

**DEPARTMENT OF DEFENSE AUTHORIZATION FOR  
APPROPRIATIONS FOR FISCAL YEAR 2018 AND  
THE FUTURE YEARS DEFENSE PROGRAM**

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**HEARINGS**

BEFORE THE

**COMMITTEE ON ARMED SERVICES**

**UNITED STATES SENATE**

**ONE HUNDRED FIFTEENTH CONGRESS**

FIRST SESSION

ON

**S. 1519**

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2018 FOR MILITARY  
ACTIVITIES OF THE DEPARTMENT OF DEFENSE, FOR MILITARY CON-  
STRUCTION, AND FOR DEFENSE ACTIVITIES OF THE DEPARTMENT OF  
ENERGY, TO PRESCRIBE MILITARY PERSONNEL STRENGTHS FOR  
SUCH FISCAL YEAR, AND FOR OTHER PURPOSES

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**PART 4  
AIRLAND**

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MARCH 22, 29, 2017



**DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2018 AND THE FUTURE YEARS DEFENSE PROGRAM—Part 4 AIRLAND**

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# CONTENTS

MARCH 22, 2017

	Page
ARMY MODERNIZATION .....	1
Anderson, Lieutenant General Joseph, USA, Deputy Chief of Staff, G-3/ 5/7, United States Army .....	4
Murray, Lieutenant General John M., USA, Deputy Chief of Staff, G-8, United States Army .....	12
Dyess, Major General Robert W. Jr., USA, Acting Director, Army Capabilities Integration Center .....	12
Marion, Brigadier General (Promotable) Robert L., USA, Deputy of Acquisi- tion and Systems Management, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology .....	13
Questions for the Record .....	33

MARCH 29, 2017

AIR FORCE MODERNIZATION .....	45
Harris, Lieutenant General Jerry D., Jr., USAF, Deputy Chief of Staff for Strategic Plans, Programs and Requirements, Headquarters, United States Air Force; Accompanied by Lieutenant General Arnold W. Bunch, Jr., USAF, Military Deputy, Office of the Assistant Secretary of the Air Force for Acquisition; and Lieutenant General Mark C. Nowland, USAF, Deputy Chief of Staff for Operations, Headquarters, United States Air Force .....	47
Questions for the Record .....	83



**DEPARTMENT OF DEFENSE AUTHORIZATION  
FOR APPROPRIATIONS FOR FISCAL YEAR  
2018 AND THE FUTURE YEARS DEFENSE  
PROGRAM**

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**WEDNESDAY, MARCH 22, 2017**

U.S. SENATE,  
SUBCOMMITTEE ON AIRLAND,  
COMMITTEE ON ARMED SERVICES,  
*Washington, DC.*

**ARMY MODERNIZATION**

The subcommittee met, pursuant to notice, at 3:31 p.m. in Room SR-222, Russell Senate Office Building, Senator Tom Cotton (chairman of the subcommittee) presiding.

Subcommittee Members present: Senators Cotton, Wicker, Cruz, King, and Donnelly.

**OPENING STATEMENT OF SENATOR TOM COTTON**

Senator COTTON. The hearing will come to order.

Today we are going to discuss how to prepare our Army for the battlefield of the future or what we might call Army modernization.

Even though our Army is second to none, our rivals are catching up. Russia and China have made big gains in the last 15 years. We are falling behind in long-range artillery, integrated air defense, cyber warfare. The list goes on. If we again face a major conflict with a great power, this capability gap can put our troops' lives at risk. Just weeks ago, the Vice Chief of Staff told Congress that the Army is, quote, outranged, outgunned, and outdated. You can understand why.

For years, we pulled the Army in two different directions. On the one hand, we have increased our commitments overseas, which require more troops, but on the other, we have cut defense spending dramatically. As a result, the Army leadership has had no choice but to focus primarily on short-term readiness, that is, the war they are fighting right now, not future conflict.

But we must prepare for the future to protect our national security and do right by tomorrow's soldiers. That is why with this hearing, we want to focus on some basic questions. Who is leading the modernization effort? What do they think of the potential for emerging technologies? How do they think combatant commanders can make use of them? This is a lot of ground to cover, so I will give just three examples.

First, active protection systems. We bought different models from different suppliers, and now we are trying to figure out how to adapt them for Abrams, Bradleys, and Strykers. Where are we on this? How long will it take to deploy these systems across the force? How might this technology change future combat vehicle design?

Second, the Distributed Common Ground System-Army (DCGS-A). We have poured billions of dollars into this program for over a decade, and yet it is still not ready for battle use. According to one report, even under laboratory conditions, soldiers and commanders, quote, did not consider it to be very helpful. End quote. Last year's NDAA [National Defense Authorization Act] directed the Army to seek a commercial solution for this problem. There are many domestic companies that might provide one. What is the current plan?

Third, the Warfighter Information Network-Tactical (WIN-T). We are on track to spend \$14 billion on this program, and yet there are still many problems with it. We need to know can it actually provide secure communications on a contested battlefield. Could enemy forces use its electronic signature to detect Army units? Are there any commercial solutions we can use to improve the program?

Finally, we need to look at how the Army is organized. Should we reorganize the Army to make sure it stays focused on modernization? How do we ensure a united effort throughout the organization? Who will supply the vision that will underpin it? Should this be a responsibility of a command or a staff element in the headquarters of the Department of the Army? These are all pressing questions, but regardless of the ways and the means, it is clear the Army must modernize for a warfighting future that is different from the past and develop a strategy to give it purpose and direction.

To explore these and other topics, I welcome our distinguished witnesses: Lieutenant General Joseph Anderson, Deputy Chief of Staff for Operations, Plans, and Training; Lieutenant General John Murray, Deputy Chief of Staff for Army Programs; Major General Robert Dyess, Acting Director of the Army Capabilities Integration Center; and Brigadier General Promotable Robert Marion, Army Deputy Acquisition and Systems Management. Thank you all for your service to our country. I look forward to your testimony and our hearing.

Senator King?

#### **STATEMENT OF SENATOR ANGUS S. KING, JR.**

Senator KING. Thank you, Mr. Chairman.

Before I begin my remarks, I want to welcome to the audience in our hearing Mr. Ted Jordan and his students from Cape Elizabeth High School in Maine, one of the great classroom teachers I have ever known. We are awfully glad to have you here, Mr. Jordan.

Mr. Chairman, thank you very much for holding today's hearing. I would also like to welcome all of our witnesses this afternoon. Thank you for your testimony and particularly for your service to our country.

Last week, this subcommittee held a very informative hearing on the future of warfare. It will come as no surprise to our witnesses that the previous panel underscored that our military must be prepared for conflict across the full spectrum of operations. In the near term, our forces will remain engaged in counterterrorism and stability operations, but we also must be ready for high-end conflict with near-peer competitors such as China and Russia.

Likewise, U.S. forces will contend with anti-access/area denial threats, as well as hybrid warfare tactics, and given the proliferation of advanced technology and weapons around the globe, it is highly likely that our military will confront advanced Russian and Chinese arms on the battlefield even if we do not face their forces directly.

The pointed language in your written statement that our Army is rapidly reaching a point where we will be outgunned, outranged, and outdated—by the way, that was reminiscent of Hamilton. I think in Hamilton, General Washington said we are outgunned, outmanned, and outplanned. Very close. Outgunned, outranged, and outdated when compared to our most capable potential adversaries. This deserves attention and action on our part to ensure that modernization efforts effectively address this challenge.

Finally, we must also acknowledge that our adversaries are capable of causing great harm to our country without directly engaging our forces in combat. As I stated last week, Russia has achieved extraordinary success in undermining Western democratic values and destabilizing its neighbors during the last several years, in many cases without firing a shot. As you know, the intelligence community concluded that Russia actively interfered in our recent presidential election, and they appear to be using some of these same tactics right now in France and Germany.

It is clear, therefore, that our strategy for countering the Russian influence, as well as other countries that adopt similar tactics, has to include more than a military response.

While today's hearing is not explicitly about the future of warfare, the testimony from our witnesses regarding the Army's modernization strategy does signal how the Army is preparing for warfare in the future. Resources are never unlimited, and the Army must make investments based on near-term risks, as well as future threats, to procure new weapons, upgrade existing platforms, and fund research and development accounts.

Furthermore, due to the spending caps mandated by the Budget Control Act, the Army has had to make very tough resource allocation choices. The Army has prioritized rebuilding full spectrum readiness and maintaining end strength levels, which puts a strain on fully funding modernization and procurement accounts. We must ensure that our troops are trained and ready for today's fights while also ensuring our modernization strategy supports the Army's ability to fight future battles against advanced adversaries.

Last year, a Center for Strategic and International Studies report illustrated how the Army's current modernization challenge is exacerbated by two trends. First, the Army is relying upon weapon systems initially fielded in the 1980s, such as the Abrams main battle tank and the Bradley fighting vehicle. Secondly, the Army has a mixed record of developing new acquisition programs to re-

place these weapon systems resulting in truncated or canceled programs and the loss of billions of dollars.

Therefore, as this committee considers funding the Army modernization efforts, we must ensure that resources are devoted to programs that will enable our soldiers to prevail in future fights.

I would like our witnesses today to address how Army procurement accounts have been adversely impacted by the reduction in funding over the past several years and if these actions have added substantial cost and risk to modernization programs.

In addition, I hope we can discuss actions the Army is taking to ensure program requirements are realistic so we can prevent future programs from being canceled due to cost growth, requirements creep, and schedule delay. As we consider increasing Army end strength and restoring readiness, we cannot afford for our future modernization programs to meet the fate of recent Army programs that were canceled such as the future combat systems, the Comanche helicopter, and the Crusader artillery system.

Finally, we must remember that resources are never unlimited, as I mentioned. Increasing defense spending at the expense of other core elements of national power will not guarantee a more effective fighting force. The administration has not yet released their final 2018 budget request, but they published a budget document detailing top line funding for the Department of Defense. According to this document, the Army will focus on rebuilding readiness and reversing the reductions in end strength levels. But both efforts have implications for Army modernization.

In addition, the administration has submitted a \$30 billion supplemental request for the Department of Defense for this year, of which \$8.3 billion is set aside for Army requirements.

Increased funding will help America rebuild readiness and begin the long-term effort to modernize the force. However, I am concerned that the administration has also proposed dramatic cuts to the Department of State, USAID, and other agencies. In my view and that of virtually every witness who has recently appeared before the Armed Services Committee, that approach is shortsighted and would risk seriously compromising our national security.

It is my hope that we can responsibly increase the defense budget while ensuring the other critical elements of national power are also adequately funded. As we plan the future force structure of the Army, we must remain mindful that end strength, readiness, and modernization are deeply intertwined and adjustments to each should be carefully synchronized and calibrated to ensure our Army is guaranteed to never face a fair fight even against our most capable adversaries.

Again, thank you, Mr. Chairman, for holding this hearing, and I look forward to hearing from our witnesses.

Senator COTTON. Thank you, Senator King.  
General Anderson?

**STATEMENT OF LIEUTENANT GENERAL JOSEPH ANDERSON,  
USA, DEPUTY CHIEF OF STAFF, G-3/5/7, UNITED STATES ARMY**

Lieutenant General ANDERSON. Thanks, Chairman Cotton, Ranking Member King, distinguished members of the subcommittee.

Thank you for the opportunity to testify on the state of your U.S. Army.

I appreciate your support and demonstrated commitment to our Army and look forward to discussing Army modernization with you today.

My experience has allowed me to witness significant, lasting detrimental effects to Army readiness and modernization caused by sequestration and continuing resolutions. The abrupt implementation of fiscal year 2013 sequestration significantly impacted every aspect of our Army, from training to readiness through delayed modernization, sequestration compelled the Army to take drastic measures. Continuing resolutions compound resourcing solutions and greatly affect the Army's ability to generate readiness and execute its modernization strategy.

Our competitors have studied our doctrine, made revisions to their own, and are rapidly modernizing their militaries. We now face the prospect of fighting in complex anti-access/area denial environments against threats equipped to overmatch several of our current capabilities. This strategic environment requires a trained and ready Army that has both the capacity and capability to meet current and future challenges and prevail against a full range of military activities.

Today the Army remains globally engaged with over 185,000 trained and ready soldiers helping combatant commanders shape today's security environment. The operation tempo required to meet current and emergent demand consumes readiness as fast as we can supply it. This places the Army's ability to meet wartime contingency requirements at high risk.

Resourcing NDAA 2017 end strength authorizations is absolutely necessary to bridge gaps within our current formations and is the first step required to meet readiness objectives. The Army will mitigate some manning shortfalls by optimizing its available resources to maximize total force readiness, filling the holes in current formations, and strengthening our armored brigade combat teams. Additional end strength increases will build greater quantities of critical unit types and develop crucial capabilities in long-range fires and air missile defense formations required to adequately prepare for major contingencies.

Readiness does remain our number one priority I think as you very well know. We must stand ready at a moment's notice to defend the U.S. and its interests. With your assistance, the Army will continue to resource the best trained, best equipped, and best led fighting force in the world.

We thank you for the steadfast support of our outstanding men and women in uniform, and I look forward to your questions.

[The prepared statement of Lieutenant General Murray, Lieutenant General Anderson, Major General Dyess, and Brigadier General Marion follows:]

JOINT PREPARED STATEMENT BY LIEUTENANT GENERAL JOHN M. MURRAY, LIEUTENANT GENERAL JOSEPH ANDERSON, MAJOR GENERAL ROBERT M. DYESS, JR. AND BRIGADIER GENERAL ROBERT L. MARION

#### INTRODUCTION

Chairman Cotton, Ranking Member King, distinguished Members of the Senate Subcommittee on Airland, thank you for your continued support and demonstrated commitment to our soldiers, Army civilians, families, and veterans. On behalf of our Acting Army Secretary, the Honorable Robert Speer, and our Chief of Staff, General Mark Milley, we thank you for the opportunity to appear before you today and look forward to our discussion.

Army modernization today stands at a precipice due to a combination of strategic, technological, and budgetary trends that threaten to place our Army at a disadvantage not only against advanced adversaries, but also against a broad range of other potential threats and enemies. In early 2016 the National Commission on the Future of the Army observed that reductions in Army modernization were elevating risk to the Joint Force. That military risk has already manifested itself: our Army is rapidly reaching a point where we will be outgunned, outranged, and outdated when compared to our most capable potential adversaries. Continued failure to fund modernization will leave the U.S. with a 20th Century Army unsuited to handle the geostrategic environment of the 21st Century. Moreover, deferred modernization costs merely place today's burden on tomorrow's Army. Given these realities, maximizing the utility of the modernization efforts after an era of uncertain and limited budgets is critical for the future of the Army.

#### THE URGENCY OF MODERNIZATION

To protect the homeland, foster security abroad, and win wars Army forces must have the capabilities, capacity, and readiness to accomplish assigned missions as part of the Joint Force. In short, Army forces must have overmatch. Army forces that possess overmatch enable the other services, create options for Joint Force commanders, give weight to diplomacy, and expand policy choice. Overmatch also constrains adversaries; if our potential adversaries cannot hope to hold ground, dominate populations, or control resources, then they cannot achieve their policy objectives. The U.S. has enjoyed the benefits of tactical overmatch for so long that some now take its benefits for granted and underestimate the effort required to maintain it.

Legacy platforms that have provided the foundation of U.S. Army tactical overmatch for decades are near the limits of what can be achieved through further upgrades and are at risk of becoming obsolete. Moreover, the U.S. must be mindful that adversaries may no longer be convinced that the U.S. Army is capable of denying them victory on the battlefield. Perceiving they can achieve their objectives within an acceptable timeframe and cost, adversaries will attempt to present the U.S. with a fait accompli. But, capable ground forces that prevail in close combat are a powerful deterrent and enable Joint Force freedom of action. To keep pace with potential adversaries and wisely invest in the opportunities presented by new technologies, the U.S. Army must undertake an innovative, ambitious modernization effort.

#### THE STRATEGIC ENVIRONMENT

Since the end of the Cold War, the U.S. Army as part of the integrated Joint Force has deterred conflict and supported allies and partners in Europe and Asia, supported civil authorities within the United States, and fought two prolonged wars in Iraq and Afghanistan—both of which remain ongoing. Today, the world is a more dangerous place than at any time since the end of the Cold War and the global security environment continues to remain volatile, uncertain, and complex. With increasingly aggressive actions by several rising and resurgent powers and disruptive regional actors, the risk of conflict is rising. Revisionist powers, Russia and China, continue their attempts to diminish United States influence while Iran and North Korea's provocative and bellicose actions increasingly destabilize their regions of the world. Violent Extremist Organizations, such as ISIS, pose potential threats to U.S. national security interests. Combined, those challenges represent a broad range of operations for which our Army must be prepared. At home or abroad, our Nation expects a ready Army with sufficient capabilities and capacity that is capable of defending the homeland or deploying rapidly in the event of unforeseen conflicts.

Russia's attempts to erode our alliances through aggressive, militarized competition are increasing the potential for miscalculation and the risk of conflict in Europe and beyond. As evidenced by their interventions in Ukraine and Syria, to achieve

its policy objectives, Russia will continue to employ conventional and unconventional military forces while operating under the threshold of a decisive U.S. or allied response. Russia's conventional capabilities are formidable and, in many areas, superior to ours and those of our allies and partners. We must be able to penetrate and operate within highly defended environments, possibly at the leading edge of a Joint Force to control the air, sea, space, and cyberspace domains. In addition, through an intensive modernization effort, Moscow is developing a significant capability advantage in several specific military areas.

Rising tensions and the actions of regional actors are increasing the risk of conflict in Asia. China's militarization of extralegal territorial claims further strains international relations in the South China Sea while their modernization programs to develop capabilities that project power within the air, maritime, space, and cyberspace domains increasingly alarm the nations of the Pacific-Rim. China is also developing offensive cyber capabilities and an ability to jam the electromagnetic spectrum capabilities that impacts U.S. communications and Assured Positioning, Navigation, and Timing, severely limiting what was once a significant differential advantage for U.S. forces. Current trends in Chinese weapons production will enable the Chinese to conduct a range of military operations well beyond its borders.

Despite increasingly constrained financial resources, the Democratic People's Republic of Korea (DPRK) continues to prioritize expansion of its nuclear and ballistic missile programs. The DPRK also possesses cyber and chemical-biological warfare capabilities while maintaining an aging, but large and capable conventional force that has the ability to mass long-range fires on targets throughout the region, particularly Seoul. As the DPRK continues to threaten attacks on the United States and our allies and the DPRK leadership faces mounting economic and political pressures, the United States must maintain its deterrent force on the peninsula and be prepared to deploy substantial ground, air, and maritime forces as part of a coalition alongside Republic of Korea forces in defense of the peninsula and region.

Iran's involvement in the Syrian, Iraqi, and Yemeni conflicts continues to deepen while their nuclear aspirations, cybersecurity threat, sophisticated ballistic missile program and links to Hezbollah threatens regional security and continues to destabilize the Middle East. Moreover, with the signing of the Russian-Iranian Military Cooperation Agreement, and the lifting of economic sanctions, it is likely that Iran will accelerate its military modernization thereby posing a greater threat to United States interests and allies in the Middle East.

Threats to national security are also increasing from non-state actors. ISIS, AQIM (al Qaeda in the Islamic Maghreb), Boko Haram, and other extremist organizations threaten stability throughout the world. ISIS inspired, planned, and resourced attacks from Iraq to Lebanon, Turkey, Paris, Libya, Brussels, and even the homeland indicate that terrorist organizations that control territory, populations, and resources must be contained and eliminated.

As these examples demonstrate state, non-state, and hybrid threats are increasingly capable and continue to narrow U.S. competitive advantages not only on land, but also in all domains. The complexity of future armed conflict requires an Army capable of conducting missions at home and in foreign lands. Our Army must maintain readiness for today and invest in modernization to ensure readiness for tomorrow in order to maintain overmatch against elusive and increasingly capable enemies.

The global security environment, increasingly characterized by instability and a growing range of threats, demands an Army that must be organized and ready for an expanding diverse and complex range of missions. While the threats and missions we face today will endure well into the future, they will be overshadowed by emerging peer competition. More than ever, this environment will require trained and ready Army formations possessing both the capacity and capability to meet current and future challenges. We must modernize to ensure that our capabilities remain relevant against constantly evolving threats.

#### MODERNIZING THE FORCE

Challenges to Army modernization have been building over the course of nearly two decades. Adjusting for inflation, the Army has nearly half of the funding for modernization and equipment that it had just 8 years ago. Declining budgets drive difficult choices; we have faced these choices over many budget cycles.

The budget issue has been further complicated by 15 years of focus on counterinsurgency and counterterrorism as the Army addressed current needs in Afghanistan and Iraq. This was the right thing to do, but it required tradeoffs. The Army, fully aware of these tradeoffs, made the right choices to support our soldiers for the missions and threats we faced at that time. This kind of approach led to the fielding

of Mine Resistant Ambush Protected vehicles, increasing the number of UH-60s for Air Medical Evacuation, significantly better Personal Protective Equipment, and rapid fielding of theater-specific equipment for our soldiers.

In terms of procurement, we are essentially relying on the same platforms that we have had since the 1980s—the Big 5, consisting of the Abrams Main Battle Tank, Bradley Fighting Vehicle, Apache Attack Helicopter, Blackhawk Utility Helicopter, and Patriot Missile System. The Army developed these systems to provide a credible deterrent during the Cold War. Given the current level of funding, we will continue to rely on all five platforms into the 2030s and beyond.

Meanwhile, our enemies have not been idle. The overmatch your Army has enjoyed for the last 70 years is at risk. Our adversaries have observed the way we fight and have developed capabilities and tactics to counter our strengths and exploit our vulnerabilities. Some of these new capabilities and tactics have already been demonstrated in combat.

Fiscal constraints have forced the Army to accept risk in starting new developmental programs in order to prioritize incremental upgrades of existing systems that can be in the hands of soldiers quickly. Over the last 15 years, the Army has not modernized for full spectrum warfare thereby risking the loss of current and future overmatch in every domain: land, air, maritime, space, and cyberspace.

Our soldiers must be able to prevail against the full range of potential threats, including near-peers in highly lethal combined arms maneuver; hybrid warfare; and determined, unconventional insurgents. This has become increasingly difficult, as our adversaries modernize at a rapid pace, while reduced funding has reduced the Army's modernization to a pace that jeopardizes our overmatch. Stretching procurement timelines has allowed us to focus on current readiness and keep production lines and key programs active, at the cost of increased risk versus our most capable adversaries.

#### PRIORITIZING CAPABILITY GAPS

This year, the Army conducted the inaugural Strategic Portfolio Analysis Review (SPAR), which enables Army senior leaders to make informed resource decisions within a larger strategic framework. The SPAR prioritizes limited modernization resources, weighed against risks and critical capability gaps, in order to balance near-term readiness requirements against long-term force development aspirations. As part of the SPAR we modeled and tested our 780-plus programs against a scenario with a near-peer adversary. This analysis resulted in the prioritization Army capabilities into four bins:

1. Critical Capability that provides a decisive advantage in which we should increase investment
2. Critical Capability that we should sustain at current levels of investment
3. Important Capability, but one from which we can divert resources
4. Still important, but we should divest in order to free up resources for the other categories.

SPAR has validated a number of critical capability gaps in key program areas. These gaps are Army modernization priorities that we must pursue in order to maintain and, eventually, regain overmatch to credibly deter and defeat near-peer adversaries.

- Air and Missile Defense (AMD). We lack the capability and capacity to meet the AMD demands of the combatant commanders to cover key fixed sites and provide effective AMD protection of the maneuvering forces.
- Long-range Fires. The Army lacks capability and capacity to provide immediately responsive, effective surface-to-surface fires at ranges beyond 40 kilometers (km) for Cannon Artillery, beyond 84 km for Rocket Artillery, and 300 km for missiles; this gap is partially due to the aging Army Tactical Missile System (ATACMS) inventory.
- Munitions. The Army anticipates significant increases to ammunition requirements based on emerging peer and near-peer threats and increased demand in Iraq and Afghanistan. We are evaluating the need to both grow capacity in some of our Government-owned and Contractor-operated ammunition plants and to broaden commercial capacity in order to meet the increased requirements for preferred munitions.
- Mobility, Lethality and Protection of Brigade Combat Teams. Our Armored, Infantry, and Stryker Brigade Combat Teams are deficient in the appropriate combination of mobility, lethality, and protection required to achieve overmatch during joint and combined arms operations.
- Active Protection Systems (APS) – Air and Ground. The proliferation of advanced man portable air defense systems significantly threaten Army Aviation

in operational environments. On the ground, our combat vehicles lack the ability to effectively detect, track, divert, disrupt, neutralize, or destroy incoming direct and indirect fire munitions.

- Assured Position, Navigation, and Timing (PNT). The commercial and Military Global Positioning Systems (GPS) are susceptible to threat disruption (jamming) and spoofing (mimicking friendly forces).
- Electronic Warfare (EW). The Army is unable to conduct Electronic Attack and EW Support against near-peer adversaries.
- Cyber (Offensive and Defensive). We lack sufficient tools, platforms, and architectures to conduct Offensive Cyber Operations in the constantly changing, complex Cyber Domain. The Army also lacks sufficient Defensive Cyber infrastructure and tools to support Mission Command in all scenarios.
- Assured Communications. Current communications systems are vulnerable to near-peer threat detection, disruption/denial, and exploitation.
- Vertical Lift. The Army's increased requirements for aircraft survivability, safety, and Mission Command have reduced fleet payload and range capacity. This limits mobility and increases risk to ground forces.

#### RESOURCING MODERNIZATION

With respect to the budget, the Army has three main categories within the topline that it can adjust: Manpower, Readiness, and Modernization. Of these three, Readiness is our top priority. We are also committed to maintaining force structure. Any adjustments to these three categories are zero sum; there must always be a "bill payer" for every increase. Inflation and increasing to personnel costs put increasing pressure on the Modernization portion of the budget.

Given this set of priorities, the Fiscal Year 2017 (FY17) President's Budget request allocated about 60 percent of the Army's topline to manpower. This is a must-pay bill. Readiness will consume approximately 24 percent of our budget; as the number one priority, the Army will not choose to reduce this allocation. This leaves roughly 16 percent for Modernization.

Ideally, we would always have the most modern equipment, but this would require painful tradeoffs with Manpower and Readiness. We would like to do all three, but large Modernization investments at the wrong time could lead to a force that is too small or a force that we cannot afford to keep ready. Maintaining balance across Manpower, Readiness, and Modernization is key to preventing a hollow force. Without sustained, long term, and predictable funding, we cannot effectively plan and execute a balanced Army program.

Given the fiscal pressures, the Army has focused constrained resources on equipping for the near term at the expense of preparing for the future. The Army is accepting risk in starting new programs in order to prioritize incremental upgrades of existing systems that can be in the hands of soldiers more quickly. Our current equipment modernization strategy has been structured to:

Protect Science and Technology to field capabilities to the force in the 2030s. We will prioritize Science and Technology efforts to develop new military capabilities to deter and defeat potential adversaries in the next fight. We are implementing a strategic approach to modernization that includes an awareness of existing and potential gaps; an understanding of emerging threats; knowledge of state-of-the-art commercial, academic, and Government research; and an understanding of competing needs for limited resources.

Sustain Incremental Upgrades. We have prioritized capabilities that have the greatest impact against a near-peer threat and can be in soldiers' hands in the next 10 years. We are focused on improving the M1 Abrams Tank, M2 Bradley Fighting Vehicle, and Stryker Families of Vehicles, as well as Paladin, Improved Turbine Engine Program, and the Guided Multiple Launch Rocket System. We are also improving the Apache, Black Hawk, and Chinook helicopter fleets, as well as our Unmanned Aircraft Systems.

Take Risk in New Development. The Army is making modest developmental investments based on critical operational requirements and capability shortfalls. Fiscal realities have led to the delay or discontinuance of new systems. Key investments that remain in the next generation of ground vehicle capabilities include the Armored Multi-Purpose Vehicle and the Joint Light Tactical Vehicle, a critical program for the Army and the U.S. Marine Corps.

The Army will begin new developmental programs only if required to close an extremely high risk gap. We will attempt to accelerate Air and Missile Defense, Long Range Fires, Mobile Protected Fire Power, Active Protection Systems (Air and Ground), Assured Positioning, Navigation, and Timing, Electronic Warfare, and Cyber offensive and defensive capabilities.

Go Slow, Keep Options Open. We have, and will continue to, slow down procurement to keep production lines open and warm for when funding becomes available.

Reset and Sustain. The Army is returning equipment to the required level of combat capability; it remains central to both regenerating and maintaining equipment near-term readiness for ongoing operations and potential contingencies.

Divest. We are identifying equipment and systems that are excess, obsolete, or no longer required to reduce and eliminate the associated sustainment costs. For example, we are divesting the aging M113 armored personnel carriers and legacy radios. Additionally, the Army's Mine Resistant Ambush Protected vehicles divestiture will eliminate a large portion of the fleet through Foreign Military Sales (FMS), distribution to other agencies, and demilitarization of older, battle-worn, excess vehicles. The Army also continues to divest its aging TH-67 training helicopters, as well as the OH-58A/C Kiowa, OH-58D Kiowa Warrior, and UH-60A Black Hawk fleets.

#### THE DEFENSE INDUSTRIAL BASE

The constrained resources in the Army's modernization account continue to present significant challenges for the Defense Industrial Base (DIB), especially for companies that cannot leverage commercial sales and for small companies that must diversify quickly to remain viable. When developing our equipment modernization strategy, we carefully assess risk across all portfolios to ensure balanced development of new capabilities, incremental upgrades to existing systems, and protection of critical capabilities in the commercial and organic elements of the DIB.

The Army remains concerned about the preservation of key skills and capabilities in the engineering and manufacturing bases for our original equipment manufacturers and their key supplier bases. Collaboration with our industrial base partners early in the process helps to reduce risk. Efforts such as the Army Manufacturing Technology Program provide affordable and timely manufacturing solutions that assist our industry partners to address manufacturing and producibility risks. Also, the Army supports efforts to develop FMS and Direct Commercial Sales to ensure sustainment of critical production lines in the DIB.

The Army continually assesses risk in the Industrial Base across all Army portfolios. Fragility and Criticality (FaC) assessments identify the fragile and critical portions of sectors within the DIB to facilitate the identification of risk mitigation strategies. FaC assessments provide Army program offices: 1) the ability to identify how potential reductions in funding could affect suppliers that provide the products, skills, and services needed to maintain readiness, and 2) information to support investment decisions to mitigate supplier risk.

The Army also continually assesses the health of the organic industrial base (OIB), including our depots, arsenals, ammunition plants, munitions centers, and Government-owned Contractor-operated plants. The Army maintains critical skill sets in our OIB by identifying workload to preserve capabilities, exploring FMS opportunities, and encouraging our OIB facilities to partner with commercial firms and other Department of Defense organizations, such as the Defense Logistics Agency, to meet future requirements. We continue to modernize our OIB infrastructure, as needed, to support readiness.

#### OPPORTUNITIES TO 'TURN THE TIDE'

Given the complex range of threats, the Army has a very short window to improve capability and capacity. By design, the Army drawdown was deliberately designed to reverse course and expand if necessary. Additionally, Army modernization, during the past several years of constrained funding and austerity maintained its resilience by:

- Protecting the defense industrial base by keeping production lines warm
- Protecting modernization options by investing in the next generation of incremental improvements, emphasizing low risk and cost efficient improvements

We have sustained many programs that could be accelerated if needed. The Army is prepared to accelerate delivery of fires capability, armor formation upgrades, aviation fleet modernization, enhanced air and missile defense, ammunition and missiles for emerging wartime requirements, lethality upgrades for Stryker vehicles, assured communications, soldier lethality and protection and finally, electronic warfare. The Army is at an historical inflection point; we are postured to pivot rapidly if directed to do so.

#### CAPACITY

The modernization priorities described above are critical to maintain overmatch against increasingly capable enemies. However, modernization alone is not enough. The Army requires ready forces that not only possess modern capabilities, but also

the capacity to translate military objectives into enduring political outcomes. Army capacity is critical to deter enemies; reassure allies; surge forces to contingencies; control territory; secure populations overseas and in the homeland; and regenerate combat power. At current levels of readiness, modernization and manning, the Army risks being unable to achieve the objectives of the Defense Strategy. Ultimately, a modern and ready Army with sufficient capabilities and capacity creates synergy that enables the Joint Force to translate military objectives into enduring political outcomes.

The Army continues to meet current demands, but doing so significantly degrades our ability to meet the Defense Planning Guidance to deter conflict, and if deterrence fails, defeat an adversary in one theater and deny the objectives of another, all while defending the homeland and conducting counterterrorism operations worldwide. Today, the Army is globally engaged with approximately 185,000 soldiers supporting Combatant Commanders in 140 countries. These soldiers conduct combat operations, deter aggression, and assure our Allies and partners. In Afghanistan, the Army continues to engage the enemy as we work with Allies and partners to train, advise, and assist Afghan National Security Forces. In Iraq, we continue to build partner capacity to fight ISIS. Throughout Africa and the Americas, we partner to prevent conflict and shape the security environment. In the Pacific, more than 105,000 soldiers remain committed; approximately 20,000 stand ready in the Republic of Korea. In Europe and Asia, Army forces also reassure our Allies and deter aggression.

An Active Army which currently stands at just over 467,000 was drawing down from a wartime high of 570,000 (1,133,000 Total Force) to 450,000 personnel (980,000 Total Force) and reducing from 45 to 30 BCTs (56 Total Force). A 980,000 Total Force places the Army at risk of being unable to execute the defense strategy. The fiscal year 2017

National Defense Authorization Act (NDAA) authorized an Active Army end strength of 476,000, which is 16,000 personnel more than the 2017 budget request. The NDAA also authorized an Army National Guard end strength increase of 8,000 personnel to 343,000 and an increase of 4,000 to 199,000 for the Army Reserves, for a Total Force of 1,018,000. Any authorized personnel increases such as these must come with appropriations to be of value. This authorization is a down payment on reducing the risk the Army is carrying, particularly in improving readiness shortfalls due to personnel fill. However, if sequestration-level cuts are imposed in fiscal year 2018 and beyond, all components of the Army would be immediately impacted, with Active Army end strength rapidly falling to 420,000, the Army National Guard drawing down to 315,000, and the Army Reserves reducing to 185,000. Those reductions would increase the military risk the Army faces. Insufficient capacity in ready land forces limits the options the President, Secretary of Defense, and combatant commanders have to respond to and resolve crises. Moreover, once we are cut it is difficult to regenerate Army forces rapidly. Growing the Army is difficult, costly and takes time due to a lack of manpower, the sophisticated nature of weapons and equipment, the importance of training teams on collective tasks, and the need for those teams to have experienced leaders.

#### IN CONCLUSION

We sincerely appreciate the opportunity to address the challenges the Army faces in maintaining readiness and modernizing its force. We are also grateful for Congress's efforts to stem the continued decrease in force structure; we are already making progress in regrowing the Army in accordance with the NDAA-prescribed end strength. We must also ensure the force is equipped and modernized for full spectrum conflict. The security challenges of tomorrow will be met with the equipment we develop, modernize, and procure today. Resource reductions and insufficient force modernization will place the Army's ability to overmatch its opponents at risk because our adversaries will continue to invest in technology to counter or evade U.S. strengths and exploit vulnerabilities.

We can assure you that the Army's senior leaders are working hard to address current challenges and the needs of the Army both now and in the future. We are doing so with a commitment to be good stewards of our Nation's resources while meeting the readiness, equipping, and modernization needs of our soldiers.

Mr. Chairman and distinguished Members of this Subcommittee, we sincerely appreciate your steadfast and strong support of the outstanding men and women in uniform, our Army civilians, and their families.

Senator COTTON. General Murray?

**STATEMENT OF LIEUTENANT GENERAL JOHN M. MURRAY,  
USA, DEPUTY CHIEF OF STAFF, G-8, UNITED STATES ARMY**

Lieutenant General MURRAY. Chairman Cotton, Ranking Member King, distinguished members of the Subcommittee on Airland. On behalf of our Acting Secretary, the Honorable Robert Speer, and our Chief of Staff, General Mark Milley, I pretty much look forward to discussing Army modernization with you today.

Today the Army has roughly half the funding for modernization and equipping the force it had just 8 years ago. We have focused our resources on generating and maintaining the best trained and equipped forces that resources would allow.

We now find ourselves in a situation where our most capable enemies are closing quickly. Senator, as you mentioned, we are losing overmatch in every domain, land, air, maritime, space, and cyberspace. In the words of General Allen during his most recent testimony, Senator, once again as you mentioned, we find ourselves outgunned, outranged, and outdated in some very critical war fighting capabilities.

The Army's current modernization strategy is to upgrade today's equipment, focusing limited modernization dollars on the equipment that will have the greatest impact against near-peer threats and can quickly be in the hands of our soldiers. For the last 10 years, we have focused on the immediate, providing the equipment necessary for our soldiers to fight in Iraq and Afghanistan along with incremental upgrades to existing combat platforms. That strategy forced us to defer the development of new combat capabilities. We have now reached a point in time where we can longer afford to do one or the other. We must find a way to do both, improve the equipment we have and begin investment into next generation capabilities.

Near-term security challenges will be met with the equipment we have today, and it must be improved to ensure our current soldiers have the best that we can provide. Tomorrow's security challenges will be met with the equipment we develop and procure over the next several years, and we owe our future soldiers the equipment they will need to fight and win on some very complex battlefields.

We urge Congress to provide fiscal stability, funding that is sustained, long-term, and predictable so we can maintain our current warfighting readiness while simultaneously beginning to build a more modern and capable force for the future.

I would like to thank you and the entire committee for your unwavering support of our soldiers, our Army civilians, and our families. Thank you very much, and I look forward to your questions.

Senator COTTON. General Dyess?

**STATEMENT OF MAJOR GENERAL ROBERT W. DYESS, JR., USA,  
ACTING DIRECTOR, ARMY CAPABILITIES INTEGRATION CENTER**

Major General DYESS. Chairman Cotton, Ranking Member King, distinguished members of the subcommittee, thank you for the opportunity to speak with you about the urgent need to invest in Army modernization.

To develop the Army, we must think clearly about the future of armed conflict. This requires a consideration of threats, enemies,

and adversaries, our missions, consideration of trends in technology development, and historical observations to anticipate the changing character of war and how that will evolve to affect tomorrow's battlefields.

Based on these factors, we envision a future environment that is characterized by increased competition amongst peer states that aim to challenge the post-World War II security order. Future forces of the Army will likely confront the advanced militaries of peer states with advanced and sophisticated capabilities, as well as elusive, yet capable non-state actors that employ unconventional and hybrid strategies that threaten U.S. security and vital interests.

There is an urgent need to modernize existing equipment and undertake developmental programs to replace the workhorses that have provided overmatch and served our Nation so well. We must do both.

To operate in this emerging environment, Army forces must innovate and develop new ideas to fight in and across all five domains, air, sea, land, space, and cyberspace. To address future challenges, the Army and the Marine Corps began the development of a multi-domain battle concept. This concept involves combined arms, to include not only capability of the physical domains, but also cyberspace, the electromagnetic spectrum, the information environment, and the cognitive dimension of warfare by accounting for the changing character of war. When complete, this multi-domain battle will enable land forces operating as part of a joint force to create windows of opportunity and advantage, restore capability balance, and build resilient formations.

To mitigate mounting military risk and operate as part of the joint force in the future, the Army must undertake innovative and ambitious modernization efforts. There is an urgent need right now. Preparing for war is expensive, but the price of losing is far greater. Our Army and our Nation requires your continued support. It is time to renew the commitment to sustaining the U.S. Army's tactical overmatch.

Mr. Chairman and distinguished members, thank you for the opportunity to speak with you today, and I look forward to your questions.

Senator COTTON. General Marion?

**STATEMENT OF BRIGADIER GENERAL (PROMOTABLE) ROBERT L. MARION, USA, DEPUTY OF ACQUISITION AND SYSTEMS MANAGEMENT, OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY FOR ACQUISITION, LOGISTICS AND TECHNOLOGY**

Brigadier General MARION. Chairman Cotton, Ranking Member King, and distinguished members of the Subcommittee on Airland, thank you for the invitation to meet with you today and discuss Army equipment modernization.

Mr. Chairman, Army modernization is the primary means by which we provide our soldiers with cutting-edge technologies and the latest in systems capabilities to empower, unburden, and protect them. In a global security environment that is increasingly uncertain and complex, the threats and challenges of tomorrow will

be overcome with the equipment we develop, modernize, and procure today.

Stable funding and continuity of effort take on increased importance in the world of acquisition. Starting and stopping programs based on available funding prevents momentum in research and lengthens the timelines for discovery and innovation. Operating under continuing resolutions and the pressures of sequestration increase risk in our procurement programs and cause delays in getting necessary equipment into the hands of our soldiers. Declining budgets drive difficult choices. Sustained, long-term, and predictable funding is essential for the Army to build and sustain current readiness and a more modern capable force.

In the current environment, we are focused on five things: protecting science and technology investments, selectively investing in new capabilities, incrementally modernizing existing systems, resetting and sustaining equipment, and divesting excess systems.

Equipping is a critical component to readiness. We cannot put our soldiers at risk by not providing them with the right equipment at the right time at the right place to accomplish their assigned missions.

Finally, limited resources in the Army's modernization account continue to present significant challenges for the defense industrial base, especially for companies that cannot leverage commercial sales and for small companies that must diversify to quickly remain viable. When developing our equipment modernization strategy, we carefully assess risk across all portfolios to ensure balanced development of new capabilities, incremental upgrades to existing systems, and the protection of critical capabilities in the commercial and organic industrial base.

Mr. Chairman and distinguished members of the subcommittee, thank you for your steadfast and strong support of the outstanding men and women of the United States Army, our civilians, and their families.

This concludes my opening remarks, Mr. Chairman. I look forward to your questions.

Senator COTTON. Thank you all, gentlemen.

I think one consistent theme of all four statements we have heard here today from four Generals and two Senators is that Congress has done no small part to hamstringing the Army over the last 5 years due to the Budget Control Act and sequestration and the stop and start nature of our appropriations process.

Just maybe if we can start down the line with General Anderson and going down the line. As Senator King said, the budget submitted last week focuses primarily on end strength and on readiness. Does it cause you concern that the budget this time around again seems to skimp on modernization?

Lieutenant General ANDERSON. I think, Senator, that modernization will keep being the bill payer. So it allows us to maintain that \$1.018 billion baseline that we are trying to achieve here based on the NDAA. It does enhance some of the readiness capabilities we have and some of that is going to fill the hole from the readiness side. Getting formations back up to about 100 percent is a good thing, and it buys back some of the capabilities that we were about to lose and it buys us a couple other capabilities like shore ad and

fires battalions. But above and beyond that, we are kind of status quo in terms of improvement.

Senator COTTON. Thank you.

General Murray?

Lieutenant General MURRAY. Senator, just for clarification, you are talking about the 2018 budget?

Senator COTTON. Yes.

Lieutenant General MURRAY. I agree with General Anderson. We make a pretty significant dent in 2017 with the \$30 billion that OSD asked for the Army. Senator King, you mentioned this. It is actually about \$4.5 billion goes directly towards modernization of equipment and investment in the future. But once again, 2018 basically sustains mostly the force structure the NDAA gave us.

Senator COTTON. General Dyess?

Major General DYESS. Senator Cotton, the organization that I am in looks at the future. We are really looking at 2025 to 2040. We are really close to that. As we developed the 1923 POM, we will be very close to that, having that force by the time that POM comes to fruition. So I am concerned that we are moving in a way that takes us to a more modern force in which we both modernize existing equipment and develop those replacements for those work-horses that were fielded in the 1980s that Senator King mentioned earlier.

Senator COTTON. Thank you.

General Marion?

Brigadier General MARION. Sir, I concur with my colleagues, especially the remark General Murray made about forgoing long-term development of systems for the incremental upgrades that we have to afford today, we have to pay for today, to ensure we have near-term readiness. So some of those incremental modernization activities that we have continued to carry on with those platforms—I think of Blackhawk as an example—we are going to be at a point where we cannot continue to incrementally modernize them anymore. From an affordability standpoint, we have got to get to a point where we can make a leap ahead in technology and a leap ahead in the other systems just like in Blackhawk.

Senator COTTON. Thank you.

As we think about the long term, General Dyess, you said in your testimony you cannot modernize effectively without the future of armed conflict. You are talking about the window of 2025 to 2040. As you look ahead to the future of armed conflict, what are the main capability gaps in the Army right now that concern you for the future?

Major General DYESS. Thank you, Senator.

In this way, we are very in line with what the Chief has established as his priorities based on both high fidelity modeling, as well as what we have seen in our Russian new generation warfare study. We have seen primarily that we have a need for a mobile, short-range air defense. We have a need for long-range precision fires. We have combat vehicles, active protection, as you mentioned before, assured communications, position navigation and timing. All of those things are consistent with what we see that we need to work on now but also will take us into the future.

Senator COTTON. Thank you.

General Murray, as you think about those capability gaps, has the Army published a strategy to address those gaps and how we are going to get to the end state that we need?

Lieutenant General MURRAY. Before I get to that, Senator, the one thing I would add is munitions, which we talked about yesterday. There is a critical shortage.

Your answer specifically is not yet. So we have published modernization strategies for the last few years. It has been very much resource-constrained. So it talks about incremental upgrades to the current systems, investing in new development only when we absolutely have to like the AMPV [Armored Multi Purpose Vehicle] for the 113 replacement. General Dyess down at ARCIC is working on a strategy that gets after a parallel path. I am also working on a short piece for the Chief that is in his hands right now for him to approve and we hope to have over with the 2018 budget if not before.

Senator COTTON. Thank you all, gentlemen.

Senator King?

Senator KING. When I was governor, I had an adjutant general, and he taught me the term “after action review.” I am wondering what the Army has done in the way of an after action review of the disastrous results of modernization efforts prior to today, over \$20 billion spent, no new fighting capability. What lessons have we learned and how can we take advantage of those lessons to not repeat the problems that plagued the Army modernization efforts 20 years ago?

Major General DYESS. Senator, I will start. The last one that you mentioned as far as time in the recent was the FCS program, which was 2008–2009 time frame. I think that in the interim period of time, we have had less money, but we worked on the requirements I think very hard in order to have a requirements process that develops equipment that we can afford. My organization inside of TRADOC [Training and Doctrin Command] works with General Murray’s organization inside of the G–8 requirements and resources, and we work with Bob’s organization inside the acquisition community in order to not reach too far, stabilize our requirements, and then work towards achieving them.

Senator KING. Eighty percent solutions instead of 100 percent.

Major General DYESS. Sir, absolutely.

Senator KING. General?

Brigadier General MARION. Sir, one of the very specific things—and by the way, that after action term is something that we have done just exactly on those programs that you mentioned to try to get at the question that you asked. How do we get better in the future? That is the key thing.

So when we look at from an acquisition standpoint, we mature technologies to a point, and then we integrate them, build them into a system, and then we test them, and then we buy them in procurement. Each program is different.

Senator KING. Where did it break down?

Brigadier General MARION. Exactly, sir. So each program is different, but one common theme—there are actually two common themes that we have seen. One is we have gotten to that point where we believe the technology was mature enough to begin to in-

tegrate into a final end item and then build it and test it, but the technology was not as mature at the component and sub-component level. It was not as mature as we thought, or in some cases we knew the risk of moving, but we wanted to develop that capability and deliver it as soon as possible. So we went forward into the integration phase, the build phase, and the test phase too soon.

Senator KING. Well, that is exactly the experience of the Air Force and to some extent the Navy of doing R&D while you are building. It makes it more expensive, and you are not sure what you are going to get at the end. It sounds like that is a common thread.

Brigadier General MARION. That is exactly correct, sir. I will give you an example with JLTV [Joint-Light Tacticle Vehicle] on how we learned our lesson.

So we only went past that phase where we were integrating technologies once we knew that those technologies were sufficiently mature at the component and sub-component level before we integrated them into an entire vehicle and before we took it to test and before we made our procurement decision. Now we are into a low-rate initial production, an LRIP [Long Range Precision Fires], phase on JLTV where we got to an 80 percent solution and we went forward with a procurement decision, and we believe that is the way to focus our activities in the future.

Senator KING. Now, has the Army made institutional structural changes to deal with these issues? Because I do not want this knowledge and memory to retire with you guys and then we have to learn the lessons all over again.

Brigadier General MARION. So, sir, the second point is once you get to that point and you are ready to build and integrate and test, then the institution has to be very disciplined about how we allow changes to occur. We cannot allow design changes to occur because of changes in funding, changes in requirements, the technology does not mature. We have to be very disciplined about that. We have instituted processes that originate with the Chief of the Staff of the Army. Once we lock a requirement, he is the authority. So we have instituted this Army Requirements Oversight Council where once the Chief locks a requirement, that is the requirement.

Senator KING. I think that is very important that we do not forget those lessons, that they are embedded somehow in the formal process and in the structure.

One of the things that we are talking about in the Air Force and in the Navy is—of course, it takes a while to procure and develop a new weapon system. It is going to be obsolete the day it is launched. We know that. It is just like buying a computer. But the key is, it seems to me, building these things in a modular way that can be upgraded, particularly with software and those kinds of things, so that you do not have to build a whole frame all over again. Is that something that you are looking at?

Brigadier General MARION. Yes, sir. That is exactly what we are looking at.

Lieutenant General MURRAY. I think a lot of the things you pointed out, Senator, have driven us almost to the incremental upgrade approach because we actually do pretty well in incrementally upgrading systems. So the big five you mentioned in your opening

statement, the tank and the Bradley specifically, are not the same tank and Bradley that rolled off the production lines in the 1980s.

Senator KING. The frame may be the same.

Lieutenant General MURRAY. The frame may be the same, but they are significantly more capable. With the next upgrade we are looking at, they will be significantly even more capable. So we have kind of focused on that with limited new developments, as I mentioned.

One of the new development items that we are looking at—it kind of gets to some of your points I think—is mobile protected fire power. So for lack of a better term, it is a lightweight tank for at least our airborne forces and potentially all of our IBCTs [Infantry Brigade Combat Teams]. So we are doing this process significantly different. So this is not something the Army is trying to start from a clean sheet of paper with the build. So we have gone to industry, looking for non-developmental systems, in other words something that currently exists or a chase and a turret that can be put together so it is all in existence. So it is not brand new technology. It gets back to your what is good enough quickly comment.

The Chief has been involved with that, along with the other four-stars, in personally approving every requirement we put against that vehicle. He sat down with industry for 6 hours, and the Vice followed up with another 4 hours in 1 day for industry to come back and talk to him about what was tough about the requirements that we laid out, what were the trades he would need to consider. Then we will lock the requirements within 8 months of actually saying this was an Army requirement. Then as General Marion said, anything that changes will have to go back to the Chief for changes. We are after a good enough quickly to get capability in the hands of our soldiers.

Senator KING. The first requirement would be that the requirements be expressed in no more than 10 pages. Just pick a number.

In any case, thank you, Mr. Chairman. We will have more questions.

Senator COTTON. Senator Donnelly?

Senator DONNELLY. Thank you, Mr. Chairman.

Generals, I would like to commend all of you and your staff for the time, the energy, and effort you have put into two important Army fleet readiness programs: the Army National Guard HUMVEE modernization program and the HUMVEE ambulance modernization program. Even after JLTV is fully fielded, HUMVEEs are going to make up the majority of the Army's tactical wheeled fleet until at least 2030.

Meanwhile, with each passing day, the HUMVEE fleet is aging. The average age of HUMVEE ambulances is now 28 years, more than a decade beyond the expected useful life. According to the Army's own assessment, these vehicles are in urgent need of either recapitalization or replacement. This is a perfect example of an area where modernization and readiness needs converge.

Congress has provided significant support to HUMVEE modernization efforts and the model public-private partnerships between Army depots and industry that do the work.

I know we are mostly talking about the fiscal year 2017 and 2018 budgets today, but I want to jump ahead 1 year. This committee

has urged the Army to expedite planning and funding in fiscal year 2019 for a long-term program of record on HUMVEE modernization. This is for whoever wants to take a shot at it. When do you think we can expect to see a comprehensive modernization plan with an associated program of record?

Lieutenant General MURRAY. I will start with that, Senator, and thank you. You mentioned this. So the help that this committee and really the Congress as a whole has given specifically to the Guard and Reserve in terms of HUMVEE recapitalization, specifically the ambulance piece, has been exceptionally helpful.

We believe we have a decision point on HUMVEEs at large in 2018 and it really comes down to what you said in your comments, that we are going to have to make a decision on either we are going to have to buy more JLTVs to replace HUMVEEs or we are going to have to start recapping the HUMVEE fleet we have. It is about a 50/50 mix, as you know, between the total requirement between JLTV and the HUMVEE.

So the average age of the HUMVEE fleet right now is about 9 and a half years. We try to maintain less than 15 years. So we are in good shape for another couple years in terms of the age of the HUMVEE fleet. But we think the decision point is in 2018 whether or not we have to fund a HUMVEE recapitalization or we have to purchase more JLTVs to replace the HUMVEE fleet.

Then the ambulances. I mean, we are looking very hard at the purchase of the A-3 vehicle to get after some of the issues you are talking about.

Senator DONNELLY. Can one of you elaborate on the Army's stated desire to not only grow and modernize its armored force but also to accelerate modernization of the Army's combat vehicles? What combat vehicle programs are you talking about modernizing?

Lieutenant General ANDERSON. Senator, I will start with the armored capability. So against the war plans we are planning against we are short. So the Chief made a decision here about 6 months ago to convert 15. There are nine ABCTs [Armored Brigade Combat Teams] in the active component. There are five in the Guard. He had a decision to convert one IBCT, a light brigade, to an armored brigade. He has just decided to go with another one. That is trying to enhance the capability so we can support the war plans to meet the requirements.

Lieutenant General MURRAY. In terms of the modernization piece you asked about, so it is really across the entire fleet. So Abrams tank—we start this September in terms of an upgrade from the B-2 to the B-3, the latest generation Abrams tank. On the Bradley, we start this year on an upgrade from the A-3 to an A-4. The Stryker you are familiar with. With a lot of help from Congress, the lethality package that we will field to the second SER is actually ahead of schedule in 2018, and then the Paladin PIM [Paladin Integrated Management] program when we go from the A-6 version of the Paladin to the A-7 version.

Senator DONNELLY. That ties in a little bit to my next question which is how do your current plans for incremental modernization of vehicles like the Abrams tank and the Bradley fighting vehicle that date back to the Cold War—how does that mesh with your

projected requirements, particularly given the changing dynamics we are seeing almost on a daily basis in Europe?

Lieutenant General MURRAY. So it really gets down to—and General Dyess can talk more about this—is the Chief is firmly convinced that there is a very real chance we will see a change in the character of war in the next 10 or 15 years. What you have kind of highlighted is the fundamental issue that we have is maintaining readiness for today so our soldiers have the best capability we can provide them, and we have programs to do that today, and finding the money to invest for 2025, 2030, for instance.

Right now, if you look at how we invest in next generation vehicles, given the resources we have for modernization, is I have got to finish upgrading a vehicle. Let us just take the tank, for instance. So I got to finish upgrading the tank before I can free up enough resources to start procuring next generation—I can do some of the development—before I can really starting buying in a big way.

Based upon the resources we have got, we have stretched out procurement and modernization production lines to a point of almost being silly. So to upgrade an ABCT with what I just laid out, it takes 3 years. One ABCT, 3 years. So to do five of them, that is 15 years. So what you find is, given the resources we have, we never finish the upgrade because in 15 years, there will be another upgrade available that we are going to have to invest money in.

So that is why I say we have got to start looking at the development, and we have. I mean, there is work going on at Fort Benning right now on the next generation combat vehicle. So the limited money it takes to start developing requirements and do some early prototyping—we can do that.

Where we run into problems is I can never afford to buy it until we finish the upgrade we got. That is where predictable funding, even if it is less than ideal, predictable, so I can kind of look year to year to year to figure out when we can do that would be very helpful.

Major General DYESS. Senator, in a couple weeks, we are going to commemorate the 100th anniversary of the U.S. entry into the war to end all wars. We did not seek that war. It sought us. The Army ordered 4,400 tanks on the entry of war for delivery a year later in 1918. Now, production did not start on those tanks until June of 1918, and they delivered 300 tanks to the United States forces in Europe.

We have had tanks in development since that time, since 1917. We have no future tank in development at this time. We are working to start, as General Murray mentioned, a next generation combat vehicle, which will be a Bradley replacement, starting at Benning, just a nascent program with small amounts of money. But this is the part about the big five, and then what is the next generation and how are we going to replace them? Modernizing existing, keeping readiness, but also moving into modernization of all those programs that we counted on so much across the years.

Senator DONNELLY. Thank you.

Senator COTTON. Senator Sullivan?

Senator SULLIVAN. Thank you, Mr. Chairman.

Gentlemen, thank you for your testimony and your service.

A number of us worked on the NDAA last year to increase the Army's end strength. What are the numbers that you are looking at right now in terms of your assumptions on planning going forward, and what do you think the optimal number would be from an end strength standpoint?

Lieutenant General ANDERSON. Hi, Senator. Good to see you.

Senator SULLIVAN. You too, General.

Lieutenant General ANDERSON. Growing that 1.013 is the sweet spot, Senator Sullivan. What did I say? \$1.018 million is the sweet spot. That is the 476 in the active to 343 in the Guard and the 199 in the Reserves. The priorities are to get to those numbers. It is then to fill—I spoke earlier about trying get our units back manned up to 100 percent, sir. So we are hovering about 95 and the non-available is down in the 80s. Then we are trying to buy back some more combat capabilities that were scheduled to go away. Then we are trying to buy some other capabilities, light fires and air defense, shore enablers that we need from the European plan.

Senator SULLIVAN. Just following up on the previous testimony, when you look at the Air Force, they are always talking about fifth gen in terms of fighters. Right? So F-35's, F-22's, and obviously those have been developed to take on a fifth gen adversary, China or Russia, in their development.

So are you saying that in terms of the main weapon system for the Army, the Abrams tank—we do not have any kind of next gen battle tank that we have envisioned or planning or working on? What is the Army's equivalent of the F-35? Maybe that is not a great analogy because that did not come off so well. But I think now the capability in terms of what that aircraft and the F-22's are able to do is pretty darned impressive. Is there an Army analog in terms of a big, kind of a next gen platform that we need and that we know the Russians and the Chinese are developing similar advances in technology in main battle systems?

Lieutenant General MURRAY. There are those out there that will disagree with me. I think for the very near term I think the Abrams is still towards the top of its class in terms of combat systems, in terms of tanks.

Senator SULLIVAN. Towards the top, General?

Lieutenant General MURRAY. I think we have parity. I think there is parity out there. I do not think we have overmatch.

Senator SULLIVAN. We do not want a fair fight.

Lieutenant General MURRAY. I would agree with you, Senator.

Now, General Dyess mentioned next generation combat vehicle development going on at Benning. That is the start of it. But the problem we have is it is just not the tank. So the infantry carrier, the next generation combat vehicle. We have got to figure out what comes after Patriot, Avenger, THAAD [Terminal High Altitude Air Defense] in terms of layered air defense systems. We have begun some work on FVLs. As you know, that is a program that is progressing for our aviation fleet. The replacement for the 113 is starting to go into low-rate production. That is AMPV. You mentioned this—and the F-35 is no exception—it is time. So it is time. So it is really a balancing of resources, risk, and time so you deliver the right solution.

One of the problems we have with heavy armor right now is this next upgrade of the Abrams will, once again, increase the weight. We are just about reaching the limits of what we can do with the Abrams. So it is time for us to start looking at next generation tech.

What I worry about is there is nothing on the near horizon that indicates a fundamental breakthrough in technology where we can come up with a lighter tank. I think we would be mistaken to build another 75-ton tank as long as protection requirements are where they are. So we are not waiting on that technology. Let us go back to your point, Senator, we need to be very careful about what technologies we count on when we go down this path so we do not end up with another program that cannot deliver.

Senator SULLIVAN. Thank you.

I have two more quick questions. Now that we have deployed with the European Reassurance Initiative, it is a very kind of different kind of deployment than we have been doing, say, in Iraq and Afghanistan. Are we seeing capabilities, now that we are on the ground there, that we need to kind of refine or get back the muscle memory? That is kind of big Army deployments, looking across the plains of Europe, serious potential adversary. How are we thinking about that?

Lieutenant General ANDERSON. I will start and Mike can follow up, sir.

That is what we kind of knew before we got there. So with the brigade brought, obviously, enhanced armor, but the issue has become again the long-range precision fires and that gap that we have been trying to fill here for quite a while in all things air missile defense. The way we are getting around that is with our NATO partners just like the Romanians that are going to send a battery to join our EFP formations starting here next month. So through the synergy of NATO, we will build some of those capabilities, but again, the issue becomes the longer-term plans to enhance those capabilities.

Major General DYESS. I would like to add on that probably training and leader development may be the thing that is the best investment at least in the short term because we have not exercised the muscle memory of full spectrum operations. We are starting that in our combat training centers. What we are seeing is that the colonels and higher have exercised that before, but below that, lieutenant colonels and below have not exercised in that and have, rightfully so, spent their resources to protect soldiers' lives, take soldiers to combat, bring them back in the last 15 years.

Senator SULLIVAN. Well, I am out of time. General Anderson, I would not end a hearing without mentioning the 425 and the appreciation we have had for you guys reevaluating that. I want to make sure you do keep in your training continued focus on the cold weather ops in the Arctic. I mean, if the North Korea—the balloon goes up there, we are going to need soldiers who know how to operate in extreme temperatures in a mountainous terrain. That unit is doing a great job in those kind of environments. Thank you.

Senator COTTON. Cold weather mountainous training in the Ozark Mountains of Arkansas, which I strongly support.

[Laughter.]

Senator COTTON. General Murray, you said that the Abrams is near the top and at parity. Whose tracked vehicles are near the top with the Abrams?

Lieutenant General MURRAY. I think the Israelis, the Merkava, would be one. I would say that the T-90 is probably pretty close. I mean, people talk about the Armada tank, and it is still in my mind not completely fielded. Probably the British tank is pretty close. I would not say that we have the world class tank that we had for many, many years. I will be the optimist and say that we are at parity with a lot of different nations.

Senator COTTON. Thank you.

Senator Peters?

Senator PETERS. Thank you, Mr. Chairman.

Thank you, gentlemen, for being here and your testimony. Thank you for your service.

As we are talking about kind of the future of warfare and new systems that are being developed, I am from Michigan and we are in the process right now of a transformation of the auto industry in ways as every bit as big as when the first car came off of the assembly line with Henry Ford, and that is in self-driving autonomous vehicles, which is happening much quicker than I think anyone anticipated, especially with Ford Motors announcement of having a production self-driving car by 2021, just a few short years from now, but certainly many vehicles before that.

At the President's address, my guest was Dr. Paul Rogers who is Director of TARDAC [Tank Automotive Research Development and Engineering Center], the Army's tank automotive research and development facility, which I know you know very well. They are doing some incredibly innovative work in autonomy and looking at how that might change how we fight wars. Certainly from a logistics standpoint, given the fact—my understanding is—we had more casualties in logistics in Iraq than in combat because it is pretty dangerous to drive a fuel truck and other types of vehicles with mines and attacks along that route.

I just want to kind of get a sense from you as to where do you see autonomy self-driving in either combat vehicles, logistics vehicles. Are we able to build some partnerships with the auto industry and work with some of the incredible engineering talent we have in the greater Detroit area where I see both the Department of Defense and the private sector working in ways that could be very transformative, kind of get your vision of where you see autonomy when it comes to land combat vehicles and logistics vehicles.

Lieutenant General MURRAY. Thank you, Senator.

As you know, we already do this in the air, so the man-to-man teaming concept. We are looking at something very similar. So in terms of concepts, robotic wingmen for ground systems. You have potentially a manned combat system paired with one or more unmanned system in the future. We fundamentally think that at some point in time as we progress, that we should never send a soldier into the most dangerous thing that soldiers do, for instance, breaching obstacles, first man into a room, you know, if you are clearing a building, et cetera, et cetera.

There are two specific programs I am sure Dr. Rogers has talked to you about. The one TARDAC is working on right now is called

leader-follower technology. That is one leader vehicle up to seven follower vehicles. It is a little bit more complicated than what is going on in the civilian industry right now because we are talking off-road, cross-terrain. So it is a little bit more difficult than I-75 in Michigan, in my home State.

Then the other piece we are working on is ESMAT. It is a mule which we have had forever. It is an equipment carrier that is fully automated to follow an infantry squad. It can carry up to 1,000 pounds of ammunition, water, their rucksacks, their batteries. It recharges batteries. So we working that. We have take both of these to AROC.

The problem I have got right now is the cost. You tied in the auto industry. So when we looked at the ESMAT going online and found that for what we think we need to pay for, what we are being told it is going to cost us to develop, et cetera, et cetera, I could buy a brand new Mercedes for a lot cheaper than I could buy basically just a four-wheel cart that is going to carry 1,000 pounds of equipment, which does not seem reasonable to me.

So we are going back and we are working more closely with industry. We are working with some partners, DIUx [Defense Innovation Unit experimental]. We are working with some other partners to find out how we can do this faster and how we can do this cheaper because if it is just one, I can afford it. If I am going to put one of these in every infantry squad across the entire regular Army, the National Guard, it is going to be billions of dollars we would end up spending on this. So I have got to figure out how to get the price point down.

Major General DYESS. Senator, I sponsored a RAND study about 4 years ago, and one of the biggest obstacles to fielding robotic capability in formations is trust and culture. I think the tipping point is going to be the sergeant 1st class, the E-7. As soon as he can adopt that in, I think that will be the tipping point for us.

Now, that does not mean that we will back away from ground robots. I think it is going to be part of our future. We just got the approved robotics autonomous systems strategy from the Vice Chief of Staff, and we are starting to work that and publicize that now. So I think robotics are going to be part of our future. Obviously, air is already there. Ground I think will be in the future as well. But I think we have to overcome a trust and culture.

Senator PETERS. Yes, certainly. I think that is in the civilian sector as well. Folks who like to drive automobiles to be able to sit back and let that automobile drive you and your family down the highway will take some time to get to that point. So certainly it is the same in a combat situation.

But actually, General Murray, I was up in Michigan Tech who I know is working with TARDAC and with others to take these vehicles through a forest situation which is much more complicated than the I-75 drive with gulleys and the like. But I am pretty impressed with the work that is being done. It has happening very quickly. As far as the cost element, obviously, the civilian world has to worry about that too to make these production ready and probably initially will be in fleets like the Ubers and Lyfts and others. But as they produce more, those costs will go down and I am

sure will be working hand in glove with you as well to make sure that happens with your vehicles.

But thank you. Thank you for the comment.

Senator COTTON. Senator Warren?

Senator WARREN. Thank you, Mr. Chair.

So for thousands of years, human beings have been fighting wars, and for thousands of years, there has been one constant and that is how much stuff can a person carry. That just has not changed. Today we can put gear in the hands of a soldier that would have been undreamed of even a decade ago. But every time we do that, we load that soldier down, and that means less mobility, getting tired faster.

I want to focus on that part when we are talking about equipment, and that is I am really interested in the research that is going on now that makes what a soldier does both more effective but also lighter, more manageable, how much stuff they are carrying around.

I am interested in this because I have had a chance to go multiple times now to the Natick Soldier Systems Center in Natick, Massachusetts. It is this incredible facility that is doing this cutting-edge work on fabrics, for example. It is amazing stuff. Lightweight fabrics now that can monitor a soldier's vital signs, batteries that can generate power from soldier's own movements, lightweight helmets that are both more comfortable and more bulletproof than in the past.

So I just wanted to ask a question—I thought I would start with you, General Marion, but I want anybody to weigh in on this that has some ideas—about speaking to one or two areas in personnel equipment that you think right now show the most promise or areas where you think the greatest need is in terms of development and testing.

Brigadier General MARION. Well, thank you, ma'am.

I think the single area that I would talk to most is lightweight body armor. The research, development, and engineering was done at Natick labs. So what we have been able to find through testing recently is that we had the same level or greater protection for up to 26 percent less weight. That is weight that we cannot off board to a mule or something else. That is protecting a soldier. So water, food, things like that, we can, but we do not want to do that with body armor.

So some other things that we have done—

Senator WARREN. Can I say before you leave body armor—I just want to get a little pitch in here too because for the first time I have seen a body armor that is different for women than for men and how much more comfortable that is and how much more effective that is.

Brigadier General MARION. Yes, ma'am. The vest that the soldier wears that these armored plates go into—those vests are now being designed from the smallest stature soldier we have, the 5th percentile female, up to the largest stature soldier we have, the 95th percentile male. So we have a variety of sizes of vests. Because of that, we can size the plates appropriately so a soldier does not have to carry a larger plate than they should be. So I think we are mak-

ing all the movements in the right directions, and the testing is going well for those specific lightweight body armor components.

By the way, we just awarded yesterday a contract for that lightweight Army combat helmet that you just referenced. So we are on the right track there too.

Senator WARREN. Good. Anything more? I think I may have distracted you. Were you about to go to another one? So we are on body armor. Right? Good.

Anybody else want to add anything? General Anderson?

Lieutenant General ANDERSON. Ma'am, it has been a problem since I was a lieutenant. So the issue becomes again—and it goes back to what Bob is talking about. There are certain things besides PPE [Personal Protective Equipment]. So as we watched over all these years when we went to Iraq back in 2003 as all this stuff kept getting added to us like a Christmas tree, side plates, groin plates, neck plates. All of a sudden, you are becoming a robot.

So we will keep working what Bob just described. I think all of us as we keep working—your basic combat level. Like you said, yes, you have to have the PPE because it protects you, but when it comes to your life support, obviously, your weapon, your night vision devices, your communications equipment, all the efforts we have done in terms of power, you talk about things that can take vital statistics, but batteries, munitions, all those types of things over the years have all come down.

But the bottom line is, you know, just being the corps commander at Bragg, we are still throwing guys out of airplanes with 135–140-pound rucksacks coming out of an airplane. So that is not good. That is too bulky. That is too onerous. When they try to get out of that airplane, they cannot get out of the airplane when you throw on things like a parachute.

So we have got to keep working all the parts of your fighting load above and beyond your personal protective equipment, and that is just going to have to be—you know, Natick has been doing that for a long time, but that is everything from aluminum type magazines to now the new plastic type. So many different examples, but we have to keep working on that effort.

Senator WARREN. Anything more anybody want to add?

Lieutenant General MURRAY. I would just say the integrated head, neck, face protection—I think you asked for probably the most promising, the ability to really monitor the vital signs of a soldier, because we cannot do that right now. So a soldier goes out for heat injury. The first time you find out he is going out for heat injury is when he falls flat on his face. So the ability to monitor vital signs so you can get a little of a warning. I think those would be the two most promising.

Senator WARREN. I have seen some of this stuff in development. Just amazing what it looks like they are going to be able to do on this.

Anything more that you want to add?

It is very helpful because I realize what we are trying to do here is we are trying to solve for two variables at the same time. We want greater effectiveness, but we also want greater safety. We want to maximize both of them, and I realize sometimes there are tradeoffs.

Lieutenant General ANDERSON. Soldier effectiveness is what you are talking about. At the end of the day, that soldier has to be able to walk quite a few kilometers with that load and be able to get the job done when he gets there. If we do not give him the kit to be effective—but he has got to be able to get there.

Senator WARREN. I have one other question I want to ask you about. Last week, we had a panel of experts who told this subcommittee that our adversaries are improving their cyber and electronic warfare capabilities. They are developing the ability to disrupt our communications systems. So that is the other part I want to ask about, about what plans the Army currently has to make sure that communications networks are resilient and they will be able to remain both operational and secure in adverse conditions. Could you say something about that?

Major General DYESS. I will just start, ma'am.

Senator WARREN. Please.

Major General DYESS. So as we look at the future of a multi-domain battle, we think that we are going to be contested in all those domains, space, cyber space, for example, electromagnetic spectrum, et cetera. That is going to be increasingly lethal. It will be increasingly complex with the urban environment. But we are going to have to operate degraded. So I think we are putting that in our concept work so that will help give us a point of direction to travel in. So it is going to inform the people who make requirements and inform the people who do the doctrine and organization and training and leader development building for requirements. So that is one thing we are putting in to define the operational requirement. That is going to be a tenet of a future battlefield for sure.

Lieutenant General MURRAY. So that near term, in the future, ma'am, so it will not come as a surprise to anybody that our adversaries have the ability to do cyber attacks. The EW [Electronic Warfare System] piece, the ability to affect our system right now, that is not a future capability. They have that right now. So we are getting after that several ways.

So in terms of a defensive standpoint, so assured P&T, the ability to use GPS [Global Positioning System] signals is very, very important to us. We are working about five different lines of effort to make sure we can guarantee that our systems can continue to rely upon—

Senator WARREN. So this is about resilience and about—

Lieutenant General MURRAY. It is resilience.

Senator WARREN.—duplication in effect. So if they knock out one way to do it, we are right back on line with a second or a third or a fourth.

Lieutenant General MURRAY. We are looking at little things like the atomic clock. So if we lose GPS, the atomic clock has the ability to provide the same type of timing that GPS does.

We are also looking at in terms of—so a COMSEC [Communications Security] modernization piece of it so to make sure we can have the secure communications.

There is also a big training piece of this that we have not really worried about this for the last 15 years. So how do you operate in that type of environment?

We are also looking at offensive capabilities so we do not have a radiation-seeking warhead right now. So we are looking at development of a radiation-seeking warhead and the ability to identify where that jamming is coming from in terms of EW and be able to address that through an offensive role too.

Senator WARREN. Good.

Major General DYESS. One other thing is experimentation. We need to be able to experiment with these things. At Fort Bliss, White Sands, we own the entire electromagnetic spectrum. So there are some capabilities that we are going to find on the future battlefield that we are not going to be able to replicate at home stations or even at our CTCs [Combat Training Centers] because it is on the flight path into LAX. We cannot turn it on.

Senator WARREN. You cannot do that in Boston.

Major General DYESS. Exactly. So simulations I think is going to be important. So brigade commanders and division commanders understand the capability. But to be able to now experiment—I always thought it was not right to attack a brigade combat team with cyber at a national level and not have a national defense capability out there. So the last year, we sent out a defense capability. They identified a machine that was attacking the network, isolated it. The brigade commander wanted that machine back in the fight because that is part of his combat power. We were not able to do that 2 years ago, but last year we were able to do it. You have to be able to experiment with this.

Senator WARREN. I appreciate the point you make about hardware and about training and just how people conceive of the problem. Good.

Anything more?

Lieutenant General ANDERSON. So you know, ma'am, we do do two EW cyber rotations at the National Training Center per year. The goal is to be able to do that every rotation. But those are massive focused. It takes a lot of enablers to come out there and do that. But how you try to operationalize cyber, EW because most commanders do not understand it and do not have the capabilities like Bo is talking about. So those are phenomenal opportunities to have them perform in a degraded environment.

But the bottom line boils down to how are you able to go from digital to analog. Mike is talking about GPS. You have got to be able to land nav the old-fashioned way, read a map. You got to be able to track a battle the old-fashioned way on an acetate map. That is the way we move forward. Places like Muscatatuck in southern Indiana have actual cyber. It is actually cyber facility where you can shut off power grids and you can shut off water. You can pick locks inside of a prison, et cetera. That is the way commanders can learn.

But, Senator King, the sad thing about your AAR comment is what Bo was talking about. We do have the facilities at White Sands but the problem we have at NIE, our network integration exercise, and our experimentation stuff—the problem was because of the demand on forces. We did learn back around 2009–2010 it was worth having a direct dedicated unit to do testing. Well, the reality of the demand I was explaining to you earlier—we cannot afford to keep that armored brigade team at Fort Bliss to do that

anymore. So we have to train rotational units to come back to do the testing. But we did learn how to fix it. But the reality of the world, based on particularly Russia, caused us to have to go heel to toe in Europe, and there goes that test brigade.

Senator WARREN. Thank you very much. I recognize we cannot be effective, we cannot be safe if we cannot communicate when we have got people out in the field and the importance of the R&D [Research & Development] on resilience but also the importance of training. I appreciate the work you are doing. Thank you.

Thank you, Mr. Chairman.

Senator COTTON. I would like to return to some of the questions I raised in my opening statement.

Does the Army need a modernization command, unity of effort, agility to stay ahead of the threat and innovation? General Anderson, do you want to take swipec at that?

Lieutenant General ANDERSON. Sir, it is something we talk about all the time. It is what TRADOC is all about, Senator. I think that is why it exists. When you look at what the centers of excellence are doing as subsets of TRADOC, I think the problem has become—a lot of those have become stovepiped entities. I think the issue becomes the integration—and Bo and I were just talking about that today about how you have the operators. You have the TCMS and the operators. Who is figuring out what the requirement is? But I do not think a modernization command is the answer. I think within TRADOC we have between what CAC [Combined Arms Center] does, what ARCIC does, and the center of excellence does. I think the issue is how do you get better collaboration between them and then between the operational force.

Senator COTTON. General Murray?

Lieutenant General MURRAY. Sir, I am with General Anderson on this primarily. When we have looked at this in the past—and I have thought about it extensively—I would be fearful that you would lose focus on what soldiers need right now and you would become almost solely focused. So it would be almost a change 100 percent of the problem we have right now. We would be worried about 2035, 2040, and then we would find ourselves short in the near term because that was always my dilemma is if you got requirements being built in this modernization command, who is doing the work that ARCIC [Army Capabilities Integration Center] is doing right now in terms of looking at right now. I am not saying it could not work. I am not convinced of what the problem is we would actually fix with standing up a new command.

Senator COTTON. General Dyess?

Major General DYESS. I think what General Murray said is on problem statement and problem identification is important. We have identified 20 first-order problems, the solutions to which would make the Army better. Those are the Army warfighting challenge. You keep it out of the stovepipes. You put the Army warfighting challenge—number one is develop situational understanding. Now, that is not a Huachuca intel problem and that is not a Fort Benning maneuver problem. It is not a Fort Sill fires problem. It is everybody's piece of the solution. So that is how we are trying to address it, Senator, is put the warfighting challenge

on the table and then develop cross-cutting solutions to answer that.

Senator COTTON. General Marion, I think I would like turn to you to DCGS-A as I raised in my opening statement, billions of dollars. The NDAA in fiscal year 2017 directed the Army to start seeking a commercial solution, and that was the compromise softer, weaker version of the provision. Where do we stand on DCGS-A?

Brigadier General MARION. Yes, sir. In the Army, we are clear on the path ahead on DCGS-A. In the fiscal year 2017 NDAA, section 113 referenced using commercial, off-the-shelf products, the prescription for firm fixed-price contracts, and timelines directly to initial operational capabilities and full operational capabilities. So we are exactly tracking the intent of section 113 and also section 220, the specific reference to post-increment one activities and the requirement to restructure the program and also use of COTS as well.

So our Chief of Staff is intimately involved in what we are doing to restructure the program. We are clear on the requirements from both sections of the NDAA, and the Chief has taken several briefings and is coming to a decision point on how we are going to move forward on restructuring DCGS-A to meet the requirements and also the provisions of the NDAA.

Senator COTTON. Is that at every echelon level?

Brigadier General MARION. Yes, sir. That is battalion and below at the tactical echelons. Section 220 says everything beyond increment one.

Lieutenant General MURRAY. Senator, I think you are tracking what we are doing at battalion and below almost right now. So we have gone out to industry with basically just a list of requirements—they are not the approved requirements for the solution—and invited industry to come in with what they have commercial, off-the-shelf that they think can meet the requirements.

Very soon here then this month, beginning of next month, they will show up. About nine, I think, vendors will show up at Fort Huachuca, and we will take them through a series of tests using real soldiers, both officers, warrant officers, and enlisted, each vendor individually just to prove out what they said they can meet in terms of the requirements. Then we will kind of figure out really what I think is—the real intent of prototyping is what the exact requirements are we need in the future and whether or not there are civilian solutions or off-the-shelf solutions out there that can meet the requirements. If there are not, do we need to change the requirements before we go after a developmental program.

Senator COTTON. Thank you.

Senator King?

Senator KING. I am a great believer that structure is policy. If you have a messy structure, you end up with a messy policy. I keep coming back to how is the procurement process structured. Just a few thoughts.

One question. When you are setting requirements, are construction engineers or representatives of the industrial base involved in defining the requirements?

Lieutenant General MURRAY. Well, industry is involved, yes, sir. So what we are trying to do right now—

Senator KING. I am just wondering if there is somebody at the table who says that is impossible or—

Lieutenant General MURRAY. In the past, the answer would be no. So what we are driving right now is when a requirement gets written at Fort Benning, Georgia, it is more than just somebody understands—so it is our S&T folks. They understand TRL levels, the technology readiness levels, associated with what we are talking about. It is the acquisition people. So they understand the acquisition process. As we write the requirements, it is the testers. So they understand as you write requirements, the testing requirements, so we do write a requirement that is going to take 2 years to test—

Senator KING. So the answer to my question is yes. Practicality and buildability is part of the requirements process.

Lieutenant General MURRAY. Yes, sir.

Senator KING. You mentioned several times off-the-shelf. You also mentioned or one of you mentioned in your testimony other good tanks. The Israelis I think you mentioned, the British. I understand there is not necessarily a tank but a fighting vehicle the Germans make called the PUMA. What about buying the design and building them here? I mean, why do we have to reinvent and do all of our own if there is a really good top-range vehicle out there that meets our needs? That would be another way to accelerate this process instead of going through 5 years of design and requirements. If the Israeli tank or the German tank is 80 or 90 percent of what we want—I do think it should be built here, but it could be licensed and built here. What about that as an option?

Lieutenant General MURRAY. We have looked at it not necessarily in the tank. I will talk about the PUMA. So, for instance, we have got some munitions gaps, and we went to the Germans in this case and looked at specifically their munitions. It came down to a capacity issue, and it came down to the cost was exorbitant in terms of what the munition would cost primarily because of the capacity. It was a cold production line. Then applied it to the PUMA.

Specifically the PUMA, I think we do not understand yet, sir, what the requirement is for the combat vehicle. So as you move to this fundamental change in the character of the war, one thing that General Milley is convinced is that we will absolutely be fighting in dense urban areas. So as we looked at the mobile protected fire power platform, one of the key things that is driving him is how wide is it, how tall is it, how long is it. If you look at the PUMA, specifically the PUMA is wider, taller, and longer than our current infantry fighting vehicle. We are trying to go the other direction. That is just one example.

For the MPF [Mobile Protected Firepower], we did have foreign competitors, foreign manufacturers come in and bid—or not bid yet, but present proposals for MPF.

If we go through the requirements process and there is a foreign manufacturer that can produce inside the United States, we will be absolutely thrilled to get them into the competition.

Senator KING. A couple of other points. At our hearing last week, we had testimony that Silicon Valley basically will not deal with the Pentagon, too cumbersome, too long, too aggravating. That is

a real problem. I mean, if our most creative, innovative sector of our whole economy says I just do not want to deal with this procurement system, it seems to me that in itself is something that should make us rethink it or meet with them. What is the problem so we can try to try to improve it? We cannot afford to lose that level of creativity and inventiveness because our systems are so slow and cumbersome and burdensome. I just commend that to you. I would suggest a summit meeting in San Jose about what are the issues and how do we improve this program.

I am worried about the industrial base and the length of time these things take. There is a danger to the industrial base. This one is partially on us because of this herky-jerky budget process that we have. You cannot predict. It seems to me the budget process that we have hurts modernization probably more than any other area because you cannot—

Lieutenant General ANDERSON. Installations too, sir.

Senator KING. Is that true?

Lieutenant General ANDERSON. Installations too. So if installations are going to be a power projection base, which they are, but you are going to have crumbling taxiways, runways, ranges, simulators, et cetera, it is pretty comparable.

But on DIUx, we did order a team out there in 2015. We went to them, sir. So, obviously, you are right. Tough coming to us, but we are just one subset of the Pentagon. So we did establish a liaison team there, started with three with a goal to grow to about 10. The issue is again how do they help us sort through and see things through on software, cyber, autonomous systems, artificial intelligence, et cetera.

Senator KING. But I would also add to that list of items the process itself as it relates to their ability to interact with the Pentagon.

Lieutenant General ANDERSON. No argument. We need to figure that out. But a bridge to that solution was to at least get embedded with them so we did not lose the opportunity.

Senator KING. Another opportunity—and I hate to raise the word “joint” because it does not have a very good history in military procurement. But if you are doing body armor, for example, should you not be working with the Marines on that project? The same thing with the fighting vehicle. I know there were efforts on a joint fighting vehicle. But to the extent that that can be done without it ballooning the requirements and ending up with a vehicle that will not work, I hope that that is still part of the picture.

Lieutenant General MURRAY. It is, Senator. So we do have a quarterly Army-Marine Corps board to focus. That is when we talk mostly about multi-domain battle, so you know, a concept. But most of those boards are joint development. So JLTV is a joint program. In terms of small arms ammunition, we are working with the Marine Corps. In terms of future vertical lift, Cape Set 3, we are working with the Marine Corps. So we work very, very closely. Body armor is another one. We discussed about specifically the female body armor about 6 months ago. So we do, about every 3 months, get together, and those types of conversations normally drive the agenda.

Senator KING. Good. Well, we are really just beginning the discussion here. But my time has expired. But I want to thank you

and urge you to maintain contact with the committee and with us as we work toward the new National Defense Authorization Act to try to capture what you need, other than regular funding. I understand that is important, but other areas of reform, structural reform, whatever we can do to try to accelerate this process because I do not want to face an adversary and have somebody say, well, we would have been ready but we could not work together or whatever the barriers were. We have got to get this right. Thank you very much, gentlemen.

Senator COTTON. Thank you all, gentlemen, for your testimony today and your many years of service to the country.

The hearing is adjourned.

[Whereupon, at 4:48 p.m., the subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

#### QUESTIONS SUBMITTED BY SENATOR TOM COTTON

##### ACTIVE PROTECTION SYSTEMS

1. Senator COTTON. Lieutenant General Anderson, Lieutenant General Murray, and Major General Dyess, last year, Congress approved a reprogramming request “to rapidly acquire Active Protection Systems (APS) for the Stryker and Bradley systems to defeat or mitigate threats to survivability.”

You highlighted the importance of APS in your testimony last week to the House Armed Services Committee, and I agree that we need to move with a sense of urgency to field technologically mature APS technologies, including solutions that are available today from our international partners. Please provide an update on the expedited Non-Developmental Item (“NDI”) effort for APS, including the results of recent tests of various systems. What is the timeline for the Army’s plan for the rest of this year with respect to the NDI? What can we expect in the fiscal year 2018 budget regarding plans following the completion of the NDI, in terms of timing, budgetary requirements, and number of systems? Is there an urgent operational need for APS? What is the Army doing to ease integration of the systems onto each of the combat vehicle platforms; especially given the constraints of size, weight, power, and cooling (“SWaP-C”), for lighter-weight vehicles?

Lieutenant General ANDERSON, Lieutenant General MURRAY, and Major General DYESS. The APS NDI efforts for Abrams, Bradley and Stryker are on independent timelines for installation and characterization. Abrams installation is complete and began automotive characterization and ballistic testing in March 2017. Automotive characterization assesses operational impacts to the vehicle platform with the APS installed. This assessment includes determining impacts of conducting daily crew level tasks, degradation of fire control performance and general interoperability. There have been no issues identified during the automotive characterization. Ballistic testing assesses the vendor claims for ability to defeat specific threats. Of the 18 scenarios executed as of May 11, 2017, there were no issues directly related to the APS system. Abrams characterization is scheduled to complete September 2017. Bradley and Stryker platforms are currently completing APS installation efforts with automotive and ballistic characterization scheduled to begin for both platforms in July 2017 and completing in December 2017. At the completion of characterization for each platform, the Army will make a decision whether or not to proceed with procurement/urgent fielding. A decision to proceed would require additional testing to assess safety, suitability and effectiveness to support urgent fielding. The Army has requested \$83.8 million (Research, Development, Test and Evaluation) to support this testing. Depending on the extent of additional testing, procurement of APS systems for Abrams could begin late fiscal year 2018 (FY18). The Army has requested \$168.7 million (Weapons and Track and Combat Vehicles) in the fiscal year 2018 budget to procure up to 87 APS sets for Abrams, with countermeasures and spares, and approximately 35 APS sets and countermeasures for Bradley. Procurement of APS systems for Stryker and the remainder for Bradley is anticipated in fiscal year 2019. The Army approved a Directed Requirement in October 2016 that “validates the operational need and serves as the directed requirement to field an initial NDI APS capability rapidly to the United States Army Europe,” contingent upon success of the installation and characterization efforts and guidance from the Army Requirements Oversight Council (AROC). Vehicle Protection Suite is the

planned Army program of record that will address ease of APS integration and size, weight, power, and cooling constraints relative to combat vehicle platforms and lighter weight vehicles.

MUNITIONS 155MM IN FISCAL YEAR 2018 BUDGET

2. Senator COTTON. Lieutenant General Murray, in your testimony you flagged the Army's anticipated need for "significant increases to ammunition requirements based on emerging peer and near-peer threats." The Committee also heard testimony from Combatant Commanders last year about the operational challenges they will face with the implementation of the policy restricting the use of cluster munitions, and the resulting shortfall in availability of critical weapon systems. The President's fiscal year 2018 budget blueprint describes the need to address "pressing shortfalls, such as insufficient stocks of critical munitions." The DOD fiscal year 2017 supplemental also requests a total of \$1.1 billion for ammunition needs, across multiple theaters. For example the request adds \$2.2 million for 155-mm rounds and \$135 million for extended-range M982 Excalibur rounds. Are those amounts sufficient to meet the "significant increases" in requirements? What legislative resources do you need, if any, to acquire capabilities that: (a) meet commanders' operational requirements; (b) keep unexploded ordnance to a minimum; and (c) do so in a rapid, cost-effective manner?

Lieutenant General MURRAY. No, those amounts are not sufficient. We project significant increases to ammunition requirements based on emerging peer and near-peer threats and increased demand in Iraq and Afghanistan—of which projected resources fall short. There are two primary issues we must address in order to meet commanders' current and future operational requirements. First, the Army is at risk if we should enter into sustained combat operations. While suitable substitutes exist to fill some shortages, there are no substitutes for ballistic missile defense or air to ground missiles. The munitions industrial base can sustain what the Army has requested up to this point. However in the event of a surge, it could take over two years to activate a production line for a "new start". We need to grow capacity in some of our Government-owned and Contractor-operated ammunition plants and to broaden commercial capacity in order to meet the increased requirements for preferred munitions. The second area of concern is the implementation of DOD cluster munitions policy which will go into effect January 1, 2019. The policy will limit the use of some of the Army's most effective weapons to support commanders' operational requirements. Denying essential terrain to our enemies will always be essential to ground combat, so reconsidering the cluster munitions policy has merit. If the policy remains in effect, the Army must continue to pursue advanced technology that is not currently ready and extremely expensive.

QUESTIONS SUBMITTED BY SENATOR ROGER F. WICKER

ARMY PILOT TRAINING AND FLEET MODERNIZATION:

3. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, and Major General Dyess, under the Aviation Restructure Initiative (ARI), the Army has leveraged its fleet of UH-72A Lakotas to modernize and enhance its pilot training capability at Ft. Rucker, AL, to create a safer, efficient and more relevant training environment. To date, over 140 Lakotas trainers have been delivered to Ft. Rucker, AL, with a current fielding objective of ~204 aircraft. Could you provide a general update on the status of the Army's pilot training capability modernization, to include observations from the initial pilot training classes on your new platform and curriculum?

Lieutenant General ANDERSON, Lieutenant General MURRAY, and Major General DYESS. The initial assessment of the Lakota helicopter's performance in support of pilot training at Fort Rucker has been good in terms of positive skill transfer for trainees in preparation for follow-on training in the Army's advanced airframes. With fielding underway, we are still evaluating impacts in terms of durability and other performance aspects. Students are adapting well to the Lakota. Based on evaluation of five student classes utilizing the Lakota for Initial Entry Rotary Wing (IERW) training in fiscal year 2016, and six student classes to date in fiscal year 2017, we assess positive outcomes in the form of increased trainee proficiency earlier in the training curriculum, which enables greater focus on tactical navigation and night vision goggle training previously withheld until students progressed to advanced track airframes. Additionally, we assess that the positive skill transfer from digital modern cockpit instrumentation and dual-engine performance contributes to reductions in training time required for students to demonstrate basic proficiency

in the Army's advanced track airframes after transitioning from Lakota-supported IERW.

4. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, I am concerned that Army leadership does not recognize the urgency of the situation surrounding the inability for the Army to execute a contract for additional UH-72A Lakota helicopters, given a contract has not been executed for the UH-72A Lakota helicopters funded in fiscal year 2016 appropriations. The failure to contract for additional Lakota helicopters will delay the transformation of the Army's pilot training capability and force the Army to continue flying its antiquated training aircraft. In addition, further delay in contracting for additional Lakotas will cause significant industrial impacts, to include a projected production gap at the manufacturer that threatens the stability of the UH-72A industrial capability. Additionally, delays in contracting is impacting the high performing production workforce and threatens to break a program that has sustained an on-time, on-budget and on-quality record for the entirety of the program.

The fiscal year 2017 appropriations bill that passed the House and will be passed by the Senate in the coming weeks includes funding for additional Lakota helicopters for other missions, as well as for the training fleet at Ft. Rucker, with explicit guidance as to how the funding is to be directed so that there is no confusion regarding Congressional intent.

Provide this committee with your plan for executing the projected fiscal year 2017 funding and the existing fiscal year 2016 funding for the Lakota program.

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. Army leadership is actively tracking the status of the UH-72A Lakota Lawsuit and potential implications to the industrial base and the Army Training Aircraft. The Army is fully aware of the Congressional Language that designated \$187 million for 28 UH-72A Lakota aircraft in fiscal year 2017 (FY17) Appropriations Bill. The Army is prepared to obligate the fiscal year 2017 appropriation as quickly as possible following a favorable court ruling.

5. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, describe the impacts to your ARI schedule, pilot training, fleet modernization and production delays that will result from the Army's inability to procure additional UH-72A helicopters for the training fleet at Ft. Rucker.

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. If the Army is unable to procure additional UH-72As for the training fleet, The U.S. Army Aviation Center of Excellence (USAACE) will sustain a split fleet (UH-72A and TH-67s) for Initial Entry Rotary Wing (IERW) Common Core (flight school) for longer than originally scheduled. This will result in USAACE having to resource personnel, facilities, simulation, and training plans for multiple tracks that were not planned nor programmed. Currently, there is insufficient room to sustain two different IERW simulators under the Contractor Owned/Contractor Operated (COCO) Flight School Simulation contract. USAACE would also have to execute a course redesign which would affect common core and advanced track (AH-64, UH-60, CH-47) hours and instruction.

6. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, are you considering a harvest of Army National Guard Lakotas to meet your training requirement should you be unable to procure additional aircraft for this requirement from the manufacturer?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. The Army has not considered any options that harvest UH-72A Lakota helicopters from the Army National Guard.

7. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, will you commit to making the UH-72A Lakota contracting problem and production stabilization a high priority for the Army, and do all in your power to expedite the contracting actions required to obligate the fiscal year 2017 appropriation?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. Yes, the Army considers procurement of UH-72A Lakota a high priority. The Army is prepared to obligate the fiscal year 2017 appropriation as quickly as possible following a favorable court ruling.

## TUPELO, MISSISSIPPI APACHE COMPANY CONSOLIDATION:

8. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, I am deeply concerned that the Commission on the Future of the Army and the Army's Aviation Restructure Initiative (ARI) have proposed moving the Tupelo, Mississippi Apache Company to Texas. This consolidation would seem to indicate an overall reduction in readiness of this Apache Battalion, and the retraining of pilots and support elements along with the move itself would increase overall costs.

Can you explain how this portion of the ARI yields fiscal savings?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. The National Commission on the Future of the Army (NCFA) recommended that 4 AH-64 Apache helicopter battalions remain in the Army National Guard (ARNG) outfitted with 18 aircraft each. The Army, along with the National Guard Bureau (NGB) and Adjutants General (TAG) from the individual States, is conducting a collaborative and inclusive process to examine the merits of the NCFA's recommendation and how best to implement it. The Army will determine the locations of the remaining 72 ARNG AH-64s in a manner that maximizes readiness in order to provide the best possible capability to our combatant commanders while incorporating the recommendation of the National Guard on how best to achieve those aims.

9. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, what are your plans for the Mississippi Guardsmen that cannot relocate?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. No decision on Army National Guard (ARNG) AH-64 stationing has been made. Should the AH-64s currently located in Tupelo, MS, be relocated then the ARNG would implement an aviation rebalancing effort for the loss of AH-64 capability, supplemental to force structure actions related to the Aviation Restructure Initiative. The extent to which a State that loses AH-64 capability and in turn gains off-setting capability is dependent on the final AH-64 stationing decision and aircraft allocation. Any Guardsmen assigned to a lost AH-64 unit will likely have potential reassignment options to other aviation units in the State, which may or may not require retraining.

10. Senator WICKER. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, what are the Army's short and long term strategies for ANG force laydown?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. The Army National Guard (ARNG) has completed most of the force structure changes implemented by the Army's end-to-end Aviation Restructure Initiative (ARI). The National Commission on the Future of the Army (NCFA) February 2016 report to Congress recommended the Army modify ARI by retaining AH-64 Apaches in the ARNG. The Army is reviewing the recommendations of the National Commission on the Future of the Army in conjunction with the National Guard Bureau (NGB) and Adjutants General (TAG) from the individual States. NCFA recommendation #57 calls for retaining four Attack Battalions and resourcing two fewer UH-60 Assault Battalions than programmed in the ARNG under ARI. This modification of ARI will result in 24 total Apache Battalions with 20 in the Regular Army (same as under ARI) and 4 in the ARNG (compared to zero under ARI). The ARNG battalions would be equipped with 18 aircraft each.

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 QUESTIONS SUBMITTED BY SENATOR JAMES M. INHOFE

## BUDGETARY PRIORITIES

11. Senator INHOFE. Lieutenant General Anderson and Lieutenant General Murray, your joint statement highlights that the clear priority for limited Army budgetary resources has been for immediate readiness to meet current requirements. With ongoing operations showing no real signs of slowing down, how do we change direction to modernize to face future threats?

Lieutenant General ANDERSON and Lieutenant General MURRAY. Today's fiscal environment impedes the Army's ability to achieve both a high state of readiness and modernize the force to a level that would allow a technological over-match against potential adversaries in the quantities required to meet war plan demands. The effects of the Budget Control Act (BCA) and continuing resolutions hamper and delay critical programs; prevent us from reprogramming money to make smart

choices with limited funds; and stop new starts to fill current and emerging requirements. Most significantly, the Army cannot meet the 2012 Defense Strategy at projected BCA funding levels. Moreover, it will take 5–8 years to recover from a fiscal year 2018 imposed sequestration funding level which further reduces buying power, disrupts modernization plans, and reduces the Army’s capability advantage over near-peer, high end competitors. A return to sequestration in fiscal year 2018 will reduce modernization another 20 percent. At that funding level the Army would need to stop Abrams and Bradley modernization, stop Stryker Lethality upgrades, stop Active Protection Systems development, and slow down aircraft survivability programs. The industrial base is postured to ramp up in many cases to help the Army modernize its existing equipment. We have sustained many programs that can easily be accelerated if resources become available. The Army is prepared to accelerate delivery of enhanced air and missile defense, long range fires, armor formation upgrades, aviation fleet modernization, ammunition and missiles for emerging wartime requirements, lethality upgrades for Stryker vehicles, assured communications, Soldier lethality and protection and finally, electronic warfare.

12. Senator INHOFE. Major General Dyess and Brigadier General (P) Marion, unfortunately, several high-profile recent Army modernization programs like Crusader and Future Combat System have wasted billions and produced little of value. What have we learned from those failures and how are we working to ensure we do not repeat past mistakes?

Major General DYESS and Brigadier General MARION. The Army is committed to successful execution of our modernization efforts and learning from cancelled programs. Stable requirements, adequate resources, and realistic acquisition strategies and timelines are key to program success. New programs such as the Armored Multi-Purpose Vehicle and the Joint Light Tactical Vehicle have conducted trade studies, tiering and prioritization early in the acquisition process to ensure affordable, achievable, and realistic programs. Additionally, a key tenet to successful modernization programs is developing and qualifying component-level technologies before integrating them at the system-level. A robust Technology Maturation phase prior to Manufacturing Development, Integration and Test is critical to success in production, and ultimately fielding to our Army formations. The Army will continue to assess requirement feasibility and stability, current and emerging threats, available resources, and technology capability and maturity beginning early and throughout program lifecycles in order to deliver needed capability to our warfighters while being efficient stewards of taxpayer dollars.

#### CURRENT STATE OF ARMY PROCUREMENT

13. Senator INHOFE. Lieutenant General Anderson and Lieutenant General Murray, in your joint statement you mentioned that the Army is “essentially relying on the same platforms that we have had since the 1980s—the Big 5.” Are these platforms—even when heavily modified—capable of giving us the kind of technological overmatch to which we are accustomed?

Lieutenant General ANDERSON and Lieutenant General MURRAY. Yes, for now. However, we face the very real possibility of losing our qualitative overmatch. Our priority has been to focus limited modernization funding on capabilities that have the greatest effect against near-peer threats and can be in the hands of Soldiers in the next 10 years. We are challenged in that those upgrades will only go so far. We must have sufficient funding to improve today’s equipment while at the same time invest in the development of future capabilities.

14. Senator INHOFE. Lieutenant General Anderson and Lieutenant General Murray, is our reliance on these five platforms impacting our modernization efforts and future national security?

Lieutenant General ANDERSON and Lieutenant General MURRAY. The reality is that these proven and capable platforms will be with the Army for the foreseeable future. Limits in funding for modernization of future systems and the speed of technological advances will cause us to continue to rely on all five platforms into the 2030s and beyond. The overmatch the Army has possessed for the last 70 years is at risk. Our adversaries have observed the way we fight and have developed capabilities and tactics to counter our strengths and exploit our vulnerabilities. Some of these new capabilities and tactics have already been demonstrated in combat. Our soldiers must be able to prevail against the full range of potential threats, including near-peers in highly lethal combined arms maneuver; hybrid warfare; and determined, unconventional insurgents. This has become increasingly difficult, as our ad-

versaries modernize at a rapid pace, while reduced funding has reduced the Army's modernization to a pace that jeopardizes our overmatch.

15. Senator INHOFE. Major General Dyess and Brigadier General (P) Marion, do we currently have the budget, flexibility and procurement processes in place to expand beyond these five platforms?

Major General DYESS and Brigadier General MARION. The constrained fiscal environment is the primary factor that limits our ability to expand beyond the Big 5. Within limited modernization funding, our priority is closing the greatest near-term capability gaps first. We need to improve capacity and capability shortfalls in air and missile defense; long range fires; munitions; lethality, protection, and tactical mobility of our Brigade Combat Teams; and active protection systems. We also need to address capability gaps in assured positioning, navigation, and timing; electronic warfare; cyber; assured communications and aviation protection. If resources were available we would simultaneously begin to invest in the development of the combat systems we will need in the future – 2030 and beyond. We would also work to increase our capacity to leverage commercial technologies for rapid integration into our formations.

16. Senator INHOFE. Major General Dyess and Brigadier General (P) Marion, you also wrote, "Stretching procurement timelines has allowed us to focus on current readiness and keep production lines and key programs active, at the cost of increased risk versus our most capable adversaries." By stretching procurement timelines to procure the minimum number of weapon systems to keep a production line open, are we decreasing efficiency and increasing procurement cost—essentially buying less for more money?

Major General DYESS and Brigadier General MARION. To support the Army's focus on current readiness in a constrained fiscal environment, the Army is stretching procurement timelines and keeping production lines and key programs active. In some circumstances, production output has been reduced to the minimum sustaining rate. However, at levels above the minimum sustaining rate, the Army cannot fully realize the economies of scale necessary to maximize potential buying power at current funding levels. Inefficiencies arise when the Army cannot synchronize production rates across multiple programs to support fieldings. For example, the Chief of Staff of the Army's goal is to modernize one Armored Brigade Combat Team per year. With multiple systems on different production time lines, the Army is challenged to synchronize schedules if additional funds are not available to adjust production rates. Additional funding does increase efficiencies and can reduce procurement costs when economies of scales are available.

#### THREATS TO OUR ARMY'S SUPERIORITY:

17. Senator INHOFE. Lieutenant General Anderson and Lieutenant General Murray, in your joint statement for the record, you warned that, "The overmatch your Army has enjoyed for the last 70 years is at risk." You further cautioned that, "Given the complex range of threats, the Army has a very short window to improve capability and capacity." If we continue with our current modernization trajectory, how soon do we risk losing our overmatch?

Lieutenant General ANDERSON and Lieutenant General MURRAY. The Army is already overmatched in several key areas. We have current, critical capability gaps in long-range precision fires; air, missile, rocket, and unmanned aerial systems defense; combat vehicle protection; and electronic warfare. Combined, these gaps threaten the Army's ability to fight into and win inside complex, contested environments against peer adversaries. Technologies to fill these gaps have already been demonstrated. With additional funding, the Army can quickly field them, making a meaningful down payment on the capabilities needed to deter potential militarily peer adversaries and, if necessary, defeat them. At the same time, our adversaries are continuing to modernize beyond what these minimum measures can address. The Army needs sustained research and development funding to not only stay ahead of our adversaries but to regain the dominance demonstrated in 1990 during Desert Storm. With sustained science and technology funding, the Army will transition emerging, cutting-edge technologies to fielded capabilities over the next ten years—five years to demonstrate the technologies, and five more to produce them at scale. If we do not begin investing in emerging science and technology now, we will be unprepared for our next war, one that will likely be fundamentally different from previous conflicts. The early battles of World Wars I and II show the tragic consequences of such a failure—the loss of countless American lives and the potential displacement of the United States by a rising power.

18. Senator INHOFE. Lieutenant General Anderson, what is the single most important thing we can do to improve our capability and capacity to address our current range of threats?

Lieutenant General ANDERSON. The most important measure the nation could take to reduce risk and allow the Army to accumulate readiness, capacity, and modernization improvements is to provide sustained, predictable funding in the base budget.

19. Senator INHOFE. Lieutenant General Anderson, your written statement note that some of our adversaries have developed capabilities and tactics to counter our strengths and exploit our weaknesses. You said some of these have been demonstrated in combat. Can you elaborate on specific tactics and capabilities to which you refer?

Lieutenant General ANDERSON. The Army's dominance in Desert Storm was underpinned by decades of sustained modernization, leading to decisive technological advantages in precision fires; major combat systems; position, navigation, and timing via the Global Positioning System; and networking. Unfortunately, our potential adversaries took note of our success. Since, they have made investments to undermine these strengths and exploit our perceived dependencies on them. The investments these potential adversaries have made include anti-access, area-denial technologies that challenge the Army's ability to project forces into a theater. Once in theater, we are outranged and outgunned, facing fires, air defense, and electronic warfare systems that overmatch our own. At the same time, the Army can no longer count on our previous advantages in position, navigation, and timing and networking, as our adversaries can now threaten the domains these capabilities require.

20. Senator INHOFE. Lieutenant General Anderson, continuing from Question 9 above, which such tactic or capability worries you the most?

Lieutenant General ANDERSON. Our potential adversaries' anti-access, area-denial; fires; air defense; electronic warfare; cyber; and space capabilities are all concerning. Combined with capacity and modernization shortfalls, they place the Army at high military risk. Though the Army's most critical capability gaps are in fires and air defense, we must tackle these issues holistically to reduce risk.

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#### QUESTIONS SUBMITTED BY SENATOR TED CRUZ

##### CANCELLED ARMY PROGRAMS REPORTEDLY WASTED \$30 BILLION IN THE LAST DECADE

21. Senator CRUZ. Lieutenant General Anderson and Lieutenant General Murray, citing your prepared remarks, you stated, "the budget issue has been further complicated by 15 years of focus on counterinsurgency and counterterrorism as the Army addressed current needs in Afghanistan and Iraq." I would undoubtedly agree that there have been tough choices within the Armed Services and that budget restrictions are negatively affecting the Defense Department. However, I would also like to reference a 2016 report from the Center for Strategic and International Studies that lists almost \$30 billion in Army Programs that were cancelled or diverted after a Program of Record was established. Trying to strike the balance between modernization and readiness of the force has been an unfortunate burden that senior Service leaders have been forced to carry for a number of years. However, as Congress considers a nearly \$30 billion fiscal year 2017 supplemental defense amendment in the coming months, how are we assured that this funding will support Army Modernization Programs that will achieve their required deliverable?

Lieutenant General ANDERSON and Lieutenant General MURRAY. The acquisition reforms included in recent National Defense Authorization Acts (NDAA) are a good start towards improving the acquisition process. As the Army's principal customer who represents the Soldier, the Army Chief of Staff (CSA) has greater involvement in 'Big A' acquisition—a combination of resourcing, requirements and acquisition. In the CSA's response to Section 808 of the fiscal year 2016 NDAA, he addressed actions being taken or will be taken to streamline 'Big A' acquisition. These include a reorganization of Army Staff functions to improve requirement generation; workforce professional development initiatives; process changes focused on delivering responsive materiel solutions; budget actions to improve long range programming; efforts to introduce prototyping earlier to reduce programmatic risk; and actions designed to lower life cycle sustainment costs. For instance, over the last year, the CSA has improved the responsiveness of the requirements process by reinvigorating the Army Requirement Oversight Council (AROC)—he now approves all require-

ments and has earlier visibility on “cost/schedule/performance” trades required to define feasible, affordable requirements. He has also consolidated and streamlined the requirements and resourcing processes under a single authority. He has expanded AROC advisors to include key stakeholders such as the Commanders of Forces Command, Army Materiel Command, Training and Doctrine Command, Army Cyber Command, Research Development and Engineering Command and Army Test and Evaluation Command. This action ensures the operational environment informs the AROC. In the 12 months prior to re-energizing the AROC we approved 19 requirements documents. In the last 12 months since re-energizing the AROC, we approved 47 requirements documents. This last year, the Army has also conducted the inaugural Strategic Portfolio Analysis Review (SPAR). The SPAR combined the previous Long-Range Investment Review and the Capabilities Portfolio Review into a fiscally informed construct. The SPAR reviews capabilities over a 30-year period, evaluates each program’s relative worth, assesses our strategic priorities, and identifies investment and divestment opportunities. The assessment has had far-reaching implications to the Army’s overall resourcing strategy and provides in-depth analysis the Army leadership needs to make difficult requirements decisions within a constrained resource environment. Beyond new NDAA authorities, we also use industry days, the Association of the United States Army, vendor engagements with Program Executives and Managers, and Science and Technology basic research funded proposals as venues that keep the Army ‘Big A’ acquisition community abreast of what industry can provide and where it is with technology and new products. Based on what is in the realm of possible, the opportunity to incorporate the state-of-the-art into individual equipment is assessed annually by Army Headquarters during the SPAR and Program Objective Memorandum processes. The variance between a threshold and objective requirement is such that we spin in the technology when required and ready based on available funding. To accelerate the testing and user evaluation, if required, we leverage the Soldier Enhancement Program and Rapid Equipping Force authorities. Requirements and solution developers also work closely with the Headquarters staff to integrate warfighter inputs throughout a programs development and we insert spiral developments as available.

#### SOUTH KOREAN ROTATIONAL UNITS AND ARMORED MODERNIZATION

22. Senator CRUZ. Lieutenant General Anderson and Lieutenant General Murray, this week my staff received a briefing on the Army’s fiscal year 2017 Budget Amendment request. During that briefing, a member of your staff discussed the Army’s Infantry BCT that will soon begin its transition to an Armored BCT. It appears that the new ABCT will be equipped using prepositioned stocks that are currently stationed in South Korea and utilized by rotational units. Can you further expand upon the reasons why the pre-positioned stock must be relocated from a forward-deployed location supporting rotational units to outfit an ABCT that will be stationed in the U.S.?

Lieutenant General ANDERSON and Lieutenant General MURRAY. The Army maintains two Armored Brigade Combat Team (ABCT) equipment sets in South Korea. One set is part of the Army’s Prepositioned Stocks (APS)–4 and is reserved for war time use only. The second set is part of the Korea Enduring Equipment Set (KEES), which the Army maintains in Korea for use by rotational forces, as a convenience. When they deploy to Korea for nine-month tours, rotational forces train hard on this equipment. Due to their “fight tonight” posture, we have been unable to take this equipment offline for depot-level maintenance. Over the last few years, the Army’s maintenance costs have risen to over \$25 million per year, which is well above average, to maintain the rotational brigade’s operational readiness. As the Army seeks to rebalance its force structure to better meet the demands of the Defense Strategy, we need to increase our ABCT capacity. Unfortunately, we do not have sufficient, excess combat equipment to convert an Infantry BCT into an ABCT, and purchasing new equipment is both cost and time prohibitive (\$4 billion and five years). Our most cost-effective option was to remove the armor equipment from the KEES, fielding it to what will become the Army’s 16th ABCT by fiscal year 2019, while leaving the set in APS–4 intact. In order to maintain our ABCT presence in Korea and meet the Joint Force commander’s requirements, the Army will continue ABCT deployments to the peninsula. Beginning in 2018, rotational ABCTs will deploy with their organic equipment. This will maintain our “fight tonight” capability in Korea while also helping the Army rebuild its force projection and deployment skills. Loading and moving an ABCT around the world is a challenging task, which we need more training, and these upcoming rotations will help improve our Army’s ability to project force and increase the overall readiness of our Army.

23. Senator CRUZ. Lieutenant General Anderson and Lieutenant General Murray, 1st Cavalry's 1st ABCT from Fort Hood just returned home from a highly successful deployment to South Korea under the existing rotation model. What are the operational and readiness impacts for future units that rotate through South Korea if the pre-positioned equipment returns stateside?

Lieutenant General ANDERSON and Lieutenant General MURRAY. From the operational perspective of United States Forces Korea (USFK), United States Pacific Command and our South Korea allies, the Army will continue providing a trained and ready ABCT on nine-month rotations to South Korea. The Army will also continue to maintain a complete ABCT set in APS-4, for war time use only. From a readiness perspective, the Army will deploy ABCTs with their organic equipment, which will enable us to exercise the entire force projection infrastructure, from the unit's installation in the United States through the rail and sealift movement to Korea. This process will also allow us and our South Korean allies to exercise the transportation and force flow infrastructure in Korea, rather than waiting until a crisis erupts. Combined, these activities will improve our Army's ability to project force and increase our overall readiness.

24. Senator CRUZ. Lieutenant General Anderson and Lieutenant General Murray, furthermore, does this serve as an example of where sacrificing armored modernization programs, as a result of either budget caps or a failure of the program of record to meet the Army's needs, has directly impacted future Army readiness and, as a result, our ability to project power?

Lieutenant General ANDERSON and Lieutenant General MURRAY. Use of the Korea Enduring Equipment Set (KEES) has not harmed future Army readiness or power projection. With congressional support, the Army is increasing the number of Armored Brigade Combat Teams (ABCTs) through converting two Infantry Brigade Combat Teams (IBCTs) to ABCTs in order to better meet the needs of the defense strategy. Future increases in ABCT capacity beyond the current conversions will require combat equipment that demands additional funding and time (\$4 billion and five years). Continual use of KEES by rotational ABCTs has made maintaining equipment readiness of the set challenging and expensive. Due to the continuous demand for forces on station, the equipment is not taken off-line for depot-level maintenance. Once the ABCT conversion is complete, the former KEES will receive the same cyclic care as other ABCT sets increasing the average equipment readiness of the Army. ABCT rotations using organic equipment will build readiness and exercise power projection. These rotations mimic the requirements of a wartime deployment. They fully exercise force projection nodes from home station to the location required by the combatant commander. This improves the unit's speed of assembly and develops "muscle memory" for future deployments as well as for the supporting units and infrastructure necessary to facilitate force flow in an emergency.

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#### QUESTIONS SUBMITTED BY SENATOR DAN SULLIVAN

##### PLANS FOR SMALL UNIT SUPPORT VEHICLE (SUS-V) AND JOINT ALL-TERRAIN ALL-WEATHER SUPPORT VEHICLE (JAASV)

25. Senator SULLIVAN. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, in order to maneuver in cold weather, austere environments, Army forces rely on the Small Unit Support Vehicle (SUS-V)—a system that was built in the early 1980s. What is the Army's plan to keep these vehicles maintained, which is becoming increasingly difficult due to the SUS-V no longer being a program of record?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. In 2012, the Army determined there is no short or long-term operational warfighting requirement to continue ownership and sustainment of the Small Unit Support Vehicle. The U.S. Army has divested all SUS-Vs; however, the U.S. Army Alaska and Army National Guard are using unit funds to sustain the remaining SUS-Vs locally.

26. Senator SULLIVAN. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, Brigadier General Marion, what is the plan to support the much-needed replacement to the SUS-V, the Joint All-terrain All-Weather Support Vehicle (JAASV)? This newly-listed requirement is a critical capability needed by both the Army and Marines to navigate the austere environments in which our other vehicles are unable.

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. The Army does not have a validated requirement for a Joint All-terrain All-Weather Support vehicle. The JAASV is not an official/enduring Army requirement and there is no capability document. The U. S. Army has divested all SUS-Vs; however, the U.S. Army Alaska and Army National Guard are using funds to sustain the remaining SUS-Vs locally.

ADVANCED INTEGRATED AIR-LAND BATTLE TRAINING

27. Senator SULLIVAN. Lieutenant General Anderson and Major General Dyess, to properly prepare for a near-peer conflict, joint training is a key part of readiness. The DOD has several joint integrated exercises that stress contested Air and Naval scenarios, such as Valiant Shield and Northern Edge. However, there are no, or very few such large scale Army and Air Force exercises. Are the Army and Air Force discussing large-scale Joint Air and Ground combat exercises that improve our joint readiness for a contested Air-Land battle campaign?

Lieutenant General ANDERSON and Major General DYESS. Readiness of joint formations to fight large-scale contested Air-Land battle campaigns is primarily the responsibility of combatant commanders and accomplished through joint exercises, like Valiant Shield and Northern Edge. The Army ensures forces provided to combatant commanders can seamlessly integrate with the U.S. Air Force and are trained during U.S. Army Combat Training Center (CTC) rotations for decisive action in unified land operations. Maneuver CTCs integrate Air Force aircraft and controllers into Army Brigade Combat Team rotations at the tactical level. The Mission Command Training Program integrates joint fires and joint intelligence/surveillance/reconnaissance into Warfighter Exercises conducted for Army Division and Corps Headquarters.

28. Senator SULLIVAN. Lieutenant General Anderson, Lieutenant General Murray, Major General Dyess, and Brigadier General Marion, the JPARC in Alaska is the largest joint overland training area in the U.S. with airspace the size of Florida and ground maneuver space the size of Delaware. What are your plans to use this ideal location for the advanced integrated training needed to best counter high-end and near-peer threats?

Lieutenant General ANDERSON, Lieutenant General MURRAY, Major General DYESS, and Brigadier General MARION. The Army, specifically, U.S. Army Pacific, plans to continue using the JPARC at the current rate to conduct the ARCTIC ANVIL training exercise on a bi-annual basis. Arctic Anvil is a live, virtual, constructive, Brigade Combat Team (BCT) home station training exercise designed to prepare a BCT for a rotation to a Combat Training Center (CTC). Arctic Anvil is conducted by the Joint Pacific Multinational Readiness Training Capability (JPMRC), which consists of a professionally trained operations group capable of providing standardized, instrumented, external evaluations. These exercises build, maintain, and extend BCT readiness using trained observer/coach/trainers, a live near-peer opposing force, and fully instrumented after-action reviews. The Army, Air Force, and Marine Corps are integrated in training exercises in Alaska that use JPARC. The most recent is Northern Edge where those services utilized Forts Wainwright, Greeley, the Yukon Training Area, Donnelly Training Area, Eielson AFB, and Elmendorf AFB. Marine Corps units used Donnelly Training area to fire the GMLRS round of the MRLS during Northern Edge and continued to train post-exercise. The Air Force conducts Exercise Distant Frontier (DF) and Red Flag-Alaska (RF-A), where U.S. and coalition air forces are integrated with ground forces. The facilities and infrastructure within the JPARC can enable scenarios and training goals supporting advanced integrated training countering high-end and near-peer threats. The Air Force proposes to expand the existing vertical and horizontal airspace structure needed to better accommodate low-altitude threat and multi-axis aircraft training mission requirements during JPARC training exercises. The Army is responsible for the management of the ground and airspace within the JPARC to support the year-round training readiness of its assigned forces, to include those in our AR 5-9 area of responsibilities. There is no joint ground management staff, therefore all joint multiservice, and coalition training efforts in the JPARC are coordinated by the Army workforce.

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QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

NATIONAL COMMISSION VERSUS AVIATION RESTRUCTURING INITIATIVE

29. Senator BLUMENTHAL. Brigadier General Marion, when the Army was forced to balance budgetary constraints with the need to support continued deployments and replace aging aircraft, the Aviation Restructuring Initiative (ARI) was developed to economize the force while maintaining capability and utility by rebalancing aircraft between the Active and Reserve components. Yet recommendations issued by the National Commission on the Future of the Army over a year ago differ from ARI, particularly for Black Hawks. ARI advocates for four Black Hawk battalions to be added to the National Guard, while the Commission recommends only two as a cost saving mechanism to offset other changes it recommends. You and I discussed this issue in my office several months back. Where does the Army stand on reconciling these strategies and how will this impact Black Hawks? What is the optimal number of battalions required to meet the National Guard mission?

Brigadier General MARION. The Army is still reviewing its decisions regarding the reconciliation and implementation of the Aviation Restructuring Initiative and the National Commission on the Future of the Army. The National Guard Mission will be fully supported.

MARINES UNITED

30. Senator BLUMENTHAL. Lieutenant General Anderson, the Marines United scandal involved a private Facebook page originally intended as a suicide prevention page and used by 30,000 active duty and veteran Marines, as well as civilians. A private page within the Facebook group provided access to a Google drive that contained naked and exploitive pictures of women, including Marines. These photos were often accompanied by obscene and misogynistic commentary, as well as their personal information such as name, rank, and place of work. An NCIS investigation is ongoing. Although this incident involved the Marine Corps, I believe we would be naive to think this event is isolated to the Marine Corps and could not occur in the Army. The Army has training and policies providing guidance for online behavior. Do you believe the current training and policies are sufficient to address cyber harassment? What is the Army doing to proactively identify any possible websites of concern and protect its soldiers from cyber bullying? Are there programs and resources available?

Lieutenant General ANDERSON. The Army's current training policies have been recently updated to reflect real work scenarios and vignettes to not only make training realistic, but to ensure all policies are written in a way that supports and protects the rights of the Soldier. Soldiers are trained on the appropriate conduct during Initial Entry Training and on an annual, recurring basis thereafter. The training approaches the problem from the perspective of Army values and respect for others. This training includes discussion points and vignettes with respect to electronic communications and online conduct. These discussion points and vignettes have been incorporated into institutional, command, and unit training packages for Equal Opportunity (EO), Equal Employment Opportunity (EEO), Treatment of Persons, Sexual Harassment/Sexual Assault Response and Prevention (SHARP), and Cyber Awareness, among others. This training is for enlisted and officer personnel, pre-command courses for command teams from company through brigade level, and functional courses that train recruiters and initial military cadre, such as drill sergeants and Advanced Individual Training leaders. From a policy perspective, the Army published interim guidance regarding online conduct in July 2015, and re-issued in 2017, to supplement the existing policy concerning the treatment of persons. The policy advises the Army personnel that online misconduct is punitive, and online misconduct, to include harassment, hazing, bullying, stalking, discrimination, and retaliation is inconsistent with our Army values and negatively impacts command climate and readiness. The Army is very serious and deliberate about combating cyber bullying and raising awareness to combat it, through both policy and training means. The Army considers cyber bullying to be a form of fratricide, as the G-1 himself describes it. Soldiers know to immediately report websites of concern to their chain of command.

BLACK HAWK MODERNIZATION

31. Senator BLUMENTHAL. Brigadier General Marion, the FYDP projects that for fiscal year 2018, the Army is planning to seek 60 Black Hawks. Do you believe your fiscal year 2018 request will remain at this level? What is the ideal number you would procure?

Brigadier General MARION. The submitted fiscal year 2018 budget includes 48 Black Hawks. We have structured the Black Hawk Multi-Year contract with options to accommodate additional aircraft if there is continued strong support for additional Black Hawks.

32. Senator BLUMENTHAL. Brigadier General Marion, what efforts are you taking to ensure a strong and reliable multi-year procurement strategy for the UH-60 million in order to give our warfighters much needed capabilities, while also ensuring a stable industrial base?

Brigadier General MARION. The Army continues to support multi-year contracts for Black Hawk because of the cost savings they provide and the stability they provide to the industrial base. The Army has worked proactively with its government stakeholders and the industrial base to document requirements, request legislative authority and allocate funding for another multi-year contract. The Army fully intends to support its ninth multi-year Blackhawk contract for fiscal year (FY) 2017 to fiscal year 2021.

**DEPARTMENT OF DEFENSE AUTHORIZATION  
FOR APPROPRIATIONS FOR FISCAL YEAR  
2018 AND THE FUTURE YEARS DEFENSE  
PROGRAM**

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**WEDNESDAY, MARCH 29, 2017**

U.S. SENATE,  
SUBCOMMITTEE ON AIRLAND,  
COMMITTEE ON ARMED SERVICES,  
*Washington, DC.*

**AIR FORCE MODERNIZATION**

The subcommittee met, pursuant to notice, at 3:30 p.m. in Room SR-222, Russell Senate Office Building, Senator Tom Cotton (chairman of the subcommittee) presiding.

Committee Members present: Senators Cotton, Tillis, Sullivan, King, Blumenthal, Warren, and Peters.

**OPENING STATEMENT OF SENATOR TOM COTTON**

Senator COTTON. The hearing will come to order.

Today we'll be discussing the future of our Air Force, what shortfalls we need to fix, what capabilities we need to develop. As we all know, Congress has a tendency to think in one-year increments, a handicap our rivals are only too happy to exploit.

So I consider this hearing our opportunity to take the long view. We'll get an update on the problems we heard about last year, like the shortage in fighter pilots and in crew members for remotely piloted aircraft. We'll also talk in more depth about how to keep our technological edge over the next 10 years.

The truth is, we've been losing ground for years. As Lieutenant General Stephen Hoog noted a little over two years ago, at the beginning of Desert Storm we had 134 combat squadrons. By 9/11, we were down to 88. Today, we're at 55. In fact, he argued, if we were to conduct Operation Desert Storm today, we would have to "completely strip out Asia or strip out Europe, and we'd still be short of the combat power we had in Desert Storm." And that was a relatively small conflict against one country in one region.

We all know how we got here. The last administration made severe cuts to the Defense budget, which Congress did far too little to oppose, and since then the threats to our national security have multiplied, whether it's the Islamic State, Russia, China, North Korea, or Iran.

At the very moment when the dangers to our country are increasing, the Air Force's capacity, readiness, and capabilities are

decreasing. But now we have a new administration that recognizes this dire situation. The President has promised to build a military that far outpaces our rivals. The question we want to discuss today is how do we do that?

I will be particularly interested to hear from our witnesses how the Air Force plans to modernize its forces as part of the larger effort to rebuild our military. A strong Air Force is key to our joint war fighting capability. We have to be able to deploy and support forces anywhere on the globe, and to do that we need a sufficient strategic and operational reserve, national mobilization capability, and robust defense industrial base.

What we do this year will determine how we fare over the next 10 years. The stakes are high, and I know all of us here take them very seriously.

I look forward to hearing our witnesses' testimony. All three of them come from the Air Force's headquarters at the Pentagon: Lieutenant General Mark Nowland, Deputy Chief of Staff for Operations; Lieutenant General Arnold Bunch, Military Deputy, Office of the Assistant Secretary of Air Force for Acquisitions; and Lieutenant General Jerry Harris, Deputy Chief of Staff for Strategic Plans, Programs and Requirements.

Gentlemen, thank you all for appearing today. Thank you for your many decades of distinguished service to our country in uniform.

Senator King?

#### **STATEMENT OF SENATOR ANGUS KING**

Senator KING. Thank you, Mr. Chairman.

I want to extend a welcome and thank you to each of our witnesses for appearing before the subcommittee today. I look forward to hearing your testimony and discussing these important issues.

Last week the subcommittee heard from the Army witnesses about the challenges that the Army has in its modernization. Following our first hearing two weeks ago on all armed warfare in the 21st century, it's clear that both our ground and air forces need to reestablish the capabilities required to dominate—I emphasize dominate—near-peer adversaries across the full spectrum of military operations.

Today I'm looking forward to hearing from our Air Force witnesses about the challenges and opportunities they face in modernizing the Air Force. I'm especially interested in hearing from the witnesses how the Air Force plans to manage its multiple modernization programs in ways that deliver the capabilities our war fighters need to defeat our most capable adversaries on a timely basis—I want to emphasize on a timely basis—while protecting our taxpayers' dollars. Often, in acquisition matters, timeliness as well as dollars are important considerations.

Too many defensive acquisition programs over-promise and under-deliver on cost and schedule, and we must do better if we're going to effectively modernize our fighter, bomber, aerial refueling and other fleets to the levels required to meet our future requirements.

Our witnesses this afternoon face huge challenges as they strive to balance the need to support ongoing operations and sustain

readiness with the need to modernize and keep the technological edge so critical to successful military operations. Resources are never unlimited, and the Air Force must make investments based on near-term risks as well as future threats to procure new weapons, upgrade existing platforms, and fund research and development accounts.

Our Air Force will bear the brunt of dealing with the anti-access, aerial denial threats that our Armed Forces may and likely will face in the future. These challenges are made particularly difficult by the spending caps imposed by the Budget Control Act. These caps were relieved somewhat for fiscal year 2016 and 2017 in the bipartisan Budget Act of 2015, but the caps again take effect in 2018 and are not automatically nullified by making cuts in non-defense discretionary programs.

Every year we are challenged to make decisions balancing a number of competing demands for resources, including resources for current operation and investment in future modernization. In the absence of specific budget proposals, however, we will be assessing overall plans and programs regarding current and future aviation programs. There are a number of other issues that we need to discuss, but in the interest of time I will stop here and wait for our discussion.

Again, I want to thank our witnesses; and thank you, Mr. Chairman, for calling this hearing.

Senator COTTON. General Nowland?

Lieutenant General HARRIS. Sir, may I start?

Senator COTTON. You may, General Harris.

Lieutenant General HARRIS. Yes.

Senator COTTON. Did you draw the short straw this morning?

Lieutenant General HARRIS. I did, sir.

Senator COTTON. Okay. Sorry to hear that.

Lieutenant General HARRIS. It's because I'm younger. They're more experienced.

Senator COTTON. You have the most hair.

[Laughter.]

Lieutenant General HARRIS. I'm not sure.

[Laughter.]

**STATEMENT OF LIEUTENANT GENERAL JERRY D. HARRIS, JR., USAF, DEPUTY CHIEF OF STAFF FOR STRATEGIC PLANS, PROGRAMS AND REQUIREMENTS, HEADQUARTERS, UNITED STATES AIR FORCE; ACCOMPANIED BY LIEUTENANT GENERAL ARNOLD W. BUNCH, JR., USAF, MILITARY DEPUTY, OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION; AND LIEUTENANT GENERAL MARK C. NOWLAND, USAF, DEPUTY CHIEF OF STAFF FOR OPERATIONS, HEADQUARTERS, UNITED STATES AIR FORCE**

Lieutenant General HARRIS. Sir, thank you for having us here today to continue our discussion on Air Force modernization.

To the several members of the committee who have served in our Armed Forces before, a special thank you for continuing to serve this great nation.

First, we would like to enter our written statement into the record.

Senator COTTON. So entered.

Lieutenant General HARRIS. Your United States Air Force is always there. We're providing global vigilance, global reach, and global power. The demand for our service has never been higher, even though we are 38 percent smaller, already noted, than we were in 1991.

We've been continuously deployed across the globe, and our adversary has been watching and copying us, learning from us every day, year in and year out. The world is changing, and our adversaries are catching us faster than we predicted. To ensure we keep the advantage across the entire spectrum of warfare, we must modernize our nuclear forces, our conventional forces, and the projection of those forces in air, space, and cyber domains.

We're increasing our fighter and tanker procurement to modernize the force, and soon we'll be producing the B-21 to modernize our long-range strike fleet.

We are also in the early stages of replacing a portion of our training aircraft, which will enable shorter training timelines and better-trained air crew.

We are also modernizing some of our older aircraft, extending their durability, and providing increased capability to kill and survive in combat.

We're making progress with the space fence, protected SATCOM [satellite communications], and our Joint Space Operation Center.

Our number-one asset is our airmen, and we continue to grow them. Venues such as this give us the opportunity to highlight our efforts, and we appreciate the opportunity to partner with the subcommittee. Thank you.

[The prepared joint statement of Lieutenant General Harris, Lieutenant General Bunch and Lieutenant General Nowland follows:]

PREPARED STATEMENT BY LT. GEN. JERRY "JD" HARRIS JR., USAF, LT. GEN. ARNOLD W. BUNCH, JR., USAF AND LT. GEN. MARK C. NOWLAND, USAF

#### INTRODUCTION

Chairman Cotton, Ranking Member King and distinguished members of the Airland Subcommittee, thank you for the opportunity to provide an update on the United States Air Force Modernization programs and Force Structure. Today's demand for Air Force capabilities continues to grow as airmen provide America with unmatched *Global Vigilance*, *Global Reach* and *Global Power*. We are supporting combatant commander requirements in response to growing challenges from Russia, China, North Korea and Iran, in addition to the ever present counterterrorism mission in the Middle East and around the world. While our forces have been heavily engaged in deterring or addressing these operational challenges, our adversaries have taken the opportunity to invest in and advance their own capabilities. To address ever narrowing capabilities gaps, we need your support in the form of increased, steady and predictable appropriations. With this support, the Air Force can invest in critical capabilities and modernization programs while sustaining capacity and recovering readiness to ensure the joint force can deter, deny and decisively defeat any enemy that threatens the United States or our national interests.

#### OPERATIONS UPDATE

*ALWAYS THERE* Your Air Force relentlessly provides *Global Vigilance*, *Global Reach*, and *Global Power* for the nation ... we're always in demand ... and we're always there. Our airmen continue to provide two legs of the nuclear triad and resource 75 percent of the Nuclear Command, Control, and Communications (NC3) framework, made possible, in part, through one of the 12 satellite constellations our space operators command and control every day. Beyond NC3, those constellations

provide other critical capabilities such as worldwide secure communications, global positional awareness, global missile warning, and a battlefield situational awareness architecture for our joint warfighters.

Your Air Force has been globally engaged for the last 26 years in combat operations. Though our end strength has decreased 38 percent since 1991, we have experienced significant growth across several mission areas. Our airmen provide joint forces with *Global Vigilance* using real-time multi-domain platforms and sensors integrated across our global intelligence and command and control (C2) networks to find, fix, and finish a range of hostile targets simultaneously across the globe. Without fail, the Air Force performs 60 combat lines of persistent attack & reconnaissance missions with remotely piloted aircraft (RPA) every day ... they serve as the unblinking eye to support combatant commanders and joint warfighters and give us a competitive advantage. Through our Intelligence, Surveillance and Reconnaissance (ISR) capabilities, we provide warfighters over 6,000 intelligence products per day used to identify enemy targets and trigger 70 percent of Special Operations Forces (SOF) assaults on violent extremist organizations.

Additionally, the Air Force has conducted 4,000 cyber missions against more than 100,000 targets, disrupting adversaries and enabling over 200 High Value Individual kill/capture missions. In securing our networks and digital infrastructure, 2016 saw Air Force cyber operators block more than 1.3 billion malicious connections—an average of more than 40 per second.

Nearly every three minutes a mobility aircraft departs on a mission, providing ... and access, projecting power through a network of airfields in 23 countries and 77 locations, while providing critical aerial refueling capability. In 2016, our aeromedical professionals evacuated over 5,700 patients and provided emergency medical care resulting in a 98 percent survival rate. Your Air Force provides unremitting ability to maneuver, sustain, and recover personnel and assets ... at home, abroad, and with our allies and partners.

With fighters, bombers, RPAs, and Intercontinental Ballistic Missiles (ICBMs), the Air Force provides conventional and nuclear Global Power that can strike an enemy on short notice anywhere in the world. In Iraq and Syria, the Air Force has led 65 percent of the more than 17,000 coalition airstrikes since 2014, delivering decisive firepower supporting joint, special operations and coalition ground forces to defeat and degrade ISIS and regain critical territory.

Stitched together, the fabric of our Air Force weaves multi-domain effects and provides U.S. servicemen and women the blanket of protection and the ability to power project America's full range of combat capabilities. Make no mistake, your Air Force is always there.

*READINESS IN A CHANGING WORLD* However, being "always there" comes at a cost to our airmen, equipment, and infrastructure, and we are now at a decision point. Sustained global commitments and recent funding cuts have affected capacity and capability for a full-spectrum fight against a near-peer adversary. In 2013, sequestration forced hard decisions that sacrificed the readiness and size of the Total Force in order to ensure our technological superiority against future adversaries. In the fiscal year 2016 and fiscal year 2017 budgets, we made the necessary adjustments to balance near-term readiness with future modernization, but due to continuous combat operations, reduced manpower, an aging fleet, and inconsistent funding our readiness has suffered.

In a world of increasing threats, stronger adversaries and a persistent war against violent extremism, there is a greater disparity between commitments and the resources necessary to achieve our national security objectives. Instead of rebuilding readiness for near-peer conflicts, your Air Force is globally engaged in operations against lesser-equipped, but still highly lethal and adaptive enemies. Airmen serve at home and abroad to underpin joint force success, but it comes at the expense of full-spectrum readiness.

The first step to regain full-spectrum readiness is to rebuild our Operational Training Infrastructure. This includes not only live, virtual and constructive environments, but also the ranges and space necessary to train against high-end threat systems in a multi-domain environment. Once established, our 4th and 5th generation fighter units need relief from current tasking against low-end adversaries in order to train for emerging threats. We prioritized this initiative by creating a directorate on the Air Staff dedicated solely to this monumental effort. We took the first step. However, the complexity of linking all of the systems needed for tomorrow's fight and deconflicting training requires both manpower and finances.

Your Air Force needs permanent relief from BCA, increased funding, flexible execution authority, and manpower to recover full-spectrum readiness. We will continue to do all we can to innovate, transform, and improve how we maximize our re-

sources. We need your help in providing stability with the ability to modernize our capabilities, at the pace required to fight and win against any emerging threat.

*PEOPLE* Airmen are our greatest resource and our Air Force needs to increase end strength to meet national security requirements. Manpower shortfalls in key areas remain the number one issue limiting readiness and is our top priority as we rebuild squadrons across the Air Force. At the start of 2016, our end strength stood at 311,000 Active Duty airmen, down from more than 500,000 during Desert Storm—a 38 percent decrease. Though we appreciate your support to build the force up to about 321,000 in 2017, we will still be stretched to meet national security requirements.

To improve readiness and attain manning levels matching our mission requirements, we are considering an increase to our Active Duty, Guard, and Reserve end strength and will work with the Secretary of Defense to develop the FY 2018 President's Budget to address personnel shortages. Our Total Force model (incorporating our Active Duty, Guard, Reserve, civilians, and our contracted capabilities) not only recognizes the value of an integrated team, but helps guarantee today's and tomorrow's capability. We will develop plans to address shortfalls in a number of key areas, including critical career fields such as aircraft maintenance, pilots, NC3, intelligence, cyber, and battlefield airmen.

We face an aircrew shortage crisis across all disciplines. The Air Force has the world's finest aircrew who enable an incomparable duality of global mobility and combat lethality. In the aircraft maintenance field, we were short approximately 3,400 aircraft maintainers at the close of 2016. Because of this shortage, we cannot generate the sorties needed for our aircrews. As airlines continue hiring at unprecedented rates, they draw away our experienced pilots. Without a healthy pool of pilots, we risk the ability to provide airpower to the nation.

Pilots are strategic national assets and the pilot crisis extends beyond the Air Force and military. It is a national problem which requires senior-level attention in Congress, the Commercial Industry, and the DOD. To address this national challenge, since 2014 the 'Air Force -Airline Collaboration', formally known as the National Pilot Sourcing Forum has increased efforts to effectively utilize and train an adequate number of pilots to meet our nation's pilot demand signal.

However, pilot retention has declined for five straight years. Today the Air Force has a rated manpower shortfall of approximately 1,550 pilots across the Total Force. This shortfall is most pronounced in our regular Air Force fighter community which is short more than 950 pilots. We are grateful for your support to increase the pilot bonus, and we will continue to ensure our retention programs are appropriately sized and utilized. Your Air Force will utilize the new Fiscal Year 2017 NDAA Aviation Bonus authority (\$35,000 per year maximum) and implement a tiered-model using a directed business case model to identify areas of greatest need.

Retaining our pilot force goes beyond financial incentives . . . it is about culture. Your Air Force is implementing many non-monetary efforts to reinvent the culture and improve the quality of life and quality of service for our airmen. We have reduced additional duties and superfluous training courses, as well as hired contractors in fighter squadrons to perform burdensome administrative tasks, enabling our pilots to focus on their primary duty: flying. We have also increased the transparency of the assignment process and increased flexibility to promote family stability. Your Air Force is exploring opportunities to reduce deployment burdens by enabling more Air Reserve Component volunteers for 179/365-day deployments. We must show our airmen that we are creating a culture that reminds them they serve in something bigger than themselves . . . defending America.

In addition to retaining our talented personnel, the Air Force must also increase pilot production and absorption while reducing requirements. The increased end-strength provided in the Fiscal Year 2017 NDAA will allow us to maximize the training pipeline and fill out under-manned units, which are vital to our recovery. Our fighter pilot production targets have increased 15 percent (to 335 Total Force pilots) per year while we surge the number of new aircraft maintainers by more than 1,500 per year to better man flying squadrons and reestablish sortie generation rates with a completion target of 3–5 years. However, other options beyond manpower increases exist to season our young pilots while accelerating readiness recovery.

The Air Force's plan to conduct an experimentation campaign this summer directed at the Air Force's light attack capabilities may provide opportunities to create a "high/low" mix for combatting low-end threats in more permissive environments. During this experimentation campaign, we will gather information before working with Congress to determine what we can afford for the future. This approach could provide more cockpits to absorb and season a greater quantity of fighter pilots and

provide 4th and 5th generation aircraft the required training time to prepare for high-end threats and the operational tempo relief to extend their service life.

#### FORCE STRUCTURE AND MODERNIZATION

**FIGHTERS** Five years ago during a period of severe fiscal constraints, the Air Force rebalanced our fighter force structure using analysis which showed the Air Force could decrease fighter force structure by approximately 100 aircraft if we were willing to accept higher risk. This resulted in the current fighter inventory of approximately 1,000 primary mission aircraft and slightly more than 1,950 total aircraft. This inventory complies with Fiscal Year 2016 NDAA language on the limitation on retirement of Air Force Fighter Aircraft; however, with today's sustained operational demand for rotational fighter presence, our current 55 combat-coded fighter squadrons do not allow for enough time at home station to train pilots and maintain aircraft to achieve the full spectrum readiness necessary to meet the requirements set forth in the Defense Planning Guidance.

We need to regrow our current fighter force to a minimum of 60 combat fighter squadrons and 2,100 fighter aircraft across our Active, Guard, and Reserve components. This

balance will evolve as we procure more F-35 aircraft and develop Penetrating Counterair (PCA) from a 4th/5th generation mix to a 5th/6th generation mix.

The Air Force's major modernization focus today is the F-35A, which is the centerpiece of our future fighter precision attack capability. Its missions will include Air Interdiction, Offensive and Defensive Counter Air, Close Air Support, Strategic Attack, Suppression of Enemy Air Defenses, Armed Reconnaissance and Combat Search and Rescue, as well as serving as a dual capable aircraft for the U.S. and partner nations. To fill capability and capacity shortfalls, the Air Force needs to increase F-35A procurement to a minimum of 60 aircraft per year as quickly as possible. This must be carefully balanced with the required follow-on modernization effort for the F-35A.

The F-35's follow-on modernization effort centers on the Block 4 upgrade, which is geared toward meeting the estimated threat in the 2025 timeframe and beyond. We cannot emphasize enough how important it is that we fully fund Block 4 to prevent delaying required capabilities for American and Coalition warfighters, including integration of additional weapons and upgrades to the electronic warfare system, data link systems, and radar. Once Block 4 upgrade is complete and ready to be fielded we will examine acceleration of the F-35A program to the maximum affordable procurement rate to meet projected 5th Generation requirements.

The F-22, currently the only U.S. fighter capable of operating in highly contested environments is also an integral piece of the Air Force's force structure modernization plan. Its stealth, super cruise, integrated avionics and sensors combine to deliver the Raptor's unique capability. We plan to retain the F-22 until the 2060 timeframe, meaning a sustained effort is required to counter advancing threats that specifically target its capabilities.

As our adversary capabilities advance, PCA will play a significant role in targeting and engaging future threats and is critical as a node in the larger network, providing data from its sensors to enable employment using either stand-off or stand-in weapons. This capability will provide the survivability, lethality and maintainability to meet emerging worldwide threats across the spectrum of conflict and will be the cornerstone of the Air Force shift from 4th/5th generation to a 5th/6th generation fleet.

In addition to pursuing new capabilities and modernizing fifth generation fighters, the Air Force also seeks to extend the service life and modernize critical capabilities of key fourth generation aircraft. Doing so will help maintain Service capacity and readiness to meet the needs of today's counterterrorism fight while ramping up the F-35 production line and developing PCA.

The legacy service life extension program (SLEP) will extend the F-16 airframe structural service life from the current 8,000 hours to 12,000+ hours, adding fifteen to twenty years of service for selected F-16s. To ensure the F-16's lethality and prominence in low-end conflicts, we are pursuing an active electronically scanned array (AESA) radar upgrade that offers advanced capabilities and improved reliability and maintainability. We are also upgrading the mission computer, display generator, electronic warfare components, and the ALQ-131 self-protection jamming pod, known as the Pod Upgrade Program (PUP) that enables advanced technology jamming techniques.

Along with the F-16, the Air Force expects the F-15E to be an integral part through at least 2040 and we are pursuing a new electronic warfare self-protection

suite, the Eagle Passive/Active Warning Survivability System (EPAWSS) for the Strike Eagle fleet.

The Air Force will not be able to rely solely on our current programs and capabilities to ensure readiness to fight the most advanced threats in the future. To that end, we are aggressively pursuing a path toward strategic agility in our capability development. We have reinvigorated development planning (DP) at the enterprise level to build-in agility and formulate truly innovative strategic choices for capability development. Core Development Planning functions include: formulating and evaluating viable future concepts, defining operational trade space, identifying technology shortfalls and Science and Technology needs, and assisting the operations community in refining requirements.

To oversee and direct capability development of the highest priority operational challenges and opportunities, the Air Force established the 3-star Capability Development Council (CDC), chaired by the Vice Chief of Staff of the Air Force, as well as stood up the Strategic Development Planning and Experimentation (SDPE) office to plan, manage, and execute warfighting experimentation campaigns. Experimentation provides the ability to rapidly explore a wide range of innovative materiel and non-materiel solution options. To further these efforts, the Air Force programmed resources starting in fiscal year 2017 to conduct concept-driven experimentation campaigns, including funds for prototyping, live and virtual simulations; developing a cadre of expertise, along with the tools to conduct experimentation campaigns.

The Light Attack Experimentation Campaign informs planning and strategic choices in this critical area. The Air Force is experimenting with potential off-the-shelf aircraft to determine industry's capability, capacity, and interest to provide cost-effective innovative solutions with low procurement, operating and sustainment costs. Since the deployment demand is not expected to decrease, the Air Force must meet capability demands in permissive environments while building and maintaining readiness to meet emerging threats in more contested environments.

Aligning capability, capacity and cost with conflict is key to meeting Air Force commitments to combatant commanders and effectively using taxpayer resources. Assessing the viability of low operating cost, light attack platforms has the potential to reduce operating costs while still meeting combatant commander needs.

The Air Force recently released an Invitation to Participate to industry for a live-fly experiment with off-the-shelf aircraft that may meet an Air Force need for a low-cost capability that is supportable and sustainable. Planned for later this year, this live-fly experiment will assess the capabilities of these off-the-shelf light attack aircraft, which will be flown by Air Force personnel in scenarios designed to highlight aspects of various combat missions, such as close air support, armed reconnaissance, combat search & rescue and strike control and reconnaissance. The experiment will also include the employment of weapons commonly used by other fighter/attack aircraft to demonstrate the capabilities of light attack aircraft for traditional counterland missions. Results from this experimentation campaign will be used to inform future experimental companies, requirements and possibly investment decisions. The evaluation of off-the-shelf candidates is not yet a program and there is no plan for what happens after the experiment.

**MUNITIONS** There is an ever growing demand for the effects airpower brings to the joint force. Within our fiscal boundaries, we have sought to balance the requirement for current munitions with the need to advance capabilities in the same manner we have with our aircraft force structure. However, sustained combat operations, BCA limitations, and support for our coalition partners have negatively impacted these efforts. Absent sustained and increased funding, munition stockpiles will continue to decrease as well as negatively impact readiness and our ability to meet national security objectives in the future.

Sustained combat operations and support for our coalition partners are reducing munitions inventories faster than our ability to procure. Historically, munitions funding has been reduced to pay other critical service bills. To resolve this issue, we need increased and sustained funding to send a more consistent demand signal to our industrial base. With the dispensation provided to us by the Congressional Defense Committees, we were able to utilize the Overseas Contingency Operations funding to replenish the munitions with high combat expenditures to date. Additionally, Overseas Contingency Operations funding while important, is only a means of replenishing what is used in contingencies and generally results in replenishment 2-4 years after the munitions are expended.

We are currently using legacy munitions on our 5th generation fleet which negates the full advantage these platforms can provide. Investments into programs such as the Small Advanced Capabilities Missile (SACM) and the Stand in Attack Weapon (SiAW) are crucial to realizing the full potential of our next generation of aircraft. The SACM is a smaller, affordable air to air weapon that is required to

increase magazine depth and maximize utility of a PCA capability. SiAW is an air-to-surface weapon designed to hold at risk the surface elements that make up the A2AD environment and will be integrated on F-35, B-21 and other future platforms like PCA. With your continued help the USAF must continue to invest in and develop advanced munition capabilities such as these to ensure future air superiority for the Joint Force.

**BOMBERS** As with the fighter force, the total bomber inventory has also been significantly reduced. To provide perspective, in 1991 we had 290 aircraft available within the bomber fleet versus 156 B-1s, B-52s, and B-2s today. The current number is insufficient to meet Defense Planning Guidance and nuclear guidance while sustaining current operational demands and maintaining sufficient training and readiness capacity.

A key modernization effort that will provide warfighters the capability to operate in tomorrow's high-end threat environment is the development of the B-21 Raider. The B-21 will provide the President with the ability to hold targets at risk around the globe while denying sanctuary to our adversaries. In addition to its conventional capabilities, the B-21 will support the nuclear triad providing an advanced and flexible deterrent capability with the ability to penetrate modern air defenses. Agile acquisition processes have been built into the B-21 development and procurement efforts, ensuring we deliver system capabilities for the best value, while integrating open architecture standards for ease of upgrade to future technology requirements.

The Air Force remains committed to B-21 affordability, with the average procurement cost of \$564 million in base year 2016 dollars. We require a fleet size that will ensure sustained dominance well into this century and intend to procure a minimum of 100 B-21s. Procuring at least 100 B-21s will also reduce lifecycle ownership costs. Further, we are continuing to study the right size of the total future bomber force. Deterrence and demonstrated combat capability remain vital instruments of power, especially as our enemies are committed to denying our attacks from the air. Only 12 percent of our current bomber fleet is survivable in such an environment. Therefore, the B-21 remains an absolute national defense priority and we are grateful for your continued support of this critical program going forward.

Equally important to developing advanced capabilities is the Air Force's commitment to modernize the legacy bomber fleet. The 19 remaining B-2 aircraft, currently the only low-observable, Anti-Access/Area Denial asset capable of penetrating advanced enemy defensive systems, are approaching 30 years of service and require engine, avionic, communications and defensive systems upgrades to maintain viability in the face of advancing enemy capabilities.

Similarly, the 62 remaining B-1s have been in service for nearly 35 years and are receiving upgrades to their avionics and flight systems. These upgrades will ensure the B-1's viability into the mid-to-late 2030s. Lastly, the B-52H is programmed to at least 2050, putting the remaining fleet of 76 at nearly 100 years of service. To sustain this venerable capability there are a number of modernization efforts currently in work: replacement radar, new engines, improved/integrated avionics, defensive and weapons management, and communication upgrades.

In conjunction with the upgrades to the bomber fleet, the Air Force is looking to update the Air Launched Cruise Missile (ALCM) inventory with the Long Range Stand Off (LRSO) program.

**SPACE** We view our national security as inextricably dependent upon space-enabled capabilities. Meanwhile, potential adversaries are investing heavily in technologies designed to exploit this dependency in order to diminish the national security advantages which stem from space capabilities. We must expect that an adversary associated with any military conflict will likely seek to attack space systems, to include offensive action in and through space; perhaps even before kinetic activities take place on land, sea, or in air.

Additional investment is required to build robust and resilient architectures while implementing the Space Enterprise Vision (SEV), which looks to invest smartly in the highest payoff capabilities that enhance space domain mission assurance. The Air Force will continue development of GPS III satellites that will provide enhanced, higher-power, and jam-resistant position, navigation, and timing for joint warfighters. This GPS warfighting advantage will be reliant upon a Next Generation Operational Control System (OCX) to provide enhanced cybersecurity, precision, reliability and integrity.

Similarly, the Air Force provides robust worldwide satellite communications (SATCOM) to joint warfighters and must continue efforts to enhance current protected SATCOM systems such as the Advanced Extremely High Frequency (AEHF) satellites while addressing current and future threats by providing resiliency and advanced defensive capabilities in architectures like the addition of Protected Anti-Jam Tactical SATCOM. Our future Space Based Infrared System (SBIRS) satellites

must also modernize into systems capable of responding quickly to threats while maintaining our edge in strategic missile warning and launch detection to our fielded forces and the homeland.

Investment in space-based assets is crucial to our ability to maintain space-enabled capabilities, but investment in space assets alone is insufficient. The nation must also invest in advanced Space Situational Awareness (SSA) and C2 capabilities, which will allow for rapid understanding of threats and decision-making to defend assets. As an example, the Air Force is investing in the Space Fence program to provide surveillance of small objects and satellites, allowing early detection of threats. Investment in additional ground-based sensors like the Space Surveillance Telescope and radars, as well as space-based sensors, will provide the necessary indications and warning of adversary actions on-orbit. Bottom line, we must gain the ability to acquire much more precise and robust data regarding activities on-orbit, which also drives a C2 requirement to synthesize data and make decisions.

The Air Force has made an initial investment in building the Joint Interagency Combined Space Operations Center (JICSpOC) which is designed to ensure the national security space enterprise meets and outpaces advances in space threats. To act on information provided by SSA architecture, JICSpOC will provide resilient, responsive, and interoperable C2 capabilities to provide the ability to respond once a threat is known.

Additionally, the Air Force is investing in C2 tools such as Joint Space Operations Center (JSpOC) Mission System (JMS), which will provide modernized hardware and software solutions to better synthesize the increased volume of SSA data. Improved SSA data coupled with a mission-ready JICSpOC ensures future implementation of SEV principles to their greatest degree of survivability in a war that extends into space, ultimately supporting joint warfighters across land, air and sea to maintain the operational advantage.

Historically, the Air Force has funded space programs in order to simply maintain an operational advantage, with no concern for resiliency and survivability because the threat of combat extending into space was not mature. The threat environment is now changed. Therefore, considerable increase in investment of SEV-enabling architectures, SSA and Space C2 are necessary if our joint warfighters are expected to operate with the traditional advantages our space systems provide.

*CYBER* The Air Force continues to build its contribution to joint cyber mission forces by developing the next generation cyber warrior, adding manpower for offensive and defensive cyber operations, and equipping them with the right capabilities to ensure effective operations. The Air Force plans to shift from a 20th century network-centric infrastructure to a 21st century data-centric infrastructure. This transition will enable power projection through information integration and reallocate critical Information Technology manpower towards emerging cyber warfighting missions.

The ability to effectively operate in cyberspace is vital to deliver airpower and conduct the Air Force's core missions. We must field and sustain cyber resilient capabilities that provide mission assurance against savvy and constantly evolving adversaries. In response to Congressional direction and our internal vision of the need, the Air Force has initiated a multi-pronged approach to provide assurance, resilience, affordability, and empowerment to enable the Air Force's assured cyber advantage to ensure our ability to fly, fight, and win in air, space, and cyberspace.

Signed in November 2015, our Air Force Cyber Campaign Plan (CCP) has two goals: 1) to "bake in" cyber resiliency in new weapon systems and 2) mitigate critical vulnerabilities in fielded weapon systems. It consists of seven Lines Of Action (LOAs) which are designed to be the "engine" behind increasing the cyber resiliency of all Air Force new and legacy weapon systems. The CCP addresses the first goal by integrating cyber resiliency into the system engineering processes to 'bake in' resiliency before systems are fielded. It also institutionalizes adaptable subsystem architectures for enterprise technology baselines and business processes, when designing and building new weapon systems. Concurrently, the plan addresses the second goal by pursuing top down and bottom up methodologies to finding and mitigating mission 'critical' cyber vulnerabilities. Other LOAs address other important CCP support activities, including cyber workforce development, creation of a cross-cutting common security environment, and the development of counter cyber intelligence capability. We are committed to building out the Air Force's contributions to USCYBERCOM's Cyber Mission Forces (CMF) to support the Nation and the Department of Defense's Joint Information Environment (JIE) framework.

*MULTI-DOMAIN COMMAND AND CONTROL (MDC2)* An MDC2 capability generates effects that present the adversary with multiple dilemmas at an operational tempo that cannot be matched. The Air Force is focused on creating feasible investment options throughout its BMC2 portfolio that drive towards the attain-

ment of an advanced MDC2 capability for the joint force. For example, multiple AWACS modernization activities are underway with the most notable being the upgrade to the Block 40/45 mission system which is the foundation for all future AWACS capability improvements. Additionally, the Air Force is in the midst of accomplishing activities for a follow-on airborne battle management command and control capability, the Airborne Battle Management and Surveillance (ABMS), which is currently provided by the E-3/AWACS fleet. The ABMS system is envisioned to be an evolutionary leap in capability intended to achieve IOC prior to the end of AWACS projected service life in 2035.

The E-8C Joint Surveillance Target Attack Radar System (JSTARS) executes Battle Management and Surveillance of air-to-ground operations, an integral piece to today's fight. Our JSTARS recapitalization strategy integrates mature sensor, communications and battle management technologies on a business class aircraft; the results should reduce life cycle cost while increasing operational availability and mission system capability. We seek to balance mission capability, risk and cost, and will look for opportunities to accelerate the recapitalization as the program progresses.

#### SUMMARY

The demand for air, space, and cyber power is growing and our Chief is committed to ensuring that America's airmen are resourced and trained to fight alongside the Army, Navy, Marines and Coast Guard to meet national security obligations. The Air Force seeks to balance risk across capacity, capability, and readiness to maintain an advantage, however persistently unstable budgets and fiscal constraints have driven us to postpone several key modernization efforts. These delays created a rapid approaching modernization bow wave that includes programs critical to meet our capacity and capability requirements across all mission areas.

The delays have also opened an opportunity to our competitors to close gaps and negate our traditional advantages. Although we are grateful for the recent fiscal relief, we still face uncertainty. Sustainable funding across multiple fiscal year defense plans is critical to ensure we can meet today's demand for capability and capacity without sacrificing modernization for tomorrow's high-end fight against a full array of potential adversaries.

As critical members of the joint team, the USAF operates in a vast array of domains and prevails in every level of conflict. However, we must remain focused on delivering *Global Vigilance*, *Global Reach* and *Global Power*, through our core missions of Air Superiority, Space Superiority, Global Strike, Rapid Global Mobility, ISR, and C2 to continue to provide our nation with security it enjoys. We look forward to working closely with the committee to ensure the ability to deliver combat air power for America when and where we are needed.

Senator COTTON. General Bunch?

Lieutenant General BUNCH. Sir, for the three of us, that one statement. We look forward to answering your questions. Thank you, Senator Cotton, Senator King, for the opportunity to be here today.

Senator COTTON. Thank you. I appreciate it.

So, as we know, the Department of Defense, like all departments, is operating under a continuing resolution until April 28th. The situation is far from ideal. There is a potential, though, for a full-year continuing resolution for all of fiscal year 2017. That would be far more damaging to our military services because of ongoing budget disagreements within the Congress.

Can I ask each of our witnesses to give examples from their respective areas of the damaging effects a full-year budget under a continuing resolution might have, General Nowland, from an operations and readiness perspective; General Bunch, for program acquisition; and General Harris, for long-term strategy effects?

General Nowland?

Lieutenant General NOWLAND. Mr. Chairman, thank you for the opportunity. A continuing resolution would devastate the readiness that we're trying to regenerate. Basically, in air, space, and cyber,

it would have operational effects as we are working to regain our readiness. We would prioritize to make sure that we continue to do the deployed mission, but those other units who are not either deployed or preparing to deploy, they would suffer readiness realities because they would basically have to stop flying in the air domain. The other missions in space and cyber would continue, but training opportunities would be lost.

Lieutenant General BUNCH. Mr. Chairman, in the acquisition community, a year-long continuing resolution would be devastating for the efforts that we're trying to do to modernize our Air Force. In the critical area of nuclear programs, we would require as many as 17 anomalies if we could afford to do that within our existing programs to keep these critical upgrades to the B-2, the B-52, Minuteman, and our NC3 [Nuclear Command Control Communications] capabilities on track.

It would also impact 60 Air Force acquisition new starts that we had planned across the spectrum, and we would end up needing another anomaly to cover the B-21 program, which is off to a good start at this point.

It would impact us in missile and ammunition procurement. It would impact us in our modernizations to aircraft and our procurement to include Compass Call. It would impact us in missile procurement. It would impact us in space procurement with our beyond-line-of-sight terminals and our evolved expendable launch vehicle programs, intended to assure that we have mission assurance in space. And it will result in a stop work issued against the GPS OCX program, just to name a few.

Senator COTTON. You mentioned the B-21. What about two other of your largest procurement programs, the F-35 and the KC-46A?

Lieutenant General BUNCH. So the F-35 right now, I do not have an anomaly that we're listing as one we would need at this stage, sir. On the KC-46, we provided an anomaly, and we were able to go award lot three already under the continuing resolution to keep the production program on track at the price bands that we had negotiated with Boeing when we awarded the contract.

Senator COTTON. You mentioned a lot of anomalies. How would you end up prioritizing and balancing those?

Lieutenant General BUNCH. Sir, that's why I said if we could afford to do that. What we would have to do is work with the remainder of the team and look at where those modernizations are for the longer-term plan that Joe Harris talks about and determine which areas we could take risks in or which areas we could not take risks in.

Senator COTTON. General Harris?

Lieutenant General HARRIS. Thank you, Chairman. That's a great question. We appreciate the opportunity to address it.

A continuing resolution, to be honest, would be something that our adversaries haven't been able to do to your Air Force, and that's going to be ground us, which, as you said, we're trying to avoid. With the current hole that we would be in, it's about \$600 million in our flying hour program alone. That's 120,000 flight hours, and your Air Force goes through that in a month-and-a-half. So it would be the last month-and-a-half the entire Air Force would have to stop flying, but because we can't do that, it would start af-

fecting units almost immediately, forcing their grounding, and that turns around our readiness program.

The airmen that we talked about are the most important to us and our chief, number-one effort. We'd have to defer all those bonus payments that we were setting up to cover to retain them, which means we're going to be training more and creating a bigger hole in our future programs.

Senator KING. I want to push down a little bit on the effects of a continuing resolution. I agree with you that it's no way to govern, and we shouldn't be even thinking about a further continuing resolution for the rest of the year.

However, basically it means that you have the same amount of money that you had last year. Why is it that it creates such a problem? For example, General Harris, you just said you'd have to ground the squadrons for two months at the end of the year. You didn't have to ground them last year. I'm unclear as to why it would have that effect.

Lieutenant General HARRIS. Sir, that's a great question. We are actually flying more this year, trying to improve our readiness status. So we had been at that since 1 October based on the signals and messaging we've had from both Congress and OSD [Office of the Secretary of Defense]. So we're flying at a rate greater than last year, trying to reverse our readiness trends and have more airmen prepared to fight the high-end conflict, not just today's fight. So we're ahead of last year's curve significantly, trying to get these airmen up to speed.

Senator KING. So basically what you're saying is if you don't have additional funding over and above what you had for last year, you'd run out of money and that's why you'd have to ground those squadrons.

Lieutenant General HARRIS. That's exactly right, sir.

Senator KING. General Bunch, the same question. Why such a drastic effect if indeed you're having the same amount? This is what my taxpayers in Maine would say: They're getting the money that they got last year; why would there be such a drastic effect on various programs?

Lieutenant General BUNCH. Yes, sir. So, some of these programs—for example, OCX [Operational Control System]—if you recall, we had to plus up the budget to get the program back on track. That's a program where we're going to be spending more money this year than we were before, so that's an example of that.

On our weapons procurement, one of the things that we've seen is the desire and the continued utilization of precision weapons to minimize collateral damage and dependence on those, and that demand signal has gone up, and we have tried to respond to that by trying to increase the production of joint direct attack munitions, small diameter bomb, Hellfire, and advanced precision kill weapons system. All of those were on a ramp to plus back up so that we can rebuild our stockpiles and match what we're utilizing in the fight today.

Senator KING. Isn't that what OCO [overseas contingency operations] was all about?

Lieutenant General BUNCH. So the problem—it is, sir. But the problem with OCO traditionally, last year you allowed us to take

some OCO dollars and predict what our utilization would be so that we could procure weapons. That's not traditionally how we've been able to do that. So that helped us. The problem with OCO is it's years before I can get to the point that I fill back up those stockpiles.

What we're trying to do is send a steady signal with stable funding and a demand signal to the industrial base so that they keep the production levels up at what we need, not only for us but also for our partners, and also for foreign military sales and for other activities as we fight around the world.

Senator KING. So part of the problem with a continuing resolution is predictability and maintaining your acquisitions and maintaining the industrial base.

Lieutenant General BUNCH. Sir, the way that we describe, I describe, particularly in the weapons area, is for many years we've been full up on the throttle and full back on the throttle, and what we've got to do is set a stable throttle and continue to keep stable funding to send that signal to industry so that industry is willing to make the investments so that they can support what we need to procure.

Senator KING. I hesitate to speculate how a jet airplane would fly if Congress was in the driver's seat, the pilot's seat.

In your prepared testimony, one of the most, I thought, troubling pieces—and this is returning to the longer-term issue—is manpower shortfalls, particularly pilots and maintainers. This appears to be a serious, ongoing problem, and particularly in the next few years I understand there are a great number of retirements in the commercial side, and you're seeing a loss of people.

How do we cope with the shortfall in pilots, and also maintainers?

Lieutenant General BUNCH. Senator King, that's a fantastic question. Our Air Force and our chief has directed that we take this on head-on. The answer is we're going to need a little bit of help from everybody, work with industry, work with Congress, but what we can control we're taking on right now. The first thing we need to do, sir, is we're working on our requirements.

So we have a rated staff allocation plan, which is as you look at your United States Air Force, not every pilot is flying. Some pilots are doing staff duty, some pilots are doing training duties—

Senator KING. Wouldn't pilots rather be flying?

Lieutenant General BUNCH. Yes, sir, they would, but not for their entire career because we need pilots in staff positions so that we can make good decisions about future acquisition, about future con ops, about command and control. So we have a myriad of duties.

Our young pilots, your first 11 years of your career essentially, sir, is built around building technical capability. So that's really where the vast majority of our pilots, our young pilots, are. As you become older, we need less older pilots, but we need to use them to train our Air Force and to operate our Air Force. But we basically have cut our staff, so we're looking at requirements.

The second thing we do is we're increasing production. We are pushing up our production to the maximum capacity that we can, and in particular with fighter pilots we're going to try to produce

335 total force fighter pilots per year, and we're going to produce those continually for the next five to seven years. We need to just produce those pilots to fill in gaps.

As we do that, we will also create mobility pilots, but we also have a responsibility to build coalition and international pilots. So we're going to maximize our production while balancing our training requirements.

Senator KING. My time has expired, but we're going to get back to this. I want to follow up on how we're going to do the retention. I think that's very important. And also recruit and retain people who are maintaining, because you can have pilots, but if the planes aren't ready, that's a problem too.

Mr. Chairman, thank you.

Senator COTTON. Senator Tillis?

Senator TILLIS. Thank you, Mr. Chair.

Gentlemen, thank you for being here and for your service.

The question I want to focus a little bit on, the continuing resolution and the effect that it may have. But before I do, I've got a couple of baseline questions.

How many squadrons do we currently have that are at their highest level of certification or readiness?

Lieutenant General HARRIS. Sir, it's not many. It's less than half that are in what we would call Level 1 or Level 2 readiness.

Senator TILLIS. How many are at Level 1?

Lieutenant General HARRIS. Three, maybe four.

Senator TILLIS. I think it's four. And that's a total of how many squadrons?

Lieutenant General HARRIS. Fifty-five.

Senator TILLIS. And the number of pilots that you all would like to have versus how many you need, how far behind are we?

Lieutenant General HARRIS. Sir, we are probably 700 to 1,000 in the Air Force alone; and, as we're talking about, we're increasing our production now. The bonus increase that Congress has given us will help us retain more of those mid-level pilots, but we don't think it's enough. Although we'll never keep up with airline salaries, currently between us and the Navy are producing about 2,200 pilots a year. This past year that we're finishing now, airlines are hiring 4,000. We're only producing 2,200.

Lieutenant General NOWLAND. Sir, we're 1,555 total force pilots behind today.

Senator TILLIS. Okay, it's even worse than I thought.

Now, with that sort of as a baseline, I don't think you all would put that as something you're really happy with and that's in the best interests of the national security, or really, for that matter, the morale of the Air Force. Let's say that some people around here are going to declare victory and high-five if we get a continuing resolution passed for 12 months that has, let's say, even the numbers that we talked about here in terms of increased spending. How do those numbers change at all over the next 24 months? Do they get better, worse, or stay the same?

Lieutenant General HARRIS. Sir, they'll get worse. First off, we won't be able to close out 2017 at our end strength that we're looking for of 321,000. We'll fall short of that number, and that will just compound as we go forward. The chief and secretary are trying

to grow the number of airmen we need—maintainers, ops, flyers, those that are working across the spectrum. Right now, we just don't have enough doing the mission.

Senator TILLIS. If passing the CR [continuing resolution] was what many people think here would be a success, I don't think anybody in uniform would think it was a success, particularly those who are worried about our readiness and our capability and our ability to project power.

Lieutenant Bunch? Or General Bunch. I'm sorry.

Lieutenant General BUNCH. I was one once, sir. I was a lieutenant.

Senator TILLIS. A little younger.

Lieutenant General BUNCH. A day or two ago, sir, and still loving it. It would be devastating for us—

Senator TILLIS. Devastating.

General BUNCH.—if we take a continuing resolution throughout the year. We'll be at \$2.8 billion short. We will have to find a way to fund within five months.

Senator TILLIS. My next question relates to the sad reality that that may be the best that we can expect. I hope we can get more, but that may be the best we can expect.

What advice would you give to us in terms of other things we could do that could remove some of the hurdles or allow you to be more productive with the money that you have if we're constrained by money? I don't want to be. I think that we need to place a priority on the challenges that you have and all the other branches have. But what other things should we be looking at that you haven't heard any movement on that could potentially increase your flexibility, reduce burdens, reduce inefficiencies to at least help bend the curve on what is otherwise just an undeniable downward trend?

Lieutenant General HARRIS. Senator, that's not an easy task to come up with. We do have some new starts that we are trying to get through authorizing those with the money would help, allowing us to move money, if necessary, left and right to cover some of these shortfalls. I think we're already doing that, and we have good support from Congress. But not having a stable budget from year to year really impacts my ability to work on my 5-, 10-, and 20-year plans.

Senator TILLIS. No doubt about it. I mean, we can sit here, and we beat you all until you bleed, we beat you for bleeding, for cost overruns on certain projects, but we create the structural inefficiencies that cause that to happen. You can't make a long-term supply chain optimization outcome happen unless you have a long-term spending horizon to plan it on.

General Bunch, you were going to say something?

Lieutenant General BUNCH. Yes. I would just say, sir, that Congress has been very helpful with us when we've come in on critical acquisition programs, to give us the anomalies, and we appreciate that support. But if we go for the year long, and I talked about the number of nuclear anomalies we would need and the number of new starts, all that is out of balance with what limited amount of money we've got, and we've got to make trades, and we have to

work on all of these together, and that would be very challenging to do.

Senator TILLIS. In my remaining time I don't expect an answer, but we would like to hear back from you specific things so that we can ease the burden. If we're going to get to a point to where the CR is all we can get, please give us feedback on things that we can go nail down that at least make you managing in this fiscally tight time more efficient. It shouldn't be the solution, but at least it provides some relief that we're not really talking enough about now.

Thank you, Mr. Chair.

Senator COTTON. General Nowland, you said you have a shortfall of 1,555 total force pilots today?

Lieutenant General NOWLAND. Yes, Mr. Chairman.

Senator COTTON. What's your shortfall of fighter pilots today?

Lieutenant General NOWLAND. Sir, today, as of today, we're 950 fighter pilots short across the total force.

Senator COTTON. Thank you.

Senator Sullivan?

Senator SULLIVAN. Thank you, Mr. Chairman.

And gentlemen, thank you for testifying today and your service, appreciate it very much.

I wanted to talk about another shortfall that we were trying to get some more focus on. In NDAA last year, I sponsored a provision that asked for a report on the F-35 maintainer shortage, and I think that was due a couple of weeks ago. I know you're busy, so maybe we can see that relatively soon, or maybe it's already completed.

But the point of the amendment was actually to be helpful, to try to get your ideas on how we actually close that gap. My one question—that language was based on the end strength of 321,000. I think General Goldfein talked about end strength of 350,000. What does that do to the maintainer shortage, and will you be explaining that kind of increase on end strength and what we need to do to address the maintainer shortage in the report?

Lieutenant General HARRIS. Senator Sullivan, I'll start with that. Thank you. Sorry if we're late on the report. We'll work on that.

Senator SULLIVAN. We know you've got a lot going on. And like I said, that was not a smack-you-down provision. That's a provision trying to help.

Lieutenant General HARRIS. Understand.

Senator SULLIVAN. Because it's an important issue.

Lieutenant General HARRIS. What we're looking at doing, when the chief talks about closing out this year at 321,000, that includes growth in our maintainers. We are over-assessing from our current need of what we need of new recruits, because it takes us so long to train. We recognize that we've got to bring them in somewhere. So we're bringing in more than 1,000 now than we had planned in the long-range plans and picking that up. So we will get healthy over time, but it will become an experience issue for a while. We won't have too many 3 level, and 5 and 7 level.

As we grow to 350,000, that will help the chief right-size all of our squadrons. Right now, it's about 80 percent manned across any squadron. We're trying to work on the ops and maintenance first to get at the combat capability, but we certainly need the support

so that we have the quality of life that takes care of all the airmen that are flying to make sure we can retain them when they're at mid-level career and they get those other choices that are out there.

Senator SULLIVAN. And more broadly speaking, how are we looking on the F-35 production, the cost, the deployment? Obviously, the President was talking about this for some time, and I think General Mattis or a senior Air Force official took that over. Are we seeing cost reductions and the deployment schedules on schedule right now?

Lieutenant General BUNCH. Sir, let me start with that, and then I'll let these two gentlemen jump in.

We are seeing General Bogdan driving cost savings into the program through his efforts with Lockheed Martin. We are seeing it come down, the price curve, the way that we want it to. It's at or better than what General Bogdan had been trying to drive to, to show us what we were doing.

So one of the things we're asking for is please keep driving that cost down and—

Senator SULLIVAN. And I think it's helpful to have the President of the United States raising that and pushing on that, too.

Lieutenant General BUNCH. Sir, we love anybody that's putting pressure on us to try to save money. We're all good with that.

Senator SULLIVAN. That's your ultimate leverage.

Lieutenant General BUNCH. Yes, sir. So we are seeing that. The message we have given out is we need to see those costs continue to come down. We want to see the sustainment costs continue to come down, and we want to continue to—

Senator SULLIVAN. Is that process impacting the schedule of deployments, or no? I mean, it's a different place.

Lieutenant General BUNCH. So right now we haven't deployed. We have done Red Flag, and I'll let these gentlemen talk to that. But right now we're staying on track with the production the way we want it, the fielding the way we want it and intended, and the schedule is moving forward with the completion of the 3-F testing. So we're moving in that direction, and I'll pass it over to General Nowland and General Harris to address the Red Flag and how the jet is performing.

Senator SULLIVAN. So there's no right movement? Aren't the Marines getting a new IwoKuni and Bravos?

Lieutenant General NOWLAND. Senator Sullivan, the Marines have moved them to IwoKuni. Our first operational squadron initial operational capability is at Hill Air Force Base. They recently deployed the Red Flag and had a very successful Red Flag. We are next going to take them and they're going to go to Europe on a theater security package and work through initial operational capability, working towards full operational capability as we work to develop the capability of the system, the network, how do we bring it all together and how do we deploy with the two increased combat capability.

Senator SULLIVAN. Okay.

Lieutenant General HARRIS. And, sir, the pilots that are flying this airplane, the Red Flag, love it. They step down out of the cockpit and they tell stories of the kill ratios that are phenomenal.

Those that have flown Red Flag in now fifth gen and fourth gen wonder why they ever did it in a fourth gen airplane.

Lieutenant General BUNCH. Sir, what I've told people is we look at the F-35 program and we had some developmental things that we worked through, and we had challenges that General Bogdan and his team have worked through with Lockheed Martin and with everybody. Probably we have semi-annual meetings with all the international partners, and it was about three ago that the conversation wasn't about the development; the conversation was predominantly focused on when we're going to start deploying and how we're going to support down range.

To me, that was a shift in the program that we are moving forward. The platform has crossed a hurdle and we're really getting to where we're looking to employ the asset.

Senator SULLIVAN. Good.

Mr. Chairman, I have a few more questions, but I'll defer to whatever your role is here.

Senator COTTON. You can ask one.

Senator SULLIVAN. It will be a multi-part one question.

[Laughter.]

Senator COTTON. Well played.

Senator SULLIVAN. Let me ask you, you talk about the fifth gen and the Red Flag. One of the things I like to do is take military members who aren't in the Air Force, other senior leaders, and try to get some of my colleagues up to Eielson to see the Red Flag Alaska exercises and J-Park. And every time I go there, which is frequently, the superlatives that are talked about with regard to the J-Park training—which I think the airspace is about the size of Florida, so a little bit bigger than what we've got down in the lower 48, actually a lot bigger, and we're expanding it right now, as you know—is that one of the issues that keeps coming out is that you talked about readiness at the outset of your testimony and the importance of ranges.

My understanding is that when you're talking about fifth gen air-to-air training, because the standoff ranges are increasingly much further with the fifth gen aircraft, that the ranges need to be increasingly large, or the airspace needs to be bigger. We have that at J-Park, which I think I'd like your opinion on whether, as General Welch said prior to his leaving, that that was the best range on the Planet Earth.

But if you agree with that, what are the suggestions to increase readiness? Although it is a remarkable place for air-to-air combat, I'd ask the question that the last Red Flag evolution they did they had close to 90 aircraft up night fighting and getting refueled, and it was remarkable—not the notional aircraft, the real aircraft.

What are your suggestions that we need to do to improve J-Park, and do you agree with oncoming fifth gen, that that is not only the crown jewel of air-to-air training in the U.S. military but it's going to be increasingly important as we move to F-35s and F-22s?

And what do we do about the aggressor squadron? We had a great aggressor squadron in Alaska. The F-16s are very good. But at the fifth gen level, are we going to need to bring in F-22s to be aggressors at a certain point?

So that's my multi-part question. And I'll also ask about where are we on KC-46 spacing. There was NDAA language last year that laid out particular principles that the Congress wanted you to look at, and I just would like an update on that.

That's one question, by the way.

[Laughter.]

Lieutenant General NOWLAND. Sir, I think you might get multiple answers.

Senator SULLIVAN. Well, if the Chairman would allow it, I think that would be great.

Lieutenant General NOWLAND. Senator Sullivan, as the director of operations, I can tell you J-Park is critical towards the future. Airspace and the range size that you talk about is absolutely—you're spot on, we need greater distances. But our chief has just directed a new initiative that's called Operational Training Infrastructure. We used to talk about live, virtual, constructive, but what we have determined, it's much bigger than just live, virtual, constructive. It's the whole system that goes into it.

So part of the F-35 and F-22 fifth generation platforms are so smart that threat replication becomes very, very important, and you can't do it necessarily. You have to have some very high-fidelity simulation. So in A-3, director of operations, we are standing up a new division with a general officer that will be looking at how—

Senator SULLIVAN. You put your pilots here and the trainers if they get a kill?

[Laughter.]

Lieutenant General NOWLAND. Every day we come to work thinking about do we do training better and how do we maximize our investments in training to include our Nellis ranges, to include J-Park, our training infrastructure, how do we man our aggressor squadrons, how do we train in our aggressor squadrons, what is the future of our adversary air squadrons, how do we get adversary air while not reducing readiness of blue forces.

So your question is spot on. We are thinking every day about it because we know that fifth generation training is different than training of fourth generation.

Senator SULLIVAN. You can integrate the fifth gen physical air-to-air with some of the notional. Isn't that correct?

Lieutenant General HARRIS. Sir, we're working on that. That's part of our upgrade that we're looking for follow-on. Right now we're concentrating on combat capability for the F-35, but we are working through several programs to bring that training in because, as you're aware, the J-Park, I've been lost in it as a former Blue Fox pilot back in the 1990s. It is a massive air space, yet these threats are partially reliant on threat density and being able to put multiple threats overlapping on top of each other. That's what we meant to kick the door in with our fifth gen aircraft, and we continue to work on that.

That's not easy to do. J-Park is a jewel. It's not a backyard range that we have, but where we base our F-35s with two squadrons at Eielson, in addition to what we've got at Elmendorf with the F-22s, we need to continue to work on that, but we have to balance it. Are we buying more threats to train against versus combat capability

in the aircraft that we're trying to do? That's always a balance that we work through on a daily basis.

Senator SULLIVAN. Thank you.

Lieutenant General BUNCH. I love what they said. We're trying to do this holistically to make sure we're on the right path to inquire what we need to be able to support the live, virtual, constructive and what we're trying to do for the future. There's not only a range aspect of this, but there's also a security aspect of this as to what you can do virtually and what you can really do in the open air that we have to balance as well, sir. And I, unfortunately, do not have the KC-46 basing thing with me, so I'll have to take that one for the record, sir. But I'll get you an answer back.

Senator SULLIVAN. Okay. Great. Thank you.

Mr. Chairman, thank you.

Senator COTTON. Thank you.

General Nowland, I want to return to this question about fighter pilot shortfalls. I'm not trying to sharp-shoot the number. I'm just trying to get a handle on them. Whatever they are, I think the upshot of those numbers is not good.

Last year your predecessor, General Raymond, testified the Air Force was short 511 fighter pilots. That was expected to grow to 834 by 2022, in part because of the higher than expected hiring by private airlines last year, though you finished 2016 short over 700 pilots. I understand that Congresswoman Wilson in her questions for the record submitted for tomorrow's hearing has said they will be short 800 fighter pilots, but you say it's 950 fighter pilots short today?

Lieutenant General NOWLAND. My numbers are total force. So it depends on how you look at the numbers, but we'll make sure we square with—

Senator COTTON. And that's total force fighter pilots.

Lieutenant General HARRIS. Nine-hundred-fifty total force fighter pilots.

Lieutenant General NOWLAND. Total force fighter pilots.

Lieutenant General HARRIS. Active, Guard, and Reserve.

Senator COTTON. So might the discrepancy be counting Guard and Reserve, along with Active?

Lieutenant General NOWLAND. Quite possibly, sir, because our 55 fighter squadrons include our Guard and Reserve. They are not in addition to that. And as we look at our requirements, we stack nearly 50 squadrons on top of each other to get through the defense planning guidance that we have now for some of our larger conflicts, and that's when we need 55 healthy and ready squadrons, then look at growth to make sure that we can meet our needs.

Senator COTTON. Whatever the number is, and I'm pleased to get it to us broken down along those dimensions, would you agree with my first statement that the upshot number is not good for the health of the Air Force and for the security of our nation?

Lieutenant General NOWLAND. Mr. Chairman, absolutely. We can show you that the number has gotten worse over time and is increasing. Now, we are very hopeful, under retention, our third line, that the extra money that Congress allocated to us and the plan that we're coming back with, with a pilot bonus, with a tiered system, a business model system that allows us to give multiple op-

tions, will be part of the solution. But it's not money alone that's going to keep pilots in. It's also partially got to do with culture of the squadrons and getting pilots back to their primary duty.

One of the primary irritants for pilots is additional duties, and our chief has taken actions to eliminate additional duties. We put five additional personnel into 24 fighter squadrons to help with the additional duties as we look at—

Senator COTTON. Could you give the committee some examples of additional duties?

Lieutenant General NOWLAND. Yes, sir. For example, we put people in that will help them do the scheduling duty that requires you to do that every day; help with reporting, reporting functions, whether that be OPRs, ZPRs, administrative type of work that needs to be done in a squadron. The things that take a squadron, a fighter pilot away from flying, being an officer—remember, we're all officers first, so professional officership comes first. But then replacing those duties that detract him from not preparing for his next sortie. So we're looking at areas such as that.

Senator COTTON. Okay. The committee last year increased the cap for bonuses from \$25,000 to \$35,000. Do you anticipate a request that you'll be increasing the cap further?

Lieutenant General HARRIS. Sir, we would request that. We're finding almost a one-to-one ratio. So with the \$35,000 bonus, that is an increase, and that's good. After two decades, we have not changed it, but we're actually hoping for higher. At \$50,000, we may get up to 50 percent retention. So we will tier that based on where we have our biggest needs, and right now that is in the fighter pilot community.

Senator COTTON. At what phase in one's career would one receive that bonus?

Lieutenant General HARRIS. At the end of your pilot training commitment. So it is around that 11- to 12-year point, and then the option is for five years or to keep you out to 20 years. We have several options to get at different lifestyles to retain as many of the pilots as we can.

Senator COTTON. So perhaps a \$50,000 bonus for a five-year commitment, or more?

Lieutenant General NOWLAND. Essentially, the RAND study said \$48,000 a year. The problem is—

Senator COTTON. I'm sorry. Is it a year?

Lieutenant General NOWLAND. A RAND study said—yes, sir—a \$48,000 bonus is what they were recommending, and that was based on a number of 3,500. The problem is the airlines are hiring more than that. In 2022, we have data that shows that 58 percent of American Airlines pilots are going to be eligible for retirement.

So as we look to the future, this problem is not going away. That's why it's production, retention, requirements, and then as we think about this as a national problem, if you think it cost us \$11 million to create an F-22 pilot, and you lose him at the peak of his proficiency, it's a loss to the nation of a big investment.

Senator COTTON. My time is up on this round. I will just say that our committee staff has traveled and conducted sensing sessions with some pilots in Europe and in the Middle East, and I think there's a strong non-monetary component to it as well. One of those

components is the operational tempo. The Air Force has been heavily deployed in those theaters now for 27 years. Obviously, there's a self-reinforcing aspect to it as well as the pilot shortage grows shorter and the up tempo becomes even greater. So I think that's something that both the Air Force and this committee needs to consider as well, as important as those monetary bonuses are.

Senator Peters?

Senator PETERS. Thank you, Mr. Chairman.

And I thank all three of you for being here. I appreciate your testimony here today.

My question centers around the A-10 aircraft. In Michigan, our Air National Guard flies A-10s and has been doing that very successfully, but we are also now on the short list of five potential sites for deployment for the F-35, which we hope will have a successful outcome as that process moves forward.

But if you could talk a little bit about how you see this transition as we move away from A-10s, what will be some of the sequencing and timelines for that, as well as new F-35 squadrons coming in, perhaps taking some of these positions. How do you see that unfolding?

Lieutenant General HARRIS. Senator Peters, that's a great question. First off, what I'd like to say is we are living with the NDAA requirements right now on the A-10s, and we are waiting for the comparison testing to be complete before we make decisions on the final outcome. But at this time we are not asking for additional upgrades with the A-10. It is an awesome airplane, and I would venture to say it is the best CAS [close air support] airplane that we have.

But where I think we have not done well in telling our story with the F-35 is that as it moves in, as we are holding at 55 squadrons, things have to fall off the bottom, and it's going to be our older fighters that we have not upgraded. A-10s may be some of that, F-16s, F-15s. We're buying roughly two squadrons a year. When we look at the 60 range that we're aiming for, by the time we put some in training, some in test, and continue to grow the efforts that we need. So that's the pace that we're looking at, and we are working a few years ahead because of the MILCON required to support the F-35 and the capabilities that it brings to any fight. A lot of that involves the higher classification and the security requirements on ramps, those types of things that we have to upgrade.

Senator PETERS. Right. Thank you.

Your testimony also mentions the space domain and that we need reliable access to space, including jam-resistant position navigation and timing. My understanding is that our adversaries have been investing a great deal in their space capability, something that we have to be concerned about.

What do you believe are the most important investments that we need to make now in space to support those vital missions? What should we be doing here in Congress to help you achieve that important mission?

Lieutenant General BUNCH. Sir, I think we've outlined in our budgets that we put in, we put those in the highest priority. I believe we're giving you what we believe we need for the future. I will

tell you right now, we're very focused on developing the new launch capability to get us off the RD-180 and to move the pads so that we can have two domestically produced, commercially viable providers of launch services to meet all of our NSS [National Security Space] requirements. So those programs, we've been doing other transaction authority investments with public-private partnerships with industry for the last few years that we're trying to expand out now to go to launch service agreements.

Also, we need to keep the OCX program on track because we need that to have a stronger encrypted M-code GPS signal for what we're going to do for those activities.

The last thing that our chief is very focused on, and I'm not going into a whole lot more details about specific programs, is we need to normalize how we're doing our space business. We need to treat it like an operational domain. We need to treat it like the air domain. We need to set the requirements. We need to make sure we've got con ops for how we would operate and do things. We have to do all those things beforehand. We need to streamline the acquisition. That's in my swim lane. We need to partner better with the NRO [National Reconnaissance Office]. We need to make sure we're moving out and using the operationally responsive space authorities that we have. We need to look at doing RCO [Rapid Capabilities Office]-like activities in the space domain, which is another area that we're focused on right now.

So we have a big focus in the space area to be more responsive to what we're trying to do because we know that's a critical domain and a critical area that we do our business in.

Senator PETERS. Thank you.

Senator COTTON. Senator Warren?

Senator WARREN. Thank you, Mr. Chairman.

General Harris, last week the House Armed Services Committee held a hearing on Air Force readiness, and during that hearing your colleague, Major General West, seemed to indicate that the Air Force might be prepared to retire the F-15C and D in the next year or two. Is that right? Does the Air Force propose retiring the F-15? And how is the Air Force going to replace that capability?

Lieutenant General HARRIS. Ma'am, thank you. It's an opportunity for us to tell the story. That's pre-decisional. We have not decided, and throughout we continue to deploy the F-15C/D fleet. It's an air superiority fighter for us with somewhat limited capabilities from a fourth gen perspective compared to an F-22, but we are not replacing it at this time. It is something that we're looking at as we continue to bring in more fifth gen capability, what assets do we push out at the bottom of that chain.

Senator WARREN. All right. So let me ask you, then, if it's pre-decisional, has the Air Force done the analysis to demonstrate that purchasing new F-16s instead of servicing the F-15s will provide the same level of capabilities and actually save the taxpayer money?

Lieutenant General HARRIS. We are doing that analysis. I don't know how that is going to turn out from a cost perspective, but I think it's going to be fairly balanced. So I look forward to providing that when we get that information completed.

Senator WARREN. And I'll take it you'll get that resolved before you make any decisions?

Lieutenant General HARRIS. We will, and certainly that's part of it, but we also have to look at the operational capabilities and what a fifth gen fighter, although it is a multi-role fighter in the F-35, brings to this fight as a family of systems. It far out-classes anything in our fourth gen.

Senator WARREN. I understand that, and actually I've got some questions about that. But what I really want to focus on is what we're doing in the next year or two, at a time when we're hearing about readiness difficulties with the Air Force.

I also want to ask, you know that more than 60 percent of our F-15s belong to the Air National Guard. So what I'd like to have here today is your commitment that the Air Force will consult with the Air Guard and specifically with the Adjutants General in states with the Air Guard F-15 wings before any decisions are made.

Lieutenant General HARRIS. Ma'am, they're part of my team on the plan process. So they're involved with us every day. At that testimony, seated next to General West was General Rice, the Air National Guard commander. So they're involved with—

Senator WARREN. I know General Rice well. Good.

General HARRIS.—and we'll continue to work with them.

Senator WARREN. All right. I just want to make sure we're going to do that.

Given its cost, I realize that we may not be able to procure the F-35 in the numbers the Air Force has planned until 2045. So I'm also not convinced that the F-16 is fully capable of replacing the F-15 in meeting the air-to-air mission. So I just want to raise the point, because it seems to me that retiring hundreds of aircraft at a time when the Air Force is in need of additional capability may not make a lot of sense here, and I just want to make sure you're looking very carefully at the proposal. I know we'll have questions as this emerges.

Lieutenant General HARRIS. Yes, ma'am, we're looking at that, and what our chief is trying to drive to is to maintain us at 55 fighter squadrons, including our Guard and Reserve in that number, and making them healthy with what we have.

Senator WARREN. Okay. I also want to, if I can get it in quickly here, I want to ask you about the nuclear command and control network, the NC3 system that connects our President to our field forces in case of emergency. As you know, the system is absolutely essential to provide early warning, to communicate critical information in a nuclear crisis. If NC3 doesn't work, the rest of our nuclear triad becomes essentially useless here.

The current NC3 system is old. General Hyten recently said that NC3 was his highest priority for nuclear recapitalization, and he said, and I'm going to quote him here, "Any delay, deferment, or cancellation of NC3 modernization will create a capability gap potentially degrading the President's ability to respond appropriately to a strategic threat."

So I just want to ask, General Bunch, is NC3 the highest priority for the Air Force as well?

Lieutenant General BUNCH. Ma'am, we have multiple priorities.

Senator WARREN. I know.

Lieutenant General BUNCH. NC3 is a priority that we have within the Air Force. We named Air Force Global Strike Command and General Rand as the lead for the NC3 effort. So we named a four-star and a MAGCOM [major commands] as the lead. We aligned NC3 efforts under a program executive officer up at Hanscom right now, and we designated someone. We did not have that before. He's designated to look over all those programs. We've aligned that into the nuclear weapons center, which we've stood up now and we've restructured so that it's really only focused on the sustainment and the modernization of our nuclear inventory.

So we, the Air Force, have made a big commitment to prioritizing that. I will not tell you that we have it 100 percent straight today. I will tell you that there are a lot of small efforts that are in a lot of different POs that don't have a whole lot of manpower. Our team met with the A-10 and pulled in all the program executive officers who have those assets, and pulled in the Global Strike Command and other expertise to get us on a path to make sure that we are focused on that and delivering those capabilities which are so critical to our ability to keep the nuclear deterrent viable.

Senator WARREN. Good. I appreciate that.

I have additional questions, but I'll just ask them in a QFR. I just want to say I think this is an absolutely critical program, and it's important for us to keep an eye on it. So, thank you, General.

Lieutenant General BUNCH. Yes, ma'am.

Senator WARREN. Thank you.

Senator COTTON. Senator Blumenthal?

Senator BLUMENTHAL. Thanks. Thank you, Mr. Chairman.

I have a couple of simple numbers questions which you may have answered; I apologize if you have, but I would like to hear the answers.

What is the ideal procurement number for fiscal year 2018 on the F-35 for you? What do you want on the F-35 for fiscal year 2018?

Lieutenant General BUNCH. Sir, I'd like to get to 60 F-35A models for the U.S. Air Force.

Senator BLUMENTHAL. Okay. And I think there's been some testimony about the number of—and by the way, I'm not a business guy, and I'm not a military professional, but common sense tells me if you order enough of them, the price comes down with scale, and I've heard that from the company. So if you confirm it, I'll believe it's true.

Lieutenant General BUNCH. Sir, what we've asked and what I've given in our dialogues and the message I've carried from our chief is we want to go to 60. We need to see the price continue to come down on the curve so that we can continue to procure those, and we need the operations and sustainment effort that we need so that we can operate and maintain those the same way. That is what General Bogdan's team is working. They understand where we want to go, and I'm comfortable that as we've gone through the buys over the years we are moshing down the curve and we are coming down to a lower rate, and that's where we want Lockheed Martin to stay.

Senator BLUMENTHAL. And Lockheed Martin and Pratt and all the contractors involved have begun a war on costs. In fact, they began it some time ago, maybe years ago, and they have continued

that war to drive down costs, but scale is very important to that effort.

Lieutenant General BUNCH. It is, sir.

Senator BLUMENTHAL. Thank you.

I know there's been some talk about the number, the shortages of pilots—how many are you down from the number that you need? I've heard different numbers—800, 900. Maybe it's—

Lieutenant General NOWLAND. Senator Blumenthal, the number changes every day. But as of today, we are 1,555 total force pilots short of our requirements.

Senator BLUMENTHAL. Fifteen hundred and fifty-five.

Lieutenant General NOWLAND. Yes, sir, 1,555.

Senator BLUMENTHAL. And what is the number from which you are short?

Lieutenant General NOWLAND. Sir, our total number of pilots is approximately 20,300. That's approximately what our total requirements are for pilots.

And I'm sorry, Chairman Cotton, I gave you 1,550 because I didn't have my glasses on. I apologize.

Senator BLUMENTHAL. And of those 1,555—again, I apologize, because my terminology probably won't be as exact, as official as it should be. What number of those are fighter pilots?

Lieutenant General NOWLAND. Sir, we are 950 fighter pilots short today.

Senator BLUMENTHAL. That would square with what I've heard. And out of what number is that?

Lieutenant General NOWLAND. Sir, I'll get you the exact number. I don't want to give you a wrong number. I've got it right down here, but I don't have total number of fighter pilots broken out. I have it broken out by the services, so I can get it to you.

Senator BLUMENTHAL. If you could, I would appreciate it.

Lieutenant General NOWLAND. Yes, sir.

Senator BLUMENTHAL. And again, I don't mean to make too much of this numbers stuff, but one theory that has been advanced to me about how to keep and maybe even attract more skilled pilots is this idea of readiness, giving them time, basically time to train, because they need, so it's been described to me, time in the air to be proficient. And if they don't get that time, they feel they're not proficient, and it's a real deterrent to stay in the Air Force. So it makes the offers they may receive from the private world all the more attractive.

So readiness is a key to keeping and attracting skilled pilots. Is that over-simplistic, or is it relevant?

Lieutenant General NOWLAND. Senator Blumenthal, no, you are exactly right. It's a combination, a series of things. Chairman Cotton already mentioned it also, personnel tempo. Deploying down-range is one thing, but then when you come home, flying and then being home—I have a story of an F-22 pilot, a major who was in Alaska, sir. He had been there for seven years. He went to weapons school. He was at the peak of his game. He came home one day and his wife put her hand on his shoulder and said, honey, I love you, but you've got to get out of the Air Force. And he said why? Because in the last five years you've been home 10 months.

So that's an extreme case. Now, the good news is he went to the Reserves and he's still serving with the Air Force. But personnel tempo is part of it. When you're a very small Air Force and you're a very small F-22 fleet, you're constantly in demand. So we're looking at how we get personnel tempo under control.

There's deployment to dwell, but there's also personnel tempo. Building white space is super important.

Lieutenant General HARRIS. May I add to that also?

Senator BLUMENTHAL. Yes, absolutely. Thank you. With the Chair's permission.

Lieutenant General HARRIS. Sir, you're exactly right. Quality of life is a part of this. The pilots came in, they intended to fly and they like to fly. So one of the chief's number-one items is to fix our squadrons and right-sizing them. So we are putting administrative support back into the squadrons. Over the last two decades as we've been getting smaller, we've been cutting as much of the tail as we can, and we realize we did too much. The flying squadrons are so small, they had no support.

So after a full day of flying or an exercise that they were deployed to, they had to come home and do a significant amount of paperwork that could be done by many people, not just the flyers. So we're looking at a lot of those tasks, if you want to call them additional duties, whether it's keeping the areas that we work in that are highly classified open and having somebody to do that, rather than requiring an aviator to do that, we're getting at a lot of those tasks.

So the quality of life will continue to rise. So as we get them home, that 10-month/5-year vignette, that's just not all combat operations. It's a significant portion of that, but it's all the other training they're doing off-station that we're trying to free up back at home.

Senator BLUMENTHAL. And if I could ask just one more question, please? In terms of continuing proficiency, the administrative duties, personnel tempo, when someone comes home they want to stay proficient, ready, are they getting enough time actually in the air flying?

Lieutenant General NOWLAND. Sir, it varies by weapon system. But the answer is we are working to increase weapon system sustainment. This is where our maintainers come in. We have a minimum number of sorties per month that we need to fly pilots to consider them mission ready, and we are driving our maintenance to try to increase our utilization rate so we can fly pilots more, because that minimum number should be the floor, not the ceiling. We want to be above that number to increase our readiness, and we are driving towards a utilization rate, with additional maintainers and more weapons systems sustainment funding, which we've done. We're moving in that direction. The trends are going in the right direction, but we're not where we want to be right now.

Senator BLUMENTHAL. Thank you. Thank you all very, very much for your service and for being so forthcoming today.

And thanks to the Chair.

Senator COTTON. Senator King?

Senator KING. Thank you, Mr. Chairman.

We've talked a lot about retention. I'd just note, General, you made the point that whatever the bonus is, it's a lot less than \$11 million, which is the cheapest training, the training you don't have to do because you've got somebody who is already trained. So I think that's got to be part of our calculus as we talk about this.

Again, talking a bit about the shortage, I understand that there is an excess of pilots on the mobility side, and I was wondering if there was any effort or plans or thought being given to shifting pilots from mobility over to where you are facing the shortages.

Lieutenant General NOWLAND. Senator King, that's a great question. The mobility excess pilots we have moved into our training architecture. So as we looked at our overall operational training infrastructure, it also deals with manning our T-38s, T-6 squadrons, and UPT [undergraduate pilot training]. And as we became shorter on fighter pilots, we took fighter pilots out of the training infrastructure and moved them into unique fighter pilot jobs. So mobility pilots have moved into that training function.

We have a very small number, but we have moved some mobility pilots who went through T-38s into a fighter cockpit. But that's a very small number because a specialized UPT, the vast majority of our pilots who have gone through T-1 training go into the mobility world, and they've not formed T-38s.

Senator KING. Are bonuses being paid to mobility pilots even though there's an excess?

Lieutenant General NOWLAND. Well, there's not really—it depends on what you mean by excess. We're still short of our overall pilot numbers, and we're still taking risk in our training infrastructure, and the mobility pilots are also going to be short like fighter pilots here. Air Mobility Command tells us by 2020 we will start to lose them.

Our pilot retention, our pilot numbers are based upon a 65 percent take rate. Unfortunately, our mobility pilots are not at that rate. They're below 65 percent. But we've been living off of over-producing mobility pilots in years 7, 8, 9, 10.

Senator KING. You had an excess but the excess is being worked down, is what you're saying.

Lieutenant General NOWLAND. We are using all of our pilots to the maximum extent capability. It's just we filled our mobility pilots; they're filling other functions. So I think we're saying the same thing. Over time, our mobility excess that is allowing us to do our training function will degrade and will be gone, and then we'll have to figure out how we're going to fill our training cockpits.

Senator KING. Let me talk about a related, not the same but a related issue, and that's UAV [unmanned aerial vehicle] pilots. My understanding is that we're now in a world of using enlisted personnel as UAV pilots, at least with the Global Hawk. What about Predators and Reapers? How is that working? Have you found any diminution of quality using enlisted people in these slots? Because we were stressing out the regular pilots, as I understand it. Has that change been implemented, and to what extent has it been successful?

Lieutenant General NOWLAND. Senator King, this is a fabulous question. I love this question. Our RPA [remotely piloted aircraft] pilots, we are moving enlisted pilots into our RQ4 community, be-

cause what we found is that in our RQ4 community it's very similar to what we did in space, the way we're operating. They have not arrived there yet, sir. They're going through the training pipeline right now. So our first batch is going through the pipeline. We now have the next batch. We just had our second batch of enlisted pilots who have been selected and now are starting down the track to be enlisted RPA pilots.

Our MQ1s and MQ9s—our MQ1 fleet we're going to retire. Our MQ9 is going to be essentially our new platform. We don't have the enlisted aviators in MQ9s right now, sir.

Senator KING. What's the MQ9?

Lieutenant General NOWLAND. The MQ9, it is the Reaper.

Senator KING. That's the Reaper, okay.

Lieutenant General NOWLAND. Yes, sir. We have the Predator, which is the MQ1, which we are eliminating, and the MQ9, the Reaper.

Senator KING. So you have no enlisted people in the Reaper program. Are you planning to move in that direction?

Lieutenant General NOWLAND. We have enlisted people in the Reaper program, sir. They're just not pilots. We have a pilot, we have a sensor operator, and they are a team, and they work side by side.

Senator KING. Will you have enlisted pilots in the Reaper program?

Lieutenant General NOWLAND. At this time, Senator, what we're doing is we are looking and evaluating. As we go down this road, we're going to evaluate all options in the future. But the first thing is we need to get our enlisted aviators into the RQ4 and see how they go.

Right now, our training pipeline is pretty much set. This year we're going to train over 300 RPA operators. Whether they're an officer or enlisted, you still have to train 300 RPA pilots. So there really is no advantage one way or the other right now. We've got time to make this decision down the road, sir.

Senator KING. I commend—again, we've got to think very creatively about how we fill this shortfall, and if the enlisted people can do this job effectively, that's another resource that at least being able to reallocate trained fighter pilots into fighters.

The B-21, are the requirements for the B-21 locked down, no more good ideas?

Lieutenant General BUNCH. Yes, sir. We locked the requirements down before we went into—General Welch did. Before General Welch, we continue to keep them under General Goldfein. General Goldfein has made it crystal clear to the two of us that he is the chief requirements officer for the Air Force, and if we want to change anything in those requirements, particularly in the KPP, key performance parameter, he needs to know about it and he needs to approve it.

Our intent all along has been to keep those locked down so that we would not increase costs. We could control. One of the things that I talk about, I believe one of the key things we did on the program was we put cost as a key performance parameter for what we wanted, and I viewed that as serving as an appetite suppressant. It caused everyone not to try to add additional things. It caused ev-

erybody to use what we had, and we built it in a way that we can increase its capability over time because of the open modular system that we designed as the backbone for the platform.

Senator KING. And as you know, we have an interesting contract, which I think is a creative solution to the risk problem of 70 percent fixed, 30 percent cost plus. But that 30 percent could explode if we start redesigning the platform in the middle of the construction process.

Lieutenant General BUNCH. It's been a key factor for us, sir, that we're looking at. There are a couple of things we didn't want to get into the B-2. We rewrote the requirements after we awarded the contract and we redesigned the platform. We don't want to go there. That's why holding the requirements so stable is so critical to us.

Senator KING. I like hearing you say we don't want to go there. I'd rather have you say we will not go.

Lieutenant General BUNCH. No. I apologize, sir. We're not going there.

Senator KING. Thank you.

Lieutenant General BUNCH. We're not going there.

Senator KING. Mr. Chairman, thank you.

Senator COTTON. I want to return to Senator King's questions about RPAs, and I want to ascend above the enlisted question for a moment. We'll return to that, though.

Last year, Secretary James recommended an RPA get well plan that included over 140 specific actions. General Nowland, how many of those actions have been completed, and when will they all be completed?

Lieutenant General NOWLAND. We call that the cultural process improvement program. The exact numbers, I'll have to consult or get back to you; I don't know. The most important part of it, though, was the deployment to dwell and the crew ratios, Mr. Chairman, and we've reached over a 10.1 crew ratio. We've had a series of initiatives.

In my previous job I was the 12th Air Force Commander, so I was intimately familiar with this. We've had a series of initiatives to try to normalize what we call life at Creech Air Force Base in Northwest Las Vegas, and those initiatives have gone through. The morale at Creech is good because we now have the crew ratios where we are driving to what we call a deploy to dwell, so that the pilots will actually have time to come out of combat sorties and go into training sorties. This is so important for us, because we are learning that our MQ9s are force multipliers.

One vignette. On the most sophisticated sortie we do at the weapons school, which is weapon school integration, they always have an exercise where they have personnel recovery of a downed airman. The RPA, the MQ9 crew, when it operates in that role, is a perfect, perfect example of how you integrate all the information in and then get it to Sandy-1, who is the A-10 that is doing the actual job of rescuing the pilot, because they can have situational awareness, coordinate all activities.

So we're learning that there's multiple functions for these weapons systems as we move forward. The exact number, sir, on CPIP

[Culture Process Improvement Program], I will get back to you, but we are progressing in a very good fashion.

Senator COTTON. General Harris, did you have an answer to that question?

Lieutenant General HARRIS. Not to the number. We closed out on the 140, but we are more than halfway through that program. Last time I left the dance at Air Combat Command, we were executing that, so we will get back to you on that.

Senator COTTON. That's fine. Just please get it to us for the record.

How are we doing on pilot production for the MQ1 and MQ9 as a whole, putting aside the question of the division of labor, or the potential division of labor between officer and enlisted?

Lieutenant General NOWLAND. Yes, sir. For Fiscal Year 2016, MQ1 and MQ9, we produced 252. We forecasted 271. So we were a little short of what we wanted to do. But we also did foreign military sales with 35, and we hit all 35 of those pilots as we moved forward.

The 271, the reason we were a little short had to do with a little bit of weather. It also had to do with some maintenance and student proficiency, and that's pretty normal as you're going through to meet your productions. As we forecast to the future, in 2017, we're expecting to produce 346 MQ1 and MQ9, although we have closed our MQ1 RTU now. We are moving exclusively to MQ9.

Senator COTTON. Three-hundred and forty-six you said?

Lieutenant General NOWLAND. Yes, Mr. Chairman.

Senator COTTON. Does that meet the standard we need for a healthy force in the RPA community?

Lieutenant General NOWLAND. Yes, Mr. Chairman. We've got a very good number now on where we're moving forward. We are driving to a 14-to-1 crew ratio, which will really enable us to start training, and that's part of the CPIP. We also are looking forward to opening another wing at Shaw Air Force Base as we grow the capability. So that will enable us to do the transition as we move over and manage our force.

Senator COTTON. Two years ago in the NDAA, the committee authorized bonuses of up to \$35,000 for these pilots. My understanding is that the bonus was at \$25,000 for some time, but it recently may have gone to \$35,000. Is that correct?

Lieutenant General HARRIS. Yes, it has. We expect to start paying that out this year. It's the initial air crew that are now coming up being bonus eligible. So to this point it hasn't mattered. They're still on that first commitment that they haven't been eligible for it. We expect it to help.

But, Mr. Chairman, I'd like to explain. We will look at how these people are being retained, because some of the contractors that we're currently competing with are paying upwards of \$40,000 a month for these RP operators to come off of Active Duty and to go fly other missions associated with what they're doing. So again, we will never, even with our RPA team, compete with the prices that are available on the commercial market, but getting back to that quality of life, opening a new base at Shaw, the mission accomplishment, the sense of being a part of the team is everything that

we're putting into the CPIP program to retain these fantastic aviators.

Senator COTTON. Finally, to return to Senator King's specific question about enlisted personnel and tie a bow on it exactly, in the Fiscal Year 2017 NDAA we directed Air Force to transition a significant number of those pilots to enlisted personnel by fiscal year 2020, and to Guard and Reserve by fiscal year 2023. Will you complete that transition and compliance with the Fiscal Year 2017 NDAA?

Lieutenant General HARRIS. Yes, sir. We are on track to meet that. That was specific to the Global Hawk, the RQ4, and we think we are on track at this time. So the first students, as you heard, are graduating this year and will start rolling through the mission. We will continue in that process, and as we learn more about how the enlisted team are doing in this, we will then take that information and consider do we move that into the next RPA platform, maybe an MQ9.

But again, they're employed differently, so that is a value judgment we'll have to look at as we understand how well these airmen are doing, and right now in the training they're doing outstanding.

Senator COTTON. So you take it as an open question at this point whether we should have enlisted personnel in the future acting as pilots for MQ9s, to be considered in the future based in light of the evidence we'll acquire during the transition for the Global Hawk?

Lieutenant General HARRIS. Yes, sir.

Senator COTTON. Thank you.

Senator King?

Senator KING. Just one follow-up on the B-21. Whatever we build will be obsolete the day it comes off the line, and therefore I hope that the design takes that into account and will allow modular replacement upgrades, software, in some cases hardware, so that the platform itself can be maintained but that its capabilities can be modernized as technology develops. Is that the design concept, General?

Lieutenant General BUNCH. Sir, that was a fundamental design concept. We went with the open mission systems architecture for the software so that everything would have an interface and we could advance technology as it evolved or we could make changes as adversaries evolved. We also designed the aircraft with additional power, electrical air conditioning in space in key areas that we may need to utilize so that we can grow the platform for the future.

Senator KING. So if you have to add one cable, there's a place for it.

Lieutenant General BUNCH. If we need to add something, sir, we've got areas that we can do that. If we need to change out a component, if it ties into the open system architecture, we can do that. We can do it and keep competition in the platform for the life of the platform, and we can do it in a more efficient manner because we won't have to test as much, and I personally believe it will increase our cyber security as we go through that process.

Senator KING. Excellent. I hope that you'll keep in touch with the committee on that project as it moves forward. I think it's one of the most important that we have, that the Air Force and the gov-

ernment is undertaking, and I hope we can have a continuing dialogue on that.

Lieutenant General BUNCH. Sir, we welcome that. We are committed to complete transparency with the appropriately cleared individuals on all the defense committees. We have been working with the defense committees for four years before we awarded the contract so that everyone knew what we were trying to do, and we're balancing all other transmissions to the public and what we can communicate against the security and the risks involved so that we can be as transparent as possible with the American public as well.

Senator KING. But you feel at this point the contract and the development is on track?

Lieutenant General BUNCH. Sir, I get monthly updates. We've done our initial baseline review. We've completed the preliminary design review. We're going into detailed design review. The contractor is hiring people at the appropriate level to get the work done, and we're tracking what they're doing. Everything right now indicates to me that we haven't slipped anything.

Senator KING. Gentlemen, thank you very much for your testimony. It's been very illuminating, and we look forward to working with you.

Thank you, Mr. Chairman.

Senator COTTON. Let me ask maybe a broader philosophical question about the B-21, but also especially what we've learned over the last 25 years.

General Bunch, do you think, from a development perspective, it's best to develop prototypes and have a fly-before-you-buy methodology for large and complex systems like these aircraft?

Lieutenant General BUNCH. It depends, in my experience, on how you set up the prototype project to go. I believe the best thing we can do, and I think the B-21 is an example of this, whether you build an exact prototype, I think a robust tech maturation and risk reduction phase is critical. If you recall, in that program we invested in the B-21 program with multiple contractors for quite a few years before we awarded a contract so that they could develop the technologies, mature those technologies. We were more informed buyers, and we had everything almost up to the preliminary design review before we awarded the contract. That cost us money up-front to be able to do it, but it also made the technology much more mature and made it much better for us to do.

There are areas, though, that we can prototype and we can go procure straight out of that. That's an area we're trying to do with some of our experimentation campaigns to see what the art of the possible is there, and the Congress has been very willing to give us rapid prototyping and rapid filling authorities that we will employ in those opportunities where that arises.

Senator COTTON. Developmental planning experimentation prototyping used to be resident in the Air Force's systems command, which was disbanded 25 years ago. Since then we've had struggles with programs like the B-2, the F-22, the C-17, the F-35. Do you think it's a coincidence that that command was disbanded and we've had these struggles since then, or is it a cause?

Lieutenant General BUNCH. Sir, I wouldn't tie it directly to the way that we reorganized to go to Air Force materiel command from systems command or logistics command. What I will say, we the Air Force, we let that developmental planning skill atrophy. That's something that our chief, General Welch, and Secretary James viewed as something we needed to get refocused on, and they believe we need to do more experimentation and more of that type of prototyping activity to see what technology can do so that we can respond more rapidly.

I believe they made a real strong commitment to that when they started budgeting \$100 million a year into the budget so that we could have it for experimentation and for developmental planning. They stood up an office that's in Air Force materiel command that leads those efforts for us.

So I believe our stepping away and letting that atrophy as we looked at capabilities and technology hurt us more than a reorg. We're refocused on that, and we're invested in those areas to see what technology can do so that we make wise investments.

Senator COTTON. So an atrophy of skill sets more so than a reorganization?

Lieutenant General BUNCH. That is my view, sir. I believe it was an atrophy of skill sets and a loss of, a lack of importance placed on that as we moved forward, and we needed to refocus on those efforts.

Senator COTTON. Thank you.

General Nowland, I want to speak about force structure, capacity. I mentioned in my opening statement General Hoog's remarks from 2014 about Air Force capacity. In response to this situation, in the NDAA a couple of years ago we directed the Air Force maintain a minimum inventory of 1,900 total fighter aircraft and 1,100 combat coded fighters. Do those numbers enable the Air Force to meet combatant commanders' demands and execute our national defense strategy today?

Lieutenant General NOWLAND. Mr. Chairman, that's a fantastic question. If you were to think about our 55 fighter squadrons, the seven years of declining budgets have caused cracks within those. So we are working on our chief's number-one priority of strengthening the squadrons. By strengthening the squadrons, we see fantastic results. I just returned from Jordan, where we have an F-15E squadron that is doing fantastic work. It's about to drop its 5,000th bomb in the war against Isis, because it has all its manning and it has the weapon system support.

So when we strengthen all of them, and if we could strengthen all of our squadrons to be at the maximum capacity, we can absolutely execute the national defense strategy, but we would be very tight if you think about the changes that have happened with our adversary. That's why the Air Force would like to grow to 60 fighter squadrons, and we would also like to build some attack squadrons in the future.

But in the end, Mr. Chairman, we can execute the strategy. But to be perfectly honest, it will be great airmen that will make it happen, and we'll do it on the back of our airmen.

Senator COTTON. So Congress did so with an intent to stem further divestment in combat air power, and sometimes Congress can

act as a blunt instrument, not a fine scalpel. So given that intent, can you tell us what the Air Force's actual requirement today is for total fighter aircraft and for total combat coded aircraft?

General Harris, you look like you'd like to answer.

Lieutenant General HARRIS. I would. As part of the requirements, sir, one of the things we're looking at is we think the 1,900 number is a bare minimum at the floor. We think it's probably closer to 2,100, a little above that for our fighter aircraft so that we can maintain probably 60 squadrons. We don't want to grow to 60 now and still have a broken force or a force that is not as ready as it can be. We want to fix the 55 we have. We are not planning to go below the 1,900. We are struggling with the way the budget is rolling out to us to maintain that in the long term, but we do understand the task of the NDAA. We do not intend to go below the 1,900. We will keep our 55 squadrons. We will grow them healthy if we are able to get a stable, predictable budget that comes to us and continue to improve along that line.

Lieutenant General BUNCH. It's a complicated answer.

Senator COTTON. A simple question, complicated answer maybe?

Lieutenant General BUNCH. Fifty-five fighter squadrons. We would like to have 24 aircraft per squadron, and that's probably our most efficient use of those airplanes. Fifty-five times 24 is not 1,900. It is slightly above that number. Where we believe we have some of that change is some of our aircraft, our squadrons are manned at 18 airplanes per squadron. So that's what drives some of these changes—

Senator COTTON. Is that a concession to budgetary necessity?

Lieutenant General BUNCH. It really is. If we were unconstrained, we would have every squadron with 24 combat coded airplanes, plus a couple of backup or BAI spares, which is common in each one of these units, so if you lose an airplane you have it available already maintained and ready to go, employed on a daily basis.

Senator COTTON. Okay. General Bunch, I need to ask about the UH1 November helicopter replacement program. There's a little bit of history here. Last year you submitted an out-of-cycle request to Chairman McCain for authorization to use provisions of the Economy Act of 1932 to purchase UH-60 Mike Model helicopters on the Army's contract. These aircraft would be replacements for our aging November model helicopters used for the ICBM missile fields security and other utility missions as determined by the commander of STRATCOM [Strategic Command].

The committee agreed, and we passed that request and authorization in the Senate version of the NDAA. Afterwards, the Air Force reversed that decision and decided to proceed with the full and open competition, and then after receiving responses from potential offerors on the draft request for proposals, the Air Force determined none of the offerors, including the 60 Mike Model, met the requirements for the program.

What was the reason the Air Force rescinded the request for authorization to use the provisions of the Economy Act when your own business case analysis showed that the course of action met the requirement and provided the best value for the taxpayer?

Lieutenant General BUNCH. Sir, the Department made a decision based on the amount of money that we were going to move into the year that we needed to—

Senator COTTON. The Department of Air Force or the Department of Defense?

Lieutenant General BUNCH. The Department of Defense made a decision based on the amount of money we were going to need to move into those areas, and we were going on a full and open competition from that point forward.

Senator COTTON. Have requirements changed from the time the decision was made to use the Economy Act until the draft RFP [request for proposal] was opened for full and open?

Lieutenant General BUNCH. Sir, let me take that. I don't believe we changed the requirements from that point forward. We did not.

Senator COTTON. General Harris—

Lieutenant General BUNCH. We did not. He's the requirements guy, and I'm the—

Senator COTTON. You're shaking your heads. Can you answer for the record?

Lieutenant General HARRIS. The requirements did not change. Yes, sir.

Senator COTTON. Okay.

General Nowland, I understand that the commander of STRATCOM has rescinded the request for forces to provide additional security since mitigation measures have been in place to satisfy his security concerns. Do these mitigation measures now supplant entirely the need to recapitalize—

Lieutenant General BUNCH. They do not, sir. They do not change the need to replace the UH1.

Lieutenant General NOWLAND. Sir, I'll pitch in also, Mr. Chairman. What they've done is they've done tactic techniques and procedures and had airmen that have been able to. It does not replace the need to replace the airplane. The requirements are still valid. It's just that the airmen have figured out a way to meet the requirements, but it's a band-aid type of solution. We need new aircraft for that mission set.

Lieutenant General BUNCH. Chairman Cotton, our nuclear arsenal remains secure, and we're able to execute the mission, but we still need the recap. We still need to get those in. We're doing a draft RFP in April. We will do the final RFP this summer. We'll award a contract next year. We plan to field helicopters in the 2020 to 2021 timeframe, sir, depending on what the winner comes in with.

Senator COTTON. Thank you.

I have one final question about the budget, which will probably tie a bow on it. My first question, the constraints of a CR in the short term. This is going to be facing the long term, General Harris. You have many large, long-term procurement programs over the next decade. We touched on some of those but not all of them, nuclear enterprise modernization, F-35A, KC-46A, the B-21, JSTARS, the TXT-38 replacement, the Presidential aircraft replacement, and now there's growing discussion of a penetrating counter-air and associated capability required to outpace our strategic competitors in the realm of air superiority.

I think it's safe to say that these represent hundreds of billions of dollars required to recapitalize and modernize the Air Force and remain ahead of our near-peer competitors. Have you received indications from the new administration that the Air Force budget modernization program will support all of these modernization programs?

Lieutenant General HARRIS. Yes, sir, we have. We continue to ensure that those modernization programs, which are large, continue to fit into the budget and the planning cycle that we have. So that's the work that my team does on a day-in and day-out basis. We're doing as much as we can in parallel to solve as many problems as we can, and then we will also continue to modernize the current fleets and assets to make sure that we can sustain the capacity that we have and not drop below any of the requirements over the long term.

So it is part parallel, part serial to get at what you're rightly pointing out are some of the concerns we have with the large budget of the future. The best thing we can get out of Congress is a stable budget that predicts, allows us to have a good prediction of where we will be in the future, and then we can right-size our acquisition and our approach to that to make sure we're getting the best value we can.

Senator COTTON. General Bunch, General Nowland, do you have anything to add to General Harris' answer?

Lieutenant General BUNCH. I do not, sir.

Lieutenant General NOWLAND. Mr. Chairman, the modernization byway that we face is critical, and Congress and working with everyone, it's critical to our operators to give our airmen the best chance of success. We are also thinking about how do we out-think our enemy. It's multi-domain operations. We need to think about how we operate in space, cyber, air domain, land, maritime domain, and bring joint effects to the battlefield.

I know we focus on all the money and how we're doing it, but what we're really going to do is enable our airmen to think multi-domain of how we can defeat our enemy who has watched us for 26 years and is working to defeat us. So we're going to out-think our enemy while we simultaneously, with your help, reestablish and renew our weapons systems.

Senator COTTON. General Bunch?

Lieutenant General BUNCH. Chairman Cotton, what I want to stress is our role as the acquisition, we have to do that efficiently and effectively to maximize the use of those dollars to get that capability, and our most important treasure, our airmen, America's sons and daughters, that were entrusted to provide that equipment and have a decided advantage on the battlefield, which, as you've talked about earlier, we do not have as much as we did before. That has atrophied away, and we need to continue to go after that. That's our commitment in the acquisition community to do that each and every day.

Senator COTTON. Thank you, gentlemen. Thank you very much for your time and your views. This has been a very wide-ranging and informative hearing. We appreciate your service to our country, and on behalf of all the airmen you represent, thank you for their service as well.

This hearing is adjourned.  
 [Whereupon, at 5:02 p.m., the subcommittee adjourned.]  
 [Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR TOM COTTON

COMPASS CALL

1. Senator COTTON. Lieutenant General Bunch and Lieutenant General Harris, where does the Air Force stand in moving out on its plan for re-hosting Compass Call? Can the process be accelerated?

Lieutenant General BUNCH. The Air Force is ready to begin the COMPASS CALL re-host; however, it is one of the many new start programs the Air Force cannot begin due to the Continuing Resolution (CR). The Air Force will move out on the COMPASS CALL re-host plan following the enactment of the Appropriations Act for Fiscal Year 2017. The Air Force is weighing options to accelerate the COMPASS CALL re-host program against fiscal constraints & production capacity.

Lieutenant General HARRIS. The Air Force is poised to begin the COMPASS CALL re-host; however, it is one of the many new start programs that the Air Force cannot begin due to the current Continuing Resolution (CR). The COMPASS CALL re-host is currently on the Chief of Staff's Unfunded Priority List and the Air Force plans to quickly move out on the COMPASS CALL re-host plan once an Appropriations Act for Fiscal Year 2017 is passed.

JSTARS RECAP

2. Senator COTTON. Lieutenant General Bunch, given the operational demand for these platforms and the cost of keeping the legacy airframes flying, assuming Congress provides the resources, can you assure me the Air Force will make a decision and move this program forward by making a contract award in fiscal year 2017?

Lieutenant General BUNCH. Currently, the Air Force does not plan to award the JSTARS Recap Engineering and Manufacturing (EMD) contract in fiscal year 2017. EMD source selection began on 2 March 2017. Any source selection timeline is speculative at this point because source selection is a data driven event, but source selection will likely span well into fiscal year 2018.

3. Senator COTTON. Lieutenant General Bunch, is JSTARS recap vulnerable to delay should Congress fail to pass a Defense Appropriations bill for fiscal year 2017?

Lieutenant General BUNCH. Yes, failure to pass the fiscal year 2017 Defense Appropriations bill will affect the JSATRS Recap Radar Risk Reduction effort and put Initial Operational Capability in fiscal year 2024 at risk.

4. Senator COTTON. Lieutenant General Bunch, could the Air Force accelerate the program once the winning bid is determined?

Lieutenant General BUNCH. The JSTARS Recap program is paced by the selected vendor's proposed schedule and funding. If there are opportunities to accelerate, the Air Force will brief the Congressional Defense Committees as directed in the fiscal year 2017 NDAA.

5. Senator COTTON. Lieutenant General Bunch and Lieutenant General Harris, do you agree that JSTARS Recap is a top modernization priority and that further delay has a negative impact on COCOM requirements?

Lieutenant General BUNCH. Yes, the Air Force is committed to accelerating IOC/FOC. However, until establishment of the program baseline with the selected contractor at Milestone B, the Air Force will focus on setting the conditions necessary to accelerate if opportunities become available. Shortly after the EMD contract award, the Air Force will provide a report outlining accelerated schedules and funding profiles.

Lieutenant General HARRIS. Yes. Multi-Domain Command and Control (MDC2) is the Chief of Staff of the Air Force's third focus area and critical for future operations. The Air Force remain committed to JSTARS Recap, which is currently under source selection as of 2 March. Contract award, scheduled for fiscal year 2018, will identify any potential acceleration options.

## QUESTIONS SUBMITTED BY SENATOR DAN SULLIVAN

## ADVERSARY AIR TO AIR AND SURFACE TO AIR CAPABILITY

6. Senator SULLIVAN. Lieutenant General Bunch, Lieutenant General Nowland, Lieutenant General Harris, we never want a fair fight with adversary, let alone a fight where we are potentially outranged. Reported advances in very long range air-to-air missiles, and surface-to-air missiles from Russia and China threaten to do just that. What technologies should we focus on for success of our 5th Generation and 4th Gen aircraft (including High Value Airborne Assets) in this environment?

Lieutenant General BUNCH. The U.S. Air Force is currently performing research on advanced capabilities Air-to-Air missiles for future demonstration, including work on sensors, fusing, warhead and propulsion. Our research goals include: high loadout and sortie effectiveness for potential future engagements and High Energy Density Propulsion for longer range in smaller volume. Our efforts in directed energy weapons (DEWs) may provide an improved capability by damaging/destroying the seeker components at longer ranges and with greater capacity.

Lieutenant General NOWLAND and Lieutenant General HARRIS. The Air Force chartered the Air Superiority 2030 Enterprise Capability Collaboration Team (ECCT) to provide a holistic approach to develop capability options to enable joint force Air Superiority in the highly contested environment of 2030 and beyond. Advances to long range air-to-air missiles and surface-to-air missiles are a part of this environment that we describe as Anti-Access Area Denial (A2AD). The Air Superiority 2030 ECCT determined that there is no single capability or technology that provides a “silver bullet” solution. Rather, to achieve Air Superiority against the threats you describe and the A2AD environment we need to develop a family of capabilities that operate in and across air, space, and cyberspace domains. This family must include both stand-off and stand-in forces, integrated and networked to achieve mission effects. Additionally, the speed of capability development and fielding will be critical to retain the U.S. advantage in the air.

## AWACS RADAR MODERNIZATION

7. Senator SULLIVAN. Lieutenant General Bunch, Lieutenant General Nowland, Lieutenant General Harris, the Air Force continues to upgrade legacy assets with sensor enhancements, such as AESA radars for F-15s and F-16s. What is the plan to upgrade AWACS sensor capability, which has not been upgraded since the completion of the Radar System Improvement Program (RSIP) in December of 2000?

Lieutenant General BUNCH. The AWACS sensor suite is anchored by the S Band Radar, but it also relies on a Passive Detection System (PDS) and an Identification Friend or Foe (IFF)/Selective Identification Feature (SIF) system. In the near term, the USAF is upgrading the S Band RSIP radar through the Electronic Protection program, which adds an adjunct processor to increase performance in an electronic attack environment. The Next Generation Identification Friend or Foe (NGIFF) program also widens the IFF/SIF capability by including Modes 5 and S. Furthermore, the Combat ID program upgrades the existing capability to provide a persistent Airborne Moving Target Indication Battle Management Command & Control (AMTI BMC2) combat ID in support of the kill chain. Finally, the PDS is reinforced by the enhanced computer processing provided by the Block 40/45 program.

Lieutenant General NOWLAND and Lieutenant General HARRIS. Air Force has begun the Joint Capabilities Integration and Development System (JCIDS) process for the air-to-air Battle Management Command and Control (BMC2) mission area. We completed a Capability Based Assessment (CBA) in fiscal year 2016 (FY16) and are developing the Initial Capabilities Document (ICD) for Advanced Battle Management and Surveillance (ABMS). ABMS will be a revolutionary leap, not a recap, driven by evolving threat and operational environments. The Air Force will make a decision on the way-forward in fiscal year 2020, based on the outcome of an Analysis of Alternatives (AOA).

## QUESTIONS SUBMITTED BY SENATOR JOE DONNELLY

## STRATEGIC MISSILES—COMMONALITY AND COLLABORATION

8. Senator DONNELLY. Lieutenant General Harris, the Air Force is undertaking a tremendous effort to both sustain and modernize its strategic missile systems, including the Minuteman III programed depot maintenance effort and the development of the Ground Based Strategic Deterrent as the next generation intercontinental ballistic missile. As we look ahead, nuclear sustainment, life extension and modernization efforts will require the Defense Department to manage a signifi-

cant—though I believe necessary—degree of cost and risk across multiple programs. General Harris, is the Air Force committed to working with the Navy to enhance commonality across U.S. strategic missile systems when such an approach will reduce cost and risk?

Lieutenant General HARRIS. Yes, the Air Force remains committed to pursuing smart strategic missile commonality not only with the Navy, but with mission partners in related areas such a ballistic missile defense, space launch, command and control, and cyber resilient software. In March 2016, a Joint Air Force/Navy team completed an assessment of potential opportunities for commonality between the Ground Based Strategic Deterrent (GBSD) and Trident missile programs. The findings of this study were subsequently incorporated into the GBSD acquisition strategy. The Air Force will continue to work with the Navy and others to lower GBSD program costs and risks while meeting operational and schedule requirements.

9. Senator Joe DONNELLY. Lieutenant General Harris, is the Air Force committed to maximize the sharing of information, best practices and services with the Navy to reduce cost and risk and avoid the duplication of effort as we undertake major Triad modernization programs over the next several decades?

Lieutenant General HARRIS. Yes, the Air Force is committed to making technologies and processes developed for GBSD available to the Navy and Department of Defense mission partners to inform other Triad modernization programs.

