

**DEPARTMENT OF DEFENSE AUTHORIZATION FOR
APPROPRIATIONS FOR FISCAL YEAR 2022 AND
THE FUTURE YEARS DEFENSE PROGRAM**

HEARINGS

BEFORE THE

**COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE**

ONE HUNDRED SEVENTEENTH CONGRESS

FIRST SESSION

ON

S. 2792

TO AUTHORIZE APPROPRIATIONS FOR FISCAL YEAR 2022 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.

**PART 4
AIRLAND**

JUNE 15, 22, 2021



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CONTENTS

JUNE 15, 2021

	Page
ARMY MODERNIZATION	1
MEMBERS STATEMENTS	
Statement of Senator Tammy Duckworth	1
Statement of Senator Tom Cotton	2
WITNESSES STATEMENTS	
Bush, Mr. Douglas R., Acting Assistant Secretary of the Army for Acquisition, Logistics, and Technology	4
Murray, General John M., USA, Commanding General, Army Futures Com- mand	5
Peterson, Lieutenant General Erik C., USA, Deputy Chief of Staff, Army G-8	7
Questions for the Record	30

JUNE 22, 2021

MODERNIZATION EFFORTS OF THE DEPARTMENT OF THE AIR FORCE	33
MEMBERS STATEMENTS	
Statement of Senator Tammy Duckworth	33
Statement of Senator Tom Cotton	34
WITNESSES STATEMENTS	
Nahom, Lieutenant General David S., USAF, Deputy Chief of Staff of the Air Force for Plans and Programs	35
Questions for the Record	79

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2022 AND THE FUTURE YEARS DEFENSE
PROGRAM**

TUESDAY, JUNE 15, 2021

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

ARMY MODERNIZATION

The Subcommittee met, pursuant to notice, at 2:30 p.m. in room SR-232A, Russell Senate Office Building, Senator Tammy Duckworth (Chairwoman of the Subcommittee) presiding.

Committee Members present: Senators Duckworth, King, Peters, Manchin, Rosen, Kelly, Cotton, Wicker, Tillis, Sullivan, Scott, and Hawley.

OPENING STATEMENT OF SENATOR TAMMY DUCKWORTH

Senator DUCKWORTH. The Airland Subcommittee will come to order.

Before we start, I would like to say how pleased I am to chair this Subcommittee and its oversight responsibilities of our Nation's primary land and air forces. I look forward to working with Senator Cotton and Committee Members as we continue the Subcommittee's collaborative approach during this critical time.

I think we can find broad agreement within the Subcommittee as we confront the issues facing our soldiers and airmen and their families. On to business. We meet today to receive testimony on the United States Army's modernization efforts and its fiscal year 2022 budget request.

Our witnesses this afternoon are Mr. Douglas Bush, Acting Assistant Secretary of the Army for Acquisition, Logistics, and Technology; General John Murray, Commanding General, Army Futures Command; and Lieutenant General Erik Peterson, Deputy Chief of Staff, Army G-8. I welcome each of you and thank you for your service and willingness to appear before us today.

The interim national security guidance states that the United States will ensure our armed forces are equipped to deter our adversaries, defend our people, interests, and allies, and defeat threats that emerge. For the Army, that means ensuring it is manned, trained, and equipped in a manner that equals its vital role in a Joint Force and remains ready for global employment.

Today, we are focusing on the equipping side. A few years ago, the Army developed a clear picture of its future, assessing requirements and identifying gaps. It then focused on prioritizing future capabilities and modernizing enduring systems while divesting legacy platforms. It has done so by appropriately recognizing the importance of focusing on its role in multidomain operations, while not losing sight of its unique place as the preeminent land force, and it has done so in the context of an assertive PRC [Peoples Republic of China] and a disruptive Russia while not losing sight of full spectrum operations.

Today, we seek updates on the Army's six modernization priorities: long-range precision fires, next-generation combat vehicles, Future Vertical Lift, the Army Network, Air and Missile Defense, soldier lethality, and its rapid capabilities development efforts in hypersonic, directed energy, indirect fire protection, and mid-range capability. We commend the Army's initiative in creating the concept of a multidomain task force to address combatant commander requirements, and we are interested in hearing about this and other operational concepts, requirements, and modernization plans underway, particularly, as they relate to planned or potential restructure changes. We hope that you articulate how the Army's fiscal year 2022 budget request balances modernization with advance procurement. We are concerned about the risk the Army is assuming by prioritizing future capability over enduring force modernization efforts, specifically, in the areas of aviation, wheeled- and tracked-combat vehicles, and IT [information technology], and cybersecurity upgrades; furthermore, we must understand the impact of these decisions on the modernization of the Army National Guard and Army Reserves, critical components of the total Army. Finally, the committee is keenly interested in how the Army's budget requests manages risk to the industrial base. I would like to commend the Army for making bold steps in its efforts to modernize soldier-centered practices, such as soldier touchpoint in the prototyping phase and "try before you buy" partnerships with industry, seem to be the evolution the Army needed to reset its acquisition programs. But hard decisions lie ahead. The establishment of Army Futures Command placed sharp focus on requirements but remains nascent. The Army must ensure the modernization enterprise and the civilian oversight function remains strong through leadership transitions. I have great confidence in you all and look forward to an open and cooperative effort in our common endeavor to continue to fuel a world-class Army.

Senator Cotton?

OPENING STATEMENT OF SENATOR TOM COTTON

Senator COTTON. Thank you, Senator Duckworth.

First, let me say that, of course, none of us ever want to turn the gavel over once you have held it, as I have chaired this Committee for the last 6 years, but is it a great honor to turn it over to a fellow veteran and someone who is served our Nation with distinction in uniform and now in the Senate in a sacrifice more than most of us could ever imagine. So, congratulations on making the chair of our Committee.

I would say that I expect to have as good a relationship with you as I did with Senator Manchin and then with Senator King, but obviously, I expect to have a much better relationship with you than those two guys.

Senator DUCKWORTH. Yes.

Senator COTTON. Mr. Bush, General Murray, General Peterson, thank you for being here today. Thank you for taking the time to visit yesterday.

I also want to recognize here at the outset that yesterday was the Army's birthday and to express my deep thanks to our soldiers and their families and the Army's civilian professionals for their selfless service to our Nation.

As you are all well aware, the National Defense Strategy directs our Nation's military to prepare for great power competition. Some might say the return of great power competition, but I would say it never left the scene to begin with. This means the Army must be prepared to compete with, deter, and if necessary, decisively defeat potential adversaries like China and Russia.

Unfortunately, the President's budget request for fiscal year 2022 does not provide the Army the resources necessary to accomplish this objective. The Army top line for fiscal year 2022 is nearly \$4 billion lower than this year's enacted amount. The request for procurement is nearly \$3 billion lower or 12 percent less than last year, and for funding and funding research funding, development, test, and evaluation activities has been slashed by almost 10 percent.

Given these cuts, the Army was forced to make a difficult choice between a holistic force modernization effort or concentration diminished resources on the development of future capabilities.

While I agree with the decision by the Army to focus on its highest modernization priorities, I am concerned, nonetheless, that delaying modernization of assets, like the Abrams tank, without a replacement even on the drawing board, leaves our Nation less secure, our troops less prepared, and our Army less ready for great power conflict.

The decision to dramatically slow the modernization of the primary platforms used by today's soldiers is extremely troubling.

I look forward to hearing from our witnesses about the impacts and risks of these cuts to the Army's ability to accomplish assigned tasks from the National Defense Strategy. I also hope to hear our witnesses explain the crucial role that Army forces would play in competition in conflict with China.

I am hopeful this explanation will dispel a misperception held by some that the Indo-Pacific is primarily or even solely an air and maritime theater of operation.

Finally, I look forward to hearing from our witnesses about the progress being made on the highest priority modernization efforts for strategic competition with China and long-range precision fires, in particular.

Thank you, again.

Senator DUCKWORTH. I thank the Ranking Member.

Our first witness is Mr. Bush. It is good to see you again. We have when through many NDAA's [National Defense Authorization

Act] together, well into the early morning. I look forward to your testimony.

Mr. Bush?

STATEMENT OF MR. DOUGLAS R. BUSH, ACTING ASSISTANT SECRETARY OF THE ARMY FOR ACQUISITION, LOGISTICS, AND TECHNOLOGY

Mr. BUSH. Thank you, Madam Chair.

Madam Chair, Ranking Member Cotton, distinguished Members of the SASC [Senate Armed Services Committee] Airland Subcommittee, good afternoon. Thank you for the invitation to appear before you to discuss the Army's modernization program and the resources requested in the President's budget for fiscal year 2022.

I am pleased to be joined today by my teammates, General Mike Murray, and Lieutenant General Erik Peterson. We appreciate your making our written statement as part of the records for today's hearing.

Madam Chair, our shared mission is to ensure that the Army continues to achieve overmatch against all potential adversaries, ensuring that our Army can fulfill its mission to compete successfully, deter, and if necessary, fight and win our Nation's wars and part of the Joint Force.

We support the Army's transformation through modernization in order to meet future challenges. Even during a global pandemic, this past year has been one of dramatic change, rapid innovation, shared challenges, and significant progress, with an unprecedented unity of effort across the Army modernization enterprise.

Next, I would like to take a moment to address the Subcommittee's specific request for views outlined in our invitation. First, the Committee has asked our views on the current status of the Army's ongoing modernization efforts across the Army's six modernization priorities, specifically focused on 31+4 signature efforts. In this regard, I would ask the Committee Members to review our joint witness statement that summarizes these efforts, but I would note that they are all fully supported by the fiscal year 2022 budget request.

Second, the Committee asked our views on how the Army's managing risk while prioritizing future capability over enduring force modernization efforts, especially in the area of aviation, wheeled- and tracked-combat vehicles, and IT cybersecurity upgrades. While difficult choice were made to make adjustments, I think this budget request reflects a careful balance between appropriate levels of funding for enduring efforts, such as these, in our future modernization goals.

Finally, the Committee asked for our views on how the Army's fiscal year 2022 request manages risk in the industrial base, as well as progress in reforming modernization requirements, acquisition, and resourcing processes. First, while no budget is without risk, I am confident that the request before you represents what we consider acceptable risks and manageable risks to the industrial base, as well as the entire equipment portfolio; further, the Army modernization community is committed to reform. We are grateful to you and your colleagues on the Committee for form initiatives that have been instrumental in our efforts to streamline and gain

efficiencies in the acquisition process and accelerate delivery of equipment to soldiers.

This includes our use of middle-tier acquisition authority for rapid prototyping, to accelerate select efforts linked to our modernization priorities, including, among others, the Extended Range Cannon Artillery, Integrated Visual Augmentation System, and Next-Generation Squad Weapon. We have also used other transaction authority or, OTAs, to help us streamline, selectively, the acquisition research initiatives, prototype projects, and follow-on production efforts.

In both of these areas, you have my commitment that the Army will use these authorities conservatively and only where needed to accomplish our modernization objectives. You also have our commitment to ensure that appropriate Army, internal Army oversight measures are in place to monitor our use of these new authorities granted by Congress. Overall, I think the fiscal year 2022 budget request for Army modernization reflects continuity in the Army's continued commitments to its highest priority modernization programs.

While Members will find that adjustments were made in programs to achieve that goal, I believe that the fiscal year 2022 budget request of \$34.1 billion for Army Research, Development, and Acquisition reflects the Army's efforts at making careful choices and supporting continued progress across the Army's modernization priorities.

Let me close by saying that realization of our modernization efforts is highly dependent on support of the Army's fiscal year 2022 budget request. Investments in this budget complement and reinforce the Army modernization efforts you have already supported so strongly and thank you for that support in the past. The key is predictable, adequate, and timely sustained funding to ensure the United States Army remains the best equipped land force in the world.

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

Senator DUCKWORTH. Thank you.

General Murray, welcome, and I want to send a word of gratitude to your wife, Jane, for being with you all these years as you served our Nation. Thank you.

General MURRAY. Some days that is in doubt, ma'am.

[Laughter.]

**STATEMENT OF GENERAL JOHN M. MURRAY, USA,
COMMANDING GENERAL, ARMY FUTURES COMMAND**

General MURRAY. Chair Duckworth, Ranking Member Cotton, and distinguished Members of the Subcommittee, on behalf of the soldiers and civilians of Army Futures Command, thank you for this opportunity to testify about Army modernization.

The dedicated and selfless men and women that I serve with, work hard every day to ensure the modernization of our Army. It is indeed an honor to join Mr. Doug Bush here today. I would just note that the partnership, which is absolutely critical, between AFC [Army Futures Command] and ASA(ALT) [Assistant Secretary of the Army for Acquisition, Logistics, and Technology] was strong

in the past and remains strong under Mr. Bush's dedicated leadership.

It is also an honor to join the newest member of the Army staff and our teammate, Lieutenant General Erik Peterson, the brand new Army G-8.

As you mentioned, the Army is in the midst of a transformational change. This change is necessary to maintain our global and competitive edge, to deter conflict, and if called upon, to fight and win, as part of the Joint Force. The Army is transforming how we fight, what we fight with, how we organize, and how we do business, and, importantly, who we are. Project Convergence, the Army's campaign of learning and experimentation is informing all aspects of transformation and I would like to take an opportunity to say just a word about each of them.

First, we are transforming how we fight. The Army's current concept is multidomain operations; our contribution to the developing Joint Warfighting Concept. The Army's Training and Doctrine Command is now in the process of transitioning multidomain operations into Army doctrine.

At the same time, our Futures Studies Program is bringing together concept writers, intelligence professionals, and S&T [science and technology] experts with leading thinkers from academia, industry, and other communities, to build our next concept.

Second, we are transforming what we fight with. Our material modernization includes the 31+4 signature efforts based upon our six consistent modernization priorities. Our fiscal year 2022 request includes \$11.3 billion to support these signature efforts. Thirty-one of these efforts are led by powerful teams comprised of our cross-functional teams, program executive offices, and program managers, and four of these efforts are led by the Army's Rapid Capabilities and Critical Technologies Office. Twenty-two of these capabilities with this budget are currently projected to begin fielding over the next 4 years.

Third, we are transforming how we organize. The multidomain task force will enable a convergence of the integration of effects across all domains for Joint Force commanders to create multiple dilemmas for our adversaries. Security Force Assistance Brigades foster close partnerships with host nation ground forces in critical locations. They give us a strong foundation in competition and a head start in crisis and conflict.

Fourth, we are transforming how we do business. Soldier-centered design puts technology and prototypes into the hands of soldiers from the operational force early so that we can learn. Learning early changes how we generate requirements and how we partner with both traditional and non-traditional industry. Our Army Applications Lab is spearheading effective ways to work with non-traditional innovators, leveraging existing authorities to make it easier to work with the Army.

Fifth, and maybe most importantly, we are transforming who we are. We are exploring how best to find, train, utilize, and importantly, retain the tech talent we know we will need for a future fight. Our Artificial Intelligence Integration Center works with Carnegie Mellon University to offer data science courses, to grow software designers and engineers, and to foster a more techno-

logically savvy workforce. Our software factory takes soldiers from any career field with the right aptitude and grows them into skilled coders.

We are in the process of transforming almost every aspect of our Army. There are, however, two key things that we must hold onto; that would be our purpose and our most precious resource: our people.

Our fiscal year 2022 budget request builds on the consistent priorities and strong momentum of our 2021 request. Stable and consistent funding from Congress supports our ability to serve our Nation, take care of our people, and continue the momentum of our modernization efforts.

Thank you for your consistent support of our Army, your consistent support of our soldiers and their families, and thank you for having me here today.

It is an honor and a privilege to lead and represent the soldiers, civilians, and families of Army's Futures Command, and I look forward to your questions.

Senator DUCKWORTH. Thank you, General.

General Peterson, it is good to have a fellow aviator here, but I am not giving you preferential treatment.

**STATEMENT OF LIEUTENANT GENERAL ERIK C. PETERSON,
USA, DEPUTY CHIEF OF STAFF, ARMY G-8**

Lieutenant General PETERSON. Thank you, Chair Duckworth.

Ranking Member Cotton, distinguished Members of this Senate Armed Services Committee, Airland Subcommittee, thanking for the opportunity to appear and testify regarding the Army's fiscal year 2022 modernization efforts. Thank you, as well, for your enduring support of our soldiers, civilians, and families, as they play their vital role in the defense of our Nation; a role that they have played for 246 years as of yesterday, our Army birthday.

Our requested investments in modernization in fiscal year 2022 reflect our deliberate 3-going-on-4-year effort to accelerate focused modernization and place transformational capabilities in the hands of our soldiers. These capabilities firmly support our National Defense Strategy and our interim defense guidance and contribute directly to the Joint Force's ability to deter, and when called upon, fight, and win decisively.

They reduce risk imposed by increasingly aggressive competitors and foes and will help us achieve the decisive overmatch that we need. To that end, we remain committed to our six modernization priorities and the 31+4 overarching efforts aligned with those priorities and that commitment, combined with several years of ruthless prioritization, constant reassessment and re-evaluation, and your sustained support, promises to bring over 20 new important capabilities to bear in the next 4 years.

Through teamwork, engaged senior leadership, refinement of process and authorities and resources you have granted us, we continue to accelerate. From refined requirements processes and the responsible employment of other transactional authorities to experimentation, prototyping, and soldier-centered design, the transformation you are helping us with is being brought to bear.

The progress is not without risk. Several years of ruthless prioritization, eliminating, reducing, and deferring lower-priority and less-necessary efforts, as well as divesting of legacy capabilities, has left little flexibility in our top line.

We made the easy choices the first couple of years of this effort. We are now well into the realm of hard choices, really-hard choices, and downright excruciating choices; as such, we ask for your continued, engaged support and its predictable authorizations and resources on time to help us maintain this transformation.

In closing, I would like to offer one additional brief thanks and that is to your staffs, committee, and personal, who professionally facilitate the engagement necessary to advance our common commitment to the defense of our Nation.

Thank you for the opportunity to appear and I look forward to your questions.

[The joint prepared statement of Mr. Douglas R. Bush, General John M. Murray, and Lieutenant General Erik Peterson follows:]

JOINT PREPARED STATEMENT BY MR. DOUGLAS R. BUSH, GENERAL JOHN M. MURRAY,
AND LIEUTENANT GENERAL ERIK PETERSON

INTRODUCTION

Chair Duckworth, Ranking Member Cotton, distinguished Members of the Senate Armed Services Subcommittee on Airland, thank you for your continued support and enduring commitment to our soldiers, our civilians, and their families. On behalf of the Secretary of the Army, the Honorable Christine Wormuth, and the Army Chief of Staff, General James C. McConville, we thank you for the invitation to appear before you today.

Our shared mission is to make sure that the Army continues to achieve overmatch against all potential adversaries, ensuring that our Army can fulfill its mandate to compete successfully, deter, and, if necessary, fight and win our Nation's wars as part of the Joint Force.

We support the Army's transformation through persistent modernization in order to meet future challenges. Even during a global pandemic, this past year has been one of dramatic change, rapid innovation, shared challenges, and significant progress with an unprecedented unity of effort across the Army modernization enterprise. The Army is boldly transforming to provide the Joint Force with the speed, range, and convergence of the cutting edge technologies that will be needed to provide future decision dominance and overmatch for great-power competition.

The Army is transforming how we fight, what we fight with, how we organize, how we do business, and who we are. We are already realizing the benefits of these efforts. Your support of our fiscal year 2022 budget request will ensure we are able to achieve persistent modernization.

THE STRATEGIC ENVIRONMENT

The Interim National Security Strategic Guidance highlights an increasingly assertive People's Republic of China and increasingly disruptive behavior from Russia. China is

our pacing threat. Both states are applying all instruments of national power, including military modernization as they compete aggressively with the United States.

China is progressing in artificial intelligence (AI), robotics, and cyber. Advancements in hypersonics add to its strategic reach, endangering some of our traditional force projection assets. Both China and Russia have also committed to an increased pace and scope of military exercises, honing their joint warfighting capability, while China went through a large scale restructure and change of leadership to reinforce and enhance its modernization goals.

In addition to these traditional threats, the United States is facing increased competition in the Arctic, challenges resulting from climate change, and the prospect of future pandemics. The Army's modernization efforts take these new realities into account as we define capability requirements and develop new concepts.

HOW WE FIGHT

Our Multi-Domain Operations concept describes how we fight—by continuously converging effects across all domains, at the speed of relevance. We are in the process of transitioning this concept to doctrine in order to ensure the Army is capable and ready to support Joint Force operations. At the same time, we are working to develop the future concept based on future threat assessments, emerging Science and Technology (S&T), and experimentation. We established “Team Ignite” in order to create feedback loops among these efforts and inform how we will fight in the future.

WHAT WE FIGHT WITH

The Army remains committed to our six consistent modernization priorities: Long Range Precision Fires, Next Generation Combat Vehicle, Future Vertical Lift, Network, Air and Missile Defense, and Soldier Lethality. In fiscal year 2022, the Army continues to focus on building a multi-domain force by divesting some equipment that does not support future warfighting capabilities.

We are grateful to Congress for the stable funding provided to support our modernization efforts. The Fiscal Year 2022 President’s Budget Request continues to fund our six priorities, as we aggressively pursue our “31+4” signature modernization systems.

The fiscal year 2022 budget builds on the progress we have made across all modernization priorities to align requirements developers with acquisition experts and representatives from the testing, logistics, science and technology, and other communities, dramatically reducing the time span from identification of a capability gap to prototype testing and operational experimentation. Within each area, we highlight our recent progress, our partnership, and the way forward with continued, steady funding.

- The Long Range Precision Fires (LRPF) Cross-Functional Team (CFT) is partnered with Program Executive Office (PEO) Missiles and Space:
- The Army’s Extended Range Cannon Artillery (ERCA) can now shoot in the 70 kilometer range with accuracy. We are on track to field the first ERCA battalion in fiscal year 2023.
- We had a successful and accurate flight test of our Precision Strike Missile (PrSM) in 1st quarter fiscal year 2020. We will begin fielding PrSM in fiscal year 2023.
- The Army Rapid Capabilities and Critical Technologies Office (RCCTO) continues to make progress in delivering the first hypersonics battery in fiscal year 2023. Working closely with the CFTs, RCCTO manages the development and production of the Army’s hypersonics effort, the Long Range Hypersonic Weapon (LRHW). With a successful flight test in March 2019, the program has additional joint flight tests planned in fiscal year 2021–23 to validate the Common Hypersonic Glide body design, the Army launcher and the Command and Control system. Also, later this year, RCCTO will field the road mobile, C-17 transportable prototype battery to an operational unit, minus the missiles. This will allow the unit’s soldiers to start training with the equipment so they are ready when the missiles arrive in fiscal year 2023, providing the Army with a hypersonic capability.
- Additionally, RCCTO received the Mid-Range Capability (MRC) mission in July 2020, which leverages existing Service missiles, software, and hardware to fill a critical capability gap identified by the U.S. Indo-Pacific Command (INDOPACOM). The MRC prototype will be fielded to an operational battery in fiscal year 2023.
- The Next Generation Combat Vehicle (NGCV) CFT is partnered with PEO Ground Combat Systems:
 - The decision to revisit the characteristics, acquisition strategy, and schedule of the Optionally Manned Fighting Vehicle (OMFV)—very early in its cycle—is the type of decisive action that working as an integrated team enables. We remain committed to the OMFV program. The need for this ground combat vehicle capability is real. It is imperative we get it right for our soldiers.
 - The Robotic Combat Vehicle will undergo increasingly rigorous experiments and capability demonstrations between fiscal year 2022 and fiscal year 2024, with a decision to procure or reassess no later than fiscal year 2024.
 - The Armored Multi-Purpose Vehicle is currently fielding and is an adaptable and more survivable general-purpose, mortar carrier, medical evacuation, medical treatment, and mission command vehicle that replaces the 1960s-era M113 Family of Vehicles.

- In 4th quarter fiscal year 2025, we are on track to deliver the first fielding of Mobile Protected Firepower (MPF) and to give our light infantry much needed firepower.
- The Future Vertical Lift (FVL) CFT is partnered with PEO Aviation:
 - Following the successful firing of a SPIKE Non-Line of Sight (NLOS) missile from an AH-64E Apache in 4th quarter fiscal year 2019, we will achieve Initial Operational Capability (IOC) in fiscal year 2023 with three Combat Aviation Brigades. This capability extends range by four times over our current HELLFIRE missiles.
 - The Future Attack Reconnaissance Aircraft (FARA) closes the gap left by retirement of the Kiowa. Two prototypes will fly in fiscal year 2023, followed by a year-long flight demonstration.
 - The Future Long Range Assault Aircraft (FLRAA) will replace part of the UH-60 Black Hawk fleet with increased speed, range, payload, and endurance. We expect initial FLRAA prototypes in fiscal year 2025.
 - FVL will leverage advances in Unmanned Aircraft System (UAS) technology to develop the Shadow replacement and Air Launched Effects, which includes a wide array of payloads and extended communication mesh networks with a fielding plan in fiscal year 2025.
- The Network CFT is partnered with PEO Command, Control, Communications-Tactical:
 - We are currently fielding Capability Set 21, including commercial radio, satellite communications, and cross domain solutions of the Integrated Tactical Network to four Infantry Brigade Combat Teams in fiscal year 2021, and a newly modernized, agile, and scalable tactical network transport tool suite to three Expeditionary Signal Battalions-Enhanced. These capabilities allow our commanders greater connectivity options, make the network more intuitive for our soldiers, and increase interoperability with allies and partners. Soldier feedback and experimentation will inform continued fielding of Capability Set 21 in fiscal year 2022, as well as Capability Set 23.
 - Congruent with Network modernization, the Army is seeking to modernize Global Positioning System (GPS) receivers to meet current and emerging threats by providing the Joint Force with advanced, assured positioning, navigation, and timing (PNT) systems. Included are modernized receivers that meet Congressional mandates to transition to M-code GPS and integrate alternative PNT technologies for our ground combat platforms, dismounted soldiers, precision weapons and munitions, and aviation systems.
 - We are currently fielding the first generation mounted assured PNT systems to our forward deployed formations with a second generation ready for fielding no later than fiscal year 2023. We are in the process of evaluating solutions for dismounted soldiers and continuing work on precision weapons and aviation variants. The Army recently approved development of Navigation Warfare tools to ensure that Army forces have continued access to this critical part of the electromagnetic spectrum.
 - Additionally, the Army continues to invest in the ground segments of space-based technologies that close operational gaps in deep sensing and targeting activities. We are coordinating with partners in the intelligence community, the Space Force, and private industry to enhance Army access to Low Earth Orbit space-based sensing and link with national level capabilities to provide tactical-level sensor-to-shooter capability to combat formations.
- The Air and Missile Defense (AMD) CFT is partnered with PEO Missiles and Space:
 - The Army's integrated Air and Missile Defense capabilities will protect Joint Forces from enemy aircraft, missiles, and drones to enable operational effectiveness. This includes both theater and short-range air defense systems like the Maneuver-Short Range Air Defense (M-SHORAD). The Army just fielded the first unit, 5th Battalion, 4th Air Defense Artillery Regiment in Europe and will have four battalions equipped by fiscal year 2023.
 - RCCTO continues to make progress on its Directed Energy Maneuver-Short Range Air Defense (DE M-SHORAD) effort, a 50 kilowatt (kW)-class laser on a Stryker, scheduled to conduct a combat shoot-off later this summer at Fort Sill, Oklahoma. This will be the directed energy component of the M-SHORAD battery, and the DE M-SHORAD prototypes with residual combat capability that will be delivered at the platoon level in fiscal year 2022.
 - There have also been advancements made in relation to directed energy development for Indirect Fire Protection Capability (IFPC), which pairs high-energy lasers with high-power microwaves for fixed and semi-fixed defense. RCCTO is leveraging Office of the Secretary of Defense and Air Force invest-

ments for a 300 kW-class IFPC–High Energy Laser, and IFPC–High-Power Microwave directed energy capabilities that will be delivered at the platoon level in fiscal year 2024. These directed energy weapons are a strategic tool in the fight against modern battlefield threats. This spring, the Army will conduct a shoot-off to inform our decision on the enduring IFPC solution.

- The Army Integrated Air and Missile Defense (AIAMD) IOC is 3rd quarter fiscal year 2022, with fielding on track for one battalion. An integral part of AIAMD, the Integrated Air and Missile Defense Battle Command System (IBCS), is a revolutionary command-and-control system that streamlines sensor-to-shooter linkages for air and missile defense engagements.
- As directed by Congress, we are preparing for an initial deployment of the Interim Cruise Missile Defense Capability at the end of fiscal year 2021.
- The Soldier Lethality CFT is partnered with PEO Soldier:
 - The Integrated Visual Augmentation System (IVAS) is a good example of a departure from the traditional requirements process. We are working with Microsoft Corporation in three-week sprints, going directly to soldiers in each of the sprints to refine the product and make sure we get it right. This approach led to a significant reduction in the estimated delivery schedule to soldiers, and we are on track for delivery to the first unit by 1st quarter fiscal year 2022.
 - We equipped the first unit with the Enhanced Night Vision Goggle–Binocular (ENVG–B (Directed Requirement)) September 2019, with five brigades equipped by March 2021. The ENVG–B (Program of Record) is scheduled to field the first unit in 2nd quarter fiscal year 2022.
 - In 4th quarter fiscal year 2022, we will equip the first unit with the Next Generation Squad Weapon (NGWS) Rifle and Automatic Rifle, as well as General Purpose Ammo and an improved sight system.
 - Additionally, our Synthetic Training Environment CFT has already put prototypes of One World Terrain (OWT) in the hands of units. More than just imagery, it provides a 3D representation of the entire earth that we can integrate into simulation. When paired with IVAS, it will allow our soldiers to simulate any location on the planet right from their combat goggles. OWT has also shown how it can be used operationally to help forward-deployed units identify locations to harden their security posture and improve the protection of their soldiers.

Our budget request also includes support for research in nine S&T priority areas: disruptive energetics, RF electrical materials, quantum, hypersonic flight, AI, autonomy, synthetic biology, material by design, and advanced manufacturing. Our investments in S&T are helping solve problems in each of the modernization priority areas, as well as identify future opportunities.

Finally, the Army is pursuing clean energy initiatives to reduce the Army’s carbon footprint and its reliance on fossil fuels. Key initiatives include the development of improved power generation sources, the electrification of small air and ground robotics systems, and advancements in fuel efficiency for both current and future programs. For example, we are developing the technology to obtain better fuel efficiency for the Joint Light Tactical Vehicle, generators, and heating and cooling systems. We are also investing in the Improved Turbine Engine Program (ITEP), which we believe will improve fuel efficiency for future Army aviation assets.

HOW WE ORGANIZE

We are developing new organizations as we transition from modernization concepts to tangible sources of strategic readiness. The Multi-Domain Task Force (MDTF) is one example, providing long range precision fires in conflict and long range precision effects in competition. During INDOPACOM’s Pacific Fury 21 exercise, the MDTF validated its ability to synchronize long range fires and effects with the Joint Force.

The Army uses AimPoint 2035 to describe what our future force will look like. We are refining those descriptions through experimentation and analysis of the impact emerging technology will have on the character of war. The investments are included in the fiscal year 2022 budget request and will inform the changes we need to provide a combat credible force of the future.

HOW WE DO BUSINESS

(ASA)ALT, AFC, and G–8 are key stakeholders in the Army modernization enterprise, along with other organizations across the entire Army, including HQDA staff and other Army commands. AFC, under the strategic direction of HQDA, develops and delivers future concepts, requirements, and organizational designs based on its

assessment of the future operating environment. AFC plays an essential role in developing system characteristics, informed by experimentation and technical demonstrations, and refining these characteristics into requirements. ASA(ALT) develops, acquires, and fields materiel solutions that meet the operational requirements defined by AFC and others, and acts as the acquisition decision authority throughout the acquisition lifecycle. G-8 is the day-to-day manager of the requirements approval process and the developer of the Project Objective Memorandum (or “POM”) at the Headquarters, Department of the Army, in concert with ASA(ALT) and AFC.

Each of the Army’s eight CFTs bring together representatives from all key stakeholder communities—scientists and technologists, operators, requirements experts, logisticians, and industry—in collaboration with their partner PEOs. The partnership among ASA(ALT), AFC, and G-8 also provides a unique opportunity for close collaboration between the CFTs, ASA(ALT)’s PEOs, and G-8’s System Synchronization Officers to bring system concepts and designs to life, along with the appropriate level of funding. With the strong partnerships between the CFTs and PEOs, the responsible PEOs assign and oversee the program managers for all “31+4” signature systems. This close working relationship between the CFTs and the PEOs is extremely valuable: the acquisition community contributes to AFC’s operational requirements development process and the CFTs participate in deliberation over acquisition strategies, while each organization retains its own responsibilities.

Soldier Centered Design drives the entire process. Taken from industry best practices, this concept allows the Army to get feedback from soldiers and commanders early in the development process. This is accomplished by getting equipment into the hands of soldiers from the operational force early, through Soldier Touchpoints, in order to refine the requirements before we even start to write requirement documents and significant investments are made.

Speeding up the staffing of requirements documents has been key to shortening the overall time line from idea to fielding. We significantly reduced the amount of time to staff and approve requirements documents since 2018, where it took an average of 245 days, to 119 days in fiscal year 2020, and we intend to reduce the staffing time by another 20 percent this year.

Project Convergence is the Army’s campaign of learning and experimentation. Working closely with our counterparts from the other Services, we identify Joint warfighting problems to solve. We use the Army’s Joint Systems Integration Lab and experimentation events “in the dirt” to test together and ensure we can connect them.

Project Convergence informs the Department of Defense (DOD) Joint All-Domain Command and Control (JADC2) and the Joint Warfighting Concept (JWC).

Congress has called on DOD to forge new partnerships with both commercial industry and small businesses to develop adaptive approaches and apply innovative contracting tools in support of modernization. The establishment of the Army Application Lab allows us to both attract nontraditional technology firms to solve Army problems and make the Army a preferred business partner while increasing the return on our investment. As an example, we have been able to reduce the award times for Small Business Innovative Research contracts from 224 days to just 25 days, removing a significant barrier to entry for many small, innovative companies.

The Army continues to implement the reform initiatives granted by Congress, which were designed to streamline and gain efficiencies in the acquisition process. These initiatives, which have reduced bureaucracy and helped the Army accelerate the delivery of capability to the field, include the granting of Middle Tier Acquisition Authority (MTA) which allows for both rapid prototyping and rapid fielding efforts, and the expanded use of Other Transactional Authority (OTA), which now can be extended to include production. The Army is using MTA for rapid prototyping to accelerate select efforts linked to the Army’s modernization priorities, including ERCA, IVAS, Lower Tier Air and Missile Defense Sensor, PrSM, NGSW, and MPF, each of which is designed to leave a residual capability with the warfighter that can enable constructive feedback and refinement of requirements. The Army effectively utilizes OTA to streamline the acquisition of basic through advanced research activities, prototype projects, and follow-on production efforts. OTAs are simplified contract mechanisms that lend themselves to working with small companies and non-traditional contractors, two known sources of technological innovation. The Army used OTAs to more quickly award contracts in support of the Federal Response to COVID-19. In fiscal year 2020, the Army awarded more than 1,300 agreements valued at \$13.7 billion.

In addition, in the fiscal year 2016 National Defense Authorization Act, Congress encouraged delegation of Milestone Decision Authority (MDA) for most acquisition programs from the Office of the Secretary of Defense to the Military Departments. The Army further delegated MDA for some of these programs to the PEO level and

below when appropriate. This delegation allows the Army to appropriately align program oversight with risk, resulting in reduced bureaucracy and increased efficiency.

All of these initiatives, combined with AFC's integrated governance process, allows for better and faster modernization decisions and faster requirements development.

WHO WE ARE

Army transformation is more than weapon systems and equipment. It also involves people. Ultimately, people are the Army's foundation and our greatest strength. It is critically important that we recruit, develop, and retain talent for the current and future force. To that end, the Army is moving to a 21st century talent management system to ensure people feel they are valued members of the team. Additionally, the Army has established digital talent initiatives to ensure our workforce is trained to effectively apply the technologies being developed. The Software Factory, for example, is increasing the Army's digital proficiencies while leveraging agile Development, Security, and Operations practices and cloud technologies to build organic software. Through partnerships with Carnegie Mellon University, the Army's Artificial Intelligence Integration Center (AI2C) is developing data science and AI expertise to ensure proficiency in the applications and ethics of AI and machine learning.

With the right people, with the right skills, in the right places, we can successfully—and persistently—modernize the Army.

CONCLUSION

The Army is nearly three years into the biggest transformational change since the early 1980s, modernizing and building a multi-domain-capable force that delivers speed, range, and convergence of emerging technologies. The Army, to be clear, will never be “done” modernizing. We are laying the foundation now to make sure the Army continues to modernize for the future of 2035, and for the one after that.

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 DUCKWORTH. Thank you.

We will begin with our first round of questions. I will begin first. General Murray, Secretary of Defense Austin has made it clear that the PRC is the top priority, that it is the pacing threat to our Nation's defense, but many suggest that the primary warfighting roles in the Pacific belong to the Navy and the Air Force.

What role does the Army play in the Pacific and how does Army modernization support the Army's ability to play at that role?

General MURRAY. Madam Chair, thank you for that question.

Obviously, I have a pretty strong opinion on the Army's role, not only in the Pacific, but anyplace the Joint Force goes, and I would just start by saying, you know, your military never fights as a single service; we always fight as a Joint Force. The Army's role, I believe, in INDOPACOM [Indo-Pacific Command], specifically, spans the spectrum you talked about from competition through crisis and into conflict, and I think we have an especially important role to play in terms of deterrence.

I mentioned the Security Force Assistance Brigades and the partner, the ability to build partners, and partner capacity up front. The partnerships with countries with your United States Army with countries throughout INDOPACOM is very strong and it gets stronger.

As the secretary mentioned this morning, the chiefs of defense in many of those countries are land force commanders and those partnerships and General McConville has been very engaged and proactive in strengthening those partnerships throughout INDOPACOM.

I would say from one aspect, in particular, is the joint service and all joint services, in order to operate, depend upon the Army for logistics support. So, that is a strong role, no matter what phase of the operation you are in, is the logistics support.

Then, specifically, as it relates to the modernization priorities, obviously long-range precision fires, when we started the concept called multidomain operations, it was based upon the premise that the Army could use long-range fires to begin to break down what we call anti-access/area denial strategies and really enable the Joint Force and really enable joint fires, operating as a Joint Force.

Then, of course, the multidomain task force brings together not only lethal capabilities, but also electronic warfare, cyber intelligence capabilities that are useful in competition, through crisis, and into conflict.

Then I would just lastly add that we are already there. So, the last time I checked, South Korea and Japan were part of the INDOPACOM AOR [Indo-Pacific Command] [Area of Responsibility] and we have sizable populations within those two locations.

Senator DUCKWORTH. Thank you. I actually just returned from South Korea where I met with General Abrams and had a very, very productive visit.

I understand that the Joint Staff is working on a new Joint Warfighting Concept. DOD [Department of Defense] just released a new joint, all-domain command, and control strategy. You have already referenced this, and as the Airland Subcommittee, we are also paying careful attention to the Air Force's work on their Advanced Battle Management System.

How do the Army's modernization efforts, including Project Convergence, support these broader joint efforts?

General MURRAY. Yes, ma'am, and thank you, again, for that question.

As I mentioned in my opening statement, we believe multi-domain operations, as we turn this into doctrine, is not only our contribution to the joint warfighting concept, but it actually is or will become part of it. We are hoping to inform that exercise, and that is from a concept standpoint.

From a Project Convergence standpoint, last year, we executed Project Convergence and it was an Army-only, because we pulled it together pretty quickly. This year, beginning in December, we formed a, at the three-star level, a joint board of directors that includes not only all four, and now five services, because the Space Force has now joined us, but also the Joint Staff J-6, who is responsible for the JADC2 [Joint All-Domain Command and Control] concept at the Joint Staff level, and the Joint Staff J-7, who is responsible for the Joint Warfighting Concept.

Those two responsibilities, nobody is trying to take that away from the Joint Staff or the Joint Requirements Oversight Council. What we are trying to do is come together as the services and begin to inform not only the concept of JADC2, but the concept of joint warfighting from the bottom up, and so, the services working together, meeting someplace in the middle with the top-down work to Joint Staff is doing, we believe, is the best way to come up with a viable Joint Warfighting Concept and a viable concept for Joint All-Domain Command and Control.

Senator DUCKWORTH. General Peterson, the President's defense budget requests for fiscal year 2022 puts some pressure on the Army top line and Army leadership as testified about the need to make tough choices. You were saying you are into the excruciating-choices level at this point.

What does that mean for the Army's ability to protect its 31+4 signature modernization efforts?

Lieutenant General PETERSON. Thank you, Chair Duckworth.

The 2022 budget request does, in fact, protect our 31+4. We have continued our deep-dive process, formerly known as night court, to realign resources to ensure we retain, and in some cases, accelerate momentum with the 31+4. But it is challenging. These are tough choices with respect to the resourcing and funding of enduring and legacy systems and we work very, very closely to assess that risk and ensure that it is manageable.

During our process for fiscal year 2022, we gleaned a realignment of \$1.6 billion through our very, very excruciating, continued, rigorous realignment of funding in order to continue to support those modernization priorities.

Senator DUCKWORTH. Thank you.

Senator Cotton?

Senator COTTON. Thank you. Let's continue down the track that Senator Duckworth started us on about the Army in the Pacific, especially in conflict against China.

General Murray, could you elaborate a little bit on the roles and the importance of land-based, long-range fires in the Pacific and why it is so vital that we modernize and procure those systems.

General MURRAY. Absolutely, Senator, and thank you for the birthday wish, and happy birthday to the State of Arkansas, 185 years today, I understand, if I am not mistaken.

It really goes back to the beginning of what I described as multidomain operations. We understood the significant modernization that China was undergoing, not only in its ground forces, but really across all of its services, and we understood, as we studied it, this concept of anti-access/area denial. I sat in this room with H.R. McMaster, and you heard when you were chair, we were outranged and outgunned.

The beginning of the breaking down that anti-access/area denial layer to enable the Joint Force, we believe, begins with long-range precision fires. We also believe that multidomain effects, better known for the Army as mid-ranged capability, the ability to target from land, either moving terrestrial or moving targets afloat, is key to the ability to begin to break down that protective bubble, that operational defense, if you will, and really open up apertures or corridors for the rest of the Joint Force to exploit.

Senator COTTON. Why is it so important that the Army and the Marine Corps, once ashore, have that capability? Why is the Navy and the Air Force not enough?

General MURRAY. Because I believe that multiple dilemmas, any opponent, the more dilemmas you can present to an opponent, they can focus on a single threat and it allows them to focus on that single threat. So, the more dilemmas you can present, the more angles you can come at on opponent from, and the terrain does offer you

an advantage in terms of places to hide and places to maneuver that the sea and the air don't necessarily give you.

Senator COTTON. You can keep a lot more of the big guns there, right?

General MURRAY. Yes, sir.

Senator COTTON. A lot easier to store those things on a piece of ground than it is on a ship or an airplane.

General MURRAY. A lot easier to resupply them.

Senator COTTON. Also, I noticed, not just the Army, but the Marine Corps has been investing heavily in that kind of long-range precision strike capability. There are some skeptics.

Can you tell me what is the status of this question between the services and the chairman and the Department's civilian leadership.

General MURRAY. I hate to speak for the chairman and the leadership at OSD [Office of the Secretary of Defense] level—

Senator COTTON. They told me you could.

General MURRAY. I doubt that.

[Laughter.]

General MURRAY. At the service level, at least when we are working through Project Convergence, there is no disagreement on the necessity of presenting those multiple dilemmas.

Senator COTTON. Thank you.

Mr. Bush, I want to turn now to the big question, though, which is the top line budget. It was cut by \$4 billion last year, and as we heard in the testimony already, the Army was in front of this Subcommittee over the last 2 years talking about how hard it was working through the night court process to find some extra pennies and nickels under underneath Uncle Sam's cushions.

So, obviously, cutting \$4 billion from the top line this year, which includes a 10 percent cut from the Research, Development, and Acquisition (RD&A) account is going to put severe strain on Army's modernization efforts.

Could you just explain to us how it is going to be possible to cut \$4 billion, 10 percent out of RD&A to sustain the modernization equipping requirements after we have heard for the last 2 years of how close we were already blade-running on these efforts. I mean, it seems to me we are well beyond fat and even muscle, and now moving deep into the bone.

Mr. BUSH. Of course, Senator.

For starting, the math is the math. It is a \$173 billion Army budget. R&D [Research and Development] procurement is only \$34 billion of that, so 20 percent. So, from an affordability standpoint, future leaders and Congress can, of course, consider how that mixes within the Army. So, the choices we had to make in the equipping area, as you pointed out, sir, do show those reductions, primarily in R&D and procurement, as the top line was reduced. So, sir, how did we do that?

We did accept risk in some areas of the budget in terms of slowing down things, such as Abrams modernization and other things, in an effort to protect the highest interests. Sir, you have seen the budget. You have seen what we did and how those choices were balanced and the Army and those members will form their own views about those choices that we made.

But there was an attempt to do that wisely, to not damage the industrial base as part of that, and to not place undue risk, while there is always some risk, on the operational force, by slowing down modernization efforts outside 31+4.

Senator COTTON. I worry that the most immediate impact is going to be on those, what we call enduring capabilities, things like the Abrams tank or the Paladin Howitzer, and I know we use terms like accept risk there, but what that means is that our soldiers are out there working those tanks and those guns right now are going to have either older equipment or equipment that is less well-maintained or less training time on that equipment; is that right?

Mr. BUSH. In some cases, sir, yes.

Parts of the Army have always had different equipment than other parts. Even in the 1980s, Europe was the priority. People back in the States had less-modern equipment, but striking that balance is not an easy one, sir. The Army has tried to maintain essential modernization so that war plans and other things can be met with the right equipment and the best equipment at the right time.

Senator COTTON. Okay. Thank you.

Senator DUCKWORTH. Senator Hawley?

Senator HAWLEY. Thank you, Madam Chair.

Thank you all for being here. Thank you for your service to our country.

I want to start, Mr. Bush, if I could, with the Missouri question from my home state. Missouri is the proud home of the Lake City Army Ammunition Plant.

So, let me ask you about the plant and the timeline to establish a 6.8 millimeter ammunition manufacturing capability at Lake City that would support the Next-Generation Squad Weapon and, otherwise, help us build war reserves.

Mr. BUSH. Of course, Senator.

So, the first thing is, as you mentioned, the Next-Generation Squad Weapon is an example of the Army doing things differently and quickly. So, we are in rapid prototyping, about to go under rapid fielding, hopefully, which will include down-selected and ammunition type of that caliber, 6.8 millimeter, which the Army does intend to produce at Lake City eventually.

So, initially, we will be relying on contractor production. The 2022 budget has projects in it that lay the groundwork on-site for the future new facilities that will produce the new ammunition in the future. So, sir, there is going to be a transition over 3 to 5 years, I believe. That timeline is partly dependent on which new specific type of ammunition the Army chooses, because each of the three vendors has a different type of round. So, we will know more about that in the fall, sir, once we have got a selection made.

Senator HAWLEY. Great. Very good. That is helpful. Thank you.

Let me shift to some questions about the pacing theater. Both Senator Duckworth and Senator Cotton were asking you about this and about the Army's role in the pacing theater in INDOPACOM and in the pacing scenario. I want to ask about the pacing scenario.

General Murray, I want to start with you. Both Secretary of Defense and Deputy Secretary Hicks have testified about the pacing

scenario being a Chinese fait accompli against Taiwan and about the need for the United States to maintain an ability to defeat that fait accompli in order to maintain effective deterrence. That, of course, puts a premium on the Army's ability to respond quickly to a Chinese offensive, maybe even without any warning. So, can I just ask how Army's Futures Command is incorporating this scenario into the capabilities development process.

General MURRAY. Thank you for the question, Senator.

The Army and none of the services can build, in my case, an Army for a specific scenario in a specific theater. We do have global responsibilities and that explains, some of the other things that we are doing in the budget.

Specific to the fait accompli, and it is a scenario that we started off with, to be honest with you, when we started to look at this, there are two sponsor to a fait accompli. You can either prevent it through deterrence or, we believe, through long-range fires positioned in the theater, because the quickest way to get from Point A to Point B is already be at Point B, or then, if that fait accompli is completed, then you are facing a potentially long, protracted effort to reverse their effort.

Our preference is either through deterrence or being present in theater with the assets, primarily long-range fires, to help convince the Chinese, number one, that today is not the day to try this, and number two is if they do try it, to help the rest of the Joint Force prevent that. That would be my response.

Senator HAWLEY. Yeah, very good.

Can I just ask you if you agree with the Secretary, Secretary Austin, that is, and the Deputy Secretary, that our forces have to be able to defeat a Chinese fait accompli scenario.

General MURRAY. Of course they do.

Senator HAWLEY. Yeah, I thought that might be your answer. But let me ask you how you envision PrSM [Precision Strike Missile] being used in the Pacific.

Do you envision it being deployed forward on a regular basis or surged into theater, as needed, in the event of a crisis or conflict?

General MURRAY. That is primarily up to the INDOPACOM commander, the employment of forces. With my experience, I could see both. As you know, for the precision strike missile, we have already flown it 400 kilometers, which is a record for one of our systems. Later this fall, we will shoot it from Vandenburg and we will see how far it will actually go and spiral to. We will incorporate a seeker to allow it to target both, land-based and sea-based emitters.

Then we have begun, in this budget, to invest in extended-range, which our hope is to get it out over a thousand kilometers.

Senator HAWLEY. Very good.

When do you plan to field PrSM with an anti-ship warhead?

General MURRAY. I believe that is in 2026 or 2027.

Senator HAWLEY. Got it.

Do you see this becoming primarily a sea-denial asset or doing both, sea-denial and land-attack?

General MURRAY. Both. Depending on which theaters you are talking about and the role, and once again, the desires of the combatant commander.

Senator HAWLEY. Very good.

Let me ask you here in my last few seconds, either for you, General Murray or you, General Peterson, how you envision the Long-Range Hypersonic Weapon helping the United States respond effectively to any Chinese fait accompli against Taiwan and any contingency. I am particularly curious in how you envision that capability allowing us to hit time-sensitive targets, the mobile command centers, for instance, that Chinese forces would rely on to mount any effective invasion.

General MURRAY. At least the first iteration, and I think this is true of most, if not all of the services, time-sensitive targets become problematic just by based on the time of flight. But if you are talking hypersonic flight, it is a very quick launch to target, so it does help you, to a degree, cover those distances in a time-effective manner.

The primary advantage of the hypersonic weapons that we are developing is the range that it provides us, and we have had one test shot. We have another test shot coming up in the not-too-distant future. So far, successful. We stood up the unit at Joint Base Lewis-McChord in Washington state and we are starting to deliver training equipment to them. So, we are on track to deliver, in 2023, the first hypersonic battery.

Senator DUCKWORTH. Thank you.

With the ranking Member's agreement, we will begin a second round of questions. Thank you.

General Peterson, I am going to follow-up with the line of questioning that the ranking Member began, which has to do with prioritizing future capabilities at the expense of ongoing modernization efforts.

The Army submitted a \$5.5 billion in unfunded requirements. Within that, there was this decision that had to be made to prioritize future capabilities at the expense of ongoing modernization efforts of enduring capabilities, which left just under \$2 billion, 1.9 billion for modernization and equipping and unfunded requirements.

I have three questions that I would like you to answer and I am going to give them all to you right now. What are the top modernization projects included in this list? How are you ensuring that enduring capabilities receive sufficient priority through support deterrence, or if necessary, emergent requirements?

I am worried, also, about the increasing costs of maintenance costs of aging equipment.

Finally, how do these decisions impact the modernization efforts and timeliness of the Army National Guard and Army Reserves, the timelines, sorry, of the Army National Guard and Army Reserves' modernization?

Thank you.

Lieutenant General PETERSON. Chair Duckworth, in reverse order, if I may. First, the Army National Guard and Army Reserve, in some cases, we do slow modernization across the entire, total Army force, be that with aviation efforts or our ABCTs [Armored Brigade Combat Teams], based on these tough choices that we have alluded to.

Each and every one of our forces will pay some of those bills across the board. As you may be aware, in the aviation portfolio,

we will retain the older versions of the Apaches in the Active force, actually longer than we will in the National Guard, and we will divest of the older Blackhawks in the National Guard earlier than we will in the Active force. So, there is not a disproportionate burden being borne by our multicombo teammates and partners here; these are informed decisions across the board as we spread the pain, if you will.

With respect to our enduring investments, there are multiple cuts in the reflected, for restorals if the resources are available in the Chief's UFR [unfunded requirements] list. We have several of the enduring systems involving our ABCTs that we reflect. Those are our prime, heavy-fighting forces that are at rate there, that we do ask for your consideration, and those would be the primary ones in the enduring forces. We will have our ABCTs, our heavy forces and the elements of those, and our striker forces for an extended period of time.

With respect to the modernization priorities that are here, there are many opportunities for acceleration; again, we funded them appropriately to meet the needs and keep them on plan. The requests in the Chief's UFR list are for opportunities for acceleration.

Senator DUCKWORTH. Thank you.

Mr. Bush, maturing technologies to an appropriate level is critical to ensuring that the systems delivered to soldiers function as expected and provide the capabilities required.

How is the Army ensuring technologies are demonstrated in an operational environment before they are transitioned to a program of record, and please describe how the Army decision-process has sufficient dexterity to ensure iterative technology development is included, even after transition to that program of record status. Thank you.

Mr. BUSH. Yes, Senator.

So, in the first part, I think the Army, as you have seen, the Army is taking a new approach over the last few years with, rather than the traditional process, going to more of a prototyping first, then determining requirements, then going into production, with soldiers involved in that prototyping phase to ensure that the requirements reflect what the needs of the service are.

That transition from prototyping at different levels of fidelity to actual production is the difficult part of this new approach. So, the key thing we are doing is working collaboratively with General Murray's team and my team, is to make sure that those handovers between prototyping and actual production are planned well in advance.

The teams work together to make sure it is not being thrown over the fence, but rather, worked together through the process to make sure we go from a prototype to a production system in a way that is responsible and is properly tested.

So, one of my personal commitments to you is to ensure that the testing, especially operational and safety testing, no corners are cut in that regard, even those we are trying to go quickly.

Ma'am, if I could on the requirements part, I would defer to General Murray for a little more color there.

General MURRAY. Ma'am, just a very quick example. So, two systems are handheld radios and the new Manpack radio. You talk

about an operational environment, we deployed them with the unit to the Joint Readiness Training Center and we had testers and evaluators with the unit at the Joint Readiness Training Center to get after exactly what you talked about. This is an example.

Senator DUCKWORTH. Thank you.

Senator Manchin?

Senator MANCHIN. Thank you, Madam Chairwoman.

General Murray, the Army has used the Reserves and National Guard forces extensively for over 20 years to support the global war on terror, however, I am concerned that they have not adapted to supporting them with the same training and assets as if they were an Active component. I will give you an example.

There are 8 Army National Guard Combat Aviation Brigades with 4 battalions of AH-64 Apache helicopters, each only manned by 18 aircraft, instead of the 24 typical of an Active Duty battalion. The number used to be higher with eight battalions of Apaches, all manned with 24 at one time.

The reduction, itself, was a blow to readiness for the National Guard, but we have heard that the Army now plans to phase out its own supply of D-model Apaches, without offering conversions of those aircraft to National Guard, which would bring the brigades back to full strength.

So, is there any reason why they can't be transferred to the National Guard, those aircraft?

General MURRAY. You know, I am going to ask General Peterson, an aviator to chime in here, Senator.

The one thing I will say before I turn it over to him is, at least from our perspective, when you look at things like rearm, which I know came up in this morning's hearings, as well, the Army views that as compo-agnostic. So, regardless of compo, the unit that is going first, give it a war plan, give it a contingency, gets the most modern equipment the Army can possibly provide.

A lot of the Echo model that you are talking about, which is replacing the Delta, is a conversion, so my guess is units across the Army are short as we send Delta models back to the factory to be refurbished as Echoes.

Senator MANCHIN. Go ahead.

Lieutenant General PETERSON. Senator, I apologize if somehow a disinformation campaign struck there.

The bottom line is, we are absolutely committed to staying on track to completely fielding our National Guard—

Senator MANCHIN. Back to 24?

Lieutenant General PETERSON. Absolutely. We are committed and we are resourced to do so.

Currently, the plan is to field the, to buy out the AH-64E by 2025 with fielding in the next couple of years. The Active component will retain two D-model equipped units. But the Guard will be fully resourced with their full battalions and the most modern capability.

Senator MANCHIN. That is good news.

Lieutenant General PETERSON. We are not diverting from that. That is not a new plan. We are rigidly sticking to it and our—

Senator MANCHIN. I have no idea how the absolutely erroneous information got out, but we will try to track it back, to help get the culprit.

Let me ask this question, if I can, General Peterson, this is probably for you, too, the Army's future fighting force method has been to strengthen existing alliances, develop new partnerships, increase readiness, and build a more lethal force.

Every day I am reminded how vulnerable we are from the cyber, and I am on the Cyber Committee and chair that subcommittee, and I am deeply concerned with the cybersecurity capacity and capabilities to operate seamlessly with our civilian partners. I view the capabilities of the National Guard in the cyber domain as critical enablers to support the local authorities and to influence national security both, abroad and domestically.

So, my question would be, as part of the future 2028 Army concept, how do you see the National Guard being used to influence cybersecurity?

Lieutenant General PETERSON. Senator, thank you for that question.

With respect to our overarching cyber approach and strategy, there are multiple components of that. First, is the people component, which involves force structure and training and recruiting and, certainly, retention of the very talented professionals associated with those unique skill sets, which also have an exceptionally high demand and competitive salaries in the civilian world. I know that our Army is taking that under our talent-management strategies very, very seriously.

We have stood up cross-components, new structures and new organizations that optimize the cyber teams at various locations. I do not recall the specific number that are in the National Guard, but I know that they have been resourced and continue to flush out those teams.

With respect to the specific implementation of the equipping or the modernization side, I would ask if we could speak in another forum or session to talk about the determined investments that we continue to make in that realm that bring us capabilities that keep us relevant and at pace with the specific threats.

Senator MANCHIN. Mr. Bush, my time is running out really quick. Referring from stagnation and research and development and doctrine is critical deficiencies to viability of any organization, as we know. My question would be, what participation from the other services is there with Project Convergence on ensuring acquisition is conducted with joint interoperability in mind? We have such a difficult situation there and challenge, it seems like.

Mr. BUSH. Yes, Senator, if I could, I will start briefly and then turn that to General Murray if that is okay—

Senator MANCHIN. Sure.

Mr. BUSH.—as the person in charge of Project Convergence.

We are constantly working with the other services across R&D efforts. I cannot say that we are perfectly synchronized, but we do meet often and have tried to leverage each other's efforts where we are doing that, especially in the realm of command and control, which I think General Murray can talk to you with regard to

JADC2 [Joint All-Domain Comand and Control] and Project Convergence.

General MURRAY. Senator, Project Convergence deals primarily with early S&T [science and technology], R&D [research and development] efforts, and so very low technology-readiness levels. I think the place where the services get the most benefit of working together is a place at Aberdeen Proving Ground, we call the Joint Systems Integration Lab, where we have the opportunity to come together and understand at the very beginning of what is going to work together well and what is not going to work.

So, instead of stove-pipe developmental systems that we have to tie together once we have produced it, we have figured out how to tie things together at the very beginning. There is a tremendous amount of learning in a lot of areas to include what is being pursued from a research, development, test, and evaluation perspective by the services and there is open sharing of good ideas and ways to proceed.

Senator MANCHIN. Thank you, all. I appreciate it.

Senator DUCKWORTH. Senator Tillis?

Senator TILLIS. Thank you, Madam Chair.

Thank you, gentlemen, for being here.

I was watching the hearing in my office and my colleagues touched on a lot of the questions that I was going to ask, but I did have a few things that I wanted to go back to. One is the Next-Generation Squad Weapon.

Mr. Bush, I think you mentioned that the Lake City Ammunition Plant, or you may have in prior testimony, I don't know if you did it in this hearing, 3 to 4 years before they can fully ramp-up for producing the munitions. I think in response to Senator Hawley's question, you said you may rely on contractors to field munitions sooner than that.

The 3 to 4 year, I go back a lot of times, if you have ever seen me do any kind of hearings on acquisition, I go back to the 680-page next-generation handgun, 10 years to select, 10 years to deploy. About the time we will need another one.

The time frame for the Next-Generation Squad Weapon, relatively speaking, is probably going to beat that mark, but what can we do to speed this up and to what extent should we be looking at other ways to produce in the future?

When we are talking about Next-Generation Squad Weapons, should we also be talking about next-generation ammunition manufacturing and distribution?

With all due respect, my colleague from Lake City, when you see some of the technologies, I have gone out and visited True Velocity, polymer-based casing, lighter, more accurate. To what extent do those moderate ways of manufacturing munitions actually enter into the equation?

Mr. BUSH. Senator, first, on Next-Generation Squad Weapon, and I think it is the polar opposite of what happened with the handgun. So, you may really use those as two extremes. It is using every rapid method we have to test weapons that are being tested now. We picked three vendors and their weapons are in the hands of soldiers going through testing.

There will be challenges with that, but we are hoping to narrow that down, and the first quarter of fiscal year 2022 is the selection down to the final one. So, in terms of acquisition process, sir, I don't think there is another authority that Congress can give us to go any faster than we are in this case.

With regard to the ammunition, I believe all three of these selected vendors have a different ammunition approach, with polymer, cased telescoped, and perhaps one that is a little bit more conventional. So, I believe the Army is aware of the innovation in that space.

This weapon will not equip the entire Army, initially, so you could probably look at it as possibly a first step, and I believe as advances in ammunition come through, General Murray's team working on requirements for possibly new types of capabilities we will need against enemy defensive equipment, for example, would be in the lead for that.

Senator TILLIS. Maybe, General Murray, you can add to that, but I am also curious about the future of designing. Right now, we design next-generation weapons around the kind of known for the ammunition, but are we reaching a point where we design guns around new ammunition-delivery systems, you know what I mean. I mean, we are using, basically, the same kind of technology that we have been using for about 100 years; the casings, build a gun around it.

But tell me a little bit about what we are doing for future generations for any of kind of small arms.

General MURRAY. So, Senator, thank you, and to add on to Mr. Bush's answer, because of the way we are doing this, we do have three entirely different designs for the bullet. So, to credit for the acquisition community in Lake City, we don't know what the manufacturing requirement is going to be, because we don't know what we are going to have yet, and so the ammunition is, by necessity, trailing the development of the weapon.

In the case of this weapon, we started with, not a bullet, but just the effector, the lethal end, the lethal mechanism of the cartridge, which was government-developed, and went to industry and said, build us not only one weapon, but two weapons, an automatic rifle and an automatic weapon, a rapid-fire weapon around this effector, and that is why we ended up with the three different types of cases and three entirely different designs for weapons.

One is what they call a bull-pup, and the other two are more conventional, and we had tremendous interest from industry, and I think we are going to end up with a very viable solution with that approach. It was a completely different approach, as Mr. Bush said, than the handgun.

Senator TILLIS. Okay. Thank you, gentlemen.

Senator DUCKWORTH. Senator Kelly?

Senator KELLY. Thank you, Madam Chairwoman.

General Murray, this question is for you about Project Convergence, the centerpiece for transformational change for the Army. So, last August and September, Project Convergence 2020 conducted its capstone event at Yuma Proving Ground, an ideal location to host an event like this, not only because Marine Corps Air Station Yuma is next door and was able to provide an F-35, but

it is a great environment to operate in; good weather, but also a challenging environment, desert environment.

That is important, to make sure that we know our technology is going to work when we need it the most. An important part of this concept of modernization is trying out innovative ideas and technologies, sometimes even before they are fully matured. You mentioned very low TRLs [Technology Readiness Level] for some of these items, finding out early on, which ones work, which ones don't. I want to really applaud that mindset, because I believe this is exactly what we need to innovate and to respond to emerging threats.

So, General, what are some of the lessons learned from last year's demonstration, maybe something that didn't go quite as planned, but also, was there any relatively low TRL item that performed well and surprised you and you think could be in the Army's future?

General MURRAY. So, Senator, thank you.

We are actually coming out to Yuma, again, later this year as you probably know, a little bit later; hopefully, it is not 120 degrees again when we are out there.

Senator KELLY. I think it is today.

General MURRAY. Project Convergence taught us a lot, and as you mentioned, it was Army S&T coming out of Army labs. The key thing there is, you know, as we begin to work with these technologies, it is Government-owned intellectual property, and so we were free to work on those technologies at Yuma in the dirt with soldiers and coders and engineers working side-by-side. That is the first lesson, is the power of marrying up soldiers and engineers, that soldiers can say, if only it could do this, and then an engineer or a coder or a scientist can say, it can do that, give me 6 hours it recode some of this and we will see what it can do. That was the first powerful lesson.

The second powerful lesson is, and we didn't have all of the cross-functional teams out there, is the realization as you look across the Army modernization, the systems integration and the systems engineering of what we are doing, the whole has to be greater than the sum of its parts. As you start to pair these things together, you can accomplish some pretty amazing things.

Last year was focused on sensor to shooter. We got a process that was in tens of minutes, down to tens of seconds using, to include space-based sensors at extended ranges.

The third thing we learned was that we have got to have coders in the Army because we were literally rewriting code each and every day to make things work, which was the genesis of the thing we called the software factory, which I mentioned in my opening comment, the ability to reach out and really capitalize on the talent, not recruit the talent, but capitalize on the talent that is currently in the Army and then give them those skills so we have those front line coders on that future battlefield.

The power of the, and we had not planned for the Marine Corps F-35. Out of the generosity and willingness to participate, they came in. We were able to link the F-35 to ground and pass traffic, targeting data both up and down, which was a first for us to be able to do that.

Project Convergence 2021, which you will see this year, and you are welcome to attend, you will see all four services out there doing basically the same thing; working to solve joint problems from the ground up.

There was an algorithm that we used to pair, and there are lots of things that I was impressed with, but to pair the best shooter that we had available in deconfliction of airspace and range, ammunition on hand, and it did it through an automated algorithm.

There was a technology we had at Joint Base Lewis-McChord that basically took the feed from the sensor, did the target mensuration down to 10 digits, cleared the fires, put it in a standard message format, passed it back down to Yuma Proving Ground in your state, and then it went through this algorithm to match it up with the best shooter.

So, we had lots of things. Nothing worked perfectly at the demonstration last year. There were very few things that worked perfectly, but I think that is the beauty of it. This is not a canned exercise. We are actually trying to make these technologies work together in ways, in some cases, they were never designed to do.

Senator KELLY. General, would you say that that algorithm was at the level of using artificial intelligence on the battlefield?

General MURRAY. I would say machine learning at this point and we are continuing to mature it.

Senator KELLY. All right. So, we are going to need to continue to have these partnerships with institutions across the country, universities like the one we have in Arizona or the three major universities, to make sure that you have those coders available to incorporate and continue to develop these technologies.

General MURRAY. Absolutely, Senator.

Senator KELLY. Thank you, General.

Senator DUCKWORTH. Senator Cotton?

Senator COTTON. Mr. Bush, last fall, the Army reported to Congress that the Iron Dome Missile Defense System would meet the Army's need for an interim capability to protect troops from short-range mortars, artillery, and rockets.

What is the current status of that program, including its acquisition, training, air defense integration, and fielding?

Mr. BUSH. Yes, Senator.

So, the first tasking from Congress was two batteries in operation, and the Army will have two operational batteries of the original Israeli Iron Dome system by the end of the year, capable of being deployed, and they will be part of the Army's air defense force.

So, what follows is what the Army is working on now, which is a system that will provide additional capability working with some different vendors that we are hoping to get a decision on in the near future to down-select and then move into production to provide protection that is even better than what Iron Dome provides, in regards to, for example, cruise missiles and some unmanned vehicles.

Senator COTTON. When you say ready to deploy later this year, that means with a maneuver unit, capable of deploying around the world, in conflict?

Mr. BUSH. Yes, sir, that is the plan.

Senator COTTON. What is the biggest hurdle to integrating Iron Dome into our maneuver units and our air defense systems?

Mr. BUSH. Full integration of software.

Senator COTTON. Is there a way to achieve that or is that why you are looking at alternative systems that will address some of those other threats, as well?

Mr. BUSH. That is part of the answer, sir, yes.

Senator COTTON. The short answer is, they don't want to give up all the code, right. Okay. Got it.

Active protection systems, General Murray, there is a \$16 million unfunded request for Bradley- and Stryker-centric active protection systems to defeat incoming RPGs [rocket propelled grenades] and recoilless rifle rounds. Can you explain the importance of getting that request funded and how delaying that fielding, the fielding of that system, or how delayed the fielding of that system will be if it remains unfunded.

General MURRAY. It would be a guess to tell you how long because it is going to depend on future budgets, Senator, whether we can fit it into the base budget.

The money you mentioned is really to work on characterization of a system called Iron Fist Light Decoupled, and that is a long acronym. We have been working with Iron Fist for a while.

The issue with the Bradley fighting vehicle is the size of the top of the turret; it is hard to get an active protective system on there. The problem with the Stryker vehicle is it is not as heavy as armor as an Abrams, so you get residual penetration of the vehicle without an appropriate system; plus, the systems have to be lighter, than, for instance, the trophy that is on the Abrams.

So, that money is designed to characterize Iron Fist Light Decoupled, plus, do some work with some other developing systems and then work that into, eventually, a capability that we will field on both, the Bradley and Stryker.

Senator COTTON. Okay. Thank you.

Lieutenant General PETERSON. Senator?

Senator DUCKWORTH. Go ahead. I'm sorry.

Lieutenant General PETERSON. Pardon me, Senator.

If I may add, that is one piece, and, again, it reflects acceleration of a specific capability in that UFR list. Overall, vehicle protective systems, or suites, which is a comprehensive, layered approach to protection of our combat vehicles, has over \$200 million invested in it in the 2022 budget, fully funded and reflected.

Again, we are seeking opportunities to invest in other capabilities and to accelerate specific capabilities. In another forum, we would be honored to talk to you about that comprehensive, layered approach.

Senator COTTON. Thank you.

General Murray, it is our understanding that some of our more expeditionary units, like the 82nd Airborne, are experimenting with a light tank that could be airdropped to provide a little extra firepower on the drop zone.

What is the current status of that program and to what extent have any testing succeeded?

General MURRAY. We are in the middle of soldier touchpoints for two vendors with what we call mobile protective firepower, which is in better terms, a light tank.

The one correction, sir, is airdrop is not one of the requirements that we are currently pursuing. One of the vendors is significantly lighter than the other. I mean, there could be a potential there, but that is not an Army requirement, to airdrop it.

So, the first vendor, and we are in competition right now, so that is why I said vendors, instead of specific industry-partner names, has completed a live-fire soldier touchpoint testing and is getting ready for a limited-user test. The second vendor is now in the process of delivering vehicles to Fort Bragg, North Carolina. The 82nd Airborne will go through the same process with soldier touchpoints, a live-fire, and then we will do the LUT [limited user test] concurrently, so we have similar weather, similar conditions, similar everything before we select which vendor.

Senator COTTON. Okay. If it is not air-dropped, how are you going to get it onto the battlefield? Is it follow-on airlift after airfield seizure?

General MURRAY. Airland, yes, sir.

Senator COTTON. Is the Marine Corps showing any interest in this kind of capability since they just got rid of all of their Abrams?

General MURRAY. No, sir.

Senator COTTON. Thank you.

Senator DUCKWORTH. Senator Kelly?

Senator KELLY. Thank you, Madam Chairwoman.

So, General Peterson, and also for Mr. Bush, so, supply chain security is an issue that is a top priority for me when it comes to our national defense and that includes all the parts and components that make our weapons systems work. That is why in recent weeks, I worked to secure \$2 billion in dedicated funding for programs like the microelectronics R&D network, as authorized by section 9903 of the fiscal year 2021 NDAA.

I am pleased that this was included in the U.S. Competitiveness and Innovation Act that passed the Senate just last week, and once implemented, this effort will close gaps in domestic, semiconductor, laboratory, and manufacturing capacity as quickly as possible by leveraging the research capabilities of universities across the Nation.

So, General Peterson, as the person responsible for matching resources to the defense strategy and the Army's plan, how are you thinking about the Army's microelectronics needs to support the services' modernization goals?

Lieutenant General PETERSON. Senator, thank you very much for that question, and as well as the recognition of the gap in the risk to our National Security Strategy with respect to the supply chain vulnerabilities.

Very specifically, in 2022, we recognized the challenge with the offshore vulnerabilities of microelectronic sources and with limited capabilities, fleeting capabilities currently here in the United States, we participated in both, a joint OSD buy with over \$200 million in 2022 of required, trusted microelectronics, as well as a unilateral investment of over \$60 million, as we continue to ensure that we have the supply chain for essential modernization, as well

as new efforts and our enduring systems to mitigate the vulnerability to that.

For a longer term, the entire Joint Force and OSD are working collaboratively with you and other supporters to ensure that we have enduring onshore capabilities, and we appreciate your continued emphasis there.

Senator KELLY. Thank you.

Mr. Bush, you know, part of, it is not only sourcing the microelectronics, the semiconductors, here in the United States, instead of overseas, one critical aspect of this is also the “fab to lab” testing component. Right now, we, as a Nation, semiconductors are often tested, ours are tested in China and some European countries. This poses a national security issue for us.

Do you agree that it would be in the best interests of our Nation and our national security to do that fabrication to lab, or “lab to fab” testing onshore, rather than in near-peer adversary countries?

Mr. BUSH. Senator, without having deep expertise, I would say, yes, of course, we would prefer do that kind of thing here.

If I could add some context to the overall efforts we are looking at with regard to supply chain risk, about 50 years or more of globalization has produced deep, interconnected, international supply chains for all our companies that the Department of Defense works for, and in particular, we find those with non-traditional companies that maybe haven’t worked with the Defense before, but are private companies or commercial companies, have international supply chains.

The first thing we are trying to do, our guidance for now, the first thing we have to do is see ourselves. So, the Army is trying to develop in-house capability to analyze and understand supply chains on our own, rather than only relying on industry to do that.

The second thing, sir, will be to evaluate risk. A different risk calculus, perhaps, between something in Canada and something in China, as you pointed out.

The third thing will be mitigation and that is where the challenges will really come and the choices will have to be made between critical things like semiconductors and microelectronics, like you are describing, sir, and choices that we will have to make on other things that might be made overseas, but might be acceptable to be made overseas and that will be a “cost to risk” trade-off because we also are trying to maintain our current production lines at the paces that they are going, while balancing the risks of international supply chains. It will be a long, ongoing effort, sir.

Senator KELLY. Well, thank you, Mr. Bush, and thank you, General Peterson.

I yield back.

Senator DUCKWORTH. Thank you.

I want to thank all three witnesses for your testimony today and your responses, and I thank you again. I look forward to working with you all into the future. Good first hearing, and, again, I just want to thank everybody.

With that, the hearing is adjourned.

[Whereupon, at 3:42 p.m., the Committee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR THOM TILLIS

FUTURE VERTICAL LIFT

1. Senator TILLIS. General Murray, the Army's Future Vertical Lift (FVL) modernization program consists of two distinct aircraft, each designed to accomplish different missions in the Army's future force. They are the Future Long Range Assault Aircraft (FLRAA) program, designed to replace the Blackhawk and the Future Armed Reconnaissance Aircraft (FARA) designed to fill the void left by the retirement of the Army's armed scout aircraft. The Army has budgeted \$181 million between fiscal year 2019 and fiscal year 2021, and Congress has added \$185 million during the same period. The Army suggests that this program is its number 3 modernization initiative (out of 6) and the total funding is between number 5 and 6 in total dollars over the FYDP. Additionally, the Army has awarded two competitive prototypes for each variant, both to Bell Helicopter and LM/Sikorsky.

The Future Vertical Lift program is considered the furthest along of all the projects under the CFTs, and Futures Command. The FLRAA program, in particular, is the one major program that is actually flying. This is not a "paper" program, and thus represents the "Poster Child" for a successful acquisition program coming out of Futures Command.

The existing vertical lift fleet, according to CSIS, lacks the necessary speed, range, endurance, survivability, and lethality to compete in the Anti Access/Area Denial (A2/AD) environment. The U.S. Army FVL program seeks to modernize the vertical lift fleet by delivering the most modern, versatile, and lethal power projection platform to insure success on the modern battlefield. There have been recent articles in the press (believed to be pushed by those opposing FVL) which have been critical for the Army's requirement for speed. The Army has pushed back aggressively citing the need for speed and range to increase lethality and allow the Army to achieve a more lethal force in the Great Power Competition, and Indo-Pacific Theater.

The Army has consistently discussed the need for speed and range, as well as survivability when it comes to the future vertical lift aircraft. Could you explain to this Committee why speed and range are so critical to the Future Long Range Assault Aircraft and how this new technology will allow the Army to leverage FLRAA as a power projection platform?

General MURRAY. FLRAA is the next generation of affordable vertical lift, assault and intra-theater aeromedical evacuation (MEDEVAC) aircraft, and is effective and decisive in the lower tier of the air domain.

FLRAA expands the reach of ground forces to conduct air assault missions from relative sanctuary across the battlespace, reducing enemy reaction time and freedom of action. The cost per effect for FLRAA to insert two infantry battalions in one period of darkness is on par with the cost of twice as many H-60s to achieve the same effect.

FLRAA compels the enemy to respond to multiple dilemmas through its ability to move and converge ground forces through decentralized operations over extended distances.

The fundamental capability of FLRAA is the reach and thereby the power projection it provides in the increasingly dangerous and complex multi-domain operations environment. Additionally, FLRAA will remain survivable with the use of Air Launched Effects (ALE) and integration with other maneuver forces and long-range fires, all enabled by the network.

2. Senator TILLIS. General Murray, how will this capability assist the Army with its strategy in the Indo-Pacific Theater and in the Great Power Competition?

General MURRAY. The Future Vertical Lift (FVL) ecosystem includes the Future Attack Reconnaissance Aircraft (FARA), the Future Long-Range Assault Aircraft (FLRAA), Air Launched Effects (ALE), an adaptive command and control network, artificial intelligence decision agents, and lethal and non-lethal effects. It is a purpose-built capability for multi-domain operations, and is set to become the tip of the spear for the Army's Multi-Domain Corps and Multi-Domain Division in the era of great power competition.

With transformational speed, range, and the ability to converge Army and Joint sensors and shooters to enable decision dominance, FVL is poised to provide the Joint Force threat penetration at the outset of large-scale conflict. In addition, FVL will provide overmatch capability and capacity to out-tempo the enemy at all Army echelons to win the close fight.

China's investment in creating a dense network of anti-access/area-denial (A2/AD) capabilities throughout the Pacific island chains presents a complex problem. It in-

hibits U.S. power projection, erodes joint freedom of maneuver, and ultimately diminishes credible deterrence.

Dominating in the lower tier of the air domain, the FVL ecosystem provides a unique advantage against A2/AD systems, such as Integrated Air Defense Systems (IADS), enemy long-range fires, and threat command and control systems. Hidden by surface clutter while operating at lower altitudes, FVL outmatches radar and observation with the standoff and swarming capability of its Air Launched Effects (ALE) with Electronic Warfare (EW) and lethal strike capabilities. Joint force aircraft and follow-on maneuver forces can exploit this penetration to destroy other critical targets once FVL destroys or neutralizes the IADS barrier.

3. Senator TILLIS. General Murray, is the Future Vertical Lift program fully resourced, across the FYDP for both the FLRAA and FARA programs, both Research and Development funding and Procurement funding? What are the amounts of funding, through the FYDP? In which year will Congress see funding requested for procurement dollars?

General MURRAY. We do not yet know how much funding will be allocated to the Army each year beyond fiscal year 2021, so I cannot tell you that both FLRAA and FARA are fully resourced across the FYDP. Fiscal year 2030 remains our target for equipping the first unit.

QUESTIONS SUBMITTED BY SENATOR DAN SULLIVAN

COLD-WEATHER ALL-TERRAIN VEHICLE

4. Senator SULLIVAN. Mr. Bush, General Murray, and Lieutenant General Peterson, the Cold-Weather, All-Terrain Vehicle is not on the Army's "31 plus 4" modernization list. As I understand it, two firms were recently selected to build CATV prototypes that would replace the obsolete Small Unit Support Vehicles, which enable mobility for Arctic operations. Can you provide an update on this modernization program, including when it will achieve initial operational capability?

Mr. BUSH, General MURRAY, and Lieutenant General PETERSON. The Cold Weather All-Terrain Vehicle (CATV) program awarded Other Transaction Authority agreements to two vendors in April 2021 for the prototype phase. Each vendor delivered two vehicles in June 2021 and the Army is performing testing at Cold Regions Testing Center, FT Greely, AK. Successful completion of the testing of these prototypes will determine eligibility to compete for a production contract.

A production award is anticipated in 4th quarter fiscal year 2022, with projected First Unit Equipped in 4th quarter fiscal year 2023.

ARCTIC BRIGADE COMBAT TEAMS

5. Senator SULLIVAN. Mr. Bush, General Murray, and Lieutenant General Peterson, the Army Arctic strategy calls for the transformation of the Alaskan-based BCTs into Arctic BCTs to "recapture our cold-weather dominance." Part of my understanding of this transformation is that it requires a shift away from Infantry Carrier Vehicles, or Strykers, to a vehicle that provides better mobility in Arctic terrain. What is the status of the Army's transformation effort?

Mr. BUSH, General MURRAY, and Lieutenant General PETERSON. The Army is finalizing options and timelines to transform the Alaska-based Stryker Brigade Combat Team (SBCT) into a more Arctic-capable formation. We are developing the formation's requirements and expect to announce options in fiscal year 2022. Ground mobility requirements in Arctic terrain could be provided by the Cold Weather All-Terrain Vehicle (CATV) that is replacing the aging Small Unit Support Vehicle (SUSV). However, the CATV is intended to provide a movement capability to support training, Homeland Defense (HD), Defense Support to Civilian Agencies (DSCA), and Search and Rescue (SAR) in a non-combat environment. If the CATV is deemed a suitable replacement for use in combat brigades, the Army will have to adjust the procurement objective. The CATV program is in the prototype phase, with vehicles from two vendors conducting testing at the Cold Regions Testing Center at Fort Greely, Alaska. Our current timeline projects a production award in fiscal year 2022, and first unit equipped in late fiscal year 2023.

6. Senator SULLIVAN. Mr. Bush, General Murray, and Lieutenant General Peterson, will the Army's focus on the "31 plus 4" modernization list impact the timelines for 1-25 and 4-25 BCTs to convert to Arctic BCTs?

Mr. BUSH, General MURRAY, and Lieutenant General PETERSON. The Army is reviewing options for conversion of structure to Arctic capable formations. Once ap-

proved, those conversions will follow the Total Army Analysis (TAA) timeline with announcements typically in the first quarter of the fiscal year. The decision will be followed with a synchronization of resources (personnel, training, and equipment) required for the conversions to meet the timeline and ensure minimal impacts to the Total Force.

ARCTIC MULTI-DOMAIN TASK FORCE

7. Senator SULLIVAN. Mr. Bush, General Murray, and Lieutenant General Peterson, it is my understanding that the Army will create an Arctic Multi-Domain Task Force (MDTF) in Alaska. It will consist of several units currently assigned to 1–25 and 4–25 in addition to newly assigned units. Which long-range precision fires systems will this unit field and will they undergo Arctic testing before fielding?

Mr. BUSH, General MURRAY, and Lieutenant General PETERSON. The Army is exploring options to build Long Range Hypersonic Weapon (LRHW) capabilities, Mid-Range Cannon (MRC) capabilities, and High Mobility Artillery Rocket System (HIMARS) capabilities. Force structure decisions in support of the Arctic are under evaluation. However, the testing and evaluation strategy of all new weapon systems considers the intended operational environment of the system and incorporates climate testing to determine operational effectiveness within that environment.

8. Senator SULLIVAN. Mr. Bush, General Murray, and Lieutenant General Peterson, it is my understanding that the Arctic MDTF will include long-range precision fires that the Army wants to operate along Alaska's vast coastline for extended periods of time to create anti-access/area denial networks. Is the Army considering how civilian and military infrastructure will impact Arctic Multi-Domain Task Force (MDTF) operations along Alaska's coastline?

Mr. BUSH, General MURRAY, and Lieutenant General PETERSON. The Army has not yet conducted the detailed analysis to evaluate the tactical, technical, and logistical feasibility of any particular concept of operations. Therefore, it is not possible to say that if an MDTF were stationed in Alaska how it would operate, to include what impact those operations would have on military or civilian infrastructure.

**DEPARTMENT OF DEFENSE AUTHORIZATION
FOR APPROPRIATIONS FOR FISCAL YEAR
2022 AND THE FUTURE YEARS DEFENSE
PROGRAM**

TUESDAY, JUNE 22, 2021

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

**MODERNIZATION EFFORTS OF THE DEPARTMENT OF
THE AIR FORCE**

The Subcommittee met, pursuant to notice, at 2:47 p.m. in room SR-232A, Russell Senate Office Building, Senator Tammy Duckworth (Chairwoman of the Subcommittee) presiding.

Subcommittee Members present: Senators Duckworth, Peters, Manchin, Rosen, Kelly, Cotton, Sullivan, Scott, and Hawley.

OPENING STATEMENT OF SENATOR TAMMY DUCKWORTH

Senator DUCKWORTH. I would like to call the hearing to order. The Ranking Member is 2 minutes out, so we will get started.

I am especially pleased that everybody is here today. I want to extend a warm welcome and thank each of our witnesses for appearing before this Subcommittee today. I look forward to hearing your testimony.

Last week, the Subcommittee heard from Army witnesses about the challenges in the Army's modernization portfolio, and I look forward to hearing from our Air Force witnesses about the challenges and opportunities they face in modernizing the Air Force.

I am especially interested in hearing from the witnesses about how the Air Force plans to manage its multiple modernization programs in ways that deliver the capabilities our warfighters need in a timely manner to defeat our most capable adversaries, while protecting our taxpayers' dollars and avoiding too much risk to support combatant commander requirements.

This discussion of modernization programs surely should include the F-35 fighter, the B-21 bomber, the KC-46 tanker, and Advanced Battle Management System, or ABMS, which seeks to replace the JSTARS' [Joint Surveillance Target Attack Radar System] capabilities, among others.

In an effort to be good stewards of taxpayer dollars, the Air Force has been particularly aggressive in implementing accelerating ac-

quisition authorities, including from major defense acquisition programs.

Congress has given DOD [Department of Defense] these new authorities and it is Congress' job to oversee the Department and 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 as they strive to balance the need to support ongoing operations and sustain readiness with the need to modernize and keep the technological edge that are so critical to successful military operations. Specifically, our Air Force will bear a large share of the burden of implementing the National Defense Strategy that is derived from Secretary Austin's review.

There is no ignoring the fact that inter-state strategic competition with increasingly capable adversaries is a primary U.S. national security concern.

There are a number of other issues that we need to hear about from the Air Force, but in the interests of time, I will stop here and wait for our discussion.

Again, I want to thank our witnesses for their service and for appearing before the Subcommittee this afternoon, and I will now turn it over to our Ranking Member, Senator Cotton.

STATEMENT OF SENATOR TOM COTTON

Senator COTTON. Thank you, Senator Duckworth.

Gentlemen, thank you for your appearance this morning. Thank you, as well, for your decades of distinguished service.

The current National Defense Strategy directs our Nation's military to be prepared, to deter, and if necessary, defeat our peers, like Russia and China. In order for the Department of the Air Force to meet that requirement, it must be properly manned, trained, and equipped to win in both, air and space. Given the President's Budget, however, I am fearful that is not an achievable goal.

At the end of the Obama administration, the Air Force was at the lowest level of readiness in history; fewer than 10 percent of combat squadrons were ready to deploy and even fewer were prepared for a peer fight. We have substantially improved readiness in the last 4 years, but we have a long way to go on modernization and this budget is nowhere close to adequate.

Air Force leaders have stated the Air Force is too small and too old to do what the Nation asks; in fact, 44 percent of our aircraft fleet is beyond its service life. Understanding that we can't continue to fly these aging fleets forever, we need to invest and increase procurement to give you the resources you need to divest older systems.

All the independent studies show that you need to grow and modernize, but in this budget, you are forced to get smaller and I am concerned that your current budget is inadequate to achieve a moderate risk force, which is required by law.

China and Russia, combined, are already spending more to modernize their force than we are, yet this budget reduces Air Force procurement by almost 15 percent and flight hours have been reduced, as well. We understand all this is caused by a budget that

falls well-short of the 3 to 5 percent real growth recommended by the National Defense Strategy Commission report; in fact, it does not even keep up with rapidly rising inflation.

The men and women who volunteer to serve this great Nation deserve to be given the tools and the resources necessary to win. So, I look forward to hearing from the witnesses about the impact of this budget on the readiness and the modernization of the Air Force and the risks that the Nation accepts if we don't change it. Thank you.

Senator DUCKWORTH. I now call on the witnesses to begin your testimony. Do you have an order that you are choosing to go with, General Nahom?

Lieutenant General NAHOM. Yes, ma'am, I will start.

Senator DUCKWORTH. Okay.

**STATEMENT OF LIEUTENANT GENERAL DAVID S. NAHOM,
USAF, DEPUTY CHIEF OF STAFF OF THE AIR FORCE FOR
PLANS AND PROGRAMS**

Lieutenant General NAHOM. Chairwoman Duckworth, Ranking Member Cotton, distinguished Members of the Subcommittee, thank you for having us here today to provide testimony on the Department of the Air Force's 2022 budget requests. Additionally, thank you for your continued leadership and dedication to the United States' military and the Department of Air Force's 689,000 total force airmen serving around the world today.

As you know, our Nation faces a complex set of current and future security challenges that require we think and act differently and with urgency. Our Chief of Staff of the Air Force, General C.Q. Brown, has articulated what is at stake. Unless we make significant changes to the Air Force's program force, we will not meet the pacing threat of China in 2030, and unless something changes, we will not be able to accomplish the Air Force's core missions in the future operating environment.

The American Homeland is no longer a sanctuary. Our citizens face threats from a variety of actors in both, physical and digital arenas, and our competitors continue aggressive efforts to negate our longstanding warfighting advantages. One of the most remarkable differences between us and China, for example, is a sense of urgency to change and modernize.

We can state definitively that China's actions show a sense of urgency. They see a future that is very different from the one that we would want to see and they are moving with a purpose to realize that future. Their efforts include a massive buildup of military power and a clear intent to use that military to create leverage on us and our allies and partners.

As we continue to work with each of you, it is becoming apparent that our collective thinking is beginning to shift. We are, together, waking up to this challenge and 2022 offers us another opportunity to change accordingly so that our actions match our growing sense of urgency.

Together, under this Committee's oversight and leadership, along with our industry partners and innovative airmen, we remain the preeminent power projection force in the world today. I would like

to briefly outline some elements of that capability and how we intend to maintain the preeminent power of our Nation's future.

The Air Force provides sole, long-range bomber capability for joint and allied forces and our fleet is in any demand across the globe. Combatant commands have discovered the flexibility and messaging power of the bomber task force. Our 2022 budget continues to fund this flexible bomber capability, while setting up a transition from three bomber fleets to two, the B-21 and a rebuilt and refurbished B-52.

A key element of this modernization is the development and fielding of advanced munitions, including hypersonic munitions, such as the Advanced Rapid Response Weapon, or ARRW, and the next generation of cruise missiles.

Extensive war gaming analysis make it clear that we must also reassess our future fighter force mix and adjust investment priorities to provide the capability, capacity, and affordability required to meet a peer threat.

Modernization programs cannot transform our fourth-generation fighters into fifth-generation or our fifth-generation fighters into the Next Generation Air Dominance, or NGAD [Next Generation Air Dominance].

The Air Force fighter fleet should match the capability and capacity of both, platforms and weapons, to mission requirements. In order to achieve this, the Air Force must have the flexibility to rightsize our current aircraft inventories, to expedite the transition away from less-capable, aging aircraft and emphasize in investment in future capabilities.

As we discuss power projection, we must remember the Air Force provides refueling capacity that makes this projection possible for both, the Joint Force and our allies. As we transition to a two-tanker fleet of modernized KC-135s and new KC-46s, we will retire the KC-10, freeing up the airmen we need to build the KC-46 into the capability the taxpayer has paid for.

While we work to rectify some discrepancies, we stand behind the KC-46 and believe it will be a great refueling capability for decades to come. Even today, it has taken on many of the day-to-day refueling requirements and that said, our plan is to make full use of the KC-46 in the near term, while fixing discrepancies as soon as possible.

One area where our investments have paid tremendous dividends is in airlift. Our airlift fleet is the envy of the air forces around the world and this year's budget continues to invest in C-5s, C-17, and C-130 fleets.

We will be paying particular attention to the tactical airlift fleet in the coming years as we balance risk across all of our Air Force portfolios. The Air Force goal is to ultimately reduce the C-130 fleet to 255 aircraft, but that is only contingent upon our ability to find mutually agreeable replacement missions for any C-130 unit that would re-mission.

To meet the challenge of a highly contested environment, we must also envision a future ISR [intelligence, surveillance and reconnaissance] portfolio that consists of multi-domain, multi-intelligence, collaborative-sensing technology. It will be resilient and

persistent to support both, kinetic and non-kinetic capabilities, alike.

Global integrated ISR must transition to connected and survival platforms. This will be required to accelerating investment and accepting short-term risk by transforming away from less-capable ISR assets. Our goal is a ready, next-generation ISR enterprise that possesses decisive advantage to the warfighter, while remaining competent across the entire spectrum of conflict.

In closing, I want to personally thank the Members of this Committee and the broader Senate Armed Services Committee, past and present. When I entered the Air Force, your predecessors and some of you had worked to develop a force that gave my generation what we needed to defend our country and interests around the world.

Today, we must work together to modernize to the future so the next generation can say the same. We have done this before and I am confident, together, we can do this again.

I am honored to serve on the same team with General Richardson and General Guastella. They work tirelessly to think differently about how we acquire and operate the force of our future airmen.

Again, thank you for having us, and we look forward to your questions.

[The joint prepared statement of Lieutenant General Duke Z. Richardson, Lieutenant General David S. Nahom and Lieutenant General Joseph T. Guastella follows:]

JOINT PREPARED STATEMENT BY LIEUTENANT GENERAL DUKE Z. RICHARDSON, LIEUTENANT GENERAL DAVID S. NAHOM AND LIEUTENANT GENERAL JOSEPH T. GUASTELLA,

INTRODUCTION AND STRATEGIC ENVIRONMENT

Chairman Duckworth, Ranking Member Cotton, and distinguished Members of the Subcommittee, thank you for having us here today to provide testimony on U.S. Air Force modernization. Additionally, thank you for your leadership and dedication to rebuilding the United States military.

Our Nation faces a complex set of current and future security challenges requiring that we think and act differently and with urgency. The American Homeland is no longer a sanctuary. Our citizens face threats from a variety of actors in both the physical and digital arenas. Competitors, especially China and Russia, continue aggressive efforts to negate our long-standing warfighting advantages while challenging America's interests and geopolitical position. China in particular is the Nation's pacing threat. It has rapidly become more assertive, and is the only competitor potentially capable of combining its economic, diplomatic, military, and technological power to mount a sustained challenge to a stable and open international system.

The Chief of Staff of the Air Force has articulated what is at stake with his *Accelerate Change or Lose* white paper. It states "unless we make significant changes to the Air Force's programmed force, we will not meet the pacing threat of China in 2030. Unless something changes, we will not be able to accomplish the Air Force's core mission's in the future operating environment." A growing body of evidence from adversary assessments, recent wargames, exercises, studies, reports, and other analysis underpins this assessment.

To make these changes will require difficult choices. It will require taking calculated risk now to reduce existential risk in the future. When considering the missions we perform today, in the Middle East and elsewhere, it is fairly easy to calculate risk and recognize the necessary changes. However, measuring risk becomes more challenging when we look into the future, at conflict scenarios with peer competitors like China. We must consider the risk that arises if we fail to recognize the

need to change. The risk to our Nation of losing in those scenarios far outweighs the calculated risks we are willing to take today to accelerate change.

The mission of the U.S. Air Force is to *fly, fight, and win ... Airpower anytime, anywhere*. Military airpower is global, agile, flexible, rapid, and when necessary, highly destructive. The Air Force was created to realize the potential of military airpower to defend the United States, our citizens, and our friends. We know our potential adversaries respect—even fear—U.S. airpower, as they devote extreme amounts of money, time, and manpower to defend against it. We also know they are fielding capabilities to attack the U.S. and our allies through the air. In this, they hope to hold our territory, bases, and citizens hostage, making us vulnerable to coercion. Both of these conditions are not new. They existed after World War II and provided the impetus to create the Air Force in 1947. In 2021, we must remember this “why” behind the Air Force as we look to the future. We can make the changes necessary to sustain and strengthen the U.S. advantage in airpower, but to do so, we must concentrate on the core reasons we exist.

The U.S. Air Force has five core missions: air superiority; intelligence, surveillance, and reconnaissance (ISR); command and control; global strike; and global mobility. These core missions represent what the Nation expects of the U.S. Air Force, and they are part of our heritage; however, our continued ability to provide these core missions in defense of the Nation is not guaranteed. The Air Force must change, because our environment is changing and our competitors are closing in. For too long, we have mitigated short-term risk at the expense of long-term, and we must correct this imbalance.

Since the publication of the National Defense Strategy (NDS) in 2018, the Air Force has worked tirelessly to identify new ways of approaching our toughest challenges in a peer fight, to include careful assessments of current and future risks. But our work is far from over. We look forward to continued engagement on the Air Force’s future force design with this Subcommittee and all of our stakeholders. It is the only way to ensure we are building a relevant and ready force for the future. This year’s budget request will be another step in that journey.

AIR FORCE IN DEMAND

Global Force Management

Through Joint Staff-led Global Force Management (GFM) processes, the Air Force attempts to optimize force capabilities for operations against peer competitors, fulfill Combatant Commander requirements, and provide stability to the Total Force. The Air Force also actively works GFM issues through the Joint Staff as the Department of Defense’s (DOD) global command-and-control mechanism to adjust distribution of forces, and to conduct global force strategic planning.

During fiscal year 2021, as in years past, the Air Force was employed in unique and disparate locations across the globe at all levels of conflict. Our limited supply of capability will never satisfy global joint force demand for air power. Through GFM, the Air Force worked hard to balance risk with supply and demand, and to optimize our unique global flexibility to rapidly deploy with scalable, tailorable forces to all Combatant Commanders.

The Air Force is the Nation’s “9–1–1” force. The preponderance of our Total Force is required within the opening days of any conflict. We have repeatedly demonstrated our ability to employ air power within hours, any day, to any point on the globe at the speed of relevance. Looking forward into fiscal year 2022 and beyond, the Air Force will continue to refine our equities and contributions within GFM processes, maturing concepts such as Dynamic Force Employment (DFE) and Agile Combat Employment (ACE), and through the utilization of our new force presentation model, Air Force Force Generation (AFFORGEN). Through these initiatives, the Air Force is postured to regain Total Force readiness, meet strategic guidance, enable current modernization, and balance current operations with future capability requirements.

Dynamic Force Employment

The 2018 NDS introduced the concept of Dynamic Force Employment (DFE) as a Secretary of Defense resource to provide options for proactive and scalable employment of the Joint Force to compete, deter, and win in great power competition. Since fiscal year 2019, the Air Force has leveraged DFE as a more effective means of using air power for strategic effect, while recovering and building peer adversary readiness in accordance with the NDS. For fiscal year 2021, the Air Force has conducted multiple DFEs and will execute several more before the end of the year.

Through the application of DFE within GFM processes, the DOD can proactively shape the strategic environment, while modernizing, testing, and gaining readiness

to both respond to contingencies and ensure the long-term viability of the Joint Force. DFE is a better utilization of air power to rapidly meet Combatant Command requirements and assure allies and partners versus the traditional readiness-consuming heel-to-toe rotational presence.

Air power's inherently dynamic, agile, and strategic attributes enhance DFE effects to expand competitive space beyond regularized patterns while providing maximum responsiveness to emergent priority missions. DFE is also a valuable resource for the Air Force to explore, experiment, and refine rapid employment concepts such as ACE and the Bomber Task Force (BTF) to advance air power's global "enhanced maneuver" effectiveness and resiliency. For all these reasons, we continue to receive more requests for DFE than we can satisfy. This will continue forward in fiscal year 2022, and highlights the importance of adhering to national strategy, the GFM process, and successful fielding of AFFORGEN to maintain a sustainable ready Air Force that can compete and overmatch peer adversaries.

Agile Combat Employment

The U.S. Air Force continues to develop and refine the ACE concept. ACE is the ability to quickly disperse and cluster forces to a cooperative security location and conduct operations across all domains, while maintaining operational flexibility. This operating method will allow the U.S. to present our adversaries with multiple dilemmas during both the day-to-day competition and potential future conflict. The ability of ACE to sustain combat operations using advanced, agile, and adaptive logistics is being validated through multiple exercises worldwide. Earlier this year, Airmen from Lakenheath Air Base, United Kingdom, exercised this concept as part of the Exercise Baltic Trident. This exercise showcased ACE concepts such as multi-capable Airmen, interoperability with allies and partners, smaller manpower footprints, and a reduction in the reliance on prepared airfields. Future investments in both U.S. and allied airfield infrastructure, combined with rapidly deployable support, will be necessary to ensure ACE viability as the concept matures. Planned fiscal year 2022 military construction investment in both European and Pacific theaters support further development of the ACE concept.

AIR FORCE WE NEED (READINESS)

Our readiness is a combination of the capacity, availability, and capability of the force to meet the tasks required of the Nation as detailed in the NDS. In spite of COVID-19, our current force readiness has remained flat over the last two years; however, we have seen modest increases in readiness for our "fight tonight" units over the same period. Today's readiness is undermined by three main factors: 1) our force is too small to meet current demand; 2) our fleets are too old and in some cases only relevant for today's needs; and 3) our training infrastructure is outdated.

Over past decades, readiness has become synonymous with "availability" and "capacity," which are largely measures of military units available for immediate deployment and ready to "fight tonight," while "capability" took on a lesser role. In order to be ready and relevant for the great power competition ahead, we must transform the force and its training infrastructure to provide the capabilities the NDS demands. We must balance the risk and demands of the current environment with the need to arrive in the future with the capacity and capability we need.

As we transition to the force we need, it is essential to modernize and eliminate costly and less-capable legacy systems. This will lower operating costs, improve availability, and provide essential capabilities to present a combat-credible and ready force to meet the demands of great power competition.

Operational Test & Training Infrastructure

We know from both experience and experimentation that combat crews increase lethality and reduce attrition when they train against the actual or representative threats they will encounter in combat. Therefore, we are fully committed to advancing and modernizing our live and synthetic programs to provide relevant and realistic training for tomorrow's force.

Ready and relevant requires improvements to training in both the live and synthetic domains. The live domain includes required airspace and ranges, modernizing the replication of current and future adversarial threats, as well as real-time data processing and control and evaluation of combat training engagements. The synthetic domain requires the creation of a common synthetic environment that provides all users the authoritative data for threats, terrain, weather, and friendly forces for high value simulator training against peer threats.

In the live domain, our range priority remains our two largest ranges, the Nevada Test and Training Range (NTTR) and the Joint Pacific-Alaska Range Complex (JPARC). We will upgrade the threat replication of both of these ranges to Level

4 (near-peer) capabilities. With current and programmed funding, NTTR and JPARC are projected to achieve Level 4 in fiscal year 2030 and fiscal year 2032, respectively. The Air Force is evaluating options to accelerate these upgrades. In addition, we intend to upgrade six Primary Training Ranges, both CONUS and OCONUS, to a Level 3 capability by fiscal year 2033.

Our range modernization approach also addresses the encryption and movement of data to improve the realism of our training events. We will procure the Navy's Tactical Combat Training System II (TCTS-II) to modernize our Combat Training System (CTS) requirement. In addition to addressing the pending obsolescence of our P5 Combat Training System pod, this will provide an ability to share encrypted data for training. This will allow our 4th and 5th generation, and eventually 6th generation platforms, to train together in a manner is not achievable with current technology. Concurrently, we are pursuing a Live Mission Operational Capability (LMOC) to standardize and modernize our training ranges. In addition to eliminating manpower intensive processes, this capability allows us to tie legacy threat systems together to create a more realistic adversary Integrated Air Defense System.

Our range modernization approach will ensure our live ranges provide both realistic and relevant training environments to our future force. Moving forward, live training will always be the cornerstone of Air Force readiness; however, the live training environment is constrained by the geographic limitations and technological improvements of both our and our future adversaries' capabilities. This mandates a shift in portions of our combat training to the synthetic training environment to allow aircrew members to fully use their capabilities and effectively practice the tactics, techniques, and procedures they will employ against future adversaries.

This shift of advanced training to the synthetic arena requires us to replace disparate, legacy synthetic environments with a common synthetic training environment. Development of this environment will provide a Level 4 (near peer) training capability for all operational units while allowing our advanced platforms to exercise capabilities they cannot use in a live environment. This synthetic environment will be the only arena in which Air Force, Joint, and Coalition units can train together using their full capabilities in realistic scenarios.

We are confident these tailored improvements to our live and synthetic training capabilities will provide our crews with the ability to maximize the lethality advantage of current and future weapon systems.

Pilot Production

The Air Force remains focused on improving the overall pilot inventory within the Active Duty, Air National Guard, and Air Force Reserve. Today we are still short approximately 1,900 pilots. Over half of that shortfall is in the Air Reserve Components. In the Regular Air Force, our shortfall resides in our younger pilot ranks due to 10-years of under-production. In order to match pilot requirements with production we must sustainably produce 1,500 pilots per year. At this rate we can properly train, absorb, and manage each production year. Substantial short-term increases in production to improve the overall inventory sooner are not manageable. We must expand production quickly to 1,500 and then maintain it for the foreseeable future.

We have spent the last two years developing ways to expand production with our existing five-base production plant. We are instituting and testing a number of initiatives that will expand our annual production capacity to at least 1,500 pilots by 2023. These initiatives include modernizing pilot training to improve the quality of new pilots for the challenges of advanced 5th generation aviation, streamlining the helicopter pilot production path, adjusting the training program for those candidates with extensive civil aviation experience or completion of accredited aviation programs, improving simulator instructor recruitment and retention, and evaluating a remote simulator instruction concept. In all of these instances we leverage technology to improve the training experience, conduct training earlier, and augment our proven production methods. In all cases, the quality of our graduates remains critical to our long-term success and readiness. As we expand production we will not sacrifice the quality within our pilot production enterprise.

Air Force Force Generation

The Air Force is transitioning to a new AFFORGEN model that provides the Joint Force with a sustainable high-end Air Force ready for peer competition and major combat operations in accordance with the NDS. Due to air power's inherent flexibility, our previous generation models could not easily define sustainable capacity and capability limits, nor could it easily facilitate modernization towards rapid force employment concepts to develop future force readiness. As a result, over the past 20+ years, the Air Force has been "all in" at the expense of readiness and mod-

ernization. While we knew this was happening, the Air Force lacked the ability to present an easily understood model that reflected all facets of airpower that could communicate how the Air Force was being consumed faster than it could rebuild readiness.

To address these issues, and to get after the heart of General Brown's *Accelerate Change or Lose* initiatives, AFFORGEN has become the Service catalyst for a paradigm and cultural shift in how we prepare and present credible and capable air power. Aligning to the notion that we can no longer sacrifice future readiness for the sake of "right now," AFFORGEN provides the Service with a standardized, easy to understand, and defensible model that builds readiness over time and clearly predicts the impact of GFM actions to future force offerings, readiness, and modernization. AFFORGEN also balances tradeoffs between short-term and longer-term force elements of equipment readiness such as depot modernization, stabilizes manning to avoid abrupt readiness declines in training, resources units to sustain higher-levels of readiness over longer periods of time, provides leadership with greater unit training and readiness forecasting, and better informs corporate resourcing and budgeting decisions.

Institutionalizing AFFORGEN will take leadership at all levels. Through GFM processes, we have begun the hard work today, setting conditions to establish Initial Operational Capability (IOC) in fiscal year 2023, maturing through fiscal year 2024 and fiscal year 2025.

CURRENT CAPACITY AND CAPABILITY

Following NDS and National Security Strategy guidance, the Air Force seeks to invest in technologies and field systems that are both lethal and survivable against a peer threat. This ultimately means transitioning away from many legacy platforms in order to free up manpower as resources to field more capable systems and modernize. If we are to modernize to address the emerging threat, we must use resources tied to our legacy platforms and weapons systems that are decreasing in relevance today and will be irrelevant in the future. We must strike a balance between risk in the near-term and risk in the future.

Bomber / ICBM Force Structure

The future of our bomber force relies on the B-21 and a heavily-modified B-52. 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. Nuclear deterrence is the highest priority mission of the Department of Defense—our deterrent underwrites every U.S. military operation around the world and is the foundation and backstop of our national defense.

B-21

The B-21 Raider will form the backbone of our future bomber force. The B-21 will have the range, access, and payload to penetrate the most highly contested threat environments to hold any target on the globe at risk. The B-21 will provide the capabilities to deter and, if needed, win in high-end, near-peer conflicts. Not only will the B-21 underscore our national security as the most flexible leg of the Nuclear Triad, it will also support Combatant Commanders across the range of military objectives as both a nuclear and conventional bomber. In under three years, the B-21 has transitioned from a digital design to two test aircraft being manufactured on the production line. The Fiscal Year 2022 President's Budget (\$2.87 billion) continues to fund the production of test aircraft and supports scaling the manufacturing infrastructure and capacity across the supply base. In addition, the budget also includes \$108 million to procure initial long-lead parts in advance of low rate initial production.

In parallel, beddown preparations at Ellsworth Air Force Base (AFB), South Dakota remain on-track. The Fiscal Year 2022 President's Budget requests \$343 million to begin construction of six projects at Ellsworth AFB. The first B-21s are projected to arrive at Ellsworth AFB in the mid-2020s with base infrastructure ready to support. A second Environmental Impact Statement is expected to begin in 2022 to assess the final two basing locations, Dyess AFB, Texas and Whiteman AFB, Missouri.

The fiscal year 2021 NDAA required the Air Force to preserve minimum Primary Mission Aircraft Inventory levels with a path to a 225 bomber fleet. Our preferred end state is a two bomber fleet comprised of 225 modernized, relevant, and healthy B-21 and B-52 aircraft. The Air Force is committed and on track to meet its key performance parameter of building B-21s with an average procurement unit

cost of \$550 million (Base Year 2010) / \$639 million (Base Year 2019), assuming a minimum fleet of 100 aircraft.

B-52

While the last B-52 Stratofortress entered service in the U.S. Air Force in 1962, we expect to continue operating the B-52 through 2050. We will continue to invest in modernization programs to keep the platform operationally relevant. Major modernization efforts include the Commercial Engine Replacement Program (CERP), Radar Modernization Program, Combat Network Communications Technology (CONNECT), and installation of Advanced Extremely High Frequency (AEHF) secured satellite communication capabilities.

The Air Force's number one priority for the B-52 is to ensure platform viability through 2050 and the CERP is critical to achieving this goal. CERP will replace legacy engines (TF33-PW-103) with new commercial engines using Middle Tier of Acquisition processes to remove more than three years from the traditional program schedule. Additionally, CERP is more complex than just a standard commercial engine refit. CERP includes new engines, flight systems, and cockpit throttle and displays. The Radar Modernization Program is also necessary to ensure viability through 2050 and will modernize the current Strategic Radar (AN/APQ-166), which is based on 1960s technology modified in the 1980s.

B-52 Combat Network Communications Technology (CONNECT) fleet modification will be complete in fiscal year 2023. This system provides an integrated communication and mission management system, as well as a machine-to-machine interface for conventional weapons retargeting. CONNECT's digital infrastructure and architecture is the foundation for the 1760 Internal Weapons Bay Upgrade, which allows for internal carriage of J-series weapons through modification of the Common Strategic Rotary Launchers. This significantly increases 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. Finally, the integration of the long-range standoff (LRSO) nuclear air-launched cruise missile and AEHF will ensure the continuation of the B-52's role in the airborne leg of the Nuclear Triad. 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 2050 and beyond.

B-1

The B-1 is a long-range, supersonic multirole bomber capable of flying intercontinental missions with the largest payload of guided and unguided weapons in the Air Force inventory. In fiscal year 2021 we are retiring 17 B-1s as authorized in the fiscal year 2021 NDAA. This will allow the Air Force to focus available resources on sustaining and modernizing the remaining combat-coded B-1s. The goal is to retire the most challenging aircraft to sustain in order to improve readiness of the remaining fleet. We will ensure the B-1s remain lethal and viable until B-21s are operational in sufficient numbers. The recently completed Integrated Battle Station upgrade enhances crew situational awareness and precision engagement capabilities and is the B-1's largest modernization effort ever. The first aircraft with this upgrade was delivered in January 2014 and the last aircraft was completed in September 2020. Other efforts to update the B-1's communication systems are ongoing and ensure the B-1 remains the backbone of the Air Force's long-range bomber force until the B-21 arrives.

Lastly, the B-1 is the Air Force's threshold platform for the Long Range Anti-Ship Missile (LRASM). Integration of this weapon, coupled with the B-1's long range, high speed, and large payload capacity, postures the B-1 for an important role in any conflict in the Indo-Pacific region.

B-2

The B-2 is 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 ensure the B-2 remains effective until the B-21 is operational. Because delays in the Defensive Management System modernization effort would limit the operational utility of the system by the time it would be fielded, the Air Force abandoned full Defensive Management System modernization. Instead, we are replacing the B-2's unsustainable cathode ray tube displays with modern sustainable displays.

The Air Force completed development efforts to re-host the Stores Management Operational Flight Program software in the Flexible Strike program. This enables 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 reached Initial Operational Capability in November 2020 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 completed fleet-wide installation of the Common Very-Low-Frequency/Low Frequency (VLF/LF) Receiver, providing the B-2 with a VLF/LF receiver for secure, survivable, strategic communications. Other on-going B-2 modernization programs include Adaptive Communication Suite upgrades, enhancement of the Identification Friend or Foe (IFF) system, replacement of the Crash Survivable Memory Unit, integration of hardware upgrades for employment of the B61-12 nuclear weapon, and software upgrades to allow the B-2 to carry the extended range variant of the Joint Air-to-Surface Standoff Missile (JASSM-ER). Development of the Radar Aided Targeting System software upgrade began in October 2018 and will provide improved navigational handoff to weapons in a GPS-denied environment. Finally, the B-2 will continue sustainment efforts for the on-going Low Observable Signature and Supportability Modification effort to improve aircraft maintainability and availability.

Intercontinental Ballistic Missile Modernization

Intercontinental Ballistic Missiles (ICBMs) are integral to U.S. nuclear deterrence. The Air Force is in the initial stages of replacing this 1970s-era ICBM capability with the Ground-Based Strategic Deterrent (GBSD). The GBSD is the most cost effective option for modernizing the ICBM leg of the Nuclear Triad and supports the NDS to modernize the capability of nuclear forces. The GBSD will extend and improve the capabilities of the ground-based leg of the Nuclear Triad, providing a credible and responsive deterrent capability against current and emerging adversaries through 2075. The new weapon system will provide improved nuclear surety, safety, and effectiveness with enhanced security features as well as technologies that cannot be incorporated into the existing Minuteman-III system. Furthermore, attempting to keep the Minuteman-III through a Service Life Extension Program (SLEP) is not a cost-effective option. GBSD will provide more efficient operations, maintenance, and security by modernizing critical infrastructure and decreasing lifecycle costs.

The GBSD program remains on track in pursuing a low risk, technically mature design and is using innovative digital engineering and acquisition strategies to increase development speed and ensure on-time delivery. Deployment is scheduled to begin in the late-2020s in order to resolve capability, attrition, and age-out concerns with the Minuteman-III weapon system, as well as meet warfighter requirements. The Nation is focusing investment on these new missiles and the associated infrastructure and accompanying re-entry systems.

Fighter Force Structure

The Air Force must accelerate change to its fighter force structure to meet the threat posed by China and Russia, ensuring the Air Force can achieve air superiority and dominance over peer adversaries and has the capacity to meet world-wide demands in the 2030s and beyond. Extensive gaming and analysis using the most difficult problem (i.e., China) and the most difficult scenario (i.e., Taiwan) at the most difficult time (i.e., 2035), shows that the Air Force must change the future fighter force structure mix by changing investment priorities to provide the capability, capacity, and affordability required to meet the peer threat. To just keep pace with the threat would require an additional \$6 billion to \$7 billion per year to modernize our current force projected into the future. Even if that was affordable, this force would fall well short of the capability required to counter a future peer threat. Modernization programs cannot transform our 4th generation fighters into 5th generation fighters, or 5th generation fighters into next Generation Air Dominance (NGAD).

Our fighters are becoming significantly more expensive to sustain as they age, and ours are the most aged of all. The average age of the Air Force fleet is 28.6 years, while the U.S. Navy is 14.4 years and the U.S. Army is 15.3 years. In comparison to our allies, the average age of the Royal Australian Air Force (RAAF) is 8.9 years and the Royal Air Force (United Kingdom) is 16.5 years. Weapons System Sustainment (WSS) costs have increased 130 percent over the last 20 years, even with a 15 percent decrease in total aircraft inventory (TAI). We need new platforms and weapons to replace an aging force, but also must invest in cutting edge technology needed to confront and pace peer threats.

In realistic budget projections, we must balance the need for high end technology with affordable capacity. To attain this desired fighter fleet, the Air Force must right size current aircraft inventories to expedite the transition away from less capable, aging aircraft and emphasize investment in future capabilities such as NGAD and F-35 modernization. The desired Air Force fighter fleet should match capability and capacity of both platforms and weapons to mission requirements. As part of its force structure change, the Air Force must transition its fighter fleet from seven platforms (i.e., F-35, F-22, F-16, F-15EX, F-15E, F-15C, A-10) to four platforms (i.e., NGAD, F-35, F-15EX, F-16) plus the A-10 in the near- to mid-term.

Next Generation Air Dominance (NGAD)

The Air Force is investing in technologies as part of a family of capabilities to assure air dominance in the future. NGAD is an advanced, air superiority fighter designed to operate within the most challenging operational environments and replace the aging F-22. The requirement to establish and maintain air superiority within the battlespace cannot be understated as it underpins the joint force operations in any theater. 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. The Fiscal Year 2022 President's Budget requests \$1.5 billion in fiscal year 2022 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 Chief of Staff of the Air Force 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.

F-35

The F-35 is the cornerstone of our future fighter fleet. The F-35 today is dominant, purpose built, and equipped with advanced weapons for the contested environment. The original program of record was designed to replace all F-16s and all A-10s. Whether the Air Force is able to afford to replace the majority of the fighter fleet with F-35s is a decision-point that is still a few years away. In the near-term, we must concentrate on achieving the F-35 capability needed for advanced threats. While the F-35 is a formidable platform today, it faces challenges to ensure it stays dominant against an evolving future threat. To keep pace with the threat in future contested scenarios, follow-on modernization efforts centered on "Block 4" enabled by Technical Refresh 3 (TR-3) hardware must be affordably realized on competition-relevant timelines. The F-35 operating costs (as currently projected) and long-term sustainment costs are areas of concern that need continued focus and work to address affordability.

The Fiscal Year 2022 President's Budget request decreases the F-35 procurement quantity in fiscal year 2022 to 48 from the fiscal year 2021 enacted position of 60 aircraft and commits \$5.09 billion to procurement, \$985.4 million to development and \$704.5 million to fund necessary sustainment, capability development, and retrofit cost gaps. Block 4/TR-3 provides the capabilities we need to address future threats and maintain advantage. Procuring additional aircraft before Block 4/TR-3 "cuts in" to production will drive a retrofit bill and is therefore not desired.

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 Fiscal Year 2022 President's Budget request includes \$1.1 billion in fiscal year 2022 for modernization efforts essential to gain and maintain air superiority against evolving threats. The Capability Pipeline, an agile acquisition construct, combines former TackLink16, Tactical Mandates (TACMAN), and GPS M-code programs to deliver slices of each capability on a regular release cadence to the field. Future modernizations will continue to leverage the "Capability Pipeline" as a vehicle to rapidly prototype and iteratively field critical enhancements with capabilities delivered to the fleet in order to ensure "first look, first shot, first kill" capability in highly contested environments. The transition timeline from F-22 to NGAD is dependent on the progress of NGAD development efforts.

F-15

The F-15C/D supports both Homeland Defense and the air superiority mission. Our F-15C fleet is aging, with two-thirds of the fleet past its designed service life. The 234 F-15C/Ds 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. The Fiscal Year 2022 President's Budget request divests 48 F-15C/Ds from the Active fleet. We have already started to replace this fleet with a modernized successor by purchasing the F-15EX. The F-15EX "Eagle II" will provide superior sensor, range, and payload for Critical Infrastructure Defense. The Eagle II additionally brings outsized long range weapons (i.e., air-to-surface and air-to-air) into a peer fight. The Fiscal Year 2022 President's Budget request procures 12 F-15EX aircraft at a cost of \$1.335 billion. Notably, the Air Force remains fully committed to advanced 5th and next generation capabilities and the F-35. The decision to refresh the 4th generation fighter force with the F-15EX is a complementary step to both F-35 procurement and NGAD development, and helps mitigate capacity risk while balancing near-term readiness concerns.

The existing F-15E Strike Eagle fleet provides all-weather, long range global precision attack in all but the highest threat environments. The Fiscal Year 2022 President's Budget requests \$488.7 million in fiscal year 2022 to continue modernization efforts to ensure the aircraft remains viable to the 2030s. Modernizing the F-15E with Early Passive Active Warning Survivability System (EPAWSS), also used on the F-15EX, demonstrates our commitment to building a more lethal Air Force. EPAWSS will allow the F-15E/EX to survive to attack targets in high threat environments.

F-16

The F-16 is the Air Force's primary multi-role fighter and Suppression of Enemy Air Defense (SEAD) aircraft. Our more than 600 late block F-16s will provide affordable capacity for the next 15 or more years, in both competition and more permissive combat environments. We are beginning to transition away from our oldest, early block F-16s, with a reduction of 47 planned in fiscal year 2022. We will continue to modernize the late block F-16s we keep as our "affordable capacity" fighter into the 2040s. The F-16 investment strategy funds modifications for the most capable, late block aircraft to ensure they can operate and survive in today's threat environment. The Fiscal Year 2022 President's Budget requests \$888.3 million in fiscal year 2022 to continue these modernization efforts. This includes continuing the Service Life Extension Program comprising 12 structural modifications, affecting 300 aircraft, as well as several avionics capability upgrades including the Active Electronically Scanned Array (AESA) Radar upgrade. The new radar replaces the current mechanically scanned radar, with greater ability to detect, track, and identify low-observable, low-flying, and slow-flying targets. This joint emerging operational need is critical for the F-16 platform to meet aerospace control alert mission requirements to properly defend the Homeland against modern threats. These radars continue fielding in fiscal year 2022.

A-10

The A-10 remains an effective close air support platform for the current Counter Violent Extremist Organization fight. With very limited utility in a contested fight, we are right-sizing our A-10 fleet for the current and anticipated future demand and then structurally extending and modernizing the aircraft we keep. We will continue to re-wing and modernize 218 A-10s while we reduce the fleet by 42 in fiscal year 2022 and an additional 21 in fiscal year 2023. The Fiscal Year 2022 President's Budget requests \$122.8 million (Procurement; and Research, Development, Test, and Evaluation funds) in Fiscal Year 2022 for modernization. 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 and associated reports, and the Secretary of the Air Force briefs the findings to congressional committees. We are seeking legislative relief to delink the Comparative Test portion, which is complete, from the overall Initial Operational Test and Evaluation report, which is not, in order to begin right-sizing this fleet.

*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. For the T-6, the Air Force is completing installation of Automatic Dependent Surveillance-Broadcast (ADS-B) Out,

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. For the T-38C, modifications are also required to sustain and upgrade the fleet until the T-7A delivers, including avionics, Pacer Classic III, Talon repair, inspections, maintenance, and front canopy replacement programs until the eT-7A is delivered. The Fiscal Year 2022 President's Budget requests \$3.9 million, \$8.8 million, and \$54.3 million for the T-1, T-6, and T-38 fleets, respectively.

eT-7A

The Advanced Pilot Trainer (eT-7A) contract was awarded to The Boeing Company on 27 September 2018. The eT-7A System Critical Design Review was completed in the summer of 2020. The eT-7A replaces the Air Education and Training Command's existing fleet of 427 T-38C aircraft with 351 aircraft and associated simulators, ground equipment, spares, and support equipment. The eT-7A 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 2022 President's Budget request of \$199.3 million continues the program's Engineering and Manufacturing Development and early aircraft flight test efforts, as well as procures long lead support equipment, ensuring we meet the 2024 Initial Operational Capability and 2034 Full Operational Capability milestones.

Munitions

The Air Force must maintain a suite of affordable air-to-air and air-to-ground kinetic and non-kinetic weapons delivering capability and capacity to defeat rapidly evolving peer competitors. As such, we continue to procure preferred munitions, but are tapering production as programs approach warfighter inventory objectives, while simultaneously investing in new technology to counter future peer threats in highly contested environments. During the last several years, we have successfully ramped up production capacity across the portfolio and our Fiscal Year 2022 President's Budget request reduces procurement rates of preferred munitions to sustain inventory objectives, while continuing to provide resources to apply toward advanced weaponry and hypersonics. We will continue to invest in future weapon design, development, and fielding to ensure advanced capabilities are available to engage all future threats. 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 in the current fight and the expenditure rate has reduced by 42 percent in fiscal year 2021 (840) compared to fiscal year 2020 (1,443). After increasing tailkit production to 45,000 tailkits per year in fiscal year 2018 to meet the needs of the Services and Foreign Military Sales (FMS) partners, the Air Force has adjusted to demand and now plans to procure 1,900 tailkits in fiscal year 2022 with a request of \$124 million, with Navy and FMS partners procuring the remaining production capacity.

Small Diameter Bomb I (SDB I) and II (SDB II) provide 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 for SDB I from 3,000 weapons per year in fiscal year 2015 to 8,000 weapons in fiscal year 2017. With demand dropping and advanced standoff weapons in higher demand, the Fiscal Year 2022 President's Budget requests \$82.8 million and plans to order 998 weapons leaving residual production capacity available to FMS partners. For SDB II, the Fiscal Year 2022 President's Budget requests \$294.6 million to procure 985 weapons.

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. With lower demand and higher priority advanced weapons requirements, the Fiscal Year 2022 President's Budget requests \$104 million and procures at least 1,274 Hellfire missiles.

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 NDS. Doing so requires advanced weapons capabilities and the Fiscal Year 2022 President's Budget request reflects the Air Force's plan to continue

investing in those areas, specifically with the Joint Air-to-Surface Standoff Missile (JASSM), the Long-Range Anti-Ship Munition (LRASM), and the Advanced Medium Range Air-to-Air Missile (AMRAAM). These weapons provide unique and necessary capabilities for the highly contested environment.

JASSM is the premier air-to-ground, low observable missile for defeating threats in highly contested environments and is the weapon of choice for a future fight against peer adversaries. 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 Fiscal Year 2022 President's Budget requests \$711 million, with the corresponding available max rate for JASSM increasing to 525.

LRASM, produced in the same facility as JASSM, is a purpose-built anti-ship missile particularly critical for the future fight in a maritime environment. The Fiscal Year 2022 President's Budget does not request procurement due to a supply chain obsolescence limitation. Future procurement has mitigated the limitation.

Production of AMRAAM missiles, a critical air dominance weapon, remains consistent with fiscal year 2022 procurement levels by requesting \$214 million for 168 missiles, as industry partners begin to cut-in a solution to obsolescence issues through the Form Fit Function Refresh (F3R) effort.

Stand-In Attack Weapon (SiAW)

To defend the Nation in an increasingly competitive global environment, 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 development of the Stand-In Attack Weapon (SiAW) to deliver a strike capability to defeat rapidly relocatable targets, a hallmark of the highly contested environment. SiAW is the munition that gives the F-35 unique air-to-surface capabilities in the high end fight for the entire Joint Force. The Fiscal Year 2022 President's Budget requests \$166.5 million for SiAW development and prototyping.

Hypersonics

The Air Force is poised to field the first production hypersonic munition in the DOD. The AGM-183 Air-Launched Rapid Response Weapon (ARRW) is completing test and begins procurement with budget requests of \$160.8 million for 12 munitions in fiscal year 2022 and \$238 million for research and development. Capable of employment from fighters as well as bombers, the Air Force is also developing the Hypersonic Attack Cruise Missile (HACM) to complement ARRW. The Fiscal Year 2022 President's Budget request of \$200 million for HACM development is designed to result in production article procurement in late fiscal year 2026.

Tanker Fleet

Tankers are not only the lifeblood of our Joint force's ability to respond to crises and contingencies quickly, but are also essential to keeping our Air Force fueled as a global force. By the end of fiscal year 2022, the tanker fleet will be comprised of 376 KC-135s, 36 KC-10s, and 74 KC-46s that execute rapid U.S. global operations. As of May 2021, we have accepted 45 KC-46 Pegasus aircraft and will receive a total of 179 KC-46s. As we transition away from the aging KC-10 and right-size the KC-135 fleet, we continue to look towards the next generation for tanker recapitalization options.

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 6 on 13 January 2021 and Lot 7 on 20 January 2021, increasing the number of production aircraft on contract to 94. The Lot 8 contract for up to 15 aircraft is projected to award in the second quarter of fiscal year 2022.

The first KC-46 aircraft delivered to McConnell AFB, Kansas (Main Operating Base 1), on 25 January 2019. The Formal Training Unit at Altus AFB, Oklahoma, received its first KC-46 on 8 February 2019. The Air Force established Main Operating Base 2 at Pease Air National Guard Base, New Hampshire, on 8 August 2019, and Main Operating Base 3 at Seymour Johnson AFB, North Carolina, on 12 June 2020. Main Operating Base 4a at Joint Base McGuire-Dix-Lakehurst is planned to receive its first KC-46 in the first quarter of fiscal year 2022. The Air Force will continue taking delivery of KC-46s at a rate of approximately 1.4 per month.

The Air Force remains committed to ensuring Boeing corrects deficiencies identified in both developmental and operational test and evaluation of the KC-46's effec-

tiveness, suitability, and mission capability. Partnered with Air Mobility Command, we have worked hard to accept the KC-46 while ensuring its major deficiencies—the Remote Vision System (RVS) and stiff air refueling boom—are properly addressed without undue burden on taxpayers or warfighters. On 2 April 2020, we reached agreement with Boeing to fix the RVS deficiencies through significant upgrades, known as RVS 2.0, at no additional cost to the government. The air refueling boom engineering change proposal, initially awarded in August 2019, was definitized on 30 September 2020. The RVS design solution is expected by the end of fiscal year 2023, and the stiff air refueling boom design solution is expected at the beginning of fiscal year 2024. The retrofits and installs for both RVS and the boom across our fleet will begin in the first quarter of fiscal year 2024. The Director, Operational Test and Evaluation (DOT&E) has stated Initial Operational Test and Evaluation (IOT&E) will conclude after the RVS and boom deficiencies are resolved; IOT&E is expected to complete in fiscal year 2024. Additionally, we delayed the full-rate production decision until after IOT&E is complete and we are in receipt of the statutorily-required Beyond Low Rate Initial Production report from DOT&E.

Despite its current deficiencies, the KC-46 is safe to operate (adhering to flight manual cautions provided to our operators) and will be the Air Force's best tanker for contested environments due to enhanced situational awareness, battle management, and threat countermeasures. By accepting the KC-46 with known deficiencies, the Air Force was able to initiate familiarization and operational test activities while working with Boeing on long-term efforts to correct deficiencies. Accepting the KC-46, and fixing deficiencies in parallel with operational test and evaluation, is the fastest way to achieve full operational capability to meet warfighter requirements. Air Mobility Command is making the KC-46 available for limited operational taskings to alleviate pressure on legacy tanker fleets and allow some legacy tanker retirements.

The Fiscal Year 2022 President's Budget requests \$73.4 million in RDT&E funding for the ongoing KC-46 Engineering and Manufacturing Development and post production modification efforts, to include the boom telescope actuator redesign effort resolving the stiff boom deficiency. Additionally, the budget requests \$2.4 billion in procurement funding to award Lot 8 (14 aircraft plus associated spares, engines, support equipment, and wing air refueling pods).

KC-10 and KC-135

The average age of our KC-135 and KC-10 tankers is 60 and 36 years old, respectively. Both fleets are challenged by aircraft parts obsolescence and diminishing manufacturing source issues. 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 beyond 2040.

The Fiscal Year 2022 President's Budget request will continue KC-135 modernization efforts including the Block 45 program, the Aero-I SATCOM program, and the Rudder Position Indicator program. To address supportability, reliability, and maintainability issues with legacy flight and engine instruments, the Block 45 program integrates a digital flight director, autopilot, radar altimeter, and electronic engine instrument display for our operators. The Aero-I SATCOM program allows the KC-135 to use Iridium SATCOM service, as the current Inmarsat service is planned to sunset in January 2023. Additionally, the Rudder Position Indicator program enhances safety of the KC-135 by providing the aircrew with situational awareness for the actual rudder position.

Additionally, the budget requests funding 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 certification.

The Air Force took measured risk in fiscal year 2022 tanker capacity in order to resource the capability we need for the future fight. As we look to better align the Air Force with the NDS, KC-10 and KC-135 retirements were accelerated. In fiscal year 2022, the Air Force is retiring 14 KC-10s and 18 KC-135s from the Active Duty fleets. 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 roles of Head of State, Chief Executive, and Commander-in-Chief. Two Boeing 747-8 aircraft are being uniquely modified to provide the President, staff, and guests with safe and reliable air transportation and a level of communications capability and security equivalent to that

which is available in the White House. Modifications to the 747–8 aircraft began in February 2020 in San Antonio, Texas, and include an electrical power upgrade, dual auxiliary power units that are usable in flight, mission communication systems, an executive interior, military avionics, a self-defense system, autonomous enplaning and deplaning, and autonomous baggage loading.

The Fiscal Year 2022 President’s Budget requests \$681 million to continue Engineering and Manufacturing Development, aircraft modifications, and other product support activities.

Strategic and Tactical Airlift

C–5

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

The Fiscal Year 2022 President’s Budget requests \$25.4 million in procurement funding, predominately for communications, navigation, surveillance/air traffic management (CNS/ATM) and core mission computer/weather radar (CMC/WxR) system equipment. CNS/ATM upgrades include Automatic Dependent Surveillance-Broadcast (ADS–B) Out modifications required for global airspace compliance. The CMC/WxR effort 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, the Fiscal Year 2022 President’s Budget requests RDT&E funding to support replacement of the Multifunctional Control and Displays (RMCD). This comprehensive sustainment modification mitigates the obsolescence of the current control and display units and increases capacity for future technology integration into the cockpit.

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 with unmatched flexibility to conduct theater and inter-theater direct delivery, airdrop, aeromedical, and special operations airlift missions. Agile and efficient software and hardware updates ensure timely readiness, safety, and capability improvements as this premier airlift platform contributes to our national security objectives.

The Fiscal Year 2022 President’s Budget requests procurement funding to continue critical modifications to the C–17 fleet. This includes a filter fire mitigation for the On-Board Inert Gas Generating System, Large Aircraft Infrared Countermeasures defensive systems, and training system upgrades. The modification effort 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. Additionally, fiscal year 2022 RDT&E funding will address obsolescence and flight safety issues. 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 Department of Defense communication infrastructure.

C–130H/J Fleet

The C–130 fleet consists of C–130H and newer C–130J aircraft, as well as special mission aircraft (AC/LC/EC/MC/HC/WC–130s). 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.

C–130H

The Air Force continues to modernize the C–130H fleet through a four-pronged approach emphasizing aircraft safety, airspace compliance, modernization, and partial recapitalization. Our C–130H Center Wing Box replacement program breathes 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 C–130H fleet is outfitted with modern communication equipment and complies with U.S. and international airspace transponder mandates. We completed the AMP Increment 1 installations for the C–130H fleet in April 2021. The AMP Increment 2 program improves the C–130H fleet maintainability and reliability by providing a new digital avionics suite, and mitigating obsolescence and diminishing manufacturing source challenges. The Fiscal Year 2022

President's Budget requests \$9.8 million in RDT&E and \$29.8 million in procurement funding to support the C-130H fleet.

As with other weapon systems, the Air Force is taking acceptable risk in the C-130 portfolio as it focuses resources toward the future force. Specifically, in fiscal year 2022 we plan to retire C-130H aircraft. Additionally, the Air Reserve Component (ARC) will be receiving five new C-130Js, resulting in a net reduction of eight aircraft.

C-130J

The Air Force has partially recapitalized the C-130H fleet with C-130Js, which also supports our Special Operations missions by providing Special Forces with 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). The Air Force has multiple modification efforts for the C-130J, including Center Wing Box replacement, Large Aircraft Infrared Countermeasures, and an accelerated avionics upgrade to meet 2024 Federal Aviation Administration and international airspace mandates. The C-130J Block 8.1 modernization program, currently in production, delivers new communication and data link capabilities, a modern flight management system, and other key capabilities to the field. In addition, the Air Force plans to upgrade both our C-130H and C-130J fleets with a Mobile User Objective System and a Second Generation Anti-Jam Tactical Ultra High Frequency Radio satellite communication system to ensure we maintain key communication links anywhere in the world.

The Fiscal Year 2022 President's Budget requests funding for C-130J RDT&E and \$933.8 million for C-130J procurement and modification efforts. The Fiscal Year 2022 President's Budget also requests funding for HC/MC-130J RDT&E and HC/MC-130J procurement and modification efforts.

Rotorcraft

The Fiscal Year 2022 President's Budget continues investment in the Air Force's critical rotorcraft modernization programs, including the CV-22 Osprey, HH-60G, HH-60W, and MH-139A programs.

CV-22

The Fiscal Year 2022 President's Budget requests \$186 million in fiscal year 2022 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 readiness, reliability, and relevance. 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 HH-60W (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 sustain existing HH-60G helicopters while using the Operational Loss Replacement program to meet Combatant Command requirements until we can fully recapitalize with the HH-60W (Combat Rescue Helicopter (CRH)) program. The HH-60W will be specifically equipped to conduct CSAR across the entire spectrum of military operations. The Fiscal Year 2022 President's Budget request reduces the total fleet to 105 air vehicles from the program of record of 113. The Air Force has fully funded the CRH program to meet National Military Strategy objectives through Personnel Recovery missions. The Fiscal Year 2022 President's Budget requests \$15.6 million and \$996.7 million for the HH-60G and HH-60W programs, respectively.

MH-139A

The MH-139A (formerly UH-1N Replacement) program is an element of the Air Force nuclear enterprise reform initiative and also supports operational airlift within the National Capital Region. This program will deliver up to 80 replacement helicopters, training devices, and associated support equipment to replace the legacy UH-1Ns. The Fiscal Year 2022 President's Budget requests \$16 million for the MH-139 program, which will fund the continued test and development of the aircraft

with a delay in production decision expected in fiscal year 2023. The first six aircraft have been delivered and are being used to finalize test and development.

Intelligence, Surveillance, and Reconnaissance

Aligned with the NDS, the Air Force is aiming to re-orient 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 uses advanced technology. It will be resilient, persistent, and penetrating to support both kinetic and non-kinetic capabilities alike. Global Integrated ISR must transition to connected, survivable platforms, and that requires accelerating investment and accepting short-term risks by transitioning away from outdated and underperforming ISR assets that offer limited capability against peer and near peer threats.

The Fiscal Year 2022 President's Budget request takes further steps towards repurposing, retooling, automating, and stabilizing the force to ensure the ISR Enterprise can achieve this vision within the next decade.

MQ-9

The Fiscal Year 2022 President's Budget request of \$357.9 million will continue MQ-9 fleet modernization efforts aimed at providing needed 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 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 development and testing of planned modernizations are conducted in parallel. 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 establishment of an MQ-9 Multi-Domain Operations (M2DO) configuration which are capability upgrades that will keep the fleet relevant. Some of the upgrades in the M2DO configuration include Anti-jam Ground Position System, C2 Resiliency, Enhanced Power, Link-16, 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.

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 using 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 2022 President's Budget request 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, and exploitation and dissemination supported by enhanced artificial intelligence algorithms. Also, the first KC-135 to WC-135 conversion will be accomplished and delivered in fiscal year 2022. Finally, our partnership with the United Kingdom's RAF on the RC-135 and the RAAF on the MC-55 Peregrine continues to set the standard for cooperative efforts that strengthen alliances while increasing partner interoperability.

RQ-4

The RQ-4 Global Hawk uncrewed aircraft system provides high altitude, long endurance, all weather, wide area reconnaissance and surveillance. The Fiscal Year 2022 President's Budget request of \$121.7 million furthers modernization and sustainment efforts, to include modernizing the ground segment, addressing diminishing manufacturing sources, and standing up and assigning a maintenance depot for RQ-4 launch and recovery elements and mission control elements.

The Ground Segment Modernization Program is on track to complete installation of upgraded cockpits at Grand Forks Air Force Base and Beale Air Force Base in fiscal year 2023. Finally, the Air Force is pursuing a Secretary of Defense waiver

for RQ-4 Block 30 divestment as authorized in the Fiscal Year 2021 NDAA. The Department intends to repurpose funding in penetrating ISR capabilities.

FUTURE CAPABILITY

Competing against rising peer adversaries during this time of unprecedented technology change requires a competitive acquisition system—one that is faster and more agile than our rivals. Consequently, the Air Force is transforming what we buy, how we buy, and who we buy from to retain the battlefield dominance we presently enjoy.

Understanding what to buy begins with a deep understanding of our potential adversaries and the anticipated future operating environment. We are using a future force design that incorporates adversary assessments and lessons from wargaming and other analysis to drive warfighter requirements and our acquisition choices. We will continue to incorporate our learning from these activities into future design iterations. This overall force design is being folded into our planning and programming in order to transition from the force we have to the force we need.

FASTER ACQUISITIONS

Fielding systems faster is step one. Through rapid prototyping authorities granted by Congress, like Middle Tier of Acquisition, we are trimming low-value-added steps that previously bogged down programs and slowed capability to warfighters. In May 2019, we achieved our “Century Challenge” goal of removing 100 years from program schedules and we’ve just kept going toward a new goal of 150 years. By the end of fiscal year 2020, we identified 83.75 years of program accelerations for MTA programs and an additional 29 years of accelerations by tailoring our traditional acquisition programs. Rapid prototyping—“flying before you buy”—is not just a faster acquisition approach; it allows risks to be tackled earlier, before systems are in production when there is still time to troubleshoot. The benefit is proving out in our MTA programs, which maintain the same documentation and discipline as traditional programs.

The Department of the Air Force is embarking on an acquisition transformation by driving a “Digital Trinity” of initiatives into our acquisition enterprise. The Digital Trinity consists of Digital Engineering, Agile Software Development, and Open Systems Architectures. These three initiatives will greatly reduce acquisition schedules, increase our access to innovative and emerging technology, reduce vendor lock, and allow us to field warfighting systems at the speed of relevance. Digital Engineering approaches will change the way we do business – shifting us from a document-based enterprise to one based in models and data, allowing us to analyze, assess, and make decisions regarding our system designs at machine enabled speeds. Agile Software Development enables us to deliver rapid, iterative improvements to our software in an assured and secure manner. Finally, Open Systems Architecture will maximize flexibility in system design, improve access to commercial products and competition, and enable our weapon systems to be affordably and quickly modernized and upgraded.

To successfully do this, the Department must establish a digital environment, or “tech stack,” that is accessible across organizations—both industry and government—and enables our workforce to access, understand, and modify the models of our weapon systems. We must change the way we do business beyond document-based descriptions of our weapon systems toward model-based systems engineering methods that extend across the lifecycle from design to disposal. We must apply smart coding and containerization to bring functionality from the labs to the field at a rapid pace.

The Air Force is pursuing these initiatives on several fronts. First, our Air Force Digital Campaign, with over 900 participants, is drafting best practices and training, developing acquisition tools and enablers, and crafting the steps forward. The Air Force has also issued acquisition guidance for each of the three elements of the Digital Trinity. We are actively deploying acquisition enablers, software containerization and code reuse platforms, and open architectures embodied in mature Government Reference Architectures.

Finally, we have a number of trailblazing programs that are actively employing these initiatives and experiencing great results. The T-7 program, our next training aircraft, is embracing model-based engineering and 3D design tools. In doing so, Boeing reduced assembly hours by 80% and cut software development time in half. The aircraft moved from computer screen to first flight in just 36 months. Our Ground Based Strategic Deterrent (GBSD) Program analyzed over 6 billion variant designs digitally prior to making a selection. GBSD’s implementation of all elements of the Digital Trinity will enable faster design cycles, ensuring the land-based ele-

ment of our nuclear triad is a deterrent for many years to come. The A-10 Enhanced Wing Assembly program demonstrates the value these principles bring to legacy platforms. Implementing digital engineering resulted in 236,500 operational hours returned to the A-10 fleet through individual aircraft maintenance assessments based on risk analysis methods pioneered by the organic A-10 government team. These tools have the ability to ensure airworthiness, safety, and affordability of the A-10 fleet into 2030 and beyond. We're excited about the potential of these new digital practices and look forward to reaping the benefits.

SMARTER ACQUISITIONS

As a key innovation engine for the Department of the Air Force, AFWERX teams Airmen and Guardians talent with commercial technology developers to transition agile, affordable, and accelerated capabilities. Per May 2020 direction from the Vice Chief of Staff of the Air Force, AFWERX 1.0 was combined with AFVentures and Agility Prime. In this arrangement we moved AFWERX under the Air Force Materiel Command, where the Air Force Research Laboratory provides the “organize, train, and equip” functions for AFWERX, while strategic direction is provided by the Service Acquisition Executive. In December 2020, SpaceWERX became part of AFWERX, and in January 2021, the Small Business Innovation Research and Small Business Technology Transfer Center of Excellence also joined AFWERX. Together AFWERX establishes technology, talent, and transition partnerships for competitive commercial advantage and military capability through the three lines of effort, AFVentures, Prime, and Spark.

“Air Force Ventures” or “AFVentures” is a key means of accelerating capability development by adjusting our work with startups, small businesses, and private investors. With over eighty percent of our Nation’s research and development (R&D) now commercial—and our Defense Industrial Base continuing to shrink through mergers and acquisitions—transforming the way we work with commercial companies is imperative. In 2018, we began energizing our Small Business Innovation Research/Small Business Technology Transfer Program (SBIR/STTR) to lower barriers for commercial tech companies, speed contracts, and bring private investment into the Defense market. Since 2018, using our AFVentures process, we have awarded more than 2,000 contracts, with over 75 percent of the recipient small businesses being new to the Department of the Air Force. Those companies have gone on to raise \$2.2 billion in follow-on private capital and win \$1.4 billion non-SBIR government funding, resulting in a \$5.6-to-\$1 Return-on-Investment for the Department of the Air Force.

This Air Force Ventures process – one in which we open the door for innovative companies to propose ideas to the Department of the Air Force – showed strong value last year in being applied to non-Defense missions. Specifically, the AFVentures team was integrated into the Department of the Air Force Acquisition COVID-19 Task Force used to fight the COVID-19 pandemic, and asked to scale their operations to support FEMA, DHHS, and Joint priority missions. Over the course of 2020, the AFVentures process brought in over 3,700 pandemic-fighting ideas, 449 of which were identified to meet emerging COVID-19 related requirements – including PPE manufacture, digital contact tracing, and remote telework. The AFVentures evaluation approach, which can scale to evaluate hundreds of proposals in a matter of weeks, was implemented by the FEMA Emergency Response team, evaluating over 300 proposals and resulting in \$645 million worth of awards. In all, the lessons learned from last year showed that the AFVentures process can be quickly implemented to solve emerging and urgent needs.

In an effort to scale the AFVentures success and accelerate transition of emerging technologies AFWERX established Prime. The first Prime program is Agility Prime. Agility Prime is a non-traditional program seeking to operationalize commercial electric vertical takeoff and landing (eVTOL) vehicles (i.e., “flying cars”) for military missions to accelerate the emerging commercial market. Agility Prime is the only all-electric passenger aircraft program in the U.S. Government. So far the program has awarded more than \$100M of contracts with close collaboration between FAA, NASA, DOT, DOE, and HHS. Agility Prime use cases include: humanitarian response, disaster relief, firefighting, distributed logistics, personnel recovery, disaster response, ship to shore delivery, and medical evacuation. The Department of the Air Force has unique testing and safety resources and military use cases to help mitigate current commercial market and regulatory risks. Agility Prime has been using these resources, rather than significant R&D funding, to attract investors, build confidence, and expedite commercialization, all while providing warfighters revolutionary flexibility with assessment across 13 different air mobility missions, some that will be tested in exercises beginning this year. Since releasing the Innovative

Capabilities Opening in February 2020, 24 companies have applied. Two of those companies have made it through the Air Force airworthiness process, with several more following soon. This unlocks their opportunity to generate revenue for commercialization and to generate more data for accelerated learning, and civil and military certification. The program is designed to certify safety and airworthiness, procure systems for the most promising missions, and reach operational capability by fiscal year 2023. Expanding our R&D enterprise from creator to catalyst is key for accelerating dual-use technology and countering the advantages of state-sponsored industrial bases. Based on the success of this model, AFWERX Prime announced Space Prime as the follow-on to “Agility Prime.” Other potential Primes go across five sectors to include commercial alternative energy, autonomy for mission and maneuver, digital engineering and advanced wargaming, supersonic travel, and microelectronics.

Foundational to the success of any of these AFWERX efforts is the amazing innovation network of Airmen and Guardians being empowered by Spark. AFWERX Spark has implemented fellowship programs to include the Defense Ventures Fellows, AFRL Fellows, and Academic fellows to rotate through AFWERX or private industry. Additionally, Spark empowers over 80 base-level Spark Cells to ensure close connectivity with current needs of our Airmen and Guardians.

INTEGRATED AND ADAPTABLE ACQUISITIONS

Our potential adversaries are modernizing and advancing individual systems while bringing families of systems (or systems of systems) together into an architecture to deny U.S. interests and counter potential U.S. action. To meet this threat we must not just field capable individual systems but also integrate our systems so they can work in unison to achieve the necessary operational effects on increasingly rapid timelines allowing us to fight at machine speeds. The Department of the Air Force must not only invest in war-winning capabilities but also invest in war-winning technology architectures. By way of analogy, it is no longer sufficient to have the right ingredients, but we must also have the best recipe.

To achieve this integrated approach, we continue to design, demonstrate, and evaluate a Department of the Air Force-wide integrated architecture under the auspices of our Department of the Air Force Chief Architect. This effort will require programs and platforms themselves to be built with agility via open systems and open standards so that they can adapt and upgrade components quickly in response to threats or opportunities to integrate technology as advances are made. We will also be engaged in a regular campaign of learning at the architecture level with live demonstrations and evaluations of how we fight and where we fight. This is critical to moving from simply buying ingredients and hoping they form a coherent recipe, to a deliberate approach that impacts overall Air Force and Space Force architecture design, investments, technical requirements for future capabilities, and acquisition baseline updates for current systems.

An example of this impact of force level demonstration and evaluation occurred in February of this year during an Architecture Demonstration and Evaluation with U.S. European Command. This effort showed the importance of demonstrating and evaluating at the architecture level not only “how” the Department fights but also “where” it fights. By taking Architecture Demonstrations and Evaluations to the field, the Department uncovered mission-critical gaps that could not have been uncovered merely at test ranges. This testing allows us to discover and fix the problems now rather than on the road to conflict when it would be too late to correct. We are committed to working with our Joint and Allied Partners so that existing systems can join easily. We ask Congress to support this capability so that future operators on the battlefield enjoy the same empowered capabilities they presently enjoy at home.

CONNECTING WITH THE JOINT FORCE

One effort that will stress how fast and smart our requirements, acquisition, and operations process can move is Joint All-Domain Command and Control (JADC2) powered by the Advanced Battle Management System (ABMS). Charged by the Secretary of Defense with leading the concept development for JADC2, the Department of the Air Force is building ABMS to create decision superiority by delivering relevant information and capabilities to warfighters and operators at all echelons. ABMS will integrate today’s and tomorrow’s sensors; develop applications embedded with artificial intelligence, sophisticated algorithms, and multi-layered protections to make sense of massive amounts of trusted data; link space capabilities with weapons systems and personnel across all domains; and design pods, platforms,

pathways, procedures, and policies that connect and integrate the warfighter better and faster than in any time in our history.

On 24 November 2020, the Department of the Air Force Rapid Capabilities Office (DAF RCO) was assigned as the Integrating Program Executive Office (PEO) for ABMS in a deliberate transition to start acquiring enduring capability through focused acquisition efforts and investments in digital infrastructure. Moving forward, the DAF RCO will build on the Chief Architect Office (CAO) work from 2019–2020 which focused ABMS resources on technology maturation across product lines identified as “ONEs” and Onramp demonstration activities to prove the viability of the JADC2 operational construct. Upon transition to the DAF RCO, the product lines were replaced with a more streamlined acquisition framework and supporting personnel returned to originating Program Offices, laboratory directorates, and integrated product teams for continued maturation and proliferation.

The ABMS acquisition effort will pursue two interconnected investment paths: enduring digital infrastructure investments and Capability Release packages, which leverage those enduring investments but focus on closing kill-chains and delivering immediate operational capability to the warfighter. DAF RCO is working in conjunction with the acquisition community to ensure Air Force and Space Force systems have seamless interoperability and compatibility to meet the JADC2 operational requirements. The six ABMS capabilities required to connect the warfighter are secure processing, connectivity, data management, applications, sensor integration, and effects integration.

Driven by requirements approved by the Chief of Staff of the United States Air Force and the Chief of Space Operations, Capability Release #1 (CR #1) (Airborne Edge Node) will focus on the edge network to enable sharing of information across 5th generation tactical air and provide situational awareness to KC-46 and C2 nodes. Data from CR #1 (Airborne Edge Node) will enable faster decision-making by the tactical, operational, and strategic customers.

Thank you again for the opportunity to testify before this Subcommittee. The dialogue we have today will help us design, build, and operate a force capable of fighting and winning now and in the future.

Senator DUCKWORTH. Thank you. Who is next?

Lieutenant General NAHOM. Ma’am, that was a combined—

Senator DUCKWORTH. That was combined for all three of you. Okay. Sounds good.

So, then, we will begin with questions. My question is actually for all three witnesses and please feel free to answer in the order that you see fit.

A large area of contention in the Air Force budget request, again, this year, is the number of aircraft the Air Force intends to retire earlier than previously planned, and you addressed this already in your remarks. Based on the testimony we have gotten at the full committee and other subcommittees, it would appear that the Air Force believes they have alleviated concerns about the number of air-refueling tankers raised last year by TRANSCOM [Transportation Command] commander, General Steve Lyons, and are now taking partial credit for the KC-46 meeting those tanker requirements.

That raises a point that I would like to make this afternoon. While there may be some parochial issues tied to retiring aircraft, I do think senators are also genuinely interested in the capabilities associated with aircraft and have concerns about risks from retiring systems too early with no replacement. I understand the issues of maintaining aging aircraft, but if there are no replacements for that capability, then we need to reconsider the retirements.

That is certainly my concern about retiring C-130s in the face of likely increases in demand arising from the forthcoming mobility-capability requirement study. So, I would like all three of you to answer this. Why does the Air Force keep asking for these re-

tirements when the rationale has not changed much and has failed to convince Congress before?

Lieutenant General NAHOM. Ma'am, I can start, and I will talk about this individually, the KC-46, and certainly when we get to capabilities, I will hand it over to General Richardson.

We have been working very closely with TRANSCOM and I know we have had very good conversations in the last year and we have come to an agreement to make sure we are correctly managing the day-to-day need for tankers worldwide, while we make sure we are also reallocating the resources to modernize, specifically, for the KC-46.

We look at the minimum tanker requirement out there, 479. We meet that now; unfortunately, that is with KC-46s that are not completely operationally ready. But we can maintain a fleet to meet the current demand. We are using a mix of, obviously, the legacy tankers, as well as using MPA days to take advantage of our total force airmen in the air refueling missions, day-to-day, both, in the Middle East and around the world.

The KC-46 is going to be an incredible asset to our Air Force. We are getting use out of it right now, not just in limited air refueling, but also in airlift and air medical evacuation. The RVS [remote vision system] 2.0 fix is coming forward and even before that, we are able to use it in many missions around here, stateside, freeing up KC-135s to go overseas.

It is very important, though, as we modernize, we have to retire some things because we have limited resources and one of the hardest resources to manage is people. The same people right now that are flying KC-10s and operating and maintaining those KC-10s are the same people we need to operate and maintain our KC-46s. So, as we continue to accept 15 KC-46s a year, if we are not retiring on the back end, we end up having a manpower problem with these units and that is certainly a concern.

Sticking with the KC-46, I will turn it over to General Richardson about the capabilities to see if there is anything that I am missing.

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

In terms of the capabilities, I think your fundamental question is a risk calculation. General Nahom mentioned limited resources, so what we are trying to do is work within those resources and basically do a risk calculation.

In terms of the KC-46, we are pretty comfortable with this Remote Vision System 2.0 redesign that we are doing. We will close out the preliminary design review of the actual new camera system this summer and then we will march towards a retrofit schedule that will start in fiscal year 2024; meanwhile, we have accepted, I think we are up to 45 of the 94 that are on contract right now.

So, that capability is building up. It is getting stronger. Our ability to use it is getting better. Air Mobility Command is working on an interim capability release plan to start using that capability.

I kind of look at this in a similar fashion as I do with some of our systems that we really love a lot today, and the two that I am thinking of right now off the top of my head are the C-17 and the JASSM [joint air-to-surface standoff missile] missile; both of those

got a very, very rough start, but we worked through them and we matured them. We were the only customer for them and so we had to kind of be the folks that matured them.

I view KC-46 the very same way. I do think it is going to be an incredible tanker and I think it is already growing towards that route. So, we have a number of deficiency reports that we are burning off. The Remote Vision System is the one that we are most critically worried about, but we are actually getting after it pretty heavily and it is not going to cost the taxpayers any additional money to get it fixed.

Senator DUCKWORTH. Thank you.

General Guastella, would you like to add anything?

Lieutenant General GUASTELLA. Ma'am, thanks for the question.

Not too much to add, except that I have actually received gas in an F-16 off the KC-46 and it is the best tanker I have ever tanked off of. It is very smooth behind that thing and it is also a very capable aircraft with excellent director lights. So, it is already delivering for us.

How we are mitigating this, ma'am, is the tanker requirements are global. We are using them right now today to retrograde out of Afghanistan. We are using them in the Pacific. While those are forward requirements where our KC-135s and KC-10s are being used, there are home-station requirements, such as training and tests that we are actually looking at employing the KC-46 as it currently is, in those roles as we modernize the visual system. So, we are getting the most we can out of it to hopefully free up some of those tails to transition to the new fleets.

Senator DUCKWORTH. Thank you.

Senator Cotton?

Senator COTTON. Gentlemen, last week I asked General Brown about the risks if the Air Force cannot modernize. According to its plans, those risks are stark, in my opinion. I don't see the PLA [People's Liberation Army] Air Force having a debate about modernization of its military or adequate top line budget.

I agree when the Air Force says modernization is critical to achieving a future force that is resilient enough to win in great power competition.

General Nahom, we have certain aircraft that are of limited capability to fight in a highly contested environment against near-peer adversaries, something like, say, the A-10. Could you please describe for us the risks that we will be accepting as a Nation if the Air Force is not given the authority it has requested to retire aircraft that might be less capable in that high-end peer conflict.

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

The A-10 is an incredible aircraft. I do, I always like to take it back to when we started with the F-35s. You know, we bought F-35s and went down this road, intending to replace A-10s and F-16s. There is a certain point where we have to actually start replacing these aircraft, and we know the F-35 has had a bit of a rocky road throughout the last decade, so we know we need to continue to work through that.

We are not trying to retire A-10s in the near term. What we are looking to do is reduce the A-10 fleet from 281 down to 218 air-

planes. That goes from nine operational squadrons down to seven. At seven operational squadrons, we will still have more A-10s than F-22s in service.

Why seven was significant, we put a lot of analysis behind that. That allows us to keep one squadron full up in Korea and the other six squadrons, three Guard, two Active Duty, and one Reserve squadron, in a rotation to always offer up the combatant commanders at least one A-10 squadron on the road continuously. We felt that was a good position to be in, so then we could actually take those resources, that frees up nearly a thousand airmen, maintainers and operators, that we can then transition into future platforms, specifically, the F-35.

As we look at the F-35, we are having resource issues, mostly with manpower, because we have to start replacing some platforms. Right now, the F-35, the Air Force has approximately 300. That is now the second-biggest fleet of fighters in the Air Force and we are going to have to resourcing it accordingly as we go forward, sir.

Senator COTTON. That is just one example of the trade-offs you have between retiring some number of legacy aircraft as you continue to build up the new fleet of aircraft; is that right?

Lieutenant General NAHOM. Yes, sir, and that goes across all of our fleets.

Senator COTTON. Some of those investments are also happening in classified programs; is that right?

Lieutenant General NAHOM. Yes, sir, especially in the ISR realm.

Senator COTTON. So, retired aircraft are done in ways that attracts Congress' attention and local newspapers' attention. It is not always clear what we are getting from those savings. Some of it is clear, we are getting more F-35 aircraft, but we are also getting a lot of stuff that we can't talk about in this setting that is essential to defeat China; is that right?

Lieutenant General NAHOM. That is correct, sir.

Senator COTTON. That is what I thought.

General Guastella, the ability for the Air Force to train to win our Nation's wars requires the Congress to provide you the resources, in particular, flight hours needed to prepare for a high-end flight. Given the removal of the overseas contingency operations fund and the reduction of flight hours for this budget request, can you explain the risk to readiness, in general, and, specifically, the impact to our pilots' ability to conduct adequate training and providing the Beyond the Horizon support for counterterrorism in the Middle East.

Lieutenant General GUASTELLA. Thank you, Senator.

So, without a doubt, pushing the OCO [Overseas Contingency Operations] flying hours into the Air Force's base budget has put additional pressure on those valuable dollars in that budget and it has been very difficult to sustain the fight against the counterterrorism fight and the counter VEO [Violent Extremist Organization] fight, as well as move to that modern, high-end training.

But I will tell you what, our airmen have done incredibly well in fighting today's fight, but the risk, just like you alluded to, sir, is the longer-term risk and the need for those airmen that are in this day-to-day fight, to be able to train against a peer competitor,

have those opportunities to fly advanced scenarios, where they can really hone their skills against a peer, and that is something that is very challenging. We are doing our best to manage this.

By the way, our flying hours are also a function of what our aging fleet can support. These very old fleets, 28-year average age, cannot generate the volume of flying hours that we would like it to, and so it is key that we retire some of those aged aircraft and allow us to modernize to airplanes that can generate to sortie rates.

Senator COTTON. Thank you.

The potential decline in flight hours can also put more stress on retention efforts of your pilots, as well; is that right?

Lieutenant General GUASTELLA. Yes, sir. Without a doubt, the pilots that came in want to fly and they want to fly in advanced scenarios that really build their skills. So, I think it will be a win-win.

Senator COTTON. I have had extensive discussion with your pilots over the years and almost all of them say that the number one reason that they would want to stay in the Air Force longer is if they could fly more, as opposed to doing administrative duties.

Did Lieutenant Guastella join the Air Force because of pay?

Lieutenant General GUASTELLA. Sir, I certainly didn't join the Air Force to do the job I am doing now.

[Laughter.]

Lieutenant General GUASTELLA. But, I will tell you what—

Senator COTTON. Did you join because of the pay or did you join because you wanted to fly high-performance aircraft in defense of our Nation?

Lieutenant General GUASTELLA. Sir, I wanted to fly high-performance aircraft in defense of our Nation and I have been honored to be able to do that.

Senator COTTON. I am sure that a bonus to retain all of those captains and majors, Guastella, and Richardson, and Nahom, might be appreciated by them, but there is no way you could possibly pay what they would make in the civilian world, but you can allow them to fly high-performance aircraft in defense of their Nation, can't you?

Lieutenant General GUASTELLA. Yes, sir.

Senator COTTON. I think we should do more of that.

Senator DUCKWORTH. I joined the Army to fly low and slow, actually, not high, and fast.

[Laughter.]

Senator COTTON. I joined the Army to sleep on those low-and-slow aircraft and jump out of them.

[Laughter.]

Senator DUCKWORTH. The Senator from Florida, Mr. Scott?

Senator SCOTT. Thank you, Chair.

First off, I want to thank each of you for your service. Do you acknowledge that our threats seem to be increasing year after year now and do you have any feeling that, whether you are thinking about Russia or China, that you think they are going to invest less money in the future than they are investing today?

Lieutenant General NAHOM. Yes, sir, and I would say, you know, when you look in 2018 when the NDS [National Defense Strategy] came out, you really had to see change.

I have been asked, did the NDS in 2018 get it right?

I would say, yes, but I would say it is accelerated much more between 2018 and now than I would ever have anticipated. So the acceleration of the threat is very eye-watering right now.

Senator SCOTT. Do you believe in the case of Communist China that as they build up their economy, they are going to continue to invest bigger and bigger dollars?

Lieutenant General NAHOM. Yes, sir, I believe so.

Senator SCOTT. So, have you participated in any war games in defense of, that would go through and say, are we adequately prepared to be able to defend Taiwan? Are you done any war games in that regard, any of you?

Lieutenant General NAHOM. Sir, we, in the Air Force, have done several war games, which get at to the hardest problems out there, vis-à-vis, China. To get into the details, I would absolutely love to get into a classified setting so we could talk more specifically about them.

But I will say that, as I said in my opening statement, there has to be a change in how we are investing our dollars if we are going to meet that threat in the future, and we are very concerned by that.

Senator SCOTT. Do those war games give you any pause that we have the ability to defend Taiwan today?

Lieutenant General NAHOM. Sir, I want to be very careful what I say in an unclassified setting, but certainly, the threat does give me pause.

Senator SCOTT. There are public articles that say in our war games, we wouldn't be able to defend Taiwan.

Have you seen those?

Lieutenant General NAHOM. I have definitely seen some public war games and items from think tanks that do question our abilities, yes, sir.

Senator SCOTT. So, do you believe that the budget that has been proposed is going to be adequate to both, defend the Indo-Pacific, and, in particular, Taiwan, and modernize the way you envision we have to do it, or do you just feel like you are stuck and you have to take this because of your position?

Lieutenant General NAHOM. Sir, I guess it would be hard for me to sit here and say that we couldn't use more resources, one of the positions I believe we have to be in is how we spend the resources we have, because I think we have some opportunity to focus the resources that the Air Force has been given, not just the dollars, but the manpower, and the incredible airmen we have, I think there are some things we can do differently as we invest moving forward.

Would more resources be helpful?

Absolutely. But I also think with how we modernize is a very important conversation that we have to have.

Senator SCOTT. Does it give you pause when you see, like you talked about that, Russia and China are spending so much more money to modernize that we are, does that also give you pause in our ability to defend ourselves and our allies?

Lieutenant General NAHOM. Sir, I would say what Russia and China are doing with their forces and how they are posturing and

their aggressive behavior at times, does give me pause continuously. Yes, sir.

Senator SCOTT. Okay. Can you give me some examples of the President's budget where it is going to give you confidence that we are getting better prepared, rather than less prepared. Any of you?

Lieutenant General GUASTELLA. Well, sir, there are definite things we are doing to improve in our readiness and we have been working on that for several years now to increase our ability to fight today. But we are also looking at our ability to fight in the future and we are not just looking at combatant commander risks today, but in the dialogue of risk, we are talking about today's risk, combined with future risk.

The work that we have been doing is actually, almost the same communication we are having right here in this setting is talking about managing the risks today; where should we accept risk today to allow aircraft to be retired or monies to be shifted to areas where we can modernize to keep pace or stay ahead of the China and Russia threat.

So, I think those are areas of success, but like General Nahom said, we are always at a shortfall for resources in this environment and considering the demands that are being placed on the Air Force across the spectrum of warfare.

Senator SCOTT. Can you all talk about where you feel like we are, as compared to Communist China and Russia with regard to hypersonic weapons? Are we doing a better job developing hypersonic or are they doing a better job?

Lieutenant General RICHARDSON. I would say we are ramping quickly, Senator. So, this particular budget that we just put forward, we have the ARRW [Air-Launched Rapid Response Weapon] program, which is going to go into production in fiscal year 2022; that will be the first operational hypersonic weapon. Not just that, but we are also starting are the HACM [Hypersonic Attack Cruise Missile] program, which uses a different flight profile to produce risks and to cause confusion for the enemy on having to handle two different delivery mechanisms. So, I think we are catching up very, very quickly.

So, whether we are at parry or not, I can't say. I do know that we are getting after it. We are applying a significant amount of resources the last few years towards that, over.

Senator SCOTT. Thank you.

Senator DUCKWORTH. Now, my partner who recently went to Taiwan with me, our senator from Alaska, Senator Sullivan.

Senator SULLIVAN. Thank you, Madam Chair, and thanks, again, for your leadership. I really appreciated the trip that we took together. I think it made an impact.

You know, when the Chinese Communist Party's mouthpiece, the Global Times, is calling a trip by three U.S. senators a vile provocation, and what else did they call it? It was pretty—

Senator DUCKWORTH. I don't know. My response was, Hooah.

[Laughter.]

Senator SULLIVAN. Our response was, Oorah, but, you know, the same, similar.

[Laughter.]

Senator SULLIVAN. It was actually, I think very impactful CODEL [Congressional Delegation], so thank you very much for that.

So, gentlemen, I am a big, big fan of the Air Force. You guys have a tough job. I am just going to state it right here: this budget is unacceptable in my view and you have to come up here and defend it. That really sucks for you, right, because you don't like the budget. You don't have that say that, but I know you don't like the budget. I don't like the budget. Hopefully, the Chair doesn't like the budget. I know the Ranking Member of this Committee doesn't like the budget.

It is a cut, inflation-based cut to our forces when the Biden administration is doing double-digit increases to other Federal Agencies. Those are all facts. You have to come up here, suck it up, try to defend a budget you don't like.

But I am going to be a little harsher on the Air Force than I typically am, because I am a pretty big advocate. Here is the issue, JPARC [Joint Pacific Alaskan Range Complex] is, I think, and I have heard it from the chief of staff and everybody else, one of the most important ranges in our inventory because it is huge. Like everything else in Alaska, it is huge. Airspace is bigger than Florida. You can do fifth-generation standoff training that we are going to need, increasingly.

Admiral Aquilino just talked about modernizing our ranges as really important. Chief of Staff, General Brown, just last week in a question I had for him, gave me his commitment, which he has given many times, on prioritizing and accelerating the investments in JPARC and the Nevada Testing Range.

But here is my issue, and I am just learning about it today, and I am actually quite ticked about it. In March of 2020, the Air Force submitted a report on the modernization of JPARC and the NTTR [Nevada Test and Training Range] and said the goal was to get complete modernization, fifth-generation modernization by fiscal year 2026, okay. That is pretty far out there, but that was the commitment about a year ago.

Today, I am learning in this hearing, your joint statement for the record indicates current Air Force planning now extends this much-needed modernization to fiscal year 2032. So, I am just learning you bumped it 6 years. The Chief of Staff of the Air Force last week said he was prioritizing this modernization and now we are going to be a decade out, and that is completely unacceptable.

You want to talk about a high-end fight with fifth-generation fighters, why am I learning about this today in this hearing and what the hell is the Air Force doing, bumping this 6 years when the Chief of Staff of the Air Force, twice in the last year, has said that this is a priority in modernization?

Is this another self-inflicted wound of the Biden budget crushing our military, crushing our readiness?

I really want an answer here, gentlemen, and I find this completely unacceptable. What the hell, how did this happen, 6 years?

Lieutenant General NAHOM. Sir, I would say for the ranges right now, I know where the Chief of Staff was just here last week about the NTTR and the JPARC, when we look at our resources across

all our ranges, we had to prioritize this year and we correctly put the NTTR and the JPARC as our top two.

Senator SULLIVAN. Uh-huh.

Lieutenant General NAHOM. Then there are going to be a series of ranges just below that. So, the NTTR and the JPARC, our intention is to get those to what we call a threat-level 4 so you can actually train at that level—

Senator SULLIVAN. By 2026. That is what your goal was last year—

Lieutenant General NAHOM. Yes, sir.

Senator SULLIVAN.—a year ago, almost to the day.

So, what happened?

Lieutenant General NAHOM. Sir, and I would say as we look—

Senator SULLIVAN. By the way, you didn't bump it 1 or 2 years; you bumped it 6 more years. Like, what happened?

Lieutenant General NAHOM. Sir, as we modernize the ranges, the concern is not only the threat emitters, which are so important, that we are trying to modernize for the JPARC for the NTTR, as well as, we have to look after the adversary air, because if those F-16s are going to timeout in the next handful of years.

Senator SULLIVAN. Right.

Lieutenant General NAHOM. Right now, we are aggressively looking at the plans to make sure that the JPARC is our exquisite training ground, because that and the NTTR truly are, especially for the Pacific Forces.

Senator SULLIVAN. Again, you are not answering my question, General, with all due respect.

This went from a 2026 timeline to a 2032 timeline and I just found out about it today. Why did you bump it 6 years?

Lieutenant General NAHOM. Sir, for the exact breakdown of what was delayed, to bump it out, I will have to take that for the record and get back to you and your staff.

Senator SULLIVAN. Again, it is not 1 year, not 2 years, not 3 years—

Lieutenant General NAHOM. Yes, sir.

Senator SULLIVAN.—you bumped it more than half a decade. Do we have half a decade to get our fifth-generation fighting fleet ready to compete with China and Russia?

I don't think so. That is actually a decade from now, 1 decade from now. I don't think this is even remotely acceptable. We need answers.

Madam Chair, this is a huge issue and with all due respect, gentlemen, and, look, I love the Air Force. I know you guys have served for decades, but this is completely unacceptable. We need details and answers, and I am going to ride the Air Force really, really, really hard on this, hopefully, in conjunction with the Chair and the Ranking Member, to get answers to this issue. I literally walked in here and just found out about it.

Lieutenant General NAHOM. Yes, sir. We will get those questions answered for the record, sir.

Senator DUCKWORTH. Via Webex, Senator Rosen?

Senator ROSEN. Well, thank you, Chair Duckworth, Ranking Member Cotton, for holding this hearing.

I appreciate the witnesses for your being here today to testify and, of course, for your service to our Nation.

I would like to speak a little bit about the MQ-9; again, of course, it is really important in Nevada. So, General Guastella, the MQ-9 Reaper is critical to supporting our current intelligence, surveillance, and reconnaissance requirements. A key part of the MQ-9 architecture is their mission at Nevada's Creech Air Force Base.

Last year, CENTCOM [Central Command] Commander, General McKenzie, included additional MQ-9 funding at the top of his unfunded priorities and in April he told the Armed Services Committee of the MQ-9's importance and his need for more of them, not fewer.

The Air Force today still lacks the ISR capacity to meet combatant commanders' requirements contained in the 2018 National Defense Strategy. Despite this, the Department has proposed cutting this platform, their most cost-effective, without a program of record, without a program of record to replace it, which would reduce, which would risk further widening the ISR capability gap.

So, General Guastella, Secretary Austin told me during the DOD posture hearing that the Air Force is reducing the number of MQ-9 lines, but not the number of tails. I am curious why there is any reduction at all when the Air Force today still lacks the ISR capacity to meet combatant commanders' requirements.

Can you please explain this counterintuitive strategy, reduction strategy, and is there something that is going to replace the MQ-9 with a new program?

Lieutenant General GUASTELLA. Thank you, Senator, I appreciate that question.

I absolutely share your observation that there is a tremendous demand for airborne ISR across the combatant commands, and it is difficult to get at that requirement with the force we have.

I will share this, though, also. Our MQ-9s have done incredibly well for decades now in the fights that we have been in and they are doing very, very well today. But the requirements for our ISR enterprise is we have aircraft that are persistent and connected. We have that today. But they also have to be survivable.

It is important that we balance the fleets of ISR that we have between today's capabilities and a modernization effort to get after a peer competitor, because that is not something the MQ-9 was designed to do. So, while we can't talk about all of the options here in this forum, we would welcome to come back to you and discuss where we intend to go with the ISR enterprise in a different setting.

Senator ROSEN. Thank you. I would like to set up a classified time to speak with you about a possible next-generation program, if it is going to replace it.

But the time I have left, I would like to talk a little bit about wildfires because wildfire season is upon us on the West Coast. We know that every state in the West is in extreme drought, not going to get any better.

So, General Nahom, the Nevada's Air National Guard's 152nd Airlift Wing in Reno, they fly, like, C-130s to some of the hottest temperatures, the highest elevations, the most challenging mountainous environments of any C-130 unit, and integral to their mis-

sion is flying the Modular Airborne Firefighting System, the MAFS, and in support of the U.S. Forest Service.

Like I said, this wildfire season is predicted to be, unfortunately, some of the worst that we have ever seen, and so, upgrading the Nevada Air National Guard C-130H fleet with the C-130Js would have substantial impact on their readiness and their firefighting capabilities, not just in Nevada, but across the entire Western United States, which it is just so critically important.

I was really discouraged the Air Force was not considering MAFS when evaluating base candidates for the C-130J, and even more disappointed when Reno wasn't selected. But last week, I was heartened when Acting Secretary Roth told me his committee would work with me to see if there are ways that the Air Force can give some consideration, and General Brown committed to having MAFS considered as one of the criteria for base candidates for the C-130J.

So, General Nahom, can I get a similar commitment from you, because we need to look at many mission sets that our National Guard has, this just being one of them, for us in Nevada, supporting the up and down the West Coast. Can I get that commitment that you will forward that?

Lieutenant General NAHOM. Yes, Senator, absolutely.

We work very closely with the Guard and the C-130 community to make sure we are prioritizing and taking into account the special missions of the C-130 fleets.

Senator ROSEN. Thank you.

I really appreciate that because we have some of the longest, roughest terrain to travel and our Guard does a tremendous job with the resources they have, and we need even more.

Thank you, Madam Chair. I yield back my time.

Senator DUCKWORTH. Thank you.

Senator Hawley?

Senator HAWLEY. Thank you, Madam Chair.

Thank you, gentlemen, for being here. Thank you for your service to our country.

I want to get to China, but I want to start with the C-130Js, where Senator Rosen, the topic she was just on. General Nahom, General Richardson, give me a sense of how the Air Force is determining the number of C-130Js that are required across the Active force and the Air National Guard.

Lieutenant General NAHOM. Sir, the total number right now we are looking at as an Air Force, I mentioned in my opening statement was 255. If you break that down by the C-130Js we either have now or are currently on order, that is about 163 aircraft. That leaves 92 C-130Hs that we would fully modify for our fleet of 255.

That is obviously subject to change. As we said, getting to 255 is a stretch goal. That is if we can get that with mutually agreeable replacement missions and we may not get there and we understand that. But we believe that 163 is a good number.

We have to be careful as we take on new C-130Js, that comes obviously at a cost to what we could do with that money for other areas that we are, frankly, carrying greater risks than on the C-130 platform.

Senator HAWLEY. Got it. The 139th Airlift Wing at Rosecrans in Missouri has done outstanding work with the C-130Hs, as I am sure you know, of countless disaster-relief operations, regular deployments to Europe, to CENTCOM, PACOM. I would hope and expect that the 139th would be at the top of the list as you think about additional, future locations for the C-130Js.

Can I have your commitment that you will work with me on that and consider us in Missouri for—

Lieutenant General NAHOM. Yes, Senator, absolutely.

Senator HAWLEY. Great. Thank you.

Briefly, on the A-10, back to your divestment plans there, what are the Air Force's plans for the 442nd Fighter Wing at Whiteman Air Force Base, also in my home state, as you continue to scale down the number of A-10s that you have?

Lieutenant General NAHOM. Right now, sir, our plan over the next 2 years is to go down 63 airplanes and, as I said, from nine to seven operational squadrons. What is at Whiteman is part of those seven, so that is part of the group that is staying.

The two squadrons that would come down would be the one operational squadron at Davis-Monthan, and the one operational squadron at Fort Wayne, Indiana, which is on, we are on track right now to convert them to the F-16.

Senator HAWLEY. Got it. That is great. That is very helpful. Thank you.

Let's shift to China. If China is our pacing threat, and I think that you have been little bit clear about that, certainly, the Secretary has been, General Millie has been, then I would say that defeating a Chinese fait accompli into Taiwan has got to be our pacing scenario, and no other scenarios is as urgent or important and no other scenario poses as great a challenge, frankly, I think to the Joint Force, than the fait accompli does in Taiwan.

So, with that in mind, General Brown testified last week that the United States must maintain its ability to deny a Chinese fait accompli against Taiwan. My question for you is, how is the Air Force incorporating that specific scenario into your capabilities-development process?

Lieutenant General NAHOM. Sir, I think, especially if we can come back in a classified setting, show you our war game and I think you would be very pleased that we are absolutely using the pacing threat, China, with the hardest scenarios in all of our war gaming. That is directly influencing our investment options right now when you look at how we are organizing our strategy and design and how we are going to implement that into our POM [program objective memorandum].

That is why you are seeing our chief talk about that two-bomber fleet, getting to the B-21 quickly and those modifications of the B-52 with the long-range weapons. Getting to that four-fighter fleet, very controversial replacing the F-22 with the next-generation air dominance to get at that toughest problem. So, I think you are seeing that, as well as in our ISR design, that we will not be able to discuss in this forum, but I think that you will see that that pacing threat with that toughest scenario is absolutely influencing our investment.

Senator HAWLEY. Great. I would love to follow-up with you and get a brief in the appropriate setting.

Can we talk about LRASMs [long range anti-ship missiles] for a second? Your budget for last year requested five. Your budget this year, unless I am mistaken, requests zero.

I asked General Brown about this. He said that the Air Force isn't buying any LRASMs this year because it is focused on hypersonics.

My concern is, is it fair to say that hypersonics are not a 1:1 replacement for LRASMs, because even if we do use them to go after Chinese surface targets, for example, they are so expensive, we won't be able to field them at a scale that we could with LRASMs.

Help me understand the thinking here, the trade-off.

Lieutenant General NAHOM. Yes, sir, and LRASM is an important weapon and we actually have that in mind with all our future scenarios.

There are other ways we can get at surface ships, as well, and we will have to get to a classified setting, but there are other, we are absolutely invested and committed to advanced weapons. We have to be really careful we don't buy a lot, with our fifth-generation and sixth-generation platforms, we don't go flying around with third-generation weapons; we are very cognizant of that. I think that you will see that in our classified investment.

Senator HAWLEY. I appreciate that and I look forward to that, and what I am driving at is just making sure that we are able to maintain a very robust sea-denial capability. Because it seems, again, in the pacing theater, and with, in your words, the most challenging threat, that is the pacing scenario, sea denial seems to be pretty key.

So, what you are telling me is that you are absolutely focused on that and on the ball?

Lieutenant General NAHOM. We are certainly focused on that scenario, sir, of the most challenging scenarios and with the pacing threat, yes, sir.

Senator HAWLEY. Very good.

All right. My time has expired. Thank you.

I look forward, and I will follow-up with you about the briefing.

Thank you, Madam Chair.

Senator DUCKWORTH. Thank you.

Now joining us via Webex, Senator Manchin.

[Pause.]

Senator DUCKWORTH. All right. He is not there.

I will take the next questions—

Senator MANCHIN. Thank you, Madam Chairwoman.

Senator DUCKWORTH. Oh, there he is.

Senator MANCHIN. Thank you. Thank you. Thank you. I appreciate it. I am so sorry. I had a little technical difficulties there.

Let me start out with, if I can, with Lieutenant General David Nahom. General, I would like to bring your attention to an issue that is very dear to me is the Airlift Wing in Martinsburg, the 167th Airlift Wing in Martinsburg, West Virginia.

They are currently down one hangar, I am sure you are aware of that, to structural issues, which, as I am understanding, greatly impacting their ability to carry out their maintenance on their fleet

of C-17 aircraft. I worry that this is isolated, to my understanding, across the Air National Guard, which is even more concerning, when you take into account that the Reserve component maintains over 70 percent of our military's tactical airlift capability.

The only thing I can ask you if that has been brought to your attention and if you can give me any type of timetable or if you will look into it.

Lieutenant General NAHOM. Sir, I would say that specific issue with Martinsburg, I do not have the data on that actual issue and I will definitely take that for the record and get back to you and your staff on that one.

But what I will say, though, if you look at our facilities modernization and sustainment accounts, we call it FSRM [facilities sustainment, restoration and modernization], this is a challenge. We have a lot of infrastructure in the Air Force and the resources and the funds are a challenge to keep up with all the facilities—

Senator MANCHIN. General, if you could give us a backlog on deferred maintenance, it would be very helpful, sir. We could see how we could help you.

Lieutenant General NAHOM. Yes, sir, absolutely. We will take that for the record with your team.

Senator MANCHIN. Okay. The tactical and operational reliance on satellite communications is deeply understood by our adversaries. I am concerned of their future efforts to interrupt that vital link between those on the ground, the air, and the space.

I think we both can agree that timelessness and accuracy of data transmissions increase survivability substantially by prioritizing support to the joint warfighter and the interoperable integrated enterprises.

So, what are your priorities to support the joint warfighting concept, as it relates to space operations?

Lieutenant General GUASTELLA. Sir, General Guastella here to take an attempt at it.

For starters, we are very excited for the Department of the Air Force to include the Air Force and Space Force's participation and engagement in development of the joint warfighting concept, and it really is illuminating the differences in how we are going to fight in the decades ahead. In every service, it offers opportunity to demonstrate desired areas of transformation and, most importantly, how we will integrate and keep that competitive edge in the future.

A huge aspect of it is modernization and, obviously, we have talked before about aircraft modernization, but, certainly, we are very, very reliant on our SATCOM, satellite communications. While I will have to get back to you with a more detailed answer from the Space Force side, as I noted, it is the Department of the Air Force, we are working together to not only defend our capabilities, but also have offensive capabilities to keep that competitive edge on orbit.

Sir, pending any questions?

Senator MANCHIN. Okay. General Richardson, this year has demonstrated very publicly, the threat posed to our critical infrastructure from malign cyber actors, and part of that critical infrastructure, as you know very well, is Defense Industrial Base.

So, how does the budget reflect your plans to integrate cybersecurity measures into each new and legacy system within the Air Force?

Lieutenant General RICHARDSON. Thank you for that question.

I would attack that a couple of ways. The Department has got a CMCC [Cybersecurity Maturity Model Certification] program that is in place now to make sure that the Defense Industrial Base has got the protections in that they need on the cyber. Another thing that we are doing, also, is this idea of digital acquisition where we are taking more ownership of the tech decks that we are developing our weapons systems in.

So, agile software, for example, the systems that we are using, the tech decks that we are working on come with continuous authority to operate, as long as the Defense Industrial Base and the Government are using those systems.

So, we are trying to attack it through a couple of different ways. Not just the requirements on the systems, themselves, but also in how we are actually developing the systems, using these digital acquisition tools. Thank you.

Senator MANCHIN. Thank you.

General Guastella, it is vital that we have a modernized nuclear deterrent to include the NC3 enterprise that is ready and capable to execute at any time. At the same time, we have rapidly aging and outdated systems to do that job with, such as the E-4B and the E-6B.

So, do the age and lack of some modern capabilities on these platforms pose a risk to us right now in guaranteeing the ability for us to employ our nuclear forces when we choose?

Lieutenant General NAHOM. Senator, it is General Nahom, I will take a swing at this one.

So, obviously, the E-4B and our Nuclear Command Control, that is a big part of our nuclear recapitalization that is going on right now, and I think you will see that with our investment in the E-4, specifically, the E-4 recap, as well as other aspects of our NC3.

So, it is certainly something that is clearly on our mind. Not just the weapons, for our nuclear recapitalization, but the command and control is an Air Force responsibility that we are taking very seriously.

Senator MANCHIN. If you could keep us informed, sir, on the timeliness of when you think that is going to be accomplished and what your timetable is to get it done.

Lieutenant General NAHOM. Yes, sir. We will get back to you in a classified setting with a timetable.

Senator MANCHIN. Thank you very much, sir.

Thank you, Madam Chairwoman.

Senator DUCKWORTH. Thank you.

Senator Kelly?

Senator KELLY. Thank you, Madam Chairwoman.

General Nahom, the Chief of Staff of the Air Force has said that the F-35 will remain a cornerstone of the Air Force fighter inventory today and into the future.

The Air Force's fiscal year 2022 budget request includes funding for the procurement of an additional 48 aircraft, bringing the Air Force F-35 inventory to 376. I support the F-35 program. I have

been very impressed with the capability. I had an opportunity to get in the simulator a few weeks back.

I am also concerned, though, that we still don't have a firm grasp on how to reduce the costs for this program. The GAO [Government Accountability Office] report released in April found that there is a difference of \$3.7 million per aircraft between actual sustainment costs and with the services, project they can afford over the program's life cycle. By 2036, this gap will lead to a total overrun of \$4.4 billion, and that is for the Air Force alone. The GAO estimates that the Air Force will need to reduce expenses by 47 percent to bring costs to a level that the service can sustain.

So, General, what is your understanding of the main factors that are driving the high program costs today and what efforts has the Air Force taken to reduce these costs to ensure that by 2036, it does not exceed the ability to maintain the fleet?

Lieutenant General NAHOM. Sir, I will start on that and then I am going to turn it over to, General Richardson has a lot of really good specifics on this.

It is a concern, when you look at the F-35. As the chief said, it is the cornerstone. We are very pleased with the F-35's performance. There are some things, increased performance we need to get out of it with TR3 [Technology Refresh #3] and Block 4 that you are very familiar with.

The operation sustainment costs and the ONS [operation needs statement] costs are a concern. When you look at those estimates you were talking about, those were estimates that we made a long time ago and they were not accurate. We are seeing out of the airplane right now, at a higher price point for ONS than we had anticipated nearly 20 years ago when we made some of these assumptions.

But when you look at the costs, the manpower and the consumables are probably the two things that we can actually affect, we are certainly getting after it.

I am going to turn it over to General Richardson, because he has more specifics on some of the programs going forward on that.

Lieutenant General RICHARDSON. Yeah, thank you, Senator.

I then if you bucketed the costs, this really comes down to just four things. The first is just consumables and repairables, things that break. So, there are lots of things you can do there. You can make them break less and you can make sure that you have the repair capability for them when they do break.

Manpower, it is manpower and tested-weapons system. I think as we mature the weapons system, those numbers will come down. We expect them to come down but right now, General Nahom is having to apply a lot of blue-suit maintenance to maintain them.

The third one is fuel. That is a bit uncontrollable. I guess it is what it is. The manpower and the fuel make up a good portion of the ONS cost on it.

The fourth one is just the sustaining support. I think the two that we are really going to try to attack are the consumables and the repairables and then the sustaining support where we are kind of needing, Lockheed help sort of maintaining the aircraft.

So, there are a number of things that we are doing. We are attacking it pretty heavily. One of the things we are doing is we are

negotiating right now to, on the 3 years, instead of, like, annual contract, a 3-year sustainment contract that actually has performance incentives in it. That is the first thing we are doing.

The second thing we are doing is we are doing what is called a business-case analysis to see what is the best way to attack those four levers, that I just talked about. That may lead to a change. It may not. I don't know yet. That is ongoing. It will conclude this summer.

We are also looking at kind of a whole host of different contracting mechanisms. I would be remiss if I also didn't mention the engine. So, as you may know, there are a lot of, I won't say a lot, I think there is—General Guastella, I think it is 30-some-odd holes that we are faced right now with on the engine. So, we are also working to make the, you know, to looking at our spares posture on the engine, doing a number of things there.

But, I can assure you that we are not happy with where we are at. General Brown is certainly not happy, but we are also not sitting around waiting; we are working very closely with the Joint Program Office, General Fick, to bring those costs down. I think we are going to make a lot of headway. I don't know if we will close the gap entirely that General Nahom needs us to close, but I know that darn well, we are going to make a very solid run at it.

Senator KELLY. General, on the consumable-repairable side of this, other than the issues with the Pratt & Whitney engine, is there any specific parts that are just experiencing other, like, high-failure rates that are a larger percentage of the consumable-repairable costs?

Lieutenant General RICHARDSON. We are having issues in a couple of areas, like canopies is an issue. It is not so much that. Actually, when this jet flies, it lands what we call, Code 1; it lands green, ready to go for another sortie most of the time, and that speaks—

Senator KELLY. My understanding is about the same as an F-16 or—

Lieutenant General RICHARDSON. Yes, sir.

Senator KELLY.—any other fighter.

Lieutenant General RICHARDSON. What we are working on right now, though, is when it does break, it tends to stay down for a very long time, and that is because we haven't stood up the repair infrastructure. We should have gotten started on that, frankly, a lot sooner than we did, and so that is the part that we are really attacking.

What I am talking about is the depots to actually repair the parts, whether they are government depots or they are contractor depots, we need to get those depots stood up so that when the part does repair, we can get it replaced quickly and back into the jet.

Senator KELLY. I understand.

I am also very interested and looking forward to seeing the TR3, Block 4 capability when that comes online. Thank you.

Senator DUCKWORTH. Thank you.

I join Senator Kelly in my concerns about the time on wing costs with the F-35 engine, as well as the overall costs. I think it is going to affect your ability to buy all the 1,763 aircraft that you plan to buy.

Senator Peters?

Senator PETERS. Thank you, Madam Chair.

Thank you, gentlemen. It is good to see you here today. I just have a few questions.

First off, with respect to aerial, unmanned refueling, two weeks after the MQ-25 successfully refueled an F/A-18, the Air Force issued a sources sought announcement for a bridge tanker that could, I think the operative word is "could," could be unmanned. This seems a little bit undefined as I look at that.

So, my question is, how does this reflect on how the Air Force views unmanned refueling, generally?

Lieutenant General NAHOM. Sir, you know, I would say there is a lot of opportunity here, and when watching the MP-25 fly, it is pretty exciting.

I think where we are with the KC-46 right now and getting the RVS [remote visual system] 2.0, and I will let General Richardson add to this, we are actually going down that road with a technology that will allow us to do unmanned refueling on a larger scale, that the Air Force needs.

Now, for the bridge contract, once we get to 179, the bridge is to allow us a bridge to what next technology is out there. So, we are just now starting to look at, to assess what that is going to look like, even though we have several years left for production on the KC-46.

But, General Richardson, over to you for the—

Lieutenant General RICHARDSON. I think General Nahom got it right. The bridge tanker is exactly that. We are looking at, largely, non-developmental items, though. So, we are not looking at something that is going to require a lot of time and effort to develop and so we are starting that process early.

We do expect to progress down. We do think we are on a path to fix the RVS 2.0. We do think we have a very good contract in place for 13 lots of 179 KC-46s that we think we have a very good price on. Even the thirteenth lot is capped in price.

This effort here, would then, kind of pick up at that point to bridge us to something that might look something like what you had mentioned, maybe something, you know, uncrewed, for example. It doesn't mean that we wouldn't look for an uncrewed on this bridge tanker.

The bridge tanker effort right now is really just, we are just kind of collecting information. It is in the very, very early stages. We will be at this for a few years, trying to figure out what our actual requirement is.

The responses to those requests for information will help inform our requirement as we get closer towards the end of the KC-46 procurement.

Senator PETERS. My next question is related, as we move forward with these new technologies, and I know the Air Force is moving to divest itself of a number of legacy aircraft and rely on the 4.5 design. But what it seems is that we are going to have more installations than missions as that continues to move forward.

So, General Nahom, the question to you is, how does the Air Force plan on transitioning these installations, which may be losing their legacy missions, to align them with the Air Force's mod-

ernization strategy so that they can continue to have a meaningful role in the Air Force?

Lieutenant General NAHOM. Sir, I would say, thank you for the question.

We are actually working very closely with the units and the locations as we do modernize, because as you rightly said, there is legacy equipment we are going to be taking out of the Air Force, but there is new equipment coming in and there are new missions coming in, as well. I think it is not about removing locations or removing units.

There is going to be some repurposing units into modern ways of fighting as we, for example, step out of the older F-16s and the older F-15s and step into the F-35s and then eventually NGAD and some of our ISR items, as well. Some of these bases are going to look very, very different, but right now, we are not seeing a lot of bases that are going to be going away and locations and units that are going away, but we do see some change in mission out there. I think it is actually fairly exciting as we look forward.

Senator PETERS. So, as the missions change, but I would—you can comment if you are looking at phasing out legacy aircraft, so a base that has a flying mission, if new flying missions are coming onboard, you would try to focus those on those bases that are losing a flying mission to get the new mission, would that be a fair assessment?

Lieutenant General NAHOM. Yes, sir. It is actually not just to keep that base in business, but we actually, we have a—there is a big advantage to this. We just did this with the F-15C, our single-seat F-15s. As they came out of service, we did a very holistic look at the new airplanes coming in, because as these locations are there and the units are there, we take advantage of not only the facilities that are already there, but you take advantage of the human capital that is at a lot of these locations, especially in the Guard and Reserve, absolutely. Because that is how we save resources, by taking advantage of what is already there at these locations with the new missions coming in.

Senator PETERS. So, for example, if you had an A-10 squadron that was going away, you would look at that base as being a priority place to put an F-35 squadron, perhaps?

Lieutenant General NAHOM. Yes, sir. Right now, we are looking at, as we bring new fighters on, and if you look over the last couple of years and looking forward the next few years, there are actually more fighters are coming into the Air Force than are going away. So, we are going to be looking for locations.

I think you are seeing a lot of that with the F-15C retirement, which is the most acute one, but you are also seeing that down in Florida with Tyndall Air Force Base and other locations, where we are taking advantage of the runways and the facilities and the people that are there to bring on these new missions. But, absolutely, sir.

Senator PETERS. Great. Thank you.

Thank you, gentlemen. Thanks for your service.

Thank you, Madam Chair.

Senator DUCKWORTH. Thank you.

This is the end of the first round of questions. I do have some additional questions and I know Senator Sullivan has indicated that he has some additional questions, as well. So, I would like for us to continue at least until 16:00, which is when the hearing was supposed to go.

So, I am going to go ahead and ask my additional question. I have to throw in a rotary-wing question because I am here and there is no way we can just talk about fighter jets all the time, all you high-speed guys flying around that are way up in the Earth's atmosphere.

The Air Force has taken a long time to get around to replacing the UH-1 helicopters in the force. At this time last year, the Air Force was planning to buy MH-139s in fiscal year 2022 and now, however, the Air Force does not have any MH-139s in fiscal year 2022. I understand there may have been some issues with FAA [Federal Aviation Administration] and certifications of the helicopters.

General Richardson, can you explain what happened with the program and was there an FAA-certification problem, and if so, what are you doing to fix the problem or to meet the need for the aircraft?

Lieutenant General RICHARDSON. Yes, Senator, I would be happy to take that question.

I wouldn't say that it is an FAA problem, per se. So, because this is derivative of a commercial helicopter, we are not going to lose, so to speak, the type certificate that comes with that helicopter. So, we are going to modify it with military equipment and systems and then we are going to get supplemental type certs that ride on top of that type certificate.

This aircraft actually needs three supplemental type certs. Type cert number three, supplemental type cert number three has already been granted. One and two are behind. The one we are most worried about is the second one, and it has to do with there is a defensive system that has a cell around it and it is causing some funny air disturbances, and so we are working to understand those air disturbances so that we can get this supplemental-type cert for that.

So, it is not necessarily that the FAA is being slow or anything like that; it is really just trying to work through those technical issues. When we look at the program, it is not ready for production.

So, here is a case where rather than just progressing forward into production, we are just going to make sure that we get that right and then we will put the production in fiscal year 2023. Other than that, the program is going pretty well. We just have to work through that one issue.

Senator DUCKWORTH. Isn't it a fixed-price contract?

What happens when you don't buy it in fiscal year 2022?

Lieutenant General RICHARDSON. It is a fixed-price contract, that is exactly right, but they will have to meet the specification requirements in order—so, before we go into production for lot one there, is a certain amount of entry criteria that we have to get past in order to award the contract. Boeing understands that.

Senator DUCKWORTH. Okay. So, the Air Force will not be penalized?

Lieutenant General RICHARDSON. No, ma'am, absolutely not.

Senator DUCKWORTH. There will be no costs, okay. Thank you.

Senator Sullivan, you had additional questions?

Senator SULLIVAN. Thank you, Madam Chair.

I want to talk again, and, again, this goes to your top line budget where you just had to make tough choices. It is just really helpful for the committee to know, but the Air Force's budget requests for this year reflects a decrease to the flying hours program, and after factoring in reduced buying power from inflation, a decrease in the weapons sustainment system, and per a GAO report released just last year, November 2020, the Air Force, with the exception of hueys, has consistently not met mission-capable rates over the past decade. I have the report right here.

So, can I get an explanation from you, gentlemen, how the Air Force justifies reducing funding to these two critical programs, flying hours, I think that is as critical as it gets in terms of training our pilots, and the Weapons Systems Sustainment program, when, according to the GAO, the service is still struggling to meet its readiness goals, particularly, in terms of flying hours.

Can I get any or all of you to take a crack at that, and, look, again, if you are reducing flying hours and training because of the budget, because the President, in my view, put forward a stingy DOD budget, which he did, I would appreciate hearing that. I know it is difficult to make that statement, but we need to know.

General?

Lieutenant General GUASTELLA. Senator, thank you for that question.

Sir, you are absolutely right, you know, flying hours are absolutely crucial to our readiness. The biggest issue that you brought forward points to one very important thing and that is the age of our fleet. You know, at 28 years, average age, it is really hard to generate the sorties, the rates, and the aircraft availability needed to get after the training.

Senator SULLIVAN. Well, let me push back a little bit here just to get down to what, the flying hours in this budget are down by about 87,000 is what I am reading. So, again, is that driven by the age of the fleet, as you just mentioned, or is that driven by a stingy budget that doesn't allow us to have enough flying hours? Which one is it?

Lieutenant General GUASTELLA. Sir, we program flying hours based on several things and first and foremost is what can our maintenance, what is our ability to generate? That is a big driver. We also have peacetime training requirements and also forecast combatant command requirements.

Our goal is to try to get the most out of every sortie that we can, and while there is no substitute to flying, it is, you know, the crown jewel of training, there is also a balance of how much we do in a simulation environment, because I will be honest with you, these fifth-generation and soon-to-be sixth-generation aircraft, very expensive flying hours. In simulation events, we can accomplish training at a much lower cost, very little cost, that is very available, weighs in, and so that is a balance that we—

Senator SULLIVAN. So, what is the driving the 87,000-hour reduction?

Lieutenant General GUASTELLA. I would say probably—

Senator SULLIVAN. Does the Air Force support that?

I can't imagine you three gentlemen, I am looking at all of your bios. You all have thousands of hours of flying, yourselves. I can't imagine that you are happy about announcing 87,000 hours of reduced flying time.

Lieutenant General NAHOM. Sir, I will expand on what General Guastella said about the aging aircraft, and it is discussing your other point at the beginning, sir, was WSS, the Weapons Systems Sustainment.

Right now, WSS is going up, well in excess of inflation. There are two main drivers of that. Number one is the aging airplanes.

Senator SULLIVAN. You mean the cost?

Lieutenant General NAHOM. The cost, yes, sir.

Senator SULLIVAN. I see.

Lieutenant General NAHOM. In fact, it is actually approaching almost a billion dollars a year, just in increased costs.

In this year, in 2022, we are not able to fund that increase and that is concerning, because that brings our funded—right now, we are going into this year, we are funded approaching 87 percent of our WSS and that is going to go down closer to 80 percent, and that is a concern.

What is driving that is the aging airplanes, that is number one, and number two, is a lot of our new platforms are coming on with a CLS, Contract Logistics Support, and many of these contracts are expensive and it is driving these increases to costs. The one way we are getting after this in our budget, I believe, is this concentration on recapitalizing our fleets to more modern aircraft that, as General Guastella said, that we can fly at a higher rate so we can generate those flying hours for our pilots. Because as you said, they badly need flying experience. The synthetic is good, the virtual environment, and we have to do that, as well, but getting them in the air is—

Senator SULLIVAN. If we were able to plus-up this budget, and I am sitting here with two senators who are aviators who know this issue better than anybody, is that an unfunded request if we put it in? You know, I am not talking about the President, but I am talking about, you know, the Congress ultimately has a say here.

Is this something that the Air Force would want to use budget money over what has been requested by the President to close that gap? Again, I can't imagine 87,000 hours of reduced flying time is something that all of you or Members of this Committee want. Is that something that you would want to help address if we got you more money? Ask.

Lieutenant General GUASTELLA. Sir, I think without a doubt, the funding of Weapons Systems Sustainment is something the Air Force would value a great deal.

Senator SULLIVAN. How about the flying hours?

Lieutenant General GUASTELLA. Sir, those are hand-in-hand. If we can fund the Weapons Systems Sustainment, that generates aircraft availability that we can turn around and lay in the flying hours for. So, those are interconnected.

I can tell you, that would be greatly valued. You know, air crews right now today out there are flying the absolute minimum number of hours they need every month to stay ready. We are offsetting that with simulation events, but we are at the lowest we can be. We want to turn that corner, and so we would value that investment in sustainment, which will enable the increased flying hours.

Senator SULLIVAN. Great.

Lieutenant General GUASTELLA. Sir, for what it is worth right now, the team is doing fantastic out there. Despite COVID, we are flying, we are at 96 percent of executing what was laid in our budget in our flying hours this year. So, we are working really hard, but those aging aircraft just make it harder and harder.

Senator SULLIVAN. Okay. The GAO report makes it sound like you are not hitting any of your readiness numbers.

But Madam Chair, thank you.

I have an additional question that I will submit for the record on the E-3s. Thank you.

Senator DUCKWORTH. Without objection.

Now to a man who has flown more hours, more distance around the Earth than any of us combined, Senator Kelly.

Senator KELLY. Thank you, Madam Chairwoman.

A lot of miles, certainly, and a lot of time, and I think to just follow-up on Senator Sullivan's comments, you know, one of the things we do really well as a Nation is we understand how to use the equipment that we build. We build great systems, great airplanes, great ships, great weapons systems, great helicopters, and then we train really well, and those flight hours do matter. They matter a lot.

Of the experienced I have had, you know, talking to some foreign air force, we have in the Space Program, we have a relationship with the Russians. When you talk to them about the number of hours they spend in the cockpit, not the same, which is good for us. That is true for a lot of our adversaries.

We do well in the air and with these systems because we train, so I think that is something we should follow-up on, Senator.

General, I had the opportunity to go out and see NGAD [Next Generation Air Dominance] in April. Very impressive. I think the NGAD efforts will help us outpace our adversaries who are also trying to invest in advanced technologies. I don't want you to go into anything that could possibly be, you know, we should be doing in another room, so let's not go there.

I am really pleased to see the non-traditional approach being taken with this program, leveraging digital engineering, agile development processes, digital design to make sure we can develop and test and field these aircraft at a faster pace. But I am also interested to find out what your thought is on what impact that this non-traditional approach will have on acquisition and life cycle sustainment costs.

Lieutenant General RICHARDSON. Senator, great question.

It is going to have a profound impact across the entire life cycle. I will answer it two ways. The first way is just specific to NGAD. Because of the way that we are doing it, using the digital acquisition that you mentioned, once we get into the product-support phase, which we always talk about that being 70 percent of the

life-cycle cost is in product support, what if we could change that figure? What if it wasn't 70 percent? What if we owned the technical baseline such that we could actually compete more of that work out in that 70 percent, such as less.

One thing I have learned in all my time doing this work is competition is your friend, and so we would like to be able to push that. So, there is a lot of effort or a lot of benefits, digital acquisition from design, to actually building the aircraft, to testing it, as you mentioned, because we don't have to do as much live-flight testing, to the sustainment part.

So, we believe, we have been talking a lot about budgets today, we believe that how we build future systems is going to help us get more out of the dollar that we do get. So, I just gave you an answer specific to NGAD. But what I will tell you also, the second aspect of the answer is that we are seeing a change in the workforce. Folks are seeing, hey, what is this all about?

So, another program, Stand and Attack Weapon, that program is doing some revolutionary work in how it is going about doing its business. So, we are starting to see this thing hit a tipping point where everybody wants to do their program using some of these techniques. I think, in fact, I think we are past that tipping point out, and so it is going to have a profound effect all across the Department of the Air Force. So, we have a bunch of guidance on how to actually get after that.

NGAD is a great example. GBSD [ground based strategic deterrent] is another one, and, SAW, Stand and Attack Weapon, it is doing the same exact thing. We are just going to kind of grow that ecosystem of digital acquisition, if you will.

Senator KELLY. Do you have any goals in mind for reducing development and acquisition costs?

Lieutenant General RICHARDSON. I think that kind of depends on the specific program. Each program will apply these tools to a different level.

I think if you look at the T-7, you know, an idea to flight in 3 years is pretty remarkable. Another aspect about T-7 is just the fact that because you end up pushing a lot more of the technical data to build the airplane out into the suppliers, the assembly time on the airplane was reduced to 75 percent. So, each of the phases, the design phase, the build phase, the test phase, and then the sustainment phase, we expect to get savings out of all of those.

To answer your question, we haven't come up with a goal necessarily, but each program will be a little bit different in terms of how it applies it.

Senator KELLY. Thank you, General.

Senator DUCKWORTH. Thank you.

Well, we are a little bit over time, but I want to thank each of you for participating today and I think we have some follow-up questions. But I really appreciate you being here and answering our questions.

With that, this hearing is adjourned.

[Whereupon, at 4:05 p.m., the Committee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JAMES INHOFE

VIRTUAL TRAINING METHODS

1. Senator INHOFE. Lieutenant General Richardson, from the recent INDOPACOM report to this Committee, we understand there is a need for more realistic air combat training environments to prepare our warfighters to win decisively in a peer/near-peer fight. Fielding a Live-Virtual-Constructive (LVC) training solution at the JPARC and other range facilities that enables our aviation, land and maritime forces to conduct training that is secure and interoperable across DOD and with Coalition partners seems to be a priority. Undoubtedly, we need this capability now to train our operators in a realistic threat representative environment.

What is the Air Force's plan to accelerate the fielding of a LVC air combat training capability at the JPARC to meet the need clearly establish by the Commander of INDOPACOM?

Lieutenant General RICHARDSON. The Air Force currently provides distributed mission operations networks in JPARC and throughout the Pacific region and is resourcing efforts to achieve a complete, relevant, and realistic peer/near-peer synthetic training capability across the Air Force Combat Air Forces (CAF). While the Air Force P6 Combat Training System program does not have LVC requirements, any Navy LVC efforts implemented into their Tactical Combat Training System (TCTS)-II will be included in the P6 system, as both services will maintain the same baseline for P6/TCTS II to ensure interoperability. TCTS-II will be an LVC-capable system able to implement future LVC capabilities for AF airframes.

- Air Combat Command (ACC) is tracking the upcoming Navy led Secure LVC Advanced Training Environment (SLATE) demonstration and is eager to observe the advancements achieved over the past three years. ACC maintains regular contact with Navy counterparts on the TCTS-II program and is tracking progress on this effort, but until the F-35 LVC fusion study concludes with positive results, Air Force LVC requirement development will remain "on hold".
- Combat Air Force and Mobility Air Force Distributed Missions Operations networks currently connect and provide readiness training to warfighters at seven Pacific bases with training centers that support A-10, C-17, E-3, F-15C, F-16, F-22, KC-135, Joint Terminal Attack Controller, and Air Operations Center airmen. This includes F-22 and C-17 aircrews at Joint Base Elmendorf-Richardson. Future additions to these networks are currently projected for F-35s at Eielson AFB (in direct support of JPARC), as well as C-130Js at Yokota AB, and KC-135s at Kadena AB.
- To complement these distributed training efforts, live training at JPARC, and training for other units in the Pacific Region, the U.S. Air Force is developing a complete, relevant, and realistic peer/near-peer Common Synthetic Training Environment (CSTE) to link simulator training devices and facilitate high fidelity training in a continuously connected virtual world. This effort is initially focused on 5th generation platforms, but could eventually cross multiple generations of aircraft and associated training systems. While live training will always be a cornerstone of Air Force readiness, our capabilities and those of our adversaries have advanced at a rate that requires us to move our most advanced training indoors. Emerging technology amplifies our inability to train for the high-end "First Night" fight. The CSTE effort offers the best opportunity to date for the Air Force to achieve a scalable and interoperable synthetic training capability.

QUESTIONS SUBMITTED BY SENATOR DAN SULLIVAN

JPARC MODERNIZATION

2. Senator SULLIVAN. Lieutenant General Nahom, in response to a question for the record concerning the interdependence of range modernization and readiness, the USINDOPACOM commander, Admiral Aquilino, stated, "[m]odernizing our ranges . . . will allow the joint force to train against an evolving threat and technologically advanced opponent with our allies and partners." I could not agree more. In March of 2020, the Department of the Air Force submitted a report to the congressional defense committees concerning range modernization for the Joint Pacific Alaska Range Complex (JPARC) and the Nevada Test and Training Range (NTTR). The report identified JPARC and NTTR as the only two major training ranges the Air Force would modernize to Threat Matrix Level 4—or near-peer—capability. The report also stated it would complete such modernization efforts by fiscal year 2026. However, your joint statement for the record indicates current Air Force planning

now extends this much-needed modernization into fiscal year 2032. I would like you to explain and justify this deviation from the Air Force range modernization plan. Why are we delaying—by nearly a decade—capability that is needed today to ensure our 5th-generation fighters can train for a high-end fight?

Lieutenant General NAHOM. The Air Force continues efforts to resource and modernize JPARC and NTTR to a Threat Matrix Level 4 (near-peer) training capability. Most of the infrastructure required for Level 4, including versions 1 and 2 of the Advanced Radar Threat System (ARTS), will be in place at these two ranges by FY26. The final step to achieving Level 4 is fielding the ARTS v3. This is a reprioritization from the original plan which was based on the ARTS v4. While the ARTS v3 will provide significantly greater capability, the current schedule projects fielding at JPARC from FY28 thru FY30. This fielding date is driven by both the acquisition process and available funding.

3. Senator SULLIVAN. Lieutenant General Nahom, during the Department of the Air Force posture hearing, I asked General Brown for his commitment to “prioritize and accelerate the investments” in the Joint Pacific Alaska Range Complex (JPARC) and the Nevada Test and Training Range (NTTR) to achieve Threat Matrix Level 4. General Brown responded in the affirmative. In a question for the record, soon-to-be Secretary of the Air Force, Frank Kendall stated, “I would continue efforts to modernize JPARC and NTTR to a Threat Matrix Level 4 capability as rapidly as feasible to facilitate the training needed to support the National Defense Strategy.” How does the U.S. Air Force reconcile the protracted fiscal year 2032 timeline, advertised in your joint statement for the record, with the commitments to prioritize and accelerate JPARC and NTTR modernization made by its current service chief and soon-to-be service secretary?

Lieutenant General NAHOM. The Air Force continues efforts to resource and modernize JPARC and NTTR to a Threat Matrix Level 4 (near-peer) training capability. Most of the infrastructure required for Level 4, including versions 1 and 2 of the Advanced Radar Threat System (ARTS), will be in place at these two ranges by FY26. The final step to achieving Level 4 is fielding the ARTS v3. This is a reprioritization from the original plan which was based on the ARTS v4. While the ARTS v3 will provide significantly greater capability, the current schedule projects fielding at JPARC from FY28 thru FY30. This fielding date is driven by both the acquisition process and available funding.

E-3 (AWACS) MODERNIZATION

4. Senator SULLIVAN. Lieutenant General Nahom, Lieutenant General Guastella, and Lieutenant General Richardson, the E-3 Airborne Early Warning and Control (AWACS) aircraft is a vital piece of air combat command and control, serving as the long-range eyes and ears for our air forces. In fact, the E-3 supported the North American Aerospace Defense Command (NORAD) in intercepting over 60 aircraft off the coast of Alaska last year—the most since the Cold War. This aircraft uses early 1970s technology and an airframe designed in the late 1950s. In February 2021, the PACAF Commander, General Wilsbach, spoke at the Aerospace Warfare Symposium and advocated for the Air Force to procure the E-7 Wedgetail to replace the E-3, which is getting “harder and harder to get airborne.” How does the Air Force plan to modernize the E-3 to keep it effective against near-peer competitors into the 2030s and beyond?

Lieutenant General NAHOM, Lieutenant General GUATELLA, and Lieutenant General RICHARDSON. The E-3 platform does not provide the capabilities that enable the aircraft to keep up with next generation airborne moving target indication (“AMTI”) and battle management requirements. The future AMTI platform must be able to sense and share data both on and off board systems across multiple frequency spectrums. Although there is promising future AMTI technologies that could someday potentially operate without a hosted airborne platform, these future concepts will not be ready before the end of service of the E-3 platform. A very near term decision is needed for a bridging capability for an AMTI platform moving forward.

There are no significant Air Force efforts with regard to modernizing the E-3 fleet. All E-3 funded modifications are to meet mandates or address DMS/sustainability issues. Main capabilities modifications were defunded when the TACS bridge strategy funding was removed. Subsequent efforts to POM for replacement funds have not been successful.

- Short list of remaining funded programs:
 - Finish 40/45 conversions (5 left)
 - Dragon—flight deck modification

- CNU—Link 16 enhancements to meet crypto and frequency mandates. Follow-on enhancements in the hopper as well
- SATURN—Son of Have Quick—mandated
- MUOS—New Narrow-band SATCOM—mandated
- 5th Generation to 4th Generation via link 16
- EP against modern threat
- CID
- Partially funded programs:
 - Global Lightning—high bandwidth communications pipe using commercial satellites. Risk reduction only for now
- Programs not currently funded:
 - Link 22, from N/NC
 - Wideband SATCOM
 - Out of Band Sensor
 - Adjunct Sensor
 - Multi-level security—OMS

5. Senator SULLIVAN. Lieutenant General Nahom, Lieutenant General Guastella, and Lieutenant General Richardson, does the President's FY22 budget submission do anything to advance the E-3 modernization effort?

Lieutenant General NAHOM, Lieutenant General GUASTELLA, and Lieutenant General RICHARDSON. The President's FY22 budget submission includes enhancements to E-3G sensors, Comm/Networking, and Mission Computing to maintain cutting edge Battle Management, Command and Control capability. The budget submission also continues efforts to address Diminishing Manufacturing Sources. However, the E-3 platform does not provide the capabilities that enable the aircraft to keep up with next generation AMTI and battle management requirements. The Air Force continues to look into future AMTI solutions that can sense and share data both on and off board systems across multiple frequency spectrums.

6. Senator SULLIVAN. Lieutenant General Nahom, Lieutenant General Guastella, and Lieutenant General Richardson, what consideration is the Air Force giving to procure the E-7 Wedgetail, flown and operated by the Royal Australian Air Force, as a potential E-3 replacement?

Lieutenant General NAHOM, Lieutenant General GUASTELLA, and Lieutenant General RICHARDSON. The Air Force is exploring the viability of acquiring the E-7 which is used by both the Royal Australian Air Force and the United Kingdom's Royal Air Force. At the forefront of the Service's evaluation is the E-7's enhanced capability(s) and assessing the aircraft's suitability to meet existing and future Air Moving Target Indicator (AMTI) and Battle Management requirements. In comparison to the E-3, the E-7 offers a superior radar capability with a modern Multirole Electronically Scanned Array (MESA) radar capable of staring at sectors of interest and closing the kill chain on small and fast targets. Based upon early assessments, the E-7 could provide capability closing both near and mid-range AMTI gaps while also providing wide-area surveillance and integrated fire control at the tactical edge. Additionally, the E-7 also presents a potential opportunity for cost savings in operations, maintenance, and fuel costs.

CYBER SURVIVABILITY

7. Senator SULLIVAN. Lieutenant General Richardson, in a Readiness Subcommittee hearing earlier this year, Dr. Raymond O'Toole, the Acting Director for Operational Test and Evaluation, highlighted in his statement for the record that, "virtually none of the programs assessed in FY20 were survivable against relevant cyber threats." This is deeply concerning to me given the role of cyber in today's and tomorrow's strategic environment. Immediately, I can recall several recent high-profile cyberattacks such as SolarWinds, Microsoft Exchange, the Florida Water System, and Colonial Pipeline, to name a few. As the Air Force continues to undergo critical modernization efforts across major weapons platforms, what steps is it taking to ensure cyber survivability of those systems now and into the future?

Lieutenant General RICHARDSON. The Air Force created a holistic, integrative strategy to incorporate cyber security in three key areas—Weapon Systems, Industrial Control Systems and Networks/Computer Systems. In addition, we have appointed a Principal Cyber Advisor for the Air Force to coordinate all cyber aspects across the enterprise. Each of these entities works closely with the intelligence communities to ensure that resources are allocated against known threat actors with the capability to do harm to our ability to conduct operations. We use this intelligence lens in order to be fiscally prudent and ensure we have prioritized our

vulnerabilities appropriately. Additionally, under NDAA 1647 and NDAA 1650, we conducted assessments against a prioritized set of mission sets to identify and mitigate cyber vulnerabilities. Further, working with NSA on the Strategic Cyberspace Program, we are continuing the efforts to identify, prioritize and mitigate vulnerabilities against our capabilities. As the Air Force modernizes our weapon systems and upgrades our ICS systems and networks, we are leveraging the work of the Cyber Resiliency Office for Weapon Systems (CROWS) System Security Engineering Guidebook (identified as a best practice by the GAO) to ensure that appropriate cyber language is incorporated into our solicitation documentation. Finally, in March 2021, the Acting Secretary of the Air Force and all MAJCOM Commanders endorsed the Department of the Air Force Strategic Plan for Control Systems which identifies the following: “Installations are power projection platforms—the foundation from which the Department of the Air Force launches critical missions and ensures readiness to execute combat operations in air, space, and cyberspace. The Air and Space Forces cannot fly, fight, and win without effective, sustainable, cyber-secure infrastructure.”

