

**DEPARTMENT OF DEFENSE AUTHORIZATION FOR
APPROPRIATIONS FOR FISCAL YEAR 2019 AND
THE FUTURE YEARS DEFENSE PROGRAM**

HEARINGS

BEFORE THE

**COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE**

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

ON

S. 2987

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2019 FOR MILITARY
ACTIVITIES OF THE DEPARTMENT OF DEFENSE AND FOR MILITARY
CONSTRUCTION, TO PRESCRIBE MILITARY PERSONNEL STRENGTHS
FOR SUCH FISCAL YEAR, AND FOR OTHER PURPOSES

PART 3

READINESS AND MANAGEMENT SUPPORT

FEBRUARY 14; APRIL 11, 2018

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**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2019 AND THE FUTURE YEARS DEFENSE
PROGRAM**

WEDNESDAY, FEBRUARY 14, 2018

U.S. SENATE,
SUBCOMMITTEE ON READINESS
AND MANAGEMENT SUPPORT,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

CURRENT READINESS OF UNITED STATES FORCES

The subcommittee met, pursuant to notice, at 2:32 p.m. in Room SR-222, Russell Senate Office Building, Senator James Inhofe (chairman of the subcommittee) presiding.

Subcommittee members present: Senators Inhofe, Ernst, Kaine, Shaheen, and Hirono.

OPENING STATEMENT OF SENATOR JAMES INHOFE

Senator INHOFE. We are going to go ahead and start without our ranking member. I am sure he is around here somewhere.

The hearing today will come to order. We meet for the first time this year to receive testimony on readiness. We actually met once before with the same group that is here. Some people got a little upset with your honesty, but I appreciated it.

I think it is one of the big ongoing debates we have right now, and you are aware of this, and that is that we have a serious problem that is—here he is, so we can start. We are just waiting.

That is, the American people need to know the problems. And it was from this committee when we had our vices here before that it was compared to the late 1970s, the hollow force and all that. Well, we have problems now, and I like to talk about them. The reason I do is because the general public, if they are just lured into this euphoria that there are no big problems out there, then we cannot justify doing what we should do in rebuilding our military. So there is a difference of opinion in doing this.

So anyway, I am going to go ahead and introduce the witnesses here. We have General James McConville, Vice Chief of Staff of the Army; Admiral Moran is the Vice Chief of Naval Operations; General Glenn Walters, Assistant Commandant of the Marines; General Stephen Wilson, Vice Chief of Staff of the Air Force. I thank all of you for your service and for being here today. I would like to remind our witnesses that while this is an open hearing, I ask

that they do not hold any unclassified information back from this committee.

Last month, Secretary Mattis wrote out the National Defense Strategy, which laid out a new strategic approach to addressing military challenges through building a more lethal force, strengthening alliances and attracting new partners, and reforming the Department for greater performance and affordability.

I believe building a more lethal force begins with rebuilding and maintaining our readiness while we also look forward to modernizing our force structure. Maintaining the delicate balance between the sustained readiness gains while modernizing is more important than ever.

For example, our Air Force continues to shrink. Since Desert Storm, there are 30 percent fewer airmen, and less than 50 percent of the Air Force fighter squadrons are ready to fight in high-intensity combat. The Marine Corps has only 32 of its required 38 amphibious warships, severely impeding their ability to achieve unit training levels necessary to recover full-spectrum readiness. Repeated collisions in the Pacific highlighted the Navy's need for increased and more training of both enlisted sailors and officers. These are problems that we have that we will be addressing today.

Ensuring the safety of the American people, that is really number one what we are supposed to be doing here. So it is up to you folks to join with this committee in trying to rebuild those areas that might have been relaxed a little bit in the last few years.

Senator Kaine?

STATEMENT OF SENATOR TIM KAINE

Senator KAINE. Thank you, Mr. Chairman.

Thanks to all the witnesses for your service and for the opportunity to visit a bit before the hearing today.

I want to thank the chairman, who I worked with in the past and look forward to more collaboration together in the bipartisan work that is the tradition of both the subcommittee and full committee.

There is a limit to what we can discuss in open session today, but I echo my statement from last year's hearing and again urge all my colleagues to read the classified readiness reporting that is available to all members, because that will amplify some of what we will discuss. We may also discuss later whether we ought to do a closed briefing for any member that is interested in getting into some of the classified update material on current readiness status.

An opening point would be I think we all took a step forward on the readiness issue by the passage of the Bipartisan Budget Act of 2018. Not a perfect budget, and there has never been one. We could find flaws. But to my way of thinking, the best part about it was it is forward-focused. Secretary Mattis has been warning us, as have all of you, about the problems of CRs [continuing resolutions] for years. And the ability to find a budget deal, which we will reduce to an appropriations deal that is forward-focused for a year and a half, I think it will be very, very positive in enabling you to plan and predict in a way that we have not been giving you the ability to do that in the past.

I want to make sure, as we write the NDAA [National Defense Authorization Act] 2019, that we take advantage of that deal to really make sure that this authorizing act helps us restore the spectrum of readiness.

We have heard all kinds of testimony and information from the various branches about readiness challenges.

The Air Force has informed Congress that it needs additional support in the areas of personnel shortages, operational training. We see that at Langley in Virginia in support infrastructure. The Army needs assistance in tackling personnel challenges, improving critical kinetic modernization capacities, and also enhancing training in full-spectrum operations. The Navy continues to cycle through maintenance and modernization while trying to maintain readiness across its seven pillars. The Marine Corps is on a path to balance global demand through five pillars of institutional readiness.

In discussions before this hearing with each of you, you kind of all talked about how you feel like we are on a path and we are making progress on the path. We have a long way to go, and giving you certainty on the budget will enable you to continue on the path.

We have a need, and I want to hear, hopefully, from each witness today about how the services will track progress toward readiness through the Readiness Recovery Framework, R2F, to ensure that we meet readiness guidelines.

I have said at these hearings before, readiness hearings always remind me of when I was Governor dealing with emergency preparation. Most things I dealt with as Governor, if I dealt with unemployment, I could ask what the unemployment rate is. If I dealt with education, I have to ask what the high school graduation rate is. When you are dealing with emergency preparation, it is different. How do you measure how you will do tomorrow? And readiness measures are kind of like that. How do you know how you will do tomorrow? And readiness measures, we need to know kind of how you set them and then how you are tracking toward them.

I am also interested in, particularly, and I have stressed this before, an update from the Navy on the shipyard optimization plan, which is something that we included in the NDAA last year.

Finally, just one concluding comment that is sort of Virginia-specific and personal to me, but it is not just Virginia-specific. In the written testimony that you submit, none of you address sort of climate- or weather-related challenges to our infrastructure. And this is a big deal in Virginia. The center of naval power in the world is in Hampton Roads, and we are seeing sea-level rise, for whatever cause, sea-level rise really affecting our installations, making roads into the naval base subject to flooding, requiring resilience investments to raise piers and make other adjustments. And I remember we had a hearing about this once down in Hampton Roads and had 500 people turn out to talk about it, and we were feeling like, is this just us? And one of our DOD [Department of Defense] witnesses said, hey, try running a military base where there are water shortages, try running a military base where there are fire risks.

So it is not just us. We are dealing with increasing severe weather that then puts a cost burden in how you make a resiliency investment to maintain infrastructure. So I may ask some questions about that as well.

But I appreciate all your service.

I appreciate the tradition of this subcommittee and our work together with the chair. And with that, Mr. Chair, I will hand it back to you.

Senator INHOFE. And I would say to Senator Kaine that I really appreciated the personal visit from you guys to be able to get into these things, because we are in a recovery mode right now, and it is going to take our interest to do it.

Let's start with you, General McConville. Opening statements would be great.

General McCONVILLE. Yes, sir.

Senator INHOFE. Your statements will be made a part of the record, so you do not need to go beyond 5 minutes, unless you really want to.

STATEMENT OF GENERAL JAMES C. McCONVILLE, USA, VICE CHIEF OF STAFF, UNITED STATES ARMY

General McCONVILLE. Good afternoon, Chairman Inhofe, Ranking Member Kaine, and distinguished members of the subcommittee. Thank you for the invitation to testify on the readiness of our Army.

In the face of an unpredictable, competitive, global environment, our Army stands ready to compete, to deter, and to win tonight. While there are challenges facing our Army, we remain poised to accomplish our essential mission, which is to fight and win our Nation's wars.

We appreciate Congress' effort to end the drawdown and to increase Army's end-strength, and we are grateful for the bipartisan budget agreement, which will fund Army readiness recoveries through fiscal year 2019.

The demand for Army forces remains high. The Army currently supports combatant commanders with more than 178,000 soldiers globally. Simultaneously recognizing we cannot fight tomorrow's wars with yesterday's weapons and equipment, we have enacted sweeping modernization reforms. The establishment of cross-functional teams focusing on the Army's six modernization priorities and the introduction of the Army's Futures Command will increase unity of effort, agility, and accountability while building a more agile and lethal force.

We request your continued assistance to provide timely, predictable, and sustained funding to ensure the Army maintains the competitive edge and remains the best trained, best equipped, and best fighting force in the world.

Thank you for your time this afternoon. Thank you for your support to our men and women in uniform, and I look forward to your questions.

[The prepared statement of General McConville follows:]

PREPARED STATEMENT BY GENERAL JAMES C. McCONVILLE

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine, distinguished Members of the Subcommittee, thank you for the opportunity to testify on the readiness of our Army. On behalf of our Secretary, the Honorable Mark Esper, and our Chief of Staff, General Mark Milley, thank you also for the support and commitment you continually demonstrate to our soldiers, Army civilians, families, and veterans.

In the face of an unpredictable, competitive global environment, our Army stands ready to compete, deter, and win tonight. Our focus on readiness over the last several years has paid dividends: our soldiers are resilient, physically and mentally fit leaders of character. They are well trained, well led, and well equipped professionals who represent the diversity and strength of America. While there are challenges facing our Army, we remain poised to accomplish our essential mission: to fight and win our nation's wars.

The single greatest challenge to maintaining and sustaining our Army's readiness is the lack of timely, predictable, sustained funding. For the past nine years, the Army began the fiscal year under a continuing resolution. The legacy of those consecutive continuing resolutions has been deferred readiness. Our inability to start new procurement programs and military construction projects, to enter into multi-year contracts, to increase production rates, or reprogram funds resulted in deferring investments in modernization to maintain support to the ongoing fight.

Beyond current readiness concerns, we are at an inflection point where we can no longer afford to defer modernizing our capabilities and developing new ones without eroding competitive advantages of our technology and weapon systems. While we remain the most capable fighting force in the world, without immediate action, we may not be able to make that same statement in five years. With that challenge in mind, we have undertaken a sweeping reform of the Army acquisition process, and made modernization a top priority. In order to make these efforts successful, we need your support. We are grateful to be in a position where Army end strength is increasing, with the Fiscal Year 2018 National Defense Authorization Act authorizing Total Army end strength growth above 1,018K. We also appreciate the enactment of the bipartisan budget agreement which will fully fund Army readiness through fiscal year 2019. Despite our positive near-term outlook, the potential future effects of Budget Control Act caps on Defense spending could undermine our previous readiness gains.

READINESS: MANNING, TRAINING, EQUIPPING/SUSTAINING, AND LEADER DEVELOPMENT

Readiness remains our number one priority. In today's terms, readiness means the preservation of a lethal conventional force that can also conduct irregular warfare as a core competency, and ensuring the Army can project appropriate units at the time and place they are needed. We build unit readiness by ensuring our formations are fully manned, highly trained, well equipped and superbly led. In order to maximize unit readiness across the Army, we focus resources on those units likely to respond to a potential contingency, increase integration between the Regular Army and early deploying units of the Army National Guard and Army Reserve, and decrease our non-deployable population to ensure optimal manning in critical operational units.

MANNING

Again, we appreciate Congress' efforts to grow the Army in accordance with the Fiscal Year 2018 NDAA prescribed end strength. As we grow, our first focus is on ensuring our formations are filled with deployable personnel. Initial increases in end strength were used to increase manning-levels within combat units and address gaps in air-defense and long-range fires. To further mitigate risk, the Army adjusted the mix of brigade combat teams to increase armor capacity, reduce the number of infantry brigade combat teams, and balance Stryker brigade combat teams within the Regular Army and the Army National Guard. This increased armor capacity provided us with increased flexibility to meet threats around the world.

Another way we are mitigating risk is with the introduction of Security Force Assistance Brigades. The first Security Force Assistance Brigade was activated in August 2017, and the second in January 2018. A total of six Security Force Assistance Brigades will be activated, with five in the Regular Army, and one in the Army National Guard. The mission of the Security Force Assistance Brigade is to provide well-trained forces to partner, train, advise, assist, and accompany developing allied Armed Forces. In addition to their core mission, these veteran Security Force Assistance Brigades can also form the nucleus of brigade combat teams, which can be ex-

panded by assigning entry-level Soldiers to rapidly produce additional brigade combat teams if urgently required.

Recognizing that cyber threats will be an enduring part of modern warfare, the Army is rapidly training and fielding a total of sixty-two Cyber Mission Force Teams: forty-one in the regular Army, eleven in the Army National Guard, and ten in the Army Reserve. The Army continues to employ innovative solutions to increase the Cyber training pipeline and expand the cyber career path for the entire Army. This capability will support both Army and Joint operations, as well as protect our Homeland.

TRAINING

The Fiscal Year 2017 National Defense Authorization Act and increased funding positioned the Army on a positive readiness recovery glide path. Today we have more units at the highest levels of readiness than we did at this time last year, and we will continue to build readiness the longer we stay on this glide path. However, our readiness recovery gains are perishable, and our readiness recovery plan depends on timely, predictable, sustained funding.

The Army is implementing objective measures to assess training readiness and ensure standardization across the force. These standards include proficiency on Mission Essential Tasks; qualification on individual, crew, and platform weapons; unit live fire proficiency; and days required to be fully trained. Combat training center rotations continue to serve as culminating training events for our brigade combat teams. By fiscal year 2020, 90 percent of all Regular Army brigade combat teams will have completed three decisive action combat training center rotations during this decade. These iterative combat training center rotations build institutional readiness at echelon, reinforcing and refining our soldiers' experience. In addition to training on decisive action, combat training centers routinely challenge units with increased exposure to electronic warfare, enemy unmanned aerial systems, cyber-attacks, more lethal indirect fire, and enemy use of precision guided munitions. Such realistic and relevant training will ensure our Army maintains a lethal conventional force while retaining irregular warfare as a core competency.

EQUIPPING/SUSTAINING

In addition to training, we recognize that we must provide our soldiers with the equipment they need to fight and win. The Army Modernization Strategy will enable us to deliver advanced capabilities to our warfighters on a substantially decreased timeline. We identified six modernization priorities, stood up cross-functional teams in support of those priorities, and realigned science and technology funds accordingly. Institutional reforms will establish unity of command, effort and purpose by consolidating the modernization process under one new command, the Army Futures Command. The cross-functional teams are key to rapidly developing requirements, and ensuring that these future capabilities transition quickly from concept to prototyping to fielding.

LEADER DEVELOPMENT

Soldiers remain our most valuable asset, and leader development remains the foundation of the Army's ability to rapidly respond to the changing nature of war. The Army is committed to accessing and retaining quality soldiers and leaders through improved talent management processes, incentives, and promotion opportunities. We remain a standards-based organization, and our leaders continue to enforce those high standards.

The Army is committed to ensuring all soldiers are provided full career opportunities to reach their highest potential and enhance Army readiness. In the past year, we continued to execute a methodical approach to opening all positions and occupations for women. Currently, every infantry, armor, and field artillery battalion in a Regular Army brigade combat team has women assigned, and 10 female officers have graduated from Ranger School—our premier tactical small unit leadership course.

CLOSING

Our Army remains ready today to fight tonight. However, sustaining readiness while finally addressing long-deferred modernization requires timely, predictable, sustained funding. We need your continued assistance to ensure your Army remains the best-trained, best-equipped and best-led fighting force in the world. We thank Congress for its steadfast support of our exceptional soldiers.

Senator INHOFE. Very good. Thank you.

Admiral Moran?

**STATEMENT OF ADMIRAL WILLIAM F. MORAN, USN, VICE
CHIEF OF NAVAL OPERATIONS, UNITED STATES NAVY**

Admiral MORAN. Thank you, Mr. Chairman, Ranking Member Kaine, and distinguished members of the subcommittee. I really appreciate you inviting us back again this year. And also, thank you for the bipartisan budget agreement, which goes a long way toward much needed financial stability and building a more lethal military force.

Once President's Budget for Fiscal Year 2018 is enacted, we will aggressively and responsibly accelerate our readiness recovery plan to earn your trust. As capable as we are today, we will continue to invest in making us even more capable in the future.

President's Budget for Fiscal Year 2019 is a strategy-driven budget. It is tightly aligned with the National Defense Strategy, which provides clear strategic direction for the United States Navy. The program we have built is laser-focused on rebuilding readiness and making our teams more lethal. As Secretary Mattis has stated, it is a budget that restores our competitive advantage, and it is what we need to bring us back to a position of primacy.

Last year, Members of Congress invested \$1.7 billion in Navy readiness. We allocated every single penny of that critical investment to arrest the erosion we were seeing in fiscal year 2017 and previous years. And it put us on a path in fiscal year 2018 to restore our most pressing readiness needs.

In the past few months, I have visited several units around the fleet, including many being maintained in our public and private shipyards.

Last year, at this hearing, you may remember us discussing the USS *Albany*, an *L.A.*-class submarine which had been tied up for over 3 years due to inadequate resources. I am happy to report to you today that the crew is wrapping up their time after over 4 years in the yards and is excited about finally being able to get underway.

On the aviation front, instead of shutting down flight operations for several fleet squadrons, we are able to continue operating and training our pilots and our aircrew. We are also able to begin addressing understocked spare parts, and we are able to build a more effective work force in our aviation depots.

That extra money also helped us recover a number of deferred surface ship maintenance and modernization periods, and allowed us to restock our munitions.

All of this started with your help. So when President's Budget for Fiscal Year 2018 is finally signed and President's Budget for Fiscal Year 2019 is enacted on time, we will be able to sustain the recovery you helped us jumpstart last year and grow and improve our lethality as a Navy. Together, these changes will expand the margin of victory in any future fight, and it will move us closer to the Navy the Nation needs.

Finally, we should talk about our people today. This year, we are growing the Navy to close personnel gaps at sea, adopting innovative policy solutions to retain the very best talent we have, and we

are committed to changing the way we train to be even more effective.

As you well know, people are the foundation of our military advantage. And the growing economy will heighten the competition for all of that talent, which makes stable, predictable funding, as reflected in your budget agreement, all the more important to all of us sitting at this table. This will help keep us competitive and allow us to bring in even more young men and women from all across the country.

It is on their behalf, and their families, that I thank you for your continued support, and I look forward to your questions.

[The prepared statement of Admiral Moran follows:]

PREPARED STATEMENT BY ADMIRAL WILLIAM F. MORAN

Mr. Chairman, Ranking Member Kaine, and distinguished members of the Subcommittee, I appreciate the opportunity to testify on the state of Navy readiness, the progress we have made over the past year, and the opportunities we have to continue this progress. While a ready Fleet is a lethal Fleet, capable of winning when called upon, it must also be a safe Fleet. It is our mission to maintain the readiness of our Navy in order to prevent it from degrading to the point where the very safety and well-being of our sailors is in question.

Foremost I want to thank Congress for the additional \$1.7 billion investment in readiness as part of the Fiscal Year 2017 Request for Additional Appropriations, which helped prevent additional backlog in surface maintenance requirements and aviation depots, and kept our airwings flying. This was an important injection of much needed funding.

At the height of the Cold War, approximately one in six ships were deployed on any given day, today almost one in three are deployed on any given day. This "math problem" clearly demonstrates that national demands for your Navy far exceed its capacity, driving operational tempo to unsustainable levels. Compound those facts with Budget Control Act (BCA) funding caps over the past five years which challenged the ability of the Navy to adequately address the full range of needed investments while meeting near-term commitments. And, the world continues to grow more complex and competitive.

During this time we prioritized funding for deployed naval forces first, and began accumulating risk to our surge forces, training forces, and our shore infrastructure. As a result, too many of our planes weren't ready to fly, too many ships were not training at sea, our ship and aircraft maintenance production was severely delayed, and our shore infrastructure had degraded to unacceptable levels.

With the funds we requested and you appropriated, we reversed the most critical readiness problems by executing 13 more ship maintenance availabilities, restoring 35 additional air frames to flight, and providing 18,000 flying hours to train 900 pilots. In addition, we gained back two ship deployments and a combined one year of carrier operations and surge capability, and we began the process of buying back critical munitions. Ship and aircraft spare parts were funded along with 16 much needed shore infrastructure projects. These funds helped arrest our readiness decline, and put your Navy in a better readiness state to fight tonight if called upon.

However, under the conditions imposed by another series of Continuing Resolutions, these improvements will not be sustainable without an appropriated budget in fiscal year 2018 and continued funding at levels that support the Navy's role in the National Defense Strategy. At the time of last year's testimony, the DOD had operated without an enacted appropriations bill for eight consecutive years. As this committee knows well, Continuing Resolutions force us to operate under previously enacted funding levels, damaging our ability to sustain our force into the future. These Continuing Resolutions have averaged 106 days per fiscal year, a total of almost three cumulative years, operating under previously enacted budget levels. This year makes nine. While the Navy fulfilled its commitment to execute the fiscal year 2017 RAA funds against the most critical readiness shortfalls, and submitted its budget for fiscal year 2018 to continue to fund readiness at historically high levels, the Congress has not fulfilled its commitment to provide the stable funding to achieve lasting results. Simply put, our gains from 2017 are at risk.

Unpredictable budgets not only hamstring the Navy's ability to prepare and plan, they are a major disincentive to industrial base investments in ship repair and modernization capacity we need to grow readiness. No business organization, public or

private, can withstand the fits and starts of our budget environment. The sporadic nature of how we are funded leads to significant workflow problems; even if fully funded, we cannot complete a net six months of work in thirty days. Continuing Resolutions, and the implication of Sequestration as a result of the Budget Control Act, severely hamper us from developing a lethal and ready Navy the nation needs.

The readiness of Naval Forces is a function of three components; people, material and time. Buying all the people, ships and aircraft will not produce a ready Navy without the time to maintain hardware and time for our people to train and operate. Too much time operating and not maintaining degrades our material and equipment readiness. Conversely, too much time for maintenance has a negative impact on meeting planned training and operational schedules, and the corresponding negative impact on the readiness of our sailors to fight. This is a vicious cycle that Continuing Resolutions and insufficient funding create by disrupting the balance we need to maintain readiness, and our ability to grow capability and capacity.

On recent visits to the USS *Leyte Gulf*, USS *Seawolf* and USS *Maine*, crews described the impacts of unreliable or insufficient funding while in maintenance periods. On each ship, shipyard workforce hiring, training and retention are directly impacted by unpredictable funding, causing delays as a result of workflow problems. On each ship, fits and starts in production schedules overwhelm crews to get work done when funding is finally made available. On each ship, maintenance runs late and as a result time to train is irreversibly lost.

Similarly, these sailors and officers will tell you, naval readiness and lethality are cultivated at sea, operating forward. Sailors that can't get out of maintenance periods to operate at sea find it hard to qualify in their jobs, and are forced to transfer to their next assignment without requisite operational experience levels and in some cases without the qualifications their peers have earned. This will have long term career and retention implications. The USS *Albany*, a submarine which I spoke to you about last year, is almost ready to dive again. However, *Albany* no longer has anyone onboard who has taken that particular ship to sea—another victim of years-long delays due to unpredictable funding from Continuing Resolutions. I also testified about the USS *Boise* last year, tied to the pier with no clear path ahead for maintenance and unable to dive. With funding from Congress this year we were able to ensure that the *Boise* would get into the yards, and when I visited the crew a few weeks ago they wanted assurances that they would not become another *Albany* now that she's pier side.

I am confident that our officers and sailors will continue to find innovative ways to compensate for these shortcomings—on *Albany* one sailor who has spent the past four years and eight months on board pier-side looked me in the eye and said, "I'm sticking around because I want to deploy. We are getting after any problem we might have because we are building a strong crew." I am proud that we have the talent that can innovate to get the job done, but it is our responsibility to ensure ship and aircraft crews have what they need in order to deliver the lethality that the Navy is called upon to deliver.

For the Navy, operating forward contributes directly to readiness. Operations forward, including missions and exercises with allies, build the muscle memory and institutional knowledge of the area in which we expect to fight. Operating forward allows us to identify, develop and test new technologies, and design improvements for existing technologies. Operating forward ensures that we stay one step ahead of the adversary, aligned hand in hand with our allies, sharp and ready to fight. The best way to know the environment is to be in the environment—the adage all politics is local applies to the maritime environment, as well. When ships and sailors are stuck in the yards, we cannot operate forward.

We are acutely aware of the stresses placed on our Navy. The most efficient way for us to relieve those stresses is to provide a reliable and consistent funding flow. The Navy is grateful for the injection of money we received last year at the last minute, however, a Hail Mary cannot be our only play. A steady balanced running game of consistent funding for maintenance and operations, along with support for our fiscal year 2019 budget request to grow capabilities and capacity to outpace our adversaries, will put us in position to win. We win by keeping the offense on the field; ships, aircraft and sailors at sea, trained and ready.

A full appropriations, as requested in fiscal year 2018, increases end-strength by approximately 4000 more sailors and maintains reasonable notification time to reduce stress on our families when changing duty stations. Our fiscal year 2018 request fully funds the Navy to operate, and continues procurement of capacity and capability needed in the future, including munitions, *Columbia*-class SSBN, nine new-construction ships, first year of full funding of CVN-80 and the balance of funding of LHA-8, and requests multi-year procurement authority for 10 DDG 51-class ships.

In contrast, a Continuing Resolution brings a \$600 million shortfall over six months and a \$1.2 billion shortfall from our fiscal year 2018 request. In a six month Continuing Resolution, we will delay up to six ship maintenance periods, suffer delays in aircraft maintenance and repair parts, delay our munitions contracts, and we will not award three ship contracts.

Beyond six months the Navy will have regressed to conditions familiar in early 2017. A full year CR will require us to cancel two ship deployments, cause one full carrier air wing to stop flying, choke off training flights, cancel 19 ship maintenance periods, cancel 19 Blue Angels shows, cancel the Rim of the Pacific exercise, prevent awarding two DDG multi-year procurements, prevent funding for *Columbia*, and halt *Virginia*-class submarine procurement to name a few examples. And while the results of a Continuing Resolution hurt readiness recovery, a sequestration stops readiness gains in their tracks.

SUMMARY

It is essential that we do not reverse the gains made last year with fiscal year 2017 funds. The fiscal year 2018 budget submission assures that we can build upon the readiness gains we have made over the past year. A predictable budget, one that we proposed for fiscal year 2018, will ensure our sailors and shipyard employees have the time required to complete maintenance availabilities in accordance with carefully planned timelines. It also ensures that our ships, aircraft, sailors and aviators get out to sea where they can build upon material readiness, at-sea training and operational experience. This is how to build the safest Navy for our sailors, the most lethal for our adversaries and the most reliable partner for our allies. We ask that Congress end the Continuing Resolution and provide the funds requested in our fiscal year 2018 submission.

Senator INHOFE. Very good. Thank you.
General Walters?

STATEMENT OF GENERAL GLENN M. WALTERS, USMC, ASSISTANT COMMANDANT, UNITED STATES MARINE CORPS

General WALTERS. Chairman Inhofe, Ranking Member Kaine, and distinguished members of this subcommittee, thank you for the opportunity to appear today and report on the readiness of your Marine Corps.

The Congress and the people of our great Nation expect the Marine Corps to be forward-deployed and forward-postured, ready and capable of rapid action to win our Nation's battles. Our readiness is essential to fulfilling this responsibility.

Previous strategies focused our investments on readiness to defeat violent extremist organizations and meet steady-state combatant commander requirements. After years of prioritizing readiness to meet these requirements, our defense strategy now defines readiness as our ability to compete, deter, and win against the rising peer threats we face.

We must modernize to achieve this definition of readiness. Your support in passing the fiscal year 2017 request for additional appropriations provide a welcome step toward correcting our readiness challenges.

We thank the Congress for efforts in reaching the recent bipartisan budget agreement. Predictable, on-time, and sustained budgets remain the essential requirement for the Marine Corps to meet our obligations as the Nation's force in readiness. With your commitment and continued support, we will move forward with our responsibility to ensure your Marine Corps is organized, manned, trained, and equipped, and postured to protect our fellow Americans, assure our allies, and deter and defeat any adversary.

Thank you and I look forward to your questions.

[The prepared statement of General Walters follows:]

PREPARED STATEMENT BY GENERAL GLENN WALTERS

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine, and distinguished members of the Senate Armed Services Subcommittee on Readiness, I appreciate the opportunity to testify on the current state of Marine Corps readiness. As set forth by the 82nd Congress and reaffirmed by the 114th Congress, the United States Marine Corps is our Nation's maritime combined arms air-ground "force in readiness." As outlined in the National Defense Strategy (NDS), our forward deployed marines, as part of the Navy-Marine Corps team, operate within the contact and blunt layer to deter our adversaries and prevent conflict from escalating into wars that require larger Joint Force intervention. As part of the blunt layer, our forward stationed Marine forces must stand ready to delay, degrade or deny enemy aggression. Our marines training and preparing for war from their home installations must be ready to rapidly aggregate with forward postured marines to blunt adversary aggression or, if required, surge as part of a war-winning Joint Force.

Your marines continue to support a high operational tempo. In the past year, they provided accurate and sustained artillery fire support to coalition-enabled Syrian Democratic Forces as they fought to clear the Islamic State from Raqqa, Syria. Marines aboard amphibious shipping projected power ashore with offensive strikes and air support. Our marines continue to build partner capacity across the globe, to include in Iraq and Afghanistan. Land and sea-based marines provided immediate disaster response in the aftermath of four hurricanes. They deterred provocations with forward postured 5th generation aircraft in the Pacific, and your marines enabled full-spectrum cyberspace operations supporting Joint and Coalition Forces.

These sustained operations and requirements continue to consume much of the useful life of many of our legacy systems. The NDS directs us to modernize our capabilities to achieve increased lethality and resilience. The Marine Corps must adapt its organization, training, equipping and posture to meet the challenges of today's environment of strategic inter-state competition. We must prioritize our readiness for war and gain the competitive advantage required to deter and defeat the pacing threats that face our Nation.

The support of Congress in passing the Fiscal Year 2017 (FY17) Request for Additional Appropriations (RAA) provided a welcomed step toward correcting our readiness challenges. Your Marine Corps requires continued support from Congress with predictable budgets over a sustained period to fully mitigate the readiness challenges we face. Fiscal instability, resulting from persistent continuing resolutions (CRs) and looming and actual government shutdowns, produce the most significant risk to our readiness. We are concerned that the instability that CRs cause are shrinking our industrial base, negatively affecting the lines that produce our spare parts and the new modern capabilities we require. We require continued near-term actions to improve warfighting readiness and achieve program balance as well as longer term efforts in the Future Years Defense Program (FYDP) to modernize the force through increased lethality and resilience. With the support of the 115th Congress, we can continue to improve our readiness to meet the requirements outlined in the NDS and deter and defeat the growing threats we face.

MODERNIZATION AND READINESS

Readiness is essential to our ethos. The Congress expects the Marine Corps to be forward deployed and forward postured, ready and capable of rapid action to win our Nation's battles. Those surge layer units not forward postured need to be prepared to rapidly aggregate and project power from home stations and bases to the point of crisis. We should be resourced accordingly to honor this commitment. We cannot afford to build readiness after a crisis occurs. We must be ready to respond immediately.

Previous strategies focused our investment on readiness to defeat violent extremist organizations and meet steady-state geographic combatant commander (GCC) requirements. After years of prioritizing readiness to meet steady-state requirements, our strategy now defines readiness as our ability to compete, deter and win against the rising peer threats we face. We define readiness by whether we possess the required capabilities and capacity we need to face the threats outlined in the NDS.

Modernization is a vital component of our readiness—our ability to deter and counter growing threats. Investing in relevant modernization and innovation directly correlates to improved readiness. Previous decrements to our modernization efforts deferred our critical future capabilities and infrastructure, forcing us to continue investing in aging legacy systems that lack the capabilities required for the 21st Century. Over time, legacy systems continue to cost more to repair and sustain.

Simultaneously, delayed modernization incurs the opportunity costs associated with the delayed fielding of replacement systems and the increased capabilities they will provide. Prioritizing modernization can reduce average unit procurement costs, achieve efficiencies and save taxpayer money. As the operating environment changes, our investment approach will align with the NDS, increasing modernization investments and innovation in capability areas required to counter modern threats, such as: information warfare (IW), long range precision fires, air defense, command and control in a degraded environment, and protected mobility/enhanced maneuver.

Information Domain

The current and Next Generation Marine Corps must dominate within the information domain. We must enable and protect our ability to command and control (C2) units distributed across an area of operations. This requires transforming Marine Air-Ground Task Force (MAGTF) C2 capabilities through a unified network environment that is ready, responsive and resilient. Our Common Aviation Command & Control System (CAC2S) will provide the MAGTF with the capabilities required to effectively command, control and coordinate air operations integrated with the Naval and Joint Force. The Ground/Air Task Oriented Radar (G/ATOR) will replace five legacy systems with one expeditionary radar, providing the MAGTF the ability to monitor the battlespace and threats like never before. These modern capabilities will facilitate improved battlefield awareness to and from small, dispersed tactical units. As warfare evolves into a battle of signatures and detection, improvements such as these are vital to maximize our marines' protection and effectiveness.

Amphibious, Maritime, Expeditionary Capability and Capacity

We require increased attention to and investment in our amphibious shipping capability and capacity. Resilient and lethal amphibious platforms provide the strategic mobility, logistical support, operational reach, and forcible entry capability required to deter and defeat our Nation's adversaries. Our amphibious capability is a centerpiece to the operational success of the Navy-Marine Corps team and remains the preferred and most effective method to deploy and employ Marine forces. The availability of amphibious shipping and modern ship-to-shore connectors remains paramount to our readiness, responsiveness and the execution of the NDS. In coordination with the Navy, we are looking at alternative maritime basing platforms as additional seabasing options. These ships may add depth and flexibility in support of lower threat contingencies. Ultimately, supporting the Navy's 30 year shipbuilding plan and accelerating the lethality and resiliency of our L-class ships can provide our Nation with the credible and decisive amphibious capabilities it requires.

Aviation Modernization and Readiness

Your support in the fiscal year 2017 enacted budget funded critical aviation shortfalls. Your Navy-Marine Corps team received \$144 million for aviation depot operations, which funded 35 additional airframe inductions for the Navy and Marine Corps. We received \$61 million for aviation logistics funding that supported over 3,000 flight hours for the F-35 and MV-22. The appropriations enabled us to invest in spare parts required to support future F-35B deployments. Perhaps most notably, the average flight hours per crew per month increased by 1.9 hours compared to fiscal year 2016—an increase of 14 percent. Your investment produced direct, quantifiable readiness gains. While we are increasing flight hours for our aviators, they still need additional flight hours to reach the proficiency we require.

We ask for your continued support to sustain and build upon these improvements. CRs impact aviation readiness by inhibiting our ability to execute a year-long funding strategy, specifically investments in spares and repair parts. Without regular appropriations, costs are driven higher as we are unable to put contracts in place with primary suppliers, or are forced to purchase parts below the optimal quantities. Through predictable budgets and on-time appropriations, we can achieve our comprehensive aviation recovery plan.

Unpredictable funding and CRs have delayed the Marine Corps' aviation modernization plan and readiness recovery by preventing execution of a long-term investment strategy. Shallow acquisition ramps for the F-35B/C and CH-53K require us to continue sustaining and operating legacy aircraft that are rapidly approaching the end of their service lives. Every dollar spent on aviation modernization has a direct positive effect on current and future aviation readiness. The most effective means to meet our NDS responsibilities, improve aviation readiness and gain the competitive advantage required for combat against pacing threats, is through your support to complete procurement of our modern aviation platforms. Last year, our first operational F-35 squadron relocated to Iwakuni, Japan. This move enhanced

the capabilities of the Navy-Marine Corps team, reassured our allies of our commitments in the Western Pacific, and improved overall Tactical Aircraft (TACAIR) readiness. This year we look forward to the first F-35B deployment as part of a Marine Expeditionary Unit (MEU) in the Western Pacific. The CH-53K Heavy Lift Replacement remains critical to maintain and improve the battlefield mobility our amphibious force requires. The CH-53K will nearly triple the lift capacity of the CH-53E it will replace. The fiscal year 2017 enacted appropriation funded a counter-unmanned aircraft systems (CUAS) capability, and some of these systems are currently supporting our forward deployed forces. We must continue to refine and develop these capabilities to win on the battlefields of today and tomorrow. The Marine Corps requires your continued support to acquire modern capabilities that can widen our competitive advantage.

Ground Modernization and Readiness

Our ground equipment readiness continues to improve. Our depot production plants at Albany and Barstow remain an essential component to our ground equipment readiness strategy. The enacted fiscal year 2017 appropriations provided additional funding that yielded near-term readiness gains. The increased funding addressed intermediate and organizational maintenance challenges, increased availability of secondary repairable parts, and focused on critical combat capabilities within specific units: engineer, communications, ordnance and motor transportation. It also funded additional munitions that mitigated risk in support of an emerging crisis. Our execution of these funds produced quantifiable ground readiness improvements; however, predictable, long-term budgets remain necessary to capitalize on and sustain these readiness recovery efforts.

While this is welcome news, our most important legacy capabilities continue to age as modernization efforts fail to keep pace with our requirements. CRs risk delaying contract award for the Amphibious Combat Vehicle (ACV) 1.1, scheduled for June 2018, directly impacting our ability to invest in the critical lethality and protected mobility upgrades inherent in the ACV. To modernize our ground combat element and ensure success against increasingly capable 21st Century threats, we need to accelerate investments in our ground systems.

Logistics Modernization

The Next Generation Logistics Combat Element will optimize tactical distribution with unmanned platforms, flatten the supply chain through additive manufacturing (AM), and enhance preventive and predictive supply and maintenance with sense and respond logistics. Further, state-of-the-art logistics command and control information technology, enabled by artificial intelligence, will extend the operational reach of the MAGTF. Our Marine Corps Warfighting Laboratory (MCWL) and Next Generation Logistics (NexLog) organizations continue to stay at the cutting edge of military innovation.

Installation Infrastructure

Our installations serve as national defense assets that enable our forces to hone their combat readiness before they deploy and operate within the contact layer force our Nation requires to deter potential adversaries. Our bases and stations are strategic power projection platforms from which our blunt and surge layer forces fight and win. They are where we house and care for our Marines and their families. In past years, we took risk in our installation portfolio to support near-term operational readiness. Continued underfunding of our long-term infrastructure needs will create increasingly disproportionate long-term costs, inconsistent with disciplined fiscal principles and business reforms prioritized by the Secretary of Defense. As outlined in the NDS, our installations must prove resilient in the face of the threats we face. We must modernize our installations to protect our blunt and surge layer forces and reassure our partners and allies. Our operational capabilities are adapting to meet these changes, and we need to invest in a next generation installation infrastructure to match the growing MAGTF capability. Your support is crucial as we begin to develop installation infrastructure to support our Next Generation MAGTF.

High Quality People

Ultimately, our readiness and the success of our Marine Corps relies upon the high quality, character, and capabilities of our individual Marines and civilians; they are the foundation of our readiness. We successfully recruit and retain high caliber women and men; over 99 percent of our newest Marines and recruits are high school graduates. This speaks to the quality of the Marines that make up our force. We closely track our ability to recruit and retain our most talented and highly qualified and skilled Marines. As the Talent Management Officer of the Marine

Corps, I am personally focused on these efforts. Now more than ever, we need Marines with the mental acuity and cognitive skills necessary to be effective in chaotic environments and complex terrain. We design our training and education continuum to produce men and women who are resilient, adaptive, innovative, and imbued with the creativity and moral values required to make sound tactical and ethical decisions. Our Marines remain the bedrock of our operational effectiveness.

CONCLUSION

On behalf of all of our marines, sailors—many deployed and in harm’s way today—and their families and the civilian Marines that support their service, we thank you for the opportunity to discuss the readiness challenges we face. Along with your authorizations as outlined in the 2018 NDAA, we require your support through the required appropriations to adapt your Marine Corps to compete, deter and win against the threats we face together. CRs and the looming threat of sequestration continue to disrupt our planning and directly threaten our readiness. Predictable and sustained budgets remain the essential requirement for the Marine Corps to meet our obligation as the Nation’s “force in readiness.” Our readiness relies upon modernization to provide increased lethality and resilience and to allow us to off ramp the continued funding for sustaining increasingly expensive legacy systems. Modernization will provide the competitive advantage required to deter and defeat the pacing threats we face today and into the future; this is the cornerstone of our National Defense Strategy. With the support of the 115th Congress, we will move forward with our responsibility to ensure your Marine Corps is organized, manned, trained, equipped and postured to protect our fellow Americans, assure our allies, and deter and, when necessary, defeat our adversaries.

Senator INHOFE. Very good.
General Wilson?

STATEMENT OF GENERAL STEPHEN W. WILSON, USAF, VICE CHIEF OF STAFF, UNITED STATES AIR FORCE

General WILSON. Chairman Inhofe, Ranking Member Kaine, members of this committee, thank you for allowing me to testify before you today. On behalf of the Secretary, the chief, and the 670,000 airmen, many in harm’s way as I speak, it is a privilege to be here with my distinguished vice chiefs.

As an Air Force, we defend the Homeland. We own the high ground of air and space. We project decisive combat power forward with our joint team to defend America’s interests and our allies worldwide.

Since the hearing last year on readiness, we have continued the longest period of combat in our Nation’s history, 27 years. We have exacerbated this period of combat with a decade of fiscal disorder while our forces shrank, our equipment aged and our equipment atrophied, leading to erosion of full-spectrum readiness.

In parallel, as the new National Defense Strategy makes clear, great power competition has reemerged. Today, our strategic competitors, China and Russia, are moving at a speed and scale unseen in recent history. We must counter that with sustained, urgent action.

With your help, we can accelerate the building of a more lethal force ready to compete, to deter, and to win any fight anywhere.

Aided by your funding in 2017, we have arrested the readiness decline. We began to do so with a keen focus on our number one resource, our people. Thanks to your help, we will be adding 3,300 airmen a year over the next 5 years.

We are also funding more flying hours and munitions, more equipment and parts, depots, training, and our training infrastructure. But we must get away from the CR this year in time to turn

the corner, so that our resources can be used against space superiority, deterrence, training, air superiority, and cyber, amongst others. We will then leverage 2019 to accelerate a multiyear climb toward full-spectrum readiness.

To move at the speed of relevance, we need your continued help in the following areas: first and foremost, budget stability and return to physical order; second, competitive personnel policies that allow us to attract and retain America's best talent; we also need continued support for risk-taking innovation to outpace the competition; and, finally, national research efforts in science and technology to expand America's competitive space. Collectively, these efforts will help build a more lethal and ready force.

Let me close with an example of the alternative and what can happen if we don't act with urgency. And I will go back to the 1950s when a retired Army senior officer, a West Point graduate of 1924, a Bataan Death March survivor who spent 3 and a half years in captivity in prison camps like Cabanatuan, said the following in a speech at a conference. "Appearing before you is an expert in failure, an authority on disaster. I am one of the few Americans who has lost a war, who has seen an American Army overrun and defeated by a combination of starvation, sickness, unpreparedness, with superior enemy forces and the nearest reinforcements 7,000 miles of enemy-controlled ocean away. I have seen veteran officers change overnight into tired, beaten, unshaven old men just trying to walk to the next waterhole.

"We used to say if what is happening could happen to everyone in United State of America for just 1 week, I believe the security of the country would never be again endangered by complacency, by red tape, or by fear of expenditure for its insurance."

He went on to say, "As a Nation, we must be prepared. We must be ready, because time is now reckoned in minutes and hours instead of months and years. And in a future war, that time will not be available."

Those comments were made by my grandfather, Colonel Ovid Wilson, and I would say his profound insights about the loss of readiness offer wisdom that cannot be ignored today.

So make no mistake, we are again in a great power competition, and margins of victory and defeat are extraordinarily narrow. Time to ready is scarce. Speed wins in preparation as in battle. We must throw off the yoke of the red tape and risk-aversion to empower airmen for sustained, urgent action.

Thank you for helping arrest the readiness decline. We have turned the corner. Now we must accelerate, gain speed, and climb to ensure America's airmen are more ready, more lethal to fight any adversary anywhere on the planet.

I look forward to your questions.

[The prepared statement of General Wilson follows:]

PREPARED STATEMENT BY GENERAL STEPHEN W. WILSON

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine, members of this committee, thank you for allowing me to testify before you today. Moreover, thank you for your leadership to begin the return to regular fiscal order.

It is our top priority to restore readiness to win any fight at any time. Nearly three decades of non-peer, non-traditional conflict has consumed our readiness attention. Today's world requires an Air Force ready for great power competition.

As conveyed by the National Defense Strategy (NDS), our nation's competitors are moving at a speed and scale unseen in recent periods. Air Force advantages are at risk. We must act with urgency. Speed will win in preparation, just as in battle.

We will remain relentless in our pursuit of readiness, and by extension lethality. The selfless efforts of America's sons and daughters will benefit from your continued help with added speed "left of the fight" in five key areas:

- Budget stability to halt the primary cause of readiness erosion.
- The continued delegation of program authorities to enable modernization speed.
- Competitive personnel policies to attract and retain America's best talent.
- Continued support for risk-taking innovation to outpace the competition.
- National research efforts in science and technology to sharpen America's edge.

For our part, as we arrest the decline, we are working to turn the corner, and accelerate the climb to full-spectrum readiness.

ARREST THE DECLINE

Thank you for your decision to pass the Fiscal Year 2017 Request for Additional Appropriations (RAA). With the additional funds we began to arrest our readiness decline. This was done with targeted efforts to address shortfalls across people, equipment, and training. Notably, your appropriation of the \$5.6 Billion RAA led to the following improvements:

- *People*—The fiscal year 2017 RAA funded 4,000 additional Active Duty airmen. While it will take another 5–7 years to develop these airmen into seasoned professionals, this began the turn back to full-spectrum readiness. We also executed our multi-year Remotely Piloted Aircraft (RPA) Get-Well Plan to achieve sustainable, agile capability in this critical mission area.
- *Equipment*—We secured new, integrated digital targeting systems for our Battle Field Airmen, reducing the risk of fratricide, increasing lethality, and lowering the weight our airmen carry in the fight against violent extremists by 30 percent. Additional funding went to new vehicles to support weapons loading, maintenance, emergency services, cargo movement, and aircraft fueling. Furthermore, we replenished a mix of BLU–117 MK–84 ("mark 84") bombs, due to significant increase in expenditures for current operations.
- *Training*—We made investments in pilot production and F–16 Formal Training Unit bed down to address pilot shortfalls. Additional training and weapon systems sustainment funding will increase readiness by establishing a strong foundation for improved aircraft availability and higher flying hour execution rates. Further, the space enterprise began executing the Space Mission Force construct, expanding space operator training and lethality toward an increased focus on contested space domain operations.

Despite diverting critical resources to arrest the decline, your Air Force still maintained enough readiness to project power across the globe. Airmen conducted more than 172,000 sorties and 98,000 precision air strikes to support Iraqi and partner forces in Syria and Iraq in 2017. These teams were ready and lethal. They would not have been successful without your additional support. However, these same airmen are not as lethal nor as ready as they *could* be for pacing threats—*the scenarios with the least margins for error and greatest risks to lives and our nation's security.*

TURN THE CORNER

Readiness and lethality are derived from stable funding and we are heartened by the recent progress in budgetary matters. Unfortunately, fiscal year 2017 gains are eroding under the continuing resolution (CR). This self-imposed penalty grants competitors a cumulative head start, year after year. We must get back to, and maintain, regular fiscal order.

Notably, a year-long CR would bring lasting consequences. We may be forced to scale back the engineering and development phase of the B–21 bomber. In addition to out-year delivery impacts, this would slow contractor staffing, engineering design, and supply chain development in ways that are only recoverable in years. Scenarios like this are prevalent throughout our force. Airmen are required to redirect scarce time and energy from readiness to navigate the pitfalls of each budgetary delay. *This takes our attention away from the competition, while they remain laser focused on us.*

Should we receive a Defense Appropriation for fiscal year 2018 in time to execute within this fiscal year, we will pursue the following readiness improvements to turn the corner:

- *People*—We will add 2,300 Active Duty airmen in fiscal year 2018 to get to a total of 325,100. In addition, we will add 1,000 reservists and 900 guardsmen. We are focused on quality of life improvements for our airmen and their families; as soon as the fiscal year 2018 budget is signed it will include a 2.4 percent increase in military pay, a 2.2 percent increase in basic allowance for housing, and a 3.4 percent increase in subsistence. *Growing our end strength to fill existing manpower requirements is the most important step to turn the corner and accelerate the climb.*
- *Nuclear Deterrence*—We are steadfast in providing the nation a safe, secure, and effective nuclear deterrent including the air and ground-legs of the triad along with 75 percent of the command, control, and communications capability. We prioritize sustainment of the ICBM force and Air Launched Cruise Missile, as well as integrated design and development of their replacements—the Ground Based Strategic Deterrent (GBSD) and Long-Range Stand-Off cruise missile (LRSO). To the maximum extent possible under the CR, we’ve continued bomber modernization efforts to include additional investment for the B-52 Radar Modernization Program and B-2 Defensive System Modernization programs.
- *Space Superiority*—The fiscal year 2018 budget represents a 27 percent increase in research, development, testing and evaluation (RDT&E) for space systems and a 12 percent increase in space procurement. The budget concludes incremental funding of the Space Based Infrared Systems (SBIRS) 5 and 6 satellites block buy. We are proceeding with the purchase of terminals, control systems, and communications security for satellites. We will also procure additional launch services as part of the Evolved Expendable Launch Vehicle (EELV) program.
- *Air Superiority*—Training to confront pacing threats has suffered in exchange for flying hours in current operations. We are at the beginning of this climb. Through the fiscal year 2018 budget we will leverage \$6.2 billion to fully fund executable peacetime flying hours. That will pair with \$12 billion for key enabling weapons system sustainment (parts, maintenance and logistics) near maximum executable levels.
- *Cyber*—We will fund all of our offensive and defensive cyber teams to full operational levels. This includes training and equipping 1,700 additional cyber operators. In parallel, we will increase our reliance on contractors for basic information technology and cloud services. This will enable our military members to focus on their readiness for advanced threats as part of the joint force.
- *Intelligence, Surveillance and Reconnaissance (ISR)*—We continue to modernize the medium-altitude ISR Remotely Piloted Aircraft (RPA) fleet and rebalance the ISR portfolio to meet the challenges we will face in future contested environments. Specifically, we will remain committed to our RPA Get Well Plan with increased training, leadership opportunities, and basing options including a new RPA wing and two operational squadrons across the five year plan.
- *Infrastructure*—We have roughly \$2 billion set aside this year for military construction. Priorities include the bed down of new missions, combatant command requirements, and strengthening the nuclear security enterprise. We will also improve ranges at the Utah Test and Training Range and Red Flag in Nevada so combat airpower can train with full F-35A capabilities. Additionally, we continue to pursue virtual Operational Training Infrastructure (OTI), to test and train against advanced threats at reduced cost.
- *Munitions*—Our use of munitions continues to out-pace assembly. Working with industry, we are maximizing production of critical types, including the Advanced Precision Kill Weapon System, Joint Direct Attack Munition, Hellfire missile, and Small Diameter Bomb. This effort to regain munitions readiness is no small feat and represents a whole-of America example to reclaim the competitive edge.

ACCELERATE THE CLIMB

The Fiscal Year 2019 President’s Budget, informed by, and synchronized with, the new National Defense Strategy, will accelerate our multi-year climb to full-spectrum readiness. That climb begins with people.

The requirements for national defense are out of balance with the number of airmen we have to meet them. In fiscal year 2019 we will address imbalances in critical fields like aviation, maintenance, ISR, cyber, and RPA while also expanding

training capacity. Further, we will support Air Force families with a military pay raise, increased housing and subsistence allowances, and bolstered family support programs.

It is also critical that we increase aviator production and seasoning through expanded flying hour and weapons system sustainment programs. By extension, operational training infrastructure is needed to provide relevant and realistic training for multi-domain, full-spectrum readiness. Those trained airmen will need munitions on hand. To support current operations and prepare for future requirements, we must fund armament delivery at industry capacity.

Further, recapitalization of our aging nuclear capability is vital to deterrence. Development of the Ground-Based Strategic Deterrent and Long Range Stand-Off Missile, while modernizing bomber fleets, are key steps. We also aim to invest in nuclear command, control, and communications (NC3) systems. This will ensure resilient and survivable connectivity between the President, national command leadership, and nuclear forces.

Additionally, our fiscal year 2019 budget continues funding priority modernization initiatives with the purchase of jam-resistant satellites, F-35As, KC-46As, and the development of the B-21. We also begin transformative initiatives to expand lethality. Examples include our light attack aircraft experiment and emphasis on multi-domain command and control.

Programs for innovation and talent management will find footing. Executing in the spirit of General Hap Arnold and Dr. Von Karman 70 years ago, our year-long science and technology review seeks partnerships across academia and defense. Findings will inform decades of Air Force investments, and where helpful, national investments.

Likewise, new mechanisms to incubate innovation—such as AFWERX—will enable teamwork with America’s strong entrepreneurial base. This will pair well with our new methods of rapid capability development to drive modernization at the speed of relevance. Finally, we will seek pliable talent policies to grant today’s airmen more career control while harnessing their patriotic commitment to service.

Today’s modernization is tomorrow’s readiness. These iterative efforts in fiscal year 2019 and beyond will accelerate the climb to full-spectrum readiness and provide a force that is ready, lethal, and efficient in this era of great power competition. Each year—truly each month—of progress builds on the previous. Conversely, delays compound exponentially in their lasting impacts.

CONCLUSION

Readiness is not static. It is inherently in decline or on the rise. Our military advantages and readiness shrunk due to the longest continuous stretch of combat in our nation’s history, coupled with years of inconsistent and insufficient funding. At the same time, our strategic competitors, notably China and Russia, have closed gaps in capability and capacity. The result is an overstretched and under resourced United States Air Force.

As the Secretary of Defense has made clear, America can afford survival. Prolonged budgetary stability is the most reliable way to ensure yesterday’s winning force does not become irrelevant tomorrow. To that end, we are deeply appreciative of recent efforts to begin the return of fiscal order and look forward to classified dialogue to fully enable your stewardship while frustrating the surveilling efforts of our competitors.

On behalf of 670,000 American Active, Guard, Reserve, and civilian airmen and their selfless families, thank you for your continued leadership and partnership in defense of this great nation.

Senator INHOFE. General Wilson, you just said you needed 3,300 airmen. Are you talking about new airmen coming in? In the next what period of time?

General WILSON. Mr. Chairman, that is 3,300 per year over the next 5 years.

Senator INHOFE. Per year over the next 5 years. Of them, how many are actually pilots?

General WILSON. I can give you a breakdown.

Senator INHOFE. We know the topline figures of those, but are you making any headway from the last time you and I talked? We had this committee hearing, which you attended, and that was one of the serious problems that the Air Force has.

General WILSON. Our pilot production is certainly a serious challenge going forward. We are still about 2,000 pilots short. We have an aircrew crisis task force underway led by a general officer who shows up to work every day with nothing on his mind but how we fix this problem.

Senator INHOFE. Okay. We have all talked about this. We did dodge a bullet, in terms of CRs. I think with what we have done, we are going to be in pretty good shape in terms of fiscal year 2018 and 2019, but then we go back to fiscal year 2020, which we really need to be trying to figure out a way to do these things more in advance.

I want to ask one question of all of you, the same question. We know what has happened to us with our 17 years of sustained fighting. We know the problems that we have. That seems to be all we talk about. But I would like to have you, from your perspective, give us the cost of not addressing these readiness issues. This is a readiness committee. Readiness is what is important. That relates to risk in lives.

Starting with you.

General MCCONVILLE. As far as the risks, readiness, I equate it to pushing a boulder up a hill, and when you stop pushing, the boulder rolls down.

For a while there, we weren't getting the appropriate funding to properly maintain our units at the proper level. We are getting that funding right now, but it needs to sustain, because we need to kind of fill in the holes in readiness that we let develop over the last couple of years when we were not getting the timely, predictable, and sustained funding that we needed.

Senator INHOFE. Yes.

Admiral Moran, what would you say to that?

Admiral MORAN. Yes, sir. There are so many components to readiness. You could pick at any one of them and find areas we need to work harder on and where the lack of resources, especially the last several years, has really been a difficult challenge for all of us.

But I think about it as a capital-intensive service, and the amount of maintenance and upgrades and modernization to pace the threat or get out in front of the threat is an enormous cost, and that is part of our readiness component.

If you can't get the ships underway, the submarines underway, or the airplanes flying, then you are going to have readiness problems across-the-board. I think that is obvious.

What always pays for those big capital investments in our business are people and munitions. And we have taken risk in those areas over the last 10 years because the resources haven't been there. Now we are starting to buy that back.

But when I think about the people, it is also the readiness component, which talks to experience and building intuition on a battlefield, at sea, in the air. And those things, you cannot buy back. Once you pass by a year or 2 of that kind of proficiency and that kind of training, it is very difficult to buy it back, unless you get it in situ, at the time when the person going through that training needs it the most.

Senator INHOFE. Yes. Thank you.

General Walters, we hear more, at least I hear more, about the readiness and what it is taking in both the Marines and the Army than I do in some of the other services. How do you come out on this?

General WALTERS. Sir, readiness, if you view it as a commodity, you build it, and it has a shelf-life, because it is all about the people.

So combine unstable funding and a drawdown, then you lose people, and you really lose opportunity.

So the opportunity cost of not training over time to build back up, it might be that sergeant that you let out who has had 8 years of experience, now I have to start over with a private and make him a sergeant. So that is the condition we find ourselves in right now with squad leaders, and that is where our tension is.

But truly, lost opportunity and lost time are something that is not a one-for-one recovery. So I will echo my mates here that stable funding over time at the right amount, with paying attention to our people, will get us out of the hole. And we have the plan for that, sir.

Senator INHOFE. Okay. I appreciate that.

General Wilson, you already answered that question in your opening statement.

Let me get back to the budget thing and the problem that we are looking at as we move forward. With the recent budget deal and the pending passage of the appropriations act for fiscal year 2018, we are already 5 months into the fiscal year, and I am concerned that the services will be unable to execute 12 months of money in 6 months remaining, and yet the need is there.

Why don't each one of you address that timing problem that is there that you are going to have to be facing?

General MCCONVILLE. Yes. Thank you, Mr. Chairman.

Sir, we appreciate the authorizations for the money that we need for readiness. Now we need to get it into the hands of our units, so they can spend it. The sooner we can do that, the better off we are going to be. If we are spending 55 percent of funds in the last 4 months, some of the things we would like to do as far as predictable funding and long-term lead items and contracting, we do not get the same rigor that we would like to get if we had it sooner.

Senator INHOFE. Admiral?

Admiral MORAN. I guess the good news, Mr. Chairman, is that we have had 10 years at this, to learn how to operate on less than a full year's authorization or appropriation. So we are ready—

Senator INHOFE. Not that you are enjoying it.

Admiral MORAN. No, no, sir, we are not enjoying it at all. But not to make light of it, it is an important question that we are spending a lot of time developing plans.

But I think we are going to need some help with the appropriators on how we spend that money. It is not going to go across evenly. The add is so significant that we are going to have to look at having the ability to transfer some of that money from account to account.

Senator INHOFE. Do you foresee a problem in that respect?

Admiral MORAN. Well, I am saying as we go, as we start to make those plans come to fruition, we may find that we can execute more

in one area than another faster. And we would like to have some authorities to be able to move the money around as we go and be able to inform Congress as we are doing it.

Senator INHOFE. General Walters?

General WALTERS. Yes, sir. As you noted, we have a year's worth of money adds in 2018 and 5 months to spend it. It might help if the appropriators can give us some flexibility, so we can spend 2018 money in 2019 and feather in the plan and give us some authorities to, as Admiral Moran said, move money around when we are executing.

So there are lots of things we can do with a little more authority to match the responsibilities that the Service Chiefs have.

Senator INHOFE. They are aware of that, and they have the authority to make those changes.

General WALTERS. Yes, sir.

Senator INHOFE. Any comments, General Wilson?

General WILSON. Chairman, I have nothing to add. We are going to do our best to spend it in that time frame.

Senator INHOFE. Senator Kaine?

Senator KAINE. Thank you, Mr. Chair. And it is interesting, preparing for this hearing today after having gotten the budget deal, it made me think about questions in a little bit different way. I am always asking readiness questions about budgetary uncertainty and the effect on readiness, and we have been doing this for years. But assuming that our budget deal is a solid one and holds through the appropriations process, let me ask how each of your branches approach a different readiness issue, which is, the more the combatant commander requirements, the higher the op tempo, the harder it is to find time to build readiness. So that is a balancing issue, too.

So assuming that the budgetary issues are now in a little bit better place and you can work on your recovery path, how does each service branch approach this issue of balancing out combatant commander requirements with the need to have time to build back to readiness?

General MCCONVILLE. Senator, for the United States Army, over the last 16, 17 years, our forces have been in high demand. We have a goal of 1 year deployed and 2 years back, and we still have not been able to meet that. We are running a little over 1 year deployed, maybe 1 year and 2 or 3 months back.

But even during that time frame, we create the readiness. As we do the analysis on what the soldiers are doing while they are back, they are really getting ready for the next deployment. So they are getting the training and the readiness they need to have, so when they go into a combat situation, they are ready to do their job.

We appreciate increasing the size of the force, which is going to help. We are also talking to the Joint Staff on some of the missions that we may not have to do in the future to reduce that demand.

Senator KAINE. Admiral Moran?

Admiral MORAN. Yes, Senator. Thank you for the question.

As you know, we are desperately trying to drive down the backlog in our maintenance account or our maintenance backlog for our surface ships, submarines, aviation, and so the budget agreement certainly helps get after that.

But to your point, the operational demand for our forces remains high, like every other service here. But I think that the global force management process through the Joint Staff, which is done routinely, the RFF, request for forces process, everybody, combatant commanders included, are certainly paying attention to the stresses on the force, to allow us to be able to have time to train and to do the maintenance. We are definitely feeling that appreciation from the COCOMs [combatant commands] this time around, even though the demands still remain very high.

Senator Kaine. Thanks, Admiral.

General Walters?

General WALTERS. Yes, sir, the NDS [National Defense Strategy] addresses this to some degree, sir. The chairman is going to set the globe now and allocate the forces that way, with a dynamic force employment methodology.

We are looking forward to seeing the results of that. We are seeing a little bit of it so far where we have garnered some relief for a portion of our forces, and that will help us build the ROMO [range of military operations] readiness back in the United States, sir.

Senator Kaine. General Wilson?

General WILSON. I would agree with everything that has been said. We talk about being strategically predictable and operationally unpredictable, and how we do that on a responsive force.

I was just at Shaw Air Force Base and talked to the F-16 unit there. They are the suppression of enemy air defenses unit. They are the only stateside unit that does that. So they are the ones that support Korea. At the same time, they have units that go out to the Middle East and support operations there.

Because they are the only stateside unit, they are also doing training at things like Red Flag or the Weapons School support, as well doing Noble Eagle. So they are as stretched as they can be, and we need to be able to balance those demands.

To the point earlier, the first thing that is going to help our readiness is getting more people—the operators, the maintainers, the intel folks, the space operators, the cyber folks—to help build up that capacity going forward.

Senator Kaine. Thank you.

Let me ask a question to Admiral Moran. I think there are reports that there is a congressionally mandated study about the naval shipyard optimization plan, and that may be forthcoming later in the month. We hear that it may include over \$10 billion of investments over a lengthy period of time, 20 years or more. Then there is a companion plan regarding private shipyards that is also in the works.

What can you share about the shipyard optimization plans and how the Navy can better assist both our public and private shipyards in completing maintenance in a more timely fashion?

Admiral MORAN. Yes, sir. That plan, I believe, has been recently signed out as of yesterday, the optimization plan.

Senator Kaine. I cannot believe my staff hasn't had me read it already.

Admiral MORAN. I am shocked. It is pretty thick.

It is very comprehensive. We looked at a lot of aspects of the shipyards and how we can optimize both the level load across our yards, both public and private, and being able to invest in them in a way we know we are going to have to do. The youngest yard we have is Pearl Harbor, which was built in 1908, I believe, so it is a long haul.

A lot of those yards need to be upgraded. They need to be modernized to be more efficient, to put the work on the pier and reduce the idle time or the busy time that people have, just going from one shop to the next.

So that is all laid out pretty comprehensively. It is a significant investment in the out-years, over a 20-year period.

To get after a Navy that the Nation needs that is in that 350, 355 level, we are going to need to be a lot smarter about how we optimize our shipyards.

Senator KAINE. I asked for that reason. Last year, the NDAA provision going to 355, it is one thing to say there is a number of ships, but it is repair, it is the manpower for the ships, it is, do you have air assets on the ships? I mean, there are so many downstream consequences from setting a goal like that, and I have a feeling we will be talking about a number of those this year as we work on the NDAA.

Let me ask General McConville a question, and it is a question that was based on an Army study, but I think it is actually relevant to everybody. Maybe you can address it first.

There were some troubling statistics presented last year about the qualified military available population of the 17- to 24-year-olds. There was an Army study that showed that nearly two out of three in that age range are disqualified because of any number of factors. It could be medical, physical, mental health, aptitude, or substance abuse challenge.

Talk about this challenge, if you would start, and if others would want to weigh in. I am not asking about the retention side. I am about the attracting of the young side. With this much of our population sort of in a position where they can't currently qualify, what do we need to do to build that availability in a more robust way?

General McCONVILLE. Yes, Senator. The Army is people, so it is very, very important to us as we grow the Army.

Right now, we see about 27 percent of American youth in that age group are not qualified to come to the Army. And what we are looking for is young men and women that are resilient; they are physically and mentally fit; and they have the appropriate character, so they can serve in the Army.

We have put some things in place. We did not used to do any type of physical assessment before we brought the young men and women into the Army. We do that right now at the recruiting stations. Before they can ship off for initial military training, they have to meet a certain standard on an Occupational Physical Assessment Test. In order to do that, they have to actually get in shape before they can do that.

Right now, we have recruiters working with the young men and women. We have only been doing it for a little less than a year, but we are starting to see some effects where we are having less musculoskeletal-type injuries.

The other thing we are doing, as we bring them through the Army, when they go to initial military training, we are screening them when they get there, and if they are not physically ready to go through, we are getting them in shape. When they go, actually, to the units, we are treating them almost as professional athletes.

We are putting physical trainers, we are putting dieticians, we are putting strength coaches inside the units. We are doing that in the 82nd Airborne Division right now, and we are getting much less on the musculoskeletal-type injuries.

The return on investment is much greater than having a young man or woman hurt and then them having to leave early or paying them disability for a long period of time.

Senator KAINE. I am over time, and I may submit that question to the record for others, but I will yield back, Mr. Chair.

Senator INHOFE. Okay, good.

Senator HIRONO?

Senator HIRONO. Thank you, Mr. Chairman.

Thank you all for your service and being here.

Admiral Moran, I am encouraged to see from the President's budget request that ship depot maintenance and, as you mentioned, as one of you mentioned, that Pearl Harbor is a pretty mature shipyard, to say the least. So depot maintenance is a top priority for the Navy to recover readiness and building the shipyard work force capacity is a component of that readiness plan.

At our meeting last week, you described the effort it has taken to begin to climb out of the readiness shortfall faced by the Navy, and I look forward to additional details and priorities for shipyard modernization and increases in work force capacity. So I am glad that that is going ahead.

So after ship maintenance and aviation readiness, what are the next priorities for Navy readiness recovery, Admiral?

Admiral MORAN. On the personnel front, we are bringing in 4,000 new sailors this year, and we are going to continue to bring in new sailors throughout the FYDP [Future Years Defense Plan] to address shortfalls in the fleet, gaps at sea, in particular, that we know we have. And we have been under quite a bit of pressure the last 2 or 3 years to fill those billets. So we are adding people to it, and we are doing a lot to try to change the way we train our young men and women as they come, as we call it, street-to-fleet through the boot camp and into the fleet.

That training has often been long, too long with too much information and a lot of waiting around, waiting for the next school to start, because we do not have a steady throughput for a variety of reasons that have occurred over the years, and also to deliver that training at the right time at the right place for the sailors as they are progressing through their careers, even in the fleet. We are bringing in more simulation, more capabilities to the waterfront and our flight lines, so we do not have to rotate sailors back to schoolhouses as often we have in the past.

Those efforts alone on the people front will do a great deal to help us on the readiness side.

Senator HIRONO. So do you have similar concerns that only about 30 percent of high schoolers can even qualify to join the military,

any of the services? Do you have particular issues with regard to the Navy?

Admiral MORAN. Yes, Senator. I think we are all facing that same challenge. I think one of the key components of that is the fact that the vast majority, at least on the Navy side, the vast majority of volunteers that come in are predisposed by the fact that they have a family member with some background that know what we do for a living, so we have to reach out to more of the rest of America and have them participate in national defense.

Senator HIRONO. Does it help to have ROTC [Reserve Officer Training Corps] programs in our colleges as a place where people become very interested in joining?

Admiral MORAN. Fully one-third of our new officers every year come from the ROTC program, and we couldn't do it without them.

Senator HIRONO. We do not have a Navy ROTC in Hawaii.

Admiral MORAN. I know. I was waiting for that.

Senator HIRONO. I know. You have read my mind.

Admiral MORAN. You stay on me, yes, ma'am.

Senator HIRONO. We have to work on that, you know? After all, if part of the goal is diversity, what could be a more diverse pool than people from the State of Hawaii?

Now that the Navy is on its way to recovering from a readiness decline, how will you ensure that the Navy is able to maintain readiness at acceptable levels? And what changes in business practices and what level of investment will be needed to smooth out the peaks and valleys of previous readiness efforts in a more steady and predictable level?

Admiral MORAN. Great question.

The last 2 years in our program builds, in our POM [Program Objectives Memorandum] cycles. We started at the front-end talking about readiness as a starting point, as opposed to the very end, we try to balance with it. And I think that sets a mindset. It changes the culture of how you invest in readiness when you try to lock in what is needed by the fleet to produce the readiness they need to do at the waterfront before we put all the other programs in place and then try to figure out how to pay the rest off.

Senator HIRONO. I hope that we can provide whatever assistance we can to make sure that we do not fall back in readiness for any of the services. I think that a 2-year budget deal will help. And I hope that is the way that we will proceed from now on, without these continual CRs.

I have a question about China and the challenges we face. This is for the whole panel.

China has invested heavily over the past several years to upgrade their military technology and systems. Whether it is a fifth-generation fighter, long-range missiles, or anti-satellite weapons, the Chinese have used a whole-of-nation approach to quickly advance many of their capabilities.

I would like to ask you, while we all agree that readiness is very important, how do you balance the need to modernize our weapons systems with readiness requirements and other needs to be able to effectively counter Chinese influence in the Asia Pacific arena?

Let's start with you.

General McCONVILLE. Yes, Senator. One of the reasons that we have stood up our cross-functional teams and our Futures Command is we are at an inflection point for the Army. We have been pretty much fighting a counterinsurgency, counterterrorism fight for the last 16 years. And now as we follow the National Defense Strategy, which goes into a great power competition between adversaries like China and Russia, we are going after those systems that are going to deter any of those types of things they want to do.

I was just looking at history. It was April 15, 1953, the last time an American soldier was killed by enemy air on a battlefield, 1953, the great Air Forces that are here. So we have gotten rid of most of our air defense elements that protect our units.

As we go into the future and we are into this more contested domain warfare that we see in the future, we need to develop those types of systems. And we are developing a whole bunch of systems that are going to make us very capable against future adversaries like that.

Senator HIRONO. Admiral?

Admiral MORAN. I wanted to give my friends here a little bit of time.

Senator HIRONO. Okay.

Would you like to respond, General Walters?

General WALTERS. Yes, ma'am.

So the new National Defense Strategy focuses on adversaries, potential adversaries like China. For the Marine Corps, it is enhanced command and control. It is IW [information warfare]. It is cyber. It is long-range fire. It is ground-based air defense. It is ground-based counter-UAS [unmanned aerial system], because they have UASes. All those things are now in our plan and our budget.

I think you are asking a question about giving up readiness to get capabilities and how you balance that.

Senator HIRONO. How do you balance?

General WALTERS. How do you balance that? I would say it this way. Buying those systems, that is future readiness, because you do not want to fight a conflict with the old equipment, because you are, by definition, not ready.

Senator HIRONO. That is a good answer.

General WALTERS. Thank you.

Senator HIRONO. Would you like to add something, General?

General WILSON. I will just add the same tagline. I would say today's modernization is tomorrow's readiness, and we have to look at how we do that faster, because we see what China is doing.

So as we develop capabilities, the whole how we do that, everything from our requirements, to acquisition, to contracting, to testing, we have to be able to do that faster. All of us are doing that. We have efforts underway to be able to speed capabilities to the field faster.

For example, we are building this light attack airplane. By the authorities that you all gave us, the Congress, you told us how to do this differently. How do you experiment and prototype rapidly? So we are doing that.

This is a coalition of the core airplane. It is economical. It will help our readiness. It will help build capacity.

It will be not just an airplane, though. It is an airplane. It is a sensor. It is weapons. It is a network that we will share with coalition partners so that we can do this smarter going forward.

From go to now, it has been 11 months. We have done the first experiment. We will do the next experiment this summer. We will start buying airplanes before 2019–2020, so in a 2-year time frame. Again, thanks to your help to be able to do that, to give us the authorities to do this differently, because that is what we are going to need to be able to do to compete.

But it is not just there. If I could go to another area, that same thing happens in space. We have to think how we do this differently in space, because today, that is the one thing that every one of our joint team members use is space, and space is going to be a contested domain in the future. It is today.

So how do we build situational awareness? How do we build the resilient communication, the resilient missile warning? How do you build antijam capabilities for GPS [global positioning system] to be able to defend in space, if the war fight goes there? And we have a lot of efforts underway in our space arena to do that.

Senator HIRONO. So I think as we think about how to contend with adversaries like China and Russia, it is long-term planning that this requires.

Thank you, Mr. Chairman.

Senator INHOFE. Thank you.

Senator Hirono, I am glad you have brought up the China thing. I remember so well, actually, back during the Clinton administration, we had this euphoric attitude out there that somehow the Cold War is over, we do not need the military that strong. I remember all the bonuses they talked about at that time.

All the time that we were cutting down, about 40 percent at that time, but not China and not Russia. At the same time we were cutting back, they were increasing.

I remember talking about this on the floor. What if we are wrong on this? And sure enough, we were wrong.

So I would like just to address from each of the services the force structure question. As we know, the Army, Marine Corps, and the Air Force have all undergone strength reductions over the last 5 years.

Now these force structure reductions occurred at the same time of increasing requirements, which we did not anticipate would be the case with the Russian aggression and the rise of the Islamic State and other problems. So in the DOD, they intended to allow the time for forces to reconstitute and reset after lengthy campaigns in Iraq and Afghanistan. But as it turned out, we weren't able to do that. So we have corrected the trajectory and are increasing the end-strength numbers in fiscal years 2018 and 2019.

But I would ask each one of you, do you believe that the force structure of your service is appropriate and adequate with the changes that we have made to meet the requirements of the defense strategy that we are looking at now?

General MCCONVILLE. Senator, I believe so. As you and I discussed, we were in a very rapid drawdown and that drawdown has stopped in the Army. We are growing the Army. I think we are on the right pace to do that.

The way you deter great powers is with tanks, artillery, and attack helicopters, and that is where our modernization effort is, and that is included in the budget as we go forward. And we think these are the right steps forward with timely, predictable, and sustainable funding.

Senator INHOFE. Where are you—and each service, I could ask the same thing—on the 1-to-2 time that you are in combat to when you are back? I think you have already said that it is not a rest period for 2 years. You are back in training and all that.

Where are you on that?

General MCCONVILLE. That is correct, Senator. Our units are less than the 1-to-2 kind of dwell time that we expect, and they are probably at 1-to-1.5, which is really not where we want them to be.

Senator INHOFE. That combined with the fact that they are working during that 1.5, during that time also.

General MCCONVILLE. Yes, they are going to combat training centers. They are doing home station training, because when they go off to their deployments, we want to make sure they are ready.

Senator INHOFE. How about the Navy?

Admiral MORAN. Sir, to your original question, do we have enough to support the strategy? The answer is yes. But every strategy has some degree of risk to it, so the bigger we get, the better we get, the less risk there is to that strategy. So we really appreciate where the budget agreement is going to allow us to go through the FYDP and beyond, hopefully.

In terms of the dwell, our forces, they are not all consistent. We deploy in different types, in different groups, but the vast majority on the optimize fleet response plan are trying to be at a 1-to-2 dwell.

Senator INHOFE. Yes.

And where do you think you are?

Admiral MORAN. It depends on which moment in time, and it depends on what the world has to say about it. It fluctuates. But our operational dwell time is 1-to-2. Our personnel dwell time is something less than that because of the rotation.

Senator INHOFE. I understand that, yes. Very good.

General Walters?

General WALTERS. Yes, sir, much like the other services, we are an aggregate of 1-to-2 dep-to-dwell. But I will say this, as we go through this set to globe and where we deploy, I would just offer this for consideration, that not all deployments are created equal, although they all count on dep-to-dwell.

But for example, the Marines we now have training in Norway, they are actually gaining readiness there. They are gaining readiness to the designed mission. So the only place you lose readiness when you are deployed, generally, is you are deployed to a region you are not doing your designed mission.

So for counterterrorism, and you are supposed to be the blunt force or the surge force, then you are losing that readiness. But if you deploy for a training deployment, say, in the Pacific, you will probably come back more ready because you have operated in the environment that you might be employed in.

I do not know if that makes sense.

Senator INHOFE. Okay. It does.

General Wilson?

General WILSON. Chairman, the majority of our folks are on a 1-to-2 dwell or better than that. But as mentioned and just like the rest of them, their pers tempo back home, they are not spending that time at home. There is what I call an “are you sleeping in your bed at night?” metric, and we need to measure that, because that has impacts on the retention of the force going forward.

In terms of your question about people, we think we will be growing through this FYDP, as I mentioned, about 3,300 a year. If we do that, we get to about 95 percent of our units being filled, and that is a step in the right direction, and we need to continue that long term.

Senator INHOFE. What I want to do is I am going to go ahead and shift over to you, and then come back, and I want to specifically talk about, each branch represented here, about the unique problems that you have. So you go ahead and take over now, and I will do that.

Senator KAINE. Thanks, Mr. Chair.

I have a question for Admiral Moran, and it deals with the action that the Navy is undertaking to learn from and then make improvements following the collisions of the USS *Fitzgerald* and then also the USS *John McCain*.

We have had testimony about this in the large committee. But after those tragic collisions, the Navy conducted the strategic readiness review [SRR], and that found several, the quote was “institutional deficiencies.” The Navy has taken some significant steps, personnel steps and otherwise, to deal with those.

The SRR made numerous recommendations to address the root causes of the incidents. A separate study by the GAO [Government Accountability Office] also had at least 14 readiness recommendations to the Navy coming out of this.

Talk about the status of implementing—I am not talking about the personnel side now. I am talking about just the recommended changes. Talk about the status of implementing those recommendations from both the SRR and the GAO’s work. And then how will you kind of monitor and evaluate progress on these going forward?

Admiral MORAN. Yes, sir. Thanks for the question.

We stood up an oversight board that is co-chaired by myself and the Under Secretary of the Navy to pull all of those reviews together, to include the GAO reviews, previously completed investigations of other mishaps, not just the ones we saw but everything else, we are pulling all that information together at once. Then seeing how the 58 recommendations from the CR, the 27 recommendations from the SRR, the 14 from the GAO, all of them, where do they overlap and where can we make sense of them? And then really rely on the fleet to tell us what prioritization needs to occur. What are the things that they believe need to be done immediately for safety? Those things are completed. Most of them were not a financial burden. They were more or less policy.

But we have now gone into how we are programming to address things like common configuration for radars, bridge configurations—

Senator KAINE. The bridge configuration, because in these instances, some of the personnel involved were cross-decked from one

platform to another, and there wasn't an identical configuration, and that may have been part of the problem.

Admiral MORAN. That is correct. Yes, sir.

So all of that is being monitored by a series of working groups overseen by the Under and myself. We meet monthly. Those working groups are meeting weekly. And then we feed that up to the Secretary and the CNO [Chief of Naval Operations], and they are required to deliver a report quarterly to the Congress. We are approaching the first quarterly report for that, which will lay out all those things.

I am not willing to call things complete until I not only see the programming but the arrival of the fixes in the fleet, so we are going to track these all the way to delivery in the fleet.

The outcome has to be that we have a safer and more effective fleet at the end of the day. That is the overarching goal.

Senator KAINE. One of the particular areas I was interested in, based on some of the early hearings we had, was whether there are recommendations for any changes to training curriculum at Surface Warfare Officers School [SWOS]. Is that a part of some of these recommendations? And is that under implementation?

Admiral MORAN. Yes, sir. The new leadership at SURFOR [surface force] out in San Diego, Admiral Brown, has only been on board a month or so. We are giving him a little bit of time to figure out how he wants to take this forward. He just came from our Personnel Command. He was the COO [Chief Operating Officer] of SWOS. He understands this very, very well.

So he is coming forward through the fleet commanders to the oversight board with his recommendations on how to implement career path changes, manning changes, and the training at SWOS.

Senator KAINE. All right, thank you.

Thanks, Mr. Chair.

Senator INHOFE. I am just going to do it one at a time, starting with you, General McConville.

The Army priorities are—and you do not have to write them down, because you know them—long-range precision fire, next-generation combat vehicle—you and I talked about that at some length—future vertical lift, network, air and missile defense, and soldier lethality.

With the priorities identified, do you have a plan to address all six of these? Or would you like to give us some kind of a priority? And where do you stand in these priorities?

General McCONVILLE. Senator, we plan and we have plans to address every single one of those. What we are really doing is, in those priorities, long-range precision fire is the number one priority. There is a lot of great work going on there, from hypersonics to extending tube artillery. What we want to do is probably get down to focus on three systems, work with a lot of the other organizations with industry and, quite frankly, have them invest along with us as we bring these systems to bear.

But with each of those portfolios, we see one or two systems we are going to laser-focus on, and those are the priorities, and those are the things we need to get done.

Senator INHOFE. We talked about the extension of six feet and what that does to range. It kind of shows that, once you make a

decision on a vehicle, on a system that as outside things change, they can change within.

Now the extreme of that is what has happened with our combat vehicles, as you and I talked in my office. We started with the Crusader. We spent about \$2 billion on that, junked that one. Went to the Future Combat System, and spent \$20 billion on that. Now we are back to our PIM [Paladin Integrated Management] system that I think we are actually a little ahead of where we should be on that. But I think, in that case, that is something that I would hope would have a priority.

Do you think that system, the way it is right now, is going to be able to sustain all the previous changes that were made? Because sooner or later, we have to have something, and it has to be something competitive. We are not ahead of all our—unlike the American people think, we are not ahead in everything. We hear about what the Germans are doing with artillery and what some of the others, even our adversaries, are involved in.

So as far as that being kind of the stock equipment for the United States Army, do you think we will stick with it?

General MCCONVILLE. What we need to do is the capability to incrementally improve those. In some cases, on the PIM, to 10X improve them.

What I mean by that is, as you know, the chassis has been significantly improved to give us much more capability to keep up with the forces. But we are looking at projects right now that can take the gun and actually give us much more increased range.

So we want to have with all our projects the ability to insert technologies. The technology comes onboard, these are not disposable-type systems. We want to be able to insert that technology, keep most of the rest of the system, so we get a much better return on our investment.

Senator INHOFE. It was kind of interesting, when I was watching down at Fort Sill, the 6-foot extension and what it did to the range, while it increased the range from this to this, I do not remember the numbers, it still left a void in between. And that was something that we are addressing today.

Okay, General Milley had identified a goal of having 66 percent of our BCTs [Brigade Combat Team] ready for combat tonight, the words he used. Where are we now on that?

General MCCONVILLE. Well, right now as far as the—and I can do this on a closed session on the exact numbers.

Senator INHOFE. Well, it wasn't closed last year when it was at 33 at that time. So we are somewhere between there.

General MCCONVILLE. Right, we are at a much better place than we were last year. I would be glad to go to a closed hearing on the exact numbers, Senator.

Senator INHOFE. Good. Okay.

And the Air Force, we have the pilot shortage, we have been talking about that, 1,500 pilots. Of those, I think we said 1,300 of those are fighter pilots. That is probably current right now.

I am concerned about the T-6 grounding. When is the end of the story?

General WILSON. Chairman, I do not know if I can give you the end of that story yet. We stopped flying, had a stand-down the 1st

of February. The first priority is to make sure that we return to flying safely, so we are looking at, holistically across, how we do that.

We brought in the Navy, who has had some recent troubles with the OBOG [On-Board Oxygen Generation], which is what we also had. We brought in the NASA [National Aeronautics & Space Administration] team. We have a full court press to be able to identify the problems. We think it is partly maintenance-related. We think there is partly an aircrew flight equipment problem. We think there is a training piece. But we have all those efforts moving forward.

The head of the Air Force Materiel Command and the head of Air Education and Training Command are meeting daily on this. I expect an update on when we will return to fly here this next week.

But in the meantime, we are not flying about 700 T-6 sorties a day. So there is an impact to the pilot production piece that has us all laser-focused. But we are not going to return them to flying until we can safely do it.

Senator INHOFE. Yes, of course. One of those, obviously, is going to be maintenance. Any time all four services have gone through what you have gone through, it is O&M [Operation & Maintenance]. It is maintenance and modernization. It is the less visible thing, so that is the first thing that we have to correct. So I do appreciate that.

What you had touched on, Air Force or Navy and Marines—

Senator KAINE. Just one question I indicated in my opening statement, the questions we are seeing in Hampton Roads around sea-level rise and our Navy base.

As we get into the NDAA, we are always grappling with readiness, but we are also grappling with MILCON [military construction]. We may be talking about an infrastructure bill in Congress where we could be looking at resilience investments. That may not be in the DOD space, but there could potentially be some synergies where we could be doing some potential infrastructure investments that would help.

Talk about how you, each in your own service branch, are dealing with kind of weather-related challenges on installations, whether it is drought, fire, sea-level rise. How do you approach those topics? And how do you factor in to your budgetary requests or other planning what we need to do?

General MCCONVILLE. We look at some of the hazards that have happened over the last couple—I mean, the hurricane, we had three major hurricanes. We have installations, camp posts and installations really in all those type areas, so they certainly affect us. We have fires in certain parts of the country. That certainly affects where our post is. The flooding is certainly there.

We are building some resilience. An example right now, we are building in partnership at Schofield Barracks a power plant in conjunction with the local area. So it will be used. We do not necessarily need it, but if there is a situation where the power goes out, we will have that capability, resilience. It is a private-public partnership, which I think is a good way to get after, and they seem very excited about that partnership that is going on there.

Senator KAINE. Excellent. So that is a shared investment that is being done by both DOD and the local community.

General MCCONVILLE. It is actually the community that is actually paying, but we are allowing them to use the land. Then if something happens where we lose power, we have first dibs on the power. It is on the grid right now, but if something happened serious, we have the opportunity to use it.

Senator KAINE. Smart contracting. Thanks.

Admiral Moran?

Admiral MORAN. I attended a briefing by the Naval Academy here recently, and they are looking out 30 years at the flood plains and the seawall associated with the Chesapeake Bay and the Severn River. It was a pretty stark demonstration of what could happen, if we do not take some action in the next 30 years to address that rise in water level. And as you know, General Walters and I, we share bases of pretty much waterfront property all over the world, so if the ocean is going to rise, we are going to be impacted everywhere.

So it does demand kind of a comprehensive look at all of our bases, especially in those areas that you already cited in Hampton Roads, Florida, on the West Coast in San Diego, et cetera. So we are going to look at that very hard in the next—

Senator KAINE. I had not really thought about it until you were using flood plains, so we are talking not just about ocean but about tidal rivers. So Quantico is on a tidal river. NAVSEA [Naval Sea Systems Command] Dahlgren is on a tidal river, and the Potomac. So we are talking about a lot of installations either right on the ocean, on the bay, or on tidal rivers that could be affected.

Admiral MORAN. Yes, sir.

Senator KAINE. General Walters?

General WALTERS. Yes, sir. We are a waterfront organization also. We have come to the conclusion that we are not going to turn the tide, but we are looking at it closely.

In this job that I am in right now, I have taken two briefs in the last 8 months on what I consider our most critical vulnerability, and that is Parris Island, South Carolina. Our logistics folks, the Deputy Commandant for I&L [installations and logistics], has done extensive work and studies. They have projected out what is the best case, what is the worst case. Obviously, there is a big variance in there.

But what I do know is that we will eventually have to bolster that. I have come to the conclusion in my own mind that it is not today. We do not have to build a seawall today, but we have to consider one. And we are monitoring it every day as we watch that, because, remember, that started out as a marsh with a little bit of an island, so marshes turn into seawater and land turns into marsh.

Senator KAINE. I am amazed at how expensive seawalls and projects like that are. And so I know how much MILCON doesn't get done. I mean, we will do a MILCON budget through approps or work here in the NDAA authorizing projects, but I do not know how many don't get done because of the absence of budgetary resources. You start to add in significant resilience investments and

things like seawalls, et cetera, you are really going to have a traffic jam of projects looking for scarce dollars.

Admiral MORAN. I guess my message, Senator, is, I do not believe it is a crisis today, but it is something that I think we as a Nation have to watch over time. And we will have to make an adjustment, because we are not going to—I do not think we can—

Senator KAINE. Pretend it is going away.

Admiral MORAN. That is right.

Senator KAINE. Yes.

Yes, General Wilson?

General WILSON. This last year was a great example. So we were fighting fires in California and using our C-130s to help fight those. We did the floods here or the hurricanes, both in Texas as well as Florida, and as the ones came up the East Coast affecting bases like Langley.

So everything we look at in terms of infrastructure, we have to look at through the lens of, how would I build and design infrastructure that would support changes in climate?

I think that and energy resiliency across our bases, as the Army just talked about, to be able to partner with local communities because our bases are power projection platforms, so we have to make sure they are energy-resilient.

Senator KAINE. The last thing I will say before I hand it back over to the chair is, I am asking about sort of readiness, MILCON, resilience investments, but the other thing that we are seeing around the world is really the persistence and acceleration of refugees and migrants. Often, they are driven by civil war. They are driven by corruption and governance challenges. But they are often driven by big weather emergencies, by long-term, persistent droughts.

We probably think of migrants and refugees as kind of episodic emergency, but anymore, it is getting to be kind of a permanent reality, and we have seen how destabilizing migrant flows can be coming into other nations, like Syrian refugees in Jordan. Jordan doesn't have enough water for its own population, much less millions of refugees.

So I think these weather-related effects, whether you are planning for resilience on bases or whether you are thinking about the national security challenges that they could cause by pushing people across borders, we will be dealing with this and having to factor this into our planning for a very long time.

Thank you for your testimony on this.

Senator INHOFE. Thank you, Senator Kaine.

Admiral, I was going to go into this, I think Senator Kaine already did, on the Fitzgerald and McCain, and where we are now and what could have been contributing factors to that. I think we all know pretty much what is happening there.

But in the area of the Marines, General, last year, I guess it was, I was trying to find it. Last year, you testified our F-18s operationally were down around 40 percent, is that right, if my memory serves me?

Admiral MORAN. It was about 50 percent last year, sir.

Senator INHOFE. Yes. What kind of progress have we made on that?

Admiral MORAN. So we have increased by about 44 aircraft. That is good. With what happened in 2017, and I am looking forward to—so the contracts in the RAA [Request for Additional Appropriations] have been let. The increase in flight hours per pilot is getting up to not quite at the level we wanted.

Senator INHOFE. Yes, you are a little higher than the Air Force, aren't you?

Admiral MORAN. Yes, sir. We are getting somewhere between 14 and 16 hours per pilot per month.

Senator INHOFE. Which I think, General Wilson, you are down close to 9 or 10.

General WILSON. Senator, I think we got a little bit more than that. We are trying to increase it about an hour per month going forward this year, and that is what we put forward in our budget, an increase in flying hours to support—

Senator INHOFE. Why do you think the Marines are ahead of you on this?

General WILSON. I do not have a good reason why they are ahead of us. I know that we are trying to increase not only our production capability, our infrastructure, our instructor pilots, our flying hours, our weapons system supports, our ranges and capacity to be able to do that. And right now, I would just say we were too small for all the missions we have been asked to do. And going to the people part will be very helpful to be able to turn that tide and get us moving in the right direction.

Senator INHOFE. I have had a lot of conversations with a lot of pilots, both Air Force and Marines, and I am more and more convinced every time I talk to them, it is not so much bonuses as it is flying hours. They want to fly.

And when I stop and think, Senator Kaine, our calculation was it costs about \$16 million to take someone off the street and get them qualified in an F-22, for example. So the money, that is an easy response, but that doesn't solve the problem.

I am convinced of this, and I think we need to get those up. I know you are working hard to get that done. That is a complaint that I hear all the time, because I have a background in that.

General WILSON. Senator, we have talked about this. You know exactly that our pilots want to fly. So trying to let them do their job, to get the right work-life balance in their life so that they can fly but be able to spend the right amount of time at home, because just as you said, if it takes \$10 million to make a fighter pilot and we are over a thousand short, then that is a \$10 billion capital investment lost, and it takes 10 years to make up.

So we are working all three efforts. On production, how do we get that right work-like balance in the middle to be able to season them, to make sure that they are proud and confident in what they are doing, and then retain them on the back side. And I hear the same thing that you hear, that money, certainly, the compensation is a piece of it, but it is not the big piece of it.

Senator INHOFE. Yes, I think you are right. Tony just handed me a note saying that all four of the vices are aviators, which is probably a first, right?

Do you all agree with our comments about the source of that problem, that it is not flying hours?

General McCONVILLE. Yes, sir.

Senator INHOFE. It is not so much bonuses.

General McCONVILLE. They did not come in to get rich, sir. They came in to fly.

Senator INHOFE. Yes, I know that.

All right, you guys, on our side, we do not have anyone else coming. Do you know of any? Okay, we are going to go ahead and adjourn the meeting.

I appreciate your time very much. And we are on the mend. That is the message for today.

[Whereupon, at 3:44 p.m., the subcommittee was adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JONI ERNST

ADDITIVE AND ADVANCE MANUFACTURING

1. Senator ERNST. General McConville, the Army's organic industrial base, especially at the arsenal level, is critical to the readiness of our forces, as it allows for surge capability during times of conflict or extended need. As additive and advanced manufacturing continue to become more predominant in the U.S. and abroad, I believe it is vital that the Army also looks to increase the use of additive and advanced manufacturing at its arsenals. Could you please provide explain the Army's position on expanding the practice of additive manufacturing on arsenals, as well as the benefits that doing so would provide?

General McCONVILLE. The Army works to expand the practice of Additive Manufacturing (AM) by focusing on the increased use of AM as well as the continued development of AM capabilities. The Army has been involved in AM for many years with current capabilities at 18 sites across labs, depots, arsenals, and sustainment brigades. To expand the practice, the Army has designated the Army Materiel Command as the lead command to integrate and synchronize AM capabilities, doctrine, policy, and resources. The Army's initial focus of additive manufacturing is to address readiness drivers, parts refurbishment, obsolete parts that are difficult to obtain through standard supply chains, long lead items, and specialty tooling requirements. These actions will enhance readiness.

2. Senator ERNST. General McConville, how does the Army plan to leverage advances made in the private sector to improve the Army's additive and advanced manufacturing practices?

General McCONVILLE. The Army is participating in the Additive Manufacturing Users Group with private sector participation including original equipment manufacturers. The Army is collaborating with numerous industry partners, and gaining knowledge with the private sector through America Makes which is structured as a public private partnership to advance additive and advanced manufacturing capabilities.

3. Senator ERNST. General McConville, could you please provide recommendations for how arsenals like Rock Island Arsenal can posture themselves to better support the Army's additive and advanced manufacturing needs?

General McCONVILLE. The Army has already begun working with Rock Island Arsenal—Joint Manufacturing Technology Center (RIA-JMTC) to posture itself to better support additive and advanced manufacturing needs by designating it as the Army's Organic Industrial Base Additive Manufacturing Center of Excellence. In this role, RIA-JMTC will work closely with the engineering support activity to ensure that the most effective additive and advanced manufacturing technologies (AM) and processes are transitioned with the required training needed to ensure that AM parts meet certification and qualification testing requirements. RIA-JMTC will also manage the data library. More work is required with industry to develop a data rights strategy.

QUESTIONS SUBMITTED BY SENATOR DAVID PERDUE

JSTARS AND DEPOT MAINTENANCE

4. Senator PERDUE. General Wilson, across the globe our combatant commanders have a constant demand for JSTARS due to its unique ISR, ground targeting, and battlefield command and control capabilities. There is only a fleet of 16 JSTARS aircraft, but it is dealing with serious delays in depot maintenance. Right now, 8 of the 16 aircraft are in the non-organic depot meaning there are less aircraft available than any time since 2002 due to depot delays. A service life extension plan for these aircraft is also worrisome because it will increase the cost and the complexity of maintaining an aging legacy fleet, as opposed to recapping the fleet as previously planned. I doubt the new Air Force plan to replace the JSTARS with a "system of systems" will be ready on the schedule the Air Force has planned. Can you speak to the readiness issues caused by unforeseen delays in the current depot maintenance?

General WILSON. The Air Force ready aircrew program defines the minimum required mix of sorties, simulator missions, and training events aircrew must accomplish to sustain combat mission readiness. In terms of lost sorties and training, from 2016 to 2017, JSTARS did not participate in 24 high value combat operations exercises due to depot maintenance related aircraft availability. Since then, aircraft availability, which also accounts for time lost to depot maintenance, has improved. As of 9 March 2018, there are six JSTARS aircraft in the contractor depot facility. The resulting training and readiness gains in March 2018, have allowed JSTARS aircrew to fully participate in combat operations exercises and increase the completion of ready aircrew program training events by 33 percent.

5. Senator PERDUE. General Wilson, can you speak to what benefits may be achieved by taking the depot maintenance capability from private to organic, especially if it was collocated with the unit, like at Warner Robins Air Force Base?

General WILSON. Moving Joint STARS depot maintenance to the Warner Robins Air Logistics Complex should provide synergy by being collocated with the Operational Wings and the Program Office. The move could also cut down on personnel travel time and save the fuel costs of flying from Robins AFB to the contractor facility.

6. Senator PERDUE. General Wilson, if work was moved to an organic facility, does the Air Force have concerns of violating any 50/50 laws?

General WILSON. 10 U.S.C. § 2466 mandates that not more than 50 percent of the funds made available in a fiscal year be used for contract depot-level maintenance. Accordingly, moving work to an organic facility would improve the Air Force position with respect to the 50/50 laws, as such a move would reduce the amount of money spent on contract depot-level maintenance.

7. Senator PERDUE. General Wilson, has the current contractor maintained its contractual throughput over the past 24 months?

General WILSON. The Joint STARS Total System Support Responsibility contract does not specify a number of days to perform depot maintenance or throughput. However, the contractor is incentivized through the award fee plan to provide mission-ready aircraft and maintain quality.

CROSS-SERVICE DEPOT MAINTENANCE

8. Senator PERDUE. Admiral Moran, this time last year nearly 2/3s of the Navy's F/A-18 Hornets were grounded because of maintenance backlogs, and more than half of the Navy's aircraft were grounded overall. Cross depot maintenance within the organic industrial base may be crucial in avoiding readiness issues in the future with programs like the F-35. I believe we can find extra capacity for these backlogs through expanding cross-service depot maintenance operations. There was language in last year's NDAA that directed the Secretary of Defense to assess the feasibility of expanding cross-service depot maintenance within the organic industrial base to avoid future backlogs. Can you provide an update on what steps have been taken to examine cross-service depot maintenance for the F/A-18?

Admiral MORAN. The USMC provided NAVAIR a list of twelve F/A-18 inventory-limited components to explore cross-service organic depot repair. Of the twelve components it was assessed that seven may be candidates for cross-service depot maintenance. On 26 October 2017, NAVAIR submitted Requests for Quote (RFQs) for the seven identified components to the USAF Depot Source of Repair and Maintenance Inter-service teams. The USAF is currently analyzing the requirements and tech-

nical documentation provided by NAVAIR. While awaiting responses to the RFQs, NAVAIR continues to dialog and coordinate with the appropriate USAF representatives.

9. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, how could the Services benefit from cross-depot maintenance in the future and with future platforms?

General McCONVILLE. By the continued use of the Department's Depot Source of Repair (DSOR) coordination process, which is an integrated process that ensures the Services collaborate and share depot maintenance capabilities, the Army seeks to ensure the most efficient, timely and cost effective results. The Army benefits from this cross-depot maintenance process today as the inter-Service coordination creates efficiencies and cost savings. For example, the Air Force depots perform maintenance on the Army Gray Eagle drones and the Marine Corps depots perform maintenance on Army ground generators. These DSOR assignments offer savings that are already calculated into the Army's budget projections.

Admiral MORAN. There are existing policies and processes in place that are executed by specific Service organizations to optimize the assignment of depots to support specific platforms and their subsystems. The policies are primarily codified in Department of Defense (DoD) Directives and Instructions. The process, known as the Depot Source of Repair (DSOR) determination process, involves all Services and is intended to ensure a competitive review and to select the overall best location for the depot maintenance of a specific DoD system. For example, the Navy currently executes cross-depot maintenance support with the U.S. Air Force for the F-35 and certain aircraft engines, utilizes the U.S. Air Force and U.S. Army depots for many communication systems, and supports most Service Electro-optical/Infra-red (EO/IR) systems at Fleet Readiness Center Southeast. The Navy makes all attempts to optimize the Program Manager's investment in depot level capabilities, with focus on single-siting support so as not to unnecessarily duplicate depot capability. We are constantly reviewing and updating the DSOR process for improvements that will be applied toward utilizing cross-depot maintenance now and in the future.

General WALTERS. The Marine Corps, as well as other Services, already benefits from cross-depot maintenance. The Marine Corps partners with our sister Service depots to sustain our ground equipment to the point that we view the DoD depots as a system and not as individual capabilities. We are currently having our tanks repaired at Anniston Army Depot, our radars repaired at Tobyhanna Army Depot, and our High Mobility Artillery Rocket Systems (HIMARS) are repaired at Letterkenny Army Depot. We also source Tactical Shelters and Defense Advanced GPS Receivers (DAGRs) to Hill Air Force Base, and Raids and Recon equipment is repaired at Naval Surface Warfare Center in Panama City. Our Marine Depot Maintenance Command conducts depot repairs at our production plant in Albany, Georgia, or Barstow, California, for the Multipurpose Wheeled Vehicles (HMMWVs) for the Army National Guard, and Tactical Power Generation sets for the Army. Additionally, we rebuild Paxman engines at our Barstow production plant for the Coast Guard and the Navy.

From an aviation standpoint, platforms common between the Services such as the MV-22, F-35 and KC-130J provide opportunities to deliver some cross-service capacity to satisfy overall demand. First, it lowers risk by expanding the supply base. Any disruption from within the providers can be more easily absorbed if other suppliers have an established capability. Second, it provides greater overall capacity. Instead of running one or two facilities at 90-100 percent capacity, leveraging another Service facility could enable each location to operate at a sustainable rate with lower throughput. This may be more expensive but it provides more predictable production when demand fluctuates.

General WILSON. Considering cross-depot maintenance strategies allows the Air Force to maximize the use of existing Department of Defense facilities, efficiently apply resources, and prevent unnecessary duplication of capabilities. Existing processes facilitate the consideration of all DoD depot maintenance capabilities when satisfying requirements, and the Air Force routinely coordinates depot workload assignments with the other Services.

MARINE AVIATION SAFETY AND PILOT AVAILABILITY AND READINESS

10. Senator PERDUE. General Walters, the Marine Corps had 12 Class A Mishaps in fiscal year 2017 which have been primarily attributed to human error. Pilots were not getting enough hours in the air due, in large part, to aircraft maintenance and readiness. Can you speak to how a stable budget process would allow you to improve aviation readiness and keep readiness high in the future?

General WALTERS. The Marine Corps requires stable, predictable funding over multiple years to achieve sustained positive results. There is a direct relationship between readiness and modernization. We seek to modernize our aviation platforms and reduce resources required to maintain aging, less lethal and less survivable systems. In previous years, we were underfunding our readiness accounts to buy new airplanes—even then we weren't buying enough new airplanes. The budget Congress is providing now—it allows us to do both. It also allows us to buy F-35s and CH-53K as we complete procurement of MV-22 and H-1. It increases our lethality, certainly with those particular airplanes, as we begin to ramp up into these new air airplanes to fulfill the new National Defense Strategy.

The new budget also allows us to modernize our depot, hire the right people, get the right people in the right place at the right time in our depots. It allows us to train, and allows us to fully fund our spares accounts to levels they've never been funded to before. Fully-funded readiness accounts ensure our jets and pilots have the right flight time to get out the door.

11. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, there is currently a retention issue within the aviation community as we lose fully trained and experienced pilots to the private sector. This loss of valuable talent occurs throughout our Services with various other critical skills as well. As stated during the Current Readiness hearing, one reason pilots leave the service is the diminished flight hours they are receiving, but there are also other incentives we can offer to our critical skill sets across the military. How would a stable budget help you implement certain incentives for our servicemembers to keep them in our military versus moving to the private sector?

General MCCONVILLE. A stable budget ensures a full complement of resources at our disposal to continue to provide incentives where needed and address quality of life issues to keep our aviators in an Army uniform.

Warrant Officers perform the majority of flight duties within the Army. Therefore, the Army focused its retention efforts on this portion of our aviator population to maintain our aviation capability. Quality of life issues are the primary reason for separation from the Army among Aviation Warrant Officers. Sustained high demand for Army aviation capabilities by combatant commanders has required frequent deployments by Army aviators. The high operational tempo of aviation units coupled with frequent permanent changes of stationing within the U.S. creates an understandable strain on families. Often, it is the promise of increased stability in the civil sector and the decision to put family first that leads an aviator to leave the Army. We are currently exploring ways to increase stability within the Army for our Aviation Warrant Officers and improve quality of life. Already we have begun offering targeted bonuses to the Aviation Warrant Officer populations deemed to be at higher risk of leaving the Army as an incentive to stay; however, monetary incentives alone do not fully address the retention challenge.

That said, a stable budget will help us promote an increased and predictable throughput of pilots in Army Aviation. Increased and predictable pilot throughput will allow us to mitigate manning shortages, thereby reducing the operational tempo for individual pilots and increasing stability and overall quality of life for the Aviation Warrant Officer population and their families.

Admiral MORAN. When operating under prolonged or recurring Continuing Resolutions, available funding is based upon the previous year's appropriated amount with no regard for mandated changes to the current year, such as pay raises or end strength. Our first requirement is to ensure we pay our sailors from those available funds. This in turn pressurizes our ability to offer robust special and incentive pays in a timely manner. Stable budgets enhance our ability to respond to the dynamics of changing recruiting and retention behavior and emerging manning requirements, through judicious application and/or adjustment to special and incentive pays. Positive retention is just one aspect of a stable budget. The other benefits are mission capable aircraft, sustained flying hours, stable PCS budgets, etc. Historically, we have been able to positively influence retention behavior by providing a fair compensation package. However, over the past several years, Naval Aviators have expressed a growing dissatisfaction with the quality of service resulting from readiness challenges associated with limited aircraft availability and reduced flying hours while not deployed, which have inhibited their timely attainment of tactical qualifications and subsequent career progression. These delays impact the time Aviators have to train and hone their skills prior to deployment. Such challenges are further exacerbated by low stocks of critical parts. Restoring short-term fleet readiness will require sufficient and predictable funding, which will allow our pilots to fly the hours needed to maintain optimum proficiency, and ensure our ability to conduct timely maintenance on our airframes. It would also enable Navy to restore stocks

of necessary parts, return more aircraft to operational status and better prepare them to remain deployed, as required. The ability to strategically address these readiness and retention issues requires a stable budget.

General WALTERS. A predictable and stable budget allows us to properly plan and execute bonus and retention incentives to retain highly qualified marines. Incremental funding for Selective Reenlistment Bonuses creates unnecessary challenges to planning and jeopardizes retention of quality marines. The recent Continuing Resolutions (CR) have negatively impacted fiscal year 2018 reenlistment approval rates. Once the Marine Corps reaches its SRB funding authority imposed under a CR, SRB approvals are halted and servicemembers are forced to delay their reenlistment and potentially explore other options in the event that their package is not funded in time. The delay in funding and approval inflicts avoidable uncertainty to a committed servicemember's future and their family.

Monetary incentives are not the only factor in such a decision, particularly where pilots are concerned. Pilot retention decisions are also impacted by availability of flight hours and the opportunity to train and/or execute their mission sets.

General WILSON. Without budget stability, it is difficult to effectively manage programs over the long term. Stable budgets provide predictability and stability in such programs like incentive programs, such as the aviation bonus, selective retention bonus, and special duty assignment pay that are designed for multi-year payments for our airmen serving in shortage specialties or in arduous and demanding positions.

Budget stability also affects the airmen we target with these programs. With large swings in funding levels or short-term budget approaches, these airmen could be less inclined to make long-term commitments to the Air Force. Consistent budgets are a critical part of the trust agreement we owe our airmen. Bottom line: If we desire airmen to make long-term commitments to the Air Force, we must show long-term commitment to them with stable budgets that support our incentive programs.

12. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, how are you currently addressing the issues with retention of critical skill sets within your respective Services?

General McCONVILLE. The Army continues to offer Selective Reenlistment Bonuses (SRB) for soldiers serving in critical Military Occupational Specialties (MOS) and skills. The SRB is reviewed quarterly through an analysis of the strengths of every skill in the Active component (AC) Enlisted Inventory to include MOS and all associated Additional Skill Identifiers (ASI)/Special Qualification Identifiers (SQI)/Languages.

The SRB is based on the projected strengths of the skill 18 months into the future and the complexity/duration of the training to accomplish strength requirements. The SRB message is published Army-wide and both Career Counselors and Command teams use this with personal counseling to assist with the retention of critical skills.

Ensuring a stable budget enables the Army to appropriately incentivize soldiers with critical skills as Army structure and strengths change.

Admiral MORAN. Navy is addressing critical skills retention issues through a combination of monetary and non-monetary incentives. Officer retention areas of focus include Aviation, Submarine Officers, Conventional and Nuclear Surface Warfare Officers, and SEALs.

- To increase the retention of top Officer and Enlisted performers, using non-monetary incentives, Navy has a set of sailor 2025 initiatives to provide greater transparency, flexibility and choice, such as, advanced education and SECNAV Tours with Industry, and is pursuing permanent Career Intermision Program authority and modernization of the Defense Officer Personnel Management Act.
- The primary monetary tools supporting aviator retention are Aviation Incentive Pay (AvIP) and Aviation Bonus (AvB) respectively. Congress' enactment of the National Defense Authorization Act (NDAA) for Fiscal Year 2017 resulted in an increase in the statutory cap for AvB from \$25,000 to \$35,000 per year and in the AvIP from \$850 to \$1,000 per month, which was well-received and appreciated by aviators. Using this authority, we made significant changes to the Aviation Department Head Retention Bonus (ADHRB) by changing when Aviators are eligible, offering flexibility in contract lengths, and increasing bonus amounts up to the statutory limits (\$35,000/year) for HM, VAQ, VFA, VAW and VRC pilots who commit to a 5-year contract. For the Aviation Command Retention Bonus (ACRB), we increased the bonus to a 3-year contract for \$100,000 (\$34,000/\$33,000/\$33,000). For AvIP, we added a merit element by creating an

- additional category whereby Aviators who are screened for their career milestone will receive a higher level of Flight Pay than those who do not screen.
- The Submarine and Surface Warfare (Nuclear) communities are using monetary incentives including retention bonuses for officers willing to commit to future service and special duty pays for challenging nuclear billets. Navy restructured the Naval Special Warfare Officer Bonus Programs in an effort to increase retention. Navy offers two SEAL retention bonuses targeting SEAL officers at critical career decision points: Naval Special Warfare Officer Continuation Pay (NSWOCP) offered to lieutenants (O-3) and lieutenant commanders (O-4), and Naval Special Warfare Officer Retention Bonus (NSWRB) offered to lieutenant commanders (O-4) and commanders (O-5). Historically, these targeted bonuses have proven effective in retaining high-quality personnel to meet operational requirements by attacking retention problems in specific communities, jobs, and experience levels. Additionally, in an effort to enhance non-monetary retention incentives, the community has undertaken a review of the career pipeline to increase career milestone opportunities for traditional leadership and community valued positions.
 - The Surface Warfare Officer community implemented a revised Department Head Retention Bonus (DHRB) program, which increased the maximum total compensation to \$105,000 for Active component (AC) officers and authorized incentive payments prior to an officer's Minimum Service Requirement (MSR). The new bonus is only offered to those highly talented officers who have demonstrated outstanding performance, possess a strong potential for future success, and have screened for a department head assignment. This monetary tool is used in combination with non-monetary incentives to improve overall Surface Warfare Officer retention and improve the quality of officers retained.
 - Enlisted retention remains high, but critical skill communities such as Nuclear Field, Special Warfare, Advanced Electronics, Aviation Maintenance and Information Technologies are increasingly requiring focused retention efforts. Navy leverages multiple special and incentive pays to recruit and retain sailors into these high-risk and/or high-investment ratings. Navy has also expanded reenlistment and rating conversion opportunities which offers greater flexibility and choice in sailors' careers.

General WALTERS. To resolve pilot inventory shortages in critical specialties, the Marine Corps will combine materiel readiness improvements, accurate and supportable accessions, and the Aviation Bonus, aimed to stabilize retention. In fiscal year 2018, the Marine Corps unveiled a new series of selective reenlistment bonuses targeting longer contract lengths for critical skills and specific maintenance qualifications. Retention bonuses have some influence on an individual's decision to depart or remain in the service. However, monetary incentives are not the only factor in such a decision, particularly where pilots are concerned. Pilot retention decisions are also impacted by availability of flight hours and the opportunity to train and/or execute their mission sets. We must address the issue holistically, by looking at monetary and non-monetary incentives, but also improving work-life balance, reducing non-flying tasks, and improving aviation maintenance, training, and production, all of which will support increased operational readiness.

General WILSON. The Air Force is employing retention bonuses, such as Aviation Bonus, Selective Reenlistment Bonus, Special Duty Assignment Pay, and the Critical Skills Retention Bonus to incentivize experienced airmen with critical skills to stay. However, monetary incentives are just one piece of our retention portfolio. Commanders have the authority to approve high-year-of-tenure extensions for personnel in undermanned key career fields to retain experienced airmen. Maintaining these airmen is essential to meeting the mission, training the new accessions and ultimately to improve readiness.

We have also taken steps to reduce the stress of additional duties on the force. In response to airmen's concerns, we conducted a review of additional duties, resulting in the realignment, reduction, or elimination of 29 additional duties across the Air Force in the last 18 months, with workload realigned to newly created Commander Support Staffs. In conducting a manpower study on the workload transferred to the Commander Support Staffs, we determined a requirement of 1,600 authorizations. We funded the authorizations beginning in fiscal year 2017, programmed incrementally through fiscal year 2020. Resourcing is well underway and we are on-target to meet fiscal year 2020 projections.

To assist with quality of life concerns, we are leveraging technology to assist officers in providing a direct voice into the assignment process through "Talent Marketplace." Talent Marketplace is a new web-based assignment matching platform that has been developed based on an algorithm used in the Nobel-Prize winning National

Residency Matching Program. Currently, we are testing the system on approximately 430 fighter pilot and combat systems officers scheduled for Permanent Change of Station in summer of 2018. Following this test, we will open Talent Marketplace incrementally to all Active Duty Air Force officer career fields beginning August 2018. It has potential to expand to the Total Force in the future. Talent Marketplace allows officers to personalize their resume, dynamically search for jobs, and submit a prioritized list of desired jobs and duty locations. During this process, officers receive real-time feedback on how many other officers are applying for the same positions in addition to having visibility on how many hiring authorities are prioritizing them to potentially fill their vacancies. Once implemented, Talent Marketplace seeks to increase transparency throughout the assignment matching process, optimize identification and utilization of talent, and increase retention of airmen in critical skills.

ARMY READINESS AND SECURITY FORCES ASSISTANCE BRIGADES

13. Senator PERDUE. General McConville, last year in this committee there was a major focus on the low number of ready Brigade Combat Teams. The Army continues to maintain a high operational tempo and a low dwell time meaning the Army still risks consuming readiness as soon as it builds readiness. Units have also been deployed for security assistance missions and have not been able to train to their standard, conventional missions. What is the current readiness level of your Brigade Combat Teams?

General MCCONVILLE. We are at a better place than we were last year when GEN Allyn appeared before this Subcommittee on February 8, 2017. We have seen a modest increase in the number of brigades ready to fight tonight. I would be happy to provide the exact readiness status of our Brigade Combat Teams in a classified setting.

14. Senator PERDUE. General McConville, how are you prioritizing readiness in the fiscal year 2019 budget?

General MCCONVILLE. The Army's number one priority remains readiness, and our fiscal year 2019 budget request will support achieving readiness objectives supporting the National Defense Strategy (NDS). This includes requests for increased funding for home station training, conducting 20 Combat Training Center (CTC) rotations, including four for Army National Guard (ARNG) brigade combat teams, and a renewed Emergency Deployment Readiness Exercise (EDRE) program. The EDRE program includes three ground exercises plus one Sea EDRE per year, in support of the NDS emphasis on readiness to sustain global commitments. To enhance ARNG and United States Army Reserve (USAR) readiness, the Army has programmed increased manning, training days, and combat training events. Additional training days will ensure units required for immediate availability meet rotation requirements.

15. Senator PERDUE. General McConville, how will you balance growing the force with improving readiness?

General MCCONVILLE. Manning is one of the four pillars of readiness. End strength growth will close lethality and capability gaps in air defense artillery and long range fires, as well as improve readiness through investment in Security Force Assistance Brigades, the training base, and the Readiness Enhancement Account (REA). The REA provides the Army the ability to increase manning of existing units to compensate for non-deployable soldiers, improving readiness of our priority units. We are also reviewing our processes to reduce non-deployable numbers.

16. Senator PERDUE. General McConville, will the Security Forces Assistance Brigade construct help you recover Army readiness by forming mission focused units?

General MCCONVILLE. Yes, the Army intends to use Security Force Assistance Brigades (SFABs) to replace Infantry Brigade Combat Teams (IBCTs) in current training, advise and assist missions, allowing IBCTs to prepare for future theater missions once replaced.

For several years, the Army has deployed portions of IBCTs to meet Security Force Assistance missions. While the missions have been successful, the partial employment of an IBCT dramatically consumes Brigade Combat Team (BCT) readiness. Applying BCTs toward non-combined arms maneuver tasks is inefficient.

In March 2018, the Army deployed the first mission-focused SFAB. We are developing options with Combatant Commands and Office of the Secretary of Defense for SFABs to replace IBCT deployments.

CYBER READINESS

17. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, each of the Services has taken slightly different approaches to address cyber readiness and the organization of your cyber forces. There is still a concern that DoD may have neither the tools and capabilities required to be effective in the cyber domain nor the “bench strength” necessary to sustain the high levels of readiness that will be demanded of the cyber force. What is the state of cyber readiness in each of the Services?

General MCCONVILLE. The Army achieved a significant milestone in cyber readiness in September 2017 when all 41 Active component Army Cyber Mission Force (CMF) teams became fully-operational, a year ahead of U.S. Cyber Command’s (USCYBERCOM’s) mandate. These teams meet the Joint criteria for manning, equipping, training and certification. We are moving to a sustainable readiness model that will ensure our cyber forces are resilient and set to support multi-domain battle. To assess sustained levels of proficiency, the Army Cyber Protection Brigade developed “Cyber Gunnery Tables,” similar in concept to gunnery tables utilized by maneuver branches. These tables define individual, crew, and mission element tasks necessary to effectively conduct cyberspace operations and provide structured, methodical, and foundational training for both individuals and teams. These gunnery tables also serve as training and readiness validation events to certify that crews have the required knowledge, skills, and abilities to participate in collective exercises. They also provide an objective assessment to determine individual and crew readiness. The Army has the people and processes to continue to evolve the needed tools and capabilities to match the current and future cyber threat, and continues to build our “bench” of Army cyber professionals.

Admiral MORAN. The Navy Cyber Mission Force (CMF) build is complete. All 40 of the Navy-sourced CMF teams achieved Full Operational Capability (FOC) as of October 6th, 2017, one year ahead of the designated U.S. Cyber Command target. FOC is an externally-validated evaluation indicating the unit has met all its capability requirements and can perform its mission as assigned. It is not, however, a measure of combat readiness. Achieving FOC is only a waypoint as the operational need for a well-trained and motivated cyber workforce will continue to be defined in the coming years.

The Department of the Navy (DON) will sustain investment levels to support key CMF requirements for access platforms, cyber tools, and critical infrastructure to strengthen Title 10 cyber space operations. As of 1 March, the Navy-provided CMF teams are manned at 88 percent overall. Navy provides 4 National Mission Teams, 3 National Support Teams, 8 Combat Mission Teams, 5 Combat Support Teams, and 20 Cyber Protection Teams.

As directed in fiscal year 2016 NDAA, the Navy is on track to begin resourcing training for sailors assigned to the CMF teams. Specifically, the Services have been directed to assume responsibility for CMF individual skills training from USCC beginning in fiscal year 2019. The transition will remove inefficiencies in the current model, while maintaining a connection to USCC requirements. Additional resources will be required to maintain curriculum relevance against the fast rate of change in threat and technology. Navy is evaluating resource shortfalls to meet the mandate as part of POM-20.

General WALTERS. The Marine Corps is currently at a transition point where we are aggressively working towards building cyberspace expertise within the MAGTF and pushing cyber capability from the enterprise level to the tactical edge.

Marine Corps Future Force 2025 (FF2025) provides additional structure across multiple units to enhance capability and capacity to conduct Information Warfare (Cyber) operations. FF2025 creates Information Warfare Coordination Centers at each MEF (within MEF Information Groups (MIG)) and adds 233 Defensive Cyberspace Operations-Internal Defensive Measures (DCO-IDM).

In fiscal year 2017 the Marine Corps created additional units and structure, both in HQMC and the operating forces, to extend operations in the cyber domain. This includes the creation and manning of the Deputy Commandant (DC) for Information and the Defensive Cyberspace Operations-Internal Defensive Measures (DCO-IDM) Companies.

DC Information will develop and supervise plans, policies, and strategy for all information environment operations (IEO) related activities, and will identify requirements for cyber doctrine, manpower, training, education, and equipment for the MAGTF.

DCO-IDM companies will conduct DCO-IDM missions in order to protect critical capabilities to preserve a MAGTF commander’s ability to command and control forces. DCO-IDM includes mission assurance actions such as actively hunting for

advanced internal threats that evade routine security measures and performing digital forensics/triage. The company will dynamically reestablish, re-secure, reroute, reconstitute, or isolate degraded or compromised local networks in response to attack, exploitation, intrusion, or effects of malware on the DODIN or other assets directed to defend.

Cyber is a dynamic, competitive environment, and we are continually responding to the increasing capability and capacity of our adversaries. As we have built Cyber Protection Teams (CPT), we have employed them across the Marine Corps Enterprise Network (MCEN). This year, our CPTs have conducted named cyber operations to include focused internal defensive maneuver missions (IDM), ensured security of Personally Identifiable Information (PII) repositories, and completed security enhancement missions for cyber key terrain, countering known threats to the network. In all DCO activities, the Marine Corps consolidates findings and actionable lessons for dissemination to the broader operational community. We are making efforts to better understand system data, and have employed Service aligned CPTs to harden Service PII repositories. In 2015, MARFORCYBER began efforts to secure PII repositories across the service. The MCCOG and Service CPTs assessed the security posture of our 40 largest PII repositories. While the overall security posture of our systems was within established standards, we identified areas for improvement we needed to address. Our Service aligned CPTs conducted on-site visits to several repositories that were deemed critical high risk. There, we identified and remediated vulnerabilities and trained system owners and administrators. We continue efforts to ensure these systems maintain the highest levels of security.

We have identified a requirement for a more robust Marine Corps Cyberspace Operations Group (MCCOG) Continuity of Operations (COOP) capability. The MCCOG COOP is effectively a MCEN COOP capability. MCCOG lacks the ability to comply with DoD Directive 3020.26 of 9 Jan 2007 requiring up to 30 days Mission Essential Services and Functions performance for no-notice events. The Marine Corps IT Center (MCITC), located in Kansas City, Missouri, is the recommended COOP site, allowing us to leverage available space and integrate with other MCCOG operations already at MCITC. We have conducted thorough analysis and research to develop an effective COOP capability, but currently lack the financial resources to put our plan into action.

We are participating in efforts to shape our battle space by designing a more defensible architecture. As we move toward implementing the Joint Information Environment, we are also working to unify and centralize our network to better see, understand, and defend the MCEN. We are integrating and standardizing cyberspace threat reporting, intelligence production and analysis to better inform commander's situational awareness and decision making. Our network must be resilient, redundant and interoperable, and extend from garrison to the tactical edge of battle. In other words, we need a seamless MCEN that provides a defensible capability providing enterprise services from "fighting hole to flagpole." We are moving out in this direction.

With regard to personnel, the Marine Corps has sub-optimal personnel inventories for field grade communications officers and data systems staff non-commissioned officers. Generally speaking, these occupational fields currently provide leadership to the Communications/IT/Cyber workforce for the Marine Corps. Due to sub-optimal "bench strength", the Marine Corps prioritizes key billets towards the operating forces and accepts gaps and/or grade mismatches, typically in the supporting establishment and garrison IT workforce. The impact, however, is not isolated to garrison IT requirements as the garrison IT workforce enables much of the warfighting network capability. The Marine Corps is working to grow a larger communications/IT workforce and is also growing a specific cyber military occupational field for specialized cyber capabilities.

General WILSON. Today's cyber teams conduct daily cyber operations in support of combatant commanders. As such, we are committed to building a robust and resilient cyber enterprise.

- The Air Force is well postured to activate all 39 Cyber Mission Force teams by September 2018. Currently 35 of 39 Air Force teams are at Full Operational Capability. With respect to "bench strength," mission surge, and daily operations, the Air Force has employed a built-in total force strategy with 15 Air National Guard squadrons and a classic reserve associate squadron providing additional trained and ready surge capacity in times of crisis.
- We are essentially doubling our cyber workforce (logically speaking) by introducing Enterprise Information Technology as a Service. This will leverage industry partners and commercial solutions for increased information technology effectiveness and security. This frees our cyber airmen to focus on defense of

Air Force core functions and weapons systems. We will use these cyber airmen to establish Air Force Mission Defense Teams. The Mission Defense Teams provide another layer of security for our combat wings by providing defense for missions, facilities, and networks.

- The Air Force leads the development of Unified Platform and Joint Cyber Command and Control Capabilities. These programs consolidate service-unique Cyber platform capabilities and integrate command and control of cyber operations across the Department of Defense, providing much increased capability to protect friendly critical infrastructure while increasing lethality of Joint operations. These programs will also allow the Cyber Mission Force to be interoperable, interconnected, and conduct integrated planning and execution across the full-spectrum of cyberspace operations.
- The Air Force is also pursuing mission assurance for weapon systems in a cyber contested environment with the Cyber Resiliency Office for Weapons Systems. This effort reduces cybersecurity vulnerabilities to infrastructure, weapon systems and business systems to enable military operations. It is transforming our acquisition and sustainment processes to “bake in” cyber security into new and existing weapons systems.
- The Air Force has invested in the creation, fielding, and sustainment of an ever-increasing portfolio cyber defensive and offensive capabilities, specifically seven cyber weapon systems designed to provide a tiered global defense of the Air Force information network. Second, defensive cyber maneuver forces to actively defend key cyber terrain. And last offensive capabilities to provide all domain integrated operational effects to combatant commanders.

18. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, what needs to be prioritized to ensure that we recruit and retain the right people with the right skills for the cyber domain?

General MCCONVILLE. People remain our most important weapon system, our most important asset. Sustained and timely funding is essential to enabling continued training of the cyber force. For retention purposes, the Army has approved monetary and non-monetary incentives, including Advanced Civil Schooling, Training with Industry, and cyber-related fellowships for cyber forces. Accordingly, the Army has expanded two key compensation programs for cyber soldiers: Assignment Incentive Pay (AIP) which is designed to encourage Officers, Warrant Officers and Enlisted soldiers to volunteer, train, and perform Cyber Mission Force work roles that are otherwise difficult to fill; and Special Duty Assignment Pay (SDAP), which is designed to compensate enlisted soldiers assigned to duties designated as extremely difficult or that involve an unusual degree of military skill.

Admiral MORAN. Navy Cyber Mission Force (CMF) enlisted ratings (CTI, CTN, CTR, IS, IT) are meeting retention goals. Our current retention data shows that only four percent of sailors within the CMF have separated or retired, six percent have done back-to-back tours within the CMF, 17 percent have transferred to a job/position outside of the CMF, and the remaining 73 percent are serving in the CMF and not yet up for orders or end of service obligation. We anticipate that we will continue to be above Navy averages in retention. We recognize that tracking overall rating recruitment and retention is only a first step. We aim to refine specific cyber skills tracking by developing additional Navy Enlisted Classification(NEC) Codes, updating Occupational Standards and building proficiency standards at the journeyman and master level.

Cyber-related officer communities are also meeting retention goals. While both Cryptologic Warfare (CW) and Information Professional (IP) communities experienced growth associated with increased cyber missions, we are retaining officers in these communities at 93 percent overall. Both CW and IP are effectively-managing growth through direct accessions and through the lateral transfer process, thereby, ensuring cyber-talented officers enter and continue to serve.

Additionally, the Navy has 21 Cyber Warfare Engineers (CWE) in the ranks, the Navy's direct commission program for experienced and highly talented cyber developers. In the next five years the number of CWE is expected to grow to 40.

General WALTERS. With regard to the high-end cyber capabilities, the Service is conducting a multi-year, Service-integrated, bottom-up approach to grow MARFORCYBER, which includes a manpower, training, and facilities/equipment build. Our growth is in-line with the Commandant's vision, Future Force 2025. Our manpower growth will require the recruitment, training, and retention of qualified civilian and military personnel. Our growth will be done right; the Service will conduct a holistic analysis (DOTMPLF) to ensure our growth is realistic and complete. Although MARFORCYBER has already postured to grow, we will begin to see change in fiscal year 2018.

Recruiting and retaining high-quality individuals to become and remain marines is an enduring challenge. Our cyber marines will prove no different. We need to make sure our recruiters have the resources that they need to succeed, and that the Corps will have the resources to ensure our retention incentives and special pays are adequate. Overall, we continue to recruit and retain a growing force by adhering to our quality and performance standards necessary to sustain the readiness of our operational forces.

We have been working with various entities in the Marine Corps to develop a dedicated Cyber MOS in order to try and retain these critical assets in the Service. This 2+ year effort is looking to change not only the MOS, but the paradigm of how we employ those marines. The standard model of three year tours doesn't work in the cyber domain. It is taking approximately 18 months to two years to get personnel fully trained and ready to operate, so the three year force structure model is not an efficient way to manage the career track for cyber personnel. By creating a cyber MOS, we can develop a grade shape model, as well as a career model that takes this into account, and will allow us to leverage these hard won skills for longer. And we will have more success retaining some of our quality people if we have a career model that allows them to remain competitive for promotion, while staying operationally focused.

For the Civilian IT Workforce, direct hire authority, flexible pay and bonus incentives, and continued support for training and education programs would reinforce our ability to recruit and retain highly qualified personnel. The proposed Cyber Excepted Service has yet to be fully realized in the DoD, but promises to streamline time intensive hiring processes and should provide additional pay/salary flexibility to improve competitiveness.

The Marine Corps presently does not access directly into the cyber domain, however, it does recruit marines from feeder MOS's that will fill out the cyber domain ranks. The Marine Corps is on the cusp of expanding its military occupational specialties to include a stand-alone cyberspace occupational field (17xx), which may open the door for recruiting to this specialty, but these foundational billets will be filled by marines until we implement a formal accession policy. Incentive pays can be utilized to retain these individuals with the right skills for the cyber domain, if needed, based on inventory levels and/or retention rates. The science of applying monetary and assignment incentives is important for retention, but should only be seen as part of the retention process. Another part of the process is "the art of retention", which comes from engaged leadership and fostering a sense of purpose in our mission. Engaged discussion with our marines at the individual level is central to understanding what motivates each of them to stay a marine.

General WILSON. We need continued support for signing bonuses, retention bonuses, and special duty pay for our military cyber workforce. While we have begun implementation of civilian Cyber Excepted Service, the funding support for retention, local market supplements, etc. based on workforce hiring challenges does not have sufficient resources. We are also implementing the cyber skills coding effort. Thus, sponsorship of a federal effort to map cognitive traits associated with highly skilled cyber professionals, will help us recruit and identify people with the right skills who may have never considered a career in cyber. Furthermore, we need continued support for constructive service credit and direct commissioning programs to attract top cyber military talent and expedite civilian cyber hiring efforts to reduce onboarding delays that cause otherwise qualified hires to accept other employment offers.

F-35 READINESS

19. Senator PERDUE. Admiral Moran, General Walters, and General Wilson, the Joint Force is sustaining over 250 F-35 aircraft, and you plan to triple the fleet by the end of 2021. According to a GAO report in October 2017, our ability to repair F-35 parts at military depots is 6 years behind schedule which has resulted in the average part repair time to be 172 days. In the first 9 months of 2017, F-35s were unable to fly 22 percent of the time due to parts shortages, and initial deployments of F-35s on ships have lacked necessary intermediate-level maintenance capabilities. The F-35 is an example of our current modernization efforts to add technologically advanced systems to our force, and it is possible that there will be similar problems with those technologies—buying equipment before being fully set up to sustain it. What is the current status of the F-35 program across the Joint Force?

Admiral MORAN. According to the F-35 Joint Program Office (JPO) Performance Management Team, for the most current status, 3-9 April 2018, the total F-35 Fleet was unable to fly 25.4 percent of the time while awaiting parts (Not Mission Capable Supply (NMCS)). For the Navy F-35Cs, the percentage was 29.1 percent

NMCS. These percentages are roughly in line with what was reported in the GAO report cited for the first nine months of 2017. The USAF and USMC will respond on the status of the F-35A and F-35B Fleet separately.

General WALTERS. In President's Budget for Fiscal Year 2019, the Navy and Marine Corps programmed money to begin standing up our own Intermediate Level maintenance capability. The Marine Corps' Intermediate Level (I Level) maintenance capability will enable the organic repair of both support equipment and aircraft components, and will also serve as a point of departure for an effort to bring test, check and repair closer to the squadron.

This Intermediate level maintenance initiative, as well as accelerating our standup of our organic depot repair capability, and fully investing in our spares capacity will drive a reduction in time lost flying due to parts shortages and bring an increase to our repair capability and capacity.

The Marine Corps is also investing in engineering to improve parts reliability and upgrading our software because many of our mission systems are the ones that give us those fault codes that provide downing discrepancies, to which new software will help us work through that—again reducing the time an aircraft is not available to fly.

There is also a learning curve associated with an updated model to our aviation logistics. The Joint Program Office re-designed their structure for this in late 2016 and we are just now seeing the effect of the Hybrid Product Support Integrator (HPSI) on the Global Support Solution for all Services and Partner nations. As this process becomes more normalized, we expect to see an increase in the effectiveness of the Global Asset Management process which will reduce repair-turn-around-time and have more aircraft flying.

General WILSON. Depot standup is behind schedule and the Air Force is working with the F-35 Joint Program Office (JPO) to remedy the repair cycle deficiencies. In fiscal year 2018 we increased funding for our initial spares purchase and invested in our repair network. These investments will result in a deeper parts pool and more robust repair capability. The combined efforts to build a robust spares pool will take time. We will continue to work with the JPO Hybrid Product Support Integrator to prioritize parts support to units conducting or preparing for deployed combat operations, and identify options to expedite procurement of mission critical components.

In addition to the items above that address the supply side of the equation, we're also encouraged by reductions in the demand signal for spare parts as well. The enhanced performance and reliability of the recent aircraft 3F software update improves internal diagnostics. The better fault isolation results in fewer serviceable parts that are erroneously introduced into the repair pipeline. Also, reliability and maintainability efforts continue to decrease Mean Time Between Failure rates resulting in fewer parts needing repair.

The combination of supply side increases and demand signal reductions will result in improved aircraft availability across the enterprise.

20. Senator PERDUE. Admiral Moran, General Walters, and General Wilson, what lessons can the Navy, Marine Corps, and Air Force learn from sustainment issues with the F-35 that can be applied to future, complex and technologically advanced programs?

Admiral MORAN. The F-35 sustainment program is a global supply chain and inventory management system based upon a global pooling strategy with a two-level maintenance concept that is the structure for the Air Force. Traditional Navy and Marine Corps sustainment relies on three-level maintenance—a combination of organizational (squadron), intermediate (CVN/L-class and ashore) and depot (shore).

The Navy and Marine Corps both require underway Intermediate-level maintenance to support their "expeditionary doctrine" of employment and operations (CVW, CVN, and Air Combat Element (ACE)). The Navy and Marine Corps also require a different supply chain management structure to support expeditionary operations. This may include an organic service integrator like Naval Supply Systems Command (NAVSUP) instead of Lockheed Martin (LM), or some type of mixed structure.

Current squadron stand-up efforts have highlighted the value of Intermediate-level repair capabilities as necessary for aircraft sustainment while deployed. Establishment of this capability for F-35 is on-going. Additionally, having a robust, organic depot maintenance capability, coupled with an easy-to-use, comprehensive enterprise information system tied into existing DoN (and DoN-external) support systems and infrastructure, is crucial to realizing an affordable sustainment solution. As the F-35 sustainment system matures, these lessons learned will be applied to

future weapon systems through investment in the early stages of the acquisition life cycle.

Finally, detailed sustainment planning and cost forecasting are key elements that must be incorporated into the early design/development process to more adequately drive down life cycle costs.

General WALTERS. In future, highly advanced and technical programs, it would be beneficial to wargame, conceptualize and then baseline the anticipated operational and sustainment environment before designing the sustainment concepts (ex. Global Asset Management, ALIS, O to D Concept). The technical support infrastructure and software should be designed to fit the anticipated operating environment (training, afloat, expeditionary) rather than starting with an innovative set of sparing and maintenance software concepts and forcing the services, maintainers, and fleet forces to fit their operational requirements into that framework. It would also be beneficial to establish multiple beta test units/software/systems to fleet test and provide robust feedback before establishing a single system that is difficult to deviate from due to it being deeply embedded and integrated into the program. If this had been done with regards to the F-35 sustainment strategy, the current ALIS and Supply Software builds might not require an end to end restructure and the GSP/GAM system would be more user friendly, understandable, effective and tailored to fleet needs. The effectiveness provided by NAVAIR/NAVSEA/NAVSUP team is somewhat marginalized by the F-35 sustainment organization and we are currently working through how to re-structure the Joint Program Office to provide a more effective long-term solution to the current Hybrid Product Support Integrator model.

General WILSON. Going forward, we need to urgently bring our best and brightest 5th generation acquisition, sustainment, operations, logistics and maintenance experts, who have learned the hard lessons first hand, into the earliest stages of new development programs. There is a DoD trend to keep new system development sterile from legacy platform experience. The advantage of this approach gives the planning team a blank slate, free from any platform bias, to develop new capabilities. This way of thinking has allowed the Air Force to develop the most capable and powerful aircraft in the world. It has also created an environment where we have repeated some acquisition and sustainment mistakes, resulting in cost overruns and avoidable sustainment challenges. It is clear that we need to take steps now to bring recent experience to our developing capability programs. Additionally, we must consider greater emphasis on logistics and affordability from the start in any new major capability development. Warfighter needs will remain the focus with early consideration of life cycle costs for affordability.

SUPPLY CHAIN IMPROVEMENT

21. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, many of our readiness issues, especially in aviation, are due to a lack of spare parts and the length of time it takes for a mechanic to order and to receive spare parts so they can actually do the maintenance on vehicles or weapons systems. The slow supply chain is unacceptable. Meanwhile, China's industrial base can produce just about anything in a very short time. We should look very hard at those supply chains to make them better and more competitive. Can you speak to the current problems with our supply chains—especially concerning maintenance and spare parts?

General MCCONVILLE. Currently, the Army is experiencing challenges in the supply chain for ground vehicle maintenance and repair parts. Army aviation is influenced less by lack of repair parts than Army ground fleets. For our heavy ground fleets, the fluctuating repair part demands over the past several years have complicated requirements forecasting; we have refocused on training for major heavy armor engagements while executing predominantly wheeled vehicle deployments in Iraq and Afghanistan. Since the U.S. Army is the sole consumer of most of these military grade repair parts, some of the supply sources have atrophied. Army leadership is engaged in reenergizing commercial vendors that in some cases shifted their business objectives to a more fruitful and dependable customer base. Maintaining numerous suppliers for military repair parts ensures depth and a warm industrial base. The Army will continue to address industrial base capacity while remaining cognizant of fiscal concerns.

Admiral MORAN. The wholesale supply system is built to achieve an overall supply availability of 85 percent. Wholesale availability, combined with shipboard and planeside stocks, achieves a 94 percent first pass effectiveness in sourcing parts from the supply system. This long-standing goal represents the optimum balance between cost and supply chain effectiveness. Within the population of supported plat-

forms and weapon systems, there exists variation of supply availability. Where systems fall short of this aggregate goal, there are several key challenges that help explain these gaps in supply availability. The following challenges are further aggravated by today's readiness environment to balance prior years' underfunding of sustainment enabler accounts, increased operational requirements, accelerated squadron stand-ups, platform growth, and service life extension of legacy platforms:

- *Lack of synchronized programmatic support elements prior to fielding a new weapon system:*
 - Many supply challenges arise from a lack of key programmatic Integrated Product Support (IPS) elements and investment in areas such as timely and accurate provisioning data, fully resourced Interim Supply Support periods, timely depot stand-up, engineering sustainment, training, field support, maintenance planning, etc. Shortfalls within these IPS elements ultimately manifest in degraded supply performance.
- *Atrophy in Organic Industrial Base:*
 - The market basket of components repaired at our Fleet Readiness Centers (FRC) today compared to FRC workload 10–15 years ago is significantly reduced. Skilled manpower, aging equipment, facilities and lack of new capability for newer platforms and systems have played a role in reduced component production and throughput.
- *Commercial Industrial Constraints:*
 - Several factors contribute to extended sparing timelines pre/post contract award, many of which are unique to the component being procured. A majority of aviation related components are sole-sourced to a single vendor. This limitation, along with competing requirements (production versus sustainment), “warm” (Super Hornet) versus “cool” (AV-8B & Legacy Hornet) production lines, production complexity, sourcing of forgings and raw materials, availability of tooling and fixtures, and contract type(s), among others, can drive uncertainty into sparing efforts.
- *Obsolescence and Diminishing Vendor Base:*
 - Lack of data rights hampers our ability to establish multiple spare and repair sources, augment capacity, increase vendor throughput, reduce lead times and mitigate obsolescence challenges during sustainment. Additionally, the length of time a weapon system is in service forces us to contend with a diminished vendor base as companies leave the business and equipment becomes obsolete.
- *Unplanned Reliability:*
 - New weapon systems are often fielded with overly optimistic engineering failure rates. This drives inadequate initial sparing requirements and provides little back up in the wholesale system to quickly adjust and react.
- *Service Life Extension of Aging platforms:*
 - Sustaining aircraft beyond intended service life results in life-limited components incurring extensive lead time to restart cold production lines. Restarting cold production lines, when it's even possible, can be extremely expensive. Obsolescence issues often preclude new production without engineering re-designs.
- *Inventory Investment:*
 - Even under the best of circumstances, timelines for procurement or repair of components for the Fleet's highly-complex ships and aircraft are too long to support readiness requirements without a sufficient level of inventory on hand. This starts with the critical initial procurement of repairable components when a weapon system is fielded, and continues throughout the sustainment phase. During sequestration, key readiness accounts were underfunded in some cases by 50 percent of the amount necessary to sustain the force. Tradeoffs were made in parts procured and repaired, which ultimately impacted the availability of parts to support our ships and aircraft.
- *Digital Modernization and Supply Chain Modeling:*
 - In an effort to achieve greater real-time analysis of supply requirements and enhance supply chain responsiveness, the service Logistics IT functional managers are evaluating the use Product Lifecycle Management Systems linked with industry partners and delivered, mature Technical Data Packages. However, increasing the effectiveness of our Information Technology that supports supply chain modeling and asset management has been slowed by sequestration and reduction in spending for modernization and research and development of supply modeling technology.

General WALTERS. Today's MAGTF is equipped with precision munitions, world-class communications and state-of-the art weapon systems, but these capabilities do not reduce our requirement to move large amounts of fuel, water and ammunition throughout the battlespace. On the one hand, our current inventory of aircraft, vehicles and weapon systems is more lethal, maneuverable and survivable than any time in our history. On the other hand, these systems are heavier and more logistics intensive. Success in this hybrid era will also require efficiency and sustainability in austere environments. We must modernize our supply and maintenance capabilities. For these reasons, we believe we are in an era of hybrid logistics, where we must continue to meet perennial demand requirements, while at the same time working to evolve our supply and maintenance, lift and distribution, medical, and other logistics capabilities to enhance the endurance, reach and overall effectiveness of the 21st Century MAGTF.

General WILSON. The supply chain has experienced stable and consistent customer response times despite having less inventory on the shelf. Across the Air Force we experience a major supply breakdown, where we do not have a part anywhere in the supply chain, .02 percent of the time (200 orders a month against a 70,000 monthly order population). One quarter of these major supply failures (50 orders a month) are parts that have not failed previously and highlight the challenges of maintaining an aging aircraft fleet.

Maintenance manpower is equally important to sortie production. As a result of sustained and sufficient manpower, our aircraft maintainers are becoming more effective each day. Because the average aircraft age is 27 years, from time to time we will experience difficult repair requirements which often will stress our supply and repair capacity. However, we have continued to invest in improving on-hand stocks at base level and making our maintainers more effective during each maintenance task.

22. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, what are you doing or recommend to be done to improve the efficiency of our supply chains?

General MCCONVILLE. The Army is implementing a number of initiatives to increase efficiency and effectiveness of the supply chain. We are focusing on forecasting effectiveness of required supplies by improving our forecasting methodology. Improvements will address refining the accuracy of sporadic demands and fluctuating quantities. We also increased funding flexibility by providing Life Cycle Management Commands with the majority of their annual funds at the beginning of the fiscal year. This allows item managers greater flexibility in planning while mitigating any effects associated with fiscal interruptions.

Senior Army leadership has increased engagement with industry partners to improve relationships and supply chain effectiveness. This supports the Army's ability to increase stockage levels of key readiness driver items that typically suffer from long acquisition times.

We have designed and implemented a revised repair parts stocking methodology within our brigade combat teams. The change has decreased repair part wait times, reduced fiscal churn, and begun to stabilize the demand signal from the tactical level to the strategic base.

The Army continues integrative efforts with the Defense Logistics Agency (DLA) to streamline the supply chain. Pilot programs at Fort Carson, Colorado, and Anniston Army Depot seek to optimize warehousing space, reduce repair cycle times, and lower Army-owned inventory costs. The Army is also pursuing increased system integration with DLA to shorten repair part procurement timelines.

These initiatives are designed to improve materiel readiness rates through a more robust, responsive, and efficient supply chain.

Admiral MORAN. *Leveraging Data and Innovation to Improve Supply Chain Effectiveness*: In an effort to tackle some of our most complex supply challenges, NAVSUP Weapon Systems Support (WSS) is aggressively evaluating our command's utilization of existing logistics management systems, as well as investing in innovative IT solutions that will advance supply chain digital initiatives and streamline our business. We are rapidly refining and expanding the use of Logistics Cell (LOGCELL), incorporating the use of other Government and Commercial IT platforms (e.g., VECTOR, AMDB, CAST, and FCOE) into our daily processes, overhauling how we communicate across the aviation readiness value chain, and aligning to the DoD's overarching LOG IT vision. Additionally, NAVSUP WSS is finding new ways to leverage these tools and available data (i.e., Supply Chain End-to-End, Production Financial, and Critical Line-Item Reviews) to achieve high-velocity learning, improve requirements forecasting and data integrity, to enhance our responsiveness and capability across readiness stakeholders.

Infusion of Logistics Cell (LOGCELL): One key initiative noted above is the Logistics Cell (LOGCELL) collaboration concept, which aligns supply chain metrics to Fleet readiness and creates a single accurate view to aid timely decision making and streamline logistical processes. This single view enables real-time collaboration with our DLA and commercial providers, ultimately expediting needed materials to the Fleet.

“Right-Sizing” the Commercial and Organic Component Supplier Base: NAVSUP WSS and DLA, in partnership with the Engineering Maintenance and Supply Chain Leadership Team are pursuing multiple efforts to increase capacity across the support provider network to meet current and future aviation material requirements. Efforts include standing-up secondary sources, reviewing and reallocating engineering resources and authorities, licensing agreements, revising material acquisition processes and strategies, and strengthening partnerships with the Fleet, SYSCOMs, industry and organic depots. By focusing on transparency, open communication, and knowledge sharing, we are optimizing supply support to make the most of our available resources.

Strategic Sourcing: Numerous efforts are underway to optimize long term performance based strategic contracts to increase material availability and incentivize Prime Contractors and Original Equipment Manufacturers (OEMs) to improve system reliability. Approximately one-third of NAVSUP WSS aviation requirements are supported via performance based contracts and we are continuing to evaluate additional opportunities to expand this effort.

Logistics Engineering Change Proposals: NAVSUP WSS is committed to making Navy Working Capital Investment to improve reliability and maintainability, while reducing supply support costs, to ultimately enhance or provide additional capability to the end user. This is achieved through engineering initiatives to extend service life of an item, introduce a new enhanced replacement item or changes to the Level of Repair Analysis to increase efficiency and supply responsiveness.

Supply Chain Levers: NAVSUP WSS, in collaboration with NAVAIR, COMFRC, and DLA, is developing a “Supply Chain Levers” strategy for the NAE to address component repair throughput at the Fleet Readiness Centers. Major action items address aged Work in Process at intermediate and depot level; eight-quarter forecasting; piece part supportability analysis for eight quarter forecast; Repair Turn Around Time accuracy; sub-routing minimization and capacity and capability assessments inclusive of manning, benches, and facilities.

Component Find and Fix Team (CFFT): NAVSUP WSS executed a services contract with Price Waterhouse Coopers to leverage industry best practices. PWC is comprised of subject matter experts in the functional areas of supply chain management, maintenance, and engineering. The charter of the team is to identify individual components driving readiness degradation across the fleet, develop solutions that provide immediate relief to the warfighter, and implement improvement initiatives that address systemic issues in the long term. The CFFT methodology merges extensive forensic data analytics with onsite fact finding to separate myth from fact and isolate the root causes of material shortfalls. The true value of the CFFT effort comes from its enablement of collaboration across organizational boundaries to focus cross-functional stakeholders on the objective shared by all: getting components back into the fight.

General WALTERS. In the future battlefield, we will still need to move large amounts of sustainment, but we will optimize tactical distribution with unmanned platforms, flatten the supply chain with 3D printing, and enhance preventive and predictive supply/maintenance with sense and respond logistics. We will extend the MAGTFs operational reach and capacity with a blend of “old and new” logistics. State-of-the-art logistics C2/IT, enabled by artificial intelligence will bring this vision to fruition. We see a future where the very nature of the supply chain is disrupted in a positive way. We envision a flattened supply chain with 3D capability arrayed in key forward operational and tactical locations, ready to manufacture “good enough” parts for emergent operational requirements. Through “sense and respond” logistics, we will have the ability to create predictive maintenance capability with our ground equipment that will save many man-hours in recovery and maintenance costs while enhancing supply-chain responsiveness.

We are developing Expeditionary Logistics systems with the following attributes:

- A Hybrid mix of legacy and evolving 21st Century logistics capabilities:
 - Additive manufacturing (3D printing).
 - Unmanned air and ground capabilities.
 - Sense and respond logistics.
 - Expeditionary medicine.
- From the sea, and naval in character:

- o Sea-based logistical capabilities.
- o Connectors, platforms and processes.
- o Integrated naval operating concepts.
- Flexible and expeditionary:
 - o Enable multi-domain fire and maneuver.
 - o Operate in austere environments.
 - o Reduce individual combat load and requirements for the “big three” (water, fuel and ammunition).
 - o Increase and streamline lift and distribution.
 - o Leverage modular logistical capabilities.
- Innovative, adaptive and versatile in thought-practice:
 - o Cross-training and certification in multiple MOSs.
 - o Training for today; educating for tomorrow.
 - o Developing leaders at all levels able to think, anticipate and act, often independently.
 - o Every marine is a logistics producer.
- Resilient and analog-capable C2:
 - o Logistics C2 “immunized” against cyber/EW threats.
 - o Seamless transition to manual/analog C2.
- Data-driven:
 - o Predictive analytics to increase readiness.
 - o Resource allocation through artificial intelligence.
 - o Marines & their gear tracked in “real time”.

General WILSON. The Air Force has prioritized restoring readiness and lethality to the force. We are doing this in our supply chain by centralizing the global management of logistics support requirements at the Supply Chain Operations Wing located at Scott AFB. This centralization gives us the ability to determine, prioritize, and reallocate resources to deliver the right part or equipment item to the right place at the right time while controlling costs. Inventory investments have been made to increase aircraft availability and restore training operations for pilot training with focused efforts on T-38, F-15, F-16, A-10 and F-22 platforms. All of these efforts are predicated on sufficient, predictable, and consistent funding which gives the Air Force stability to continue restoration efforts for the maintenance workforce and supply chain.

MILITARY CONSTRUCTION AND INFRASTRUCTURE

23. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, what infrastructure issues are you facing that impact our readiness?

General MCCONVILLE. The Army has taken risk in infrastructure to fund higher warfighting priorities. We have about 34,000 facilities in poor and failing condition, and have made great strides over the past year identifying which of these most affect unit readiness. We will use this information to focus infrastructure investment on barracks, airfields, training areas and maintenance facilities. Sustained, adequate and predictable funding will help restore these facilities and allow the Army to maintain its critical infrastructure.

Admiral MORAN. Over the past several years, Navy took a deliberate level of risk in shore infrastructure investment to resource critical warfighting readiness and capabilities. To mitigate this risk, the Navy targeted its limited resourcing on sustaining mission-critical facilities, allowing other facilities to degrade at an accelerated rate. The current facilities maintenance backlog across the Navy is \$14.3B. Although we have taken measures to prevent degradation to mission-critical facilities, this maintenance backlog affects sailors’ ability to train, their quality of life, and often requires operational workarounds, such as waivers, temporary facilities, or inefficient processes.

General WALTERS. Our installations are platforms upon which our marines live and train and from which our units launch and recover. They are the platforms that generate our readiness. Though the Marine Corps has made significant progress in replacing old and unsatisfactory infrastructure, reduced funding availability will have long term impacts on support to training, operations, logistics, and ultimately readiness.

Underfunding MILCON leads to the deferment of critical infrastructure required to support training, operations, and logistics. Further, it limits the capacity of our Installations to serve as training, sustainment, and deployment platforms. MILCON is also needed to enable the fielding of new capabilities, including the F-35. Without MILCON funding, the realization of these capabilities will not happen.

Current Restoration and Modernization funding levels will only allow the Marine Corps to address potential life/safety/health requirements and invest in mission critical facilities. We will be forced to take risks in non-operational facilities such as quality of life (QOL), warehousing, maintenance/production, administrative, and some mission relevant training facilities and utilities infrastructure. This will result in increased long-term costs to restore these facilities back to current conditions.

Facilities Sustainment funding is intended to ensure that facilities can be effectively used for their designated purposes. Currently facilities sustainment is funded to 80 percent of the requirement. Underfunding facilities sustainment increases the rate of degradation of Marine Corps infrastructure, which leads to more costly repairs, restoration, and new construction in the future.

General WILSON. Air Force installations are our power projection platforms, crucial enablers to readiness and lethality in air, space and cyberspace. As such, operational facilities capable of mission generation are vital to our success as a force.

As of 2018, the Air Force has identified approximately \$33 billion in deferred maintenance and repair. This includes facilities and facility systems which have reached the end of their regular life cycle, as well as, repairs to failed or failing systems due to inadequate preventative maintenance over many years. Reversing the trend of growth in deferred maintenance would take significant additional investment over many years.

Some near-term examples of needed facility and infrastructure investment which directly enable readiness and lethality include:

- Aircraft hangar fire suppression systems at Nellis Air Force Base, Nevada; Dyess Air Force Base, Texas; Shaw Air Force Base, South Carolina; and Columbus Air Force Base, Mississippi (among others) at a cost of more than \$24 million.
- Utility transfer and disconnect switches for remotely piloted aircraft mission facilities at Creech Air Force Base, Nevada (\$8 million).
- Combat Arms firing range repairs at Joint Base Langley-Eustis, Virginia (\$3 million).
- Airfield pavement and lighting repairs at Joint Base Elmendorf-Richardson, Alaska (\$18 million).
- Electrical distribution system repairs which support Air Mobility Command and US Transportation Command operations centers at Scott Air Force Base, Illinois (\$5 million).

Despite these challenges, the Air Force seeks to enhance readiness and lethality by prioritizing our limited military construction and infrastructure investment funding on the combatant commanders' most urgent needs, enabling new mission beddowns, and sustaining and maintaining critical mission facilities.

24. Senator PERDUE. General McConville, Admiral Moran, General Walters, and General Wilson, what is the way forward to address our infrastructure readiness issues?

General MCCONVILLE. While the Army has taken risk in infrastructure to fund higher priorities directly impacting warfighting readiness, we are methodically increasing facility sustainment levels and focusing infrastructure investment on readiness priorities that support power projection platforms, mobilization, and the warfighter. In fiscal year 2019, we will continue to focus infrastructure funding on projects that most directly contribute to readiness and soldier quality of life, such as vehicle maintenance facilities at Fort Campbell KY; a multi-purpose machine gun range at Camp Ravenna, OH; Permanent Party Barracks at Fort Hood TX; and Training Barracks at Fort McCoy WI.

Admiral MORAN. The fiscal year 2019 budget request is an improvement over fiscal year 2018 levels, and the Navy continues to prioritize mission-critical deficiencies in our infrastructure. The fiscal year 2019 budget request also continues to exceed the statutory minimum funding requirement to modernize and improve the efficiency of our public Naval shipyards. While the Navy will begin to reduce the facilities maintenance backlog with the fiscal year 2019 budget request, maintaining the path to full readiness recovery will take a long-term commitment of resources, predictable funding and time.

General WALTERS. As a result of these past resource challenges, we developed the Commandant-signed Infrastructure Reset Strategy to optimize and modernize our bases and stations. The intent of the Commandant's Infrastructure Reset Strategy is to provide Marine Corps installations that are data-driven power projection platforms, capable of adapting ready training venues to the evolving operating environment, while maintaining a high quality of life for our marines and their families, all at an economically sustainable rate. We will maximize critical capabilities, mini-

mize total life cycle cost, and better enable operating force readiness. Congressional support and continued funding of the Infrastructure Reset strategy will improve the operational readiness of the Marine Corps.

General WILSON. Installations, the Air Force's power projection platforms, are a critical component of readiness and lethality. We need stable and predictable budgets going forward to address infrastructure readiness. The fiscal year 2019 budget proposes to fund new construction at various installations and sustain our existing infrastructure.

Based on our fiscal year 2019 level of investment, we know we have facility maintenance and repair requirements that will go unfulfilled and that our accumulation of deferred maintenance will continue to grow. We minimize impacts to missions through the use of analytical tools that give us greater fidelity in how risk is manifesting itself today, as well as how we predict it will impact our facilities and infrastructure in the future.

Importantly, while we believe the current facility investment rate is a sound decision amid the many competing and higher budget priorities, we do not view the current investment rate as sustainable. We have developed new visualization tools to support our facility investment decision making as we enter into the internal Air Force budget deliberations for fiscal year 2020 and beyond.

QUESTIONS SUBMITTED BY SENATOR JEANNE SHAHEEN

MARITIME SECURITY BARRIERS

25. Senator SHAHEEN. Admiral Moran, there have been concerns regarding the survivability, reliability, and long-term cost-effectiveness of existing U.S. Navy (USN) port security barriers, particularly the survivability of the barriers in high-threat environments. Have the existing port security barriers been tested to withstand an attack by a high-speed vessel, to include a vessel laden with explosives?

Admiral MORAN. Current intelligence and threat analysis confirm Navy's existing port security barrier systems meet the operational requirements necessary to protect our ships in port. The existing port security barriers were tested to withstand an attack by a high-speed vessel during the design validation process. The testing did not include a vessel laden with explosives.

26. Senator SHAHEEN. Admiral Moran, have there been any reports of existing port security barriers being used to protect USN facilities capsizing during inclement weather, which would temporarily render them less effective until they can be repaired?

Admiral MORAN. Yes, there have been isolated instances of barriers capsizing in 1 of 24 Navy locations. In particular, the existing port security barriers in Norfolk have had issues due to local site constraints, operational tempo and environmental conditions. In the rare occasion that a port security barrier is inoperable, installation security and port operations departments have effective mitigation strategies in place to ensure the continuous protection of Navy vessels in port.

27. Senator SHAHEEN. Admiral Moran, has the Department of the Navy conducted a long-term cost analysis to compare existing USN port security barriers to commercially-available maritime barrier systems that meet existing USN requirements?

Admiral MORAN. The current Navy port security barrier system is a commercially-available product that meets Navy requirements. In the next year, Commander Navy Installations Command will oversee a pilot project at Naval Station Norfolk to test next-generation barrier capabilities in an operational environment and gather actual operations and maintenance data. Navy will use the data from this pilot to produce a Navy cost analysis within three months of the pilot's completion.

CYBER READINESS

28. Senator SHAHEEN. General McConville, Admiral Moran, General Walters, and General Wilson, according to a recent news article, the commander of Naval Information Forces, Admiral Matthew Kohler, said that the Navy's overworked information technology (IT) teams need new "virtual training tools" and more time to train, especially for all-out cyber/electronic warfare against a high-end adversary. Admiral Kohler likened the Navy's IT workforce situation to that of the recent ship collisions in the Pacific in that these ships were operating all the time to meet mission demands, but were cutting corners on training and safety certifications. Admiral Kohler is concerned about the assumption that if IT professionals are operating all the time, they are getting all the practice they need and forego valuable training.

I recognize that this is a Navy example, but I'd like to hear from each of you about the state of readiness of your respective IT professionals. How are you ensuring that training is maintained and what, if any, tools or resources do you need to ensure the IT workforce is up to date on the latest cyber related technology and training?

General MCCONVILLE. Readiness is the Army's number one priority and overall Army readiness is critically enabled by our network readiness. The Army follows common DoD standards to baseline training requirements for the IT workforce. Following initial schooling, the IT workforce utilizes online training courses for Information Technology and cybersecurity certification to assist soldiers and civilians in maintaining readiness. The Army continues to enhance the training facilities at Fort Gordon to enable state of the art capabilities for training both offensive and defensive operations. Additionally, the Persistent Cyber Training Environment, if funded as requested, will ensure our soldiers are initially trained to achieve mission readiness and subsequently are able to maintain mission readiness through recurring individual qualifications and collective training and certification events.

Admiral MORAN. The Navy is investing in realistic virtualized environments in which to train our cyber and IT workforce. Specifically, SPAWAR is developing a virtual training environment for training (VE4T) on the Consolidated Afloat Network and Enterprise Services (CANES) Network. This will allow training to be delivered to any of the Navy standard schoolhouses via a network connection.

Additionally, for the Navy Cyber Mission Force (CMF) teams, U.S. Cyber Command (USCC) mandates Joint Cyberspace Training and Certification Standards, which encompass procedures, guidelines, and qualifications for individual and collective training. Most of the training today is delivered by USCC and the National Security Agency (NSA) in a federated but integrated approach that utilizes existing schoolhouses and sharing of resources. CMF training specifically involves 54 role-specific, intermediate through advanced training pipelines using a mix of nearly 100 Joint, NSA National Cryptologic School (NCS), and multi-Service courses to prepare officers, enlisted and civilians for their CMF work roles. These training events are not only aimed at the individual sailors, but also provide operational team certifications and sustainment training. Once certified, our team training is maintained throughout the year via several key unit level exercise events which allow individuals and the collective team to demonstrate required skills against simulated adversaries. U.S. Fleet Cyber Command/U.S. Tenth Fleet (FCC/C10F) augments the required USCC training pipeline in two ways—online skills development and the provision of supplemental academics.

Navy Information Technology forces have a mature training path covering network operations and network defense that is integrated with the network system's technical authority and covers training opportunities prior to and during deployment cycles. Individual training for network professionals occurs within the Navy's Education and Training system and includes fundamental skills, Journeyman and Advanced level network security skills, and individual system operations training. Each of the higher level training sets were created and are maintained in currency based on a partnership between the Navy's training domain and the acquisition community. Further, a partnership has been formed to include technical authority influence on fundamental system administration skills. Above the individual training level, Navy training and readiness accounts for team training and readiness through all phases of deployment and operations.

Navy organic Defensive Cyber Operations (DCO) forces make use of much of the same training pipeline that is available to forces associated with CMF. While their initial fundamental training paths are the same, and they have access to the additional training sponsored under USCC, their individual training mandate is maturing. The need for additional resources to assure higher level individual skills training is under evaluation by the Navy resource sponsor staff. It should be acknowledged that the individual skills required for Navy DCO are similar to those required for CMF.

Using the DoD's Enterprise Cyber Range Environment (DECRE) resources, provided by the Joint Staff, FCC/C10F utilizes Joint Information Operation Range nodes (JIOR) to connect CMF teams with ranges which are representative of shipboard networks. These networks are used for mission rehearsal platforms and to augment individual training for various team work-roles. FCC/C10F has also invested in a web-based individual and collective training platform, to augment the academic portions of the USCC training pipeline with hands-on skills development. The Persistent Cyber Training Environment (PCTE), managed by the Department of the Army, is expected to incorporate similar distributed training methodologies in module-based systems. When necessary, teams seek out and receive additional training based on work roles or specific mission requirements.

From a formal educational perspective, to develop officers to succeed in the increasingly complex cyberspace environment, the Navy offers the following opportunities for cyber development:

- The U.S. Naval Academy requires introductory cyber courses for all freshman and juniors to baseline knowledge. Additionally, USNA began a Cyber Operations major in the Fall of 2013. Furthermore, the Center for Cyber Security Studies harmonizes cyber efforts across the Naval Academy.
- Our Naval Reserve Officer Training Corps' program maintains affiliations at 51 of the 180 NSA Centers of Academic Excellence at colleges around the country. Qualified and selected graduates can commission as Cryptologic Warfare Officers, Information Professional Officers, or Intelligence Officers within the Information Warfare Community.
- For graduate-level education, the Naval Postgraduate School (NPS) offers several outstanding graduate degree programs that directly underpin cyberspace operations and greatly contribute to the development of officers and select enlisted personnel who have already earned a Bachelor's Degree. These degree programs include Electrical and Computer Engineering, Computer Science, Cyber Systems Operations, Applied Mathematics, Operations Analysis, and Defense Analysis. In addition, NPS tenure track professors are required to conduct research in their respective areas of expertise; this research keeps them up to date and enhances their professional credentials while informing the curricula they teach and offering research and thesis opportunities for their students.
- The Naval War College is also incorporating cyber into its strategic and operational level war courses, at both intermediate and senior graduate-course levels. The College also integrates strategic cyber research into focused Information Operations IO/Cybersecurity courses, hosts a Center for Cyber Conflict Studies (C3S) to support wider cyber integration across the College, and has placed special emphasis on cyber in its war gaming role.

General WALTERS. The Marine Corps is responsible for 13 of USCYBERCOM's 133 Cyber Mission Force (CMF) teams: one National Mission Team (NMT), eight Cyber Protection Teams (CPTs), three Combat Mission Teams (CMT), and one Cyber Support Team (CST). These 13 teams are aligned against USCYBERCOM (Cyber National Mission Force), USSOCOM, and Marine Corps missions. Three of the eight CPTs are service retained and oriented to service missions, (23 percent of the total Marine Corps CMF).

Of our 13 teams, nine teams have reached and four teams remain at Initial Operating Capability (IOC). All 13 teams are scheduled to reach FOC in fiscal year 2018. It's important to note, that all 13 teams designated as having reached IOC are employed against real-world problem sets and are fully engaged in supporting the mission. It is also important to note that achieving FOC is also not an indication that work is done. We must continually ensure we are training and sustaining the force to ensure we remain agile, adaptable, and ready to defeat all enemies.

To that end, we are moving forward with the creation of a cyberspace occupational field. We have learned a great deal in the past several years about the training, clearance, and experience requirements across the cyber mission force. We know that in order to be effective, we must retain a professional cadre of cyberspace warriors who are skilled in critical work roles, and we know that many of our marines desire to remain part of the cyber work force. The Commandant has told us to move out, and we are planning with Headquarters, Marine Corps (HQMC) to design a cyberspace occupational field to address offensive and defensive team readiness requirements. We intend to begin assigning marines to the cyberspace MOS in fiscal year 2018. This will significantly improve both readiness and retention of the force.

This year the Marine Corps continued its initial investment in specialized tools for defensive cyberspace operations. The Deployable Mission Support System (DMSS) hardware and software tools comprise the weapons system CPTs use to meet any mission they may be assigned, from readiness and compliance visits to incident response or Quick Reaction Force missions. This year, we championed an ability to conduct split based operations with the DMSS, enabling the CPT lead to forward deploy a small element and push information back to a home station "war room" for remote analysis and remediation. This initiative and concept of employment will reduce deployed time and costs and increase our ability to collaborate more freely with other CPTs or across the mission force.

We are rapidly establishing relevant operational capability in support of the warfighter. We have experienced tremendous growth in operational capability over the past year as we have fully supported the delivery of operational cyberspace effects under Joint Task Force Ares, a USCYBERCOM led effort designed to support C-ISIS efforts in U.S. Central Command (USCENTCOM). Our Joint Force Head-

quarters is providing relevant support to more fully integrate planning cyber operations, intelligence and fires, and we continue to refine procedures with each exercise and operation we support. On the defense, our CPTs are contributing to Cyber National Mission Force priorities around the globe, and at USSOCOM. Across USCYBERCOM, marines are at the point of friction, increasingly relevant and eager to contribute to the fight.

We are also Active participants with other Service components and USCYBERCOM in a variety of new processes, infrastructure and tool development, acquisition initiatives, training transition, and Tactics, Techniques and Procedures (TTP) development for the CMF. We know we must continually adapt, innovate, and change to meet future threats.

Additionally, at the service level, the Marine Corps Cyber Range (MCCR) provides the service the ability to conduct realistic, cyber-related training, offers tailored cyber effects to unit exercises, and provides the means to conduct radical / aggressive cybersecurity testing on products and capabilities in deployment configurations without risk to the Marine Corps Enterprise Network. MCCR is a critical component of the 06xx Force Modernization. By leveraging the MCCR, we provide a distance education and virtual learning capabilities and more specifically a 'live-fire' cyber range to support the Marine Expeditionary Force (MEF) Information Group and improves training and TTPs, and increases effectiveness of cyber effects.

General WILSON. The Air Force has similar concerns with its Information Technology (IT)/cyber workforce. High operational tempo, coupled with manpower shortages, especially in our mid-grade officer and enlisted ranks, and retention of civilian talent due to retirements and exits to industry, have stressed the force. To address training and readiness of our cyber forces, the Air Force has integrated cyber into operational exercises to hone skills, enhance readiness, and work jointly with our Air, Land, Maritime, and Space forces. Additionally, we are transitioning from front-loaded training at the beginning of an airman's career to initial apprentice level fundamentals followed by a career long continuum of training. Furthermore, because the Air Force is implementing Enterprise IT as a Service and re-missioning airmen from IT support to Cyber Mission Teams, we will require a robust learning/training management system, as well as expansion of our cyber training ranges, additional secure classrooms, and more instructor billets to support increased training throughput and effectiveness.

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2019 AND THE FUTURE YEARS DEFENSE
PROGRAM**

WEDNESDAY, APRIL 11, 2018

U.S. SENATE,
SUBCOMMITTEE ON READINESS
AND MANAGEMENT SUPPORT,
COMMITTEE ON ARMED SERVICES,
Washington, DC.

**THE HEALTH OF THE DEPARTMENT OF DEFENSE INDUSTRIAL
BASE AND ITS ROLE IN PROVIDING READINESS TO THE
WARFIGHTER**

The subcommittee met, pursuant to notice, at 2:32 p.m. in Room SR-232A, Russell Senate Office Building, Senator James M. Inhofe, presiding.

Subcommittee members present: Senators Inhofe, Rounds, Ernst, Perdue, Kaine, and Hirono.

OPENING STATEMENT OF SENATOR JAMES M. INHOFE

Senator INHOFE. The Subcommittee on Readiness will come to order.

The subcommittee meets today to discuss the health of the Department of Defense (DOD) organic industrial base and their crucial role in providing readiness to the warfighter.

You know, General Levy, I can remember back 25 years ago when we were talking about the organic capabilities that we had to have and the reason for it. And 25 years ago, we made a decision that 50/50 was arbitrary and we were going to figure out some way to be more sophisticated. Now it is 25 years later and nothing has happened. But, nonetheless, it is still just as important as it was.

We are joined this afternoon by Lieutenant General Edward Daly, Deputy Commanding General of the Army Materiel Command; Vice Admiral Paul Grosklags, Commander of the Naval Air Systems Command; Vice Admiral Thomas Moore, Commander of the Naval Sea Systems Command; Lieutenant General Lee Levy from Tinker and elsewhere; and Major General Craig Crenshaw, Commanding General of the Marine Corps Logistics Command. I thank all of you for being here. It is very significant what we are doing today.

I would also like to thank our ranking member, Senator Kaine, as well as the rest of our members who represent the shipyard in-

dustry base so well. I trust that like last year, you will keep Vice Admiral Moore quite busy today.

In February, the subcommittee received testimony from the service vice chiefs on the current readiness of our Armed Forces. We heard many troubling details about how each of the services is currently positioned to respond to the next global contingency. Simply put, we are not.

The National Defense Strategy [NDS] provides the Department of Defense a new approach to ensure our national security. Several of the lines of effort prioritized by the Secretary of Defense in the strategy are directly dependent on the organic industry base. It forms the backbone of our NDS, and for that reason, it is more important than ever that our organic industrial base remains strong.

Unfortunately, we are facing serious challenges. Last week alone, we saw five separate aircraft crashes across the services. That was on April 3rd and April 4th. Five of them in that period of time. And you know, you have to come to the conclusion, without any studies being made, that it is a combination of either training or maintenance. These are problems that have been suffering during the last administration that we are trying to correct now.

The organic industrial base workforce is also facing serious challenges as it ages across the board, and there is a lack of skilled personnel. General Levy, you and I have talked about this. I think they said at the University of Oklahoma, you are in a position to hire every single one that they graduate from their engineering school. This is not just confined to the State of Oklahoma. We need experienced personnel. It is something that we are going to have to address. I appreciate your being here.

I recognize our ranking member, Senator Kaine.

STATEMENT OF SENATOR TIM KAINE

Senator KAINE. Thank you, Mr. Chair.

Thanks to our witnesses. Three of you testified before us last year, and hopefully all five of you get promotions and you will not need to come back next year.

[Laughter.]

Senator KAINE. But it is good to have you here, and this is going to be an important discussion.

Two months ago, as the chair indicated, we had testimony from the vice chiefs about pressing readiness challenges, and today I look forward to delving a little more deeply into some specific issues. I want to just raise two.

First, with respect to our industrial facilities, I applaud the Navy for delivering the Shipyard Infrastructure Optimization Plan. That is very, very helpful. It is a good first step toward identifying necessary long-term investments for Norfolk, obviously I am very focused on, but the other three critical organic shipyards, very helpful. I will have some detailed questions about that. But I would like to hear about sort of the long-term strategy for executing on the plan.

We did a 2-year budget deal that I am happy with. I think it is encouraging for the Department of Defense, but I am concerned about other federal agencies that support our defense mission. I am concerned also about the remaining 2 years of the Budget Control

Act after 2019 and needing a bipartisan strategy for eliminating that burden on our defense.

The ability to hire and train workers is probably the area where I am going to ask the most about. I had a little chart put on folks' desks. I think they have it. What this shows is the average experience of all who work in the Navy shipyards and then especially the production workers. You see over time, from 2006 to 2017, this average year experience is declining. I think that poses some challenges that I would like to hear, especially from the Navy, about how we deal with it.

I thought it was interesting. We are working on the NDAA [National Defense Authorization Act] right now, and as we work on the NDAA, we ought to be thinking about these workforce questions. There may be things we can do in the NDAA to address them. I noticed, for example, that when the Trump administration delivered an infrastructure plan to Congress about a month ago, they actually within the infrastructure plan had some bills dealing with a trained workforce because they knew just investing in infrastructure, you could have whatever investment you wanted, but you are going to have to have somebody do the paving, you are going to have to have the structural ironworkers. They actually put workforce components into the infrastructure proposal that they delivered to us. This budget that we got—again, I think it is good for defense, but it also means if we are going to be ramping up investments in *Columbia*-class subs or block buying on carriers or other things, that workforce is going to be very, very critical.

In the meeting that I had right before I came here, I was with a number of folks in the defense industrial base. If I just gave an open-ended question, what do you want to talk about, the issue that they are sort of grappling with right now is workforce questions. Giving them predictable funding for this to your budget is really helpful in that, and if that represents a step back toward regular order and they think that we are more likely to do that in the future, that will also help.

But it is not just predictability funding. It is also strategies. I am on the Health, Education, Labor and Pension Committee. We are starting to work on the higher ed reauthorizing act. There might be some things we could do in the higher ed act to more vigorously promote the kind of career and technical training that would feed into the industrial base.

So these are some of the issues that I am most interested in hearing you talk about today. I want to thank the chair, and I know we are going to have a good discussion.

Senator INHOFE. Thank you very much, Senator Kaine.

We would like now to have opening statements and try to confine them to about 5 minutes since there are five of you, but your entire statement will be made a part of the record. We will start with you, General Daly.

**STATEMENT OF LIEUTENANT GENERAL EDWARD M. DALY,
USA, DEPUTY COMMANDING GENERAL, UNITED STATES
ARMY MATERIEL COMMAND**

Lieutenant General DALY. Good afternoon. Chairman Inhofe, Ranking Member Kaine, and distinguished members of the sub-

committee, I appreciate the opportunity to testify on the preparedness of the Army's organic industrial base and its critical role in providing and sustaining warfighter readiness.

On behalf of Secretary Esper and General Milley, thank you for your strong support and continued commitment to our soldiers, Army civilians, families, and veterans.

I am honored to be here today with my counterparts from the Navy, Marine Corps, and Air Force.

The Army's organic industrial base, the OIB, is a \$14 billion enterprise consisting of 23 ammunition plants, depots, and manufacturing arsenals with a workforce of over 22,000-plus professionals.

The OIB delivers readiness through two key functions: depot maintenance and the Army's role as the Department of Defense executive agent for conventional munitions. The OIB possesses unique and critical industrial capabilities and capacity that is not easily replicated in the corporate sector, providing for immediate requirements, as well as a base from which to surge during periods of crisis.

While the OIB successfully surged over the last 17 years of conflict, it has been largely reactive to emerging requirements. To be relevant for the future fight going forward, the OIB is now transforming and modernizing to focus on the output required to sustain current and future readiness.

The Army is also improving the effectiveness of the OIB through readiness-driven workload forecasting, innovative process improvements, and partnerships and collaboration with the private industry.

The Army's organic industrial base was designed to sustain the high volume production rates needed to meet World War II demand. Over the past several decades, the OIB has been reduced from 77 plants, depots, and arsenals to 23 facilities at present. Of these 23 facilities, all are at least 50 years old. Aging infrastructure poses a risk to the OIB's capacity and capability to meet current and future demands. The Army recognizes this and as such, has invested over \$2 billion to modernize antiquated, unreliable, inefficient OIB facilities, shortfalls that affect critical systems such as the Abrams tank, the Stryker, the Bradley fighting vehicle, and the Apache helicopter.

President Washington once said to be prepared for war is one of the most effective means for preserving peace. A strong, healthy organic industrial base directly generates the readiness that underpins our preparedness.

I would like to again thank each distinguished member of the committee for allowing me to appear before you and for your continued support that enables Army Materiel Command to maintain and modernize the organic industrial base delivering materiel readiness to the joint warfighter at the tactical and operational points of need worldwide. Thank you.

[The prepared statement of Lieutenant General Daly follows:]

PREPARED STATEMENT BY LIEUTENANT GENERAL EDWARD M. DALY

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine and distinguished members of the Subcommittee, thank you for the opportunity to testify on the preparedness of the

Army's Organic Industrial Base (OIB), its critical role in providing and sustaining readiness for the Warfighter, and our ongoing initiatives in support of its revitalization.

On behalf of Secretary Esper and General Milley, I would like to express our gratitude to Congress for its strong support. As the Secretary outlined in his recent testimony before the House Armed Services Committee, we face a strategic security environment more complex and volatile than any we have experienced in recent memory. The Army stands ready to answer the Nation's call—we are a lethal and effective force. To maintain our effectiveness, we must continue to focus on Readiness, Modernization, and Reform.

A key component of Readiness is the Army's Organic Industrial Base (OIB). This \$14 billion enterprise consists of 23 ammunition plants, depots, and manufacturing arsenals, with a workforce of 22,000 professionals. The OIB builds and maintains readiness by executing two key functions. The first is depot maintenance: the overhaul and rebuild of major systems such as the Abrams, Bradley, Stryker, communications equipment, weapons, and other materiel. The second function is the execution of the Army's role as the DOD Executive Agent for Conventional Ammunition. This includes the manufacture of critical conventional munitions, including propellants, energetics, and small arms ammunition. It also includes maintaining preferred munitions and the loading, assembling, packing, storing, outloading, distributing and demilitarization of munitions.

The past seventeen years of conflict have demonstrated the value the OIB provides to Army readiness and to our Nation's security. The OIB successfully surged in order to manufacture and sustain the warfighting equipment needed to execute contingency operations in Afghanistan and Iraq. As we redeployed forces and drew down the Army over the past decade, workload reductions contributed to rate increases and inefficient operations. The OIB has been largely reactive to emerging requirements. This reactive model does not ensure a healthy organic capability to maintain core competencies and surge capacity to generate combat power.

To reverse these trends requires change. Today I will discuss how the Army is implementing a new, proactive paradigm—one that relies upon a business and operational approach, rather than historical practice. I will also discuss how the OIB is in the midst of transformation as we focus on production output required to support sustained readiness; how we manage capabilities and capacity; and how we execute continuous capital investments to attain viable, modern state-of-the-art industrial facilities. Finally, I will discuss how we are improving our effectiveness through the creation of reliable forecasts of our workload; innovative product support; exploitation of synergies created between the OIB and industry through public-private partnerships; and streamlining depot maintenance through automation and continuous process improvement initiatives.

HOW THE OIB ENSURES THAT THE ARMY IS READY AND MAINTAINED

The OIB brings to bear unique industrial competencies that are not easily replicated in the commercial sector. These capabilities provide for the Army's immediate needs as well as a base from which to expand in times of crisis. One example within the depot maintenance arena resides at Watervliet Arsenal in New York. Watervliet Arsenal is the Army's Center for Industrial and Technical Excellence for cannon and mortar systems and is the Nation's only manufacturer of large caliber cannon barrels, breach blocks and breach rings. Another example is Anniston Army Depot in Alabama. Anniston returns combat readiness to the warfighter, resets the Army's Stryker Combat Vehicles and overhauls M1 Abrams Tank engines. With respect to the ammunition industrial base, including both organic and commercial segments, the Army has identified 103 critical capabilities, 25 of these reside solely in the OIB. Radford Army Ammunition Plant in Virginia, is the only producer of nitrocellulose, a key compound used in making explosives. Holston Army Ammunition Plant in Tennessee, is the only manufacturer of High Melting Explosive and Research Development Explosive in the United States. Holston recently began production of IMX—Insensitive Munitions Explosive, the first in a family of "insensitive munitions." Insensitive munitions are far more stable than conventional TNT and Composition B, and much safer to transport. McAlester Army Ammunition Plant in Oklahoma produces bombs for all the services and is the principal source of supply for both wartime and training requirements across the DOD.

The OIB has been sustaining continuous operations since 2003. During this time, the OIB produced over 21 billion rounds of ammunition and reset over 3.9 million pieces of equipment valued at approximately \$32 billion. Importantly, \$5.7 billion of this work was in support of other services. This effort has positively impacted Equipment on Hand (EOH) readiness rates of units across the Army and assisted

in the execution of other key readiness initiatives. One example is the Army's expansion and reconfiguration of Army Prepositioned Stocks (APS) around the globe—significantly increasing the speed of response to combatant commanders' requirements by reducing the amount of time it takes to issue the equipment to deploying units. A second example is the building and equipping of the Army's 15th Armor Brigade Combat Team (ABCT) at Fort Stewart, Georgia.

To ensure Army readiness now and into the future, the Army is developing a schedule-driven, depot workloading strategy that is directly linked to the Army's Sustainable Readiness Model. This approach ensures the Army's organic capabilities are focused on meeting its highest readiness priorities, and precious resources are optimized at the enterprise-level. This approach also yields a predictable and stable workload while providing a mechanism to continually evaluate and assess risk to the operating force.

Simultaneously, we are also creating a resilient and responsive ammunition industrial base by analyzing storage and outload requirements and aligning manufacturing capability, capacity and modernization efforts to support it.

IMPROVING THE EFFICIENCY AND EFFECTIVENESS OF THE OIB

The Army's Organic Industrial Base was designed to sustain the high-volume production rates needed to meet World War II demand. Over the past several decades, the OIB has been reduced from 77 plants, depots, and arsenals to 23 facilities at present. The aging infrastructure poses a risk to the OIB's capability and capacity to meet current and future demands as well as surge to support all required missions. The Army recognizes that modernization is especially critical now and has invested over \$2 billion to modernize antiquated, unreliable and inefficient machinery and facilities at Government Owned-Contractor Operated (GOCO) and Government Owned-Government Operated (GOGO) installations. The installation of automation and robotics, accompanied by upgrades to facilities and infrastructure have enhanced productivity. As productivity and efficiency increase we are seeing corresponding decreases in labor, maintenance, and utilities costs.

Likewise with our manufacturing arsenals and depots—over 6 percent of these facilities, valued at \$2.5 billion—are in substandard condition. The Army plans to invest over \$1.8 billion, which is needed to address inefficiencies in lines that support critical weapon systems including Abrams, Bradley, Stryker, Paladin, Apache, Patriot, MRAPs and C4ISR.

Coupled with modernization, the OIB has recently transitioned to business systems that use standard, industry-recognized processes. The Logistics Modernization Program (LMP) and its Complex Assembly Manufacturing Solution (CAMS) are applications built on commercial off-the-shelf software for Enterprise Resource Planning (ERP) and shop floor integration. These tools allow the Army to completely see its manufacturing and service operations for the first time. These applications also permit the Army to improve the accuracy of its Bills of Materials; engage in more efficient production scheduling; enable interaction with its supply chain of over 11,000 first, second and third tier vendors; and reduce delays for parts. These capabilities coupled with the Army's tactical-level ERP called the Global Combat Support System—Army (GCSS-A), are increasing the speed at which materiel reaches the warfighter, and provides the Army with true "factory to foxhole" asset visibility and auditability.

The OIB is also executing a number of supply chain initiatives to improve its effectiveness. These include improving demand forecasting accuracy and imposing tougher performance standards on suppliers. The aforementioned efforts improve our ability to purchase, manufacturer, and repair critical parts required to support warfighting equipment.

SYNERGY THROUGH PUBLIC-PRIVATE PARTNERSHIP

Public-private partnerships are important in assisting the OIB to improve Army readiness. These partnerships allow private sector companies to access OIB manufacturing capabilities and permit the Government to act as a supplier to commercial industry under certain circumstances. Last year, 263 partnerships across the OIB produced \$412 million in additional revenue for the Government and brought with them innovative ideas and best business practices.

There are many exciting examples of these projects. Anniston Army Depot continues to partner with General Dynamics to reset Strykers and with Honeywell to recapitalize Army M1 tank engines at 25 percent of their original cost, saving the Government \$45 million annually. Tooele Army Depot in Utah, has a joint venture with Safety Management Services (SMS), Inc., to operate an on-site commercial laboratory that tests and grades explosives. AM General is partnering with Rock Island

Arsenal's Joint Manufacturing Technology Center in Illinois, and the Army National Guard to manufacture M997A3 HMMWV ambulances, and with Red River Army Depot in Texas to overhaul older HMMWV models.

The OIB contributes \$3.6 billion to local communities across the country and often has a positive effect on economies across multiple states. For example, recapitalizing the M1 Abrams Tank requires suppliers in 41 states; overhauling an UH-60 Blackhawk helicopter involves companies in 19 states; and manufacturing a single 5.56 mm bullet brings work to 9 states.

STREAMLINING DEPOT MAINTENANCE

The introduction of Lean Six Sigma and continuous process improvement has allowed the OIB to realize \$5.6 billion in cost savings and avoidance since 2012.

Industrial operations require tremendous water resources and energy. The OIB has successfully used Energy Savings Performance Contracts and Utility Energy Service Contracts to solicit third party investment and save over \$30 million annually.

The Army is actively pursuing advanced manufacturing. Advanced manufacturing integrates a number of cutting edge technologies including robotics, artificial intelligence, computer learning and additive manufacturing to improve products or processes.

Manufacturing organizations successfully employing advanced manufacturing share a common attribute. They have all recruited and retained a workforce possessing Scientific, Technical, Engineering and Math (STEM) skills far above the national average. This requirement aligns closely with those manufacturing skills required by the OIB to sustain readiness as it moves into the latter half of the 21st Century, including: materials engineers, capacity planners, chemists, test pilots, industrial radiograph operators, and electroplaters. Our laboratories and Research, Development and Engineering Centers actively work with local high schools and universities to support STEM initiatives and expose students to rewarding careers within the OIB. We are particularly grateful for direct hiring authorities provided by Congress, which enable us to more efficiently hire skilled and talented workers.

Additive Manufacturing (AM) is a technology that could revolutionize the way in which our arsenals and depots maintain, repair, and recapitalize equipment. AM enables the quick replication of obsolete and difficult to obtain parts, this translates to reduced down time and higher operational readiness rates. The Army continues to participate in the private sector Additive Manufacturing Users Group which includes original equipment manufacturers. Thus far, AM capabilities have been installed at 18 sites across our Army. Fourteen are located within the OIB. Rock Island Arsenal—Joint Manufacturing Technology Center (RIA-JMTC) has been designated as the Army's Organic Industrial Base Additive Manufacturing Center of Excellence. RIA-JMTC is charged with establishing a data library and institutionalizing the most effective technologies. As we continue to explore this promising technology, our expectation is to deliver this capability to the point of need on the battlefield, getting equipment quickly back into action while eliminating wait time and transportation costs.

These efforts to streamline depot maintenance have been recognized both inside and outside of the DOD. Collectively the OIB has earned 47 ISO Quality Certifications, 31 Shingo Manufacturing Awards for Excellence, and 26 DOD Value Engineering Awards.

CLOSING

I would like to thank each distinguished member of the Committee for allowing me to offer this testimony today. To quote President George Washington, "*To be prepared for war is one of the most effective means of preserving peace.*" Consistent, predictable, funding enables the OIB to optimize resources and to best support the Army. Your continued support enables us to equip and sustain the best fighting force in the world.

Senator INHOFE. Thank you, General Daly.
Admiral Grosklags?

STATEMENT OF VICE ADMIRAL PAUL A. GROSKLAGS, USN, COMMANDER, UNITED STATES NAVAL AIR SYSTEMS COM- MAND

Vice Admiral GROSKLAGS. Chairman Inhofe, Ranking Member Kaine, distinguished members of the subcommittee, thanks for the

opportunity to appear before you today to talk about naval aviation readiness and the health of our industrial base.

As I testified last year, naval aviation faces readiness challenges, and while we are making some definitive progress, we also have a long way to go in returning Navy and Marine Corps aviation to the required level of readiness across the force. A critical component in our efforts to achieve this readiness turnaround is the performance and the health of our organic industrial base, typically called aviation depots, but in our case, we call them naval aviation fleet readiness centers, or FRCs.

As I discussed last year, they are continuing a steady recovery from years of uncertain and limited funding while facing an increasing workload not only driven by the continued high utilization of our aircraft but also by the aged and degraded material condition of the aircraft that are being inducted into maintenance.

Today I am pleased to be able to report that fiscal year 2017 marked the first time in over 5 years that our FRCs were largely able to meet the fleet demand signal for production of aircraft and engines. They produced 485 out of 487 expected aircraft, including critically meeting the requirement for 69 F-18 A through D aircraft and delivering actually two more than the required or expected number of F-18E and F aircraft. This was done while also improving their turnaround time by 5 percent.

Now, over the last 2 years, I have also been able to reduce the number of aircraft requiring in-service depot-level repairs and in doing so have returned aircraft directly back to the fleet available for them to use to meet mission requirements.

Now, the improved performance in these two specific areas are the good news. The not so good news is that our FRCs are not performing as needed in the area of component repair and overhaul, which represents about 20 percent of their workload. To date in fiscal year 2018, they are lagging their production plan, and there are a number of actions we are taking obviously to improve their performance in this area, including workforce hiring, developmental training, quality and manufacturing process improvements, and infrastructure upgrades. It is this latter area in particular, infrastructure, where the history of constrained resources has had the biggest negative impact and potentially where the additional resources identified in 2018 and 2019 can have the biggest positive impact.

Today, much like the Army, 50 percent of our FRC component test equipment—so the individual test equipment for a PC gear that has to be tested at the FRCs—is greater than 25 years old. This equipment is also housed in facilities with an average age of 58 years, and 64 percent of our facilities are actually greater than 67 years old. So think about Jacksonville, Florida in the summer with facilities without air conditioning trying to do avionics maintenance and think about paint hangars trying to do painting of aircraft in Norfolk that leak when it rains. Think about facilities dealing with hazardous material in North Island where the ventilation system fails on a weekly basis. Those are the types of things that our workforce is dealing with. So the modern facilities and equipment are vital to ensuring that our organic industrial facilities have the capability and the capacity to not only improve current

performance but to support the next generation of aircraft engines and components such as the F-35.

So the bottom line is that our workforce has made significant progress over the last 2 years, but we have a long ways to go and we need to take the next step by providing the tools and the infrastructure needed for that workforce to continue to improve their performance. Naval aviation leadership looks forward to working with this subcommittee and the larger Congress to achieve this end state.

I would very much appreciate your continued support of our sailors and marines.

I look forward to your questions.

[The joint prepared statement of Vice Admiral Grosklags and Vice Admiral Moore follows:]

JOINT PREPARED STATEMENT BY VICE ADMIRAL PAUL A. GROSKLAGS AND

VICE ADMIRAL THOMAS J. MOORE

Mr. Chairman, Ranking Member Kaine, and distinguished members of the Subcommittee, we appreciate the opportunity to testify on organic industrial base issues, the current state of Navy readiness, the progress we have made over the past year and the challenges we face today and in the future. Before we begin, we would like to thank Congress for your support of the Bipartisan Budget Act of 2018 and the fiscal year (FY) 2018 Consolidated Appropriations Act. This legislation provides the predictability and stability in funding that allows us to continue the work we started in fiscal year 2017 to restore the Navy's organic industrial base.

Our Navy provides the Nation with timely, agile, and lethal options to win wars, deter aggression and maintain freedom of the seas. Today's dynamic maritime environment, coupled with proliferating threats from Nation-state actors and terrorist organizations, requires a global presence of Naval forces not seen in the past 25 years. However, as a result of Budget Control Act (BCA) funding caps, years of Continuing Resolutions, and associated budget uncertainty, the Navy has been challenged in its ability to adequately address the full range of investments required to fully support near term commitments. The resultant confluence of high demand for Naval forces, constrained funding levels, and budget uncertainty, impeded our ability to build, maintain and modernize the workforce and infrastructure to support current and future readiness at the levels the Navy and DOD require.

In our testimony to this committee last year, we described the challenges of restoring readiness, and how the funds requested in President's Budget for Fiscal Year 2018 would support that recovery. Today, with your help, we have stemmed the tide of readiness degradation. The Fiscal Year 2017 Request for Additional Appropriations (RAA) helped us arrest some of our most critical readiness problems. We executed 13 more ship depot maintenance availabilities, increased aviation depot throughput with 35 additional air frames, increased our investments in ship and aircraft spares, and funded much needed shore infrastructure projects. The fiscal year 2018 budget and President's fiscal year 2019 budget submission will reverse previous trends, improving readiness.

The Fiscal Year 2018 Consolidated Appropriations Act continues to strongly support our readiness recovery efforts, which include increased investments in infrastructure, equipment recapitalization and modernization. The Operation and Maintenance account flexibilities provided are key to ensure the most efficient and effective use of taxpayers' dollars and further support our efforts to restore readiness.

The Navy's 2019 President's Budget continues to build upon the foundations enacted in the fiscal year 2017 and fiscal year 2018 defense appropriations. It funds afloat readiness to historically high levels, and continues the course for full readiness recovery, while simultaneously investing in modernization, increased capacity, lethality and improvements in infrastructure that are necessary to maximize naval power. The majority of our Readiness accounts are funded to 100 percent of the requirement or maximum executable levels. It includes funds that would support 57 ship maintenance availabilities across the public and private shipyards and funding to support 100 percent of the required ship operations necessary to ensure ships and crews get the dedicated time at sea to train and hone skills. In addition, the budget request would fund aircraft depot maintenance and aviation spares, at significantly

increased levels to allow Navy to induct 652 airframes and 1,887 engines, reduce part shortages, and improve flight line availability of operational aircraft. We look forward to working with this committee and with the entire Congress to ensure continued support in future budgets for adequate and predictable funding for readiness.

NAVAL SHIPYARDS

Having combat-capable ships forward-deployed around the world is predicated on having ready ships. Readiness includes ships that are properly maintained and modernized over their service life. At any given time, the Naval Sea Systems Command (NAVSEA) has under its care approximately one-third of the battle force as they undergo maintenance and modernization availabilities. For that reason, NAVSEA's number one priority remains the on-time delivery of ships and submarines to the Fleet, from both new construction and maintenance availabilities. Whether a ship is in a public Naval Shipyard or a private shipyard, NAVSEA is focused on executing the planned work on time and on cost so our warfighters have the most capable platforms and systems they need to defend our Nation.

Last year, we testified before this Committee about how shortfalls in the size of the needed workforce, coupled with reduced workforce experience levels (about 50 percent of the workforce has less than five years of experience) and shipyard productivity issues were impacting Fleet readiness through the late delivery of ships and submarines. The capacity limitations and the overall priority of work toward our Ballistic Missile Submarines (SSBNs) and Aircraft Carriers (CVNs) resulted in our Attack Submarines (SSNs) absorbing much of the burden, causing several submarine availabilities that were originally scheduled to last between 22 and 25 months to require 45 months or more to complete. This situation reached a boiling point last summer when, in order to balance the workload, the Navy decided to defer scheduled maintenance availability on the USS *Boise* (SSN 764) that will effectively take it off-line until 2020. Ultimately the *Boise's* availability was contracted to the private sector and will begin this year. The Navy will continue to consider the private sector for future maintenance work during peak workload periods in our Naval Shipyards and to ensure we maintain the health of the private sector nuclear industrial base.

As we testify this year, we are on an improving trend. We have hired 19,200 people across our four Naval Shipyards from fiscal year 2013 through fiscal year 2017 and are on the path to reaching our goal of having 36,100 full time shipyard employees by the end of fiscal year 2019. The growing and better trained workforce is beginning to have a positive impact. In 2017, all four CVN availabilities were completed on time and we significantly reduced the delays in delivery of our submarine force. More work remains as we continue to train this workforce, improve our planning, material availability, and execution performance, but we are on the right track.

People alone will not provide the throughput and productivity needed to meet the maintenance and readiness requirements today into the future. As outlined in our recent report to Congress on the Naval Shipyard Development Plan, we must also make substantial investments in our four nuclear capable shipyards to ensure we have 21st Century Naval Shipyards ready for the challenges of maintaining a growing fleet. This plan has three key investment priorities over the next 20 years. This includes repairing and upgrading our public shipyard dry-docks to accommodate future *Virginia*-class Payload Module submarines and the new FORD Class carriers, recapitalizing the equipment to replace aging equipment with up-to-date technology, and optimizing the layout of the shipyards by moving and upgrading facilities closer to the actual work to improve productivity and throughput. We look forward to working with the Congress in the execution of this plan.

The challenges facing our private sector non-nuclear surface ship repair base are similar to those seen in our Naval Shipyards with the private sector also facing capacity versus workload challenges and the need to make investments to upgrade facilities, equipment, and dry docks. The lack of stable and predictable budgets in an era of Continuing Resolutions over the past ten plus years has had an even more detrimental impact on the stability and predictability of work and how the private sector approaches hiring and investments in their facilities. The Navy is committed to working collaboratively with industry to provide them a stable and predictable workload in a competitive environment moving forward so they can hire the workforce and make the investments necessary to maintain and modernize a growing non-nuclear fleet. As the Navy executes readiness recovery, and begins to grow capacity to provide the Navy the Nation Needs, our industry partners must grow capacity in stride. We are as dependent on their capabilities and capacity as we are on the public depots. We know from hard experience that workload to capacity mis-

match creates delays in maintenance completion, increasing costs and reducing time for training and operations. As we look to the future, we see the potential for these conditions to exist. To that end, the Navy has begun working with industry to build a similar plan that is detailed in the public shipyard report to Congress.

As we build the Navy the Nation Needs, we must also ensure that we have the maintenance capacity and infrastructure needed to ensure our growing fleet is maintained and modernized on-time and on-budget to deliver forward deployable combat ready ships. Our ongoing efforts to hire more people and invest in our Naval Shipyards, combined with the Navy's continuous dialogue with industry, lays the foundation required to maintain today's force while also looking to future requirements. We have challenges ahead of us, but we are on an improving trend that will ensure we have the capacity today and into the future to maintain and modernize the Navy the Nation needs.

NAVAL AVIATION FLEET READINESS CENTERS

Commander, Fleet Readiness Centers (COMFRC) oversees three depots, ten intermediate level and 25 tenant sites. Our workforce comprises 19,000 shore-based aviation maintenance workers working to deliver flight-line readiness by providing Maintenance, Repair and Overhaul (MRO) of Navy and Marine Corps aircraft, engines, components and support equipment, as well as logistics and engineering support to Navy and Marine Corps squadrons throughout the world. Our highly skilled workforce spans five countries and territories, 13 states, and is made up of approximately 10,000 civilians, 6,000 sailors and marines, and 3,000 contractors.

Continuous high operational tempo, chronic underfunding and financial uncertainty have real and lasting consequences. The capability and capacity of our Fleet Readiness Centers (FRCs) are still recovering from the impacts of the 2011 Budget Control Act, fiscal year 2013 sequestration driven furloughs, and years of chronic reduced funding.

Despite these challenges, the Navy and Marine Corps are working to stem the tide of Naval Aviation readiness degradation. Across the FRCs, we are focused on three primary Lines of Effort (LOE): (1) Aircraft production; (2) In-Service Repairs; and (3) Organic component production. The enablers for these three LOEs are a qualified proficient workforce; facilities and infrastructure; and supply.

Sustained improvement in the readiness of our Naval Aviation forces requires successful execution of multiple ongoing activities across each of these LOEs, as well as optimal and predictable resourcing.

In particular, we must maintain a focus on increasing throughput to put aircraft back in the hands of our warfighters faster, investing in our FRC workforce and infrastructure, and achieving optimal funding of our "enabler" sustainment accounts.

To increase throughput, we are focusing on readiness efforts such as In-Service Repairs (ISRs). These are emergent, unscheduled repairs that take place in the field, rather than planned maintenance completed at a depot. Annually, FRC artisans complete more than 3,000 ISRs around the world. Before 2015, these repairs were managed locally with use of existing staffs and equipment. Since then, we have incorporated better management tools to have corporate visibility into the work at the sites and quickly assigned artisans, engineers, equipment and material to where the work is building up. As a result we have seen an average "Work-in-Progress" status reduction of 23.8 percent since fiscal year 2016.

We are now meeting Fleet aircraft production goals. During fiscal year 2016 and 2017, the FRCs have eliminated production aircraft backlog through the use of Critical Chain Program Management. Now we are focused on component production through the use of Drum Buffer Rope to systematically release work into the industrial shops.

In fiscal year 2018, our FRCs continue to rebuild their workforce to recover from sequestration, and in direct response to increased aircraft and component workload. At the beginning of fiscal year 2013, the end strength for engineers was 1,306 compared to the January 2018 end strength of 1,802. The end strength for logisticians at the beginning of fiscal year 2013 was 536 compared to the January 2018 end strength of 667. The fiscal year 2013 beginning end strength for artisans and industrial workforce was 6,305 compared to the January 2018 end strength of 6,815.

Our fiscal year 2018 hiring goals are structured to hire artisans to meet fleet production demands, particularly in the area of organic component production, and also include targets for engineers and logisticians to support readiness recovery initiatives.

Direct Hiring Authority provided by Congress has been vital to our workforce rebuilding efforts, and we request your support in providing continuation of that support authority, which currently expires in September 2018. To attract the best tal-

ent, we are also using incentives such as the Special Wage Increase in the San Diego area. However, across the FRCs, normal workforce attrition, regional competition and economic conditions continue to challenge hiring plans. In addition, once hired, it takes up to 18 months to fully train and certify an artisan. We have established an apprenticeship program across the enterprise to build a workforce structure that produces skilled tradespersons capable of filling key artisan, managerial and supervisory positions.

Increasing the trained workforce size is only one piece of the puzzle. Our skilled and diverse artisans must have the proper equipment and modern facilities to execute their work. Furthermore, proper equipment and facilities are essential to ensuring we have the capacity to support next generation aircraft that provide the tactical edge over our adversaries.

Infrastructure—particularly Military Construction (MILCON)—is a significant challenge. For many years while working in a resource-constrained environment, we did not maximize the Navy Working Capital Fund investment in infrastructure and equipment readiness. We are now at a point where we must maximize our internal Navy Working Capital Fund investment.

Finally, creating a path to continued full funding of aviation sustainment accounts which support FRC production and overall flight-line readiness is imperative. These accounts support activities ranging from procurement of new and repaired spare parts, maintaining the currency of technical and repair manuals, and updating the maintenance plans used in the FRCs and on the flight line. As we have painfully experienced over the last few years, being underfunded and “unbalanced” in these accounts has resulted in significantly decreased flight-line readiness.

We look forward to continuing to work with Congress to provide the Fleet Readiness Centers with the resources necessary to recover Naval Aviation readiness.

Senator INHOFE. Thank you very much.
Admiral Moore?

STATEMENT OF VICE ADMIRAL THOMAS J. MOORE, USN, COMMANDER, UNITED STATES NAVAL SEA SYSTEMS COMMAND

Vice Admiral MOORE. Mr. Chairman, Ranking Member Senator Kaine, and distinguished members of this committee, thank you for the opportunity to discuss Navy readiness, in particular our readiness in our ship depots today.

Last year, I testified before the committee about how shortfalls in the size of the needed workforce, coupled with reduced workforce experience levels and shipyard productivity issues were impacting fleet readiness through the late delivery of ships and submarines. The capacity limitations and the overall priority of work toward our ballistic submarines and aircraft carriers resulted in our attack submarines absorbing much of the burden, causing several submarine availabilities that were originally scheduled to last between 22 and 25 months to require 45 months or longer to complete. This situation reached a boiling point last summer when, in order to balance the workload, the Navy decided to defer the scheduled maintenance availability of USS *Boise* that will effectively take it off line until 2020.

As we testify this year, we are on an improving trend. We have hired 19,200 people across our four naval shipyards between 2013 and 2017 and are on a path to reach our goal of having 36,100 full-time shipyard employees by the end of fiscal year 2019. The growing and better trained workforce is beginning to have a positive impact. In 2017, all four CVN aircraft carrier availabilities were completed on time and we significantly reduced the delays in the delivery of our submarine force. More work remains as we continue to train this workforce, improve our planning, material availability, and execution performance, but we are on the right track.

However, people alone will not provide the throughput and productivity needed to meet the maintenance and readiness requirements today and into the future. As outlined in our recent report to Congress on the Naval Shipyard Optimization Plan, we must also make substantial investments in our four nuclear-capable shipyards to ensure we have the 21st Century naval shipyards ready for the challenges of maintaining a growing fleet.

The challenges facing our private sector non-nuclear surface ship repair base are similar to those seen in our naval shipyards with the private sector also facing capacity and workload challenges and the need to make investments to upgrade facilities, equipment, and dry docks. The lack of stable and predictable budgets over the past 10 years has had an even more detrimental impact on the stability and predictability of the work in the private sector and how the private sector approaches hiring and investments in their facilities. The Navy is committed to working collaboratively with industry to provide them a stable and predictable workload in a competitive environment moving forward so that they can hire the workforce and make the investments necessary to maintain and modernize a growing non-nuclear fleet.

Additionally, I have tasked my staff with developing a companion plan to the Naval Shipyard Optimization Plan on the private sector so that we can provide the Navy leadership of where we need to make investments in the private sector so the private sector is poised as well to handle the size of the growing fleet.

As we build the Navy the Nation needs, we must also ensure that we have the maintenance capacity and infrastructure needed to ensure our growing fleet is maintained and modernized on time and on budget to deliver forward deployable combat-ready ships. Our ongoing efforts to hire more people and invest in our naval shipyards, combined with the Navy's continuous dialogue with industry, lay the foundation required to maintain today's force while also looking to the future. We have challenges ahead of us, but we are on an improving trend that will ensure we have the capacity today and into the future to maintain and modernize the Navy the Nation needs.

I thank you for the opportunity to talk to you today about Navy readiness, and I look forward to your questions.

Senator INHOFE. I appreciate it. Thank you very much.

General Levy?

**STATEMENT OF LIEUTENANT GENERAL LEE K. LEVY II, USAF,
COMMANDER, AIR FORCE SUSTAINMENT CENTER, UNITED
STATES AIR FORCE MATERIEL COMMAND**

Lieutenant General LEVY. Chairman Inhofe, Ranking Member Kaine, distinguished members of the subcommittee, thank you for the opportunity to again testify on the readiness of your United States Air Force. On behalf of the Secretary, the Honorable Heather Wilson, our Chief of Staff, General Dave Goldfein, we are grateful for your support and commitment to our 670,000 Active, Guard, Reserve, civilian airmen, their families, and our veterans.

About this time last year, I had the privilege of appearing before the subcommittee to talk about this very topic. Today, your Air Force Sustainment Center, a \$16 billion a year global enterprise,

delivers combat power. We support joint and coalition forces at the beginning, middle, and end of every single operation. We secure our Homeland by enabling continuous surveillance and air defense, and critically, we also sustain two of the three legs of our Nation's strategic nuclear triad. We accomplish these missions with a fleet averaging 28 years of age, an Air Force that is too small for the missions it has been tasked with, and an aging infrastructure, as my colleagues also referred to, that continues to present challenges absent necessary upgrades and, in some cases, replacement.

That said, our total force airmen are dedicated, and nearly 43,000 airmen across the Sustainment Center in 28 locations around the globe that I have the privilege to lead, our Nation's sons and daughters, as the Air Force Sustainment Center Commander—they continually amaze me every single day with their ability to innovate, achieve, but more importantly, deliver results.

Make no mistake. The United States Air Force is ready to fly, fight, and win, but I am concerned with our ability to sustain our Air Force for tomorrow's fight. Our capability to deter, respond to, and eliminate threats relies upon our ability to proactively and continuously develop advanced air, space, and cyber capabilities while simultaneously honing the readiness and lethality of the logistics and sustainment enterprise to meet evolving requirements and ever-increasing demand signals.

Achieving this requires a healthy organic industrial base. Our organic industrial base simply serves a national insurance policy. It underwrites our Nation's ability to respond rapidly and persevere against threats that may challenge us and our allies.

As you previously heard, workforce hiring challenges, unpredictable, inadequate, and insufficient funding, aging infrastructure, emerging software challenges, cybersecurity, and weapon systems sustainment are all challenges that impact our readiness and the health of our organic industrial base and, by extension, the readiness of our United States Air Force and the joint team.

I would say our civilian hiring system remains ill-suited for the 21st Century and bears strategic readiness implications. We are transitioning to an information age fighting force, recognizing that our ability to modify key software in our weapon systems will be a decisive capability in the conflicts of tomorrow.

To that end, we compete with industry for a limited pool of science, technology, engineering, and math (STEM) workforce candidates. We are thankful for the congressionally approved direct hire authority, but this is limited in temporary authority. To remain relevant and ready, we need a more efficient system to recruit and hire our future airmen, and I will venture to say that my colleagues would say the same thing about their soldiers, sailors, and marines.

Additionally, trained mechanics are growing increasingly scarce. Thus, we rely heavily on former military technicians separating or retiring from service and seeking government employment. In these instances, the current 180-day waiting period to hire military retirees presents a challenge.

We are addressing these challenges and many more such as the defense supply chain that is growing increasingly brittle with such innovative technologies as additive manufacturing in order to pro-

vide your Air Force an edge against peer competitors. This requires rapid reverse engineering capability and a workforce that understands how to leverage it. It also requires intellectual property and access to those intellectual property rights that continue to be a challenge in an increasingly litigious environment. It is simply that important.

I would close my remarks by sharing a quote from our Chief of Staff. As recently published in the National Defense Strategy, we face the reemergence of great power competition. While we did not seek this competition, let there be no doubt in this room and around the world, your airmen stand ready to defend the Homeland, deter nuclear conflict and nuclear readiness, own the high ground in any conflict with air and space superiority and project global vigilance, reach, and power with our joint teammates, allies, and partners.

Again, thank you for allowing us the opportunity to be with you today, and I very much look forward to your questions.

[The prepared statement of Lieutenant General Levy follows:]

PREPARED STATEMENT BY LIEUTENANT GENERAL LEE K. LEVY, II

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine, distinguished Members of the Subcommittee, I would like to thank you for this opportunity to testify on the readiness of your United States Air Force. On behalf of our Secretary, the Honorable Heather Wilson, and our Chief of Staff, General David Goldfein, we are grateful for your support and commitment to our 670,000 Active, Guard, Reserve, and civilian airmen, along with their families and veterans that have faithfully served.

It was about this time last year that I had the privilege of speaking with you on this very topic. We discussed the fact that without pause, the United States Air Force delivers global combat power to deter and defeat our Nation's adversaries; we support joint and coalition forces at the beginning, middle, and end of every operation; and we secure our Homeland via continuous surveillance and air defense and of course we operate two of the three legs of our Nation's strategic nuclear triad. As you're aware, we're doing this with a smaller force, a fleet that has an average age of 28 years, and an aging infrastructure that continues to present challenges absent necessary upgrades, or in some cases replacement. That said, our Total Force Airmen (Active Duty, National Guard, Air Force Reserve and Air Force civilians) are dedicated. The nearly 43,000 airmen across 28 locations around the globe that I have the privilege to lead as the Air Force Sustainment Center Commander continue to amaze me with their ability to innovate and achieve. They persevere through these times of increasing requirements to deliver combat power to warfighters by adding service life to weapons systems and creating additional capabilities through innovative modernizations and upgrades. Make no mistake, the United States Air Force is ready to fight, but my concern regarding our ability to sustain our Air Force for tomorrow's fight is very real. Every day the threats to this Nation and our interests increase. Our capability to deter, respond to, and eliminate these threats relies upon our ability to proactively and continuously develop advanced air, space, and cyber capabilities while simultaneously honing the readiness and lethality of the logistics and sustainment enterprise to meet evolving requirements. This can only be accomplished through a vibrant and healthy organic industrial base. This industrial base serves as a national insurance policy that underwrites our Nation's ability to respond rapidly and persevere in depth, against threats that may challenge us.

The Air Force Sustainment Center's mission is to deliver combat power for America. It is the engine that drives readiness for the Air Force. The Center's three air logistics complexes, three air base wings and two supply chain wings directly support combatant commanders with depot-level maintenance, supply chain management and power projection for the combatant commands. As the Air Force global supply chain manager we plan, source, manage, and deliver multi-billions of dollars in parts annually to the combatant commands. This suite of organic industrial base

capabilities enable not only our AF but the joint team, other government agencies including NASA, as well as 63 coalition and partner Nations.

The Air Force Sustainment Center remains critically involved in, and essential to, sustaining our Nation's nuclear enterprise. Our sustainment of components for two of three legs of the nuclear triad is vital to our Nation maintaining a credible nuclear deterrent. We directly enable bombers, inter-continental ballistic missiles, dual capable fighters, air launched cruise missiles, and Navy command and control aircraft that communicate with submerged nuclear assets.

The organic industrial base is the country's national security insurance policy. It represents protection and coverage for today in the form of readiness for our joint force, while also enabling sustained combat operations and force regeneration at the outset of future conflicts. Simply put, it mitigates risk to the Nation with strategic depth, in times of crises, with flexible and scalable response. The Air Force organic industrial base is much different than in the past. We've broken out of the individual islands of capability that operate independently with isolated impact to work accomplished in a particular zip code. We now operate Air Force logistics and sustainment as a global interconnected eco-system where an action in one area has an impact on the other side of the planet. The supply chain is no longer bifurcated into "wholesale" and "retail" buckets of work, but is instead managed across the spectrum of sourcing, repair and delivery to the supported commander at the point of need. Organic depot maintenance accomplished at our three Air Logistics Complexes is a ballet of sophisticated theory-of-constraints and guided processes, with the complexes themselves operating in a symbiotic, interdependent manner, forming a logistics and sustainment network that underpins Air Force readiness. This is the logistics kill chain needed for a 21st Century military to deter our adversaries and reassure our allies.

Traditionally, we think of sustaining the force as maintaining hardware or 'bending metal.' If you consider the highly digitized, interconnected Air Force of tomorrow, we will instead manipulate ones and zeroes. As software becomes increasingly pervasive throughout our weapons systems, test systems and support equipment, our ability to manage and sustain it organically will be critical. Even today, many of the weapons systems sustained within the Air Force Sustainment Center require a vast amount of technology to operate. As an example, the newest aerial refueling tanker, the KC-46A, requires millions of lines of code to operate; thus, our ability to maintain a skilled workforce going forward is critical. Doing so, however, remains an ever-present challenge.

Last year I expressed my appreciation for your support in increasing Air Force end strength, while recognizing that we remain stretched thin as we meet our national security requirements. Over the past two and a half decades, the Air Force has experienced a 30 percent end strength reduction across the Total Force. To improve readiness and attain manning levels matching our mission requirements, we must increase our Active Duty, Guard, and Reserve end strength, to include growing the Active Duty force. We appreciate your continued support in this endeavor.

CHALLENGES

The Air Force Sustainment Center, with its organic industrial base, provides essential enablers in the air, space, and cyber domains with ever-increasing demand signals. Our readiness challenges persist in the areas of predictable, sufficient funding, workforce hiring, aging infrastructure and weapon system sustainment.

WORKFORCE CHALLENGES

Manning challenges, particularly in our civilian workforce, continue to impact our ability to keep pace with current workloads, as well as prepare for emerging workloads like the F-35 and KC-46A. As Chief of Staff of the Air Force, General David Goldfein, recently testified at the House Appropriations Defense Subcommittee hearing for the fiscal year 2019 Air Force Budget, "The security landscape we face has become more competitive, complex and dangerous. In air, space, and cyberspace, potential adversaries are rapidly leveling the playing field. We need the talent to compete and defend against those threats." Within the Air Force Sustainment Center, we depend on an 80 percent civilian workforce; 89 percent if you include contractors, our "commercial airmen."

I have spoken previously, and passionately about our 'fifth-generation Air Force' requiring a 'fifth-generation workforce.' Few people realize just how ubiquitous Science-Technology-Engineering-Math (STEM) is in influencing our workforce and the way we do business in other areas including: energy and hazardous materials reduction and elimination; environmental remediation; safety; financial and resource management; healthcare; structural, mechanical, and computer engineer-

ing—it is a key to defending our infrastructure. Our requirements for a STEM educated workforce, as well as advanced manufacturing and technical skills, have rapidly increased and will continue to do so. The sophisticated software packages and software-intensive weapons systems that we possess require a sound application of technical skillsets to keep our fleet flying in air, space, and cyberspace.

Yet, our civilian hiring system remains ill-suited for the 21st Century. We are limited in effectively competing with industry for a qualified workforce, and the ability to hire engineers, scientists, software developers, and cyber experts remains a strategic concern. As a case in point, our requirement for software engineers continues to grow annually at a rate of 10–15 percent. Between Federal agencies and industry, we simply do not have enough qualified applicants to meet the shared demand. Thus, we must remain resilient in our recruiting endeavors to ensure that we can maintain a relevant and ready status as we transition to an information-age fighting force; recognizing that our ability to modify key software in our weapons systems will be a decisive capability in the conflicts of tomorrow. Additionally, we need to do our part to ensure that we are educating and inspiring the youth of America to aspire to join the STEM workforce.

Across the Air Force Sustainment Center we have made a commitment to attract, excite and educate the future STEM workforce. For example, our personnel partner with schools on robotics and technology teams and provide support through volunteer hours, mentoring and grants. These efforts have reached tens of thousands of children and more than a thousand educators. This is good for our communities and our Nation, not just our Air Force.

Further, last year was a dynamic year for change as we made adjustments in our mechanisms to maximize the benefits Defense Acquisition Workforce Development Fund provides for recruiting, retaining, training, and developing our scientist and engineer workforce. Our ability to use this funding has been critical to remaining competitive with industry. We also worked with Headquarters, Air Force Materiel Command, to expand the use of the DOD Civilian Acquisition Workforce Personnel Demonstration Project (AcqDemo) to approximately 5,700 non-bargaining employees within the Air Force Sustainment Center. This pay system offers greater flexibilities and competitive salaries to compensate our technical workforce according to labor market considerations. Most importantly, our ability to compete for top scientist and engineering talent is dependent on the combination of three things: mission, salary, and benefits. We have a tremendous mission and are implementing new ways to showcase our mission to prospective scientists and engineers through additional internships and innovative partnerships with universities.

On the hiring front, the Air Force Sustainment Center drove hard to maximize Direct Hire Authority within the Air Force Logistics Complexes, authorized by Congress. Direct Hire Authority was added to the Expedited Hiring Authority process, and is currently being used for almost two-thirds of the external hiring actions in over 100 different occupational series. A total of 874 employees have been appointed under Direct Hiring Authority and 212 under Expedited Hiring Authority within the Air Logistic Complexes with an average end-to-end time of 72 days. Utilizing a constraints-based management system, efforts are ongoing to reach our 40-day Direct Hire Authority hiring goal. Concurrently, we are tirelessly working to reduce traditional hiring timelines. Over the course of the last four years we have done a tremendous job to reduce this timeline—a hiring end-to-end average of 280 to 115 days. But there is much more to be done. Extending Direct Hire Authority and expanding it to more job series would enable us to go further in obtaining the best talent the Nation has to offer.

As you know we rely on a very large labor force of highly skilled technicians and mechanics. Our data shows that the population of trained mechanics is simply not as available as in the past, and that it is predicted to grow increasingly scarcer as we move into the future. While we work very closely with vocational training centers around our bases, we rely heavily on former military technicians that separate or retire from Military Service and seek a government civilian position. Thus, another challenge that we face is the 180-day waiting period to hire military retirees. Revising the current 180-day waiting period to hire military retirees would allow us quicker access to fully qualified, trained personnel and reduce the ramp-up time of hiring a brand new employee.

Continued unpredictable appropriations for the Department of Defense has considerable impact on our hiring and partnering. As previously reported, volatile and uncertain funding discourages many companies from investing in advanced technologies or sustaining existing capabilities that support the Department of Defense. Additionally, government furloughs and repeated continuing resolutions are not reassuring to potential employees. Industry partners are dis-incentivized to bid on

contracts when budgets are unpredictable or it is not cost-effective for them to manufacture small quantities of parts.

DIMINISHING MANUFACTURING

As our weapon systems age we are seeing increased first time demands for structural parts and other subsystems. For example, over the past six months, 37 percent of critical parts shortages, those that ground aircraft, were first time demands. This failure pattern, coupled with irregular appropriations and the consolidation and reduction of the Defense industrial base in the early 1990's, presents a significant sustainment problem to the Air Force. Additionally, when we reach outside of our organic capabilities, more than half of the items we manage rely on a single-source vendor for manufacture or repair. The result is a slow but steady increase in production lead time for items we manage, with increased costs, and decreased readiness.

When viewed with the demands of worldwide readiness, future pilot production needs, an evolving global trade environment, and an era of uncertainty in the amount and timing of appropriations, our dedicated Air Force Sustainment Center professionals continue to perform a delicate balancing act ensuring sustainment of warfighter equipment and weapons systems. We continue to work with industry leaders to watch, learn and leverage technology, develop advanced capabilities for the future, advance manufacturing and repair capabilities, as well as maintenance repair and overhaul to help us sustain our Air Force.

PUBLIC PRIVATE PARTNERSHIPS

The Air Force Sustainment Center—with its organic industrial base—is the Nation's readiness and war sustaining insurance policy. Throughout the life cycle of a weapon system, our relationship with industry is integral to the success of our warfighters. However, we must be clear in our approach, evaluating any relationship against its ability to: increase readiness, decrease costs, infuse new technology into our industrial base, and impact our ownership of the technical baseline. These principles help shape where we invest, and where we divest of partnered activity. They are applied to support strategic decisions and ensure we have clarity of purpose to exploit opportunities, mitigate risks and hold industry accountable, ultimately ensuring the best outcome for our warfighters. Our first responsibility is to the Nation . . . to be effective in combat.

INNOVATION CENTERS

The Air Force Sustainment Center, through external partnerships and organically, is in the process of establishing Innovation Centers at or near each of its Air Logistics Complexes. These centers will be focused on inserting agile manufacturing technologies into the production environment, and allow the workforce to reverse engineer, re-design, prototype, and qualify Technical Data Packages for weapon system components, tooling, fixtures, and parts to improve availability and reduce weapon system sustainment costs. Additionally, it can provide stop-gap solutions while waiting for contract award and/or first article testing. These centers will be a shared collaboration space for the Air Force Sustainment Center, Air Force Life Cycle Management Center, Air Force Nuclear Weapons Center, Defense Logistics Agency, industry, academia, and other government entities, in order to maximize lessons learned while solving complex problems with new innovative methods and equipment. While initially focused on additive technologies, the Innovation Centers will also explore other emerging potential manufacturing solutions that could include composites, robotics, laser processing, and manufacturing.

ADDITIVE MANUFACTURING

Agile manufacturing technologies, such as additive manufacturing, support the Air Force Future Operating Concept by providing the Air Force an edge against our adversaries through a smaller deployed footprint, more agile/efficient maintenance and modification, and faster supply chain sourcing. Agile manufacturing technology is especially well-suited to sustaining low quantity part production because it is not hampered by high startup costs associated with traditional manufacturing methods. By growing a cyber secure library of qualified parts that can be printed across an Air Force network of certified printers we enable a more agile and efficient logistics supply chain that can quickly deliver the right part on demand. This will have a direct and appreciable impact on a weapons systems mission capable rates.

As an example, the Reverse Engineering and Critical Tooling (REACT) cell at our Oklahoma City Air Logistics Complex has been solving parts supportability challenges using additive manufacturing since 2013 with great success. REACT im-

proved local manufacturing support in fiscal year 2017 by supporting 70 different components and reducing flow time to the customer by 350 days, and with a cost avoidance of more than \$367,000.

While additive manufacturing presents itself as a viable solution to rising costs associated with Diminishing Manufacturing Sources, the process requires a rapid reverse engineering capability and a workforce that understands how to leverage it in order to provide a responsive, resilient parts supply chain. It also requires access to Intellectual Property (IP) that the department currently does not possess. These challenges remain a barrier.

ARTIFICIAL INTELLIGENCE / CYBER

One of the most daunting challenges remains in the area of cybersecurity, specifically the roles of artificial intelligence and data security. The budding artificial intelligence capabilities on the commercial market promise faster, predictive, and more accurate decisions for our supply chain and engineers that troubleshoot aging weapon systems and our industrial plant. Adapting and implementing artificial intelligence systems to our legacy data systems holds great promise, but will require significant investment.

To counter cyber-attacks, we are working to secure our industrial depot maintenance equipment. We have implemented processes and devoted resources to protect our organic manufacturing capability, responsible for aerospace quality parts, against similar threats. The cyber threat also extends to our Nations secrets. The Air Force and our industry partners must continue to strive to secure our intellectual property against exfiltration to and exploitation by our adversaries.

NUCLEAR SUPPORT

The Air Force Sustainment Center remains essential in sustaining our Nation's nuclear enterprise, from the depot level maintainer in the Nation's missile fields to managing the nuclear supply chain. As the Secretary of the Air Force, the Honorable Dr. Heather Wilson recently testified, "The Nuclear Posture Review reaffirms the importance of the triad and nuclear command and control and communication, and says that it is our responsibility as the military to maintain a safe, secure and effective nuclear deterrent." We thank you for your budgetary support to ensure we can maintain this responsibility at optimal levels.

SHAPING FUTURE LOGISTICS CAPABILITIES

Today's evolving warfighting concepts require a fundamental change to the logistics environment. Within this transformation, a most critical element is a logistics command and control capability that truly ensures the effective employment of resources. Only ten years ago, the focus of logistics command and control was directed at task organizing and logistics mission assignments. Command and control was not automated and was functionally centric and non-integrated. Information was derived from after-the-fact reporting focused on transactional activity and latent/static white board displays of assets and resources. The predominant characteristic of logistics—responsiveness—was achieved by maintaining large stockpiles to meet every possible requirement. Logistics capabilities may have been responsive, but they were also cumbersome. Few logisticians spoke in terms of command and control, and even fewer spoke in terms of situational awareness and decision support.

The new environment demands a logistics command and control capability that emphasizes situational awareness and decision support to meet commanders' emphasis on speed and agility. Operational speed and agility means logistics forces will need to cover greater distances, while lacking secure lines of communication. Tempo will be the key element of operations and thus logisticians can no longer count on (or cause) the traditional operational pauses that allowed the logistics effort to catch up. Logistics can become an enabler of tempo only if logisticians can observe, orientate, decide and act based on situational awareness and rapid analysis of courses of action founded in real-time information. Warfighters develop requirements; logistics must match resources to meet those requirements.

Command and control seeks to reduce the amount of uncertainty through situational awareness. However, reducing uncertainty comes with a cost in time. The challenge is to find the optimum balance, reducing uncertainty within the minimum time. The operational concept for logistics command and control is to enhance the capabilities of the agile combat support enterprise by providing a system that improves logistics situational awareness while reducing the decision-making cycle time.

By implementing multi-domain logistics command and control, we will no longer think about one combatant command or region at a time. It will create complete

global asset visibility and decision support tools to best assign and allocate limited global resources to meet immediate theater needs. This new way of operating will allow us to integrate with global and theater planning, articulate risk to the combatant commanders, provide intelligent logistics command and control in anti-access and area denial environments, prioritize and synchronize resources, set and re-set the theaters, and interact with a global distribution network.

CLOSING

This committee, more than anyone else, knows that the world is more dangerous and unpredictable than it has ever been and we are continually surprised this unpredictability. In every instance of crisis, the organic industrial base has responded by providing solutions to meet unanticipated demands. We must continue to invest now in the organic industrial base if we expect its performance in the future to meet the needs of an increasingly sophisticated ... contested ... and lethal ... battlespace in the 21st Century. Adequate, consistent, and predictable funding to preserve, maintain and modernize our critical logistics and sustainment capabilities underwrite our ability to produce readiness that guarantees that we will win whenever and wherever our Nation calls.

I would like to thank each distinguished member of the committee for allowing me to offer this testimony today. Your continued support enable our true Total Force Airmen to drive our joint team's readiness for not only tonight's fight but for tomorrow and what lies beyond. Thank you.

Senator INHOFE. Thank you, General.

Before we hear from General Crenshaw, since Senators Ernst, Perdue, and Rounds all have a hard stop at the same time, Senator Kaine and I have agreed to withhold our questions until after they have had theirs at the conclusion of the remarks from General Crenshaw.

General?

**STATEMENT OF MAJOR GENERAL CRAIG C. CRENSHAW, USMC,
COMMANDING GENERAL, MARINE CORPS LOGISTICS COM-
MAND**

Major General CRENSHAW. Chairman Inhofe, Ranking Member Kaine, and distinguished members of the Senate Armed Services Subcommittee on Readiness, I appreciate the opportunity to testify on an important aspect of Marine Corps warfighting readiness and our industrial depot. Industrial depot capabilities help ensure that your Marine Corps and our marines are ready today to succeed at difficult tasks and return home safely to their families. The workforce believes this profoundly and is mindful that what they do is important and that every day a marine's life depends on their success. This is why we sincerely thank you for your continued support that enables our success.

As we look to the future, we see our depot as a pacesetter, modernizing to meet challenges while embracing the technologies of the 21st Century. Through our Marine Corps Logistics Command of the 21st Century and the depot of the 21st Century initiatives, the Marine Corps is posturing itself to execute its title 10 responsibility with logistics solutions that embrace evolving technologies and business processes in order to provide readiness that achieves Marine Corps Logistics Command's top priority which is supporting the warfighter.

To communicate the value of our depot in providing the readiness to the warriors, I will touch briefly on four areas: depot maintenance, our workforce, innovation, and facilities.

The Marine Corps ground weapons systems depot is centrally managed by Marine Depot Maintenance Command and is com-

prised of two production plants: one in Albany, Georgia and the other in Barstow, California. Each plant delivers its own distinct capability to the Marine Corps industrial base while reinforcing broader industrial base capabilities of the Department and the Nation. Both plants sustain competitive capability to repair our most valuable ground combat weapon systems, such as amphibious assault vehicles and our light armored vehicles. In addition, each plant specializes as the center of excellence for specific systems for the Marine Corps and other Department of Defense customers.

Geography is also an important consideration for our plants. Strategically located near major east and west coast operational commands in California and North Carolina, our depot capabilities are collocated with our supply management and distribution centers in order to provide integration and efficient movement of equipment, including war reserves. Our Barstow production plant is situated with one of the largest railheads in the Department of Defense and astride some major interstate highways. Our Albany plant production plant, in addition to being collocated with the Marine Depot Maintenance Command and Marine Corps Logistics Command headquarters, also enjoys access to robust transportation infrastructure, as well as east coast seaports such as Charleston, South Carolina and Jacksonville, Florida, home to the Marine Corps maritime prepositioning program. I share this background so that you can understand our organization and that our location is integral to the success of our mission of sustaining readiness.

The funding Congress provides to the Marine Corps depots is essential to readiness. Those funds are used to make sure the equipment marines need is provided when it is needed, where it is needed, and it moves, shoots, and communicates as intended. In fiscal year 2018, Marine Corps depot maintenance was funded to 80 percent of identified maintenance requirements. To optimize the impact on those funds and mitigate the gap, we use a conditions-based methodology and prioritize depot repair requirements based on warfighting value. These methods allow us to keep pace with the ever-present readiness challenges that have accumulated over the last 17 years of conflict.

I must be frank about the challenge that you can help us with. One uncertainty is the fiscal environment has exacerbated this challenge. For each of the past 2 fiscal years, we received funding in the third quarter. Funding delays disrupt our maintenance production cycle and pressurizes the supply chain that supports production. It would be of great assistance to our effectiveness and efficiency if we could receive funding at the beginning of the fiscal year. The production plan that depends on timely resources is complex and diverse.

Our depot would not be what it is today without the highly qualified experience of our workforce. The 2018 National Defense Strategy rightly identifies recruiting, developing, and retaining a high quality workforce as essential for warfighting success. The Marine Corps is building a balanced, competent, and adaptive workforce through recruitment, development of skilled artisans and employees who possess the right skills to accomplish our mission. We do this in many ways. For example, the strong relationship we have with our technical colleges and university, Albany State University

and Albany Technical College. We have access to vital local talent that we can draw upon to sustain a workforce that increasingly requires a high level of technical skills. Specifically, we are grateful to Congress for providing direct hire authorities, which are a critical asset in the competitive environment of talent acquisition.

Innovation is inherent and fundamental to marine tradition, doctrine, and leadership. Innovation is essential to the industrial capability we need and paves the path to the future readiness. At the service level, our Marine Corps Warfighting Lab, our Next Generation Logistics, and Installation-Works organizations are at the cutting edge of military innovation. These staff organizations are collaborating with an array of internal and external partners across the major categories. One of those categories is additive manufacturing. Across the Marine Corps, we have over 70 3D printers. Each of our production plants recently took delivery of a large-scale 3D metal printer. Our vision is to leverage this technology and produce targeted, positive readiness impacts. We are also seeking innovation and constant improvement through partnerships with academia. Marine Corps Logistics Command's relationships with outstanding academia institutions such as Georgia Institute of Technology and Penn State University exemplify how we are working to leverage the best in class supply chain manufacturing.

My last topic is facilities. Modern, high quality, distributed industrial facilities are essential elements in maintaining a viable Marine Corps depot maintenance capability. We became acutely aware of this in January 2017 when the base at Albany was struck by a catastrophic EF-3 tornado. Your timely response has been invaluable to the restoration of our operations at our depot and other affected areas of Marine Corps Logistics Base Albany. Your fiscal year 2018 support to fund a military construction project for a tornado damaged combat vehicle storage facility in Albany is greatly appreciated as well.

We are also very grateful for the fiscal year 2018 funds to build a combat vehicle repair facility in Barstow.

Senator INHOFE. General Crenshaw, you have to wind up real quick.

Major General CRENSHAW. Yes, sir.

The Marine Corps depot maintenance capability underwrites warfighting readiness in direct support of dedicated men and women. It is through your support that we continue to be successful. On behalf of all marines, sailors, and many deployed harm's way today and their families and the civilians that support their service, thank you for the opportunity to discuss our organic industrial base and its role in supporting the readiness of our Marine Corps.

[The prepared statement of Major General Crenshaw follows:]

PREPARED STATEMENT BY MAJOR GENERAL CRAIG CRENSHAW

INTRODUCTION

Chairman Inhofe, Ranking Member Kaine and distinguished members of the Senate Armed Services Subcommittee on Readiness, I appreciate the opportunity to testify on an important aspect of Marine Corps warfighting readiness, our industrial depot. Industrial depot capabilities help ensure that your Marine Corps and our Marines are ready today to succeed at difficult tasks and return home safely to their

families. The workforce believes this profoundly and is mindful that what they do is important and that every day a Marine's life depends on their success. This is why we sincerely thank you for your continued support that enables our success.

As we look to the future, we see our depot as a pacesetter, modernizing to meet the challenges while embracing the technologies of the 21st Century. Through our "Marine Corps Logistics Command of the 21st Century" and "Depot of the 21st Century" initiatives, the Marine Corps is posturing itself to execute its title 10 responsibilities with logistics solutions that embrace evolving technologies and business processes in order to provide readiness that achieves Marine Corps Logistics Command's top priority of supporting the warfighter. To communicate the value of our depot in providing the readiness that warriors require, I will touch briefly on four areas: depot maintenance, our workforce, innovation, and facilities.

The Marine Corps' ground weapons systems depot is centrally managed by Marine Depot Maintenance Command, and is comprised of two production plants: one in Albany, Georgia and the other in Barstow, California. Each plant delivers its own distinct capability to the Marine Corps' industrial base while reinforcing the broader industrial base capabilities of the Department and the Nation. Both plants sustain a competitive capability to repair our most valuable ground combat weapon systems, such as Amphibious Assault Vehicles (AAV) and Light Armored Vehicles (LAV). In addition, each plant specializes as a "Center of Excellence" for specific systems for the Marine Corps and our other Department of Defense customers.

Geography is also an important consideration for our plants. Strategically located near our major east and west coast operational commands in California and North Carolina, our depot capabilities are collocated with our supply management and distribution centers in order to provide integration and efficient movement of equipment including war reserves. Our Barstow production plant is situated with one of the largest railheads in the Department of Defense and astride major interstate highways. Our Albany production plant, in addition to being collocated with the Marine Depot Maintenance Command and Marine Corps Logistics Command headquarters, also enjoys access to robust transportation infrastructure as well as major east coast seaports such as Charleston, South Carolina and Jacksonville, Florida—home to the Marine Corps' maritime prepositioning program. I share this background so that you can understand our organization and that our location is integral to the success of our mission of sustaining readiness for the Marine Corps.

DEPOT MAINTENANCE

The funding Congress provides to the Marine Corps' depot is essential to readiness. Those funds are used to make sure the equipment Marines need is provided when it's needed, where it's needed, and that it moves, shoots and communicates as intended. In fiscal year 2018, Marine Corps depot maintenance was funded to 80 percent of the identified maintenance requirement. To optimize impact of those funds and mitigate the gap, we use a conditions based methodology and prioritize depot repair requirements based on warfighting values. These methods allow us to keep pace with the ever-present readiness challenges that have accumulated over the last 17 years of conflict.

I must be frank about one challenge that you can help with. Our uncertain fiscal environment has exacerbated this challenge. For each of the past two fiscal years, we received funding in the 3rd quarter. Funding delays disrupt our maintenance production cycle and pressurize the supply chain that supports production. It would be of great assistance to our effectiveness and efficiency if we could receive funding at the beginning of the fiscal year. The production plan, that depends on timely resources, is complex and diverse. In fiscal year 2017, we remanufactured and repaired over 400 different kinds of equipment and returned over 8,000 items to operating forces—in addition to thousands of additional items that went into our strategic programs such as war reserve and prepositioning. The core of our productivity is consistently dedicated to our primary readiness drivers—Amphibious Assault Vehicles, Light Armored Vehicles, tanks, and lightweight howitzers. These systems comprise 50 percent of our fiscal year 2019 depot maintenance budget. Readiness of these and other critical systems will remain a service priority and underpin our overall ground equipment readiness strategy.

WORKFORCE

Our depot would not be what it is today without a high quality, experienced workforce. The 2018 National Defense Strategy rightly identifies recruiting, developing and retaining a high-quality workforce as essential for warfighting success. The Marine Corps is building a balanced, competent, and adaptive workforce through the recruitment, retention and development of skilled artisans and employees who pos-

sess the right skills to accomplish our mission. We do this in many ways. For example, through strong relationships with colleges and technical schools such as Albany State University and Albany Technical college, we have access to vital local talent pools that we can draw upon to sustain a workforce that increasingly requires high levels of technical skill. Specifically, we are very grateful to Congress for providing Direct-Hire Authorities, which are critical assets in the competitive environment of talent acquisition. These authorities are an essential tools that allows us to level the playing field with industry in order to more quickly fill critical positions that require top talent and high demand skills. These hiring authorities will become even more important and effective going forward as we strive to develop the 21st Century industrial workforce needed by our Nation and our Marines.

INNOVATION

Innovation is inherent and fundamental to Marine tradition, doctrine and leadership. Innovation is essential to the industrial capability we will need and paves the path to future readiness. At the Service level our Marine Corps Warfighting Lab, Next Generation Logistics (NexLog), and Installation-Works (I-Works) organizations are at the cutting edge of military innovation. These staff organizations are collaborating with an array of internal and external partners across four major categories. One of those categories is additive manufacturing. Across the Marine Corps, we have over 70 3D printers. Each of our production plants recently took delivery of a large-scale 3D metal printer. Our vision is to leverage this and other technologies to produce targeted, positive readiness impacts. We are also seeking innovation and constant improvement through partnerships with academia. Marine Corps Logistics Command's relationships with outstanding academic institutions such as Georgia Institute of Technology and Penn State University exemplify how we are working to leverage best in class supply chain, additive manufacturing and analytical expertise to enhance readiness and efficiency while posturing for the future.

FACILITIES

My last topic is facilities. Modern, high quality, and distributed industrial facilities are an essential element in maintaining a viable Marine Corps depot maintenance capability. We became acutely aware of this in January 2017, when the base at Albany was struck by a catastrophic EF-3 tornado. Your timely response has been invaluable in the restoration of operations at our depot and at other affected areas of Marine Corps Logistics Base Albany.

Your fiscal year 2018 support to fund a military construction project for a tornado damaged combat vehicle storage facility in Albany is greatly appreciated. We are also very grateful for the fiscal year 2018 funds to build a combat vehicle repair facility in Barstow. That badly needed facility will improve the productivity of the plant and significantly increase the quality of the work place for our artisans. We are also looking comprehensively at the future. To that end, we have initiated an industrial infrastructure strategy to clearly articulate the long term vision, priorities and pathway necessary to equip and sustain the industrial facilities that support our Marines and enhance the combat readiness of our Corps.

CONCLUSION

The Marine Corps' depot maintenance capability underwrites warfighting readiness in direct support of the dedicated men and women of our Corps. Its value is realized every day by forward deployed marines and sailors providing security around the globe, and its value is most apparent when the rigor of sustained combat operations drive surge operations throughout the industrial base of the Department and the Nation. The support of Congress, to our depot maintenance program and facilities, to our workforce and to the innovation that postures us for success now and in the future, is essential. On behalf of all of our marines, sailors—many deployed and in harm's way today—and their families, and the civilians that support their service, thank you for the opportunity to discuss our organic industrial base and its role in supporting the readiness of the Marine Corps.

Senator INHOFE. Thank you, General Crenshaw.

We will have 5-minute rounds. Senator Ernst?

Senator ERNST. Thank you. I guess it is ladies first.

General Daly, it is great to see you again. Thanks so much for your wonderful support at Rock Island Arsenal.

About 15 years ago, I was running convoys with my soldiers through Kuwait and Iraq, and at that time, I was driving in a canvas-sided, canvas-top, zip-down vinyl window humvee. We all remember those days.

But then all of a sudden, we started seeing the development of IEDs [improvised explosive devices], and more and more of those came out on the roads. At that point, we were using sandbags then to basically up-armor our own vehicles because there was not such a thing in our company as an up-armored vehicle. That is really where our arsenals came into play at that time and filled a critical role for the men and women that were on the roads in Iraq and, in turn, Afghanistan as well. They rapidly filled a need that the United States Army and the other components needed with up-armor kits. They did that in the drop of a hat. So we are very, very thankful for that.

Unlike depots that perform maintenance on existing equipment on a more predictable basis and which are guaranteed a large percentage of Army maintenance, arsenals do not have a predictable workload. They do not have that type of supply.

Can you talk briefly about the critical capabilities our arsenals provide to our national security efforts and what we can do to increase their workload? Because they are so valuable to us in our time of need.

Lieutenant General DALY. Senator, that is a great question. Thanks.

In terms of our strategy going forward for our arsenals, as you pointed out, the ebb and flow of that workload—there are critical capabilities within the arsenals that are needed to support the warfighter and readiness not only for the Army but for the Joint Force. As you know Watervliet in terms of what they do, in terms of manufacturing gun tubes and cannons, but also the Joint Manufacturing Technology Center at Rock Island is very, very critical in terms of their capabilities. As you know, we are increasing their workload.

The initiatives that we have ongoing right now with AM General in terms of humvees but across the board—we are working hard at looking at the critical manufacturing capabilities needed at those arsenals and how we workload them predictably over the future. We are developing this comprehensive strategy that looks at that, that maximizes their abilities, and again going back to the workforce, utilizes our artisan skill set to be able to provide those capabilities to the warfighter.

Senator ERNST. Just as follow-up please, can you provide us with an update on implementing guidance for a make or buy analysis when it comes to our DOD procurement?

Lieutenant General DALY. I can, Senator. In fact, a make or buy policy was just signed by the Assistant Secretary of the Army for Acquisition, Logistics and Technology on the 15th of March. What we are looking at now is the comprehensive strategy and implementation plan associated with it. So it goes much more beyond just cost in terms of evaluation criteria. This gets at your point in terms of make or buy and the value of our arsenals. We expect that our implementation plan will be done within the next 30 to 60 days, and we look forward to sharing that with you.

Senator ERNST. Excellent. I appreciate that very much, General. Thank you.

I will yield back my time.

Senator INHOFE. Senator Perdue?

Senator PERDUE. Thank you.

Any hearing where the witnesses either outnumber or match the number of Senate members in here, you know it is an interesting topic. Thank you, guys, for all being here.

I have 5 minutes. I am going to be very brief.

Aside from the funding issues that we have all talked about before, the CRs [continuing resolutions] and what it does to you guys, sequestration, the Budget Control Act, I would like each of you to respond to one question. That is, would you rate your readiness capability right now within your command 0 to 10, 10 being ready to go to war tonight or best in class, however you want to do it? But then give us three priorities that you are working on right now that would bring that back up to where you want it to be. Each of you, if you will. General Daly, do you want to start? Admiral Moore, he was trying to get you to go first.

Vice Admiral MOORE. I am happy to go.

Senator PERDUE. Do you want to do that? That is fine. You guys are filibustering my 5 minutes here.

Vice Admiral MOORE. I am happy to go first.

So I think we are probably at a 6 or a 7 where we are today, which is probably better than the 3 or 4 I would have rated it at last year because we have started to grow the size of the shipyards, and we are almost at the capacity that we need to get to.

A challenge remains. I really liked the slide that Senator Kaine handed out. I actually like the logo on the upper left-hand corner there as well. I have seen the slide before.

If you are talking the three challenges that we have, so, one, as we grow the size of our depots, the average age of the workforce has gone down. So we have a relatively inexperienced workforce compared to where we have been today. Now, that will start to stabilize and come back up as we sort of get to the level that we need to be at and just kind of hire at the level that we attriting at. So that would certainly be one of them.

The second thing is I think in the naval shipyards and in my private depots that are doing surface ship repair, we are competing with the big tier one yards, Electric Boat, Newport News Shipbuilding, et cetera. As we ramp up to build new ships, we are competing for the same talent to repair the ships as they are as well. So there is a competition for the talent going on out there, and I think it is something that we are going to have to collectively address with industry to ensure we are getting the skilled labor that we are going to need on both sides, on the new construction side and on the repair side.

Thirdly, I would tell you the third most important thing is a stable and predictable workload or stable and predictable funding, if you will, as we move forward. That is the one thing that really prevents the private sector from making the long-term investments they need to be able to manage the growth to 355 on the new construction side but also the repair work that is going to come along with that.

So those would be the three things that I think would be the biggest challenges for me going forward.

Senator PERDUE. Thank you.

Vice Admiral GROSKLAGS. Senator, I will be brief.

The first is infrastructure, which I touched on earlier. That includes both the facilities themselves, as well as the support equipment and tooling that lets the workforce do their job.

The second is getting the skilled workforce that we need, the challenges with engineering, logisticians, but it is primarily for us with the skilled artisan in some of the very specific trades. So somebody asked earlier—that direct hiring authority is absolutely critical to us for that.

The third thing is transforming our workforce and our workplace and our depots, our Fleet Readiness Centers, into a digital organization and getting out of the paperwork business, which is what we are mired in right now.

So infrastructure, workforce, and digital transformation.

Senator PERDUE. Thank you.

Lieutenant General LEVY. Sir, thanks for the opportunity to comment on that.

So you asked for a score, so I will give you one. I would give it an 8, 8 and climbing. But it is something we focus on. But I would offer that it is not simply the depot or the air logistics complex system. I would offer that it is the entire logistics kill chain that we integrate.

To that point, there are parts of that that I would tell you that keep us from being better than we are today and things that we are focusing on.

First and foremost for us would be software. If we are going to be a fifth generation Air Force, we need a fifth generation workforce, and that includes software sustainment capabilities. We treat software like hardware today, and we do not understand that our ability rapidly adjust software to meet emerging threats and protect against our own vulnerabilities is a challenge that we need to close the gap on very quickly inside of the larger industrial base. In my organization alone, 3,500 software engineers. So there is lots of work to do there in terms of how we accelerate our software velocity.

The second thing I would offer in my universe would be the supply chain. It is extraordinarily brittle. The industrial base is very small, both organic and commercial, and it presents some rapid expansion challenges for us in times of conflict.

Lastly, I would be remiss if I did not also say workforce, workforce, workforce. The quality, the nature, the ability to hire, recruit, and retain. We do not have the right 21st Century mindset for a 21st Century workforce across the entire skill set base in the DOD, and we really simply need to change that.

Thank you, sir.

Senator PERDUE. Thank you.

Major General CRENSHAW. Sir, one of the things—the number—I would say 7. Again, there is certainly room for continued improvement.

As I look at the areas of priority and focus, this kind of goes back to my opening statement. People are important, and we have to

have a viable workforce, one that is educated, one that is trained. Part of that is how do we train them in a manner that they are able to understand the new environment they are going to be operating in. We have kind of done that within the command, kind of explained to them what their future looks like. We are going to have to educate them in order to take on the new challenge.

We need infrastructure to make that happen. Again, a lot of our buildings, much as the other services, are old buildings. We need to institute ways to make them a building of the future which has all the efforts of wifi, you name it when it comes to what the new building looks like.

And then really the other one, sir, kind of capsulates on both, the interests of innovation. Because we recognize the environment of our workforce, we recognize the challenge of the workforce and the facility, how do you create an environment of innovation that causes people to understand how they fit into the organization. Once you get the buy-in as we see it from our workforce, that we will have the right skill set, right focus for our 21st Century Marine Corps.

Senator PERDUE. Thank you, sir.

Lieutenant General DALY. Senator, from an Army perspective, we are in the process of refining our comprehensive strategy for revitalization of the organic industrial base. So I would give it a 7 and climbing. In fact, that report—I know it was due to Congress here based on section 326 of the NDAA.

So three things that we are really focused on here, and it was mentioned by the other members of the panel here. One is workforce, the artisan skilled workforce that quite frankly is worth their weight in gold. With a workforce that in our case within the Army, 50 percent of the artisan workforce is over the age of 50 years old. And so to maintain that artisan workforce going forward is critically important. As you know, it takes several years to train and get an artisan to the level of competency that we need them at.

The second piece that was mentioned but it is also for us, infrastructure and facilitization. So not just the buildings but obviously state-of-the-art 21st Century depot maintenance equipment to be able to improve efficiencies and increase efficiencies on the production line.

Then the third is the way we are doing business in terms of change, and that is really developing and refining the way we workload our arsenals and depots and really to focus it on a workload that drives readiness to support the joint warfighter, and using business systems and innovation to do that, and in our business systems, looking at production planning, looking at auditability, and then looking at supply/demand forecasting. That would be overarching what we are focused on in this comprehensive strategy.

Senator PERDUE. Thank you, sir. Thank you all.

Mr. Chairman, thank you for your discretion. Thank you.

Senator INHOFE. Thank you, Senator Perdue.

Let me just ask one general question here. You heard in the opening statement—my opening statement—we had a little colloquy with General Levy. I would like to know from each one of you. You are having the same problems. I hear from both sides,

and I have even talked to our universities about this thing in terms of the problem with engineers. The quote that I used came from General Levy several months ago that they could hire every graduate that came out of Oklahoma University. How about the rest of you? Are you having the same problems?

Lieutenant General DALY. Mr. Chairman, I would like to take that question first.

In terms of the organic industrial base wage-grade workforce, quite frankly I think we have all the direct authorities for hiring that we need. So the six that were brought into the NDAA recently we feel very, very comfortable with. So between direct hiring authorities and then the Pathways programs, I could just give you a quick data point. To this point, we have hired about 147 with those new direct hire authorities, and then for the Pathways program, about 108 in the last year and a half. We see that increasing exponentially based on these new authorities going forward, again to get at the artisan workforce.

In terms of STEM, we have really taken a proactive approach within the Army. Quite frankly, again there I think we have all the authorities we need as well. So we are engaging with colleges and universities. We are attending conferences, Beta Conference, the Woman of Color and STEM Conference, Hispanic engineer conferences. Quite frankly, this past year we have made almost 100 job offers on site at those conferences, as well as at colleges and universities. So I think we are given the authorities now to be able to hire both wage-grade employees for our artisan workforce, but also STEM employees as well right now.

Senator INHOFE. So I think the short answer is no.

How about you, Admiral Grosklags?

Vice Admiral GROSKLAGS. Yes, sir. On the engineering side of the house, we are hiring significantly more engineers for our FRC support this year than we have in the past.

Senator INHOFE. Are you finding it, though?

Vice Admiral GROSKLAGS. To date, we are doing okay. As I mentioned in response to Senator Perdue's question, we are actually having a harder time with certain skill sets in our depot artisans, particularly in areas where there is a lot of competition like San Diego and where there is a very high wage rate. Our engineering workforce is spread around the country, and to date, we have been able to hire the engineers that we need. But it takes a lot of work.

Senator INHOFE. Admiral Moore?

Vice Admiral MOORE. Yes, sir. On the engineering side of the house, we have to work hard to get them, but we are not finding on the engineering side of the house that we are challenged to find the engineers that we need in the depot.

Senator INHOFE. General Crenshaw?

Major General CRENSHAW. Sir, today we are fine with them. As we look at are we going to envision our new depot, what is it going to look like, there will be a requirement for additional engineers. But today we are fine with it, sir.

Senator INHOFE. Senator Kaine?

Senator KAINE. Thank you to the witnesses.

Admiral Moore, I want to ask you about this chart first since you noticed my NAVSEA [Naval Sea Systems Command] in the upper

left. You can look at this chart two ways. So tell me what this chart says to you. It clearly shows that the average years of experience of shipyard workers and production workers is coming down. That could also be a sign of health if it showed a workforce where everybody was near retirement, now we are successfully bringing in younger people, and that is bringing the average years of experience down. So do you look at that chart as exemplifying a problem or some positives or a little bit of a mix?

Vice Admiral MOORE. Well, I think if you look at the chart, it was a negative probably up from fiscal year 2006 to fiscal year 2011 because that was an era where we were not hiring and we were losing experienced workers.

I think that what you are seeing from 2011 on—and you will notice in 2016 and 2017, it has leveled out. I think it is a positive because we have ramped up substantially, and we are going to be at 36,100 by the end of calendar year 2018. At that point, then I adjust the faucet so that the attrition, which is about 6 percent historically, matches the people I am hiring. And so you will start to see, I suspect, starting in fiscal year 2018—

Senator KAINE. It will start to come back up.

Admiral MOORE.—you start to see this number come back up. So I think this is kind of a tale of two cities here, probably not a good news story for the first half of the chart, but probably a reflection of a pretty good news story going forward that we have recognized that we have got to bring the capacity of the depots back up. This was a necessary outcome of hiring the people.

Senator KAINE. Excellent.

I want to ask you about the shipyard infrastructure optimization plan. That plan suggested significant additional investment, \$21 billion over the course of a number of years. This is going to be an optimization and modernization while you are also using the shipyards for normally scheduled maintenance availabilities.

Talk to us about sort of how you plan to execute over this long period of time if we do what we need to do budget-wise and what will sort of the metrics and measurements be to determine whether those dollars are being invested the right way to get us where we need to be.

Vice Admiral MOORE. Yes, sir. Thanks for the question.

So we, as we go, make the investments in the yard. This is the first time that we have put an integrated plan together that looked across all four yards.

We know where the investments are going to be made year to year. What we will do is we will make sure that the work in that particular depot in that year—we will make sure, for instance, if I am working on a dry dock at Norfolk Naval Shipyard in 2022–2023, we will clear out dry dock work to the left and right of that so we will not interfere with that.

But undoubtedly, there is going to be some impact to productivity. It is kind of like—my analogy is—I have been living here for 19 years, and when I first moved here, they had not built the mixing bowl yet and you still had to get to work every day. But somehow they were able to figure out how to go build the mixing bowl, at the same time allowing—

Senator KAINE. I was the governor when we built the mixing bowl.

Vice Admiral MOORE. You sure did a great job. I think it was on cost and under schedule.

[Laughter.]

Vice Admiral MOORE. So we will have to be sensitive to watching productivity in particular when we are moving and building new shops and moving the workforce in the yards. We will have a plan to do that.

As far as the long-term metrics on how this plan goes, we are going to manage this like a shipbuilding program, not like four individual shipyards. So we are standing up a program office, which will have the authorities to go manage this. I am going to be the person responsible for the plan. The Chief of the Naval Installations Command and Facilities Command will all work for me so that we can integrate all the pieces together.

So two things. Near term what we will measure is our ability to get things under contract and meet program milestones, and then as we start the work, we will measure productivity in the shipyards and throughput. So we will be able to show you, as we start working on these projects and as we start to recapitalize the yards—you will see the cost performance and the throughput in these individual yards improve. Ultimately, when we finish the plan, we believe that the plan itself eliminates 6 percent of wasted time in the shipyards just traveling to and from the buildings to the docks. So the long-term plan will provide substantial savings and throughput, and we should be able to execute the same amount of depot work that we are today with probably a smaller workforce than we have today going forward, and I think that would be good news for all of us.

Senator KAINE. I have one, Mr. Chair, that is going to require a little bit of an answer. So why do I not allow Senator Rounds to go first?

Senator INHOFE. That would be great.

Senator Rounds?

Senator ROUNDS. Thank you, Mr. Chairman. Thank you, Senator.

Vice Admiral Moore, you talked about this in your opening statement a little bit, but I would like to pursue it a little bit more. When you and I met back in September of 2017, we discussed the attack sub maintenance delays. Of particular concern to me at the time were the delays facing the USS *Boise*. I understand that insufficient public shipyard capacity has led to cost inefficiencies and delays and that the Navy was rescheduling some of the planned maintenance to private shipyards. I believe the USS *Boise* was rescheduled from a 2016 public shipyard planned maintenance to, if I am correct, to a 2019 private shipyard availability. Now, you talked about this briefly earlier in your comments.

Would you mind giving us some more information both on the delays surrounding the *Boise*, where it is at right now, and then also as well the other nuclear attack subs that may also be experiencing similar delays and what the plans are to eliminate those delays?

Vice Admiral MOORE. Thanks, Senator, for the question.

So there are no other *Boise*-like submarines out there. So we have gone back and looked at the rest of the submarine fleet and ensured ourselves from an engineering standpoint and where they are going to be loaded in the yard that we do not have the delays that we saw on *Boise*.

You know, there is no reason that *Boise* should have happened. The Navy should have been able to predict far enough in advance that we did not have the capacity at our naval shipyards to do that work.

So today, *Boise* is going to go to Newport News Shipbuilding starting in January 2019—you are correct—and we will deliver in the 2020 time frame. So we are talking about a substantial period being off line.

We have gone back and looked at the rest of the submarine fleet. We have also recognized that when we do not have the capacity in the yards, we need to go look to the private sector. We have four submarine availabilities right now, USS *Helena*, USS *Columbus* and *Boise* at Newport News Shipbuilding, and USS *Montpelier* up at Electric Boat [EB]. Both Newport News Shipbuilding and Electric Boat have told the Navy they are happy to provide capacity when we reach a situation when we do not have the workload.

So as we move forward, we absolutely have the ability to predict when I have too much work for the capacity in the shipyards I have. That is going to be minimized by our growing the workforce from around 30,000 up to 36,100. But we know far enough in advance that if I do not have the capacity, we should move to go put that work into the private sector where the capacity exists.

Senator ROUNDS. I have got to ask this, and perhaps I am misunderstanding. But it seems that last time that we were in this room and talking about these issues, there were at that time several other nuclear attack subs that were in the same position or coming up on the same position as the *Boise*. The *Boise* had been docked not in dry dock or not in depot, but had been docked for more than 3 years. Perhaps my information is off by a year. But I am just curious. What changed from last September until now that allows us to feel confidence that the backlog at the depot or at the facilities has been addressed? Because we had those private facilities and public facilities at that time as well. What changed in terms of management style or management directives?

Vice Admiral MOORE. So I think it is two. It is certainly a management directive that we look further out than we did before. So that is why you have the four submarines in there today. We are looking very closely, as we head out into 2020, 2021, and 2022, where we have a significant amount of work, is there opportunity to perhaps put some of these submarines into the private sector at Newport News and Electric Boat. In fact, it may have a benefit to both Newport News and EB as they have a requirement to start ramping up their workforce as they start to build *Columbia* and the two carriers. So there is a benefit there.

To your first question on what has changed since last November is we have done a detailed engineering analysis of each submarine, and I can tell you there are no *Boise*-like submarines out there. There are a handful of submarines which will have a delay getting into a yard on the order of months, single digit months, less than

5 months, versus the *Boise*, which was years. So we have the capacity in the shipyards to go put these submarines into the availability, and we will not have another case of a submarine sitting pier-side for years like *Boise* has before we start the work on her.

Senator ROUNDS. Very good.

Thank you, Mr. Chairman.

Senator INHOFE. Thank you.

Senator KAINE?

Senator KAINE. Yes. Just one last question that I wanted to ask, and it is really for each of you.

There has been some indication that committee members have heard that the Department is considering outsourcing some of the depot and other organic industrial base facilities to private contractors for cost savings or other reasons. I would like each of you to talk about that as we seek to rebuild the military and improve readiness. Do you think that we need to outsource more work to contractors? Is that sort of the plan that is in place in any of your responsibilities, or is there more of a focus on strengthening the Government yards, depots, and workforce? It could be a little bit of both. So I am curious.

Lieutenant General LEVY. Senator, thank you for the question.

So from an Air Force perspective, we are actually bringing work into the organic industrial base. What we find is that we have been more cost effective and we have achieved greater throughput through our efficiencies, through our ability to implement across my logistics enterprise, the command I am lucky enough to lead, called the "art of the possible." That is how we manage the horizontal enterprise. By doing that, we have created efficiencies, cost savings, throughput improvements, readiness increases, all the numbers that you would look for in that kind of activity. What that has done is it has created some competition in the marketplace where in some cases there has not been competition. We have raised our performance, and that has given us capacity and capability and desire to bring work in.

A great case in point at Robbins Air Force Base. By improving the performance on some of the C-130 lines, we increased the capacity and drove the cost down such that we could go back to the Air Force and say, you want to put infrared countermeasure systems on those airplanes? Okay, we now can do that more affordably and we have the real estate, if you will, to bring those airplanes and do it when previously the Air Force did not have the money allocated and did not have the time available in the production flow.

So we have been able to do things like that across the enterprise not just for airplanes but for software—and we can talk about that extensively—but also for commodities. I would also tell you that at least in our organization, 70 percent of what I do is for the Air Force. The other 30 percent is for my teammates here to either side of me, for example, Navy and Marine F-135 engines for the F-35 at Tinker, and I could go on and on supporting the F-18's, et cetera.

So that increase in performance and improvement in capacity allows us to help the joint team as well, not just the Air Force team. So not much desire at all to move it to the commercial space. It

is actually quite the opposite because of performance, efficiency, and effectiveness reasons.

Senator Kaine. How about our other witnesses?

Major General CRENSHAW. Sir, again, a great question. Thanks for allowing me to have a chance to speak on it.

I think there is value when you look at, in some cases, surges, how the industrial base or commercial can support you. But I think as the Marine Corps, being able to support the Marine Corps, being able to be able to deliver as required to support our Commandant's requirement, at the same time as I spoke to earlier, as a depot and arsenal, we have numbers of groups. I look at where is the best place to go to get work done. The Army does a lot of work for the Marine Corps at Anniston. The Army does our tanks. At Letterkenny, they do work for us and Tobyhanna, even to include the Navy and the Air Force. So we do have, I believe, a good commission that kind of outlines where are the best places to put the resources based on type of work that needs to be done. But I think there is value when it comes to maybe surge capability that we cannot field, for whatever reason it may be, that we rely on the commercial industry to provide that gap for us.

Senator Kaine. Please, Admiral Moore.

Vice Admiral MOORE. Yes. First and foremost, the most important thing is to make sure that the public organic depots are sized properly to handle the work. So there is no plan to outsource significant amounts of work to the private sector.

Having said that, you would like a level workload. That is the best, and we do have an obligation to manage the entire industrial base. Where there is opportunity in a year where we may have more work than we would typically have in a normal year, I think it would make sense for us to go look to the private sector as a way to kind of balance that out. But there are no plans, in the name of cost savings, to outsource work.

Senator Kaine. Thank you, Admiral Moore.

Vice Admiral GROSKLAGS. Senator, there is certainly no overarching plan one way or the other, quite honestly. We deal with each individual case kind of on its own merits both from a business as well as a risk management perspective, whether or not we want to keep that work inside the Government. One area where we have started establishing more commercial capability is second sources of component repairs that we do at our organic sites to help with some of the workload. But if I look across our expectations for our organic workload for the next 5 years, it is not going to go up or down dramatically over that time period. It is fairly consistent.

The other thing we are seeing more of, quite honestly, are public-private partnerships where we and industry are teaming. One or the other has the lead, but we are working together to get capabilities back out to the fleet.

General Levy mentioned, I think one of the areas where we are trying to pull actually more work into the Government is in software, and we would really, I think collectively with the Air Force, like to get our arms around the F-35.

Senator Kaine. Got it.

General Daly?

Lieutenant General DALY. Senator, I appreciate the question.

Just as was mentioned earlier, I think it comes down to the exact type of work. There are some specific critical manufacturing and depot capabilities that only exist in the organic industrial base, for one, and then looking at where our centers of excellence are in our 23 organic industrial base facilities, whether they are in maintenance or ammunition.

The second piece is in terms of private-public partnerships. Right now, we have about 263 private-public partnerships valued in terms of revenue at about \$263 million. So that is situations where we have companies that are operating in our depots hand in hand. Obviously, it affects cost. It affects quality. It shares best practices and then drives innovation as well.

Then the third piece is the joint workload that we just talked about. So we do, as you know, a significant amount of joint work. If you look at Anniston, for example, mentioned with M-1 tank engines, the M-1's—and our joint work right now is about \$5 billion over the past several years with about \$500 million programmed for this upcoming year.

So it is really a balance of all to really get at the complexities and the totality of the capabilities in the industrial base.

Senator KAINE. Great. Thank you for that full answer.

Senator INHOFE. Senator Perdue?

Senator PERDUE. Thank you again.

I just have one closing question. I do not need a response from all of you, but I would like you to think about this. This is bigger than your responsibility, but you guys have the backbone of our kinetic responsibility of getting ready to fight again.

But also in the other two domains, we mentioned space, General Levy. Nobody has mentioned cyber today. I will hold that to the side.

But in terms of the leadership continuity, each of you are laying in plans right now that will go beyond your tenure. That is the normal thing at your level. You are the up and comers of our DOD leadership, but you will be on a new responsibility as these plans come to fruition.

Are we in a moment of crisis that we need to review that at this level of leadership? I am not talking about chain of command progression, et cetera, et cetera. But this is a difficult question. A new leader comes in. New priorities are set. A new focus is made, and all of a sudden we might lose the continuity that you guys are laying in right now. This is coming from a guy that has been a turnaround guy doing exactly what you are doing right now. If you had changed the top guy in the middle of that process, I guarantee you it would slow that process down, change directions. It would be an inefficient use of resources.

My challenge within the DOD structure of moving individuals through their career at this level—we are all at very senior levels here. How would you respond to that today? I mean, how should we think about that here in terms of trying to—I know our biggest responsibility is getting the funding. We got that and we are on it. I consider that the most important thing in the United States Congress today is to fix that one thing. But aside from that, I am looking at something here that—please address the continuity of lead-

ership as you go through a multiyear effort to get this thing turned around. Anybody. Admiral, you reached first.

Vice Admiral MOORE. I should have let the marine go first.

[Laughter.]

Vice Admiral MOORE. So I think it depends on the job. So if you are talking major business-oriented job like a systems command or a program executive officer, I think having longer tenure agreements to stay in these jobs makes sense. I was the program executive officer for an aircraft carrier for 5 years. So that is a substantial amount of time to really try to go make change. I do not know if I will be in this job for 5 years.

But I think there are particular jobs which are very business-oriented, if you will, and change-oriented, talking about management plans. Those jobs probably require us to stay in those jobs a little bit longer than we would, say, in some of the fleet operational jobs where you have got to go build a skill set pretty quickly to move up to the four-star rank.

Senator PERDUE. Sorry. But the turnover at your level is not necessarily the entire story. You have got big staffs that run this too. And so you do not turn everybody over at the same time. Is that correct? I mean, for the most part.

Vice Admiral MOORE. That is correct. At the systems command, 90 percent of the systems command is civilian. So I have a very strong leadership team there that provides some of that continuity as well. So there is a balance there. It is not a wholesale change-out. I may move but a lot of the senior leadership at the systems command will stay in place.

Senator PERDUE. General Crenshaw, do you have something?

Major General CRENSHAW. Sir, just from the Marine Corps perspective, if you look at this, it is really much broader than at the level that I am at at this command level. It is a top-driven issue. We do not operate independently in terms of what that cyber plan is. It is less about the individual who is in command. It is more of a process, what type of things we have in place that allow that focus to stay.

Marine Corps Cyber Command kind of has that overarching responsibility in terms of how do we fight this and what are the right process and policies and training that is required that goes into the various commands at different levels. So it is not an independent command. It is more of a Marine Corps process and overarching approach and how you get after that. So almost anyone can come in and fill the shoes and continue to move because the process in place allows us to get after that issue of cyber threat, sir.

Senator PERDUE. Thank you.

Senator INHOFE. Thank you, Senator Perdue.

First of all, the line of questioning that Senator Kaine came up with talking about the core capability, no one said it, but let us go back historically. The reason for that is—it is a security reason that we have to keep that capability there. I can remember back when—I have been around long enough—there were a multitude of contractors and all of that. Then when it became smaller and smaller, to me that became more important because we do not want to be in a position where we are held hostage.

I would just ask you a yes or no question. Do you think right now with the requirements that we have concerning core capability that is adequate in your minds?

Lieutenant General DALY. Mr. Chairman, I think it is adequate right now.

Vice Admiral GROSKLAGS. Adequate and appropriate.

Vice Admiral MOORE. Yes.

Lieutenant General LEVY. Yes, Mr. Chairman, I think so.

Major General CRENSHAW. Yes, sir.

Senator INHOFE. Even though it was totally arbitrary.

We had a hearing yesterday, and we talked about the—well, I would say the aircraft—the problems that we have right now. We have the KC-46 is going to be coming on board. We have had the KC-135 for 61 years. We have discontinued the production of a KC-17—or C-17. When you are looking at this and we are looking at the fact that the KC-46 is still down the road—and this would be for you, Admiral Grosklags and you General Levy—do you think the math is going to work on that? And is that not going to have the effect of increasing your workload? Are you going to be capable of handling that? Because the big question that was before our committee yesterday is the math working in terms if we are going to be able to keep the equipment going long enough until help has arrived with the KC-46. What do you think about your capability of doing that? Because the older the vehicles get, the longer it takes to maintain.

Lieutenant General LEVY. So, Senator, thanks for the question.

You are spot on. Absolutely, the older the equipment gets, the more it takes to maintain and the more it requires us to plan and be thoughtful and the more it requires us to manage the industrial base to support that weapon system. So I will give you a vignette on the KC-135 and then I will connect it to your KC-46 question specifically.

So the single source repair for the KC-135 for modification and for maintenance repair and overhaul for depot maintenance is Tinker Air Force Base. Last year, they did 73. They are on track to do 75 this year. That is a pretty significant number of airplanes. All the while the workload package, the amount of work, if you will, the hours, however you want to measure it, has almost doubled—almost doubled—but yet we have held the amount of time that they have remained in the facility fairly constant, accommodated that almost doubling of workload, and still met the warfighter requirements to produce the aircraft availability that he or she needs to fly.

Senator INHOFE. You see that is the past. I am projecting forward.

Lieutenant General LEVY. So if past is prologue for us and I look at the trend lines, I would say we are absolutely poised to continue to support the KC-135 while the KC-46 comes on board. I think that is your specific question, sir.

Senator INHOFE. Well, it is. Right now, they are talking about 179 is the figure they are using in the KC-46. But we always know that—you know, it is going to fall behind that. We know that. But go ahead.

Lieutenant General LEVY. So as the sustainment guy, I will not necessarily speak to the requirements side of that. I will leave that to Air Mobility Command and U.S. Transportation Command [TRANSCOM]. That is maybe a little bit out of my lane.

But to your question about can we keep the 135 going as the KC-46 comes on board I think is sort of your question for us as professional sustainers, the answer is yes. As you know, the Air Force has a plan to keep the KC-135 in the inventory till the 2040s time frame. So we are on path. We are on course, on glide slope to do that.

Senator INHOFE. Admiral?

Vice Admiral GROSCLAGS. Senator, it is kind of an interesting question. When I look at the new platforms we have coming on line—take P-8, for example, where there are certain pieces of equipment on that aircraft, certain parts that we are 100 percent organic. There are other parts such as the engines and big chunks of the airframe, because it is a commercial derivative aircraft, that it makes much more sense to use commercial capabilities that already exist out in the private sector. So that is one instance.

F-35 is another great example where General Levy and our organization are working with the program office to try and increase the speed with which we transition that work from the private sector into our organic depots. I think it is important to note we have the ability to surge or increase our capacity. We just need a couple years to do it, whether it is facilities or as we have talked today about workforce. So bringing a new airplane on line or new type model series or taking something that is in the commercial sector today and bringing it into the organic sector does not concern me at all as long as we have got the amount of time we need to plan and get adequate workforce and tooling in place.

Hopefully that answers your question. I think it depends on the airplane.

Senator INHOFE. Yes, it does. This comes from the hearing we had with TRANSCOM yesterday. So I knew we were going to be in this today.

All I have left is one. I want to get this on record for each one of you to respond to two things. You had to be going through a real era of trauma before we took care of the fiscal year 2018 and fiscal year 2019. What I would like to get from each one of you, if we are not able to continue to do that, because that stops in fiscal year 2020—now, if that should happen, what is going to happen to you at each of your facilities if we do not rectify that and continue that past the end of fiscal year 2019?

Lieutenant General DALY. Mr. Chairman, if we do not continue beyond 2019—

Senator INHOFE. So it goes back, you know, what happens if we do not.

Lieutenant General DALY. I am sorry, Mr. Chairman.

Senator INHOFE. Well, you know the consequences if we cannot continue what we did in 2018 and 2019 into future years.

Lieutenant General DALY. Yes, sir. If we do not continue beyond 2019, there will be significant adverse impacts to the organic industrial base.

Senator INHOFE. Okay. Try to be a little more specific.

Vice Admiral GROSCLKAGS. My answer is going to be less about the organic industrial base and more about the readiness of the fleet because in the end the organic industrial base there is to ensure that we have that readiness. What you have seen up until the fiscal year 2017 additional funding and then into 2018 and 2019 is that the state of naval aviation readiness has degraded significantly over the last 7 or 8 years. That is due in large part to the fact that our readiness accounts, which include support for our fleet readiness centers, have been funded well less than the requirement.

I will give you a great example. Just spares for aircraft across that 8-year period was funded to an average of 72 percent of the requirement for 8 years. That is like skipping two full years of funding spares at all. That is the type of impact that will continue to perpetuate itself if we cannot get a consistent budget after 2019. It is both consistency as well as—people have mentioned—getting it on time at the beginning of the fiscal year.

Senator INHOFE. The reason I am asking this, we want to get something started on the record now to prepare for that possibility.

Vice Admiral MOORE. Thank you, Senator, for the question.

I agree with everything that Admiral Grosklags said, and I would additionally add that we are already seeing some of this in the private sector right now because they know the money is there in 2018 and 2019. They are not sure it is there in 2020 and 2021. Therefore, they can see the workload in 2020 and they should be hiring just like I am hiring in the naval shipyards, and they are hiring at a much slower pace because they are not sure the money is going to be there in 2020. So they are not hiring and they are not making the investments in the private sector surface ship facilities. We are already starting to see a little bit of a backlog in work in private sector surface ship maintenance because of their reluctance to make the long-term investments and hiring necessary because they do not know if there is any stability in the plan beyond 2019.

Senator INHOFE. Excellent.

Lieutenant General LEVY. Mr. Chairman, so I would agree with everything my colleagues said.

So we have been managing in this unusual fiscal environment. We have a 2-year agreement that adds funding. The majority of it, at least in the Air Force, is for modernization, which we very desperately need. It helps us with readiness. Please, do not misunderstand me. We are grateful for that. But we have the same concerns particularly in the industrial base, both the commercial and the organic industrial base, where I see, just like Admiral Moore opined, commercial industries somewhat reluctant to take risk because they are not sure that there will be the opportunity in 2020 and beyond. And so they are hedging.

What that does for us from a readiness perspective is that sort of diminishes the value of the money you have given me today—right—because the vendor says I am not sure you are going to be there in 2020. I am not so sure how much I am going to respond to you today even though you have money today. That runs a readiness risk. So in one or two little examples, it is not particularly impactful, but what I would tell you is across the \$9 billion of the

supply chain that I manage for you every year, it is corrosive. When that corrodes, it affects fleet readiness, and when that affects fleet readiness, pilots do not fly. When pilots do not fly, they leave the Air Force. All of these things are very interconnected from the budget to the industrial base, both organic and commercial, all the way to our readiness of our Air Force, sir.

Senator INHOFE. Excellent answer.

General Crenshaw?

Major General CRENSHAW. Chairman, sir, thank you.

I could not have stated it any clearer than what has been said earlier.

I would add it is all about readiness. For the Marine Corps, it is. We are trying to maintain some legacy systems today as we wait for our new ACVs [amphibious combat vehicles] to come on board, other new tech equipment. And so not having that dedicated funding and deliberate funding can reduce our readiness, as well as General Levy talked to, there is a possibility of our workforce. So what do they do? As they start to read the tea leaves as well, do we have a probability of the workforce moving to another sector where the organic base now does not have that workforce to meet the potential workload of the future. So all those are different variables that we kind of look at as we address the funding issue as we go forward, sir.

Senator INHOFE. We saw the problem that you had with the F-18 during this past 4 years.

All right. We do not have any more questions. We appreciate very much—I really wanted to get this on record, though, because people are kind of shrugging their shoulders. They are not too sure. There is a lot of competition with defending America. I do not think there should be but there is. So we want to prepare for it now.

I appreciate all of you and the statements you made and the help you are to us.

We are adjourned.

[Whereupon, at 3:57 p.m., the committee was adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR DAVID PERDUE

WORKFORCE ISSUES

1. Senator PERDUE. Lieutenant General Levy, in your written testimony, you discussed the antiquated hiring process for the civilian workforce and the need to recruit and hire a “fifth-generation workforce” with an emphasis on Science, Technology, Engineering, and Math. Can you tell me, how long on average, does it take you to hire a scientist, an engineer, or a trained mechanic?

Lieutenant General LEVY. Scientists and engineers (S&E) average 97 days; trained mechanics average 114 days.

2. Senator PERDUE. Lieutenant General Levy, what is causing this delay, and have you been able to overcome the hurdle of last year’s civilian hiring freeze?

Lieutenant General LEVY. With regard to the hiring freeze, due to the rapid approval process and exemptions the Depots did not have problems recovering. However, our Air Base Wings and supply chains are still recovering. Delays in Hiring: Overall the hiring process is slow to need as our average time to fill an S&E and FWS position in comparison with industry is significantly higher. We must continue to drive the timeline down through our Art of the Possible initiatives. In addition:

- *S&E*: The main challenge is keeping the candidate interested and engaged during the recruitment process while waiting for a firm job offer. Air Force Sustainment Center (AFSC) was 134 S&Es short of its hiring target of 417 in

fiscal year 2017 and will most likely fall short of the 560 target in fiscal year 2018.

- *Federal Wage Grade Positons*: Due to low unemployment and the changing landscape (i.e. higher levels of skills to support new technology, etc.), a trained mechanic is hard to find. We have a shrinking candidate pool as industry is paying higher salaries and making firm job offers to students prior to graduating the Vocational Technical Schools.

3. Senator PERDUE. Lieutenant General Levy, does the slow hiring process impact your ability to recruit new and talented people?

Lieutenant General LEVY. Yes on all fronts. We are facing a supply/demand crisis in a variety of different series. Whereas industry can compensate (i.e. salary increases, higher bonuses, etc.) if they face a shortage to meet their demands, the Department of Defense does not have the flexibility to react in a corresponding fashion in either the General Schedule (i.e. Science & Engineering, child care, air traffic controllers, firefighters, etc.) or the Federal Wage System (mechanics, Non-Destructive Inspection inspectors, etc.).

4. Senator PERDUE. Lieutenant General Levy, how can you stay competitive in the market for these highly qualified people?

Lieutenant General LEVY. There must be a multi-prong approach to this problem:

- OPM's Federal Wage Classification Standards, established in 1965, have had only minor revisions that have not kept up with the pace of technology and/or skills requirements. This is not progressive.
- We must recognize that the Federal Wage System employee skill sets, as well as the technology to operate in those environments, have changed. We must have the ability to develop a flexible, fluid process to classify positions that rapidly respond to our changing environments, enabling our supervisors to compete and pay for the talent they require.
- We must protect our benefits for our civilian workforce. There are numerous studies published which show the fifth generation workforce values quality of life issues more than higher salaries. Preserving existing core benefits, and exploring other opportunities for expansion, is a critical piece to our success.
- Expand flexibilities in support of school loan repayment programs, increasing funding for tuition assistance, moving costs to attract out of state candidates, recruitment/retention guidelines, graduate programs leading to Master's and, in some cases, PhD degrees paid for by the Department. Increase internship programs such as Palace Acquire, SMART Scholars, etc.

5. Senator PERDUE. Lieutenant General Levy, how would competitive salary and benefits for the STEM workforce improve the Air Force's ability to hire and retain a highly skilled civilian workforce?

Lieutenant General LEVY. The AFSC loses quality Science & Engineering candidates due to low starting salaries for our engineers in comparison to industry. We have made some advances with the onset of Acquisition Demonstration as we have established pay setting guidance based on local market conditions. However, due to limited budgets and unemployment conditions, we still fall short. We have combined the flexible pay setting with recruitment bonuses to help us fill the majority of our positions. A competitive salary, combined with increased quality of life benefits and additional flexibility in work hours would enhance our ability to effectively compete for, and retain, these talented individuals.

6. Senator PERDUE. Lieutenant General Levy, what more can be done on our end to help you hire the right people faster?

Lieutenant General LEVY. Defense Acquisition Workforce Development Fund (DAWDF) funds are sporadic in delivery making early recruitment initiatives within our Science & Engineering community difficult. We need Congress to help advocate the continued support of this funding as it helps us deploy our critical outreach programs, offer incentives in sometimes budget constrained environments, and retain/develop our acquisition workforce. Initiate the security clearance process at the time of the tentative job offer; not waiting until the firm job offer is made. Many tentative job offers are made months in advance of the firm job offer. These months can be well spent clearing the selectee for the level of security needed. For example, the wait time for an F-22 employee security clearance is approximately 200 days after the person's effective date. If the selectee starts the security process at the tentative job offer stage, this could cut the time down to an average of 80 days.

7. Senator PERDUE. Lieutenant General Levy, as you know, SASC granted Direct Hiring Authority for depots. To what extent have all the DOD maintenance depots begun using the Direct Hiring Authority to hire new personnel?

Lieutenant General LEVY. Over the last 6 months Direct Hiring Authority accounted for 89 percent of our external hiring actions; 1398 personnel were on-board within an average of 79 days. Note: The remaining 11 percent were brought on board through veteran's hiring authorities (VRA, VEOA), Schedule A (30 percent disabled vet program, persons with disabilities), as well as traditional hiring.

8. Senator PERDUE. Lieutenant General Levy, has this authority been a useful and necessary tool used during recent hiring actions, and to what extent has this hiring tool been more beneficial or useful in certain regions of the country than others?

Lieutenant General LEVY. Direct Hire Authority has helped us revolutionize the way we hire in a number of ways. First, it has brought the supervisors directly in touch with the applicant where they can evaluate their skills and assess if the person is the best fit within their organizations. Secondly, it has enabled us to integrate our on-boarding (fingerprint, drug testing, and medical) processes into our hiring events. For example, we recently hosted a hiring event at Robins Air Force Base where we issued 44 firm job offers in approximately 2.5 hours. This included meeting with the applicant, working them through the on-board process, HR qualifying them, and tendering the job offer. Finally, it has provided the avenue to marry our forecasting with real time needs, gaps, and competencies as well as gauge our successes through our consolidated metrics.

9. Senator PERDUE. Lieutenant General Levy, given this authority, how do depots prioritize what critical skills and positions they plan to use this authority to hire for?

Lieutenant General LEVY. We have annual and supplemental requirement and determination reviews during the year which provide a baseline for future workload and how much manpower is required. This assessment enables us to prioritize critical skill sets if needed. In addition, our Depots work very closely with our Human Resource professionals to 'walk the wall' using Art of the Possible principles on a weekly basis. These meetings identify each gate in the hiring process to identify constraints. Additionally, they work through any affects this may have on hiring critical skills. Overall, Direct Hiring Authority has provided us with the authority to hire all skill sets. Use of these mechanisms allows us to manage very well.

10. Senator PERDUE. Lieutenant General Levy, do you believe an extension is warranted for this authority?

Lieutenant General LEVY. Based on our demonstrated success—a Direct Hiring Authority extension is critical to our ability to deploy combat power. Since Direct Hiring Authority was instituted, we have maintained a 95 percent manning rate. Of note, just three years ago we were at a 77 percent manning rate.

11. Senator PERDUE. Lieutenant General Levy, what other initiatives could assist in decreasing the hiring timeline associated with on-boarding new staff?

Lieutenant General LEVY. The critical nature of classification impacts our ability to respond to changing conditions and enables us to offer competitive salaries. We must have Congressional support to tackle the Federal Wage Classification Standards and re-engineer how we classify our positions. When positions are classified correctly we can decrease timelines because we are recruiting for needed skill sets rather than those that we have to accept, which subsequently bears a cost on our mission as we have to then spend time training personnel to meet the required/desired qualifications.

12. Senator PERDUE. Lieutenant General Levy, I've heard from people at the Robins Air Logistics Complex that the current direct hiring authority could be expanded to cover civilian engineers conducting plant service and planning. Would you agree that this would be beneficial?

Lieutenant General LEVY. The Department appreciates the many personnel flexibilities and authorities that Congress has provided the DOD, including those granting direct hire for certain occupations supporting national security missions. DOD's existing direct hire authorities have allowed for additional flexibility and efficiency; however, the number of stand-alone authorities—each with varying scopes of coverage, waivers of law, usage restrictions, and expiration dates—has increased variability and complexity, creating challenges within the DOD for simplified, efficient, and standardized use. The Department would prefer a comprehensive and stream-

lined direct hiring authority to meet all hiring needs. DOD hiring policies and processes must be as expeditious, clear, and concise as possible to enable DOD components to acquire new talent when needed.

ALBANY—TORNADO DAMAGE TO MCLB

13. Senator PERDUE. Major General Crenshaw, in January 2017, Albany, Georgia was impacted by not one, but two tornados. As you know, the Marine Corps Logistics Base suffered hundreds of millions of dollars in damage to equipment and facilities. Could you give us the total dollar amount of that damage?

Major General CRENSHAW. Total equipment and facilities related costs for clean-up, emergency repairs, permanent repairs to equipment and construction = \$396.8 million (\$208 million—Facilities) (\$188.8 million—Equipment)

14. Senator PERDUE. Major General Crenshaw, what is the status of the recovery and repair at Albany?

Major General CRENSHAW. Our regeneration effort following the tornado covered two broad areas, our equipment and our facilities.

Equipment: Approximately 47,390 pieces of equipment were impacted by the tornado. To date we have returned over 75 percent (35,587) back to ready-for-issue condition. The funding you provided to support these actions has been critical in rapidly getting us the resources necessary to perform this work.

Facilities: There were 64 structures damaged and in various stages of disrepair. Approximately 65 percent of the repairs have been completed. Twenty facility repairs have been completed to date, 44 facility repairs are ongoing, and four facilities were destroyed.

15. Senator PERDUE. Major General Crenshaw, what was the impact of Congress's inability to pass the 2018 budget on time on the recovery efforts in Albany?

Major General CRENSHAW. Funding delays caused by Continuing Resolutions (CRs) resulted in delayed procurement of parts, equipment, and services needed to recover and repair damaged property which ultimately slowed our recovery efforts.

ALBANY—NET ZERO FACILITY AND PRIVATE-PUBLIC PARTNERSHIPS

16. Senator PERDUE. Major General Crenshaw, Marine Corps Logistics Base Albany is on track to be DOD's first Net Zero installation. This is a major accomplishment that improves our warfighting readiness by enhancing energy security, energy resiliency, and energy efficiency. MCLB Albany's ability to become Net Zero relies heavily on crucial public-private partnerships with the local community. What is the status of MCLB Albany's Net Zero initiative?

Major General CRENSHAW. *Energy security:* MCLBA will be the first installation in the Marine Corps to achieve Net-Zero energy status. The base is on track for Net-Zero by Spring 2019 when it will produce as much electricity from renewable energy sources as it consumes. Therefore, we will no longer be dependent on the electrical grid.

Energy resiliency: MCLBA will be the first installation in the Marine Corps to have a fully functional and accredited Smart Grid. MCLBA energy resiliency consists of (1) Hardened against attack—Information Assurance, (2) Ability to quickly restore power from internal system failure, and (3) Ability to quickly restore power from external grid failure.

We have a fairly resilient grid now, as evidenced by the Jan 17' hit by an EF-3 tornado which severely damaged the base, but key facilities were up on generators within hours. However, much of the back-up power was diesel and was manually operated. The Smart Grid the base is currently installing will be automated and have the ability to open and close electrical switches to re-route power, start and stop generators, load shed non-essential services (such as reduce cooling and heating in facilities), etc . . . It includes all required cyber-security measures (hardware and software) and has been reviewed by the MCICOM G-6/CIO in preparation for full IA accreditation.

Energy efficiency: MCLBA has a large portfolio of cutting edge energy technologies to reduce overall energy consumption. An example is Bore Hole Thermal Energy Storage (BTES). The traditional chillers and boilers which heated and cooled my HQ building (800+ personnel) were replaced in summer 15' with a ground source heat pump (GSHP) system which included controls and dry cooling towers. The system was heavily modeled with technology which has proven very successful in the Netherlands and South Africa but is very new to the U.S. It has achieved a 52 percent annual reduction in overall energy consumption and a 100 percent reduction of water usage (the traditional cooling towers were removed).

17. Senator PERDUE. Major General Crenshaw, how important have public-private partnerships been to the Net Zero initiative?

Major General CRENSHAW. MCLBA relies on Energy Savings Performance Contracts (ESPC) to reduce energy consumption and improvements to vital equipment and infrastructure. Without this type of partnership MCLBA would not be able to fund energy projects to provide the base with energy resiliency as well as reducing energy usage. This also allows us to tap into outside resources which have far more experience doing these projects than the Government has. This partnership allows us to move forward without having to compete with other programs for funds that are needed elsewhere.

18. Senator PERDUE. Major General Crenshaw, what is the importance of our installations and industrial base being energy resilient and having robust energy security, and can you describe the cost savings achieved?

Major General CRENSHAW. A secure supply of energy is critical to enable our bases and stations to fulfill the role of force projection platforms and support the training the necessary to make Marines successful on the battlefield. To achieve this resilience, the Marine Corps is moving beyond the assumption that “energy will always be there,” adopting a proactive approach to improving its energy security posture by reducing dependence on external suppliers of vital energy resources through conservation, efficiency, and on-site generation, as well as improving the resilience of energy infrastructure against physical and cyber vulnerabilities.

A prime example is Marine Corps Logistics Base (MCLB) Albany which is a leader within the Department of Defense in utilizing third party financing agreements to implement innovative technology solutions to ensure the resilience of mission operations. Through an ongoing Energy Savings Performance contract (ESPC) with Chevron, methane gas from the Dougherty County landfill is piped aboard the Depot and converted into electricity and process steam to directly support the Maintenance Center. Included is the capability to support functions during a commercial grid outage. The resilience aspects of this project were on display in January 2017 when despite a direct strike by an EF3 tornado, the Maintenance Center was back on-line within hours of the event. Energy resilience solutions should not be limited to traditional standby or emergency generators. They can include integrated, distributed, or renewable energy sources; diversified or alternative fuel supplies; and movements to alternative locations, as well as upgrading, replacing, and maintaining current energy generation systems, infrastructure, and equipment. Cost savings can be attributed to reduced number of power outages and improved command and control capabilities allowing for greater support of critical mission requirements.

19. Senator PERDUE. Major General Crenshaw, what lessons learned from MCLB Albany’s successes have you or will you share with other installations across all the Services?

Major General CRENSHAW. I would say be sure to do ample research and question anyone who tries to sell a one-size-fits-all product or service. Ask the hard ball questions: Where have you done this before; Show us the measured results delivered from your company and bottom line guarantees with your service.

CROSS-SERVICE INFORMATION/WORKLOAD SHARING

20. Senator PERDUE. Vice Admiral Grosklags, this time last year nearly 2/3s of the Navy’s F/A–18 Hornets were grounded because of maintenance backlogs. Overall, more than half of the Navy’s aircraft were grounded. We’re starting to fix the money issue but fixing these maintenance backlogs is still going to take time and a lot of manpower. Cross depot maintenance within the organic industrial base may also be crucial in avoiding readiness issues in the future with programs like the F–35 Joint Strike Fighter. I believe we could find extra capacity for these backlogs through expanding cross-service depot maintenance operations, which is why I secured language in last year’s NDAA that directed the Secretary of Defense to assess the feasibility of expanding cross-service depot maintenance within the organic industrial base to avoid future backlogs. Can you update the subcommittee on what steps have been taken to examine cross-service depot maintenance for the F–18?

Vice Admiral GROSKLAGS. The Navy has two tools to service F/A–18 maintenance across inter-service depots. The first is a Depot Maintenance Inter-Servicing Agreement (DMISA) that puts an entire aircraft into another service’s depot for repair. The second is a component-level repair where another service provides a component repair capacity until the Navy’s workload has increased to meet demand. There are currently no Active DMISAs. DMISAs would be helpful if we had a capacity issue (facilities for example), but since this is not the case, an agreement to have another

service or even another depot work on the aircraft would only bring us to the same problem more quickly. The F/A-18 Program Office (PMA-265), has been approved to move a portion of the component workload as needed to meet production goals organically.

21. Senator PERDUE. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, have the Services conducted the required study on the use of cross-depot maintenance?

Lieutenant General DALY. The Army, along with its sister Services, is involved in extensive inter-Service collaboration within the DOD's Organic Industrial Base (OIB). This coordination includes:

- 1) a variety of meetings and information sharing groups;
- 2) the active and continuous coordination of actual depot maintenance assignment of all DOD Component Services' depot maintenance workload via the Depot Source of Repair (DSOR) determination process as outlined in DODI 4151.24; and
- 3) the Maintenance Inter-Service Support Management Offices (MISMOs), through its established network and their location within the depot maintenance and repair structure of each of the Services, provides a conduit for opportunities to collaborate and share best practices.

Vice Admiral GROSKLAGS and Vice Admiral MOORE. We are not aware of a requirement to have the Services conduct a study on the use of cross-depot maintenance.

Lieutenant General LEVY. Yes, the study was completed. The results were sent forward by the Assistant Secretary of Defense for Logistics and Materiel Readiness in March 2018, entitled, Report to Congress On Sharing of Best Practices for Depot-Level Maintenance Among the Military Services.

Major General CRENSHAW. The Marine Corps partners with our sister service depots to sustain our ground equipment to the point that we view the DOD depots as a system and not as individual capabilities. We are currently having our Tanks repaired at Anniston Army Depot, our radars are repaired at Tobyhanna Army Depot, and our High Mobility Artillery Rocket Systems (HIMARS) are repaired at Letterkenny Army Depot. We also source Tactical Shelters and Defense Advanced GPS Receivers (DAGRs) to Hill Air Force Base, and Raids and Recon equipment is repaired at Naval Surface Warfare Center in Panama City. Our Marine Depot Maintenance Command conducts depot repairs at our Production Plant in Albany, Georgia, or Barstow, California, for the Air Force on their Mine-Resistant Ambush Protected (MRAP) vehicles, High Mobility Multipurpose Wheeled Vehicles (HMMWVs) for the Army National Guard, and Tactical Power Generation sets for the Regular Army. Additionally, we rebuild Paxman engines at our Barstow Production Plant for the Coast Guard and the Navy which, propel their coastal patrol fleet.

22. Senator PERDUE. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, how could the Services benefit from cross-service depot maintenance in the future and with future platforms?

Lieutenant General DALY. We collaborate with each other through the Depot Source of Repair (DSOR) process to identify the best overall location for maintaining a new weapon system depot maintenance requirement. Each Service submits to the other Services their new program depot maintenance requirements for review. This process has several goals, to include: 1) identifying the overall best location for the performance of depot maintenance requirements; 2) creating transparency in the process; 3) limiting locations to the minimum necessary number to support readiness requirements; and 4) helping ensure compliance with the "CORE" laws (10 USC 2460/ 2464/ 2466 & etc.)

Second, looking forward, we expect to continue reaping the above benefits and even greater rewards. Areas for future improvement include: greater manufacturing within the Organic Industrial Base (OIB), especially the Army Arsenals and all DOD depot maintenance facilities, as well as, expanded efforts in the Joint Technology Exchange Group to share innovation, technology improvements and sharing of best practices in the maintenance fields. As our inter-Service cadre become more experienced and continue to expand their influence, a synergistic effect will occur and create greater cooperation between the Services. This is already underway and will have its greatest effect on future weapon platforms.

Vice Admiral GROSKLAGS. OSD has a program, the Joint Depot Maintenance Program, that has been employed for years to formally execute the Depot Maintenance Interservice (DMI)/DSOR process. It's a collaborative program whereby a requiring

service formally coordinates across other services to nominate a specific depot activity for its weapon system support. Once it receives concurrence from all services, then funds can be expended to stand up that depot capability. The DMI/DSOR process is codified in a fairly new instruction, DODI 4151.24. In addition, the Navy has OPNAVINST 4790.14B that also provides guidance regarding the formal DSOR process to the Systems Commands. Lastly, within the last year, the Joint Group on Depot Maintenance developed a Memorandum of Agreement between the services to leverage joint industrial capabilities and processes for depot level maintenance and manufacturing needs. We always look to leverage capabilities of the other Services to help optimize a program manager's investment in depot sustainment support.

Vice Admiral MOORE. OSD has a program, the Joint Depot Maintenance Program, that has been employed for years to formally execute the Depot Maintenance Interservice (DMI)/DSOR process. It's a collaborative program whereby a requiring service formally coordinates across other services to nominate a specific depot activity for its weapon system support. Once it receives concurrence from all services, then funds can be expended to stand up that depot capability. The DMI/DSOR process is codified in a fairly new instruction, DODI 4151.24. In addition, the Navy has OPNAVINST 4790.14B that also provides guidance regarding the formal DSOR process to the Systems Commands. Lastly, within the last year, the Joint Group on Depot Maintenance developed a Memorandum of Agreement between the services to leverage joint industrial capabilities and processes for depot level maintenance and manufacturing needs. We always look to leverage capabilities of the other Services to help optimize a program manager's investment in depot sustainment support.

Lieutenant General LEVY. The Services will benefit from cross-service depot maintenance relationships in the future by sharing business practices and processes, such as the capital investment program and public private partnerships, as well as exploring sister service capabilities before potential contract to non-organic entities with engagement of continued DMISAs. This brings efficiencies to the Department by capitalizing on existing organic capabilities, reducing CORE shortfalls, and achieving cost-effective readiness by increasing throughput and reducing costs. By utilizing cross-service depot maintenance practices, we are able to quickly match available capabilities to the emergent requirements. Internal to the Department of Defense, we are able to share information that one Service may have (i.e., Tech Data) and collaborate on the development of technologies and best practices improving our overall readiness and effectiveness.

Major General CRENSHAW. Continuing to collaborate with our sister service depots is an operational imperative given the need to conserve the resources that Congress provides. We have a Maintenance Interservice Support Management Office at our Logistics Command that interfaces with the joint community continuously. The joint body is responsible for Depot Maintenance Inductions and determining which service depot is best suited to perform depot maintenance on a specific piece of equipment, based on several factors including capacity and capability. We look to see which service has a niche for a certain platform, and that capability weighs heavily on the decision. Additionally we are working in a shared environment where collaboration is the daily theme. Our Depots share innovation, technology, and best practices with each other through the Joint Technology Exchange Group to ensure that we are operating at peak levels, and staying on the cutting edge along with our industrial partners in the civilian sector. So we plan to continue this collaborative theme well into the future as we continue to modernize our equipment sets and try to squeeze the most out of the resources with which we have been entrusted. We have had great success in this area over the years and will continue to enjoy that flexibility in the years to come.

JSTARS—LEGACY FLEET MAINTENANCE

23. Senator PERDUE. Lieutenant General Levy, I understand that JSTARS maintenance is done by a private contractor, and not at one of your depots. However, I was very concerned to see the DOD Inspector General's audit report regarding the maintenance of the E-8C JSTARS fleet. The report found that the Air Force overpaid in contracts for this work, and that the contractor did not meet aircraft availability metrics needed for aircraft operators to meet their mission requirements from 2011 to 2015. Do you think it would make sense to bring maintenance for the JSTARS fleet into the Air Force depot system?

Lieutenant General LEVY. E-8C JSTARS aircraft are a high-demand asset needed in theater today. We must find ways to increase aircraft availability. Adding an organic Program Depot Maintenance capability would help accomplish that goal. This initial induction should help prove that the concept will work.

24. Senator PERDUE. Lieutenant General Levy, what types of cost savings could you achieve, especially with JSTARS fleet being located next to the Warner Robins Air Logistics Complex at Robins Air Force Base?

Lieutenant General LEVY. Inducting an aircraft, and potentially others down the line, at Robins AFB may offer numerous advantages: the program office, operational wings, functional check flight crews, and Air Combat Command's flight test detachment are all located at Robins AFB; the community has significant expertise with JSTARS; the community of potential JSTARS mechanics is fairly broad; and transportation costs would be reduced.

25. Senator PERDUE. Lieutenant General Levy, is this something we should consider doing when the current contract expires?

Lieutenant General LEVY. Despite more than two years of intense focus on the contractor's depot performance, the amount of time aircraft are kept in depot remains too high. We have to find ways to do better and to increase overall depot capacity. Other JSTARS may be inducted in the future.

USMC—USE DEFENSE LOGISTICS AGENCY FOR SERVICES

26. Senator PERDUE. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, the Military Services have, to varying degrees, transferred retail supply, storage, and distribution functions at their depot-level industrial sites to the Defense Logistics Agency (DLA) and achieved some efficiencies. Specifically, Air Force Air Logistics Complexes (ALC) and Navy Fleet Readiness Centers (FRC) transferred all retail supply, storage, and distribution functions to DLA over the course of several years, which has led to a number of benefits, including a 20 percent reduction in on-hand inventory and a 10 percent reduction in backorders at the Air Force ALCs over a 5-year period. By contrast, the Army and Marine Corps have retained most supply functions at their depots and DLA manages inventory at the Navy shipyards while still using Navy systems and processes, rather than those of DLA. What steps are the Military Services pursuing in collaboration with DLA to improve the efficiency and effectiveness of retail supply, storage, and distribution functions at the depots and shipyards?

Lieutenant General DALY. Since BRAC 2005, DLA is using Army systems and processes rather than those of DLA at five of our industrial sites. Army and DLA have created a team of subject matter experts and have identified three Courses of Action (COAs) in determining a rough order of magnitude (ROM) for DLA providing full retail support at the Army organic industrial sites. Currently, this team is mapping out the business processes for these COAs and will present ROM assessment and updated COA analysis with recommendations to Senior Army Leadership for decision August 2018.

Vice Admiral GROSKLAGS and Vice Admiral MOORE. The Navy's transfer of supply, storage and distribution functions within the depots and shipyards to DLA have been completed. The Navy and DLA continue to finalize a Strategic Memorandum of Agreement (SMOA) to align the command and control structure within the shipyard to improve the efficiency and effectiveness of supply support functions executed by both DLA and Navy.

The Navy and DLA have a Performance Based Agreement (PBA) that provides senior leader engagement in an overarching framework for continuing cooperation, coordination and alignment of resources in support of Navy logistics. The PBA highlights key strategic and partnering efforts that affect DLA's collective ability to provide effective, efficient and best value to Navy FRCs. The PBA outlines the governance framework for the Navy-DLA Partnership Council, which provides senior level engagement and summarizes performance metrics (e.g., Total Customer Orders, Material Availability, Unfilled Customer Orders, and Aged Unfilled Customer Orders) and goals that both parties agree to use to measure success and support readiness. These performance metrics and goals are reviewed on a regular basis to ensure coordination of the repair and availability of parts and materials that could reduce fleet aircraft availability, directly impacting on the Department of Navy's ability to carry out the national defense strategy.

Lieutenant General LEVY. See Appendix A—Bullet Background Paper—AFSC Collaboration with DLA.

Major General CRENSHAW. The Marine Corps has already transferred some functions to DLA, has additional integration planned, and is assessing the potential for further incorporation of DLA support at the tactical level within the Operating Forces.

In 2009, Marine Corps Logistics Command (MARCORLOGCOM), the organization responsible for depot level repair in the Marine Corps, transferred depot-level industrial retail storage and distribution functions to the Defense Logistics Agency (DLA).

Given the success of the 2009 transition efforts to DLA and recommendations from a 2016 GAO audit (GAO-16-450), in October 2018, LOGCOM launched a continuous process improvement (CPI) event to develop a Business Case Analysis (BCA) that would provide an objective, third-party perspective on the merits of transferring the depot-level industrial “Supply” functions to DLA. Based on the results of the BCA, LOGCOM intends to move forward with transferring industrial supply functions to DLA in order to gain additional efficiencies in support of depot-level maintenance.

In addition to the efforts ongoing at LOGCOM, we are evaluating opportunities to leverage DLA capabilities to gain efficiencies within our operating force retail supply management units at the tactical level. We’ve conducted process improvement events at both Marine Forces Command and Marine Forces Pacific and are currently evaluating the outcomes. While there are some potential efficiencies to be gained through partnering at the retail level, we are working with DLA to ensure our forces maintain the right level of flexibility to provide effective support for exercises, deployments and contingency operations—especially during periods of reduced funding. I am confident we can find the right balance between DLA and organic capability. Most recently, at the USMC-DLA Service Day in early June, expanding DLA inventory partnership opportunities was the subject of detailed discussion. Both the Deputy Commandant for Installations and Logistics and the Director, DLA emphasized the value of increasing our interoperability and leveraging DLA resources.

27. Senator PERDUE. Lieutenant General Daly and Major General Crenshaw, why have the Army and Marine Corps been reluctant to transfer aspects of the noted functions to DLA and are there plans/efforts underway to do so?

Lieutenant General DALY. Army and The Defense Logistics Agency (DLA) have a collaborative team that is working to identify opportunities to improve effectiveness, efficiency, and cost of managing depot support inventories. The team is reviewing cost efficiencies between DLA and Army systems’ integration, and are analyzing solutions to develop mutual key performance indicators and metrics for optimum DLA retail support.

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QUESTIONS SUBMITTED BY SENATOR LINDSEY GRAHAM

SMALL ARMS INDUSTRIAL BASE—MEDIUM MACHINE GUN

28. Senator GRAHAM. Lieutenant General Daly, the Army has acknowledged that the M240 provides a unique and vital capability for the service. I understand that the Army intends to continue to operate the weapon well into the future. Sustaining this weapon technology and the industrial base that produces it is of critical importance to US national security. However, I am concerned that the current plan for the program, as reflected in the fiscal year 2019 budget and Future Years Defense Plan, does not provide sufficient resources to maintain and sustain the M240 industrial base. The M240 manufacturing process requires specialized facilities and a highly trained and skilled work force. A lack of sufficient production volume could result in a complete shutdown of the manufacturing capability, which would be very difficult to re-establish given the highly specialized nature of the process. Can you respond to the following questions?

Lieutenant General DALY. Yes

29. Senator GRAHAM. Lieutenant General Daly, how does the Army intend to sustain the M240 production capacity and industrial base for the projected life of the program until a replacement is developed and fielded?

Lieutenant General DALY. Army is at its Army Acquisition Objective on all M240 systems. Sustainment is done via organic overhaul at Anniston Army Depot. PM Soldier Weapons funded a limited survey conducted by TACOM on the M240B weapon system to assess the condition of the fleet for high tempo units to determine if weapon replacement is warranted. TACOM Weapons Equipment Specialists visited Ft. Bragg and Ft. Leonard Wood. PM Soldier Weapons has the results and will use that information to determine whether to pursue funding in support of weapon overhaul/rebuild, or identify funding necessary for replacement weapons.

30. Senator GRAHAM. Lieutenant General Daly, what would be the operational impacts of an M240 production shutdown?

Lieutenant General DALY. The current Fabrique National (FN) M240L contract is being extended through May 2020 in order to accommodate other Service buys, additional Army procurement as directed by Congress and spare receiver procurement to support weapons overhaul at Anniston Army Depot. The Army has procured enough M240 series to equip all units to their authorization. The Army has met its acquisition objective for M240 weapons and conducts weapon overhaul (as needed) at Anniston Army Depot to keep inventory levels sufficient to meet readiness requirements.

31. Senator GRAHAM. Lieutenant General Daly, what does the original equipment manager report the annual cost is to maintain the production line?

Lieutenant General DALY. The Rough Order of Magnitude to maintain M240 production at the minimum sustaining rate of 150 weapons per month is \$12-\$15 million per year.

32. Senator GRAHAM. Lieutenant General Daly, in the event of a production line shutdown, how long would it take to reestablish the line?

Lieutenant General DALY. Last year Fabrique Nationale (FN) did state that restarting a cold production line would take 44 months and cost \$16.8 million.

33. Senator GRAHAM. Lieutenant General Daly, what is the current Ready for Issue (RFI) M240 Inventory and how does the Army maintain and assure RFI status while the system is stored in inventory?

Lieutenant General DALY. There are approximately 1,572 M240s in the Army inventory. TACOM utilizes Logistics Modernization Program (LMP) to track and monitor the M240 series inventory.

QUESTIONS SUBMITTED BY SENATOR JEANNE SHAHEEN

WORKFORCE AT PORTSMOUTH NAVAL SHIPYARD

34. Senator SHAHEEN. Vice Admiral Moore, I have studied the report to Congress on extending the service life of select *Los Angeles*-class submarines and I am in support of this effort to reduce the expected shortfall in fast attack submarines. The proposed service life extension effort spans a decade from 2021 to 2031 and it is proposed that the work be performed at the Portsmouth Naval Shipyard. Given that our public naval shipyards, particularly Portsmouth, are the foremost experts at

overhauling and refueling submarines, this makes sense. While the report details infrastructure investments needed to support this effort, what actions are being taken to ensure that the Portsmouth Naval Shipyard has a sufficiently sized and experienced workforce that is ready to efficiently carry out this important mission?

Vice Admiral MOORE. To properly align Portsmouth Naval Shipyard's (PNSY) workforce and capacity, the Navy reassigned five availabilities: three *Los Angeles*-class inactivations, one *Los Angeles*-class Docking Selected Restricted Availability, and one *Virginia*-Class Extended Docking Selected Restricted Availability to the other shipyards to ensure PNSY was not overloaded during the five planned *Los Angeles*-class engineered refueling overhauls (ERO).

As the Navy developed its fiscal year 2019 to fiscal year 2023 future years defense plan, it determined that it needed to increase the size of the workforce across all NSY in order to execute the expected workloads in fiscal year 2019 to fiscal year 2020. The subsequent realignment of availabilities to support the *Los Angeles*-class EROs to PNSY necessitated an additional nominal increase in the manpower requirement in fiscal years 2020 to 2022 to sufficiently size the workforce to match this additional workload. Based on NSY ability to hire, onboard, and train new employees, we are confident PNSY will be able to increase employment to match the workload. The ability to hire is based on the shipyard's ability to accommodate new hires into training and development pipelines and facility constraints in accommodating a larger workforce. This hiring effort is already in place and underway.

To ensure a proficient and capable workforce, PNSY has a robust full scale training and qualification program for new and existing employees who will be performing work on the EROs including reactor servicing. PNSY is already performing reactor servicing work on the S8G prototype. This work allows employees to achieve and maintain qualifications and establish proficiency for reactor servicing—an essential element in conducting a successful ERO. Finally, PNSY has an ongoing element of nuclear and non-nuclear workload on *Los Angeles*-class submarines that fosters employee hands-on, deck-plate level experience. The consistent schedule of EROs allows personnel to continually train, qualify, and perform work on multiple EROs.

PRIVATE SECTOR MAINTENANCE OF ATTACK SUBMARINES

35. Senator SHAHEEN. Vice Admiral Moore, in your advance opening statement you indicated that deferred maintenance of the USS *Boise* attack submarine reached a boiling point in the Summer of 2017 and that in order to balance the workload, the Navy opted to contract maintenance of the USS *Boise* to the private sector. Further, you stated “The Navy will continue to consider the private sector for future maintenance work during peak workload periods in our Naval shipyards and to ensure we maintain the health of the private sector nuclear industrial base.” How does the Navy define “peak workload periods” in order to determine whether the maintenance of our attack submarines will be conducted by our public shipyards or private companies?

Vice Admiral MOORE. The Navy defines peak workload periods as times that require excessive overtime work or creates such a workload peak that a project's duration would significantly exceed its notional duration. During these periods, the Navy will reassess the naval shipyard workload to identify opportunities to better balance maintenance work across the nuclear enterprise.

36. Senator SHAHEEN. Vice Admiral Moore, how many public shipyard overload periods does the Navy project to see over the next five years?

Vice Admiral MOORE. The Navy is actively and continuously manages the public shipyard workload to eliminate potential overload periods across the FYDP. The Navy has undertaken workforce right-sizing and workload-to-capacity matching efforts at the public naval shipyards to improve accuracy in assessing overall executability, arrest year-to-year carryover of workload, improve on-time maintenance delivery, and best support Fleet operational requirements. The Navy also considers using the private sector industrial base when balancing maintenance and modernization requirements.

QUESTIONS SUBMITTED BY SENATOR KIRSTEN GILLIBRAND

ENHANCING THE CYBERSECURITY OF SMALL DEFENSE SUPPLIERS

37. Senator GILLIBRAND. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, we can all agree that the country's small manufacturers play an important role in the defense

supply chain. For that reason, I am concerned that so many of these companies face significant cybersecurity vulnerabilities that threaten our national security. Further, as of December 2017, Department of Defense (DOD) suppliers must comply with new, tougher cybersecurity requirements to continue doing business with the Government. The federal Hollings Manufacturing Extension Partnership (MEP) Program has interacted with over 1,000 small manufacturers regarding DOD's cybersecurity requirements, and have found a significant lack of awareness of these new requirements and a deficiency of financial and technical resources required to manage cybersecurity risks. If this goes unaddressed, defense supply chains face a higher likelihood of serious and exploitable vulnerabilities, as well as a substantial reduction in the number of suppliers compliant with Department of Defense requirements, and thereby eligible to provide products and services to the Department of Defense. Please provide an explanation for what your respective service branch is doing to help small manufacturers in your defense industrial base come into compliance with DOD's new cybersecurity requirements.

Lieutenant General DALY. The Army does provide guidance to Small Manufacturers through the Army Small Business Office on how to leverage the assistance available to them through the Manufacturing Extension Partnership (MEP) program. Examples like the U.S. Army Tank and Automotive Command (TACOM) provide tools and hyperlinks on its public facing website to help small manufacturers locate their respective MEP center. The Army recognizes the challenge Small Manufacturers face meeting the recent cybersecurity requirements associated with being a part of the Department of Defense's supply chain. We are also aware of recent success stories Small Manufacturers, in our supply chain, have experienced by reaching out to their local MEP for assistance.

References: <https://www.tacom.army.mil/sbo/newsevents.html> <http://www.industryweek.com/technology-and-iiot/small-manufacturer-solves-cybersecurity-puzzle>.

Vice Admiral GROSKLAGS and Vice Admiral MOORE. The Naval Sea Systems Command (NAVSEA) is working to make sure small manufacturers are aware of DOD cybersecurity requirements. Outreach has included cybersecurity sessions at last year's NAVSEA Small Business Industry Day and additional planned cybersecurity sessions at this year's upcoming Small Business Industry Day. In addition, we provide expertise to respond to questions on cybersecurity from suppliers and to guide suppliers toward low or no cost options to address DOD cybersecurity requirements. This includes the free-to-the-public Cybersecurity Evaluation Tool (CSET) Tool developed by the Department of Homeland Security (DHS), which provides easy to use checklists for suppliers to self-assess their compliance with National Institute of Standards and Technology (NIST) Special Publication 800-171 requirements for Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations.

The Naval Air Systems Command (NAVAIR) is working through its program offices, Cyber Detachment, Contracts Department, and Small Business Office to ensure small manufacturers are aware of new DOD cybersecurity requirements. This outreach has included involving the Cyber Detachment early and upfront in the program planning and requirement development phase to guarantee cybersecurity requirements are understood and levied upon large and small manufacturers contractually. In addition, NAVAIR's Contracts Department, Cyber Detachment, and Small Business Office are establishing relationships with small manufacturers to provide informed answers to questions on cybersecurity, to include low or no cost options to address DOD cybersecurity requirements. This includes the free-to-the-public CSET Tool developed by the DHS.

Lieutenant General LEVY. See Appendix C—Cyber Insecurities.

Major General CRENSHAW. DOD Contracting personnel follow contractual cybersecurity requirements implemented through the Defense Federal Acquisition Regulation Supplement (DFARS). Specifically, DOD contracting personnel incorporate cybersecurity-related clauses into applicable contracts (such as DFARS clause 252.204-7012 "Safeguarding Covered Defense Information and Cyber Incident Reporting"). In addition, DOD contracting personnel enforce compliance with contract terms and conditions after contract award, which may include cybersecurity requirements.

DFARS Clause 252.204-7012 "Safeguarding Covered Defense Information and Cyber Incident Reporting" leverages security standards such as those identified in National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171 "Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations." NIST SP 800-171 standards help small businesses meet cybersecurity responsibilities to protect DOD's supply chain, and improve the security posture of their information systems and networks.

38. Senator GILLIBRAND. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, given MEP's national network of assistance for small manufacturers and focus on helping such companies improve their cybersecurity, do you see cross-government partnership opportunities between DOD and MEP to improve small defense manufacturers cybersecurity?

Lieutenant General DALY. Yes, the Army does see possibilities for cross-government partnerships between the Department of Defense (DOD) and the National Institute of Standards and Technology (NIST) to improve small defense manufacturers' cybersecurity. The NIST has partnered with the Department of Commerce to implement Manufacturing Extension Partnership (MEP), and the DOD already has a Memorandum of Understanding with the Department of Commerce that creates the Institutes for Manufacturing Innovation that leverages DOD authorities and resources that allow the DOD to seek contract proposals from MEP network partners. These are, again, opportunities to raise awareness and provide guidance to small manufacturers. Reference: <https://www.nist.gov/sites/default/files/documents/mep/about/MOU-NIST-OSD-Signed-Executed-2015.pdf> Background: The Hollings Manufacturing Extension Partnership (MEP) is based at the National Institute of Standards and Technology (NIST). The National Program Office (NIST MEP) which provides the Federal Government funding for the MEP National Network is located in Gaithersburg, MD. The MEP National Network comprises the NIST MEP, 51 MEP Centers located in all 50 states and Puerto Rico, and it's over 1,300 manufacturing experts at over 400 service locations, providing any U.S. manufacturer with access to resources they need to succeed. MEP is a public-private partnership, designed from inception as a cost-share program. Federal appropriations pay one-half, with the balance for each Center funded by state/local governments and/or private entities, plus client fees. This cost-share model contributes to MEP's success. A GAO study found that because client fees give manufacturers a higher stake in the outcome of services, the positive impact on their businesses is greater. Meanwhile, public funding allows smaller manufacturers to afford services. NIST MEP uses 2 CFR 200 to monitor and govern the recipients' use of Federal funds.

Vice Admiral GROSKLAYS and Vice Admiral MOORE. The Naval Sea Systems Command (NAVSEA) consistently stresses the importance of cybersecurity in our interactions with our small defense manufacturers. We see the resources provided by MEP as valuable assistance, especially the NIST Handbook 162 "NIST MEP Cybersecurity Self-Assessment Handbook for Assessing NIST SP 800-171 Security Requirements in Response to DFARS Cybersecurity Requirements." This handbook provides a step by step guide allowing small defense manufacturers to self-assess their compliance with the DFARS 252.204-7012 required NIST SP 800-171 security controls, which is a critical first step. NAVSEA will be providing information on MEP resources as part its Small Business Industry Day scheduled for August 21 to raise awareness of these free resources.

The Naval Air Systems Command's (NAVAIR's) Office of Small Business Programs (OSBP) consistently stresses the paramount importance of small business compliance with the DFARS 252.204-7012 clause, the NIST SP 800-171 Security Standard, and the risks associated with non-compliance. This is reiterated at our one-on-one meetings, pre-solicitation conferences, and industry days, Small Business Round Tables.

Secondly, NAVAIR is collaborating with the Small Business Development Centers and the Procurement Technical Assistance Centers to assist in reaching small businesses and advising them about the NIST Hollings MEP, which has cybersecurity resources for manufacturers, along with the NIST Small Business Center.

The NAVAIR OSBP refers small businesses interested in doing business with the Navy to the "Small Business Information Security: The Fundamentals," NISTIR 7621 Rev1 for additional information and guidance.

Lieutenant General LEVY. See Appendix C—Cyber Insecurities.

Major General CRENSHAW. While we cannot speak to the potential of a DOD/MEP relationship, small defense manufacturers that obtain a contract with the Government will improve their cybersecurity posture through compliance with the NIST SP 800-171 standards required by DFARS Clause 252.204-7012 "Safeguarding Covered Defense Information and Cyber Incident Reporting."

QUESTIONS SUBMITTED BY SENATOR MAZIE HIRONO

PUBLIC SHIPYARD MODERNIZATION

39. Senator HIRONO. Vice Admiral Moore, the Navy's effort to fully plan and synchronize the modernization of our nation's public shipyards over 20 years was a significant task and I applaud the work you've done. I am concerned that if shipbuilding levels increase in the near term, the demand for the repair yards, specifically from the *Virginia*-class, may come earlier than originally planned. Does the shipyard modernization plan have room for growth to match possible increased shipbuilding levels?

Vice Admiral MOORE. Yes. Based on the current submarine and aircraft carrier acquisition and service life extension plans, the investment strategy provided in the February 2018 Shipyard Infrastructure Optimization Plan Report to Congress is projected to support the near-term needs of a 355-ship fleet. However, as the additional nuclear-powered ships are added to the inventory over the next two decades, we will continue to evaluate public shipyard dry dock and facilities capabilities to ensure any additional infrastructure investments required to support the fleet are identified and programmed. This includes ensuring dry dock capacity allows for emergent work and periodic dry dock maintenance. These evaluations will be performed using existing resources, including the newly established shipyard infrastructure optimization program office, in accordance with the normal budget process. The annual updates to the Shipyard Infrastructure Optimization Plan will capture new mission requirements, submarine or aircraft carrier acquisition plan changes, new ship class requirements, new technology insertion opportunities, and other fact of life changes.

40. Senator HIRONO. Vice Admiral Moore, what investment in time or resources will be required to ensure that the shipyard modernization plan stays in sync with changes in shipbuilding levels?

Vice Admiral MOORE. Based on the current submarine and aircraft carrier acquisition and service life extension plans, the investment strategy provided in the February 2018 Shipyard Infrastructure Optimization Plan Report to Congress is projected to support the near-term needs of a 355-ship fleet. However, as the additional nuclear-powered ships are added to the inventory over the next two decades, we will continue to evaluate public shipyard dry dock and facilities capabilities to ensure any additional infrastructure investments required to support the fleet are identified and programmed.

WORKFORCE ISSUES

41. Senator HIRONO. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, the written testimony from all of the witnesses mentioned the challenge of recruiting and maintaining the skilled labor force, and that direct hiring authority has been a useful tool to meet workforce demand. What other authorities for hiring or retention would help you to maintain your workforce?

Lieutenant General DALY. Army Materiel Command does not see a current need for additional hiring or retention authorities. Previous Defense Authorization bills have provided a number of authorities to assist us in meeting manpower and retention requirements. Going forward, we need time to implement the authorities and take the time to assess their effectiveness. In the future, we may need Congress' help in making these authorities permanent.

Vice Admiral GROSKLAGS and Vice Admiral MOORE. The current hiring process for public shipyard apprentices takes an average of six to eight months and results in considerable attrition of high quality candidates. While the Navy will work to streamline processes that are under its control, the Navy requests congressional support for streamlining hiring processes outside of the Navy to allow for expedited recruitment, selection and onboarding of highly qualified candidates while meeting all administrative requirements. Examples for causes of delays outside of the Navy include the Advanced Fingerprint Report requirement (Federal Bureau of Investigation) and security clearance processing (Office of Personnel Management).

The following authorities for hiring or retention would help the Naval Air Systems Command Fleet Readiness Centers (FRCs) better maintain its workforce:

Expand the use of a retention incentive for workforce members who want to stay within Government service. Managers cannot currently use retention incentives to retain workforce members who take other government positions—they are only available for use if a member of the workforce is retiring or moving into private industry.

Lieutenant General LEVY. The Department appreciates the many personnel flexibilities and authorities that Congress has provided the DOD, including those granting direct hire for certain occupations supporting national security missions. DOD's existing direct hire authorities have allowed for additional flexibility and efficiency; however, the number of stand-alone authorities—each with varying scopes of coverage, waivers of law, usage restrictions, and expiration dates—has increased variability and complexity, creating challenges within the DOD for simplified, efficient, and standardized use. The Department would prefer a comprehensive and streamlined direct hiring authority to meet all hiring needs. DOD hiring policies and processes must be as expeditious, clear, and concise as possible to enable DOD components to acquire new talent when needed.

Major General CRENSHAW. Specifically, we are very grateful to Congress for providing Direct-Hire Authorities, which are critical assets in the competitive environment of talent acquisition. These authorities are essential tools that allow us to level the playing field with industry in order to more quickly fill critical positions that require top talent and high demand skills. These hiring authorities will become even more important and effective going forward as we strive to develop the 21st Century industrial workforce needed by our Nation and our Marines.

Authorities to approve recruitment, retention, and relocation incentives at the local level will help MARCORLOGCOM to maintain its workforce.

42. Senator HIRONO. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, how can STEM education efforts better target the pool of workers you are trying to recruit?

Lieutenant General DALY. The Army Materiel Command's STEM outreach is very strong. Our activities realize the importance of working with our youth, colleges and various associations (all proficiency levels) and create opportunities to engage and support, in meaningful, real-world STEM experiences, competitions, and paid internships. The next generation of scientists, technicians, engineers and mathematicians need to be exposed to as many opportunities as possible to realize how much is available to them and the difference they can each make to support our National Defense and the Department's future modernization. Events such as Black Engineer of the Year Awards (BEYA), Hispanic Engineer National Achievement Award Conference (HENAAC) and Women of Color (WOC) Conference are just a few recent events AMC has participated, promoted interest, and increased awareness about the Army's educational, high-technology career and leadership opportunities as well as showcase how much the STEM candidates can contribute to the critical mission in support to the Warfighter.

Vice Admiral GROSKLAGS and Vice Admiral MOORE. By participating in outreach programs and educational partnership agreements, the Navy can better target the pool of workers in for which they are trying to recruit. The long-term goal is to interest students in a future STEM career with the Navy.

It is incredibly important that the Naval Shipyards (NSY) and Naval Aviation Fleet Readiness Centers (FRCs) have access to candidates with STEM education in order to achieve their—hiring goals. The NSYs and FRCs foster STEM education efforts by sponsoring events for children of all ages where they can participate in a number of engaging STEM-related projects. At the post-secondary level, the NSYs' apprentice programs partner with local community colleges to develop prospective employees. These events and partnerships introduce young people to the NSYs' operations and generate interest in future employment.

Lieutenant General LEVY. As a nation, we must continue the full-court press to attract, excite, and educate the next generation of STEM patriots. The increase in electronics and computer science in all of our weapons systems platforms, legacy and future, means that workers at every level, both civilian and military, will need these fundamental skills. Last year volunteers from the Air Force Sustainment Center donated over 7,100 hours to STEM outreach initiatives. We need continued Congressional funding through the Department of Defense for STEM outreach programs, such as STARBASE; in fiscal year 2017 the Air Force Sustainment Center provided approximately \$700,000 to support competition teams, sponsor events, and provide classroom enhancements. Additionally, continued fiscal support and expansion of K–12 STEM outreach, scholarships, and internships like the DOD SMART scholarship program, will help expand the supply for STEM graduates that will enable the Air Force Sustainment Center to hire the technical workforce needed for the future.

Major General CRENSHAW. We are building partnerships with local high schools, colleges and technical schools, such as the Commodore Conyers College and Career Academy; Albany State University; and Albany Technical College to develop talent

pools that we can draw upon to sustain a workforce that will require increasing levels of technical skills.

MAINTENANCE FUNDING GAPS

43. Senator HIRONO. Major General Crenshaw, your written testimony stated that Marine Corps Depot Maintenance was funding to 80 percent of the identified maintenance requirement in fiscal year 2018. What are we giving up by not funding 20 percent of the requirement and what is the projected long-term impact of delaying or deferring this maintenance?

Major General CRENSHAW. The 20 percent represents \$115 million in deferred maintenance which includes 74 different weapon systems for a total of 11,785 assets. These weapon systems include a wide variety of automotive, combat vehicles, construction equipment, electronic and communications equipment, and ordnance weapons. Delaying maintenance has a negative impact on Enterprise readiness, which must be balanced with modernization, which equates to future readiness. To mitigate funding impacts to current readiness, we use an Enterprise Life Cycle Maintenance Process to inform senior USMC leadership on the prioritization of maintenance to develop an optimized plan that maximizes readiness with available resources. Systems that are deferred, have the opportunity to become future candidates in the subsequent annual prioritization and planning cycle.

44. Senator HIRONO. Major General Crenshaw, does the Marine Corps Fiscal Year 2019 budget fund depot maintenance to 100 percent of the identified requirement?

Major General CRENSHAW. No. The fiscal year 2019 Marine Corps depot maintenance budget funds 80 percent of the total depot maintenance requirements as mandated by the Office of the Secretary of Defense (OSD).

45. Senator HIRONO. Major General Crenshaw, I want to understand the trend in Marine Corps Depot Maintenance funding. What level was depot maintenance funded to on average over the past five years?

Major General CRENSHAW. The following provides the Marine Corps depot maintenance funding profile for fiscal year 2013 to fiscal year 2017.

Total Requirements	\$623M	\$802M	\$724M	\$428M	\$467M
Total Funded	\$623M	\$802M	\$677M	\$428M	\$367M
% Funded	100%	100%	93%	100%	79%

As a result of resetting equipment returning from Operation Enduring Freedom and the subsequent use of OCO funding received, the Marine Corps was almost fully funded fiscal year 2013 to 2016. Beginning in fiscal year 2017 and beyond the Marine Corps will fund depot maintenance at the OSD mandated 80 percent of the total depot maintenance requirements.

MILCON

46. Senator HIRONO. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, each of the services has requested MILCON funds to address maintenance facility modernization and optimization. What is the biggest deficiency in your area that can be addressed with MILCON funds and how would that funding ultimately result in increased readiness for the warfighter?

Lieutenant General DALY. Over half of Army Materiel Command's facilities were built before or during WWII. The average age of our \$40 billion inventory of facilities (building and supporting infrastructure) is 53 years and our identified requirements needing recapitalization totals \$1.7 billion. We have used Restoration and Modernization to address many recapitalization requirements but MILCON investment is essential for us to meet our goal to recapitalize the Organic Industrial Base (OIB) by 2030. We can attain that goal with steady and consistent MILCON funding of between \$200 million and \$300 million annually. We have come close to meeting those targets in the current program but must continue to receive Congressional support of our projects if we are going to meet the requirements for State-of-the-Art Depots and Arsenal. The OIB must be optimized to both maintain unit readiness across the force and the ability to surge in support of contingencies. Failure to recapitalize the OIB risks losing the Army's capabilities and capacities to deliver tanks, helicopters, wheeled and track vehicles, electronic systems, ammunition, and other essential warfighting materiel to our soldiers and to the non-Army components which we support (Air Force, Navy, Marines).

Vice Admiral GROSKLAGS and Vice Admiral MOORE. The naval shipyard facilities are not optimally configured to support modern maintenance processes.

The naval shipyards are comprised of infrastructure from the 19th and 20th centuries, primarily designed for ship construction using early 20th century industrial models. There have been minimal major recapitalization efforts since the early 20th century. In addition to the poor material condition of naval shipyard production facilities due to age, their configuration is not optimized to support modern nuclear ship depot maintenance. Moreover, dry dock and infrastructure investments are needed to support USS *Gerald R. Ford*-class, USS *Virginia*-class including *Virginia* Payload Module (VPM) variants, and the growing nuclear fleet. If not improved, an estimated 68 major maintenance periods between fiscal year 2020 and fiscal year 2040 will have to be moved, deferred and/or rescheduled primarily due to dry dock obsolescence.

The February 2018 Shipyard Infrastructure Optimization Plan Report to Congress provides the 20-year investment strategy that will provide required dry dock capacities and modernize, reconfigure, and best locate facilities to maximize submarine and aircraft carrier depot maintenance throughput. This plan includes the following facilities and dry dock investments funded primarily by MILCON appropriations:

- \$14 billion in facilities layout and optimization investments that are required to best execute current and future shipyard mission and recover 328,000 man-days per year back to productive work solely by reducing worker and material movement as well as fully realize capital equipment return on investment.
- \$4 billion in dry dock investments to recover 67 of the projected 68 moved, deferred and/or rescheduled submarine and aircraft carrier maintenance availabilities, support new class introduction, maintain dry dock certifications, and provide seismic and flood protection improvements.

These investments will maximize the Navy's return on investment and improvement to depot maintenance throughput, returning 67 aircraft carriers and submarines on time to the fleet and significantly increasing readiness of the Navy's nuclear fleet.

Similarly, the current condition of naval Fleet Readiness Centers (FRC) is also not optimally configured to support modern maintenance processes. With almost \$800 million in unfunded projects ranging from modern maintenance hangars to state-of-the-art paint and corrosion control facilities (12 projects, between fiscal year 2021 and fiscal year 2025), the biggest deficiency that can be addressed with MILCON funds is depot-level Air Vehicle Maintenance, Repair, Overhaul, and Upgrade (MRO&U). From an FRC perspective, the impact of funding these projects would have significant positive impact on the rate at which aircraft are returned to the flight line for operational use. Upgrading these facilities would increase capacity, quality and performance at the organic depots, and reduce or eliminate the requirement for depot induction deferrals or extensions thus creating a larger pool of aircraft available to the warfighter to support training and operational missions. In addition, the artisans tasked with conducting the MRO&U events would be working in properly sized and configured workspaces that are fully compliant with modern safety, environmental, and quality requirements.

Lieutenant General LEVY. The greatest deficiency in our AF Depots are facilities for component repair (commodities, software, engines, etc.) and their associated support infrastructure (waste water treatment, electrical grids, natural gas lines, steam operations, etc.). These facilities are aged beyond useful life and stressed due to current operations. Additionally, equipping new facilities with future-state technologies to improve energy resiliency, cyber/communication and safety would best support current and future workloads. Funding for new component, engine, and software repair and associated support infrastructure would yield readiness increases through higher materiel availability. First, new facilities would eliminate unscheduled disruptions and work stoppages, resulting in aircraft returning back to the warfighter on or ahead of schedule. Second, these facilities also support the AF supply chain, so updated, more efficient facilities would enable a decrease in wait times and flow days, putting critical commodities back into the pipeline to reach warfighters more quickly. Finally, more efficient facilities and infrastructure would cost less to operate/sustain and those savings could fund more operational readiness for the warfighter.

Major General CRENSHAW. For the Marine Corps, our depots generally require MILCON to support improved efficiency and capacity to maintain and perform depot work on vehicles and equipment. The MILCON that Congress has approved for the Marine Corps' depots in the past enables the depots to provide vehicles and equipment to the Operating Forces faster.

The Marine Corps unfunded priorities list for fiscal year 2019 includes a \$31.9 million MILCON project at Marine Corps Logistics Base Albany to provide a dedicated welding and body repair shop facility. This facility would provide the capacity needed to support the increased demand for welding, fabrication, and light/heavy combat vehicle repairs and meet production commitments for essential warfighting equipment.

QUESTIONS SUBMITTED BY SENATOR TIM KAINE

CONDITION OF SHIPYARD CAPITAL EQUIPMENT

47. Senator KAINE. Vice Admiral Moore, what is the Navy's plan to reduce the average age of its capital equipment, and what specific types of shipyard equipment are you targeting to improve efficiency and effectiveness for shipyard operations?

Vice Admiral MOORE. The February 2018 Shipyard Infrastructure Optimization Plan Report to Congress (RTC) provides the investment strategy to modernize naval shipyard capital equipment to within private industry standards. This will result in efficiencies that improve submarine and aircraft carrier depot maintenance execution and throughput. Targeted Capital Investment Program requirements include Industrial Plant Equipment, Information Technology, portal cranes, MILCON collateral equipment, test and inspection equipment, and reactor support equipment. Navy is programming funding that reflects a 30-year, \$150 million per year capital equipment modernization strategy, with fiscal year 2018 funding increased to \$151 million from the \$57 million funded in fiscal year 2017. Fully funding the President's Budget requirement is needed to realize efficiencies outlined in our 2018 Shipyard Infrastructure Optimization Plan RTC.

In addition to modernization, capital equipment investments are also needed to support new mission requirements, including *Los Angeles*-class refueling evolutions at Portsmouth Naval Shipyard, concurrent *Virginia*-class availabilities at Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility, *Virginia*-class introduction at Norfolk Naval Shipyard, and *Ford*-class introduction at Norfolk Naval Shipyard and Puget Sound Naval Shipyard and Intermediate Maintenance Facility.

48. Senator KAINE. Vice Admiral Moore, to what extent would improving capital equipment affect the demand for skilled workers or personnel retention at the shipyards?

Vice Admiral MOORE. Modernizing and improving public shipyard capital equipment will not reduce the demand for skilled workers but instead provide these skilled workers the tools they need to best perform submarine and aircraft carrier depot maintenance at the increased tempo required to support increased fleet size. Modernizing shipyard capital equipment infrastructure is expected to improve personnel retention. Showing the workforce that the Navy is investing in them by recapturing their current industrial plants with modern, state of the art capital equipment that is comparable to what they'd use in private industry will increase job satisfaction, morale, and dedication to best executing mission.

ADDITIVE MANUFACTURING CAPABILITIES

49. Senator KAINE. Lieutenant General Daly, Vice Admiral Grosklags, Vice Admiral Moore, Lieutenant General Levy, and Major General Crenshaw, the Department has been experimenting with a variety of materials and applications for additive manufacturing, given the potential to reduce long lead time for parts delivery, decrease costs, etc. What specific actions are you taking to advance the qualification and certification of additive manufacturing?

Lieutenant General DALY. The Army has established an Additive and Advanced Manufacturing Center of Excellence (COE) at Rock Island Arsenal, IL—Joint Manufacturing and Technology Center (RIA-JMTC). The purpose of this COE will be to develop and mature Additive Manufacturing (AM) technologies, establish processes, and develop AM technical data packages specifically for near-term use in the Organic Industrial Base (OIB) as well as for deployed tactical and operational units. The Army is working AM certification and qualification through our engineering centers including collaboration with the other Services, other Government Agencies (including NASA), Industry and Academia. The Army has Additive Manufacturing capabilities at 18 sites including the OIB (depots, arsenals, and ammunition plants), Research, Development, and Engineering Centers, Corps of Engineers, and Medical Research.

Vice Admiral GROSSEKLAGS and Vice Admiral MOORE. The Navy is actively leveraging Additive Manufacturing (AM) to develop innovative new designs, address part obsolescence, and shorten part acquisition timelines that impact readiness. The Navy is working with our sister Services, other Government organizations, Academia and Industry to develop plans that will enable Additive Manufacturing across the enterprise—harnessing rapid AM advances from the private sector while tapping the innovation potential of our sailors, Marines, scientists, engineers and industrial workforce. The Naval Systems Commands (including the Marine Corps) have developed a DoN Implementation Plan that will speed adoption of AM and support the safe and cost-effective use of additively manufactured parts within Naval systems and processes. The Implementation Plan maps out 5 focus areas, including Qualification and Certification. In addition to Qualification and Certification, development of an AM Digital Engineering environment and the ability to print in afloat and expeditionary environments are among other focus areas that will enable distributed AM design sharing and production, including in dynamic environments aboard Navy combatants and auxiliaries. To enable this plan, an executive committee, comprised of the Deputy Assistant Secretary of the Navy for RDT&E, the Deputy Chief of Naval Operations, Fleet Readiness and Logistics (OPNAV N4), the Deputy Commandant for Installations and Logistics (DC, I&L) and the commanders of all of the Naval Systems Commands, is guiding Naval AM maturation and roll-out. This EXCOMM has identified specific projects that align with the implementation plan and will accelerate Naval AM. Of these acceleration projects, qualification and certification is the #1 priority, and efforts are underway to develop the necessary technical requirements to qualify AM processes and certify AM components to be installed shipboard.

NAVSEA will employ Technical Authority to develop these technical requirements and promote AM application across our enterprise—afloat for ships and embarked systems/personnel, in our shore-side industrial facilities, and at our research labs where material and component test & evaluation and new design methods are currently under development. My engineering organization is issuing guidance on approval of AM parts for shipboard use, and developing specifications and standards to communicate Naval AM qualification and certification requirements to Industry. I'm seeing an increased use of Additive Manufacturing in the Naval Shipyards as affordable, capable printers become available. The shipyard workforce is leveraging AM to design and create tools and mock-ups, then use them in training and the job site; and throughout the NAVSEA enterprise personnel use AM to rapidly prototype at low cost, encouraging a culture of affordable innovation.

Lieutenant General LEVY. See Appendix B—Bullet Background Paper—Organic Innovation Center Standup.

Major General CRENSHAW. The Marine Corps has embarked on an aggressive effort to implement additive manufacturing (AM) across the Marine Corps. This includes a detailed focus with multiple stakeholders to address qualification and certification of parts.

On the lower end of AM capability, we are using desktop polymer 3D printers in the field to produce low-criticality, high-demand parts and have published interim guidance to empower local commander's authority to approve the use of parts within the established Risk Assessment Criteria. These results are iteratively demonstrating the minimum requirements of qualification/certification for "good enough" parts that keep our equipment and Marines in the fight.

On the higher end of AM capability, we are pursuing several qualification/certification efforts across Marine Corps Logistics Command, Marine Corps Systems Command, and the Office of Naval Research. The primary initiative is the ONR led QUALITY MADE project, focused on parts qualification/certification of specific metals and alloys. MARCORSYSCOM has established an initial certification process and is establishing an in-house AM engineering capability to provide Program Management Offices the ability to organically perform AM parts qualification/certification. In March, LOGCOM installed two metal AM machines, and are partnered with leading universities to develop AM parts candidates to help further refine the qualification/certification process in partnership with MARCORSYSCOM. We have already developed several candidate parts using this organic metal AM depot capability.

We look forward to continuing to strongly advocate for increased efforts that advance AM qualification and certification.

APPENDIX A

BULLET BACKGROUND PAPER
ON
AFSC COLLABORATION WITH DLA

PURPOSE

To provide information on steps AFSC is pursuing in collaboration with DLA to improve the efficiency and effectiveness of retail supply, storage, and distribution functions at the depots?

DISCUSSION

- DLA is a strategic partner to the Air Force Sustainment Center. Over the past five years, AFSC has taken a number of steps to make DLA more efficient and effective as a retail supplier to Depot Maintenance and Base Maintenance:
 - DLA Planners are key members of the Depot Supply Chain Management (DSCM) Team, a joint AFSC supply, maintenance, and DLA focused on forecasting depot maintenance parts requirements and procuring those assets in advance of maintenance actions. DSCM plans 90–180 days in advance of maintenance activities and takes steps to put parts at the point of use.
 - Planning for Depot Maintenance Consumables (PDMC) is a AFSC-centric effort to forecast base and depot maintenance requirements, through demand data exchanges, direct to DLA Planners for items with known shifts in historic demand patterns. PDMC processes were developed jointly between AFSC and DLA to ensure clear, concise demand signal communication.
 - Performance Management is a joint effort with AFSC and DLA. DLA participates actively in AFSC Production performance reviews and briefs parts status to AFSC Senior leaders on a weekly basis. DLA's participation in performance reviews is a critical component of instituting Art of the Possible and accountability of DLA to the depot maintenance machine.
- Supply Chain Integration
 - Strategic Sourcing is a joint effort between AFSC and DLA. AFSC uses DLA Procurement Detachments to buy spare parts. Further, AFSC is working with DLA to take advantage of Captains of Industry contracts including (but not limited to) Raytheon (~\$408 million), Rockwell (~\$298 million) and BAE (~\$209 million) to reduce redundant contract vehicles and take advantage of economies of scale.
 - Additional commodity-based PBLs are being collaborated and awarded to improve readiness. Most recent (11Jun18) includes an award on the UTAS Wheel & Brake PBL increment 1 for the F-16. The contract includes a future cost reduction of 10 percent over previous unit price and reduced Production Lead Time (PLT) for carbon brakes by 50 percent through the reutilization of carbon. The next increment will be on the C-130 platform.
 - DLA has representatives embedded in the 635th Supply Chain Operations Wings to help resolve supply constraints effecting Operational Air Force bases. These reps are our DLA "First Responders" to help improve parts support to weapon systems.
 - AFSC and DLA jointly work annual excess inventory reviews to reduce excess material no longer needed to support weapon systems.
 - AFSC and DLA have focused on reducing the number of suspended assets in stock through the Suspended Asset Working Group.
 - DLA has supported multiple AFSC and Air Force initiatives over the past years, to include HAF's Aircraft Availability Campaign and Full Spectrum Readiness.
 - AFSC and DLA hold annual Planning Conferences to address and improve planning processes between the agencies, plus select specific programs and initiatives to focus improvement efforts.
 - AFSC and DLA meet annually at Air Force & DLA Day to discuss common issues at a strategic level.

SUMMARY

For information only.

APPENDIX B

BULLET BACKGROUND PAPER
ON
AFSC ORGANIC INNOVATION CENTERS

PURPOSE

To provide information on AFSC's organic Innovation Centers.

DISCUSSION

- More than 70 percent of the funds required to develop, qualify, and operate an aircraft in service are spent in operation and maintenance (SAB-TR-11-01). The time spent in operation and maintenance is much longer today than it ever has been in the history of the USAF (SAB-TR-11-01). Reverse engineering & production efforts for aircraft parts requires on average 4.6 years for a redesigned part, 3.2 years to develop a part repair procedure, and 2.1 years to test and qualify a new vendor.
- Emerging technologies are promising to shorten the timeline from design to production and revolutionize long held operating constraints with respect to production lead time requirements and supply chain support. These include: additive manufacturing (3D Printing), additive repair, in-situ quality control and non-destructive assessment. Investment is needed to purchase equipment, develop processes and procedures, and validation through prototypes to accelerate the fielding of these game changing technologies.
- AFSC's vision of innovation focuses on exploration of these advanced manufacturing technologies for introduction into the sustainment infrastructure. Innovation Centers (IC) will provide a hub for manufacturing innovation by providing access to a variety of technologies, tools, training, and fostering collaboration with industry in a maker-space open to scientists and engineers across the sustainment enterprise.
 - The ICs will provide a controlled environment to design, test, redesign without impacting depot production. This can be done relatively inexpensively with organic capabilities when compared to non-organic options.
- AFSC/EN is working jointly with AFLCMC/EZP to develop a repeatable & reliable production process and air worthiness certification methodology for additively manufactured parts.
- An organic capability will enable AFSC to address critical parts shortage issues and overcome diminishing source of supply issues currently affecting the sustainment enterprise.
 - Almost 50 percent of AFMC's Scientists, Engineers, and Technicians reside at an AFSC location
 - The rapid speed enabled by this technology is most effective when performed at the point of need by those with an intimate knowledge of the problem needing to be solved. Every flow day saved decreases the time an aircraft is in depot and back to the warfighter quicker.
 - In fiscal year 2017, 309 MXSG (Hill AFB) additively manufactured and/or developed TDP for 147 different components, cut production flow time by 420 hours, and yielded \$211,000 in savings. To date for fiscal year 2018, they have produced 90 different components, cut production by 640 hours, and yielded \$198,700 in savings.
 - In fiscal year 2017, 76 CMXG (Tinker AFB) additively manufactured and/or developed TDP for 120 different components, cut production flow time by 1850 days, and yielded \$480,000 in cost avoidance. To date for fiscal year 2018, they have produced 56 different components, cut production flow time by 780 days, & yielded \$230,000 in cost avoidance.
 - In fiscal year 2017, 402 EMXG (Robins AFB) developed TDP/Repair processes for 9 projects, resulting in the repair of 11 items, yielding \$1.5 million in savings. To date for fiscal year 2018, they have completed 10 projects, resulting in the repair of 34 end items, yielding \$96,000 in savings.
- AFSC/EN and the Innovation Centers regularly collaborate with other industry and DoD partners to share best practices and lessons learned in a effort to bend the learning curve.

- Participates in monthly Additive Manufacturing for Maintenance and Sustainment telecom hosted by America Makes.
- Participates in monthly Air Force Additive Manufacturing User Group telecom hosted by UDRI and AFLCMC/EZP.
- Participates in OSD led Joint Technology Exchange Group (JTEG).
- Collaborates with AFRL on Maturation of Additive Manufacturing for Low-cost Sustainment (MAMLS) projects.
- Participates in monthly Additive Manufacturing for Maintenance Operators (AMMO) Working Group.
- Collaborating directly with DLA to validate AM as a viable alternative manufacturing source.
- Regularly presents at AM forums, summits, and symposiums (i.e Military Additive Manufacturing Summit, National Center for Defense Manufacturing and Machining).
- The AFSC IC strategy proposes investments over multiple years to purchase additional equipment, software, services, and facility construction to fully achieve the benefits these technologies offer.
 - Examples include: metal and polymer 3D printers, sand printers for castings, design software, robotics, cold spray equipment, multilayer circuit board printers, facility upgrades for handling reactive materials.
 - Current approach is to apply for WCF funding across 10 years. Additional funding sources are being sought that would speed up the timeline.

SUMMARY

For information only.

APPENDIX C

BULLET BACKGROUND PAPER

ON

CYBER INSECURITIES ASSESSMENT IMPACT TO AFSC

PURPOSE

Defense Federal Acquisition Regulation Supplement (DFARS) 252.204.7012 addresses “Safeguarding Covered Defense Information and Cyber Incident Reporting.” Defense contractors shall implement the requirements of the clause no later than 31 December 2017. AFSC is pursuing a multifaceted approach to ensure our small business partners are aware of and working diligently to comply with this requirement. Below is a synopsis of the work AFSC has done to date.

DISCUSSION

DFARS 252.204.7012 requires contractors to protect unclassified information in accordance with National Institute of Science and Technology (NIST) Special Publication 800–171. Contractors must complete a Cybersecurity Compliance Readiness Assessment, to include a gap analysis, plan of actions and milestones, and implement a security plan. Defense contractors must meet 110 security control requirements and report incidents to the Pentagon. All contractors should have a plan to achieve cybersecurity compliance by EOY 2017.

- The burden of DFARS 252.204.7012 compliance falls on contractors. Specifically, prime contractors are held accountable for the performance of their suppliers. There is recognition that smaller contracting companies may struggle to implement strong cybersecurity with limited staff and resources.
- AFSC has contracts to buy, repair, and modify assets as well as engineering services contracts with hundreds of contractors/suppliers. Cyber risk is reduced when DFARS 252.204–7012 requirements are included in contract documents for any company with a direct contract with the AF.

AFSC has already taken action to prepare for the new rules and mitigate any impacts from these changes being enforced on AFSC’s small business contractors.

- AFSC will continue to ensure solicitations and contracts include the DFARS prescribed cybersecurity requirements.
 - To date, AFSC concludes DFARS 252.204–7012 has not had a negative effect on contractors doing business with the Government. Our analysis of the history of this clause revealed that this type of requirement began around 2011 with an initial implementation beginning around 2013. Over the span of six years the clause has been revised from a broad requirement to a more specific requirement. Ultimately, companies have had ample time to adapt to implementing the requirement in DFARS 252.204–7012.
 - AFSC surveyed our geo-locations to determine if contractors have complained or expressed concern of this clause. The consensus is that there has been limited concern from all businesses which includes covered small businesses.
- AFSC has been proactive with its approach to helping small business prepare for the new cyber requirement. Some of the steps taken to mitigate obstacles include:
 - The DOD Office of Small Business Programs and the DOD CIO engaged industry with a media blitz, most notably the DOD CIO Industry Day in June 2017.
 - The Procurement Technical Assistance Centers (PTAC) took on the training of small businesses to increase awareness. The Utah PTAC held two sessions for industry.
 - In collaboration with DLA and the PTAC, grant money has been available for Small Businesses to begin the process.
 - The Small Business Administration has initiated Cybersecurity for Small Business training at its regional districts and online.
 - The large OEMs have taken an aggressive posture in assuring that their supply chain is in compliance, which in some cases are the same DOD suppliers.

SUMMARY

With overall Center awareness of this increased focus on cybersecurity, and appropriate mitigation strategies, AFSC can position itself along with our small business partners to succeed in a challenging cybersecurity environment.

