

**DEPARTMENT OF DEFENSE AUTHORIZATION FOR  
APPROPRIATIONS FOR FISCAL YEAR 2020 AND  
THE FUTURE YEARS DEFENSE PROGRAM**

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**HEARINGS**

BEFORE THE

**COMMITTEE ON ARMED SERVICES**

**UNITED STATES SENATE**

ONE HUNDRED SIXTEENTH CONGRESS

FIRST SESSION

ON

**S. 1790**

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2020 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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APRIL 2, AND APRIL 9, 2019



**DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 2020 AND THE FUTURE YEARS DEFENSE PROGRAM—Part 4 AIRLAND**

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**DEPARTMENT OF DEFENSE AUTHORIZATION  
FOR APPROPRIATIONS FOR FISCAL YEAR  
2020 AND THE FUTURE YEARS DEFENSE  
PROGRAM**

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**TUESDAY, APRIL 2, 2019**

UNITED STATES SENATE,  
SUBCOMMITTEE ON AIRLAND,  
COMMITTEE ON ARMED SERVICES,  
*Washington, DC.*

**ARMY MODERNIZATION**

The Subcommittee met, pursuant to notice, at 3:01 p.m. in room SR-232A, Russell Senate Office Building, Senator Tom Cotton (Chairman of the Subcommittee) presiding.

Subcommittee Members present: Senators Cotton, Sullivan, Scott, King, Blumenthal, Peters, Duckworth, and Jones.

**OPENING STATEMENT OF SENATOR TOM COTTON**

Senator COTTON. The Airland Subcommittee will come to order.

Today, we meet to receive testimony on the U.S. Army's modernization efforts and its fiscal year 2020 budget request.

We welcome Lieutenant General Paul Ostrowski, Principal Military Deputy to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology, and Director of the Army Acquisition Corps; Lieutenant General James Pasquarette, Deputy Chief of Staff, G-8; and Lieutenant General James Richardson, Deputy Commander, Army's Future Command. Thank you all very much for your distinguished service to our Nation and your appearance here today.

The National Defense Strategy (NDS) directs our Nation's military to prepare for the return of great-power competition. This means the Army must be prepared to deter and, if necessary, decisively defeat potential near-peer adversaries, like China and Russia. In order to be prepared for future battlefields, the Army must rapidly modernize after the last 18 years of counterinsurgency warfare. For that reason, the Army created Army Futures Command. This new command will help shape modernization requirements to meet these future threats.

The senior Army leadership has undertaken a detailed and exhaustive look at every single program to ensure that each one supports our National Defense Strategy. The Army has already made hard decisions on programs that didn't meet the NDS in order to reallocate funding for some of these modernization efforts that will

help the Army regain both its qualitative and quantitative advantage against near-peer competitors.

These choices will require open and transparent debate with Congress along the way. We look forward to working with you to make the Army's modernization vision a reality as the Army reinvents itself to become the 21st Century fighting force that we need to be prepared to defeat a more lethal and dynamic battlefield of the future.

Senator King.

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

Senator KING. Thank you, Mr. Chairman. Thank you for today's hearing.

Welcome, to our witnesses. Look forward to your testimony.

The National Defense Strategy, as the Chairman stated, reorients the Department of Defense (DOD) toward great-power competition, with an emphasis on China and Russia. The National Defense Strategy has serious implications for the Army, as our soldiers must be prepared for a high-end fight that requires modernized military platforms and upgraded equipment to ensure success on the battlefield, a fundamentally different military challenge than that which the Army has been facing in counterterrorism activities over the last 15 or 20 years.

To meet the challenge, the Army has been focused on modernizing the force, transforming the process by which warfighting capability is delivered to our soldiers. As Secretary Esper and General Milley testified last week before the full committee, this reorganization has been necessary to, "to ensure the" "entire modernization enterprise" can respond with, "greater speed and efficiency."

As we consider the Army's budget request for fiscal year 2020, we should evaluate it in context of how the Army is transforming the modernization enterprise. Specifically, the Army is pursuing a new modernization strategy focused on six major modernization priorities: long-range precision fire, next-generation combat vehicles, future vertical lift, Army network, air and missile defense capabilities, and improved soldier lethality. To support this effort, the Army has established eight cross-functional teams (CFTs) designed to break down acquisition stovepipes and expeditiously field new weapon systems that align with the Army's modernization priorities. I'm sure we're going to be talking about that this afternoon.

In conjunction with the creation of the CFTs, the Army established Army Futures Command (AFC) last summer to oversee all of these modernization efforts. The creation of Army Futures Command is a significant organizational change for the Army, as Secretary Esper testified last week. Army's Futures Command is, "developing the systems needed to maintain battlefield overmatch in future conflicts." This committee will closely monitor Futures Command to see what impact it will have on acquisition culture within the Army and to ensure that civilian oversight of the acquisition process remains strong, given the new authorities provided to the AFC. I would—I'm going to be looking today for an update from our witnesses on the status of the standup of the Futures Command

and when we can reasonably expect that it will show results improving the Army's modernization record.

In addition to these organizational changes, the Army's prioritized funding in the fiscal year 2020 budget for critical programs and technologies necessary to prevail against our most capable adversaries. The Army's budget includes \$12.2 billion for research, development, test, and evaluation accounts, with a focus on funding those efforts aligned under the Army's six modernization priorities. This includes funding for the development of a new attack reconnaissance aircraft and prototype contracts for the optionally-manned fighting vehicle, the OMFV, to replace the legacy Bradley vehicles.

With regard to procurement, the budget requests a total of \$25.2 billion in funding for critical programs, including upgrades to the M1 Abrams tank, procurement of AH-64E Apache helicopters, and the UH-60M Black Hawk—Patriot MSE missiles, in addition. I'd like our witnesses today to discuss how the Army is balancing investments in capabilities for the future fight while at the same time upgrading legacy platforms for current threats.

Finally, resources are not unlimited, and the Army must prioritize investments and make tough budget choices. The Army has emphasized that, during the budget review process, existing programs were closely scrutinized, with a focus on prioritizing funding for those programs that have supported the Army's modernization priorities. I'm going to ask our witnesses today to provide additional details on that process, as well as any efforts the Army is taking to ameliorate negative impacts to our industrial-base partners.

Thank you again, Mr. Chairman, for holding this hearing. I look forward to the testimony of our witnesses.

Senator COTTON. General Ostrowski.

**STATEMENT OF LIEUTENANT GENERAL PAUL A. OSTROWSKI,  
USA, PRINCIPAL MILITARY DEPUTY TO THE ASSISTANT SEC-  
RETARY OF THE ARMY FOR ACQUISITION, LOGISTICS, AND  
TECHNOLOGY, AND DIRECTOR OF THE ARMY ACQUISITION  
CORPS**

Lieutenant General OSTROWSKI. Chairman Cotton, Ranking Member King, and distinguished Members of the Senate Armed Services Subcommittee on Airland, good afternoon. Thank you for the opportunity to appear before you today to discuss the Army's modernization priorities and the strategy, resources, and key programs needed to support them.

I'm joined today by Lieutenant General Jim Pasqualette, the Army G-8, who will follow my remarks by laying out the path that the Army has taken to construct the fiscal year 2020 budget request, including many tough decisions that our senior leaders have made to prioritize funding our Army's top six modernization priorities. Next, Lieutenant Jim Richardson, Deputy Commanding General of the United States Army Futures Command, will update you on ongoing efforts by the Army's eight cross-functional teams and the 31 signature efforts that are aligned with our priorities.

But, first, I'd like to begin by discussing the national security context. Our operating environment is changing rapidly, marked by

an uncertainty and an increasing pace of events. While we spent more than 15 years focused on operations in Iraq and Afghanistan, other potential peer and near-peer competitors, such as Russia and China, have studied us closely. They have used those lessons learned to develop new approaches to conflict designed to exploit the gaps and seams within our military capabilities.

For nearly two decades, the Army has deferred modernization in order to support continuous combat operations while still globally looking at the security environment and seeing that it has grown more competitive and volatile. Army leadership has recognized the need for fundamental change and reorganized our entire modernization enterprise for greater speed and efficiency.

Last year, the Army made its most significant organizational restructure in over 40 years by establishing the Army Futures Command. For the first time, one Command is driving constant development, requirements determination, organizational design, science and technology research, and solution development. Army Futures Command is a critical player in the Army's Future Force Modernization Enterprise, or FFME, which describes the Army's expertise, organizations, and infrastructure for rapidly developing and delivering the future force. The FFME includes three primary organizations responsible for modernization: the Army Futures Command, Assistant Secretary of the Army for Logistics, Acquisition, and Technology, and the Deputy Chief of Staff, G-8. The key to the FFME is synchronization through inclusivity. I would be remiss if I did not thank you for all of your efforts to implement the acquisition system and changes associated with it.

From a reform perspective, the Army continues to implement the past acquisition initiatives that Congress has authorized, such as section 804 middle-tier acquisition, from the Fiscal Year 2016 National Defense Authorization Act, other transaction authority, and the experimentation and prototyping of weapon-system components. With the requisite level of acquisition authority, the Army is using these precious tools to accelerate selected efforts linked to the Army's modernization programs.

Before I turn over to Lieutenant General Pasqualette, thank you again for this opportunity to discuss Army modernization and for your strong support of soldiers, Army civilians, and their families. We look forward to your questions.

Senator COTTON. General Pasqualette.

**STATEMENT OF LIEUTENANT GENERAL JAMES F. PASQUALETTE, USA, DEPUTY CHIEF OF STAFF, G-8, UNITED STATES ARMY**

Lieutenant General PASQUALETTE. Chairman Cotton, Ranking Member King, distinguished Members of this Subcommittee, thank you for the opportunity to speak about the fiscal year 2020 Army modernization budget request.

This year's budget request includes \$34 billion of investments in Army equipment, \$8.9 billion of which supports development of our next-generation modernization priorities overseen by Army Futures Command. You will find no daylight between the National Defense Strategy in the areas we are investing in to ensure the U.S. Army remains the dominant land force in the world for decades to come.

In building the 2020 budget, the Secretary of the Army and the Chief of Staff recognized that future defense budgets would likely stay flat or potentially decline. So, rather than seek for an increase in Army top line, they chose to reprioritize from within the Army's projected resources to pay for near-term readiness and future modernization requirements. As I believe you know, the leadership personally reviewed over 500 programs as a part of the budget formulation process. Those programs that did not directly contribute to lethality of the force or were assessed as ineffective in the future operational environment against near-peer threats became a funding source. In the end, this process resulted in the elimination or reduction of over 180 programs and the reprioritization of over \$30 billion across the 2024 Future Year Defense Program (FYDP) in favor of the Army modernization priorities. These investments in the budget request will provide the next-generation capability the Nation's soldiers need to win in a potential future conflict against Russia or China.

I'd like to stress that we are not walking away from our critical legacy systems. We cannot walk away from them, as we will be operating on them for many years to come. For example, the Army will continue significant investments in the Abrams, Black Hawk, and Stryker programs within this current request and throughout the FYDP.

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

Finally, with continued predictable, adequate, timely, and sustained funding, the United States Army will continue to be the best-equipped land force the world has ever known. I sincerely appreciate your time today, and I look forward to your questions.

Thank you.

Senator COTTON. General Richardson.

**STATEMENT OF LIEUTENANT GENERAL JAMES M. RICHARDSON, USA, DEPUTY COMMANDER, ARMY FUTURES COMMAND, UNITED STATES ARMY**

Lieutenant General RICHARDSON. Chairman Cotton, Ranking Member King, distinguished Members of the Airland Subcommittee, thank you for the opportunity to have this conversation today. Thank you for your steadfast support and demonstrated commitment to our soldiers, civilians, and their family members.

The United States Army is at a strategic inflection point. The Army must modernize now, because the United States has near-peer competitors for the first time since the Cold War. Army Futures Command was established to address this challenge through a unified and integrated approach to developing and delivering concepts, requirements, and future-force designs. The Command is posturing the Army for the future by setting the strategic direction, integrating the Future Force Modernization Enterprise, aligning resources to the modernization priorities, and maintaining accountability for the modernization solutions.

The underpinning of these modernization capabilities and organizational structures is Multi-Domain Operations 2028, known by the acronym as MDO. This concept articulates how Army forces as part of the Joint Force will compete with and, if needed, defeat a near-peer adversary, as tasked in the National Security Strategy and the National Defense Strategy. In order to synchronize the capabilities, development, and organizational concepts that the Army will need to conduct MDO, the Army is developing a modernization strategy. The Army modernization strategy will design how the U.S. Army will modernize to become a multi-domain-capable force in 2028. However, we will need to streamline processes in order to succeed.

We are also focusing on organizational and physical resources on a select group of programs linked directly to the Army's modernization priorities. AFC's eight cross-functional teams support the Army modernization priorities by integrating capability and requirements, acquisition, science and technology, test and evaluation, resourcing, and logistics on a single team led by a general officer or an SES. We already seeing progress from their efforts, to date. As early as this fall, new capabilities, like the soldier lethality CFT enhanced night-vision goggle—binocular—will be entering our Army formations. I am confident that Army forces will have the concepts, capabilities, and organizational structures they need to fulfill our mission on the Nation's behalf.

Thank you again for this opportunity, and I am looking forward to your questions.

[The joint prepared statement of Lieutenant General Paul A. Ostrowski, Lieutenant General James F. Pasquarette and Lieutenant General James M. Richardson follows:]

JOINT PREPARED STATEMENT BY LIEUTENANT GENERAL PAUL A. OSTROWSKI, LIEUTENANT GENERAL JAMES F. PASQUARETTE AND LIEUTENANT GENERAL JAMES M. RICHARDSON

#### INTRODUCTION

Chairman Cotton, Ranking Member King, distinguished Members of the Senate Armed Services Subcommittee on Airland, thank you for your steadfast support and demonstrated commitment to our soldiers, our civilians, and their families. On behalf of the Secretary of the Army, the Honorable Mark T. Esper, and the Army Chief of Staff, General Mark A. Milley, we thank you for this opportunity to appear before you today and look forward to our discussion.

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

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

## THE STRATEGIC ENVIRONMENT

Today, our operating environment is changing rapidly, marked by uncertainty and an increasing pace of events. As the 2018 National Defense Strategy indicates, strategic competition between nation states now surpassing violent extremism as the central challenge to American prosperity and security. The NDS prioritizes China and Russia as the respective primary long-term and near-term threats for the United States Military.

Both Russia and China have embarked on an energetic push to reestablish influence, security, buffer zones, and national prestige. This is occurring in real time today in places like Ukraine, Syria, and the South China Sea. While we spent more than 15 years focused on operations in Iraq and Afghanistan; Russia, China, and other potential adversaries such as Iran and North Korea, have studied us closely. They have used those lessons learned to develop new approaches to conflict designed to exploit the gaps and seams within our military capabilities.

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

Their A2/AD strategy relies on new capabilities intended to provide overmatch against U.S. capabilities that we have allowed to age and atrophy or that we have chosen to divest due to obligations in support of counterinsurgency investments. While potential adversaries have modernized their forces, the U.S. Army has essentially missed an entire generation of modernization. Meanwhile, the military modernization enterprise has become a Gordian knot of laws, regulations, risk averse organizations, and byzantine bureaucratic processes. These processes—along with overly ambitious requirements, technology immaturity, and scarce resources—have led to the delay and cancelation of new systems while incrementally modernizing existing systems at increasingly greater cost.

As we look ahead, we must ensure that we have the right concepts, capabilities, and organizations to deter Russia, China, and any other rising powers from any potential aggression. Our concepts and capabilities must be fully integrated and built based on how we will fight, not on how we would like to fight. Additionally, we must do this while growing and maintaining our readiness to make sure we always retain the advantage. We must make it very clear that we can defeat A2/AD, and it will neither stop us nor rip apart the fabric of our alliances.

The Multi-Domain Operations (MDO) concept will inform our modernization effort. The MDO Concept details how the Army, as part of the joint force, continuously and rapidly integrates cross-domain capabilities to defeat an adversary's efforts to create stand-off. Army forces, as an element of the Joint Force, conduct MDO to prevail in competition. Specifically, Army forces penetrate and disintegrate enemy anti-access and area denial systems, exploit the resultant freedom of maneuver to achieve strategic objectives, and force a return to competition on favorable terms.

## MODERNIZING THE FORCE

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

The Army has identified six enduring Modernization Priorities and is laser-focused on regaining superiority over our peer and near-peer competitors. The Fiscal Year 2020 (FY20) President's Budget Request is the first budget in decades to begin to fully fund our modernization priorities. The fiscal year 2020 budget requests \$8.9 billion to support the Army's Modernization Priorities, which represents a \$3.9 billion increase over the fiscal year 2019 enacted level. Across the Future Years Defense Program (fiscal year 2020–24), we are committed to investing a total of \$51.7 billion to support the six Modernization Priorities. We are significantly increasing investment in our priorities to escalate the pace of technological development in areas where we face the greatest capability shortfalls. We must aggressively pursue these initiatives in fiscal year 2020 in order to start fielding the next generation of combat vehicles, aerial platforms and weapon systems by 2028, the timeframe we

anticipate Russia will realize its modernization goals. The fiscal year 2020 Budget includes:

- Long Range Precision Fires (LRPF)—requests \$1.3 billion for prototyping and initial fielding; improving range and lethality of cannon artillery and increasing missile capabilities. Includes funding for:
  - Hypersonic systems by 2023 to stay ahead of recent Russian and Chinese advances and put their forces at risk from a distance; Precision Strike Missile (PrSM) provides increased range, lethality, pod capacity, and survivability.
  - An Extended Range Cannon Artillery (ERCA) with the capability to fire artillery up to 70 kilometers, with more precision and volume than current systems;
  - A strategic long-range cannon with a range that will exceed 1,000 miles.
- Next Generation Combat Vehicle (NGCV)—requests approximately \$2 billion to deliver the next generation of combat vehicles with greater firepower, mobility and protection than our current fleet. Includes funding for:
  - An optionally manned fighting platform that maneuvers soldiers to a point of positional advantage to engage in close combat and deliver decisive lethality;
  - Robotic combat vehicle variants to enhance our future force's ability to deliver decisive lethality, increased situational awareness, and formation overmatch.
- Future Vertical Lift (FVL)—requests approaching \$800 million to develop initial designs of manned systems and demonstrate unmanned systems with extended range, endurance and lifting capacity. Includes funding for:
  - A future attack reconnaissance aircraft (FARA) that will include sensor and network packages that can coordinate with other aerial, long range precision fire, and ground platforms—optionally manned.
  - A future long range assault aircraft (FLRAA) that can fly at 250–280 knots and operate in a degraded visual environment—optionally manned;
- Army Network—requests almost \$2.3 billion to build an integrated tactical network that supports continuous integration of combined arms and Joint capabilities. Includes funding for:
  - A unified and resilient network effective in the most challenging contested and congested environments that leverages commercial satellites and has the capability to survive in a near-peer fight while providing direct support for our brigade combat teams.
  - Assured Position Navigation and Timing (A–PNT) systems work to overpower, navigate through, and mitigate jamming to ensure our warfighters overmatch threats in an electronically contested environment.
- Air and Missile Defense (AMD)—requests approximately \$1.4 billion to deliver initial capabilities that protect joint operations against adversary aircraft, missiles and drones. Includes funding to:
  - Revitalize our atrophied mobile short range air defense to emerging near-peer capabilities in the MDO environment. This includes both theater systems and short range air defense.
  - Indirect Fire Protection Capability (IFPC) provides protection of fixed and semi-fixed sites from unmanned aerial systems (UAS); cruise missiles (CM); and rocket, artillery, and mortar (RAM) projectiles.
- Soldier lethality requests approximately \$1.2 billion to rapidly improve the individual lethality of the Close Combat Force by treating the soldier/squad as integrated combat platform. Includes funding for:
  - Integrated Visual Augmentation System (IVAS) with a heads-up display, which will provide augmented reality, digitally fused thermal and image intensifying capabilities, and synthetic training environment which will ultimately change how our soldiers train, rehearse and fight on the battlefield.
  - Synthetic Training Environment (STE) will converge our current Live, Virtual, Gaming, and Constructive environment into a single simulation training environment that will provide common global terrain established through common data within an open architecture and common application programming interfaces.
  - Next generation squad weapon (NGSW), which includes both an automatic weapon and rifle that leap ahead from a World War II physics design, extending range and capability at target with the most capable small caliber weapon and ammunition to achieve overmatch against current and future adversaries.

Under AFC, there are eight Cross-Functional Teams (CFTs) focused on 31 signature systems. Six of the CFTs are aligned to each Army Modernization Priority plus

two additional CFTs are aligned to A-PNT and STE. The CFTs are resourced and empowered to rapidly generate cost-efficient capabilities that ensure overmatch against potential adversary capabilities, and can be rapidly fielded to warfighters.

#### THE ENTERPRISE

The Army's Future Force Modernization Enterprise, or FFME, describes the Army's expertise, organizations, and infrastructure for rapidly developing and delivering the future force. Its responsibility spans from identification of future threats and opportunities all the way to first unit equipped. The FFME includes three primary organizations responsible for modernization: AFC; the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)); and the Army Deputy Chief of Staff, G-8 (DCS, G-8). However, FFME also extends to Army Commands, such as the U.S. Army Training and Doctrine Command and the U.S. Army Materiel Command; the Department of Defense and Joint community; and to external partners across industry, academia, and others.

The key to the FFME is synchronization through inclusivity. Each of the organizations is focused on a particular portion of modernization, enabling them to focus resources and expertise together, while reducing redundancy. The FFME makes use of one of the "principles of war"—unity of effort—to largely eliminate bureaucratic infighting.

The FFME unity of effort drives a process of early teaming between requirements development, Research and Development, Test and Evaluation, and acquisition communities to support rapid innovation through soldier touchpoints, demonstrations, prototyping, experimentation, and analysis. This process is designed to build velocity for validated requirements, to reduce the challenge of technology transition through the "valley of death," and to support seamless progression into the acquisition life-cycle.

The process works like this: AFC creates concepts for how Army forces will fight in the future. AFC then experiments to inform requirements. While not all initiatives need to be prototyped, once an initiative is mature enough, ASA(ALT) acquires and fields it. The Army DCS, G-8 matches resources to these requirements, based on Army strategic plans and Army concepts. Together, these organizations usher lethal, modern capabilities and formations from conceptual idea to a fielded reality in soldiers' hands.

AFC's directorates bring together organizations that were previously scattered across the force, with little coordination. All of the Army's organizations that have a role in future studies, concepts development, capabilities development, experimentation, testing, and prototyping will work together in a coordinated effort. By bringing unity of effort and unity of command, AFC provides the same synchronization to these organizations that the FFME provides to the Army writ large.

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

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

The Army continues to implement the past acquisition reform initiatives that Congress has authorized such as Section 804 Middle Tier Acquisition (MTA) from the Fiscal Year 2016 National Defense Authorization Act, Other Transaction Authority (OTA), and the prototyping of weapons systems components. With the requisite level of acquisition authority, the Army is using section 804 to accelerate select efforts linked to the Army's Modernization Priorities. Examples of these efforts include: ERCA, IVAS, Lower Tier Air and Missile Defense Sensor, NGCV, NGSW, Mobile Protective Firepower, Rapid Opioid Countermeasures System, and Standoff Activated Volcano Obstacle.

#### CONCLUSION

In summary, Army Modernization is driven by the impetus of increasingly capable near-peer competitors with advanced A2/AD capabilities. Our past focus on equipping for the near-term at the expense of preparing for the future will no longer suf-

face. Today's Army Modernization efforts are linked directly to challenges outlined in the NDS, and are focused on the enduring Army Modernization Priorities.

Army senior leader emphasis is enabling the FFME. AFC, ASA(ALT), and DCS, G-8—are working together in a new way, leveraging authorities derived from Congress to improve the way we do business to free up resources that will make the Total Army more lethal, capable, and efficient. This extends to subordinate organizations within the FFME, such as the CFTs.

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

Thank you again for this opportunity to discuss Army Modernization and for your strong support of our soldiers, Army civilians, and their families. We look forward to your questions.

Senator COTTON. Thank you, gentlemen.

General Richardson, let's stick with you. You know, sometimes we can get a little abstract and use too much jargon on this committee or in the Department of Defense. Let's just be concrete here about the threat we face. Over the last 18 years, we've been fighting counterinsurgency, lower-intensity kinds of wars in places like Iraq and Afghanistan, primarily, and also in nearby countries with related threats, like Syria or Somalia or what have you. While that's been happening, Russia and China have stolen the march on us, is that correct? In systems like artillery, armor, air defense, artillery, electronic warfare, and so forth?

Lieutenant General RICHARDSON. That is correct, sir.

Senator COTTON. To what extent do those specific threats, not abstractions like near-great-power—or near-peer competition or great-power competition, but those specific threats, Russia and China, factor into the Army's thinking and priorities in its modernization strategy?

Lieutenant General RICHARDSON. Sir, as we look at our potential adversaries and look at what their intentions are, to—one, to deny us access of geographical—their geographical theater of operations and develop sophisticated anti-access/denial systems, such as radars, long-range precision fires, they have generated layers of defense and layers of standoff. Our modernization priorities, and specifically our modernization efforts, are geared and prioritized to defeat that standoff.

You mentioned long-range precision fires. We have prioritized our long-range precision fires and strategic, operational, and tactical fires to suppress that formation. As well, we have focused our efforts in our non—next-generation combat vehicle to penetrate, as well. So, all of our efforts are threat-based, MDO, in line with our modernization priorities and our modernization efforts.

Senator COTTON. Thank you.

Two other kinds of threats that we might face, specifically Army threats, would be North Korea and Iran. Is there any modernization effort that the Army would want to undertake to counteract that kind of threat that is not already part of its modernization strategy to counteract the threat of Russia and China?

Lieutenant General RICHARDSON. Sir, I think we are focused—with our modernization priorities and our modernization efforts, it will counter those threats. What comes to mind is air and missile defense, our number-four priority within the Army that's fully

funded. Our air and missile defense is focused at the strategic and operational level to defeat those incoming threats, as well as at the tactical level to protect our formations.

Senator COTTON. Thank you.

General Ostrowski, long-range precision fires is your top modernization effort priority. Is that correct?

Lieutenant General OSTROWSKI. Yes, Mr. Chairman, it is.

Senator COTTON. I was looking through some of the briefing material that y'all sent ahead. Could you tell me what you plan to extend the range of the precision strike missile 2 at this date?

Lieutenant General OSTROWSKI. Sir, as you know, currently we are under the INF Treaty and are limited to 499 kilometers. We—

Senator COTTON. Okay. So, can I—

Lieutenant General OSTROWSKI.—have the—

Senator COTTON.—can I stop right there?

Lieutenant General OSTROWSKI. Yes, sir.

Senator COTTON. Four hundred and ninety-nine kilometers drives me up a wall. The INF Treaty is dead. It is not coming back. I hope that we have a plan to modernize our long-range precision-strike capabilities based on the threat that we face from countries like Iran, North Korea, Russia, and China, without regard to a dead treaty. Do we?

Lieutenant General OSTROWSKI. Mr. Chairman, I assure you that we do. We have worked with industry, and we have that capability today.

Senator COTTON. Thank you very much.

General Pasqualette, obviously, to pay for a lot of these modernization efforts, there's been a lot of eliminations, reductions, or delays of various programs. I think the exact number is 186 different programs. I suspect we'll probably get into some of those specific items either in this Subcommittee or in the full committee. I know that there'll be a lot of Senators and Congressmen with, perhaps, some home state or home district interest in them. But, rather than getting into those specific items at this moment, could you talk, as a general matter, about the underlying analysis that went into those conclusions, and how the Army reached the conclusions, how they communicated them to the various stakeholders, whether the companies that make those systems, the districts and the states where those systems are made, that sort of thing?

Lieutenant General OSTROWSKI. Yes, Mr. Chairman. The—

Senator COTTON. Turn your microphone on, please.

Lieutenant General OSTROWSKI. Thank you. Rookie mistake, there.

Yes, thanks for the question. There was analysis that was applied as we reviewed the programs by—with the Army's senior leadership. And, as I mentioned in my opening statement, we looked at lethality, which is highlighted in the NDS. If a program did not meet the lethality mark, it was considered a billpayer. We also looked at its ability to operate in 2028, when we want to be ready for potential conflict with Russia and China. And, if it didn't meet the mark there, again, it became a source. And finally, we looked at large programs, where there was a lot of dollars parked, that we feel—felt we could stretch out and delay within this pro-

gram, within acceptable risk, and then move those dollars against the modernization priorities. So, that was the analysis that was applied in this program by our senior leadership, and it was the ruthless application—or, the application of ruthless prioritization, is the quote from our Secretary.

Senator COTTON. Okay. Well, thank you all for that. I want to commend you, just like I commended the Secretary and the Chief last week, on all the work that went into that. No one has to agree with all 186 items to understand the rigorous thought that went into them, and to appreciate the Army responding to Congress' directive over the years to begin to focus on badly needed modernization efforts.

Senator King.

Senator KING. Thank you.

I want to follow up and also compliment you for starting with a rigorous analysis of existing programs rather than just a request for new money. And I—one specific question. What was the total amount of the savings that you found in order to apply to the modernization effort?

Lieutenant General PASQUARETTE. Well, I can talk—across the program, Senator, it was—we reallocated over \$30 billion in the 2024 FYDP. We—in—\$8.9 of that, in 2020, that we moved around. So, we had \$5 billion in the modernization priorities in fiscal year 2019, and it's increased to 8.9 billion here in fiscal year 2020, for a comparison.

Senator KING. Well, again, I want to compliment you on the process. I know that wasn't easy, there'll be a lot of discussion about it here. But, that's significant money, and I think that's an impressive effort.

Lessons learned in that analysis? Did it lead you to thinking about other programs and to looking wider? This was a—this was an important exercise.

Lieutenant General PASQUARETTE. You know, when we went through it, the Secretary has charged me—he says, "I know we went through this, and we've taken some risk." As we were going through the current program, the—or the budget that we're building now, or the program in 2021 to 2025, he has asked us to come back, reassess it. Maybe the—there was—we maybe reached too far—and readdress that, or tee up options with further analysis.

So, we believe, in most every case, it was acceptable risk. There's one or two issues, as we're going through with the Secretary and the Chief this time around, where we're looking at addressing or maybe we bit off a little more than we might have, to get it back to acceptable level of risk.

Senator KING. Thank you.

Where are we on the Army Futures Command standup? How many slots have been filled, out of how many do you anticipate? Do you have space? Where is that process?

Lieutenant General RICHARDSON. Sir, we're constantly building capacity, every single day. Army Futures Command has occupied a building at the University of Texas system in Austin, Texas. We have a cap of 500, both civilians and military. We're sitting at approximately 40-percent strength of our headquarters staff right now. Our FOC, our fully-operational capability, will be in the end

of July. We have made a number of moves with our subordinate organizations. After standing up in September, where we cut the ribbon, we immediately brought the eight cross-functional teams underneath the organization.

Senator KING. Are these people being moved from other parts of the enterprise across the country?

Lieutenant General RICHARDSON. No one is being moved, sir. The eight cross-functional teams are located in their location. We brought our Army research and development—

Senator KING. So, the cross-functional teams are not in Austin.

Lieutenant General RICHARDSON. No, sir.

Senator KING. Is that what you're saying?

Lieutenant General RICHARDSON. The cross-functional teams are located all over the United States. We have—in the NGCV, in Detroit, Michigan. Our air and missile defense, as well as our long-range precision fires, is located at Fort Sill, Oklahoma. Our position, navigation, and timing, and future vertical lift cross-functional team is in Huntsville, Alabama. The network CFT is in Aberdeen Proving Grounds. As well, our STE [synthetic training equipment] CFT is now in Orlando, Florida. Everybody—no one moved. The only people that moved and are coming to the headquarters are the 500 people who are coming to Austin to occupy those positions up in the headquarters.

Senator KING. Are they principally coming from Washington, from—

Lieutenant General RICHARDSON. No, sir. We're hiring from all over the United States. We're hiring—

Senator KING. So, these are new hires.

Lieutenant General RICHARDSON. These are all new hires, sir.

Senator KING. Civilian and bringing in military—

Lieutenant General RICHARDSON. Yes, sir. Approximately 400 civilians will occupy the headquarters, and 100 military. We want a very lean organization that's agile and adapted to better support the future-force modernization effort.

Senator KING. I'm running out of time, and I'm—we'll have time to return to this question. But, turning to development of new systems, new weapons, new platforms, I mean, that's really what we're talking about here. One of my concerns is small businesses. We've had testimony before the full committee, for example, that Silicon Valley doesn't want to do business with the Pentagon. It's too complicated, too burdensome, too lengthy. Are you aware of this issue and problem? What are we doing to address it?

Lieutenant General RICHARDSON. We absolutely are, Senator. We have actually stood up an organization called our Army Applications Lab—Laboratory in Austin that specifically focuses on the small business area, focused on those small companies that can bring technologies to bear. That's one of our organizations. As well, we track our Research and Development Command that's reaching out to small business in our S&T environment, as well. So, a big emphasis—and being in Austin has placed an emphasis on small business, and specifically those young entrepreneurs that bring technology to the Army that we would otherwise not have seen.

Senator KING. Thank you. My time is expired. We'll come back to some of those questions.

Thank you, Mr. Chairman.

Senator COTTON. Senator Scott.

Senator SCOTT. First off, thanks for your service.

What—how important are allies, going forward? How do you think about the relationship with allies, and how do you work with them, and are they investing dollars, and things like that?

Lieutenant General RICHARDSON. Senator, our allies are extremely important. I have met with a majority—I would probably say 20 countries, their general officers, with a big focus on the—on our Five Eyes partners. Those countries are going to be colocated in Army Futures Command. We're going to have Law & Order (L&O) representatives within the Command. We already have, and have started putting some of their officers and non-commissioned officers in our cross-functional teams.

Interoperability is huge for our Army. We fight as a coalition, and we fight as joint partners. And it's been one of General Murray's top priorities, to ensure that we're interoperable, not only across the Joint Force, but our coalition forces.

Lieutenant General PASQUARETTE. If I could just follow up on that. It's one of the three tenets of both the National Defense Strategy and our Army strategy, Senator, is the importance of allies and partners. And so, we have a robust exercise program in both Europe and INDOPACOM, our two focus theaters, where—that help us deepen those bonds. We believe it's making a big difference, and we believe, in the future, it's our way of countering the two threats we've been talking about here today, Russia and China.

Senator SCOTT. Do we have—who are our allies in South America?

Lieutenant General PASQUARETTE. We have partners in South America. I'm not sure if we actually have an alliance with anybody in South America. I'm familiar with the Pacific more specifically, and NATO, but I don't know if we actually have an alliance by using the technical term. We surely have partners down there through our U.S. Southern Command and our Army service component.

Senator SCOTT. Are they—aren't the—are any of the countries in South America investing in their armed services?

Lieutenant General PASQUARETTE. I really—little bit out of my lane. I'm not—I'd love to come back and get you that information, Senator.

[The information referred to follows:]

Lieutenant General PASQUARETTE. Allies are a select group of countries with whom the United States has committed to pursue long-term goals, usually related to mutual defense. To be an Ally, the relevant treaty requires a commitment to come to the defense of the other country. Based on the definition, the United States has no Allies in South America. A Partner is any country with whom the United States engages in practical cooperation to advance mutual interests, often related to securing U.S. access to territory, infrastructure, information, and resources, and/or to build and apply their capacity and capabilities consistent with U.S. defense objectives. American partners in South America are: Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Paraguay, Uruguay, Guyana and Suriname. Countries not considered Partners are Bolivia and Venezuela. South American countries that are investing in their armed services include: Brazil, Columbia, Chile, Argentina, Venezuela, Peru, Bolivia, Ecuador, Suriname, Uruguay, and Paraguay.

Senator SCOTT. All right. What threats do you foresee in South America, in that area? Do you see many threats? We have Cuba, we have Venezuela.

Lieutenant General PASQUARETTE. You know, I think, again, U.S. Southern Command is best suited to answer that.

Senator SCOTT. Okay.

Lieutenant General PASQUARETTE. We—there's always the drug issue that has been—the military's been a part of that in the past. But, I really am a little light on to be able to talk about the threat in that part of the world.

Senator SCOTT. All right. Thanks.

Thank you.

Senator COTTON. Senator Jones.

Senator JONES. Thank you, Mr. Chairman.

Thank you all for being here today.

One of the things that I've been particularly interested in is the air and missile defense modernization priority. The budget requests \$228 million for land-based hypersonic missile prototyping, which will go through the Army Space and Missile Defense Command, Redstone Arsenal, in Huntsville. But, also, the Air Force and the Navy are doing some work in the field hypersonics, as well. So, this I'll ask just generally of the panels. What steps are the services taking to ensure that they're creating compatible and interoperable technologies and avoiding duplication of effort?

Lieutenant General PASQUARETTE. Well, I'll start, Senator, and perhaps Paul or—may have some thoughts.

This was worked last fall during program review with Office of the Secretary of Defense (OSD), and these decisions about which service would pursue which programs in hypersonics. The Army and the Navy are working together with a booster, a 34-and-a-half-inch booster with a similar glide body, ones—they're shot out of a submarine. Ours will be a land-based—a mobile launcher. And so, there is jointness in this, and efficiencies, just through that means, based on OSD guidance.

We do believe there's a requirement for multiple different types of systems to put our adversaries at a dilemma, that they can't expect it from just one domain. And internal to the Army, we're looking at the most efficient way to do this within the various missiles that we've been tasked by OSD and that we're developing within our own means.

So, there is—it's a new technology, and I think OSD is looking to reinforce this across joint lines, and manage it closely so we don't have that—inefficiencies that you talked about.

Senator JONES. Great.

Lieutenant General PASQUARETTE. Paul, do you have any—

Lieutenant General OSTROWSKI. Senator, I would just add that there's a tri-service memorandum agreement with respect to all the services on this, and our service secretaries serve on the board to ensure that each service is represented. And, in accordance with what Jim said, the bottom line is, we are in charge—the Army's in charge of the common glide body for all three of the services, and we are in the process of developing that. And, from the land-based perspective, we are in the process of being able to now—between now and 2023, we'll be testing our—not only the 50-inch, which is

the current booster that's been shot before, but also the 34-and-a-half-inch. So, between now and 2023, we'll be—have six shots working with this particular system.

Senator JONES. All right. Great. Thank you.

General Pasquarette, the Army's unfunded requirements list includes \$75 million for the future vertical lift, which, of course, is one of the six, you know, modernization priorities. Is that funding for capability set 3 or for something else? Do you know?

Lieutenant General OSTROWSKI. So, I could take that—

Senator JONES. Okay.

Lieutenant General OSTROWSKI.—if I could. The bottom line, sir, it is for capability set 3. What we realized was the fact that we could accelerate the future long-range assault aircraft, based on the process—what we went through with the joint multi role, where we had two competitors that the Army funded, as well as the companies themselves funded, whether it would be Bell-Textron or whether it be Boeing, Lockheed Martin, and Sikorsky. And, as you know, sir, both of those aircraft are now flying. So, we knew that we had the ability to move faster than what we had originally planned, so we've been able to condense that a little bit.

Now, while the acquisition decision is still in Ms. Lord's hand—Honorable Lord's hands—the bottom line for the Army is, we're going to represent a strategy to her—an acquisition strategy to go after a nondevelopmental-item approach, which will speed up that acquisition so that we can get to a down-select by 2022 in order to bring about a capability by fiscal year 2030.

Senator JONES. Great.

Can—I would like to just expand on that a little bit and talk about—and this is mainly just for the record, here—the significance of this project to the Army's mission, as set forth in the NDS. Anybody can answer that, but I'd like to just get that out for the record.

Lieutenant General RICHARDSON. Yes, Senator, the significant—of future vertical lift is absolutely huge for the United States Army. We're coming at going after two aircraft. Producing two aircraft, both the attack reconnaissance version as well as the replacement for the Black Hawk assault version, at once is an undertaking, but it's something that we have done before. We did it with the Black Hawk and the Apache. What this capability will do will give us the range, the speed, and the survivability we have never had before. When you look at the speed of these helicopters, a UH-60 travels at 120 knots. We're looking—the replacement for that aircraft, at a minimum, to travel 250 knots, with ranges to air assault our forces out to 200 nautical miles. This will not only increase our capability, but it will increase our survivability, as well at that speed. And we've been doing a lot of modeling and simulation with what we're doing, and we're having very, very positive results. So, we're looking forward to the future vertical lift aircraft, both from an attack reconnaissance perspective as well as an assault perspective.

Senator Jones. Great. Well, thank you.

Thank you, Mr. Chairman.

Senator COTTON. Senator Peters.

Senator PETERS. Thank you, Mr. Chairman.

My first question is for you, General Richardson. You know, in Michigan we're very proud to host the cross-functional team for the next-generation combat vehicle, which I know is the Army's number-two modernization priority. Certainly, the Army benefits from its location in Warren, Michigan, which is at the very heart of the auto industry and some exciting technologies that are coming out of our area, in terms of automation, self-driving vehicles, which will transform not only the civilian auto market, but will also be transformative for military applications, as well.

But, my question is—I'd like to get a better understanding of how the cross-functional team is going to interact with the headquarters, with AFC headquarters, and what it means for our stakeholders in the industrial base in Michigan, which is extensive. So, if my—and the reason I bring that up is that I understand that a robotic combat vehicle tech demo was scheduled for next month. It was originally going to be held in Camp Grayling, which is the National Guard base in Michigan, just north of—by a couple—3 hours north of Warren, an extensive maneuver area. But, it was moved to Byron, Texas, instead, which is not particularly close to Michigan compared to the National Guard base. It's concerning to some of the folks in the industrial base, because, here, you're moving a test away from where all of that activity is actually located.

My question is, How should we expect the headquarters to interact with the cross-functional team? Who's ultimately making the decisions as it relates to modernization priorities like the next-generation combat vehicle?

Lieutenant General RICHARDSON. Thank you for the question, Senator.

The answer to your question—I will tell you that the cross-functional team and Detroit all working together with our program executive officers (PEO) brothers, acquisition officers, our science and technology community, contracting, the CFT—all are working together in Austin—I mean, in Detroit—has made a huge difference. We just recently released the request for proposals (RFP) for the next operationally-manned fighting vehicle. Working with the industry, that team has had over 20 engagements with industry to ensure that our requirements are right and adjusted. As—and you spoke of the remote-control vehicle. Something that we learned with FCS or the other combat vehicles is that we wrote requirements, really, in a stovepipe. We wrote requirements, long ago, that did not consider the technology that exists today, or where we were going—what was technologically achievable for the future. This team, working together, are conducting experiments, one in 2020, one in 2022 and 2023. They're designing and building these remote-control vehicles to learn, to inform the requirements of where we're going for tomorrow.

As you talked about testing, sir, I'll have to get back to you why it moved, but I can tell you that what we're focused on in testing, and what we've learned, is, you have to have soldiers in the loop during the design, during the build phase, and during the test phase. The next-generation combat vehicle, CFT and all the members associated with it have a close relationship with 3rd United States Corps at Fort Hood, Texas. FORCECOM has dedicated a unit to that CFT to support its production of this equipment. That

may be one of the reasons, but I need to get back with you on the specific reason why it moved. I don't have that answer, but I will get back with you.

[The information referred to follows:]

Lieutenant General RICHARDSON. The NGCV Robotic Combat Vehicle demonstration was moved to Texas to capitalize on the habitual relationship between the NGCV CFT and U.S. Army's 3rd Corps at Fort Hood, Texas. Future NGCV demonstrations will resume in Michigan and other locations that best serve Army Modernization efforts.

Senator PETERS. Well, I'd appreciate it. It's informative just so we have a better sense of how that decisionmaking process is. Obviously, we want to make sure that the reason why that facility was located there is because it's close to all of the resources that you mentioned are necessary in order to modernize and achieve the priority that you have set for the next-generation combat vehicle. So, I'd appreciate that, General.

Now, in the—I have not a lot of time left, but I understand that the Army is also testing multiple systems to add additive—or, I should say, active protection system for the Stryker, General. I was told that we were going to hear, by the end of this quarter, as to where the testing was, and a finalist. I'm not aware that a vendor has been selected or occurred. So, if you could give us some sense of what we're looking at when it comes to active protection system, where—is there a new timeline now for us to understand what will happen next?

Lieutenant General OSTROWSKI. Yes, sir. As you already know, we've made a nondevelopmental-item approach to combat systems such as this, in terms of the active protection piece, with the Trophy on the Abrams tank and then, in terms of the Bradley, the Iron Fist system. Right now, we didn't do as well with respect to artists and their version of what we call Iron Curtain with the Stryker. So, we went back out to industry and asked industry to come back to us with their ideas as to how we could protect the Stryker vehicle, in terms of a nondevelopmental-item approach to armor protection systems. We have two companies that are joined to—that are in the process of competing for that. One is a venture between the company I'll call EDS, as well as Rafeal. So, DRS—I'm sorry—DRS and Rafeal—and the other one is Rheinmetall and UBT, have partnered, as well. So, we're in the process of evaluating their systems as they build those and we get them the vehicles. So, we will be in the process of going through that. It's going to take about a year, quite frankly, in order to put those systems on the vehicles, characterize them, and make a determination as to whether or not to move forward with either one of the two vendors, sir.

Senator PETERS. So, are you saying the new deadline is a year from now?

Lieutenant General OSTROWSKI. What I'm saying, sir, is, we are in the process now of working with those two partnered companies, and the—they are in the process of—in terms of—what they offered us before was blueprints and a build. So, they're in the process of doing that build. Once the build is put on the vehicle, then it's a matter of testing that in order to ensure that it works. And so, that whole process, from when we started, this several months ago,

until the final product of a determination, it will take about a year. That's been the average with respect to the Trophy, and it was the average with respect to the Iron Fist, on Bradley.

Senator PETERS. Great. Thank you.

Senator COTTON. All right, gentlemen, round two.

Let's stick with the NGCV; specifically, the optionally-manned fighting vehicle (OMFV).

Before I go into that, I think I'm going to make a point that I made last week with Secretary Esper and the Chief. So, you have something called the NGCV OMFV. I hope the Army has plans to give all of these new systems cool names that soldiers want to use and ride in. General Ostrowski?

Lieutenant General OSTROWSKI. Sir, I would—I believe that the Chief of Staff of the Army answered back with a couple of Senators' names, as a matter of fact, on that particular question.

[Laughter.]

Lieutenant General OSTROWSKI. I think he even used yours, as well, Mr. Chairman. But, the——

Senator COTTON. Flattery is not needed.

[Laughter.]

Lieutenant General OSTROWSKI. Yes, sir.

Senator COTTON. Although it's always appreciated.

[Laughter.]

Lieutenant General OSTROWSKI. Always, sir.

I would tell you, sir, that that would be, obviously, what the Army does.

Senator COTTON. No, you're good. No one wants to ride around in an NGCV. They want to ride around in a Bradley or maybe an Eisenhower, Sheridan.

But, on a more serious note, obviously the optionally-manned fighting vehicle is basic—it's designed to replace our Bradley, right? Armored personnel carrier? Is its main purpose still to get an infantry into the fight?

General Richardson, I see you nodding——

Lieutenant General RICHARDSON. Absolutely, sir.

Senator COTTON. Okay. How many original equipment manufacturers are you anticipating will bid on that contract?

Lieutenant General RICHARDSON. Sir, we believe there'll be between three and five original equipment manufacturers (OEMs) competing on that. They've had 12 industry days, up to this point. We believe the outcome will be very positive. We believe we'll get a fair price for a great vehicle.

Senator COTTON. Well, it's good to hear that you're going to have serious competition on it.

Let's move on to those infantrymen in the back of the OMFV, or the Ike, or whatever it's going to be called in the long term. The soldier lethality cross-functional team is working on both a new rifle and a new SAW, squad automatic weapon. Can you tell us how that is going?

Lieutenant General OSTROWSKI. Sir, I can. We put out the solicitation. At this point in time, we expect competitors to bring in their prototypes for both weapon systems in the month of May. We'll begin the evaluation process and select down—down-select down to three in the month of July of this year. Following that, we'll run

those three weapon systems—again, both a rifle and an automatic rifle—through their paces, for a down-select the first quarter of 2021. We'll be fully—we'll be fielding in the fourth quarter of 2021. So, the biggest points are first quarter 2021, down-select to one; and then, by the fourth quarter of two, we'll be in the process of fielding.

Senator COTTON. What are the key features that you anticipate both of those weapons having, relative to the current M-4 and M-249?

Lieutenant General OSTROWSKI. The bottom line, sir, is the ability to address a threat of a peer or near-peer competitor. The current weapon systems that we have are okay in the fight, with respect to the war that we're currently in, in both Iraq and Afghanistan. The issue runs deeper, though, with respect to a peer or near-peer threat and their ability for individual protection that they have. What these weapon systems are designed to do is be able to reach out to greater ranges and have the penetrating power necessary in order to defeat threats at those ranges.

Senator COTTON. That means they're going to have a bigger round, right?

Lieutenant General OSTROWSKI. Yes, sir. The intent is a 6.8, which we will provide the actual projectile, they will provide the common cartridge. So, in other words, whether it's a—one that you see today, in terms of a brass cartridge, or whether it be a different type of cartridge, we are the ones that are going to provide them with the bullet, and they build their cartridge around that.

Senator COTTON. What does that mean for the weight of those weapon systems compared to the current M-4 and M-249?

Lieutenant General OSTROWSKI. Yes, sir. The intent of the rounds that we have is to push them towards keeping it the same weight constraints as the 5.56. So, polymer casings, for instance. Case telescopes, for instance. These are new and innovative ways that industry has been working in order to try to make sure that the rounds are not much heavier, if heavier at all, than the current 5.56 rounds that we carry today.

Senator COTTON. And to, again, just put it in layman's terms, this is all designed to shoot through the enemy's body armor?

Lieutenant General OSTROWSKI. That's correct, sir. At range.

Senator COTTON. Okay. Any—what are the challenges you anticipate for the logistics system, making that change from the current 5.56 caliber?

Lieutenant General OSTROWSKI. I expect very little, Senator. The reason is because of the fact that we are not going to issue this across the entire Army. These go to the top 100 that are—100,000, actually, that are in the close fight with the threat. And so, we have the ability today. We use 7.62, we use 5.56. Entering the 6.8 into this will not be an issue whatsoever, in terms of the logistics piece. Will it take a little bit of time to get it in? Yes, it will. But, it should not be an issue, just based on the fact that we're not issuing this to the whole 1-million-man Army.

Senator PETERS. Okay.

Thank you, gentlemen.

Senator Blumenthal?

Senator BLUMENTHAL. Thanks, Mr. Chairman.

I am interested in the—and I appreciate your service and your being here today—the UH-60 modernization recapitalization program. The Army National Guard Black Hawk helicopter fleet, as you well know, continues to age, many units operating aircraft that are more than 25 years old. The Army's Black Hawk recapitalization efforts are extremely important to the Active, Guard, and Reserve components, as we know in Connecticut, because they provide a very significant increase in capability, reduce crew workload, and lower sustainment costs, which increase our unit readiness.

The 1109th theater aviation sustainment maintenance group in Groton maintains Black Hawks, and the 169th general support aviation battalion in Windsor Locks flies Black Hawks. So, Connecticut is very familiar with the importance of these aircraft and the maintenance strain that results from continuing to fly these aging aircraft. The UH-60A have served the Army well, but the question is whether now is the time to recapitalize. There's a lot of evidence that there is, that it is time.

General Ostrowski, do you agree that recapitalizing the Army National Guard Black Hawk fleet is a necessary investment? How would you—how would recapitalizing that fleet aid in the Army's capability and readiness?

Lieutenant General OSTROWSKI. Sir, I'll tell you, that is on the top list of the Secretary of the Army. He's made it very clear that what we're going to do is, by fiscal year 2022, that all of the alpha models will be outside the National Guard, so they'll be either Limas, Victors, or Mike model aircraft in the National Guard. By 2024, they'll—all the alpha models will be out of the Active Duty forces, as well. So, we've made the commitment to get rid of all the alpha-model aircraft by 2024 within our Army. Going forward, the intent is also to convert all of the Lima aircraft of Victor models, as well, the glass cockpit, as you know. Again, between Mikes and Victors, by—in the 2030s, we will have transitioned both the Active Duty as well as the National Guard to either Limas or Mike models within our Army.

Senator BLUMENTHAL. And—

Lieutenant General OSTROWSKI. Let me correct that, sir. Victors or Mike models within our Army.

Senator BLUMENTHAL. The CH-53K—and I apologize if I'm re-treading on ground you've already covered, but how would you characterize the current state of that program?

Lieutenant General OSTROWSKI. Sir, I would just say that it is not an Army program. Obviously, I have heard rumors of cost increases and so forth on the program. But, I would have to defer you to the correct service on that. I don't have enough information to be able to tell you. I can certainly ensure that we provide it to you.

[The information referred to follows:]

Lieutenant General OSTROWSKI. Sir, I would just say that it is not an Army program. Obviously, I have heard rumors of cost increases and so forth on the program. But, I would have to defer you to the United States Marine Corps to provide you with further details.

Senator BLUMENTHAL. Thank you.

Thanks, Mr. Chairman.

Senator COTTON. Senator King.

Senator KING. Thank you, Mr. Chairman.

You guys are the experts, but we—one thing we can bring to this discussion is seeing other elements of some of the same problems that you're dealing with. Just an hour ago, I was in an Intelligence Committee meeting, and the number-one threat to our Nation that they articulated was cyber. This is sort of the reciprocal of my question about small businesses. A threat that's been identified in a lot of the hearings that I've been in, in the last several months, is cyber intrusion through small businesses, through subs. They would love to get a hold of the plans for the new vehicle or the new rocket or whatever you're doing. I hope that this is a—how do we protect ourselves from this kind of intrusion at the same time not burdening small businesses? You may have a business with 10 people, and they can't really afford to have a full-blown cyber. We have to figure this out, because, otherwise, this is going to be—this is the path that our adversaries are using to get into the utilities, for example. So, I commend this problem to you, and want to have your thoughts.

Lieutenant General RICHARDSON. Senator, you're absolutely right. Supply-chain management is—it's at the—extremely important for Army Futures Command, because, you're absolutely right, our cyberattacks will hit these small businesses. What we're looking at specifically in Army Futures Command is from a requirements perspective. What are the requirements that we're putting on industry for the protection of our systems and the network? Every single program that comes across General Murray's desk, it is a topic of discussion with this, and requirements are placed on that to ensure our security.

Senator KING. I would urge you to not accept assurances from the major contractors that everything is good. I've never had anybody appear before a committee that hasn't told me everything is good. I commend to you the Red Team approach—

Lieutenant General RICHARDSON. Absolutely.

Senator KING.—where, you know, a skull and crossbones appears on the CEO's computer, and it says, "Your—congratulations, you have been hacked, and your prize is the termination of your contract." You've got to be aggressive and active about this. You can't simply accept assurances. I hope that's the case.

Lieutenant General RICHARDSON. Absolutely, sir. We take it from a requirements perspective at Army Futures Command, and then we'll do a battle handover to General Ostrowski from an acquisition perspective and what they demand of their customer, or the A can take it.

Lieutenant General OSTROWSKI. Well, I would just tell you, sir, that these are the meetings that we're having at the highest levels, not only within the Army, but also OSD. I sat in one, just last week, with the Acting Deputy Secretary of Defense on this very topic. That's how important it is across the entire spectrum. We realize that the reason that we are at parity today across all the services in many areas is based on the cyber espionage that has occurred over time.

Senator KING. That's right.

Lieutenant General OSTROWSKI. And we—

Senator KING. They haven't taken the time to design and prototype. They've just stolen.

Lieutenant General OSTROWSKI. That is absolutely correct. We have got to stop that. That's a tough order. Now, we can write it into contracts that we are demanding that they have the right cybertools in order to defeat the threat. But, let's be honest, the threat is extremely good at what they do, and it doesn't take more than a novice or a little bit better than that to tap into 90 percent of our small businesses today. And so, we can hold them to a standard, we can tell them that they have to meet it, but, unless you're policing it, you're not going to get anywhere. And then, on top of that, you might lose some of these innovative incubated companies that just strictly don't have the resources in order to do the kind of work that we're asking them to do on the systems that we're asking. So, we have to be able to help them with that process. We are starting to face these challenges, going forward. But, we know that if we don't, that we will continue to have parity and never gain the overmatch.

Senator KING. Well, lots of possibilities, but I'm glad to hear you're—it's the policing, it's the aggressive policing that I think is important. Also, we may have to air gap these subs from the majors. We may have to insert some barrier so that an adversary can't get into the prime's systems through a small sub.

Question about acquisition. I'm a little unclear. Do—does Army Futures Command have acquisition authority and structure that's outside of the Department of Defense system? Is Ms. Lord involved in your process, or is this a separate process?

Lieutenant General OSTROWSKI. Yes, sir. I would tell you that the Futures Command uses the ASA (ALT), the Army Acquisition Executive, in order to drive the authorities for all of acquisition. So, my boss, Dr. Jette, controls all of acquisition within the Army, and we support—we directly support the initiatives by the Futures Command. So, that is how this is laid out.

With respect to OSD and The Honorable Lord, Honorable Lord still has the milestone decision authority on a couple of Army programs. A lot of that, she has delegated based on her desire to allow the services the opportunity to run their programs. We applaud her efforts in that. So, we own 99 percent of all of the Army programs today. She owns just a very small number, in terms of her milestone decision authority. So, she's been a great partner in all of this.

Senator KING. Thank you. I have a great deal of respect for her expertise, and I hope that's being brought to bear in these situations.

Thank you.

Thank you, Mr. Chairman.

Senator COTTON. Senator Jones.

Senator JONES. Thank you, Mr. Chairman.

Just one question. One of the things we're going to be looking at over the next couple of years is contracting reform. So, General Ostrowski, I'd like to ask you just your general thoughts on contracting reform and what are some of the areas that we ought to be looking at.

Lieutenant General OSTROWSKI. Sir, I will tell you that, number one, the amount of effort that the Congress has put in to help us fix our acquisition system, writ large, has been phenomenal. The

fact that we have a Futures Command that's able to reach out to incubating companies, to accelerator companies, to small businesses the way that they've been able to do is a function, largely, of the tools that you have given us, you provided us, and our ability to use those tools. I mentioned mid-tier acquisition, I mentioned the OTAs just a little bit earlier, other transaction authorities. So, all of these have been great tools.

With respect to contracting, I will tell you that there are still several areas that we think need to be reformed. The first one is the area of protests. Right now, a competitor can protest an award to another in three different areas. They can protest at the agency level, which is the contracting officer level. They can protest again at the GAO level. Then they can also take it to the Court of Federal Claims. So, they get three bites at the apple. There is no disincentive for someone to protest an award, especially if they are the current incumbent and they are still able to milk out that contract for a longer period of time before turning it over to someone else.

So, there needs to be some type of reform associated with that, allowing a particular contractor, one that wants to protest, one bite at the apple. One bite at the apple. For instance, last year, 515 protests were issued against the Army contracting. Five of those—only five of those did we lose. But, that's a lot of lost time. The GAO takes a minimum of 100 days in order to make a ruling. And so, what—that puts us in a position, both the contractor that is—that won the contract as well as the program office are sitting idle, burning time, burning money during that process.

So, stays are the other piece of this. GAO, if they could give us a stay, a decision on a stay within 10 days of getting the case. Without a stay, we could go ahead and continue work, but if they put a stay on it, we won't. But, if we could get an answer within 10 days, that would also be relatively important to us, such as what happens in a Court of Federal Claims, for instance. So, that's one—another initiative that I think needs to be considered with respect to contracting reform.

Senator JONES. Thank you, General.

I'll yield the rest of my time, Mr. Chairman. Thank you.

Senator COTTON. Senator Blumenthal.

Senator BLUMENTHAL. Thanks, Mr. Chairman.

I have a couple of questions that I'd like to pursue that are not sort of high-tech questions in the area of cyber, but, as you know, the 2018 annual report issued by

Defense Advisory Committee on Women in the Services recommended that the Secretary of Defense require all military services to provide women servicemembers with gender-appropriate, properly-fitting personal protective equipment and gear for training and operational use. I'm sure that you are familiar with this issue. There have been significant efforts on the part of the Army and other services in this regard. Despite these efforts, that Advisory Committee determined that there are still challenges for women; in fact, a problematic lack of access to new gear during training and deployment, including for Guard and Reserve members, in addition to women servicemembers. That issue will become increasingly relevant, due to the increased numbers, thankfully, of women who are

coming into the ranks. I wonder if you could update us as to the status of efforts to achieve those goals.

Lieutenant General OSTROWSKI. Senator, I will tell you that the Army is leaning forward, and has been for quite some time, with respect to personalized protective equipment for females. We've lowered the size of plates in order to address the anatomy. We've changed the design of the plate carriers in order to adjust that to the different levels of anatomy. We've changed the yoke on the collar of a lot of our body armor that still has that, in order to make up for the hair bun and other things. So, the Army's been leaning very far ahead with respect to cutting down the weight and tailoring those particular devices for our females.

Now that we have women that are allowed to be into the combat arms, and we have our soldier protection system, which is our next-generation body armor and force-protection capability that's entering the service now, eight sets—eight different sizes are what we're fielding to the 121,000 front-line combat armed soldiers within our ranks, to include our females. So, it's very important for us to get the sizing right, because we realize that they are an extremely important part of our force and now are in every single branch within our Army.

So, we have been taking those methods for a long period of time, and we work very closely with Natick in order to ensure that the anatomy piece is addressed as we develop these systems so that we don't have to go back and second-guess and retrofit on a continual basis.

Senator BLUMENTHAL. I have one last question, which you may not be prepared to answer here, but, I recently, in the course of my contacts with veterans at various events over this past weekend, ran into one of our Connecticut veterans who had a military working dog as his companion. It reminded me that we work very hard, going back a number of years ago, on this committee to make sure that military working dogs are brought back from the combat theaters, and also that they are properly appreciated and cared for once they come back. I know that this may be outside your purview, but I wonder to what extent military working dogs are now used. I recognize that our force structure has been greatly reduced, and they were used primarily to detect IEDs and to protect our forces when we had greater numbers there. But, again, if you need to respond in writing, that's fine, too, but just to update us on the military working dogs. Not exactly high-tech, but still very important in many areas.

Lieutenant General PASQUARETTE. Senator, yes. We'll get back you—with you with the details. They still are incredibly important, not just in combat, but in peacetime applications.

Senator BLUMENTHAL. Right.

Lieutenant General PASQUARETTE. So, we'll get you the details I think you're looking for here in the near term.

[The information referred to follows:]

Lieutenant General PASQUARETTE. The Army's Military Working Dog (MWD) Program continues to be a critical capability that supports a wide range of operational requirements, to include Overseas Contingency Operations around the globe. Additionally, the Army incorporates MWD requirements into all Geographic Combatant Command Operations Plans in order to combat emerging threats the Army may encounter across any contingency. Army MWDs also provide frequent support to mis-

sions outside their combat skill set. These missions include special security support to the U.S. Secret Service for the President of the United States, Vice President and Secretary of State, as well as operational law enforcement support to our installation commands.

Senator BLUMENTHAL. I appreciate that. Thank you.

Thanks, Mr. Chairman.

Senator COTTON. Senator Duckworth.

Senator DUCKWORTH. Thank you, Mr. Chairman.

Gentlemen, thank you so much for being here.

One of my priorities is making sure we learn sometimes—that sometimes hard lessons from past acquisition challenges, like the significant cost overruns, repeated delays, and ongoing technical problems we’ve seen with the F-35. What are some specific challenges or mistakes you all have identified in the past—not necessarily Army problems, but in past acquisition efforts, especially of our major weapons platforms? What are you doing to make sure those same challenges do not negatively impact future vertical lift as we move forward?

Lieutenant General RICHARDSON. Senator, I’ll start off with the answer. I’m sure General Ostrowski will jump in.

We’ve studied all of our failed programs over the last 2 to 3 years as we looked at acquisition reform of the United States—in the United States Army. What we found were—it starts off with the requirement, where we’re writing requirements that are not technologically achievable. We also found that we’re changing our requirements over time. We’ve put in place, with the cross-functional teams—if you look at—whether it’s FVL or the Joint—with JMR, with the joint demonstrator—we are starting to experiment with all of our major programs. We design, build, and test to learn about the technology. That informs us when we write that requirement. That is one of the biggest lessons learned—that we’ve learned. We have also learned, as it relates to the requirement, to get it right, is, you have to write it as a team. You have to bring in the acquisition professionals, the science and technology professionals, to ensure that it’s technologically achievable. You have to bring in our acquisition logisticians to make sure it’s—this piece of equipment is reliable. Because we don’t want to field equipment on the backs of soldiers that is not reliable. So, what we have found in our process is, it starts off with the requirement, to make sure it’s technologically achievable, that it’s going to be reliable when we field this piece of equipment.

The second area that we focused on as we go through our lifecycle program and our acquisition process, if we hand it over to the acquisition community, there’s a supported and supporting relationship. They’re supporting us in writing the requirement. We’re supporting them as we move along this lifecycle and providing feedback. Because there are always going to be trades. But, the warfighter has to be involved in that. I think that’s the power of the cross-functional teams, that’s what AFC brings to the table. It’s the integration and synchronization across the Future Force Modernization Enterprise.

Lieutenant General PASQUARETTE. I would just offer one quick thing, and then Paul may add, I think.

I was General Casey's XO, back in—almost exactly 10 years ago, when SECDEF canceled FCS. Really, I think, the challenge there, and the lesson learned—there's a great RAND study I just read on our lessons learned from FCS. It was incredibly complex, and we couldn't explain it to Congress, and we couldn't explain it to OSD. I think the other issue there, it wasn't tied to a threat. It was a capability that we were developing—complex, as I described, but we could—we weren't targeting against a certain threat, like we are today in our development against Russia and China.

Senator DUCKWORTH. I want to follow up on a question that was—you all answered a little bit earlier while I wasn't here, but, basically, keeping on the future vertical lift theme. Your written testimony breaks out the budget request into funding both a future attack recon aircraft and a future long-range assault aircraft. The question, I think, earlier asked is, How are you going to be able to—do you have experience developing two different aircraft systems? The answer was, "Well, yes, we did both Apaches and Black Hawks at the same time." That was well over 30 years ago. General, I am not sure what you flew, but you and I know darn well that the difference between an Apache and a Black Hawk—same engine, same power system, same transmission system—it's not the same as what you're doing right now with FVL. With FVL, you have—very different aircraft, different ranges, different, you know, systems. So, how are you going to be able to do this, moving forward? I just want you to elaborate on how working on both of these lines simultaneously is driving or changing the requirements and improving the overall odds that each of these programs would be a success. I'm concerned that the Army is now developing a system that may be really meeting the requirements of the Marine Corps, a far smaller branch that has a very different requirement than what Army needs.

Lieutenant General RICHARDSON. Well, I'll have Jim talk about it from a budgetary perspective, but these are absolutely, you're right, two separate programs, Senator. The priority the Secretary of the Army has set is our—is for our future attack reconnaissance aircraft, followed by the replacement for the Black Hawk, which is a future vertical lift assault aircraft. Today, as opposed to years ago, when we wrote a requirement—we just wrote a requirement and said, "Go buy it." Today, we're learning. As you well know with the joint demonstrator that we've been working on for the last 4 years, we are learning daily with the technologies that that demonstration is producing. And taking that technology and going to put it into the aircraft as we go forward; therefore, reducing the risk of failure as we go forward. They are going to be different aircraft with similar capabilities—speed, range, survivability—but, yes, they will be different—

Senator DUCKWORTH. Completely different systems.

Lieutenant General RICHARDSON. They are different aircraft, different engines.

Senator DUCKWORTH. Yeah. So, it's not the same as the Hawk and the Apache.

Lieutenant General RICHARDSON. It's not. It's going to be—you know, the future attack reconnaissance aircraft will utilize the Improved Turbine Engine Program (ITEP) engine that we've designed

for the Black Hawk and the Apache. But, the—as you well know, the cap-set-3, the replacement for the Black Hawk, is a bigger aircraft and will require different engines.

So, you're right, there are different systems. We're trying to make things as common as we can. For an example, the cockpit. But, they are different aircrafts, they're—difference in size, difference in weight, difference in power. But, based on the approach that we're taking with our experimentation, we're learning as we go, and they both may not come out at the same time. Obviously, money has a lot to do with it. The Secretary of the Army has set priorities. So, as we go forward, we will see.

Senator DUCKWORTH. I am very concerned with this process, and that—I hope that we have a tight rein on it.

Thank you, Mr. Chairman. I hope that we can follow this train of thought maybe in another hearing at some point.

Senator COTTON. Someone earlier was talking about active protection system. Who was that? General Ostrowski? You want to say a little bit more about active protective systems, where we are today with the Bradley, where we want to be with the next-generation combat vehicle?

Lieutenant General OSTROWSKI. Yes, sir. On—with respect to Bradley, the intent—again, we picked the—a nondevelopmental item. This is the IMI Iron Fist effort. In 2019, we bought approximately 88 of those systems, and we're buying another 36 this year in the budget for 2020. So, we want to get one brigade worth of Bradley equipped with active protection system, to start off with.

At the same time, with respect to the Abrams tank, we are buying four brigades of the Trophy system and we'll be fielded by 2021 with respect to that particularly capability.

From there, sir, we have a decision point. What we're looking forward is—the Army is developing its own, with the Research and Development Center at Warren, Michigan—what we call MAPS, so Mobile Active Protection System, which is going to turn into—vehicle protection system is a program of record. What we're looking for is the backbone, the digital backbone, an integrated backbone from which different companies can then come forward with an open-system architecture and provide us with radars and other sensors, optical sensors, and effectors, the ability to defeat, in particular, projectiles that are coming to us, whether it be a rocket-propelled grenade, whether it be a tank round. So, as a program of record, we want to move forward with our modular open systems architecture, as opposed to being tied to a proprietary solution, which is what we're going to get with Trophy and with Iron Fist. But, it's important to get a capability out there first. That's exactly what we've done with this nondevelopmental approach with those two particular vehicles. So, now it's just a matter of moving beyond that, but with the MAPS program, into vehicle protection system.

Senator COTTON. Let's talk in layman's term, again. So, active protective system is something that goes out and tries to intercept the enemy's round. So, what you have today, to put it in bureaucratic jargon, is passive protection system. You know, you shoot a round at an Abrams or a Bradley's armor, and you hope that that armor is strong enough to stop that round. The bad guys are getting bigger rounds. I mean, probably the—the best example of this

that probably pops out in people's mind would be the grates that we used to put around Strykers in Iraq, designed to keep an RPG round off of the light-skinned armor of the Stryker. So, active protective systems are designed to intercept those rounds before they get to the armor in the first place. So, you're saying that, right now, you're buying off-the-shelf solutions to meet that need, but, in the long term, it's better to have an integrated system in a new kind of vehicle.

Lieutenant General OSTROWSKI. That is correct, sir. That's why we were asking—the optionally-manned fighting vehicle will have an integrated APS system within it, as well. So, as vendors come forward, part of the requirement is that they will have an integrated active protection system that they can choose. So, it's very important for that. It's not only the hard kill, sir, it's also the soft kill. So, it's also the ability to affect a particular warhead coming at you through soft-kill means. So, not only just the kinetic hard kill, but also a soft kill. And you think of the counter infrared—counter—or common infrared countermeasure, for instance, and what we use on our Apaches and Black Hawks and Chinooks, here in the future, the ability to dazzle that particular round, the warhead, the seeker.

Senator COTTON. All right. Thanks.

Let's go into something else that I—that one of you mentioned earlier: night optical devices. Was that you, General Richardson?

Lieutenant General RICHARDSON. I did, Senator.

Senator COTTON. So, I know this is part of the soldier lethality cross-functional team. Talk to us about where we are on night vision, and where we hope to go.

Lieutenant General RICHARDSON. Absolutely, Senator.

Sixteen months ago, we stood up the soldier lethality cross-functional team. In 6 months, we'll be putting in the hands of soldiers a night-vision goggle that is 5X. It's a dual-tube goggle. It's not only RF passive white phosphorus, but it's thermal. We have been testing and designing, working with soldiers, for the last 9 months on developing this night-vision goggle. It's been so successful with our Rangers and our infantry as they've been using this night-vision goggle in the daytime on the ranges, and they're going from marksman to expert. It was more than we thought it was going to be, from a day—from a night perspective. They're using it in the daytime. It—

Senator COTTON. I know some captains who could have used that.

Lieutenant General RICHARDSON. It—absolutely, sir. And it—what it does is, it—it's survivable. As you know, when you wore goggles, it—the green tint comes out of the goggle and gives you position away. That is gone with the white phosphorus. It's a better goggle. You can see further. You can see at night, if there's smoke, someone behind a tree. It's hooked—there's a reticle that is hooked to your weapon system, where you can shoot it at whatever position you would like. It's supposed to be—and we're on track to field it in October, sir, to the first 100,000. It is definitely a winner. I have used the goggle. I have shot with the goggle. It's better than anything I've experienced in my Army career.

Lieutenant General PASQUARETTE. If I could—

Senator COTTON. General Pasquarette.

Lieutenant General PASQUARETTE.—add quickly that the first unit equipped actually is going to be an armored brigade combat team that's going to rotate right afterwards to Korea, given the requirements that the commander over there has for that capability.

Senator COTTON. So, General Richardson, I think maybe one of the biggest misperceptions about the way our infantry fights is night-vision capabilities. Obviously, we have the best in the world. That's why so many Army units say they own the night and they prefer to fight in the middle of the night, on a new moon. I think most civilians would think that their night-vision goggles are the size and probably the weight of a, you know, quarter, maybe a silver dollar. That's not the case. Would you explain to us the difference, in terms of weight and shape of this next generation of night-vision goggles versus what our troops have been using?

Lieutenant General RICHARDSON. Sir, the next-generation night-vision goggles, as far as weight, with the Night Vision Goggle Bushes (NVGB) that will be fielded this fall, is lighter than the goggle that we have today, even though it's dual-tube versus monocular. Where we're going to the—into the future is Integrated Vision Augmentation System (IVAS) that many people have heard of, where we can train—rehearse, train, and fight with the same night-vision goggle. We have a four-phased operation. In fact, I was down at Fort Pickett this past week, where we had just finished phase 1 of the operation, where you would have a—like a pair of Oakleys on your head, where, not only do you get able to have the night vision, dual, you know, fuse both thermal and night system, but you're able to train and rehearse that mission with a set of glasses that are not in—that the tubes have gone away, it's embedded in the glasses, which will significantly reduce the weight of where we're going. We're on track. General Ostrowski's team has done a wonderful job with this. We have three phases left to go, and we believe, in the next 2 years, that we'll put the IVAS system on soldiers, beginning third quarter of—fourth quarter of 2022.

Senator COTTON. Okay.

General Ostrowski, let's return to the Intermediate-Range Nuclear Forces Treaty, which is dead, if I didn't make my point earlier. Will this be the last time we have a hearing with senior Army officers and talking about long-range fires that are slightly under 500 kilometers and slightly over 5500 kilometers?

Lieutenant General OSTROWSKI. That is the intent, Senator.

Senator COTTON. So, in the future, all of our long-range fires, whether they're operational, whether they're strategic, will be designed to meet the enemy threat and neutralize that threat, not to adhere to a dead treaty.

Lieutenant General OSTROWSKI. That is correct, Senator.

Senator COTTON. One final question that is more fundamental about the way the Army fights. We've heard a lot today about next-generation weapons. We've heard a lot—or some about robotics and artificial intelligence and so forth. Ever since mankind picked up a spear or a sling or a longbow, soldiers and their leaders have been trying to find weapons that give greater standoff and protect the fighting soldier, yet here we've been, in the last 18 years, in Iraq and Afghanistan, with our soldiers on the front line, in close-

quarters combat, using rifles and sometimes knives and sometimes their bare hands. Is there anything that the Army is doing now that's going to forever eliminate that fundamental truth that war, when you get down to the end of the line, is fought by young men and women on the front lines against enemies just like themselves?

Lieutenant General PASQUARETTE. Well, I'll start.

I think that's a—we're—we can't walk away from that, my estimation. I think we're looking hard at how we are going to fight in the future, and that's really under General Murray now, in AFC, on multidomain operations. But, at its core, we still think it's a human activity and it's going to require having soldiers. That is the finishing force at the point that's decisive. And so, that's why we're investing a lot of money and a lot of brainpower on soldier lethality, and why that is one of our six modernization priorities, to ensure that we have the overmatch where it matters most and where we're challenged right now. But, what Jim just talked about, I think, we'll have that, we'll be—we're on the right track to reestablish the overmatch that we want to maintain well into the future.

Senator COTTON. General Richardson, General Ostrowski, anything to add?

Lieutenant General RICHARDSON. Sir, I agree with General Pasquarette. I will tell you that the soldier is the centerpiece of our formation, and everything that we do is designed to support that soldier. That's where we're focused with our eight cross-functional teams. No matter whether it's the night—next-generation combat vehicle or a future vertical lift, it's all integrated and networked to support that soldier.

Lieutenant General OSTROWSKI. Sir, I would just say and just add that wars are fought and won on land by soldiers that are committed to the fight. I don't see that changing. It hasn't changed in history, and I don't see it changing anytime soon.

Senator COTTON. I agree. Obviously, we want more standoff for our troops. Some of their sister services, like the Navy and the Air Force, do great things to help provide them those standoff capabilities, some of the weapon systems we've discussed here, as well. But, at root, wars ultimately have to be fought between men and women, in the dirt, in the sand, in the mountains, in close quarters.

Senator KING. Spoken by a true Army veteran.

Senator COTTON. Well, as Senator Blumenthal said, that's why we invest so much money in personal protective equipment, that's why we invest so much money in squad automatic weapons and rifles and night-vision goggles, because we can have all the automation we want, we can have all the artificial intelligence, all the standoff weapons—in the end, they're designed to serve that fighting man and woman out on the front lines.

Gentlemen, thank you very much for your service to our Nation. Thank you for your testimony today. We look forward to working with you, going forward, on the fiscal year 2020 budget request.

This hearing is adjourned.

[Whereupon, at 4:23 p.m., the Subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

## QUESTIONS SUBMITTED BY SENATOR THOM TILLIS

## ARMY MODERNIZATION

1. Senator TILLIS. Lieutenant General Pasquarette, Lieutenant General Richardson, and Lieutenant General Ostrowski, numerous industry partners, including those involved in the CH-47 modernization program and the Heavy Dump Truck replacement, have expressed their concerns regarding the shift in funding away from legacy systems to investments in the Army's Modernization Priorities. Can you elaborate on the underlying analysis that caused you to curtail these programs and others similar to them?

Lieutenant General PASQUARETTE. Yes. To find resources for Army Modernization Priorities, the Secretary and Chief of Staff of the Army personally scrubbed over 500 programs during what has become known as "Deep Dives." Those programs that did not directly contribute to lethality or were assessed as ineffective against near peer threats became a funding source. If the answer was "no" they considered eliminating, reducing or delaying the program. At the end of the program review process, 186 programs were eliminated, reduced or delayed—freeing up over half of the \$33.1 billion found to realign against the Army Modernization Priorities within the Army topline. The remainder of those funds came from implementing aggressive reforms and efficiencies across the Army Enterprise.

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2. Senator TILLIS. Lieutenant General Pasquarette, Lieutenant General Richardson, and Lieutenant General Ostrowski, as Army Futures Command develops, can you explain your vision for the command's ultimate role, including its projected size, and national footprint?

Lieutenant General PASQUARETTE. The Army Futures Command (AFC) leads a continuous transformation of Army modernization in order to provide future warfighters with the concepts, capabilities and organizational structures they need to dominate a future battlefield. AFC's ultimate role is to develop the systems needed to maintain battlefield overmatch in future conflicts. We are charged with delivering decisive warfighting capabilities into the hands of soldiers faster with a greater return on investment. AFC has presence in 28 states. At 100 percent manning the projected number of authorized personnel in the headquarters is 500 personnel (400 civilians/100 military). The Austin Headquarters will represent 2.5 percent of the AFC workforce with 97.5 percent residing in the same communities as they did prior to the transfer of authorities.

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3. Senator TILLIS. Lieutenant General Pasqualette, Lieutenant General Richardson, and Lieutenant General Ostrowski, Tactical Radios were recently fielded in support of the newly formed Security Force Assistance Brigades. Considering that these purchases were not posted on FBO, can you comment on the procurement mechanism used to award these contracts that were in excess of \$70 million?

Lieutenant General PASQUALETTE. To meet the Security Force Assistance Brigades (SFAB) urgent operational needs statements and directed requirements for specific non-program of record tactical radio equipment essential to their unique mission, the Army utilized the Defense Logistics Agency (DLA) Troop Support Special Operational Equipment (SOE) Tailored Logistics Support Program (TLSP). The use of this DLA contract vehicle allowed the Army to meet SFAB equipping timelines by providing tactical radios for one SFAB. DLA's contract vehicle is Multiple Award Indefinite Delivery Indefinite Quantity (IDIQ) Program that was competitively awarded to six (6) vendors. Under Multiple Award IDIQ contracts, all IDIQ awardees are provided a fair opportunity to be considered for each requirement exceeding \$3500 under Delivery Order competition.

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4. Senator TILLIS. Lieutenant General Richardson, it is clear that innovation is a key driver behind the Army modernization process. Internally, the Army, through the Army Futures Command, has deployed innovative strategies to realign and synchronize its components to more effectively address and respond to future threats. In turn, Army Future Command has placed great emphasis on partnering with the nation's innovation community, including industry, academia, and entrepreneurs, to achieve its modernization goals. Could you please explain the process through which you plan to partner with these communities and how that will be coordinated with the development of AFC's internal modernization and requirements process?

Lieutenant General RICHARDSON. AFC will promote collaboration between Army Application Lab, Combat Capabilities Develop Command labs and the rest of the DOD innovation enterprise. We will reduce bureaucratic barriers, drive innovation to develop advanced technologies and fund efforts that show promise in getting capabilities to the soldier faster. AFC will also facilitate and continue to build upon partnerships with academia and commercial industry. For example, we have established a presence at Carnegie Mellon University to incorporate artificial intelligence into our modernization efforts. Recently, the 101st ABN Division established a part-

nership with Vanderbilt University and we are encouraging our other Divisions to do the same with nearby universities. In May, NGCV CFT engaged with traditional and non-standard industry partners at Texas A&M University by hosting an industry live demonstration event that is open to anyone interested in offering RCV options to the Army. Army Futures Command also recently established a University Technology Development Directorate to further assist in its outreach efforts with academia.

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QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

UH-60 MODERNIZATION AND RECAPITALIZATION

5. Senator BLUMENTHAL. Lieutenant General Ostrowski, do you agree that recapitalizing the Army National Guard Black Hawk fleet is a necessary investment? How would recapitalizing the Black Hawk fleet improve the Army's capabilities and readiness?

Lieutenant General OSTROWSKI. Yes, investment in the recapitalization program is necessary to ensure future combat capability, while reducing operational sustainment costs. The recapitalization program integrates enhanced capabilities, adds a digitized cockpit, extends the useful life, and reduces operational sustainment costs of the Black Hawk by replacing obsolete or damaged components.

6. Senator BLUMENTHAL. Lieutenant General Ostrowski, What is the Army's plan to recapitalize the aging UH-60 Blackhawks? Will you commit to ensuring that the National Guard is not left behind as the Army pushes to modernize?

Lieutenant General OSTROWSKI. The Army plans to recapitalize the UH-60 and replace the National Guard's H-60 Black Hawk fleet with modernized, digital cockpit versions (H-60M or UH60V). Under the current plan, the Army will divest the older UH-60A models from the National Guard in fiscal year 2022 (FY22), while the active Army will complete its divestment 2 years later, expected in fiscal year 2024. The recapitalization program is necessary to ensure future combat capability, while reducing operational sustainment costs. The recapitalization program integrates enhanced capabilities, adds a digitized cockpit, extends the useful life, and reduces operational sustainment costs of the Black Hawk by replacing obsolete or damaged components.

7. Senator BLUMENTHAL. Lieutenant General Ostrowski, how does your plan account for equipping the Army National Guard through the National Guard and Reserve Equipment Appropriation (NGREA)? Will you commit to proportional and concurrent equipment appropriation between your National Guard and active components?

Lieutenant General OSTROWSKI. NGREA is a special appropriation added by Congress each year, intended for use by the Reserve Component to fill their equipment needs outside of the Services' annual procurement requests. Therefore, the Army's plan does not account for equipping the National Guard through NGREA. The Army's Black Hawk procurement plan, which is reflected in the President's Budget request for fiscal year 2020, supports the National Guard's wartime H-60 Black Hawk requirement. This plan includes replacing the National Guard's H-60 Black Hawk fleet with modernized, digital cockpit versions (H-60M or UH60V). The Army does not equip the total force through a proportional and concurrent equipment appropriation between the Army components. The Army equips formations to meet Combatant Commanders' warfighting, Homeland Defense and strategic competition requirements. Modernization decisions attempt to sustain a lethal, resilient and adaptive Total Force that minimizes risk. As modernized items displace currently fielded older—yet operationally effective—items, the Army cascades the less capable items to the next priority unit, regardless of component. When cascades occur, the Army works to ensure interoperability between formations with different variants of systems. Whenever possible within resources available, the Army strives to achieve parity in equipping across the Total Force.

COMBAT EQUIPMENT

8. Senator BLUMENTHAL. Lieutenant General Pasqualette, Lieutenant General Richardson, and Lieutenant General Ostrowski, a leading cause of injury among servicemembers is ill-fitting Personal Protective Equipment (PPE) and combat gear, and that women disproportionately incur such injuries. What are you doing to ensure the next generation of combat equipment is better suited for women?

Lieutenant General PASQUARETTE. The Army has fulfilled many initiatives to provide high performing Personal Protective Equipment specifically designed for female soldiers. We presently provide the Female Improved Outer Tactical Vest (F-IOTV) to deploying female soldiers; available in eight sizes and incorporates a darted front panel for better coverage; shorter length with narrower shoulders and more shoulder and waist adjustments; and a redesigned collar to better accommodate a hair bun. The Army plans to field the next generation Soldier Protection System (SPS) Torso Extremity Protection which will provide seven new sizes to accommodate male and female soldiers between the 2nd and 98th percentile range. Pelvic protection is specifically sized for women while providing equal protection as the male variant. Sizing is based on hip circumference vice waist circumference. The female sized Ballistic Combat Shirts feature collars which accommodate the hair bun. Deliveries are scheduled to begin in June 2019.

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9. Senator BLUMENTHAL. Lieutenant General Richardson, I am concerned with the barriers to equipment access across the Armed Services. Are you currently developing and fielding new PPE and combat gear in Army Futures Command?

Lieutenant General RICHARDSON New Personal Protective Equipment (PPE) and combat gear is being developed in the Soldier Lethality Cross Functional Team and the CCDC Soldier Center. These materiel solutions address current and emerging threats and include body armor and head borne protection systems with focus on reducing weight and increasing the level of protection for all soldiers.

10. Senator BLUMENTHAL. Lieutenant General Pasquarette, Lieutenant General Richardson, and Lieutenant General Ostrowski, in the past there have been issues with getting new equipment to our servicemembers prior to deployments so they deploy with the same equipment used in training before deployment. This is critical to preventing injuries and ensuring readiness. As you develop this equipment, how will the Army ensure the new equipment is available not only for deployments, but also while conducting pre-deployment training stateside?

Lieutenant General PASQUARETTE. The Army makes every effort to ensure soldiers are properly trained on all equipment prior to deployment. For example, Organizational Clothing and Individual Equipment (OCIE) and Personal Protective Equipment (PPE) are fitted and issued to Soldiers at Central Issuing Facilities (CIFs) or Rapid Fielding Initiative (RFI) venues. The fitting and issue activity ensures optimum sizing and proper adjustment (i.e., helmets, soft & hard armor, cold weather gear, rucksacks). Soldiers who have orders for a deployment receive and train with real-world mission OCIE/PPE prior to deployment. Soldiers who have not received orders for deployment on a named operation train with OCIE/PPE issued to them based on their local environment and job series (Military Occupational Specialty).

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#### FUTURE VERTICAL LIFT

11. Senator BLUMENTHAL. Lieutenant General Richardson, the Sikorsky-Boeing SB-1 Defiant conducted its first flight last month. Can you please provide an update on how the Army's Future Vertical Lift (FVL) program is progressing?

Lieutenant General RICHARDSON The flight of the Sikorsky-Boeing SB-1 Defiant is another step in the Joint Multi Role Tech Demonstrator (JMR-TD) process that is helping Future Vertical Lift reduce risk as it develops new aircraft. The Future Vertical Lift Cross Functional Team is on schedule to field both Future Attack Reconnaissance Aircraft and Future Long Range Assault Aircraft to units in the 2030 timeframe. We will accomplish fielding by capitalizing on existing, mature technology and through a Modular Open Systems Architecture (MOSA) enabling Future Vertical Lift to integrate the most reliable and capable technical solutions available from government efforts and commercial industry for Future Vertical Lift.

12. Senator BLUMENTHAL. Lieutenant General Richardson, do you believe—as your Future Vertical Lift Cross Functional Team leader Brigadier General Rugen does—that the Army is at an inflection point in aviation modernization and should now pursue a new design or concept for power lift?

Lieutenant General RICHARDSON Yes, I agree with Brigadier General Rugen. In the era of great power competition, we can't afford not to modernize. Future Vertical Lift must be more sustainable, lethal, survivable, and have greater stand-off in order to maintain our Vertical Lift dominance. We had to make a decision as to whether we keep incrementally upgrading our current rotary wing fleets designed in the 1970s or go with a "clean sheet." A "clean sheet" design allows us to use leap ahead technology to achieve optimal manning with revolutionary increases in reach, speed, range, protection, lethality, and agility at the objective. The current rotary wing fleet is as capable as ever against the current threat. Now is the time to build an Army aviation force that is optimized for large-scale combat operations against peer or near-peer competitors.

13. Senator BLUMENTHAL. Lieutenant General Richardson, are you satisfied with the progress of the Future Vertical Lift Program? How can Congress best support your aviation modernization efforts?

Lieutenant General RICHARDSON While I am satisfied with where we are with Future Vertical Lift, we are always looking for opportunities to accelerate the programs to deliver advanced capabilities to our Army sooner. We've enjoyed recent successes under the Other Transaction Authorities that Congress has provided the Services and look to continue to leverage those authorities to deliver advanced capabilities to our Army.

14. Senator BLUMENTHAL. Lieutenant General Richardson, do you believe the Cross Functional Team organization is effective in leading modernization efforts in powered lift for the Army? What are the challenges and how are you addressing them?

Lieutenant General RICHARDSON Yes. The Cross Functional Team construct allows us to consolidate warfighter, technical, programmatic and acquisition commu-

nities to reduce time and investment in readiness priorities. The Cross Functional Team is an empowered team, designed to rapidly integrate and synchronize critical solutions across the modernization enterprise and deliver timely solutions to the warfighter. As we have demonstrated in the Future Long Range Assault Aircraft (FLRAA) and Future Attack Reconnaissance Aircraft (FARA) schedules, the Future Vertical Lift Cross Functional Team has literally cut years off the normal requirements and procurement schedule by working with the acquisition and contracting community to maximize the use of Other Transaction Authorities (OTA), and worked with the Science and Technology community to capitalize on existing, mature technology as well as the Joint Multi Role Tech Demonstrator (JMR-TD) program to reduce risk in the accelerated timeline. Our challenge moving forward is ensuring we maximize existing technologies to meet our near-term requirements while developing an architecture that allows for the integration of future technological advances. The Joint Multi-Role Technology Demonstrator (JMR-TD) program has helped to inform our strategy by identifying new technologies and capabilities. We are focused on utilizing a Modular Open System Approach (MOSA) to the greatest extent possible to build the flexibility we need to incorporate leap ahead technology and maintain our Vertical Lift dominance. Ultimately, we need to provide a capability to the Warfighter using an expedited acquisition approach that fills the capability gap now and into the future. Additionally, we are using a strategy that is significantly different from previous programs and leveraging new and expanded acquisition authorities. Use of Other Transactional Authorities (OTA) streamlining contracting methodology and preserving competition while driving down risk.

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#### QUESTIONS SUBMITTED BY SENATOR GARY C. PETERS

##### ARMY RDEC AND LAB MANAGEMENT FLEXIBILITIES

15. Senator PETERS. Lieutenant General Richardson and Lieutenant General Ostrowski, in order to allow the Army's network of world class laboratories and research, development, and engineering centers to remain at the forefront of technology and innovation, this committee has provided laboratory and center directors with specialized authorities to cut bureaucratic red tape, streamline processes, and become more similar to the fast moving tech companies and innovators that the Army needs to model. The Army has been slow in implementing many of these authorities, in some cases with Army Futures Command delaying their implementation.

Please provide a detailed update on the use and the plans for expanded use of the following authorities, and whether Futures Command and ASA(ALT) has authorized and supports the full use of these authorities: Fiscal Year 2017 NDAA Section 233-Pilot Program for the Enhancement of the Research, Development, Test, and Evaluation Centers of the Department of Defense; Fiscal Year 2017 NDAA Section 1124-Pilot Program On Enhanced Pay Authority For Certain Research And Technology Positions In The Science And Technology Reinvention Laboratories Of The Department Of Defense.

Lieutenant General RICHARDSON In July 2017, ASA(ALT) issued a policy approving all Army Science and Technology Reinvention Laboratories to participate in the Fiscal Year 2017 NDAA Section 233 pilot program. In June 2018, ASA(ALT) issued an implementation policy for the Fiscal Year 2017 NDAA Section 1124 pilot program to attract, recruit and retain unique technical talent at the Army laboratories.

Lieutenant General OSTROWSKI. In July 2017, ASA(ALT) issued a policy approving all Army Science and Technology Reinvention Laboratories to participate in the Fiscal Year 2017 NDAA Section 233 pilot program. In June 2018, ASA(ALT) issued an implementation policy for the Fiscal Year 2017 NDAA Section 1124 pilot program to attract, recruit and retain unique technical talent at the Army laboratories.

##### HIRING RESTRICTIONS AT FUTURES COMMAND LABS AND ENGINEERING CENTERS

16. Senator PETERS. Lieutenant General Richardson, I understand that has Futures Command imposed hiring restrictions on the Labs and Engineering Centers, even though the committee has provided authority (10 USC 2358a) to allow lab directors to manage their workforce without regard to any limitation on positions in a manner consistent with available budgets. Why has this restriction been put into place?

Lieutenant General RICHARDSON The Army Futures Command (AFC) has not imposed hiring restrictions on its labs and engineering centers.

17. Senator PETERS. Lieutenant General Richardson, what specific limits have been placed on hiring of new technical staff?

Lieutenant General RICHARDSON No limits have been placed by AFC on the hiring of new technical staff. The Direct and Expedited Hiring authorities, which lab and engineering center Directors execute has been instrumental in enabling AFC to remain competitive with industry partners.

18. Senator PETERS. Lieutenant General Richardson, what has been the impact of these restrictions on growing lab and engineering center technical workforce in emerging areas like robotics, Artificial Intelligence, hypersonics, and other relevant technical fields?

Lieutenant General RICHARDSON No impacts. AFC has placed no specific limits on hiring of new technical staff in emerging areas like robotics, Artificial Intelligence, Hypersonics, and other relevant technical fields.

#### BASIC UNIVERSITY RESEARCH

19. Senator PETERS. Lieutenant General Richardson and Lieutenant General Ostrowski, the Army's fiscal year 2020 budget request cuts funding for Army basic research programs from over \$500 million in the fiscal year 2019 Appropriations bill down to slightly over \$450 million. This reduction means that fewer university groups and students will be researching Army-inspired technical challenges, resulting in less innovation and a reduced STEM and technical workforce in the pipeline to support Army mission and partners. What was the rationale for this reduction?

Lieutenant General RICHARDSON The Army's fiscal year 2020 budget request does not cut funding for Army basic research programs. The fiscal year 2019 budget request was \$446 million compared to \$455 million in fiscal year 2020. The enacted fiscal year 2019 budget for Army basic research programs was \$60.5 million above the President's budget request. The Army has a holistic view of growing and diversifying the technical workforce in both quantity and quality to support the Science and Technology (S&T) Enterprise and to secure Army innovation and its technical capabilities. The S&T Enterprise is highly dependent on the development of the next generations of scientist and engineers; and we will ensure the budget request does not adversely impact the future STEM workforce.

Lieutenant General OSTROWSKI. The Army's fiscal year 2020 budget request does not cut funding for Army basic research programs. The fiscal year 2019 budget request was \$446 million compared to \$455 million in fiscal year 2020. The enacted fiscal year 2019 budget for Army basic research programs was \$60.5 million above the budget request. The Army has a holistic view of growing and diversifying the technical workforce in both quantity and quality to support the Science and Technology (S&T) Enterprise and to secure Army innovation and its technical capabilities. The S&T Enterprise is highly dependent on the development of the next generations of scientist and engineers; we will ensure the budget request does not adversely impact the future STEM workforce.

20. Senator PETERS. Lieutenant General Richardson and Lieutenant General Ostrowski, if more funds were available, what are your highest priority underfunded basic research areas?

Lieutenant General RICHARDSON The Army's fiscal year 2020 budget request is adequate to maintain a healthy infusion of new ideas into the Army's technology base. The Army funds research in a large variety of areas since it is not possible to always know where the next breakthroughs come from; therefore, the Army's basic research investments provide foundational research in areas crucial for Army information superiority, intelligence supremacy, dominance in autonomous systems, soldier and platform protection, and advantage in novel weapons. Some of the investments also are in areas that are not yet identified priorities. Research areas of emphasis that could always fund more projects include advanced materials; artificial intelligence, machine learning, and autonomy; ultra-secure communications; robotics; directed energy; synthetic biology; social science and networks; and disruptive energetics and advanced warheads.

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emphasis that could always fund more projects include advanced materials; artificial intelligence, machine learning, and autonomy; ultra-secure communications; robotics; directed energy; synthetic biology; social science and networks; and disruptive energetics and advanced warheads.

21. Senator PETERS. Lieutenant General Richardson and Lieutenant General Ostrowski, what in general has been the value of previous investments in Army basic research?

Lieutenant General RICHARDSON The Army's previous investments in basic research have improved understanding of principles/phenomena fundamental to realizing the next generation of superior warfighting capabilities. Basic research shapes future investments, informs concept development, and anticipates future science and technology (S&T) threats. For example, investments in basic research 20 years ago currently provide the scientific foundation to support the Army's Modernization efforts to provide capabilities in support of the National Defense Strategy and Multi-Domain Operations.

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22. Senator PETERS. Lieutenant General Richardson and Lieutenant General Ostrowski, what specific fielded capabilities today were influenced and supported by advances made by past Army basic research?

Lieutenant General RICHARDSON Army basic research investments have informed and enabled development and transition of a number of fielded capabilities. While a comprehensive list is too robust, in one program area alone, new knowledge developed under a Multi University Research Initiative (MURI) project (Standoff Inverse Analysis and Manipulation of Electronic Systems (SIAMES)) on electronic target signatures and signal processing transferred to Navy Electronic Warfare (EW) programs and under the Office of Secretary of Defense Rapid Innovation Fund program software inserted in the Army EW and Planning Management Tool. Improvised Explosive Device (IED) detection technology developed under the SIAMES MURI led to successful IED detection in Iraq. MG Justice presented the Commander's Award for Public Service to the Principle Investigator for "saving lives in the current operational environment", saying "this put us back on the battlefield and gave us the ability to go out there knowing we can protect the young soldiers". Single investigator programs and a MURI on Quasi-optical power combining led to graduate student forming a company that put unique microwave amplifiers in the satellite uplinks for HBO, STARZ, and other commercial satellite services and in most of the Army satellite uplinks. Almost all landmine detection systems now fielded in the Army rely on signal processing and hardware concepts developed during three demining MURI's and subsequent single investigator programs. Similar stories can be told in all areas of the basic research program. As a result, Army basic research investments have resulted in the developments that ranged from cost effective synthesis of biofuels for aviation platforms, to low-profile ultrathin antennas, to extended range munitions, to next generation weapons, to improved computer network defense, to advancements in vehicle armor.

Lieutenant General OSTROWSKI. The Army's previous investments in basic research have improved understanding of scientific principles that are fundamental to realizing the next generation of superior warfighting capabilities. Basic research shapes future investments, informs concept development, and anticipates future science and technology (S&T) threats. The Army is capitalizing on investments in basic research from 20 years ago that currently provide the scientific foundation supporting their modernization efforts to provide capabilities in support of the National Defense Strategy and Multi-Domain Operations. In almost any area of fielded/warfighting capability, there are components where the basic research investment was responsible for either an evolutionary or revolutionary change.



**DEPARTMENT OF DEFENSE AUTHORIZATION  
REQUEST FOR FISCAL YEAR 2020 AND THE  
FUTURE YEARS DEFENSE PROGRAM**

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**TUESDAY, APRIL 9, 2019**

UNITED STATES SENATE,  
SUBCOMMITTEE ON AIRLAND,  
COMMITTEE ON ARMED SERVICES,  
*Washington, DC.*

**AIR FORCE MODERNIZATION**

The Subcommittee met, pursuant to notice, at 3:03 p.m. in room SR-232A, Russell Senate Office Building, Senator Tom Cotton (Chairman of the Subcommittee) presiding.

Subcommittee Members present: Senators Cotton, Scott, King, Blumenthal, and Jones.

**OPENING STATEMENT OF SENATOR TOM COTTON**

Senator COTTON. This hearing of the Airland Power Subcommittee will come to order.

The Committee meets today to receive testimony on the modernization of the U.S. Air Force and its fiscal year 2020 budget request.

We welcome General Arnold Bunch, the Military Deputy to the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics; General Tim Fay, Deputy Chief of Staff for Strategy, Integration and Requirements; and General Brian Robinson, Assistant Deputy Chief of Staff for Operations. Thank you all, gentlemen, for your appearance today.

The National Defense Strategy (NDS) directs our Nation's military to prepare for the return of great power competition. This means we must be prepared to deter and, if necessary, defeat potential peer adversaries like China and Russia. In order for the Air Force to achieve that goal, it must be properly manned, trained, and equipped. Unfortunately, as pointed out by the National Defense Strategy Commission, we are still in a readiness and modernization crisis.

By the end of 2016, the Air Force was at a historic low in readiness. Fewer than 10 percent of combat squadrons were ready to deploy and even fewer were prepared for a peer fight. We have made some progress in rebuilding readiness, but more needs to be done.

Unfortunately, while our forces stagnated or declined, our adversaries recapitalized their forces with alarming speed. China and Russia now present a real threat to America, our allies, and in-

creasingly the civilized world. In fact, in some areas they have surpassed us.

Despite years of neglect, our men and women have done an outstanding job for the Nation, but it is past time for action.

The Secretary of the Air Force recently testified that our Air Force is too small and too old to do what the Nation asks and that the Air Force needs to grow to 386 squadrons. I agree on the need to both grow and modernize.

The future of our Air Force's readiness and relevance requires both now. Any successful modernization strategy must focus on results and meeting the needs of tomorrow's fight. Building relevant technology quickly will require discipline and acquisition strategies. It will also require rapid prototyping, experimentation, such as the light attack experiment in order to get modern, reliable, and lethal systems into the hands of our warfighters on time and on budget.

I am interested to hear today from our witnesses what progress already has been made and what capabilities currently are in development. Executing this strategy will require an open and transparent dialogue with Congress. We look forward to working with you to make our shared modernization vision a reality and ensure the Air Force is prepared for the more lethal and dynamic battlefields of the future.

Senator King?

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

Senator KING. Thank you, Mr. Chairman.

Mr. Chairman, I want to extend a welcome as well to each of our witnesses appearing before the Subcommittee. I look forward to hearing your testimony.

Earlier this year, this Subcommittee heard from Army witnesses about the challenges in the Army modernization portfolio. I look forward to hearing today from the Air Force witnesses about the challenges and opportunities they face in modernizing the Air Force. Earlier this year, we also had a closed briefing on the B-21 bomber program.

I am especially interested in hearing from the witnesses how the Air Force plans to manage its multiple modernization programs in ways that deliver the capabilities that our warfighters need in a timely manner to defeat our most capable adversaries while protecting our taxpayers' dollars.

The Air Force has been particularly aggressive in implementing accelerated acquisition authorities, including for major defense acquisition programs. Congress has given the Department of Defense (DOD) these new authorities, and the job of Congress is now to oversee the Department to ensure that the Department uses its authorities to pursue these modernization programs in a more efficient and effective manner.

Our witnesses this afternoon face huge challenges, which I am sure they know, 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. I cannot help but think of the old story about building the airplane as you are flying it, and you guys are pretty close to that challenge.

Specifically, our Air Force will bear a large share of the burden of implementing the National Defense Strategy that identifies inter-state strategic competition with increasingly capable adversaries as the primary U.S. national security concern.

These challenges have been made particularly difficult by the spending caps imposed in 2011 by the Budget Control Act (BCA). Last year, we had the benefit of an early budget and an agreement that included increases in the Department of Defense top line. This year we are again facing the constraints of the caps in the Budget Control Act unless Congress acts to the contrary.

The President's budget includes an attempt to finesse the caps for the Department of Defense by moving a large portion of the base budget into the overseas contingency operations, or OCO, accounts that are exempt from the caps, specifically using something, a new term to me, "OCO for base." I in one previous hearing said that is like rabbits for bicycles. The two things are not related. OCO is not base, but that is the world that we are in. While I support an adequate budget for the Department, I do not support such budgeting gimmicks. I hope that we can move quickly to achieve an honest agreement on the budget resolution for fiscal year 2020 that does not include such things as OCO for base so that we can avoid delays in getting the necessary resources to the Defense Department, to the Air Force, and to other parts of the United States Government.

There are a number of other issues 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. Thank you, Senator King.

General Bunch?

**STATEMENT OF LIEUTENANT GENERAL ARNOLD W. BUNCH, JR., USAF, MILITARY DEPUTY FOR OFFICE OF THE ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS; ACCOMPANIED BY LIEUTENANT GENERAL TIMOTHY G. FAY, USAF, DEPUTY CHIEF OF STAFF FOR STRATEGY, INTEGRATION AND REQUIREMENTS, HEADQUARTERS UNITED STATES AIR FORCE; AND MAJOR GENERAL BRIAN S. ROBINSON, USAF, ASSISTANT DEPUTY CHIEF OF STAFF FOR OPERATIONS, HEADQUARTERS UNITED STATES AIR FORCE**

Lieutenant General BUNCH. Good afternoon, Chairman Cotton, Ranking Member King, and distinguished Members of the Subcommittee. Thank you for having us here today to provide testimony on Air Force modernization and priorities for fiscal year 2020.

Additionally, we appreciate your service, leadership, and dedication to rebuilding the United States military and supporting our airmen and their families. We also thank you for an on-time defense bill last year and hope that that trend continues. Stable, adequate, timely budgets are vital to our efforts to restore readiness and modernize to meet the Nation's challenges.

Today I am accompanied by Lieutenant General Tim Fay and Major General Brian Robinson. We have prepared a joint state-

ment that I request be entered into the official record, and I will provide brief opening remarks for the team.

Senator COTTON. Without objection.

Lieutenant General BUNCH. When you consider the scale and scope of what our Nation demands of us, today's security environment is perhaps one of the most challenging we have faced as an Air Force. We face challenges in and across all domains in which we operate. We are in global competition across the spectrum of potential operations, ranging from countering malign influence in gray zones all the way to deterring nuclear war. We cannot allow the gap between national security demands and the resources provided to meet those demands to grow, all while we continue to operate at a pace that challenges readiness.

As captured in the National Defense Strategy, the United States faces an increasingly complex global security environment, characterized by long-term strategic competition, a rapidly growing China and resurgent Russia aimed to coerce their regional neighbors, undermine longstanding alliances, and displace American influence from critical regions around the globe.

Your Air Force must be ready to compete, deter, and win in these complex and evolving security environments. We must defend the Homeland and provide a safe, secure, and effective nuclear deterrent and be able to defeat a powerful conventional enemy and continue to disrupt violent extremists and other tasks. The Air Force must be prepared to do all of these missions each and every day.

As we have analyzed this array of mission sets, the unmistakable conclusion is the Air Force is too small for what our Nation needs. Our airmen perform strategic and vital missions in all domains across the spectrum of conflict from 60 feet below the ground to our highest geosynchronous orbits. We are always there meeting and rising to the challenges by defeating our adversaries, deterring threats, and ensuring our allies 24 hours a day, 7 days a week, 365 days a year, and serving as a beacon of hope for many nations around the world.

Thanks to your help in recent years, together we have made solid gains in improving wartime readiness and returning some fiscal stability, but there remains work to be done, particularly in the area of modernization, force structure capacity, and warfighting capability. The dialogue we have today will help us as we design and build a better future worthy of tomorrow's airmen and our Nation. We cannot win this contest with an acquisition system from the Cold war. We must modernize at the speed of relevance. We are building tomorrow's Air Force more lethal and ready, faster and smarter.

We are utilizing the new authorities you granted us like section 804 and tailoring traditional acquisition approaches to buy equipment and capabilities and experiment and prototype in new ways to meet a rapidly innovating adversary. As of the end of February of 2019, we estimate that we have saved over 88 years of acquisition schedule through the use of these tailored acquisitions and section 804 authorities. We are confident that our initial goal of saving 100 years will be accomplished in less than 1 year of the pursuit. As a result, we are modernizing at the speed of relevance.

We are also doing this in a way that is as transparent or more transparent than how we have executed traditional acquisition programs by giving reports to Congress three times a year and updating when we get outside the bounds of what we have set for our guardrails.

I must shift the focus of this for just a moment based on today's events. Today America lost a hero. Lieutenant Colonel Dick Cole, the last Doolittle Raider, died at the age of 103. Emblematic of what being an airman is all about, he and the other Doolittle Raiders embarked on a mission that they were told they may not return from. They did what airmen do. They went. Airmen like Lieutenant Colonel Dick Cole are the foundation of our Air Force.

We look forward to working closely with the committee to ensure the ability to deliver air power for America when and where we are needed. Generals Fay, Robinson, and I look forward to answering questions from the Subcommittee this afternoon. Thank you for your continued support of the world's greatest air force.

[The prepared statement of Lieutenant General Bunch, General Fay, and Major General Robinson follows:]

PREPARED COMBINED STATEMENT BY LIEUTENANT GENERAL ARNOLD W. BUNCH,  
LIEUTENANT GENERAL TIMOTHY G. FAY, AND MAJOR GENERAL BRIAN ROBINSON

#### INTRODUCTION

Chairman Cotton, Ranking Member King and distinguished Members of the Subcommittee, thank you for having us here today to provide testimony on Air Force modernization. Additionally, thank you for your service, leadership and dedication to rebuilding the United States military. The modernization of America's Air Force is a critical national security issue worthy of attention and action.

Today's security environment is perhaps one of the most challenging we've faced as an Air Force when you consider the scale and scope of what our Nation demands of us. We face challenges in and across all domains in which the Air Force operates. Our ability to compete, deter, and win are being challenged by others. We are in global competition across the spectrum of potential operations, ranging from countering malign influence in gray zones all the way to deterring nuclear war. Others have made gains as we return to great power competition. We cannot allow the gap between national security demands and the resources provided to meet those demands to grow all while we continue to operate at a pace that challenges readiness.

Thanks to your help, in recent years, together we have made solid gains in improving wartime readiness and returning some fiscal stability, but there remains work to be done, particularly in the area of modernization, force structure capacity, and warfighting capability. The dialogue we have today will help us as we design and build a better future Air Force worthy of tomorrow's airmen and our Nation.

#### STRATEGIC ENVIRONMENT

The National Defense Strategy captures the national security challenges we face as a Nation. The United States faces an increasingly complex global security environment, characterized by long-term, strategic competition. A rapidly growing China and resurgent Russia aim to coerce their regional neighbors, undermine long-standing alliances, and displace American influence from critical regions around the globe.

Our United States Air Force must be ready to compete, deter, and win in this complex and evolving security environment. We must defend the Homeland; provide a safe, secure, and effective nuclear deterrent; and be able to defeat a powerful conventional enemy; deter opportunistic aggression; and continue to disrupt violent extremists. The Air Force must be prepared to do all of these missions every day.

All of this drives how we design and modernize our forces and highlights the need for a larger military. As the bipartisan National Defense Strategy Commission (NDSC) stated in its final report, "The United States needs a larger force than it has today if it is to meet the objectives of the strategy. The Air Force, Navy, and Army will all need capacity enhancements." Additionally, the same report acknowledges that the, "Air Force will need more stealthy long-range fighters and bombers,

tankers, lift capacity, and intelligence, surveillance, and reconnaissance platforms.” As a Service and a Nation, we are the best at what we do, but in order to maintain our position we must work towards it. It is not a birthright.

#### AN AIR FORCE IN DEMAND

*“Regardless of where the next conflict occurs or which adversary it features, the Air Force will be at the forefront.”—NDS Commission*

Our airmen are already at the forefront, performing vital missions in all domains—providing Global Vigilance, Reach and Power. Our airmen perform strategic and vital missions in all domains, across the spectrum of conflict, from 60 feet below ground to our highest geosynchronous orbits. Last year our airmen conducted more than 50,000 sorties and 3,400 precision airstrikes in partnership with a joint ground force that destroyed ISIS as a conventional force. In Afghanistan, the Air Force executed 44,000 sorties in support of our Afghan partners, and targeted Taliban and extremist networks with more weapons than any time in the past 10 years which helped bring the Taliban to the negotiating table.

In 2018, Air Force bombers flew over 840 missions in support of Operation Inherent Resolve, helping to defeat ISIS and the Resolute Support mission in Afghanistan. Our bombers executed over 60 Continuous Bomber Presence missions in the Indo-Pacific region, demonstrating U.S. commitment. American bombers also flew 12 assurance and deterrence missions, reinforcing NATO’s eastern flank.

Our mobility forces provided strategic maneuver to the Joint Force by transporting over 1.26 million personnel, 1 billion pounds of warfighting equipment and supplies, and evacuated over 5,400 patients for critical care. Airmen also delivered 152,000 short tons of relief supplies across Southwest Asia, supporting those who are displaced and suffering, and demonstrating U.S. commitment to building a stable and peaceful region. Our Tanker forces passed more the 1 billion pounds of fuel in-flight.

#### AIR FORCE WE NEED (READINESS & CAPACITY)

We have made great strides since fiscal year 2017 in readiness recovery—and it has been a team effort by all airmen to include our civilian leadership, Congress, and industry. Because of this effort, over 90 percent of our “lead” force packages in “pacing squadrons” are ready—the first airmen to respond at the beginning of a conflict. When we include their “follow-on packages”, we are on track to reach 80 percent readiness for our pacing units by 2020, 6 years faster than originally planned. In addition, we are continuing to pursue the SECDEF’s goal of 80 percent Mission Capable rates for F-35, F-22 and F-16 Aircraft.

Readiness recovery is dependent on getting enough people with the right experience. Last year we increased our total force end strength by 5,800 personnel. Over the last two years, we eliminated a shortage of 4,000 maintainers and are currently working to build expertise in these young airmen. To address our aircrew shortage, we are implementing nearly 70 initiatives to increase the number of pilots we are training, season them in operational units, and retain experienced aircrews. In 2018, we produced 1,211 pilots, 146 more than originally expected.

Our airmen are shifting their focus to great power competition, and we must train and equip them for the high-end fight. We continue to modernize our live and virtual training ranges and infrastructure to provide relevant and realistic training against our most advanced threats. We are investing to build the Nevada Test and Training Range, the Joint Pacific Alaska Range Complex, the Utah Test and Training Range, and several smaller range complexes to better replicate the capabilities of our peer adversaries. The reality is we cannot do it with only ranges, which is why we must invest in live and virtual training.

We are continuing to recover our readiness and in this cycle are focusing on experiencing personnel, high-end training capability, and sustainment to meet National Defense Strategy demands. The Air Force is grateful to be recovering readiness as it comes close to its 30th year of continuous combat and contingency operations, but the road to recovery remains a long one.

#### CURRENT CAPACITY AND CAPABILITY

Our analysis aligns with the conclusions of the NDSC. When we assessed the operational plans and scenarios, we validated that the Air Force we need to meet the demands of the National Defense Strategy should grow from 312 to 386 operational squadrons, about a 25 percent increase. This would permit us to execute the National Defense Strategy with moderate risk. Just to be clear, this was a pure

strategy-based analysis—not a budget constrained one—and it looked at the entirety of Air Force force structure.

#### *Bomber Force Structure*

We must continue to modernize and sustain the legacy bomber fleets to ensure they remain viable and capable until we transition to the B-21. Our budget proposal supports the Defense Department’s principal priority to maintain a safe, secure, and effective nuclear deterrent that safeguards the Homeland, assures allies, and deters adversaries.

#### *B-21*

The National Defense Strategy provided strategic direction to develop a new stealth bomber, and the B-21 Raider is the answer. The B-21 has a mature and stable design and is transitioning to manufacturing development of the first test aircraft on the path to the significant first flight milestone. The President’s Budget provides \$3.0 billion of funding in fiscal year 2020, and \$20 billion across the FYDP, to progress the program through the Engineering and Manufacturing Development to progress towards fielding this fleet.

The B-21 will provide critical operational capability and flexibility across a wide range of military objectives providing both conventional and nuclear capabilities. The B-21 will be a highly survivable asset with the ability to penetrate modern air defenses to accomplish mission objectives in an anti-access/area denial environment. We will need a minimum of 100 B-21s in our inventory. We are also pursuing legacy bomber fleet upgrades in order to keep those assets sustainable and viable, which is necessary until the B-21 becomes operational in sufficient numbers.

#### *B-52*

The last B-52H Stratofortress entered service in the United States Air Force in 1962, we expect to continue operating the B-52 through 2050 and will continue to invest in modernization programs to keep the platform operationally relevant. Major modernization efforts include the Commercial Engine Replacement Program, \$1.4 billion across the FYDP; Radar Modernization Program, \$1.0 billion across the FYDP; and Combat Network Communications Technology, \$74 million across the FYDP. The B-52 Commercial Engine Replacement Program will replace legacy engines with new commercial engines using section 804 processes to remove more than three years from the traditional program schedule. Boeing as lead integrator, is currently conducting risk reduction studies to fully define engine and aircraft requirements. Going forward, the Air Force will employ a “hands-on” approach, leveraging competitive prototyping and industry best practices to allow for early identification and mitigation of any risks. The Radar Modernization Program will modernize the current Strategic Radar (AN/APQ-166), which is based on 1960s technology and was last modified in the 1980s.

B-52 Combat Network Communications Technology (CONNECT) provides an integrated communication and mission management system, as well as a machine-to-machine interface for weapons retargeting. CONNECT’s digital infrastructure and architecture provides the backbone for the 1760 Internal Weapons Bay Upgrade, which allows for internal carriage of J-series weapons through modification of the Common Strategic Rotary Launchers, thus significantly increasing the B-52’s capability to store and deliver the Joint Direct Attack Munition (JDAM), Laser-JDAM, Joint Air-to-Surface Standoff Missile (JASSM) and its extended range variant, and the Miniature Air Launched Decoy (MALD) along with its jamming variant. The Air Force remains committed to B-52 modernization to ensure the nation’s oldest and most versatile frontline long range bomber remains relevant through at least 2050.

#### *B-1*

The B-1B is a long-range, air-refuelable multirole bomber capable of flying intercontinental missions with the largest payload of guided and unguided weapons in the Air Force inventory. We continue to invest in B-1 modernization and sustainment to ensure the platform remains lethal and viable through 2040. The Integrated Battle Station upgrade, \$56 million across the FYDP, will enhance crew situational awareness and precision engagement capabilities and is the B-1B’s largest modernization effort ever. The first aircraft with this upgrade was delivered in January 2014, and a total of 50 B-1s are currently modified with this capability. This modernization effort will complete in 2020. Other efforts to update the B-1B’s navigation and radar systems were completed in early 2016. These efforts improve the reliability and maintainability of these critical systems.

The B-1B was the Air Force threshold platform for early operational capability of the Long Range Anti-Ship Missile, which transitioned from a Defense Advanced Research Projects Agency (DARPA) demonstration to the Navy-led Offensive Anti-

Surface Warfare Program. Integration of this weapon, coupled with the B-1B's long range, high speed and large payload capacity, will posture the B-1B for an important role in any conflict in the Indo-Pacific region.

#### *B-2*

Until the B-21 is fielded, the B-2 will be the only long-range strike aircraft capable of penetrating and surviving advanced Integrated Air Defense Systems to deliver weapons against heavily defended targets.

Its unique attributes of intercontinental range, precision strike, large conventional or nuclear payloads, ability to penetrate defenses, and low observable profile allow it to execute Nuclear Deterrence Operations, Nuclear Response, Global Strike, and Global Precision Attack missions. The Air Force will continue to modernize the B-2 to ensure it remains effective as enemy defensive systems advance. Current efforts to modernize the Defensive Management System, \$1.5 billion within the FYDP, will ensure the B-2 can continue to counter sophisticated air defense networks and operate in highly contested environments.

The Air Force has completed development efforts to re-host the Stores Management Operational Flight Program software in the Flexible Strike program, enabling the B-2 to take advantage of advanced digital weapon interfaces, such as those used by the B61-12 nuclear weapon. The Flexible Strike capability will begin fielding this year as part of the B-2 P6.2 block effort, which includes Military GPS User Equipment and B-2 hardware to support carrying the B61-12 weapon. The Air Force began installing the Common Very-Low-Frequency / Low Frequency (VLF/LF) Receiver and will complete fielding the system in all twenty B-2 aircraft in fiscal year 2020. This program provides the B-2 with a VLF/LF receiver for secure, survivable strategic communications capability.

Other on-going B-2 programs address modernization efforts with \$176 million across the FYDP to enhance the Identification Friend or Foe (IFF) system, replace the Crash Survivable Memory Unit, and integrate hardware upgrades for the employment of the GBU-57 Massive Ordnance Penetrator, as well as the B61-12 nuclear weapon. The Radar Aided Targeting System software upgrade began development in October 2018 and will provide improved navigational handoff to weapons in a GPS-denied environment. Next year the Air Force will begin exploring modifications, \$23 million within the FYDP, to the B-2 to enhance the aircraft's capability against hardened, deeply buried targets. And, finally, the B-2 will continue sustainment efforts, \$139 million across the FYDP, for the on-going Low Observable Signature and Supportability Modification effort, to improve aircraft maintainability and availability.

#### *Fighter Force Structure*

We remain committed to the dual-capable F-35 and its game-changing capabilities, while we continue to modernize and sustain our aging legacy fleet. However, our current fighter force of 55 squadrons is too small. To restore readiness of the force we must refresh the fighter fleet with a mix of 4th and 5th generation aircraft to ensure the right capacity and capability to fully implement the National Defense Strategy.

#### *F-35*

The F-35A is the centerpiece of the United States Air Force's 5th generation multi-domain capability and it is a critical force multiplier for legacy forces. It directly supports National Defense Strategy objectives to, "Build a More Lethal Force and Strengthen Alliances and Attract New Partners." We remain fully committed to the F-35 program of record of 1,763 aircraft. Our budget requests \$6.5 billion in fiscal year 2020, and \$31.7 billion across the FYDP, to continue production and integrate vital capabilities. No money from this program was taken for the 4th generation refresh. We expect to have over 20 combat-ready F-35 squadrons in our inventory by 2030, but to ensure those squadrons are ready to achieve National Defense objectives in future threat environments, we must field full F-35 Block 4 capabilities as quickly as possible.

Our budget decreases the F-35 buy profile by 18 aircraft between fiscal year 2020 and fiscal year 2023 in order to align the procurement timeline with capability development and reduce retrofit costs. We must also continue our work with the F-35 Program Office to deliver in three key areas as soon as possible: 1) Autonomic Logistics Information System must fully operate as intended; 2) F-35 Reprogramming Enterprise must update F-35 Mission Data Files at the speed of war to ensure operational relevancy; and 3) F-35 simulator must be current with fielded aircraft operational flight programs, have sufficient fidelity to provide effective training, and be Distributed Mission Operations Network-capable.

We are taking steps to achieve 80 percent Mission Capable Rates by September 2019 in our combat coded F-35s by addressing prioritized efforts to improve supply chain performance, Reduce Depot span time, Accelerate Modifications, and Optimize Unit Level Performance.

#### *F-22*

The F-22 is the only operational multi-mission air superiority fighter aircraft that combines stealth, supercruise, maneuverability, and integrated avionics to make it the world's most capable air superiority aircraft. The F-22 request adds \$953 million in fiscal year 2020, and \$5.2 billion across the FYDP, for modernization efforts essential to gain and maintain air superiority against evolving threats. The Capability Pipeline, a section 804 program, combines former TackLink16, TACMAN and GPS M-code programs to deliver slices of each capability on a regular cadence to the field. Future modernizations will leverage the "Capability Pipeline" as a vehicle to rapidly prototype and iteratively field critical enhancements with capabilities delivered to the fleet on a regular cadence and ensure first look, first shoot, first kill capability in highly contested environments.

#### *F-15*

The F-15C/D supports both Homeland Defense and the air superiority mission. Our F15C fleet is aging, with two-thirds of the fleet past its designed service life. The 234 F-15Cs in the Air Force inventory will reach the end of their design service life in the next six to eight years, and our analysis shows additional service life extension programs are not cost effective. Our budget proposes to replace our aging F-15C fleet with a modernized successor by purchasing the F-15EX. We propose to buy 80 aircraft across the next five years to begin a cost-effective replacement of our F-15C fleet. The Air Force remains fully committed to advanced 5th generation capabilities and the F-35. The decision to refresh the 4th generation fighter force helps mitigate capacity risk while balancing near term readiness concerns.

The F-15E fleet provides all-weather, long range global precision attack in all but the highest threat environments. Our F-15 budget requests \$2.1 billion in fiscal year 2020, and \$12.6 billion thru the FYDP, to continue modernization efforts to ensure the aircraft remains viable through the 2040s. Modernizing the F-15E with Early Passive Active Warning Survivability System (EPAWSS) demonstrates our commitment to building a more lethal Air Force. EPAWSS will allow the F-15E to attack targets in high threat environments that the aircraft cannot currently engage.

#### *F-16*

The F-16 is the Air Force's primary multi-role fighter and Suppression of Enemy Air Defense (SEAD) aircraft. This program is in the midst of the largest modernization period in program service history in order to remain operationally capable through the 2040s. The program adds \$443 million in fiscal year 2020, and \$3.8 billion across the FYDP, for modifications to ensure the F-16 can operate and survive in today's threat environment. Major efforts in this year's budget include a Service Life Extension Program comprising 12 structural modifications, effecting 300 aircraft, with the biggest structural changes being wings, canopy sill longeron, and lower bulkhead. In addition, there are several avionics capability upgrades including the Active Electronically Scanned Array (AESA) Radar upgrade, this replaces the current mechanically scanned radar, with greater ability to detect, track, and identify low-observable, low-flying, and slow-flying target. This joint emerging operational need is critical for the F-16 platform to meet aerospace control alert mission requirements in order to properly defend the Homeland against modern threats, these radars will begin fielding in 2019. Another key avionics capability upgrade is Auto-Ground Collision Avoidance System (AGCAS) that prevents most controlled flight into terrain by executing an automated recovery maneuver to avoid collisions. The AGCAS system already has eight confirmed saves on F-16 block 40/42/50/52 aircraft. Working with Air Force Research Laboratory, we integrated this capability on F-16 Block 25/30/32 analog flight control computers when completed. We are excited to continue fielding this life saving capability for our warfighters.

#### *A-10*

The A-10 is an effective close air support platform for the current Counter Violent Extremist Organization fight. Our analysis anticipates that, without further wing funding, aircraft groundings due to wing lifespan will begin in fiscal year 2021, with at least 26 aircraft grounded by fiscal year 2023. To retain the A-10 fleet at 281, we must continue to replace the wings to ensure the A-10 remains operationally capable through the 2030s. Our current budget adds \$168.9 million in fiscal year 2020, and \$751.7 million across the FYDP, to modernize the A-10, including \$100

million for 10 more wings. The new wing contract is currently in source selection with contract award planned for late Fiscal Year 2019. The 2016 and 2017 National Defense Authorization Acts restrict retiring or divesting A-10s until completion of the F-35 Initial Operational Test and Evaluation comparative tests, associated reports, and the Secretary of the Air Force briefs the findings to Congressional committees. The Comparative Tests are scheduled to complete in Fall 2019, with Initial Operational Test & Evaluation and Air Force reports complete Spring 2020.

#### *Light Attack*

The Light Attack effort supports the National Defense Strategy second line of effort for our allies and partners, finding ways to increase their ability to contribute to the counter-violent extremist fight. The Light Attack Experiment taught us important lessons we would not have learned through a traditional acquisition process. This experiment sought to test whether an existing commercial aircraft could perform as a combat capable and cost-effective platform to support the global campaign to counter violent extremist organizations. Key to the experiment was the demonstration of an exportable information-sharing network that will improve interoperability with allies and partners. Based on available aircraft that met experimental criteria, we focused last year on only one aircraft type.

With the Light Attack effort being additive to the Air Force's topline, the fiscal year 2020 budget requests \$35 million, and \$1 billion across the FYDP, to expand the experiment in this budget to include additional aircraft types (rotary, unmanned, turbojet) and technologies. Additionally, we intend to continue our close partnership with industry and allies as we determine the best strategy going forward. We remain committed to developing a cost-effective and increasingly networked counter-violent extremist capability to deepen these partnerships and directly support the National Defense Strategy.

#### *Next Generation Air Dominance*

The Air Force is investing in technologies as part of a family of capabilities enabling air dominance in the most challenging operational environments. The requirement to establish and maintain air superiority within the battlespace cannot be understated—it underpins the joint force operations in any theater. Air superiority remains a core function of the Air Force, however is not a birthright, and given threat advances, cannot be assumed. Next Generation Air Dominance (NGAD) is our program that supports studies, analyses, technical maturation, and prototyping activities leading to enhancements in lethality, survivability, interoperability, and persistence to ensure air superiority. This budget requests \$1 billion in fiscal year 2020 and \$6.6 billion across the FYDP to fund the continued development of a next generation open mission system architecture, advanced sensors, cutting-edge communications using open standards, and integration of the most promising technologies into the family of capabilities. Furthermore, this program incorporates novel agile acquisition practices through its competitive industry consortium approach that is yielding favorable results and provides greater value for the taxpayer. Our efforts are being shaped by multiple analyses, including recommendations from the CSAF approved Air Superiority 2030 Flight Plan, recently completed NGAD Analysis of Alternatives, and several others from renowned analytic organizations. Continued investment in NGAD technologies is critical to ensuring continued air dominance within emerging threat environments for all future joint operations.

#### *Trainers*

##### *T-1, T-6, and T-38*

The Air Force is continuing investment efforts in its trainer platforms, including modernization programs for the T-1, T-6, and T-38 fleets. The T-1A Avionics Modernization Program will modernize the T-1A fleet and address known obsolescence and diminishing manufacturing supply issues. The Air Force is completing installation of Automatic Dependent Surveillance-Broadcast (ADS-B) Out across the entire T-6 fleet, modernizing the Aircrew Training Devices and Crew System life support equipment, and providing logistics support. Additionally, research and development activities will be funded for the Next Generation On-Board Oxygen Generation System (OBOGS) to improve the safety of pilot training and address on-going Physiological Events in the T-6 aircraft. Modifications are also required to sustain and upgrade the T-38C fleet, including Pacer Classic III, Talon Repair, Inspection, Maintenance, and front canopy replacement programs until T-X is delivered. The fiscal year 2020 requests are \$26.8 million, \$13.0 million, and \$37.9 million for the T-1, T-6, and T-38 fleets, respectively.

*T-X*

The Advanced Pilot Trainer (T-X) contract was awarded to the Boeing Company on September 27, 2018. The Budget request in the FYDP has been reduced to reflect the approximate \$10 billion cost savings realized from the original program cost estimate. T-X replaces the Air Education and Training Command's existing fleet of 429 T-38C aircraft with 351 aircraft and associated simulators, ground equipment, spares, and support equipment. The T-X will provide student pilots with the skills and competencies required to be better prepared to transition into 4th and 5th generation fighter and bomber aircraft. The fiscal year 2020 request of \$348.4 million continues the program's Engineering and Manufacturing Development effort, ensuring we meet a 2024 Initial Operational Capability and 2034 Full Operational Capability.

*Munitions*

While operational demand for preferred munitions continues, so do our efforts to secure sufficient inventories for our warfighters. During the last several years, we have successfully ramped up production capacity across the portfolio, and our fiscal year 2020 Budget Request funds preferred munitions to industrial production capacity. Thanks to strong Congressional support and funding, this budget continues to improve on significant fiscal year 2019 munitions gains and emphasizes the munitions most relevant to the high-end fight. Consistent with prior budgets, the fiscal year 2020 request again leverages increased base budget and Overseas Contingency Operations (OCO) funding to rebuild inventories and replenish the large number of munitions expended to counter violent extremist organizations around the world. Additionally, this budget also requests funding to develop more lethal weapons capabilities to meet future operational requirements. As we continue working to synchronize munition inventories with National Defense Strategy objectives, the Air Force is grateful for the continuing Congressional support to confront these challenges. To ensure success, munitions procurement will remain an item of interest across the FYDP.

*Joint Direct Attack Munition and Small Diameter Bomb*

The Joint Direct Attack Munition (JDAM) is the air-to-ground weapon of choice and the expenditure rate has increased 134 percent so far in fiscal year 2019 (6,202) compared to fiscal year 2018 (2,656). In fiscal year 2015, JDAM production capacity was 18,500 tailkits per year; by fiscal year 2018 tailkit production increased to 45,000 tailkits per year to meet the needs of the Services and Foreign Military Sales (FMS) partners. The Air Force plans to procure 37,000 tailkits in fiscal year 2020 with a request of \$1.07 billion, with Navy and FMS partners procuring the remaining production capacity.

Small Diameter Bomb I (SDB I) provides reduced collateral damage effects and increased load-out per sortie for our warfighters. Due to its high operational utility, the Air Force ramped the line from 3,000 weapons per year in fiscal year 2015 to 8,000 weapons in fiscal year 2017. The Air Force's fiscal year 2020 budget requests \$275.4 million and plans to order 7,078 weapons and the remaining quantity is available to FMS partners.

SDB II will complete Initial Operational Test and Evaluation in fiscal year 2019, and in conjunction with the Navy, the Air Force's fiscal year 2020 budget requests \$212.4 million to procure 1,175 weapons, maximizing the production capacity. Though not yet fielded, the SDB II will soon provide a key air-to-ground capability to kill mobile and fixed targets through adverse weather from standoff ranges. All of these production increases expedite the inventory replenishment of our critical munitions and build stockpiles for future needs.

Finally, Hellfire missiles provide a time-sensitive, direct strike capability for our remotely-piloted aircraft and remain in high demand around the world. Production capacity, shared between Hellfire and Joint Air-to-Ground Missile (JAGM), was ramped up from 5,000 missiles per year in fiscal year 2015 to 11,000 missiles per year in fiscal year 2019. The fiscal year 2020 budget requests \$299.6 million and procures at least 3,859 Hellfire missiles. With other Services and critical FMS partners, the production line will remain funded to maximum production capacity.

*Joint Air-to-Surface Standoff Missile and Advanced Medium Range Air-to-Air Missile*

As the Air Force responds to current operational demands, we are also looking to the future to ensure we are prepared to defend against more advanced threats as directed in the National Defense Strategy. Doing so requires advanced weapons capabilities, and the fiscal year 2020 budget request reflects the Air Force's plan to continue investing in those areas, specifically with the Joint Air-to-Surface Standoff

Missile (JASSM) and the Advanced Medium Range Air-to-Air Missile (AMRAAM). These weapons provide unique capabilities in an anti-access/area denial (A2/AD) environment.

JASSM is the premier air-to-ground, low observable missile for defeating threats in highly contested environments. The fiscal year 2020 budget requests \$503.4 million to procure 430 missiles. The program is focused on increasing inventory by implementing a strategy to ramp up production rates and monitor subsystems for obsolescence. To achieve this, we have partnered with industry to expand production capacity to satisfy a 47 percent increase in our inventory objective. The total production capacity for the fiscal year 2020 procurement will be 510, with the available max rate for JASSM increasing to 430.

Production of AMRAAM missiles, a critical air dominance weapon, remains consistent with fiscal year 2019 procurement levels by requesting \$332.3 million for 220 missiles, as industry partners begin to cut-in a solution to obsolescence issues through the Form Fit Function Refresh (F3R) effort. Cut-in of F3R begins this year with initial deliveries starting in fiscal year 2021, and production rate continues to ramp up thru fiscal year 2024.

#### *Stand-In Attack Weapon and Extended Range Weapon*

To defend the Nation in an increasingly competitive global environment, however, we must look beyond currently fielded weapons systems and invest in future advanced munitions capabilities. To that end, the Air Force continues to invest in the Stand-In Attack Weapon (SIAW) to deliver a strike capability to defeat rapidly relocatable targets that create the A2/AD environment. The fiscal year 2020 Budget requests \$162.8 million, and \$841.4 million across the FYDP. Additionally, the Air Force is investing \$246.2 million in fiscal year 2020, and \$587 million across the FYDP, in the Extended Range Weapon (ERWn), a rapid prototyping program to develop an advanced multi-role interceptor missile to defend against and defeat missile threats. Finally, the fiscal year 2020 Budget request continues to invest in rapid prototyping programs to develop hypersonic weapons for long-range, prompt strike capabilities.

#### *Tanker Fleet*

Tankers are the lifeblood of our joint force's ability to respond to crises and contingencies quickly and are essential to keeping our Air Force fueled as a global force. The tanker fleet is comprised of 396 KC-135s, 59 KC-10s, and 6 KC-46s that provide the backbone of rapid U.S. global operations. Delivery of 179 KC-46 Pegasus aircraft by 2028 will replace less than half of the current tanker fleet and leave the Air Force with 300 aging KC-135s awaiting recapitalization.

#### *KC-46*

While we continue to sustain the current tanker capability, building the future tanker fleet remains one of the Air Force's top acquisition priorities. The KC-46 will deliver greater operational readiness, flexibility, and survivability to the Global Reach mission. The Air Force awarded Lot 4 on 10 September 2018, increasing the number of production aircraft on contract to 52. Lot 5 (15 aircraft) is projected to award in July 2019.

The first four KC-46 aircraft were delivered to McConnell AFB, KS (Main Operating Base 1), 25-31 January 2019. Two additional KC-46s were delivered to Altus AFB, OK (Formal Training Unit), 8-9 February 2019. The Air Force will continue taking delivery of KC-46s over the next year at a rate of approximately 3 per month until the backlog of aircraft is exhausted, at which point the delivery rate will reduce to approximately 1.25 per month. The Air Force will begin Initial Operational Test and Evaluation (IOT&E) in Spring 2019.

Partnered with Air Mobility Command, we have worked hard to accept the KC-46 while ensuring its major deficiencies—the Remote Visual System (RVS) and boom—are properly addressed without undue burden on taxpayers or warfighters. We initiated a subject matter expert team that derived critical performance parameters for both the RVS and boom and codified these parameters in a legally-binding agreement with the vendor. Due to the extensive nature of the fixes, especially the RVS, both actions will take 3-4 years to implement and retrofit fully across our fleet. Consequently, our warfighters strongly desired the KC-46 in their hands, vice the vendor's, while these corrections are being implemented for training and readiness purposes. Despite its current deficiencies, the KC-46 is safe to operate (adhering to flight manual cautions we have provided to our operators) and is the Air Force's best tanker for contested environments due to enhanced situational awareness, battle management, and countermeasures.

The fiscal year 2020 Budget requests \$59.6 million in RDT&E funding for the ongoing KC-46 Engineering and Manufacturing Development and post production

modification efforts. Additionally, fiscal year 2020 also has a request for \$2.2 billion in procurement funding to award Lot 6 (12 aircraft).

#### *KC-10 and KC-135*

The average age of our KC-135 and KC-10 tankers is 57 and 34 years old respectively. Both fleets are challenged by aircraft parts obsolescence and diminishing manufacturing source issues. However, with the help of organic Air Force depots and industry, we are able to maintain these platforms as effective and safe weapon systems for the warfighter. We are executing several key modernization, safety, and compliance initiatives to ensure our KC-135 fleet remains viable through at least 2045.

The fiscal year 2020 Budget requests \$124.5 million to continue KC-135 modernization efforts. The Block 45 program addresses supportability, reliability, and maintainability issues with legacy flight and engine instruments by integrating a digital flight director, autopilot, radio altimeter, and electronic engine instrument display for our operators. Additionally, the Real Time in the Cockpit program provides real time situational and battlespace awareness to aircrews.

Furthermore, fiscal year 2020 also requests \$13 million through the FYDP to keep our KC-10 fleet operational through its planned retirement and includes funding for service bulletins and low cost modifications to ensure Federal Aviation Administration (FAA) certification.

#### *Presidential Airlift*

##### *VC-25B*

The VC-25B program will replace the U.S. Air Force Presidential VC-25A fleet, which faces capability gaps, rising maintenance costs, and parts obsolescence as it ages beyond 30 years. The VC-25B program will deliver two new aircraft to meet the requirements for the President to execute the three roles of Head of State, Chief Executive, and Commander-in-Chief. The Boeing 747-8 aircraft will be uniquely modified to provide the President, staff, and guests with safe and reliable air transportation with an equivalent level of communications capability and security available in the White House. The modifications to the 747-8 aircraft will include an electrical power upgrade, dual auxiliary power units that are usable in flight, a mission communication system, an executive interior, military avionics, a self-defense system, autonomous enplaning and deplaning, and autonomous baggage loading. The fiscal year 2020 Budget request aligns funding with the Acquisition Program Baseline and requests \$757.9 million to continue Engineering and Manufacturing Development to design, modify, test, and field VC-25B aircraft by 2024, or sooner.

#### *Airlift*

The fiscal year 2020 Budget continues to further investment in the Air Force's critical airlift modernization programs for C-5 Super Galaxy, C-17 and the entire C-130 fleet.

##### *C-5*

The C-5 Super Galaxy provides all-weather worldwide strategic airlift for combat forces, equipment, and supplies, exemplifying Rapid Global Mobility outlined in the National Defense Strategy. Current investment programs focus on fleet obsolescence, maintainability, and safety of flight.

The fiscal year 2020 Budget requests \$73.6 million in procurement funding, predominately for C-5 core mission computer/weather radar system equipment. This system replaces an antiquated radar system with diminishing manufacturing sources and upgrades the core mission computer processor to meet the demands of future software modifications.

Additionally, fiscal year 2020 Budget requests \$10.2 million in RDT&E funding to support communications, navigation, surveillance/air traffic management upgrades, including Automatic Dependent Surveillance-Broadcast (ADS-B) Out modifications required for global airspace compliance. Replacement of the Multi-function Control and Displays is a new start in fiscal year 2020 also included in this RDT&E funding request.

##### *C-17*

The C-17 is the only aircraft in the Air Force inventory that combines tactical capability with strategic range to operate from austere airfields. The fleet of 222 aircraft provides our Nation unmatched flexibility to conduct theater and inter-theater direct delivery, airdrop, aeromedical, and special operations airlift missions. Agile and efficient software and hardware updates will ensure timely readiness, safety, and capability improvements as this premier airlift platform contributes to our national security objectives.

The fiscal year 2020 Budget requests \$138 million in procurement funding to continue critical modifications to the C-17 fleet. This includes ADS-B Out to satisfy FAA and civil airspace compliance mandates, Identify Friend or Foe (IFF) for the identification and control of military aircraft, and Large Aircraft Infrared Countermeasures defensive systems. Additionally, \$25.1 million of fiscal year 2020 RDT&E funding will address obsolescence and flight safety issues. The development of a replacement heads-up display will address obsolescence of the current C-17 heads-up display and improve the system's availability, reliability, and maintainability. The Beyond Line-of-Sight communication system effort modernizes multi-channel voice and data communication subsystems to ensure the C-17 keeps pace with changes in DoD communication infrastructure.

#### *C-130*

The C-130 fleet consists of legacy C-130H and C-130J aircraft, as well as special mission aircraft (AC/LC/EC/MC/HC/WC-130s). The C-130Hs and C-130Js are medium-size transport aircraft capable of completing a variety of tactical airlift operations across a broad range of missions. The fleet delivers air logistics support for all theater forces, including those involved in combat operations.

The Air Force continues to modernize the C-130H legacy fleet through a four-pronged approach emphasizing aircraft safety, airspace compliance, modernization, and partial recapitalization. We remain committed to ensuring C-130H aircraft remain safe to operate through efforts such as center wing box replacements. By replacing aging center-wing boxes, we are able to breathe new life into some of our hardest flown aircraft enabling them to continue to safely operate well into the future. The C-130H Avionics Modernization Program (AMP) Increment 1 ensures the legacy fleet is able to fly in international airspace by complying with 2020 U.S. and international airspace mandates. The AMP Increment 2 program is key to the modernization of the C-130H fleet. This program will improve the fleet's maintainability and reliability by providing a new digital avionics suite mitigating obsolescence and diminishing manufacturing source issues. The Air Force is also partially recapitalizing the legacy fleet with C-130Js. The fiscal year 2020 President's Budget requests \$140 million in RDT&E and \$52 million in procurement funding to support the legacy C-130H fleet.

Partial C-130H recapitalizing also supports our Air Force special operations forces. The newer C-130Js provide our special forces with the extra weight carrying capacity, longer range, and better fuel efficiency. These special mission variants of the C-130J conduct airborne psychological operations and offensive electronic warfare (EC-130J), weather reconnaissance (WC-130J), search and rescue (HC-130J), and special operations (MC-130J and AC-130J). Along with purchasing new aircraft, the Air Force has multiple modification efforts for the C-130J to include center wing box replacement, large aircraft infrared countermeasures, and an accelerated avionics upgrade to meet 2020 international airspace mandates as part of the C-130J Block 8.1 upgrade. The C-130J Block 8.1 modernization program, currently in production, will begin delivering new communication and data link capabilities, a flight management system, and other key capabilities to the field. In addition, the Air Force plans to upgrade our C-130H and C-130J fleets with a Mobile User Objective System satellite communication system to ensure we can maintain key communication links anywhere in the world.

The fiscal year 2020 Budget requests \$8.7 million for C-130J RDT&E and \$142 million for C-130J modification efforts. There is also a request for \$17.2 million for HC/MC-130J RDT&E and \$958 million for HC/MC-130J procurement and modification efforts.

#### *Rotorcraft*

The fiscal year 2020 Budget continues investment in the Air Force's critical rotorcraft modernization programs, including the CV-22 Osprey, HH-60G, Combat Rescue Helicopter (CRH), and UH-1N Replacement programs.

#### *CV-22*

The fiscal year 2020 President's Budget requests \$83.3 million, and \$760.7 million across the FYDP, for the CV-22 fleet to assist in execution of the National Military Strategy by providing transformational mission capability to special operations forces warfighters. The Air Force continues to make improvements to the CV-22 with modifications designed to improve reliability, survivability, and capability. Future efforts will make the CV-22 more cost-effective while ensuring the viability of its unique long-range payload capacity coupled with vertical take-off and landing capability.

*HH-60G and Combat Rescue Helicopter*

The Air Force is the only Service with a dedicated force organized, trained, and equipped to execute theater-wide Personnel Recovery. The HH-60G fleet currently accomplishes this mission by conducting day, night, and marginal weather Combat Search and Rescue (CSAR) operations to recover isolated personnel in hostile or permissive environments. Due to the advancing age and current attrition rates of the HH-60G, the Air Force must continue to modify existing HH-60G helicopters while utilizing the Operational Loss Replacement program to meet combatant command requirements until we can fully recapitalize with the Combat Rescue Helicopter (CRH) program. The CRH will be specifically equipped to conduct CSAR across the entire spectrum of military operations. The fiscal year 2020 Budget adds one test aircraft to bring the total fleet to 113 air vehicles. The Air Force has fully funded the CRH program to meet National Military Strategy objectives through Personnel Recovery missions. The fiscal year 2020 Budget requests \$22.7 million and \$1.1 billion for the HH-60G and CRH programs, respectively.

*UH-1N*

The UH-1N Replacement helicopter is an element of the Air Force nuclear enterprise reform initiatives and also supports operational airlift within the National Capital Region. Last September, the Air Force awarded the \$2.38 billion fixed price UH-1N Replacement contract. This contract will deliver up to 84 replacement helicopters, training devices, and associated support equipment to replace the legacy UH-1Ns. The fiscal year 2020 Budget requests \$171 million for the UH-1N Replacement Program, which will fund the continued integration of non-developmental items, the non-recurring engineering work required to certify the modified air vehicle, and preparations for the test program. The first two test aircraft will deliver in first quarter fiscal year 2020.

*Intelligence, Surveillance, and Reconnaissance*

Aligned with the National Defense Strategy, the Air Force is aiming to reorient the Intelligence, Surveillance, and Reconnaissance (ISR) Enterprise by aligning ends, ways, and means to address the peer threat environment through the increased use of human-machine teaming. The end goal is a ready Next Generation ISR Enterprise possessing a decisive advantage for the warfighter while remaining competent across the entire spectrum of conflict.

To meet the challenges of a highly contested environment, the future ISR portfolio will consist of a multi-domain, multi-intelligence, collaborative sensing grid that utilizes advanced technology; it will be resilient, persistent, and penetrating to support both kinetic and non-kinetic capabilities alike. The fiscal year 2020 budget submission takes the first steps towards repurposing, retooling, automating and stabilizing the force to ensure the ISR Enterprise can achieve this vision within the next decade. The Air Force aims to increase both the quality and quantity of ISR capabilities with fewer airmen while remaining dominant across the Range of Military Operations. The very innovation and technologies our airmen have created in the field will allow our entire ISR Enterprise to advance and posture for operations in the Digital Age.

*MQ-9*

The Air Force's fiscal year 2020 investment funding request of \$1.1 billion will continue MQ-9 fleet modernization efforts aimed at providing cutting edge capabilities to the combatant commands. To date the MQ-9 fleet has flown approximately 2 million hours, with 91 percent of those hours supporting combat operations. This extraordinary level of warfighter support is facilitated by a unique program architecture in which MQ-9 sustainment and modernization efforts are managed as separate, yet fully integrated and complementary programs of record. This allows the Air Force to focus on operating and sustaining fielded MQ-9s while robust development and testing of planned modernizations is conducted in parallel. This strategy keeps the MQ-9 relevant with regards to the needs of the combatant commands while at the same time addressing future and emerging requirements. By structuring this way, mature and proven upgrades for the program at large are delivered when and where they are needed.

MQ-9 modernization efforts include the new Block 50 Ground Control Station currently in development, a new DAS-4 sensor package, an Extended Range enhancement for Block 5 aircraft and an effective and reliable open systems architecture. Additionally, the MQ-9 program is actively engaged in mitigating the operational and maintenance impacts of sustaining a multi-configuration fleet as well as enabling airspace integration and access. The desired end state is a 100 percent Block 5 MQ-9 fleet operated exclusively by Block 50 Ground Control Stations in

Mission Control Element operations, with Block 30 Ground Control Stations used solely for launch and recovery operations.

#### *RC-135*

The Air Force is committed to sustaining and upgrading the RC-135 fleet as it continues to be our most capable, relevant and viable signals intelligence platform. Continued modernization utilizing rapid acquisition and fielding processes is critical as we address emerging peer threats and the return to great power competition. The RC-135 is critical to our decision advantage as it provides vital intelligence data at unrivaled speeds to both the national-level intelligence community and the tactical-level warfighter.

The fiscal year 2020 investment funding request of \$289.9 million facilitates mission system improvements for the entire RC-135 variant fleet. Efforts include the automation of additional search and detection capabilities, improved near-real-time data distribution and collaborative processing, exploitation and dissemination supported by enhanced artificial intelligence algorithms. Finally, our partnership with the United Kingdom's Royal Air Force on the RC-135 continues to set the standard for cooperative efforts that strengthen alliances while increasing partner interoperability.

#### *RQ-4*

The RQ-4 Global Hawk unmanned aircraft system provides high altitude, long endurance, all weather, wide area reconnaissance and surveillance. The fiscal year 2020 investment funding request of \$257.5 million, \$1.6 billion across the FYDP, furthers modernization efforts, to include MS-177 sensor integration, a ground segment modernization program and a communications system modernization program.

The MS-177 sensor is on track for Initial Operating Capability in the third quarter of fiscal year 2019. The MS-177 will utilize the Block 30 ISR Payload Adapter, which has been fully tested and approved for future modifications. The Ground Segment Modernization Program is progressing smoothly, with installation of upgraded cockpits at Grand Forks Air Force Base and Beale Air Force Base projected for completion in fiscal year 2020. Finally, the program's efforts to modernize ground and air vehicle communications equipment is also moving forward. The Communications System Modernization Program will improve RQ-4 communications capability while alleviating Diminishing Manufacturing Source (DMS) issues with current equipment.

#### *Multi-Domain Command and Control*

In future conflict, the prerequisite to achieving a strategic advantage over a peer competitor will be the ability to exercise Multi-Domain Command and Control. The Air Force approach to Multi-Domain Command and Control is focused on complicating our future adversaries' abilities to defend themselves. The Air Force is developing a Multi-domain Operations Center to fill a joint capability gap in command and control across regional and functional combatant commands. In fiscal year 2020, the Air Force will experiment with enterprise data to address network challenges with a goal of eventually fielding a "Data Lake" to serve as a command and control platform across air, space, and cyber domains. We plan to have an initial capability by fiscal year 2022 and then continuously expand the capability through rapid software acquisition.

#### *Advanced Battle Management System*

The Advanced Battle Management System (ABMS) will realize the vision of multi-domain command and control to propel our warfighting capability through a layered family of systems construct. We are striving for the capability where any sensor can talk to any shooter whether in space, on land, at sea, in the air, or in cyberspace. Our aim is to have intelligence and targeting data transformed into timely and actionable information through trusted networks and intelligent algorithms that enable our people to focus on decisions. In this construct, information is a service, rather than a platform, and the layers of sensing and the communication pathways will provide reliability and assurance in a contested environment.

We have started reviews to evaluate existing and emerging potential technologies and platforms across the Defense Department, the Intelligence Community, and the commercial world, to perform integrated analysis of the capability of various options to contribute to the fight and prioritize investment over time. We are beginning to develop requirements and standards for engineering discipline during execution, and all along the way to challenge ourselves and our Labs, commercial, and government partners to demonstrate capability early. As we pursue ABMS, we will maintain the right mix of legacy and future capabilities over time to be ready to fight. We are dedicated to pursuing ABMS thoughtfully. In total, from fiscal year 2019-

fiscal year 2024, the Air Force is funding \$3.8 billion towards the pursuit of ABMS across supporting programs. The fiscal year 2020 President's Budget request includes \$525.5 million for investments across sensors, battle management command and control, communications, and architecture activities.

To date there have been no changes to the Joint Requirements Oversight Council requirements for the ABMS Initial Capabilities Document. The Initial Capabilities Document addresses JSTARS requirements for ground centric requirements, in addition to air centric targets as well. ABMS will be able to perform the mission sets associated with both the JSTARS and AWACS platforms and possibly assume other roles of the Theater Air Control System. Additionally, Ground Moving Target Indicator (GMTI) requirements are being folded into the overarching ABMS architecture.

We are moving forward on ABMS, with the Analysis of Alternatives beginning in January 2019. It is being accomplished on a compressed schedule with release of results expected in the Fall 2019 timeframe. The on-going Analysis of Alternatives addresses our ability to conduct both the air moving target indicator (AMTI) mission and ground moving GMTI mission from permissive to highly contested environments in a disaggregated manner.

Recently we hired a Chief Architect, as a permanent Senior Executive Service position, and he officially began work in this month. His first of many tasks will be to oversee the ABMS architecture design, enterprise communications and integration across programs. He will also identify technologies to enable horizontal and vertical integration across operating environments and warfighting domains.

#### *Air Operations Center/Kessel Run*

Air Operations Center (AOC) Weapon System interoperability with the Multi-Domain Command and Control (MDC2) vision remains essential to the AOC way ahead. The fielded AOC Weapon System Increment 10.1 legacy system will not support the MDC2 vision without significant improvements and modernization, and the Air Force is committed to fielding a modern architecture for the AOC that enables MDC2's goal of a common command and control platform. The fiscal year 2020 President's Budget request includes \$148 million to support sustainment and the additional AOC development capacity required to retire the AOC 10.1 infrastructure and software while leveraging modern commercial software best practices. This year's budget request is required for the AOC to remain viable and will result in faster decision making capability, leading to more success in combat when fighting against a near-peer adversary.

#### *Kessel Run*

We are revolutionizing the way we build and deliver software. The Air Force's Software Factory, the Kessel Run organization, is proving we can get valuable software released faster, with higher quality and reduced risk using an agile software development operations (DevOps) approach. This approach focuses on obtaining immediate user feedback, allowing for rapid delivery of capability that matters most to the warfighters. Kessel Run's initial effort, the AOC Pathfinder, was successfully completed in July 2018 and transitioned to the AOC Weapon System Block 20 development effort using section 804 authorities of the fiscal year 2016 NDAA. The Air Force appreciates the use of these rapid prototyping and rapid fielding authorities, which have created a potential two-year schedule savings to retire the outdated legacy AOC 10.1 baseline.

We are leveraging the flexibility in these authorities to not only make development faster and delivering capabilities in weeks instead of years, but to also achieve better results for planning, executing, and assessing theater-wide air and space operations. To date, we have successfully deployed capabilities at Langley Air Force Base, Al Udeid Air Base and Osan Air Base to prove out agile DevOps at scale. Within these deployed capabilities, we have demonstrated the ability to increase the speed of initial software product delivery by as much as 83 percent, and the ability to successfully deliver software application updates to users within hours. The Kessel Run organization also offers Enterprise Services, has expanded beyond AOC's current 17 applications, and is developing a diverse portfolio of 12 additional applications including business enterprise systems and a logistics information system for the F-35.

#### *Modular Open Systems Approach*

Modular, open systems, based in common and consensus based standards, reduces acquisition and lifecycle costs, improves innovation and competition, simplifies technology refresh, improves interoperability, and enables cheaper and faster modernization. The Open Architecture Management Office, established in January 2019, is posturing to be an Air Force wide office of expertise for common standards and

open architecture efforts. The Open Architecture Management Office, located under the Air Force Life Cycle Management Center, currently manages the Open Mission System and Universal Command and Control Interface initiatives. These consensus based standards initiatives are being implemented on major weapon systems, such as the F-22 and B-52 Radar Modernization Program. There are also significant efforts to ensure these standards are compatible with other consensus standards such as the Future Airborne Capabilities Environment and Sensor Open System Architecture. The Air Force efforts in modular, open systems will enable rapid and reduced cost modernization.

#### FUTURE CAPABILITY

To compete against rising peer adversaries during this time of unprecedented commercial technology change requires a competitive acquisition system: one that is faster and more agile than all rivals. Our analysis, including multiple war simulations, workshops and wargames, clearly shows we must adopt the latest technology and deliver capability faster to stay ahead in the near-peer fight.

To achieve our National Defense Strategy, *“the delivery of performance at the speed of relevance”* matters. We must design, build, integrate and field systems faster than any adversary. That is why we have taken full advantage of rapid acquisition authorities to accelerate our programs to maintain our cutting edge. Through authorities given to us by Congress, like section 804 and tailoring traditional acquisition approaches to match the program needs, we are trimming excess, non-statutory steps that have previously slowed programs down. As of the end of February 2019, we have saved 88.5 years through the use of tailored acquisitions and section 804 authorities. The initial goal of saving 100 years will be accomplished in less than one year of pursuit. As a result, we are getting better results and meeting warfighter needs faster. For instance, using section 804 authorities, the Air Force is leading the development B-52 Commercial Engine Replacement Program, F-22 Capability Pipeline and Unified Platform. Stripping years from F-22 and Unified Platform programs are reaping the benefits as they shift to Agile Development Operations, accelerating delivery to the warfighter by over seven years. With the B-52 effort, we are duplicating commercial practices and aim at getting the new engine fielded three and a half years sooner than under a traditional Major Defense Acquisition Program.

Another contributor to fielding tomorrow’s Air Force faster is agile software development. With the establishment of the Program Executive Office Digital, Kessel Run and Kobayashi Maru software factories, and Software Engineering Squadrons, we are scaling the successes of recent pathfinders to implement modern commercial software development practices across the Air Force to speed delivery and close cyber vulnerabilities more rapidly.

Faster acquisitions go hand-in-hand with smarter ones. One area where we are applying innovative thinking is in the area of sustainment. The new Air Force Rapid Sustainment Office has Program Executive Office authorities to drive innovation in sustainment programs, lower cost and improve readiness. The office is developing, transitioning and training Air Force maintainers to use technologies found in commercial manufacturing. Technological advances such as artificial intelligence, robotics and 3-D printing are being incorporated into our labs to lower costs and speed-up repairs for our warfighters. To date, the Air Force has certified broad swaths of metal and plastic additively manufactured parts, cold spray repair at our depots in Tinker and Robbins AFB, and over 140 predictive maintenance algorithms, saving cost while increasing readiness.

Other smart practices center around the industrial base, both growing it and getting performance out of it. Over the past year, the Air Force saved the taxpayer over \$15 billion through competitively awarding major contracts. We are committed to getting the most out of competition through maintaining stable requirements and remaining transparent with industry. We are also using new authorities, including section 804, for competitive prototyping in major programs like B-52 Commercial Engine Replacement Program and Next Generation Overhead Persistent Infrared to expand our industrial base while lowering overall risk to the programs. Robust experimentation and prototyping are also enabling the Air force to develop disruptive technologies to retain our cutting edge while we sharpening industry’s. New organizations, such as the Air Force Warfighting Integration Capability, AFWERX, and the Strategic Development Planning and Experimentation Office, are providing new ideas and tools to increase overall speed of idea to pathfinder to program.

Outside of the Defense Industrial Base, we know many innovative ideas are being birthed in U.S. startup companies and that we are largely missing out on them. In order to break down barriers for small businesses who want to work on our toughest

challenges, we have created an innovative new contracting approach. Using a one-page contract and a small-dollar contracting mechanism that can “pay-in-a-day”, we invited small businesses to pitch their ideas to the Air Force on March 6th and 7th. Of the 407 proposals received, we invited 59 companies to NYC to pitch their proposals. We were able to awarded 51 contracts valued at \$8.75 million, with \$3.5 million awarded that day within 3 to 15 minutes. The week before Pitch Day we also held a Contracting Sprint, 25 February through 1 March, awarding 183 contracts and continuing to prove the concept of rapidly awarding contracts. Overall, this shows that we are able to move faster and smarter by awarding 242 Small Business Innovation Research contracts valued at \$75 million in the span of less than two weeks and expanding working relationships with startup companies and small businesses.

Based on the success, we plan to repeat Pitch Days to increase Air Force access to a broader demographic of small disruptive companies revolutionizing U.S. and global technology industries. As we move into the future of building our Air Force for the future faster and smarter, the Fiscal Year 2020 President’s Budget that has been submitted for your consideration is the avenue for us to fund the critical programs and initiatives to get there.

We want to give credit and thanks to Congress. Without the Rapid Acquisition Authorities there would still be a half-century worth of unnecessary time in 20 of our programs that are using the new authorities in section 804 to develop and field faster. Additionally, we appreciate the delegation of Milestone Decision Authority to the Service Acquisition Executive; we have subsequently delegated all medium and small programs to the field, increasing overall decision-making capacity and speed. Because of Congressional action, we can focus on performance—rather than process—in our rapid capability development efforts.

We have many other initiatives that will commence later this year, all centered speeding our process to remain competitive for tomorrow’s airmen as we remain dominant for today’s. There will be no silver medal for building the world’s second-best Air Force. We hope the steps we have taken with the authorities you have given us demonstrate that we do not intend to.

Senator COTTON. General Fay, General Robinson, any remarks?  
Lieutenant General FAY. No, sir.

Senator COTTON. Thank you.

One issue on which both Senator King and I have worked in the past is the shortage of pilots. Why do we not start, General Robinson, there specifically on that shortage and pilot retention efforts over the last couple years and where we stand?

Major General ROBINSON. Thank you, Mr. Chairman.

Indeed, the Air Force has been focused on that very problem, as you alluded to. Where we stand today is we are increasing—there are three parts to the equation. It is producing pilots, seasoning or experiencing pilots to retain the experience, and then retaining the experienced pilots to the best that we can.

The area that we focus greatly on is the production, and that is increasing our goal to get our pilot production up to 1,480 pilots per year starting in fiscal year 2020. This year the glide path still continues to increase. In fiscal year 2019, we are on track to produce 1,211 pilots and on track for fiscal year 2020 for that 1,480.

Senator KING. Could you put those numbers in context? What were we producing 2 or 3 years ago or 5 years ago, for example?

Major General ROBINSON. Yes, sir.

Two or 3 years ago, we were down on the order of about 1,100 to 1,000, in that range, for production of pilots. Of course, the production for us is Active Duty, Guard, Reserve, as well as international allies and partners, and we have a small fraction of pilot training slots set aside for producing pilots for our able partners to do what we need to do in our missions globally.

The other part we focused on is the retention perspective. We have done things to revitalize the squadron much like General

Goldfein has talked about where we have reduced the administrative burden in the squadron by putting contractors in the squadron to take some of that burden off so that the pilots can focus on their primary missions.

Senator COTTON. Can you be more exact by what you mean by those administrative burdens?

Major General ROBINSON. We call those additional duties, so things like, for example, you would have somebody who is a mobility officer who tracks whether or not somebody is ready to deploy and mobilization requirements are met, training administration commander support staff, so looking at performance reports and awards and decorations in the administrative nature of the squadron. A lot of that has fallen on the Active Duty members to do over the past few years.

Senator COTTON. Basically any extra tasks besides flying a high-performance aircraft and blowing up the bad guys.

Major General ROBINSON. Yes, sir. We have taken some of that burden off.

The other thing we have done in terms of retention is we have reduced the number of 365-day deployments. We cut those significantly approximately in half, reduced those to 179 days or less, as well as increased the bonus. We have taken advantage of the authorities that Congress has given us with regard to the aviation bonus as well. The combat air forces last year were offered a \$35,000 bonus, the highest year, and based on what we see coming forward for mobility pilots in the next year or two, we are going to increase them as well to \$35,000 a year.

Senator COTTON. In return for how many years of service?

Major General ROBINSON. It can go out to 9 years. There is a scale that they can take to the maximum. What we have done with that from that perspective is that has arrested the decline particularly in the combat air forces in terms of the bonus take rate. We have come up 1 percent—or actually 9 percent up to 44 percent. The take rate, retention rate, if you will, for the rest of the Air Force is leveling off at 45 percent. Still short of our goal of 65, but it has at least arrested the decline.

Senator COTTON. Will the Air Force ever be able to match the compensation of what pilots can get in airlines or in other private aviation jobs?

Major General ROBINSON. No, sir, I do not believe we can do that. Those are substantial salaries.

Senator COTTON. Yes. I do not think we can either. I do not think Senator King thinks we can either. We can pay them well, and we can give them bonuses, which they deserve, but ultimately they joined the Air Force to serve and to fly those high-performance aircraft in defense of our Nation.

Major General ROBINSON. Yes, sir.

Senator COTTON. I am glad to hear that we are focusing on making sure they have the time to do that as opposed to being the admin duty clerk when they are back at their squadron.

Another aspect of this problem is the RPA [remotely piloted aircraft] Get Well Plan. Could you give us an update on where things stand there?

Major General ROBINSON. Yes, sir. On the RPA Get Well Plan, we are making quite a bit of headway there. In that respect, we have selected 87 aviators, if you will, for the enlisted pilot portion of that out of the 100. We are on track to make our 100 enlisted aviators this year for the RQ4 [the Northrop Grumman RQ-4 Hawk]. Then we will continue to assess their performance. Initial feedback is their performance is very, very well, and they have handled a number of in-flight emergencies, for example, flawlessly just like you would as any other aircrew member that is trained properly to do that job.

Senator COTTON. Thank you.

Senator King?

Senator KING. Thank you, Mr. Chairman.

For the past 25 years or more, when the Air Force has been presented with the option of buying additional fourth generation aircraft, F-15's or F-16's, the Air Force has always said no. We are going to wait for that fifth generation aircraft. Yet, this budget includes \$1.8 billion to buy eight F-15's in 2020 and a total of \$7.9 billion over the FYDP [Future Years Defense Program] to purchase a total of 80.

General Bunch, based on your personal and professional judgment, is buying more F-15's a sound decision?

Lieutenant General BUNCH. Sir, based on the situation we find ourselves in, we need both fourth and fifth gen aircraft to be able to execute our missions. We were counting on fourth gen aircraft such as the F-15E, the F-16, the A-10, as well as the F-15C to fly through the 2030s or deep into the 2030s. Our F-15C fleet is not going to make it.

Last year in our hearing, we talked about the cost of trying to accomplish a service life extension program on the platform, and that was something that we were going to have to look at. We have now looked at that and what it takes to modernize that capability up in an F-15C, and the determination we made was that was not what we needed to do. We made the determination to buy F-15EX's so that we could keep our readiness at a higher level and meet the capacity need that we had for those fourth generation platforms.

That is important from a readiness perspective because the time to transition from an F-15C to an F-15EX we estimate at 3 to 6 months, while the time to transition from an F-15C to an F-35 could be anywhere from 18 to 36 months and would require MILCON [Military Construction] and other attributes that are not in our budget.

Senator KING. Essentially you see the continuation of the F-16, F-15's as a gap filler as we transition to F-35. Is that accurate?

Lieutenant General BUNCH. It is sure, and what I want to make sure—and I should have started my statement with it. We are not backing off in any way, shape, or form from the F-35 program. We are fully committed to the program. We need it to serve as the quarterback as we try to penetrate anti-access/area denial areas. It has an unbelievable suite, and it is the only platform that can penetrate and do those missions. We have to have that platform. This is about filling a capacity need that our F-15C's are not going to be available for.

Senator KING. Do you have figures either today or could you give me for the record the comparable operating cost per hour of the two aircraft, the F-16 and the F-35?

Lieutenant General BUNCH. Sir, you want F-16 or do you want F-15EX?

Senator KING. I am sorry. F-15EX.

Lieutenant General BUNCH. Our current estimate right now is roughly \$29,000 per hour. That is based on an estimate out in the future for the F-15EX. And the estimate for the F-35 at that same time right now is \$44,000 per hour.

Senator KING. My question. How do we get the sustainment cost for the F-35 down so that it is affordable over time.

Lieutenant General BUNCH. Sir, it is a big focus of the Department. I will say it is something we are working with Ms. Lord's team, the Honorable McMahon, with the JPO [Joint Program Office], and with all the services to try to drive that down and with the contractor. We have set a goal. I heard the chief in his testimony last week say he wanted it under \$30,000 an hour. We actually want it "25 by 25" is the phraseology we are trying to use. I do not know that they can make that. What we want them to do is try to drive those costs down. We are trying to increase the amount of efforts that are going on at the squadron level that we do not have to involve the contractor with. We are trying to improve ALIS [Autonomic Logistics Information System] so the performance is better so that we do not have to ship parts back maybe that we do not need to, or we have a better status of what is going on with the platform. We are trying to stand up the organic depots quicker so that we can do the work internally. We have a multifaceted approach, as well as identifying the components that are the high failures ones and the high cost ones and putting action plans together to attack those to get those into the field in a timely manner to both drive down costs and increase mission capable rates.

Senator KING. I think you answered this in part in your answer, but what are the elements of that per hour cost?

Lieutenant General BUNCH. Sir, this is one where there are a lot of factors that play into it, and if you ask three people about cost per flying hour, you got to really make sure you are all talking about the exact specific things.

What I will do is I will take it for the record and give you exactly what we count in the dollar figure that we have, but it is additional people that are supporting. It is the spares. It is the parts. It is everything associated with operating that aircraft, and I want to make sure I give you the exact components that add up into it.

[The information referred to follows:]

Lieutenant General BUNCH. OSD CAPE estimates of Cost Per Flying Hour (CPFH) account for fixed and variable costs of manpower, operations, maintenance, sustaining support, and continuing systems improvement. For the fiscal year 2020 President's Budget, the \$44,000 F-35A CPFH is based on a \$50,000 fiscal year 2017 actual in fiscal year 2017 dollars, modified by applying real growth to non-fuel and non-MILPERS costs to account for inflation and an 85 percent learning curve to account for production improvements. The \$44,000 CPFH is an average across 2020 to 2035 in fiscal year 2020 dollars.

The \$29,000 F-15EX CPFH average is based on a curve that was informed by industry CPFH estimates and fiscal year 2018 F-15E actual CPFH escalated to fiscal year 2020 dollars (\$30,400).

Both F-35 and F-15EX estimates are based on 250 flight hours per aircraft per year.

Please note: other CPFH estimates may not contain the same elements and their dollars may be stated in years other than fiscal year 2020 dollars. For example, the F-35 Joint Program Office is required by statute to report cost figures in fiscal year 2012 dollars.

Senator KING. Well, your answer was very comprehensive. I take it from your answer there is a sense of urgency about this because if we are going to buy 1,700 of these airplanes, we are not going to be able to do anything but maintain them if we cannot bring that cost down.

Lieutenant General BUNCH. Sir, there is most definitely a sense of urgency in the Department, and we are having regular meetings to look at how we are executing the action plan. Cost is a big factor, sir, but I need the aircraft available and operating as well. It is a multi-pronged approach to get the most mission capability and combat capability that we can.

Senator KING. Sorry, Mr. Chairman. Can I follow up? I am a little over time.

In this calculation, there should be a calculation of incremental warfighting capability that we are buying. If we are paying more per hour, but the F-35 has capabilities that its predecessors did not have, I do not know how to calculate that dollars per lethality index. Do you see what I am driving at?

Lieutenant General BUNCH. I do understand what you are talking about, sir. We will tell you today there are missions that if you send a fourth gen and a fifth gen aircraft into the mission, the fourth gen is going to die. There are missions that we absolutely—

Senator KING. That is a high cost.

Lieutenant General BUNCH. That is a high cost. That is what we are looking at and the reason we are willing to pay more, but we need to get it down lower so that we can sustain the numbers that we have.

Senator KING. Thank you.

Thank you, Mr. Chairman.

Senator COTTON. One quick follow-up. Senator King referred to this F-15/F-35 issue as a gap filler. General Bunch, you stressed that the Air Force is not backing off the F-35. Is part of the reason that we have this gap now that we need to fill is that we did not acquire the number of F-22's that the Air Force had planned to?

Lieutenant General BUNCH. Sir, in the early 1990s, we planned to buy well over 600 F-22's.

Senator COTTON. We did not quite make it to 600. Did we?

Lieutenant General BUNCH. We did not make it there, sir. One hundred eighty-seven. That caused our F-15C fleet to have to last longer and go far beyond where we thought that would be flying in our inventory.

Senator COTTON. If there is any lesson to be learned from what we face today, it is looking back to that decision perhaps and playing it forward and saying we should get as many of these F-35's as quickly as we can in large numbers that we can.

Lieutenant General BUNCH. We do need to get them quickly, but I also need to—

Senator COTTON. Senator Jones?

Senator JONES. Thank you, Mr. Chairman.

I hate to continue to follow up on the F-15 issue, but as you can see, it is pretty important to folks. What I am curious about is just logistically. If we purchase new F-15's, are they going to be housed and based at bases instead of F-35's? I mean, those have been designated. We are putting them in place. Obviously, Dannelly Field has been designated. Is that something we need to worry about?

Lieutenant General BUNCH. Sir, we are buying F-15EX's to replace the F-15C fleet. We will go through the strategic basing process to determine where we do that. Why that is so important for us is, as we understand it right now, 90 percent of the support equipment is the same for an F-15EX as it is for an F-15C. Seventy to 80 percent of the parts and components are the same. I do not have to do MILCON. There are a lot of variables that play into that, but right now, we are looking at the F-15EX's going to the bases that we already have F-15's.

Senator JONES. Okay, great. Well, thank you for that.

There is an unfunded line item for somewhere between 200 and 320 personnel to better manage the military family housing programs at 63 bases. Based on the information we have received not only at the committee, but certainly in our personal offices, as well as these two hearings that we have held, we all agree we got to do something to improve the programs for military housing. I am really happy to see that we are trying to do it.

Would these additional personnel that you are talking about be civilian or contractor, and what exactly would these personnel do to improve the management of the housing programs? General Fay, do you want to take that one?

Lieutenant General FAY. Sir, I think we are going to have to take that one for the record. I know that our IE [Installations, Environment, and Energy] experts are the ones working that issue right now. I know probably the most important aspect they are working right now is the bill of rights that we are working for all of our military tenants on our military bases to make sure there is clear understanding among all parties involved of what the responsibilities and the rights are and how those relationships work. But as far as exactly what is the composition of those personnel, we will have to get you an answer.

[The information referred to follows:]

Lieutenant General FAY. The Air Force's fiscal year 2020 unfunded request for \$31.2 million is to support additional manpower to perform enhanced Military Housing Privatization Initiative (MHPI) project oversight and ensure our military families are provided safe and quality homes. The exact number of personnel is still being determined. The additional personnel will primarily be civilian employees and will restore housing offices to optimum staffing levels. Contractor positions will only be used to supplement short term requirements. The additional personnel will enable more comprehensive oversight of work performed on homes during emergency and routine maintenance. Personnel will be trained to inspect homes for life, health, safety deficiencies and code compliance and to follow through until the quality of work is satisfactory and complete. A dedicated resident advocate position is also planned to assist residents with unresolved issues, lead resident council groups, and to educate residents on their tenant rights.

Senator JONES. You are just anticipating, which is fine.

Lieutenant General BUNCH. I cannot tell you exactly. I can tell you that taking care of our families and making sure we have that

right is very critical, and we are taking the steps we need to to get at that.

Senator JONES. Great. Well, I know that that is somewhat of a work in progress, especially after all that has come to light in the last few months. All I would ask is that—you know, we have got two or three places in Alabama that have had some issues, and if you would just please stay in touch with us and keep us advised of the progress on all those issues, I would very much appreciate it.

Lieutenant General BUNCH. Yes, sir.

Senator JONES. I will yield remainder of my time, Mr. Chairman. Thank you.

Senator COTTON. Thank you.

Let us go to some bigger picture items and then maybe we will turn back to some specific programmatic matters.

General Fay, the Department's overall budget request—Department of Defense—is still less than the recommended level of funding growth by the National Defense Strategy Commission. I understand that the Air Force, like the other services, had to make some tough choices. Can you tell us, given these constraints, where you see the most risk in your Department's budget request?

Lieutenant General FAY. Mr. Chairman, thank you.

Essentially what we have seen and what we have heard from some of the other folks that have testified is 3 to 5 percent is what we need to do to be able to modernize and maintain the readiness of the force. Three percent above inflation is roughly what it takes to help us start getting at the readiness issues that we have had, with 5 percent roughly above inflation of about what it would take for us to be able to get after the modernization.

I think that kind of addresses where we are taking the most risk in the Department. We are always in that balance, if you will, between readiness, modernization, and capacity. I think we have already heard some of those tensions in the testimony today. We are always working to keep that force lethal and ready, which is number one because we have to be ready to go to war tonight, ready to fight tonight. We are working very hard on recovering readiness right now. I think you see that we have done a great job with our pacing units, and we have knocked 6 years off our readiness recovery in a number of those units. The modernization is absolutely demanded based on the security environment that we are operating on. We need to get after fifth generation modernization, and we need B-21's, F-35's, KC-46's to be able to ensure that we maintain our superiority over our potential adversaries. At the same time, we cannot shrink because we have a certain capacity that is required to meet the demands of the warfighter and to meet the demands required in the future. All of those tensions I would say is where we continually take risk in our budget.

Senator COTTON. Looking to fiscal year 2020, last week I had a similar conversation with the Secretary and the Chief. Some of the testimony we have heard here we heard last week was couched in terms of return to sequestration. I think it is highly unlikely given what we have seen over the last 6 years of stop and start budgeting practices and getting 2-year agreements to lift the budget caps and then pass spending bills.

I want to probe a little more deeply and you can go in more detail perhaps than we were able to last week about a different scenario, one that we have not seen but some in Congress are starting to propose, which would be a full year continuing resolution (CR), the thinking by those proponents being that, well, you know, the Department of Defense has had 2 years of large top line budget increases and spending bills that allow them to reset their priorities. They should be able to live with a full-year continuing resolution.

Could you explain to the committee why that might pose risk to the Air Force?

Lieutenant General FAY. Mr. Chairman, there is essentially a significant impact on us if we are under a continuing resolution. Essentially the two big impacts are we are not able to do any sort of new start program and there are also military construction impacts on us.

Specifically, if we were under a CR for approximately a 6-month period, there would be at least 16 new mission MILCON projects that would not happen. There would be another 18 military construction projects underway that would not happen. We did a rough look, and if it was a 6-month CR, you would be looking at 89 programs that would not be able to start. Those are things like our next generation GPS [global positioning system]. They are F-22 modifications. They are F-35 modifications, very important required warfighter requirements. Our readiness gains would begin to eek out, and then we would also anticipate our desired growth of the 4,400 airmen that we were looking for in the 2020 budget would not happen. Sir, those are real specifics.

Now, sir, if it goes all the way to a year and we hit sequestration, you heard the Secretary and the Chief testify to the draconian impact that would have on us if we hit those BCA caps. You are talking about things—in rough order of magnitude, \$29 billion, four times what we had during the last sequester. Our entire military personnel account is \$31 billion for an order of magnitude on how gigantic that is. We would have to do things like make a decision to stop flying, not just a little, but all. Our entire flying in our program is \$6.1 billion. Stop fixing all of our aircraft. Our entire weapon systems sustainment account is \$15 billion. All base operations, all airfield operations, all munitions stop.

Or you could trade all science and technology, all procurement on such things as B-21's, KC-46's, F-35's, next generation air dominance, all of our space investment would be gone, and all our fourth and fifth generation modifications.

If we get to BCA, sir, draconian, bad on CR, very frustrating to get anything done and to advance the ball in lethality and readiness, modernization, and doing things faster and smarter.

Senator COTTON. Thank you, General Fay.

General Bunch, one final question along these lines. Can you tell us why the Air Force UPL [unfunded priority list] is more than a billion dollars than it was last year despite the top line growth?

Lieutenant General BUNCH. Sir, thank you for that question.

We had not finished our Air Force We Need analysis when we concluded our budget. That was a factor that played into it. That analysis, of course, supported the fact that we needed to get to 386 operational squadrons.

The unfunded priority list that the Chief provided gives Congress the option to jump start us and accelerates toward building to that Air Force we need by allowing us to buy additional fighter and air refueling capability. Those are two of the ones that must increase in the Air Force We Need analysis.

The other part that is in our unfunded priority list is \$579 million to recover readiness losses if we are unable to get a supplemental to support Tyndall and Offutt. Right now, we are cash flowing that so we can keep those efforts going forward. We will have to take it out of somewhere, and those will be readiness things we will not be able to get at.

Senator COTTON. That is a result of a stalled disaster supplemental spending bill. Correct?

Lieutenant General BUNCH. Yes, sir.

Senator COTTON. Thank you.

Senator King?

Senator KING. Thank you.

If someone comes up to me on the street who is mildly knowledgeable and says, what are we getting for this F-35, this program has had a lot of overruns, it has taken a long time, what do you the pilots think of it, and is it really worth the extra money? Maine people are very practical. That is a question I am liable to get.

Lieutenant General FAY. Ranking Member King, what I would do is I would refer you to talk to the pilots that are flying the aircraft and operating the aircraft. The results that we are getting back from those that are operating the aircraft is the aircraft is absolutely phenomenal, that it gives them situational awareness that they do not [otherwise have]. It allows them to act as a quarterback for the rest of what I will say is the traditional force. What I mean by that is because the F-35 has such phenomenal situational awareness and understanding, they are able to share that with other platforms that do not have the same ability that the F-35 has. That makes them more lethal and more able to operate in combat. We have seen just fantastic performances coming out of high-end combat training exercises, our Red Flags.

I will give credit to the Marine Corps and refer you to them. They have actually seen their first combat deployment with the F-35B that they fly. We have some feedback from them that would be appropriate for another forum.

But overall what I would say is performance of the aircraft, when it is operating, is really second to none.

Senator KING. This is from the pilots themselves.

Lieutenant General FAY. Sir, that is from the operators, the pilots flying the airplanes, operating the aircraft, the units that are prepared to employ them.

Lieutenant General BUNCH. Sir, if I can add on that. Everything that Tim just said is everything I am hearing not only from them but from partners that are flying the aircraft. We are hearing nothing but phenomenal things and about how it is so much more situational awareness with that platform. They are changing how they report defense things. I mean, it is just completely different. It is a game-changer for everybody involved.

The piece that I do want to kind of add into this is, but we have to keep modernizing it to get after the threat. We have funded the

C2D2 [continuous capability development and delivery] effort to keep the software going. We are doing things like adding the agile software development to get capabilities out into the field quicker. One of those, Auto GCAS [Automated Ground Collision Avoidance System]—we have pulled that to the left. We think we will start fielding that this summer. The last estimate I had was June. We can get that. That is 4 years earlier than we had originally planned. But we got to get at continuing to develop it and to continue to develop those capabilities to get at where we see the threat coming in 2025.

Senator KING. I take it that the underlying design is built for modernization. We do not have to build a sixth generation in order to upgrade the capabilities of the fifth generation.

Lieutenant General BUNCH. Sir, we need to invest in both. The fifth gen is critical for what we are trying to do, and we can continue it and it will be a part of what we do far out into the future. But we also must continue to invest in technologies that would take us to that next level as we see those threats evolving.

Senator KING. Well, my question is, is the F-35 designed in such a way that changes can be made incrementally without fundamentally altering the platform?

Lieutenant General BUNCH. I apologize, sir. I did not understand your question.

Yes, we can. One of the upgrades we are going to do is add more computing power to it so that it can do more things in the future. We can incrementally add the software and we have got a roadmap laid out for all of our partners and the United States to go far out into the future for what we need the platform to be able to do without changing any of the outer mold lines or anything else.

Senator KING. Let me change the subject. You are using the 804 authorities in a variety of ways. I supported those. Senator McCain certainly did. But you have a budget request for the next generation overhead persistent infrared, OPIR, at \$1.4 billion, replace the space-based infrared, the SBIRS, and you are going to use 804 programs.

Given the history of the SBIRS, which was Nunn-McCurdy breaches, long lead times, a lot of extra money, do you really think that this project is suitable for 804 authority?

Here is why I am asking the question. I do not want a disaster that undermines the political support for the 804 authority.

Lieutenant General BUNCH. Sir, it is a fair question. When Dr. Roper reviewed and we reviewed the program, we felt that it was. We had a common bus that we could utilize. We were trying to meet an urgent JROC [Joint Requirements Oversight Council] requirement to have a capability on orbit in 2025. That is what the program was established to be able to go do. We are trying to pull it left. The team has gone through independent tech assessments within the Air Force. The team has already got contractors on contract to move forward to do the work. They are already starting to do the risk reduction, and we are already starting to design our prototype payloads. That is the real advantage of the 804 efforts is that we can get the prototyping and do some of that hardware stuff before we would normally have been able to go through all those acquisition processes.

Senator KING. Well, you understand my concern.

Lieutenant General BUNCH. Yes, sir.

Senator KING. Do not screw it up.

[Laughter.]

Lieutenant General BUNCH. Sir, the commitment that we have is that we are utilizing the 804 authorities more than the other services. Our words are "speed with discipline." We need to be as good or better on the 804 programs as we are on the traditional programs so that we do not lose the confidence of the Congress that we can execute, and we must be transparent with you when we run into issues.

Senator KING. One final question on this subject. I also serve on the Committee on Intelligence. A sort of dumb question. Why is NRO [National Reconnaissance Office] not doing this? Why does the Air Force have to design its own satellites when we have got a whole agency that does nothing but design satellites?

Lieutenant General BUNCH. Sir, I can take that one. I think we do them both for different mission sets, and we work as partners and we are actually working some where we are doing the acquisition together to get at different mission areas.

Senator KING. I would like you to give me an answer for the record on that.

Lieutenant General BUNCH. Yes, sir.

[The information referred to follows:]

Lieutenant General BUNCH. Driven from U.S. Strategic Command requirements, the Air Force provides capabilities for inherently warfighting purposes. Strategic missile warning, a key enabler of nuclear deterrence, provides timely warning of strategic and theater ballistic missile attacks. This mission area is the foundation of the nation's missile defense system as it provides the initial indications and warnings needed to identify, track, and protect against a missile attack. Other examples of mission areas for which the Air Force provides warfighting capabilities are missile warning, space control, and positioning, navigation, and timing.

Warfighting capabilities are delivered by the Department of Defense under authorities provided by title 10 of the U.S. Code. The NRO, a member organization of the Intelligence Community, is focused on building satellites to provide intelligence data and operates under authorities provided by title 50 of the U.S. Code.

Senator KING. Thank you, Mr. Chairman.

Senator COTTON. Senator Scott?

Senator SCOTT. First, thanks for your service. Thanks for all your commitments to Florida. You got a lot of assets in Florida.

Can you let me know where you think we are on rebuilding Tyndall and then after that, talk about the movement of the F-22's from Eglin?

Lieutenant General FAY. Sir, where I think we are on building at Tyndall right now is—I think you heard the testimony from the Secretary last week—is based on the fact that we have not been able to get a supplemental, we are coming up to some very difficult decisions that she is going to have to make in the very near future about whether we can continue with Tyndall's recovery or whether we are going to have to pause.

Senator SCOTT. You just take it out of other—

Lieutenant General FAY. Sir, that is all we are doing is we are cash flowing it from other accounts. Right now, there are other projects in other States that are not being accomplished because of what we are cash flowing and kind of betting on with a supplemental to get us to that recovery point with Tyndall.

Sir, I would offer the same for Offutt Air Force Base in Nebraska. We are in the same situation for both bases.

Senator SCOTT. That was with the flooding just recently?

Lieutenant General FAY. Yes, sir, the significant flooding that hit them as well. In addition to the very difficult time we had at Tyndall with over 95 percent of our facilities being damaged during that hurricane, we had a significant amount of our base at Offutt under water here very recently.

Senator SCOTT. How hard is it going to be if we do not get the disaster bill done? I do not think Offutt is even in Senator Shelby's bill. Right?

Lieutenant General FAY. Sir, I cannot speak to what is in the bill.

Senator SCOTT. I do not think it is because it happened afterwards.

But take Tyndall as an example. What if you have to stop and restart? Is that going to cost a lot more money?

Lieutenant General FAY. Sir, I cannot say for sure what it will cost money-wise, but I can tell you it will cause disruption. It will be difficult on mission. It will be difficult on people, and certainly it is going to break some things across the Air Force. I believe the Secretary has testified even further that if we are unable to get a supplemental going further into the summer and then into the fall, that she is going to have to make decisions that could impact readiness and maintenance and flying as well. Some very tough decisions for her or her successor are coming if we are unable to do the supplemental.

Senator SCOTT. Do you want to explain the F-22 decision and the impact that will have on—I know the impact it will have on Florida, but just overall. What was the thought process of that?

Lieutenant General FAY. Sir, I think what we can talk to on the F-22 is—and when we took a look at kind of looking at a max effectiveness, a max efficiency laydown for the airplane—and I think the Government Accountability Office also took a look at this about kind of what would that look like so we could capitalize on things like our simulators, our training ranges, maximizing our maintenance, and recovering—and certainly our low observable facilities were an important consideration in that and some of the other specialized equipment we need for the F-22—we kind of took a look at a decision on where we could base those based on what happened at Tyndall to maximize efficiency and effectiveness.

Senator SCOTT. Is there a similar training range like in the eastern Gulf? Is there a similar training range off of Virginia's coast, or do they still have to go down to Florida to do their training?

Lieutenant General FAY. Sir, I actually cannot answer that question. I can take that for the record. I know there are training ranges off the Virginia coast where our F-22's execute and train every single day. I do not know whether one is larger than the other.

But I will tell you that that range off the coast of Florida is actually a very important range to us. "National treasure" is the word we often use because we do a lot of good tests there. That is a unique range for a lot of reasons, and "national treasure" is the best terminology we could call it.

Senator SCOTT. Is it important that we continue to take the eastern Gulf off of any chance of doing any oil drilling for the military?

Lieutenant General FAY. Sir, again, I cannot speak to oil drilling. I would have to probably circle back for the record on that as well. [The information referred to follows:]

Lieutenant General FAY. The specific Special Use Airspace in the eastern Gulf of Mexico, historically used by the F-22s, is Warning Areas W-151 and W-470. Likewise, there are numerous Warning Areas off the eastern coast of the United States, similar in volume and attributes, proximately scheduled by both Air Force and Navy units. Of particular note is Warning Area W-386 off the coast of Virginia, Maryland and Delaware, scheduled by the U.S. Navy, Fleet Area Control and Surveillance Facility, Virginia Capes. Through local agreement and with the exception of high priority Navy taskings, the F-22 from Joint Base Langley-Eustice have almost exclusive use of this Special Use Airspace.

Lieutenant General BUNCH. As a former test center commander who the Eglin range fell under as the commander, that range is a national treasure. There are unique things we can do only in that range with that water space and the ability to freely operate. It is one that we would like to be consulted on if a decision is made to change away from the lines that are there. I would encourage us to be allowed to be part of that conversation so that the overall impacts to what we are doing from a test and training perspective are considered as we make a final decision.

Senator SCOTT. Thank you.

Senator COTTON. Senator Blumenthal?

Senator BLUMENTHAL. Thanks, Mr. Chairman.

I know there has been some fairly extensive discussion of the F-35. I want to focus on a question that I think so far has not been asked. My understanding is that the Air Force is working with industry on a program called Adaptive Engine Transition Program, AETP. You are familiar with it. The goal is to develop a next generation engine for the Air Force variant of the F-35 and other future fighter aircraft. We are implementing the F-35 and already thinking about the next generation of engine, which is a good thing. Senator King has asked about the improvements that can be made to the F-35 as it is produced. This area may be one.

The baseline improvement threshold for the fighter aircraft air-line is a 10 percent increase in thrust I believe and a 25 percent increase in fuel efficiency. Once fielded, this increased capability will have a cascading positive impact, very importantly, that allows for longer missions and greater standoff from threats for refueling tankers.

It is important that the Air Force gives industry the clarity it needs for the future of this program to allow for proper planning and investment in this vital next gen technology. Being from the State where Pratt Whitney produces engines, I am very interested in your thoughts about the funding for this program because I understand it is going to expire fairly soon. Am I right about that?

Lieutenant General BUNCH. Sir, I am not aware that it is going to expire. What I will say is it is a critical program that goes to a new generation of engines to provide the thrust that you discussed and much greater fuel efficiency so we could go farther with the aircraft or we could reduce the tanker footprint to support operations. It is one that as we have done it with the two contractors that we have equally funded to go forward on the program or we

have funded to go on the program, that we are doing mission analysis as to what the impacts of that is on the overall force structure and whatever else it may change.

It is a program right now that we are in debate about how we go forward on. That is a discussion that is going on within the Air Force. Where we are right now is they are building production representative engines and we are running them in the tunnels for a great deal of time so that we get the right data.

The other part we are looking at on those is looking at whether we can scale those engines up or down so that we could utilize them in other areas.

Senator BLUMENTHAL. Utilize on other planes, other type of aircraft?

Lieutenant General BUNCH. Yes, sir, because if I can scale it up or down and I get the same performance, then I may be able to get other improvements. Now, that would take time to get a production line set up because what we have been focused on is building something that would go into an F-35 if we wanted to go there.

Right now, it is a ground run, and we have got both contractors funded to complete that. The Department is looking at having further discussions about how we take or what the next step we take forward is. But it is critical technology that the companies are working on to keep us with a tech advantage against our potential adversaries.

Senator BLUMENTHAL. Does it have an expiration date?

Lieutenant General BUNCH. Sir, I have had the team in and briefed me within the last 2 months multiple times. I am not aware that they are running at an expiration of funds, but I will take it for the record to go back and I will get back to you. If that is an issue, that is not one that I am aware of at this time.

Senator BLUMENTHAL. If you could, just let me know.

Lieutenant General BUNCH. Yes, sir. We will make sure we get you the right information.

[The information referred to follows:]

Lieutenant General BUNCH. There are no funds currently being executed in the Adaptive Engine Transition Program (AETP) that are set to expire.

The AETP prototyping effort is scheduled to successfully demonstrate the adaptive architecture's ability to achieve significant gains in fuel efficiency, thrust, and thermal management at the completion of the prototyping effort in fiscal year 2021. Therefore, the fiscal year 2020 President's Budget does not currently show any funding beyond fiscal year 2021 for AETP in Program Element 0604004F, Advanced Engine Development.

The Air Force is reviewing potential follow-on efforts that will most appropriately leverage this revolutionary new technology to include a potential F-35 engine upgrade as well as other potential air platforms.

Senator BLUMENTHAL. The other question I wanted to ask in the brief time I have left is the personal protective equipment and gear training for females in the Air Force. The 2018 annual report issued by the Defense Advisory Committee on Women in the Services, as you know, recommended the Secretary of Defense require all of the services to provide women in the Air Force and all the other services with gender-appropriate properly fitting personal protective equipment and gear for training and operational use.

When I asked the Army acquisition corps, Lieutenant General Ostrowski about this issue, he said that the Army has already

made adjustments in its gear and its equipment and other relevant body armor and so forth.

Perhaps you can describe for us what the state of your work is on that issue.

Major General ROBINSON. Senator, thank you for that question. I will take a first stab at answering that.

The truth of the matter is the Air Force has been very, very focused on that. Our Human Performance Program Office assessment has been looking at this for well over a year. The focus so far has been on aircrew flight equipment primarily, and we have looked at how do we produce more aptly suited flight suits, survival gear, as well as parachute restraining harnesses, and even ejection seats that are more amenable to both genders in terms of comfort and to reduce stress on the persons themselves.

We have also looked at flight helmets, aircrew flight equipment and helmets, and make sure they fit appropriately for the different skull sizes and the comfort factors there, as well as different urinary devices, if you will, for those long, extended over war to fight so that they can take care of the biological needs as well, much in the same manner as the male gender can.

The Vice Chief of Staff has recently asked us to focus on the defender force the security forces, to your point about what we call battle rattle or body armor to make sure that all the gear that they have to wear on the ground forces and that role is also looked at. He has actually put us on task to take a good, hard look at that. That is just recently in the last about 3 weeks or so.

Lieutenant General BUNCH. The other piece that I will add to that, sir, because it is so important is we are increasing our education and our communication to make sure that everyone understands what is out there.

We are also increasing our training of our life support technicians and everybody because that is not something that they as up [to date] as we needed them to be. We are changing that.

The other one that we are doing, in an attempt to get additional feedback, is we just recently funded the development of an app that we can put out so that our female aviators can give direct feedback to issues they want looked at so that we can try to get at it more rapidly and aggressively.

We had a group out at AFWERX within the last 2 months where we had a big study and had brought a bunch of aviators in to get at what problems we needed to be trying to tackle.

As General Robinson said, we are now focused on defenders. We have got a team that is standing up right now. What we have done within the acquisition group, within the acquisition team is we have designated a program executive officer to be the lead for that. We have a lead MAJCOM [major command] that is going to come forward this year with a POM [Program Objective Memorandum] input, and we are trying to get at it so that we put the right level of focus on that. We are making sure that it gets the appropriate funding as the Chief has asked us to do to ensure that it is looked at as the budget is closed so that we are getting the proper amount of funding into those areas.

Senator BLUMENTHAL. Thank you very much.

Thanks, Mr. Chairman.

Senator COTTON. Senator King?

Senator KING. A quick update on two projects. KC-46. Where are we with the debris problem, with who is paying for what, and when are we going to be fielding these airplanes?

Lieutenant General BUNCH. Sir, I will start with the thought. We have not started accepting aircraft yet. We did stop, and we are not accepting aircraft at this time. We are in the discussions as to when that will start back up. We think late this month, but I am not going to go to a specific date. We have meetings with Boeing on a regular basis and the Defense Contract Management Agency to make sure that we are doing the right steps to measure performance. We have asked for corrective action plans that go through what steps are going to be taken to reduce that, and then we are going to measure the success against that over time so that we determine where we are at. We are actually opening up sealed areas that were sealed before and doing further inspections. We are seeing progress, but we are not ready to start accepting aircraft yet. That is the first question that I think you asked.

Senator KING. Is Boeing being cooperative and forthcoming on this process?

Lieutenant General BUNCH. Boeing is being very cooperative and very forthcoming with what we are doing into this area and it is increasing its work to do these inspections. But they readily admit they need to do this. We are not having any issues in that area whatsoever, sir.

Senator KING. Good.

Finally, as I mentioned, Senator Cotton and I had a briefing on the B-21 back in February. But what can you tell us in an open setting about progress, whether you feel the contract is being adequately monitored, progress is being made? Are we on the right track, no surprises coming?

Lieutenant General BUNCH. Sir, I am very confident in how the program is proceeding at this time. We are still within our acquisition thresholds and baselines. It is executing the way we want. We got past critical design review. Our next major milestone is first flight. We are using concepts here.

You asked earlier about what are we doing to make sure we stay on cost and how we do this for the longer term to make sure we do not have problems. Open mission systems that we have got is a standard in there, open architecture. We are doing model-based systems engineering. We have brought the warfighter in early to make sure we are getting the right inputs in. We are, I will tell you, actively managing the program from a senior leader perspective with visits and dialogues with industry to ensure that we know exactly where they are at on the program and what issues they are having. We are still making great progress, sir. I am very comfortable with where we are right now.

Senator KING. Thank you.

Thank you, Mr. Chairman.

Senator COTTON. Thank you.

I am glad that we touched on the B-21. We mentioned earlier the F-22 and how we planned 600 and we ended up with 187. I think on the B-2 we planned 80 and ended up with 21. Not good performance.

Senator King and I will probably continue to have those classified settings, for your information, once a year, once every 6 months to ensure the program is where we want it to be. General Bunch, you look like you have a comment.

Lieutenant General BUNCH. Sir, we welcome the opportunity to come talk about the program with you or any of the staff.

Senator COTTON. Thank you.

Let me follow up on the KC-46. Actually before I do that, let me just touch on another bomber for the old bomber pilots.

The Air Force is going to extend the life of the B-52 out to the 2040s I believe. That is a pretty old aircraft already. General Bunch, can you tell your airmen that that aircraft is not older than you. Is it?

Lieutenant General BUNCH. Sir, I actually got a note on that, and I am afraid I am a little bit older than it.

Senator COTTON. Surely not. I know we have a lot of Senators that are older than that airplane. Sorry. Stepping on toes here.

[Laughter.]

Senator COTTON. But I would say if it ain't broke, don't fix it. It still fills a lot of capability requirements that we have.

But could you explain why the B-52 will be in use out for another 20-plus years if the B-1 and B-2, much younger aircraft, will not?

Lieutenant General FAY. Sir, the good news is I am actually younger than the B-52.

Senator COTTON. Your airmen will be shocked to hear that.

Lieutenant General FAY. I know. With the hair, I get that sometimes, Mr. Chairman.

Senator COTTON. It is your airmen who probably gave you that hair.

Lieutenant General FAY. Yes, sir. As a B-52 guy, I can tell you I absolutely love the airplane, a great airplane for America.

Its modernization plan is on track. We have taken a look at all the things that we need to modernize. The engines are obviously something that folks are talking about a lot right now as we move into that program aggressively to make sure that we have got good engines on it that are fuel efficient and easy to maintain and operate. We are also going to replace the radar. We are doing some work on the avionics to get them up to 21st century standards, and we are also working on some of the weapons capability that the airplane has to be able to employ with.

Overall, it is a pretty good refresh for the airplane. The service life of the airframe has got a long ways to run. You said 2040, and we actually could say 2050 based on kind of where we think we are at now. I will tell you that our maintainers are doing a fantastic job and our sustainers, making sure that that airplane is in good shape and able to operate.

At the end of the day, this is about combat capability for the warfighter. Its capacity, its diversity, its range, its payload are a unique combination that make us probably have at least 75 of them in the fleet for a long time to come.

Senator COTTON. If Lieutenant General Fay were Lieutenant Fay again today, you would be very excited about continuing to fly the B-52?

Lieutenant General FAY. Sir, I would trade tomorrow my desk in the Pentagon for the right seat of a B-52 any day of the week.

Senator COTTON. Okay.

Back to what Senator King was talking about on the KC-46. The buy was reduced this year by three. I believe that was from 15 to 12. General Bunch, can you explain that?

Lieutenant General BUNCH. It was, sir. We weighed it out. As we got to the end, we got three additional last year from Congress, and we thank you very much for that. What we got ourselves in a situation here based on priorities and what we needed. We took it for other higher priorities. We took three out of the budget, and we did that in 2022 and 2023 as well.

Senator COTTON. Either for General Bunch or General Fay, let us talk about light attack. This is a saga going back now over 10 years. It seemed like last year the Air Force was on the cusp of procuring a fleet of light attack, and it appears this year it has been rescoped and changed. Can we get an explanation of that and what is going on?

Lieutenant General FAY. Yes, Mr. Chairman. Again, thank you for the authorities that allowed us to do that because I think what our Chief would tell you and I think what he has testified to is the fact that we are able to do that experiment, that we were able to move rapidly and move out was exactly what we think the intent of the 804 authorities was.

We moved out on that with an eye on our allies' and partners' line of effort and our National Defense Strategy. We were looking for ways to include them in our counter violent extremist organization fight globally. This was one of the ways we wanted to get after it. I will say that one of the good lessons learned that we took out of that that we are applying today already is the network, the fact that we are able to take those airplanes and with technology that we can export to any partner or ally, connect them in a way that makes them part of the network in their country or to connect to the larger network, if you will, in this counter violent extremist organization fight. That was one of the good things that we took out of our experiment.

Where we are going with that, based on what we have learned, is we are probably going to expand the scope of that experiment a little bit. We are going to take a look at some other potential platforms that we could use based on the needs of a wide variety of allies and partners. We are going to bring them under the tent, include them in the experiment, as well as the United States Marine Corps. In 2022, we are set up to make a decision about if we want to procure aircraft based on what we learn during that experiment. That is kind of our way forward.

Now, we are going to buy a small number of those aircraft this year from the original experiment—the two different types of aircraft. We are looking at taking those aircraft and putting them to use and, again, extending the experiment, learning what we can work with allies and partners to get after this.

Senator COTTON. Senator Blumenthal?

Senator BLUMENTHAL. Thank you, Mr. Chairman.

As a trial lawyer, I was taught never to ask a question when you have no idea what the answer is going to be, but I am going to do it.

The A-10. You know, there are advocates for the A-10. You know who you are. I would like to know from you what is the replacement for the A-10 in terms of its versatility in the kind of fights that we had in Afghanistan and Iraq where troops on the ground need that kind of air support in the midst of kinetic situations.

Lieutenant General BUNCH. Sir, let me start by telling you what it is not. It is light attack. Two different programs. Light attack in no way, shape, or form was ever intended to be a replacement for the A-10. There are some that have come out with that. They are separate and distinct. I want to be real clear that we are all good on that.

The second part is right now we are not planning on replacing the A-10 for an extended period of time. We got a new wing contract that is in source selection. We expect to award later this year. We are going to have options to buy—I am going to say it is up to 112. I may not have the number exactly right, but well over 100 based on how we see the force structure plan out long-term.

Right now, we are in operational test on the F-35 doing the comparative testing that Congress told us we needed to do between the F-35 and the A-10. Any decisions we would make on the A-10 we would not do till long after that, but right now we are planning on flying them into the 2030s.

Senator BLUMENTHAL. Planning on doing what?

Lieutenant General BUNCH. Flying the A-10's out into the 2030s. Yes, sir.

Senator BLUMENTHAL. Well, I am going to read the first sentence of your testimony on that. A-10 is an effective close air support platform for the current counter violent extremist organization fight. Does that mean we will not have an aircraft performing that mission for the next how many years?

Lieutenant General BUNCH. Sir, we can do that mission with a lot of platforms. The A-10 is very efficient and effective in that area, and that will be part of the considerations that we would make before we would decide if we wanted to change where we are going with our force structure, was how would we meet that need. The Chief has been really clear. We are 100 percent committed to close air support and what we do with our troops. We do it with a variety of different platforms. The A-10 is very effective and it will be something that we would consider. I will stop there so that the requirements guy can give you a better answer than me.

Lieutenant General FAY. Senator, I just want to clarify your question. If your question was are we going to continue to use the A-10 in the counter violent extremist organization fight, the answer is absolutely.

Senator BLUMENTHAL. But you will continue using it for that mission, but it is being phased out. Maybe I misheard or misinterpreted your response.

Lieutenant General BUNCH. Sir, I think I said we are going to fly it through the 2030s before we do any reduction.

Senator BLUMENTHAL. Are the numbers not diminishing in terms of what you have available?

Lieutenant General BUNCH. Because of the way the wing contract and the timing of that, we will start grounding aircraft in 2021, but we will stay above the number of fighter aircraft that Congress has told us we must. We will have to force manage our force structure to meet the numbers. But the part that we also will find out when we award this contract, is how quickly can we do this, how many are we going to have to ground. But we will actively manage the fleet to make sure that we meet our requirements for those units.

Senator BLUMENTHAL. I understand. Thank you. Sorry to be a bit dense there. Thank you.

Thanks, Mr. Chairman.

Senator COTTON. Gentlemen, thank you very much for your appearance today and thanks for your service to Nation.

This hearing is adjourned.

[Whereupon, at 4:08 p.m., the committee adjourned.]

[Questions for the record with answers supplied follow:]

#### QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

##### COMBAT EQUIPMENT

1. Senator BLUMENTHAL. Lieutenant General Bunch, can you provide any examples of improvements to flight gear and body armor you are fielding to improve fit and functionality for women?

Lieutenant General BUNCH. The Air Force is focused on female fitment integration. We are actively working programs to implement female-specific 2-piece flight suits, bladder relief devices, body armor carrier vests for female defenders, and ejections seats accommodating smaller-stature and lower weight individuals.

2. Senator BLUMENTHAL. Major General Robinson, a leading cause of injury among servicemembers is ill-fitting Personal Protective Equipment (PPE) and combat gear. Women disproportionately incur such injuries. What are you doing to ensure the next generation of combat equipment is better suited for women?

Major General ROBINSON. The Air Force is standing up Combat Ready Airman (CRA) as a single program office to develop, acquire, field and sustain standardized, integrated, and state of the art equipment for all airmen. We continue to work with sister services to develop common Organizational Clothing and Individual Equipment (OCIE) and PPE solutions that are specifically designed to meet unique female anthropometric requirements within its programs.

3. Senator BLUMENTHAL. Lieutenant General Bunch, in the past, there have been issues with getting new equipment to our servicemembers prior to deployments so they deploy with the same equipment used in training before deployment. This is critical to preventing injuries and ensuring readiness. As you develop this equipment, how will the Air Force ensure the new equipment is available not only for deployments, but also while conducting pre-deployment training stateside?

Lieutenant General BUNCH. The Air Force Materiel Command has taken steps to institute central management processes and practices for all mobility Individual Protective Equipment (IPE) warehoused within Logistics Readiness Squadrons/Individual Protective Equipment Elements. This will ensure all deployers have the required equipment for pre-deployment training and deployments by balancing inventory excesses and shortages amongst bases. The remaining shortages have been addressed by consolidating all funding requirements and coordinating a single comprehensive funding plan through Air Force Installation and Mission Support Center. The AF is also standing up Combat Ready Airman as a single program office to develop, acquire, field and sustain standardized, integrated, and state of the art equipment for all airmen. The intended result will be to not only ensure adequate inventory levels, but modernize IPE across the FYDP by leveraging and fielding new technologies that will be available to future deployers prior to deployment.

## C-130H MODERNIZATION

4. Senator BLUMENTHAL. Lieutenant General Bunch, can you provide any updates to the approval process since I wrote to Secretary Wilson on this issue?

Lieutenant General BUNCH. The NP2000 8-bladed propeller is a performance enhancing modification approved and currently funded for 44 total C-130H aircraft. Currently, 11 aircraft have had been modified with NP2000 propellers. The remaining 33 aircraft will begin NP2000 installations in June 2020. Since your letter, we have continued flight testing of the NP2000 propeller with other C-130H propulsion modifications all scheduled for completion Fall 2019. Data from this test and the accompanying analysis of performance information will inform Air Force leadership of composite propeller capabilities as a baseline for future decisions for the C-130H fleet.

5. Senator BLUMENTHAL. Lieutenant General Bunch, in light of the recent tragic events and the revelation that our Air Force C-130H aircrews face serious risk while flying the legacy propeller, what is the proposed timeline for installation of the NP-2000 propeller on the C-130Hs like the ones we have in Connecticut?

Lieutenant General BUNCH. Yes, the USAF supports additional Congressional appropriations for the purpose of increasing propeller production.

6. Senator BLUMENTHAL. Lieutenant General Bunch, I understand that Collins Aerospace is currently producing enough propellers for two aircraft per month. Due to the risk associated with the legacy propeller, would you support an increase to three or four aircraft per month if Congress appropriated additional funding to support the increased production costs?

Lieutenant General BUNCH. The Air Force does not consider the NP2000 upgrade to be a safety or efficiency upgrade. The NP2000 8-bladed propeller is a performance enhancing modification approved and currently funded for 44 total C-130H aircraft. Currently, 11 aircraft have had been modified with NP2000 propellers. The remaining 33 aircraft will begin NP2000 installations in June 2020. The Air Force continues flight testing of the NP2000 propeller with other C-130H propulsion modifications scheduled for completion in Fall 2019. Data from this test and the accompanying analysis of performance information will inform Air Force leadership of composite propeller capabilities as a baseline for future decisions for the C-130H fleet.

## AETP (ADAPTIVE ENGINE TRANSITION PROGRAM)

7. Senator BLUMENTHAL. Lieutenant General Bunch, can you provide an update on the program, are you confident that industry can meet your capability requirements?

Lieutenant General BUNCH. The Adaptive Engine Transition Program (AETP) is an fiscal year 2016-21 technology maturation/risk reduction prototyping effort to design, fabricate, and test the first-ever complete, flight-weight adaptive engines in preparation for next-generation propulsion system development for multiple combat aircraft.

The AETP prototyping effort is scheduled to successfully demonstrate the adaptive architecture's ability to achieve significant gains in fuel efficiency, thrust, and thermal management at the completion of the prototyping effort in fiscal year 2021.

We are confident that our industry partners will continue to meet milestones of this prototyping effort and will successfully complete all capability requirements.

8. Senator BLUMENTHAL. Lieutenant General Bunch, I understand the funding for this program is set to expire as soon as 2022. What is the future vision for this program past the F-35A engine replacement?

Lieutenant General BUNCH. The AETP prototyping effort is scheduled to successfully demonstrate the adaptive architecture's ability to achieve significant gains in fuel efficiency, thrust, and thermal management at the completion of the prototyping effort in fiscal year 2021. Therefore, the fiscal year 2020 President's Budget does not currently show any funding beyond fiscal year 2021 for AETP in Program Element 0604004F, Advanced Engine Development.

The Air Force is reviewing potential follow-on efforts that will most appropriately leverage this revolutionary new technology to include a potential F-35 engine upgrade as well as other potential air platforms.

9. Senator BLUMENTHAL. Lieutenant General Bunch, is there any potential to down select to one industry partner in 2022 after the Option 1 active engine control review (ACR)?

Lieutenant General BUNCH. The AETP prototyping effort has been designed with multiple potential transition paths. There is a potential to down select to a single industry partner for the F-35 application after the Adaptive Engine Requirements Document Compatibility Review (ACR). The Air Force values a robust industrial base with multiple industry partners to ensure the continued development of this revolutionary new technology.

The potential to continue with multiple industry partners for the F-35 application will need to be weighed against fiscal requirements as the Air Force plans for potential follow-on efforts.

10. Senator BLUMENTHAL. Lieutenant General Bunch, this next generation engine technology has applications beyond just the Air Force. Is the next generation F-35 engine you are testing potentially compatible with the Carrier variant of the F-35?

Lieutenant General BUNCH. The AETP prototyping effort will result in the first-ever complete, flight-weight adaptive engine prototypes that have gone through design, fabrication, and testing for an F-35A. While the engine prototypes have been specifically designed for the F-35A, the engine prototype will require only minimal modifications to enable integration into the F-35C.

11. Senator BLUMENTHAL. Lieutenant General Bunch, have you coordinated or discussed this program with the Navy and Marine Corps to determine if you can achieve an economy of effort in fielding the next-generation fighter engine?

Lieutenant General BUNCH. Yes. The Air Force has ongoing discussions with our sister services and OSD to determine the most appropriate level of collaboration to successfully transition this revolutionary new technology.

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QUESTIONS SUBMITTED BY SENATOR ELIZABETH WARREN

F-15EX

12. Senator WARREN. Lieutenant General Bunch, in your testimony before the Subcommittee, you stated that the Air Force intends to go through the strategic basing process to determine which units will receive F-15EX aircraft. Does the Air Force plan to field the F-15EX across both Active Component and Air National Guard squadrons, as the F-15C is fielded today?

Lieutenant General BUNCH. The F-15EX is intended to replace the Air Force's oldest F-15C/D aircraft. The decision of fielding locations and timelines will be made using the Air Force Strategic Basing process.

13. Senator WARREN. Lieutenant General Fay and Major General Robinson, the Air Force maintains a diverse array of capabilities across the Air Force fighter, bomber and mobility fleets—all of which complement and support one another. It is important that this committee understand the Air Force's decision to procure the F-15EX from an operational perspective. What unique capabilities does the F-15EX bring to the Air Force tactical fighter inventory, whether in terms of range, payload or stand-off?

Lieutenant General FAY. The F-15EX will be able to carry more air-to-air missiles than any other 4th generation aircraft in the USAF inventory. Additionally, the F-15EX will be able to employ large munitions in the above 2,000 pound weapons class. A more detailed discussion of the F-15EX's unique capabilities is best provided in a classified setting, which we are ready to provide at your request.

Major General ROBINSON. The F-15EX will be able to carry more air-to-air missiles than any other 4th generation aircraft in the USAF inventory. Additionally, the F-15EX will be able to employ large munitions in the above 2,000 pound weapons class. A more detailed discussion of the F-15EX's unique capabilities is best provided in a classified setting, which we are ready to provide at your request.

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QUESTIONS SUBMITTED BY SENATOR DOUG JONES

MILITARY FAMILY HOUSING

14. Senator JONES. Lieutenant General Bunch, in the Air Force's unfunded list, there is a line item for between 200 and 320 personnel to better manage the Military Family Housing programs at 63 CONUS (Continental United States) bases. Would these additional personnel be civilian or contractor, and what exactly would they do to improve the management of the housing programs?

Lieutenant General BUNCH. The Air Force's fiscal year 2020 unfunded request for \$31.2 million is to support additional manpower to perform enhanced Military Housing Privatization Initiative (MHPI) project oversight and ensure our military families are provided safe and quality homes. The exact number of personnel is still being determined. The additional personnel will primarily be civilian employees and will restore housing offices to optimum staffing levels. Contractor positions will only be used to supplement short term requirements. The additional personnel will enable more comprehensive oversight of work performed on homes during emergency and routine maintenance. Personnel will be trained to inspect homes for life, health, safety deficiencies and code compliance and to follow through until the quality of work is satisfactory and complete. A dedicated resident advocate position is also planned to assist residents with unresolved issues, lead resident council groups, and to educate residents on their tenant rights.

SPACECOM (U.S. SPACE COMMAND) HQ (HEADQUARTERS) LOCATION

15. Senator JONES. Lieutenant General Bunch, it is my understanding that Huntsville, Alabama is being considered for the headquarters of SPACECOM, and I believe Huntsville would be the ideal location for the new combatant command, given the space equities already in the area. Can you tell us the timeframe for this decision and the factors being considered?

Lieutenant General BUNCH. On 15 April 2019, the Acting Deputy Secretary of Defense designated the Secretary of the Air Force as the interim Combatant Command Support Agent for U.S. Space Command upon establishment. The Air Force through their Strategic Basing process will be responsible for selecting the permanent location for U.S. Space Command. On 14 May 2019, the Secretary of the Air Force announced the enterprise definition, candidate bases, reasonable alternatives (for purposes of environmental analysis), and site survey criteria for United States Space Command.

The enterprise definition is: a Department of Defense space installation that contains a (future) United States Space Command component or center. Site survey criteria include mission (alignment with critical space force expertise, co-location with a United States Space Command component or center, access to a C-17 capable airfield), capacity (administrative building requirements, communications connectivity, base operating support), environmental (air quality, biological and cultural resources), and costs (one-time and recurring). The Air Force anticipates a final basing decision in late summer/early fall timeframe.

