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HEARING
ON
NATIONAL DEFENSE AUTHORIZATION ACT
FOR FISCAL YEAR 2020
AND
OVERSIGHT OF PREVIOUSLY AUTHORIZED
PROGRAMS

BEFORE THE
COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES
ONE HUNDRED SIXTEENTH CONGRESS
FIRST SESSION

SUBCOMMITTEE ON TACTICAL AIR
AND LAND FORCES HEARING

ON
**DEPARTMENT OF THE ARMY
MODERNIZATION PROGRAMS**

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**DEPARTMENT OF THE ARMY
MODERNIZATION PROGRAMS**

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
SUBCOMMITTEE ON TACTICAL AIR AND LAND FORCES,
Washington, DC, Wednesday, May 1, 2019.

The subcommittee met, pursuant to call, at 2:37 p.m., in room 2118, Rayburn House Office Building, Hon. Donald Norcross (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. DONALD NORCROSS, A REPRESENTATIVE FROM NEW JERSEY, CHAIRMAN, SUBCOMMITTEE ON TACTICAL AIR AND LAND FORCES

Mr. NORCROSS. The hearing will come to order. The Tactical Air and Land Forces Subcommittee meets today to review the Department of the Army's modernization programs for the fiscal 2020 budget request.

The Army has made significant changes, and that is an understatement, and some very tough choices with regards to the 2020 request to fund future capabilities without asking for an increase to their budget top line.

Our subcommittee intends to examine the rationale behind each choice with the senior Army leaders that we have with us today.

I would like to welcome our distinguished panel of witnesses.

Dr. Bruce Jette, Assistant Secretary of the Army for Acquisition and Logistics and Technology.

General John Murray, Commanding General, Army Futures Command.

And I would like to thank both of you for meeting us up at Pica-tinny and spending the day with us, very informative and very helpful.

Also joining us is Lieutenant General James Pasquarette, Deputy Chief of Staff of the Army, G-8, and Mr. Jon Ludwigson, Director of Contracts and National Security Acquisitions, Government Accountability Office [GAO].

Thank you for joining us today.

I know we are all looking forward to your testimony and this is something that has been very much on top of everybody's mind because of the scrubbing that the Army has done over the course of the last year.

The subcommittee will review a broad portfolio of Army ground, aviation, ammunition, and air and missile defense, and soldier individual equipment programs.

The Army's fiscal 2020 modernization request, research and development acquisition programs, totals \$34 billion, essentially in

line with last year's enacted amount. Though the Army's modernization top line did not change, the programs funded under these accounts certainly did. The subcommittee wants to learn about these changes, the reasoning behind it, and the associated risk that was taken or improved.

To fund the future modernization priorities, the Army leadership conducted a yearlong examination of all research and development procurement programs, weighing the cost and benefits of each against the Army's current needs and with the anticipated future threats in support of the new National Defense Strategy.

Some 180 programs were deemed less relevant, that is certainly a relative term, to our strategy and were not as capable as a replacement, therefore not worth the expense. They were cut from the fiscal 2020 request.

One of the subcommittee goals today is to better understand the context, the analysis behind those decisions.

One significant program reduction involves an upgrade to the CH-47F Chinook helicopter. Despite having invested significant funds to develop the Block 2 aircraft with greater lift, increased range capabilities, the Army deferred the program indefinitely, using the assumption that the aviation community would absorb the risk to the heavy-lift mission, and the industrial base will somehow weather this loss.

The subcommittee expects to hear more about the Army—how you reached these conclusions and how the service intends to manage this risk going forward.

Army modernization has had a rocky road. The Army leaders with us today are familiar with that and the history and are committed to a new way of planning and managing modernization. Most important, the Army leaders have [reorganized] for the future, standing up the Army Futures Command, General Murray's new command, and creating of the cross-functional teams to identify and develop solutions to serve the top six modernization priorities.

They are long-range precision fire; next-generation combat vehicles; future vertical lift; Army network; air and missile defense; and soldier legality—lethality, excuse me.

The committee expects to hear how the fiscal 2020 request will address these modernization priorities and align acquisition with the National Defense Strategy. We also want to know what will be different this time, and we have had this conversation so many times we have gone through this and somehow expecting that we change. Many are describing that this feels different, and certainly we want to make sure that, A, it is sustainable and it is working the way that it is designed.

What new processes or internal oversight will ensure that the Army gets its money's worth in this wide-reaching modernization endeavor? We are interested in the distribution of responsibility, the authority, as well as the relationship of Dr. Jette's organization, ASA(ALT) [Assistant Secretary of the Army (Acquisition, Logistics and Technology)] and the Army's Future Command and the Army staff, how will these three organizations work together and prioritize and come out with one correct decision.

Given congressional and DOD [Department of Defense] interest in improved acquisition, the Army has enthusiastically embraced rapid prototyping authorities granted by Congress to speed innovation and shorten development cycles for those key technologies.

While the subcommittee supports the use of the so-called transfer authorities and other transaction authority, we also want to be sure that these rapid prototyping approaches are used in the spirit of good acquisition processes and practices that yield real measurable results.

Buying too many of the same design prototype while in the test and evaluation phase might not be the best use of taxpayers' money. The committee will conduct oversight in these areas to assure that prototype-related funding is programmed and spent in a reasonable manner.

And of course GAO has extensive knowledge of the Army acquisition, past and present, and understands those challenges.

The subcommittee is interested in the GAO assessment of the Army Futures Command which is in your packet. And it is all driving the innovation and the relationship to the rest of the Army acquisition community.

We look forward to your testimony to discuss these topics.

Before we begin I would like to turn to the ranking member, the distinguished lady from Missouri who we had a chance to be in her district a couple of weeks ago and looking forward to your comments.

Mrs. Hartzler.

[The prepared statement of Mr. Norcross can be found in the Appendix on page 41.]

STATEMENT OF HON. VICKY HARTZLER, A REPRESENTATIVE FROM MISSOURI, RANKING MEMBER, SUBCOMMITTEE ON TACTICAL AIR AND LAND FORCES

Mrs. HARTZLER. Thank you, Mr. Chairman, and we look forward to you coming back, so we can go to Fort Leonard Wood as well and see that very important Army installation.

But thank you so much all for being here and to provide us testimony in the Army modernization efforts in the fiscal year 2020 budget request.

The National Defense Strategy directs our military to prepare for the return of the great power competition with strategic near-peer, and I would say equal-peer almost, competitors like Russia and China.

The Secretary of the Army has noted that this budget request represents an inflection point for the Army. And in order to meet these National Defense Strategy objectives the Army needs to rapidly modernize now.

Overall, it appears that the Army's modernization request continues to build on the progress made in the previous two budgets in rebuilding readiness and modernization. This is important because Army modernization funding declined by well over 50 percent from 2008 through 2016 as a result of the drawdown from two wars and the imposition of the budget caps by the Budget Control Act.

Most of this impact was seen in the later stages of the R&D [research and development] accounts such as prototyping and system

development stages, which are the precursors to fielding new capabilities. So I am pleased that this budget request continues to request needed growth in modernization.

The Army's modernization request includes \$12.2 billion in research, development, test, and evaluation funding, and \$21.8 billion in procurement which will begin to address the Army's identified top six modernization priorities which the chairman listed.

In building this year's budget request, I understand senior Army leadership reviewed and scrutinized every program to determine which ones supported the National Defense Strategy, and which programs could be reduced or cancelled so that savings could be re-invested into the Army's "big six," quote, priorities.

Obviously, tough choices had to be made and while we might not agree with every decision the Army made, we can commend the Army for making these tough decisions in order to prioritize limited investment funding for the future fight and effectively begin to operationalize the National Defense Strategy.

I would like our witnesses today to provide additional details on this process and help us understand how you are managing strategic risk as a result of these decisions, to include operationally as well as impacts to the industrial base.

Since we met last year to review the Army's modernization request, the Army's Future Command has reached initial operational capability, congratulations, and is well underway in developing modernization requirements to meet these future threats.

We expect witnesses today to provide an update on how the Futures Command has begun to improve the acquisition and modernization process.

To support this effort, I understand the Army has also established eight cross-functional teams [CFTs] that align with the Army's modernization priorities. These CFTs are pursuing 31 separate lines of effort with over \$8.8 billion total requested for these efforts in the budget. I expect our witnesses today to provide updates on these efforts.

Given this focus on next-generation capabilities, I would like our witnesses today to discuss how the Army is balancing investments and capabilities for the future fight while at the same time upgrading legacy platforms for current threats.

Finally, I want to stress the importance of having a defense top line that represents real growth. We cannot afford to go backwards. And the level of funding in this budget request is the minimum required to continue repairing our military.

So I thank the chairman for organizing this important hearing, and I yield back the balance of my time.

Mr. NORCROSS. Thank you, Mrs. Hartzler.

I understand each of the witnesses will provide both the [off mic], starting with Dr. Jette, followed by General Murray and ended with Lieutenant General Pasquarette. And then Mr. Ludwigson will provide a perspective from the GAO that everybody is looking forward to.

And without objection each of the witness prepared statements will be included in the record. Hearing none, so ordered.

So Dr. Jette, you can lead off and share with us something we have been looking forward to, how the midnight scrub reallocated

much of what we do. And on our platter there are 300 requests from fellow members to make those adjustments a little bit different. So we have before us quite a challenge and we want to make sure we hear the rationale, the risk, and where we are going.

STATEMENT OF HON. BRUCE D. JETTE, ASSISTANT SECRETARY OF THE ARMY FOR ACQUISITION, LOGISTICS AND TECHNOLOGY, DEPARTMENT OF THE ARMY

Secretary JETTE. Chairman Norcross, Ranking Member Hartzler, and distinguished members of the Subcommittee on Tactical Air and Land Forces, good afternoon.

Thank you for the opportunity to appear before you today to discuss the Army's modernization priorities and the resources we have requested for the fiscal year 2020 President's budget.

Before I begin, on behalf of the Army family I would like to extend our deepest sympathies on the passing of Congresswoman Ellen Tauscher. She had a very distinguished career as a public servant and was a true friend and supporter of the Army. We share the sadness of your loss.

For nearly two decades, the Army has deferred high-intensity combat capability modernization in order to support continuous low- to medium-intensity operations while the global security environment has grown more competitive and volatile.

Army senior leaders identified our budget, organization, acquisition, and talent management as central to ensuring unquestionable superiority. In all of these, one primary objective guided us: Make soldiers and units more capable and lethal to deter conflict or win decisively if necessary.

The fiscal year 2020 budget request before you is the first budget in decades to fully fund the modernization priorities. Through a series of introspective assessments of existing programs as they contribute to our primary objective, we eliminated, reduced, or consolidated nearly 200 programs, reallocating the funding to more essential modernization priorities rather than asking Congress for additional funding.

The Army leadership recognized the need for fundamental change to better employ those resources, a revitalized future force modernization enterprise was necessary.

Last year, the Army made its most significant organization restructuring in over 40 years by establishing the Army Futures Command. As a result, one commander is driving support for the NDS [National Defense Strategy] through concept development, experimentation, modeling, simulation, organizational design, requirements determination, and material solution validation.

Through the cross-functional teams, AFC [Army Futures Command] remains laser-focused on the six modernization priorities. The Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology retains management and control over all aspects of material development and procurement.

However, the establishment of AFC affords an opportunity to create a more collaborative working environment between the CFTs and the program executive offices [PEOs]. Each CFT has a PEO. The 30 signature systems of the CFT each have a program manager.

Of greatest value is the collaboration. AFC and the CFT participate in deliberation over acquisition strategies. Equally the acquisition community contributes to the operational requirements through a development process. Yet each retain their responsibilities.

While retaining management control of funding at the ASA(ALT) level, Army Science and Technology Funding 6.1 through 6.3 is managed for execution by AFC, to which the Army Organic Technology Base is assigned, Army Research Office, Army Research Laboratory, Combat Capabilities and Development Directorate Command.

As the Army Chief Scientist, I am personally involved in the technology strategies and planning. Advanced Component Development and Prototyping 6.4 dollars remain managed by the PEOs and PMs [project managers], but with the objective of fulfilling AFC experimentation, modeling and simulation, and prototyping, in order to facilitate a more seamless transition to programs of record.

The Army continues to responsibly implement acquisition initiatives that Congress authorized such as Section 804 Middle Tier Acquisition and other transaction authorities.

We established an intellectual property policy that protects the equities of both the government and private industry to encourage inventive and innovative companies to work with the Army. We have a draft transition to sustainment policy with execution plan, currently under test, to better manage resources and are working on a transition to divestiture for obsolete equipment.

Our advanced manufacturing policy will help reduce part stockages and time to repair and we believe the size of the sustainment tail in general. And with the complexities of the emerging battlefield, ASA(ALT) has drafted a revised talent management program for acquisition professionals that, particularly in the case of officers, stretches back to ROTC [Reserve Officers' Training Corps] and West Point.

Thank you again for this opportunity to discuss the Army's modernization priorities and for your strong support of the Army's programs. I look forward to your questions.

[The joint prepared statement of Secretary Jette, General Murray, and General Pasquaretti can be found in the Appendix on page 44.]

Mr. NORCROSS. Thank you.
General Murray.

**STATEMENT OF GEN JOHN M. MURRAY, USA, COMMANDER,
ARMY FUTURES COMMAND, DEPARTMENT OF THE ARMY**

General MURRAY. Thank you, Mr. Chairman.

Chairman Norcross, Ranking Member Hartzler, distinguished members of the Tactical Air and Land Forces Subcommittee, thank you for the opportunity to appear before you today and thank you for your long-time, steadfast support and demonstrated commitment to our soldiers, our civilians, and their families.

And Ranking Member Hartzler, the United States Army is indeed at a strategic inflection point. Both Russia and China have begun a very aggressive modernization program for their armies.

Up until this point and really the last couple of years the United States Army has not and we are in danger of falling behind.

The Army established Army Futures Command to provide unity of effort and to make sure that the Army becomes a continually modernizing organization. The key is unified and integrated approach to develop and deliver operational concepts, future force designs, and material solutions to support those concepts.

The Army Futures Command has postured the Army for the future by setting strategic direction, integrating the Future Force Modernization Enterprise, aligning resources to Army priorities, and maintaining accountability. In doing so, Army Futures Command works hand in hand with the Assistant Secretary of the Army (Acquisition, Logistics and Technology) Dr. Jette and the Army G-8 led by Lieutenant General Jim Pasquarette.

The Army's new concept, Multi-Domain Operations 2028, is the foundation for the Army's modernization plan. This concept articulates how the Army as part of the joint force and with our allies will compete with and if necessary defeat near-peer adversaries as directed in the National Defense Strategy.

The Army's next modernization strategy will be published this summer. It will describe how the Army will continually modernize, become a multi-domain capable force by 2028 and a multi-domain ready force by 2035.

As mentioned, Army Futures Command has eight cross-functional teams that are powerful tools for modernization. These teams directly align with the Army's modernization priorities, and initiatives that they oversee are the critical first steps of the Army modernization.

Each team is led by a general officer or senior executive and directly partnered with both the program manager and the program executive officer, and this team brings together all the relevant communities to work together from the earliest stages of the process, from requirements to science and technology, testing and evaluation, costing, resourcing, contracting and logistics, so we have the opportunity to get it right from the beginning.

We are already seeing results of these efforts; the new enhanced night-vision goggle binocular with a requirements document about 12 months ago will be fielded to Army formation this fall and deployed to the Republic of Korea.

Additionally, mobile short-range air defense requirements document about 2 years ago is on track for initial fielding in fiscal year 2020.

I am absolutely confident that our Army will have the concepts, capabilities, and organizational structures that it needs to fulfill our mission on the nation's behalf.

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

Mr. NORCROSS. Thank you.

General Pasquarette.

STATEMENT OF LTG JAMES F. PASQUARETTE, USA, DEPUTY CHIEF OF STAFF, ARMY (PROGRAMS), DEPARTMENT OF THE ARMY

General PASQUARETTE. Thank you, Mr. Chairman.

Chairman Norcross, Ranking Member Hartzler, distinguished members of this subcommittee, thank you for the opportunity to speak about the fiscal year 2020 Army modernization budget.

You will find no daylight between the National Defense Strategy and the areas we are investing in to ensure the U.S. Army maintains land force dominance in the future versus near-peer competitors.

This year's budget request is driven by the Army strategy and if fully funded will enable the Army to meet its modernization priority objectives by 2028 in support of the NDS.

In building the fiscal year 2020 budget the Secretary of the Army and Chief of Staff recognize that future defense budgets would likely remain relatively flat or potentially decline, so rather than asking for additional resources, they chose to reprioritize resources from within the Army's projected top-line to pay for near-term readiness and next-generation modernization.

As mentioned, the Army leadership personally reviewed over 500 programs. Those that did not directly contribute to lethality or assessed as ineffective against near-peer threats in the envisioned future operational environment became a funding source.

In the end this process and the implementation of aggressive reforms and efficiencies resulted in the reprioritization of over \$30 billion across the fiscal year 2020 FYDP [Future Years Defense Program] in favor of modernization priorities.

These decisions while not easy were necessary to put the Army on an azimuth to maintain land dominance, given the acknowledged return of great power competition with Russia and China.

Let me close by saying that the realization of our modernization objectives is highly dependent on what is in the fiscal year 2020 budget request by the Army. The investments in this budget request complement and reinforce what was jump-started in the fiscal year 2018 and 2019 budgets of which we thank Congress for their great support.

Finally, with continued predictable, adequate, timely, and sustained funding, the U.S. Army will continue to be the best equipped land force the world has ever known.

I sincerely appreciate your time today and I look forward to your questions. Thank you.

Mr. NORCROSS. Thank you.

Mr. Ludwigson.

STATEMENT OF JON R. LUDWIGSON, ACTING DIRECTOR, CONTRACTING AND NATIONAL SECURITY ACQUISITIONS, GOVERNMENT ACCOUNTABILITY OFFICE

Mr. LUDWIGSON. Chairman Norcross, Ranking Member Hartzler, and members of this subcommittee, I am pleased to be here today to discuss the Army's modernization.

I will summarize my written statement which draws upon three prior modernization-related reports. My statement today will provide observations on three broad topics.

First, the organizational changes occurring with modernization; second, some positive aspects of modernization we have seen; and third, some steps the Army should take while modernizing.

Regarding the organizational change. As a part of modernization, the Army is substantially restructuring, including the creation of the new four-star Army Futures Command which seeks to integrate and connect the forward-looking components of Army. This restructuring also aims to improve how requirements are developed, something GAO and others have identified as part of the problem with past failed modernization efforts.

Despite these steps, Army modernization remains very much in process. While Futures Command has begun operating, it is not expected to be fully operational until this summer, and efforts aimed at modernizing the Army's capabilities are considerable and could take a decade or longer to be realized.

While modernization is just starting, I would like to highlight three positive aspects. First, we have seen a strong organizational commitment to modernization across senior levels of Army and Futures Command. And the Army has begun to follow relevant leading practices for organizational change we have identified.

Also, we see the establishment of cross-functional teams as offering the promise of improving modernization efforts. These teams are intended to guide progress towards the Army's six modernization priorities while pulling in new ideas from industry and academia, identifying opportunities to experiment and prototype, and identifying opportunities to improve the acquisition process.

These teams bring together stakeholders with diverse expertise including requirements, contracting, cost analysis, and the potential users of these weapon systems. These teams bring together stakeholders earlier than the traditional process where stakeholders provided their input sequentially and later. These teams have also generally followed relevant leading practices we had identified.

Finally, we see Army taking steps to realign research and development investments with its modernization priorities. Identifying and maturing technologies to address capability needs takes time, and ensuring that these efforts are directed at modernization efforts early is important.

I would like to mention four changes the Army should consider as it modernizes. First, the Army and Futures Command could do more to broaden the organizational commitment to restructuring by more clearly seeking to leverage the strengths and experiences of existing organizations, and formalizing coordination with organizations who do not directly report to Futures Command but are instrumental to the success of the modernization enterprise.

For example, Futures Command had not yet recently—until recently finalized details of how it will work with the civilian acquisition authority and I think it is still working through some of those issues.

Second, the Army should improve the transparency of its near-term modernization efforts as we recommended in 2018 by establishing a plan for evaluating how near-term modernization investments contribute to its modernization goal, and finalizing its estimate of near-term investments and providing all of those estimates to Congress.

Third, the Army should ensure that it has enough key personnel to support the work of modernization, as we recommended in 2017.

At that time, we reported the Army had declining levels of acquisition personnel who helped develop requirements. With the expected increased pace of modernization, the Army should evaluate whether they have enough of these key personnel.

Finally, the Army should commit to using mature technologies in new weapons systems as we recommended earlier this year. Past failed modernization efforts have left the Army with equipment in need of an update. Developing new weapons systems using mature technologies would lower the risks associated with updating its capabilities compared with its past practice of developing these integrated weapon systems while maturing the underlying technologies.

In conclusion, the Army has taken promising early steps to address some of the reasons it has struggled with past modernization efforts, but it could do more. GAO stands ready to help Congress as they oversee these important efforts.

Chairman Norcross, Ranking Member Hartzler, this concludes my statement. I would be happy to answer any questions the subcommittee members may have.

[The prepared statement of Mr. Ludwigson can be found in the Appendix on page 56.]

Mr. NORCROSS. Thank you. And certainly for the report which went to each of the offices dated January 2019, so there are some very positive things in there, but there are certainly some challenges, still very new and you pointed that out.

So I am going to start out, I will just go with two general questions, the first one more aspirational on how the design and the way it was supposed to work, and the way we think it is working now.

Hard scrub over the course of last year, what fits into our new priorities?

So first question is when the programs were reviewed, you were measuring against the six priorities that we set forth. Risk is assessed across the board. Are you using the same risk assessment for each of the programs, or does that risk change based on the program as you move forward?

So General Murray, let us start with you and then Dr. Jette.

General MURRAY. Thank you, Mr. Chairman. And I would actually start the process a little bit earlier. So that the risk has to start to be assessed against what the Army has been told to do in the National Defense Strategy and that the concept that we have come up with to allow the Army to fight and win on the future battlefield.

So that is, when we looked at, and both Dr. Jette and I were part of the process a year ago, or a year and a half ago, the process that you are talking about.

The senior leaders—and you have heard this number before—for up to 60-plus hours over the course of probably 2 months, so it wasn't for 60 straight hours obviously. And probably—and I was the G-8 at that time and most of the staff was mine. But between the 6- to 800 hours of analysis that went in to prepare for those 60 hours, each system was looked at with a common lens, is does this contribute to how the Army will fight in 2028 to 2035. And if

the answer was no, it will not contribute, that was kind of an easy place to look for resources.

Mr. NORCROSS. But that is only one-half of the equation. The other ask is what risk are we assuming?

General MURRAY. I am getting there, sir. So obviously there is risk to the industrial base. And I am going to allow Dr. Jette to talk about that. My role was primarily to look at it from an operational risk, and there is risk; if, you know, are you going to be able to maintain that piece of equipment because it is not like you just divested something and automatically produce something out of the air to replace it. So how much risk are you assuming with a legacy piece of equipment while we get new equipment in place.

That was looked at and the 31, I think you said, efforts that the cross-functional teams are looking at, those were the key capabilities to allow us to fight and win on a future battlefield fiscal year 2028 along with the organizational structure. And so when you look at it with that lens, what is most important for the United States Army to protect this nation, that was the operational lens we looked at it from.

Secretary JETTE. Mr. Chairman, as General Murray said, the acquisition side was considered at the same time that the operational side was considered. So the first place that was confirmed was the value to the operational forces. Once that was made, then we took a look at the impact to programmatic and the impact to the industrial base.

So for example, if a technology currently existed and we looked at it from a programmatic basis, could we end the contract, could we reduce the contract? What were the impact of doing either of those steps have on the contract value, so that we were honest and upfront about what type of harvesting might be made in the budget out-years.

So we didn't want to go into this and assume that something may be \$10 million, we are going to cancel it and we are going to get \$10 million back when in fact we had obligations that maybe \$8 million of it, so you are only going to harvest two. And that may be worth the risk and it may not and those type of things were considered.

A second piece of consideration that was done in each of these was to take a look at the risk of terminating or curtailing a program to the continued sustainment of the existing program. So as you know, in many cases, we have large quantities of equipment. If I terminate a continuing upgrade to a particular set of equipment, now I have to change from an upgrade strategy being able to compensate for my sustainment aging, I now have to be able to adjust to just a sustainment mode.

And we took a look at that, again, in the same light, what is affordability and what is the industrial base going to be able to sustain. And then we did take a look at the industrial base and the risks there on both sides. So the first side would be were we losing an industrial base, would we have a risk that we may be putting out, vendors may not be able to survive after a period of time, what would we do for those parts. Conversely, did we believe that the industrial base would be able to grow in the new venture, whatever that might be that we are producing.

Mr. NORCROSS. So who put together the impact to the industrial base, those procurement definitions of minimum sustaining rate, who actually puts that together in what timeframe?

Secretary JETTE. So there are two questions there and I just want to make sure that I answer them correctly, sir. In the case of taking a look at the industrial base, the acquisition community, I have a large staff, we put together our assessments of where we thought things were. I have a Deputy Assistant Secretary of the Army that does—

Mr. NORCROSS. Is that in conjunction with industry or outside of it?

Secretary JETTE. The initial assessment is always done internally so that we have a pretty flat view of what we think is out there. That way, we don't necessarily run into industry's interest in a particular direction. We want to make sure that we know what we think is right.

Then we will talk to industry and we do. I meet with the Secretary as a continuing program every Monday evening, most every Monday evening we will meet with an industry CEO [chief executive officer] and president. We discuss these things with them and then my door is always open, I have a lot of people who come through it.

Mr. NORCROSS. Probably an understatement on going through. So we have literally spent tens of billions on modernizing the Army, critical to both Army and DOD that are we getting the return on our investment and that can be measured in several ways. So the question, is the Army assessing its return on modernizations? It is very new, is it working as you originally designed it and expected, and to layer on top of that, the relationships between general and the doctor is different now, is that working? Is that relationship, do we need to define it any better? So those are two questions.

General MURRAY. Yes, sir. So as you mentioned, and I would like to describe Army Futures Command as a startup trying to manage a merger right now, so it is very new. And I would say that it is working, because we are showing some early success with what the cross-functional teams are working on. I mentioned some of that just from my opening statements.

Another example would be historically, if you look back over time, it was taking the Army 3–5 years just to get a requirement approved in the first place before it even went over to acquisition. We are averaging 3–5 months and that is a significant reduction in the time it is taking to get requirements approved.

Mr. McCarthy and General McConville started a lot of this for us and we are carrying on that process to make sure that we are moving at the speed of relevance to get capability to our soldiers. Dr. Jette and I had a good relationship before the G–8 and the ASA(ALT), the Acquisition, Logistics and Technology Assistant Secretary, have a relationship. I used to spend at least one day a week in his office and we could compare notes. And I would just say and I think he would agree that the relationship is only getting better and will continue to get better in terms of how we approach this.

And I think the key thing there is we both have the common end state, of making sure—and it is not today's soldiers, that future soldiers have what they need to fight and win on a future battlefield.

Secretary JETTE. If I may, sir.

Mr. NORCROSS. Is it defined as well as you would like to see it?

Secretary JETTE. Sir, I think I mentioned in our visit up at Pica-tinny, when you have such a change, you have storming, forming, and norming, and I think a reasonable description of where we are, we are past the storming, there are no hurricanes anymore, we still have a tornado roll by every so often. We discover some conflict between the two organizations and how we do business and General Murray and I then get together and try to resolve that. And so far, we have been very successful.

As we do that, we are beginning to codify those relationships and different methodologies. For example, the PMs and PEOs that are linked together weren't sure of exactly how that was going to work, and it is taking a bit of a cultural difference.

In the past, as I mentioned, there was—you did requirements, you did the acquisition, and that is how we met, but now literally they come together to work through those things, and so the acquisition people have the authority to sit there and say, Listen, that is great, but that is not achievable on that timeframe. Or you could achieve this if you just asked for it.

Conversely, the requirements side of things can say, Well, why can't we do this and how come you are holding up the acquisition process that way when couldn't we try something else? So we are trying to find even more aggressive methods of working more closely together as opposed to against each other.

Mr. NORCROSS. I know my colleagues want to ask some questions, I just before I turn it over, so I want to look at the Block 2, the Chinook as an example. I got into it a little bit more and we are going to get into the weeds when we start making those assessments of risk.

So it is as proposed indefinitely put off for that. So we were out in Phoenix 2 weeks ago and learned that the decision to cancel this, the upgrades, was made without input from the contractor which is what you explained to me that you do. Is that phase one, it is your staff that comes up with that, but then you would go after that to industry.

So on the CH-47F, the assessment was made and the minimum requirements to keep a line going is something that your office put out first. If there is a difference, significant, between what your assessment is and what industry who is on the floor, how is that rectified or addressed?

Secretary JETTE. So let me make sure I just clarify one detail, sir. The quantities, actually quantities that we want for a given year are not defined by the acquisition community but the requirements, so General Murray would bring that in.

Mr. NORCROSS. But this is an order to keep.

Secretary JETTE. Yes, sir.

Mr. NORCROSS. Whatever the program is, the minimum sustaining rate which is what you publish.

Secretary JETTE. Yes, sir. So the minimum sustaining rate is arrived at by discussing that with the contractor. It is an open dis-

cussion. We don't always agree on what we believe the number should be, and I am not sure we are done with fully understanding that in the case of the Chinook. At the same time, we are looking at—so when we say we are not doing the F model, it is not that we are not doing any Block 2, we are doing Block 2 for the G model which is basically an F model converted to the special ops community.

Mr. NORCROSS. Right.

Secretary JETTE. And so we add those into the mix over a period of time.

Mr. NORCROSS. That is eight a year I believe?

Secretary JETTE. Six, sir.

Mr. NORCROSS. Six.

Secretary JETTE. And then on top of that, we have been supportive of FMS, foreign military sales, and there are a number of them that fill those.

We are looking at other potential opportunities to bring partners into the mix to help us with some of the quantities right now. And I think the Secretary made it clear that in his discussions that this is a halt, it is a halt to try and find out where we need to go with respect to a true future technology for heavy future vertical lift. That doesn't necessarily exclude the 47, the 47 Block 2, or an alternative variant along. It is just a statement to slow down, stop, let us make reassessments and make sure that we are spending the taxpayer's dollars appropriately to meet the vertical lead—heavy lift needs.

Mr. NORCROSS. And the reason I am going into this is that if you arrive at it separately or individual, but they are close. On this one, they are saying you need 24 a year minimum to keep the line open, so if that is part of your risk assessment and it is radically different, that would potentially change the outcome of that decision making. So I am going to move on, but that is one of the areas that if you are using that tool and we have that big of a discrepancy and this just happens to be this one, what is the correction factor, how do we go after it?

But we will talk about that later on.

Mrs. Hartzler.

Mrs. HARTZLER. Yes. Thank you. Thank you, Mr. Chairman.

And I think it really is refreshing what you have done already. I mean it is very impressive that Army leadership personally reviewed over 500 programs, weighing the benefits and looking into the future. I like what you said, General, that it is a startup trying to manage a merger. I think that is pretty good.

And the example of how you have already been able to reduce from 3–5 years to 3–5 months some of the requirements, I mean that is impressive. So this is a great example of probably what we need to do all over government, is stop and look before we move forward.

I did want to give you, first of all, General Murray and Dr. Jette, an opportunity to address some of the concerns laid out by Mr. Ludwigson, the GAO, and they did give you a lot of positives of things they are seeing that they feel good about, but there was four areas he mentioned.

So regarding to the amount of personnel, do you have enough that you need, transparency on how you evaluate the modernization efforts, I think maybe that was some of the discussion we just had, and technologies, ways to reduce risk, to ensure that they are fully mature. So anything you would like to respond to those concerns that were laid out?

General MURRAY. Thank you, ma'am. And I obviously have seen all of those GAO reports. And I was on the chopping line either as a G-8 or the Army Futures Command. And the Army, I believe, went back and concurred with every one of those recommendations.

And I personally concur with every one of those recommendations. I think the first one, that ongoing relationship between the outside organization, ASA(ALT) is one of them, there are other organizations within OSD [Office of the Secretary of Defense] and within academia and within commercial industry that those relationships are being built and also within key universities throughout the country.

So for artificial intelligence, we have established a presence at Carnegie Mellon University to begin to learn how to incorporate artificial intelligence into the way forward. Obviously some key universities in Texas, we have some presence and some partnerships. And so those are ongoing. So I believe that those things kind of take time, but we are in the process of establishing some non-traditional relationships, if you will, to include some innovation all around the country.

In the plan to determine the value of the investments against the end state is where I kind of took that. I think you have to look at the timing of the report. It was prior to this budget and as Dr. Jette mentioned, this is the first budget we have presented to the Hill that I think clearly lays out where our priorities are in terms of modernization.

I know there is also a question about investments in legacy programs and how they contribute and I think we continue to work to define very analytically how our investments are aligned against that end state that I talked about earlier.

The people, then I think—you know, the requirements community is a pretty broad community and I think that is where the comment mostly was on the requirements and its systems engineers and operational research systems and analysis, our ORSA population.

Just last Friday, I had all of my requirements people come to Austin and we sat down and talked about their needs and there is an element that is under strength throughout the requirements community and has been probably since budgets were pretty lean at the sequester year and during the 2016, 2017, 2018 timeframe. And so we are taking a holistic look at what is required for the requirements community, trying to capitalize on the lessons of the CFTs which is also highlighted.

And then on mature tech, I obviously am a huge fan of mature tech before you move to the program of record, but I think it can't be a one size fits all. I think you've got to take it on a case-by-case basis. Going back to risk, you've got to kind of look at the risk of letting that technology mature. But we definitely do not want to go back to betting on some very immature technologies and baking

programs around those immature technologies which has gotten us in trouble in the past.

Mrs. HARTZLER. Sure. And getting those stakeholders including the users involved in developing the requirement is really important.

I wanted to talk about a little bit the lessons learned and best practices that Army Futures Command has been able to identify to date and planning that incorporates as you march toward full operational capability this year, that includes examples of working with small business. Can you kind of talk about that a little bit, what you are doing with small businesses?

General MURRAY. Yes, ma'am. So a couple of instances. One would be Army Applications Lab which is also located in Austin, Texas. And if you are familiar with the Defense Innovation Unit, it is not a carbon copy of it, but it is focused on outreach to small businesses and innovation throughout the—one of the things that I think is very promising that, just as an example, that we discovered through Army Applications Lab is the opportunity to inject virtual reality training into our basic pilot training.

The Air Force has done this and they are a little bit ahead of the Army, but we are going to stand up a pilot at Fort Rucker this summer and we believe that we can significantly reduce the amount of actual flight hours with no degradation in the training. And when you reduce flight hours, you have the potential to probably every class saving tens of millions of dollars in terms of sustainment of aircraft, those hours you are not actually flying.

Mrs. HARTZLER. That is amazing. Dr. Jette and General Pasquarette, the next-generation squad weapon program is requiring a new caliber to be used in these weapons, a 6.8 millimeter round. I understand that the ammunition is going to be produced at Lake City Army Ammunition Plant. Could you update us on this effort, and do you require any additional funding in fiscal year 2020 for additional tooling or modernized equipment at Lake City, which is near my district. Many of my constituents work there and we are very proud of the mission there.

General PASQUARETTE. Well, I would talk, ma'am—thanks. I would talk in a broad sense on any of our efforts that General Murray is shepherding as the AFC commander to include next-gen squad weapon, when the requirements have been identified and validated, we have fully funded it in this program to include in fiscal year 2020.

So there are near-term adjustments that are out there with—that I believe as this—and I have to check on this, but it might be with this system we are talking about here, but those were new—that is new information since we submitted this program and budget down to OSD, so that is why there might be minor adjustments. But programmatically, it is fully funded based on the requirements that we know today.

Mrs. HARTZLER. Dr. Jette.

Secretary JETTE. So you are right. The new round is going to be a different size and shape. We haven't confirmed exactly which, the shape, what the final shape will be because we still have a competition for the weapon to move forward and we have a common round between the two weapons, the automatic and the rifle.

We then will have to go back in and review the development of the hardware that is necessary to produce the rounds specifically, but at this point I don't believe that we see any additional funding that is necessary in the 2020 budget in order to accommodate that for production.

Mrs. HARTZLER. Great, thank you. Dr. Jette and General Murray, if United States withdraws from the INF [Intermediate-Range Nuclear Forces] Treaty in August in response to ongoing Russian violations, does the Army intend to remove the previously imposed range restriction for long-range precision fires that complied with the treaty?

General MURRAY. And, ma'am, if I could just go back to your last question? There was a 2019 mark against the rifle that causes a quarter slip if it is not restored. I think that was what the request was. And yes, ma'am, we are looking at that.

Obviously, the treaty is still in place until August when the 6-month period runs out for, I guess, to change your mind. But within specifically the Precision Strike Missile [PRSM] which is the ATACM [Army Tactical Missile System] replacement, ATACM 350, right now, we say PRSM is 499.9 [km maximum range] to stay within the INF Treaty. We are already planning future upgrades to get well beyond 500 if the treaty is not in place.

Mrs. HARTZLER. Great, thank you. I have more, but I will wait for the second round.

I yield back. Thank you.

Mr. NORCROSS. Thank you.

Mr. Carbajal.

Mr. CARBAJAL. Thank you, Mr. Chair. And thank you to all of you for being here today. General Pasqualette, the Army has emphasized the necessity to invest sufficient funding into its modernization priorities. In your written statement, you mentioned that the Army has protected key legacy systems.

Just trying to get some insight as to how that process ensued, how did the Army determine which programs to protect?

Two, what was the analysis that supported this election of these systems?

And three, who were the Army leaders and program representatives involved in those discussions and decisions?

General PASQUALETTE. Well, it was some of it we have talked a little bit, sir, but I will recount a little bit of it and then a little more detail. The analysis was conducted, it was kicked off by our analytical agencies back when Russia actually, the intervention in Crimea had us take a hard look at what our requirements to deal with Russia, that was our first wake-up call as we were trying to, still committed fairly heavily in Iraq and Afghanistan.

But that was the leading analytical assessment by our Center for Army Analysis and TRAC [U.S. Army Training and Doctrine Command Analysis Center] and others. That informed eventually what was produced in the NDS and identified our capability requirements we need that General Murray is leading, the six modernization priorities, but also looked at our near-term gaps based on OP [operations] plans of our legacy systems that we needed to invest in today also.

That produced the need to upgrade our armored brigade combat teams as an example when we looked at requirements versus Russia. And what we have ended up doing and as a result of that is coming up with a strategy to modernize our armored brigade combat teams at a rate of 1 to 1.5 a year, and this program here is a result of that analysis.

So those are legacy systems that we have been on in one form or fashion for several decades that we will upgrade them incrementally to keep them as best, as good as they can be, in some ways integrated to what Futures Command will bring online over time and will replace. An example is the future ground combat vehicle, eventually we will replace the Bradley as an example.

So I think that is an example. Our Stryker fleet is another one that we are—we will have Strykers in our formation until at least 2035 and we are investing about \$750 million a year roughly in our Strykers across the FYDP to keep them as incrementally as good as they can be out for the next 15 or 20 years.

General MURRAY. And sir, I will just add—and General Pasquette makes a great point. But the reality is, we have to be ready to do both. We have to be able to be ready to fight tomorrow and we have to be ready to fight in the future.

And that is an element of the risk that when you look at—I mean do you upgrade a system or do you not upgrade a system, because there is not an endless pot of money and the Army is not asking for that.

We're going to have to make some financial decisions based upon the concepts that I talked about earlier that have been run through modeling and simulation to the point where we are confident that with multi-domain operations, with certain organizational structures, with the key things we are trying to pursue in modern systems, we can get to a win on the future battlefield.

And so it has been through extensive modeling and simulation, experimentation if you will, to determine that. The senior leaders, Dr. Jette was there.

I was there as the G-8; the Secretary of the Army was there; the Chief of Staff of the Army was there; the Vice Chief of Staff of the Army was there and the Under Secretary of the Army was there; the FORSCOM [U.S. Army Forces Command] four-star commander was there; the AMC, Army Materiel Command, four-star commander was there; the Training and Doctrine Command four-star commander was there; plus experts from Dr. Jette's side and experts from the requirements side to make sure that we stay grounded. But the decision making was really the corporate, the board of directors if you will for the United States Army.

Mr. CARBAJAL. Thank you very much.

Mr. Ludwigson, many Army leaders at various levels have stated that the service will now pursue incremental acquisitions that are "good enough" rather than exquisite solutions that solve all problems.

Does GAO support this path to capabilities development?

Mr. LUDWIGSON. Thank you, sir. I think that we are very positive as it relates to incremental acquisitions. I think that one of the pivots that is helpful is to shift from aspirational acquisitions to thinking agile. And the way to meet our recommendation as it related

to implementing with mature technologies is to recognize that you build now what you can and you invest for the future and you add what is available when it is available rather than building that into program of record and then if it doesn't work out, particularly if it is a critical technology, ending up not being able to deliver on time and on schedule.

Mr. CARBAJAL. Thank you.

Mr. Chair, I yield back.

Mr. NORCROSS. Thank you.

Mr. Cook.

Mr. COOK. Thank you, Mr. Chairman. I will apologize in advance for my cynicism. General Murray, thank you for your patience.

We talked about some of these—I am still trying to come to grips with the CH-47 Block 2 and we will probably have this conversation. I heard one of the comments about some of these things might take decades and I can't think in terms of that, not the way the Chinese and the Russians are modernizing, particularly the Chinese. We don't have decades.

And so I am probably very, very impatient. I think what you are doing I think is outstanding and I want to give you a compliment. A number of years ago, I was one of those ones who was beating the drum about the active protective, protection systems, and this and that. I got a lot of pushback and of course I used the Israeli scenario. And we got four brigades that have them right now.

What is the prognosis for the rest? Are we still looking to flesh that out or?

General MURRAY. The requirement is every combat vehicle has active protective system eventually. So we are exploring—Trophy is the system you are talking about, it is too heavy for our Bradleys and Strykers so we are right now in the process of proving out a different system. And then for the next-generation combat vehicle, the Bradley replacement, one of the threshold requirements is an integrated active protective system.

Mr. COOK. You know, I know the Dutch had something for their APCs [armored personnel carriers], I don't know whether they did, but as long as you are looking at other systems like that I'm very, very happy, and just the fact that, I guess, Iron Dome where you have that cross-pollination.

Are you also exploring some of those systems that I just mentioned?

General MURRAY. Yes, Iron Dome specifically, the air defense system, yes, sir. But I think it was the 2018 NDAA [National Defense Authorization Act] directed the Army to field two batteries by fiscal year 2020. There is an ATR [above threshold reprogramming] associated with it. It is not above threshold reprogramming, it is not additional dollars. We need to turn some RDT [research, development, test] dollars into procurement dollars; that is on the Hill right now. And if we can get kind consideration in a relatively timely fashion, we think we are on track to meet two batteries by 2020 and additional two batteries by 2023.

Mr. COOK. I think that would be great. Vertical lift, future vertical lift. These timelines on when do you fish or cut bait or how we are going to do this, we are talking about a lot of money and where we are going. Are we going to be fed in on that a little bit

so you can help us in terms of—because we are going to make recommendations in the budget and everything else and this is very, very important, so could you comment on that a little bit?

General MURRAY. Absolutely, sir. And as you know that there are two versions of future vertical lift we are working on right now, some call it CAP SET 1 [Capability Set 1], we are now calling it FARA, the Future Attack Reconnaissance Aircraft; and then FLRAA which is the Future Long Range Assault Aircraft.

Roughly speaking, the first one I talked about is a scout which we divested our scout aircraft based upon—

Mr. COOK. A more Kiowa—

General MURRAY. Yes, sir. Which is a critical gap we are seeing in the future fight, so that is our number one priority. And then the second one is really a medium-lift helicopter that would replace the Black Hawk which is very, very vulnerable.

Apaches will be in the fleet for a long time and then the CH-47 when we went through the analysis, it is the youngest fleet we have in terms of production and it met the operational requirements we were looking at. And I understand your position; my position is it meets the requirement we have in the near future.

But the two future vertical lift aircraft are the Army's priorities with the first one being FARA and the second one being FLRAA and we would be happy, and we spent a lot of time over here already both Dr. Jette's staff and mine, so the staffers fully understand where we are trying to go with those two aircraft.

Mr. COOK. Yes. And I appreciate that.

By the way, you didn't give me my gouge on acronyms. I won't say a word. Next time, please, a list so I can understand it, because it changes every committee. My time is running out.

The last thing, you know that I am going to keep banging the drum on the MICLIC [Mine Clearing Line Charge] about mines and everything else, and as I said over and over again, that was used by me in Vietnam. And I tell you, I am not 39, this is many, many years ago and we are still using that stuff and we still don't have it straight. So that is my big item.

Thank you, Mr. Chairman.

Mr. NORCROSS. Thank you.

Mr. Langevin.

Mr. LANGEVIN. Thank you, Mr. Chairman.

I want to thank our panel witnesses for your testimony and thank you for your service to the country.

Secretary Jette, I want to start with you if I could. The Army's Future Years Defense Plan looks to shift more than \$30 billion toward modernization, the bulk of which is under the purview of Army Futures Command. As you know, our enemies and adversaries have invested heavily in offsetting our advantages in a number of areas, particularly in the electromagnetic spectrum.

I want to know, how is the Army building EW [electronic warfare] resiliency in the modernization efforts to ensure that new platforms and systems will function in a contested environment?

Secretary JETTE. Thank you, sir, for the question, because it is one of my areas that I just find very, very important.

I helped develop some of the critical systems for the Army's electronic warfare when I was back in uniform. EW remains essential

to how we work on the battlefield. The bar keeps getting raised, and I think that we are working diligently and it is a very challenging area. But we are working diligently to try and contend with that raising of the bar.

How we can apply electronic energies to disrupting the opponent's electronic systems and how they can disrupt ours, it becomes more and more challenging as we go along. And so we have to have an offsetting strategy. There is the offensive capability and the defensive capability.

It used to be just simply a question of jamming and spoofing, and now what we are having to do is also assess each of these weapon systems for insertion; so it is a more sophisticated variant of spoofing by actually inserting things into the system and letting them run like a virus or to trick the systems.

To do that, we literally start all the way down at the chip level in some cases, we will actually buy chips for critical systems, open them up, look at them, look at the second vendor's chips, open them up, make sure there are two dies, we know where the dies came from themselves and we have been working our way right from the supplier level up.

We are doing reviews on our existing systems in that matter to make sure that they are not vulnerable, and then we are also all of those steps are being incorporated in our assessment of the new systems.

Mr. LANGEVIN. I just want to make sure this remains obviously a high priority and remains dynamic, that it's not just a one and done, but obviously ongoing review and point counterpoint.

Next, I want to also, on that same area that on the cybersecurity front, we have seen a number of vulnerabilities identified in major systems, through the 1647 process. So I want to know is the Army position to finish its 1647 assessments by the statutory deadline?

General MURRAY. I am not sure I have a good answer for you, sir. I will have to come back to you.

[The information referred to can be found in the Appendix on page 77.]

Mr. LANGEVIN. Okay. I appreciate that. And then as a follow-up to that, one of my concerns from the 1647 reviews is that lessons learned need to be fed back into the requirements development process, and so I also will ask how are resiliency measures being baked into new acquisitions from the start?

And given the dearth of metrics in the cybersecurity space, I also want to know what specific metrics you are using to ensure that delivered systems meet the requirements for resiliency. So if you need to get back to me on those, for the record, we can do that. But that is a priority that I would like to get an answer to.

General MURRAY. Yes, we will take that, sir.

[The information referred to can be found in the Appendix on page 77.]

General MURRAY. But I would add—so it all starts with the requirement. And so we talked about the four-stars as part of the review process we had. So we still have a requirements process in place. And one of the things that General Milley put in place when he became the Chief of Staff of the Army was Army Cyber Command is part of the requirements process.

So we look at what we need for cyber protection before a requirement ever gets approved, to ever go over to Dr. Jette and be produced.

Mr. LANGEVIN. Okay. Thank you for that and I look forward to the additional answers on the record.

In your joint statement, you referenced directed energy, factors to address the air and missile defense mission. I am specifically interested in the transition from initial mobile, short-range air defense to directed energy systems and I wanted to ask if you can discuss your progress on these efforts so far, as well as how you are training soldiers to operate such systems.

General MURRAY. So we have had several efforts with very small low-power lasers that we call MFLX [Maneuver and Fires Integrated Experiment] at Fort Sill, Oklahoma, against mostly small unmanned aerial vehicles. And those are real soldiers operating those. They get feedback from the soldiers in terms of the interface with the firing mechanisms, the equipment, and we are seeing some great success in terms of small-power lasers. The laser I think you are talking about is a higher power laser that right now we are planning to integrate into a larger air defense platform in around fiscal year 2023.

And so right now we are focused on getting it out of S&T [science and technology] and getting it into development. And Dr. Jette has graciously assigned a program executive officer [PEO] to help us do that, which never had a PEO in the past and not only directed energy, but also hypersonics. And they are working very, very closely with the air and missile defense CFT and the long-range precision fire CFT.

Mr. LANGEVIN. Thank you. I know my time has expired, and I am glad to hear you are getting ready to do the transitions, so once the technology matures, my message is get ready because it is coming.

I follow directed energy very closely and it is getting out of the labs and getting to a mature level; it is going to be an effective capability for the warfighter.

So thank you.

Mr. NORCROSS. Thank you.

Mr. Mitchell.

Mr. MITCHELL. Thank you, Mr. Chair.

We will go from directed energy to simple ground combat. How is that for yin and yang?

We had a brief, a secure brief, a classified brief quite a bit ago, on their situation in Europe, ground combat vehicles, tanks, their survivability and lethality, and upgrades that were being done. You outlined—and the GAO report outlines, the September 2018 report on page 5, the process of the investments being made in Bradleys, in Strykers, and a variety of the ground combat vehicles, how much money is going to the plan to upgrade those additional armored brigades.

Is that adequate near term to keep us in a position we are able to defend Eastern Europe at this point in time in your opinion?

General MURRAY. It is, in my opinion, sir, and I think one of the things we often overlook is we look at individual systems. The Army fights in formations.

Mr. MITCHELL. Yes.

General MURRAY. And when we looked at the Army brigade combat team, the Abrams tank, we are doing an upgrade to the Abrams. So, we will go to SEpv4 [System Enhancement Program Version 4].

Mr. MITCHELL. Yes.

General MURRAY. And that, in my opinion, that is still the most capable tank in the world. It is too heavy, but it is still the most capable tank in the world. And when we looked at the Army brigade combat team, the most vulnerable combat vehicle was the Bradley and that is why we chose to replace it first.

Mr. MITCHELL. Well, you are right. It is heavy. Is the number of Abrams you are talking about for Eastern Europe in these upgrades are they adequate number over the term that is projected?

General MURRAY. Well, deterrence is in the mind of the beholder.

Mr. MITCHELL. Sure.

General MURRAY. So, one of the things we are looking at is posture. I mean, do we need to have more posture? And it has been talked about in hearings over the last 2–3 months. We can accomplish that in one of two ways, either through forward presence or rotational basis.

Right now, the Army is in a rotational basis. So, I think that is appropriate. And I think here next calendar year, you will see an increase in the number of rotations or possibly the size of rotations and exercises we are doing to get after some of that and then of course, we just deployed a brigade on no-notice exercise from Fort Bliss, Texas, to draw the equipment we have prepositioned and exercise in. So, we are working various ways to get after, I think, the mass that you are talking about.

Mr. MITCHELL. It is just in my opinion necessary to keep that while we are modernizing, because I don't believe it is becoming any less dangerous a place in Eastern Europe.

General MURRAY. Yes, sir. You have to be ready to fight tonight and you have to be ready to fight 20 years from now, and that is the balance we are trying to achieve.

Mr. MITCHELL. Let us talk a little bit about the next-generation combat vehicle [NGCV]. The May 1st report talks about some of the unfortunate outcomes in terms of the future combat vehicle and a fair amount of money has been invested in this over a couple of efforts that had been, in fact, ended because they were premature at best.

Are we comfortable at this point in time where the next-generation combat vehicle is going in terms of the, we are on track to accomplish that in your opinion?

General MURRAY. We are and I am very comfortable. And so, one of the—besides immature technologies, another problem we have with Future Combat System, there was—when you step back and look at it, there was no concept that it was supporting. So, it was a pretty amazing capability if we got to it. But it really doesn't fit the battlefields of Iraq and Afghanistan.

So, NGCV, OMFV, if you will, the optionally manned fighting vehicle, fits the MDO [multi-domain operations] concept. So, it is critical to the concept. So, they are coming hand-in-hand just like we did in the 1970s and 1980s with the Abrams and AirLand Battle.

The other thing I would say is, in this case, it was mentioned before, these are mostly non-developmental vehicles. So, these vehicles exist today. Now, there are some going to be some integration challenges and we are trying to make some upgrades and we are watching that very, very closely to make sure that the technology is mature enough. But for the most part, these vehicles exist today.

Mr. MITCHELL. One last question for you. You mentioned optionally manned or autonomous combat vehicles which are wonderful in concept. My concern is the ability of them to communicate some form of control.

Given the active electronic warfare we saw exhibited in Eastern Europe and Ukraine, you are well aware of the capabilities, so much so we can't talk here.

I still have not gotten a compelling answer as to how we are addressing that for these vehicles or for this technology. Can you give us any general information, we can talk about it later, because I am really concerned that we develop this capability.

General MURRAY. Just very quickly and then I am going to let Dr. Jette talk to the specifics, but one of the reasons they are optionally manned as opposed to fully autonomous is what you bring up. So, commander on the ground based upon a lot of different factors.

And one of them would be the electromagnetic spectrum. Do you choose to man the vehicle or do you choose to go tele-operated really is what we are talking about.

Secretary JETTE. Sir, I think that you bring up a great point. When we talk about an unmanned system, getting to an unmanned system, a fully autonomous vehicle, I do not believe it is around the corner. That is going to be quite a bit of work before we allow something to go off into the field with an armed weapon system to be able to fire at will.

That leads you back to your question about how do I make sure I remain in control of it. And so, that, too, has a lot of, Well, I think this, but I haven't proven it yet.

So, we have a number of technology efforts ongoing. One of them, we have got a turret development program that we are working on right now which is essentially taking a 30-millimeter turret and I flip the button on, it finds the target. It classifies the target. It determines if it is a threat or not. It then categorizes which one is the most threatening. It does the fire solution and then it can fire.

And it can do that entire loop alone. That is the objective of the experiment. The reason is to then figure out where we put in the gates and where we can apply AI [artificial intelligence] in the background to be able to manage that more effectively. We have a number of communications technologies that we are working on as well that are very nascent that will enhance our ability to make sure we retain communications. But I would rather discuss those in private.

Mr. MITCHELL. Yes. And I would ask, Mr. Chair, if we could do that at some point in time is schedule to have a conversation, a briefing on communication technologies for not only in this case, but these optionally manned or semi-autonomous vehicles and how they communicate under various threat scenarios because it is

starting to concern me that we've seen the ability to infiltrate those and damage that.

And without the ability to communicate, our people in the field have a very difficult time responding, protecting themselves, or never mind defending the area.

Thank you. And I yield back. Thank you, gentlemen.

Mr. NORCROSS. Mr. Golden.

Mr. GOLDEN. Thank you, Mr. Chair.

Gentlemen, I am new to the committee and I am perhaps a little bit more at home in seapower, having served in the Marines, and becoming familiar with the Army, and that is why I came here today. It has been helpful to sit here and listen to you all talk about this budget, about your modernization efforts, and go back and forth.

So, really, I think being the last one to ask a question, I will just put something out there for you or anything that you have missed that you like to talk about in regards to this modernization budget request and how it aligns with the NDS, specifically its emphasis on peer competition with larger forces like China or Russia and others.

The entire time I served, I was in Afghanistan and Iraq. So, hearing your testimony talking about some of the ways, perhaps where some capabilities have atrophied over time as you focused on that mission, do you have any specific examples you haven't had an opportunity to talk about today that you would like to throw out there that will help us understand why you are putting a priority on some of these new systems, what is it that you are worried that you have not been focused on over the last 18 years or so and when you think about competitors of the future.

General PASQUARETTE. I will just start, but I think it is appropriate General Murray probably follows up.

I think some of the questions we have got is why are we having to do this now. I would say because the capabilities we need for our soldiers in the future, they do not exist today in large part. We have to start with the research and development now and that is a lot of dollars we have to move internally to do that to produce, that eventually shift to procurement to put in soldiers' hands by the time when we need it in our strategy.

So, some of the questions we have gotten is 2028 seems like a long way away, but what we are trying to produce and what is, will be relevant in that potential future conflict against Russia or China does not exist today and that is why we are asking General Murray to lead the way on.

General MURRAY. So, to me, it always comes back to the concept. So simply while you and I were involved in Iraq and Afghanistan, both the Russians and the Chinese watched how we fought back to Desert Storm and then the opening phases of Iraqi Freedom, and they vowed never to face the United States Marine Corps and the United States Army in close combat. And so they have developed systems to establish standoff, much like a boxer uses a jab to keep somebody with shorter arms away from them.

And so that is fundamentally what we saw in the Ukraine and with our next-generation warfare study. And what we are seeing really in a lot of places like the South China Sea and along the

coast of China is this problem called standoff—a different problem than we had during the Cold War, but a similar approach to how do we solve this standoff problem. And it is not just the Army; it is how do we enable the joint force to solve this standoff problem. I think that is driving a lot of our modernization strategy.

Secretary JETTE. Sir, I think General Murray has it exactly right. Requirements drive the acquisition process. I spent a lot of time operationally. I spent a lot of time in Iraq and Afghanistan as well. While I am an acquisition professional, I understand that there is no purpose in me developing something if it doesn't have operational value.

So to that end, the number one requirement is let us take a look at what the potential adversaries are doing and how we can counter their capabilities, and the standoff is a significant one. If you take a look at Eastern Europe, you will see the Russians doing exactly what he says. They do not want to get in a face-on-face fight with an M1 tank. Therefore, they put a large amount of rockets, artillery, and mortars, and they put air defenses in place to try and protect those assets.

So we are adjusting our capability in long-range precision fires to be able to get at those, take out the protection measures that they have in place for air defense. And then we have got defensive systems, particularly the directed energy we are putting in place to be able to counter the inbound systems as well.

Mr. GOLDEN. Just a few seconds left here, but so I have a greater understanding, you are telling me what they want to do.

Is it still our goal then to defeat their efforts to hold us off so that you can close with them and get into that face-to-face or are we changing the strategy and getting into more of a long-range fight as well?

General MURRAY. So, both. So, we have changed the doctrine. And part of it is competing below the threshold of war which is also going on each and every day and you see it in the newspaper each and every day.

So how do we get to a strategy where it is not black or white? We are at war. We are at peace. And it is a conflict almost every day—or not conflict, excuse me, competition. And then, if it goes to conflict that we have the ability to defeat that standoff that they are trying to achieve.

And like I said, it is really to enable the joint force because right now, the standoff they have created does not hold just the Army at bay. It holds really the joint force except for some very expensive and exquisite capabilities.

So how do you enable the joint force? And then, really, how do you do this in such a way that we never have to use it, that we invest this money and we achieve deterrence. We never have to prove that we can defeat that theory.

Mr. NORCROSS. Thank you.

Mr. Wittman.

Mr. WITTMAN. Thank you, Mr. Chairman.

Gentlemen, thanks so much for your service to our nation and coming in to testify today.

General Murray, I want to begin with you. You had spoken in your opening testimony about the air and missile defense mod-

ernization priority and specifically, it was mentioned the Army is pursuing acquiring Iron Dome and that as you pointed out is an interim solution for indirect fire protection capability specifically against unmanned aerial systems, cruise missiles, other projectiles coming in.

Certainly understand that. I know the Marine Corps is looking at the same sort of system as that indirect fire protection capability. In looking at what Israel has done and how effective Iron Dome is, they report that there is about a 90 percent effectiveness in taking down incoming targets through this interceptor system. That is good news.

The challenging side is, is that it is about \$100,000 per shot. So the Israelis have looked at directed energy. They have looked at the comparable system using a laser family of systems called Iron Beam to be able to take out those threats at a much, much more efficient and cost-effective cost per shot.

Can you give me your perspective on how the Army is looking at directed energy in its effort concerning indirect fire protection capability and how you see integrating that into your future doctrine?

General MURRAY. Absolutely, sir. And so, I have not heard of Iron Beam. I will definitely look into it. But in terms of directed energy strategy, so right now we are on a path to integrate directed energy onto our Stryker air defense vehicle in I'd say roughly the 2023 timeframe because we are still trying to pull it out of S&T and I do not want to make too much of a bet too early that we'll be at 2023. But that is absolutely the goal we are working towards.

Effective against rockets, mortars, artillery, small UASs [unmanned aerial systems], that type of power of directed energy laser, if you will. And then, there is also another S&T program that is on a much bigger truck, a much higher energy that we'd get after some larger targets that we are working on. And once again, not only hypersonics, but Dr. Jette has been gracious enough to stand up a PEO office that is working getting that through S&T. And so, there is somebody there to catch it. So, we are trying to cross that valley of death with these S&T efforts to make sure we can get them into a program of record.

Mr. WITTMAN. That is great. Thank you, General Murray.

Dr. Jette, I wanted to get you to maybe to elaborate on this and looking at how the Army is going about modernization. Can you comment a little bit more on how directed energy is going to be integrated into that effort? So, it is not just things like laser family of systems, but it is high-energy microwaves where you can address swarms of these potential adversarial platforms. Can you talk about that?

There is a lot of technology going on in the other service branches as they are bringing this to bear. The other service branches, too, have very specific elements in their program decision making for rapid prototyping, rapid acquisition to bring this technology using COTS, commercially off-the-shelf available technology, trying to get that as quickly as we can to the warfighter.

Can you speak a little bit about the Army's effort in that realm?

Secretary JETTE. Yes, sir. Just—so General Murray made the point that we have established a Rapid Capability and Critical

Technology Office [RCCTO]. It is headed by my senior PEO. He is a three-star general. His background is in space, missiles, air defense, but he is very technically competent as well as programmatically competent and it has been a real blessing to get him on hand.

As we have set that organization up, I established some specific efforts to frankly find all of the cats. Everybody is out there working on something they call directed energy and I am trying to figure out what that really means and what they are really doing. And so, we have—we know where—we think we know where most of the cats are, not all of them. We are also beginning to herd them in.

We pass that off. RCCTO has just been stood up in literally—I went down for the promotion ceremony for my three-star a week and a half ago. So, he is taking that role on to make it a formal program and clean that up. We do have ongoing efforts to move from a 10-kilowatt on a Stryker to a 50-kilowatt. The Navy, for example, has already a 100-kilowatt and their nice 20-foot shipping container.

But what makes lasers difficult, it is not just being able to put energy out the front end of it, it is keeping it cool so it doesn't melt.

Mr. WITTMAN. Yes.

Secretary JETTE. It is powering it. It is getting the targeting data and all of those things. When you try to shrink all that down and keep a continuous beam, it becomes very difficult.

Mr. WITTMAN. Yes.

Secretary JETTE. They have got a ship to stick it on the front deck of and use all the other assets. We don't have that.

Mr. WITTMAN. Got you.

Secretary JETTE. I will just—my last thing is I will say, yes, sir, we are doing some work in the other—it is not just lasers in directed energy and we are working in those areas as well and they might be something better to talk about separately.

Mr. WITTMAN. Very good. Thank you.

Thank you, Mr. Chairman. I yield back.

Mr. NORCROSS. Ms. Sherrill.

Ms. SHERRILL. Well, thank you, gentlemen, for being here today. Thank you, Dr. Jette and General Murray, for visiting Picatinny and seeing the wonderful work the men and women do there. I know I heard some great things from the base about your visit and I appreciate you taking the time to do that.

Dr. Jette, I believe that highly skilled acquisition professionals are exactly what we need to ensure that we modernize government-owned, contractor-operated ammunition facilities correctly. But it does concern me that modernization funding which was recently moved from the equipping line of effort where the joint program executive office had visibility and control to the sustaining line of effort creates a situation in which modernization funding could be tapped into for other priorities.

Additionally, it creates a situation in which funding is not fully aligned with the responsibilities and authorities of the lifecycle manager at Picatinny, and as a result, there is a lack of accountability. Will acquisition professionals at Picatinny who have the lifecycle responsibility for ammunition from development to produc-

tion, to maintaining, to disposal, continue to receive the funding authority and responsibility to continue to remain responsible and fully accountable and funded for carrying out this important mission?

Secretary JETTE. Thank you, ma'am, and thank you for the—we had a great time at Picatinny and I appreciate the comments.

This is a great area of importance to me. One of my top—when I was first coming into the job, I said I am going to do top 10. What are my top 10? One of them is the development of the right talent base and putting them in the right place. So we have a significant program plan that develops the talent and makes sure that we have the right people in the right place and that they have proper training.

Congress has been very gracious to the acquisition community in providing us methodologies by which we can send people to school if necessary and all our constraints become our problem with timelines in their career path. To that end, the Secretary has stepped in and made a specific effort to find ways to mitigate any of the timeline issues in a person's career development. So, I can see a significant improvement coming along.

With respect to the funding moving from the EE PEG [Equipment Program Evaluation Group] to the SS PEG [Sustainment Program Evaluation Group], there is a little bit of a cheat in that because I am the co-chair of EE PEG and I am the co-chair of the SS PEG. So, I am watching those funding lines specifically. I recently went down to the ammo plants, particularly I went to Holston and Radford. While the two plants are very functional, they are clearly—we need to work significantly on our tech base.

I recently have been working with my military deputy for acquisition who works my uniform side and does most of my program management oversight for me, and we tentatively, so I am being a little wishy-washy on my commitment because I am trying to finish the details of it. But I see this as being a significant issue. These plants need more attention to a long-term program that meets the operational needs as we see them in the future, and the need to do that is not an incidental capability that is kind of put on the PEO armaments and ammunition.

But he retains control because he controls the ammo, but we are looking at putting—creating a strategic PM specifically to work on the GOCOs [government-owned, contractor-operated] and make sure that those are properly planned and the proper funding profiles get into the POM [program objective memorandum] and that those programs actually modernize those plants which are—as you—if you have been to them are not terribly modern.

Ms. SHERRILL. So my concern is simply that I think Picatinny has a great relationship in the full life cycle of the ammunition. And I think that has helped Picatinny in some ways uniquely bring their research and development to the field more quickly and more efficiently than what I have seen in many areas of our military.

And so I guess with that as a model and as well as they are doing at that, I am concerned about changes to what we might see coming are the—I think there is a draft of transition to sustainment. I am concerned about how that might affect the great work that Picatinny is doing.

Secretary JETTE. Yes. The transition to sustainment—so, in the way that we deal with ammo, as soon as it is produced, it fundamentally transitions to sustainment. We hand it over to the command to store it and manage it until it gets to the point of disposal. Then there is sort of a linkage between the PEO for the ammunition and the AMC [Army Materiel Command] entity that manages the storage and transportation of the ammo.

So it is treated very differently and it is not this transition to sustainment where I have got a vehicle and we are trying to determine whether or not to pass it off to AMC as a completed vehicle with no further need for development. The—Picatinny is essential. All the processes that we do with the plants come from Picatinny. My concern is that I don't think that the portion of the enterprise that does the actual production has the foresight to be able to develop better production plans for the capabilities Picatinny brings to the table, and then that is the part I am trying to fix.

Ms. SHERRILL. Well, I really appreciate you talking to me today. I would love to talk more about this and get a better understanding of how we can engage, because I do think that you see how important Picatinny has been to the modernization of our Army and I just want to make sure we don't lose any of those critical capabilities, but thank you so much.

Mr. NORCROSS. We are going into round two if you want to stick around. Because as we went through and had our first set of questions, there was probably 2 months ago when there was a question of trying to move some funds around that we had within the Department of Defense for another item, the wall.

And military construction leaked out, who was going to do it, and we got all the phone calls in the world. And I said that is just a practice round for what we are doing today. And to try to explain that, as far as I know there has never been this level of change in the history in terms of review, plus-up, plus-down, or eliminate. So when we are questioning particularly it may get into some of the deep-rooted questions of how the assessment is made, it is because I have 300 requests to change what you just handed us in this request.

I know you understand that, but we just brought the example up on the industrial base. Once we dismantle—and it happens all the time—that industrial base wherever it might be, because we are anticipating that next generation coming on in 5 years. And then, in 5 years, it gets delayed, and we know how that goes, 4 years. You do not reassemble that industrial base, and that is much of our concern in addition to all the risk assessments for the six priorities.

And times that all 300 programs because it is somebody's district, is why we are digging in. We better understand it—I get much better response when you dig deeper into these issues and that is where I want to go now is the relationship that you are standing up. Something as massive as this not having more problems, it means good basic design.

So, Mr. Ludwigson, when we start looking at—and this is, Mikie had a great question, you'd like to have one size fits all so there is uniformity, but the uniqueness of each of the programs that we have doesn't lend itself to that. When you are looking at the rela-

tionship that is going on now from the acquisition side to the general's piece, is it working?

We are early—is there anything you would recommend in terms of tweaking, changing, getting feedback that you do each and every day that we can look at now or potential for running into an issue later on?

Mr. LUDWIGSON. So, obviously, when we did this work it was early on and we had great access across senior levels of the Army as well as at Futures Command in its nascent form looking at—in fact, talking to the CFT pilots and understanding what they were doing and understanding how they were transitioning across to Futures Command. I do think that there are important transitions that are happening as they are moving to programs.

That is part of the reason that we are emphasizing the idea that using mature technologies is important to end this idea of shifting from aspirational acquisitions toward more of an agile approach makes some sense from our standpoint. We didn't look at the specifics of the plus-ups or reductions or eliminations funding-wise. What we are doing is going forward in response to requests from this committee is we are going to look at ground combat vehicle; we have a slate of a couple of different programs that we are going to look at.

So we will look at ground combat vehicle as a portfolio, not just the optionally manned vehicle, but the slate. And then we will burrow in to look at some of these other programs as it is appropriate and timely for the committee to look at, because I think there are a couple of layers that the committee can pay attention to. It is sort of the organizational element as well as the sort of the program-specific side.

Mr. NORCROSS. I think there is good news in there. The main priority that I am seeing and hearing from particularly with those who are calling us up to say, Is this a system that has been set up that is fundamentally fair to industry, and this is my question to you, Generals, why is this time different. And we talked about that because of the speed, the agility that you bring to this, bringing industry with us is critical.

There are those who will say, Well, we will just wait this one out and come in under a new one, which is the worst thing we could do. What are we doing to bring industry with us, particularly given the fact that you did such a massive change and some people have hurt feelings for a variety of reasons?

General MURRAY. And I think one of the things that is fundamentally different this time is—and Dr. Jette mentioned this—is the dialogue that is going on and has been going on with industry for a while. So, Dr. Jette mentioned the Secretary's Monday evening dinners which he is pretty religious about and normally the Chief or the Vice would be there.

And there was an attempt to without—we can't communicate exactly what is in the budget before it is released, but there was an attempt, I know, by the Secretary and the Chief to communicate where we were going and why this was very, very important that the Army is going to have to pivot sometime and every day you wait is one day later before you make the pivot. And what we were

talking about, we have been very clear about communicating what our priorities are to include specific programs.

And really what we are asking industry to do, and I have been in constant dialogue with industry, is meet us in the future. So we tend to look at this in terms of near-term losses, but there is tremendous opportunity as we begin to invest in the future and that has been pretty much a consistent message to industry, is come along with us.

Mr. NORCROSS. Dr. Jette, do you see essentially the same way particularly when you start going at just one measurement, the minimum sustained rate? Do you independent of industry create the number first and then later on you go to industry, get their feedback, and adjust? I might have confused those two.

Secretary JETTE. Yes, sir. Generally, what we do is we make our assessment and come up with a number.

Mr. NORCROSS. Okay.

Secretary JETTE. And then, we go to industry because we may not know everything and of course, particularly when you are talking about things like cost-plus contracts or cost-based contracts, we have access to their pricing data and their labor rates, their material buys, those types of things.

Mr. NORCROSS. Leaking that out for their stock prices alone can create havoc.

Secretary JETTE. Yes, sir. Well, we are very good. We make sure that our people are very careful about not leaking out anything on those things. But then they go back and they make their own assessments to try and determine what the right number should be.

We then have discussions. I have several calls a week with CEOs of major corporations and just work through these types of things. If I think that they are missing something, if they think that I am missing something, I am always open to it and try to come to an agreement. It doesn't always occur that we agree, but at least we always know where our disagreement is.

Mr. NORCROSS. Ms. Hartzler.

Mrs. HARTZLER. Thank you very much.

I wanted to ask a question for one of my colleagues, of our subcommittee members, Representative Bacon who had to leave and he wanted to know how are you incorporating the ISR into your plans.

General MURRAY. Yes, ma'am. So, ISR—intel, surveillance, reconnaissance—it is a critical requirement today and it is a critical requirement for the future. It is only going to get more difficult because right now, most of our ISR platforms would not survive on a modern lethal battlefield.

So, one of the things that we have done here recently and it's really over the last about a 6-month effort is start to link from a systems engineering standpoint the requirements for not only ISR but the networks, communications, et cetera, and we are beginning to look here pretty—within the last couple of months pretty hard at various ways of attaining the ISR that we need from various altitudes on various platforms in various ways, and then getting that data where it needs to get to.

And I am kind of talking around it. I think probably at another session in a different setting would probably be appropriate, we can lay out specifically what we are talking about.

Mrs. HARTZLER. Great. That would be appreciated because it is very, very important.

And along that lines, Dr. Jette, what is the Army's plan to modernize the on-the-move network capability in the combat vehicles in your armored brigade combat teams?

Secretary JETTE. So I know these may be words which sometimes cause people stress, but we had WIN-T1 [Warfighter Information Network-Tactical Increment 1] which was essentially a capability to get wideband communications on, in a stationary mode. And it was oriented primarily on the—primarily because that is the way we were fighting in Afghanistan and Iraq; we needed widebands and we were in fixed locations. The upgrade to that, so WIN-T1 is done, fielded, over, we are not doing anything. And then we moved to WIN-T2 which we have finished—I think we are pretty much finished up with it this year the fielding of all aspects of it, and that gives us an ability to have the same type of wideband communications links while on the move at the brigade level. But we are not stopping there.

So, again, I go back, when you find a good horse, ride it a lot. So, I have four strategic areas that have been assigned to my new senior PEO. One is the directed energy. One is hypersonics. One is space. And one is AI—and then, the other one is AI. In the space area, that includes communications architecture. So, we are working extensively to look at multiple options on how we can bring communications that are becoming available in the space realm to the battlefield and make it pervasively available.

And again, sometimes, when we get into the communication things, I would rather talk about them in a closed forum than an open forum.

Mrs. HARTZLER. That sounds good. So, we have had some discussions about the optionally manned fighting vehicle already and I know we—you intend to bring that out with the middle acquisition authority to replace the Bradley fighting vehicle.

I guess my question hasn't been asked about is how many vendors do you expect to compete for this contract and what will the Army do if only one original equipment manufacturer submits a proposal?

Secretary JETTE. So I did require the PEO when they drew up the document that it said up to and not one or two vendors. And I did that particularly to leave the Army room in case we ended up with just one reply to the solicitation, because I didn't want us cornered into a position where we had to take a vendor and that was the only vendor that made an offer.

So, if we get no vendors that give an offer, of course, we will retry. If we get one, we can retry and what we will do is we will look at the offer and make a determination as to whether or not it is sufficient to go ahead with. We don't expect that to be the case at this point. We know from the questions that we have gotten back at the different industry PEO sessions, we think we are probably going to have three or four submissions.

Mrs. HARTZLER. That would be interesting to see how that comes out.

So I recently visited the Aviation Classification Repair Activity Depot, AVCRAD, in Springfield, Missouri, and this depot was very interesting. It was converting the UH-60A Alpha models to the UH-60L Lima models. These are Black Hawk helicopters and which is an upgrade over the old Alpha models and will improve the Army National Guard capability.

However, as you know, the Lima models are still operating on analog gauges and they lack digitized capability. So, I understand that the Army's UH-60V Victor program will upgrade the Lima models with an advanced digital cockpit among other upgrades effectively making these helicopters comparable to the UH-60M Mike model which is the most advanced Black Hawk helicopter.

So, Dr. Jette, what is the status of the Army's UH-60V program and is this program still a priority for the Army across the Future Years Defense Program?

Secretary JETTE. Thank you. Okay. I have 841 programs and 512 research projects. So I am not sure I am going to give you the exact answer you want and I will be happy to come back with a more detailed one. Perhaps General Murray can close.

Mrs. HARTZLER. Sure.

Secretary JETTE. But Victor is important. And particularly just for your feeling comfortable with respect to the National Guard, if you talk about aviation assets and the Vice Chief of Staff of the Army is in the room, you better not do anything that negates the capability of the National Guard with respect to their aviation assets.

Mrs. HARTZLER. So, I will just interject before General Murray. I do have an Army Guard Black Hawk unit at Whiteman in my district. It is my understanding that only the Victor models and the Mike models can be deployed, and is that—it is not correct?

General MURRAY. I am sorry. It was on before. I turned it off. So, you mentioned Alphas, Victors, Limas, Mikes, and you did well keeping those straight. The Alpha model is the oldest model aircraft that we have in terms of the Black Hawk; it will be out of the National Guard I think in 2022 or 2023 and out of the Active Component in 2025. So we will actually divest the Alpha model; there is no Alpha to Victor conversion or Alpha to Lima.

I am very familiar with the Lima, my son-in-law flies one. The Lima to Victor conversion, we were looking at options on that. The Secretary has said publicly and obviously since he has set this mark on the wall, we are fully committed to converting all the Limas to Victor in both the Active Component, the Regular Army, the National Guard, and the U.S. Army Reserve, and then continuing with the Mike model procurement.

And so we would have a pure fleet of Mike and Victor at some point in the future. And you are absolutely correct, it turns an analog aircraft at least from the cockpit perspective into a digital aircraft. And we would—right now probably because the Victors and the Mikes are our newest model aircrafts, that is probably why they are deploying. I don't think there is a restriction on a Lima aircraft deploying especially in terms like MEDEVAC [medical evacuation] aircraft.

General PASQUARETTE. I would just say just from the cost of the aircraft, Mike models are just under \$20 million a copy and we can get a Victor which is essentially just about the same as a Mike for about \$12 million. So, from a budget perspective, it is very helpful.

Mrs. HARTZLER. When I came back from that visit I became a fan of the Victor model. So I concur with that. And one last question I have, General Murray and Dr. Jette, I am concerned about the proliferation of advanced threats to Army rotorcraft platforms.

How are you staying ahead of these threats and what actions are you currently taking to ensure all rotorcraft programs have the most advanced aircraft survivability equipment?

General MURRAY. I will start off from the requirements if I could, ma'am. So absolutely in many cases the threat is proliferating as you mentioned a lot faster than we had anticipated, you know, 5, 10 years ago. And so there is constant advances in terms of threats to rotorcraft.

From a today perspective, we are continuing to upgrade what we have and prioritizing units that are deploying, so where it is most needed is where it is going. There are several programs that Dr. Jette and I talked about a couple of days ago that would have to be done in a different session, different setting as we start looking into threats in the future.

Secretary JETTE. The one that most, I can discuss here most is our CIRCM [Common Infrared Countermeasure] which is a—

Mrs. HARTZLER. I am sorry, did you say what?

Secretary JETTE. CIRCM.

Mrs. HARTZLER. CIRCM.

Secretary JETTE. The CIRCM system is an advanced threat detection and defense system that the helicopters will have deployed on them; exactly how it works I would rather reserve for a separate discussion.

But we have a solid program. When I came in there were some technical challenges, we put a team against it, solved them, and now the system is fully online to go forward. As General Murray has stated, the two of us have done a review of all our special access programs in detail and their applicability, just the same thing as we did with all the open programs. And there are a number of things there that address some of the issues here.

Mrs. HARTZLER. Well, great. I am very encouraged by that and appreciate all of your being here today and all of your work, and I am done with my questions. I yield back. Thank you.

Mr. NORCROSS. Let me try to wrap this up. We had a conversation at Picatinny, EMP [electromagnetic pulse] hardening, as the new systems develop, you spoke cyber and reviewing it every step of the way. Do you see a need to create a little bit more strict view of the EMP hardening of assets new versus retro? Where do you see this going, particularly now with Russia and China?

General MURRAY. So, once again, it all comes back to requirements and then I will let Dr. Jette talk about it. So there actually is in the joint process a requirement to look at survivability of nuclear effects, EMP is what you are talking about. I think that is what you are talking about.

Mr. NORCROSS. Yes. But also the physical end of the EMP isn't the kinetic piece, just the parts that they—

General MURRAY. Oh, yes, sir.

Mr. NORCROSS. And there are some other things as you know that—

General MURRAY. No. I understand exactly what you are talking about. And sometimes though—and we have this debate often during our requirements process, for like let's say a rifle. Does a rifle really need to be EMP hardened?

Maybe, maybe not. So we have those types of debates. But when you are talking about architectures that depend heavily upon electronics, yes, it is part of the—before it ever becomes a formal requirement, and we have those discussions about how much it requires and how to spec.

Mr. NORCROSS. And—

General MURRAY. Yes, sir.

Mr. NORCROSS [continuing]. I want to thank you. There are a couple of things I want to follow up on. It was actually a lot easier than I expected. You guys are still cranking this up, as long as we have these risks to our country, we will be happy to continue on like this.

With that, unless there is anything, we are adjourned.

[Whereupon, at 4:29 p.m., the subcommittee was adjourned.]

A P P E N D I X

MAY 1, 2019

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

MAY 1, 2019

**Statement of the Honorable Donald Norcross
Chairman, Subcommittee on Tactical Air and Land Forces
Hearing on “Department of the Army Modernization Programs”
May 1, 2019**

The hearing will come to order.

The Tactical Air and Land Forces subcommittee meets today to review the Department of the Army’s modernization programs in the fiscal year 2020 budget request. The Army made significant changes and tough choices in the FY20 request to fund future capabilities without asking for an increase to their budget topline. Our Subcommittee intends to examine the rationale behind these choices with the senior Army leaders here today.

I would like to welcome our distinguished panel of witnesses:

- Dr. Bruce Jette, Assistant Secretary of the Army for Acquisition, Logistics and Technology;
- General John Murray, Commanding General, Army Futures Command;

I’d like to note here how much I enjoyed meeting Dr. Jette and General Murray at Picatinny Arsenal during my visit there during our last recess. Thanks again for your help that day.

Also joining our panel is:

- Lieutenant General James Pasquarette, Deputy Chief of Staff of the Army, G-8; and
- Mr. Jon Ludwigson, Director, Contracts and National Security Acquisitions, Government Accountability Office.

Thank you to the witnesses for joining us. I know that we are all looking forward to your testimony.

Today the subcommittee will review a broad portfolio of Army ground, aviation, ammunition, air and missile defense, and Soldier individual equipment programs.

The Army’s fiscal year 2020 modernization request – Research and Development and Acquisition programs – totals \$34 billion, essentially in line with last year’s enacted amount.

Though the Army’s modernization topline did not change, the programs funded under these accounts did. The subcommittee wants to learn more about these changes and the reasoning behind them.

To fund future modernization priorities, Army leadership conducted a year-long examination of all Research and Development and Procurement programs, weighing the cost and benefit of each against the Army’s current needs and anticipated future threats in support of the new National Defense Strategy.

Some 180 programs were deemed less relevant to our strategy or not as capable as a replacement and therefore not worth the expense and were cut from the fiscal year 2020 request. One of the subcommittee's goals today is to better understand the context and analysis behind these decisions.

One significant program reduction involves an upgrade to the CH-47F Chinook helicopter. Despite having invested significant funds to develop a Block II aircraft with greater lift and range capability, the Army deferred the program indefinitely, assuming the aviation community can absorb the risk to the heavy-lift mission and that the industrial base will somehow weather this loss of work.

The subcommittee expects to hear more about how the Army reached these conclusions and how the service intends to manage the associated risk going forward.

Army modernization has had a rocky road. The Army leaders with us today are familiar with that history and are committed to a new way of planning and managing modernization.

Most important, Army leaders have reorganized for the future, standing up Army Futures Command, General Murray's new command, and creating Cross Functional Teams to identify and develop solutions to the service's top six modernization priorities.

Those six priorities are:

- Long Range Precision Fires;
- Next Generation Combat Vehicles;
- Future Vertical Lift;
- Army Network;
- Air and Missile Defense; and
- Soldier Lethality.

The subcommittee expects to hear how the fiscal year 2020 request will address these modernization priorities and align Army acquisition with the National Defense Strategy.

We also want to know what will be different this time. What new processes or internal oversight will ensure the Army gets its money's worth from this wide-reaching modernization endeavor?

We are interested in the distribution of responsibility and authority – as well as the relationships – between Dr. Jette's organization, "ASA(ALT)", Army Futures Command, and the Army Staff. How will these three organizations work together to prioritize effort and make tough, realistic investment decisions?

Given congressional and DOD interest in improved acquisition, the Army has enthusiastically embraced rapid prototyping authorities granted by Congress to speed innovation and shorten development cycles for key technologies.

While this subcommittee supports use of so-called section 804 authorities and Other Transaction Authority, or OTAs, we also want to be sure that these rapid prototyping approaches are used in the spirit of good acquisition practices and yield real, measurable results. Buying too many of the same design prototype

while in the test and evaluation phase may not be the best use of taxpayer dollars. The subcommittee will conduct oversight in these areas to ensure prototype related funding is programmed and spent in a responsible manner.

GAO has extensive knowledge of Army acquisition, past and present, and understands the challenges the service is facing. The subcommittee is interested in GAO's assessment of Army Futures Command, its role in driving innovation, and its relationship to the rest of the Army acquisition community.

I look forward to your testimony and discussing these topics. Before we begin, I would like to turn to my Ranking Member, the distinguished lady from Missouri, Mrs. Hartzler, for any comments she may want to make.

RECORD VERSION

STATEMENT BY

**THE HONORABLE BRUCE D. JETTE, PhD
ASSISTANT SECRETARY OF THE ARMY
FOR ACQUISITION, LOGISTICS AND TECHNOLOGY
AND ARMY ACQUISITION EXECUTIVE**

AND

**GENERAL JOHN M. MURRAY
COMMANDING GENERAL, ARMY FUTURES COMMAND**

AND

**LIEUTENANT GENERAL JAMES F. PASQUARETTE
DEPUTY CHIEF OF STAFF OF THE ARMY, G-8**

BEFORE THE

**SUBCOMMITTEE ON TACTICAL AIR AND LAND FORCES
COMMITTEE ON ARMED SERVICES
UNITED STATES HOUSE OF REPRESENTATIVES**

ON ARMY MODERNIZATION

FIRST SESSION, 116TH CONGRESS

MAY 1, 2019

**NOT FOR PUBLICATION UNTIL RELEASED BY THE
COMMITTEE ON ARMED SERVICES**

INTRODUCTION

Chairman Norcross, Ranking Member Hartzler, distinguished Members of the House Armed Services Subcommittee on Tactical Air and Land Forces, thank you for your steadfast support and demonstrated commitment to our Soldiers, our Civilians, and their Families. On behalf of the Secretary of the Army, the Honorable Mark Esper, and the Army Chief of Staff, General Mark Milley, we thank you for this opportunity to appear before you today and look forward to our discussion.

One of the most important characteristics of a modern Army is that it is well-equipped. It must possess the most advanced, capable, reliable, and survivable weapon systems and equipment that guarantee our Soldiers a clear advantage in all future conflicts. Air and ground force modernization remains an urgent necessity. We must have an Army prepared for high-intensity conflict that is modernized to extend overmatch against near-peer adversaries. The Army must be trained to fight as part of the Joint Force alongside our allies and partners while sustaining the ability to conduct irregular warfare.

For nearly two decades, the Army has deferred modernization in order to support continuous combat operations while the global security environment has grown more competitive and volatile. Army leadership has recognized the need for fundamental change and reorganized our modernization enterprise for greater speed, effectiveness and efficiency. Last year, the Army made its most significant organizational restructure in over 40 years by establishing the Army Futures Command (AFC). One command is now driving concept development, requirements determination, organizational design, science and technology investment, and solution development. AFC is guided by the Army's six modernization priorities that emphasize rapid maneuver, overwhelming fires, tactical innovation, and mission command.

THE STRATEGIC ENVIRONMENT

Our operating environment is changing rapidly, marked by uncertainty and an increasing pace of change. As the *2018 National Defense Strategy* states, strategic competition between nation states now surpasses violent extremism as the central challenge to American prosperity and security. The NDS prioritizes China and Russia as the respective primary long-term and near-term threats for the U.S. Army.

Both Russia and China have embarked on a deliberate strategy to reestablish influence, security, buffer zones, and national prestige. This is occurring in real time today in places like Ukraine, Syria, and the South China Sea. While we spent more than 15 years focused on operations in Iraq and Afghanistan; Russia, China, and other potential adversaries such as Iran and North Korea, have studied us closely. They have used those observations to develop new approaches to conflict designed to create and then exploit gaps and seams in the Joint Force.

Russia and China intend to use their weapons and tactics to deny us access to key geography in theaters of operation. To accomplish this they have developed sophisticated anti-access and area denial (A2/AD) systems, fires, cyber, electronic warfare, and space-based capabilities that generate layers of stand-off to disrupt the deployment of military forces, deny the build-up of combat power, and sow fissures within the Joint and allied force in time and space. By making it difficult and costly for us to act, both China and Russia are hopeful we will be deterred from entering into conflict and simply acquiesce to their strategic misbehavior.

Their A2/AD strategy relies on new capabilities to provide overmatch against U.S. capabilities that we have allowed to age and atrophy or that we have chosen to divest due to obligations in support of counterinsurgency investments. While potential adversaries have modernized their forces, the U.S. Army has essentially missed an entire generation of modernization. Byzantine bureaucratic processes – along with overly ambitious requirements, technology immaturity, and scarce resources – have led

to the delay and cancelation of new systems while incrementally modernizing existing systems at increasingly greater cost.

As we look ahead, we must ensure that we have in place the right concepts, capabilities, and organizations – and that we continually update them over time - to deter Russia, China, and any other rising powers from aggression. Our concepts and capabilities must be fully integrated and built based on how we would have to fight, not on how we would like to fight. We must do this while simultaneously increasing and maintaining our readiness to make sure we always retain an advantage.

The Multi-Domain Operations (MDO) concept is the foundation of our modernization effort. The MDO Concept details how the Army continuously and rapidly achieves convergence of cross-domain capabilities, to defeat an adversary's efforts to create stand-off. Army forces, as an element of the Joint Force, execute MDO to prevail in competition below the level of conflict and if necessary, win in armed conflict. Specifically, Army forces enable the Joint Force by penetrating and disintegrating enemy anti-access and area denial systems, exploiting the resultant freedom of maneuver to achieve strategic objectives, and force a return to competition on favorable terms. MDO's effectiveness helps deter conflict, which is the ultimate goal.

MODERNIZING THE FORCE

The Army Modernization Strategy (AMS) 1.5 will describe how the U.S. Army will modernize in order to become a multi-domain capable force by 2028, and a multi-domain ready force by 2035. This strategy outlines the ends, ways, and means for modernizing our Army to win future wars directly supporting the NDS line of effort "Build a More Lethal Force" and the Third Pillar of the *2017 National Security Strategy*, "Preserve Peace through Strength."

The Army has identified six enduring Modernization Priorities and is laser-focused on regaining superiority over our near-peer competitors. The Fiscal Year 2020

(FY20) President's Budget Request is the first budget in decades to fully fund our modernization priorities. The FY20 budget requests \$8.9B to support the Army's Modernization Priorities, which represents a \$3.9B increase over the FY19 enacted level. Across the Future Years Defense Program (FY20-24), we have committed a total of \$51.7B to support the six Modernization Priorities. We are significantly increasing investment in our priorities to accelerate the delivery of capability to our Soldiers, focused on our most critical capability gaps. We must aggressively pursue these initiatives in FY20 in order to start fielding the next generation of combat vehicles, aerial platforms and weapon systems within the next decade. The FY20 Budget includes:

- Long Range Precision Fires (LRPF) – approximately \$1.3 billion:
 - A land based Hypersonic system to begin to defeat the “standoff” our near-peer adversaries are creating.
 - Precision Strike Missile (PrSM) to provide increased range, lethality, capacity, and survivability.
 - An Extended Range Cannon Artillery (ERCA) with the capability to fire artillery up to 70 kilometers, with more precision and volume than current systems;
 - A strategic long-range cannon with a range that will exceed 1,000 miles.
- Next Generation Combat Vehicle (NGCV) –approximately \$2 billion:
 - An optionally manned fighting platform that maneuvers Soldiers to a point of positional advantage to engage in close combat.
 - Experimentation with robotic combat vehicle variants to enhance our future force's ability to deliver decisive lethality, increased situational awareness, and formation overmatch.
 - The Armored Multi-Purpose Vehicle (AMPV), a replacement for the M113 family of vehicles.
 - Mobile Protected Firepower (MPF), an armored vehicle that provides precise, large caliber, long range direct fire capability to Infantry Brigade Combat Teams.

- Future Vertical Lift (FVL) – approximately \$800 million:
 - A future attack reconnaissance aircraft (FARA) that will include sensor and network packages that can coordinate with other aerial, long range precision fire, and ground platforms – optionally manned.
 - A future long range assault aircraft (FLRAA) that can fly at 250-280 knots and operate in a degraded visual environment – optionally manned.
- Army Network – approximately \$2.3 billion:
 - A unified and resilient network effective in the most challenging contested and congested environments that leverages commercial technologies.
 - Assured Position Navigation and Timing (A-PNT) systems to overpower, navigate through, and mitigate jamming.
- Air and Missile Defense (AMD) –approximately \$1.4 billion:
 - Initial Mobile Short-Range Air Defense (IM-SHORAD) capability beginning in FY21, followed by directed-energy effectors.
 - Lower Tier Air and Missile Defense Sensor (LTAMDS) provides improvement to sensor capability over the current PATRIOT radar.
 - Indirect Fire Protection Capability (IFPC), including Iron Dome as an interim solution, provides protection of fixed and semi-fixed sites from unmanned aerial systems (UAS); cruise missiles (CM); and rocket, artillery, and mortar (RAM) projectiles.
- Soldier Lethality - approximately \$1.2 billion:
 - Integrated Visual Augmentation System (IVAS) will provide augmented reality, digitally fused thermal and image intensifying capabilities, and synthetic training environment which will ultimately change how our Soldiers train, rehearse and fight on the battlefield.
 - Synthetic Training Environment (STE) will converge our current Live, Virtual, Gaming, and Constructive environment into a single simulation training environment.

- Next generation squad weapon (NGSW), which includes both an automatic weapon and rifle to achieve overmatch against current and future adversaries.

Under AFC, there are eight Cross-Functional Teams (CFTs) focused on 30 signature systems. Six CFTs align to the 6 Army Modernization Priorities plus two additional CFTs align to A-PNT and STE. The CFTs are resourced and empowered to rapidly generate cost-efficient capabilities that ensure overmatch against near-peer adversaries, and can be rapidly fielded to warfighters.

THE ENTERPRISE

The Army's Future Force Modernization Enterprise, or FFME, describes the Army's expertise, organizations, and infrastructure for rapidly and effectively developing and delivering the future force. Its responsibility spans from identification of future threats to delivery of material solutions. The FFME includes three primary organizations: AFC; the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)); and the Army Deputy Chief of Staff, G-8 (DCS, G-8). Broadly defined, the FFME involves the entire Army. Army modernization also requires close collaboration with the rest of the Joint Force, industry, academia, international partners, and others.

The FFME is based on strong unity of effort - multiple organizations working in distinct but complementary ways toward the same objective. That unity of effort drives a process of early teaming between requirements development, Research and Development, Test and Evaluation, and the acquisition community to support rapid innovation through Soldier touchpoints, demonstrations, prototyping, experimentation, and analysis. This process is designed to build increased velocity for validating requirements, to reduce the challenge of technology transition through the "valley of death," and to support seamless progression into the acquisition life-cycle.

AFC, ASA(ALT) and the G-8 all play distinct but closely integrated roles. AFC brings together modernization organizations that were previously scattered across the Army, bringing unity of effort and unity of command. This enables AFC to create concepts for how Army forces will fight in the future, and experiment to inform requirements. ASA(ALT) acquires and fields materiel solutions that are sufficiently mature. The Army DCS, G-8 matches resources to these requirements, based on Army strategic plans and Army priorities. Frequent leadership touch points and organizational ties forge and reinforce unity of effort. Together, these organizations usher lethal, modern capabilities and formations from conceptual idea to a fielded reality into Soldiers' hands.

ASA(ALT) will continue its supervision of the Department of the Army's acquisition, logistics, and technology efforts. The Army Acquisition Executive retains the title of the Army's chief scientist, as well as his authority and responsibility to deliver capability to Soldiers in order to achieve the modernization priorities and requirements identified by AFC. In addition, ASA(ALT) continues to provide policy guidance and identify ways to streamline and improve acquisition processes and maintains the responsibility of training, educating and managing the Army acquisition workforce.

This unity of effort enables the Army to utilize our world-class military and civilian workforce, incorporate constant Soldier input, and partner with innovative industries, entrepreneurs, academics, scientists, and engineers. That is how we will imagine, test, and build the capabilities future Soldiers need.

The Army continues to implement the past acquisition reform initiatives that Congress has authorized such as Section 804 Middle Tier Acquisition (MTA) from the Fiscal Year 2016 National Defense Authorization Act, Other Transaction Authority (OTA), and the prototyping of weapons systems components. With the requisite level of acquisition authority, the Army is using Section 804 to accelerate select efforts linked to the Army's Modernization Priorities. Examples of these efforts include: ERCA, IVAS,

Lower Tier Air and Missile Defense Sensor, NGCV, NGSW, and Mobile Protected Firepower.

CONCLUSION

In summary, Army Modernization is laser focused on the immediate impetus of increasingly capable near-peer competitors with advanced A2/AD capabilities, and the longer-term imperative to continuously modernize to stay ahead. Today's Army Modernization efforts are linked directly to challenges outlined in the NDS, and are focused on the enduring Army Modernization Priorities.

Army senior leader emphasis is enabling the FFME. AFC, ASA(ALT), and DCS, G-8 – are working together in a new and more effective way, leveraging authorities derived from Congress to improve the way we do business and to free up resources that will make the Total Army and Joint Force more lethal, capable, and efficient.

The Army is moving quickly to modernize – and we are seeing results. Time is not on our side. With continued support from Congress, including predictable, adequate, sustained, and timely funding, the Army will build and maintain a force ready to deter potential adversaries. If deterrence fails we will be able to rapidly deploy, fight, and win as part of the Joint Force.

Thank you again for this opportunity to discuss Army Modernization and for your strong support of our Soldiers, Army Civilians, and their Families. We look forward to your questions.

The Honorable Dr. Bruce D. Jette
Assistant Secretary of the Army (Acquisition, Logistics and Technology) and
Army Acquisition Executive

Dr. Bruce D. Jette was confirmed by the United States Senate as the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)) on December 20, 2017, and sworn into office on January 2, 2018. In this position, he serves as the Army Acquisition Executive, the Senior Procurement Executive, the Science Advisor to the Secretary of the Army, and the Army's Senior Research and Development official. He also has principal responsibility for all Department of the Army matters related to logistics.

Dr. Jette leads the execution of the Army's acquisition function and the acquisition management system. His responsibilities include providing oversight for the life cycle management and sustainment of Army weapon systems and equipment from research and development through test and evaluation, acquisition, logistics, fielding, and disposition. He is also responsible for appointing, managing, and evaluating program executive officers and managing the Army Acquisition Corps and Army Acquisition Workforce. In addition, he oversees the Elimination of Chemical Weapons program.

Prior to his confirmation, Dr. Jette served as President and Chief Executive Officer of Synovision Solutions, LLC, an innovative company he founded to provide management and technical consulting, engineering services, and project management in support of military and governmental agencies, as well as commercial industry.

A decorated veteran of 28 years of active duty, Dr. Jette retired as a Colonel following a career that included several armor and cavalry company commands, two overseas tours, various staff assignments at the battalion and brigade level, and over two years of operational deployments to Afghanistan, Iraq and Kuwait. Highlights of his previous acquisition service include founding the U.S. Army Rapid Equipping Force; serving as Program Manager for Soldier Systems which led to the establishment of Program Executive Office Soldier; and being honored as U.S. Army PM of the Year for his success as Product Manager for all Army airborne electronic warfare systems.

Dr. Jette is a graduate of the United States Military Academy with a Bachelor of Science degree in Nuclear Engineering and Chemistry. He also holds both a Master of Science degree and a Doctorate in Electronic Materials from the Massachusetts Institute of Technology. He was an Adjunct Professor at the Edmund A. Walsh School of Foreign Service Security Studies Program at Georgetown University.

His numerous military awards and commendations include the Distinguished Service Medal, Legion of Merit (3), Bronze Star Medal, Meritorious Service Medal (3), Army Commendation Medal, Army Achievement Medal (2), National Defense Medal (2), Operation Iraqi Freedom Campaign Ribbon, Operation Enduring Freedom Ribbon, Army Service Ribbon, Army Overseas Ribbon (2), Parachutist Badge, Army General Staff Award, and Order of Saint Maurice (Legionnaire).

General John M. Murray
Commanding General, Army Futures Command

General Murray was commissioned as an Infantry officer in the U.S. Army upon graduation from the Ohio State University in 1982. Throughout his career, General Murray has served in leadership positions and commanded from Company through Division, with various staff assignments at the highest levels of the Army.

General Murray has held numerous command positions. His command assignments include: Commanding General Joint Task Force-3; Deputy Commanding General – Support for U.S. Forces Afghanistan; Commander Bagram Airfield; Commanding General 3rd Infantry Division at Fort Stewart, Georgia; Commander, 3rd Brigade, 1st Cavalry Division, at Fort Hood, Texas while serving in Operation IRAQI FREEDOM; Commander, 1st Battalion, 18th Infantry, 1st Infantry Division, United States Army Europe and Seventh Army, Germany; Commander, C Company, 1-12th Infantry Battalion, 4th Infantry Division (Mechanized), Fort Carson, Colorado.

Previously, he was the Deputy Chief of Staff, G-8, in the Pentagon; Director, Force Management, the Pentagon; Assistant Deputy Director for Joint Training, J-7, Joint Staff, Suffolk, Virginia; Director, Joint Center for Operational Analysis, United States Joint Forces Command, Suffolk, Virginia; Deputy Commanding General (Maneuver), 1st Cavalry Division, Fort Hood, Texas; Deputy Commanding General (Maneuver), Multi-National Division-Baghdad OPERATION IRAQI FREEDOM, Iraq; G-3 (Operations), III Corps, Fort Hood, Texas; Chief of Staff, III Corps and Fort Hood, Fort Hood, Texas; C-3, Multi-National Corps-Iraq, OPERATION IRAQI FREEDOM, Iraq; G-3 (Operations), 1st Infantry Division, United States Army Europe and Seventh Army, Germany; Chief, Space Control Protection Section, J-33, United States Space Command, Peterson Air Force Base, Colorado; S-3(Operations), later Executive Officer, 1st Battalion, 5th Cavalry, 1st Cavalry Division, Fort Hood, Texas; Chief, Plans, G-1, III Corps and Fort Hood, Fort Hood, Texas.

General Murray's awards and decorations include: the Distinguished Service Medal w/ Oak Leaf Cluster, the Defense Superior Service Medal with Oak Leaf Cluster, the Legion of Merit with two Oak Leaf Clusters, the Bronze Star Medal with three Oak Leaf Clusters, the Defense Meritorious Service Medal, the Meritorious Service Medal with two Oak Leaf Clusters, the Army Commendation Medal with Oak Leaf Cluster, the Joint Service Achievement Medal, the Army Achievement Medal with Oak Leaf Cluster, the Ranger Tab, the Combat Infantryman Badge, the Expert Infantryman Badge, the Parachutist Badge, the Air Assault Badge, the Joint Chiefs of Staff Identification Badge and the Army Staff Identification Badge.

General Murray hails from Kenton, Ohio. He and his wife, Jane, have three lovely daughters and seven grandchildren.

James F. Pasquarette
Army Deputy Chief of Staff, G-8, United States

Lieutenant General Pasquarette was commissioned as a second lieutenant armor officer in the U.S. Army upon his graduation from Furman University in 1983. His first duty assignment was 1st Battalion, 13th Armor in Illesheim, West Germany. As a captain, LTG Pasquarette served in 1st Cavalry Division in G-3 Operations, as the 1st Brigade logistics officer, and as a tank company commander in 2nd Battalion, 8th Cavalry Regiment. His company subsequently deployed as a Cohesion Operational Readiness Training (COHORT) unit to the Republic of Korea and became part of 1st Battalion, 72nd Armor Regiment, 2nd Infantry Division.

Upon completion of company command, LTG Pasquarette spent two years as a staff officer in the Strategy, Plans and Policy Directorate, Office of the Deputy Chief of Staff, G-3, on the Army Staff in Washington, DC. He subsequently spent three years at Fort Stewart, Georgia, as Chief of Plans, 3rd Infantry Division and operations officer for 3rd Battalion, 69th Armor Regiment and 1st Brigade, 3rd Infantry Division. He then served at Fort McPherson, Georgia, as a plans officer in 3rd Army and as aide-de-camp to the U.S. Army Forces Command Commander.

LTG Pasquarette commanded the 2nd Battalion, 12th Cavalry Regiment, 1st Cavalry Division, from 2001-2003. Upon completion of battalion command, he served on the Joint Staff in Washington, DC. From 2005-2007, LTG Pasquarette commanded 1st Brigade, 4th Infantry Division at Fort Hood, Texas, and in Iraq. Following his attendance at the Army War College, he served as executive officer to the Chief of Staff of the Army followed by an assignment as Deputy Commanding General (Support) for 4th Infantry Division (Mechanized) at both Fort Carson, Colorado, and Iraq. Upon his return from Iraq, LTG Pasquarette served as Director, Comprehensive Soldier Fitness, prior to becoming the Deputy Director, Program Analysis and Evaluation Directorate, Headquarters, Department of the Army, G-8. His most recent assignments were as Chief of Staff, United States Army Pacific, from July 2013 to August 2014; Deputy Commanding General of U.S. Army Pacific Command at Fort Shafter, Hawaii; and as Commander, U.S. Army Japan from July 2015 to July 2018. He assumed his present duties in August 2018.

His awards and decorations include the Distinguished Service Medal, Legion of Merit, Bronze Star, Defense Meritorious Service Medal and Meritorious Service Medal. He has earned Master's degrees from Harvard University, U.S. Army Command and General Staff College, and the Army War College.

LTG Pasquarette hails from Florida. He and his wife, Liz, have three sons, two of whom serve in the Army and the other is a sophomore at in high school.

United States Government Accountability Office



Testimony
Before the Subcommittee on Tactical Air
and Land Forces, Committee on Armed
Services, House of Representatives

For Release on Delivery
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Wednesday, May 1, 2019

ARMY MODERNIZATION

Army Should Take Steps to Reduce Risk

Statement of Jon Ludwigson, Acting Director,
Contracting and National Security Acquisitions

GAO Highlights

Highlights of GAO-19-502T, a testimony before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, House of Representatives

Why GAO Did This Study

The Army is investing in near- and long-term modernization efforts to maintain its technological edge over potential adversaries. It is doing this by upgrading and updating current weapon systems, developing new capabilities, and reshaping its doctrine, force structure, training, and leader development.

This testimony is based on prior GAO work conducted 2016 through 2019 and addresses the Army's progress in (1) establishing Army Futures Command, and (2) developing its near-term and long-term modernization strategies. It also highlights several actions recommended in prior reports related to Army modernization.

To conduct this work, GAO assessed the Army's near- and long-term modernization efforts, application of leading practices to those efforts, budget documents, and the effectiveness of the process for developing requirements for major weapon systems. This statement includes updates to this information, as of April 2019.

What GAO Recommends

Over the past 3 years, GAO has made recommendations related to the body of work, Department of Defense and Army concerned with all the recommendations and are seeking to implement them.

View GAO-19-502T. For more information, contact Jim Lohmeier at (302) 512-4441 or jlohmeier@gao.gov.

May 1, 2019

ARMY MODERNIZATION

Army Should Take Steps to Reduce Risk

What GAO Found

In January 2019, GAO reported on initial steps the Army has taken to consolidate its modernization efforts under one authority—Army Futures Command. Army officials call it their most significant institutional change since 1973, when the Army was reorganized after the Vietnam War. As a precursor to this new command, the Army established eight cross-functional teams as a pilot program to increase the efficiency of requirements and technology development in six key modernization areas. These areas are described in the table below.

Description of Army's Six Prioritized Capability Needs

Army priority	Description of priority
Long-Range Precision Fires	Capabilities, including munitions that restore Army dominance in range, lethality, and target acquisition.
Next Generation Combat Vehicle	Manned and unmanned combat vehicles with modern firepower, protection, mobility, and power generation.
Future Vertical Lift	Manned and unmanned platforms capable of attack, lift, and reconnaissance missions on modern and future battlefields.
Army Network	A mobile system of hardware, software, and infrastructure that can be used to fight cohesively in any environment where the electromagnetic spectrum is denied or degraded.
Air and Missile Defense	Capabilities that ensure future combat formations are protected from modern and advanced air and missile threats.
Soldier Lethality	Capabilities, equipment, and training for all fundamentals of combat—shooting, moving, communicating, protecting, and sustaining. This includes an expansion of simulated training.

Source: GAO review of Army documentation | GAO-19-502T

Since announcing the modernization efforts in 2017, the Army has directed more funding toward closing near-term capability gaps. For example, as part of the planning for the fiscal year 2019 budget process, the Army identified 67 high-priority programs that require a \$16 billion investment between now and fiscal year 2023. In addition to the near-term capabilities the Army is pursuing, it has identified a number of long-term needs—those focused after fiscal year 2024—and taken steps to realign research and development efforts and funding with those needs.

Over the past 2 years, GAO highlighted several steps Army should take to improve its modernization efforts, including:

- Apply leading practices to Army Futures Command's cross-functional teams, and capture their lessons learned.
- Assess the resources, particularly personnel, necessary to support its requirements development process.
- Increase the transparency of its efforts by clarifying how it evaluates whether its modernization efforts are achieving the Army's goals and clearly stating the full costs of pursuing those goals.
- Reduce risk by ensuring technologies are fully mature—such as demonstrating technologies in an operational environment before starting a formal acquisition program.

By implementing these recommendations, Army Futures Command could better ensure its ability to deliver enhanced capabilities to the warfighter and decrease the risk of cost and schedule growth.

United States Government Accountability Office

Chairman Norcross, Ranking Member Hartzler, and Members of the Subcommittee:

Thank you for the opportunity to be here today to discuss our recent work on the Army's efforts to upgrade or replace its capabilities—a process generally referred to as modernization. The Army has determined that it must undertake this modernization in order to maintain its edge over potential adversaries, or risk falling behind. Over the past 2 years, our reports have highlighted some aspects of modernization including where the Army has taken some positive steps and where we have identified opportunities for improvement.¹

According to the Army Strategy of 2018, the Army's modernization efforts fall within broader efforts to maintain the ability to deter or defeat potential adversaries. Simultaneous with modernization of its weapon systems, the Army has begun an effort to reshape its warfighting concepts for engaging with potential adversaries across all domains; including land, air, sea, space, and cyberspace. These new operational concepts will shape not only the Army's equipment modernization priorities, but also its doctrine, force structure, training, and leader development.

This statement will address the Army's progress in: (1) establishing Army Futures Command, and (2) developing its near-term and long-term modernization strategies. In addition, it will highlight several key actions that we recommended in our prior reports related to Army modernization.

This statement is based on prior work in three GAO reports. The prior work that we drew from, among other things, assessed the Army's near- and long-term modernization efforts, application of leading practices to those efforts, budget documents, and the effectiveness of process for developing requirements for the major weapon systems. The statement also includes updates to information as of April 2019 as appropriate, based on Army documentation. The reports cited throughout this statement contain more details on the scope of the work and the methodology used to carry it out.

¹GAO, *Army Modernization: Steps Needed to Ensure Army Futures Command Fully Applies Leading Practices*, GAO-19-132 (Washington, D.C.: Jan. 23, 2019); *Army Modernization: Actions Needed to Measure Progress and to Fully Identify Near-Term Costs*, GAO-18-604SU (Washington, D.C.: Sept. 28, 2018); *Army Weapon System Requirements: Need to Address Workforce Shortfalls to Make Necessary Improvements*, GAO-17-568 (Washington, D.C.: June 22, 2017). GAO-18-604SU is a For Official Use Only document, but we use only information that is not labelled For Official Use Only.

We conducted the body of work on which this testimony is based from March 2016 to January 2019 in accordance with generally accepted government auditing standards.² 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.

The Army Can Take Steps to Improve the Way Army Futures Command Operates

Army Futures Command Established to Lead Modernization Efforts

In January 2019, we reported on the initial steps the Army has taken to consolidate all its modernization efforts under one authority.³ Establishing Army Futures Command is reported to be the most significant institutional change to the Army since it reorganized in 1973 after the Vietnam War. According to Army documentation, the intent of the new command is to provide unity of command, accountability, and modernization at the speed and scale required to prevail in future conflicts. The organization is led by a four-star general like its organizational peers: Army Materiel Command, Training and Doctrine Command, and Forces Command. The Army declared the commencement of operations for the command in July 2018, and has begun to define its organizational structures. Army Futures Command is expected to be fully operational by July 2019, meaning it will have sufficient staff with operational facilities, secure funding, and the ability to execute its assigned mission, roles, and responsibilities.

Army Futures Command is headquartered in Austin, Texas. According to Army officials and documentation, the Army chose Austin because of its proximity to science, technology, engineering, and mathematics talent, as well as private sector innovators that officials believe will assist the command in achieving its modernization goals. According to senior Army leadership, the new command headquarters will have around 300 staff in place by July 2019, a workforce that may grow to as many as 500

²GAO-19-132, GAO-18-604SU, and GAO-17-568.

³GAO-19-132

employees—100 military and 400 civilians. Our analysis of Army's plans for initial staffing at the Army Futures Command headquarters, based on data from July 1, 2018, found that about one-third of headquarters staff would be involved directly in modernization efforts, such as engineers and operations specialists, and the remaining two-thirds would consist of support staff, including legal counsel and contracting professionals.

According to Army Futures Command officials and documentation, the new organization will be organized around three major components:

- **Futures and Concepts Center** is responsible for identifying and prioritizing capability and development needs and opportunities. This organization subsumed the Army Capabilities Integration Center on December 7, 2018. The center was formerly part of Army Training and Doctrine Command and is located at Fort Eustis, Virginia.
- **Combat Capabilities Development Command** is responsible for conceptualizing and developing solutions for identified needs and opportunities. This organization subsumed the Research, Development and Engineering Command on February 3, 2019 and is located at Aberdeen Proving Ground, Maryland.
- **Combat Systems Directorate** is responsible for refining, engineering, and producing new capabilities. This directorate will communicate with the program executive offices and program management offices reporting to the Assistant Secretary of the Army for Acquisition, Logistics and Technology. Combat Systems Directorate is in the process of being established and is located in Austin, Texas.

Among other things, the reorganization is intended to establish Army Futures Command to oversee development of Army's six modernization priorities. The Army's then-Acting Secretary and the Chief of Staff in an October 3, 2017 memorandum identified these priorities to guide Army modernization:

- long-range precision fires,
- next generation combat vehicle,
- future vertical lift,
- network,
- air and missile defense, and
- soldier lethality.

Army Established Cross-Functional Teams to Improve How it Develops Capabilities

As we reported in January 2019, to pursue the six priority areas, the Army established eight cross-functional teams.⁴ These teams were initially created as a pilot effort to increase the efficiency of requirements and technology development for modernization before the announcement of the new command. They were subsequently moved into Army Futures Command in 2018. These cross-functional teams are located throughout the country in areas of relevance to their mission. The eight cross-functional teams and the priority areas they address are outlined in table 1.

Table 1: Army Modernization Priorities and Assigned Cross-Functional Teams

Army priority	Description of priority	Cross-functional team location
Long-Range Precision Fires	Capabilities, including munitions that restore Army dominance in range, lethality, and target acquisition.	Long-Range Precision Fires – Fort Sill, Okla.
Next Generation Combat Vehicle	Manned and unmanned combat vehicles with modern firepower, protection, mobility, and power generation.	Next Generation Combat Vehicle - Detroit Arsenal, Mich.
Future Vertical Lift	Manned and unmanned platforms capable of attack, lift, and reconnaissance missions on modern and future battlefields.	Future Vertical Lift – Redstone Arsenal, Ala.
Army Network	A mobile system of hardware, software, and infrastructure that can be used to fight cohesively in any environment where the electromagnetic spectrum is denied or degraded.	Network Command, Control, Communication, and Intelligence – Aberdeen Proving Ground, Md. Assured Positioning, Navigation, and Timing – Redstone Arsenal, Ala.
Air and Missile Defense	Capabilities that ensure future combat formations are protected from modern and advanced air and missile threats.	Air and Missile Defense – Fort Sill, Okla.
Soldier Lethality	Capabilities, equipment, and training for all fundamentals of combat—shooting, moving, communicating, protecting, and sustaining. This includes an expansion of simulated training.	Soldier Lethality – Fort Benning, Ga. Synthetic Training Environment – Orlando, Fla.

Source: GAO review of Army documentation. | GAO-19-502T

Note: Two of the modernization priorities—Army Network and Soldier Lethality—were subdivided into two cross-functional teams while the other four priorities each were assigned one cross-functional team.

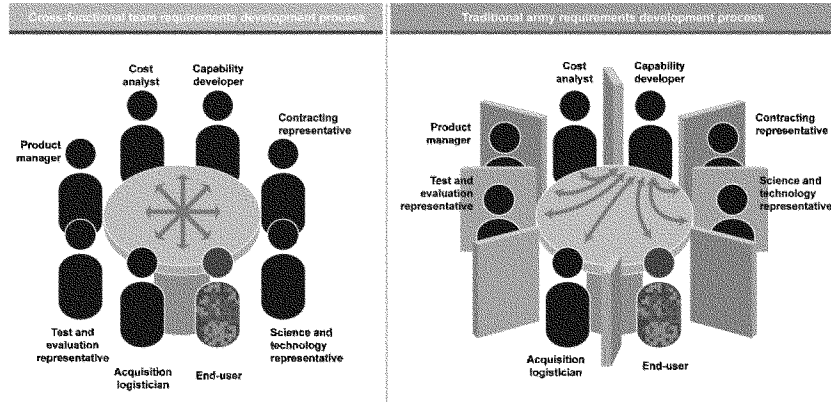
⁴GAO-19-132

These cross-functional teams are intended to:

- take steps toward achieving the six modernization priorities;
- leverage expertise from industry and academia;
- identify ways to use experimentation, prototyping, and demonstrations; and
- identify opportunities to improve the efficiency of requirements development and the overall defense systems acquisition process.

The cross-functional team pilots were structured to help achieve these goals. Each cross-functional team consists of core staff and subject matter experts from across the Army. To facilitate the rapid approval of requirements, each cross-functional team is led by a general officer or a senior civilian official who could communicate directly with the highest levels of the Army. The goal of staffing these teams is to ensure that each team had individuals who specialized in acquisition, requirements, science and technology, test and evaluation, resourcing, contracting, cost analysis, sustainment, and military operations. The goal of bringing different experts together is to facilitate collaboration and immediate opportunities for stakeholders to provide input as opposed to the more traditional requirements development process, in which input has typically been provided separately. Officials told us that, while all of these subject matter experts may have provided input on the requirements development process in the past, placing them on a single team offers the promise of streamlining those efforts and could eliminate the need for multiple reviews. Figure 1 below compares the requirements development process under cross-functional teams to how the Army has traditionally developed requirements.

Figure 1: Comparison of Cross-Functional Teams and Traditional Requirements Development Processes



Source: GAO interpretation of Army information. | GAO-19-502T

Further Implementation of Leading Practices Could Reduce Risk for Army Futures Command

In January 2019, we recommended that Army Futures Command incorporate leading practices for effective cross-functional teams. We determined that the documentation that established the cross-functional team pilots fully addressed four of our eight leading practices for effective teams, and at least partially addressed another four. The leading practices and their implementation by the cross-function teams are described in table 2 below.

Table 2: Implementation of Leading Practices for Establishing Effective Cross-Functional Teams

Leading practice	Description	Cross-functional team implementation
Open and regular communication	Efficient cross-functional teams have effective communication mechanisms.	Fully applied
Well-defined team goals	Effective cross-functional teams have clear, updated, and well-defined goals common to the team, team leader, and management.	Fully applied

Leading practice	Description	Cross-functional team implementation
Inclusive team environment	Effective cross-functional teams invest in a supportive and inclusive team environment where all team members have collective responsibility and individual accountability for the team's work.	Partially applied
Well-defined team structure	Effective cross-functional teams have well-defined team operations with project-specific rules and procedures established for each team.	Partially applied
Autonomy	Effective cross-functional teams are independent and have the ability to make decisions independently and rapidly.	Fully applied
Senior management support	Effective cross-functional teams have senior managers who view the teams as a priority within the organization and provide these teams with resources and rewards to recognize their work.	Partially applied
Committed cross-functional team members	Effective cross-functional teams have members committed to the team's goals.	Fully applied
Empowered cross-functional team leader	The selected cross-functional team leader should provide clear guidance for team members, be proactive and empowered to make decisions, and provide feedback and developmental opportunities to team members.	Partially applied

Source: GAO | GAO-19-502T

In addition to the practices listed above, the cross-functional team pilots generally applied leading practices for requirements development. One leading practice the teams generally applied was promoting communication between requirements developers, warfighters, and industry representatives. This enables the cross-functional teams to better match developer resources with end-user needs.

While applying this practice, the cross-functional team pilots had initial progress in writing requirements documents more efficiently. According to cross-functional team officials, they were able to shorten the requirements development process for several capabilities.

However, we found that Army Futures Command does not have a formal plan to identify and share lessons learned from cross-functional team pilots to incorporate or expand application of these leading practices. Doing so would allow Army Futures Command the opportunity to accelerate the progress these teams made and spread the benefits across all of the teams and a wider range of specific military capabilities they are pursuing. We recommended that the Army (1) incorporate cross-functional teams' experiences in applying leading practices and (2) execute a process for identifying and incorporating lessons learned. The Department of Defense concurred with these recommendations, and

stated that Army Futures Command expects to apply leading practices and capture lessons learned by the end of 2019.

Our January 2019 report also identified leading practices for mergers and organizational transformations. These leading practices are listed in table 3 below.

Table 3: Leading Practices for Mergers and Organizational Transformations

Leading practice
Ensure top leadership drives the transformation.
Establish a coherent mission and integrated strategic goals to guide the transformation.
Focus on a key set of principles and priorities at the outset of the transformation.
Set implementation goals and a timeline to build momentum and show progress from day one.
Dedicate an implementation team to manage the transformation process.
Use the performance management system to define responsibility and assure accountability for change.
Establish a communication strategy to create shared expectations and report related progress.
Involve employees to obtain their ideas and gain their ownership for the transformation.
Build a world-class organization.

Source: GAO | GAO-19-502T

We found that the Army Futures Command had implemented some of these practices, particularly leadership's dedication to the new command and the clear statement of its mission. However, we have previously reported that, according to federal internal controls standards, it is important to implement all of these practices in order to establish the organizational structure necessary to enable an entity to plan, execute, control, and assess the organization in achieving its objectives. Establishment of this structure is particularly important for the Army where leadership and its priorities can change frequently. Therefore, we recommended in January 2019 that Army Futures Command fully apply these leading practices. The Department of Defense concurred with the recommendation, and stated that it would start pilot processes in fiscal years 2019 and 2020.

**Army Futures Command
Should Assess Availability
of Key Acquisition
Personnel Needed for
Requirements
Development**

In addition to further implementing leading practices, Army Futures Command can reduce risk to meeting its goals by fully assessing the workforce necessary to develop requirements—the testable and measurable characteristics necessary for the design of a proposed system. Historically, the Army has been unable to ensure that requirements for new capabilities are feasible due, in part, to a declining workforce for requirements development. In June 2017, we reported that the Army had prioritized combat readiness over resourcing its requirements development process to meet future readiness needs.⁵ We recommended that the Army assess the resources, particularly personnel, necessary for requirements development. The Army concurred with the recommendation, and has stated it would implement this recommendation once Army Futures Command is fully operational. As Army Futures Command centralizes and takes responsibility for requirements development, this recommendation is even more pertinent. Therefore, we recently elevated the status of the recommendation to a priority recommendation for the Secretary of the Army, as we believe it warrants greater attention from the Department of the Army.⁶

**Army Futures Command
Has Not Developed
Formal Policies and
Procedures for
Coordination with Other
Army Acquisition Entities**

As Army Futures Command approaches full operating status, it is important to define not only how the command functions, but how it works with other organizations. In our January 2019 report, we found that Army Futures Command had not yet established policies and procedures detailing how it will execute its responsibilities in coordination with other Army organizations that do not directly report to it. One such organization is the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology—the civilian authority responsible for the overall supervision of Army acquisition matters—and the acquisition offices it oversees. To mitigate concerns about coordination, the Army issued a directive in August 2018, signed by the Secretary of the Army, designating the military deputy to the Assistant Secretary as an advisor to Army Futures Command, and Army Futures Command officials have stated that the Assistant Secretary will retain full acquisition authorities as required by law. The command expects to continue to refine its coordination with the Office of the Assistant Secretary of the Army for Acquisition, Logistics, and Technology.

⁵GAO-17-568

⁶GAO, *Priority Open Recommendations: Department of Defense*, GAO-19-366SP (Washington, D.C.: March 28, 2019).

The Army Is Funding Modernization Priorities, but Further Steps Can be Taken to Manage Risk

Army Modernization Has Prioritized Near-Term Capability Gaps while Identifying and Beginning to Fund Long-Term Needs

Since announcing the modernization efforts in 2017, the Army has directed more funding toward closing near-term capability gaps, focused on fiscal years 2019 through 2023. For example, as part of the planning for the fiscal year 2019 budget process, the Army identified 67 high-priority programs, such as the M-1 Abrams tank and the AH-64 Apache helicopter, which require further investment. To support these priorities, the Army identified a need for \$16 billion in increased funding in fiscal years 2019 through 2023. The 2018 Army Modernization Strategy report identified the need for additional resources for near-term efforts, including plans to spend billions of dollars for acquisition of maneuverable short range air defense capabilities in fiscal years 2020 through 2024.

In addition to the near-term capabilities the Army is pursuing, it has identified a number of long-term needs—those focused after fiscal year 2024—and begun to align research and development efforts with these needs. The Army identified long-term capabilities for all of the modernization priorities, as well as dates that science and technology efforts should transition to programs of record. As part of this overall effort, the Army has evaluated its science and technology portfolio to realign funding toward its six modernization priorities.

In an October 2017 Army review, the eight cross-functional teams examined science and technology investments to identify which efforts contributed to the priorities and which did not. The review was performed for the Office of the Deputy Under Secretary of the Army. Based on that work, as of our January 2019 report, the Army had taken steps to realign over \$1 billion from previous priorities and toward the new priorities for fiscal years 2019 through 2023. Army officials stated that they expect to undertake similar reviews annually.

Tracking Near-Term Modernization Efforts and Costs Could Address Management Challenges

The Army is executing near-term modernization programs, but could better manage how it evaluates them and estimate their costs. In September 2018, we reported that the Army used its six priority capabilities to identify key mission areas—such as long-range artillery, air and missile defense, brigade combat teams, and cyber and electronic warfare—that require near-term modernization investments.⁷ Based on its assessments, the Army prioritized and proposed several near-term solutions to address its critical capability gaps. These solutions included adding personnel—and different types of personnel—to combat forces, updating existing weapon systems, and investments in research and development. However, the Army had not established processes for evaluating whether its modernization efforts allow it to deter or defeat potential adversaries during a major conflict.

We also found that the Army had not fully estimated the costs or sources of funding for its near-term modernization efforts. In particular, we found that the Army did not report in its modernization strategy the extent to which it relied on Overseas Contingency Operations appropriations. We recommended that the Army (1) develop a plan to finalize the processes for evaluating how its near-term investments contribute to the Army's ability to decisively defeat a major adversary, and (2) finalize its cost analysis of near-term investments and report those costs to Congress in its fiscal year 2020 budget request. Army officials told us in April 2019 that the Army has taken steps to implement these recommendations.

Addressing Past Challenges with Technology Development Could Help Address Long-Term Modernization Risks

The most recent efforts to modernize follow several past efforts. Unfortunately, the Army has a history of failed, costly weapon system procurements to replace older weapons systems. These failures are due, in part, to requirements that could not be met and the immaturity of key technologies. Many of these programs failed to provide any capability to the warfighter despite the considerable time and funding expended. Some examples of these cancelled programs are listed in table 4 below.

⁷GAO-18-604SU

Table 4: Examples of Cancelled Army Modernization Programs

Name	Year cancelled	Cost of cancellation (dollars in billions)	Description	Reasons cancelled
Comanche	2004	10.1	Armed reconnaissance helicopter	Cost increases, schedule delays, performance shortfalls.
Future Combat Systems	2009	21.4	Family of light and mobile manned and unmanned vehicles	Over ambitious requirements, immaturity of key technologies, cost increases, schedule delays.
Ground Combat Vehicle	2014	1.5	Replacement for the Bradley Infantry Fighting Vehicle	Infeasible requirements.

Source: GAO review of Department of Defense documentation. | GAO-19-502T

Note: All dollars in fiscal year 2019 dollars.

Achieving Higher Levels of Technology Maturity Can Reduce Risks for Long-Term Modernization

While the Army has dedicated significant funding towards its long-term modernization priorities, other changes may also be needed. Among them, we recommended in our January 2019 report, that Army Futures Command take steps to follow our leading practices to mature technology to a sufficiently high level prior to system development, which can reduce risk.⁸

There are indications that, in some cases, the Army plans to mature technology to a sufficiently high level prior to system development. For example, officials from the Future Vertical Lift cross-functional team told us they will complete technology demonstrations on two competitive prototypes before choosing to develop a design for the Future Attack Reconnaissance Aircraft. However, we found that the Army may continue its past practice of proceeding into system development with less mature technologies. In particular, we identified some plans to mature technologies in a relevant environment prior to authorizing the start of a new acquisition program, rather than the higher level of demonstrating them in an operational environment as recommended by our leading practices.⁹ This increases risk that new capabilities will require further maturation in system development, which could raise costs and extend timelines for delivery of equipment to the warfighter.

⁸GAO-19-132

⁹While the Department of Defense has a policy, based in statute, that generally requires major defense acquisition programs to, at a minimum, demonstrate technologies in a relevant environment before system development, that policy does not preclude the cross-functional teams from pursuing a higher level of maturity.

We recommended in our January 2019 report that the Army should demonstrate technologies in an operational environment before starting a formal acquisition program. The Department of Defense concurred with the recommendation and stated that the Army Futures Command will execute a new development process that will include operational technology demonstrations. Pilot processes for this are expected to begin in 2019.

In summary, we recognize that the Army is early in its modernization efforts but could make changes now that would be helpful. Army Futures Command should implement not only the leading practices we describe as well as the lessons learned by its own cross-functional teams. The Army should also increase the transparency of its efforts by clarifying how it evaluates its progress towards modernization goals and clearly stating the full costs of pursuing those goals. Finally, the Army can reduce the risk to the long-term modernization of its capabilities by ensuring that the technologies it uses in future weapon systems are fully mature.

Chairman Norcross, Ranking Member Hartzler, and Members of the Subcommittee, this concludes my prepared statement. I would be pleased to answer any questions that you may have at this time.

GAO Contact and Staff Acknowledgment

If you or your staff have any questions about this testimony, please contact Jon Ludwigson, Acting Director, Contracting and National Security Acquisitions at (202) 512-4841, or ludwigsonj@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 J. Kristopher Keener (Assistant Director), Joe E. Hunter (Analyst-in-Charge), Emily Bond, Matthew T. Crosby, Cale Jones, Kevin O'Neill, John Pendleton, and Roxanna Sun.

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Jon Ludwigson

Mr. Ludwigson is an acting Director in the Contracting and National Security Acquisitions (CNSA) team and has worked for the United States Government Accountability Office (GAO) for over 20 years. His work with CNSA has spanned a variety of areas including acquisition workforce, Army modernization, software acquisitions, weapons systems acquisitions, and oversight of research and development of related technologies. Previously, Mr. Ludwigson served as an Assistant Director in the Natural Resources and Environment team where he led numerous engagements examining a variety of topics including energy systems, energy markets, energy technologies, electricity infrastructure, oversight of oil and gas produced from federal lands. In addition, he contributed to GAO's duplication, fragmentation and potential cost savings reports and the high risk reports. In recognition of his contributions, Mr. Ludwigson received numerous accolades including 2 Meritorious Service Awards, a Client Services Award, 2 Managing Director's Awards, and an Assistant Comptroller General Award. Prior to joining GAO, Mr. Ludwigson worked in private consulting, examining energy and electricity issues among other things. Mr. Ludwigson holds a master's degree in public policy from Georgetown University and a bachelor's degree in business administration from the University of Colorado at Boulder. Outside of GAO, Mr. Ludwigson enjoys skiing, hiking, and cycling with his family and has served on the budget and audit committee for Lakewood, Colorado, the board of a private foundation supporting low income families' efforts to become self-sufficient, and as an Assistant Scoutmaster for the Boy Scouts.

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

MAY 1, 2019

RESPONSES TO QUESTIONS SUBMITTED BY MR. LANGEVIN

General MURRAY. The Army will meet the Congressional reporting timeline for FY16 NDAA Section 1647. The service is on track to have all reports complete and provided to the Secretary of Defense by 31 December 2019 in accordance with FY16 NDAA Section 1647 guidance. [See page 21.]

General MURRAY. The Army follows the Cyber Survivability Endorsement Implementation Guide developed by the Joint Staff J6. The Guide describes ten cyber security attributes (CSAs) that must be considered during a system's development phase, and provides criteria to identify Cyber Survivability Risk Category (CSRC). Requirements to mitigate this risk are "Baked in" to our requirements documents. The Army established metrics to quantify and qualify resiliency for both individual systems and the network as a whole. Specific metrics for new systems are developed based upon the specific capability being delivered. For example, metrics to assess resiliency of the integrated tactical network will include:

—Ability of the network to maintain connectivity during an electronic warfare attack. This includes: the percent of the network that remains connected during an electronic warfare attack, the number of disconnected fragments the network may break into, any critical nodes disconnected from the main network fragment, and, for how long; and to what degree can mitigation techniques improve performance.

—Ability of the network to maintain information services/message dissemination services to host applications during the presence of a threat. This includes maintaining adequate message completion rates and message delivery times, both for individual messages and for mission threads. The Army tailors metrics to assess cyber resiliency of a system, across the Prevent, Mitigate, Recover (PMR) analysis process.

- Prevent: controls system access, reduces the system cyber detectability, secures transmissions and communications, protects the system information from exploitation, partitions and ensures critical function performance levels, and hardens attack surfaces.
- Mitigate: baselines and monitors system to detect anomalies and manage system performance if degraded by cyber events.
- Recovery: measures the system's ability to recover from cyber-attack.

[See page 21.]

QUESTIONS SUBMITTED BY MEMBERS POST HEARING

MAY 1, 2019

QUESTIONS SUBMITTED BY MR. NORCROSS

Mr. NORCROSS. The GAO reports that the Army has come to rely on the use of Overseas Contingency Operations (OCO) funding to pay for upgrades to its weapon systems and platforms. However, such funds are not typically included in the 5-year spending plans that accompany the congressional budget submission, making it difficult to project the total funding requirements for efforts that span fiscal years. GAO recommended that the Army report to Congress plans, if any, to continue this practice.

How much of the Army's OCO submission for fiscal year 2020 is being used to support modernization goals?

What are the Army's cost projections in its 5-year spending plans for modernization efforts being funded through OCO?

What systems are particularly dependent on OCO appropriations in fiscal year 2020?

Secretary JETTE and General MURRAY. None. The Army uses Overseas Contingency Operations (OCO) funding to meet immediate or near term theater requirements and base dollars for its six Modernization Priorities for future multi-domain operations battlefields in Fiscal Year 2028 (FY28) and beyond. In FY20, the Army requested \$3.7 billion in OCO to fill Joint Urgent Operational Needs Statements (JUONS) and Operational Needs Statements; replace munitions expended in combat; build-up Army Prepositioned Stocks (APS) in Europe; and other theater based requirements through the European Deterrence Initiative (EDI). The Army does not develop externally releasable five-year estimates on OCO. In FY20, the systems particularly dependent on OCO appropriations include: Multiple Launch Rocket System Modifications (EDI APS 2)—\$348 million (M); Guided Multiple Launch Rocket System (GMLRS)Rockets (combat replenishment)—\$281.6M; Hellfire missiles (combat replenishment)—\$236.3M; Armored Multi-Purpose Vehicles (EDI APS 2)—\$221.65M; Mobile Short Range Air Defense System (EDI)—\$158.3M; GMLRS Rockets (EDI)—\$150M; Army Tactical Missile System Block IA (EDI)—\$130.7M, and the Common Missile Warning System(JUONS)—\$207.6M.

Mr. NORCROSS. GAO's work has shown that demonstrating that technologies work as intended in an operational environment, or Technology Readiness Level 7, as opposed to a laboratory environment or a strictly controlled test site, is a best practice. Some DOD leadership has stated that maturing technologies to this level may be required to overcome the "valley of death" that prevents good ideas from becoming reality in the hands of the warfighter.

Will Army Futures Command pursue a goal of TRL 7 for its technologies or settle for a lesser level of maturity? If not then, please explain why.

General MURRAY. AFC agrees with GAO and will do everything in its power to get capabilities in the hands of Soldiers as quickly as we can. Technologies differ, so it is difficult to give a one size fits all answer. We are committed to working with the Army Acquisition Executive (AAE) to bridge the "valley of death" between the science & technology and acquisition communities. Of note, we believe more effective use of prototypes will significantly assist us in this effort. We will examine both the Technology Readiness and the manufacturing levels of relevant efforts. Each will be assessed individually to determine how to deliver optimal solutions into the hands of our Warfighters as quickly as possible.

Mr. NORCROSS. The Army has emphasized the necessity to invest sufficient funding into its modernization priorities. In your written statement you mention that the Army has protected key legacy systems.

How did the Army determine which programs to protect?

What was the analysis that supported the selection of these systems?

Who were the Army leaders and program representatives involved in those discussions and decisions?

General PASQUARETTE. During what has become known as "Night Court" the Secretary and Chief of Staff of the Army personally evaluated over 500 programs to identify those programs that: 1) did not directly contribute to increased lethality in a high intensity conflict with Russia or China; 2) were designed primarily for counter-insurgency operations; or 3) had quantities above and beyond what is need-

ed to support our most stressing war plans. Those programs were delayed, reduced, or divested to fund the six Army Modernization Priorities. Through this process, the Army leadership also determined which legacy systems were most relevant in a near-peer fight and required continued funding.

The analysis supporting the selection of legacy systems began about five years ago. We had a “wake-up call” when Russia intervened in Crimea, and North Korea escalated threats of retaliation against the U.S. for holding military exercises on the Korean Peninsula. We took a hard look at our requirements and capabilities. The Army studied how it must fight and win in complex, contested environments against near-peer threats. Our analytical communities conducted rigorous threat assessments which identified significant capability gaps, both today and in the future. These modelling and simulation exercises also ascertained which legacy systems would be needed, in one form or fashion, for years to come. In 2018, the National Defense Strategy (NDS) shifted the Army’s focus to Great Power competition and directed us to re-focus on high-intensity conflict to deter or defeat Russia or China. Against the back-drop of the NDS and informed by analyses, the Army leadership prioritized filling our greatest capability gaps for the future fight in the form of the six Army Modernization Priorities. We also determined which key legacy systems we must upgrade and sustain to win now and in the future.

The Secretary and Chief of Staff were supported by a group of the Army’s most senior leaders, who brought careers’ worth of expertise to the “Night Court” deliberations. This included the Under Secretary of the Army; the Vice Chief of Staff; the Commanding Generals of Forces Command, Army Materiel Command and Training and Doctrine Command; the Assistant Secretary of the Army (ASA) for Acquisition, Logistics and Technology and his Military Deputy; the Deputy Chiefs of Staff for G-8, G-2 and G-3/5/7; and the Military Deputy to the ASA (Financial Management and Comptroller). Other subject matter experts provided additional information to assist in assessing impacts of and finalizing these decisions, as needed.

Mr. NORCROSS. Since the retirement of the OH-58 Kiowa scout helicopter, the Army has used a manned-unmanned teaming combination of the Apache and the Shadow UAV to perform the scout reconnaissance mission. Please assess the effectiveness of the Apache-UAV teaming in this scout role.

Has manned-unmanned teaming been demonstrated in an operational environment? Is this a sustainable long-term solution for this mission?

General PASQUARETTE. Yes, Apache-Unmanned Aerial Vehicle (UAV) teaming has been demonstrated in an operational environment in support of operations in Iraq and Afghanistan where enemy threats to aviation have been relatively limited and not on the scale of threats we will face from a great-power competitor. As a result, Apache-UAV teaming is not the long-term solution for this mission. While it has enjoyed success in Counter-insurgency operations, it does not provide sufficient capability in a Multi-Domain environment against a near-peer threat. To address this capability in the future, the Army is developing the Future Attack Reconnaissance Aircraft (FARA). FARA is the number one priority in our Future Vertical Lift program, and it is central to the lethality of the Army Aviation ecosystem and its ability to be effective on the future multi-domain battlefield. The FARA will address threats across domains to ensure the ability to compete, penetrate, dis-integrate and exploit in the adversary’s anti-access area-denial environments. The Army is also developing Air Launched Effects (ALE), which is a crucial piece of the advanced team concept to synergistically enhance survivability, threat identification, targeting and lethality for FARA, Advanced Unmanned Aircraft Systems and ground force commanders. The program aims to develop a family of small Unmanned Aircraft Systems that would team with other manned and unmanned platforms to penetrate denied airspace and attack integrated air defense systems. ALE payload and mission flexibility will provide Army aviation forces windows of opportunity to enable ground and air freedom of maneuver.

QUESTIONS SUBMITTED BY MRS. HARTZLER

Mrs. HARTZLER. Recent successful APS demonstration on the Stryker platform (TROPHY system) presents a new opportunity for the Army to begin full testing and fielding of an APS on that vehicle. The Army has contracted four brigades for Abrams, and recent APS tests on Stryker were successful. However, no funding was requested in the FY20 budget or in the FYDP for expedited non-developmental APS efforts. What is the funding profile the Army could use in FY20, that Congress could authorize in FY20, in order to complete testing and procurement on Stryker to meet directed requirements?

General PASQUARETTE. In March 2019, the Army concluded vendor demonstrations of two Active Protective Systems (APS) at Redstone Arsenal in Huntsville, Alabama. The goal of these demonstrations was to determine whether to proceed with a non-developmental (NDI) hard kill APS for the Stryker platform. Based on the results of the demonstrations it was determined that there are no NDI APS solutions immediately suitable and rapid deployment of an NDI APS solution would not be feasible for Stryker. Therefore, there is no requirement for funding in Fiscal Year 2020 (FY20) for additional testing. Both of the systems have shown some promise. They will continue to be tested in a platform agnostic set of procedures to determine suitability for other future platforms such as the Armored Multipurpose Vehicle and the Next Generation Combat Vehicle-Optionally Manned Fighting vehicle. Funding for this effort was included in the FY20 President's Budget Request.

Mrs. HARTZLER. The Army has robust funding for Abrams SEPv3 procurement in the FYDP, but without APS included on that variant. What is the Army's plan to insert APS into Abrams SEPv3 in time to support its fielding schedule?

General PASQUARETTE. The Army will field its first set of Trophy later this year to our pre-positioned stock of Abrams SEPv2 in Europe as well as units designated by the Army to be equipped in Fiscal Year 2020 (FY20). Efforts are underway now to enable Abrams SEPv3 to integrate the Trophy system beginning in FY22. Abrams SEPv3 will require additional modifications to software and hardware to facilitate that integration. Abrams SEPv3s currently in production are having many of the hardware modifications made to them at the factory to facilitate their ability to accept APS systems as future operational requirements dictate. The initial four sets of Trophy for Abrams SEPv2 were a non-developmental solution that filled an immediate survivability gap while the Army determined the best approach to provide protection to its vehicles and crews across the entire fleet.

QUESTIONS SUBMITTED BY MR. COOK

Mr. COOK. After reviewing the Army budget request, I have concerns about the steep cuts in funding for systems required for current readiness like tactical wheeled vehicles. While I know that successful modernization will require difficult choices, I am concerned that the FY20 budget request assumes too much risk by embracing a lopsided bet on future systems at the expense of platforms needed today and for the foreseeable future. As we've seen before with failed modernization programs like Crusader, Comanche, and Future Combat Systems, fielding new systems is difficult. I believe a proper balance must be achieved or we risk decimating our current platforms before we've proven a modernization strategy will work.

When considering the modernization priorities and establishing Cross Functional Teams, what efforts were made to ensure existing systems' capabilities were considered for new and innovative uses in a near-peer threat environment? For example, I have heard tactical wheeled vehicles described as bill payers from an era of counter-insurgency operations, but I'd like to know if the Army did any analysis regarding their use in the current National Defense Strategy?

Second, do you believe every modernization priority is adequately de-risked to assume such deep cuts in current platforms? I'm concerned we're cutting too deep, too quickly, and before we know if each modernization platform will become a reality.

Secretary JETTE. The Army did consider existing systems' capabilities and their potential for use in a near-peer threat environment. The Secretary and Chief of Staff of the Army personally evaluated over 500 programs to determine whether the systems could be utilized in support of the National Defense Strategy. Those that would not directly contribute to lethality or were assessed as unable to effectively operate in a Multi-Domain environment against near-peer threats were considered as potential funding sources for Modernization Priorities.

The Army also recognizes we cannot walk away from modernizing the current force. We are continuing to invest in key systems that are required to maintain the Army's advantage, and to deter or defeat current and near term threats. We will continue to modernize our Armored Brigade Combat Teams by incrementally upgrading systems such as Stryker, Abrams, Blackhawk, and Communications Security and by procuring systems such as the Joint Light Tactical Vehicle (JLTV) and the Armored Multi-purpose Vehicle. Soldiers will be operating these systems—and many others we have in the Army today well into the future.

In regard to Tactical Wheeled Vehicles (TWVs) specifically, the Army will continue to require Light, Medium and Heavy TWVs in support of the National Defense Strategy and Multi-Domain Operations. TWVs are essential to move Soldiers, equipment and supplies throughout the battlefield. We did make modest reductions to TWV funding due to their relatively low fleet ages. In the future, we will continue

to review Army requirements to ensure we have those vehicles that we need because we cannot afford to have more trucks than necessary. However, in Fiscal Year 2020 alone, the Army requested \$1 billion for JLTV procurement. We have also started a recapitalization program to modernize the aging High Mobility Multipurpose Wheeled Vehicle fleet and are developing the Family of Medium Tactical Wheeled Vehicles A2 model to improve survivability and maneuverability.

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The 31 CFT efforts are essential to modernizing the Army to fight and win on future battlefields. As an Army, we are doing all we can to reduce risk to these efforts. As part of our analysis we conducted multiple Senior Leader led sessions to assess both the value of, and the risks of not having, various capabilities. We assess this approach provided the best method to identify reasonable divestitures to fund the Army's modernization priorities. Additionally, we are leveraging new and expanded acquisition authorities to include the Other Transaction Authority and Middle Tier Acquisition (MTA) (Section 804). Both enable us to streamline our contracting methodology and preserve competition while driving down risk through competitive prototyping vice a single source solution. We also conduct Army Senior Leader updates to provide the status of each CFT effort and Soldier touchpoints. These regular updates enable us to assess if we must alter our plan, that we do so early in the process, rather than discover problems late in the game which can be costly to fix.

Mr. COOK. General Murray, you mentioned the weight of Trophy being an issue. We have heard that Army recently tested Trophy's lighter version, Trophy VPS on a Stryker. Can you provide information back on the testing of that system and

whether it can provide a mature, ready to field, APS solution within the Army's weight requirements for Abrams and/or other systems, including the Stryker.

General MURRAY. The Army remains committed to providing increased protection for our vehicles and their crews. To that end, the Army is pursuing Non-Developmental Item-Active Protection Systems (NDI-APS) for a limited portion of our ground combat fleet as we work towards an integrated Program of Record solution for all of our combat vehicles. The Army did conduct a limited demonstration of Trophy's lighter version, called the Trophy Medium Variant, to assess this potential NDI APS solution for Stryker. The system demonstrated the ability to intercept the threats tested, however, the Army determined due to vehicle concerns it is not suitable for Stryker. The Army intends to further evaluate the Trophy Medium Variant to better understand the system's functionality with respect to application on other platforms.

QUESTIONS SUBMITTED BY MR. GALLEGO

Mr. GALLEGO. The Improved Turbine Engine Program (ITEP) recently saw a contract award. Were engine power, engine power growth, fuel consumption, reliability, and maintenance key elements for this ITEP decision? Were these elements prioritized?

Secretary JETTE. Reliability and engine growth are Key System Attributes (KSAs) for ITEP. Engine power, specific fuel consumption, and maintenance were derived from the capability based Key Performance Parameters (KPPs) and KSAs identified in ITEP's Capability Development Document (CDD). The KPPs and KSAs were not prioritized in the CDD supporting ITEP. These technical requirements were included in the System Requirements Document (SRD) which was attached to the ITEP Engineering and Manufacturing Development (EMD) Request for Proposal (RFP) and thoroughly evaluated by the Army.

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Mr. LUDWIGSON. GAO is unable to answer this question as we have not reviewed the extent to which the Army considered or prioritized the elements of engine power, engine power growth, fuel consumption, reliability, and maintenance as part of its Improved Turbine Engine Program (ITEP) award decision. In a recent GAO bid protest decision, Advanced Turbine Engine Company, B-417324; B-417324.2 (May 30, 2019), we concluded that the Army's evaluation of proposals was reasonable, consistent with the terms of the agency's solicitation, and in compliance with procurement law and regulation. However, GAO did not review whether the aforementioned elements were key in the award decision. Instead, GAO reviewed whether the Army evaluated the factors set forth in the solicitation prior to the submission of proposals, and provided to the companies as the criteria the Army would use for its review. GAO's decision is available on the GAO website.

QUESTIONS SUBMITTED BY MR. TURNER

Mr. TURNER. The GAO report from September 2018 [title: Actions Needed to Measure Progress and to Fully Identify Near-Term Costs; Tab 7 of binder] stated that the Army has come to rely on the use of Overseas Contingency Operations (OCO) funding to pay for upgrades to its weapon systems and platforms. However, such funds are not typically included in the Future Years Defense Program (FYDP) that accompany the congressional budget submission, making it difficult to project the total funding requirements for efforts that span fiscal years. GAO recommended that the Army report to Congress plans, if any, to continue this practice.

How much of the Army's OCO submission for fiscal year 2020 is being used to support modernization goals?

What are the Army's cost projections in its 5-year spending plans for modernization efforts being funded through OCO?

What systems are particularly dependent on OCO appropriations in fiscal year 2020?

Secretary JETTE. None. The Army uses Overseas Contingency Operations (OCO) funding to meet immediate or near term theater requirements and base dollars for its six Modernization Priorities for future multi-domain operations battlefields in Fiscal Year 2028 (FY28) and beyond. In FY20, the Army requested \$3.7 billion in OCO to fill Joint Urgent Operational Needs Statements (JUONS) and Operational Needs Statements; replace munitions expended in combat; build-up Army Preposi-

tioned Stocks (APS) in Europe; and other theater based requirements through the European Deterrence Initiative (EDI). The Army does not develop externally releasable five-year estimates on OCO. In FY20, the systems particularly dependent on OCO appropriations include: Multiple Launch Rocket System Modifications (EDI APS 2)—\$348 million (M); Guided Multiple Launch Rocket System (GMLRS) Rockets (combat replenishment)—\$281.6M; Hellfire missiles (combat replenishment)—\$236.3M; Armored Multi-Purpose Vehicles (EDI APS 2)—\$221.65M; Mobile Short Range Air Defense System (EDI)—\$158.3M; GMLRS Rockets (EDI)—\$150M; Army Tactical Missile System Block IA (EDI)—\$130.7M, and the Common Missile Warning System (JUONS)—\$207.6M.

Mr. TURNER. I understand one of the Network Cross Functional Team's (CFT) focus areas is ensuring joint interoperability. As we move through the development process, what specific steps are you taking to maintain connectivity with other branches of service in order to conduct Multi-Domain Operations in 2028 and beyond?

General MURRAY. The Army is supporting Joint efforts to strengthen the networking of our forces to improve readiness in the near term while meeting the challenges of Multi-Domain Operations in the future. The emerging Mission Partner Environment (MPE) will connect Joint and Multinational partners for large-scale combat operations. The MPE is an example of these efforts and is being pursued in both Joint Warfighting Assessments (JWA) 2019 and 2020. Each JWA has been connected to Joint and Service exercises. In addition, the Network CFT will test and advance our capabilities to work with our Joint and Multinational partners in challenging and realistic scenarios in Europe and the Pacific. These exercises will be the largest test of our deployment capabilities since the end of the Cold War and will help shape our Joint and Multinational interoperability efforts across a range of warfighting functions.

Mr. TURNER. The Army recently awarded a contract for the Improved Turbine Engine Program (ITEP) and is deeply involved in the Future Vertical Lift (FVL) CAPSET 1 and 3. Will these overlapping efforts impede the timeline of any of the programs or can you assure the committee that all three programs are on track?

General MURRAY. Improved Turbine Engine Program (ITEP), Future Vertical Lift (FVL) CAPSET 1 and 3 are currently on track. We have been able to leverage new and expanded acquisition authorities, such as Other Transaction Authority and Middle Tier Acquisition (MTA) Section 804. These authorities will better enable us to field two aircraft nearly simultaneously by streamlining the contracting methodology and preserving competition while driving down risk through a competitive prototype "fly-off" vice a single source solution. We are committed to staying on schedule with disciplined requirements development based on known, proven technologies learned from the Joint Multi-Role Technology Demonstrator program.

Mr. TURNER. As AFC's 31 lines of effort across 6 priorities are developed and fielded, how are they being divided among all three components of the Army? Will it be a phased approach with Active Duty receiving the bulk of the programs first and then to the Guard and Reserve?

General MURRAY. Analysis of equipping the Army's three components is ongoing. While we can reasonably assume there will be changes in both equipping and organizing the force, there is a great deal of analysis needed. Given the complexity of assessing multiple combinations of technologies, operational employment options, and organizational impacts—an endless number of combinations exists. We have started that analysis, and it continues.