improve the interceptor fleet, with deliveries starting as early as 2028. The Department awarded two NGI contracts in March 2021, and our competing Industry prime contractors are advancing through the design development process with full technical rigor to deliver this new capability as soon as possible. Both designs feature multiple kill vehicle payloads to reduce the number of interceptors required to defeat a single ballistic missile threat to our Nation. Our FY 2023 request will continue to mature critical technologies for the NGI booster, payload, and sensors.

Regional Defense

Globally deployed ship-based and land-based Aegis BMD capabilities are critical to the Nation's integrated defense of our deployed forces, allies, and partners against short- to intermediate-range missile threats. In FY 2023, we will continue to meet the quickly advancing threat through improvements to the Aegis BMD capability, including procuring and delivering Standard Missile (SM)-3 Block IB and Block IIA missiles, improving Sea-Based Terminal (SBT) defense, advancing weapon system and missile reliability, and enhancing Aegis BMD engagement capacity and lethality. We will continue developing Aegis BMD weapon system software to enhance functionality and leverage more-capable radars, artificial intelligence, and national technical means.

MDA continues to support protection of NATO's European territory and forces against the ballistic missile threat from the Middle East. Aegis Ashore in Romania is

operational, and we plan to complete construction on Aegis Ashore Poland in 2023. Both sites are designed to launch the SM-3 Block IB and Block IIA. This past year, installation of select combat system equipment occurred in parallel with construction activity, and U.S Navy sailors moved into the residential building at Naval Support Facility Redzikowo.

We are planning to conduct in FY 2022 an Aegis Weapon System flight test experiment (FEM-01), which will be an exo-atmospheric engagement to demonstrate an Aegis ship firing an SM-3 Block IIA against a Medium-Range Ballistic Missile (MRBM) target. We also plan to execute an Aegis intercept flight test campaign with Japan (JFTM-07) in which we will demonstrate the newest BMD engagement capability of the Japan (J7) Aegis BMD configuration with SM-3 Block IIA against an MRBM. We will also demonstrate Aegis ship-to-ship engage-on-remote in a simulated engagement, an IAMD capability using SM-2 surface-to-air defense missiles, and an organic engagement of an SRBM with SM-3 Block IB Threat Upgrade interceptor.

The THAAD weapon system is globally transportable and ground-based and is highly effective against short-, medium- and intermediate-range missile threats inside and outside the atmosphere in the terminal phase of flight. MDA currently supports forward-deployment of two batteries stationed in the U.S. Indo-Pacific Command area of responsibility and continues to cooperate with UAE and KSA in support of operational FMS THAAD batteries. The UAE THAAD weapon system successfully intercepted ballistic missiles launched at the UAE in January 2022, marking the first operational use of the U.S.-built system. In FY 2023 we will continue THAAD development and interceptor procurement, obsolescence mitigation efforts, production and training

support, the THAAD Stockpile Reliability Program, and modifications to meet growing cybersecurity threats.

MDA is providing a more robust IAMD capability, one that integrates THAAD, Army Patriot, and at-sea Aegis ships into a seamless network. THAAD/Missile Segment Enhancement (MSE) integration improves the area defended by a THAAD battery without the requirement of a dedicated Patriot battery and increases engagement opportunities while conserving THAAD interceptors. In February 2022, THAAD demonstrated control of MSE interceptors in a simulated SRBM non-intercept flight test (TH CTV-01a). TH CTV-01a verified that the latest THAAD software could allow the THAAD weapon system to compute an MSE firing solution, communicate with an M903 Launcher, and control an MSE interceptor in flight. In THAAD Flight Test (FTT)-21, a combined developmental and operational test conducted in March 2022, we used the latest THAAD software to fire two MSE interceptors to engage the SRBM target. In FY 2023, we plan to conduct the first THAAD demonstration of concurrent control of THAAD and MSE interceptors against multiple MRBM targets.

In FY 2022, MDA will begin engineering and planning a survivable and operationally effective IAMD architecture to defend Guam from ballistic, hypersonic, and cruise missile threats. Defense of Guam IAMD architecture would leverage proven missile defense capabilities, allow for expansion of emerging capabilities, and provide a single command and control structure. Our FY 2023 funding request allows continued development, to include engineering and planning activities, environmental impacts studies, procurement on long lead items, and integration between Army and Navy

assets. All early design and integration activities will support a range of architecture options, pending upcoming Departmental decisions.

We are investing in defensive capabilities to counter regional hypersonic missile threats by upgrading sensors and C2BMC for early warning, identification, and tracking of regional and strategic hypersonic threats from space (e.g., HBTSS). We also are leveraging existing systems where possible (including proven engage-on-remote and launch-on-remote capabilities) and pursuing a Glide Phase Intercept (GPI) demonstration. We are working closely with the Navy to develop, field, and upgrade the SBT capability to counter regional maneuvering and hypersonic threats in the terminal phase of flight. The SBT program already provides an initial terminal defensive capability to counter hypersonic threats, and additional improvements are scheduled for 2024. Today, the SM-6 missile is the only weapon in the country's arsenal capable of engaging highly-maneuverable hypersonic threats. In FY 2023, Aegis SBT will demonstrate a simulated engagement against a hypersonic target (FTX-40) and in FY 2024 will demonstrate a salvo engagement firing two SM-6 Block IA Upgraded guided missiles against a Hypersonic Glide Vehicle target (FTM-43). Complementing this terminal capability, in FY 2023, MDA will continue to develop and plan a GPI demonstration and leverage the Aegis Weapon System to provide the U.S. Warfighter increasingly capable regional defensive capabilities.

We will continue to work with North American Aerospace Defense Command (NORAD) and USNORTHCOM to develop system architecture for cruise missile defense (CMD) of the Homeland. I agree with the NORAD/USNORTHCOM Commander that modern threats require improved all-domain awareness, updated

capabilities, and policies and strategies that reflect the current strategic environment and the advanced capabilities of our competitors. We have been able to make good progress on enhanced indications and warning and will continue to develop the systems architecture and conduct a demonstration of CMD capabilities using the Joint Tactical Integrated Fire Control (JTIFC) capability. JTIFC enhances integrated fire control capabilities across the Services by connecting existing sensors, command and control systems, and weapons at the tactical level through real-time sensor networks. I also share the NORAD/USNORTHCOM Commander's desire to have an Over-The-Horizon radar fielded as soon as possible to support All Domain Awareness and agree with his assessment that the air and cruise missile threat to the Homeland is a top priority.

We are continuing our cooperative missile defense relationship with Israel to help our partner develop systems to strengthen its missile defenses and increase interoperability with U.S. forces. Our two nations continue to cooperate on engineering, development, co-production, testing, and fielding of the Arrow Weapon System, the David's Sling Weapon System, and co-production for the Iron Dome Defense System. I would like to highlight our cooperative demonstration of interoperability in the successful flight test of the Arrow Weapon System and Arrow-3 interceptor conducted on January 18, 2022. In FY 2023, MDA will continue co-development, testing, and co-production with Israel.

Developing Technology for Future Competition

With mission focus on warfighting outcomes, MDA is investing in innovative and disruptive technologies to provide leap-ahead capabilities to address the emergence of new and more advanced threats. We must continue to sustain, modernize, and expand

missile defenses by pursuing rapid, yet measured, development of advanced missile defense concepts and technologies for homeland and regional defense. We will continue to develop mission-aligned disruptive technologies, solutions, and transition opportunities for future ballistic and hypersonic defense architectures, investing in the technology development necessary for the next increment of capability, including externally and internally-cooled seeker window technology, axial upper stage throttling and maneuvering capability, robust and resilient materials for hypersonic flight, secured mesh communications, and novel guidance and control capability.

MDA continually assesses emerging and disruptive technology for potential applications to missile defense utilization that are producible, reliable, and cost-effective. We are pursuing efforts in directed energy, artificial intelligence, machine learning, nanosat technology, Left-through-Right of Launch Integration, cybersecurity, and quantum science. Keys to this assessment have been our insight into the missile defense industrial base and our development of testbeds that allow us to exercise and demonstrate capabilities and test new concepts, algorithms, simulations, and software. We are also expanding technology opportunities through cooperative, collaborative engagements with our DoD partners, laboratories, allies, industry, and universities.

Conclusion

Chairman Cooper, Ranking Member Lamborn, Members of the Subcommittee, we will continue to increase the readiness, resiliency, cybersecurity as well as the capability and capacity of fielded homeland and regional missile defense systems while investing in mission-focused advanced technology. We are committed to attracting and building a strong, talented future workforce to meet the mission challenges of tomorrow.

I would like to recognize and thank the men and women who serve in our Armed Forces at home and abroad and who operate the integrated Missile Defense System with the support of our dedicated civilian and contractor workforce. I appreciate your continued support for MDA and the missile defense mission, and I look forward to answering the committee's questions. Thank you.

Vice Admiral Jon A. Hill
Director, Missile Defense Agency

Vice Adm. Jon Hill is a native of Texas, born and raised on Fort Bliss. A Surface Warfare Officer, designated as an engineering duty officer, he is a graduate of Saint Mary's University. He earned his Master of Science in Applied Physics and Ordnance Engineering from Naval Postgraduate School.

Hill's first flag officer tour was program executive officer for Integrated Warfare Systems (PEO IWS). In this role, he was accountable for developing and certifying the deployment of all surface ship combat control systems, radars, missiles, launchers, electronic warfare, naval gunnery systems, and surface and subsurface anti-submarine warfare mission capabilities within the fleet and joint force.

Hill previously served as the deputy director, Missile Defense Agency. Other leadership and acquisition engineering positions include AEGIS Shipbuilding (PMS 400), Naval Surface Warfare Center (NSWC) Dahlgren Division and Port Hueneme Division, PEO Theater Surface Combatants, and on the Assistant Secretary of the Navy staff for Research, Development and Acquisition (ASN RD&A).

He also served on the Joint Staff (J-6), U.S. Army Staff for Missile Systems, and as a senior fellow on the Chief of Naval Operations Strategic Studies Group (CNO SSG XXVII). He served as technical director for AEGIS Ballistic Missile Defense then as AEGIS Combat Systems major program manager responsible for delivering Naval Integrated Fire Control and Counter Air (NIFC-CA) and Integrated Air and Missile Defense (IAMD) capabilities to forces afloat.

In June 2019, Hill became the 11th director of the Missile Defense Agency (MDA). In this capacity, he oversees the MDA's global mission to develop, deliver, and sustain layered capabilities to defend deployed forces, the United States, allies and friends against ballistic missile attacks in all phases of flight.

Personal awards include the Navy Distinguished Service Medal, Defense Superior Service Medal (two awards), the Legion of Merit (two awards), the Defense Meritorious Service Medal (two awards), Meritorious Service Medal (three awards), Joint Service Commendation Medal, U.S. Army Commendation Medal, Navy & Marine Corps Commendation Medal (two awards) and the Navy Achievement Medal (two awards).

RECORD VERSION

**STATEMENT BY
LIEUTENANT GENERAL DANIEL L. KARBLES, USA
COMMANDING GENERAL,
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
AND
COMMANDER,
JOINT FUNCTIONAL COMPONENT COMMAND FOR
INTEGRATED MISSILE DEFENSE**

BEFORE THE

**SUBCOMMITTEE ON STRATEGIC FORCES
COMMITTEE ON ARMED SERVICES
UNITED STATES HOUSE OF REPRESENTATIVES**

SECOND SESSION, 117TH CONGRESS

FISCAL YEAR 2023 AUTHORIZATION REQUEST FOR MISSILE DEFENSE

MAY 11, 2022

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Introduction

Chairman Cooper, Ranking Member Lamborn, and distinguished Members of the Subcommittee, thank you for your continued support of our Service Members, Civilians, and Families and your continued support of the Army, U.S. Strategic Command (USSTRATCOM), U.S. Space Command (USSPACECOM), Department of Defense (DoD), and the space and missile defense community. Thank you also for inviting me to highlight the importance of space and missile defense capabilities and ongoing enhancements that enable the defense of our Nation, forward stationed and deployed forces, allies, and partners.

Today, with my assigned roles, I bring both an Army and a joint perspective on effective space and missile defense capabilities. Within the Army and joint communities, my responsibilities encompass several mission areas.

As commander of the U.S. Army Space and Missile Defense Command (USASMD), I serve as the Army's force modernization proponent and operational integrator for space, missile defense, and high altitude capabilities. In short, USASMD provides trained and ready space and missile defense forces and capabilities to the warfighter and Nation. With regard to missile defense, I am the Army Service Component Commander responsible for planning, integrating, coordinating, and providing Army missile defense forces and capabilities in support of USSTRATCOM missions. Additionally, I am a supporting commander to the Commander, U.S. Northern Command (USNORTHCOM), for the Ground-based Midcourse Defense (GMD) System. In the space mission area, I am the Army Service Component Commander to USSPACECOM, providing trained and ready Army space warfighters and capabilities to compete, fight, and win in the space domain.

As the Army's air and missile defense (AMD) enterprise integrator, I synchronize the balanced execution of the Army's AMD posture across the functions of force planning and sourcing requirements, combat and materiel development, AMD acquisition, and life cycle management. I coordinate with the AMD community of interest to balance priorities, inform resourcing decisions, and pursue innovative approaches in order to fulfill our AMD mission requirements.

Finally, as Commander of USSTRATCOM's Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), I am responsible for providing operational-level global missile defense expertise in support of USSTRATCOM's Unified Command Plan (UCP)-assigned global missile defense operations support mission. In the missile defense arena, this includes plans integration, operations support, asset allocation recommendations, and support to missile defense capability development on behalf of combatant commanders (CCDRs). These efforts deter adversaries, assure allies, and defend U.S. deployed forces, allies, and partners against missile attacks.

The world has changed greatly since my testimony last year. We have witnessed the largest use of offensive missile systems in Europe since World War II in an unprovoked invasion of a sovereign nation by the Russian Federation in Ukraine. Like Russia, other potential adversaries globally are developing and fielding increasingly more diverse, robust, and lethal offensive missile systems in an attempt to gain coercive power and strategic advantage over the Nation and our allies and partners. It has never been more imperative that we deny them the benefits of using these weapons. We will accomplish this through continued investment and sustainment of combat ready, integrated, capable, and lethal AMD. Space capabilities, combined with our allies' and partners' abilities as part of a comprehensive approach to integrated deterrence, will also prove essential in ensuring our Nation's security.

People First

USASMDC and JFCC IMD, both comprised of multi-component Soldiers, Airmen, Sailors, Marines, Guardians, and dedicated Civilians and Contractors, cannot carry out our wide-ranging, no-fail national security missions without the commitment of our greatest asset—our people. We prioritize "People First" as we recruit, train, and develop Army space and missile defense professionals. Six values are embedded in our People First mandate: communication, recognition, trust, teamwork, transparency, and empowerment. Despite the many challenges introduced by the COVID-19 pandemic, our professionals continue to provide space and missile defense capabilities that support combatant command (CCMD) plans and operations. It is our people who make us strong; it is our people who make winning possible.

Recent Contributions and Upgrades to Army Space and Missile Defense Capabilities

The people of USASMDC and JFCC IMD continue to learn new ways to operate, accomplish our missions, enhance capabilities, and support global theaters. Throughout the last several months, we have realized essential space and missile defense operational, capability, and training successes, a few of which follow.

- We recently completed an upgrade of our Joint Tactical Ground Stations (JTGS) configuration at our four theater missile warning company locations. This upgrade provided a significant improvement in our missile warning, missile defense cueing, and battlespace characterization capabilities in support of Multi-Domain Operations (MDO). It also enabled us to keep pace with rapidly growing, complex, and capable threat systems.
- In March 2022, the Army relocated two European-based Patriot missile defense batteries to Poland. This defensive relocation served to reinforce our Nation's commitment to Article 5 and proactively counter any potential threats to U.S. and allied forces in the eastern NATO region.
- During a March 2022 joint exercise, a subordinate air defense regiment under the European-based 10th Army Air and Missile Defense Command successfully deployed four Maneuver-Short Range Air Defense (M-SHORAD) Stryker-based platforms to the eastern NATO region. This deployment demonstrated the Army's newest short range air defense system's ability to defend maneuver forces against unmanned aerial systems (UAS), rotary-wing, and fixed-wing air threats.
- Our Army Space Training Division (ASTD) served as the lead proponent for equipping Army divisions and training centers with essential training aid devices that enable organizations to train in a degraded and disrupted space operations environment. With fielding completed, ASTD will lead future efforts on life cycle replacement of these devices.
- The USASMDC Technical Center leveraged commercial synthetic aperture radar imaging of current interest locations and, using artificial intelligence and machine learning algorithms, provided key operational data to tactical warfighting organizations.

- Support to significant testing and exercises remains a priority. Earlier this year, Air Defense Artillery (ADA) Soldiers participated in the Terminal High Altitude Area Defense (THAAD) Flight Test-21, where two Patriot Advanced Capability-3 (PAC-3) Missile Segment Enhanced (MSE) interceptors were integrated with THAAD software to successfully intercept a short range ballistic missile. This integration enables earlier interceptor launch and results in a longer fly-out time, which increases the defended area or battlespace. Our ADA Soldiers also recently participated in the initial operational test and evaluation of the successful Integrated Air and Missile Defense Battle Command System (IBCS) test. During this event, IBCS maintained continuous tracking of two cruise missile targets by fusing together data from multiple sensors while degraded by electronic attack. Finally, we continue to deploy Army space professionals to numerous joint and partner nation exercises and wargames.
- In addition to exercise support, operational deployments to CCMDs continue. Our 1st Space Brigade rotated an Army Space Control Crew to U.S. Indo-Pacific Command (USINDOPACOM), an Army Space Support Team to both U.S. Central Command (USCENTCOM) and U.S. European Command (USEUCOM), and Space Control Planning Teams to USEUCOM and USSPACECOM.
- Our Force Tracking Mission Management Center continues to support global operations in the USCENTCOM, U.S. Africa Command, and other CCMD geographic areas of responsibility. The Center provided vital management and dissemination of friendly force tracking data to theater commands.

U.S. Army Space and Missile Defense Command

To accomplish our vision of providing space, missile defense, and high-altitude forces and capabilities to support joint and combined warfighting readiness in all domains, USASMDC is organizationally aligned to accomplish three major tasks. These include: providing forces and capabilities for current operations; preparing forces and capabilities for the future fight; and researching and developing Army technologies to provide future advancements in space, air, and missile defense capabilities.

The command aligns its activities to these priorities:

- Accomplish our mission as a People First team of empowered, innovative, ready, and resilient professionals.
- Provide trained and ready forces for space, missile defense, and high-altitude missions.
- Conduct integrated planning and synchronized operations in the execution of our space and missile defense missions.
- Prepare for future conflict.

Providing Forces and Capabilities for Current Operations

In accordance with Title 10 responsibilities, USASMDC is a force provider of missile defense capabilities. Our first major task is to provide trained and ready missile defense forces and capabilities to CCDRs. USASMDC Soldiers serving in the homeland and in remote and austere forward-deployed locations operate the GMD and AN/TPY-2 Forward-Based Mode (FBM) radars. Highlights of the capabilities provided to current operations and readiness by our missile defense professionals include:

Support to Homeland Missile Defense: Soldiers from the 100th Missile Defense Brigade (MDB), headquartered in Colorado Springs, Colorado, and 49th Missile Defense Battalion, headquartered at Fort Greely, Alaska, stand ready to defend our Nation from intercontinental ballistic missile (ICBM) attack 24/7/365. In support of USNORTHCOM, Army National Guard and Active Component Soldiers operate the GMD Fire Control Systems located at the Fire Direction Center in Alaska; Missile Defense Element in Colorado; a detachment that oversees operations at Vandenberg Space Force Base, California; and a detachment that secures GMD sensor infrastructure at Fort Drum, New York. At the Fort Greely Missile Defense Complex, 49th Missile Defense Battalion military police secure interceptors and command and control (C2) facilities from physical threats. These security Soldiers perform their duties in some of the most austere conditions in the United States, with winter temperatures plummeting to 50 degrees below zero and fewer than 4 hours of sunlight in the winter months.

1st Space Brigade Soldiers provide CCDRs certified AN/TPY-2 FBM missile defense batteries that support strategic and regional missions. These batteries are

globally located in five strategic, yet remote and austere locations, where they provide ballistic missile search, track, and discrimination operations in support of both homeland and regional defense. These Soldiers continuously demonstrate our Nation's commitment to defend deployed forces, allies, and partners from ballistic missile attacks.

Support to Global Missile Defense Test and Development: Soldiers from the 100th MDB and 49th Missile Defense Battalion participate in GMD test activities and work with Missile Defense Agency (MDA) developers on enhancements to the GMD. The MDA's testing regime, conducted through a series of ground-based and operational flight tests, emphasizes operational realism during test design and execution. This realism enables system operators to sustain and improve their proficiency and validate the system's operational employment.

Space Support to Missile Early Warning: Space-enabled capabilities are essential for missile defense operations. They provide and enable communications; positioning, navigation, and timing (PNT); intelligence; and surveillance to meet the demands of modern warfare. In support of joint force commanders, USASMDC continues to provide missile warning within the USEUCOM, USCENTCOM, and USINDOPACOM theaters of operations. The 1st Space Brigade's forward stationed JTACS theater missile warning companies are essential for USSPACECOM's assured missile warning mission. They are operated by USASMDC Soldiers who monitor launch activity and other events observed by infrared sensor platforms and quickly provide information to members of the AMD and operational communities. The JTACS forward stationing reduces the risk of solely relying on long-haul communications and ensures the resilience of USSPACECOM's comprehensive missile warning system.

Preparing Forces and Capabilities for the Future Fight

USASMDC's second major task is to develop future missile defense forces and mature current capabilities. The Space and Missile Defense Center of Excellence (SMD CoE) is the Army's force modernization proponent responsible for managing change to Army doctrine, organization, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P) requirements for space, strategic missile defense, and high-altitude capabilities. The SMD CoE trains and educates agile, adaptive, and

ready Soldiers and leaders; executes life cycle management for Army space operations officers; develops Army Space Soldiers; and enables informed decision making.

To carry out its mission, the SMD CoE executes practices established by U.S. Army Training and Doctrine Command and Army Futures Command to meet force management and Army modernization enterprise responsibilities. These functions include performing concept development, capabilities determination, and capabilities integration relative to DOTMLPF-P for process change, integration, and transition for materiel development.

Specifically, in the training arena, SMD CoE conducts the Army's institutional Soldier qualification training and education for space and GMD mission areas. The SMD School writes, coordinates, and publishes Army doctrine for space and GMD while also integrating space training and education in curriculum across all Army proponent schools, operational unit home stations, and pre-deployment training events. These efforts prepare Soldiers across all warfighting functions to integrate Army and joint space and missile defense capabilities and effects in the conduct of MDO.

Research and Development of Army Technologies

USASMDC's third major task is to provide critical technologies to address future needs that will enhance warfighter effectiveness. USASMDC's Technical Center supports joint warfighters by providing science, technology, and test and evaluation expertise to enable warfighter dominance both today and in the future. The Technical Center contributes to warfighter and joint force success in four major areas: directed energy (DE); tactical responsive space and high altitude; test and evaluation; and hypersonic and strategic weapons.

Directed Energy: The Technical Center is the Army lead for high-energy laser technology development. High-energy lasers complement kinetic systems in addressing rocket, artillery, and mortar threats; UAS; and cruise missiles. Additionally, the Technical Center is exploring high-power microwave technology for use in interdicting a multitude of improvised threats. As systems are fielded, the Technical Center will continue developing new and improved DE technologies for insertion into weapon systems to maintain warfighter dominance.

Tactical Responsive Space and High Altitude: As the Army lead for space and high-altitude research, development, and engineering, the Technical Center identifies, develops, demonstrates, and integrates technologies in the areas of responsive space, space superiority, and high altitude. Working with other Army, DoD, and industry partners, the Technical Center focuses on persistent beyond line-of-sight communications for forces in remote areas; functionally effective resolution imagery; solutions for assured PNT; ground C2 systems; and direct downlink of tactical data feeds.

Test and Evaluation: As an invaluable part of the Army test and evaluation enterprise, the Technical Center supports developmental and operational AMD defense testing with a suite of low-cost ballistic missile targets, transportable and configurable launchers, and test execution and evaluation. These ballistic missile targets are critical to threat-representative, operationally realistic testing of high-priority Army systems such as Patriot, THAAD, and IBCS, with future testing planned for the Lower Tier Air and Missile Defense Sensor (LTAMDS).

Hypersonic and Strategic Weapons: Since completing the Nation's first successful hypersonic weapon test in 2011, the Technical Center has continued supporting hypersonic testing for the Army, Navy, and Air Force, from test planning and design through mission execution and post-flight analysis. Additionally, the Technical Center is continuing to develop capabilities that enable rapid systems development and fielding through integration and interoperability testing, sensor and C2 design, flight test analysis, verification and validation, and warfighter training within an independent laboratory infrastructure.

Missile Defense Testing Assets and Range: The Technical Center also oversees the Ronald Reagan Ballistic Missile Test Site (RTS) at U.S. Army Garrison-Kwajalein Atoll, Republic of the Marshall Islands. The RTS is a vital national asset that provides live-fire developmental and operational flight testing of offensive and defensive missile, hypersonic, and space systems; equatorial satellite launch capability; space object tracking and characterization; and atmospheric science research. This unique range and test facility, located 2,300 miles west-southwest of Hawaii, provides test support to MDA, NASA, the U.S. Air Force, and other agencies.

The RTS supports developmental and operational testing of both homeland and regional missile defense systems, as well offensive ballistic missile testing for the Air Force Global Strike Command. Hypersonic system testing has become a significant element of near-term test planning at RTS. In concert with its testing mission and using a suite of the world's most sophisticated radar systems, to include the U.S. Space Force's Space Fence, RTS also supports space object identification and space domain awareness missions in support of USSPACECOM. This mission includes space object tracking and characterization, providing critical orbital information on new foreign launches and high-resolution images in support of space situational awareness.

Army Contributions to the Nation's Missile Defense Capabilities

The DoD will adopt a new strategic course in 2022, with a new National Security Strategy, National Defense Strategy, Nuclear Posture Review, and Missile Defense Review. The Army will establish its corresponding strategy nested in Office of the Secretary of Defense (OSD) guidance. USASMD will update the Army Air and Missile Defense 2028 vision document to meet these directives and enable MDO. To achieve an AMD force capable of supporting the Army of 2030, we must continue modernizing and developing AMD capabilities, building sufficient AMD capacity for MDO, and ensuring AMD forces are trained and ready. We must also ensure that our capabilities and associated C2 systems are resilient and interoperable with joint and allied forces. Accomplishing these essential tasks will allow us to provide deterrence through deployments and forward stationing and enable a more robust, comprehensive defense by coordinating and integrating with our allies and partners.

Army AMD is undergoing its most significant modernization program in the last four decades, as it is one of the Army's six modernization priorities receiving substantially increased investment. The AMD Cross Functional Team (CFT) serves as the Army's modernization lead and works closely with the other Services, Joint Staff, and MDA toward joint integrated AMD (IAMD) capabilities. The Program Executive Office Missiles and Space is the Army's materiel developer for these capabilities and works closely with AMD CFT and U.S. Army Aviation and Missile Command. A summary of the Army's AMD strategic direction and major programs follows.

Air and Missile Defense Readiness: Multiple factors—including the enduring demand from CCDRs, the transition to great power competition and its associated complex threat set, and the overdue and critical need to modernize the Army's AMD force—have all converged to impact Army AMD force readiness. High operational demand of missile defense forces to support joint warfighters continues stressing Army AMD force readiness, modernization, and Soldier welfare. Enduring high operational tempo and limited deployment predictability negatively impact Soldier readiness and family well-being. Currently, twice as many ADA Soldiers are dwell restricted as compared to the overall Army. In an effort to improve Soldier predictability and readiness, the Army has established a new unit life cycle modernization model known as the Regionally Aligned Readiness and Modernization Model (ReARMM). It is critical that the ADA Branch leverage ReARMM to inform the Joint Staff and OSD on force availability and improve deployment predictability for AMD Soldiers.

Mission Command: Closely linked to AMD readiness is the ability to provide low density, high demand AMD mission command elements. These elements are pivotal to laying the foundation for and creating an environment that supports integration of Army AMD forces into joint and combined C2 architectures. During the past few years, the Army has activated an additional active component ADA brigade headquarters in USINDOPACOM and rotated a National Guard ADA brigade headquarters to USEUCOM. Also in the USEUCOM theater, the Army will soon stand up an active component ADA brigade headquarters.

Integrated Air and Missile Defense Battle Command System: The IBCS program is a top Army AMD modernization priority that integrates current and future AMD sensors and weapons into a common integrated fire control capability, allowing warfighters to fully integrate AMD capabilities across all echelons. The IBCS is the direct replacement for mission command nodes in the Patriot weapon system, headquarters elements, and airspace management cells. It also allows rapid convergence of sensors, shooters, and mission command components on an integrated fire control network. Once fully fielded, IBCS will provide a game-changing capability that allows appropriate tailoring and scaling of AMD forces to meet the given threat. The quantity and mix of capabilities can be dynamically retasked into a formation with an

inherent, integrated mission command system to build tiered and layered defenses. In addition, IBCS open architecture enables rapid integration of legacy and developmental sensors and shooters that provide capabilities to defeat emerging threats in MDO. This year, the IBCS program entered low-rate initial production and began initial operational testing and evaluation.

The IBCS program will field common mission command nodes for Army AMD forces to defend against manned aircraft, UAS, air-to-ground missiles, tactical ballistic missiles, cruise missiles, and rockets, artillery, and mortar (RAM) attacks. Ultimately, IBCS will operate with air surveillance and fire control capabilities across the Army, Air Force, and Navy, and with joint and multinational AMD forces at all echelons, thereby enhancing AMD force lethality. By dismantling the current system-centric mission command paradigm, it will dramatically increase systems capability and facilitate open industry competition in support of the AMD community. The IBCS is one of the Army's contributions to Combined Joint All Domain Command and Control, currently in development between the Army and Air Force; continued experimentation to link with C2 systems for Army and joint fires is ongoing. Additional efforts are currently underway to support IBCS interoperability with MDA's Ballistic Missile Defense System, exploring the feasibility and potential benefits of integrating IBCS with MDA's Command and Control, Battle Management, and Communications (C2BMC) program.

Terminal High Altitude Area Defense System: THAAD is a key component of the ballistic missile defense system-of-systems architecture and designed for area defense against short, medium, and intermediate range ballistic missiles. It is a mobile and globally transportable, low density, high demand asset that has a unique endo- and exoatmospheric intercept capability using proven hit-to-kill technology. There are currently seven operational THAAD batteries, two of which are forward stationed in Guam and the Republic of Korea in response to the North Korean nuclear and missile threat. Development efforts associated with U.S. Forces Korea Joint Emergent Operational Need (JUONS) improved Patriot and THAAD interoperability, as successfully demonstrated in a recent THAAD/Patriot MSE developmental and operational test where THAAD software used two MSE interceptors to engage a ballistic

missile target. As directed in the 2019 Missile Defense Review, the Army, in conjunction with OSD and MDA, reassessed the THAAD requirement to eight batteries.

Patriot/Patriot Advanced Capability-3 Missile Segment Enhancement: The Army Patriot force remains the cornerstone of AMD protection for our deployed forces, friends, and allies. The PAC-3 MSE is a high velocity, hit-to-kill, surface-to-air missile capable of intercepting and destroying tactical ballistic missiles and air-breathing threats. The PAC-3 MSE, a follow-on variant of the PAC-3, is in full-rate production and the latest generation hit-to-kill PAC-3 interceptor in the Patriot force to meet global capability requirements. The PAC-3 MSE fills the engagement gap between THAAD and PAC-3 missiles while also defeating advanced threats earlier, at greater range, and with increased lethality. The PAC-3 MSE's improved capability is achieved through a higher performance solid rocket motor, modified lethality enhancer, more responsive control surfaces, upgraded guidance software, and insensitive munitions improvements.

Patriot must continually modernize through software and hardware upgrades to address obsolescence and evolving threats, and to best utilize extended battlespace performance afforded by the PAC-3 MSE interceptor. Modernization efforts provide combat identification enhancements, address upper-tier debris mitigation, improve PAC-3 MSE interceptor performance, and enable increased Army and joint interoperability. The Army leverages the program's stable funding profile to reduce price risk to the government through firm fixed price contracting and value engineering initiatives. In doing so, the Army mitigates obsolescence and counters emerging threats through hardware and software improvements. In addition to the integration efforts with the LTAMDS radar and IBCS, the Army supports the MDA-led integration of PAC-3 MSE interceptors and launchers into the THAAD weapon system. These new integrated capabilities expand battlespace by leveraging the THAAD AN/TPY-2 and Patriot radars together to detect threat targets at greater ranges. They will be pure fleeted across all Patriot battalions beginning in Fiscal Year 2023. In addition, to overmatch the near-term evolving threat, the Army is continuously improving Patriot while moving toward an IBCS architecture that enables kill-chain contributions from a wider spectrum of Army and joint sensors and weapon components.

Lower Tier Air and Missile Defense Sensor: Replacing the current Patriot radar, LTAMDS will provide networked sensing capabilities in lower tier missile defense battlespace and enable full capability of the PAC-3 MSE. The LTAMDS significantly improves legacy Patriot radar by providing expanded range and 360-degree coverage combined with the benefits of a networked sensor on the Army IAMD integrated fire control network. This modern technology will reduce current Patriot radar operations and sustainment costs by offsetting system equipment requirements and enhancing reliability and maintainability. Recent program successes include approval of an updated acquisition strategy that enables rapid prototyping and major capability acquisition, as well as approval of the LTAMDS PNT strategy. The Army plans to begin testing LTAMDS prototypes with IBCS and the Patriot family of interceptors, with the objective of fielding four sensors under urgent materiel release to a Patriot battalion by the end of 2023.

Indirect Fire Protection Capability: Indirect Fire Protection Capability (IFPC) is a ground-based weapon system designed to acquire, track, engage, and defeat cruise missile, UAS, and RAM threats. The Army's IFPC must integrate with IBCS as its C2 to enable an MDO-ready Army by 2030. In accordance with the Fiscal Year 2019 National Defense Authorization Act, the Army completed acceptance and fielding of two Iron Dome system batteries as an interim cruise missile defense capability. This past February, the Army supported Operation Iron Island, an Army executive order requirement that served as an opportunity to gain awareness of the system in an operational environment.

The Army is currently executing a competitive acquisition strategy to develop and field an enduring IFPC capability integrated with IBCS. IFPC Increment 2 will be an industry built solution for a launcher, and interceptor, and an all-up-round-magazine. This weapon platform will integrate with IBCS fire control with Sentinel as the primary organic sensor. In September 2021, the Army announced the award of a rapid prototype agreement with an industry partner for development and delivery of 16 launchers and 60 interceptors for IFPC Increment 2.

Army Long-Range Persistent Surveillance: The Army Long Range Persistent Surveillance (ALPS) passive sensor provides continuous, 360 degree, long range

surveillance against fixed- and rotary-wing aircraft, UAS, and cruise missile threats and has demonstrated the ability to integrate into joint and Army C2 systems, including IBCS. In response to multiple CDR requirements, ALPS completed a USCENTCOM deployment last year and is currently being fielded in the USEUCOM and USINDOPACOM theaters.

Counter-Small Unmanned Aircraft Systems: Technological advances and the proliferation of commercial and tactical UAS in both reconnaissance and attack capabilities have matured to the point where they present a significant threat to Army operations from both state and nonstate actors. To address these threats, the Army continues to serve, at the direction of the Secretary of Defense, as the executive agent for countering UASs, having established the Joint Counter-Small UAS (C-sUAS) Office (JCO). Key JCO focus areas include developing joint requirements and materiel solutions, as well as joint training and doctrine. The JCO continues to work across DoD to synchronize and coordinate the development of C-sUAS technologies that meet Service-specific and joint requirements. Development efforts such as high-power microwave and DE are critical to ensuring the Army maintains pace with both commercial and state developed UASs. In response to a warfighter JUONS, the Army recently deployed over 500 man portable, fixed site, and mobile C-sUAS systems and continues adapting to changing theater UAS threats. The Army is now focused on providing critical C-sUAS capabilities to divisions in the operational force while growing protection of vital fixed and semi-fixed sites. For instance, in support of the Immediate Response Force in Europe, the Army has provided the 82nd Airborne Division kinetic and non-kinetic C-sUAS capabilities, allowing the division to detect, track, and defeat sUAS.

Maneuver-Short Range Air Defense: In response to identified operational needs, M-SHORAD will provide maneuver forces a dedicated, Stryker-based air defense capability against fixed-wing, rotary-wing, and UAS threats. In Fiscal Year 2018, the Army approved and began developing initial M-SHORAD systems that integrate existing Army capabilities into Stryker combat vehicles. The program successfully delivered four first unit equipped systems to an artillery regiment in April 2021 and remains on track to deliver four M-SHORAD battalions by Fiscal Year 2024. The Army also continues

maturing high energy laser and electronic warfare technologies to increase M-SHORAD capabilities in support of the maneuver force. Ultimately, M-SHORAD battalions will contain a mix of complementary DE and kinetic intercept systems to protect the maneuver force.

**Joint Functional Component Command for Integrated Missile Defense—
Integrating and Synchronizing Missile Defense**

The Joint Functional Component Command for Integrated Missile Defense (JFCC IMD) is USSTRATCOM's integrating element for global missile defense. USSTRATCOM formed JFCC IMD to execute its UCP-assigned missile defense responsibilities, enabling the headquarters to focus on integration and advocacy. Established in 2005 and headquartered at Schriever Space Force Base, Colorado Springs, Colorado, JFCC IMD is manned by a cohesive team of subject matter experts from the Army, Navy, Air Force, Space Force, and Marine Corps, as well as Government Civilian and Contractor personnel.

The JFCC IMD is the recognized subject matter expert across the missile defense enterprise in matters of global missile defense operational support, policy, plans, intelligence, communications, training and education, and operational risk assessment. The command's principal mission is to integrate these transregional missile defense functions across the joint and combined warfighting force. On behalf of USSTRATCOM and other CCDRs, JFCC IMD champions warfighter priorities and operational needs. These include continued development of a robust missile defense sensor network, integrated discrimination capabilities, redundant and resilient C2 networks with enhanced cybersecurity defenses, and improved means of intercept for all missile and hybrid threats.

The JFCC IMD works across DoD and alongside allies and key partners to improve integration of existing capabilities, maximizing efficiency and effectiveness in global missile defense missions. Integration is the essential force multiplier—a critically important mission enabler that JFCC IMD directly supports. As a functional component command of USSTRATCOM, JFCC IMD supports designated UCP responsibilities along four lines of effort:

- Synchronizing global missile defense planning, global force management, and missile defense security cooperation activities.
- Conducting global missile defense operations support, to include asset management, alternate execution authority, federated intelligence support, and network monitoring and protection.
- Executing above element, joint, and combined global missile defense training and education, exercises, and experimentation.
- Advocating for, and recommending acceptance of, global missile defense capabilities, conducting analyses and assessments of current and future capabilities, and supporting tests.

To accomplish these efforts, JFCC IMD maintains close collaborative relationships with CCDRs, MDA, OSD, the Joint Staff, Services, intelligence community, and our allies and partners. The JFCC IMD continually seeks to enhance deployed forces' capabilities while gaining operational experience and confidence in our collective ability to defend the Nation, deployed forces, allies, and partners. Some key efforts to enhance missile defense planning and capabilities for both homeland and regional architectures follow.

Expansion and Integration of the Missile Defense Architecture: In response to the evolving strategic environment, JFCC IMD continues to bolster homeland and regional missile defense capabilities and further the global missile defense mission through advancement of new capabilities. These advancements include the Aegis Ashore site in Poland; continued development of the Standard Missile-3 Block IIA; the Long Range Discrimination Radar, Clear Space Force Station, Alaska; Space-based Kill Assessment; MDA's Hypersonic and Ballistic Tracking Space Sensor; Space Development Agency's Tranche 1 Tracking Layer; the Next Generation Interceptor for homeland defense; and the Glide Phase Interceptor for regional hypersonic defense. Given the challenges associated with integrating these capabilities into a global architecture, JFCC IMD, in support of USSTRATCOM, provides essential collaboration with CCDRs to assess and address transregional gaps in the areas of planning, policy, capabilities development, and operations.

Integrated Missile Defense Asset Management: The JFCC IMD, in coordination with USSTRATCOM and CDRs, manages missile defense operational readiness posture, coordinates global missile defense system maintenance, and supports MDA and Service tests. The asset management process allows JFCC IMD to continually assess system readiness to defend against missile attacks and recommend adjustments to optimize overall missile defense architecture.

Cybersecurity of the Missile Defense System: The JFCC IMD, in coordination with USSTRATCOM and MDA, conducts the cybersecurity service provider mission for missile defense architecture to ensure cyber defenses and operations are planned and executed across the globe. Working with key stakeholders, JFCC IMD enhances the cyber defense posture of the missile defense operational architecture against malicious activity. The JFCC IMD also collaborates with mission partners to incorporate realistic cybersecurity testing in support of the warfighter capability acceptance process. Additionally, JFCC IMD works closely with the Joint Staff, CCMDs, and MDA to educate, train, and exercise cybersecurity protocols to ensure the highest levels of global missile defense readiness.

Global Force Management: USSTRATCOM, as the designated Joint Functional Manager for Missile Defense, relies upon JFCC IMD to evaluate and recommend to the Joint Staff risk-informed sourcing of missile defense requirements. Due to the low density and high demand nature of missile defense assets, all sourcing decisions have a direct and significant impact on other CDRs' campaign and contingency plans. The JFCC IMD continues refining this approach, ensuring integrated capabilities are appropriately postured to counter transregional threats in accordance with the current National Defense Strategy, Missile Defense Review, and Department steady-state priorities. This globally integrated approach serves as the baseline for risk-based recommendations to the global force management process, enabling senior leaders to make informed decisions.

Allied and Partner Missile Defense Integration: Given that we will never have enough active defense capacity, integrating our allies and partners into a common and mutually supportive architecture is a critical warfighter priority. We must move beyond merely enabling the independent "burden sharing" of allies and partners to an

environment of mutual trust and information sharing that empowers truly integrated planning and operations enabled by combined force development, simulation, experimentation, testing, and exercise. We must acknowledge that future major conflicts should not be fought alone and that our greatest strategic advantage is the power of our alliances and partnerships. We should not hamstring this historic advantage with continued policies and practices that hinder collective action.

The Nimble Titan Campaign of Experimentation, a biennial series of multinational missile defense experiments, is one venue aimed at promoting this increased cooperation. This event brings together subject matter experts from allied and partner nations to explore the national policy and military interfaces and dynamics involved in collaborative coalition and alliance missile defense planning. Meeting this intent is necessary to developing regional defense designs, C2 relationships, and collective, bilateral, and multilateral policy. Nimble Titan fosters greater confidence in combined missile defenses and provides a means to advance U.S. efforts in collaboration, interoperability, and operational integration with our allies and partners.

Joint Missile Defense Training and Education: Even with ongoing challenges posed by COVID-19, JFCC IMD, in coordination with USSTRATCOM, the Joint Staff, Services, and CCMDs, continues developing comprehensive and innovative training programs to close gaps between Service, joint, and regional missile defense training and education. The JFCC IMD's Joint Ballistic Missile Defense Training and Education Center offers 18 mission-focused resident, online, and mobile training team courses including orientation, asset management, C2BMC situational awareness, and general and flag officer seminar training. During 2021, JFCC IMD instructors executed 169 courses that trained more than 4,100 students worldwide. Enhancing collective advantage, JFCC IMD also provides training courses to allies and partners through both military to military and Foreign Military Sales training venues. Additional foreign training opportunities are anticipated as the COVID-19 pandemic wanes globally.

Warfighter Inputs to Capability Development: The JFCC IMD helps streamline and accelerate MDA's efforts to provide integrated kill chain capabilities (sense, C2, and effect) to warfighters as quickly as possible to meet increased threat developments. As multiple reviews have identified, the Nation must streamline requirement generation and

reform acquisition and fiscal processes and cultures to enable MDA and the Services to quickly develop, test, and deliver effective, reliable, and sustainable missile defense capabilities. Our adversaries are not waiting, so we must change our typical ways with innovation, adaptability, risk acceptance, and speed. The JFCC IMD collaborates with CCDRs, MDA, and the Services, as well as their respective test agencies, to leverage emerging technologies to enhance existing systems, explore innovative operational concepts, and prioritize maturing technological advancements with the most promising near-term potential. To that end, JFCC IMD continues optimizing the collaboration inherent in the warfighter involvement process as an operational proponent for required missile defense capabilities and performance enhancements.

Sustaining our competitive advantage through innovation and expedience depends on well-resourced and operationally relevant test campaigns, as well as high fidelity modeling and simulation infrastructure and forward looking wargaming to challenge assumptions regarding our future missile defense readiness and posture. In testing over the past year, JFCC IMD supported demonstration of the selectable 2- and 3-stage GMD interceptor, which will improve the effective engagement and defeat zone of incoming threats; several data collections of hypersonic vehicle flight tests to characterize sensor performance; and test planning for an upcoming operational flight test to demonstrate the Long Range Discrimination Radar's capabilities.

Comprehensive Missile Defeat: As I have highlighted, adversary offensive missile and hybrid systems are increasingly complex and challenging in their delivery means and scale. As such, an optimal missile defense requires both defensive and offensive capabilities to defeat potential threats. By sustaining a capability to not only attack the adversary's ability to launch missiles but also destroy them after launch, a comprehensive approach can lower overall costs and reduce risk of failure. Creating this comprehensive posture—involving the integration of both defensive and offensive capabilities - will require balancing a variety of approaches within our capability set.

Importantly, as we continue developing innovative capabilities, it is imperative that we implement integrated deterrence as the framework that weaves together all instruments of national power. These actions include diplomacy at the forefront and advancing cross-domain deterrence together with the capabilities and actions of allies

and partners to ensure the costs and risks of adversary aggression remain disproportionate to any conceivable benefit. These capabilities must include conventional kinetic, DE, cyber, and electromagnetic attack as part of a comprehensive approach. Each individual approach provides opportunities to reduce the burden on active defenses; however, none alone is a “silver bullet” to defeating the threat. As such, our future offensive materiel solutions will likely be a mix of guns, missiles, electronic warfare, cyber, space, and DE weapons. To this end, we must understand how each of these systems complement one another and strive for a balance that allows prelaunch attack operations and offense-defense integration, and then organize to operationalize these capabilities and maximize their contributions to missile defense.

In summary, JFCC IMD continues to expand our Nation’s global missile defense architecture and explore developing capabilities to maintain operational advantage against current and future threats. We maintain our competitive edge through integrated planning and operational support, development of warfighters through education and training, expansion of collective capabilities in collaboration with our allies and partners, and rapid delivery of innovative and impactful capabilities to warfighters that enhance national security.

Conclusion

Chairman Cooper and Ranking Member Lamborn, as members of the joint missile defense community, the Army and USSTRATCOM continue pursuing enhancements to the Nation’s IAMD systems, from tactical to strategic levels of warfare. As outlined here, USASMDC and JFCC IMD perform a broad set of critical national security missions. These missions include providing professional warfighters and capabilities to support current operations, ensuring they are prepared for tomorrow’s fight, and developing the new technologies required to achieve and maintain technological advantage against our adversaries. Our trained and ready Soldiers, operating GMD elements in Colorado, Alaska, New York, and California, and from remote, globally deployed locations, remain ready to defend the homeland against ICBM attack. As a force provider to CCDRs, we provide essential regional sensor capabilities, ballistic missile early warning, and space-enabled communications. Our regional forces continue to leverage allied collaboration and planning efforts in

developing integrated and interoperable defenses against various threat sets. USSTRATCOM, through JFCC IMD, continues to integrate missile defense capabilities to counter global missile threats and protect our Nation, deployed forces, and allies and partners.

While operational, doctrinal, and materiel developments are essential, our most important assets are the thousands of Soldiers, Sailors, Airmen, Marines, Guardians, Civilians, and Contractors who deploy and employ our IAMD systems. As recognized by Department leadership, the strength behind our outstanding workforce is their families. Their contributions and sacrifices are foundational to the dedication and performance of our workforce—the role and support of our families empowers mission accomplishment.

I appreciate the opportunity to address missile defense matters and look forward to addressing your questions.

LTG Daniel Karbler
Commanding General, USASMDC

Lieutenant General Daniel L. Karbler assumed command of the U.S. Army Space and Missile Defense Command and Joint Functional Component Command for Integrated Missile Defense on Dec. 6, 2019.

LTG Karbler most recently served as the chief of staff, U.S. Strategic Command, Offutt Air Force Base, Nebraska. He was the principal adviser to the USSTRATCOM commander and deputy commander, and directed the activities of the command staff by developing and implementing policies and procedures in support of the command's missions. He chaired numerous boards, oversaw the command's corporate process and served as the director of the commander's staff.

LTG Karbler also served as the commanding general of the U.S. Army Test and Evaluation Command. Prior to that, he served as the director, Joint and Integration, Army G-8 at the Pentagon.

LTG Karbler has held multiple leadership positions, from platoon leader to installation chief of staff and school commandant. He has commanded both B Battery and D Battery in the 5th Battalion, 7th Air Defense Artillery Regiment, 32nd Army Air and Missile Defense Command while assigned to U.S. Army Europe. He also commanded 3rd Battalion, 43rd Air Defense Artillery Regiment, 32nd AAMDC at Fort Bliss, Texas; the 31st Air Defense Artillery Brigade, 32nd AAMDC at Fort Sill, Oklahoma; and the 94th AAMDC at Fort Shafter, Hawaii.

LTG Karbler earned his Bachelor of Science in 1987 from the United States Military Academy at West Point where he was commissioned as a second lieutenant in the Air Defense Artillery branch. He also holds a Master of Business Arts from Benedictine College in Atchison, Kansas, and a Master of Arts in strategic studies from the National War College. His military education includes the Air Defense Artillery Officer Basic and Advanced Courses, the Command and General Staff College and the National War College.

His awards include the Distinguished Service Medal, Defense Superior Service Medal, Legion of Merit, Bronze Star, Defense Meritorious Service Medal, and the Israeli Air Force Combat Operations Badge.

December 2019

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UNITED STATES SPACE COMMAND

PRESENTATION TO THE SUBCOMMITTEE ON STRATEGIC FORCES
HOUSE ARMED SERVICES COMMITTEE
U.S. HOUSE OF REPRESENTATIVES

SUBJECT: United States Space Command's Role as the Global Sensor Manager

STATEMENT OF: Lieutenant General John E. Shaw
Deputy Commander, United States Space Command

May 11, 2022

UNCLASSIFIED

Introduction

Chairman Cooper, Ranking Member Lamborn, and distinguished members of the House Armed Services Committee's Subcommittee on Strategic Forces, thank you for the opportunity to represent United States Space Command (USSPACECOM) on the topic of our Unified Command Plan assigned task as global sensor manager, and the relationship between our efforts in that task and our broader operational efforts on space domain awareness, missile warning, and missile defense of the United States and our allies.

The President has assigned USSPACECOM the specific responsibility to serve as the global sensor manager. As the global sensor manager, USSPACECOM leads the planning and coordination efforts of sensors across combatant commands, U.S. Government Agencies, and our partner nations. USSPACECOM is uniquely suited to maximize the employment of multi-role capable sensors, both terrestrially and on orbit, contributing to our understanding and awareness of threats in space, while also supporting missile warning and missile defense missions. Although United States Strategic Command (USSTRATCOM) retains the responsibility for global missile defense, global sensor management is a critical enabling function for responding to today's increasingly complex and pervasive threat environment. Global sensor management plays an integral role in deterrence by denial, which helps achieve the National Defense Strategy's priorities of defending the homeland, deterring strategic attacks, and deterring aggression.

USSPACECOM's Role as Global Sensor Manager

In USSPACECOM's role as the global sensor manager, the command is tasked with the responsibility to plan, manage, and oversee the operations of all assigned space domain awareness, missile defense, and missile warning sensors in order to provide the necessary data

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that enables Department of Defense and Inter-Agency decision superiority. Moreover, the global sensor manager is tasked to coordinate with all Combatant Commands (CCMDs), U.S. government agencies, and with our international partners to integrate the fullest range of sensors capable of contributing to space domain awareness. The unified integration of these systems across CCMDs provides consistent awareness of both terrestrial and space-based threats, 24 hours a day, 365 days a year.

Environment

The 2022 Missile Defense Review emphasizes the evolving air and missile threat environment is one of the main challenges to U.S. national interests. A critical component in countering these threats is first understanding our adversaries. Consequently, one of the key tasks for the Commander of USSPACECOM (GEN James Dickinson), and U.S. Space Command's top requirement, is to understand our competition. This includes expanding our space domain awareness—which allows the Command to identify, characterize, and attribute threats—through an array of traditional and non-traditional sensors capable of enhancing vital space domain awareness, missile warning and missile defense functions.

Our adversaries are evolving, diversifying, and proliferating their inventories of advanced missiles and technologies that can threaten both the U.S. homeland and our interests around the globe. Hypersonic glide vehicles, fractional orbital platforms, and hypersonic cruise missiles pose diverse threats complicating targeting and tracking. China is the pacing challenge, and it is rapidly expanding its missile capabilities with an emphasis on hypersonic platforms, as well as orbital and maneuverable reentry vehicles (like the one they tested on July 27, 2021) complicate the sensor tracking function. Russia's large strategic arsenal and continued upgrades to its ballistic and cruise missile arsenals, alongside their nuclear weapons, pose a significant strategic

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threat designed to stress our sensors and our defensive postures. In light of Russia's recent actions in the Space and Terrestrial Domains, and aggressive posturing, the threats they present take on increased significance. Finally, rogue actors like North Korea and Iran continue to expand their offensive strategic capabilities, developing hypersonic, ballistic, and cruise missiles to threaten the U.S. homeland, our deployed forces, allies, and partners.

This environment demands integrated missile warning, space domain awareness, and missile defense solutions to enable globally persistent space and missile threat tracking. The complexity of the threats we face means we can no longer think in terms of "a linear kill chain" where one sensor identifies a threat and relays it for prosecution to a single weapon system. Rather, we must face our challenges with "kill webs" where a multitude of sensors around the globe and on-orbit identify targets, retain custody, and pass data through integrated command and control systems to enable in time engagement by the best-suited weapon system. These sensors may be theater or strategic level sensors and their seamless integration is where USSPACECOM's role as global sensor manager enables flexibility and rapid decision making for missile warning, missile defense, and space defense functions.

USSPACECOM's Technical Sensor Contributions

USSPACECOM's assigned sensors are a critical enabler to all CCMDs and national-level military command centers reliant on space domain awareness, missile warning, and missile defense capabilities. The preponderance of these assigned sensors perform missile warning, missile defense, and space domain awareness missions simultaneously; however, the same is not typically said for the majority of purpose built, missile defense sensors that are also capable of contributing to USSPACECOM's space domain awareness mission; often referred to as non-traditional sensors. For example, in our role as the global sensor manager, and in partnership

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with other CCMDs, the Space Development Agency, and the Missile Defense Agency (MDA), we demonstrated how regional missile defense sensors can and should be used for more than one function in order to maximize their technical potential. Traditional missile defense sensors are capable of augmenting missile warning sensor coverage and have proven their value in support of detecting and tracking space threats entering, transiting, and reentering from the space domain. While we leverage both terrestrial and space-based systems to provide missile warning, missile defense, and space domain awareness, we do not require tactical control of another CCMD's assigned assets to execute these missions.

USSPACECOM's sensors like the Space-Based Infrared System (SBIRS) and Defense Support Program satellites provide the first alert of a missile launch from anywhere on the planet to all CCMDs, the National Military Command System, national leaders, and select international partners. This initial alert tips and cues USSPACECOM's and other CCMDs' sensors through theater and homeland defense communications architectures. Those communication architectures connect USSPACECOM's space-based warning segment to the USSPACECOM and Department's terrestrial warning and defense sensors for the purposes of theater and homeland missile defense. Near term proliferation of these architectures and capabilities by the Department is critical in our future approach. Proliferation in times of war adds resilience to essential capabilities; in times of peace, resiliency is cost imposing on our competitors' attack strategies and critical to integrated deterrence.

USSPACECOM is actively working with other CCMDs and Agencies to leverage existing sensors to contribute to the space domain awareness mission. Operators of the AN/TPY-2 Sea-Based X-Band Radar and Aegis Combat System demonstrated the capability to support our collective understanding of events and activities in the space domain in both exercise and

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real-world operations. In coordination with other CCMDs and Agency partners, we are actively testing technical solutions so that both the supported CCMDs' mission(s) and USSPACECOM's space domain awareness mission are enhanced. Additional fusion of other intelligence disciplines through our close cooperation with the Intelligence Community helps further improve our understanding of the space domain and our competition.

Additionally, USSPACECOM is working to leverage commercial space domain awareness partnerships. American commercial innovation is an asymmetric advantage that our competitors do not possess, and commercial companies are providing unprecedented capability in support of our response to the ongoing Russian invasion of Ukraine. The USSPACECOM Commander recently released a commercial integration strategy outlining how the command will work with commercial partners to improve space domain awareness and other capabilities.

Coordination with Other CCMDs and Agencies

USSPACECOM is in close partnership with U.S. Northern Command (USNORTHCOM), USSTRATCOM, and other agencies as we provide exquisite global sensor management capabilities. In the past year, our team broke down barriers in support of our nation's collective warning and defense interests. Admiral Charles Richard, Commander of USSTRATCOM, explained in his 20 April 2021 testimony before the Senate Armed Services Committee that after USSPACECOM's assumption of global sensor manager responsibilities, he receives better missile warning and missile defense data and more efficient utilization of existing assets. Moreover, our integration with USNORTHCOM on missile warning and missile defense provides seamless sensor coverage in support of the homeland defense mission. In addition to our CCMD's support functions, the global sensor management role continues to expand our relationship and integration with allied nations and organizations such as NATO who are reliant

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on us more today than they ever have been before.

Additionally, USSPACECOM and U.S. Cyber Command (USCYBERCOM) integrate daily to protect against growing cyber threats to our operations. USSPACECOM established a Joint Cyber Center at the headquarters to help prioritize digital superiority and embedded a Joint Integrated Space Team at USCYBERCOM to synchronize planning efforts. The command is harnessing current and emerging technologies, leveraging commercial innovations, and applying interoperable and secure data to achieve digital superiority. Through these efforts, we help increase the cost calculus of our competitors and contribute to our integrated deterrence goals.

Beyond our daily coordination in response to real world operational demands, USSPACECOM also regularly participates in advanced, coalition-integrated global and regional exercises and war-games to build and test our sensor management processes. Exercises like GLOBAL LIGHTNING, GLOBAL THUNDER, AUSTERE CHALLENGE, and PACIFIC FURY provide opportunities to exercise our sensors and management capabilities, and train our crews in this complex environment, while also preparing the Joint Force, allies, and partners to better leverage the global sensor management capabilities USSPACECOM can provide. USSPACECOM demonstrated our sensor management and other operational concepts by executing Exercise SPACE LIGHTNING, our own tier one, multi-combatant command exercise in Fiscal Year 2022.

Today's Sensor Architecture and Building Future Capabilities

The confluence of global sensor manager responsibilities with missile warning and missile defense will also help us advocate for an integrated and efficient solution that modernizes and recapitalizes our aging sensor architecture. We face a continuing challenge of keeping pace with evolving threats and technologies while ensuring our sensor architecture components - such

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as ground-based radars and SBIRS - remain optimized and modernized with key technical software and hardware upgrades. The challenge of sustaining and upgrading 20th Century sensors that are increasingly obsolete and hard to maintain remains a difficult one. The existing portfolio of aging terrestrial and space-based sensors which are the workhorses of our architecture is both driving us to pursue the fielding of new capabilities in the future and requiring us to leverage and integrate legacy sensors in support of critical warning and active defense functions right now. This is consistent with the Secretary of Defense's 2020 Defense Space Strategy approach which requires we enhance existing capabilities in order to gain and maintain strategic and operational advantages.

Research and development efforts such as continued funding of next-generation, space based and terrestrial sensor systems are key to ensuring we keep pace with evolving adversary threats across all domains. Moreover, these capabilities must be resilient, and we must be able to defend and reconstitute them to achieve the space and cross-domain mission assurance required by the future Joint Force. Space systems provide valuable solutions to layered tracking and discrimination capability for terrestrial threats while terrestrial systems provide valuable solutions to tracking and characterization of friendly or nefarious activities in space. A space tracking and characterization constellation combined with next-generation, Overhead Persistent Infrared systems would provide the significant improvements necessary to detect advanced threats. Future space-based sensors must be able to detect, track, characterize and target hypersonic glide vehicles and ballistic missile threats globally. We cannot fully achieve these abilities solely with terrestrial-based radars due to the constraints of geography and the characteristics of future missile threats, so a space sensor layer integrated with a web of terrestrial sensors is critical to defeating these advanced and evolving threats.

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Whether future systems exist in the orbital regime, air, land, or sea, they must possess multiple mission or mission area capabilities and be interoperable in a joint environment. Space-based and terrestrial sensor architectures must be capable of supporting the space domain awareness, missile defense, and missile warning missions simultaneously. Their disparate data must be fusible and displayable to allow decision makers to act on the best available and relevant information. Only through achieving this goal can we expect to maintain our edge throughout the spectrum of competition to conflict.

USSPACECOM strongly endorses continuing work with the developing agencies on systems such as the MDA's Long-Range Discrimination Radar, the Space Development Agency's Tracking Layer Satellites, and the MDA's Hypersonic and Ballistic Missile Tracking Space Sensor. We continue to work across the Department to integrate into the Joint Warfighting Concept and leverage systems like Joint All-Domain Command and Control, and the Command and Control, Battle Management and Communications (C2BMC) system in support of the space domain awareness mission. We are also working to integrate Space Surveillance Network sensors into C2BMC to greatly enhance our battlespace awareness. This multi-mission system provides USSPACECOM greater flexibility as the global sensor manager and is critical in integrating the missile warning, missile defense, and space domain awareness missions.

Conclusion

USSPACECOM's team of outstanding service members, civilians, and contractors work every day to integrate within the Department of Defense as the global sensor manager. We provide unmatched support to missile warning and missile defense through the optimization of existing sensors and we appreciate Congress's support as we develop the next generation of advanced terrestrial and on-orbit capabilities. USSPACECOM also advances the use of

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traditional missile warning and missile defense sensors for space domain awareness facilitating the Command's protect and defend mission in space, while providing additional capability in countering advanced missile threats. Under the direction of the President and Secretary of Defense, and with the support of Congress, USSPACECOM is prepared to provide global sensor management in support of missile warning, missile defense, and space domain awareness to ensure there is never a day without space.

Lieutenant General John E. Shaw

Lt. Gen. John E. Shaw is the Deputy Commander, U.S. Space Command. U.S. Space Command is the 11th and most recently established Unified Combatant Command responsible for conducting operations in, from and to space to deter conflict, and if necessary, defeat aggression, deliver space combat power for the Joint/Combined force, and defend U.S. vital interests with allies and partners.

Lt. Gen. Shaw entered the Air Force in 1990 as a distinguished graduate of the U.S. Air Force Academy with a degree in astronautical engineering and a minor in Russian language. He has served in a variety of air and space operations and staff positions, including operations tours in the 50th Space Wing, the National Reconnaissance Office, the 32nd Air Operations Group and the Space Warfare Center. His operational commands have included the 4th Space Operations Squadron, the 50th Operations Group and the 21st Space Wing. He also served at U.S. Strategic Command as Director of the Commander's Action Group and as Deputy Director for Operations, and in the Pentagon as an Air Force intern, as Deputy Chief of Space Strategy and Integration, a speechwriter and as a senior space policy advisor.

Prior to his current position, Lt. Gen. Shaw was dual hatted as the Commander, Combined Forces Space Component Command, U.S. Space Command, and Deputy Commander, Space Operations Command, U.S. Space Force, Vandenberg Air Force Base, California. He also served as the Deputy Commander of Air Force Space Command, United States Air Force.

EDUCATION

1990 Bachelor of Science, Astronautical Engineering, minor, Russian Language, U.S. Air Force Academy, Colorado Springs, Colo.
 1991 Master of Science, Aeronautics and Astronautics, University of Washington, Seattle
 1995 Squadron Officer School, Maxwell Air Force Base, Ala.
 1998 Master of Arts, Organizational Management, The George Washington University, Washington, D.C.
 2004 Master of Arts, Military Operational Arts and Sciences, Air Command and Staff College, Maxwell AFB, Ala.
 2008 Master of Science, National Security Strategy, National War College, Fort Lesley J. McNair, Washington, D.C.
 2010 Senior Executive Fellow, Harvard Kennedy School, Cambridge, Mass.

ASSIGNMENTS

August 1990–August 1991, Student, University of Washington, Seattle
 September 1991–September 1994, Deputy Crew Commander and Spacecraft Systems Engineer, 1st Space Operations Squadron, Falcon Air Force Base, Colo.
 October 1994–July 1996, Flight Commander and Chief of Mission Analysis, Mission Control Complex IX, Operating Division 4, Onizuka Air Station, Calif.
 August 1996–May 1998, Air Force Intern, Office of the Deputy Under Secretary of Defense for Space, and Office of the Assistant Secretary of the Air Force for Acquisition, the Pentagon, Arlington, Va.
 June 1998–December 1999, Chief, Special Information Warfare Plans, 32nd Air Operations Group, Headquarters U.S. Air Forces in Europe, Ramstein Air Base, Germany
 April 1999–June 1999 (Deployed), Chief, Special Technical Operations, Joint Task Force Noble Anvil, Operation Allied Force, Headquarters NATO Armed Forces South, Naples
 January 2000–March 2001, Executive Officer, Director of Aerospace Operations, Headquarters U.S. Air Forces in Europe, Ramstein AB, Germany
 April 2001–March 2002, Deputy Chief, Strategy Branch, Directorate for Space Operations and Integration, Headquarters Air Force, the Pentagon, Arlington, Va.
 April 2002–July 2003, Speechwriter, Secretary of the Air Force & Chief of Staff of the Air Force Executive Action Group, Headquarters Air Force, the Pentagon, Arlington, Va.
 August 2003–May 2004, Student, Air Command and Staff College, Maxwell AFB, Ala.
 June 2004–May 2005, Operations Officer, 25th Space Control Tactics Squadron, Space Warfare Center, Schriever AFB, Colo.

June 2005–June 2007, Commander, 4th Space Operations Squadron, Schriever AFB, Colo.
 July 2007–June 2008, Student, National War College, Fort Lesley J. McNair, Washington, D.C.
 July 2008–June 2010, Director, Commander's Action Group, U.S. Strategic Command, Offutt AFB, Neb.
 July 2010–July 2012, Commander, 50th Operations Group, Schriever AFB, Colo.
 August 2012–July 2013, Senior Policy Advisor, Office of the Deputy Assistant Secretary of Defense (Space Policy); Office of the Under Secretary of Defense for Policy, the Pentagon, Arlington, Va.
 July 2013–June 2015, Commander, 21st Space Wing, Peterson AFB, Colo.
 June 2015–June 2017, Deputy Director, Global Operations Directorate, U.S. Strategic Command, Offutt AFB, Neb.
 June 2017–August 2018, Director of Strategic Plans, Programs, Requirements and Analysis, Headquarters Air Force Space Command, Peterson AFB, Colo.
 August 2018–November 2019, Deputy Commander, Air Force Space Command, Peterson AFB, Colo.
 November 2019–December 2019, Commander, Combined Force Space Component Command, U.S. Space Command; and Commander, 14th Air Force, Air Force Space Command, Vandenberg AFB, Calif.
 December 2019–October 2020, Commander, Combined Force Space Component Command, U.S. Space Command, and Commander, Space Operations Command, U.S. Space Force, Vandenberg AFB, Calif.
 October 2020–November 2020, Commander, Combined Force Space Component Command, U.S. Space Command, and Deputy Commander, Space Operations Command, U.S. Space Force, Vandenberg AFB, Calif.
 November 2020–present, Deputy Commander, U.S. Space Command, Peterson AFB, Colo.

SUMMARY OF JOINT ASSIGNMENTS

April 1999–June 1999 (Deployed), Chief, Special Technical Operations, Joint Task Force Noble Anvil, Operation Allied Force, Headquarters NATO Armed Forces South, Naples, as a captain
 July 2008–June 2010, Director, Commander's Action Group, U.S. Strategic Command, Offutt Air Force Base, Neb., as a colonel
 August 2012–July 2013, Senior Policy Advisor, Office of the Deputy Assistant Secretary of Defense (Space Policy); Office of the Under Secretary of Defense for Policy, the Pentagon, Arlington, Va., as a colonel
 June 2015–June 2017, Deputy Director, Global Operations Directorate, U.S. Strategic Command, Offutt AFB, Neb., as a brigadier general
 November 2019–November 2020, Commander, Combined Force Space Component Command, U.S. Space Command, Vandenberg AFB, Calif., as a major general
 November 2020–present, Deputy Commander, U. S. Space Command, Peterson AFB, Colo., as a lieutenant general

MAJOR AWARDS AND DECORATIONS

Distinguished Service Medal
 Defense Superior Service Medal with oak leaf cluster
 Legion of Merit with oak leaf cluster
 Kosovo Campaign Ribbon with campaign service star

OTHER ACHIEVEMENTS

General Jerome O'Malley Distinguished Space Leadership Award
 Associate Fellow, American Institute of Aeronautics and Astronautics
 National Reconnaissance Office Gold Medal
 National Finalist, White House Fellow Program
 Royal Air Force Historical Society and U.S. Air Force Historical Foundation "Two Air Forces" Award for Writing (1998)

SELECTED PUBLICATIONS

"Guarding the High Ocean: Towards a New National-Security Space Strategy through an Analysis of U.S. Maritime Strategy," *Air & Space Power Journal* (Maxwell Air Force Base, Ala., Spring 2009)
 "On Cossacks, Subs, and SAMs: Defeating Challenges to U.S. Space Superiority," *High Frontier Journal* (Peterson AFB, Colo., Winter 2005)
 Whither Space Power? Forging a Strategy for the New Century, with Brig. Gen. Simon P. Worden; (Monograph, Maxwell AFB, Ala.: Air University Press, 2002)
 "The Influence of Space Power Upon History: 1944-1998," *Air Power History Journal* (Lexington, Va.: Air Force Historical Foundation, Winter 1999)

Optimal Control Designs for an Inverted Cart-Pendulum Array, Formal Thesis; University of Washington, Seattle, 1991

EFFECTIVE DATES OF PROMOTION

Second Lieutenant May 30, 1990

First Lieutenant May 30, 1992

Captain May 30, 1994

Major May 1, 2001

Lieutenant Colonel May 1, 2005

Colonel Oct. 1, 2008

Brigadier General June 5, 2015

Major General Aug. 17, 2018

Lieutenant General Nov. 23, 2020

(Current as of December 2020)



United States Government Accountability Office

Testimony

Before the Subcommittee on Strategic
Forces, Committee on Armed Services,
House of Representatives

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MISSILE DEFENSE

Acquisition Processes Are Improving, but Further Actions Are Needed to Address Standing Issues

Statement of John D. Sawyer, Acting Director,
Contracting and National Security Acquisitions

GAO Highlights

Highlights of GAO-22-105925, a testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, House of Representatives

Why GAO Did This Study

Since MDA was established in 2002, DOD has spent over \$174 billion to develop a network of sensors, interceptors, and command and control capabilities collectively called the Missile Defense System. GAO has previously reported on MDA's process to acquire assets and capabilities for this system.

This statement highlights key findings from GAO's work on missile defense acquisitions. Specifically, this testimony provides information on (1) changes to MDA's acquisition processes; (2) program and flight test cost estimates and reporting; and (3) MDA's implementation of GAO's prior recommendations relevant to missile defense acquisitions. This statement is primarily based on GAO reports issued since 2020 on MDA's requirements and cost estimating process. In addition, the statement draws upon GAO's body of work issued since 2010.

View GAO-22-105925. For more information, contact John Sawyer at (202) 512-4841 or SawyerJ@gao.gov.

May 11, 2022

MISSILE DEFENSE

Acquisition Processes Are Improving, but Further Actions Are Needed to Address Standing Issues

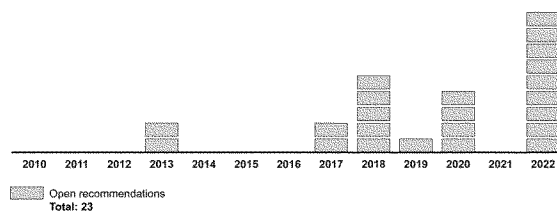
What GAO Found

The Missile Defense Agency (MDA) was established 20 years ago to develop a system to defend the U.S. and its allies against ballistic missile attacks. Since then, MDA has made progress developing and testing the Missile Defense System. MDA has taken steps to improve how it develops missile defense assets and capabilities, but problems with its acquisition policy and practices persist. For example:

- **Limited stakeholder input in requirements-setting.** In 2020, the Department of Defense (DOD) made changes to MDA's acquisition processes to more closely align with leading practices, such as working closely with stakeholders throughout program development. In November 2021, GAO found opportunities for DOD to better incorporate the warfighter's needs by establishing processes to better align MDA programs in early development with warfighter-approved requirements.
- **Problematic cost estimates and underreported costs.** In 2013 and 2017, GAO found shortfalls in MDA's cost estimates and reporting. In February 2022, GAO found that MDA continues to omit key costs from program life-cycle cost estimates and lingering accuracy issues with flight test cost estimates. These deficiencies limit decision-makers' insight into the financial commitments necessary for making funding and other determinations.

Since 2010, GAO has made 61 recommendations to improve missile defense acquisitions. While MDA has generally agreed with most of these recommendations, 23 still require additional actions (see figure). Addressing the open recommendations would help reduce acquisition risk. For example, early alignment of MDA programs to warfighter-approved requirements helps ensure delivery of needed capabilities while minimizing the risk of late-cycle design changes—which has proven to raise cost and create schedule delays—or delivering capabilities that do not fully meet warfighter's needs.

Unimplemented GAO Recommendations on Missile Defense Acquisitions by Year, 2010-2022



Source: GAO. | GAO-22-105925

Chairman Cooper, Ranking Member Lamborn, and Members of the Subcommittee:

Thank you for the opportunity to discuss our work assessing the Missile Defense Agency's (MDA) acquisition practices. The Department of Defense (DOD) has charged MDA with developing and fielding the Missile Defense System (MDS) to defend the United States, deployed troops, and allies against ballistic, cruise, and hypersonic missile attacks. The MDS architecture includes (1) space-based sensors as well as ground- and sea- based radars; (2) ground- and sea- based interceptor missiles; and (3) command and control, battle management, and communications systems to enable a coordinated response from the warfighter. Since MDA was established in 2002, the agency has spent over \$174 billion developing and fielding missile defense capabilities. The agency is requesting an additional \$9.6 billion for fiscal year 2023 to continue its efforts.

The National Defense Authorization Act for Fiscal Year 2002 and subsequent Acts have included provisions for us to prepare annual assessments of MDA's progress toward its acquisition goals and objectives. We have carried out those assessments since our first report in 2004.¹ We have also reported on other important areas within MDA, such as collaboration with the intelligence community, the contracting strategy for MDS elements, and the acquisition risks in developing and delivering targets to support flight testing.

GAO's body of work on MDA's acquisitions has shown that MDA has taken important steps to

- increase transparency in its documentation;
- improve its outreach to stakeholders, including the intelligence community and other DOD stakeholders; and
- reduce concurrency (broadly defined as the overlap between product development, testing, and production).

However, MDA continuously struggles to meet its annual acquisition goals and has canceled a number of critical efforts due to cost and

¹We were unable to assess MDA's progress in fiscal year 2002 because MDA did not establish cost, schedule, testing, and performance goals for that fiscal year. Our assessment of MDA's progress in meeting its acquisition goals for fiscal year 2021 (our 19th annual assessment) is underway and we anticipate issuing the report in June 2022.

technical challenges—a trend the department indicated must not continue given the importance of these systems.

This testimony statement focuses on two of our recent reports: one evaluating changes to MDA's acquisition flexibilities that we issued in November 2021, and another assessing MDA's cost estimating and reporting that we issued in February 2022.² This statement will also highlight MDA's progress implementing GAO's recommendations relevant to missile defense that we have made over the past decade. More information on our objectives, scope, and methodology is available in the reports cited.

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

Background

MDA is responsible for developing a number of systems that will be combined into an integrated system-of-systems known as the MDS. To remain responsive to rapidly evolving threats, MDA incrementally improves each system via multiple subparts—blocks, configurations, increments, or spirals. As required by law, each acquisition program has a baseline that MDA reports annually to Congress in the Missile Defense Accountability Report (referred to here as baseline reporting).³ MDA conducts flight tests to verify that each system's design is built correctly and to demonstrate that each system, alone or integrated, can successfully accomplish its mission in the hands of the warfighter under realistic conditions. MDA uses program life-cycle cost estimates and flight

²See GAO, *Missile Defense: Recent Acquisition Policy Changes Balance Risk and Flexibility, but Actions Needed to Refine Requirements Process*, GAO-22-563 (Washington, D.C.: Nov. 10, 2021); and *Missile Defense: Addressing Cost Estimating and Reporting Shortfalls Could Improve Insight Into Full Costs of Programs and Flight Tests*, GAO-22-104344 (Washington, D.C.: Feb. 2, 2022).

³Pub. L. No. 112-81, § 231, as amended, codified at 10 U.S.C. § 225, requires the MDA Director to establish and maintain an acquisition baseline for each program entering engineering and manufacturing development, and production and deployment. This law details the specific content MDA must include in the acquisition baseline. MDA's acquisition baselines include: (1) contract, (2) operational capacity, (3) resource (or cost), (4) schedule, (5) technical, and (6) test.

test cost estimates to identify the necessary investment and funding needs for programs as well as flight tests in its annual budget request.

MDA has been granted exceptional flexibilities to set requirements and manage the acquisition of the MDS to more quickly expedite the availability of MDS assets and capabilities. These flexibilities allow MDA to (1) diverge from DOD's traditional acquisition life-cycle and (2) defer the application of certain acquisition laws and policies designed to facilitate oversight and accountability until a mature capability is ready to be handed over to a military service for production and operation. DOD issued a directive in 2009 referred as the "MDA charter" establishing roles, responsibilities, and authorities for MDA and DOD components involved in the development of the MDS.⁴

In 2019, DOD determined that changes were needed to MDA's acquisition approach to, among other things, reduce risks and promote the transfer of systems to military services.⁵ Consequently, in March 2020, DOD issued a memorandum requiring, among other items, MDA obtain independent cost and technology risk assessments earlier in program development.⁶ The memorandum also assigned the Under Secretary of Defense for Acquisition and Sustainment (USD (A&S)) the responsibility for deciding whether a program can proceed to certain points in the acquisition process—a responsibility previously assigned to the Director, MDA.

⁴DOD, *Missile Defense Agency (MDA)*, DOD Directive 5134.09 (Washington, D.C.: Sept. 17, 2009).

⁵MDA is required to transfer ownership (i.e., the acquisition and total obligation authority) of certain systems to the designated military service (e.g., Air Force, Army, Navy) when there has been a decision to enter into production. Once transferred, the designated military service becomes responsible for the ownership costs, and operating and sustaining the system over the duration of its life. Congress mandated that MDA transfer ownership of these systems by the time the President's fiscal year 2021 budget was submitted but later extended the deadline to October 1, 2023. See the National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 1676(b) (2017), as amended by John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, § 1679 (2018), the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 1643 (2020), and the National Defense Authorization Act for Fiscal Year 2022, Pub. L. No. 117-81, § 1663 (2021). See also 10 U.S.C. § 4172(e)(8).

⁶Deputy Secretary of Defense, *Directive-type Memorandum (DTM) 20-002 – "Missile Defense System Policies and Governance"* (Mar. 13, 2020).

Opportunities Remain for DOD to Build On Recent Efforts to Balance Acquisition Flexibility and Risk

In November 2021, we found that policy changes DOD implemented in 2020 have the potential to improve MDA's acquisition outcomes, as most of the changes aligned with actions we previously recommended and were consistent with our identified acquisition best practices.⁷ For example, MDA must now obtain independent cost estimates before starting product development, and obtain USD(A&S) approval of its acquisition strategies before starting technology development. Our prior work has shown that knowledge-based acquisition practices such as those DOD implemented take time to complete but are intended to identify issues that could later derail a program.⁸

However, we also found that DOD continues to rely on MDA to decide operational-level capability requirements during early program development, rather than relying on the warfighter to make those decisions. These requirements decisions help inform key development decisions that are made during program development, such as selecting weapon system concepts to pursue and awarding contracts for their development. Our prior work on missile defense acquisitions has shown that leveraging the warfighter's expertise—attained through decades of experience operating missile defense systems—can help MDA establish a sound business case for its new efforts. It can also help increase the likelihood that the capabilities MDA pursues are needed, affordable, effective, and delivered as quickly as feasible.⁹

The policy changes implemented by DOD in 2020 provided the warfighter with increased responsibility for missile defense requirements-setting but, as figure 1 shows, MDA continues to retain some responsibility for determining operational-level capability requirements.¹⁰ As we found in

⁷GAO-22-563.

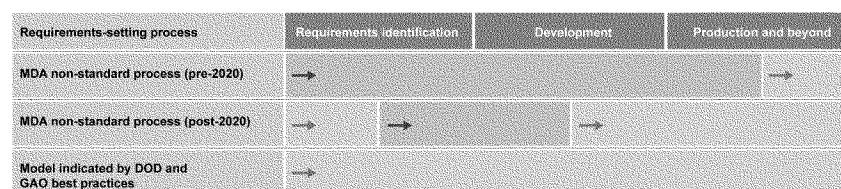
⁸See GAO, *Weapon Systems Annual Assessment: Updated Program Oversight Approach Needed*, GAO-21-222 (Washington, D.C.: June 8, 2021); GAO-17-381; *Missile Defense: Mixed Progress in Achieving Acquisition Goals and Improving Accountability*, GAO-14-351 (Washington, D.C.: Apr. 1, 2014); and *Missile Defense: Opportunity to Refocus on Strengthening Acquisition Management*, GAO-13-432 (Washington, D.C.: Apr. 26, 2013).

⁹For examples, see GAO, *Missile Defense: Further Collaboration with the Intelligence Community Would Help MDA Keep Pace with Emerging Threats*, GAO-20-177 (Washington, D.C.: Dec. 11, 2019); and GAO-17-381.

¹⁰See GAO-22-563 for further information on the policy changes DOD implemented in 2020 that provided the warfighter with increased requirements-setting responsibility. For example, MDA must now produce a Top Level Requirements Document that is coordinated with combatant commands and lead military service at the start of the product development phase for MDS programs.

November 2021, the absence of continuity in warfighter-approved requirements guiding MDA and its programs through early development creates the potential for later challenges that could result in significant program disruptions.

Figure 1: MDA and Warfighter Responsibilities for Determining Operational-Level Capability Requirements



Warfighter responsibility
Developer (MDA) responsibility

DOD = Department of Defense
MDA = Missile Defense Agency

Source: GAO analysis of DOD information. | GAO-22-105925

Note: In this figure, requirements identification includes materiel solution analysis and development includes technology development and product development. DOD's standard process has acquisition phases and decision points that are similar to but not the same as MDA's acquisition process.

As a result, in November 2021, we made three recommendations for DOD to establish processes and products to ensure MDA's programs are aligned with warfighter requirements, as indicated by DOD's and GAO's identified best practices. DOD did not agree with our recommendations, citing, among other things, the need for MDA to retain the flexibility to develop capabilities based on existing technologies rather than warfighter requirements. In our report, we pointed to the early collaboration that occurred between MDA and the warfighter on developing a top-level requirements document for the Next Generation Interceptor. This example serves as a proof-of-concept that DOD can retain MDA's design flexibility while also anchoring MDS programs to warfighter requirements. As such, we maintain that DOD should implement our recommendations or find ways to ensure continuity in warfighter-approved requirements throughout program development.

DOD has ongoing efforts to update missile defense policies that provide the department with opportunities to improve upon and fine-tune the

policy changes it made in 2020. For example, DOD officials said that the department is in the process of updating the MDA charter to implement the policy changes from 2020, and is considering other policy changes. DOD indicated in its response to our November 2021 report that MDA would recommend an edit to the MDA charter so that analyses of alternatives would be conducted for all major MDS programs using warfighter-provided initial requirements. This change would effectively implement one of our recommendations. Also, the Joint Chiefs of Staff are establishing a process for annually producing a list of prioritized integrated air and missile defense requirements that is validated by the Joint Requirements Oversight Council. These changes could potentially address another of our November 2021 recommendations. We will continue to monitor and await the results of these efforts.

MDA's Cost Estimates and Reporting Have Improved, but Shortfalls Persist

For many years, we have reported that the program and flight test cost estimates MDA uses to support its \$7 billion to \$10 billion annual budget requests are incomplete and inaccurate and that MDA has underreported the costs of both.¹¹ MDA has taken various actions to improve these cost estimates, such as revising its Cost Estimating and Analysis Handbook to generally comport with GAO's cost estimating best practices and releasing a new flight test cost model to better and more accurately capture costs. In addition, MDA attempted to improve its program baseline reporting by adding a list of significant changes, and Congress mandated that MDA provide semiannual reports on flight test costs.¹² While these efforts are steps in the right direction, we reported in February 2022 on issues that persist with MDA's cost estimates and reporting for programs and flight tests.

MDA's program cost estimates still do not account for all life-cycle costs; specifically, the military services' operations and sustainment costs. MDA and the military services have prepared joint cost estimates for some programs, but not all applicable programs have one as required by

¹¹GAO, *Missile Defense: Actions Needed to Improve Transparency and Accountability*, GAO-11-372 (Washington, D.C.: Mar. 24, 2011); GAO-13-432; *Missile Defense: Cost Estimating Practices Have Improved, and Continued Evaluation Will Determine Effectiveness*, GAO-15-210R, (Washington, D.C.: Dec. 12, 2014); and GAO-17-381.

¹²Pub. L. No. 114-328, § 1695 (2016) and Pub. L. No. 116-92, § 1702(b)(9) (2019) required MDA to report from March 2017 through December 2021 on the outcome and costs for all flight tests planned to occur during each 180-day notification period.

policy.¹³ Further, some of the joint cost estimates are outdated, and none of them have been independently verified by DOD's office of Cost Analysis and Program Evaluation (CAPE).¹⁴ Moreover, these joint cost estimates are not a part of MDA's program life-cycle cost estimates or baseline reporting. Thus, decision makers and others lack critical information on costs that can represent up to 70 percent of a program's cost over its entire life-cycle. Specifically, this cost information is needed by:

- (1) Congress and DOD to adjust priorities and funding as needed, and to cancel a program in the event costs become untenable;
- (2) the military services to prepare for the financial commitments that will be levied on them when transfers of ownership occur; and
- (3) DOD's CAPE to prepare independent cost estimates now required by DOD policy.¹⁵

In 2013, we made it a priority recommendation that MDA account for these costs and in February 2022 further identified a practical action it could take to do so.¹⁶ Specifically, we advised MDA to include a citation to the joint cost estimate or other source for these costs in its program cost estimates and baseline reporting. We also recommended that MDA ensure applicable programs have a joint cost estimate and that these estimates are independently verified by DOD CAPE.¹⁷ DOD concurred with these recommendations and MDA intends to implement them.

¹³MDA Directive 5010.19, *Ballistic Missile Defense System Capability Transition and Transfer Policy* (May 2014).

¹⁴MDA Directive 5010.19.

¹⁵Pub. L. No. 115-91, § 1676(b) (2017), as amended by Pub. L. No. 115-232, § 1679 (2018), Pub. L. No. 116-283, § 1643 (2020), and 10 U.S.C. § 2366(e)(8). DTM-20-002.

¹⁶We identified two recommendations from GAO-13-432 as "priority" because they are important to helping save the federal government money, aiding in congressional decision-making, and improving government programs, among other things. The Comptroller General of the United States provides an annual report on priority recommendations to encourage action. The most recent annual report is: *Priority Open Recommendations: Department of Defense*, GAO-21-522PR (Washington, D.C.: Aug. 2, 2021). Also, see GAO-22-104344.

¹⁷GAO-22-104344.

In February 2022, we also found that while the accuracy of MDA's flight test cost estimates is improving, lingering accuracy issues mean that MDA's average annual funding request of \$1.3 billion for flight testing may still be under- or over-stated. For example, MDA's flight test cost estimates continue to use estimating methodologies that can misrepresent costs, contain mistakes, and are not updated with actual costs.¹⁸ We believe that MDA needs more time to refine its new flight test cost model and associated processes, and recommended that MDA update its *Cost Estimating and Analysis Handbook* to require actual costs to be regularly incorporated into its estimates, which it has since done.¹⁹

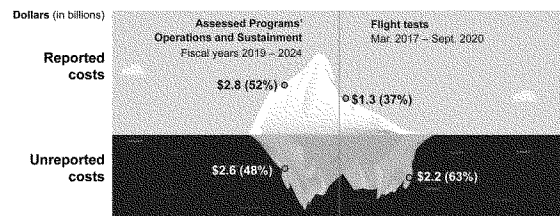
Regarding MDA's reporting on program and flight test costs, MDA has significantly underreported the costs of both.²⁰ In February 2022, we found, as shown in figure 2, that MDA underreported its program operations and sustainment costs by nearly 50 percent and flight test costs by more than 60 percent over the identified timeframes.

¹⁸GAO-22-104344.

¹⁹GAO-22-104344.

²⁰For program costs, the National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112-81, § 231 (2011), as amended, codified at 10 U.S.C. § 225, requires the MDA Director to establish and maintain an acquisition baseline for each program, which includes cost (such as the life-cycle cost estimate and unit cost). For flight test costs, the National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 1695 (2016) and the National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, § 1702(b)(9) (2019), required MDA to report from March 2017 through December 2021 on the outcome and costs for all flight tests planned to occur during each 180-day notification period. The National Defense Authorization Act for Fiscal Year 2022, Pub. L. No. 117-81, § 1673 (2021), further detailed this reporting and extended it for five years.

Figure 2: Example of Missile Defense Agency's Unreported Program and Flight Test Costs



Source: GAO analysis of Missile Defense Agency data. | GAO-22-105925

Note: Assessed programs include: Aegis Ashore Poland; Aegis Ballistic Missile Defense Standard Missile-3 Block II; Aegis Weapon System Spiral 5.1; Army Navy/Transportable Radar Surveillance and Control Model-2 Configuration 4; Command, Control, Battle Management, and Communications Spiral 8.2-5; Ground-based Midcourse Defense Enhanced Homeland Defense; and Terminal High Altitude Area Defense II. The flight test information shown is based on our analysis of MDA's mandated reports to Congress between March 2017 and September 2020 as compared to the agency's total funding request for flight test between fiscal years 2017 and 2020.

MDA's underreporting of program costs continues to impede decision makers' insight into the total cost of a system and the cost performance of the programs that comprise it. In February 2022, we found that MDA continues to adjust program baselines in such a way that progress over time is no longer traceable, which is the same issue we found in 2013 that we made a priority recommendation for MDA to address. We also found that MDA foregoes recurrent comparisons to the original program baseline needed to understand how the program's cost have evolved since its starting point and shifts costs across and outside of program baselines, thereby obscuring or omitting billions of dollars.²¹

Decision makers need clear program baselines that capture all costs and clearly track progress from the program's starting point. This informs prioritization decisions, funding determinations, and considerations of whether to continue a program or cancel it to pursue a more affordable option. We suggested practical actions to address these issues, and MDA recently informed us that it is taking some preliminary steps in this regard. We also made two recommendations. However, DOD did not concur with our recommendations for MDA to include recurrent comparisons against

²¹GAO-22-104344 and GAO-13-432.

each program's original baseline and to track total system costs, stating that the department believes MDA's baseline reporting is sufficient.²² We maintain that our recommendations are appropriate and that implementing them will provide additional insight necessary for informed decision-making.

MDA has also underreported flight test costs to date—accounting for less than 40 percent of the testing funding it received for fiscal years 2017 through 2020—due to methodological issues.²³ For example, in February 2022, we found that MDA used varying methodologies for including or excluding flight tests from a report to Congress, some of which were problematic. Specifically, MDA generally did not use the test plan that aligned with its budget request, which means some costly and important tests were entirely omitted from a report. This mandated reporting requirement ended in December 2021.²⁴ However, we suggested that Congress consider reinstating this reporting requirement and clarifying some of the methodological aspects necessary to obtain more complete insight into flight test costs, which it has since done in the National Defense Authorization Act for Fiscal Year 2022.²⁵

Addressing GAO Recommendations Would Reduce Acquisition Risk

Since 2010, we have made 61 recommendations intended to improve MDA's acquisition practices and increase transparency. Of these, 23 remain open. As shown in figure 3, MDA has more work to do in five general areas.

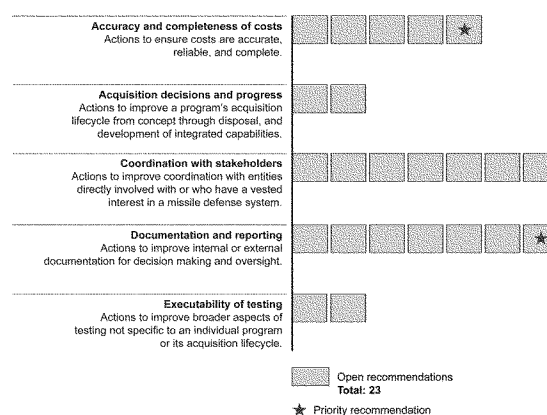
²²GAO-22-104344.

²³GAO-22-104344.

²⁴Pub. L. No. 116-92, § 1702(b)(9) (2019).

²⁵GAO-22-104344 and Pub. L. 117-81, § 1673 (2021).

Figure 3: Implementation Status of GAO Recommendations Made Since 2010 on Missile Defense Acquisitions



Source: GAO. | GAO-22-105925

Addressing these recommendations would reduce acquisition risks in the MDA program. For example, ensuring that MDS programs, in the early stages of development, maintain their linkage to warfighter-approved requirements could reduce the risk of costly, time-consuming design changes to meet warfighter needs. In addition, addressing completeness, accuracy, and transparency issues with its program and flight test cost estimates and reporting—used to support MDA's budget request—would provide congressional, DOD, and other stakeholders the information needed for better informed decision-making.

In conclusion, over the years, Congress, DOD, and MDA have explored ways to improve MDA's acquisition outcomes. Recent actions include (1) updating MDA's charter to incorporate changes to the acquisition process; (2) mandating flight test costs reporting requirements; and (3) assessing ways to ensure testing is executed as scheduled. In addition, rapidly evolving threats and budget pressures have lent additional importance to quickly acquiring demonstrated capabilities to the

warfighter within budgeted costs. While progress has been made on this front, we continue to report on the same kinds of problems today that we did in the past. To more effectively meet its acquisition goals, there is a new urgency for DOD and MDA to improve stakeholder input and transparency in cost estimates and reporting. Doing so can help ensure that the warfighters get the systems and equipment they need, and that stakeholders get the information they need to support program and funding decisions.

Chairman Cooper, Ranking Member Lamborn, and Members of the Subcommittee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact John D. Sawyer, Acting Director, Contracting and National Security Acquisitions, at (202) 512-4841 or Sawyer.J@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are James Madar (Assistant Director), Steven Stern (Analyst in Charge), Matthew Ambrose, Pete Anderson, Dennis Antonio, Jasmina Clyburn, Jim Cora, Helena Johnson, Michael Moran, Miranda Riemer, Brian Tittle, and Alyssa Weir.

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John D. Sawyer**Acting Director, Contracting and National Security Acquisitions**

John Sawyer is a Director in GAO's Contracting and National Security Acquisitions (CNSA) team. He oversees GAO's work monitoring the Missile Defense Agency's multi-billion dollar effort to defend the United States and its allies from ballistic missile attacks.

John joined GAO in June 1989. During his tenure, he has led reviews of financial management at the Department of Defense, the Department of Homeland Security, and the Internal Revenue Service.

John earned a bachelor's degree in accounting from Elizabeth City State University.

**WITNESS RESPONSES TO QUESTIONS ASKED DURING
THE HEARING**

MAY 11, 2022

RESPONSE TO QUESTION SUBMITTED BY MR. LANGEVIN

Admiral HILL and General KARBLER. As directed by Section 1687 of the Fiscal Year 2017 National Defense Authorization Act, the Missile Defense Agency (MDA) serves as the Department's executive agent for the continuing development of capabilities to counter the evolving hypersonic boost-glide vehicle threat. Since our adversaries are seeking to develop and mature a diverse inventory and means of delivery of hypersonic capabilities, I remain an advocate of multiple offensive and defensive capabilities. We must continue to improve our ability to address hypersonic threats at left-of-launch as well as during the boost, midcourse, and terminal phases of flight. Current and further development of kinetic and non-kinetic strike capabilities provide us the ability to address threats at left-of-launch while the SM-6 Sea-Based Terminal missile provide us a terminal phase of flight capability. With the support of Congress, MDA continues to pursue improvements to the space sensor architecture, communications network, and command and control capabilities. The continued development and future fielding of the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) and the Glide Phase Intercept (GPI) demonstration efforts will provide the Warfighter added capabilities to detect, track, and defeat hypersonic threats. Finally, continued pursuit of non-kinetic capabilities remain key to addressing future adversary threat capabilities. [See page 2.]

RESPONSES TO QUESTIONS SUBMITTED BY MR. WILSON

Admiral HILL. Our missile defense cooperation with Israel remains strong as we continue the development and coproduction activities of our joint United States—Israel missile defense systems. Under the 2016 United States—Israel Memorandum of Understanding (MOU), the United States Government provides Israel \$38 billion (B) for ten years (Fiscal Year (FY) 2019–2028), of which \$5B (\$500 million (M)/year) is for missile defense efforts. In accordance with this MOU, Missile Defense Agency (MDA) executes several Research, Development, Test and Evaluation (RDT&E) and Coproduction agreements furthering our defense cooperation with Israel. These efforts include the development, coproduction, and fielding of the Arrow Weapon System and the David's Sling Weapon System, in addition to Iron Dome Defense System (IDDS) coproduction activities. For FY 2022, in addition to the \$500M for our RDT&E and coproduction activities, the United States Government provided Israel an additional \$1B of IDDS funding as a result of Operation Guardian of the Walls. [See page 3.]

Admiral HILL. In addition to MDA's robust cooperation with Israel, MDA has several Foreign Military Sales (FMS) activities with our Middle East partners. These activities include active FMS cases with the UAE and the Kingdom of Saudi Arabia for the Terminal High Altitude Area Defense Weapon System. [Defer question to OSD and U.S. Central Command for additional input.] [See page 3.]

Admiral HILL. The United States and Israel jointly develop Arrow-3 for the defense of Israel. In accordance with our joint international agreement, this potential purchase by Germany is pending United States Government approval [See page 3.]

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

MAY 11, 2022

QUESTIONS SUBMITTED BY MR. LANGEVIN

Mr. LANGEVIN. As we know, directed energy weapons, such as lasers and high-powered microwaves, can effectively engage a variety of threats with speed, flexibility, precision, and on a low cost-per-shot basis.

Despite this, the FY23 budget request has cut all funding for a critical directed energy effort—specifically the Diode-Pumped Alkali Laser (DPAL)—despite its recent history of success, and the proven value DE technologies provide to our warfighters.

Can you speak more to MDA's development and pursuit of a rapid prototype and demonstration of DPAL, and most importantly, please describe how valuable this asset would be in your arsenal?

Dr. PLUMB. The Department fully supports the development of directed energy solutions, which, along with other non-kinetic capabilities, will have an increasingly important role in our future missile defense architecture. In 2019, the Department consolidated directed energy efforts at the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) level, and the Department has since issued a Directed Energy Roadmap in order to best utilize scarce resources and leverage existing work across the Department. The total amount requested by the Department for directed energy for Fiscal Year 2023 is nearly \$1.1 billion and the total over the Future Year Defense Program is over \$3.4 billion. The Missile Defense Agency (MDA) continues to collaborate closely with USD (R&E) and the Services on missile defense-related directed energy efforts including the Diode-Pumped Alkali Laser (DPAL) program. Congress appropriated \$42M in FY21 and \$6 million in FY22 for the DPAL program which MDA is now executing. DPAL's shorter wavelength offers key advantages for higher laser intensity on target and greater potential for scaling to the higher powers required to defend against ballistic missiles, hypersonic glide vehicles, and high-altitude hypersonic and supersonic cruise missiles at longer engagement ranges. To date, DPAL performance goals are being met and power levels in the 100 kilowatt-class are anticipated to be achieved prior to the end of Fiscal Year 2022. Additionally, in May 2022, MDA solicited industry to conduct six-month studies assessing potential uses of DPAL technology in a future weapon system and to list the cost and power levels required for such a capability. Once the power scaling effort is complete, MDA plans to transition DPAL to industry.

Mr. LANGEVIN. As we know, directed energy weapons, such as lasers and high-powered microwaves, can effectively engage a variety of threats with speed, flexibility, precision, and on a low cost-per-shot basis.

Despite this, the FY23 budget request has cut all funding for a critical directed energy effort—specifically the Diode-Pumped Alkali Laser (DPAL)—despite its recent history of success, and the proven value DE technologies provide to our warfighters.

Can you speak more to MDA's development and pursuit of a rapid prototype and demonstration of DPAL, and most importantly, please describe how valuable this asset would be in your arsenal?

Admiral HILL. USSPACECOM constantly pursues a more resilient, persistent, and robust missile tracking/missile warning architecture against emerging threats. However, for the specific timelines of acquisition and initial operational capability, I will have to defer to the Secretary of the Air Force and the Chief of Space Operations. USSPACECOM will continue to engage with them to evaluate divergent options based on this timeline. USSPACECOM stands ready to operationally accept and integrate this capability into the fight as soon as it comes available.

QUESTION SUBMITTED BY MR. TURNER

Mr. TURNER. I understand Missile Tracking/Missile Warning is the Space Force's top priority. The types of the missiles that satellites need to detect is changing, including the need to detect hypersonic glide vehicles, and diversifying space architecture reduces the threat of an attack. I also understand the Space Force FY23 budget requests funding to field two Next Gen OPIR Polar satellites, and also starts proto-

typing a more resilient and capable Missile Tracking/Missile Warning architecture at Medium Earth Orbit and Low Earth Orbit. Can you accelerate the operational fielding of this more resilient and capable architecture so the two Next Gen OPIR Polar satellites are not required?

General SHAW. USSPACECOM constantly pursues a more resilient, persistent, and robust missile tracking/missile warning architecture against emerging threats. However, for the specific timelines of acquisition and initial operational capability, I will have to defer to the Secretary of the Air Force and the Chief of Space Operations. USSPACECOM will continue to engage with them to evaluate divergent options based on this timeline. USSPACECOM stands ready to operationally accept and integrate this capability into the fight as soon as it comes available.

QUESTIONS SUBMITTED BY MR. LAMBORN

Mr. LAMBORN. The previous Missile Defense Review decided to deploy an additional twenty Ground-based Interceptors to stay ahead of the rogue missile threat to our homeland. It seems that this decision will not be to either refurbish 20 existing GBIs with 20 new systems, or to deploy an additional 20 GBIs. Can you tell this committee what the Administration's policy is on this issue, and when we can expect a decision?

Dr. PLUMB. The Department's priority is to defend the homeland and deter attacks against the United States, and is committed to improving the capability and reliability of the Ground Based Midcourse Defense (GMD) system. The FY23 budget requests \$2.8B for the development and production of 20 new Next Generation Interceptors (NGI) and the service life extension of our existing Capability Enhancement I fleet of Ground Based Interceptors (GBI).

Mr. LAMBORN. The Administration wants to move all of the Space missions from the National Guard into the United States Space Force (USSF) Single Component by FY2025. It is my understanding that one-third of the Nation's Strategic Missile Warning in the U.S. is performed by the National Guard. It is also my understanding that these National Guard members will not transfer to the USSF Single Component. How do you plan to assume these Strategic Missile Warning missions with your current force structure? In your best military advice, should we establish a Space National Guard in order to maintain this critical strategic missile warning capability?

General SHAW. First, National Guard members are an invaluable part of our team throughout our Headquarters and Components. We understand the complexities associated with transitioning National Guard roles into the U.S. Space Force without transferring personnel billets to execute those roles. However, USSPACECOM cannot speak on behalf of the U.S. Space Force on how to satisfy these operational roles with the current operational staff. I would defer to the Office of the Secretary of Defense, the Air Force and Space Force, National Guard leadership, and Chief of Space Operations to field this question.

Mr. LAMBORN. We've seen some very drastic deployment dwell times for soldiers working the missile defense mission. The demand for missile defense is clearly not going to abate. What is the Department doing to get these dwell times back to the realm of reasonable?

General KARBLER. Army senior leadership is aware the Air Defense Artillery (ADA) branch faces many complex and challenging issues regarding not only ADA Soldier dwell time but also the overall health of the ADA branch (Soldiers and families). In a positive development, over the past 18 months, we have been successful in significantly reducing our ADA posture in the U.S. Central Command theater. The Army has also committed to standing up an additional 16th Patriot Battalion which will increase our ADA inventory as well as Soldier dwell time.

QUESTION SUBMITTED BY DR. DESJARLAIS

Dr. DESJARLAIS. With rising North Korea missile tests and provocations, it is imperative that we maintain a robust Homeland GMD system while we wait for the Next Generation Interceptor to come online. Can you assure the committee that the GMD system will remain at 44 ready-to-fire GBIs for the NORTHCOM commander? If not, what's your plan to get it to 44? How low will ready to fire GBIs go, when, and for how long?

Admiral HILL. The GMD Weapon System including the GBIs is undergoing multiple reliability and availability upgrades to provide the Warfighter the most capable system in the short-term while providing a foundation for future integration of NGI. Consistent with previous decisions on GBI emplacements and availability, the GBI

Service Life Extension Program (SLEP) and the new Launch Support System (LSS) upgrade ensures assets and capability are maintained to address changing threat and geopolitical environments. The daily/weekly activities associated with these upgrades will adhere to established USNORTHCOM processes for coordinating and approving all maintenance and upgrade activities impacting system availability and capability. These upgrades are critical investments to ensure the GMD system and GBIs remain available in the future at the very high system readiness levels to which the Warfighter is accustomed. The attached plan is being coordinated with USNORTHCOM along with options to accelerate the LSS deployment. See the attached classified GBI Availability for current and projected GBI Inventory, Emplacements, and Availabilities.

QUESTION SUBMITTED BY MR. HORSFORD

Mr. HORSFORD. It's my understanding that the biggest risk to on-time delivery of the Space Development Agency's Tranche 1 missile tracking layer is the accelerated launch timeline and requirement to use the National Security Space Launch program. Under NSSL, SDA will be required to procure launches two years in advance, meaning they will require funding in FY23 in order to launch Tranche 1 in FY25. Needless to say, industry does not do business this way, and I'm concerned that these extended timelines are unnecessary given SDA's unique model and will put on-time delivery of these urgently needed systems at risk.

SDA will also be required to pay exorbitant amounts of money for "mission assurance", even though the average price per satellite in the tracking layer is only \$14 million dollars. We spend hundreds of millions of dollars on mission assurance programs through launch support services and launch vehicle procurement. I'm curious what we're getting for all this extra spending other than adding significant amounts of time to our launch timelines. The risk for the vehicles used in the NSSL program is already incredibly low. Yet the enterprise is so risk-averse that in some cases, we haven't put satellites on rockets that we put American astronauts on. SDA satellites are uniquely cost-effective, and this constellation is specifically designed to be robust enough to absorb some loss, either during launch or as the result of adversary action. For that reason, the requirement for SDA to procure launches under NSSL seems unnecessary and wasteful.

Satellites launched by SDA as part of Tranche 0 were procured commercially, outside of the NSSL program. Why are Tranche 1 launches required to be procured under the NSSL program and do you see a benefit to allowing SDA to continue to use commercial launches? What missile defense use cases do you foresee where SDA or another agency may need to launch vehicles into orbit on a timeline shorter than two years, and what are their current options to do so within and outside of the NSSL framework?

Dr. PLUMB. SDA Tranche 1 launches are procured under the NSSL program because the FY22 National Defense Authorizations Act Section 1601 stated it shall be the policy of the DOD and NRO to use the NSSL program to the extent possible to procure launch services only from launch service providers that can meet Federal requirements under the requirements of phase two, and for the Secretary of Defense or Director of National Intelligence, to notify the appropriate congressional committees if a launch service will instead use an alternative launch procurement approach that could be met using phase two contracts. The NSSL Phase 2 contract, awarded to United Launch Alliance (ULA) and SpaceX, meets federal and SDA Tranche 1 mission requirements, and has mission acceleration options to can reduce the nominal 24months commercial integration timeline if required, and achieves the best overall value across all defense agency procured launches. The NSSL Phase 2 contract launch providers are capable and proven providers whom SDA can benefit from for assured access to space. SDA and other defense agencies have the benefit of using a multiple variety of contract vehicles offered across USSF AATS programs. These contract structures have the benefits of assured access to space, commercial-like pricing, and accelerated integration timelines. In addition to the NSSL Phase 2 contract, the Rocket System Launch Program (RSLP) has contract vehicles to facilitate small mass to orbit requirements and experimental launch vehicle flights for possible missile defense use cases. RSLP is used routinely by the Missile Defense Agency for their testing events.