

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

HEARINGS

BEFORE THE

**COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE**

ONE HUNDRED FIFTEENTH CONGRESS

FIRST SESSION

ON

S. 1519

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

**PART 2
SEAPOWER**

JUNE 6, 13, 21, 2017



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**DEPARTMENT OF DEFENSE AUTHORIZATION
REQUEST FOR APPROPRIATIONS FOR FIS-
CAL YEAR 2018 AND THE FUTURE YEARS
DEFENSE PROGRAM**

TUESDAY, JUNE 6, 2017

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

MARINE CORPS GROUND MODERNIZATION

The subcommittee met, pursuant to notice, at 2:29 p.m. in Room SR-232A, Russell Senate Office Building, Senator Roger F. Wicker (chairman of the subcommittee) presiding.

Committee members present: Senators Wicker, Cotton, Rounds, Tillis, Sullivan, Hirono, Blumenthal, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER F. WICKER

Senator WICKER. The hearing will come to order.

The Senate Armed Services Subcommittee on Seapower convenes this afternoon to examine the Marine Corps ground system modernization programs.

This afternoon we welcome Mr. John M. Garner, Program Executive Officer for Land Systems Marine Corps; Lieutenant General Robert S. Walsh, who serves as Deputy Commandant for Combat Development and Integration. General Walsh is also the Commanding General of Marine Corps Combat Development Command, and Brigadier General Joseph F. Shrader, Commander of the Marine Corps Systems Command.

Our subcommittee thanks these distinguished witnesses for their selfless and steadfast service to the Nation.

As the saying goes, there is no better friend than a marine. There is also no worst enemy than a U.S. Marine. I truly believe this sentiment captures the professionalism and tenacity of the Marine Corps. That perseverance, ingenuity, and smarts are traits engrained in the Marine Corps' DNA [deoxyribonucleic acid]. These traits have served the marines well during the last 15 years of war.

However, even marines have limits. An unrelenting operational tempo has damaged readiness and undermined critical modernization efforts to replace aging equipment. Today the subcommittee will focus on modernization, but I cannot emphasize enough the connection between readiness and modernization.

In terms of modernization, for too long many Marine Corps modernization programs have suffered from drawn-out development timelines and unrealistic requirements and cost overruns. These factors have often conspired to prevent fielding replacements for aging systems. An ever-increasing array of threats is exacerbating the need to modernize, which include explosive foreign projectiles, IEDs [Improvised Explosive Devices]; long-range rocket artillery; anti-tank guided missiles; electronic warfare drones; and cyber threats, just to name a few. Additionally the use of anti-access/area denial tactics is putting a premium on increasing the lethality and survivability of smaller, more dispersed ground units. Today our witnesses will update us on the Marine Corps' efforts to meet these threats head on.

First, the subcommittee wishes to discuss the Marine Corps strategy for modernizing its vehicle fleet, particularly amphibious combat vehicles. These programs are crucial for enabling the marines to maintain their amphibious assault capabilities while providing mobile armored protection for ground maneuver forces.

There are two key vehicles. One is the Assault Amphibious Vehicle (AAV), survivability upgrade program, which modernizes some of the AAVs remaining in service. The other program is the amphibious combat vehicle, ACV 1.1 program. Both programs will provide increased maneuverability and protection over current platforms until the future ACV 1.2 is ready, hopefully around 2025. The Marine Corps intends ACV 1.2 to match capabilities similar to those envisioned for the canceled expeditionary fighting vehicle.

However, a recent GAO report contends that the Marines may be overstating potential savings when comparing the ACV 1.1 to the retiring AAVs it will be replacing. The subcommittee is interested in hearing the Marine Corps' perspective on the GAO's findings and a current update on these programs.

The wars in Iraq and Afghanistan have demonstrated the urgent need for increased protection and mobility offered by the Joint Light Tactical Vehicle [JLTV]. The subcommittee wants to hear how the Marine Corps plans to acquire its fleet of 5,900 JLTVs particularly in light of the fiscal year 2018 budget request for just 527 vehicles. That figure is about half the level that the Marine Corps projected to procure in the fiscal year 2017 budget request. Such shortfalls have an impact on capability, readiness, and program costs that should be addressed so our Humvees can be replaced as soon as possible.

While the Army is upgrading its Stryker infantry fighting vehicles and planning Abrams main battle tank, or MBT, modernization, it is worth noting that the Marines use the Light Armored Vehicle 3 (LAV-3), a vehicle very similar to the Army's Stryker and also the Abrams. The subcommittee is interested in the Marine Corps' plans for modernizing these two platforms.

In addition to tactical vehicle modernization, the witnesses should discuss Ground-Air Task Oriented Radar (G/ATOR) development, a system which will replace five older radars. G/ATOR is an all-purpose radar system that can provide marines with early warning from missiles, indirect fire, and aerial systems, and also eventually provide air traffic control capabilities. The subcommittee

wishes to learn more about this complex program and its future role.

We are also going to hear our witnesses discuss less prominent equipment essential to the Marine Corps mission, such as small arms. Over the past year, the Marine Corps has collaborated with the Army on a joint 5.56 millimeter round. Recent testimony, however, has cast doubt on the effectiveness of this round in light of the proliferation of advanced body armor. The committee looks forward to getting a better understanding of this strategy.

The subcommittee is also concerned with potential capability gaps within the Marine Corps ground tactical formations centered primarily on short-range air defense systems and long-range precision fires. Given the Marine Corps' close relationship with the Navy, this subcommittee is very interested in how the two services can leverage each other's capabilities to meet these requirements, especially given the Navy's experience in long-range fires and air defense systems.

Finally, this subcommittee is committed to maintaining a healthy industrial base which fosters innovation and competition. The Marine Corps leveraged competition to assess technological feasibility and affordability early on in the ACV and JLTV programs. Competition requires viable competitors which we do not always have. This might be why the prototypes of the last two contenders for the ACV 1.1 program are based on designs from Italy and Singapore. I would like our witnesses to address the state of the U.S. industrial base for ground combat and tactical vehicles and perhaps to suggest options to sustain its viability.

The Marine Corps budget accounts for approximately six percent of DOD's total budget. I remain concerned about the impact of budget uncertainty on modernization and readiness across the Defense Department but especially for the Marine Corps. As such, I hope our witnesses today will elaborate on the impact that such uncertainty would have on our expeditionary marines, their ability to execute our country's national security strategy, and the vitality of our defense industrial base.

For these reasons, it is imperative that Congress and the Corps continue to work together to ensure that the brave young men and women of the Marine Corps have the very best to accomplish their dangerous missions.

So I look forward to the testimony of our witnesses.

In the meantime, Senator Hirono, our distinguished ranking member, is recognized for her statement.

STATEMENT OF SENATOR MAZIE HIRONO

Senator HIRONO. Thank you, Mr. Chairman. Thank you, of course, for holding this important hearing on Marine Corps ground modernization.

I also, of course, would like to welcome our witnesses to today's hearing and thank you for your service to our country.

Some of the areas that I will highlight or focus on in my short remarks today will be areas that the chair has already talked about, but it just means that the chairman and I are on the same page, on the same wavelength.

Last year, I had the honor of attending the change of command ceremony for the 3rd Marine Regiment at Marine Corps Base Kaneohe Bay in Hawaii. The 3rd Marine Regiment has a proud and storied history as a fighting unit. They fought in some of the fiercest battles of the wars in Iraq and Afghanistan, including the battle of Marjah, the second battle of Fallujah, and Operation Khanjar in Helmand Province. In the years to come, these marines will continue to be an integral part of supporting our strategic interests in the Indo-Asia-Pacific region.

We ask our marines to do an awful lot. We ask them to take on some of the toughest jobs on the front lines. Given the evolving nature of the threats we face, it is also crucial that our marines remain ready and capable to address contingencies at a moment's notice. We owe it to these men and women to ensure that resources are available for training and readiness activities and to ensure that they have fully functional equipment to get the job done.

To ensure that our marines will be supplied with the most effective equipment, the fiscal year 2018 budget request makes targeted investments in the ground combat and tactical vehicle portfolio of the Marine Corps. The Amphibious Combat Vehicle (ACV), is one of the most important Marine Corps ground modernization programs. The ACV will eventually replace the amphibious assault vehicle, the AAV, that has been in operation for over 40 years.

As part of the ACV acquisition strategy, the Marine Corps has awarded contracts to two vendors, each tasked with building 16 prototypes for testing and evaluation. Following the testing, the Marine Corps plans to down select to a single vendor in 2018 with the goal of purchasing 204 vehicles for the program. I welcome an update from our witnesses on the status of this program and if our witnesses anticipate any problems with the program's schedule.

While we wait for the ACV to come into service, it will remain critically important to modernize our existing AAVs. This vehicle has been in the Marine Corps inventory, as I mentioned, for more than four decades and requires modernization to meet today's threats. The Marine Corps has decided to modernize a portion of their AAV fleet with survivability upgrades to address obsolescence and increase the vehicle's capacity. Currently 10 prototypes are undergoing testing, and I would welcome any updates from our witnesses on the progress of this update program.

The joint light tactical vehicle is another priority in the Marine Corps combat vehicle program. The JLTV is a joint Army and Marine Corps program that will replace the high mobility multi-wheeled vehicle, the Humvees. The fiscal year 2018 budget included \$234 million to procure 527 vehicles. Over the course of the program, the Marines will procure at least 5,500 vehicles to replace roughly one-third their legacy Humvee fleet. The Marines are scheduled to receive approximately 300 JLTVs in 2020. However, it is my understanding that the Marine Corps would like to procure additional quantities for future JLTV increments if resources are available. I would be interested in hearing more from our witnesses on this matter and this need.

In addition to the major ground modernization programs that I have highlighted, the Marine Corps is also developing the Ground-Air Task Oriented Radar, G/ATOR, which the chairman also men-

tioned. The G/ATOR is an expeditionary radar system that will replace legacy radar systems currently fielded by the Marine Corps Ground Task Force. The Marine Corps has begun testing the block 1 variant of the G/ATOR, and I would welcome an update from our witnesses on the status of this program.

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

Senator WICKER. Thank you, Senator Hirono.

Gentlemen, I understand from a discussion beforehand that Lieutenant General Walsh will make an opening statement that will suffice for all three of you. So, Lieutenant General Walsh, we are delighted to have you, and you may proceed with your statement.

STATEMENT OF LIEUTENANT GENERAL ROBERT S. WALSH, USMC, DEPUTY COMMANDANT FOR COMBAT DEVELOPMENT AND INTEGRATION; COMMANDING GENERAL, MARINE CORPS COMBAT DEVELOPMENT COMMAND; AND COMMANDER, UNITED STATES MARINE FORCES STRATEGIC COMMAND; ACCOMPANIED BY: JOHN M. GARNER, PROGRAM EXECUTIVE OFFICER, LAND SYSTEMS MARINE CORPS; AND BRIGADIER GENERAL JOSEPH F. SHRADER, USMC, COMMANDER, MARINE CORPS SYSTEMS COMMAND

Lieutenant General WALSH. Thank you, Chairman Wicker, Ranking Member Hirono, and distinguished members of the subcommittee for this opportunity to testify before you today.

Joining me today are my combat development partners, Brigadier General Joe Shrader, who is the Commander of Marine Corps Systems Command, and Mr. John Garner, who is our Program Executive Officer for Land Systems Marine Corps.

The Marine Corps' ability to serve as our Nation's premier crisis response force is due in large part to the subcommittee's continued support, and on behalf of all marines, I thank you.

The United States is a maritime nation with global responsibilities. These responsibilities include guaranteeing freedom of navigation and commerce on the seas, promoting international stability and order, and protecting ourselves and our allies and partners from threats and aggression. Our Navy and Marine Corps' persistent presence and multi-mission capability represent U.S. power projection across the global commons. Where adversaries would prefer to keep us distant, we are already present on scene, engaging with our allies and partners, and operating routinely inside the potential engagement zone of threat weapons as a deterrent force.

Today we are at an inflection point. Our priority of effort over the 15 years of war in Iraq and Afghanistan has been meeting the immediate requirements of combat operations. We risked modernization to ensure the combat readiness of deploying marines. While our focus was elsewhere, our potential enemies modernized, reducing the technological advantage American forces once stood or took for granted. In many theaters, we can no longer assume superiority in any domain: sea, air, surface, or the electromagnetic spectrum.

Growing instability in multiple areas around the globe is increasingly a requirement for forward naval forces to protect our national interests. Potential adversaries seek to secure their objectives by

taking a continuous series of small steps to incrementally establish new conditions favorable to their objectives, undermining existing authority and eroding prevailing norms without resort to actual fighting. As a result, the traditional technological and professional advantages enjoyed by U.S. forces for decades is eroding.

Over a period of 18 months, the Marine Corps conducted an extremely exacting capabilities-based review of our force structure. This iterative effort examined end strength, force structure, equipment of all types, and across all warfighting functions in order to identify needed changes to meet this threat. This effort, which is collectively called Marine Corps Force 2025, sought to define a Marine Corps optimized to meet future challenges. The Marine Corps Force 2025 effort identified both broad capability gaps and specific requirements in developing a fifth generation Marine Corps.

Within current budget and end strength limits, the Marine Corps has prioritized its efforts across the Marine Air-Ground Task Force. Ground program priorities include modernizing the amphibious vehicle fleet, the combat and tactical fleet, and our sensor and command and control capabilities. We are committed to delivering the required warfighting capabilities to our marines in a timely and affordable manner. However, continued budget uncertainty risks our ability to fulfill this commitment.

The Marine Corps is at a critical juncture. We have delayed modernization so long that our technical advantage over our adversaries has been diminished. The continuing need to maintain and update legacy systems takes the focus off innovation and is costly in its own right. Experience tells us that investing in new capabilities and technologies is a proven cornerstone for your marines and sailors to achieve mission success and into an uncertain but no less demanding future.

The Marine Corps continues to improve our essential ground capabilities through a series of strategy of stability and affordability. We recognize the need for continued vigilance in achievement of a proper balance between current readiness and long-term imperatives of modernization and innovation. This balance is critical to ensuring the Marine Corps and the individual marines have the ability to fight and win in the future battlefields and are prepared to respond to our Nation's force in readiness.

Principal combat and tactical vehicle modernization programs account for a significant portion of the Marine Corps' ground combat modernization investment. The Marine Corps overarching combat and tactical vehicle investment priority, the modernization of our amphibian capability, the amphibious assault vehicle survivability upgrade, and the amphibious combat vehicle programs are a means to replace the legacy AAV and are both in engineering and manufacturing and development phase.

The second highest priority for combat and tactical vehicle investment remains the replacement of a portion of the high mobility multi-purpose wheeled vehicle, or Humvee, fleet that is most at risk. Those trucks have performed a combat function and are typically exposed to enemy fires. In partnership with the Army, the Marine Corps has sequenced the joint light tactical vehicle, or JLTV, program to ensure affordability while, in the first increment,

replacing about one-third of our legacy Humvee fleet with a modern tactical truck in conjunction with fielding the ACV.

Our third priority concerns our ability to coordinate and synchronize command and control sensors and systems to ensure the critical success of the MAGTF [Marine Air-Ground Task Force] both afloat and ashore. These capabilities are ever more important as our adversaries' technological capabilities continue to advance. Our top priority in this area is the ground/air task oriented radar, or G/ATOR radar. The state-of-the-art ground-based medium range multi-role radar is designed to detect low and low radar cross section air threats for the MAGTF. It adds superior tracking capability and sensor coverage, flexibility to the MAGTF. This critical MAGTF enabler is central for identifying and destroying air and surface targets. Combined with the common aviation command and control sensors ensures no other service is more capable in controlling MAGTF airspace.

On behalf of the marines and sailors who provide the Nation with the forward-deployed crisis response capability, we thank you for your constant support in an era of competing challenges. We are proud of our reputation for frugality, and we remain one of the best values for the defense dollar. These critical modernization investments, among many others, will ensure our success not if but when the future conflict occurs. Fiscal uncertainty is threatening both our capability and capacities. Recognizing these fiscal challenges, we remain committed to fielding the most ready Marine Corps the Nation can afford.

Mr. Chairman, distinguished members of the committee, on behalf of your marines, we request your continued support for our modernization strategy.

[The prepared statement of General Walsh, General Shrader, and Mr. Garner follows:]

PREPARED STATEMENT BY GENERAL WALSH, GENERAL SHRADER, AND MR. GARNER

INTRODUCTION

Mr. Chairman, Ranking Member Hirono, and distinguished members of the Subcommittee, we thank you for the opportunity to appear before you today to discuss Marine Corps Ground Programs. Our testimony will provide the background and rationale for the Marine Corps' fiscal year 2018 budget request which is aligned to our strategic priorities and budgetary goals.

The United States is a maritime nation with global responsibilities. These responsibilities include guaranteeing freedom of navigation and commerce on the seas, promoting international stability and order, and protecting ourselves and our allies and partners from threats and aggression. Our Navy and Marine Corps' persistent presence and multi-mission capability represent U.S. power projection across the global commons. Where adversaries would prefer to keep us distant, we are already present on scene, engaging with our allies and partners, and operating routinely inside the potential engagement zone of threat weapons systems.

The Marine Corps is the Nation's expeditionary force-in-readiness. By Congressional mandate, it has a unique role and structure described as a "... balanced force-in-readiness, air and ground." Our forces enable global reach and access through presence, sea control, mission flexibility and when necessary, direct interdiction. This mandate also requires the Marine Corps to maintain a high state of combat readiness and to be "most ready, when the Nation is least ready."

CURRENT OPERATIONS

The past three decades have seen an incessant and growing demand from our regional combatant commanders (CCMDs) for forward naval forces, Marine Corps forces in particular. Last year alone, the Marine Corps executed over 210 oper-

ations, 20 amphibious operations, 160 Theater Security Cooperation (TSC) events, and participated in 75 exercises. Marine Corps units deployed to every geographic combatant command (GCC) and executed numerous TSC exercises to help strengthen relationships with allies and build partner capacity. Advise and Assist teams from Special Purpose Marine Air Ground Task Force—Crisis Response (SPMAGTF – CR)—Central Command helped enable Iraqi Army operations at multiple sites in Iraq. SPMAGTF–CR–Africa’s crisis response force maintained alert postures from Naval Air Station Sigonella, Italy, Moron Air Base, Spain and Djibouti during multiple Special Operations Command operations in North Africa. In Afghanistan, the Marine Corps deployed Task Force Southwest to Helmand Province to train, advise and assist the Afghan National Army and Police.

Marine Expeditionary Units (MEU) deployed to multiple GCCs over the year and successfully integrated with U.S. Special Operations Command in support of operations in North Africa and the Southern Arabian Peninsula. Marine Security Augmentation Unit (MSAU) teams deployed 64 times in 2016 at the request of the State Department, executing 20 Embassy/Consulate security missions and 46 VIP security missions. Additionally, at the request of the U.S. Agency for International Development, Joint Task Force-Matthew was activated in October 2016 in response to Hurricane Matthew, a Category four hurricane which made landfall in Haiti and left over 750,000 people in need of assistance. Within 48 hours, SPMAGTF–Southern Command (SC) self-deployed to provide much needed aid to the people of Haiti. Shortly thereafter, the 24th MEU deployed to Haiti aboard amphibious shipping to provide additional support. Overall, SPMAGTF–SC and the 24th MEU delivered 578,491 lbs. of relief supplies to the disaster stricken area.

FUTURE OPERATING ENVIRONMENT

Today we are at an inflection point. Our priority of effort over the 15 years of war in Iraq and Afghanistan has been meeting the immediate requirements of combat operations. During this period, we risked modernization to ensure the combat readiness of deploying marines. While our focus was elsewhere, our potential enemies modernized, reducing the technological advantages American forces once took for granted. In many theaters we can no longer assume superiority in any domain; sea, air, land, space or the electromagnetic spectrum. In short, the Marine Corps is not organized, trained, or equipped to meet the demands of the future operating environment.

Growing instability in multiple regions increases the necessity of having forward postured naval forces to protect our national interests. Some regional actors seek to secure their objective by taking a continuous series of small steps to incrementally establish new conditions favorable to their objectives. This undermines existing authority and erodes prevailing norms without resorting to actual fighting. Simultaneously, these actors seek to challenge us in new ways within the littorals, advancing their ability to locate, track, and attack the naval fleet and testing current naval force designs and operating concepts. As a result, the traditional technological and professional advantages enjoyed by US forces for decades are eroding.

The Marine Corps Operating Concept (MOC), published in September of 2016, articulates these problems and several drivers of change affecting the future operating environment. First, increasingly complex and highly populated urban coastal regions magnify the challenges of operating in the littorals. Second, technology proliferation grants many adversaries access to high end technologies that allow them to engage our forces more effectively, from greater distances and in any environment. Third, our adversaries increasingly use information as a weapon, soliciting local support and effecting global opinion. Fourth, every observable aspect of our force is a vulnerability, be it visual, audible, or electro-magnetic. Lastly, the maritime domain is becoming ever more contested, with adversaries challenging our in and around the global commons.

In order to compete in the future operating environment characterized above, the MOC identifies five critical tasks which are guiding our efforts to change how we organize, train and equip our forces. In support of our title 10 responsibilities to serve as the Nations’ expeditionary naval force, we must first integrate the naval force to fight at and from the sea. The MAGTF’s ability to rapidly deploy, employ, and sustain versatile combat power from the sea to the shore and back is crucial to the security of the Nation.

Second, we must evolve the MAGTF by maintaining and improving its ability across the Range of Military Operations, enhance Special Operations Force integration, exploit automation and manned- unmanned teaming, and improve the agility the MAGTF through improved command and control. Third, the MAGTF must be able to operate with resilience in a contested network environment by reducing sig-

natures, improve our networks, enhance the effectiveness of massed and precision fires, and improve our ISR. Fourth, we must enhance our ability to maneuver in and around the littorals, broaden our idea of combined arms to include information warfare, and improve our mobility and ability to disperse in increasingly complex urban terrain.

The fifth and final task identified in the MOC is to exploit the competence of the individual marine. This requires seeking high-quality human capital first and foremost. Accomplishing this task also requires training and educating marines in ways that prepare them for the complexity of the future operating environment. Lastly, it requires developing leaders at every level and managing our talent to improve our return on investment.

THE 5TH GENERATION MARINE CORPS

The MOC defined the problem, offers a framework for developing solutions, and an azimuth for the Marine Corps to follow. What remained was the detail work, work that would clearly articulate specific requirements. Over a period of 18 months, the Marine Corps conducted an extremely exacting capabilities-based review. This iterative effort examined end strength, force structure, equipment of all types and across all warfighting functions, in order to identify needed changes. The output of this work, which is collectively called Marine Corps Force 2025, seeks to define a Marine Corps optimized to meet future challenges. Marine Corps Force 2025 also identifies several immediate priorities that must be addressed in order to fight and win against highly capable enemies.

First, within the fiscal year 2017 NDAA authorized endstrength of 185,000 marines, the Marine Corps will focus its personnel growth in areas such as intelligence, electronic warfare, cyber and information warfare. This growth will compliment both planned and current equipment modernization efforts. While I want to express my gratitude to the Congress for the additional endstrength authorization, it is also important to be clear about the gaps these extra 3,000 marines do not fill. For example, we are nearing the official activation of the office of the Deputy Commandant for Information, but our information warfare and cyber capabilities will still be constrained under current endstrength levels.

Most critically, 185,000 marine endstrength only improves the deployment-to-dwell ratio slightly. A 1:3 deployment to dwell ratio is our goal, which merely means that if a marine deploys for seven months, they are non-deployed for 21 months. At the individual and personal level, a 1:3 deployment-to-dwell ensures our marines achieve a minimal level of work-life balance, taking care of their families and their own personal needs. However, the 1:3 metric serves a broader purpose which is directly linked to providing for the Nation's defense. The 1:3 ratio is the only way to ensure marines are afforded the training time necessary to build full-spectrum readiness necessary to fight peer adversaries. Operating below a 1:3 ratio also forces us to choose between the readiness of deploying units and modernizing the force.

The Marine Corps operating forces are currently averaging, in the aggregate, less than 1:2 deployment-to-dwell ratio. Individual unit deployment tempo remains on par with the height of our commitments in Iraq and Afghanistan. Deliberate and measured capacity increases, reduction of our operational tasking, or a combination of the two, are solutions that would put us on the path to improve our deployment-to-dwell ratio.

Naval forces postured forward in formations appropriately tailored to the requirements of a region are essential to continual engagement and underscore our commitment to allies. Fielding naval forces at the capacity needed to operate forward is critical to projecting a credible deterrence. Insufficient endstrength creates a lack of capacity. Marine Corps Force 2025 attempts to mitigate some of these shortfalls.

REQUIREMENTS OF THE FUTURE FORCE

In addition to force structure changes, the Marine Corps Force 2025 effort identified broad ground equipment capability gaps and specific requirements of the future force. Within current budget and endstrength limits, the Marine Corps has prioritized its efforts across the MAGTF. Ground program priorities include modernizing the amphibious vehicles, combat and tactical vehicles, sensor and command and control capabilities, and long range precision fires.

Modernize the amphibious vehicle fleet

The combat and tactical vehicle modernization programs account for a significant portion of Marine Corps modernization investment. The overarching combat and tactical vehicle investment priority is the modernization of the assault amphibian (AA) capability with a combination of complementary platforms. The Amphibious

Assault Vehicle Survivability Upgrade (AAV SU) and the Amphibious Combat Vehicle (ACV) programs are the means to replace the legacy AAV.

The AAV SU program will ensure the current fleet of AAVs is more survivable and combat effective until ACV and future systems are fully developed. The AAV SU program will modernize 4 of 10 Assault Amphibian (AA) companies and requisite elements of the supporting establishment. This quantity supports the phased modernization of this critical capability while sustaining sufficient capacity to meet a 2.0 MEB Assault Echelon lift through 2035. The Amphibious Combat Vehicle (ACV) 1.1 program will modernize 2 of 10 AA companies. The program was certified Milestone B in the fall of 2015. Two vendors, BAE and SAIC, were selected to produce 16 prototypes each for further testing. The vendors are currently building and delivering their prototypes for developmental testing. Milestone C is planned for 3rd quarter fiscal year 2018, with an Initial Operating Capability (IOC) planned for fiscal year 2020, and Full Operating Capability (FOC) by fiscal year 2022. ACV increment 1.2 will modernize 4 of 10 AA companies and is expected to achieve IOC by fiscal year 2023, FOC by fiscal year 2026. Increment 1.2 will also add mission role variants for command and control and recovery.

We plan to replace AAV SU by 2035. We remain committed to evaluating ways to extend the amphibious task force's operational reach. We have identified a decision point in the mid-2020s that will allow us to assess technologies and materiel alternative to enable extended reach without unacceptable trade-offs and unaffordable costs. Science and Technology (S&T) lanes have been established to (1) improve water speed and fuel economy, (2) research future sleds and connectors to transport lower water speed platforms at higher speed and (3) to develop and experiment with small unmanned amphibious vehicles and swarms with modular payloads. This mid-2020s decision point will set conditions to begin a program to replace the Survivability Upgrade AAV.

Modernize ground vehicles

Replacement of the portion of the high mobility multi-purpose, wheeled vehicle (HMMWV) fleet that is most at risk remains our second highest priority. Our most at-risk HMMWVs are those that perform combat functions which typically expose them to enemy fires. In partnership with the Army, the Marine Corps has sequenced the Joint Light Tactical Vehicle (JLTV) program to ensure affordability while in the first increment replacing about one third of the legacy HMMWV fleet in conjunction with the fielding of ACV 1.1. This first procurement constitutes Increment 1.0, which achieves the Approved Acquisition Objective (AAO) of 5,500 vehicles. This AAO is fully funded and will achieve IOC in fiscal year 2020 and FOC in fiscal year 2022. Future increments will address the remainder of the HMMWVs.

Modernize our ability to command and control

The ability to coordinate and synchronize distributed Command and Control (C2) sensors and systems is critical to the success of the MAGTF both afloat and ashore. These capabilities are ever more important as our adversaries' technological capabilities rapidly advance. Our top priority in this arena is the Ground/Air Task Oriented Radar (G/ATOR). G/ATOR Block 1 provides the MAGTF a state-of-the-art air defense/surveillance capability. Block 1 is currently in low rate initial production (LRIP) and the first two systems were received by the Marine Corps this spring for testing. G/ATOR Block 2 provides the MAGTF new counter-battery/target acquisition capability and is in the Engineering & Manufacturing Development (EMD) phase of acquisition. Block 1 and 2 systems will achieve IOC during fiscal year 2018 and FOC by 2024.

In addition to these major programs, the Marine Corps is developing and procuring several critical enablers for the MAGTF of 2025. Common Aviation Command and Control System (CAC2S) provides common, modular, and scalable solutions to replace legacy aviation Command and Control (C2) systems in C2 nodes such as the Direct Air Support Center (DASC) and Tactical Air Command Center (TACC). The system integrates G/ATOR and AN/TPS-59 radar feeds with tactical data link information from other networks in order to conduct air command and control. CAC2S Phase 2 fielding began on May 8th at Marine Air Control Group 28, Cherry Point, NC. The first nine systems will be fielded by February 2018.

The MAGTF of 2025 must also improve the networking capability of ground systems. Networking on the Move (NOTM) is being procured to enhance networking among both ground vehicles and aviation platforms. NOTM provides the MAGTF with robust beyond-line-of-sight command, control and communication capabilities while on the move or stationary. Using existing commercial or military broadband SATCOM, this system extends the digital network to marines at the furthest

reaches of the battlefield. This system will enable the distributed Marine Forces of 2025.

The Marine Corps continues to make rapid progress in the use Small Unmanned Aerial Systems (SUAS). Within the next 18 months, every infantry battalion in the Marine Corps will have multiple SUAS platforms for conducting Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISR), enhancing the reach of current communications equipment, and for use in training for countering enemy UAS platforms. As recently as February 2017, 3rd Light Armored Reconnaissance Battalion conducted a proof of concept during training using SUAS as the primary observer for the adjustment of mortar fires. The Marine Corps is using some commercial off-the-shelf systems as well as systems produced through the use of additive manufacturing. Simultaneously, the Marine Corps is advancing the digital interoperability between these systems and digital communications systems in order to synchronize as well as control SUAS platforms.

Lastly, the Marine Corps must advance its long range precision fires capabilities. In support of this requirement, we have prioritized the reactivating 5th Battalion, 10th Marines as a High Mobility Artillery Rocket System (HIMARS) unit. Due to reach IOC in fiscal year 2021, this battalion will expand long range fires capability to II Marine Expeditionary Force based in Camp Lejeune, North Carolina. In addition, we are exploring the ability to launch Guided MLRS rockets from aboard ships and modifications to the rockets to enable engagement of moving targets.

Create opportunities to innovate and achieve rapid advances in capability (separate section, not linked to "ground programs")

Innovation, both at the individual and institutional level, is key to building the future force. The Marine Corps Warfighting Lab/Futures Directorate (MCWL/FD) leads the Marine Corps' innovation efforts. In constant pursuit of leap ahead technologies and innovative ideas, MCWL, along with the operating forces, the supporting establishment, and coalition partners, conducts exercises and experiments to test ideas that will enable the amphibious force of the future. Just over a month ago, MCWL and its Rapid Capabilities Office (RCO) lead the Ship to Shore Maneuver Exploration and Experimentation (S2ME2) demonstration, part of the Advance Naval Technology Exercise series of experiments. The exercise explored over 110 technologies focused on enabling amphibious operations in a contested maritime environment. Technologies on display included unmanned systems and robotics, additive manufacturing and autonomous technologies and weapons platforms. At little cost to the Marine Corps, the exercise identified several technologies with potential that will be further explored at exercises like Bold Alligator 17, and subsequently provide operational prototypes for employment and assessment by the operating forces. For fiscal year 2018, MCWL and DASN, RD&E will seek opportunities to equip marine units with emergent and disruptive capabilities in areas such as long-range precision fires, swarming unmanned systems, and tactical Information Warfare.

Experiments and exercise like S2ME2 enable the pursuit of practical, cost effective advancements in technology. Authorized funding for these low-risk, potentially high-reward efforts must be protected as the Congress seeks cost savings across the federal budget. The fiscal year 2017 NDAA enabled the Marine Corps' rapid acquisition process through section 804 and 806. Though successful, our efforts have been funded by sacrificing funding in other related programs. Access to the funds authorized under the Rapid Prototyping Fund, referred to in section 84, will enable the service to make the most out of these new authorities.

CONTINUED RELEVANCE OF THE AMPHIBIOUS FORCE

I must take a moment to emphasize our title 10 responsibilities to serve as the nations' amphibious force in readiness. The MAGTF's role in the nation's defense is to serve as part of the naval force. Our ability to project power and respond swiftly to any crisis is contingent upon the mutually supporting relationship between the Navy and Marine Corps. The ground programs highlighted previously serve little purpose if they cannot be projected to the point of crisis. Power projection from the sea requires a forcible entry capability, capability that is provided by Marine Expeditionary Brigades (MEB) embarked on amphibious warships. Current strategy requires us to be able to respond to two crises simultaneously, referred to as the 2.0 MEB requirement. While the on hand number of amphibious warships falls short of the mutually agreed upon 38 ship requirement, the current 30 year shipbuilding plan supports a 38 ship amphibious fleet. The Marine Corps fully supports the 38 ship amphibious fleet and the allocation requisite funding to improve the readiness of the current amphibious fleet.

The requirement for 38 ships remains relevant despite the increasingly contested maritime domain. Peer and near-peer adversaries with increasingly capable technology have caused us to re-examine how we operate and how we gain and maintain access to the littorals. We continuously study the problem, and we explore possible solutions in the form of concepts, such as Littoral Operations in a Contested Environment, through exploration of new technologies such as those highlighted at S2ME2, and through cooperation with the Joint Force and coalition partners. Access to the littorals is a requirement for United States to remain a credible force on foreign shores and to deter aggression.

Lastly, the Marine Corps Operating Concept requires surface and vertical lift capability to transport personnel, supplies and equipment from within the sea base and maneuver them to objectives ashore. The ability to project credible power from the sea is contingent upon the availability of high speed, heavy lift, long range surface connectors that allow future expeditionary force commanders the flexibility to operate in contested environments. We will continue to use multiple complementary systems that buttress the strengths or mitigate the weaknesses of sister systems to set the conditions for forcible entry operations. However, the current fleet of surface connectors, the Landing Craft Air Cushioned (LCAC) and Landing Craft Utility (LCU), are reaching the end of their services lives. The Marine Corps supports the current Navy Connector Strategy to procure replacement LCAC 100s, but remains extremely concerned with any delay in delivery of these platforms. Further delay risks creating gaps in this critical capability.

CONCLUSION

We are committed to delivering required warfighting capabilities to marines in a timely and affordable manner. However, continued budget uncertainties risk our ability to fulfill this commitment. The Marine Corps is at a critical juncture. We have delayed modernization so long that our technical advantages over our adversaries have been diminished. The continuing need to maintain and update legacy systems takes the focus off innovation and is costly in its own right. Experience tells us that investing in new capabilities and technologies is a proven cornerstone for your marines and sailors to achieve mission success today and into an uncertain, but no less demanding future.

The Marine Corps continues to improve our essential ground capabilities through a strategy that is stable and affordable. We recognize the need for continued vigilance in achievement of a proper balance between current readiness and the long-term imperatives of modernization and innovation. This balance is critical to ensuring the Marine Corps and the individual marine has the capability to fight and win future battles while being prepared to respond today as our Nation's force in readiness.

On behalf of the marines and sailors who provide the Nation with its forward deployed crisis-response force, we thank you for your constant support in an era of competing challenges. These critical modernization investments will ensure our success not if, but when future conflict occurs. Recognizing fiscal challenges faced by the Nation, we remain committed to fielding the most ready Marine Corps the Nation can afford. Mr. Chairman, and distinguished committee members, on behalf of your marines, we request your continued support for our modernization strategy.

Senator WICKER. Well, thank you. You were kind enough to thank the committee, but thank you.

With regard to your record of frugality, we appreciate that, but frankly I think frugality can only go so far. We need to get you what you need, General. I hope this hearing will enlighten us and perhaps those who are watching this hearing about what we need.

So let us drill down on some of the things that Senator Hirono and I mentioned in our opening statements. Walk us through the concept of operations for getting ashore from the amphibious ships in the future, the roles of ship-to-shore connectors, utility landing craft, and amphibious combat vehicles.

Lieutenant General WALSH. Thank you, Chairman.

I would start with whatever the mission may be. The Navy-Marine Corps team forward deployed is ready for a number of missions. Those could be from the lower end humanitarian assistance missions to the higher end of joint forcible entry operations where

we may be the first ones on the scene. So taking a look at that capability, I would start with whatever the mission is, and we always start with what that threat may be and defining how we will approach that threat based on the capabilities that not only we but also the naval force and the joint force at large.

So with that said, the first thing that we always have to do is take a look at the threat and set the conditions to operate in that environment. So depending on that threat bringing in joint and naval capabilities to set those conditions right to be able to allow us to operate from those amphibious ships to conduct amphibious operations is a critical part of setting those conditions right.

We have got the landing force that is out on those ships on the amphibious task force that we have got. To be able to get ashore to move those both marines, sailors, and equipment ashore, we start with the AAV, or our primary vehicle that we have today that we are upgrading, to be able to move those marines ashore in a requirement that we have today for a two marine expeditionary force forcible entry capability that would allow in that size operation in a large-scale operation.

Now, those same vehicles can be used all the way down to the low end for humanitarian assistance all the way to more crisis response type missions. Those AAVs are those first capabilities that bring those marines ashore to conduct those amphibious operations.

At the same time, we are developing the amphibious combat vehicle 1.1. That 1.1 capability will be a follow-on amphibious capability that we will be using into the future.

Senator WICKER. Well, let us go ahead and then talk about the 1.2 and the 2.0.

Lieutenant General WALSH. The 1.1 is—again, it is two companies or two battalions—an amphibious company supports a Marine battalion. So the ACV 1.1 is 204 vehicles to be able to support Marine operations with two battalions of marines. So that is the next increment.

The program itself is designed along an incremental approach. So these vehicles, as we talked about at the beginning, were by two contractors right now, two vendors, that we will evaluate over the next year to be able to decide as we downsize which one has the best capabilities. But those capabilities are really designed to get the marines, once they are ashore, to operate in a lethal and maneuverable fashion.

As we evaluate what we see out of the 1.1 capability, those 204 vehicles, about 3 years behind that is we are developing the 1.2 capability. That 1.2 capability is going to be a little over double in size the requirement of the 1.1. So we will learn from the 1.1 capability, and as we then look to see how the incremental approach towards the 1.2 capability to spiral in new capabilities into that, that would provide the capability for four battalions to operate once they are ashore. So between the AAV with the amphibious assault capability of four battalions, two battalions on the 1.1, and four battalions on the 1.2, that would be our requirement for 10 battalions' worth of amphibious capability.

Senator WICKER. Very good. I really anticipated that that question would take my entire first round. So Senator Hirono, you are recognized, and then Senator Cotton.

Senator HIRONO. Thank you very much.

General, I noted in your testimony that you paint a very serious picture of where we are in terms of our capabilities. I quote. While our focus was elsewhere, our potential enemies modernized, reducing the technological advantages American forces once took for granted. In many theaters, we can no longer assume superiority in any domain: sea, air, land, space, or the electromagnetic spectrum. In short, the Marine Corps is not organized, trained, or equipped to meet the demands of the future operating environment. So clearly, you need help. That is what we are here to do.

So the various vehicles like the ACV, are really critical to your mission. The ACV is your highest priority in the ground combat and technical vehicle portfolio, as it will replace, as you said, the existing AAV.

In November 2015, the Marine Corps awarded, as I mentioned, two contracts. I just want to make sure that these contracts are on time, and there has already been a bid protest. So do you feel confident, General, that the program is on track and will still meet the development and testing guidelines because there are 32 vehicles that are going to be developed by these two companies, and there will be all kinds of testing? Can you assure us that things are on track?

Lieutenant General WALSH. Yes, ma'am. We are just getting ready to start the testing, and we are on track for that. But if I could, I would ask if I could defer the question to Mr. Garner, who has really the expertise and can really walk you through that.

Mr. GARNER. Yes, Ranking Member. This is actually a good day for me to do this because we have had some successes as recently as today.

Both contractors are delivering. It is a competitive environment. One of them is ahead on the delivery schedule, is meeting all criteria, is ahead on testing, and by the end of this week, we will have 13 vehicles from one of them. We currently have 12 already from them.

The other one—we are accepting four vehicles today, which is why I say it is a good day to do this. We already had two. So we will have six.

By the end of next week, it will be 15 from one and it will be 12 from the other. That is enough to fully support the test schedule to maintain the critical milestone, the milestone C, about this time next year, next July or August time frame.

These are in many cases well developed vehicles and are doing well in the testing and are in fact exceeding some of our expectations. So we are very much comfortable that we are on course. Between the two competitors, we are going to have a very good selection that will bring really good capabilities to the Marine Corps, and we will be prepared to move forward this time next year into production.

Senator HIRONO. To follow up, the GAO [Government Accountability Office] office noted in an April 27 report that the protest, as I mentioned, resulted in testing delays for the program. While

you are articulating that we are on track, I have a concern that there will be an overlap between the testing and the production. So what should follow is the testing is completed and then you produce the vehicles. But apparently with the time frame, there may be an overlap? So there may be some vehicles that will be built that potentially will require costly modifications. So what are you doing to make sure that that—

Mr. GARNER. Well, ma'am, we have done a couple of things. One is that we actually adjusted the schedule to accommodate the protest. So we actually moved the schedule almost three months to the right in terms of the testing and the milestone C. So the protest did slow down the overall program, but it did not affect the testing. The testing that we are conducting is all of the testing prior to milestone C, is all of the testing that was originally in the testing plan that was approved by DOT&E [Department of Test & Evaluation] and all the agencies. All of the critical testing required prior to milestone C will still be done. On practically any program, some testing like continued reliability growth, other testing continues after milestone C. That is considered to be actually very low risk.

Our budget includes the ability to do the retrofit for the initial vehicles which is actually a pretty low number of vehicles. It is in the 20s. So we believe we have accommodated that.

Frankly, DOD non-concurred with that GAO report, to include the DOT&E strongly non-concurred with it. They believe we are doing what we need to do.

Senator HIRONO. Thank you.

Senator WICKER. Senator Cotton?

Senator COTTON. Thank you.

Thank you, gentlemen.

General Walsh, I found a line from your opening testimony to be particularly notable. You said on page 3: Some regional actors seek to secure their objective by taking a continuous series of small steps to incrementally establish new conditions favorable to their objectives. This undermines existing authority and erodes prevailing norms without resorting to actual fighting. That is pretty much the definition of strategy. Is it not?

Lieutenant General WALSH. Yes, Senator, it is.

Senator COTTON. To achieve a preponderance of force and strategic position from which to deploy to force your enemy to submit to your will, preferably without fighting.

Lieutenant General WALSH. Yes, Senator.

Senator COTTON. As you say, without resorting to actual fighting, that is because the forces in defense of the international order that are attempting—that is being challenged are refusing to commit to fighting to defend that order against such incremental steps.

Lieutenant General WALSH. Yes, sir. Like I said, I think since we have been so focused on Iraq and Afghanistan, that a lot of things have gone on around the world, and we are being challenged in areas where we have not—we have taken for granted in the past.

Senator COTTON. So you say some regional actors. Who are those regional actors?

Lieutenant General WALSH. I would start with Russia, China, North Korea, Iran would be the four main actors, and certainly a lot of violent extremist state actors around the world.

Senator COTTON. Are Russia and China the biggest challengers since they are the ones who have global or at least continental ambitions?

Lieutenant General WALSH. As we look at the threats that are out there, obviously there are threats like North Korea and a very conventional fight in North Korea, a major adversary for us to deal with. But I think as we have looked at modernizing the force and looking at the future operating environment, there is no question that as we look at as regional actors, Russia, China, and Russia operating in areas well outside of where we have seen them operate before, the capabilities that they are developing are certainly capabilities that work asymmetrically against our strengths. I think that is what we are seeing is that for us to be able to stay with overmatch wherever we go we expect our marines to have, we are going to have to continue to look at that threat and outpace that threat in a lot of areas that we have not had to deal with in the last 15 years.

Senator COTTON. Can you say more about those asymmetrical capabilities that they are developing, in particular Russia and China?

Lieutenant General WALSH. Things I think that we focus on is when we talk about maneuver warfare, maneuvering today in all domains. So when we talk about maneuvering in the electromagnetic spectrum, we see today capabilities that while Russia kept a lot of their Cold War capabilities when it came to electronic warfare, they have kept those, they have improved on those, and they have kept a lot of their fielded formations that we have let those capabilities recess that we did not need. A lot of our EW [Electronic Warfare] capabilities—we worked in the counter-IED areas. We did not work against counter long-range fires, counter-battery, electromagnetic spectrum denial, the EW capabilities that we had back in those days. So I think the electromagnetic spectrum we see, we see in cyber them operating in that area, along with capabilities and information operations that we have seen expand tremendously when you look at some of the operations that they have done in Ukraine.

Long-range precision fires, now capabilities that in the Cold War days we would constantly have to meet that threat and outpace that threat. We see in a lot of cases today that their long-range precision fires, their ability to sense, make sense of the area, then act, and use long-range precision fires is well beyond what we have been looking at over the last few years in our own arsenal.

Senator COTTON. Long-range precision fires, whether that is in Eastern Europe with Russia advancing a more advanced air defense system or on the Chinese shore with anti-access/area denial weapons—we often focus on what that means for air power pushing, for instance, ships out of the first island chain in East Asia or even out to the second. What does it mean, though, for amphibious warfare? How will the marines conduct amphibious warfare in a hostile A2/AD [Anti Access/Area Demand] environment?

Lieutenant General WALSH. The first thing I would say is pushing us out—that is some of the things that we do, your forward-deployed naval forces do every day. We operate inside that contested space every day, building alliances, building partners, work-

ing with our allies. So with the hope that we are there, we build partners. We have done the deterrence that we never go the war.

At the same time, when you see China building some of the islands that they have done in the South China Sea, those kind of things challenge not only freedom of navigation, but they also threaten our allies. So building those kind of partnerships to ensure we can persist and operate with advanced expeditionary bases is a piece of that.

But when it comes to operating in that contested environment, it is certainly going to take not only our amphibious force and our marines, but the entire joint force and probably more specifically, the entire naval force when it comes to submarines, aircraft carriers, cruisers, destroyers to be able to persist and operate in that contested environment.

Senator COTTON. Thank you, gentlemen.

Senator WICKER. Senator King?

Senator KING. Thank you, Mr. Chairman.

We are talking mostly about amphibious vehicles here so far. Over the last 20 years, what percentage of marine deployments have involved amphibious assaults? Any idea?

Lieutenant General WALSH. We kind of track that and show that over the years, depending on what type of amphibious operation, but between exercises, deployments, humanitarian assistance operations, we use our amphibs all the time. I mean, there are times—I mean, we use examples where we were conducting humanitarian assistance, disaster relief operations that were conducted in Pakistan at the same time we were doing deep strike operations into Afghanistan from the same three ships, and the third ship doing maritime counter-piracy operations. So these type of operations are going on every day with those amphibious ships.

Senator KING. These amphibious attack vehicles, though—were they used in those?

Lieutenant General WALSH. Certainly in the case of our humanitarian assistance in Pakistan specifically, they would have been used. Anytime our marines are going ashore, they are taking these vehicles with them to operate. In many cases, they are coming ashore where they do not need any type of pier capability to be able to come ashore. They can come ashore, bring their capabilities with them, along with the connectors we bring like our LCACs [Landing Craft Air Cushion] and our LCU capability.

Senator KING. These vehicles that we are talking about, the AAV and now the ACV—how effective are they on land? They will drive up on the beach. Are they effective fighting vehicles on land, or does that have to be an entirely different vehicle?

Lieutenant General WALSH. That is a great question. So one of the things that we were struggling with the EFV [Expeditionary Fighting Vehicle] program that was canceled was trying to design a vehicle that could go fast like a connector would, like an LCAC, something like that, and could fight ashore. What we decided with that was the tradeoff was just too high to try to do both things within one vehicle. So the effort that we have put into now with the ACV is to be able to get a vehicle that can get us ashore, but when it operates, it is probably going to operate 99 percent of the

time ashore. It is going to be able to operate a fighting vehicle with our marines when they get ashore.

Senator KING. When it is ashore.

Lieutenant General WALSH. When it is ashore.

Senator KING. So the ACV is designed to do both.

Lieutenant General WALSH. It is designed to do both, but I would argue where we were with the EFV where we were trying to optimize in warfare at sea, the ACV is more optimized to operate and fight ashore.

Senator WICKER. So what will it not be able to do that you hoped the—

Lieutenant General WALSH. What we had hoped is we had speed desirements up to about 25 knots back on that vehicle, to try to be able to come from the ships to shore at about 25 knots. Now we are looking at vehicles that are at a much lower number than that because of the technology. To get them to go that fast, we are trading off too many capabilities, armor protection, lethality, and mobility, the ability to maneuver quickly when they got ashore.

Senator KING. Our question is how effective is it as an onshore vehicle.

Lieutenant General WALSH. Once it gets ashore?

Senator KING. Correct.

Lieutenant General WALSH. I think that is where we are going to see the real benefit. It is a wheeled vehicle, number one, which is probably going to operate much better ashore than we had with some of the tracked vehicles that we have had in the past. So I think by going in this direction, the marines that are going to be optimized when they are ashore—they are going to have a much better capability now with the two vendors we are using today as we compete those two capabilities that we will see as probably a much better fighting vehicle ashore than we have in our current AAV force today.

Senator KING. How heavily armored is this? Is there any consideration of active defensive measures?

Lieutenant General WALSH. The armor protection that we have got in those vehicles today would be what we call a two times armor protection capability. So on the order of what we have got in our MATVs [Mine Resistant-All Terrain Vehicle] or MRAP [Mine Resistant Ambush Protected Vehicle] capabilities. So built into that vehicle is high protection capability once that vehicle gets ashore.

Going back to what we were talking about earlier with the threats that we are seeing today, the active protection system, by buying a new vehicle like the ACV with the growth capacity that the vehicle will have, we will be able to bring in active protection systems into the future. It is something we are looking at very hard right now. The technology really has just not been where we wanted it to be. It is starting to get there. Coming from the sea as more of a light force, these active protection systems have weighed an awful lot, and we did not want to be able to put them—some of it is a buoyancy thing being able to get the vehicles ashore. The technology is getting better, and we are looking at that. We think in the ACV in the future we will be able to do that. With General Shrader, we are already, along with the Army, experimenting with an active protection system, the Trophy system, on

our M1A1 tank because it can carry a lot more weight than our amphibious vehicles can.

Senator KING. I hope when you are designing, testing, and developing the manufacturing that modularization is part of the concept so that we do not have to build new platforms as technology changes. I think that is a key thought because technology is developing so fast. We have to be able to plug and play different systems and different types of technology. General, is that part of your design concept?

Brigadier Brigadier General SHRADER. Yes, sir, absolutely. Right now, speaking about active protection systems, the challenge right now is size, weight, and power. As General Walsh said, a lot of the systems—right now, what we have basically non-developmental or off-the-shelf—are heavy and they draw a lot of power. So while we are looking at those to how it would adapt to the M1A1 tank, we are also looking at how can we now take that and design it into future vehicles so that we can plug and play because maybe we only want to buy a battalion's worth of set—

Senator KING. We do not want to be bringing marines ashore in a vulnerable vehicle given development of offensive capability.

Brigadier General SHRADER. Yes, sir.

Senator KING. Thank you very much, Mr. Chairman.

Senator WICKER. General Walsh, before I recognize Senator Rounds, if we came back early on a Monday morning and went to Aberdeen, what could this subcommittee—what sort of testing could you show this subcommittee?

Lieutenant General WALSH. We need to defer that to Mr. Garner, if you do not mind, Senator, because he is probably a little bit more familiar than I am in the exact testing. I know a lot of it is how the vehicle can sustain damage hits. We have got the testing going on in a lot of different places, but specifically to Aberdeen, which is close by, if you do not mind, I would like to defer to Mr. Garner, sir.

Mr. GARNER. Mr. Chairman, had you gone this morning, you would have seen the final live fire shot on the AAV-SU [Assault Amphibious Vehicle Survivability Upgrade] which was successful, the survivability upgrade. So AAV-SU, as of about 10 o'clock this morning, has met all of its survivability requirements.

Senator WICKER. I did not get the invitation. I was with General Goldfein on this originally.

[Laughter.]

Mr. GARNER. So Aberdeen does a lot of our testing. We do a lot of the swim testing out at the amphibious vehicle test branch in California. What is primarily done at Aberdeen is all of the live fire testing. We do a lot of the reliability testing where they run it over various mobility courses. In fact, they will swim it up there and they do reliability growth testing. They do a lot of the other what we call just general mobility testing, how it handles rough courses, how it goes over obstacles, et cetera. That is the bulk of it—the mobility. The live fire is the big one up there. But we currently have ACVs up there doing testing every single day from both vendors.

Another thing they do is what we call transportability testing where they hook onto the tie-downs and pull on them to make sure

they do not break and that you could hook the vehicle down on a ship or on a connector, an LCAC.

If you were to go up on a Monday morning, you would see right now primarily ACV doing those sorts of things because AAV is pretty much finished up there. They are within the last week of their operational assessment, and they are done with their first round of testing leading to a potential milestone here in about two months.

Senator WICKER. Senator Rounds?

Senator ROUNDS. Thank you, Mr. Chairman.

Gentlemen, thank you for your service.

General Walsh, in testimony before the full committee, General Dunford identified inventories of Javelin, TOW [tube-launched optically tracked wire-guided missile], and HIMARS [High Mobility Artillery Rocket System] weapons programs as insufficient to meet U.S. Marine Corps requirements. Can you describe in more detail the risks being assumed by these shortfalls and your efforts to mitigate them?

Lieutenant General WALSH. Senator Rounds, we have had those shortfalls that were identified because of the numbers that we had been using. During the last year and into this budget year, we are plusing up all three, the Javelin, the TOW, the HIMARS, to include the new HIMARS AW [Advanced Warhead] round, alternate weapon. So we have seen that, and I think with the focus with the additional money that Congress has been giving us, the Secretary of Defense has had us focused on near-term readiness, along with filling holes, as we have called it, in 2018 with looking at more modernization growth into 2019. In that filling holes, one of it was exactly what you are talking about, filling holes in our ammunition accounts. The ones that have been focused on in this budget was the Javelin, TOW, and certainly the HIMARS pieces.

Senator ROUNDS. Any other weapons systems that are facing similar shortages?

Lieutenant General WALSH. The 155. As you have probably seen in the paper, we have been firing a lot of 155 HE [High Explosive] rounds in Syria and Iraq. That is an area that we are funding and plusing up that account also, Senator.

Senator ROUNDS. Can you update the subcommittee on the Marine Rotational Force Darwin? They will be conducting exercises and training on a rotational basis with the Australian defense force. Can you kind of give us an update on what is going on? I understand that the intent in the coming years is to establish rotational presence of up to, I believe, 2,500 Marine Air/Ground Task Force members in Australia.

Lieutenant General WALSH. Thanks for that question, Senator.

I tell you, the partnership that we have always had with the Australians is it is just a tremendous ally all the way back to the days where marines were working with the Australians in World War II. This has become a very good partnership. As you know, the Pacific is such a huge area, and trying to find good locations where we can train as a Marine Air/Ground Task Force Darwin operating down there, along with other places in Australia, has been a great place to now train and operate in the Pacific.

We have been at it now for a few years. We continue to gain and learn from that. This last cycle that we—we go there in what is considered the dry period, which is April through October. We are there right now. For the first time, Senator Hirono, we flew four MV-22's all the way from Hawaii all the way to Australia. So we now have four MV-22's. You have seen them fly from the east coast or the west coast going over to the CENTCOM [Central Command] AOR [Area of Responsibility]. We just flew them all the way to the Pacific in a lot of areas marines throughout World War II had flown.

Now we have got 1,250 marines there. We are continuing to maintain that. We have got ambitions to grow up to 2,500, and a lot of that so far has been fiscally constrained. But we have got a lot of great ideas we have to work with our partners over in Australia.

Senator ROUNDS. Either for General Walsh or Mr. Garner. During the full committee as well as the Airland Subcommittee testimony, Army leadership and outside experts have cast doubt on the ability of the 5.56 round's ability to penetrate modern composite body armor that is proliferating at an alarming rate. We are concerned that Marine infantry units could find the standard issue M4A1 ineffective, which naturally we would consider to be wholly unacceptable.

How closely is the Marine Corps working with the Army in terms of fielding a new round that can penetrate enemy body armor? Is there a strategy in place to accomplish this? If so, please provide an update.

Lieutenant General WALSH. We are. We have been after this for quite a while with the Army trying to—and Congress has pushed us in this direction too to try to find a common round with the Army. Just as you said, we are seeing more body armor wherever our marines and soldiers deploy, more of it and better quality or better capability.

So the rounds that we currently have are 855 rounds. We have been in the process of looking at a SOCOM [Special Operations Command] round, the 318A1, along with the 855A1 that the Army is using. We have been testing with them now for well over a year, trying to figure out the best round to go with. Indications are that we are trying to go with the direction that the Army is. In fact, right now our marines that are deployed into Afghanistan with our weapons are using the Army round. So there is a lot of good reason to have commonality.

The good news with that round—both rounds actually—much more capable, and specifically the Army 855A1, much better at penetrating armor, along with personal armor protection. So that is a good reason to go with that. We have to work through a lot of things on our own weapons. The M-4, our M-27's, our IAR [infantry automatic rifle], infantry advanced weapon, along with our M-16's that we are working through some of the reliability things we are learning and testing. But we will make some adjustments from that, and I think in the end our marines will have a much better capability when we are done with it.

Senator ROUNDS. So you think are moving in the right direction with regard to the new—

Lieutenant General WALSH. I do, sir. Not only that, we are looking with the Army at another weapon that would give us increased capability for our marines, to include a higher caliber weapon.

If you do not mind, I would like to let General Shrader who knows a little bit more about the testing of the 5.56, if he has time for that.

Brigadier General SHRADER. So, sir, General Walsh is referring to the testing that we have been doing with the Army on the EPR [Enhanced Performance Round] round, which is their advanced round. It is the M855A1 round. That is the one we have heard a lot about. The Marine Corps and the Army have been working toward trying to get to the same round.

The testing that we are doing is that round has had some durability—it causes some durability issues for our new infantry automatic rifle that we fielded, the M-27. The testing will be complete by July of this year, and along with performance, specifically stopping power, effect on the durability of that weapons system, the ancillary equipment like the rifle combat optic—it has a flatter trajectory than the round that we currently have. Also training facilities—that round requires a larger surface danger area that we have to take into account for our ranges. So those four areas is what we are looking at for testing to inform us to make a decision how we will go forward.

With regard to maybe a higher caliber, to answer the question about proliferation of body armor, we are working with the Army and SOCOM. As late as last week, there was a limited technical demonstration that was done with SOCOM on a higher caliber round specifically for their sniper rifle suite that we are working with them on. That could potentially address that. So we are very in tune with that. We do understand that that is a capability we have to pay attention to.

Senator ROUNDS. Thank you, gentlemen.

Thank you, Mr. Chairman.

Senator WICKER. Senator Kaine?

Senator KAINE. Thank you, Mr. Chair.

Thanks to the witnesses. Good discussions so far. There are a couple of things I wanted to ask about.

Power source increasingly is a limiting factor that I know we are all trying to grapple with. Secretary Mattis, when he was General Mattis, used to come before the committee and once testified that we needed to unleash us from the tether of fuel, and recently Tesla surpassed GM in market capitalization. There is a lot of potential in markets for alternative power sources, and I wondered if you would talk about how you are looking at new power sources either for amphibious or ground combat vehicles.

Lieutenant General WALSH. Thank you, Senator Kaine.

This last year, as we were looking at where the force should go, one of the things that we did was we took 3rd Battalion 5th Marines as experimentation force. We took that battalion, redesigned the way they were configured by each company designed in a different configuration, and we gave them different capabilities from weapons, electronic warfare capability, intelligence.

One of the things that we have been working very hard with is how do we save power differently, and not only how do we save

power, how do we do things like purify water in different ways so we are not carrying as much water to things like General Shrader is looking at, how do we use polymer casing to lighten the load on the ammo to be able to do that.

We did a lot of solar efforts with the experimentation force and hybrid generators. What we are seeing is with that experimentation battalion, between those different efforts, we are allowing them to maneuver much further and much faster because they have much less logistics requirements and able to operate on their own.

One of the things that we are trying to do is operate in a distributed manner. The more we can distribute, the more we can maneuver and out-maneuver the enemy. But to distribute, you have got to have a lot of capabilities and be able to go further, and some of it is on the power side.

So we are moving forward. We realize that that is something that has been our weak link, and it is going to allow us to operate in new ways. So I think between the hybrid generators that we are able to pull dirty power from a lot of different places, along with the solar capabilities that we are getting down to the squad level, it is moving us in the right direction.

Senator KAINE. That is exciting and something that we focus on a little bit in the Readiness Subcommittee too, and we will continue to ask questions about that.

Another innovation question that I am interested in Ranking Member Hirono talked about is the G/ATOR system in her opening comments. This one interests me because it is an open systems architecture model. I wonder about pursuing open systems architecture. Are there acquisition challenges to that? Is that relatively easy? Are you finding the private contractors you are working with are excited about that model? Talk a little bit about open systems architecture and the G/ATOR system and what you are learning as you are using that model.

Mr. GARNER. Senator, that is the way to go because it allows you to have the flexibility, obviously, to continue to develop a system for the future. That is one of the reasons that G/ATOR will actually replace five other radars and will fill multiple roles that will fill the role of air defense. It will fill the role of counter-battery, counter-mortar, and eventually it will do traffic control. It is the open system that allows us to do that.

Back to Senator Hirono's remarks, G/ATOR is also doing extremely well. We are on track to field around February of next year the first block, which is the air defense, and later next year, the second block, which is the counter-battery radar. As we speak, it is down at Wallops Island conducting very, very successful DT [developmental testing] and, I would comment, linking with the common air command and control system, which provides an overall capability to the Marine Corps to detect but also to communicate. When you link that with shooters, that is a big part of your counter-UAS [unmanned aerial systems] and other evolving threats.

So I could have given a shorter answer which says we are very focused on it. Industry works with us on it. It is absolutely the way we have to go, and it is being very successful.

Senator Kaine. It is vendor independent. It is nonproprietary. It allows interoperability among a number of different platforms. It allows private contractors to kind of use the open architecture and then build add-on units that you can more easily incorporate as you are working on—

Mr. Garner. Absolutely, sir. All of those things and very successful.

Senator Kaine. You know, the open architecture in G/ATOR—is this something that you are doing in other acquisition programs? I just have not focused on this as much in other hearings we have had, and I was interested in the use of the open systems architecture on the G/ATOR.

Mr. Garner. Generally, yes, sir. We are mandated, but we would do it anyway whether we were mandated or not. But that is across our acquisition programs we want to do that.

Senator Kaine. That is great.

Mr. Garner. Because we absolutely want to be able to—the ACV is a perfect example. The mention was made earlier of plug and play. We can plug and play weapons systems on that. We can plug and play things like the active protection. We can plug and play all the communications type systems, eventually even engines and transmissions. So we focus on it.

Senator Kaine. If I could ask just one more question, Mr. Chair. Did the open systems architecture create security challenges of, you know, easier to hack? I mean, by being a more open system, are there unique security challenges to it?

Mr. Garner. To be perfectly honest, sir, everything we do right now is creating—

Senator Kaine. They have their own challenges.

Mr. Garner. We have to go through the same measures regardless, and that is a growing and very complicated thing. But I would not say it is any harder because it is open architecture. You get into the issues of who is providing it and what the sources are for a lot of the stuff, but we have to do that with everything we do anyway.

Senator Kaine. I appreciate it.

Thank you, Mr. Chair.

Senator Wicker. Senator Tillis?

Senator Tillis. Thank you, Mr. Chair.

Thank you, gentlemen, for being here.

General Walsh, in your opening testimony in closing, I think you said that you are working to have the most ready Marine Corps the Nation can afford. The question that I have is, is the Marine Corps the Nation can afford the best possible Marine Corps to protect our troops and to project lethality on the battlefield? What is the gap, if there is one?

Lieutenant General Walsh. I think that has been a real challenge or us looking back to where we have been. We have been so focused on forward-deployed readiness, very high tempo, and looking at the constant, same area we were deploying to, Afghanistan and Iraq, pretty much the same threat—it changed a little bit—trying to keep the readiness up so those marines had the best ready equipment to go forward.

What we see now, though, as I touched on earlier, is if you continue to do that and do not modernize your force, you are not going to be ready to fight the next threat or these threats today with the high technology we are seeing, for example, unmanned aerial systems, some of the signals intelligence capabilities that they are getting. These things are pretty off-the-shelf technologies that they can buy, and now we are putting our marines at risk if we do not modernize also.

So the challenge that I am seeing that we are working with the Commandant on is we cannot modernize across the entire force. So we are looking at where we can buy two battalions' worth, four battalions' worth of a capability to get modernized in these different areas so that we are getting these advanced capabilities but it is unaffordable to get them across the force in many cases. So the focus now is to modernize in discrete ways where we see a capability that we have got to have and try to bring that in as fast as we can, maybe at smaller quantities than we would have in the past.

Senator TILLIS. The next question has more to do with just the underlying processes of modernization and going from the concept to actual testing and certification. What work is being done to look back at the current processes and drive out efficiencies, compress timelines, and reduce cost? What specific efforts, beyond just fielding the capability, can you point to that you think are good practices to get to leaner execution?

Lieutenant General WALSH. Two areas I would say is, one, the amphibious combat vehicle is one. It is an example of taking a non-developmental program that is pretty far along that somebody else has put the R&D [research and development] into, that you can look at it, compete it, and be able to procure that right in, bring that right in like we are doing right now. That is one example.

The other one that I would say—and a lot of the help that Congress has done with the law with rapid acquisition that now what we are able to do much more effectively is something that works underneath me down at Quantico is the Marine Corps warfighting lab where we are able to bring in—buy a capability, experiment with our experimentation force, with our marines, experiment that, use that within our rapid capabilities office, and if we like what we see, to bring this in very quickly instead of in a slow developmental process where we would develop the requirement and go through our normal requirements process that in many cases can take years. So I think what we are seeing is being able to buy things quickly that have already been developed, a lot of technologies that way, and bring them in much later than when we experiment with it, try it, and then go out and buy it very quickly.

Senator TILLIS. Are you moving to a point to where when you are looking at fielding new capabilities, that you would use rapid acquisition process before you choose a more lengthy or costly process? Is that a standard operating procedure?

Brigadier General SHRADER. Senator, I think what you are describing is probably the rapid prototyping effort where we go out on the market and see if there is something out there that matches a need that we need. If we find it, we will go after it, buy it, and try it. Once we have tried it, if we think it is worthy of then field-

ing, the challenge, frankly, is trying to figure out how to take it from that to fielding and the funding that goes along with that, making sure that you have a long-term funding stream to support it, once it is fielded because if you buy it, try it, and then field it and if it is not supported in the long term, then you can run into problems there downstream with readiness and how do you refresh it.

Senator TILLIS. So that speaks to our ability to provide reliable funding streams on the tail end after you determine you need to deploy it.

Brigadier General SHRADER. Yes, sir.

Senator TILLIS. Today, how would you rate our reliability in terms of providing those kind of reliable funding streams?

Brigadier General SHRADER. I would say there have been some challenges in the past, sir.

Senator TILLIS. Thank you.

Thank you, Mr. Chair.

Senator WICKER. Were you asking the witness to rate the Congress, Senator?

[Laughter.]

Senator WICKER. Good question.

I have been an advocate, gentlemen, of giving the Ukrainian military the weapons they need to get the job done. General Walsh, you and I discussed this earlier when you came by the office. What does that mean? What do I mean when I say what is going to be necessary and what are the Russians doing that we will have to combat? We are not going to put ground troops there. If we give them lethal weapons so they have a chance to win, which I think is in the vital national security interests of the United States' taxpayer, what are the dynamics there, sir?

Lieutenant General WALSH. I think the dynamics would be the same whether it is equipping the Ukrainian forces—and I really probably am not smart enough to talk to exactly what they need specifically. However, what we see and how they are operating against Russian forces or Russian-supported forces is the same thing that we are viewing on how we would operate against them. So as we study them and watch, it is literally becomes a laboratory both for the Russian forces and the Russian-supported forces and also what we are seeing. It is a laboratory both ways. They are testing their capabilities. They are using their capabilities, and then we are having to see what they are doing, just like we did in a lot of cases in the Cold War, but this is on an actual battlefield.

So as I look at that and look at a lot of the ways the forces are being used—I mentioned to you earlier, Senator Wicker, a lot of this is stuff we had never dealt with for a long, long time, Cold war capabilities that certainly to be able to detect our radios when we operate. Everything we are doing today is the ability to share information, sharing information as our computers are up, our radios are up. We are emitting. In Afghanistan and Iraq, we took that for granted. We did not in the Cold War. We knew what our signatures were, what the requirements for signature management was.

So in today's force, as we are experimenting based on what we see the Russians doing and what we now have to do in our own force-on-force training that we are doing today and the equipment

that we are buying, is looking at how we can detect how we are emitting, what our electromagnetic signature is. Some of it is training. Some of it is capability on much they emit. But if they turn their radios on, what we see there, they are quickly detected. The Russian capabilities will know what units are located, just like they did in the Cold War and just as we did. We could locate units very quickly.

A lot of what the UAS capability, unmanned systems that we see today that lots of proliferation of unmanned systems that are up that have electronics capability, along with EOIR [Electro Optical Infrared] capability, can quickly figure out where the units are located based on their electromagnetic signatures, and then with that, be able to target them very quickly with long-range precision fires that can move. How that equates to is if the enemy has better capabilities and they are able to bring that into their command and control construct better, that they can outpace and out-tempo the enemy. So in essence, when a force like us would turn on our gear to try to detect where an enemy force that has a higher capability, by the time we can pull it all together and target them, they have already got incoming rounds at us before we can target them.

Senator WICKER. But how does that translate into what the Ukrainian forces need?

Lieutenant General WALSH. I think it is a lot of cases, the same type of capabilities that we need, the ability to sense the electromagnetic spectrum, how we are emitting, where are our radios, how far out the distances are going, how we can detect enemy signals, where they are located, how strong they are, and quickly be able to figure out what type of unit that is located, get precision locations against those units to be able to jam those units, and be able to target them with precision fires.

Senator WICKER. How helpful would this be to the Ukrainian effort to combat what the Russians are doing?

Lieutenant General WALSH. I think just as helpful as it is for our own forces.

Senator WICKER. It might be a game changer. Might it not?

Lieutenant General WALSH. I will give you an example. One of the things, if you are familiar with our CREW jammers, are jammers that have been used to detect and defeat IEDs on the ground. We have got good capabilities against that. Now today, we are looking at those CREW jammers to use them to be able to sense the electromagnetic spectrum and also jam enemy capabilities. That is one example of repurposing what we already have in a way that we are going to be able to use that to get all of our ground formations the ability to operate in an electromagnetic way that we have never done since probably the Cold War. So those same kind of capabilities that we are trying to develop in our own force would be useful for the Ukrainians or any other friendly force.

Senator WICKER. What would your advice be to the commander in chief about what our policy should be with regard to supplying lethal weapons to the Ukrainians?

Lieutenant General WALSH. Sir, I would have to take that for the record, and that would be one that would be outside my lane to be able to talk into that area. I could talk to capabilities, but what

they should be getting and what they do not have today is something that—

Senator WICKER. No reason I should not try. But I did expect that answer.

Senator HIRONO?

Senator HIRONO. General Walsh, you describe scenarios where it is really important that technologically we are able to keep up with whatever our enemies are doing in terms of detection and jamming. In line with some of the modernization questions that Senator Tillis was asking, are you satisfied with the targeted investments in research and development that are included in this budget request, and do we need additional investments? Because they are constantly improving their ability to see what we are doing and prevent us from doing whatever we are doing. We have to do the same thing. So are we keeping up or advancing actually?

Lieutenant General WALSH. You know, I think, Senator, in the past—I think we have to look at research and development and experimentation in a new way. In the past, when we have put research and development out there, the money that we put into R&D is tied to a specific program in most cases. So as we develop an amphibious combat vehicle, we review the requirements process. We know we have to do the R&D to develop the program. We kind of know where we are going. The technology is moving so fast today that we do not necessarily know where it is going. A large vehicle like an F-35 or a *Ford*-class carrier or an ACV, you have got to put that R&D into the program to develop the program.

What I think what we really need is, as General Shrader was touching on, money for R&D past the S&T [Science & Technology] world, but in the R&D world where we can have money that we can experiment and use some of these non-developmental capabilities that are out there to be able to procure some of it, to use it, test it, experiment with it, and see where those capabilities are going to take us. If we learn from it quickly—we may fail in certain cases and say that is not the direction we go. But I think in a lot of cases, what we are seeing is as we experiment in that area—I will give you an example of what Senator King was talking about.

We have got a lot of light utility vehicles that are lightening the load. They are ATVs [All Terrain Vehicles] that can move marines and equipment very quickly around the battlefield, go on our MV-22's, and give mobility as we go forward. We were just out in an experiment that we did out at Camp Pendleton where we had over ten different vendors come in that allowed us to kind of see what their wares were, and we experimented with those capabilities. Afterwards, we went forward with contracts to buy a few more of those capabilities to put them into our next series of exercises like Bold Alligator.

In the past when we have gotten the money for that R&D is I have had to tie to that to say, hey, this is tied to ship-to-shore maneuver, and I would squeeze John's programs, Mr. Garner's programs, out of money he needed for something that it was already designed for. What we need is money in the R&D budget to be able to experiment with to be able to move forward in ways that we can learn from that experimentation as we see this technology moving so fast. It is almost a way to look at colorless money that we could

work with Congress on set areas that we want to work on with congressional oversight, but yet we have got the ability to experiment and demonstrate capabilities.

Senator HIRONO. Is there such monies in the fiscal year 2018 budget?

Lieutenant General WALSH. We put some money in this year. We put about \$10 million to do this. What I am hoping to do is that the appropriators—we can have the right conversation with the appropriators that they see what we are doing, and we can explain to them the different project areas that we are working and that money can stay in the budget. I think we can do a lot more of this. But the law that you have written allows us to move in that direction, but I think there is some hesitancy to allow us to have funds that may not have the discrete money tied to existing programs like we have had in the past. I think that is the old way of thinking, and I think you may have to do that on the large programs, but some of the things we are talking about we are talking about spending \$10 million to \$50 million in a year to be able to move things much faster in our acquisition process.

Senator HIRONO. I am very intrigued by your approach. Are other services also wanting to do these kinds of experimenting, and do they have monies in their budgets, the Navy, the Air Force?

Lieutenant General WALSH. On the Navy side, we tried that last year from the Department of the Navy, and I think it was around \$55 million that was put into that. When it got up, it was taken.

Senator HIRONO. When you say it was taken, it was taken away?

Lieutenant General WALSH. It was taken away when it got up with the Congress.

I think this is something that we just need to have better dialogue back and forth. As we put the money in, what are we going to use it so Congress understands it may not be on a specific because we cannot, a year in advance, figure out exactly, but we know areas that we want to experiment in. It could be electronic warfare jamming capability. It could be how we are going to have unmanned vehicles get us ashore in a different way. We know we want to kind of go in that direction. We do not have the exact project a year out. Then when we see what is out there and having that dialogue with Congress so you know where we are going to spend the money, and then it is appropriated in the right way.

Senator HIRONO. Well, it make sense to me. It is very intriguing. I would want to have further dialogue with you, and I would like to be as supportive as I can be. I hope the chair is there too.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Gentlemen, I said I would ask about the industrial base. So who would like to take that question? Assess the state of our industrial base for ground combat and tactical vehicles and suggest options.

Mr. GARNER. Senator, on my programs, which covers that portfolio of basically all the ground vehicles and G/ATOR and common aviation command, we do not really have significant industrial base issues right now in the traditional sense of your thinking of the heavy steel or the turrets or things of that nature.

Part of our strategy is that a lot of the things we use have commercial applications. So to use again ACV as an example, the en-

gines and transmissions and things of that nature are used in a lot of agricultural applications and they are worldwide.

Where we do have an issue is sometimes with some of the suppliers of not the major components but the lesser components and the fact that if you do not have enough demand for them, they will go out of business and then you do not necessarily have a supplier. So we use a lot of mechanisms to deal with that, including foreign military sales in the case of the AAV.

But quite frankly, at our scale—now, the Army may have a very different issue, but at our scale with our heavy vehicles—for example, when we did the ACV competition, we did have five vendors, and all of them had the industrial capability that they could have built it. It is not the standard model that it was in the past. But, for example, with ACV, about 80 percent of those vehicles and eventually more is being transitioned to U.S. production, and it has not been a major issue with us yet.

What is an issue is when you go low and then you come back up. So it is true that some of the major producers—BAE, being a perfect example—went into a trough a couple of years ago. So now they are having to ramp back up, and it is less their plant capacity. It is the skilled workers. It is the highly trained welders, people of that nature. That is a challenge as they ramp back up to production.

Senator WICKER. On the BAE situation, what was the reason for that?

Mr. GARNER. It was just lack of demand, Senator. It was the fact that they were not doing enough work to keep the size workforce they had had in previous years. In a place, for example, like York, Pennsylvania, those skilled workers will move away. They will go somewhere else. Then it takes a while to train them and grow them back up. So I would say on the labor end of it, it is an issue. In terms of plant capacity and things of that nature, it has not been as much of an issue for us.

Senator WICKER. I also said in my opening statement—on short-range defense systems and long-range precision fires, can you give us anything on the Navy and the Marine Corps leveraging each other's capabilities?

Lieutenant General WALSH. I think, Senator, one example that I would say that we have had is looking at this threat. It was a little bit the piece that Senator Cotton was touching in the Pacific—is to be able to operate inside that A2/AD environment. So many times people ask this question. How are amphibians going to be able to operate in that environment? Well, they are not going to operate in a contested environment in the big shooting or all by ourselves. It is going to be the Navy and the Marine Corps working together, along with the joint force.

Over the last year, one of the things we focused on very heavily—and I co-chair the Naval Board for the CNO and the Commandant, along with Vice Admiral Aquilino—is operating together. We have developed a concept called littoral operations in a contested environment. That has driven many war games and experiments. One exact experiment that we are doing here—I think it is next month—is to put a HIMARS rocket firing battery or capability, one of our HIMARS shooters, onto an LPD-17 ship. That is

just one example on how we could use that, but there are many more on how we are using our long-range precision fires to try to use them in more a sea-controlled role going from shore to sea, then using them from just on land in that capability. So there are many capabilities. I think we do like that.

I think another example would be our F-35's operating off the amphibious ships and how they would support the Navy in a sea-controlled mission.

Senator WICKER. General Shrader, we have a budget request for 527 JLTVs. The Marine Corps says they want to acquire 5,500. Do you acknowledge that is an unrealistic budget request in light of what it will buy?

Brigadier General SHRADER. Sir, I would love to answer the question, but John manages it, so I am going to defer to John Garner, sir, on JLTV.

Mr. GARNER. Sir, the 5,500 is the ultimate acquisition objective over many years. The 527 is, of course, this year.

Senator WICKER. Are you okay with that for a year?

Mr. GARNER. Would I like it to go higher? Yes, sir. But there are always other competing priorities, including things like ACV. So that is balanced. Right now, that works fine for 2018. What we would like to do is probably in future years, we may decide we would like to accelerate and increase that requirement. But for right now—remember, Senator, we are still in the low rate initial production phase. We have not completed the IOT&E [Initial Operational Test & Evaluation]. So between our buy and the Army buy, we are pretty much against the LRIP [Low Rank Initial Production] cap right now.

Senator WICKER. Well, we will have some questions for the record.

Senator HIRONO. I just have one question—

Senator WICKER. Senator Hirono?

Senator HIRONO.—regarding the JLTVs. So the ultimately goal is 5,500 JLTVs. So what is the time frame for that 5,500 to be procured?

Lieutenant General WALSH. Senator Hirono, so right now, as we look at the requirement, the initial acquisition objective was 5,500. Just as Mr. Garner said, with the delays in the program initially, that slid the full rate production decision a year. So that caused some of the reduction in the vehicles that we would have been buying. But in the long-term, we have got that 5,500 objective. But our entire Humvee fleet is up over 17,000 vehicles. We are not exactly sure what that objective is going to be in the long term on those numbers. It is going to be much higher than 5,500 we think out in the future. But what we do not know is also do all those Humvees need to be JLTVs. Could they be some other type of lighter truck that does not have the same protection requirements that a JLTV would have? Because not all our vehicles may be operating in a highly contested threat environment. So that is part of the decision as we continue to build this increment from increment 1 to increment 2 to increment 3. We will look through what that long-term requirement will be.

Senator HIRONO. So setting aside any potential further delays with the JLTVs, what is the time frame for when you will be get-

ting to the 5,500 number? Are we talking about 2030? What kind of time frame?

Mr. GARNER. Ma'am, I would like to take that one for the record. I believe it is within the FYDP [Future Years Defense Program].

Senator HIRONO. Within the what?

Mr. GARNER. Within the next 5 years. It is in the 2022–2023 time frame.

Senator HIRONO. Thank you.

Mr. GARNER. Because we hope to kick up significantly as soon as we hit the full rate production decision.

Senator HIRONO. My understanding is that you would like to get to more than 5,500.

Lieutenant General WALSH. Senator Hirono, if I could correct that. Actually what I have got is within PB–18, we funded a quantity of 7,241. So we move into increment two inside the FYDP.

Senator HIRONO. Thank you.

Senator WICKER. Might some of those vehicles continue to be Humvees for a long time?

Lieutenant General WALSH. So the 7,241 that I just briefed—that would be coming from the 17,000. There would be plenty of Humvees out there for many, many more years until we figure out how many we are going to turn into JLTVs.

Senator WICKER. Gentlemen, thank you very much. We appreciate your service and we appreciate your information today.

The hearing is closed.

[Whereupon, at 3:56 p.m., the hearing was adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JEANNE SHAHEEN

AMPHIBIOUS COMBAT VEHICLE

1. Senator SHAHEEN. Mr. Garner, on Friday, June 2nd, Inside the Navy published an article regarding the status of the Amphibious Combat Vehicle (ACV) 1.1 program. The article indicated that the Marine Corps intends to modify the prototype vehicle delivery schedule for ACV 1.1 due to “challenges” and “technical issues” experienced by one of the contractors. Will this adjustment to the prototype delivery schedule delay program milestones and eventual fielding to the marines?

Mr. GARNER. The modifications to the contractor's delivery schedule of prototypes will not delay the ACV 1.1 milestones or fielding. The developmental testing is well underway with the prototypes already delivered, and it is anticipated that testing will remain on schedule.

2. Senator SHAHEEN. Mr. Garner and General Walsh, your joint written statement discusses increments 1.1 and 1.2 for the Amphibious Combat Vehicle identifying that increment 1.1 vehicles will reach full operating capability in fiscal year 2022 and increment 1.2 vehicles in fiscal year 2026. Will the improvements from increment 1.1 to increment 1.2 be backfit on all the increment 1.1 vehicles to ensure the same capability across the fleet of vehicles?

Mr. GARNER and Lieutenant General WALSH. It is anticipated that the improvements from increment 1.1 to increment 1.2 will be back fitted on the increment 1.1 vehicles.

CYBERSECURITY

3. Senator SHAHEEN. General Walsh, in light of the focus on cybersecurity and modernizing your command and control systems, what steps are you taking to ensure the security of all your networked systems?

Lieutenant General WALSH. The Marine Corps takes cybersecurity seriously. It is vital to the protection of our data, users, systems, connections, and networks. We understand the ever-changing cyber threat environment and continue to pursue and

implement agile and responsive defense-in-depth for the Marine Corps Enterprise Network (MCEN), both in garrison and deployed environments. We are taking the following steps:

- **Implementation of DOD's Comply to Connect on the MCEN:** This is an automated capability that ensures information systems comply with cybersecurity and technical standards (e.g., patch management, end-point/end-user protections, security standard configurations) before connecting to the network. The end result is improved cybersecurity through automated end-to-end network visibility and assured interoperability through a single security architecture framework. We are currently testing this capability prior to full implementation across the MCEN.
- **Cybersecurity Assessments:** These assessments occur in coordination with MARFORCYBER's Cyber Readiness Reviews and Cyber Protection teams and in conjunction with named operations. These occur monthly at the regional level and cover all Marine Corps bases, camps, stations.
- **Mission Assurance Assessments:** These assessments identify cybersecurity issues that could impact ground, air, and logistics missions areas in order to resolve vulnerabilities. The Marine Corps Operational Test and Evaluation Activity conducts test and assessments throughout the acquisition process to determine cyber resiliency of tactical systems.
- **Marine Corps Cyber Range:** Aggressive testing occurs at the Marine Corps Cyber Range (part of the DOD Cybersecurity Range) to resolve cybersecurity weaknesses before they become a compromised vulnerability. We are currently growing this capability and capacity.
- **Cryptographic Modernization:** The Marine Corps is moving out on the DOD's mandate to meet improved NSA Communications Security (COMSEC) and encryption standards by 2024. Specifically, the USMC tactical radio portfolio is being modernized (\$600 million + investment) to meet advanced cryptography standards, limit adversary threat, and improve security of our tactical networked systems.
- **Communications Military Occupational Specialty (MOS) (06XX) modernization.** Improves Cybersecurity training across the spectrum of communications occupational fields. Network and System Operators take over an increased responsibility for Cybersecurity, while Cyber defense technicians are trained to enhanced standards and capabilities.
- **Completed the "MAGTF Defensive Cyberspace Operations Internal Defensive Measures Company Concept of Employment" in July 2017.** This concept supports CMC's intent and direction to increase the service's ability to defend the MAGTF (in and through Cyberspace). USMC has approved force structure force both Active and Reserve components for fiscal year 2019. CD+I is currently working development of tool set requirements and training to round out the full capability. Proof of concept to begin later this year and next spring.

The Marine Corps has also maintained compliance with the DOD Cybersecurity Scorecard, and we have had success in software assurance testing (as directed by NDAA 966) and Command Cyber Readiness inspections. We will increase security by transitioning from the Electronic Key Management System (EKMS) to the new Key Management Infrastructure (KMI) by the end of CY17. The Marine Corps is also improving how we measure and analyze cyber risk. We must continue to be proactive in the cybersecurity environment, counter adversary threats, and ensure the security of our networked systems.

QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

LASER WARNING RECEIVER SYSTEM

4. Senator BLUMENTHAL. Mr. Garner, Lieutenant General Walsh, Brigadier General Shrader, since 1994, the Marine Corps has had a requirement generated from a joint Mission Need Statement and follow on Operational Requirements Document to incorporate a laser warning receiver system to protect Marine Corps combat vehicles from threats. The requirement was a part of a joint effort between the Marines Corps and the US Army and included the M1A1 Main Battle Tank, Light Armored Vehicle (LAV), and the Assault Amphibious Vehicle (AAV). Why has this laser warning system requirement not been fielded? Are you working toward fielding it in the near term? What are the obstacles? What can this capability bring to the Marine Corps' armored fleet?

Mr. GARNER, Lieutenant General WALSH, Brigadier General SHRADER. The Marine Corps has an overall survivability requirement for the M1A1 tank

which laser warning receiver systems can help satisfy in some cases. The USMC tested several LWS systems in June 2011 and determined that they provided a mixed level of performance against threats that employ lasers to either locate or designate the M1 prior to or during attack. After completion of the testing, the USMC reviewed options for development of an integration kit and fielding but did not pursue a LWS program at that time based on service priorities. As part of ongoing efforts to improve M1A1 vehicle protection, including addition of Active Protection Systems, the USMC is reviewing the integration and benefits of LWS systems along with other survivability improvements. A key enabler will be improvements in the integration of M1A1 displays and battle management systems which will allow operators to take immediate advantage of LWS warnings and indicators. Without the ability to fuse LWS data into a complete battle management picture to enable rapid response from the crew, the utility of an LWS system is limited.

UNITED STATES-ISRAEL COOPERATION ON ACTIVE PROTECTION SYSTEMS

5. Senator BLUMENTHAL. Mr. Garner, Lieutenant General Walsh, Brigadier General Shrader, Israel has deployed Active Protection Systems (APS), such as the Trophy and Iron Fist systems, to provide protection for combat vehicles against rocket-propelled grenades and anti-tank missiles—a threat US forces also must contend with. I understand the Marine Corps is evaluating the integration of Israeli Active Protection Systems (APS) into our own efforts. Where do marine efforts stand in upgrading their armored fleets to defend against current and future threats by deploying active protection system technologies?

Mr. GARNER, Lieutenant General WALSH, Brigadier General SHRADER. The Marine Corps has just completed the initial testing of the Trophy Active Protection System (APS) on the M1A1, observing good intercepts against the evaluated threat. We are in the process of evaluating the impact of the additional weight, power and space claim of the APS system on other tank systems. For example, the APS system in the current configuration blocks vision in some angles and reduces the ability to traverse the main gun in some situations. The operational impact of these issues and how they can be mitigated is ongoing. Presently, the USMC has programmed procurement beginning in fiscal year 2021. However, options to accelerate the program to achieve early system fielding in fiscal year 2019 and maintain program alignment with U.S. Army timelines are being developed. Our APS effort is a cooperative effort with the Army using the Army's existing Project Agreement with the Israeli Ministry of Defense. As such, the Marine Corps has been able to leverage a significant amount of work and test data completed by the Army and the USMC plans to continue to move forward with the Army on APS efforts.

6. Senator BLUMENTHAL. General Walsh, last year at this hearing you noted that the Marine Corps is working to “try to buy or lease some Trophy systems . . . and put those on our M1A1 tanks.” How soon will APS technologies be integrated on-board Marine armored platforms?

Lieutenant General WALSH. The USMC M1A1 Trophy Technology Demonstrator (TD) is part of the US Army Expedited APS program. The TD has provided a platform for the installation and test of the Trophy Active Protection System on an USMC M1A1. Over the past year the TD has been useful in the development of requirements, setting the conditions for a future program of record, and has allowed the Marine Corps to characterize an Israeli active protection system in a U.S. Government controlled test environment. As of August TD performance testing is complete. The next phase in developing this capability, for which the Marine Corps is fully funded, transitions to U.S. Army led developmental and operational testing. Current USMC planning supports system procurement in beginning fiscal year 2021, however, options to accelerate the program to achieve early system fielding in fiscal year 2019 and maintain program alignment with U.S. Army timelines are being developed.

**DEPARTMENT OF DEFENSE AUTHORIZATION
REQUEST FOR APPROPRIATIONS FOR FIS-
CAL YEAR 2018 AND THE FUTURE YEARS
DEFENSE PROGRAM**

TUESDAY, JUNE 13, 2017

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

NAVY AND MARINE CORPS AVIATION PROGRAMS

The subcommittee met, pursuant to notice, at 2:34 p.m. in Room SR-222, Russell Senate Office Building, Senator Roger Wicker (chairman of the subcommittee) presiding.

Committee members present: Senators Wicker, Rounds, Tillis, Sullivan, Hirono, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER WICKER

Senator WICKER. The hearing will come to order.

We've been advised by minority staff that Senator Hirono is on her way from the vote and that in the interest of time it might be best if I went ahead, so we'll do that. I certainly would not have done that without permission of Senator Hirono's staff.

The Senate Armed Services Subcommittee on Seapower convenes this afternoon to examine Navy and Marine Corps aviation programs.

Our subcommittee welcomes three distinguished witnesses: Vice Admiral Paul A. Grosklags, Commander, Naval Air System Command; Lieutenant General Jon M. Davis, Deputy Commandant for Marine Corps Aviation; and Rear Admiral Chip Miller, Director of Air Warfare for the Department of the Navy.

Our subcommittee is grateful to these witnesses for being here, for their decades of dedicated service. I'd like to offer special thanks to General Davis, who for some reason is retiring next month after nearly 37 years of service. Best wishes to General Davis and his family.

The United States faces a complex and increasingly dangerous security environment. This subcommittee is well aware of the challenges posed by China and Russia's military modernization and assertive behavior, North Korea's belligerence, and Iran's malign activities. The Islamic State also remains a potent threat.

To confront these challenges, our country relies heavily on Navy and Marine Corps aviation. However, 15 years of continuous, high-

tempo operations and years of inadequate budgets have strained our aviation forces. Congress has not delivered sufficient and predictable funding to our naval aviation forces. I look forward to hearing from the witnesses about the long-term funding requirements necessary to regain full-spectrum readiness.

Today, our subcommittee will examine five key areas related to the Navy and Marine Corps aviation programs. First, physiological episodes. First and foremost, the safety of our Navy and Marine Corps aviators remains paramount. The subcommittee remains concerned about the persistence of these PE episodes experienced in Navy aircraft, particularly the F/A 0918 [Fighter/Aircraft] Hornets and Super Hornets, EA-18G and T-45s. This situation is naval aviation's number-one safety priority.

As subcommittee chairman, it remains a matter of great personal interest. In early April, I made a fact-finding trip to Naval Air Station Meridian following a widely observed instructor pilot boycott of training flights at Meridian, Kingsville, and Pensacola. I spoke with instructors and students, and also senior leadership, including the commander of naval forces, Vice Admiral Shoemaker, and the chief of naval air training, Rear Admiral Bull. I've also received updates from each of our witnesses, which I appreciate.

After my visit to NAS [Naval Air Station] Meridian, the Vice CNO [Chief of Naval Operations] directed the Commander of Pacific Fleet, Admiral Scott Swift, to conduct a review of the facts, circumstances, and processes surrounding the PE [Physiological Episodes] issue. We hope to get an update on this today.

Overall, the Navy needs a plan to get T-45 students back flying safely and to fix the problem for the long term. Looking toward the future, the subcommittee would like to hear assurances from the witnesses that the Navy and Marine Corps are taking action to prevent the F-35 from suffering the same problems. It's worth noting that Luke Air Force Base temporarily canceled flying operations last week after five Air Force pilots experienced physiological episodes.

Next, aircraft readiness, our second area of interest. The Navy and Marine Corps lack sufficient numbers of ready, basic aircraft for aviators to remain qualified, proficient, and motivated. The witnesses should discuss the Navy's budget request for depot maintenance, flying hours, and spare parts.

Third, our subcommittee would like to learn more about gaps in the Navy fighter fleet. The Navy's Strike Fighter shortfall will continue to expand unless enough aircraft are procured to replace the 24 to 36 aircraft which are retired annually. The CNO and Commandant both included Strike Fighters on their unfunded priority lists. In fact, the Navy's number one and number three unfunded priorities are Super Hornets and F-35C Joint Strike Fighters, respectively. Our witnesses should provide more details on unfunded requirements for multi-role fighter aircraft.

The fourth area of interest is development of operations of the F-35B and F-35C Joint Strike Fighter. While F-35 is approaching the end of its development phase, the Marines are already flying the aircraft operationally. Earlier this year the Green Knights permanently changed their home station to Iwakuni, Japan, and will make the first F-35 shipboard deployment in 2018. The sub-

committee looks forward to hearing an update on F-35 operations and the lessons learned from the first units to fly the aircraft.

Finally, our subcommittee would like an update on inventories for air-launched munitions. Inventories for many of our weapons remain critically low. At the same time, technological advances of our potential adversaries require us to modernize our munitions to remain relevant. The subcommittee needs to understand where the Department is taking risk, what is being done to mitigate that risk, and also comment on the industrial base's ability to produce the required munitions.

So I welcome our witnesses, and if we will pause for a moment, we will check on the whereabouts of our distinguished—

Senator HIRONO. Here she is.

Senator WICKER. My goodness, I couldn't have timed it better.

Senator HIRONO. I heard my name and—

Senator WICKER. Now, Maize, you know I went ahead only with permission.

Senator HIRONO. Oh, of course. You always have.

Senator WICKER. Well, we're delighted to see you, and we know you are very, very busy this afternoon and will have to leave to attend another very important matter.

Senator HIRONO. Yes, thank you.

Senator WICKER. You are recognized.

STATEMENT OF SENATOR MAZIE HIRONO

Senator HIRONO. Thank you. Thank you, Mr. Chairman.

I would also, of course, like to welcome our witnesses for this afternoon's hearing. We are grateful for your service and for the professional service of the men and women who are under your command.

Today we have an opportunity to discuss how the Department of the Navy's fiscal year 2018 budget request for Navy and Marine Corps aviation programs would help increase readiness, a huge issue for all of our services, address shortfalls in munitions, pilots, and maintenance personnel, and modernize our strategic deterrence capability.

Navy and Marine Corps aviation programs play a critical role in supporting and advancing our country's strategic interests in the Indo-Asia Pacific region, including, of course, from bases in Hawaii.

Last summer I attended the dedication of the first of two new MV-22 hangars at Marine Corps base Kaneohe. In April, four Ospreys operating from those hangars departed Kaneohe Bay for the Royal Australian Air Force Base Starwin after flying nearly 6,000 miles. This flight demonstrated how the operating range of our MV-22s and the strategic location of Hawaii permit us to reach across the Pacific Ocean to respond to the ever-growing threats in the region.

These threats require us to consider how best to get the Navy and Marine Corps the resources that you need, but we must also make sure that any increases in resources do not come at the expense of important domestic programs that families, including our military families, rely on every day.

In this request, the administration is asking for a \$54 billion top-line increase above the total budget for fiscal year 2018, prescribed

in the Budget Control Act (BCA). Of that total, the Department of the Navy budget would receive an increase of roughly \$12 billion. Unless Congress can achieve a broad and bipartisan agreement to repeal or modify the BCA, any approval of the \$12 billion increase for the Navy and Marine Corps will trigger sequestration of a similar amount in domestic programs.

This increase would come at the expense of huge cuts to health care, environmental protection, and State Department programs critical to our national security, and I'd like to mention in that regard Hawaii's East-West Center. This is a non-starter. As Secretary Mattis said this morning, no enemy has done more damage to the U.S. forces than what we've done to ourselves with the BCA.

Mr. Chairman, I look forward to working with you and other members to eliminate sequestration in a way that balances the needs of our military with critical domestic programs. We cannot continue down this path.

As we consider the fiscal year 2018 budget, we must also consider the significant challenges we face in naval aviation. While the Marine Corps has been operating the F-35B variant, we need to hear more about how testing on the F-35C is proceeding. We also need to understand better how other parts of the program are supporting the Navy's initial Operating Capability Declaration plan for 2018, or OCD.

In the budget, the Defense Department is also asking for authority to execute economic order quantity, EOQ, contracts with the F-35 program in advance of successful completion of operational testing. Normally, Congress has not approved EOQ authority unless and until the weapon system in question has completed a successful operational test, and we will have to consider this matter carefully.

Second, the Navy is facing a major shortfall in its Strike Fighter inventory. The Navy responded to forecasts of a shortage of almost 200 aircraft several years ago by better managing the remaining life on the existing aircraft. They've done this by redistributing aircraft within the force, designing a series of maintenance and rehabilitation measures, including a service life extension program (SLEP), for older aircraft, and by new F-18 aircraft. The Navy has predicted that SLEP would lead to significant improvements in its ability to support operating forces such as aircraft carrier squadrons and Marine Corps squadrons for several years.

This year, however, the Navy is still having difficulty moving F-18 aircraft through the SLEP lines, which means that fleet squadrons are having to make due with fewer aircraft. This puts a strain on the whole system. We need to hear about actions the Navy is taking to improve this situation.

Navy and Marine Corps pilots have been experiencing problems with the environmental control systems in certain aircraft, mainly F-18s and T-45s, that have resulted in what is referred to as "physiological episodes." We need to hear from the services what progress is being made to address those problems.

I'd also like to hear about the investments the Navy and Marine Corps are making in training and maintenance operations.

General Davis, yesterday at our meeting, I was encouraged to hear that Marine Corps aviation has chosen to focus significantly

on training and development for pilots and maintenance workers, both officers and enlisted personnel. Sending Marine aviators and maintainers to the advanced aviation management training course is a demonstration of your commitment to improving readiness and getting the aviation fleet back to where it needs to be.

Thank you again, Mr. Chairman. I certainly look forward to hearing from our witnesses. Mahalo.

Senator WICKER. Very good. Our distinguished ranking member has to testify at a hearing and may be able to come back and be with us.

Admiral Grosklags?

STATEMENT OF VICE ADMIRAL PAUL A. GROSKLAGS, USN, COMMANDER, NAVAL AIR SYSTEMS, DEPARTMENT OF THE NAVY; ACCOMPANIED BY LIEUTENANT GENERAL JON M. DAVIS, USMC, DEPUTY COMMANDANT FOR AVIATION, UNITED STATES MARINE CORPS; AND REAR ADMIRAL DEWOLFE H. MILLER, III, USN, DIRECTOR, AIR WARFARE (OPNAV N98), DEPARTMENT OF THE NAVY

Vice Admiral GROSKLAGS. Sir, I'll be giving an opening statement for all three of us.

Senator WICKER. Oh, okay. Good.

Vice Admiral GROSKLAGS. Mr. Chairman, Ranking Member Hirono—I hope she comes back—and distinguished members of the subcommittee, it's our pleasure to be here with you today to talk about naval aviation and our programs.

Our 2018 President's budget submission is governed by the Secretary's priorities to improve war-fighting readiness by addressing pressing programmatic shortfalls that have accrued from 15 years of wartime operational tempo and chronic under-funding of many of our readiness accounts. This budget request is designed to maintain the operational effectiveness of our current force, also building a bridge to growing the future force starting in 2019.

Current readiness of our naval aviation forces is clearly, as you stated, less than it needs to be. The fiscal year 2017 enacted budget provided much needed increases in funding for many of our naval aviation readiness accounts. Our fiscal year 2018 request builds on 2017 with a request for funding of these readiness accounts that both in real terms and as a percentage of the requirement is to a level not seen in eight to ten years. Support for these readiness accounts is the most important leverage that we have in returning our aircraft to the required state of readiness.

Close behind is the need to continue, and in some cases to accelerate, the procurement of new aircraft. This includes F-35s for both the Marine Corps and the Navy, as well as additional F-18 Super Hornets for the Navy. As we continue to struggle with extending the service life and maintaining the readiness of our legacy F-18s, both services are working to accelerate the transition to other aircraft.

In addition to the F-35B and C models, critical priorities for the Marine Corps include initiation and the ramp-up of CH-53K production, completing the procurement of the KC-130J, execution of the V-22 common configuration readiness and modernization ini-

tative, also known as CCRAM, and initiation of the MAGTF Expeditionary Unmanned Air System, also known as MUX, M-U-X.

Each of these priorities is a key contributor today and in the future to the Marine Corps' capability and capacity to meet plans and combatant commander requirements.

On the Navy side of the house, in addition to the F-18s and the F-35s required to minimize our Strike Fighter inventory challenges, priorities include initiating service life extension of our F-18 Super Hornets, pushing forward with MQ-4 Triton procurement, awarding a development contract for the MQ-25 carrier-based unmanned tanking aircraft, continued development of the next-generation jammer for our Growlers, and fielding of the long-range anti-ship missile on initially the B-1 and then the F-18.

We will continue to leverage every tool and opportunity available to drive down the cost of each of our programs, and this subcommittee has been very supportive of our efforts in the past, and we are again asking for your support for a couple of initiatives.

One is the V-22 multi-year program which will support the final seven years of planned Marine, Navy, and Air Force procurements; and the second one, already mentioned by the ranking member, is the F-35 EOQ associated with a block buy, and I'd be happy to talk about the importance of that in more detail if we have the opportunity.

Separate from the procurement focus, this subcommittee is well aware, as you stated, of the continued challenges that we face in resolving the high rate of physiological episodes that we have seen in our T-45s and F-18s. It bears repeating that this is naval aviation's number-one safety issue, and we continue to approach our mitigation steps and our search for root cause in an unconstrained funding perspective.

As we continue to assess potential root causes, we in parallel are focused on implementation of air crew alerting and protection devices and systems so that we can resume student training in the T-45 just as soon as possible, but keeping in mind that safety is the number-one priority.

Now, our aviation priorities are directly tied to the increasing worldwide security challenges. Our ability to achieve the improved readiness, increased capacity, and enhanced capabilities required to deal with these challenges remains constrained by the overall resourcing constraints imposed by the Budget Control Act and the often inefficient use of resources driven by the seemingly chronic extended execution under continuing resolutions. You have our commitment to making the best possible use of the resources we are given, and we ask this subcommittee's continued support in working to eliminate these barriers.

I want to thank you again for your support of our sailors and Marines, and we look forward to answering your questions.

[The prepared statement of Admiral Grosklags, Lieutenant General Jon Davis, and Rear Admiral DeWolfe H. Miller III follows:]

PREPARED COMBINED STATEMENTS BY VICE ADMIRAL PAUL GROSKLAGS, LIEUTENANT
GENERAL JON DAVIS, AND REAR ADMIRAL DEWOLFE H. MILLER III

INTRODUCTION

Mr. Chairman, Senator Hirono, and distinguished members of the Subcommittee, we thank you for the opportunity to appear before you today to discuss the Department of the Navy's (DON) Aviation programs. Our testimony will provide background and rationale for the Department's fiscal year 2018 aviation programs budget request aligned to our strategic priorities and budgetary goals.

The United States is a maritime nation with global responsibilities. Our Navy and Marine Corps' persistent presence and multi-mission capability represent U.S. influence across the global commons. We are an agile maritime strike, amphibious and expeditionary power projection force in readiness, and such agility requires that the aviation arm of our naval strike and expeditionary forces remain strong. Our budget submission ensures Naval Aviation possesses the capability, capacity and readiness to deliver five essential functions outlined in our maritime strategy—All Domain Access, Deterrence, Sea Control, Power Projection and Maritime Security. These key, essential functions are missions that depend upon Naval Aviation to enable their success.

Global connections continue to multiply, fueled by rapid advances and proliferation of technology, particularly cyber and other information technologies. Our competitors are pursuing advanced weapon systems at a development pace we have not seen since the mid-1980s, and because of these focused pursuits; both near-peer nations and non-state actors pose credible threats to our security. As such, it is imperative that we fund a force with the capability and capacity to fight and win against any of our five major challengers (China, Iran, North Korea, Russia, and Violent Extremism) by investing in advanced systems that increase lethality for both the current and future force.

Our ability to respond to this dynamic strategic environment, high operational tempo and evolving combatant commander (CCDR) requirements continues to be constrained by current fiscal realities. The Department is still recovering from appropriations that were significantly lower than the budget requests for fiscal years 2013–2016. We strive to improve efficiency in our own internal business practices to make every dollar count, but our efforts are undermined by the absence of stable, timely budgets and resources aligned to stay ahead of the threats. We encourage Congress to re-evaluate the Budget Control Act caps, as outlined by our President's Budget request. Timely passage of a full year appropriation as at requested level will provide for the most efficient execution of the resources provided by Congress, while bringing stability to our workforce and the industrial base.

This fiscal context drives difficult choices to best balance between capability, capacity, readiness and the industrial base. Our fiscal year 2018 budget supports the five essential functions outlined in our maritime strategy, the operational context we as a Nation find ourselves in, and the current fiscal environment.

Our investments are focused, balanced and prioritized to deliver and support a global sea-based and expeditionary force. Our budget is based on the transition of major components of the Carrier Air Wing (CVW), Expeditionary Strike Group and land-based Expeditionary Wings, and includes: manned and unmanned aviation system teaming; integration of warfighting capabilities to ensure multiple systems operate together across platforms, weapons, networks and sensors; advanced computing; and incorporation of commercially driven technology and additive manufacturing to provide a technological advantage over adversaries.

The Department continues to pursue acquisition and business process reform measures to deliver capability faster at reduced cost. New measures include implementation of accelerated acquisition policies for Rapid Prototyping, Experimentation and Demonstration; establishment of Maritime Accelerated Capability Office programs; and the use of Rapid Deployment Capability processes. We are actively promoting innovation and the transition of key manufacturing technologies and processes with investments focused on affordability and those most beneficial to the warfighter. There is also a continuing transition from a hardware-centric world to a software-centric world by leveraging common development standards and requirements for modular weapon system components.

The Navy/Marine Corps "Vision for Naval Aviation 2025" provides the framework for determining investment priorities across the triad of warfighting capability, capacity, and Naval Aviation wholeness. There are several central themes to our 2018 Naval Aviation budget plan: next generation fighter/attack capability; unmanned systems; netted persistent multi-role intelligence, surveillance, reconnaissance (ISR) and targeting; advanced strike and networked enabled weapons programs; sup-

porting capabilities such as electronic attack and electromagnetic spectrum superiority, maritime patrol, and vertical lift; readiness; and targeted modernization of the force for relevance and sustainability.

The best way for pilots to train for combat is by flying their aircraft in live, scenario-based training missions against live opposition. However, many elements of combat cannot be replicated in the training environment. The Department is committed to augment aircraft flight hours by providing high-end virtual training. To do that, we are making investments in Live, Virtual, and Constructive Training that enable our aircrews to link across the country and train in high fidelity simulators. As we develop these technologies, the Department plans to connect aircrews in live flying aircraft against synthetic adversaries. We are also dedicated to leveraging the Science of Learning into all levels of aviation training. To do this, we are exploring innovative ways to leverage big data/analytics and flexible training systems that will maintain the nation's competitive advantage.

At its foundation, as core unpinning principals, Naval Aviation is actively pursuing and seizing innovation and advantage wherever it can. We are implementing our vision toward greater tactical and technical innovation to provide the right capability in the hands of the warfighter, on schedule, and in the most affordable manner possible.

TACTICAL AVIATION

F/A-18 Overview

There are four Navy and eleven Marine Corps F/A-18A-D active strike fighter Hornet squadrons with a total inventory of 546 aircraft. There are 30 Navy Super-Hornet (F/A-18E/F) strike fighter squadrons with a total inventory of 544 aircraft. Combined, F/A-18A-D Hornets and F/A-18E/F Super-Hornets have conducted more than 219,454 combat missions since September 11, 2001.

F/A-18 A/B/C/D Hornet

Based on inventory modeling, a portion of the existing inventory of 546 Navy and Marine Corps F/A-18 A-D aircraft will be flown through the mid-2030 timeframe. The DON will continue to meet Navy active F/A-18A-D squadron operational commitments until 2027, Marine Corps active and Reserve squadrons until 2030, and Navy Reserve squadrons through 2034.

To support this Fleet plan, the Fiscal Year 2018 President's Budget requests \$294 million in APN to implement aircraft commonality programs, enhance relevant capability, improve reliability, and ensure structural safety of the inventory of 546 F/A-18 A-D Hornets; \$31.4 million is for a Service Life Extension Program (SLEP). The funding priorities for F/A-18 A-D Hornet will be safety, reliability, and capability.

Service life management efforts have extended the F/A-18 A-D beyond its original service life of 6,000 flight hours to 8,000 flight hours with select aircraft that may be extended up to 10,000 flight hours. Discovery of unanticipated corrosion on these legacy jets complicates depot throughput, and service life extensions for aircraft with more than 8,000 flight hours require High Flight Hour inspections, which further increases maintenance-man hours. These inspections assess the material condition of each aircraft and apply a unique combination of inspections and airframe modifications to maintain airworthiness certification. As of April 2017, 92 percent of the F/A-18 A-D fleet has over 6,000 flight hours and 24 percent have flown more than 8,000 flight hours; the highest flight hour airframe has attained over 9,799 hours. The Department endeavors to return the required number of aircraft to the flight line with the necessary capability upgrades, but remains concerned that low reliability rates will affect our ability to train and fight.

In addition to the flight hour extension strategy, these aircraft require capability upgrades in order to maintain warfighting relevancy. The Department will continue to procure and install advanced systems such as mission computers, aircraft survivability equipment, radios, radars and targeting pods on select F/A-18 A-D aircraft to counter evolving threats. However, while the DON continues investing in warfighting upgrades in order to maintain tactically relevant aircraft, the Services are challenged to improve the reliability of this aged airframe.

F/A-18E/F Super Hornet

The F/A-18E/F Super Hornet will be the numerically predominant aircraft in the Navy's CVW Strike Fighter force through 2035. The F/A-18E/F began Full Rate Production (FRP) in 2000. Continued investment in capability upgrades significantly improves the lethality of the CVW.

The Fiscal Year 2018 President's Budget requests \$1.25 billion in APN for 14 F/A-18E/F Super Hornet aircraft and \$251.2 million of RDT&E for F/A-18 Block III,

IRST Block II, F/A-18E/F Service Life Assessment Program (SLAP), radar upgrades and improvements. With the support of Congress, we will also procure a minimum of 80 additional Super Hornets across the Future Years Defense Program (FYDP) and continue modernization plans to address continuing warfighter demand for advanced tactical aircraft. These additional procurements begin to mitigate the decline in DON's strike fighter inventory and enable older aircraft to be pulled from service for mid-life upgrades and rework to extend their service life.

The Super Hornet modernization plan features an incremental approach to add conformal fuel tanks to extend range and replace outdated electronics. Other modernization efforts will incorporate new technologies and capabilities, to include, Digital Communication System Radios, Advanced Targeting Forward Looking Infrared (with shared real-time video), Accurate Navigation Distributed Targeting System, Infrared Search and Track, and continued advancement of the APG-79 Active Electronically Scanned Array Radar.

Due to high utilization rates, the F/A-18E/F fleet has flown approximately 47 percent of the total flight hours available within the 6,000 hour limit design life. The remaining fleet flight hour capacity will be inadequate to meet operational commitments starting in the early 2020s. As a result, the Department initiated a phased F/A-18E/F SLAP to determine requirements to extend the airframe service life beyond 6,000 flight hours. The F/A-18E/F SLAP incorporates lessons learned from the F/A-18A-D SLAP and SLEP analysis and was initiated earlier in the F/A-18E/F life-cycle. Super Hornet SLAP commenced in 2008 with completion expected in 2018. The SLAP goal is to analyze actual Fleet usage versus structural test data to support the design of Service Life Modifications (SLM) that will ultimately extend F/A-18E/F service life from 6,000 to 9,000 flight hours. The initial phases of the F/A-18E/F SLM began in 2014 with the development and fielding of Engineering Change Proposal kits to upgrade life-limited areas of the F/A-18E/F that were revealed by SLAP analysis.

EA-18G Growler

The EA-18G Growler is a critical enabler for the Joint force. EA-18G brings fully netted warfare capabilities to the fight, providing unmatched agility in the Electromagnetic Maneuver Warfare environment. The Fiscal Year 2018 President's Budget requests \$173.5 million of RDT&E for modernization.

To date, 136 EA-18G aircraft have been delivered, representing 85 percent of the funded inventory objective. Initial Operational Capability (IOC) occurred in September 2009 and the Fleet Response Plan was approved in November 2009. Since their initial deployment, Growlers have flown more than 2,300 combat missions and have expended approximately 16 percent of the 7,500 flight hour life per aircraft. Electronic attack capabilities, both carrier-based and expeditionary, continue to mature with development of the Next Generation Jammer (NGJ). NGJ Increment 1 is scheduled to begin replacing the legacy ALQ-99 Tactical Jamming System in fiscal year 2021. Additionally, we continue to invest in the EA-18G passive detection and identification capabilities while improving network connectivity to provide overall battlespace awareness and targeting for the carrier strike group.

The recent authorization of seven additional EA-18Gs will extend aircraft deliveries into fiscal year 2018. With the seven additional aircraft, the total procurement quantity of 160 EA-18Gs fulfills Navy requirements for carrier-based Airborne Electronic Attack (AEA) and expeditionary EA-18G squadrons.

Additional EA-18Gs, above the funded procurement objective of 160, may be explored by the Department of Defense as it considers options to support an AEA force structure that meets the Joint Warfighter requirement.

AV-8B Harrier

Since the beginning of the war on terror, the AV-8B Harrier has been a critical part of the strike fighter inventory for the Joint force. This aircraft has flown more than 60,000 hours in combat since 2003, an average of over 475 hours per aircraft, with zero losses from the enemy in the air, but six losses on the ground when the enemy broke through our perimeter at Bastion Air Base in 2012.

The Fiscal Year 2018 President's Budget requests \$48.8 million in RDT&E funds to continue Design, Development, Integration and Test of various platform improvements. These improvements include an Engine Life Management Program, Escape Systems, Joint Mission Planning System updates, Link 16 Digital Interoperability (DI) integration, Operational Flight Program (OFP) block upgrades to mission and communication systems, navigation equipment, weapons carriage, countermeasures, and the Obsolescence Replacement/Readiness Management Plan. Additionally, the Department is requesting \$43.6 million in APN funds to continue the incorporation of Obsolescence Replacement/Readiness Management Plan systems, electrical and

structural enhancements, inventory sustainment and upgrade efforts to offset obsolescence and attrition, LITENING Pod upgrades, F402-RR-408 engine safety and operational changes, and DI upgrades that include Link 16.

The AV-8B continues to deploy in support of operational contingencies and each Marine Expeditionary Unit (MEU) deploys with embarked AV-8Bs. The AV-8B equipped with LITENING targeting pods and a video downlink to ROVER ground stations, precision strike weapons, Intrepid Tiger II Electronic Warfare (EW) pods and beyond visual range air-to-air radar guided missiles, continues to be a proven, invaluable asset for the Marine Air Ground Task Force (MAGTF) and Joint commander across the spectrum of operations. AV-8B squadrons, both land- and sea-based, have flown more than 10,000 hours of strike sorties against Islamic State in Iraq and Syria with an average combat radius of 900 miles. Digital Improved Triple Ejector Racks have allowed us to load up to six precision guided munitions per aircraft, with fuel tanks, guns, and LITENING Pods, exponentially increasing the combat viability of this platform. Airborne Variable Message Format terminals are currently being installed in AV-8B to replace the current digital-aided Close Air Support (CAS) technology. The program will continue development of the H6.2 OFP which includes initial integration of Link 16 message sets. Additionally, this OFP will integrate Federal Aviation Administration compliant Navigation Performance/Area Navigation capability, an update to the LITENING Common OFP to implement improvements to moving target tracking, and correction of software deficiencies identified through combat operations. The program will also work on the H7.0 OFP which will integrate full Link 16 functionality. As an out-of-production aircraft, the AV-8B program continues to focus on sustainment efforts to mitigate significant inventory shortfalls, maintain airframe integrity, achieve full Fatigue Life Expended, and address reliability and obsolescence issues of avionics and sub-systems.

Operations Odyssey Dawn, Odyssey Lightning, Enduring Freedom, Freedom Sentinel, and today's Operation Inherent Resolve confirm the expeditionary advantages of Short Take-Off and Vertical landing (STOVL) capabilities. Placing the Harrier as the closest multi-role fixed-wing asset to the battlefield greatly reduces transit times to the fight and enables persistent CAS without strategic tanking assets. Airframe sustainment initiatives, capability upgrades, and obsolescence mitigation is essential and must be funded to ensure the AV-8B remains lethal and relevant.

F-35 Lightning II

The F-35 Lightning II will form the backbone of U.S. air combat superiority for decades to come. The F-35 brings unprecedented low observable technology, modern weaponry, and electronic warfare capability to the Navy and Marine Corps. Delivering this transformational capability to front-line forces as soon as possible remains a top priority. The F-35 will replace legacy tactical fighter fleets of the Navy and Marine Corps with a dominant, multirole, fifth-generation aircraft, capable of projecting U.S. power and deterring potential adversaries. The Fiscal Year 2018 President's Budget requests \$550 million in RDT&E to support system design and development close-out and ramp-up Follow-on Modernization and \$3.9 billion in APN for 20 F-35B aircraft, 4 F-35C aircraft, modifications and spares.

The F-35 has flown over 70,000 flight hours, including approximately 27,000 for the F-35B and 7,000 hours for the F-35C. Marine Fighter Attack Squadron (VMFA) 121, the first IOC squadron, is now forward deployed in Japan defending the Nation's interests abroad. In 2018, the Navy and Marine Corps team will deploy two MEUs with a detachment of F-35Bs aboard ship marking the first extended at sea deployments for F-35. The fielding of the Marine Corps' F-35B STOVL variant continues to make excellent progress due to the combined efforts of the Department, industry, and Congress. Critical Military Construction (MILCON) at our bases and air stations is underway both at home and overseas to support this fifth generation capability. Due to the level of effort, funding, and timely MILCON, the Marine Corps' transition plan remains on-track. VMFA-211 stood up in July 2016 on Marine Corps Air Station, Yuma, AZ and the Marine Corps' will transition its third operational squadron, VMFA-122, to the F-35B in 2018.

The F-35B achieved a number of operational and training milestones. Operationally, the Marine Corps has permanently stationed an F-35B squadron in Japan, conducted trans-oceanic flights across both the Atlantic and Pacific, and exercised the expeditionary capability of the aircraft both aboard ship and in austere environments. In training, Marine Corps has seen return on training investments. The first two F-35B pilots graduated flight school and have conducted sustained training operations across the range of military operations, including participation in large-scale joint exercises like "Red Flag". Pilots and instructors continue to praise the

F-35 situational awareness and lethality as it achieves mission success previously unrealized in legacy platforms.

The Navy's first F-35C squadron begins transition in 2018. Navy IOC is event-driven and expected in the late 2018 to early 2019 timeframe. The first F-35C aircraft carrier deployment is planned for 2021. The Marines begin their first F-35C squadron transition, VMFA-314, in 2018, will be ready for expeditionary operations by 2020 and deploy aboard a carrier in 2022. Together, the Navy and Marine Corps will be operational in 2020 and replace our aging aircraft inventory with the greatest practical speed. The F-35B/F-35C aircraft will help recapitalize some of our oldest aircraft—our legacy F/A-18s—which are rapidly approaching the end of their service lives.

F-35 employs a block upgrade program to usher in new and advanced war-fighting capabilities. Whether the mission requires the execution of strike, CAS, counter air, escort, or EW, this aircraft is the key to our future. It empowers our maritime forces to fight from sea bases and expeditionary bases ashore anywhere in the world. However, to take full advantage of the aircraft's advanced capabilities and to keep the transition from legacy platforms on-track, this effort requires the continuation of the support received from Congress thus far.

The F-35 continues to mature and progress with programs in development and design, flight test, production, fielding, base stand-up, sustainment of fielded aircraft and stand-up of a global sustainment enterprise. The final system development and demonstration configuration, Block 3F, is finishing its final developmental test flights and our overall assessment is that steady progress continues to be made on all aspects of the program, although not without risk in software development and integration. This risk will continue to decline as the Department learns and makes adjustments. The discipline instilled several years ago in the method by which software is developed, lab tested, flight tested, measured and controlled has resulted in improved and more predictable outcomes.

The program has delivered over 230 aircraft to test, operational, and training sites, with the production line delivering F-35s on schedule. It remains a clear and prominent priority for the Department to complete the development phase on cost and schedule. DON is committed to drive aircraft production cost and life-cycle costs down. As examples of cost reduction efforts, combined government and industry teaming has reduced aircraft production costs through "blueprint for affordability" initiatives and reduced F135 engine costs through ongoing engine "war on cost" strategies.

These affordability efforts include up-front contractor investments in cost reduction initiatives that are mutually agreed upon by the government and contractor team. This arrangement motivates contractors to accrue savings as quickly as possible in order to recoup their investment, and benefits the government by realizing cost savings at the time of contract award. The Department's goal is to reduce the flyaway cost of the USAF F-35A to between \$80 and \$85 million dollars by 2019, which is anticipated to also decrease the cost to the Marine Corps F-35B and Navy F-35C variants. The Department set a goal of decreasing overall operating and support life-cycle cost by 30 percent.

Next Generation Air Dominance (NGAD) Family of Systems

The Department initiated a Next Generation Air Dominance (NGAD) Analysis of Alternatives (AoA) in January 2016 to address the anticipated retirement of the F/A-18E/F and EA-18G aircraft beginning in late 2020 early 2030 timeframe.

The Joint Chiefs of Staff approved the Initial Capabilities Document that frames NGAD study requirements to support the full range of military operations from carrier-based platforms. The AoA will consider the widest possible range of materiel concepts while balancing capability, cost/affordability, schedule, and supportability. It will assess manned, unmanned, and optionally manned approaches to fulfill predicted 2030+ mission requirements. Analyses will consider baseline programs of record (current platforms), evolutionary or incremental upgrades to baseline programs (including derivative platforms), and new development systems or aircraft to meet identified gaps in required capability.

STRIKE FIGHTER INVENTORY MANAGEMENT

Through 2009, the Department's Strike Fighter force was relatively healthy. Several events transpired since 2009, however, which drove our current Strike Fighter inventory shortfall. The Budget Control Act of 2011 started multiple years of reduced military funding and F-35B/C fielding plans were delayed. As a result, the DON decided to extend the life of legacy F/A-18A-Ds using our aviation depots. Sequestration led to furlough and a hiring freeze of a skilled government civilian artisan workforce at aviation depots, significantly impacting depot throughput and fleet

readiness along with other factors such as high utilization rates, lack of aircraft procurement and lack of spare parts. Throughout this period, the operational demand for Naval Aviation forces remained high and accelerated the consumption of existing fleet aircraft. In essence, consumption of aircraft exceeded the new and rework production capacity of aircraft and caused an increasing shortfall.

The Naval Aviation Enterprise (NAE) aggressively tackled Strike Fighter Inventory Management (SFIM) to ensure that deployed forces are properly manned, trained and equipped. Each budget year, the NAE attempts to harmonize available funding between flying hours and readiness enabler accounts in order to achieve the greatest return on investment towards improved readiness.

Under the current budget and with Secretary Mattis' focus on readiness, aviation spares and readiness enabler accounts are receiving improved funding levels. It is important to note, however, that years of underfunding cannot be corrected in one budget year and will require stable, predictable funding over multiple years to achieve positive results. This shortfall will take time and likely require several years to correct.

The DON has accepted significant risk in SFIM. The Department remains challenged with planning for F/A-18A-D and AV-8B aircraft that reach the end of their service life before replacement aircraft (F-35B/C or follow on F/A series) can be delivered into service. Fiscal year 2018 investments begin to address the gap between the Strike Fighter inventory forecasts and Global Force Management Allocation Plan (GFMAP) demands by fully funding depot capacity. Near-to-mid-term risk remains due to uncertainty in readiness accounts and procurement levels that fail to match Strike Fighter service life consumption. Mid-to-long-term risk is driven by a shortfall in tactically relevant aircraft to replace F/A-18E/Fs that are soon to be inducted into commercial depots for SLM. Long-term risk is driven by Strike Fighter procurement that fails to match Strike Fighter service life consumption and attrition.

SFIM should be viewed in two separate and distinct phases. The near-term challenge is managing a DON Tactical Aviation (TACAIR) force that has been reduced in capacity through a combination of historically high TACAIR utilization rates, constrained resourcing of sustainment and enabler accounts resulting in inadequate availability of spare parts, F/A-18 depot production falling short of the required output, and reduced Strike Fighter aircraft procurement. TACAIR aviation depots are expected to continue to improve productivity through 2019. In 2019, the focus will shift toward F-35 repair and begin to support F/A-18E/F SLM. In a similar effort to increase Harrier aircraft availability, the Marine Corps conducted a Harrier Independent Readiness Review which identified a need for changes in the Harrier sustainment plan to achieve required flight line and inventory readiness. This year, with sufficient resources, the Department is implementing these changes to return Harrier readiness to the required T 2.0 levels.

In the far-term, Strike Fighter inventory is predominantly affected by new procurement of F-35B/Cs and F/A-18E/Fs, as well as the F/A-18E/F SLM of our current fleet. CCDR driven operational demand, Fleet Response Training Plans and readiness requirements are expected to continue to drive increased Strike Fighter utilization rates that outpace procurements.

The DON program of record is 680 F-35 aircraft. The Navy F-35C requirement is 340 aircraft, which includes 67 Marine Corps F-35C aircraft. Due to evolving circumstances, the total Marine Corps F-35 requirement is 420 aircraft; 353 F-35Bs and the 67 F-35Cs. The Navy and Marine Corps will continue to modify transition plans to take advantage of any possible F-35 accelerated procurement. Due to delays in the F-35 program and a changing threat environment, sustainment and modernization funding will be required to maintain the relevant operational capability of the F/A-18A-F and the AV-8B.

Strike-Fighter Force Structure

The 1,174 aircraft Strike Fighter force provides the projected DON inventory needed to support the anticipated operational demand of nine CVWs through the 2025 timeframe. The Navy inventory requirement of 779 aircraft supports 36 Active Duty DON Strike Fighter squadrons (with a mix of 10-12 aircraft per squadron). This requirement includes four Marine Corps Strike Fighter squadrons and is composed of 396 aircraft and two Reserve squadrons with 22 total aircraft assigned. In order to maintain the operational aircraft, support aircraft are required for aviator training, flight-test, attrition Reserve and the depot pipeline. This inventory entitlement is estimated based on historical averages and supports the validated requirement of four Strike Fighter squadrons per CVW. Through detailed analysis, inspections and structural repairs, the DON has been successful in extending F/A-18 A-D aircraft to 8,000 flight hours to 2,000 flight hours beyond the original designed

service life. Future inventory projections are based on a service life extension for F/A-18E/F aircraft to 9,000 flight hours from the current design life of 6,000 flight hours.

The Department's F-35C Strike Fighter program requires 14 Active Navy squadrons, four Active Marine Corps squadrons, and two training squadrons. The F/A-18E/F capabilities complement the F-35C and enhance the overall carrier-based warfighting capabilities. This force structure supports the operational demand per the GFMAP and projected aircraft carrier deployments. The Marine Corps' F-35B Strike Fighter program requires 14 Active, 2 Reserve and 2 training squadrons. Integral to DON's current force structure reductions, tactical aviation squadrons were restructured to optimize the support they provide to the MAGTF and the Joint force.

PHYSIOLOGICAL EPISODES

The status of DON efforts to address Physiological Episodes can be found at Addendum A.

AIRBORNE ELECTRONIC ATTACK (AEA)

Next Generation Jammer (NGJ)

The Next Generation Jammer (NGJ) is the follow-on to the Vietnam-era AN/ALQ-99 initially fielded in 1971. The ALQ-99 has reached its capability limit both technologically and materially and is challenged against modern state-of-the-art computerized surface-to-air missiles systems. NGJ is designed to provide improved capability in support of Joint and coalition air, land and sea tactical strike missions and is critical to Navy's vision for the future of strike warfare. It will be DOD's only comprehensive tactical airborne electronic attack platform and is required to meet current and emerging threats. NGJ will use Active Electronically Scanned Array technology to provide full-spectrum dominance, the ability to jam multiple frequencies at the same time, higher radiated power, increased precision, and the application of digital techniques to counter increasingly advanced and sophisticated adversary radars and communications systems. NGJ will be implemented in three increments: Mid-Band (Increment 1), Low-Band (Increment 2), and High-Band (Increment 3).

Our fiscal year 2018 budget request of \$632.9 million RDT&E,N is vital to maintain Increment 1 schedule, continue procurement and assembly of the Engineering and Development Models, and commence developmental flight testing. In addition, \$66.7 million RDT&E,N is requested to complete Increment 2 technology feasibility studies and initiate technology demonstration efforts.

MAGTF Electronic Warfare / EA-6B Prowler

The Fiscal Year 2018 President's Budget request includes \$29.6 million in RDT&E,N and \$10.1 million in APN for MAGTF EW.

The MAGTF EW approach to Electromagnetic Spectrum Operations (EMSO) is a distributed, platform-agnostic strategy where every platform contributes and functions as a sensor, shooter and sharer to include EW. Marine Aviation is integrating EW systems and Intrepid Tiger II (IT II) payloads across all aviation platforms to provide commanders with an organic and persistent airborne EW capability—for every MAGTF—large and small. Included in this plan are the IT II EW payload, the F-35s organic EW capabilities, and the EW Services Architecture network to facilitate collaborative EW Battle Management.

IT II is a precision EW system providing EW Support and Electronic Attack capabilities. IT II has been integrated on the AV-8B, F/A-18A-D, and UH-1Y. Since 2012 IT II has completed over 20 deployments, and is currently deployed with the 11th, 24th, and 31st MEUs. Future aviation platforms for IT II integration are the MV-22B, KC-130J, AH-1Z, CH-53K, and RQ-21. Development of an IT II counter-radar capability began in fiscal year 2016 and will be fielded on the AV-8B, F/A-18A-D, and MV-22B from fiscal years 2020-2022. The F-35 brings a powerful combination of EW, weapons, sensors, and reduced signature to the MAGTF.

Currently, there are 18 EA-6Bs distributed to two Marine Corps operational squadrons, one deactivating Marine Corps squadron, and one Navy flight test squadron. Final retirement of the EA-6B from the DON inventory will be in fiscal year 2019.

Future aviation EW capabilities will also be provided by the MAGTF Expeditionary Unmanned Aviation System (MUX). In addition to providing persistent reconnaissance, surveillance and communications, MUX will also provide a long range, persistent, penetrating and responsive airborne EMSO capability.

OTHER ELECTRONIC WARFARE INQUIRIES

Responses to Congressional requests for updates on electronic warfare can be found at Addendum B.

AIRBORNE EARLY WARNING AIRCRAFT

E-2D Advanced Hawkeye (AHE)

The E-2D AHE is the Navy's carrier-based Airborne Early Warning and Battle Management Command and Control system. The E-2D AHE provides Theater Air and Missile Defense and is capable of synthesizing information from multiple on-board and off-board sensors, making complex tactical decisions and then disseminating actionable information to Joint Forces in a distributed, open-architecture environment. E-2D is also a cornerstone of the Naval Integrated Fire Control—Counter Air system of systems capability.

Utilizing the newly developed AN/APY-9 Mechanical/Electronic Scan Array radar and the Cooperative Engagement Capability system, the E-2D AHE works in concert with tactical aircraft and surface-combatants equipped with the Aegis combat system to detect, track and defeat air and cruise missile threats at extended ranges.

The Fiscal Year 2018 President's Budget requests \$292.5 million in RDT&E,N for continuation of added capabilities, to include Aerial Refueling, Secret Internet Protocol Router chat, Advanced Mid-Term Interoperability Improvement Program, Multifunctional Information Distribution System /Joint Tactical Radio System Tactical Targeting Network Technology, Counter Electronic Attack, Sensor Netting, and Data Fusion, Navigation Warfare, Fighter to Fighter Backlink, ALQ217 Electronic Support Measures, and Crypto Modernization/Frequency Remapping. In the fifth year of a 26 aircraft Multi-Year Procurement (MYP) contract covering fiscal years 2014–2018, the budget also requests \$835.9 million in APN for five FRP Lot 6 aircraft and Advance Procurement for Fiscal Year 2019 FRP Lot 7 aircraft.

ASSAULT SUPPORT AIRCRAFT

MV-22/CMV-22

The Fiscal Year 2018 President's Budget requests \$171.4 million in RDT&E,N for continued product improvements, including continued development of a Navy variant, the CMV-22B; and \$706.7 million in APN for procurement of 6 Lot 22 CMV-22s.

The DON begins procurement of the Navy CMV-22B variant in support of the Carrier On-Board Delivery mission in fiscal year 2018 which represents the first year of the next V-22 MYP contract (MYP III). The proposed follow-on MYP III contract will span seven years (fiscal years 2018–2024) and buy out the remaining domestic aircraft program of record. Fiscal Year 2018 President's Budget requests will fully fund Lot 22 and procure long-lead items for fiscal year 2019 Lot 23 CMV-22 aircraft. The request also includes \$228.3 million to support Operations and Safety Improvement Programs (OSIPs), including Correction of Deficiencies, Readiness improvements, Common Configuration, and Aerial Refueling.

MV-22 Osprey vertical flight capabilities, coupled with the speed, range, and endurance of fixed-wing transports, continue to enable effective execution of current missions that were previously unachievable. The MV-22 fleet continues executing at a high operational tempo consisting of multiple MEU deployments and two Special Purpose MAGTF—Crisis Response (SPMAGTF—CR) deployments in support of AFRICOM and CENTCOM. During 2016, the 15th of 18 planned Active component squadrons met Full Operational Capability (FOC), with the 16th scheduled for FOC in June 2017. This marks the beginning of MV-22 capacity catching up to operational demand requirements. To date, 293 of 360 MV-22s have been delivered and 52 of 53 AFSOC CV-22s have been delivered. The V-22 program focus establishes a third MYP for production aircraft, sustains Fleet aircraft, improves aircraft readiness, reduces operating costs, and expands the domestic and international business base. Both the MV-22 and CV-22 continue to meet all cost, schedule and performance requirements.

MYP III continues affordable procurement, provides stability to industry and maintains a production line and contractual foundation to attract future V-22 international sales/customers. Continuing procurement under a MYP is particularly beneficial to the supplier base. It provides long-term stability and generates lower costs that may provide incentive for international V-22 customers. The program's first Foreign Military Sales program, 17 aircraft with the Government of Japan, was established under MYP II. The final four (of 17 aircraft) are planned to be included in the fiscal year 2018 procurement contract.

Due to extremely high CCDR MV-22 demand and operational tempo, the mission capability (MC) aircraft readiness rates have not improved as desired. The primary contributor to lower than planned MC rates is our ability to train and retain enlisted maintainers with the requisite qualifications needed to sustain the high demand. An equally important secondary contributor is related directly to multiple MV-22 configurations. In an attempt to increase overall readiness, the Marine Corps reduced each of the SPMAGTF-CR to a 0.5 VMM squadron footprint. The Marine Corps plans to allow the “remain behind” element necessary time to develop and train personnel for future deployments and improve the overall MV-22 readiness and MC rates.

Marine Aviation commissioned an Osprey Independent Readiness Review which identified a number of factors driving down MV-22 readiness. The major factor identified was the excessive number of aircraft configurations that resulted from years of concurrently incorporating engineering changes and reliability improvements during aircraft production. The Department’s “Common Configuration, Readiness and Modernization” plan will streamline the total number of MV-22 configurations from 77 to three, simplify the supply system, reduce the number of technical manuals and improve troubleshooting and maintenance procedures. This will decrease maintenance man-hours, increase aircraft availability and reduce total operating costs by approximately \$1.5 billion. The Fiscal Year 2018 OSIP provides a necessary and stable source of crucial modification funding as the program continues to implement these readiness and cost reduction initiatives.

Along with the readiness and support initiatives, the Department is adding new capabilities to the MV-22 that will make it more valuable to the CCDRs such as the development of MV-22 Aerial Refueling System which will enable the MV-22 to deliver fuel to other airborne platforms. This is a critical enabler for both shore and sea-based operations and will extend the operational reach of deployed MAGTFs. Initial capability is planned to deliver by the summer of 2019.

Another transformative capability for the entire aviation force is the continued development and integration of Digital Interoperability (DI). A limited DI objective experiment was conducted utilizing a deployed MEU. The results showed promise and informed continued development of this capability. Initial DI fielded capability will consist of a suite of electronics to allow the embarked troop commander and aircrew to possess unprecedented situational awareness via real-time transmission of full motion video and other data generated by multiple air and ground platforms throughout the battlespace. This DI suite will also be able to collect, in real time, threat data gathered by existing aircraft survivability equipment and accompanying attack platforms, thereby shortening the kill-chain against ground and air based threats.

The MV-22 is the assault support platform of choice for all CCDRs. From MEUs to SPMAGTF-CR, the speed, range, and aerial refueling capability allow the Osprey to remain postured in strategic locations throughout the world, ready and poised to quickly support Marines Corps operations wherever they are required.

CH-53K Heavy Lift Replacement Program

The Fiscal Year 2018 President’s Budget requests \$341.0 million in RDT&E,N to continue the Engineering Manufacturing Development (EMD) phase of the CH-53K program and \$756.4 million in APN for Low Rate Initial Production (LRIP) Aircraft (Lot 2), including Advance Procurement and initial spares.

The CH-53K achieved Milestone C, receiving an Acquisition Decision Memorandum April 3, 2017, authorizing LRIP. To date, four Engineering Development Model aircraft have accumulated over 450 test flight hours, completed the first ‘Operational Test Assessment’ ahead of schedule and set a U.S. Heavy Lift record with an 89.5K Maximum Gross Weight lift.

During fiscal year 2018, the program will continue to execute developmental test flights, complete the relocation of test assets to NAS Patuxent River, and take delivery of System Demonstration Test Article (SDTA) aircraft (production representative aircraft utilized for Operational Test). Three of the four SDTAs will deliver to NAS Patuxent River to supplement the remainder of developmental test. Marine Test and Evaluation Squadron One will take delivery of the balance of aircraft at Marine Corps Air Station (MCAS) New River to execute publication and maintenance demonstrations prior to Operational Test & Evaluation.

The CH-53K will provide land and sea based heavy-lift capabilities not resident in any of today’s platforms and contribute directly to the increased agility, lethality, and presence of joint task forces and MAGTFs. The CH-53K can transport 27,000 pounds of external cargo out to a range of 110 nautical miles under the most extreme operational conditions, nearly tripling the CH-53E’s lift capability under similar environmental conditions, while fitting into the same shipboard footprint.

The CH-53K will provide an unparalleled lift capability under high-altitude and hot weather conditions and greatly expand the CCDRs operational reach and flexibility.

Compared to the CH-53E, maintenance and reliability enhancements of the CH-53K will improve aircraft availability and ensure cost effective operations. Additionally, survivability and force protection enhancements will dramatically increase protection for both aircrew and passengers. Expeditionary heavy-lift capabilities will continue to be critical to successful land and sea-based operations in future anti-access, area-denial environments, enabling sea-basing and the joint operating concepts of force application and focused logistics.

CH/MH-53E

As the CH-53E approaches 30 years of service, the community has accumulated over 95,000 combat flight hours in support of various combat operations. The unprecedented operational demand of this aircraft (peaking at three times the published utilization rate) has degraded the material condition of our heavy lift assault support aircraft sooner than expected. This makes them more challenging to maintain and underscores the importance of its replacement, the CH-53K King Stallion. We have instituted a fleet wide "reset" of the CH-53E inventory to ensure we extract maximum utility and readiness until the transition to the CH-53K occurs.

The MH-53E continues to perform its primary mission of airborne Mine Countermeasures (MCM) as well as transport of cargo and personnel. Over the past 12 years the MH-53E community has accumulated 84,131 flight hours. It too is approaching 30 years of service life and continues to be a challenging asset to maintain. MCM operations put added stress on these airframes. These aircraft are planned to remain in service until they are replaced by the Littoral Combat Ship (LCS) with its MCM mission package systems.

To keep the CH-53E and MH-53E viable through their remaining services lives, the 2018 President's Budget requests \$37.0 million in APN and \$5.1 million in RDT&E,N. The requested funding provides for critical capabilities, including Condition Based Maintenance software upgrades, finishing Kapton wiring replacement installations, improved engine nacelles, non-recurring engineering cockpit upgrades, Embedded Global Positioning System/Inertial Navigation System, T-64 engine reliability improvements, critical survivability upgrades, satellite communications kits and Phase I of CH-53E's Degraded Visual Environment capability. These critical safety and avionics upgrades will address obsolescence issues within the cockpit and increase overall situational awareness and mission effectiveness.

ATTACK AND UTILITY AIRCRAFT

UH-1Y / AH-1Z

Marine Corps Venom and Viper utility and attack aircraft have been critical to the success of the Marines in harm's way and have flown over 162,000 hours over the past decade. The Fiscal Year 2018 President's Budget requests \$61.3 million in RDT&E,N for continued product improvements and \$822.4 million in APN for 22 AH-1Z aircraft and system improvements. This budget reflects a deliberate decision to fund readiness through a five aircraft procurement reduction.

As of April 2017, 210 aircraft are operational within the Marine Force (146 UH-1Ys and 64 AH-1Zs). An additional 72 aircraft are on contract and in production, to include the first three of 12 Pakistan Foreign Military Sales aircraft. Lot 1-7 (fiscal years 2004-2010) aircraft deliveries are complete for both the UH-1Y and AH-1Z. Lot 8, 9, and 10 (fiscal years 2011-2013) deliveries are complete for the UH-1Y. Lot 11 UH-1Y deliveries are in progress and ahead of schedule. Additionally, the Czech Republic signed a Letter of Request for Letter of Acceptance in April 2017 for 12 UH-1Ys, which will be placed on contract in fiscal year 2018.

The H-1 Upgrades program is integrating both the UH-1Y and AH-1Z into the DI environment established throughout the MAGTF. With the integration of IT II EW pod, the Marine Corps' Light Attack Helicopter Squadron community will be able to provide MAGTF commanders with all six functions of Marine Aviation, further increasing capability and flexibility. Additionally, these aircraft will incorporate Software Reprogrammable Payloads (SRP), which enables utilization of diverse networks and waveforms, thereby enabling maneuverability within the EW spectrum. SRP will employ systems such as Link-16, Tactical Targeting Network Technology, Adaptive Networking Wideband Waveform, and the Soldier Radio Waveform.

MH-60 (Overview)

MH-60 Seahawks have consistently met readiness and operational commitments. There will be 38 Navy Seahawk squadrons, with 275 MH-60S and 280 MH-60R aircraft, when transitions from the SH-60B, SH-60F, and HH-60H are complete. The last MH-60S delivered in January of 2016 and MH-60R deliveries are projected to

continue into fiscal year 2018. The production program continues to deliver on cost and on schedule. Over the last twelve years of combat operations, deployed ashore and aboard our aircraft carriers, amphibious ships, and surface combatants at sea, Navy H-60 helicopters have provided vital over-watch and direct support to troops in combat across multiple theaters of operation and a variety of mission areas; including support for Surface Warfare (SUW), Anti-submarine Warfare (ASW), special operations forces, mine warfare, logistics support and humanitarian assistance/disaster relief.

The MH-60R Multi-Mission Helicopter provides Carrier Strike Group protection and adds significant capability in its primary mission areas of ASW, EW and SUW. The MH-60R is the sole organic air ASW asset in the Carrier Strike Group and serves as a key contributor to theater level ASW. The MH-60R also employs advanced sensors and communications to provide real-time battlespace management with a significant, active or passive, over-the-horizon targeting capability, as well as Fast Attack Craft/Fast In-shore Attack Craft threat response capabilities. Secondary mission areas include Search and Rescue, Vertical Replenishment, Naval Surface Fire Support, Logistics Support, Personnel Transport and Medical Evacuation.

The MH-60S supports Carrier and Expeditionary Strike Groups, Combat Logistics Ships, and LCS Surface Warfare and Mine Countermeasures variants in the mission areas of SUW, Strike Warfare, Combat Search and Rescue, Vertical Replenishment.

The Fiscal Year 2018 President's Budget requests \$11.3 million in RDT&E,N across the FYDP for an MH-60S SLAP. SLAP will inform the Department on what will be required to extend the MH-60S airframe service life beyond 2030. The program will initially focus on the air vehicle and include a Fatigue Life Assessment, Dynamic Component, and Subsystem Analysis to inform SLEP requirements.

The Budget request includes \$5.4 million in RDT&E,N to support the MH-60 test program and other improvements. The MH-60 test program consists of numerous system upgrades and Pre-Planned Product Improvements, and include the Multifunctional Information Distribution System—Low Volume Terminal Block Upgrade 2, the VHF Omnidirectional Ranging/Instrument Landing System, System Configuration 18 enhancements, MH-60S fixed forward-firing weapon/rocket corrections of deficiencies, and commencement of initial studies for a MH-60 Mid-Life Upgrade. These investments improve MH-60S lethality and provide forward-deployed capabilities to defeat area-denial strategies and allow joint forces to project and sustain power.

EXECUTIVE SUPPORT AIRCRAFT

VH-3D/VH-60N Executive Helicopter Series

The VH-3D and VH-60N are safely performing the Executive Lift mission worldwide. As these aircraft continue to provide seamless vertical lift for the President of the United States, the DON works closely with HMX-1 and industry to sustain these aircraft until a Presidential Helicopter Replacement platform (VH-92A) is fielded.

The Fiscal Year 2018 President's Budget requests an investment of \$38.8 million of APN to continue programs that will ensure the in-service Presidential fleet remains safe and reliable. Ongoing efforts include a Communications Suite Upgrade (Wide Band Line of Sight) that provides persistent access to the strategic communications network, the continuing Structural Enhancement Program necessary to extend the service life, and Obsolescence Management needed to sustain and improve system readiness for both VH-60N and VH-3D platforms. The Cabin Interior and Environmental Control System upgrade is a critical obsolescence management effort for the VH-3D, reducing aircraft operational weight and improving maintainability. Where appropriate, technology updates for legacy platforms will be directly leveraged for the benefit of the VH-92A program.

VH-92A Presidential Helicopter Replacement Aircraft

The Fiscal Year 2018 President's Budget requests \$451.9 million in RDT&E,N to continue Engineering Development Model (EDM) activities, to include, contractor test for airworthiness certification and modifications of EDM and System Demonstration Test Article aircraft. The Sikorsky S-92A aircraft will be used to execute the acquisition strategy of integrating mature subsystems into an air vehicle that is currently in production. Significant progress has been made in the past year: completion of the System Critical Design Review in July 2016; continued progress of the test aircraft build with first flight and Contractor Test beginning July 2017; and the projected induction of the first of four S-92A aircraft into the modification process

in May to become the SDTA aircraft that will support IOC. Government ground and flight testing is planned to commence in 2018. The first four of the planned operational inventory of 21 aircraft are planned to achieve IOC in 2020.

FIXED-WING AIRCRAFT

KC-130J

The DON continues to procure two KC-130Js per year, and will continue product improvements. Targeted improvements include aircraft survivability through advanced electronic countermeasure modernization and obsolescence upgrades to the Harvest HAWK ISR/Weapon Mission Kit.

Fielded throughout our Active force, the KC-130J brings increased capability, performance and survivability with lower operating and sustainment costs for the MAGTF. Forward deployed in support of ongoing operations since 2005, the KC-130J continues to deliver Marines, fuel and cargo whenever and wherever needed. Today, the KC-130J remains in high demand, providing tactical air-to-air refueling, assault support, CAS and Multi-sensor Imagery Reconnaissance (MIR) capabilities in support of SPMAGTFs and deployed MEUs.

First deployed in 2010, the roll-on/roll-off Harvest HAWK Mission Kit for the KC-130J continues to provide extended MIR and CAS capabilities. With almost 7,000 hours flown, 210 Hellfire missiles, and 91 Griffin missile combat engagements, this expeditionary mission kit has proven its worth and made the KC-130J even more indispensable for Marines on the ground. All six mission kits have been fielded, and the requested funding in the fiscal year 2018 budget request will be used to maintain operational relevance of this mission system through compatibility with additional Hellfire variants and an improved full motion video data-link.

The Marine Corps has funded 66 of the 79 KC-130J aircraft through the current FYDP. The 3 aircraft included in the fiscal year 2013 budget would have completed the Active Component (AC) requirement of 51 aircraft. However, in 2014 the Marine Corps began using the AC backup aircraft to accelerate the Reserve Component (RC) transition from the legacy KC-130T aircraft to the more capable and efficient KC-130J. The aircraft requested in the Fiscal Year 2018 President's Budget will continue to increase KC-130J inventory as we strive to achieve FOC in the RC. Delays in procurement would force the Marine Corps to sustain the KC-130T aircraft longer than planned at an increased cost and incur additional manpower issues.

It is also important to note that the USAF C-130J procurement is anticipated to end in 2023. If the Marine Corps procure KC-130Js at a rate of two per year, we will have approximately ten aircraft remaining to procure after fiscal year 2023 in order to reach the POR of 79 aircraft. The loss of USAF aircraft quantities and the uncertainty of additional Foreign Military Sales may result in a significant unit cost increase for these final aircraft.

MARITIME SUPPORT AIRCRAFT

P-8A Poseidon

The P-8A Poseidon recapitalizes the ASW, Anti-Surface Warfare (ASuW) and armed ISR capabilities from the aging P-3C Orion. The P-8A combines the proven reliability of the commercial 737 airframe with avionics that enable integration of modern sensors and robust military communications. The first P-8A operational deployment was completed in June 2014, with continuous deployments to both 7th Fleet and 6th Fleet underway. As of April 2017, seven of twelve fleet squadrons have completed transition and an eighth is underway. All squadrons are scheduled to complete transition by fiscal year 2020. The P-8A program is meeting all cost, schedule and performance parameters in accordance with the approved Acquisition Program Baseline. It has achieved and surpassed reliability standards for operational availability and delivered forward commanders unprecedented capability.

Each of the 54 fleet aircraft delivered early or on time. Lot 6 and Lot 7 are under contract, including eight aircraft for the Royal Australian Air Force, our cooperative partner. Lots 8-10 will include nine aircraft for the United Kingdom and five for the Royal Norwegian Air Force. In fiscal year 2018, our request is for \$1.386 billion in APN for seven aircraft and \$181.7 million in RDT&E,N for aircraft updates to include the addition of Networked Enabled Weapons capabilities.

The first planned upgrade for the P-8A, Increment 2, added a broad-area, multi-static acoustic (MAC) ASW capability to the aircraft. This capability significantly increased the P-8A ASW search rates in harsh, littoral environments. The capability is scheduled to receive regular incremental upgrades over the next five years in order to pace the threat and improve the aircraft's search capability. MAC completed Follow-On Operational Test & Evaluation in April 2015 and has been deliv-

ered to the Fleet. Separately, Increment 2 integrates a High Altitude ASW Weapons Capability under a contract awarded in December 2014, in support of a planned 2020 fleet introduction.

P-3C Orion

The aging P-3C fleet will continue to provide critical ASW, ASuW and ISR support for operations worldwide until the fleet completes transition to P-8A. The fiscal year 2018 budget request provides \$0.7 million to manage P-3C aircraft mission systems obsolescence and \$1.4 million to fund the P-3 Fatigue Life Management Program in order to maintain sufficient capacity to complete the transition to P-8A.

EP-3 Aries

The EP-3E Aries is the Navy's only Maritime ISR and Signals Intelligence (SIGINT) platform. The Joint Airborne SIGINT Common Configuration includes Multi-INT sensors, robust communication, and data links employed by the venerable P-3 air vehicle to ensure effective fleet support across the full spectrum of military operations. The Fiscal Year 2011 National Defense Authorization Act directed the Navy to sustain EP-3E airframe and associated mission systems to minimize SIGINT capability gaps until the systems are fully recapitalized with a system or family of systems that in aggregate provide equal or better capability and capacity. The Navy's family of systems approach to ISR shifts the focus from platforms to payloads to deliver increased capacity and persistence by the end of this decade. The EP-3 fiscal year 2018 budget request of \$14.5 million (Baseline and OCO) reduces risk compared to previous fiscal years while the Navy continues to collaborate with the Joint Staff and DOD to optimize the future of ISR.

UNMANNED AIRCRAFT SYSTEMS (UAS)

The DON has placed a priority on the development of unmanned systems leading to a fully integrated manned and unmanned fleet. Unmanned technology will not replace our sailors and marines; instead it will unlock their full potential as we integrate this technology within our total force.

MQ-4C Triton UAS

The Fiscal Year 2018 President's Budget requests \$84.1 million in RDT&E,N to continue Triton baseline development activities; \$229.4 million in RDT&E,N for Triton modernization; and \$676.3 million of APN for procurement of the third lot of LRIP aircraft and spares, retrofit of the LRIP Lot 1 aircraft to the Multi-INT configuration, and for procurement of long lead materials for the fourth lot of LRIP aircraft.

The MQ-4C Triton is a key component of the Navy Maritime Patrol Reconnaissance Force. Its persistent sensor dwell, combined with networked sensors, will enable it to effectively meet ISR requirements in support of the Navy Maritime Strategy. Triton will start establishing five globally-distributed, persistent Maritime ISR orbits beginning in fiscal year 2018, as part of the Navy's Maritime ISR&T Transition Plan. MQ-4C Triton test vehicles have completed over 110 test flights as of April, 2017, and will complete sensor and performance flight testing this fall in support of establishing an early operational capability in the Pacific next year. Milestone C was successfully completed in September 2017, and the program has entered the production and deployment phase.

The Navy currently maintains an inventory of four RQ-4A Global Hawk Block 10 UAS, as part of the BAMS Demonstrator, or BAMS-D program. These aircraft have been deployed to CENTCOM's AOR for over eight years. BAMS-D recently achieved over 23,000 flight hours in support of CENTCOM ISR tasking.

MQ-25 Stingray

MQ-25 will deliver the Navy's first carrier-based unmanned aircraft to function primarily as a mission tanker to extend the range and reach of the CVW with secondary recovery tanking and ISR capabilities. MQ-25 will reduce current use of F/A-18E/Fs as CVW tankers and extend F/A-18E/F service life. As a secondary mission, MQ-25 will provide the Carrier Strike Group Commander an organic, persistent ISR capability for maritime domain awareness. The Fiscal Year 2018 President's Budget requests \$222.2 million in RDT&E,N for MQ-25 developmental activities and the Air System Engineering and Manufacturing Development contract award.

MQ-8 Fire Scout

The MQ-8 Fire Scout is a rotary-wing system that includes two airframe types, the MQ-8B and MQ-8C. The MQ-8C is a larger, more capable and more cost-effective

tive airframe that uses the same mission control system, avionics and payloads as the MQ-8B. The system is designed to operate from any suitably-equipped air-capable ship, carry modular mission payloads, and operate using the Tactical Control System and Line-Of-Sight Tactical Common Data Link. The Fiscal Year 2018 President's Budget requests \$62.7 million of RDT&E,N to continue hardware and software modifications, payload integration, cyber vulnerability closure and safety capability improvements such as a backup landing system and collision avoidance system. The request for \$85.4 million in APN procures four MQ-8 mission control systems, MQ-8C AESA Radar kits, ancillary shipboard equipment, trainers and aircraft support equipment, technical support, modifications based on engineering changes, and logistics products to outfit suitably-equipped air-capable ships and train the associated Aviation Detachments.

The MQ-8B has completed 11 operational deployments and flown more than 16,000 operational hours, including deployments to Afghanistan, deployments on Navy Frigates, and deployments aboard LCS supporting Special Operations Forces and Navy operations. The MQ-8B is currently deployed on USS CORONADO (LCS-4) with HSC-23 in a composite aviation detachment with an MH-60S. This detachment represents the first deployment of an MQ-8B with a maritime search radar capability. HSC-21, located in San Diego, California, is currently working up for a fiscal year 2018 employment onboard USS *Independence* (LCS-2) marking the first deployment of the Coastal Battlefield Reconnaissance and Analysis MCM payload. HSC-22, located in Norfolk, Virginia, has been identified as the MQ-8 introductory squadron for the east coast and will deploy onboard the USS DETROIT (LCS-7) in early 2018.

The MQ-8C Fire Scout has flown more than 800 flight hours conducting developmental and land-based operational testing including dynamic interface testing on LCS-8 in April 2017. The program begins Initial Operational Test & Evaluation in the first quarter of fiscal year 2018. The Navy is continuing efforts to integrate an AESA radar capability into the MQ-8C and is planning to integrate the APKWS II weapon system and future MCM payloads. The Fire Scout program will continue to support integration and testing for LCS-based Surface Warfare and MCM mission modules.

Tactical Control System (TCS)

The Fiscal Year 2018 President's Budget requests \$7.8 million in RDT&E,N for the MQ-8 System's Tactical Control System (TCS). TCS provides a standards-compliant open architecture with scalable command and control capabilities for the MQ-8 Fire Scout system. In fiscal year 2018, TCS will continue transition of the Linux operating system to a technology refreshed mission control system, and enhance the MQ-8 System's Automatic Identification System and sensor track generation integration with ship systems. The Linux operating system conversion overcomes hardware obsolescence issues with the Solaris based control stations and provides lower cost software updates using DOD common application software. In addition, the TCS Linux upgrade will enhance collaboration with the Navy's future UAS Common Control System.

RQ-21A Blackjack

The Fiscal Year 2018 President's Budget requests \$13.7 million in RDT&E (\$4.8 million USN, \$8.9 million USMC); \$4.8 million in APN for support of Naval Special Warfare; and \$86.2 million in PMC for four expeditionary RQ-21A systems (which includes 20 air vehicles) to address Marine Corps ISR capability requirements. This Group 3 UAS provides persistent ship and land based ISR support for expeditionary tactical-level maneuver decisions and unit level force defense and force protection missions. Blackjack entered LRIP in 2013, completed Initial Operational Test & Evaluation in the second quarter of fiscal year 2015, and reached IOC in January 2016. FRP was approved in the fourth quarter of fiscal year 2016.

The RQ-21 completed its first combat deployments in 2016 with support to the 24th and 22nd MEU and Marine Corps Special Operations Command operations in Operation Inherent Resolve. The Blackjack has flown over 700 sorties and 3940 hours in support of the MAGTF.

The RQ-21's current configuration includes full motion video, communications relay package and automatic identification systems. The air vehicle's bay allows for rapid deployment of signals intelligence payloads. The Marine Corps is actively pursuing technological developments for the RQ-21A system in an effort to provide the MAGTF and Marine Corps Special Operations Command with significantly improved capabilities. Initiatives include over-the-horizon communication and data relay ability to integrate the system into future networked digital environments; electronic warfare and cyber payloads to increase non-kinetic capabilities; and

change detection radar and moving target indicators to assist warfighters in battlespace awareness and force application.

MAGTF Expeditionary UAS (MUX)

As the Marine Corps recapitalizes toward a more diverse, lethal, amphibious and middleweight expeditionary force, the Marine Corps will require a UAS that is network-enabled, digitally interoperable, and built to execute responsive, persistent, lethal, and adaptive full-spectrum operations. A MUX is planned to be the system that will provide the MEF/MEB-sized MAGTF with an advanced multi-mission platform.

The fiscal year 2018 budget requests \$5.0 million in RDT&E for the MUX program to conduct an AoA and begin development of an acquisition strategy; \$3.0 million in RDT&E for KMAX operations in support of MUX technology demonstrations and Concept of Operation development (included under the MUX line).

The MUX Initial Capabilities Document was approved by the Joint Requirements Oversight Council on October 4, 2016. The AoA study plan and guidance are being developed with OSD(CAPE). The AoA is projected to be completed by the fourth quarter of fiscal year 2018.

MUX supports the Marine Corps Operating Concept by significantly mitigating or eliminating the following MAGTF gaps: EW, ISR, Command, Control and Communications (C3) DI, Aerial Escort, all weather, persistent CAS and Deep Air Support, Airborne Early Warning, and Tactical Cargo Distribution. MUX will be a long range (690+ NM), persistent (24+ hours) UAS capable of complimenting MV-22 operations and operating from both sea and expeditionary bases.

Common Control System (CCS)

The Fiscal Year 2018 President's Budget requests \$39.7 million in RDT&E,N for the Common Control System (CCS). The primary mission of CCS is to provide common control across the Navy's unmanned systems (UxS) portfolio to add scalable and adaptable warfighting capability, implement robust cybersecurity attributes, leverage existing government owned products, eliminate redundant software development efforts, consolidate product support, encourage innovation, improve cost control, and enable rapid integration of UxS capabilities across all domains: Air, Surface, Sub-Surface, and Ground. CCS leverages existing Government owned software to provide UxS Vehicle Management (VM), Mission Management (MM) and Mission Planning (MP) capabilities. CCS uses an open and modular business model and is being developed initially as Government Furnished Information/Equipment for the MQ-25 and for follow-on use with Triton and Fire Scout. In fiscal year 2018, CCS Increment I will continue to perform software design, development, integration and test for VM. Concurrently, CCS Increment II will conduct MM/MP requirements development and software design.

SAFETY

Responses to Congressional requests for updates on Naval Aviation safety can be found at Addendum C.

STRIKE WEAPONS PROGRAMS

Cruise Missile Strategy

The DON has aligned its Cruise Missile Strategy along warfighter domains to pursue maximized lethality while minimizing overall costs to the taxpayer and Department.

The first tenet of our plan is to sustain the Tomahawk cruise missile inventory through its anticipated service-life via a mid-life recertification program (first quarter of fiscal year 2019 start). This recertification program will increase missile service-life by an additional 15-years (total of 30-years) and enable the Department to support Tomahawk in our active inventory through the mid-late 2040s. In concert with our recertification program we will integrate modernization and technological upgrades and address existing obsolescence issues. In addition, we are developing a Maritime Strike Tomahawk capability to deliver a long-range anti-surface warfare capability.

Second, we will field the Long Range Anti-Ship Missile (LRASM) as the air-launched Offensive Anti-Surface Warfare (OASuW)/Increment 1 material solution to meet near to mid-term anti-surface warfare threats. LRASM is pioneering accelerated acquisition processes in accordance with DOD-5000.02 (Model 4). Currently, we anticipate LRASM to meet all Joint Chiefs of Staff approved warfighting requirements, deliver on-time, and cost within approximately one-percent of its original program cost estimate.

We also plan to develop follow-on next generation strike capabilities. We intend to develop an air-launched OASuW/Increment 2 weapon to address long-term ASuW threats and a surface and submarine launched Next Generation Land Attack Weapon (NGLAW). NGLAW will have both a long-range land strike and maritime ASuW capability that initially complements, and then replaces, the highly successful Tomahawk Weapon System.

To the maximum extent possible, the DON plans to utilize common components and component technologies (e.g. navigation, communications, seeker, guidance and control) to reduce cost, shorten development timelines, and promote interoperability. Based on performance requirements and launch parameters, next generation strike capability missile airframes and propulsion systems will differ between the air-launched and sea-launched weapons.

Tactical Tomahawk (TACTOM) BLK IV Cruise Missile

The Fiscal Year 2018 President's Budget requests \$234.5 million in WPN for procurement of an additional 100 TACTOM weapons and associated support to include replacement of weapons launched in combat (Syria), \$31.7 million in OPN for the Tomahawk support equipment, and \$114.8 million in RDT&E,N for capability updates of the weapon system. WPN resources will be for the continued procurement of this versatile, combat-proven, deep-strike weapon system in order to meet ship load-outs and combat requirements. OPN resources will address the resolution of Tactical Tomahawk Weapons Control System obsolescence, Tomahawk Theater Mission Planning Center (TMPC) complexity and usability issues, interoperability, and information assurance mandates. RDT&E,N resources will be used to develop navigation system improvements and communications upgrades to improve TACTOMs performance in Anti-Access/Area Denial environments, as well as development of a seeker to enable TACTOM to engage maritime targets, and the development and integration of a multiple effects warhead.

Tomahawk provides an attack capability against fixed and mobile targets, and can be launched from both Ships and Submarines. The current variant, TACTOM, preserves Tomahawk's long-range precision-strike capability while significantly increasing responsiveness and flexibility. TACTOM's improvements include in-flight retargeting, the ability to loiter over the battlefield, in-flight missile health and status monitoring, and. Other Tomahawk improvements include rapid mission planning and execution via Global Positioning System (GPS) onboard the launch platform and improved anti-jam GPS.

Tomahawk Theater Mission Planning Center (TMPC)

The Fiscal Year 2018 President's Budget for TMPC requests \$18.8 million in RDT&E,N and \$41.5 million in OPN. TMPC is the mission planning and strike execution segment of the Tomahawk Weapon System. TMPC develops and distributes strike missions for the Tomahawk Missile; provides for precision targeting, weaponeering, mission and strike planning, execution, coordination, control and reporting. TMPC provides CCDRs and Maritime Component Commanders the capability to plan and/or modify conventional Tomahawk Land-Attack Missile missions. TMPC is a Mission Assurance Category 1 system, vital to operational readiness and mission effectiveness of deployed and contingency forces. RDT&E,N efforts will address National imagery format changes, update Tomahawk navigation and accuracy algorithms—to include operations in the maritime and/or Anti-Access Area Denial environments, upgrade obsolete Tomahawk Cruise Missile Communications and initiate a Tomahawk seeker integration into the TMPC mission planning environment. OPN resources will enable the Navy to continue software engineering efforts associated with Tomahawk Missile Modernization, upgrade unsupportable and obsolete TMPC software to ensure compliance with DOD cybersecurity mandates, and implement the TMPC Enterprise Network to allow for rapid delivery of security policies, cybersecurity software patches and anti-virus definitions. All of these upgrades are critical for the support of over 180 TMPC operational sites worldwide, afloat and ashore, to include: Cruise Missile Support Activities (inclusive of STRATCOM), Tomahawk Strike and Mission Planning Cells (5th, 6th, 7th Fleet), Carrier Strike Groups, Surface and Subsurface Firing Units and Labs/Training Classrooms.

Offensive Anti-Surface Warfare (OASuW) Increment 1 (Long Range Anti-Ship Missile (LRASM))

OASuW/Increment 1 (LRASM) will provide CCDRs the ability to conduct ASuW operations against high-value surface combatants protected by Integrated Air Defense Systems with long-range Surface-to-Air-Missiles and deny adversaries the sanctuary of maneuver against 2018–2020 threats. The program is scheduled to achieve Early Operational Capability on the Air Force B–1 by the end of fiscal year 2018 and Navy F/A–18E/F by the end of fiscal year 2019.

The Fiscal Year 2018 President's Budget request contains \$160.7 million in RDT&E,N for LRASM development and testing and \$74.7 million in WPN to purchase 25 LRASM All-Up-Round weapons. OASuW Increment 1 (LRASM) leverages the Defense Advanced Research Projects Agency weapon demonstration effort.

Offensive Anti-Surface Warfare (OASuW) Increment 2

OASuW/Increment 2 is required to deliver the long-term air-launched ASuW capability to counter 2024 (and beyond) threats. The Department continues to plan for OASuW/Increment 2 to be determined via full and open competition. Full OASuW/Inc. 2 capability is delayed until at least fiscal year 2026 (est.).

Next Generation Land Attack Weapon (NGLAW)

The Next Generation Land Attack Weapon (NGLAW) will provide the next generation of long-range, kinetic strike to destroy high-priority fixed, stationary and moving targets—as well as those targets hardened, defended or positioned at ranges such that engagement by aviation assets would incur unacceptable risk. NGLAW will be capable of kinetic land and maritime attack from surface and sub-surface platforms and initially complement, and then eventually replace, the Tomahawk Weapon System. IOC is planned for the 2028–2030 timeframe (est.).

On November 28, 2016, the Under Secretary of Defense approved Navy's entry into the MS–A phase and authorized initiation of an AoA. Fiscal year 2018 resources totaling \$9.9 million begins the transition from the analysis phase to planning for a formal program of record.

Sidewinder Air-Intercept Missile (AIM–9X)

The Fiscal Year 2018 President's Budget requests \$ 42.9 million in RDT&E,N and \$79.7 million in WPN for this joint DON and USAF program. RDT&E,N will be applied toward the Engineering Manufacturing Development phase of critical hardware obsolescence redesign and Developmental Testing of Version 9.4 missile software, both part of the AIM–9X/Block II System Improvement Program (SIP) III. Navy also continues the design and development of Insensitive Munitions improvements in accordance with direction from the Joint Chiefs of Staff. WPN funding is requested to procure a combined 185 All-Up-Rounds and Captive Air Training Missiles and associated missile-related hardware. The AIM–9X Block II/ II+ Sidewinder is the newest in the Sidewinder family and is the only short-range infrared air-to-air missile integrated on Navy, Marine Corps, and USAF strike-fighter aircraft. This fifth-generation weapon incorporates high off-boresight acquisition capability and increased seeker sensitivity through an imaging infrared focal plane array seeker with advanced guidance processing for improved target acquisition; data link capability; and advanced thrust vectoring technology to achieve superior maneuverability and increase the probability of intercept of adversary aircraft.

Advanced Medium-Range Air-to-Air Missile (AMRAAM/ AIM–120D)

The Fiscal Year 2018 President's Budget requests \$25.4 million in RDT&E,N for continued software capability enhancements and \$197.1 million in WPN for 120 All-Up-Rounds and associated missile-related hardware. AMRAAM is a joint USAF and DON weapon that counters existing aircraft and cruise-missile threats. It uses advanced counter-electronic attack capabilities at both high and low altitudes, and can engage targets from both beyond visual range and within visual range. AMRAAM provides an air-to-air first look, first shot, first kill capability, while working within a networked environment in support of the Navy's Theater Air and Missile Defense Mission Area. RDT&E,N will be applied toward critical hardware obsolescence through the Form, Fit, Function, Refresh (F3R) redesign effort as well as software upgrades to counter emerging Electronic Attack threats for AIM–120C/D missiles. Production challenges linked to the F3R program forced the Navy to reduce its planned procurement of AMRAAM in fiscal year 2018.

Small Diameter Bomb II (SDB II)

The Fiscal Year 2018 President's Budget requests \$112.8 million in RDT&E,N for continued development of the USAF-led Joint Service SDB II weapon and Joint Miniature Munitions Bomb Rack Unit (JMM BRU) programs and \$21.0 million in WPN to procure 90 All-Up-Round weapons. Using multi-mode seeker and two-way data-link capabilities, SDB II provides an adverse weather, day or night standoff capability against mobile, moving, and fixed targets, and enables target prosecution while minimizing collateral damage. SDB II will be integrated into the internal carriage of both DON variants of the Joint Strike Fighter (F–35B/F–35C) and externally on the Navy's F/A–18E/F via the JMM BRU (BRU–77A). JMM BRU completed Milestone B and entered Engineering Manufacturing Development in August 2015.

Both SDB II and JMMU BRU will use an Universal Armament Interface architecture to enable more efficient and less costly future weapon/platform integration.

Advanced Anti-Radiation Guided Missile (AARGM) & AARGM Extended Range

The Fiscal Year 2018 President's Budget requests \$6.4 million of RDT&E,N for High-Speed Anti-Radiation Missile (HARM) and AARGM Foreign Material Assessment; \$15.2 million for AARGM to implement M Code, transition receiver upgrade from ONR efforts and Block 1 follow-on development; \$66.3 million of RDT&E,N for AARGM Extended Range (AARGM-ER) development; and \$183.4 million of WPN for production of AARGM modification kits for 251 All-Up-Rounds and Captive Training Missiles. The AARGM cooperative program with the Italian Air Force transforms the HARM into an affordable, lethal, and flexible time-sensitive strike weapon system for conducting Destruction of Enemy Air Defense missions. AARGM adds multi-spectral targeting capability and targeting geospecificity to its supersonic fly-out to destroy sophisticated enemy air defenses and expands upon the HARM target set. The program achieved IOC on the F/A-18C/D aircraft in July 2012, with forward deployment to PACOM; integration is complete for AARGM with release of H-8 System Configuration Set for F/A-18E/F and EA-18G aircraft. The AARGM Block 1 software only update will achieve IOC the third quarter of fiscal year 2017. The AARGM-ER modification program, involving hardware and software improvements, began in fiscal year 2016. This effort will increase the weapon system's survivability against complex and emerging threat systems and affords greater stand-off range for the launch platform. AARGM-ER will be designed to fit internally in both the F-35A and F-35C, thereby increasing the capability and lethality of the Lightning II weapon system.

Joint Air-to-Ground Missile (JAGM)

The Fiscal Year 2018 President's Budget requests \$15.5 million in RDT&E,N to continue a five year integration effort of JAGM Increment 1 onto the Marine Corps AH-1Z and \$3.8 million in WPN to support the fiscal year 2017 procurement of 96 All-Up-Rounds in order to meet the IOC in fiscal year 2020. The fiscal year 2017 and fiscal year 2018 funding will be used to procure the JAGM LRIP All Up Rounds, Other Production Support, training missiles, production related engineering and logistics to support the procurement in order to meet the IOC.

JAGM is an Army-led, Joint ACAT-1D Major Defense Acquisition Program. JAGM is a direct attack/CAS missile program that will utilize advanced seeker technology to provide fire-and-forget, simultaneous target engagement against land and maritime targets. JAGM will replace the HELLFIRE and TOW II missile systems for the DON. In November 2012, the Joint Chiefs of Staff authorized the JAGM incremental requirements and revalidated the DON's AH-1Z Cobra aircraft as a threshold platform. JAGM Increment 1 achieved Milestone B approval in fiscal year 2015, a Milestone C (LRIP) is planned for the fiscal year 2018 and AH-1Z Cobra/JAGM IOC is planned for fiscal year 2020.

Advanced Precision Kill Weapon System II (APKWS II)

The Fiscal Year 2018 President's Budget requests \$39.5 million in PANMC for procurement of 1,210 APKWS II Precision Guidance Kits. APKWS II provides an unprecedented precision guidance capability to DON unguided rocket inventories, improving accuracy and minimizing collateral damage. Program production continues on schedule, meeting the needs of our warfighters in today's theaters of operations. Marine Corps AH-1W and UH-1Y achieved IOC in March 2012 and the Marine Corps AH-1Z platform was certified to fire APKWS II in June 2015. To date, these platforms have expended more than 190 APKWS II weapons during combat missions. The Navy successfully integrated APKWS II on the MH-60S for an Early Operational Capability in March 2014 and fielded a similar effort on the MH-60R in March 2015. A variant of APKWS II has been integrated onto the AV-8B, A-10 and F-16 aircraft, and is currently being employed in support of Operation Inherent Resolve.

Direct Attack Weapons and General Purpose Bombs

The Fiscal Year 2018 President's Budget requests \$108.9 million in PANMC for Direct Attack Weapons and General Purpose bombs and an additional \$164.3 million specifically to procure 7,209 Joint Direct Attack Munition (JDAM) kits to enhance readiness. In thirty months of Operation Inherent Resolve, DON aircraft have expended more than three times the number of 500lb JDAM kits than we have procured during the same period. This significant warfighter demand has forced the Navy to reduce the number of 500-pound JDAM available for training in order to preserve warfighting inventory. The OCO request for fiscal year 2018 replaces the ordnance expended in the first six months of 2016. While OCO replenishment is

helpful, it does not overcome the remainder of the year's expenditures which will continue to exacerbate the current inventory shortfall. Fully funding the General Purpose Bomb line item is critical to sustaining the DON's inventory for ongoing combat operations and replenishing it for future contingencies.

CONCLUSION

The Department of the Navy continues to instill affordability, strive for stability, and maintain capacity to advance capabilities and meet mission requirements. We remain an agile strike and amphibious power projection force in readiness, and such agility requires that the aviation arm of our naval strike and expeditionary forces remain strong. Mr. Chairman, and distinguished committee members, we request your continued support for the Department's fiscal year 2018 budget request for our Naval Aviation programs.

Addendum A

PHYSIOLOGICAL EPISODES

Physiological Episodes (PEs) occur when aircrew experience a decrement in performance, related to disturbances in tissue oxygenation, depressurization or other factors present in the flight environment. PEs are categorized into two general groups, those related to Onboard Oxygen Generation Systems (OBOGS) or pilot breathing gas, and those caused by problems in the Environmental Control Systems (ECS), i.e.—unscheduled pressure changes in the flight station. These phenomena jeopardize safe flight.

As a result of physiological episodes, the F/A-18 Program Office (PMA-265) established a Physiological Episode Team (PET) in 2010. In March of 2017, the PET was reorganized to form the PMA-265 Physiological Episode (PE) Integrated Product Team (IPT) to perform a formal Root Cause and Corrective Action analysis of F/A-18A-F and EA-18G events. The F/A-18 PE IPT is a formal partnership between PMA-265 and Boeing, and includes participation from Northrop Grumman, the NAVAIR Engineering Fleet Support Team (FST), NAVAIR 4.3's Environmental Control System (ECS) Team, NAVAIR 4.6's Human Systems Team, and the NAE's Aeromedical Crisis Action Team. The F/A-18 PE IPT works closely with other program offices, cross-service affiliates and industry partners in evaluating each episode for root cause and appropriate corrective action.

The PMA-265 PE IPT is currently addressing hypoxia and decompression events as the two most likely causes of recent physiological episodes in aviators. As symptoms related to depressurization, tissue hypoxia and contaminant intoxication overlap, discerning a root cause is a complex process. Episodes of decompression sickness typically accompany a noticeable loss or rapid fluctuation of cabin pressure, while the cause of hypoxic related events is often not readily apparent during flight or post flight. Reconstruction of the flight event is difficult with potential causal factors not always readily apparent during post-flight debrief and examination of aircraft and aircrew.

Historical data of F/A-18 physiological events prior to May 2010 is based on safety reports. The rate per 100,000 flight hours during fiscal year 2006 to fiscal year 2010:

Date Range	F/A-18A-D	F/A-18E-F	EA-18G
FY06	3.66	2.18	0.00
FY07	1.63	3.73	0.00
FY08	3.72	4.28	0.00
FY09	6.19	8.33	0.00
FY10	4.95	11.96	0.00

In May 2010, the Commander, Naval Air Forces directed specific reporting procedures to collect more data on the occurrence of PEs. Following implementation of the new reporting protocol, the rate per 100,000 flight hours beginning in May 2010:

Date Range	F/A-18A-D	F/A-18E-F	EA-18G
05/1/2010 – 10/31/2010	12.20	8.98	0.00
11/1/2010 – 10/31/2011	10.90	8.65	5.52
11/1/2011 – 10/31/2012	16.39	23.35	5.42
11/1/2012 – 10/31/2013	21.01	26.23	9.80
11/1/2013 – 10/31/2014	29.54	26.39	15.05
11/1/2014 – 10/31/2015	30.20	28.02	42.89
11/1/2015 – 10/31/2016	57.24	31.05	90.83

The process for investigating a physiological episode begins with the submission of data describing the event. Engineers from the ECS FST and the Aircrew Oxygen Systems In-Service Support Center work with the squadron maintenance department to identify which components of the aircraft should be removed and submitted for engineering investigation. The squadron flight surgeon also submits data on the medical condition of the pilot and in-flight symptoms that were experienced.

After completion of the component investigations, the incident is examined holistically by members of the engineering teams and Aeromedical specialists to identify the most likely cause of the incident. Of 382 cases adjudicated by the PET so far, 130 have involved some form of possible contamination, 114 involved an ECS component failure, 91 involved human factors, 50 involved an OBOGS component failure, 13 involved a breathing gas delivery component failure, and 76 were inconclusive or involved another aircraft system failure. Of note, some of the events resulted in assignment to more than one category.

T-45 Physiological Episodes

Data recorded since introduction of the T-45 Physiological Event Reporting Protocol form in November 2011 is presented below by calendar year. Prior years' data for T-45 aircraft is incomplete and is not included.

Calendar Year	Calendar year rate per 100K flight hours	Cumulative rate per 100K flight hours
2012	11.86	11.86
2013	16.22	13.94
2014	18.43	15.36
2015	44.99	22.70
2016	46.97	28.01

The process for investigating a physiological episode mimics that being used by the F/A-18 and is also managed by PET. After completion of the component investigations, the incident is examined holistically by members of the PET's engineering teams and aviation medical specialists to identify the most likely cause of the incident. More than one causal factor can be attributed to a single physiological episode event. Of the 79 physiological episode reports adjudicated to date, 24 were assessed to be possible contamination, 12 involved human factors (these may also include incidents of airsickness and vertigo), 12 involved OBOGS component failure, 11 involved a breathing gas delivery failure, three involved cabin integrity, and the remaining 23 were inconclusive or involved another system failure.

Efforts to Mitigate Physiological Episodes on F/A-18 and EA-18G

A variety of actions have been undertaken to address the occurrence of physiological episodes in the F/A-18 / E/A-18G:

1. New maintenance rules for handling the occurrence of specific ECS built-in test faults have been implemented throughout the fleet requiring that the cause of the fault be identified and corrected prior to next flight.
2. Transportable Recompression Systems have been put on forward deployed aircraft carriers to immediately treat aircrew in the event they experience decompression sickness symptoms.
3. Mandatory cabin pressurization testing is now performed on all F/A-18A-F and EA-18G aircraft every 400 flight hours and ECS pressure port testing is performed on all F/A-18A-D aircraft every 400 flight hours. Overhaul procedures for ECS components and aircraft servicing procedures have been improved.
4. Emergency procedures have been revised, all pilots now receive annual hypoxia awareness training, and biennial dynamic training using a Reduced Oxygen Breathing Device to experience and recognize hypoxia symptoms while operating an aircraft simulation.
5. Aircrews are provided portable hypobaric recording watches to alert them when cabin altitude reaches a preset threshold.
6. Internal components of the F/A-18 OBOGS have been redesigned to incorporate a catalyst to prevent carbon monoxide from reaching the pilot and provide an improved capability sieve material (filter). These new OBOGS components have been installed in 84 percent of the in service F/A-18 fleet so far.
7. Improvements to existing maintenance troubleshooting procedures and acceptance and test procedures for reworked components have been incorporated and additional improvements are under evaluation.
8. Hardware and software changes are in work for Super Hornets and Growlers to mitigate cabin pressurization issues due to moisture freezing in the ECS lines.
9. Component redesign, improved performance testing, and newly established life limits will improve component reliability across all F/A-18 configurations.
10. An increased capacity for the emergency oxygen bottles is under contract.
11. Trial sampling efforts for contamination have been conducted at EA-18G squadrons located at NAS Whidbey Island to improve real-time data collection for OBOGS related systems. "Sorbent tubes" which help collect and identify unknown contaminants have been attached to aircrew regulators to collect samples of breathing gas for post-flight analysis of potentially harmful compounds.
12. An ECS laboratory is under construction to improve root cause and correct actions of ECS engineering investigations of fleet events. The projected operational date of the ECS lab is September of 2017.
13. Aircraft are flown with "slam sticks" to track and collect cabin pressure changes over time for rigorous data analysis and to compare data to what the aircrew experienced.
14. Future projects include systematic evaluations of technologies to monitor and detect physiological symptoms.

Efforts to Mitigate Physiological Episodes on T-45

A variety of actions have been undertaken to address the occurrence of physiological episodes in the T-45:

1. Instituted recurring immersion training at all Chief of Naval Air Training sites using Reduced-Oxygen Breathing Devices.
2. Flight manual procedures were updated to optimize crew posture for PE recognition, response, and avoidance.
3. Revised maintenance publications at both the operational and intermediate maintenance levels to increase the minimum oxygen generating performance of the concentrator.
4. Conducted engine wash water intrusion tests to determine if water was entering the OBOGS bleed air. Tests indicated that no water was ingested in the OBOGS bleed air lines.
5. Installed sorbent tubes and hydrocarbon detectors on aircrew to monitor breathing gasses coming off OBOGS. The sorbent tube and HCD are attached to the aircrew vest and ported off the oxygen mask hose.
6. Installed new sieve beds in the Gas Generating Unit (GGU)-7 Oxygen Concentrator. The new sieve beds addressed the possibility of built up contaminants in the sieve bed material by installing all new material, and incorporated a carbon monoxide catalyst to protect against carbon monoxide.
7. Began fielding of new design CRU-123 oxygen monitoring units. A fielded demo unit has over 100 flight hours; up to 15 additional new monitors are expected by the end of May. Thirty additional units will be installed every

month thereafter. The new oxygen monitor provides new aircrew alerting if delivery pressure falls, and it records system performance and faults.

8. Initiated requirements analysis for a new OBOGS oxygen concentrator unit.
9. Formed a combined team with Government, Boeing (T-45 OEM), and Cobham (Oxygen Concentrator OEM) members to cooperate on multiple lines of effort to address Physiological Episodes.
10. Conducted multiple rounds of high intensity stress testing of the GGU-7 Oxygen Concentrator at both NAVAIR and Cobham Laboratories to determine concentrator performance outside of the normal operating limits (high temperature and high humidity).
11. NAVAIR released an end to end cleaning procedure for the OBOGS bleed system. Updated regular maintenance procedures to sustain system hygiene. Additional thorough cleaning procedures are being developed.
12. Evaluated the thermal performance of the OBOGS bleed air system by conducting tests on in-service heat exchangers and temperature switches that provide alerts when over-temperature conditions occur.
13. Conducted laboratory testing and on-aircraft fit checks of a new water separator that would be installed in the OBOGS bleed line prior to the OBOGS concentrator to help guard against water intrusion in the concentrator. This program is currently in the early stages of detailed engineering design.
14. Enhanced data management and collection through initiation of a new data management plan; contracted data analysis support to
15. Developed new test procedures and conducted OBOGS and ECS bleed air contaminant testing on fleet aircraft to establish measurement thresholds and foment a predictive system performance methodology; developed new test sets to assess oxygen system degraded performance.
16. Updated flight and maintenance publications to help prevent inadvertent system damage, ensure leak free system integrity, add periodic inspections, and ensure system cleanliness.

The Department of the Navy remains focused on solving this issue. Fleet awareness is high, protocols are in place and we are focused on mitigating risk, correcting known deficiencies and attacking this issue. Moving forward we will continue to fly while applying every resource to solve this challenging problem.

End of Addendum A

Addendum B

ELECTRONIC WARFARE SUPPLEMENTAL

AN/ALQ-214—Navy completed testing the upgraded version of the ALQ-214 v4 Integrated Defensive Electronic Countermeasure (IDECM) last year and continues developing software improvements under the Software Improvement Program (SWIP). IOC of SWIP is expected in the second quarter of fiscal year 2018. IDECM hardware is currently being installed into deploying F/A-18 E/F aircraft on the planned procurement ramp.

Next Generation Jammer (NGJ)—The first increment of NGJ, which covers a mid-band frequency range, completed its critical design review in May and is on timeline for a fiscal year 2021 IOC. OSD established this program as a Skunk Works charter in fiscal year 2015 which has allowed a small team of experts to streamline the acquisition process. The Next Generation Jammer Low Band (increment 2) is the next material solution to replace the 40 year old ALQ-99 low band transmitter systems. The acquisition strategy for Low Band (Inc. 2) will be a full and open competition supporting program entry at Milestone (MS) B. Prior to the EMD competition, there will be up to three Demonstration of Existing Technology (DET) contracts awarded as an extension of the Low Band (Inc. 2) program's market research effort. In the execution of the DET contracts, contractors will demonstrate their existing, mature technologies in a relevant environment (i.e. not a technology maturation effort, but rather substantiation of the assertion the technologies of appropriate level of maturity currently exist to support program entry at MS B). Not being awarded a DET contract will not preclude any contractor from submitting a proposal and competing for award of the Low Band (Inc. 2) EMD contract, as, again, it will be a full and open competition. IOC for NGJ Low band is being planned for fiscal year 2025.

ALQ-99—While sustainment and reliability of the 40 year old ALQ-99 systems continues to challenge the DON (USMC and Navy), we have prioritized NGJ imple-

mentation to replace the most stressing frequency coverage first. Navy is developing an interim upgrade solution for the low frequency range transmitter in the Low Band Consolidation (LBC) transmitter set. The LBC is on track to field in the first quarter of fiscal year 2020. The LBC does not meet the full requirements of the NGJ Low Band system, however will increase the reliability of the low frequency system.

End of Addendum B

Addendum C

SUMMARY OF CLASS A, B AND C AVIATION-RELATED SAFETY ISSUES

A summary of all Naval Aviation Class A, B and C aviation-related safety issues, including recent mishaps, trends, and analysis from October 2015 through May 24, 2017 follows. The rates presented in the table are based on total mishaps per 100,000 flight hours and include Flight, Flight-Related and Ground mishaps.

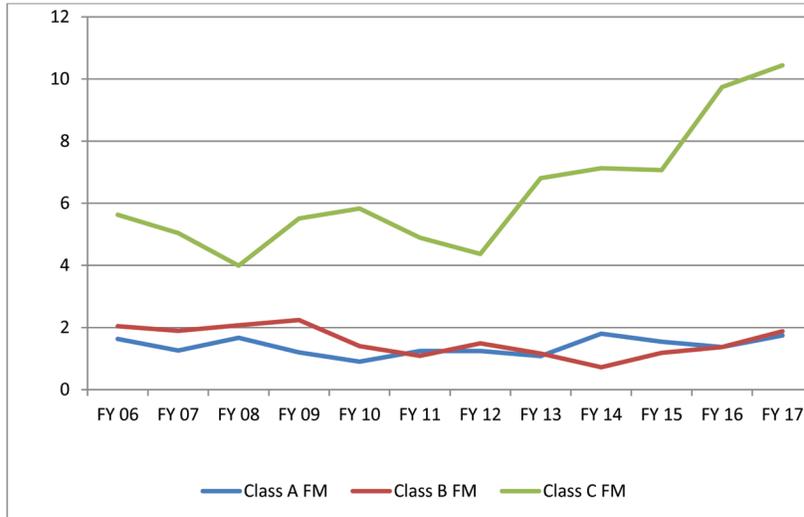
Year	Flight Hours	Class A	Class A Rate	Class B	Class B Rate	Class C	Class C Rate
FY16	1,098,519	18	1.64	27	2.46	224	20.39
FY17	689,850	15	2.17	19	2.75	163	23.63

The most recent fiscal year 2017 DON flight Class A mishaps include: 26 Apr 2017: (Off the Coast of Guam) MH-60R collided with water on initial takeoff from ship. No injuries.

- 21 Apr 2017: (Philippine Sea) F-18E lost on approach to landing on carrier. Pilot ejected without injury prior to water impact.
- 05 Apr 2017: (Yuma, AZ) CH-53E landed hard and rolled on day training flight. Crew of 5 uninjured.
- 17 Jan 2017: (NAS Meridian, MS) T-45 crashed following a BASH incident on takeoff. Both crewmembers ejected. No fatalities.
- 13 Dec 2016: (Off the Coast of Okinawa, Japan) MV-22B attempted a precautionary emergency landing (PEL) to dry land but crash landed in shallow water. Crew of 5 evacuated with injuries.
- 07 Dec 2016: (Off the Coast of Iwakuni MCAS, Japan) F/A-18C crashed into the water while conducting a night mission. 1 fatality.
- 21 Nov 2016: (Upper Mojave Desert Region) F/A-18F struck a tree while instructor pilot was conducting a currency flight event. Returned to base safely. No injuries.
- 09 Nov 2016: (Off the Coast of San Diego) Two F/A-18As were conducting basic flight maneuvers and had a mid-air collision. 1 aircraft crashed in the water. Pilot ejected successfully. 1 aircraft landed with significant damage
- 27 Oct 2016: (MCAS Beaufort, SC) F/A-35B had an inflight weapons bay fire followed by an uneventful landing. No injuries.
- 25 Oct 2016: (Twentynine Palms, CA) F/A-18C crashed on final approach. Pilot ejected successfully. No injuries.
- 20 Oct 2016: (Yuma, AZ) CH-53E main rotor contacted building causing damage to the aircraft.
- 13 Oct 2016: (Tinker AFB, OK) E-6B #2 engine sustained compressor blade damage due to bird ingestion. Aircraft landed safely. No injuries.

There are three recent fiscal year 2017 DON Class A aviation ground operations mishaps (AGM):

- 19 January 2017: (NAS Norfolk, VA) Three E-2C aircraft damaged in an engine oil related event. (AGM)
- 18 December 2016: (Kadena Air Force Base, Japan) Tow bar separation resulted in aircraft/tow collision with damage to nose gear and lower fuselage of P-8A. (AGM)
- 16 December 2016: (NAS Whidbey Island, WA) Canopy on EA-18G exploded/jettisoned resulting in severe injuries to two personnel. (AGM)

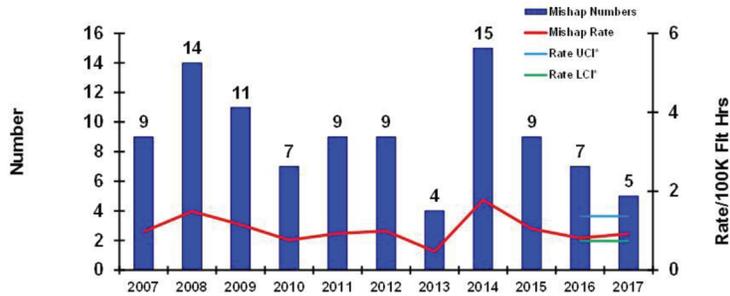


DON Historical Mishap Rate Trend per 100K Flight Hours per Mishap Class (As of 24 May, 2017)



CLASS A FLIGHT MISHAPS

Manned Aircraft Only



	24-May-17	24-May-16
CLASS A MISHAPS/MISHAP RATE FY COMPARISON:	5/0.92	1/0.18
FY16 MISHAPS/MISHAP RATE:	7/0.81	
10-YEAR AVERAGE (FY07-16) MISHAPS/MISHAP RATE:	9.40/1.04	

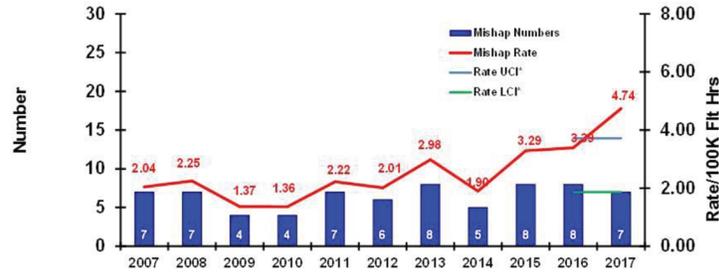
*see last slide for definition of UCI/LCI

Class A Manned Flight MISHAP Historical Data for U.S. Navy



CLASS A FLIGHT MISHAPS

Manned Aircraft Only



	24-May-17	24-May-16
CLASS A FM/FM RATE FY COMPARISON:	7/4.74	5/3.26
FY16 MISHAPS/MISHAP RATE:	8/3.39	
10-YEAR AVERAGE (FY07-16) MISHAPS/MISHAP RATE:	6.40/2.28	

Class A Manned Flight MISHAP Historical Data for U.S. Marine Corps

UCI = Upper Confidence Interval LCI = Lower Confidence Interval

Rate values above the UCI or below the LCI infer a statistically significant change is probable. This is only an indicator. Significance cannot be determined until end-of-year. Values between the UCI and LCI infer that nothing significant has occurred to increase or decrease mishap rate.

End of Addendum C

Senator WICKER. Well, thank you very much.

I said this this morning at the full committee, and I'll say it again today at the subcommittee level, about the chronic underfunding. We really do need to join hands and address this once and for all. I would remind members and guests and everyone listening or watching that the reason we adopted sequestration in the first place was as an incentive to make us come to grips with entitlement programs, entitlement programs like Medicare, Medicaid, Social Security, and, of course, interest on the debt, which is only partially within our control.

The good news about these very valuable safety-net programs is that we don't have to cut them. They need to grow and will continue to grow, but we simply need to grow them at a slower rate. It is the inability of the House and Senate and the collective administrations to deal with this issue that got us to sequestration.

So, I am not the least bit proud of our record with regard to this chronic underfunding. We certainly don't need to use sequestration as a way to short-change the war fighter, and we certainly don't need to short-change national security, the security of Americans. But it is worth saying that it is a failure because we have been unwilling, for whatever reason, unable, for whatever reason, in both parties and at both ends of Pennsylvania Avenue, to come to grips with simply slowing the growth rate of these excellent programs that we all depend on.

Admiral Grosklags, I appreciate the information your team has given to all of us about the PE issue, and you mention it in your testimony. But if you're sick, if a person is sick, the most important step is a good diagnosis. Once we get the diagnosis, physicians know how to come in and give the right medicine or the right treatments.

We're having a diagnosis problem with the physiological episodes, so tell us where we are. I appreciate Admiral Miller and General Davis coming in and speaking to me yesterday about this. But how are we doing on the diagnosis? Are you able to give us any hope on a timeline to solving this problem?

Vice Admiral GROSKLAGS. Sir, we're not doing well on the diagnosis. We have two parallel paths under execution right now. As you said, it would be far easier if we could find out what the root cause was and then go after correcting that root cause. To date, we have been unable to find any smoking guns. I will refer back to an exception to that here in just a second.

But for T-45s specifically, where most of our issues to date, almost all of them, have been associated with what we'll call breathing gas issues, as opposed to the pressurization issues in the cockpit that we've seen with some of our F-18 incidents, we do not—

Senator WICKER. Toxic oxygen, actually.

Vice Admiral GROSKLAGS. Well, to date, we have not been able to discover a toxin or a contaminant in the breathing gas despite our testing. Just to give you a snapshot without going into great detail, we have taken several of the aircraft from CNATRA [Chief of Naval Air Training] from the training squadrons, brought them up to Patuxent River, and we have torn some of them apart to the extent that we took every component, every single component in that gas path, that breathing gas path if you will, out of the air-

craft, starting with the engine and going through the entire system, inspecting all the piping in-between, all the way up to the mask and the vests that the air crew wear. We've subjected each one of those individual components to extremes of testing, extremes of environmental conditions in excess of what we would ever expect to see in the aircraft, and we still have not been able to find what we would consider a proximate cause of contamination or something being released into that gas path.

We are also doing testing at the system level. We're flying the entire aircraft—again, these are aircraft that had issues down at CNATRA. We're flying the entire aircraft with additional instrumentation on the aircraft, trying to detect stuff in-flight, real time. To date, we have not been able to find that root cause or been able to diagnose the problem.

In parallel, for T-45, because obviously one of our concerns is getting back into the training environment as quickly as possible, but we focused on 10 to 12 different alerting or protective measures for the air crew, and it is our plan that once we are comfortable that we've got those individual items all in place for every single aircraft and air crew down at CNATRA, that is at the point where we will consider resuming the training syllabus.

We believe that will probably be a matter of weeks instead of months, but there is still some testing of new equipment that we intend to—

Senator WICKER. The full training syllabus.

Vice Admiral GROSKLAGS. Yes, sir. So that's kind of our path, the two parallel paths on T-45s.

On F-18s—

Senator WICKER. Well, sir, on the training syllabus now, what are you able to do and what are you not able to do?

Vice Admiral GROSKLAGS. To date, since the beginning of April/end of March, we have not flown any training events with the students. The students have not flown at all. Our instructor pilots are flying some currency flights. They are not using the oxygen generation system, so they're basically breathing ambient cockpit air, and because of that we've restricted their flight envelope to 5,000 feet and below and less than 2 G's. So a relatively benign environment but sufficient for them to remain proficient in flying the aircraft.

Senator WICKER. We're going to lose a crop of undergraduate pilots?

Vice Admiral GROSKLAGS. We won't lose them permanently, but we lose about—we delay about 25 a month if we don't start flying students again. So if you say the end of June, we will have racked up about 75 students that have been delayed going to the next squadron, which would be the fleet replacement squadron.

Senator WICKER. Senator Kaine?

Senator KAINE. Thank you, Mr. Chairman.

Thanks to the witnesses for your testimony and service.

A couple of disparate items. The force structure assessment recently has led the Navy to readjust their thought about the size, the number of ships, from 308 to 355. But I was interested that the force structure assessment didn't talk about what that would dictate in terms of aviation. Since a lot of the ships have an aviation component, I would suspect that that's kind of the next ask, there

would be kind of an aviation follow-on component that would change if we were able to grow the Navy that size of ships. I'm sure there isn't an answer to that question today, but I would just love you to address that issue, what are we likely to see as the Navy contemplates the shift in the number of ships and what that would mean in terms of additional need for aviation assets.

Rear Admiral MILLER. Yes, sir. I'll go ahead and take that. As you know, in the budget in 2017, the whole focus was on readiness, and on 2018 now it's to continue that readiness and look at the wholeness. So the question that you ask is really what we're working in the building right now as we're putting together the 2019 budget. Part of that is, okay, we envision eventually getting back to 12 aircraft carriers, which is going to require an extra air wing. So with the timing of that, how you would then flow in the aircraft to be able to support an extra air wing to be able to deploy on that 12th carrier is something that would have to be mapped out and, of course, have the available resources to be able to do that.

On the surface side, the largest contributor to aviation support to our surface Navy has to do with our helicopters. Currently, the H-60 inventory that we have meets the requirements that we have currently in our surface fleet. Again, once those plans are determined on when and if we're able to grow the Navy per what we assess the needs are, then we would obviously lay in a procurement program that would be able to support that on the aviation side.

Senator KAINE. Okay. I just wanted to have some sense, as you point out, for the future. I'm on the Budget Committee too, and I'm curious about this.

We've had some posture hearings in the main committee with Air Force, and one of the issues we've talked about is the issue of maintainers. So we're talking about aviation programs. Platforms is one thing; pilots are critically important. I was a little struck in the Air Force discussions we've had that some of the workforce gaps are more significant on the maintainer side than even on the pilot side, and both are significant.

Talk a little bit on the Navy and Marine side about what you're doing to deal with the maintainer workforce.

Lieutenant General DAVIS. Thanks for that question, Senator. We've done five independent range reviews in the Marine Corps and looked at all the things we need to do to make sure our legacy fleet generates the range requirements we use in the Marine Corps. One of the things that came out of that was not the numbers of maintainers we have but the overall qualifications of the maintainers we have, especially with a little bit different readiness model for the United States Marine Corps and the United States Navy.

So we actually needed to hire density of maintainers in each unit and tailored for each unit's mission out there to make the range requirements. We looked at those qualifications and how hard it is. It takes two years to make a collateral duty inspector. It takes four years to make what they call a CDQAR [Collateral Duty Quality Assurance Representative], which is the next level up. Your master mechanic takes seven years on average to make those, and it's kind of consistent between the Navy and the Marine Corps.

What we have done is we've mapped out for each and every unit, and now providing incentives, starting this July, to keep both Marines who earn those qualifications, and those are the very best Marines and sailors inside those units that do that, and keep them in the densities we need to make our range requirements out there.

The second thing is we've looked at—I ran our fighter weapons school in Yuma, Arizona for two years, great job as the CO [Commanding Officer] of that schoolhouse, and almost 40 years ago we created Match 1 to make sure we were at the top of our game in standards and best tactics, techniques, and procedures to go fight the looming threat on our nation's bow. We didn't do that for our aviation maintainers. We are doing that now.

So a kind of companion schoolhouse, a top wrench, if you want to call it that, for our young officers and our maintenance Marines to make sure that they are sharing best practices and getting the very biggest bang for the buck we can out of our Marines.

Senator Kaine. Excellent, excellent. I'll ask you one other question, if I could. This is one for me and for Senator Tillis. So if he comes in, tell him I had his back.

We have training ranges that we use heavily, Navy and Marines, in Virginia and North Carolina. With the advent of fifth-generation aircraft, are we making the investments that we need in maintaining the usefulness of those ranges, or do the ranges maintain continuing viability? Because some of the platforms have some additional bells and whistles to them.

Rear Admiral Miller. Yes, sir. Thank you for that question, because when we talk about wholeness, everyone likes to look at, hey, I'm providing this object, whether it's a new F-35, but with that comes the whole training apparatus that goes with it. So not only from the maintainers that are maintaining the aircraft but for the aviators that have to fly it, the decision-makers as we put together, and as you well know, COM 2 exercises are pretty large events that we do off of the coast of Virginia.

So we are making investments in live virtual constructive. We have to, with the threat that's continuing to evolve, with the tactics that continue to keep pace with the threat, and with a lot of the new equipment, we have to transition the way we train.

So it's a combination of using simulation, combining that with live assets, and also being able to throw constructive threats out there. For example, to be able to have a scenario that has representative threat aircraft, we probably don't have the adversary support to be able to do that.

So we need to evolve the way we train. So that live virtual constructive aspect absolutely needs to start down at the basic level where I'm learning how to fly an airplane and, hey, I need to connect an E-2 to an F-18 in a simulator. Then as we use the building block approach, as we prepare our carrier strike groups and our amphibious groups to deploy, to be able to take it up to the fleet-wide level of training as well.

So there are definite investments in live virtual constructive, and it's all part of the wholeness aspect of our approach to new weapon systems and new platforms.

Senator KAINE. No other questions. Thanks, Mr. Chairman. I think maybe General Davis wanted to weigh in briefly, if that would be acceptable?

Senator WICKER. That would certainly be acceptable.

Lieutenant General DAVIS. Thank you, sir. That's a great question, sir. What we're finding with operating our fifth-generation airplanes, we actually expanded Townsend Range to accommodate the mission profiles the F-35s can bring to flight, and we're seeing it every day in Yuma. For Senator Tillis, we're already looking at what we need to do off the coast of North Carolina to make sure that the Cherry Point facility is ready to take those airplanes.

The fifth-gen airplanes are changing the way we train and changing the way we fight and changing the way we think about fighting in a very dynamic way, in a very good way. It's really good news for the nation. But these airplanes, we're finding, require—the standard formations aren't the close formations like I grew up flying. They are separated by tens of miles. The bottom line is the airplane is perfectly comfortable flying like that. It will also fly and fight in bad weather as well, and allow our training.

It's not just how we train in the air component; it's how we train with our surface forces and our land forces out there as well. The other day, doing close air support through the cloud with F-35s with guys on the ground, that was something we probably wouldn't do with a high degree of fidelity, but now they actually not only do that but see the targets through the cloud.

I think it's going to change the way we do business, both live virtual constructive and also, too, the mandate for us to protect our training ranges and the air space over those training ranges. It's going to require some different thinking, and it will be a national asset for all of us with these new airplanes.

Senator KAINE. Thanks, Mr. Chairman.

Senator WICKER. Senator Rounds?

Senator ROUNDS. Thank you, Mr. Chairman.

Gentlemen, thank you for your service.

When it comes to the readiness and the capabilities or the availability of your aircraft right now, could you share with me what the readiness percentages are? I think the last couple of months it seems like the unavailability was somewhere in excess of 60 percent for FA-18s and so forth. Could you share with me what your readiness capabilities are? It seems to me that the F-35B variant, being new, was actually having a pretty good capability rating, even this early in its current development, if you want to call being seven years late current. But it seems like its capabilities were maintaining in excess of 80 percent. So could you share with me?

Vice Admiral GROSKLAGS. I can give you some generic numbers. We can drill down on each platform if you want, but you're about on the money. We're currently at a mission capable percentage as of the 24th of last month, at 56 percent. So it's mission capable across the fleet.

For the F-35 in particular, for the F-35B, we're actually above 80 percent, as you stated. So it's doing very well.

Lieutenant General DAVIS. Sir, if I could, looking at the VMF/A-121, the VMF/A-211, getting ready to be VMF/A-122, and then the 501, which is our training squadron at Buford, South Carolina, fo-

cusing on 121, very active squadron. Ten of the 16 are over there now. The next six show up this summer. I track them every day between 70, 75 and 80, 85 percent, so very high rates. The Marine F-18s in particular right now running a little bit less than 50 percent, although we're trending up, and Harriers are better than that.

But bottom line, the newer metal gets us to higher rates across the force. Those F-18s are old, trusty airplanes, but we're finding that with the readiness rate—and we're doing better in F-18 now. Our flight time per pilot has gone up significantly from the last time we talked. We're still shy of our objective, but we have a break. We start off in the morning, we have a 55 percent break rate with the older airplanes. So we start off in the morning, we've got them on the line, you worked all night to get them up. We used to do a six turn, six turn four, to get your training objectives, and that's how we fight as well.

A lot of those airplanes, half those airplanes are breaking after the first go, so we're not getting the numbers and the production we need out of those old platforms.

Senator ROUNDS. I have to share. I had the opportunity to fly with the Blue Angels last fall in a demonstration, and I think these guys do their best to break them sometimes. I know I was going left when he was going right on several different occasions, and I wasn't that far away from him.

Senator WICKER. You're scaring me, Senator.

Senator ROUNDS. I'm just telling you, these guys are good, but they put those aircraft through their paces, and you can see why they have some challenges once in a while. But that's the way that they need to train, the way that they need to fight, and those aircraft have got to be as top-notch as we can keep them.

I'm just curious, Admiral, you indicated 56 percent. Is that across the entire fleet, or is that across the fighter fleet?

Vice Admiral GROSKLAGS. That's across the entire fleet, sir.

Senator ROUNDS. How about if we just change that to the fighter fleet right now? Where are we at then?

Vice Admiral GROSKLAGS. Probably—well, certainly a little bit less than that. If we're talking about F-18s of all makes and models, it's probably right around 50 percent.

Senator ROUNDS. Okay. Thank you.

You indicated that the anti-ship missile that's being developed—and if I heard you correctly, originally or to begin with you were going to be placing it on the B-1.

Vice Admiral GROSKLAGS. Yes, sir.

Senator ROUNDS. Then eventually transitioning over to the FA-18. I presume that would be on the Super Hornet?

Vice Admiral GROSKLAGS. That's correct.

Senator ROUNDS. Okay. Can you share how that would be utilized if it's on a B-1? I mean, it seems to me that that's a new capability that we're talking about for the B-1 or a new use for the B-1.

Vice Admiral GROSKLAGS. I've got to be a little bit careful here.

Senator ROUNDS. Okay.

Vice Admiral GROSKLAGS. It's a derivative of the JASSM [Joint Air to Surface Stand Off Missile] missile that's already carried on

board the B-1. It has a different target set, and it will be used differently, but the mission is very compatible with that aircraft, as well as with the Super Hornet.

Senator ROUNDS. Having the Ellsworth Air Force Base as one of the homes of the B-1, we're always happy to hear of new mission sets for the B-1 as well.

When it comes to the F-35—and I recognize this is the aircraft of the future for the Navy and the Air Force and the Marines. Over its lifetime, the F-35 sustainment is projected to cost over \$1 trillion. Most alarming is that the cost may be underestimated. Based on data from the Air Force and the Marine Corps concerning F-35 variance at testing and operational sites, parts are being replaced on average 15 to 16 times higher than the assumptions used across the life cycle of the Joint Program or JPO [Joint Program Office] estimate. A GAO [Government Accountability Office] report highlights a multi-billion-dollar increase in each of the service's flying hour programs.

My question, based on the procurement of 20 additional F-35Bs and four additional F-35Cs in 2018, what impact will this have on the U.S. Navy and the U.S. Marine Corps in terms of your O&M challenges?

Lieutenant General DAVIS. I can answer that one if you want?

Senator ROUNDS. Yes.

Lieutenant General DAVIS. First off, we've got to be driving costs out of all of our programs. So we're actually running actually shy of the estimates for what it's going to be to run the F-35 for the Marine Corps. So we're kind of out there in front. The Air Force is building up steam right now.

But what we're spending to fly the airplane is actually less than we estimated. We also just hired an outside firm to go look at it, because even though it's less, I'd like it to be even less. We believe we can take significant amounts of money out of what we're spending just by doing it differently, working that in conjunction with the Joint Program Office, Lockheed Martin and the engine manufacturers to drive cost out of this program.

So what we do know is we have a winner on our hands. As we have more airplanes in the fleet, you actually will be able to drive cost out. Right now it's costing a heck of a lot of money to fly the legacy airplanes and get readiness out of that, and that's a very expensive proposition when you have airplanes you can't fly but you're still trying to maintain them because they're broken.

The F-35 has a high readiness rate for us right now, also working and driving cost per flight hour down and the O&S cost out. So we're attacking it very aggressively. The Marine Corps did that as a beta test, but we're sharing our information with both the Navy and the Air Force, and we'll do that at the CEO conference coming up this week. But we believe we can drive cost down significantly, sir.

Senator WICKER. What about that replacement rate that Senator Rounds mentioned? Is that accurate?

Lieutenant General DAVIS. I'd have to get back to you on break rates for parts.

Senator WICKER. Admiral Grosklags, is that going to continue?

Vice Admiral GROSCKLAGS. I think we'd have to get to the specific components. I would not be, quite honestly, surprised if we saw that for some number of components on the airplane. I would also be willing to bet that there is some number that are having lives in excess of what we predicted, and that's pretty typical with every new aircraft we introduce to the fleet. We and the industry make assumptions and calculations on what the reliability of every single component is going to be, and then we are continually surprised. We have to either buy more spares, which is not a good answer, or we figure out how to deal with the specific reliability issue associated with those components you're talking about.

Senator WICKER. General Davis, since this is a winner, Admiral Groscklags, should we be proud of this aircraft?

Vice Admiral GROSCKLAGS. I'll answer it quickly and turn it over to Admiral Miller.

I think so, sir. I think we are in a fairly good place as I've been watching the completion of developmental tests. General Davis can certainly talk more about how it's performing for them operationally, but I think in terms of the development process, we're on very solid ground at this point, and I look at a couple of key metrics, one of them being software stability. As we want to get to the final 3F software configuration before we introduce the aircraft in the Navy, we're very closely watching the stability, and we have seen over the last year to 18 months the in-flight stability go from where they were having a system reset or having to do something with the system in-flight from about every five hours to the most recent software releases are about every 40 hours, which is more than acceptable for us right now.

Senator WICKER. Good to hear it.

Admiral Miller?

Rear Admiral MILLER. What's that, sir?

Senator WICKER. That's good to hear, isn't it?

Rear Admiral MILLER. Oh, it's great to hear. We're quite excited. General Davis says it's a winner. We absolutely agree.

I get the question a lot, hey, tell me about the F-35 versus F-18, and I say it's not a versus. The complementary nature of both of these aircraft into the future for our aircraft carrier Navy is very exciting. We've taken F-35 out to the ship already. About 150 traps, this is with fleet pilots, 100 percent boarding rate, no 1 wires—it was a dream to bring aboard.

So as we integrate it, the fact that we're getting supersonic stealth, data fusion, the sensor netting that this airplane is going to be able to provide, it adds capability, lethality and survivability not just to the air wing but to the entire carrier strike group. The way we integrate it with our Aegis ships and our baseline 9 configuration, the way we fight it alongside of our—the capability that it brings with the capacity that the Super Hornet brings under the control of an E2D and with the capability of a Growler is just exciting for us guys who are carrier aviators.

Senator WICKER. Thank you.

Lieutenant General DAVIS. Sir?

Senator WICKER. Yes, General Davis.

Lieutenant General DAVIS. On the Marine Corps side, we also track the Air Force numbers as well. It's hard to put a qualitative

number on what an airplane brings to the fight, but the Air Force—and we are seeing similar operation in our major exercise. We just got back from a big exercise in Alaska, sir, 20 to zero, 21 to zero. I mean, the exchange rates for these airplanes going into highly contested environments, operating in weather that we wouldn't be able to operate in before, electronic warfare mission, strike mission, air-to-air mission, in the hands of what were pretty inexperienced, younger guys flying airplanes, it's exceptional.

The other thing, if you combine that with the Marine Corps being all F-35 and F-35Cs. But the ability to go land in an expeditionary base—75 percent of our error in the big fight is ashore with the capability to go back aboard the ship and 25 percent aboard the ship.

For the Marines, where we go, we're probably going to be in a kinetic fight. You cannot rule that out. So the ability to go, take the airplane from an amphibious ship, go to a strike mission, land at a forward operating base ashore, get rearmed with the motor down, which we practice with the F-35 right now in our weapon school, and get airborne again to go basically take whatever number of airplanes that you have look like more and be more is a truly incredible capability, and you can do that any climate, any place, and any threat.

Senator WICKER. Thank you.

Senator Sullivan?

Senator SULLIVAN. Thank you, Mr. Chairman.

I wanted to discuss an issue that doesn't come up too much on the readiness with regard to naval aviation. There was an article—and, Mr. Chairman, I'll ask that this be submitted in the record. It was from the Marine Corps Times last year titled "Marine Corps Aviation Fleet is in Peril."

Senator WICKER. Without objective.

[The information referred to follows:]

Your Marine Corps**The Marine Corps' aviation fleet is in peril**By: [Jeff Schogol](#)

April 26, 2016

The number of Marine Corps aircraft ready to fly on any given day has plummeted in the last seven years, leading to serious questions about the safety of the service's aircraft as leathernecks continue to wage war on terrorists and respond to crises around the world.

Mission-capable rates for all but one of the Marine Corps' 12 fixed-wing, rotary and tiltrotor airframes have fallen since the end of fiscal 2009, according to data obtained by Marine Corps Times via Freedom of Information Act request. While officials stress that the number of flyable aircraft fluctuates daily, the downward trends have alarmed Marine leaders and members of Congress.



U.S. Marines with Marine Heavy Helicopter Squadron 462 perform maintenance on a CH-53E Super Stallion at Camp Bastion, Helmand province, Afghanistan, Oct. 14, 2013. The Marines removed the top rotor and prepared the aircraft for a replacement. (U.S. Marine Corps photo by Sgt. Gabriela Garcia/Released)

Of the Marine Corps' 276 F/A-18 Hornets, only 87 are currently flyable, Marine Corps officials said on April 20. That is less than one-third of all the service's F/A-18A-D variants that can be used to strike the Islamic State group, provide close-air support or fly reconnaissance missions.

By comparison, 73 percent of F/A-18As were mission capable in fiscal 2009 along with 77 percent of the C-variant and 76 percent of F/A-18Ds.

Marine helicopters have seen the biggest drop in readiness. Only 42 of the Marine Corps' 147 CH-53E Super Stallions are flyable, or about 28.5 percent of the CH-53E fleet, according to Marine aviation officials. At the end of 2009, the CH-53E's mission-capable rate more than doubled that at 63 percent, with 39 percent of the helos fully mission capable.

"In the typical squadron ... the remaining six are not able to fly tonight due to a shortage in parts, long-term fixes or need some kind of attention that the squadron doesn't have the ability to provide," Salene told Marine Corps Times. What that means is we can meet today's mission, but we haven't the depth to meet tomorrow's."



Marines, Sailors, Coast Guardsmen and family members pay their respects during a memorial ceremony honoring 12 Marines from Marine Heavy Helicopter Squadron 463 aboard Marine Corps Air Station Kaneohe Bay, Jan. 22, 2016. Two CH-53E Super Stallion helicopters with HMH-463 were involved in an incident off the coast of North Shore, Oahu, Hawaii, Jan. 14. (U.S. Marine Corps photo by Cpl. Jonathan E. LopezCruet).

Photo Credit: Cpl. Jonathan LopezCruet/Marine Corps

Marines pay their respects during a memorial ceremony honoring the 12 members of Marine Heavy Helicopter Squadron 463 killed in a January crash.

As the Marine Corps figures out how best to meet its missions overseas, those left in the rear are flying less — and that has leaders, former pilots and members of Congress concerned.

Marine aviation-related deaths hit a five-year high in September when fatalities reached 18 during the first nine months of 2015. About four months later, a dozen more Marines were killed when two CH-53E Super Stallions crashed off the coast of Hawaii.

They were assigned to Marine Heavy Helicopter Squadron 463, and their commanding officer was relieved of command three days prior. A Marine familiar with the situation told Marine Corps Times following the crash that the squadron as a whole was "way, way low" on flight time, adding "they were not flying enough."

Retired Navy Cmdr. Chris Harmer, a former HH-60H Seahawk instructor pilot, said steep federal budget cuts are to blame. There's a direct line between flight hours and mishaps, he said.

"For a given population of pilots — aviators," he said, "the less they fly, the less training missions they get, the less training the aviation maintenance personnel get, the less money we have for spare parts, the less money we have for training exercises, the higher the mishap rate will be if everything else is held constant."

Marine CH-53E pilots averaged about 10.7 flight hours over the last 30-day reporting period, said Capt. Sara Burns, a Marine Aviation spokeswoman.



U.S. Marines Lance Cpl. Jordan J. Gomez, bottom, and Lance Cpl. Steve G. Pitkin, both electricians with Marine Fighter Attack Squadron (VMFA) 115, troubleshoot issues with the right engine of a F/A-18 Hornet aircraft at Marine Corps Air Station Beaufort, S.C., May 15, 2014. Daily maintenance is vital to VMFA-115 and their aircraft. (U.S. Marine Corps photo by Lance Cpl. Austin A. Lewis/Released)

Photo Credit: Lance Cpl. Austin Lewis/Marine Corps

Between Feb. 18 and March 18, Hornet pilots were averaging about 8.8 flight hours, she said. That was a little more than half the 15.7 flight hours the Marine Corps wanted to give F/A-18 pilots during that time period.

Marines troubleshoot issues with an F/A-18 Hornet engine. Fewer Hornets were mission capable at the end of fiscal 2015 compared with rates seven years prior.

Harmer said ideally, the pilots should fly between 25 and 30 hours per month. Averaging eight or nine hours a month could lead to fatal mistakes, he warned.

"Fifteen hours a month for a Hornet, to me that's the absolute hard deck," he said. "You're increasing risk with every hour beneath that. Eight hours a month, that's completely irresponsible, completely unsustainable. You're going to kill a lot of people if that's the new norm."

Burns said Marine aviators' flight hours vary. Those gearing up to deploy are likely to have all or most of their aircraft in working order and tend to fly more.

Marine All-Weather Fighter Attack Squadron 533, for example, is set to deploy. All 12 of that squadron's aircraft are flyable and pilots averaged 10.8 flight hours in the last 30-day reporting period. Meanwhile, Marine Fighter Attack Squadron 312, a South Carolina-based unit that's currently stateside, has just three of its nine aircraft ready to fly. Its pilots averaged 4.5 flight hours in the last reporting period.

Following the fatal helicopter crash in Hawaii, Assistant Commandant Gen. John Paxton told lawmakers in March that the Marine Corps is examining whether lower readiness rates have led to more aviation mishaps.



INDIAN OCEAN (July 20, 2015) - A U.S. Marine CH-53E Super Stallion from the "Greyhawks" of Marine Medium Helicopter Squadron 161 (Reinforced), 15th Marine Expeditionary Unit, departs the amphibious assault ship USS Essex (LHD 2). The 15th MEU maintains the readiness of the aircraft and pilots through continuous flight operations and maintenance while deployed. The "Greyhawks" are the aviation combat element of the 15th MEU, based out of Camp Pendleton, California, and embarked aboard the Essex, are conducting naval operations in the 6th Fleet area of operations in support of U.S. national security interests in Europe and Africa. (U.S. Marine Corps photo by Staff Sgt. Miguel Carrasco/Released)

Photo Credit: Staff Sgt. Miguel Carrasco/Marine Corps

A Marine CH-53E Super Stallion assigned to the 15th Marine Expeditionary Unit, departs the amphibious assault ship Essex.

"We're looking to see if there's a linear correlation," Paxton said. "We know historically that if you don't have the money and you don't have the parts and you don't have the maintenance, then you fly less."

That same day, Sen. John McCain, R-Ariz., went as far as describing the Marine Corps' aviation problems as a "crisis."

"Many aircraft are down hard, pilots are not flying, and non-deployed Marine aviation squadrons are short of the number of aircraft needed to train or respond in a crisis," said the chairman of the Senate Armed Services Committee and veteran Navy pilot.

A top lawmaker was recently up in arms when he said he learned that Marine aviation squadrons are using parts from museums to keep their aircraft flying.

"I have heard firsthand from service members who have looked me in the eye and told of trying to cannibalize parts from a museum aircraft ... getting aircraft that were sent to the boneyard in Arizona back and ready to fly missions, pilots flying well below the minimum number of hours required for minimal proficiency," said House Armed Services Committee Chairman Mac Thornberry, R-Texas, at a March 22 hearing.

The Marines were eventually able to make the part they needed using a 3-D printer, said Lt. Gen. Jon Davis, deputy commandant for aviation.

"Marines will find parts." Davis told the Senate Armed Services Seapower Subcommittee on April 20. "They will find them on other airplanes and cannibalize. We don't want them doing that."



120404-N-VE788-036 U.S. Marines assigned to Marine Medium Tiltrotor Squadron 261 with the 24th Marine Expeditionary Unit perform maintenance on two CH-53E Sea Stallion helicopters aboard the amphibious assault ship USS Iwo Jima (LHD 7) while in the Atlantic Ocean on April 4, 2012. The Iwo Jima is deployed as part of the Iwo Jima Amphibious Ready Group with the 24th Marine Expeditionary Unit in support of maritime security operations and theater security cooperation efforts in the U.S. 5th and 6th Fleet areas of responsibility. DoD photo by Petty Officer 3rd Class Travis J. Kuykendall, U.S. Navy. (Released)

Photo Credit: MC3 Travis J. Kuykendall/Navy

Marines fix a pair of CH-53E Super Stallion helicopters. Mission-capable rates on the heavy-lift helos are on the decline.

To help restore the CH-53E fleet, Congress has provided the Marine Corps with \$360 million to refurbish and repair all of the service's 147 helicopters, said Salene, the MAG-29 commander.

"The second part, staying on step, is working with all of the naval aviation team to ensure we have the parts we need, the aircraft we need and most importantly, the training we need for our people so that we can remain America's 911 force," he said.

But getting spare parts is a challenge, Burns said. And when a fleet of Marines is competing for the same parts, the winner will be the unit closest to deploying.

"We do not have enough ready basic aircraft," she said. "That means we are not getting enough flight hours and we aren't up on our maintenance requirements for those specific aircraft."

The Marine Corps has requested another \$460 million from Congress next fiscal year to address readiness shortfalls. Some of that money would buy spare parts for Marine aircraft.

"We know we're under resourced for spare parts," Lt. Gen. Glenn Walters, deputy commandant for Programs and Resources, told reporters in early March.

While Davis said getting parts for aging aircraft like AV-8B Harriers is top on his priority list, so are parts for new planes, like the F-35 joint strike fighter.

"We've got these great, brand-new airplanes but sometimes we don't have the parts we need to get to full readiness," he said.

Seeing newer aircraft with mission-capable rates as low as some of the Marine Corps' oldest planes or helicopters is a red flag, said a retired Marine pilot and

Iraq War veteran, who spoke on the condition of anonymity since he works in the aviation industry. That includes several critical aircraft that Marines fly, like the new versions of the Super Cobra or Hercules.

Mission-capable rates for the AH-1Z have fallen from 74.2 percent to 52.2 percent between fiscal years 2009 and 2015. During that same period, mission-capable rates for the KC-130T fell from 70.7 percent to 68.1 percent.



Marines watch as an MV-22 Osprey lands during an aircraft and personnel recovery training mission in California.

Photo Credit: Sgt. Paris Capers/Marine Corps

While Marines are known for doing more with less, Burns said it poses challenges when they identify needed repairs, only to find they're competing with everyone else in need of the same parts.

"We can realistically only look Marines in the eyes so many times and ask them to do one more thing for America, knowing that unless something changes, we will just be asking them again," she said. "Ingenuity only gets us so far, however, we are equipped to fight our current battles, but our units at home who are on the bench are hurting the most."

At a time when the service is trying to retain its top talent amid an improving economy, those types of frustration can drive Marines out of the Corps. Marines who completed an annual retention survey last year cited a lack of job satisfaction as the fourth-highest reason for wanting to leave the Corps in 2015, up from the No. 6 spot in 2014.

The reasons behind the steep declines in mission-capable rates can vary widely by aircraft, according to officials at Fleet Readiness Center Southwest at Naval Air Station North Island, California. About 30 percent of the center's workload is devoted to repairing Marine aircraft.

F/A-18 Hornets require the most maintenance due to its age and frequent support in accomplishing naval and Marine Corps missions, said Mike Grice,

the systems engineering department head there. Hornets are susceptible to cracks and corrosion, he added.

Since the CH-53E is out of production, there can be delays in getting needed parts, said John Olmstead, a spokesman for Fleet Readiness Center East at Cherry Point, North Carolina. They are sometimes required to make certain parts in-house, he said, which can take a while.

The situation became dire when across-the-board spending cuts known as sequestration hit in 2013, Olmstead said. The readiness center was not able to hire replacements for artisans who retired or took jobs elsewhere, and it could not order badly needed maintenance materials or spend money to fix equipment at the center, he said.

"This meant no preventive maintenance on plant equipment. That led to many machines being down for extended periods of time," Olmstead said. "This inhibited our ability to produce parts, further slowing our turnaround time. Both issues continue to impact our throughput and cost."

The retired Marine pilot who works in the aviation community said he's particularly concerned about readiness rates for the CH-53E. The heavy-lift helo is a workhorse for the Marine Corps, and the mission-capable rates, which dropped from 63.6 percent at the end of fiscal 2009 to 46 percent at the end of 2015, "look horrible," he said.

"The [mission-capable] rate should be 70 percent," he said. "...They're not hitting it. They're not coming close to it at all."

He recalled that his Marine Heavy Helicopter Squadron was at 70 percent full-mission capable when it deployed to Iraq about a decade ago. At the end of 2015, the helo was at was at 50 percent. The pilot said he believes the problems with that aircraft are unique, stemming from a lack of funding for repairs, maintenance and spare parts that predates sequestration.

When the threat of sequestration first hit in 2013, then-Commandant Gen. James Amos and his top adviser for the budget at the time, Lt. Gen. John Wissler, warned different audiences in Washington about the possible fallout.

Amos said at the time that "only two-thirds of our aviation combat units will be at readiness levels required for overseas deployment; decreased readiness will compound in 2014 and beyond." Wissler said entire F/A-18 fighter squadrons could be shut down. Fewer available aircraft would mean less flight time for pilots — and if Marines weren't training to fly, he said they could become a liability.

Harmer, the retired Navy commander and former Seahawk pilot instructor, said Congress has forced the military to cut training and operations budgets because they were not allowed to take money from elsewhere, such as pay and benefits.

"This is a problem the Marine Corps itself cannot address," he said. "The president and Congress have committed us to an operations regime overseas and

not financed a training regime for stateside, and then basically said to the Marines, 'You guys figure it out.' There's nothing to figure out. There's no way for the Marines to reallocate funding that just isn't there."



U.S. Marine Corps Lance Cpl. Moses G. Roman, a tiltrotor mechanic, replaces a blade on an MV-22 Osprey aircraft assigned to Marine Medium Tiltrotor Squadron 265 (Reinforced), 31st Marine Expeditionary Unit in Iwakuni, Japan, April 20, 2016. U.S. Forces in Japan provided operational airlift support in coordination with the Government of Japan's efforts to provide relief following the recent earthquakes in Japan. (U.S. Marine Corps photo by Cpl. Justin Glandon-Hall)

Photo Credit: Cpl. Justin Glandon-Hall/Marine Corps

Lance Cpl. Moses Roman, a tiltrotor mechanic, replaces a blade on an MV-22 Osprey. Marine leaders and members of Congress are concerned about the state of the Corps' aircraft.

While lawmakers have taken steps to ease the cuts since 2013, neither Congress nor President Obama seem willing to permanently fix the damage sequestration has done to readiness.

As things now stand, the Marine Corps does not expect to return to optimal aviation readiness levels until at least 2020 — assuming the service gets all the money it needs between now and then, Paxton told members of the House March 3.

But the Marines may have to face another budget shock. Unless lawmakers reach a compromise, sequestration spending levels will return in fiscal 2018, when a two-year budget deal expires, said Jesse Sloman, a research assistant with the Center for Strategic and Budgetary Assessments think tank in Washington.

That would sink the Marine Corps' plan to fix the damage to aviation units by 2020, Sloman said.

"If we went into another sequester, I think it would be disastrous," he said.

Commandant Gen. Robert Neller has called aviation readiness his "No. 1 concern," but said it will take a couple years for the Marine Corps to get more

flight hours for pilots and enough spare parts for maintainers to keep planes and helicopters in the air.

For now, Congress needs to provide more funding to the Marine Corps and other services so they keep aircraft flying, said Virginia Republican Rep. Rob Wittman, chairman of the House Armed Services Readiness Subcommittee.

"It requires that we fully fund readiness accounts ... that include flying hours, that include parts and inventory of parts, including maintenance schedules and maintainers," he told Marine Corps Times.

Past experience has shown that when defense budgets are cut, spare parts become harder to come by and mission-capable rates decline, Wittman said.

"When you don't have those resources, you have to prioritize and there are fewer aircraft that are available," he said. "Sometimes, in order to get critical parts, you do need to go to other aircraft."

If Marine units aren't in the lineup to deploy, they have the hardest time getting spare parts, Wittman said.

"We've seen that happen in the past," he said. "We've seen it every time we go through a reset, whether it's back post-Vietnam War, post Carter administration, wherever we may be. All of us want to believe that the lessons have been learned and we don't need to repeat that."

Gidget Fuentes contributed to this report.

Senator SULLIVAN. Thank you.

One of the things that this article highlighted was it's not just readiness but actually the safety of our aviators when they're not being able to fly. So this whole article talked about how Marine aviation-related deaths hit a five-year high in September. This was last year, when fatalities reached 18 during the first nine months of 2015, and there's a quote from a retired Navy commander who is a pilot saying there's a direct line between flight hours and mishaps. The less they're flying, the less they're training, the less maintenance personnel are getting involved, the higher the mishap rate.

So can you talk about that? We always talk about, hey, we're not ready to fight, but maybe even more troubling is our lack of readiness is potentially risking the lives of our aviators who are already in a very dangerous profession.

Lieutenant General DAVIS. Here's how I'd couch that, Senator, watch it very closely. Every one of those losses affected me personally, deeply. What I would say is we're flying safe airplanes. We're not flying them enough.

I would say probably the bigger threat out there is when you don't have enough hours, you can fly according to the book safely, but what you're not getting is the looks at the ball, not being as proficient as you should be. To me, the primary player at risk is the Marine infantryman. They deliver close support fire, air-to-air fire, assaults aboard for them, that the pilots and the crews aren't as practiced as they should be, and doing that under every threat condition that's out there.

We've not been able to draw a line with the mishaps we've had to a lack of proficiency with those crews out there.

Senator SULLIVAN. I think it's good, General, that you guys are focusing on that because, obviously, readiness is one thing, we

want that, but if we're losing lives because we're not training enough, I think that's—shame on all of us.

Lieutenant General DAVIS. As the nation's force, on readiness, we have to be ready to go, especially a small force, small in size. We're supposed to be in a high state of readiness. That readiness has taken a hit over 16 years of fighting, flying airplanes that were built in the 1980s at a depth to dwell of 1 to 2 that General Miller talked about this morning, sir.

Senator SULLIVAN. Yes.

Lieutenant General DAVIS. All that puts wear and tear, and it's just not enough time and not enough power tools to train the aviators to the degree they need to be truly on their A game for that force of readiness. So the risk for us is there. We need to get out of this zone of low readiness, low inventory, as quickly as we can to provide the fires that we need for the Marine Corps to be that force we need.

Senator SULLIVAN. I wanted to follow on to Senator Kaine's point and what you mentioned, General. I did get to see just briefly the F-35 Bravos that were in Alaska. As the Navy and the Marine Corps are fielding the F-35s, the discussion about having a much bigger range complex for the standoff to be able to train better with these fifth-generation aircraft is critical.

So I would welcome all of you to come on up and see the Joint Pacific Alaska Range complex (JPARC), which some of you might be familiar with. The Air Force, obviously, is very familiar. But that has an air size bigger than Florida, and we're actually expanding it. You can do CAS. It's got the SAM simulations.

The Air Force is up there a lot. I had General Neller up in Alaska two summers ago, and there was a squadron of Hornets that had just done the Red Flag exercise and stayed after, and they happened to bump into the commandant of the Marine Corps on a Sunday morning, which was a little bit, I think, stunning for them. But the squadron commander said to the general, to General Neller, that that was the best air-to-air training he had ever done in his entire career.

So we would welcome whether it's Northern Edge or Red Flag, getting up and seeing that, because there's a dedicated F-16 Aggressor squadron up there. It's probably the best air-to-air training on the planet, and it's only going to get better when the F-35s are fully fielded because the space is so huge.

Any comments on that, about the great training at JPARC?

Lieutenant General DAVIS. Sir, I wish I was still flying gray airplanes like that so I could be up there in Alaska flying with those. I'll tell you, though, and I'll speak for the brothers as well, but we like to deploy, we like to go train, we like to train hard. It's a great place to train hard, up there in Alaska. It's new. It's great adversary support.

Again, we need to be able to train, as General Miller said and the CNO said, to the high-end fight. That's a great place to train to the high-end fight. You can do everything you need to do in the theory books and all that stuff, and training transactionally in garrison. When you get out, you get on the road, you go someplace else, you take your unit out there, you focus on the task at hand, it's great training in Alaska.

Senator SULLIVAN. Also, a lot of CAS opportunity.

Lieutenant General DAVIS. Absolutely.

Senator SULLIVAN. Admiral, have you ever trained at JPARC?

Vice Admiral GROSCKLAGS. I have not. I'm a helicopter pilot, so we try to stay out of those cold weather areas if we can.

[Laughter.]

Vice Admiral GROSCKLAGS. I will comment that one of the critical things, whether in Alaska or other places, that we need to continue to invest in is the threat simulations or the actual threats on the range. That is one of the places where, I'll say, we've fallen a little behind. I think there's some investment in our budget request exactly for that.

Senator SULLIVAN. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Senator Tillis?

Senator TILLIS. Thank you, Mr. Chairman.

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

Admiral Groscklags, I wanted to ask you—I think last year I asked the question. I assume it's the same answer, that the LAFAM facility down at Cherry Point is still a priority, and it looks like we're probably two or three years away from beginning to see a flow of Joint Strike Fighters—I woke up thinking about it this morning—going down to that area. So, do you feel like—we were talking about the limits at the Rolls Royce factory and the need to stand this thing up. I mean, is the run rate in reaching maximum capacity at the Rolls Royce facility roughly the same? So the need, the priority is still there?

Vice Admiral GROSCKLAGS. Yes, sir, the priority is still there. As we were talking just a minute ago about combatting the cost of sustaining these aircraft, one of the things that we need to do sooner and one of the things that has been a large topic of discussion over the last six months or so with the F-35 program office and all the services is standing up that depot capability across the board, organic depot capability much more quickly.

So we're trying to pull all of that stuff to the left so that we can not only support the aircraft more cost effectively but in cases like this just support the aircraft, because the vendors, the OEMs [Original Equipment Manufacturers] are quickly, I believe, going to be in a spot where they're trying to support a significant increase in production at the same time they're seeing increase in demand for their repair capability, and that's truly our challenge.

Senator TILLIS. Yes. Just to finish this thought and move to a related topic, I worked with the state legislature, and they're negotiating a budget right now that is a specific appropriation for things that the states can do to anticipate some of the broader needs that will occur with getting the LAFAM facility there and maybe an increase in depot operations down there.

Another topic that came up that I told the legislature to look at is the potential hangar capacity to really be able to expand and leverage that site down there. Is that something that you all agree has potential and a part of that solution?

Lieutenant General DAVIS. Sir, we are already starting to lay in the money in our five-year plan to start to build out Cherry Point.

Part of that is hangars. It's ramp improvements to handle F-35s. So not only the lift facility at the FRC but also, too, the hangars and the construction we need in the simulator buildings to bring in F-35s. So we're starting to get to a healthier ramp-up. We can certainly use more and faster to replace those older airplanes that we're using up. But that money is starting to go into the budget now to go build those hangars.

Senator TILLIS. Well, there are a number. If you all think more broadly when you do that and you increase the operations, the number of either civilian or uniformed personnel that are going to be down there, to the extent that that suggests some need for underlying infrastructure that may be appropriate for state investment, I would very much appreciate. We've certainly gotten the attention.

I, for one, wouldn't want you to put the LAFAM facility or the hangar in any place that's not what you all consider to be the best and highest use. So if you've arrived at the conclusion that Cherry Point is one of those places, what I would also like to do is make sure that we're ahead of the curve on things that we may be able to work with the state legislature and the governor, who are very open and supportive, because it has an economic impact for the state, and we want to make sure that we're doing everything at the state and local level to knock down any other challenges that come when you expand the capacity down there.

Lieutenant General DAVIS. A lot of the infrastructure at Cherry Point, sir, is World War II infrastructure. It has not been improved since then. So this is sorely needed out there, and it's in the plan right now, so we'll look forward to teaming with the State of North Carolina to build hangars and build facilities as quickly as we can so we get a place to bed these airplanes down.

Senator TILLIS. We'll probably submit some questions for the record.

Mr. Chair, I apologize for coming late. I've got to go off to another commitment, but I wanted to thank you all. I appreciate you getting it on the priorities list and appreciate your feedback on anything we can do to facilitate the process. Thank you for your service.

Senator WICKER. Thank you, Senator Tillis.

Senator HIRONO?

Senator HIRONO. Thank you, Mr. Chairman.

General Davis and Admiral Miller, when Congress agrees to support an administration request for multi-year procurement authority, it is a serious matter, and this year the Department is seeking authority to enter into contracts for economic order quantity items with the F-35 contract. EOQ [Economic Order Quantity] contracting authority is typically limited to the programs that have been approved for multi-year contracting authority.

So why is the Department asking for a multi-year-like contracting authority when the F-35 program has not completed operational testing? How can you assure us that this is a low-risk kind of authorization?

Vice Admiral GROSCLAGS. Senator, I'll take that one, if I may. What we're specifically asking for is taking approximately 4 percent of the fiscal year 2019 and 4 percent of the fiscal year 2020

EOQ [Economic Order Quality] and pulling it forward and executing it with the fiscal year 2018 EOQ. So it's a total across all the services—Navy, Marine Corps, and Air Force—of about \$616 million that we would pull forward. That enables Lockheed and the other vendors, the makers of the airplanes, the engines, et cetera, to go out and buy those long-lead materials and get the economic order quantity cost savings.

What outside agencies have told us, as well as our own calculations, the savings associated with pulling that money forward would be about \$800 million across the three services for the aircraft, reduction in aircraft unit cost, because we're able to pull that relatively small amount of money forward.

So it's not additional money. It's money that would already be spent in fiscal year 2019 or fiscal year 2020 for those lots of airplanes. It's only 4 percent of the EOQ in each one of those years, and it does not commit the services nor the Congress to actually buying a set number of aircraft in those years. So it is not a multi-year procurement from that extent. We are committing to absolutely nothing, other than a cost savings.

Senator HIRONO. Well, that's good, because I was going to say if we're committing to absolutely nothing, why do you even need authorization? But, be that as it may, we'll be talking with you further about that.

I have a question regarding—is for General Davis. The commandant's unfunded priority list includes a request for two C-40A aircraft this year, similar to the request the commandant made last year. Last year, the Congress provided two C-40 aircraft for the Navy in accordance with the CNO's unfunded priority list but failed to address the commandant's request.

I understand that the current aging C-9 aircraft that the C-40s would be replacing are now, in the words of Reserve Commander Lieutenant General McMillan, hard down and not safe to fly. General Davis, do you agree with General McMillan's assessment? If you agree that they are hard down and not safe to fly, why doesn't the budget request fix this problem?

Lieutenant General DAVIS. Senator Hirono, thanks for the question. I would say the C-9s are not only hard down but we've transitioned them out of the Marine Corps inventory. They're gone. We're the only people in the United States military flying those airplanes, those old C-9s. It's very difficult to get them parts, to get them worked on, and it was, frankly, we thought it was too much of a high-risk proposition to be flying our Marines around on those airplanes, so we transitioned them out. So they're out of the inventory now. We don't own them anymore.

We have a lot of requirements. The C-40s are on the unfunded priority list, but if you looked at our other inventory challenges with the nation's force and readiness, what we have to be ready to do, we do need those C-40s, but we also need F-35s, we need 53 kilos, we need C-130Js even more. So we are asking for the C-40s, but as far as rank order priority, at the end of the day the nation needs the Marine Corps to be able to go forward, and I have no options for the jets, I have no options for the helicopters, I have no options for the C-130Js. So I had to put the priority there. It's not

a perfect world, but we laid out what we thought we were going to be called on to do as a nation.

But right now, to fulfill that mission, we count on the Navy to fly us around when they can. We use C-130s to go with the cargo seats, or commercial carriers to do the C-40 mission right now.

Senator HIRONO. So with the C-9 aircraft out of your inventory, has that impeded the operational support aircraft mission flown by the Marine Corps Reserve?

Lieutenant General DAVIS. It has. The Marine Corps Reserve is flying the UC-35 and the UC-12 for the bigger missions, and we transitioned the VMR-1 down to the Reserve unit down there in Texas. We're waiting for airplanes to arrive. They're co-located with some of the Navy C-40s that are there and looking for some help from this body to get those airplanes. It's just there's not enough money in our budget to cover everything, so they are on the unfunded priority list, ma'am.

Senator HIRONO. Then would you consider the need for the C-40 replacements critical at this point for cargo and passenger movement?

Lieutenant General DAVIS. They are critical for cargo and passenger movement, but also too we have war-fighting requirements that have to be met as well, ma'am, and that's why they're not right at the top of the list.

Senator HIRONO. You and I talked about the problem of corrosion, Admiral Miller, and this is something that Admiral Grosklags—am I pronouncing the name correctly? Close enough? Sorry.

Vice Admiral GROSKLAGS. Grosklags.

Senator HIRONO. Grosklags. About two years ago Rear Admiral Manazir, speaking before a conference here in D.C., said that the corrosion damage on the F-18 fleet was more than expected. Many Navy and Marine Corps airplanes and helicopters are grounded due to corrosion issues. As corrosion costs the Department about \$20 billion annually, it seems to make sense to provide for preventing corrosion where possible, including robust R&D work in this area.

So can you tell me how the fiscal year 2018 budget request impacts the Department's corrosion program and what the Department of the Navy is doing in terms of meeting the challenges caused by corrosion, and are steps being taken in new acquisition programs to ensure that, to the extent possible, corrosion can be controlled or prevented?

Vice Admiral GROSKLAGS. Ma'am, I can tell you that there is not a specific RDT&E line or other line for corrosion prevention in our budget. There are funding corrosion efforts that are embedded in a number of lines. I'll give you at least one example from aviation, and we can go beyond that if you want.

We fund today about 60, 65 individuals that are called our corrosion maintenance readiness team, and those individuals are at every one of our fleet sites, and their sole purpose in life is to help the squadron maintenance professionals understand what they need to do in terms of corrosion prevention work on the aircraft in those squadrons.

We've been doing that—we started that back in about 2011. We started with F-18s because of the very issue that you mentioned earlier, and we had gotten away from it. We had gotten away from doing that basic level of corrosion control at some of our squadrons. This has reinvigorated that, and we're starting to see the benefits. So as we've been tracking this, what we have been measuring is the change in the number of corrosion hours that our depot artisans have to do on aircraft in areas that should have been done at the squadron level. For those aircraft that we started this on several years ago, we are seeing a significant decrease in the labor hours at the depot, so we know we're having an impact and it's worth the investment in this particular area.

On the research and development side, I can also tell you we have about nine ongoing projects with universities around the nation where we're involved in basic research on materials and coatings and that type of thing. We also have as of today about 60 funded projects that are being run. This was OSD [Office of the Secretary of Defense] money that was given to the services. We have about 60 projects that we are running with various organizations and companies around the nation, again looking at materials, coatings, how to combine the two and how to stay away from—I dropped the sink on the word I'm looking for, but how to prevent this similar metal corrosion even in cases where, from a technical aircraft structure aspect, it may make sense, and I'll give you an example.

Our F-18Es and Fs, considerably greater use of composites, a titanium center barrel. These are as opposed to our F-18A through D, where we're seeing the problems that you mentioned earlier and that Admiral Manazir talked about.

So on F-18E and F, we're seeing significantly less of that deeply embedded corrosion in the aircraft because we changed materials, we changed the build process, and we added corrosion protection into those aircraft as we built them.

Senator HIRONO. I think it's really important that you are paying attention to the corrosion issue because the lifetime use of our aircraft can be extended by that kind of attention to that matter.

Thank you very much, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

General Davis, let's talk about the CH-53K and the costs having a marked rise. Can you explain the causes of the cost inflation?

Lieutenant General DAVIS. I can, sir. A couple of things. The costs are staying in band with the estimates that we have. There's no threat of a Nunn-McCurdy breach or anything like that. So we're staying inside the band for the cost. Sometimes people get confused about the cost, are acquisition costs really staying very close to what we originally projected. A lot of times people dump in the cost out there that includes the military construction, includes all spare parts, all the engineering and the cost of the airplane. But when you compare apples to apples, we're staying very close to our original cost.

We did have a quill problem that we worked our way through last year. We are going to build the airplane up in Connecticut in case some of the labor rates that we dealt with, with Sikorsky and Lockheed Corporation to build the airplane. But at the end of the

day, this airplane is going to—right now what we're seeing in tests is incredible capability. We have to work every day—

Senator WICKER. Another winner.

Lieutenant General DAVIS. It is, actually, and there's nothing like it in the world that does what the 53K will do. It's designed with kind of a clean sheet design to take a Marine battalion's worth of gear and lift that in one area of darkness from a sea base ashore at a 100-mile distance. That's a 36,000-pound lift capability. No airplane in the world can do that. The 53K can. So it's an incredible capability.

I would tell you that as a guy who spent a lot of time in college working for minimum wage, you want to keep all the costs of these things down. I think we need to hawk that, and Admiral Grosklags, Admiral Miller and myself, the commandant worked very hard to keep the cost under control and make sure that the company is doing right by us, right by the taxpayer in keeping costs down.

What we are finding is an airplane that is very easy to maintain. So if you look at the amount of hours, not just what it cost to buy it but how many man hours it takes to maintain the airplane, a much easier airplane to maintain and sustain than the 53E.

I think, as—you and I have talked, Senator Hirono, about the lessons learned about the 53E and what we have to do to extract maximum value from that airplane. We did an independent range review and, frankly, we stole a playbook from the United States Army, who were doing a better job resetting their helicopters than we were. We are adopting that very same strategy that the United States Army did. So bringing all of our 53E's out, resetting them completely, and those airplanes on the back side of that reset are much lower cost per flight hour. They're running about half what it costs to run an airplane that's not been through reset. A properly reset, sustained airplane is half the cost per flight hour, which is a lot of money.

So if we maintain it, if we sustain it, we train those enlisted Marines the right way, we'll be in much better shape, and we'll keep the cost, the total ownership cost of the 53K down and have a winning capability for our nation.

Senator WICKER. So the cost is no surprise.

Lieutenant General DAVIS. Right now it's an expensive airplane, but it's staying within its cost band, and we have every intention of keeping it within its cost band, sir.

Senator WICKER. At the top of it.

Lieutenant General DAVIS. We don't want it to go to the top because if we go to the top, we go into a Nunn-McCurdy breach. We're not interested in that. We're interested in keeping that very close to what the original estimates were for that airplane.

Senator WICKER. Do you think Admiral Grosklags could fly it?

Lieutenant General DAVIS. I do, and I think he would actually want to fly that one in cold weather too, because the Marines do fly our helicopters in cold weather, and I've seen pictures of Navy helicopters in my first deployment up north of the Arctic Circle, in some very cold weather.

Vice Admiral GROSKLAGS. Not intentionally.

Senator WICKER. Admiral Grosklags—

Vice Admiral GROSKLAGS. Yes, sir.

Senator WICKER. I guess this is the first hearing you've ever had in which your name has been mispronounced.

Vice Admiral GROSKLAGS. Absolutely.

Senator WICKER. I'm so sorry for that.

[Laughter.]

Senator WICKER. Let's talk about the Osprey. There's a request for multi-year procurement for seven years. Can you describe the need for such a long multi-year?

General Davis, I understand the Marine Corps is studying the potential need to increase the V-22 program, a record, from 360 to 380. Can you update us on that?

Admiral Grosklags?

Vice Admiral GROSKLAGS. I'll start with the multi-year and then pass it over to the General.

Seven years. Typically we ask for five years for a multi-year. Seven years would enable us to buy the remaining total of 67 Navy, Marine Corps, and Air Force aircraft that are currently in the three services' plans, notwithstanding your question about potentially increasing the Marine Corps requirement. Otherwise, if we just got a five-year multi-year, we would have the two years and about 20-plus airplanes hanging out.

We've got the cheap single-year cost estimate, which is the foundational piece of understanding what our savings will be by going to a multi-year. Last week we received the not-to-exceed letters from the OEMs, Bell and Boeing in this case, that really justify that, and you should see that package coming over here to the Hill shortly.

But the savings in those NTE [not to exceed] letters get us 10 percent per aircraft. So without getting into the street costs right now, we're looking at about \$650 million-plus of savings across that seven-year multi-year. So it is a bit unusual to ask for seven versus five, but we think it's justifiable given the savings and the fact that if we leave two years hanging out on the end, those aircraft will certainly cost us more than if we were able to include them in the multi-year.

Senator WICKER. General Davis?

Lieutenant General DAVIS. Sir, we have a study that looks at would we want to increase the total program of V-22, and as you know, the Marine Corps, we pride ourselves on our ability to stay on our mark-up there as far as staying with the program of record.

On the V-22, though, the priority for us is this thing that Admiral Grosklags talked about earlier, this common configuration reliability and maintainability initiative, which is basically going to take all of our earliest V-22s through—basically, it's more than a reset. It would bring us up to a common configuration. We introduced the V-22 in 2007 and sent it directly into combat, and every single year we had it in combat we would have these urgent changes to make sure we were adapting the airplane for threat conditions, reliability conditions for the battlefield.

On the back side of that, one of our range reviews showed us that we had about 77 different variations of V-22s in the Marine Corps. If you were a young enlisted Marine, that makes it very difficult to maintain, to get high manage rates out of that airplane.

So job 1 for us is to make them all one configuration, V-22, one parts list for the V-22, high reliability components on there, and drive costs out of owning that airplane. That's job 1 for us right now, and we'll look at increasing the—buying the additional 20 airplanes.

But right now we want to continue our fielding and deliver a very high readiness aircraft to the fleet, and that requires [inaudible], which is where 52 percent of the readiness challenges in the V-22 reside, and then making it so we have one parts list, one repair manual, and one configuration of the V-22.

Rear Admiral MILLER. Senator, if I may, normally when we're having a V-22 conversation, I'd be silent, but this year is different in that this budget, the 2018 budget, is the first year of the CMV-22 for the Navy. Our request is for six aircraft, and the CMV-22 takes the Marine Corps MV-22, adds some extra fuel, puts an intercom for passengers in the back, and also adds a SATCOM radio for long-distance operations overseas, and this is going to replace the carrier on-board delivery, the C-2, for our carrier strike groups embedded on our aircraft carriers.

The reason for this change and the reason that we're making the move to the CMV-22 is twofold. One, our cods are old and need to be recapitalized. Secondly and most importantly, you'll see that the CMV-22s are going to be tied to our F-35C deployments on the carriers. It's the only thing that can actually carry the engine on board, and that's clearly going to be critical as we sustain that airplane into the future. So CMV-22 will now be a part of the air wing of the future.

Senator WICKER. Last question, Admiral Miller. What do you think about General Davis' upcoming retirement?

Rear Admiral MILLER. I think it's a great day to celebrate a fantastic Marine who has dedicated his entire life to the defense of this country, sir.

Senator WICKER. So do I. Is this the sort of career you'd recommend to the next generation?

Rear Admiral MILLER. In a heartbeat. As a matter of fact, I'd do a re-do if I could, and I'm sure he would as well.

Senator WICKER. General Davis, you have the last word.

Lieutenant General DAVIS. I walked into a recruiting office 40 years ago as a college freshman needing discipline. I found that in the United States Marine Corps, and I didn't even know they had airplanes. So the fact that I'm running Marine Corps aviation—the three of us, we support and defend the greatest country the world has ever seen. It's been an absolute honor every single day on Active Duty. I'll miss it, but like Cincinnatus, I'll be ready to go help out any way I can in the years to come. I love this country, love the Corps, love the naval services. Semper fidelis.

Senator WICKER. Thank you very much.

Let's get our questions for the record in by Friday afternoon.

Senator HIRONO. General Davis, we want to wish you the best in your retirement. Didn't you tell me that your wife wanted to move to Hawaii?

Lieutenant General DAVIS. She does. She was very angry that I never got orders to Hawaii in 37 years.

Senator WICKER. This hearing is adjourned. [Whereupon, at 3:49 p.m., the hearing was adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JOHN MCCAIN

DOD BUDGET

1. Senator MCCAIN. Lieutenant General Davis, Vice Admiral Grosklags, and Rear Admiral Miller, is the President's budget sufficient to meet the needs of Navy and Marine Corps aviation in terms of readiness and modernization? What are the implications for Naval Aviation of returning to Budget Control Act levels of funding?

Lieutenant General DAVIS. A return to BCA funding levels will jeopardize Marine Aviation's readiness recovery and force us to re-prioritize our sustainment funding on units preparing to deploy—at the expense of remain-behind units. Efforts to modernize our aviation fleet will also be at risk as most of our aircraft procurement programs are currently at or near the minimum sustainable production rate and reducing procurement of any (e.g. F-35B/C, CH-53K) increases the individual unit cost. In addition, Marine aviation will incur additional risk by operating rapidly aging legacy aircraft well beyond the platform's intended service life. The President's Budget provides Marine Aviation the resources to continue to modernize our fleet of aging legacy aircraft by procuring F-35 and CH-53K, among others. By funding the readiness enabler accounts to their maximum executable levels, this budget provides the resources required to continue our readiness recovery plan and train a "ready bench" by fiscal year 2022. Stable, predictable funding for sustainment and aviation spares accounts is critical to our ability to increase our number of flyable aircraft so that we can fulfill our responsibility as the Nation's Force in Readiness.

Vice Admiral GROSKLAYS. The Fiscal Year 2018 President's Budget (PB18) builds on the fiscal year 2017 (FY17) readiness investments to address programmatic shortfalls and achieve greater wholeness, both now and into the future. Although PB18 is a critical step in readiness recovery, PB18 alone is insufficient to fully address aviation readiness and modernization. The Department's significant readiness debt was accrued over years of high optempo, budget reductions and fiscal uncertainty, and it will take time, sufficient funding and stability to fully recover.

Returning to BCA funding levels would reverse the readiness recovery progress made in fiscal year 2017 and exacerbate shortfalls. Naval Aviation would be unable to provide the trained and ready forces the nation needs in both the near and long term. The Navy overall would be too small and lack advanced and asymmetric capabilities needed to conduct our primary missions.

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PHYSIOLOGICAL EPISODES

2. Senator MCCAIN. Vice Admiral Grosklags, how much funding does the budget request include for addressing physiological episodes in Navy aircraft? The Navy has repeatedly referred to its "resource unconstrained" efforts to mitigate and solve the PE problem. In other words, money, time, and personnel are no object. Is there any program or project which needs more funding?

Vice Admiral GROSKLAYS. The President's Budget currently funds \$4.211 million of RDTEN for physiological monitors and an Enhanced Emergency Oxygen System in efforts to solve the PE problem. There are currently no PE-related programs or projects that require additional fiscal year 2018 funding. As continuing investigations identify root causes and solutions, additional funding may be required.

3. Senator MCCAIN. Vice Admiral Grosklags, please describe the Navy's most recent efforts to mitigate physiological episodes.

Is a limited number of vendors hindering equipment modification efforts? Can industry produce enough specialized components?

Vice Admiral GROSGLAGS. The Navy's most recent efforts to mitigate physiological episodes center on alerting, protecting, preventing, and monitoring. Specific actions include performance of maintenance activities to ensure the hygiene and integrity of the breathing gas system and to functionally check and recertify critical systems sensors and components that affect its designed functionality; air quality will be measured for all aircraft. System modifications include addition of a water separator and a new oxygen monitoring system. All flights include sorbent tube assemblies and hydrocarbon detector devices issued to all aviators to measure the quality of the breathing gas reaching their masks.

The breathing gas system is highly specialized and there are a limited number of vendors in this industry sector. That said, current industrial and sustainment capacity for onboard oxygen generating system (OBOGS) components had been planned and resourced at a level consistent with current demand for specialized components, yet some capacity shortfall does exist. Given this condition, all known industrial partners capable of aiding in root cause resolution and manufacturing capacity have increased their participation and production capacity to support expeditious resolution of PE issues.

4. Senator MCCAIN. Vice Admiral Grosklags, what is the latest projection for when T-45s will be back training student pilots at their full envelope?

Vice Admiral GROSGLAGS. Student syllabus events began the first week of August.

5. Senator MCCAIN. Vice Admiral Grosklags and Lieutenant General Davis, students have not flown since April 14. What are the implications for pilot production? Has this reached a critical stage?

Vice Admiral GROSGLAGS. As of 21 July CNATRA has lost 30 percent of its yearly production and missed delivery of 154 FRS seats. We do not expect any new T-45 students from CNATRA in the 3rd QTR of fiscal year 18. CNATRA is working with FRS and PERS-43 to understand the impacts of lost throughput to the fleet, impacts to the careers of instructors and students, and mitigation measures for each. CNATRA has identified its flight training priorities for the return to training and is working with NAVAIR to identify options to restore lost throughput such as expanded support capability and incentives for Contractor Logistics Support maintenance. CNATRA is also working with PERS 43 and our Reserve component to identify additional instructor support. Dispersed across the 58 VFA, VAQ, VAW, and VRC squadrons, such a shortfall can be managed in the near-term through routine personnel distribution measures (tour extensions and re-tours of some fleet squadron junior officers), coupled with minor manning adjustments to non-deployed units while keeping our deployed units fully manned.

Lieutenant General DAVIS. As of 21 July CNATRA has lost 30 percent of its yearly production and missed delivery of 154 FRS seats. We do not expect any new T-45 students from CNATRA in the 3rd QTR of fiscal year 2018. CNATRA is working with FRS and PERS-43 to understand the impacts of lost throughput to the fleet, impacts to the careers of instructors and students, and mitigation measures for each. CNATRA has identified its flight training priorities for the return to training and is working with NAVAIR to identify options to restore lost throughput such as expanded support capability and incentives for CLS maintenance. CNATRA is also working with PERS 43 and our Reserve component to identify additional instructor support. Dispersed across the 58 VFA, VAQ, VAW, and VRC squadrons such a shortfall can be managed in the near-term through routine personnel distribution measures such as tour extensions and re-tours of some fleet squadron junior officers, coupled with minor manning adjustments to non-deployed units while keeping our deployed units fully manned. Based on CNATRA N3's assessment that training flights will resume at the end of August or early September 2017, HQMC Aviation expects minimal short-term impacts to pilot production. To date, USMC FRSs have not missed any starts based on students awaiting training. If training commences in September, the pool of students awaiting training will deplete and we project only five missed FRS starts. However, if training delays continue past September the number of missed starts will increase each month. By December, the cumulative missed FRS starts would be 26. Long-term impacts are insignificant if T-45 commences in September as forecasted. If delays continue past September and into the first half of fiscal year 2018, impacts can be offset by adjusting pilot assignments of existing TACAIR pilots.

6. Senator MCCAIN. Vice Admiral Grosklags and Lieutenant General Davis, since these aircraft do not have automatic PE sensors, maximizing data collection is criti-

cally important. Collecting and analyzing more flight data will help us find the root cause. As students begin flying again, can you assume this committee that all aircraft—both operational and training—will include data collection tools such as hydrocarbon detectors and sorbent tube assemblies? Given the Navy’s “resource unconstrained” commitment to fixing this problem, I would be concerned if the Navy was not making every effort to collect data.

Vice Admiral GROSCLAGS. Hydrocarbon detectors and sorbent tubes are data collection tools being provided for all T-45 aircrew. Instructors and student aviators are required to have these devices incorporated into their flight gear. Additional physiological episode (PE) sensors, data collection and analytics are being investigated and aggressively pursued to include automated sensing monitoring and reporting technology that measure aircraft performance and/or human performance related to PEs. Aircraft also have a new O2 monitoring system and incorporate a water separator to improve system operation.

Our current plan is to also outfit all F-18 aircrew with sorbent tube assemblies and hydrocarbon detectors. This is being accomplished as the components become available.

Lieutenant General DAVIS. Hydrocarbon detectors and sorbent tubes are data collection tools that will be issued for all T-45 aircrew. Instructors and student aviators will have these devices incorporated into their flight gear prior to return to flight with the onboard oxygen generating system (OBOGS). Additional physiological episode (PE) sensors and filters to include an O2 monitor and vest pocket aircrew filter are being investigated and aggressively pursued. Data collection and analytics to include automated sensing monitoring and reporting technology that measure aircraft performance and/or human performance related to PEs remain a priority and will be fielded expeditiously. (NAVAIR, CNAP N40, DASN, N98 CHOP)

INDUSTRIAL BASE

7. Senator MCCAIN. Vice Admiral Grosklags, how would you describe the state of the industrial base that supports Navy and Marine Corps aviation programs? What must this subcommittee be particularly mindful of related to the industrial base?

Vice Admiral GROSCLAGS. The state of the Navy/Marine Corps aviation defense industrial base is directly related to timely and stable budgets which drive steady weapon system design, manufacturing, and operations & sustainment programs. With resource and program stability, the defense industrial base can maintain a highly trained work-force, support long-term continuity of operations, and make prudent investments in manufacturing and depot tooling/robotics that can sustain, and if necessary, surge to meet current and projected future warfighter readiness demands.

The subcommittee should be particularly mindful in understanding that a design engineering and sustaining engineering/logistics core of highly trained personnel are required for each weapons system and that many industrial sectors and sub-contractors that support our national security requirements are also supported by highly competitive commercial markets that are larger than the Department of Defense (DOD). If business operations do not support timely and consistent contract awards that support long-term profitability, vendors can and do walk away from the defense sector. In particular, the industrial sector is routinely impacted by shifts in DOD demand as a result of budget fluctuations and constraints and the demands placed on them by statutes and derived regulations.

MULTIYEAR PROCUREMENT OR BLOCK BUY AUTHORITIES

8. Senator MCCAIN. Vice Admiral Grosklags, are there programs that would benefit from cost reduction initiatives, such as Multiyear Procurement or block buys, that do not currently have these authorities?

Vice Admiral GROSCLAGS. The V-22 program is currently benefiting from the Congressional approved fiscal years 2013–2017 Multi-Year Procurement (MYP) II contract. Given the lower costs, stabilization of contractor work force and continuity of production facilitated by MYP contracts, V-22 has requested a fiscal year 2018 Congressional authorization of a MYP III strategy through the established certification process. The Department of Defense expects the proposed follow-on MYP to yield significant savings and industrial base benefits, while instilling confidence in the international community and generating additional V-22 sales that will increase overall MYP savings.

FUTURE CARRIER AIR WING

9. Senator MCCAIN. Vice Admiral Miller, what is your vision for the future carrier air wing?

Rear Admiral MILLER. The future of Naval aviation continues to face, and must pace, a rapidly evolving threat. Substantial force modernization is required to pace the threat in the near term and through the 2024–2030 timeframe. The Air Wing of the future will be lethal, survivable, relevant, networked, sustainable, flexible and increasingly unmanned and autonomous. This Air Wing will decisively defeat increasingly advanced near peer threats using a balanced mix of 4th and 5th generation aircraft; netted sensors, systems and weapons; and include manned and unmanned capabilities.

- *Lethal.* A 4th and 5th generation strike fighter mix provides the necessary complementary capacity and capability required through the 2030s. The Navy's planned strategy for sustaining and recapitalizing strike fighters is reliant on fully funded readiness sustainment accounts, strike fighter utilization management, and F/A–18E/F and F–35C procurement. Future Air Wings will include two F–35C squadrons and two F/A–18E/F squadrons with a minimum of 44 Strike Fighters. This makeup provides the best balance between capability, capacity and affordability.
- *Survivable.* The EA–18G Growler is the Department of Defense's single aviation platform with the capability to detect and identify emitters as well as provide passive precision targeting and connectivity. Future integration of the Next Generation Jammer will improve electronic attack capabilities and contribute to outpacing future threats. To defeat more technologically advanced threats, the Navy expects an increase from five to seven aircraft per Air Wing.
- *Relevant.* The Navy is conducting strike fighter assessments for sufficiency (capacity) and proficiency (capability) gaps in the 2025 and beyond timeframe when F/A–18E/F and EA–18G aircraft begin reaching the end of service-life. This analysis, referred to as Next Generation Air Dominance (NGAD), will inform future balances for Air Wing capability, capacity, affordability and risk across the family of Air Wing systems. NGAD will support the full range of military operations, be foundational to future air-sea battle engagements and a critical element for Joint operations.
- *Networked.* Countering advanced threats requires battlespace awareness dominance. The Air Wing of the future will utilize five E–2D Advanced Hawkeyes (multiple simultaneously airborne) to process tremendous amounts of battlespace information producing actionable decision space. The Navy is conducting a study to identify the correct number of E–2Ds per squadron required to fully implement future capabilities of the Air Wing. The Air Wing of the future will rapidly share multi-spectrum sensor and target information across the battlespace while countering threat sensors and weapon capabilities using robust, secure and survivable tactical data link networks. These systems will fuse information from multiple input sources into a clear and accurate common operational picture.
- *Sustainable.* The oldest aircraft currently operating from the flight deck is the C–2 Greyhound. In fiscal year 2018, the Navy begins procurement of a new Air Wing logistics aircraft—the CMV–22 Osprey. The Osprey will provide increased flexibility and range to our fleet logistics capability and is the only aircraft capable of transporting the F–35 engine to the Carrier Strike Group.
- *Flexible.* The multi-mission MH–60R combat helicopter will continue to support Air Wing of the future requirements for Anti-Submarine Warfare, Anti-Surface Warfare, Naval Surface Fire Support, Search and Rescue and Logistics Support with an 11 aircraft squadron. Five helicopters will embark the aircraft carrier and six will embark the Carrier Strike Group's cruisers and destroyers. Similarly, the multi-mission MH–60S combat helicopter provides Anti-Surface Warfare, Personnel Recovery, Naval Special Warfare Support, Search and Rescue and Logistics Support with an 8 aircraft HSC squadron. Six helicopters will embark the aircraft carrier and two will embark a supporting auxiliary ship. By 2025, as MH–60R/S approaches service life limits and requires a Service Life Extension Program (SLEP) and Mid-Life Upgrade (MLU) program. These programs will modernize, sustain and extend service life.
- *Increasingly Unmanned and Autonomous.* MQ–25 Stingray will be the Navy's first unmanned Air Wing platform and will increase the lethality and reach of the Air Wing as a tanker with a secondary Intelligence, Surveillance and Targeting (ISR&T) roll. The Navy will leverage unmanned and autonomous systems as they become more available and affordable. These systems could fill diverse rolls in a future Air Wing in missions such as refueling, communications relay, logistics, airborne electronic attack, strike and ISR&T. Unmanned and autonomous teaming will reduce risk to the force, increase access to denied areas, increase force capability and capacity at lower costs.

10. Senator MCCAIN. Rear Admiral Miller, the Air Force Research Laboratory's Loyal Wingman program seeks to pair unmanned aircraft with a fifth generation fighter. How do you envision such manned-unmanned teaming manifesting in naval aviation and with strike-fighters in particular?

Rear Admiral MILLER. The Department of the Navy is committed to the use of unmanned capabilities providing communications relay nodes; Intelligence, Surveillance, Reconnaissance, Targeting (ISR&T); refueling; logistics; Airborne Electronic Attack; and strike. Integration of these systems with manned systems will reduce risk to the force, provide access to areas previously denied to manned platforms, increase force capability and capacity at lower costs, and provide distributed intelligent battlespace awareness.

Continued research is required to determine how to most efficiently use inexpensive, unmanned systems. This enables our 5th generation manned aircraft to maintain the tactical advantage. How the Navy envisions employing these systems would need to be addressed at a higher classification.

F/A-18 SUPER HORNET BLOCK

11. Senator MCCAIN. Rear Admiral Miller, can you please describe the Navy's plan and timeline for upgrading its Super Hornet fleet?

Rear Admiral MILLER. The F/A-18E/F will be the Navy's predominant strike fighter platform into mid-2030s. President's Budget 2018 requests procurement of 14 F/A-18E/F aircraft in fiscal year 2018 (FY18) and an additional 66 aircraft across the Future Years Defense Plan, with upgrades to Block III configuration starting in fiscal year 2019. Block III is designed to be complementary to the capability delivered in F-35 and E-2D. The Navy's fiscal year 2018 Unfunded Priorities List itemizes an additional 10 aircraft procurement.

12. Senator MCCAIN. Vice Admiral Grosklags and Rear Admiral Miller, please describe how the Navy is preparing for the Service Life Extension Program (SLEP) for the Super Hornet using the lessons learned from our experience with the Legacy Hornets.

Vice Admiral GROSKLAGS. Lessons learned from legacy Hornet have resulted in a significantly different approach for Super Hornet service life extension. Material supply challenges and non-standardized repair requirements driven by material condition challenges have hampered legacy Hornet life extension efforts. For the first several years, the Super Hornet Service Life Modification (SLM) program will be accomplished at a Boeing commercial depot rather than using organic depot facilities. This approach will leverage the supply chain and technology of the currently active F/A-18E/F Super Hornet production line while incorporating the latest industry best practices to standardize production flow and speed delivery of extended life aircraft. New facilities will enable Boeing to perform engineering dispositions and resource/supply material requirements for this effort under the SLM Contract. In addition, protocols have been established to ensure knowledge gained from material condition findings during SLM are incorporated into fleet preventative maintenance practices resulting in better aircraft material condition at induction. Taken in the aggregate, these efforts are expected to minimize material issues, enhance service life extension predictability and reduce SLM cycle time, thus returning aircraft to fleet customers in less time than under previous efforts.

Rear Admiral MILLER. Navy's planned Super Hornet service life extension program (referred to as the Service Life Modification (SLM) program) was developed around lessons learned from the Legacy Hornet.

Legacy Hornets were inducted into organic depots late in their service life cycles for life extensions. These aircraft were significantly degraded with unplanned material condition issues. This drove unplanned material supply requirements and resulted in non-standardized repair efforts. Additionally, Legacy Hornet service life extensions used an "inspect and then repair" model. This model forced additional time for aircraft extensions and further strained throughput at the depot. The Navy plans to reduce the time required (relative to Legacy SLEP) by conducting concurrent overhaul and aircraft modification (SLM earlier in the aircraft's life cycle).

Learning from Legacy Hornets, the Navy funded a Super Hornet Service Life Assessment Program (SLAP) to identify maintenance and material required to extend Super Hornet service life and minimize aircraft maintenance backlog. "Early-learning" Super Hornets were recently inspected to inform this analysis. "Early-learning" Super Hornets were recently inspected to inform this analysis. Preliminary data indicates material degradation is as originally expected by analysis. These two "early-learning" aircraft are about to undergo destructive teardown. The results of the early inspection will aid in the SLM specification development, inspection tech-

niques, and build of materials that will be required to extend the life of these aircraft.

To mitigate Navy depot throughput constraints during Legacy SLEP, Super Hornet SLM will be accomplished at a Boeing commercial facility (with more capability) for the first several years. This approach will leverage the supply chain and technology of the currently active F/A-18E/F Super Hornet production line while incorporating the latest industry best practices to standardize production flow and ensure efficient timelines for SLM completions.

The Navy also established protocols to ensure knowledge gained from material condition findings of “early-learning” aircraft and those undergoing SLM are incorporated into fleet preventative maintenance practices. This effort will be used to address material condition issues early and minimize major (unexpected) aircraft material condition issues.

The Navy is making every effort to minimize material issues, enhance service life extension predictability and reduce SLM cycle time based on lessons learned from the legacy Hornet extensions. These efforts will ensure SLM aircraft minimize unexpected costs and are returned to the warfighter as fast as possible.

STRIKE-FIGHTER SHORTFALL

13. Senator MCCAIN. Rear Admiral Miller, please update us on the Navy’s strike-fighter shortfall, efforts to alleviate it, and the biggest challenges to overcome.

Rear Admiral MILLER. The Navy’s biggest challenges for Strike Fighter Inventory Management (SFIM):

- (1) *Unexpected Demand and Consumption Rate:* F/A-18E/Fs were designed and delivered with a 6,000 flight hour service life. Heavy warfighting demand around the world over the past decade consumed these flight hours much sooner than expected. Recapitalization has not kept up with the level of aircraft the Navy “consumes” each year. The Navy’s current deficit is projected to grow higher by 2024 as additional fleet aircraft reach the 6,000 hour service life limit.
- (2) *F/A-18E/F Service Life Modification Program (SLM):* F/A-18E/Fs begin to reach designed limits (6,000 hours) next year. The Navy needs to extend the life of these aircraft to 9,000 hours to meet SFIM targets through 2035. As F/A-18E/F SLM begins, the Navy needs to plan for 15 percent of aircraft inventory (“pipe”) to be in extended depot maintenance at any given time. Extension of aircraft life will ultimately reduce procurement requirements, but some recapitalization investment is required to avoid significant gaps on the flight line beginning in the early 2020’s.
- (3) *F-35C Delays:* Due to the F-35C Initial Operational Capability delay from 2012 to 2019, the lack of F-35C procurement has increased the impact of not replacing F/A-18s. These aircraft would have provided the needed replacement “flight hours” for F/A-18A-F.
- (4) *Readiness:* An expeditious and effective lever for the Department to increase readiness is for the Navy to accelerate divestment from Legacy F/A-18A-D. Accelerating transition to Super Hornets will allow cost savings and reduce depot maintenance workload. As the Navy approaches the end of the extended service life for Hornets, the cost per flight hour continues to rise. Additionally, there are shortages in the Department of the Navy’s (DON) spare parts and supply system that have contributed to flight line readiness challenges, as well as our ability to extend the service life of these airframes. Accelerated divestiture of operational Hornets will avoid further costly repairs and depot inductions. Working together, the Navy and Marine Corps are developing a DON solution to efficiently and effectively sundown legacy F/A-18A-Ds.

The Navy is taking the following actions to help mitigate the shortfall:

- (1) Prioritizing funding for aviation readiness, flying hour and enabler accounts.
- (2) Managing and conserving hours on our aging fleet.
- (3) Extending aircraft service life from their originally planned 6,000 hours to 9,000 hours using our aviation depots and commercial assistance. We expect to induct 60-70 aircraft per year.
- (4) Procuring new aircraft (both F/A-18E/F and F-35C).

The Department will continue to meet operational demand with continued support of strike fighter procurement that paces retirements, modifications that increase capability, and service life extensions.

To overcome years of underfunding aviation readiness accounts coupled with continuous high operational tempo and delays to the F-35C program, we require a disciplined commitment toward increased funding of enabler accounts and increased procurement of both FA-18E/Fs and F-35Cs. Efficiencies and desired ROI will be

maximized only through stable and consistent funding throughout the Future Years Defense Program.

F/A-18 SERVICE LIFE EXTENSION

14. Senator MCCAIN. Vice Admiral Grosklags, please describe what the Navy is doing to improve depot throughput for Legacy Hornets and to apply lessons learned to the looming service life extension program for the Super Hornet.

Vice Admiral GROSKLAYS. The Navy has several initiatives underway that are designed to improve depot throughput. First, Critical Chain Project Management (CCPM) is a rigorous, theory-of-constraints based approach designed to maximize depot throughput by performing an exhaustive analysis to identify and alleviate constraints affecting the production, material, and engineering pillars associated with depot maintenance. Second, the Navy is implementing a consolidated end-of-life management strategy for the F/A-18 A-D that better aligns major depot maintenance events. Finally, by continuing to execute the SLEP, through by complete development and fielding of all required structural modifications, depot maintenance will become more predictable and less variable from one induction to the next as inspections continue to be replaced by modifications and standard work.

UNFUNDED PRIORITY LIST—F/A-18E/F REQUEST

15. Senator MCCAIN. Rear Admiral Miller, the CNO's Unfunded Priority List has 10 additional Super Hornets as the Navy's #1 priority. Given the strike-fighter shortfall and concerns about aviation readiness, why were these aircraft not included in the President's budget request?

Rear Admiral MILLER. The Navy's Fiscal Year 2018 President's Budget (PB-18) includes procurement of 14 Super Hornets to mitigate the strike fighter shortfall. In addition, PB-18 increases investments in aviation readiness accounts and enablers, such as flying hours, air depot maintenance, logistics and spares. Both the procurement and readiness investments will increase the number of ready available strike fighter aircraft. Additional aircraft procurement was not included in PB-18 in order to prioritize other readiness recovery and improve program balance across the entire Navy portfolio, consistent with the Secretary of Defense's three-phase campaign. Years of high optempo, funding reductions and budget uncertainty have resulted in a significant readiness debt that cannot be fixed in one year—it will take years of sustained commitment to readiness in order to fully recover. PB-18 delivers the best balance of resources to improve all aspects of readiness within fiscal controls.

EA-18G GROWLER REQUIREMENT

16. Senator MCCAIN. Rear Admiral Miller, the Navy has completed its planned procurement of 160 EA-18G Growlers. Navy leadership has testified to Congress that 160 fulfills the Navy requirement for Growlers, but the number needed to fulfill the joint requirement is still being evaluated. Do you believe the Navy requires more Growlers to fulfill the needs of the joint force?

Rear Admiral MILLER. The Navy has a sufficient number of EA-18G Growlers to support current Joint force requirements. The Joint Staff plans to reassess the joint force requirement following review of the National Defense Strategy.

ELECTRONIC WARFARE—NEXT GENERATION JAMMER

17. Senator MCCAIN. Rear Admiral Miller, the Navy is currently developing an advanced electronic warfare system, the Next Generation Jammer, currently planned to only be carried by the EA-18G Growler. How does the Navy envision operating these Jammers? Is the currently planned number of Growlers sufficient to effectively employ the NGJ?

Rear Admiral MILLER. Next Generation Jammer (NGJ) is a powerful electronic warfare jamming technology designed to allow strike aircraft to destroy enemy targets without being detected by modern surface-to-air missile systems. NGJ will be employed to protect fighter and stealth aircraft, allow penetration closer to intended targets and increase probability of mission success.

The Navy has a sufficient number of EA-18G Growlers to support current Joint force requirements. The Joint Staff plans to reassess the joint force requirement following review of the National Defense Strategy.

18. Senator MCCAIN. Vice Admiral Grosklags, the Next Generation Jammer (NGJ) has been designated the first program in a "SkunkWorks" pilot that aims to streamline the acquisition process. Can you describe how the NGJ has benefited from this

approach and any programs currently using this approach or that are planned to use it in the future?

Vice Admiral GROSCKLAGS. USD(AT&L) and ASN(RDA) selected the Next Generation Jammer Mid-Band (NGJ-MB) program (formerly known as Increment 1) as the first Skunk Works program in April 2015 following the program's Development Request for Proposal Release Decision Point. The program was formally chartered on September 17, 2015, and the Skunk Works management construct has been implemented. The benefits of the Skunk Works charter to NGJ have been directly realized as reduced administrative and oversight burden as a result of tailored documentation and milestone processes. Documentation tailoring includes the optimization of regulatory requirements and delegation of document approvals. Milestone process tailoring includes elimination of the traditional OSD Defense Acquisition Board process and the Navy Gate Review process, including associated preparatory reviews such as Overarching Integrated Product Teams. These are replaced with a program execution review process overseen by an Executive Management Board (EMB). The EMB brings together key leadership from the Navy and OSD to review program execution at relevant, and more frequent, program knowledge points, rather than just the traditional milestones. The EMB is supported by a 'core team' of empowered subject matter experts from the EMB offices. The core team actively participates in the program in order to transform traditional external oversight and influence into hands-on insight. EMB reviews are conducted directly and concurrently with both ASN(RDA) and USD(AT&L), eliminating multiple pre-briefs at both the Navy and OSD levels, therefore allowing the program to focus on program execution. To date, three EMB reviews have been successfully executed: a post Preliminary Design Review; a Technical Deep Dive/Milestone B held at the contractor site; and a post Critical Design Review summary and recent wind tunnel test overview held at the Pentagon.

The NGJ-MB Skunk Works charter has been expanded to include the Next Generation Jammer Low Band program (NGJ-LB) (formerly Increment 2) and is pending final approval by USD(AT&L).

MARINE AIR GROUND TASK FORCE ELECTRONIC WARFARE (MAGTF EW)

19. Senator MCCAIN. Lieutenant General Davis, when the last EA-6B Prowler squadron sundowns in 2019, the Marine Corps will no longer have a dedicated airborne electronic attack aircraft. How will the Marine Corps through the MAGTF [MAG-TAFF] EW systems of systems replace the electronic surveillance and electronic attack capabilities of the Prowler? Will the lack of a dedicated airborne electronic attack aircraft community create a capability gap for the Marines?

Lieutenant General DAVIS. The Marine Corps' approach to electronic warfare (EW) after the EA-6B sundowns will ensure that the MAGTF commander has access to EW assets that are adaptable, scalable, and collaborative. There are several initiatives that will be used to meet and modernize the Corps' capacity and capabilities for electronic warfare support (ES) and electronic attack (EA). These initiatives will be complementary to our sister Services' programs, providing the joint force with diverse and flexible options for EW. The Intrepid Tiger II (IT II) pod is currently carried on the AV-8B, F/A-18, UH-1Y. The IT II pod provides EA against communications targets—an organic capability that the MAGTF commander has previously lacked. Future platforms for IT II integration include the MV-22B, KC-130J, AH-1Z, RQ-21A, and CH-53K. IT II Block X was funded for technology development starting in fiscal year 2016 and is funded through the FYDP. This variant will provide counter-radar EA—again, a capability that the MAGTF commander has historically lacked. The F-35 Joint Strike Fighter possesses inherent EW capabilities and the Marine Corps is exploring options to further expand this ability. The Marine Corps intends to retain its existing airborne EA-6B EW expertise to the maximum extent possible. We are offering in-service transitions to EA-6B aircrew so they may continue to contribute to the operating forces and supporting establishments. The personnel structure (106 billets) currently allotted to the EA-6B community has been re-allocated to a mixture of operational and support billets, predominantly concentrated in the UAS community. To equip the UAS community with the material solutions to conduct EW, the Marine Corps has fully funded in POM-18 through the FYDP an IT II payload for the RQ 21A. Future Marine Corps Group 4/5 UAS platforms will also be key airborne EW nodes for the MAGTF. To date, (53) EA-6B aircrew have been selected for MOS transition (EA-6B Pilot: F-35B, F/A 18, MV-22B, KC-130J, C-9), (EA-6B Electronic Counter Measures Officer: F/A-18 Weapon Systems Officer, Student Naval Aviator, UAS). EA-6B aircrew MOS transitions will continue to be offered for the foreseeable future. Any structure lost

as the EA-6B sundowns is consistent with the overall drawdown of Marine Corps total strength.

JOINT STRIKE FIGHTER OPERATIONS

20. Senator MCCAIN. Lieutenant General Davis, could you provide an update on F-35B operations since VMFA-121 moved to Japan?

Lieutenant General DAVIS. Since moving to Japan in January of this year, VMFA-121 has executed over 1,033 flight hours and 470 sorties (as of 19 Jul 17). They are the first USMC unit to field CAT I Pilots (first-tour aviators) into the Operational Fleet. As the first F-35 unit, they have participated in exercises Northern Edge and Distant Frontier in Alaska. They have flown Close Air Support (CAS) training missions over the Korean Peninsula in support of the Korean Marine Exchange Program exercise with our partnered nation (ROK Marines). They have also conducted CAS training missions in Okinawa in support of III MEF ground units to include inert ordnance employment. VMFA-121's recent flight operations also validated adaptive basing concepts in support of future strategic and operational plans by conducting distributed aviation operations, expeditionary refueling, joint Forward Arming Refueling Point, and "hot" reloading evolutions (rearming the aircraft while the engines are still running). Lastly, they have begun in-depth planning for the first shipboard deployment with 31st Marine Expeditionary Unit scheduled in spring 2018.

21. Senator MCCAIN. Lieutenant General Davis, the F-35B brings new capabilities and operational possibilities to the Marine Expeditionary Unit and you have discussed the vision of linking Marine Expeditionary Units (MEUs) more closely into the joint force. However, those new capabilities and operating concepts require investment in shipboard infrastructure to include upgraded data links. Please discuss your vision for L-class ship connectivity and current plans to achieve that vision.

Lieutenant General DAVIS. The Marine Corps Operating Concept imposes an operational requirement to command and control (C2) the Marine Air Ground Task Force (MAGTF) from the sea base during operational maneuver from the sea and distributed enhanced MAGTF operations. To meet this requirement for enhanced C2 while embarked, and exploit the improved capability of the F-35B, we must improve the capability of the LHD/LHA to send, receive, and distribute C2 data. This includes shipboard integration of weapons coordination as well as control and status reporting with remote land, air, surface, and sub-surface units. The F-35B provides great potential for increased capability within the MAGTF, Naval and Joint Force—but only if it is appropriately integrated. In forums, councils, wargames and concept of operations development over the past decade, we have carefully identified current and future requirements that will ensure integration between the F-35B, the MAGTF Tactical Data Systems, and L-class ships. These requirements outline the human and system interfaces for commanders and decision makers to access the operational environment and information network and enable effective C2 of all fires and aviation assets in support of the MAGTF afloat and ashore. Five areas of improvement are identified to achieve system level digital interoperability: Improved Link-16 capabilities to support C2 in a digital environment, track data exchanges, electronic warfare, mission assignment, target engagement order/status, imagery, and free text messages. Improved Variable Message Format (VMF) to support digital C2 track data, mission assignment data (e.g. Close Air Support, Airspace Control, and Fire Support Control Measures, Call for Fires), imagery, and free text messages. Ability to send/receive Intelligence, Surveillance, Reconnaissance (ISR) Full-Motion Video/Still Imagery Photograph (FMV/SIP) receipt via Common Data Link (CDL). Integrated Combat Systems and local area networks cross-domain solutions to support exchanges of track, targeting, electronic warfare, cyber, ISR and C2 data to supporting systems and functional agencies. Sufficient network and communications capacity to provide increased throughput and reach back to facilitate F-35B pre-flight data upload, in-flight information exchange, and post flight mission data downloads and ISR/FMV/SIP on-board and off-board distribution. At a minimum, the end-state is to elevate the capability of the Amphibious Ready Groups and Marine Expeditionary Units to match the information exchange capabilities of today's Carrier Strike Groups. Ideally, these capabilities would be elevated to match the F-35B's 5th Generation sensing and fusion capability in order to effectively command and control the amphibious force in the future operating environment. Beginning in 2018, the F-35B will represent the nation's most-advanced (5th generation), forward deployed, counter Anti-Access/Area Denial (A2/AD) capability for a period of several years. The requirement to implement the identified solutions is valid,

compelling, and urgent. Additionally it is critical to synchronize and track ship upgrades and deployment schedules to avoid a gap in capability.

22. Senator MCCAIN. Rear Admiral Miller, what do you view as the biggest challenges to successful integration of the F-35 into the carrier air wing?

Rear Admiral MILLER. The largest challenge to F-35C Carrier Strike Group (CSG) integration is aligning F-35C capability procurement with investments in other current and future CSG platforms. Full F-35C integration and interoperability (across all CSG platforms) ensures critical battlespace awareness and dominance across all spectrums of Naval operations. The Navy needs these capabilities to fight and win.

23. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, Navy leaders have testified regarding their concerns about the sustainment model and costs for F-35. What recommendations do you have to increase the affordability and transparency of F-35 sustainment?

Lieutenant General DAVIS. The Marine Corps' concerns are being addressed; we remain engaged throughout the Global Support Solution (GSS) development process and the program's "blueprint for affordability." Over the course of the past year, the Joint Program Office (JPO) made significant strides in developing, refining and implementing the F-35 GSS. The USMC remains committed to this architecture as outlined in the "Hybrid Product Support Integrator" (HPSI) initiative and continues to monitor the implementation of the GSS. Simultaneously, select subject matter experts from various Marine Corps competencies have been participating in its development, which is categorized as a "best of breed" construct. This new GSS concept contains elements from both the JPO and USAF proposed models. The best recommendation from my view is to continue to adjust the program based on the lessons learned from our experienced folks as the processes mature, and not become married to our current construct. We are confident that our concerns are being addressed and that the program is headed in the right direction for sustainment.

Rear Admiral MILLER. Increasing the affordability and transparency of F-35 sustainment remains a top priority for the Department of Defense. The Joint Program Office (JPO), the Services and Industry partners have committed to reduce overall F-35 operating and sustainment life-cycle cost by 30 percent.

The Navy is evaluating acceleration of organic depot capabilities to provide cost-effective aircraft support while augmenting the Original Equipment Manufacturing (OEM) existing capacity. While OEM production requirements remain high, acceleration of depot capabilities will ensure efficient production and maintenance of aircraft.

Recent efforts, including the combined Joint Strike Fighter Program Office, Hybrid Product Support Integrator (HPSI) and the Marine Corps Pathfinders Campaign, evaluate operational/sustainment costs and aggressively pursues cost reduction initiatives. Additionally, with a shared vision, mission and objectives, the Services, industry and international partners plan to deliver Global Sustainment Support framework, coupled with maturing HPSI in order to increase F-35 sustainment affordability and transparency.

F-35 FOLLOW-ON MODERNIZATION

24. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, the follow-on modernization for the F-35 is scheduled to bring key warfighting capabilities to the fleet, but the schedule and budget remain in flux. Are you concerned about the affordability and executability of the Department's plan for Block 4 Follow-on Modernization?

Lieutenant General DAVIS. Follow-on-Modernization (FoM) is critical for the F-35 program to remain the most advanced, capable and lethal platform against current and emerging threats in the air-to-air and air-to-ground arenas. FoM efforts focus specifically on developing capabilities that pace the threat and complete the required kill chains. The schedule and budget are certainly a concern and we work diligently with the JPO and our partners. While the structure of the Block 4 program may deviate from its current state, I have no doubt that the capabilities contained within the program will deliver the best schedule technologies and budgets will allow. We monitor FoM closely and remain actively engaged.

Rear Admiral MILLER. The F-35 Joint Program Office (JPO) is continuously evaluating processes and methods to bring capabilities to the fleet. These efforts include an ongoing 90 day study to evaluate capability delivery timelines and associated costs. The Department of the Navy (DON) will review this study to inform decisions concerning DON Joint Strike Fighters and Follow-on Modernization.

Significant threat capabilities have reached Operational Capability in the late 2010s and will continue to improve into the early 2020s. Multiple marks against the F-35 Modernization Program Element have delayed necessary pre-engineering contract work which, if not funded in fiscal year 2018, could delay capability delivery to the warfighter. This adversely impacts our ability to adequately pace the threat resulting in increased warfighting risk.

F-35 PROGRAM MANAGEMENT

25. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, does the Joint Program Office management structure properly align responsibility and accountability? What are your views on alternative management structures for the F-35 program, such as establishing separate service or variant program offices rather than maintaining a joint program office?

Lieutenant General DAVIS. Ultimately, the Department of the Navy seeks to develop, procure, and deliver the most combat capable weapon system to the warfighter in order to meet operational requirements. While the Joint Program Office handles overall program management well, it is incumbent upon each service and partner nation to recognize the challenges of fleet integration and requirements definition and adapt to overcome these concerns. Much like other Marine Aviation programs, Headquarters Marine Corps has a team dedicated managing Marine Corps F-35 requirements. Today, it is critical to our success to have an external program management structure that coordinates and focuses service and partner requirements and manages vendors in order to maximize efficiency and effectiveness of the program. While there are certain pieces of the JPO structure and operation that may need to change and evolve as we move forward, I do not believe that having each service stand-up its own program office is the answer. If each service produced its own program management office, the layers in the program would only increase and synchronization would decrease.

Rear Admiral MILLER. In response to Section 146 of the National Defense Authorization Act for Fiscal Year 2017 (Public Law 114-328), the Department has initiated a comprehensive study of potential alternative management structures for the F-35 Joint Strike Fighter program. This study will also address the alignment of responsibility and accountability across the Department of Defense's F-35 enterprise. The study is presently on-going, led by the Office of the Under Secretary of Defense Acquisition, Technology & Logistics with representation from each of the services and a report will be submitted to your committee by December 30, 2017.

AIRBORNE DATA LINK PLAN

26. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, you both have talked about the importance of networks to your visions of Naval and Marine aviation. The committee is concerned that the Department of Defense's ideas for airborne data links have lacked vision and been disjointed. Please discuss your efforts in this area and how you are ensuring that the Navy and Marine Corps are interoperable not only with each other, but with the Air Force and Army as well.

Lieutenant General DAVIS. The United States Marine Corps is leveraging the capability of a software reprogrammable payload, which will host waveforms from the Joint Tactical Networking Center DOD Waveform Information Repository. This enables an infrastructure of air data links that leverages the standardized DOD waveforms, including TTNT and Link-16 in the short term, and provides the flexibility to adjust to new waveform capabilities via the inherent reprogrammable framework. Additionally, the Marine Corps is maturing a gateway technology that enables the Service to exchange data between compatible and non-interoperable networks. Marine Aviation is working closely with NSA to overcome the challenges of handling the multi-level security challenges inherent in this approach. The Marine Corps' efforts align with the Marine Operating Concept.

Rear Admiral MILLER. The Navy achieves secure tactical communications using different tactical data link waveforms for diverse missions and platforms. This complexity requires different types of tactical datalinks to meet differing requirements.

The Link-16 network is planned to remain the foundation for Navy Tactical Data Links (TDL) for the foreseeable future. Worldwide, there are more than 10,000 Link 16 terminals integrated in the Navy, the Marine Corps, the Army, the Air Force, and the 43 partner nation's combat systems. Currently, all Navy and Air Force tactical aircraft either have Link 16, or are in the process of being upgraded to this capability. Seamless network integration in a combat environment (with so many diverse systems) remains one of the highest priorities of the Department. Link-16 working groups, across all Military Services, review interoperability regularly. The US Coast Guard and international partners are also included where appropriate.

The Navy uses a number of other tactical data links that fulfill requirements that are different or mutually exclusive of the Link 16 attributes and capabilities. Radio Frequency (RF) spectrum mission requirements that differ from Link 16 specification is one reason other TDLs are required. Some alternative TDLs that the Navy uses for tactical communications are Cooperative Engagement Capability (CEC), Multifunction Advanced Data Link (MADL) and Tactical Targeting Network Technology (TTNT).

CEC uses a common architecture and uses the exact same hardware, software, messages and algorithms amongst the participants to achieve interoperability.

MADL exists only on the Joint Strike Fighter and similarly achieves network interoperability by using a common architecture including hardware, software, messages and algorithms amongst the participants to achieve interoperability. MADL is common among all variants of F-35 to include the F-35 sold to partner nations.

TTNT is currently on DON platforms only, but could be integrated on other services' platforms. TTNT is a transport mechanism that provides an internet protocol (IPv4) enabled waveform and uses commonly defined message formats such as JPEG, HTML and XML. Common applications and common messages among TTNT platforms ensure interoperability.

Interoperability from Joint Publication 1-02 is the condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. The discussion above is summarized in that context in the table below.

Level of Ambition	Definition	Example
Integrated	Able to merge seamlessly and are interchangeable	F35B to F35B on MADL Or Aegis to Aegis on CEC
Compatible	Able to interact with each other in pursuit of a common mission	Link 16(F18 to F22 to F35 to E-2D to Aegis, etc. etc.)
De-conflicted	Can co-exist but not interact together	CEC/MADL/Link 16/TTNT

USMC AVIATION READINESS

27. Senator McCAIN. Lieutenant General Davis, Marine Corps aviation readiness appears to still be in a crisis. How did we get here, what are you doing to improve readiness, and what are the biggest challenges to overcome?

Lieutenant General DAVIS. Marine aviation support to OEF and OIF utilized aircraft at wartime surge rates for over a decade, including in 2013 at the onset of sequestration. A shrinking force and continuous deployments, combined with fiscally constrained budgets and the loss of skilled artisans, set the current conditions. The reduction of contract services and funding shortfalls resulted in a degraded aviation force that was in need of a reset. Since 2014, with the end of OIF and a major force reduction in Afghanistan, the Marine Corps continues to respond to the Nation's requirements with Marine Expeditionary Units. However, lack of available amphibious ships forced the Marine Corps to adapt and create a forward-deployed, land-based crisis response force to protect the Nation's interests abroad and respond at a moment's notice. In an effort to recover readiness, Marine Corps leaders have prioritized and balanced funding between readiness accounts and procurement of new aircraft to enable recovery. 2016 was a transitional year, and while some efforts for recovery of funding were identified, the majority of long-term recovery efforts began in 2017. There are many reasons for these reduced readiness numbers. Budget constraints lowered readiness funding; High Operational Tempo; Aging aircraft have not been replaced or reset. Less-than-optimal procurement rates to replace over-age and aging aircraft, which is critical to maintaining our capability over near peer competitors; Spares—Aircraft Not Mission Capable Supply rates are 25+%; RBA recovery has stalled. There is a two-year lag between funding readiness accounts and realized gains; Continued support of readiness and Flight Hours Program is critical; RBA aircraft is 441. Marine aviation requires 589 to maintain T-2.0 and 690 to achieve a ready bench. The flight hour metric, while not the only

measure of capability, is an indicator of the depth of the material bench and of the ability to surge. Marine aviators and aircrew operate in high-tempo environments, flying increasingly complex mission profiles. The time between operational deployments is decreasing, the inventory of aircraft to train with is decreasing and today's aviators are not getting enough "looks at the ball" to ensure they are as proficient as they should be. Marine aviation initiated six Independent Readiness Reviews (IRRs) beginning in December 2014. To date, AV-8Bs, CH-53Es, H-1s, MV-22s, as well as an aviation ground MISHAP review are complete. These reviews, led by independent leaders outside the Naval Aviation Enterprise, provide different perspectives, assessments and courses of action to achieve positive gains and meet readiness requirements. Since implementation, there are more Ready Basic Aircraft (RBA) on the flight line than previous years, and the recovery effort focuses on four primary lines of effort: 1) Depot throughput; 2) In-service repairs; 3) Non-mission capable supply; 4) Non-mission capable maintenance. The common thread in each IRR focused on non-mission capable supply aircraft and identified funding shortfalls in readiness accounts as a critical factor. PB-18's focus is to fund these accounts to the maximum executable level, ensuring stable and predictable funding to support Marine Aviation's recovery to training levels by fiscal year 2020 and a ready bench by fiscal year 2022. Four main factors surfaced within each IRR (with different combinations in each Type/Model/Series): People, Parts, Process, and Funding. The Marine Corps is tackling these components head-on. Continuing resolutions and delays in budgets have stalled recovery in the short-term. The real key to reducing risk in capacity and recovering future readiness is through recapitalization of the fleet—transitioning to new aircraft. The Marine Corps is 41 percent through its aviation fleet transition of every type/model/series. Twenty-eight squadrons are complete with 40 awaiting transition. This recovery plan balances current readiness and modernization to maintain and increase our operational advantage as we procure a new aircraft and transition to a modern force.

V-22 OSPREY

28. Senator MCCAIN. Vice Admiral Grosklags, the President's budget request includes a request for authority for multiyear procurement for 7 years. Can you describe the need for such a long multiyear?

Vice Admiral GROSKLAGS. The proposed follow-on multi-year procurement contract (MYP III) spanning seven years (fiscal years 2018–2024) would buy out the remaining domestic aircraft program of record. Buying out the remaining requirement (44 CMV-22 for the US Navy and 21 MV-22 for the US Marine Corps) under a single MYP is the most cost effective means to complete the production phase of the program. Competing resource requirements and the constraints imposed by the Budget Control Act preclude the Department from completing the program of record under a five year MYP contract. If MYP III were only to cover five years, the requirement remaining after the MYP would likely be unaffordable. Including these final two years under a seven year MYP is expected to net an additional \$223 million in savings.

A seven year MYP III continues affordable procurement, provides stability to industry and maintains a production line and contractual foundation to attract future V-22 international sales/customers. Long-term stability and lower costs provide incentives for prospective international V-22 customers which benefits both the Department and the industrial base.

29. Senator MCCAIN. Lieutenant General Davis, I understand the Marine Corps is studying the potential need to increase the V-22 Program of Record from 360 to 380. Can you provide an update on that study and what an increase in the PoR would mean for the proposed multiyear?

Lieutenant General DAVIS. Marine Corps Concept Development & Integration's Operational Analysis Division recently completed a study concerning future capability and warfighting capacity within the MV-22B community. The study suggests an increase of 20 MV-22B aircraft to the Program of Record (PoR) may be required to meet future Major Combat Operation demands and account for projected attrition losses. The Marine Corps is not currently increasing its MV-22B PoR but will continue assessing potential requirements.

NAVY AND MARINE CORPS AIR-LAUNCHED MUNITIONS

30. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, in your judgment, are your air-launched munitions inventories sufficient to support current operations and the Defense Strategic Guidance writ large? Are there individual air-launched munitions whose inventories, either present or projected, are insufficient

to meet requirements? If so, what are they and what is being done to address the shortfalls?

Lieutenant General DAVIS. The Department of the Navy (DON) continues to lag behind the Total Munitions Requirement (TMR) for Air-to-Air and Air-to-Ground weapons. In order to fill the current munitions shortfalls, the DON will continue to rely on legacy weapon variants to bridge the gap in quantity but this does not address shortfalls in capability. Due to challenges from the Budget Control Act and resultant funding inconsistencies, there are a number of weapons that lack capacity and capability. Budgetary constraints have also had the same effect on the industrial base and their ability to address capacity shortfalls, capability upgrades and parts obsolescence issues. The DON conducts detailed analysis on a yearly basis which analyzes our current inventory referencing OPLAN requirements and attempts to determine risk mitigation strategies in regards to munitions funding shortfalls.

Rear Admiral MILLER. The Department of the Navy (DON) is committed to maintaining the Total Munitions Requirements for Air-to-Air and Air-to-Ground weapons but continues to lag. To fill capacity shortfalls, DON relies on legacy weapon variants. Decreased funding across DON's air launched weapons portfolio has resulted in lower procurement numbers. This shortfall is compounded by a constrained industrial base that has struggled to address capability upgrades, parts obsolescence issues and would find it very difficult to increase production to address capacity shortfalls. DON conducts yearly inventory analysis and establishes risk mitigation strategies to support operational requirements around the world.

ADVANCED WEAPONS

31. Senator MCCAIN. Lieutenant General Davis and Rear Admiral Miller, what steps are the Navy and Marine Corps taking to ensure they have munitions that are relevant and effective against the increasingly difficult defenses our potential adversaries are developing and fielding?

Lieutenant General DAVIS. It is an imperative that the Department of the Navy (DON) has a force with the capability and capacity to fight and win against any of our five major challengers (China, Iran, North Korea, Russia, and Violent Extremism) by investing in advanced weapon systems that increase lethality for both the current and future force. We are engaged towards implementing our vision of greater tactical and technical innovation to provide the right capability in the hands of the warfighter, on schedule, and in the most affordable manner possible but are disadvantaged by fiscal constraints and budget instability. Our strategy is based in part by the transition/update to major components of the Carrier Air Wing (CVW), Expeditionary Strike Group and land-based Expeditionary Wings, and includes: manned and unmanned aviation system teaming; integration of warfighting capabilities to ensure multiple systems operate together across platforms, weapons, networks and sensors; advanced computing; and incorporation of commercially driven technology to provide a technological advantage over adversaries. In the near-term, we have implemented a series of modernization programs to legacy weapon systems that includes technological upgrades to Tactical Tomahawk, Harpoon/BLK II, and AIM-9X/BLK II. In the mid-term we are investing in new development programs as the Joint Air-to-Ground Missile and Small Diameter Bomb II. For the long-term, we have developed a Cruise Missile Strategy to develop the next generation of long-range strike weapons that will enable Carrier Strike Groups, Amphibious Strike Groups, Surface Action Groups and individual firing units to project power across the global commons, against near-peer threat nations and non-state actors. Answered via DASN(Air)

Rear Admiral MILLER. The Department of the Navy (DON) is committed to maintaining a force with the capability and capacity to fight and win. Investments in advanced weapon systems increase lethality for both the current and future force. Providing needed warfighter capabilities, when needed, and in an affordable manner, is often challenged by fiscal limitations and budget instability.

The Department's strategy focuses on transition and modernization of needed capabilities for the Carrier Air Wing, Expeditionary Strike Group and land-based aviation squadrons of the future. This effort includes advancements in manned and unmanned aviation system teams; maximization of sensor, payload and platform capability integration; and advanced computing. Commercially driven technology should provide a technological advantage over adversaries.

In the near-term, DON has invested in modernization programs to legacy weapon systems that includes technological upgrades to Tactical Tomahawk, Harpoon Block II and AIM-9X Sidewinder Block II.

In the mid-term, DON plans investments in new development programs such as the Joint Air-to-Ground Missile and Small Diameter Bomb II.

In the long-term, DON's Cruise Missile Strategy focuses on the next generation of long-range strike weapons that will enable the Carrier Strike Groups, Amphibious Strike Groups, Surface Action Groups and individual firing units of the future to project power across the global commons against near-peer threat nations and non-state actors.

32. Senator MCCAIN. Vice Admiral Grosklags and Rear Admiral Miller, in your statement for the record you state that the Department intends to develop and acquire an Offensive Anti-Surface Warfare (OASuW) Increment 2, yet the budget zeroes out the funding for the effort. Can you explain the Navy's plan and why this effort is being delayed when threat advancements are not?

Vice Admiral GROSKLAGS. The Department of the Navy (DON) requested funding for OASuW Increment 2 (OASuW-2) in fiscal year 2015 and fiscal year 2017 to meet a 2024 Initial Operational Capability. These requests were not funded due to "early to need" justifications. In President's Budget 2018 (PB18) request, funding reductions for OASuW-2 were necessary to address immediate fleet readiness issues which delayed fielding these capabilities. An OASuW-2 material solution remains a key component of DON's long-range Cruise Missile Strategy. DON will continue to evaluate a cost effective and timely solution to mitigate additional delays in fielding OASuW-2.

Rear Admiral MILLER. The Department of the Navy (DON) requested funding for OASuW Increment 2 (OASuW-2) in fiscal year 2015 and fiscal year 2017 to meet a 2024 Initial Operational Capability. These requests were not funded due to "early to need" justifications. In President's Budget 2018 (PB18) request, funding reductions for OASuW-2 were necessary to address immediate fleet readiness issues which delayed fielding these capabilities. An OASuW-2 material solution remains a key component of DON's long-range Cruise Missile Strategy. DON will continue to evaluate a cost effective and timely solution to mitigate additional delays in fielding OASuW-2.

USMC UNMANNED ROADMAP

33. Senator MCCAIN. General Davis, please discuss the roadmap for Marine Corps unmanned systems, and in particular L-class ship-based unmanned systems, including MuX.

Lieutenant General DAVIS. The USMC unmanned roadmap provides for a family of unmanned aircraft systems that will support any sized MAGTF for influence of the electromagnetic spectrum, battlespace awareness, offensive air support, target acquisition, force protection, and digital communication backbone. The Marine Corps' small unit leaders are supported by the Small Unit Remote Scouting System (SURSS) Family of Small UAS and provide Marines at the lowest tactical level the decision-speed and decision-space to out-maneuver and outpace the enemy by providing for and having the most current and accurate battlespace information at their disposal. In accordance with the Commandant's guidance, we are aggressively pursuing man-portable technology solutions to be deployed with Marine Corps infantry that support a single operator while offering multi-mission and multi-intelligence capabilities to ensure significant battlespace awareness with kinetic capability. The Marine Corps is currently operating the RQ-21 aboard L-class shipping with our Marine Expeditionary Units. Unlike most type/model/series, the RQ-21 deployed simultaneously to multiple operational deployments across the globe within six months of initial operational capability in July of 2016. In addition to flying over 2000 combat flight hours in support of Marine Special Operations in Operation Inherent Resolve, the RQ-21 has successfully deployed aboard the 22 MEU, 24 MEU, and will shortly expand out to the PACOM AOR with the 15th MEU. Equipped with a day/night electro-optical sensor, Link-16 (system dependent), a communications relay package, as well as a collection payload, the RQ-21 has performed admirably in both combat and peacetime missions to include humanitarian assistance operations. The Marine Corps' next L-class capable UAS will be the MAGTF Expeditionary UAS (MUX). While seeking opportunities to achieve affordable and cost-effective technical solutions, MUX will be built to be shipboard capable and expeditionary. It will provide multi-sensor, electronic warfare, C4 bridge, anti-air warfare and strike capability at ranges complimentary to the MV-22 and F-35, giving MAGTF commanders flexible, persistent, and lethal reach. It will provide scalable MAGTF support deploying as detachments or squadrons supporting commanders at the tactical, operational, and strategic levels. We are currently working with Combat, Development, and Integration, Naval Air Systems Command, as well as indus-

try, to establish requirements and secure the most viable and efficient acquisition pathway for MUX.

MQ-25 (CBARS)

34. Senator MCCAIN. Vice Admiral Grosklags, the Navy has designated the MQ-25 one of the first Maritime Accelerated Capabilities Office (MACO) programs, yet the schedule in the budget docs does not appear to show anything close to an accelerated program, with first flight in fiscal year 2024 and IOC in fiscal year 2028. Please describe how the Navy intends on ensuring this is in fact a rapid program.

Vice Admiral GROSKLAGS. The MQ-25 program office (PMA-268) and all industry partners remain engaged to identify opportunities to accelerate first flight and Initial Operational Capability (IOC) to meet a fiscal year 2024 IOC objective. The Department of the Navy (DON) has introduced the framework to accelerate acquisitions through the following two instructions:

1) Secretary of the Navy (SECNAV) Instruction 5000.42, Department of the Navy Accelerated Acquisition for the Rapid Development, Demonstration and Fielding of Capability, December 22, 2016.

2) Chief of Naval Operations (OPNAV) Instruction 5000.53, Navy Accelerated Acquisition for the Rapid Development, Demonstration, and Fielding of Capabilities, March 15, 2017.

SECNAV Instruction 5000.42 establishes the Maritime Accelerated Capability Office (MACO) which enables rapid development, demonstration and fielding of capability to the fleet. MQ-25 was designated a MACO program on March 24, 2017, and empowers the staff of the Chief of Naval Operations (CNO) and the Program Executive Officer, Unmanned Aviation and Strike Weapons, (PEO (U&W)), to identify and address systematic issues associated with the acquisition process to accelerate IOC when compared to a traditional program. Additionally, these instructions establish the Accelerated Acquisition Board of Directors (AA BoD), co-chaired by the CNO, the Assistant Secretary of the Navy for Research, Development and Acquisition (ASN(RD&A)), and when required the Commandant of the Marine Corps. The AA BoD provides oversight of MACO designated programs and facilitates direct access by MACO program stakeholders to DON leadership for expeditious decision making that will aggressively manage cost, schedule and performance enabling accelerated capability to the Fleet.

MQ-25 is the first program designated by the Deputy Secretary of Defense as a Key Performance Parameter (KPP) Reduction Pilot Program per Section 854 of Public Law 114-328, the fiscal year 2017 National Defense Authorization Act. This designation reduces rigid, non-warfighter KPPs and facilitates DON requirements ownership and oversight in order to manage cost, schedule and performance throughout the acquisition process. Additionally, MQ-25 was the first Navy program with parallel Navy and Joint Staff Capability Development Document staffing. This resulted in accelerated validation of requirements so the Navy can remain focused on draft RFP feedback prior to formal source selection and contract award.

The DON will continue to assess every aspect of the entire acquisition process to identify opportunities to accelerate the MQ-25 program. The MQ-25 program is fully funded in fiscal year 2017 and fiscal year 2018 to execute an accelerated source selection and contract award process. The CNO is committed to addressing out year funding requirements to support an accelerated IOC in future budget submissions. Acceleration of MQ-25 will require stable, predictable funding support from all quarters to ensure success.

CH-53K KING STALLION

35. Senator MCCAIN. Lieutenant General Davis, the costs for the CH-53K have seen a marked rise. Can you explain the causes of the cost inflation?

Lieutenant General DAVIS. Along with normal inflation, additional factors for increased cost include labor rate increases from the OEM, schedule delays, a revised estimate for engines, and a shallow procurement ramp. Although cost has increased, this program is not in danger of a Nun Mc-Curdy breach.

36. Senator MCCAIN. Lieutenant General Davis, can you describe why the USMC needs the exquisite capabilities the King Stallion will bring?

Lieutenant General DAVIS. The CH-53E Super Stallion entered service in 1981—the average age of the aircraft is 28 years old. It is the only heavy-lift helicopter in the DOD rotorcraft inventory. Although a very capable platform, the out of production CH-53E is 55 aircraft short of the required inventory and maintenance man-hours for the CH-53E have doubled due to age and obsolescence. More importantly, the CH-53E cannot lift 100 percent of today's vertical MAGTF—the payloads

and ranges required to support the ship-to-objective maneuver concepts outlined in Marine Operating Concept exceed the capability of the CH-53E. The CH-53K provides three times the lift capability under the same ambient conditions, and is the only fully marinized, heavy-lift rotorcraft capable of supporting current and future warfighting concepts by lifting 100 percent of the vertical MAGTF for approximately the same projected O&S cost as the legacy CH-53E. The CH-53K will be a game-changer for the MAGTF by providing unprecedented heavy lift with increased range and payload, interoperability, and survivability.

QUESTIONS SUBMITTED BY SENATOR LUTHER STRANGE

F-35 CAPABILITIES

37. Senator *Strange*. Rear Admiral Miller, the F-35 currently does not have a powered, internal-carriage, air-to-surface/ground standoff weapon. Given that such a weapon would minimize drag while enhancing survivability by maintaining the aircraft's low-observable characteristics, does the Navy consider that situation to indicate a potential capability gap? If so, is it receiving consideration regarding future weapons procurements?

Rear Admiral MILLER. There are scenarios where internal carriage, air-to-surface/ground standoff weapon would be advantageous in the future fight and the Navy will continue to balance all capabilities against available funding in order to field the required force to meet threats in accordance with Defense Planning Guidance scenarios. The Navy fights as an integrated Carrier Strike Group (CSG) and does not rely on any one platform to provide needed capabilities. The Navy is committed to developing and deploying a broad range of weapons systems to address threats in the next decade, including long-range, precision, air-to-surface/ground weapons. Through the 2020s, the CSG will include both 5th and 4th generation aircraft and will continue to develop capabilities that can be employed for both.

F-35'S OPERATIONAL ENVIRONMENT

38. Senator *Strange*. Rear Admiral Miller, while recent military conflicts have been in permissive environments, it appears that the likelihood of conflicts in high-end, non-permissive environments (like those that could occur with China, Russia, Iran, and North Korea) has risen. Given that 5th Generation aircraft like the F-35 were developed so they could operate in such environments, is there a reason that no 5th Generation standoff weapons that leverage the F-35s unique capabilities (like internal carriage) are currently being developed? If such weapons were developed by partner nations, would they be considered to address that apparent shortcoming?

Rear Admiral MILLER. The Navy fights as an integrated Carrier Strike Group (CSG) and does not rely on any one platform to provide needed capabilities. The Navy is focused on meeting the requirements in Defense Planning Guidance and committed to developing and deploying a broad range of weapons systems to address threats expected in the next decade. This includes long-range, precision, air-to-surface weapons. The CSG requires a mix of 4th and 5th generation aircraft. It is critical to develop capabilities that can be employed effectively from both. There are scenarios where internal carriage, along with other survivability features, would be advantageous in the future fight. The Navy will continue to balance capabilities against available funding to field the capability required to meet the threat.

If North Atlantic Treaty Organization partner nations develop and produce 5th generation weapons, with inherent capabilities to survive in rigorous flight and austere maritime environments (where the Navy operates), the Navy would be very interested in exploring options to expand capability and increase competition within the industrial base.

NEGATIVE IMPACTS ON MISSION PACKAGES

39. Senator *Strange*. Rear Admiral Miller, does the lack of an internally-carried, powered, standoff weapon for the F-35 negatively impact the types of mission profiles the F-35 can fly in non-permissive environments?

Rear Admiral MILLER. There are scenarios where internal carriage, along with other survivability features, would be advantageous in the future fight and the Navy will continue to balance all capabilities against available funding in order to field the required force to meet threats in accordance with Defense Planning Guidance. The Navy fights as an integrated Carrier Strike Group and does not rely on any one platform to provide needed capabilities. The Navy is committed to devel-

oping and deploying a broad range of weapons systems to address threats in the next decade, including long-range, precision, air-to-surface weapons.

ADVERSARY CAPABILITIES

40. Senator *Strange*. Rear Admiral Miller, given the “tyranny of distance” and the long range of potential adversary air defense systems currently confronted by the Navy, would an air-to-surface/ground weapon for the F-35 that extended the aircraft’s engagement range while maintaining its low observable radar signature be considered to be of significant utility?

Rear Admiral MILLER. The Navy is committed to developing and deploying a broad range of weapons systems to address threats in the next decade, including long-range, precision, air-to-surface/ground weapons. The Navy fights as an integrated Carrier Strike Group (CSG) and does not rely on any one platform to provide all required capabilities in accordance with Defense Planning Guidance scenarios. Through the 2020s, the CSG will include both 5th and 4th generation aircraft and will continue to develop capabilities that can be employed for both.

QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

CH-53K

41. Senator BLUMENTHAL. Lieutenant General Davis, the CH-53K “King Stallion”—the replacement for the only true heavy lift helicopter—will play an integral role for the U.S. Marine Corps in the coming decades, providing significant improvements to the CH-53E “Super Stallion” predecessor—three times the external lift capacity, greater range capability, and better reliability to move heavy equipment for longer distances from sea to land. Replacing the legacy CH-53E remains crucial as low numbers of flyable aircraft is impacting the current state of Marine Corps aviation readiness. The CH-53K program successfully reached Milestone C earlier this year. What does heavy lift capability bring to the Marine Corps? How will it be improved with the CH-53K? Can any other helicopter meet heavy lift requirements?

Lieutenant General DAVIS. The CH-53K will provide unprecedented heavy lift along with increased range, payload, interoperability, and survivability. This aircraft leverages technology to increase reliability, maintainability (reduced maintenance man-hours as compared to the CH-53E), and reduce overall cost of ownership. This aircraft is optimized for vertical heavy lift—delivering heavy equipment, supplies and troops—to mass combat power in the objective area that was previously not possible. In addition to the lift capability, the CH-53K’s cabin is wider than the CH-53E and can handle increased payload. The wider cabin is also compatible with the large TRANSCOM 463L pallets used for intermodal transportation throughout the battlespace. The new triple-hook external cargo system enables discharging three different external loads to three different locations during one sortie. Other improvements include a modern glass cockpit, fly-by-wire flight controls (increases safety and survivability and decreases pilot workload—especially in a degraded visual environment), efficient 4th generation main rotor blades, and an engine that produces 57 percent more horsepower with 63 percent fewer parts than its predecessor. There is no other helicopter in the DOD that can meet the Marine Corps’ heavy lift requirements. As demonstrated by a MAGTF capabilities analysis in support of the 2014 Heavy Lift Helicopter Requirements Analysis, it would take nearly three times the alternate or medium lift assets to accomplish what the CH-53K is capable of doing under one period of darkness. The next closest competitor is the CH-47, which is classified as a medium lift platform due to its Maximum Gross Weight and is not marinized. Modifying a CH-47 it would sacrifice payload, requiring even more sorties to equal the CH-53K. The increased capabilities that the CH-53K brings to the MAGTF, coupled with its increased reliability and ease of maintenance will set a new standard for vertical heavy lift.

42. Senator BLUMENTHAL. Lieutenant General Davis, I am concerned about the shallow production ramp this program is facing. Last year it was just two, this year the official request is four, and it continues to be slow in future years’ projections. The Marine Corps top priority on its unfunded request list is two additional CH-53Ks—to total 6 helicopters. Can you explain why these additional two helicopters are so important?

Lieutenant General DAVIS. The two additional aircraft will accelerate transition to the first CH-53K Heavy Helicopter Squadron and ensure we qualify and train aircrew who are ready to deploy in support of the DOD and MAGTF. With the cur-

rent procurement ramp, the first squadron transition will take longer and will delay delivery of this capability to the fleet.

43. Senator BLUMENTHAL. Lieutenant General Davis, last month, you visited Sikorsky to assess the CH-53K production line in Connecticut. Are you confident in Sikorsky's ability to produce this helicopter?

Lieutenant General DAVIS. Yes, I am confident in Sikorsky's ability to execute the plan.

F-35

44. Senator BLUMENTHAL. Lieutenant General Davis, Vice Admiral Grosklags and Rear Admiral Miller, while we often focus on the importance of the F-35 as it pertains to the Air Force, the other variants are just as crucial to our national security. The F-35B short take off vertical landing variant and the F-35C carrier variant will transform Navy and Marine Corps Aviation. In the President's fiscal year 2018 budget request, there are 20 F-35Bs, as anticipated last year. However, there are only 4 F-35Cs, two less than what was anticipated just last year, which is accompanied by lower projected buys in the FYDP. Do you agree that the F-35 has leaps in stealth and strength that a fourth-generation fighter jet cannot match? What capability with the F-35C bring to the fleet that the F-18 cannot? Will fourth-generation aircraft be survivable in an advanced threat environment in the coming years and decades?

Lieutenant General DAVIS. Yes, the F-35 is capable of exceeding every mission essential task assigned to current legacy platforms while operating in a high threat environment due to its advanced stealth technology and sensor fusion technology. This ensures greater survivability and mission success in a robust integrated air defense system (IADS) environment without external support. Penetrating an advanced IADS of a peer or near-peer adversary is operationally challenging with extremely high risk for legacy 4th generation aircraft in the current threat environment. The F-35, on the other hand, is designed to operate in that environment. The aircraft is not only more effective there, but the pilots are now better equipped to train to those threat levels and are well-postured for the future fight with this aircraft. With potential adversaries equipped with advanced anti-access / area denial (A2/AD) long-range precision strike capabilities that threaten traditional US power projection, it is increasingly critical that we field this next generation strike weapons system. The F-35 was developed using a complete analysis of legacy aircraft shortfalls, emerging threats, and consideration of future operating locations. This approach led to an aircraft design that incorporates advanced stealth characteristics and a powerful sensor suite that provides superior awareness to the pilot and ensures increased survivability and lethality in all environments. The aircraft has an autonomous capability to strike a broad range of moving or fixed targets, either day or night and in adverse weather conditions, which is a capability gap within 4th generation aircraft. These targets include air and ground threats, as well as enemy surface units at sea and anti-ship or land attack cruise missiles. Using fused information from its onboard systems and/or other F-35s within the flight allows pilots to complete the entire kill chain without reliance on external sources. This capability shortens engagement times, reduces exposure to threats, and retains the element of surprise. Together these elements allow the pilot to affect the tactical environment using proactive tactics. The 5th generation capabilities that the F-35 brings to the mission increase the synergy, awareness, lethality and survivability of the entire force. In the coming years and decades everything will advance and we continuously view the requirements of air power through a lens of continuous modernization. The F-35 modernization plan is mapped in detail over the next decade, both in terms of the technologies that we pursue and in terms of managing our fleet so that we can modify the earlier lot aircraft and cut new developments into the production line. This aircraft will last for decades, both in terms of its long, 8000 hour, airframe life and the long term view to continuously improve capabilities to pace the threat.

Vice Admiral GROSKLAGS. While the answers to your direct questions cannot be fully answered in an unclassified format, the F-35 does bring revolutionary advances in stealth, survivability, information management, and sensor fusion to the Carrier Strike Group for the first time. The F-35, with its stealth and advanced sensors will make the entire CSG more lethal and survivable. It is the combination of both 4th and 5th generation aircraft that will ensure that the Navy has both the capacity and capability to meet the threat in the next decade.

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45. Senator BLUMENTHAL. Lieutenant General Davis, Vice Admiral Grosklags and Rear Admiral Miller, what is the status of DOD's review and comparison of the F-35 and the F-18 as directed by Secretary Mattis in January?

Lieutenant General DAVIS. The USMC and Navy contributed to the requested review by Secretary Mattis, and were active participants throughout. The comparison was based primarily in capabilities and cost, and was conducted at the classified level. The information was compiled and delivered to the Office of the Secretary of Defense as requested.

Vice Admiral GROSKLAGS. The Office of the Secretary of Defense Cost Assessment Program Evaluation (OSD CAPE) completed the F-35/F-18 review on March 1, 2017 in cooperation with the Department of the Navy, Acquisition, Technology & Logistics, and the F-35 Joint Program Office. The Secretary of Defense delivered a copy of the report to the National Security Advisor during the week of 13 March.

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46. Senator BLUMENTHAL. Lieutenant General Davis, Vice Admiral Grosklags and Rear Admiral Miller, the F-35C projected ramp rate has been reduced in this year's budget request. I am concerned that if we delay procurement, it will negatively impact cost and affordability. Are you concerned about the adjustments made to the planned procurement pace for the F-35C?

Lieutenant General DAVIS. Delays in procurement of F-35C are a major concern for the Marine Corps. Our recapitalization and transition plan allows Marine Aviation to support our global commitments—a delay in procurement puts our transition at risk. We do not foresee a delay in our transition to our first F-35C squadron, but reduced procurement will certainly delay transition with our remaining three F-35C squadrons. Any delay in the F-35C transition will burden our legacy fleet with additional deployments in aircraft that are rapidly approaching the end of their service lives.

Vice Admiral GROSKLAGS. The Navy continues to focus on cost and affordability due to procurement rate changes. However, our primary concern remains the F-35C squadron standup and transition plan. Maintaining this plan is critical towards reducing warfighter risk in the coming decade through modernization of our fleet and delivering warfighter capability that 5th generation aircraft bring.

Rear Admiral MILLER. As one of the highest priorities for the Department of Defense, the Department of the Navy is committed to increasing the affordability of the F-35 program. Current F-35C procurement plans focus on cost and affordability.

The Navy is committed to ensuring the F-35C delivery and transition plan remains on schedule. Maintaining this plan as part of the overall Strike Fighter Inventory Management strategy is critical towards reducing warfighter risk.

The F-35C plays a critical role in the Air Wing of the future. A mix of 4th and 5th generation Strike Fighters will provide the complementary capacity and capability from our flight decks that is needed to meet the threat through the 2030s. Stable funding and timely fleet integration is critical to meet this requirement.

47. Senator BLUMENTHAL. Lieutenant General Davis, Vice Admiral Grosklags and Rear Admiral Miller, in the Marine Corps' and Navy's unfunded request lists, the services request an additional 10 F-35s—4 F-35Bs and 6 F-35Cs. Can you explain why it is so critical to ensure these additional aircraft are procured?

Lieutenant General DAVIS. The F-35B replaces legacy F/A-18, AV-8B, and EA-6B aircraft – modernizing the entire USMC TACAIR fleet. Our current transition to F-35 is already behind timeline as our legacy fleet aircraft rapidly approach the end of their service lives. While we continue to operate the battle-proven aircraft in our legacy fleet by executing a robust airframe life-extension program, we are unable to increase the reliability of these aircraft. The real key to attaining future readiness is through recapitalization – transitioning to new aircraft as fast as possible to increase our fleet readiness numbers. The addition of these F-35 aircraft

in fiscal year 2018 maximizes capacity on Lockheed Martin's production line, which is capable of producing 24 aircraft per year.

Vice Admiral GROSCKLAGS. The additional six F-35Cs in fiscal year 2018's (FY18) Unfunded Priority List support training and deployment requirements for the second F-35C squadron and contribute to the third squadron transition (beginning in fiscal year 2021). Without these six aircraft, there is substantial risk to the second squadron's deployment and third squadron's transition. Complementing the capability of the F-35C with the capacity and capability of the F/A-18 is critical to pace the nation's threats over the next decade.

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48. Senator BLUMENTHAL. Lieutenant General Davis, Vice Admiral Groscklags and Rear Admiral Miller, the Marine Corps has already declared initial operational capability (IOC) in July 2015 and forward based its first operational squadron of F-35Bs in Japan earlier this year. What does this fifth generation capability bring to our national security and the region?

Lieutenant General DAVIS. VMFA-121 is forward-deployed with 10 F-35Bs in Japan and will have their full complement of 16 aircraft by this summer. By the end of this year, they will fill both the 31st Marine Expeditionary Unit (MEU) requirement and the land-based requirements within PACOM. At the most basic level, 5th generation capabilities bring stealth and sensor fusion to the fight. In an operational setting, this means the aircraft has unfettered access to high threat environments and can provide real time targeting through overcast weather. Our legacy systems cannot target through visible obscuration such as an overcast cloud layer. Even a single well-placed medium threat surface-to-air capability would create a significant hurdle for a legacy system—where a 5th gen aircraft would probably categorize a medium threat system as a minor nuisance on a strike or close air support mission. Today we use a combination of strategic targeting and electronic warfare (EW) assets to overcome the aforementioned threats, but an F-35 can operate independently and unsupported by dedicated EW assets. In addition to being able to operate autonomously in these environments, the F-35 provides a significant enhancement to our high-end strategic fight. The jet is not only an extremely effective platform for penetrating complex Integrated Air Defenses, it has also proven to be a significant contributor to the overall situation awareness of the larger combat force by providing threat and targeting data to supporting assets over multiple waveforms. Additionally, the proliferation of long-range, precision, conventional threats such as advanced SAMs, cruise missiles, and armed UAVs, contests the use of traditional bases and methods of operations. With the Short Take-Off and Vertical Landing (STOVL) variant of the aircraft, the Marine Air Ground Task Force (MAGTF) aviation combat element has the ability to conduct distributed aviation operations (DAO) in support of land and/or naval campaigns. DAO is a task organized MAGTF operation, employing aircraft in a distributed force posture, independent of specialized fixed infrastructure. The F-35B will be a key part of DAO due to its STOVL capabilities because it expands basing options by reducing runway requirements. The F-35B can launch from a sea base or land base to conduct multiple missions then re-arm and re-fuel at mobile forward arming and refueling points (M-FARPS), which may be located closer to or within the operating area. The Marine Corps' F-35B brings strategic agility, operational flexibility and tactical supremacy to the MAGTF and represents the centerpiece of Marine aviation transformation. This aircraft is incredibly capable in its 5th generation day one IOC configuration. The F-35B unites 5th generation stealth, precision weapons and multi-spectral sensors with the expeditionary responsiveness of a STOVL fighter-attack platform.

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49. Senator BLUMENTHAL. Rear Admiral Miller, the production line for the MH-60R helicopter is coming to an end in 2018. As the Navy's 2016 Force Structure Assessment (FSA) seeks to build a 355-ship Navy, is the Navy reexamining its helicopter force structure? Do you see a need for additional helicopters beyond the current requirement? If so, how many?

Rear Admiral MILLER. The Department is committed to building the capability and capacity in our Fleet, and Seahawk helicopters play a vital role in accomplishing these goals. The Navy operates nearly 600 MH-60 helicopters around the world, and intends to modernize and sustain MH-60 inventory via planned Service Life Extension Program and/or Mid-Life Upgrade initiatives. These programs will ensure the capabilities of these aircraft remain relevant well into the future.

Although the current fleet of Seahawks is fulfilling our needs, we need to consider airframe delivery schedules relative to future ship delivery timelines before committing to purchasing additional Seahawks. The decision to procure or recapitalize the current MH-60 in the face of increasing threats will be considered alongside all of our warfighting priorities.

**DEPARTMENT OF DEFENSE AUTHORIZATION
REQUEST FOR APPROPRIATIONS FOR FIS-
CAL YEAR 2018 AND THE FUTURE YEARS
DEFENSE PROGRAM**

WEDNESDAY, JUNE 21, 2017

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

NAVY SHIPBUILDING PROGRAMS

The subcommittee met, pursuant to notice, at 9:03 a.m. in Room SR-232A, Russell Senate Office Building, Senator Roger F. Wicker (chairman of the subcommittee) presiding.

Committee Members Present: Senators Wicker, Cotton, Rounds, Tillis, Sullivan, Hirono, Shaheen, Blumenthal, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER F. WICKER

Senator WICKER. The Senate Armed Services Subcommittee on Seapower convenes this morning to examine Navy shipbuilding programs.

We welcome our three distinguished witnesses: Ms. Allison F. Stiller, performing the duties of Assistant Secretary of the Navy for Research, Development, and Acquisition; Vice Admiral William K. Lescher, Deputy Chief of Naval Operations for Integration of Capabilities and Resources—and that is a mouthful—and Lieutenant General Robert S. Walsh, Deputy Commandant for Combat Development and Integration.

Our subcommittee is grateful to all of you for your decades of service.

We are at a critical juncture for shipbuilding. We currently have 276 ships in the fleet. In 2016, after deliberation and consideration, the Navy increased its requirement to 355 ships for the battle fleet, a figure that is supported by a number of congressionally mandated future fleet architecture studies. Admiral Richardson, the Chief of Naval Operations, believes we need to reach the 355-ship objective in the 2020s. Given the timelines for new ship construction, such as the 5 years it takes to build a new submarine, the Nation must commit to building a bigger Navy now.

While I support the budget request focused on improving readiness, I agree with the Chief of Naval Operations (CNO) that we must build more ships at the same time. The Navy's fiscal year 2018 budget request includes funding for eight new construction

ships, which is one less than the number procured in 2017. Following the budget submission, the administration announced a request for a second littoral combat ship, but Congress has not received the formal documentation.

While the budget request is a good start, the shipbuilding industrial base can support higher levels of shipbuilding today. In fact, the CNO's white paper, "The Future Navy," states that the industrial base could build 29 additional ships over the next 7 years, over and above those that are already projected. Given sufficient and stable funding, industry leaders told the subcommittee that their shipyards are up to the task.

In addition to new ship construction, some naval analysts have proposed increasing the size of the fleet through reactivating ships, extending service life, and other alternatives. The subcommittee will explore all options.

The Nation has supported a major fleet expansion before. During the Reagan era buildup, the Navy added 91 ships to the fleet in 8 years. This subcommittee wants to help the Navy build a firm foundation in this year's authorization bill to support a substantial buildup in the near future.

There is no time to waste. Our real and potential adversaries are out-competing the United States in this area. Our maritime edge is eroding. If we fail, I believe General Dunford's assessment will come to pass that within 5 years, we will lose our ability to project power, the basis for how we defend the Homeland, advance U.S. interests, and meet our alliance commitments. These are the words of the Chairman of the Joint Chiefs of Staff.

I would like to hear our witnesses' views on this critical juncture and four other key issues.

First, industrial base vitality. The Navy must comply with the law and submit its 30-year shipbuilding plan to Congress. The strength of our shipbuilding industrial base will determine the viability of the plan. Reaching the Navy's 355-ship objective is not possible without the unique skills, capabilities, and capacities inherent found in the new construction shipyards, repair facilities, and among our dedicated suppliers. The witnesses should describe the budget request's effects on the shipbuilding industrial base. The subcommittee would also like to hear about ways in which Congress can help support the industrial base.

Second, best use of taxpayers' resources. The subcommittee will conduct rigorous oversight of shipbuilding programs to ensure the Navy is making the best use of taxpayer dollars. Congress expects the Navy shipbuilding programs to deliver promised capability on time and on budget. Schedule delays and cost growth put additional strain on the legacy platforms which these new ships will replace. Specifically, I am interested in understanding why the cost of the USS *Enterprise*, CVN-80, is more than \$1 billion greater than the previous aircraft carrier, USS *John F. Kennedy*.

I also remain concerned that the key warfighting capabilities of the LCS [Littoral Combat Ship], including mine countermeasures and antisubmarine warfare, have fallen years behind schedule and remain unproven. The witnesses should address the Navy's plan to pursue full and open competition in selecting a new frigate with greater lethality and survivability.

Third, building the future force. This subcommittee also has the duty to shape the future of our Navy. Each of our surface combatant ships, cruisers, destroyers, and littoral combat ships will begin retiring within the next 20 years. Now is the time to determine the requirements for our future surface combatants, as well as the munitions they will carry. Our main concern is that the *Columbia*-class submarine program, the second largest DOD [Department of Defense] acquisition program, may stress our already constrained shipbuilding budget. This is an important program, but we do need to look at the strains it places on the budget.

Fourthly, amphibious ships. The Navy and Marine Corps continue to serve as the linchpin of American force projection around the globe. I am interested in ways we can address the demand from our combatant commanders for amphibious ships. The combatant commanders need more than 50 amphibious ships on a day-to-day operational basis, but the current inventory includes only 31 amphibious ships. The witnesses should discuss the Navy's ability to accelerate procurement of the next amphibious assault ship known as the LX(R).

So thank you to our witnesses and thank you to interested Americans who are attending.

I now recognize my good friend and ranking member, Senator Hirono.

STATEMENT OF SENATOR MAZIE HIRONO

Senator HIRONO. Thank you, Mr. Chairman.

I join the chairman in welcoming our witnesses this morning.

Over the weekend, we all learned about the tragedy on the USS *Fitzgerald*. Our thoughts are with the USS *Fitzgerald* crew and the families of the seven sailors who lost their lives in service to our country. These seven young men represented diverse backgrounds but were united in their service to our country. As we honor their lives, we must also move forward to support their fellow sailors and marines.

Over the past weeks, we have held a number of hearings on the future of a number of Navy and Marine Corps programs. Today's witnesses will also tell us about the balancing act our military faces. On one hand, they need to support ongoing operations and sustain readiness. On the other, they need to modernize and keep the technological advantage that is critical to military success, all of this under the cloud of limits imposed by the Budget Control Act.

While that law necessarily raised the debt ceiling, it also imposed draconian caps on defense and non-defense programs and included sequestration. Sequestration, or automatic, across-the-board cuts, was included as a worst case scenario to motivate Congress. The mindless cuts to defense and non-defense programs brought by sequestration were meant to be so bad that Congress would move forward or would be forced to find an alternative way forward. We all learned a lesson in 2013 when sequester was allowed to take effect. In fact, some in our industrial base are still working through the aftermath of that fiasco.

Yet, here we are 6 years later living under the caps and in fear of sequestration and what it would do. Funding for critical pro-

grams, both defense and non-defense, is not an either/or proposition. We cannot enact the priorities and programs discussed today until we lift the caps and eliminate the fear of sequester.

I look forward to working with the chairman and other committee members to balance the needs of our military with critical domestic programs. It has been long enough and the time for leadership is certainly now.

With that in mind, a continuing focus of this subcommittee has been to see that we improve our acquisition stewardship and thereby ensure that we are getting good value for every shipbuilding dollar that we spend.

The big news this year is the increase in force structure that was recommended by the Chief of Naval Operations' most recent force structure assessment. The Navy has not submitted a plan—and the chairman has mentioned this also—for ramping to meet this new 355-ship goal, but we hope to gain some insight into what reasonable steps we could take now to help the Navy achieve this increase.

Eventually we will need to increase attack submarines and major surface combatants to much higher force levels. The Navy was supposed to implement an engineering change proposal for the DDG-51 destroyer program to include the air and missile defense radar, or Area and Missile Defense Radar (AMDR), on one of the ships in the fiscal year 2016 shipbuilding program. To date, the Navy has not signed a contract for that upgrade. We need to assess why this has been delayed and whether the Navy and contractors are making sufficient progress on the AMDR program to award a new multiyear procurement program in fiscal year 2018. I know that the Navy conducted what by all accounts was successful testing of the AMDR system at the Pacific Missile Range Facility (PMRF), located on the Island of Kauai. I hope we can hear from Secretary Stiller on this important program as well.

I look forward to hearing your testimony this morning.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Who would like to go first on the testimony? Ms. Stiller?

Ms. STILLER. Yes, sir. I am going to give an opening statement for the three of us.

Senator WICKER. Excellent.

STATEMENT OF ALLISON F. STILLER, PERFORMING THE DUTIES OF ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT, AND ACQUISITION; ACCOMPANIED BY: VICE ADMIRAL WILLIAM K. LESCHER, USN, DEPUTY CHIEF OF NAVAL OPERATIONS FOR INTEGRATION OF CAPABILITIES AND RESOURCES, N8; LIEUTENANT GENERAL ROBERT S. WALSH, USMC, DEPUTY COMMANDANT FOR COMBAT DEVELOPMENT AND INTEGRATION; COMMANDING GENERAL, MARINE CORPS COMBAT DEVELOPMENT COMMAND; AND COMMANDER, UNITED STATES MARINE FORCES STRATEGIC COMMAND

Ms. STILLER. Chairman Wicker, Ranking Member Hirono, distinguished members of the subcommittee, thank you for the oppor-

tunity to appear before you today to address the Department of Navy's shipbuilding programs.

Each day we are mindful of our men and women in uniform serving this great Nation, and we especially hold the USS *Fitzgerald's* sailors and their families and friends in our thoughts and prayers.

I am joined this morning by Lieutenant General Bob Walsh, Deputy Commandant for Combat Development and Integration, and Vice Admiral Bill Lescher, Deputy Chief of Naval Operations for Integration of Capabilities and Resources. I request that our written statement be included in the record.

Senator WICKER. Without objection.

Ms. STILLER. Thank you.

On behalf of our Navy and Marine Corps, we want to thank this subcommittee for your strong support in the fiscal year 2017 defense authorization and appropriations bills. Not only has Congress supported our request, but the committee increased funding for many of our critical programs. We are committed to making good on that investment and to do so in the most fiscally responsible manner possible to provide the ships, aircraft, vehicles, and weapons that are needed for our men and women in uniform to be successful.

We continue to leverage every tool available to drive down costs. We have tightened requirements, maximized competition, capitalized on multiyear and block buy procurements, explored cross-program efficiencies, and attacked our cost of doing business so that more of our resources can be dedicated to the warfighting capability.

Global activities over the last year have made it clear that security challenges are intensifying at an increasingly rapid pace. To remain competitive, it is imperative that we continuously adapt to the emerging security environment and do so with a sense of urgency. This requires us to work closely with Congress to return budget stability and predictability to the Department, which necessitates increasing defense caps under the Budget Control Act.

Our 2018 President's budget submission is governed by SecDef's priorities to improve warfighting readiness by addressing pressing programmatic shortfalls that have accrued from 15 years of wartime operational tempo. The budget maintains the operational effectiveness of our current force while also building a bridge to growing the future force starting in 2019.

Over the past year, 11 ships were delivered and an additional 12 ships were christened. One of the ships delivered this year was DDG-1000 USS *Zumwalt*, a truly transformational platform. Just last month, CVN-78, *Gerald R. Ford*, our newest aircraft carrier, was delivered to our Navy. This past Friday, we awarded the detail design and construction contract for LHA-8 Bougainville.

Today there are 61 ships under contract and 44 are in construction. These include aircraft carriers, submarines, large surface combatants, small surface combatants, amphibious ships, and auxiliary ships. The shipyards constructing these vessels have a vast infrastructure of suppliers supporting them, and we are mindful of this industrial base as we build our budgets and recapitalize our force.

I would like to briefly discuss a couple of items posed by our budget request.

First, as mentioned, we have requested multiyear procurement authority for the fiscal year 2018 to fiscal year 2022 DDG-51 Flight III buy. We have a handshake agreement with Huntington Ingalls Industries to introduce the Flight III capability on their fiscal year 2017 ship, the last of this current multiyear. We are also requesting multiyear procurement authority for the fiscal year 2019 to fiscal year 2023 *Virginia*-class, which will introduce the Virginia payload module capability. In both cases, the multiyear criteria laid out by Congress is met.

Second, we have made a couple of adjustments to our 5-year shipbuilding plan. We added a *Virginia*-class submarine in fiscal year 2021 and we deferred the start of the frigate program from fiscal year 2019 to fiscal year 2020 while we revisit the ship's requirements. Our small surface combatant requirement remains at 52 ships and we desire to transition to the frigate as soon as possible.

The administration's supports funding a second LCS in fiscal year 2018 and an amendment to the President's budget is expected to be delivered to the Congress very soon.

We note that our shipbuilding plan beyond fiscal year 2018 may be adjusted in our Presidential Budget 2019 submission as a result of the defense strategic review that we will complete later this summer, consistent with SecDef's fiscal year 2019 priority to grow a larger and more lethal force.

In summary, the Navy's 2018 budget is focused on improving the wholeness of our current forces. We greatly appreciate this subcommittee's strong and consistent support of your sailors and marines.

Mr. Chairman, thank you for the opportunity to appear before you today, and we look forward to answering your questions.

[The combined prepared statement of Ms. Stiller, General Walsh, and Admiral Lescher follows:]

COMBINED PREPARED STATEMENT BY ALLISON F. STILLER, LIEUTENANT GENERAL
ROBERT S. WALSH, AND VICE ADMIRAL WILLIAM K. LESCHER

Chairman Wicker, Ranking Member Hirono, and distinguished members of the subcommittee, thank you for the opportunity to appear before you today to address the Department of Navy's shipbuilding programs.

The global activities over the last year have made it clear that the security challenges from major power competition are intensifying at an increasingly rapid pace. The Navy and Marine Corps continue to support the Joint Force in defending the Homeland and responding to the security challenges of Russia, China, North Korea, Iran and global counter-terrorism. In the Indo-Asia-Pacific, our carrier strike groups, amphibious ready groups, and destroyers provide presence, strengthen partnerships, patrol the South China Sea to maintain interoperability, and deter adversaries. In the Middle East, our carrier strike groups and strike fighter aircraft continue operations against the Islamic State of Iraq and Syria. In Afghanistan, the Marine Corps deployed to Helmand Province to train, advise and assist the Afghan National Army and Police. This past April, two destroyers operating in the Mediterranean Sea enabled the United States to take swift action against chemical attacks in Syria with Tomahawk cruise missile strikes.

Over 2016, the Marine Corps executed over 210 operations, 20 amphibious operations, 160 Theater Security Cooperation events, and participated in 75 exercises, with units deployed to every Geographic Combatant Command. In response to a request for the U.S. Agency for International Development to assist with U.S. Government disaster relief efforts after Hurricane Matthew made landfall in October 2016, a Special Purpose Marine Air Ground Task Force (MAGTF) self-deployed within 48 hours to provide much needed aid to the people of Haiti, followed by the 24th Marine Expeditionary Unit (MEU) shortly thereafter. Our sailors and marines deployed

around the world continue to perform missions and operate forward—ready to respond to any challenge and being where it matters when it matters.

To remain competitive, it is imperative that we continuously adapt to the emerging security environment—and do so with a sense of urgency. This requires working closely with Congress to return budget stability and predictability to the Department, and address defense spending in a fiscally responsible manner. Together, we can ensure our military’s capability, capacity and readiness can continue to deliver superior naval power for the United States around the world, both today and tomorrow.

THE FISCAL YEAR 2018 PRESIDENT’S BUDGET REQUEST

The Fiscal Year (FY) 2018 President’s Budget submission is governed by the defense priorities of the Secretary of Defense to improve warfighting readiness and program balance by addressing pressing programmatic shortfalls that have accrued from 15 years of wartime operational tempo, fiscal constraints and budget uncertainty. Improving readiness directly impacts the operational capacity of our current fleet by ensuring that our ships and aircraft are ready to deploy when needed. If a ship is de-certified due to lack of maintenance, it is one less asset that the Navy and Marine Corps can deploy. The Department thanks the subcommittee for your efforts in supporting the Administration’s request for additional funding for our critical readiness shortfalls and increases in force structure procurement in the fiscal year 2017 Consolidated Appropriations Act.

At the same time, investing in the modernization of our current platforms and weapons is necessary to restore the fleet to full health and ensure they have the advanced capabilities needed to address the dynamic current and future threats. The fiscal year 2018 request continues key investments in advanced technologies and modernization of our current Seapower and Projection forces.

The Navy prioritized addressing the significant readiness debt and improving the wholeness of our current fleet over our ability to grow force structure in this budget. The fiscal year 2018 President’s budget supports procurement of nine ships in fiscal year 2018: two SSN 774 *Virginia*-class attack submarines; two DDG 51 *Arleigh Burke*-class destroyers; two Littoral Combat Ships (LCS); one *Ford*-class aircraft carrier (CVN); one *John Lewis*-class fleet oiler (T-AO); and one Towing, Salvage and Rescue ship (T-ATS). The Secretary of Defense has prioritized growing capacity and lethality, informed by the National Defense Strategy, for the fiscal year 2019 President’s Budget. The wholeness that the fiscal year 2018 President’s Budget delivers will accelerate key warfighting capabilities and maintain the operational effectiveness of our current force, while also building a bridge to growing the future force.

The Navy’s 2016 Force Structure Assessment (FSA) was developed in an effort to determine the right balance of forces—ships currently under construction and future procurement—needed to address the evolving and increasingly complex threats naval forces are expected to counter. The FSA detailed a long-term requirement for 355 ships in the battle force, assuming the Navy continues to replace the ships we have today with ships of similar capability and employs them using similar concepts of operations. The fiscal year 2019 President’s Budget will be informed by the pending National Security Strategy and the National Military Strategy and chart a course to building the larger, more capable battle force the nation needs.

In addition, the Department continues to analytically assess the Future Fleet Architecture studies directed by the fiscal year 2016 National Defense Authorization Act in order to incorporate the most promising elements in our concept development, research and development, and rapid fielding efforts. This assessment will innovate ways to deliver the equivalent naval power of a larger force.

SUMMARY

The Department of the Navy’s fiscal year 2018 budget request strategically delivers the best balance to responsibly improve the wholeness of our current forces. In addition, the Department is aggressively pursuing efforts to accelerate acquisition processes and schedules and further drive affordability into our programs, in order to deliver capability to our warfighters faster and be as effective as possible within our resources. We greatly appreciate this subcommittee’s strong and consistent support for your sailors and marines.

Programmatic details regarding Navy and Marine Corps capabilities are summarized in the following section.

U.S. NAVY AND MARINE CORPS SEAPOWER CAPABILITIES

AIRCRAFT CARRIERS

The aircraft carrier is the centerpiece of the Navy's Carrier Strike Groups and central to Navy core capabilities of sea control, maritime security, and humanitarian assistance and disaster relief. *Nimitz* and *Ford*-class carriers will be the premier forward deployed asset of choice for crisis response and early decisive striking power in major combat operations for the next half-century. The Department has established a steady state *Ford*-class procurement plan designed to deliver each new ship in close alignment with the *Nimitz*-class ship it replaces. The USS *Gerald R. Ford* (CVN 78), the first new design aircraft carrier in 40 years delivered this past May, returning force structure to 11 aircraft carriers and providing an unprecedented capability to our nation for the next half century.

By capitalizing on lessons learned from the lead ship, CVN 79 and 80 have achieved significant cost reductions. The USS *John F. Kennedy* (CVN 79) is 28 percent complete with launch planned in 2020 and delivery in the fall of 2024. The USS *Enterprise* (CVN 80) has begun construction planning and long lead time material procurement. Construction is scheduled to begin in spring of 2018.

The *Nimitz*-class Refueling Complex Overhaul (RCOH) is key to both the maintenance and modernization of each carrier in support of the second half of its service life. This spring, USS *Abraham Lincoln* (CVN 72) will return to the Fleet for another 23 years after completing her mid-life recapitalization depot availability to accomplish refueling of the ship's reactors, modernization, and repair of ship systems and infrastructure. This fall, USS *George Washington* (CVN 73) will begin her mid-life recapitalization.

SUBMARINES

Ballistic Missile Submarines, coupled with the Trident II D-5 Strategic Weapon System, represent the most survivable leg of the Nation's strategic arsenal and provide the Nation's most assured nuclear response capability. The current SSBN and SSGNs' life cycles cannot be extended, and the *Columbia*-class Program is on track to start construction in fiscal year 2021, deliver to pace retirement of our current ballistic missile submarines, and deploy for first patrol in fiscal year 2031. The Navy released the Detail Design Request for Proposal for *Columbia* and plans to award the design contract in calendar year 2017. The fiscal year 2018 President's Budget supports the funding required to achieve a target of 83 percent design completion at construction start in fiscal year 2021. This budget request also funds Continuous Production of Missile Tubes which will improve manufacturing efficiencies and vendor learning, maintain critical production skills, and reduce costs by leveraging high-volume procurements.

In addition to the Department of the Navy's budget request, the continued support of Congress for Naval Reactors' Department of Energy funding is vital to the Navy mission and ensuring the safe, reliable, and enduring operations of the nuclear-powered fleet. The President's fiscal year 2018 budget fully funds Naval Reactors' request for the *Columbia*-class SSBN. Recapitalizing this capability is critical to the Navy's readiness, specifically by ensuring adherence to the tight refueling and defueling schedule of nuclear-powered aircraft carriers and submarines.

The *Virginia*-class submarine program continues to deliver submarines that are operationally ready to deploy within budget. The Block IV contract for 10 ships continues the co-production of the *Virginia*-class submarines through fiscal year 2018. The Navy intends to build on these savings and capitalize on increased efficiency and decreased costs with a *Virginia*-class Block V Multiyear Procurement (MYP) contract for 10 boats, planned for fiscal year 2019. The Block V contract will bring to bear two new capabilities to the fleet with the introduction of the *Virginia* Payload Module (VPM) and Acoustic Superiority. The Navy is investing in VPM to mitigate the 60 percent reduction in undersea strike capacity when the SSGN boats retire in fiscal year 2026-2028.

In 2014, the Navy led a comprehensive government-industry assessment of shipbuilder construction capabilities and capacities at General Dynamics Electric Boat (GDEB) and Huntington Ingalls Industries-Newport News Shipbuilding (HII-NNS) to formulate the Submarine Unified Build Strategy (SUBS) for concurrent *Columbia* and *Virginia*-class submarine production. This build strategy's guiding principles are: affordability; delivering *Columbia* on time and within budget; maintaining *Virginia*-class performance with a continuous reduction in costs; and maintaining two shipbuilders capable of delivering nuclear-powered submarines. In 2016, the Navy established the Integrated Enterprise Plan to further the SUBS effort and provide a framework for an integrated approach to support *Columbia*, *Virginia*, and CVN

construction. This long term plan will guide the execution of these nuclear powered platforms to reduce cost and schedule risk.

LARGE SURFACE COMBATANTS

The *Arleigh Burke*-class (DDG 51) program remains one of the Navy's most successful shipbuilding programs with 64 ships delivered to the Fleet. The fiscal year 2018 President's Budget request includes the fiscal year 2018–2022 MYP for ten destroyers, maximizing affordability and stabilizing the industrial base. All ships in this MYP will incorporate Integrated Air and Missile Defense and provide additional Ballistic Missile Defense (BMD) capacity known as Flight III, which incorporates the Air and Missile Defense Radar (AMDR). AMDR meets the growing ballistic missile threat by improving radar sensitivity and enabling longer range detection of increasingly complex threats. The program demonstrated design maturity through its successful completion of several stages of developmental testing and its recent achievement for entry into the Production and Deployment phase.

This radar is planned for inclusion in fiscal year 2017 via an Engineering Change Proposal to the Flight IIA configuration. This much needed capability is essential for future sea-based BMD and is expected to deliver to the fleet in the early fiscal year 2020s.

The DDG 1000 *Zumwalt*-class guided missile destroyer is an optimally crewed, multi-mission, surface combatant designed to provide long-range, precision, naval surface fire support to Marines conducting littoral maneuver and subsequent operations ashore. The DDG 1000 program accomplished several milestones in 2016 including the first phase of delivery, commissioning, and sailaway of USS *Zumwalt* to her homeport of San Diego. The ship has completed multiple at sea underway periods for follow on testing and has since commenced its Combat Systems Activation period in her homeport of San Diego. USS *Zumwalt* will deliver in the spring of 2018. The remaining two ships of the class, DDG 1001 and DDG 1002 are under construction and are 92 and 59 percent complete, respectively.

SMALL SURFACE COMBATANTS

The 2016 FSA revalidated the warfighting requirement for a total of 52 small surface combatants. To date, nine LCS ships have delivered and 17 are in various stages of construction. Both LCS shipyards have upgraded their facilities and have a qualified work force and industry team in place for full serial production; delivering ships well below the congressionally mandated cost cap. The Department continues to refine the requirements and acquisition strategy for the Frigate. To allow adequate time to mature the design and thoroughly evaluate design alternatives, the fiscal year 2018 President's Budget request defers the first year of Frigate procurement to fiscal year 2020 with the LCS program continuing in fiscal year 2018 and fiscal year 2019 to bridge to the Frigate. The Department plans to transition to Frigate in fiscal year 2020 and maximize competition in the shipbuilding industrial base.

The LCS Mission Modules program continues the development of the Surface Warfare (SUW), Mine Countermeasures (MCM), and Anti-Submarine Warfare (ASW) capabilities and delivering individual mission systems incrementally as they become available. The LCS with an embarked SUW Mission Package (MP) provides a robust and flexible combat capability to rapidly detect, track, and prosecute small-boat swarm threats. The Surface-to-Surface Missile Module with Longbow Hellfire is currently in testing with Initial Operational Capability (IOC) planned for fiscal year 2018. Development and integration of the ASW MP Escort Mission Module (EMM) and Torpedo Defense Module are ongoing. The Department recently awarded an option to build the ASW EMM and is on track to fully integrate with LCS to support IOC with the ASW MP in fiscal year 2019.

The MCM MP provides the capability to detect, classify, identify, and neutralize mines throughout the water column, from the beach zone to the sea floor. Several of the MCM MP systems performed well during MCM MP TECHEVAL. IOC for Airborne Laser Mine Detection System and Airborne Mine Neutralization System was achieved in November 2016. These systems are in production and are being delivered to the fleet today. After cancelling the Remote Minehunting System program in fiscal year 2016 due to poor reliability during TECHEVAL and following the conclusion of the Independent Review Team recommendations, the Department designated the MCM Unmanned Surface Vehicle (USV) as the new tow platform for minehunting operations. The MCM USV is based on the USV already used in the Unmanned Influence Sweep System program and development began in March of 2017. IOC is planned for fiscal year 2020.

AMPHIBIOUS SHIPS

Amphibious ships operate forward to support allies, rapidly and decisively respond to crises, deter potential adversaries, and provide the Nation's best means of projecting sustainable power ashore. They also provide an excellent means for providing humanitarian assistance and disaster relief. The 2016 FSA validated the warfighting requirement for 38 amphibious ships, driven by: maintaining persistent forward presence, which enables both engagement and crisis response; and delivering the assault echelons of two Marine Expeditionary Brigades (MEB) for joint forcible entry operations. The 38 ship requirement is comprised of 12 Amphibious Assault Ships (LHD/LHA) and a mixture of 26 Amphibious Transport Dock (LPD), Dock Landing Ship (LSD), and Amphibious Ship Replacement LX(R) Ships. The amphibious force structure is projected to grow to a total of 34 ships starting in FY 2021.

LX(R) is the replacement program for LSD 41 and LSD 49 classes. The LX(R) program focus during the remainder of this year will be on completing the contract design efforts. The LX(R) contract design is being performed by General Dynamics National Steel and Shipbuilding Company (GD-NASSCO) and HII, in support of the future Detail Design and Construction competitive acquisition. The lead LX(R) is planned to begin construction in fiscal year 2022.

LHA 6 *America*-class ships are flexible, multi-mission platforms with capabilities that span the range of military operations, from forward deployed crisis response to forcible entry operations. These ships will provide the modern replacements for the LHA 1 *Tarawa*-class ships and the aging LHD 1 *Wasp*-class ships. USS *America* (LHA 6) will begin her first operational deployment with the 15th MEU in July 2017. USS *Tripoli* (LHA 7) construction is 70 percent complete and on schedule to deliver in 2018. LHA 8 will have a well deck to increase operational flexibility and a reduced island that increases flight deck space to enhance aviation capability. The Detail Design and Construction contract for LHA 8 was awarded last Friday and delivery is planned for fiscal year 2024.

The *San Antonio*-class (LPD 17) provides the ability to embark, transport control, insert, sustain, and extract elements of a MAGTF and supporting forces by helicopters, tilt rotor aircraft, landing craft, and amphibious vehicles. Two ships are under construction, *Portland* (LPD 27) and *Fort Lauderdale* (LPD 28), and are planned to deliver in October 2017 and August 2021 respectively. LPD 28's design and construction features will leverage many of the ongoing LX(R) design innovations and cost reduction initiatives that are necessary for the program to achieve affordability goals while maintaining the high level capabilities of the *LPD 17*-class. Congress added a 13th ship (LPD 29) in fiscal year 2017 which will mitigate critical impacts to shipbuilding and combat systems industrial bases caused by the gap in ship construction between the start of construction for LPD 28 and the start of construction for LX(R).

AUXILIARY SHIPS, EXPEDITIONARY, AND OTHER VESSELS

Support vessels such as the Expeditionary Sea Base (T-ESB), Expeditionary Transfer Dock (T-ESD) and the Expeditionary Fast Transport (EPF) provide additional flexibility to the combatant commanders. The USNS *Montford Point* (T-ESD 1) and USNS *John Glenn* (T-ESD 2) provide two core capabilities of vehicle and equipment transfer at-sea and interface with surface connectors to deliver vehicles and equipment ashore to complete arrival and assembly. The USNS *Lewis B. Puller* (T-ESB 3), the first Afloat Forward Staging Base variant of the T-ESD, was delivered in June 2015 and becomes operationally available this year. T-ESBs are flexible platforms capable of hosting multiple mission sets with airborne, surface, and subsurface assets. T-ESBs 4 and 5 are under construction, with deliveries scheduled for March 2018 and May 2019, respectively.

The T-EPF provides a high-speed, shallow-draft alternative to moving personnel and materiel within and between the operating areas, and to supporting security cooperation and engagement missions. T-EPF 8 was delivered in April 2017 and production continues on EPFs 9–11.

The Combat Logistic Force consists of T-AOE fast support ships, T-AKE auxiliary dry cargo ships, and T-AO fleet replenishment oilers. Combat Logistics Force ships fulfill the vital role of providing underway replenishment of fuel, food, repair parts, ammunition and equipment to forward deployed ships and embarked aircraft, to enable them to operate for extended periods of time at sea. The *Kaiser*-class (T-AO 187) fleet replenishment oilers will be replaced with the *John Lewis*-class fleet replenishment oilers, designated *T-AO 205*-class. The Detail Design and Construction contract was awarded in 2016 to GD-NASSCO for production of the first six ships of the class.

The Department has begun procurement of a combined Towing, Salvage, and Rescue (T-ATS) ship to replace the four *T-ATF 166*-class fleet tugs, which reach the end of their expected service lives starting in 2020, and the four *T-ARS 50*-class salvage ships, which reach the end of their expected service lives starting in 2025. The lead ship is planned for award in 2017 and the total ship quantity is planned to be eight ships.

Also in 2016, the Navy and Coast Guard established an Integrated Program Office to rebuild the Nation's heavy icebreaking capability. The Navy is supporting the Coast Guard's efforts to responsibly and affordably recapitalize the heavy polar icebreaker fleet. The Coast Guard intends to leverage existing designs and mature technologies to mitigate schedule and cost risks using a strategy based on robust industry collaboration and competition. Based on this effort, the Coast Guard expects delivery of the first icebreaker as early as 2023.

SURFACE SHIP MODERNIZATION

Modernization is a critical aspect of sustaining the current fleet with advanced capability. The Navy and industry are collaborating on innovative approaches to conducting Modernization of Cruisers and Dock Landing Ships. The fiscal year 2018 President's Budget includes funding for the modernization of six destroyers to sustain combat effectiveness, ensure mission relevancy and achieve the full expected service lives of the AEGIS Fleet. The request also continues to execute and fully funds \$4 billion over the FYDP for "2-4-6" modernization of seven cruisers to ensure long-term capability and capacity for purpose-built Air Defense Commander platforms. The remaining four CGs, which have BMD capability, will receive modernization to their hull, mechanical and electrical systems to support their operation through their engineered service life.

In order to maintain 11 deployable LSDs in the Active Force until LX(R) delivers, the Department continues modernization of three LSDs to ensure 40 years of operational service life for each ship. The first LSD, USS *Tortuga* (LSD 46), was inducted into modernization in fiscal year 2016 and is scheduled to begin her modernization availability in fiscal year 2018. This plan mitigates presence shortfalls and supports 2.0 MEB Assault Echelon shipping requirements.

AUTONOMOUS UNDERSEA VEHICLES

Autonomous Undersea Vehicles (AUV) are a key component of the Navy's effort to expand undersea superiority. These unmanned vehicles operate independently from or in cooperation with manned vehicles, conducting maritime missions such as Intelligence, Surveillance and Reconnaissance (ISR), Seabed Warfare, and Deception.

The Orca Extra Large Unmanned Underwater Vehicle (XLUUV) is one of the larger class unmanned undersea vehicles that is being designed to launch from a pier or large surface ship and operate for weeks or months. It will have extended range and a reconfigurable, modular payload bay to support multiple payloads and a variety of missions to complement manned systems.

The Snakehead Large Displacement Unmanned Underwater Vehicle (LDUUV) is an unmanned undersea vehicle to offload "dull, dirty, dangerous" missions from manned platforms and mitigate the submarine gap beginning in 2022. Snakehead LDUUV will be launched from a variety of platforms, including both surface ships and submarines. The initial craft's mission will be intelligence preparation of the operational environment with follow-on missions including ISR, acoustic surveillance, ASW, MCM, and offensive operations.

COMBAT SYSTEMS

The Department continues to field the most capable and lethal surface and submarine combat systems in the world. The AEGIS Combat System Baseline 9, fielded on cruisers and destroyers, offers unprecedented defense capabilities, including simultaneous air and ballistic missile defense on Destroyers and Air Defense Commander capability on cruisers. By the end of 2017, the Navy will have completed a total of twelve AEGIS Baseline 9 Combat Systems installations. Baseline 10 will bring the AMDR radar providing enhanced radar performance and expanding the Navy's ability to perform the Integrated Air and Missile Defense mission.

The Ship Self Defense System combat system supports a myriad of mission areas on all Carrier and large deck Amphibious Class Ships (six ship classes).

The Department continues to aggressively pursue affordable defensive systems that are employable from multiple platforms. Under the Surface Electronic Warfare Improvement Program (SEWIP), the Department is replacing aging analog electronic warfare defensive systems first fielded in the early 1970's with new, digital

systems. SEWIP Block 1 and 2 systems have been approved for Full Rate Production and are currently being fielded across the fleet. The SEWIP Block 3 program has completed its Critical Design Review in 2017 and is currently on track to begin fielding in the 2019–2020 timeframe.

The Submarine community continues to successfully deliver improvements in Anti-Submarine Warfare utilizing a bi-annual spiral development model and leveraging commercial off-the-shelf (COTS) technologies via the Acoustic Rapid COTS Insertion (A-RCI) program. Developmental towed arrays with improved telemetry have been successfully fielded on deployed fast attack submarines and new contracts for TB-29X and TB-34X, with these new telemetries were awarded in FY 2016.

WEAPONS

The Department continues to make significant strides in extending the fleet's layered defense battle-space while also improving the capabilities of the individual ship defense layers in order to pace the increasing anti-ship missile threat. Standard Missile-6 (SM-6) provides theater and high value target area defense for the fleet and with integrated fire control, has more than doubled defensive battle-space. In April 2017, SM-6 Block I testing successfully completed live fire requirements and the program is on schedule to declare Full Operational Capability (FOC) by the end of this calendar year. SM-6 Block IA is an enhanced version of SM-6 Block I with guidance section hardware and software modifications for improved capability against advanced threats. Delivery of both the SM-6 Block I and SM-6 Block IA continue to meet contractual delivery schedule requirements.

The Evolved Sea Sparrow Missile (ESSM) provides another layer to the Navy's defended battle-space. The ESSM Block 2 Milestone C decision is scheduled for July 2018 with IOC for AEGIS platforms scheduled for 2020 and Ship Self Defense System platforms IOC in the 2022–2023 timeframe.

The third inner layer of the fleet's layered defense is the Rolling Airframe Missile (RAM) Block 2 designed to pace the evolving anti-ship cruise missile threat and improve performance against complex stream raid engagement scenarios. In fiscal year 2017, the RAM Block 2 Program continued to demonstrate outstanding performance through successful fleet and ship qualification firing events. The RAM Block 2 will proceed to a Full Rate Production Decision Review in fiscal year 2018 upon completion of the final modeling and simulation runs.

The fiscal year 2018 President's Budget includes funding to continue upgrades to the Standard Missile-2 (SM-2) inventory with active guidance. This investment provides an affordable, integrated fire control capable, area defense missile to counter stressing threats.

CONNECTORS

Our expeditionary warfare doctrine requires surface and vertical lift capability to transport personnel, supplies and equipment from within the seabase and maneuver them to objectives ashore. Surface and aviation connectors with enhanced speed and range will provide future expeditionary force commanders greater flexibility to operate in contested environments. While the aviation component of our connector capability has seen significant modernization with the fielding of the MV-22 and continuation of the CH-53K program, our primary surface connectors, the Landing Craft Air-Cushion (LCAC) and the Landing Craft Utility (LCU) are reaching the end of their service lives and require modern replacements.

The fiscal year 2018 President's Budget funds the new *LCAC-100*-class air cushioned vehicles. The Ship-to-Shore Connector program will replace the aging LCACs which have undergone service life extension programs (SLEP) and a post-SLEP sustainment program. Additionally, fiscal year 2018 budget request includes the procurement of the first *LCU-1700*-class craft which will begin the recapitalization of the aging *LCU 1610*-class.

These platforms are essential in connecting the combat power and logistics sustainment the sea base provides, with the forces operating in the littorals and executing inland missions. The Department will continue to explore future connector options that will increase our ability to exploit the sea as maneuver space by increasing range, speed, and capacity.

CONCLUSION

The Department of the Navy continues to instill affordability, stability, and capacity into our shipbuilding and supporting programs. Continued congressional support of the Department's plans and budgets will help sustain a viable industrial base. This request begins to lay the ground work for growing warfighting capabilities in

the fiscal year 2019 President's Budget, as the Department also makes initial investments in a larger Navy and Marine Corps. We thank you for your continued support of the Navy and Marine Corps and request your support of the fiscal year 2018 President's Budget.

Senator WICKER. Thank you, Ms. Stiller, and thank you to our other witnesses.

Well, let me ask about the 355-ship requirement. I jotted down some words that you used, which I think should be instructive to the Congress and also to the public, Ms. Stiller. You talked about the emerging security environment, which is much more dangerous than it has been. You said that we must proceed with a sense of urgency. As chairman of this subcommittee, I can tell you that I want to help you proceed with that sense of urgency on a number of these issues, including accelerating the 355-ship buildup.

This has been asked a number of times in this subcommittee, and so I want to make sure that we understand. With regard to the requirement of 355 ships, that requirement includes a requirement that those ships be fully staffed with additional personnel. Is that correct?

Ms. STILLER. Yes, sir.

Senator WICKER. That we have the capability of having the aircraft that is required for that size fleet.

Ms. STILLER. Yes, sir.

Senator WICKER. That you have the munitions that a 355-ship fleet with that particular mix—with the appropriate mix would need to get the job done.

Ms. STILLER. Yes, sir.

Senator WICKER. So it is not just building these floating fortresses, but it is making them fully operational. The requirement is that we be able to have all of that in a package that gets us up to 355. Is that correct?

Ms. STILLER. Yes, sir.

Senator WICKER. What options is the Navy exploring—and this is to any of you—to grow the size of the fleet more rapidly?

Vice Admiral LESCHER. Mr. Chairman, I will take a stab at that.

So the Navy is looking at a very comprehensive approach to accelerate the growth of the fleet that the CNO has talked extensively about with a sense of urgency to bring a broader capability, a more capable, more lethal Navy in the 2020s. One element of that is clearly new construction that we have talked about and that is featured in the force structure assessment, a very analytical look at the way we have operated the force over a decade and a half of wartime OPTEMPO [Operation Tempo], at the current security environment, and our commitment to combatant commanders in terms of presence and surgability.

Beyond that, the Navy is also looking at service life extensions on existing platforms. So Vice Admiral Tom Moore at Naval Sea Systems Command (NAVSEA), is leading an effort right now and it shows some potential to extend service lives both hull, mechanical, and electrical, as well as combat systems in cruisers, destroyers, amphibs, logistic force ships. Then we are also looking at reactivation of ships. This is something that is an ongoing analysis right now. We have to look very carefully at that because the ships that have been decommissioned are older and have older combat

systems. We have to have a strong look at the return on investment from that approach. But between all those elements, a very comprehensive approach at accelerating the growth to the 355-ship Navy.

Senator WICKER. When do you think you might have something to us about whether reactivation is pragmatic and doable?

Vice Admiral LESCHER. I will take that for the record and talk to Admiral Moore and the team he is leading. I know they are looking at that aggressively. I do not have a sense for specifically when they will develop that insight. So we will get back to you.

[The information follows:]

In May 2017, the U.S. Navy began an assessment of the technical effort and costs to reactivate and extend the expected service life of specific classes of surface ships. The Navy's review and assessment is ongoing, with a target completion date of fall 2017. Naval Sea Systems Command is leading the assessment in coordination with OPNAV, Military Sealift Command, and other Navy stakeholders. The assessment is focused on the reactivation and/or service life extension of the following ship classes: FFG, CG, DDG, LHD, LHA, LSD, LPD 17, LCS, T-AO, T-AOE, and T-AKE Class Ships.

Senator WICKER. Okay.

Now, we are going to have a 30-year shipbuilding plan, which is required of the Navy. When is that coming? When do you think that is coming, Ms. Stiller?

Ms. STILLER. Sir, we are staffing that 30-year shipbuilding plan now. As you know, that has to be signed out by the Secretary of Defense's Office.

Another nuance, just to make sure you are aware, is that part of the language that requires submittal of the plan also requires us to certify that the plan that we submit is adequately funded. As we are looking at today's FYDP [Future Years Defense Program], we do not see growth in the out-years at any kind of rate. So the 355-ship plan would be addressed in a future 30-year shipbuilding plan because this current budget environment does not give us that assurance to be able to certify.

Senator WICKER. I wanted the committee to fully understand this. I am probably at first blush going to be a little disappointed when I see this shipbuilding plan, but it is not because the leadership of the Navy represented at this table and on up, to include the top leadership of DOD, does not believe in the 355-ship idea. It is because you are constrained by the statute to put only a certain level of shipbuilding on paper until we get the funding straightened out.

Vice Admiral LESCHER. Yes, sir. I was going to say the law stipulates that we certify in the 30-year shipbuilding plan that it is funded in the program.

Senator WICKER. We are going to try to help you on that.

Unless any of you have any follow-up on that, I will be happy now to turn the questioning over to my good friend, Ms. Hirono.

Senator HIRONO. Thank you, Mr. Chairman.

Admiral Lescher, I just want to get clarification then. The ways to get to the 355-ship number—and you cited three ways: new construction, extend service life of our ships, and then to reactivate ships. Are there numbers attached to these three ways that you intend to or you see getting us to 355 ships?

Vice Admiral LESCHER. Ma'am, there are definitely numbers attached to the new construction element, which is the force structure assessment.

Senator HIRONO. Yes.

Vice Admiral LESCHER. The examination of service life extensions and how it can accelerate the path to 355 beyond just what is available in the industrial base and reactivations—that is analysis that is going on right now at Naval Sea Systems Command. So I do not have numbers right now for you.

Senator HIRONO. You were just talking about reactivation or are they extending the life of our—

Vice Admiral LESCHER. For both. That is both ongoing work right now.

Senator HIRONO. So there will be an assessment of how many ships can actually be brought back and how many can be extended.

Vice Admiral LESCHER. Yes.

Senator HIRONO. When is the time frame for that assessment?

Vice Admiral LESCHER. I will take that for the record and talk to Admiral Moore and see what the time frame to complete that analysis on both those pieces is.

[The information follows:]

Huntington Ingalls Industries received a modification to an existing contract on June 27, 2017 to build DDG 125 to the Flight III baseline standard. Negotiations with General Dynamics Bath Iron Works, to incorporate Flight III, is ongoing.

The fiscal year 2018–fiscal year 2022 MYP Request for Proposal is planned to be released by first quarter of fiscal year 2018 with a contract award targeted for third quarter of fiscal year 2018. The Navy plans to leverage a competitive acquisition strategy, with all ships procured in the Flight III configuration. The design for Flight III is currently over 88 percent complete and expected to be 100 percent complete at the time of the MYP contract award.

Senator HIRONO. I wanted to ask you again—well, not again, Admiral Lescher. I and others on the SASC committee, as well as on the subcommittee, have been very focused on what we need to do in the Asia-Pacific area. I would like to ask you how are you incorporating the shift to the Asia-Pacific as you consider expanding the fleet to deploy the number of ships you need? Where are you intending to base this larger fleet?

Vice Admiral LESCHER. So this broader approach of the approach to the Asia-Pacific encompasses a number of elements that I think in some respects you are tracking. In terms of the actual number of ships that we are deploying—you are familiar with the Navy commitment to have 60 percent of the fleet in the Asia-Pacific or in the Pacific fleet by 2020. So that is going to grow the physical number of ships on the order from 160 in fiscal year 2016 I believe to 176 in fiscal year 2020. The number of deployments will increase as well.

Beyond that, the Navy is preferentially deploying our newest capability to the Asia-Pacific. So whether it is P-8, E-2D, F-35B, F-35C, MQ4 Trident, those newer capabilities are going first to the Asia-Pacific region. The same thing applies for our ships as well. So whether it is Zumwalt, DDG Flight III, the newest, most capable ships will go to the Asia-Pacific.

So it is a combination of numbers. It is a combination of capability, and then as you indicated, the infrastructure to support that as well.

General Walsh might talk about some of the particular work that is going in Guam as a hub of activity. Of course, we have submarines forward deployed there as well. Then the infrastructure required for this balance in Hawaii and broader areas is part of ongoing investment. So across all those elements.

Senator HIRONO. When you are talking about infrastructure, you are talking about the movement of a number of our troops from Futenma to Guam and recycling through Australia and eventually to Hawaii.

General Walsh, would you like to add something to this discussion?

Lieutenant General WALSH. What I would add on just the amphibious piece that Admiral Lescher talked about as part of this growth as we increase the number of the size of the fleet and we increase the size on the current growth path we are on with the amphibious forces, the plan is to put a second amphibious ready group in the Pacific. Currently the one that we have right now is in Sasebo with the 31st MEU [Marine Expeditionary Unit]. So that is part of that.

But any other further questions on the Guam relocation—we are continuing to execute that plan.

Senator HIRONO. Thank you. Yes, we need to keep the Futenma issue on track I would say.

I mentioned in my opening statement that the Navy had been testing an engineering and development model of the air and missile defense radar (AMDR), at PMRF [Pacific Missile Range Facility]. The Navy's testing of AMDR was supposed to allow the Navy to award a contract for an engineering change proposal last fall to upgrade one of the fiscal year DDG-51 destroyers to a Flight III configuration.

Secretary Stiller, could you give us an update on the Navy's progress in signing a contract for the engineering change? Why has there been a delay in signing this engineering change proposal? Does this delay have any implications for the Navy being ready to sign a multiyear procurement contract in fiscal year 2018, and how many DDG-51's could the industrial base handle in fiscal year 2018? So I hope you can remember all the series of questions.

Ms. STILLER. If I do not, please remind me. But, yes, ma'am, let me give you a status on Flight III.

From a ship design perspective, we are 86 percent complete with the design to introduce Flight III to the DDG-51. As I mentioned in my opening statement, we have a handshake agreement with Ingalls to introduce that engineering change proposal on their fiscal year 2017 ship. We recently received a proposal from Bath Iron Works for their ECP [Engineering Change Proposal], and we are in negotiations with them. We have also received a bid from them on their 16 ship as a Flight IIA, and we are also asking them to also give us an ECP to look at that as a Flight III.

But talking about the radar, the radar, as you mentioned, is doing quite well. It is in testing. We have been before the OSD [Office of the Secretary of Defense] Defense Acquisition Board and gotten the permission to proceed to buy the radars for those ships. We also are testing our Aegis combat system that will marry up with that radar, and testing is going well.

All the way along, we have the radar folks, the shipbuilding folks, the government folks, the combat systems folks working together. So there is no mystery here.

But where we will be at start of construction with the 2018 multiyear, we are 100 percent complete with the design. As I said, we are 86 percent complete today. We completed our CDR back in November of 2016.

You asked me about number of ships in the multiyear. Our request is 10. Certainly the industrial base can handle more than two a year, but our request right now in our budget constrained environment is for 10 in the multiyear.

I think that I got all your questions.

Senator HIRONO. I think so. Thank you.

Senator WICKER. Thank you.

Senator Rounds?

Senator ROUNDS. Thank you, Mr. Chairman.

First, let me thank you all for your service to our country.

Admiral Lescher, recently the proposed budget for 2018 requests the funding, if I am correct in my addition, of eight additional ships based on the administration's proposal for a 350-ship Navy and the current fleet at 275 ships. First of all, I am just curious and just a confirmation that the 350-ship number is an appropriate number in your opinion. Second of all, is the current fiscal year 2018 ship construction plan in line with the strategic goals of the United States Navy?

Vice Admiral LESCHER. Yes, sir. Three hundred fifty-five ships delineated in the force structure's estimate is the correct number. It is the objective number. The fiscal year 2018 budget submission with the addition of the second littoral combat ship that the administration has indicated is forthcoming in an amendment would bring it to nine ships in fiscal year 2018, eight right now as you cited.

I am sorry.

Senator ROUNDS. I am just curious as to the—is it in line with the strategic goals of the United States Navy?

Vice Admiral LESCHER. So it is aligned in this manner. The Secretary of Defense has talked very extensively about the path to get to a larger, more capability, more lethal Navy that we all believe is urgently required. The path that he laid out in his direction—he calls it a three-phase campaign plan to get there.

Fiscal year 2017, with the request for additional appropriations, which we thank the committee and the broader Congress for enacting, was all about getting up to the readiness debt that all the services have accumulated over the course of this decade and a half of wartime OPTEMPO.

Fiscal year 2018, this budget is to build on that readiness recovery and address pressing shortfalls wholeness issues. So you see, for example, in the Navy budget a strong focus on ship depot maintenance, on aviation depot maintenance, on the flying hour program, on the steaming days program, and funding the enabling readiness accounts to elevate the readiness of the force. That is across spares, logistics, and depot support funding. So it sets the condition now. That is the design of this budget, to set the condition for the third phase of the campaign plan the Secretary was

talking about, which is an fiscal year 2019 budget, given the relief from the defense caps in the Budget Control Act that will support and make actionable the growth of capacity and modernization as well.

So that is really the strategic concept.

Senator ROUNDS. I am curious. The relationship between the ability of the industry and the depot capabilities—is there a relationship or a limitation there between the number of new ships or boats that can be delivered and the number of existing submarines, as an example, that can be appropriately depoted? Is there a limiting relationship between the two? Are there suppliers? Are there limiting processes here that we should be aware of? I am thinking in particular, just as an example, the USS *Boise* is sitting at dock. It is not usable. It is an asset which most certainly I believe the Navy had anticipated would be usable.

Vice Admiral LESCHER. Yes, sir.

Senator ROUNDS. Is there a relationship between the numbers that we are building versus the numbers that we are trying to get through depot?

Vice Admiral LESCHER. Yes, sir. That is a great question. I will ask Ms. Stiller to talk in a moment.

But to your point, I think your insight is right on, which is a submarine we have that is not deployable because we cannot execute the depot maintenance on it is every bit as lost an opportunity as a submarine we did not build.

We are very focused on increasing the throughput on our public nuclear-capable shipyards to get after the issue, the prioritization being on the ballistic missile submarines, the nuclear aircraft carriers, and then attack submarines are third in priority right now. That is what led to the prioritization of Boise not being—

Senator ROUNDS. Share with me this. I do not mean to interrupt, but I am really curious. Clearly we have some very, very smart people within the Navy. This is not a surprise that you now have three of these submarines which are sitting basically at dock, are not in depot. I do not think that this was simply a case of malfeasance. This is not a case of where there was not an understanding that it needed to be done. Would you share with the committee what causes this type of a backup at dock, please?

Vice Admiral LESCHER. Yes, sir. Part of it is us learning about the dynamics of growing the capacity in our shipyards. As we saw, for example, the *Los Angeles*-class submarines come into mid-life as a surge in workload, along with refuelings in the aircraft carriers. People certainly were looking at that forthcoming bow wave of workload and trying to be thoughtful about growing the capacity of our four public shipyards to get after that.

We are on a path, and this budget continues that path, for example, to grow labor in the public shipyards from 33,800 full-time equivalents in this budget to 36,100.

I think what was a little bit of a learning curve here is understanding what happens to the demographics of the labor force in a shipyard as you grow it that quickly. We are at a place right now where well over 50 percent of the people in our public shipyards have less than 5 years of experience. The training element of taking a new hire, becoming an artisan is something that was learned

and understood in terms of how productive they are. I think in aggregate what that showed—what that led to is insufficient capacity. Even as it was growing, it was an insufficient rate of growth of capacity in the public yards that led to us not being able to put through all these submarines.

Senator ROUNDS. Well, if I could. My time has expired. I am just going to ask one thing for the record, please. When would this backlog of existing assets—when would this backlog of existing submarines be taken care of in the current budget process? Could you share that with us either—

Senator WICKER. Go ahead.

Vice Admiral LESCHER. What the Navy is doing to get after that backlog is a number of investments in this budget. I talked about the growth in the labor elements. There is growth in improving the infrastructure itself, capital investment in the shipyards at rates well above what is legislated to increase the throughput. Again, that is the bottom line goal here. We need to buy and increase throughput.

The other thing you see in this budget—and planning continue—and it gets back to the foundation of your question of the relationship between the nuclear-capable shipbuilding industry and our public depots is we are leveraging across both to get after this, both on a—we will bring touch labor out of—

Senator ROUNDS. Look, I am going to run out of time. I would like if you could get back to us with a timeline for the elimination of that backlog.

Vice Admiral LESCHER. Fair enough. Yes, sir.

[The information follows:]

The Navy is taking several actions to improve public shipyard capacity and productivity in order to reduce the current backlog. The Navy's goal is to size the Naval Shipyards capacity to match the programmed workload requirements for aircraft carrier and submarine readiness.

Specifically, the Navy's Fiscal Year 2018 President's Budget (PB18) includes investments to increase hiring of shipyard workers; enhance workforce training and development; improve and modernize aging infrastructure facilities, information technology systems, and equipment; and modernize shipyards with an architecture that optimizes the layout for ship maintenance and modernization and improves the productivity of the workforce. The Navy also uses return data from every type of availability at the Naval Shipyards as feedback for programming and planning efforts on future hulls to improve the planning/estimation process.

At PB-18 funding levels, the Navy anticipates recovering the public shipyard backlog by the end of fiscal year 2023. The timing of full recovery is dependent upon several factors outside of the Navy's direct control, including stable and consistent funding and global operational demands.

Senator ROUNDS. Thank you.

Thank you for your patience, Mr. Chairman.

Senator WICKER. Senator King?

Senator KING. Thank you, Mr. Chairman.

Ms. Stiller, welcome. Delighted to have you here to discuss these important issues.

I have probably been to a dozen hearings, maybe more, about procurement and particularly about procurement problems. It always seems to come back to trying to build something while you are designing it and changes in requirements, changes in design, unanticipated changes whether it is the F-35 or any of the other big issues that we have been dealing with.

I am very much in favor of multiyear contracts for all the reasons you have stated: taxpayer savings, better for the industrial base. I am worried, however, about the Flight III being ready for multiyear. You have testified and Mr. Stackley testified the other day, 86 percent design complete. But generally, one of the criteria—and the GAO [Government Accountability Office] talks about this—is not only a complete design but having built one or two and having seen how it actually works and whether the cost estimates are realistic. You mentioned that you have an agreement with Ingalls, a handshake, to build one.

My only request is to consider slowing the multiyear down maybe 6 months in order to start construction on the first Flight III before we buy 10 ships and ask our industrial base to make commitments based upon not an unproven design, but a new design and a substantially changed design. This is not minor changes. This is much more than the Flight IIA changes. It really is a question of not whether there should be a multiyear but when and when do we get to the point where we have full confidence, enough confidence to buy 10 at a time.

Could you give me your thoughts?

Ms. STILLER. Yes, sir. I look at the multiyears that we have sent over both for *Virginia* and DDG-51 kind of in the same boat. We are going to introduce the *Virginia* payload module into the *Virginia* multiyear as well. Right now, that is a year behind because we are asking for—that multiyear starts in 2019. But to give you some perspective, that design is approximately 10 percent complete today. Obviously, we will be in the 80 percent complete when we get to that multiyear as well and close to 100 by the time we start construction.

The way we are trying to mitigate the risk on the 51 program is by trying to introduce that Flight III ECP into this last multiyear, the one that ends in 2017, on the last ships of those multiyears. As I pointed out, we have a handshake with Ingalls. We are in negotiations with that. We feel like that the design is mature and that we understand it. We want to continue to work with the companies.

Obviously, it will take us time. We will have a competition for the multiyear. I cannot tell you exactly when we will award. We usually never award on the first day of the fiscal year anyway. We are never that prepared. But I would tell you that I have high confidence that we have the design well in hand. Both yards have been on schedule on design.

Senator KING. The design—but again, generally in the past when there is a multiyear, one or two have been built, not only the design, but you have something afloat that you can say did it work or were the prices realistic. Did we understand the risks? Were there design changes during construction? I am just suggesting again not stepping away from the multiyear, but it is just a question of timing to be sure that we get it right because you are asking our yards to take a big risk on 10 ships, none of which have—none of that design have ever been built before. That is my question.

Ms. STILLER. Yes, sir. I understand your concern, but we have been successful in doing this in the past. I will point out on the *Virginia* side, this current multiyear that we are in, we introduced ad-

ditional change into that ship design, as we did block upgrades. We talk about the blocks on *Virginia*. We have introduced at a lesser extent on DDG-51 over the years change. We view that the amount of change in this particular Flight III design, it touched about 45 to 50 percent of the drawings.

Senator KING. That is not inconsiderable.

Ms. STILLER. I know that is not but it is along the same lines on the *Virginia* as well. In fact, in the Flight IIA, we touched more drawings on Flight IIA than we are on Flight III. But that aside, we also were not nearly as complete with design when we introduced Flight IIA. We are making ourselves and making ourselves to be disciplined about making sure we are at a certain percent design complete before we start getting into construction. I think we have changed our processes and the way that we look at percent design complete to make sure that we are not putting undue risk.

Senator KING. I appreciate that. Again, I am a big supporter of multiyear. I am a big supporter of Flight III. I think it is going to bring a major advantage to the fleet, and we want to get it as soon as possible. But I would rather get it right than get it fast. Thank you very much.

Senator WICKER. Ms. Stiller, with regard to IIA, those concerns, as Senator King mentioned, in your view turned out to be unfounded.

Ms. STILLER. I would say IIA goes back quite a bit, but certainly there were challenges on the lead ships when we went to Flight IIA. But I would also tell you that we went into Flight IIA with a much less percent complete of the design products. That is one thing we have learned, and the Congress has stressed and we have taken that to heart. For example, *Columbia*. The lead *Columbia* we predict will be 83 percent complete design before we start construction. That is far better than we saw *Seawolf*. *Virginia* even was only about in the mid-40 percent complete when we started that program.

We understand the reasons we need to get percent design complete way up there before we start construction. We are committed to it and we have learned our lessons. Back to your comment about having on-time and on-schedule, that resonates with us because it is important to us to be able to make sure that are affordably procuring these assets.

Senator WICKER. On the Flight III, how much do you think we are going to save by doing it this way?

Ms. STILLER. Well, the Flight III capability will cost more. The radar is a bit more expensive but not very much.

Senator WICKER. How much are we going to save through using multiyear?

Ms. STILLER. On the DDG-51, we predict we are nearly 10 percent, and on the *Virginia*, we are at 14 percent. We obviously have to go through the certification process with the CAPE [Cost Assessment and Program Evaluation], and so those numbers will solidify over time and certainly having industry bids will help us to inform. But we always see on multiyears that we get at least 10 percent savings.

Senator WICKER. Well, Senator King, has a concern and so I hope you will work with us to see if we can achieve a consensus.

Ms. STILLER. Yes, sir. We will lay out the schedule for Senator King to show you what our timeline is. I do not have that off of the top of my head.

Senator WICKER. Senator Strange?

Senator STRANGE. Thank you, Mr. Chairman.

I thank our witnesses for their appearance here today. I appreciate your service as well.

I appreciated Senator Rounds' question to Admiral Lescher about shipyard expertise. That is an issue of particular concern to me. I think we see how it affects various aspects of the programs we are trying to achieve. As I know you well know, Madam Secretary, there are 21,000 men and women at two shipyards, 1,200 suppliers in 45 States who support the current LCS program. I am very pleased with the administration's decision to add an additional ship in the budget and look forward to seeing that. It is not sufficient in my view, and I will certainly be weighing in on that subject, but it is a step in the right direction. I greatly appreciate that.

Back to the issue of shipyard capability and efficiency, should we agree to cut production back in those shipyards, in my view it will have a significant affect on efficiency, competition, and other factors, particularly price. In my view that is, in this current budget environment, a very significant concern. In my view, if we truly want to grow our Navy fleet, which I strongly support, to the 350 to 355, we have got to expand the LCS frigate program rather than cut it back at this time.

I guess my question is pretty basic. If we want to achieve that goal, does cutting back on the frigate LCS program help us achieve that goal? How does it impact in your view how we get to that goal in the most efficient, cost-effective way that actually delivers something that our warfighters need in the theater? Whoever would like to take a shot at that.

Ms. STILLER. Well, sir, as I mentioned in my opening statement, we have a requirement for 52 small surface combatants, and we want to get to the frigate as soon as we possibly can. We had taken a pause to go and—with the emerging threat environment out there to take a look again at the requirements to make sure we have it right. As we transition from LCS to the frigate, that is why we put in quantities to bridge to getting to frigate and know they are not at the optimal build rates for the yards but they are where we feel that we are at minimum sustaining rate so that we can transition to frigate because we want that 52 total number to have a number that are frigates. Twenty is where our head has been for a while now.

We realize that we cannot just turn off LCS and immediately get to frigate. That is why you see ships added because we are mindful that we have an industrial base out there that we do not want to walk away from because they are a critical part of our ability to build the ships.

Admiral, if you wanted to comment on the requirements.

Vice Admiral LESCHER. Absolutely. This is very much an intersection of sustaining the industrial base and getting the design and the requirements right and preferably working with the industry to get them right.

Senator, I know you are very familiar with the evolution requirements and the concept of the littoral combat ships we have put on contract. We absolutely need to buy the fleet. Admiral Rhode and the surface force commanders said I need them now. I need more of them.

At the same time, as we broaden our operational concept to distributed maritime operations, distributed lethality, looking for these ships to operate not only in the littorals but perhaps more independently, that is what is driving them from being a single-mission focus to a multi-mission focus. As we mature those requirements and work with industry to understand where the knee in the curve is for most capability, for price, that also drives very much into this timeline that you talked about.

Senator STRANGE. Thank you very much, Admiral. I look forward to following up on that issue.

Mr. Chairman, I will yield back my time. Thank you.

Senator WICKER. Thank you, Senator Strange.

Senator KAINE?

Senator KAINE. Thank you, Mr. Chair. Thanks for yielding me a few seconds. I will not take it.

But thank you all, witnesses, for your good testimony.

A couple of things. The high costs associated with shipbuilding are often attributed to the time elapsed between building. You have had some success in both the Arleigh Burke and the *Virginia*-class sub when you have done multiyear procurements. Is there any reason to think that that would not potentially yield similar cost saving results if applied to other programs like carriers, for example?

Ms. STILLER. Senator, we have found that once you have a stable design—we have just come through the lead carrier. As you look forward to and you say, yes, I am not going to be introducing great change to the carrier, there are opportunities. We have done a 2-year block buy on carriers in the—two carrier block buys in the past. It is certainly something that if we can make the commitment to the supplier base, it is effective, and we can get savings.

We do try to look, after we get through a lead ship, to get into multiyears as soon as we possibly can and be able to introduce capability incrementally.

So, yes, sir, we find that giving the industry that predictability—and it is not just at the shipyard level, but the supplier level too—is critical.

Senator KAINE. The second question is there was a Bloomberg article in the last day or so that talked about something that we might be seeing. You talked about an additional presidential budget coming over I think with respect to the second LCS. I am a strong LCS fan, but my understanding from the article is part of the funding for that. Second is going to be reducing aircraft overhaul by \$300 million.

Is that accurate? If that is so, give me some kind of context as to why that is a good idea and what it would mean.

Vice Admiral LESCHER. Yes, sir. I will not speculate on what will be in the OMB submission to you, but I will tell you what you cited is inaccurate. It would not be a source coming out of overhaul funds.

Senator KAINE. Are you familiar with the Bloomberg piece that I just referenced? As you know right now, that is not an accurate article.

Vice Admiral LESCHER. Correct.

Senator KAINE. Thank you.

Thanks, Mr. Chair.

Senator WICKER. Senator Sullivan?

Senator SULLIVAN. Thank you, Mr. Chairman.

I appreciate the service of our witnesses today. Thank you, all three, very much.

I wanted to focus, not surprisingly for some of my colleagues on the panel, on our Arctic strategy. We are an Arctic nation because my great State, the State of Alaska. Secretary Mattis during his confirmation hearing said the Arctic is key strategic terrain in part because of the new opportunities there, new challenges. The Russians are building up their icebreaking fleet, their navy. They are putting new brigade combat teams in the Arctic, very aggressively, probing countries by their bomber runs. Just in the Alaska air space in the last month and a half, we have had to go intercept them with our F-22's up in Alaska.

So this committee mandated that the Secretary of Defense put out a new Arctic strategy which the end of the Obama administration/beginning of the Trump administration did, which was a much better improvement on the old one which was not really a strategy but more of a document with a lot of nice pictures in it.

One of the elements of the new Arctic strategy is that we, to protect our interests and sovereignty in the region, need to be able to conduct FONOPS [Freedom of Navigation Operations] in the Arctic. Yet, Admiral Richardson just testified before this committee. He said it is absolutely true we do not have the capacity or the capability to conduct Arctic FONOPS. Our strategy right now has an end state that we cannot meet. It is very obvious.

Admiral, I wanted to talk a little about—you know, as we look to pursue a fleet of 355 ships, what are the current plans in the Navy to include ice hardening of any ships that we are obviously going to need to be able to conduct FONOPS and protect our interests in the region? If so, what ships would we be looking at to ice harden?

Vice Admiral LESCHER. Right. I will take this for the record as well to give you a more detailed, fulsome answer. Right now, I am unaware of any current plans announced—if you chose to correct me, please do so—for ice hardening.

Senator SULLIVAN. Why is that? We have been focused on it. The Secretary has focused on it. We have a new strategy. It says we need to conduct FONOPS [Freedom of Navigation Operations]. I am going to get to the icebreakers here in a minute.

Vice Admiral LESCHER. The short answer is the Navy has a very active presence in the Arctic but it is undersea and in the air right now, and it is not on the surface right now.

Senator SULLIVAN. Can you conduct a FONOP with a sub? Not an obvious one.

Vice Admiral LESCHER. Not the way we envision it. Exactly right. It would depend on how you message that.

Let me get back to you with the detail on the hardening of our ships.

Are you aware of any ongoing work with that?

Ms. STILLER. I am not aware.

[The information follows:]

Vice Admiral LESCHER. The Navy is currently not pursuing ice hardening of surface combatant ships because there is no current validated combatant commander requirement for these ships to operate in the Arctic year-round. Preliminary examinations of ice-hardening surface combatants and amphibious ships revealed re-design would be required at significant cost and design risk. In addition to ice-hardening the hull, designs for ships operating in the Arctic would also need to factor in the many operational risk factors, including sea-ice, wind, ice accumulation on equipment, and limited communications and satellite coverage. In addition, surface operations in the Arctic would require significant new infrastructure in the Arctic region and regional authorization for development that would likely have cultural and social impacts on the local population. This would entail substantial investment of funding beyond ice-hardening ships.

The DOD has several options to conduct Freedom of Navigation operations (FONOPS) beyond Navy surface combatants. First, Navy submarines can and do conduct FONOPS, either undersea or by surfacing. Second, Navy surface combatants could conduct Arctic and sub-Arctic FONOPS in open water conditions during the summer melt season. Third, the DOD's FON Program employs every branch of Military Service, including the U.S. Coast Guard (USCG). Thus, USCG cutters could conduct FONOPS in the Arctic and the new Heavy Polar Icebreakers are planned to have maritime security capability and the capability to provide assured year-round access to the Arctic. Fourth, the Arctic Strategy continues to prioritize and maintain the long-standing partnerships with other Arctic nations who have publicly committed to working within a common framework of international law and diplomatic engagement. FONOPS support international law. If necessary, FONOPS could be conducted by a partner nation, as is currently being done in the South China Seas.

The Navy's undersea and air assets continue to fulfill current operational requirements in the Arctic. Advances in the Navy's undersea technology and modernization of both undersea and aviation platforms (e.g. P-8A aircraft) will continue to provide greater capabilities for the Arctic region. DOD and the Navy continue to closely monitor the Arctic activity and will continuously re-assess requirements with combatant commanders.

Senator SULLIVAN. Mr. Chairman, this is actually a really important issue. We are looking to build a 355-ship Navy. We have an Arctic strategy. The CNO is saying we cannot conduct what we are saying we are supposed to do in our strategy, and we have no plans to ice harden our ships and we are going to increase our ships by 60 ships. I think we need a very detailed answer on why that is not even being considered. It seems to me a huge oversight. I would appreciate that.

Let me get to the icebreaker issue. You know, the Coast Guard has talked about the need for three heavy icebreakers, three medium icebreakers. Again, Admiral Richardson stated in his confirmation hearing that it is clearly in the national interest for the U.S. to have more than one heavy icebreaker. Right now, we have two, but one is broken and that was commissioned in 1976. I went and toured it recently. I think was shameful. We should have no man or woman who puts the uniform of the U.S. military on that should deploy on a ship that is that old and broken. You should go see it, Admiral. It is really shameful for our Coast Guard men and women who have to deploy on that.

Initially the estimated cost of one single icebreaker was 10 years it would take and a billion dollars to build. The Norwegians just built the first-ever liquid natural gas powered medium icebreaker for \$150 million. What are we doing wrong here? What can we be

doing, and is the Navy working with the Coast Guard on trying to get at least the original. The target is 2023. I think it needs to be sooner. But why are we talking 10 years and a billion dollars to build a ship? We put a man on the moon in a shorter amount of time. Everybody else is doing it. What is the problem, and how are we going to fix it? How are we going to get Navy-Coast Guard cooperation and working together on this issue which seems to have a little bit of a hot potato. No service wants to own it. Yet, everybody says it is in our national interest to do it. How are we addressing this?

Ms. STILLER. Sir, we are working very closely with the Coast Guard. It is a joint program office right now on the icebreaker. There are two memorandums of understanding that we have signed, one at the Department of Homeland Security level and Department of Navy. I signed for the Navy. The other one is the Navy with the Coast Guard. There are a little bit different nuances in both.

But both of them reference that the Coast Guard's mission is icebreaking, and so Coast Guard will have the lead on this and Navy is in a supporting role. We are providing technical assistance with them. We are providing program management type support, contracting if they need it. We are participating in their reviews. I sit with the Vice Commandant of the Coast Guard on all of their reviews. I can tell you that they are going through every single requirement and questioning them, and we are driving the cost of that ship. It is not going to be a billion dollar ship.

I am not sure the 10 years was not tied to when funding might become available. Obviously, we are looking at how do you bring that in subject to funding.

But we are very much engaged with the Coast Guard. We have a great working relationship with them, and we are working very closely together to get this program on solid footing at an affordable cost.

Senator SULLIVAN. Is the target of 2023 still doable?

Ms. STILLER. Yes, sir, subject to funding availability, but yes, sir. We are doing design work right now. We have five industry teams providing great insight on what our cost drivers are so that we can get the specifications right to get this out for bid. There is \$150 million that the Congress appropriated as part of the Navy's budget last year that will go towards the detail design and then the construction funding will have to follow.

Senator SULLIVAN. Thank you.

Thank you, Mr. Chairman. I think this committee needs to keep a very close oversight role here because there is just a lot we need to do and the coordination between the Navy and the Coast Guard has not been that good. I am glad to hear that it is improving.

Senator WICKER. Senator Sullivan, you have raised a very important topic. Let me just ask this. Admiral Lescher, you have taken a few questions for the record and perhaps others of you, and I appreciate that because we want to get the right information to the committee. This does provide a record for us to look at in the future. But this should be fairly easy for you to get back to us about. Is that correct?

Vice Admiral LESCHER. Yes, sir. Again, the answer was none of us are aware of a program for hardening of the ships. But I will just go back and do a quick check to make sure that is factual.

Senator WICKER. Along with these things, do you think maybe you could get back to us in 2 weeks?

Vice Admiral LESCHER. Yes.

Senator WICKER. On all of the things that you have taken for the record. Thank you. Ms. Stiller is nodding yes also. I do appreciate that.

Senator Shaheen is next.

Senator SHAHEEN. Thank you, Mr. Chairman.

Thank you all very much for being here and for your service to the country.

I apologize for missing your opening statements, but I understand that there was some discussion about how to get to a 355-ship Navy.

The question that I have is how did we arrive at 355 as the appropriate number and how do we break down the components of that 355 number in a way that provides for the national security that we think we need.

Vice Admiral LESCHER. Yes, ma'am. The analytical basis for the force structure assessment is it takes a look really starting with the combatant commander requirement to execute the strategy. The current strategy we have is the Quadrennial Defense Review Strategy of 2014. It talks about everything from ensuring a safe and secure nuclear deterrent, which drives the requirement for our ballistic missile submarines, to building peace and security globally, which drives our presence requirement, our so-called phase zero, phase one, set to theater forces, to deter coercion and defeat when necessary, which drives capability in a high end.

As we integrate those strategic requirements, that is the charter to the Navy. These are the missions to execute. We did an analytic basis. Each of the combatant commanders made an assessment of this is what I need in my theater in Central Command, in Pacific Command to execute the strategy that I have been assigned. That essentially boils down to essentially a contract the Navy has with the Nation to provide rotational forces forward for presence and then to surge forces for crisis.

That is the analysis that was done that culminated with a number of options, and the best military advice of the service leadership was 355 is the right recommendation to the Nation. It is not a zero-risk force, but it is a moderate risk we can execute. That really is the analytic basis that looks at the current security environment and the current requirements to execute the strategy.

Of course, the security environment is very dynamic. There was a surge in Russia, North Korea, et cetera.

Senator SHAHEEN. Well, along those lines, I was surprised to hear in testimony before the full committee probably in the last couple of months that we expect China to get to a 350-ship Navy by 2020. How concerned are we about that and about our capacity at that point to be able to offset what we expect China to be doing?

Vice Admiral LESCHER. Yes, ma'am. That is a great question.

But we do not mirror image platform versus platform. That is not the way we fight, and so you hear the CNO and the Secretary

talk very extensively beyond the platforms. Obviously, numbers absolutely matter, to your point.

But our view of executing that strategy to include the deter, coercion, and defeat, when required, has to do with the innovation that will be taking place concurrently with growing the ship to the 355 level. That is everything from new technology and the investments you see in this budget in unmanned, directed energy, digital elements networking, electromagnetic maneuver warfare, and the new operational concepts, distributed maritime.

Senator SHAHEEN. Given that, how important—I guess this is for Ms. Stiller. How important is it that we maintain a robust industrial base?

Ms. STILLER. Ma'am, it is vital that we have a robust industrial base, and we watch that very carefully. We watch critical suppliers. We rely on our shipyards to identify critical suppliers that we might not see. It is very important that we have that industrial base there to be able to help us grow.

Senator SHAHEEN. One of the shipyards I am concerned about is our public shipyard at Portsmouth, the Portsmouth Naval Shipyard. Can you talk about the role that the public shipyards play in making sure that we have the naval capability that we need?

Ms. STILLER. Yes, ma'am. They are also vital because we have to have our public shipyards in place to address our nuclear-capable ships and their maintenance and modernization availabilities. It is very important that we invest in our naval shipyards. Admiral Lescher talked earlier about we are ramping up the number of folks that are going to be in our public shipyards. We are also looking at infrastructure improvements. What do we need to position ourselves so that those public yards can also be more productive and allow the proper throughput that we need to support our fleet.

Senator SHAHEEN. I appreciate the challenges that the Navy has, given Congress' failure to address the budget issues. I remember being at the first Navy caucus, and Admiral Richardson pointed out that they have instructed agencies within the Department not to plan on doing anything in the first quarter because of the budget uncertainty because we have had so many years of continuing resolutions and lack of budget certainty. Maybe you could all speak to what that means as we are trying to address the challenges that we face around our national security.

Vice Admiral LESCHER. I will start. What we see under a continuing resolution—and as you have precisely described, you know, every year for the last 8 or 9 years, we are starting with a continuing resolution. It is very inefficient. It constrains our ability to execute the program. The CNO has talked about essentially the Department on three-quarters of a year from a planning perspective.

The technical aspects of a continuing resolution. We cannot do new starts. We cannot do production rate increases. From an industrial base stability and the industrial base, we are talking about a lot of churn in that.

Our inability to execute the ship depot maintenance in the private shipyards on a scheduled plan means we took availabilities planned for the first quarter and we are pushing them into the sec-

ond and third quarter. Churn again now in our private shipyards as they are trying to have a stable labor force.

It is very inefficient on the government workforce. Instead of signing a yearlong contract, for example, to execute a service, it is broken down into multiple contract actions at the same time as we are driving to a 25 percent reduction in management headquarters, at the same time as we are driving very strongly to auditability. It drives workload inefficiency and it absolutely costs the taxpayer money to do it that way.

Lieutenant General WALSH. If I could, Senator. To add on to what Admiral Lescher said, like you said, I think 9 out of the last 10 years, we have been operating under CRs [Continuing Resolution]. I think we have had over 30 continuing resolutions. It just gives us instability in our readiness and our modernization plans. If you kind of look at it as Admiral Lescher kind of walked through and said the Secretary of Defense has a campaign plan in 2017 to fix readiness, 2018 to kind of continue to solve the readiness issues, fill those holes, increase some of that modernization capability, and then now start to modernize and grow the force, without the stability—you could see that looks good from this plan 2017 on, but if we do not get the stability that we need, then we do not solve the readiness, and therefore, you cannot have the stability you need to modernize.

Ms. STILLER. I think they hit all the points.

Senator SHAHEEN. I think they did. Thank you.

Senator WICKER. Senator Cotton?

Senator COTTON. Thank you.

In his opening, Chairman Wicker addressed the cost of the USS *Enterprise*, and I know that Chairman McCain mentioned this recently at the Navy posture hearing. I understand the cost was projected to increase from \$11.4 billion to \$13 billion, a whopping \$1.6 billion, but I have also heard some reports that the cost is under review and may be revised downward.

Ms. Stiller, can you update the committee on your current cost estimate for the *Enterprise*? Is it \$13 billion, or is it something less?

Ms. STILLER. Sir, it is something less. It is at \$12.6 billion, and when we send the amended budget over for the additional LCS, we intend to send a budget exhibit that reflects that. You will not see a reduction in the fiscal year 2018 column. As you know, that ship is incrementally funded, but you will see a net reduction to the cost of the *Enterprise*.

Senator COTTON. That is a good news story.

Ms. STILLER. Yes, sir.

Senator COTTON. \$400 billion—I am not great at math, but that is what? About a 4 percent, 5 percent decrease?

Ms. STILLER. Yes, sir.

Senator COTTON. What accounts for that break in savings?

Ms. STILLER. We looked hard at what we were counting on as inflation rates, which we are not experiencing at this particular point in time. We also looked at the effect of where we have added the second *Virginia*-class in fiscal year 2021 and what that does to rates at the shipyard. Those were the two large drivers there. We are also looking at efficiencies we are seeing on 79.

Senator COTTON. When you say inflation rates, inflation rates in what? Could you be more specific?

Ms. STILLER. Inflation rates for material specifically. A lot of time shipbuilding inflation rates do not mirror the rest of the world or the rest of the country. But we are seeing that coming more in line, and so we do not feel like we have to address larger inflation.

Senator COTTON. Do you think we might anticipate the possibility of future downward revisions as well?

Ms. STILLER. We will continue to scrub the numbers as we get there. Obviously, as we get to contract on that ship, that may also—but, yes, sir. We also look at inefficiencies we are seeing today on 79, and we will apply those to CVN-80.

Senator COTTON. Thank you. That is good news.

I would like to turn my attention now to the undersea domain. In terms of the program cost, the *Ohio*-class replacement, the *Columbia*-class is going to be, I think, only second to the Joint Strike Fighter. Those submarines are going to carry about 70 percent of the Nation's deployed ballistic missiles, obviously, the most survivable part of our nuclear triad. But if the *Columbia*-class turns into an acquisitions debacle the way some of our big programs have in the past, that would not just be very bad consequences for the taxpayer, it would be grave consequences for the safety of our Nation.

What steps are we taking to ensure that we get the *Columbia*-class right from lessons learned on past acquisition experiences, especially with the 78?

Ms. STILLER. Yes, sir. We are robustly, along with industry, managing this program. The Congress—you have given us authorities that we feel will help us to drive cost and efficiency into the program, and we thank you for those. We are continuing to look for if there are additional authorities we might need. We are carefully watching how the shipyards are able to—what they plan to do for facilities to be ready for *Columbia*.

We are looking at what critical skills do they need to hire and how they are going to get ahead of that so that we are not in a situation where we do not have the skilled workforce we need.

We are looking at critical vendors to make sure they can ramp up as they are building attack submarines and *Columbia*-class.

We are looking at synergies where we need to support the UK [United Kingdom] because they also are building their replacement. For example, a common missile compartment. We know we have not built missile tubes in over 40 years since we built the *Ohio*, and so we see that there are synergies to go ahead and build continuously those missile tubes to make sure we are getting risk out of the program.

I can assure you there were a lot of lessons learned that we are applying today. I mentioned earlier our intent is not to start construction until we are over 80 percent. We are targeting 83 percent complete with design on that program. Right now, all the metrics are leaning in the right direction. We are on track with design, but it is not something that we are going to take our eye off of. It is critical to us, and we fully understand your concerns.

Senator COTTON. Thank you.

Admiral Lescher, turning our attention to attack submarines, Admiral Harris recently testified that only about half of his re-

quirements for attack submarines in the Pacific theater is being met, and the challenge is only going to grow more in the 2020s as we retire these at a faster rate than they are planning to be built. China continues to expand its fleet, and many other nations in East and Southeast Asia go on something of an attack submarine buying spree of their own.

What steps is the Navy taking to try to mitigate this shortfall in attack submarines, especially as it relates to the Asia-Pacific theater?

Vice Admiral LESCHER. So a number of steps I would cite.

The first is, obviously, the path we are on to grow the number that are being purchased. Beyond that, we are making strong investments to make the submarines we do have more capable and execute their missions more broadly as well. Some of the investments you see in this budget to get at that are, for example, the investments in the family of underwater unmanned vehicles. This will allow any submarine across the spectrum of that family—so there is small, medium, large, and extra large. The ones that are deployable on submarines will actually execute subsets of missions for that submarine, whether it is ISR [Intelligence, Surveillance and Reconnaissance] or other missions—we could talk in a different forum—to make the ones we do have forward more capable.

Similar to that is the investment, obviously, in the *Virginia* payload module. That again makes the submarines we have, particularly for Admiral Harris in that theater, able to carry broader types of weapons that will make them just more effective in what they do.

It is a combination of growing capacity and then growing capability to make the ones we have more effective.

Senator COTTON. Thank you.

Senator WICKER. Ms. Stiller, before I turn to Senator Blumenthal, let me follow up on an important matter that Senator Cotton mentioned, and that is avoiding an acquisition budget disaster on these big programs. The Senator mentioned the F-35. At what point will we have a comfort level that this new replacement, the *Columbia*-class submarine, is proceeding as you expect it to do in terms of the cost?

Ms. STILLER. We have an integrated master schedule that the shipyards collectively have put together on how they are going to get through the design products, what they need to do from an integrated schedule on having the facilities in place, and I mentioned the workforce. It is something that we on a very regular drum beat at the program executive officer level is reviewing. We cannot just review *Columbia* in isolation. We have to make sure we are looking at *Virginia* and *Virginia* payload module to make sure that we do not have one program getting out of step with the other.

I can tell you at the senior leadership, Admiral Caldwell, Director of Naval Reactors, and I are going to take a trip up to Electric Boat this summer to review both programs in detail. Mr. Stackley and Admiral Caldwell did this last year. We are going to make this manual daylong review. But we have regular reviews in the building to go through the program. If we start to see things going not in the right direction, we are going to put the attention and focus

to make sure we get it back on track. But I can tell you that we are managing it very, very carefully because it is critical.

Senator WICKER. It is critical, absolutely. Thank you.

Senator Blumenthal, you are recognized.

Senator BLUMENTHAL. Thanks, Mr. Chairman. I would just like to assure Senator Wicker and Senator Cotton that there is a very strong program of oversight and scrutiny in place to avoid any of the kinds of mishaps that have plagued other programs. I have been briefed. I am sure that Electric Boat would be more than happy to brief anyone on our committee or any Member of the Senate, for that matter. But there is a very strong sense that the tradition of producing submarines on time and on or under budget, as has happened with the *Virginia*-class, has to be continued into the *Columbia* program even though it is a much more complex—well, I should not say more complex. It is certainly a challenging and, as you have observed, Senator Cotton, a critically important part of our national defense.

Senator COTTON. I will just add that I appreciate those comments. This is something that is bipartisan. Obviously, nobody on this subcommittee or full committee wants to see something like what happened with the F-35, whether it is the *Columbia*-class or the B-21. We have experts and professionals that handle these matters, but it is incumbent upon us to have these kind of regular check-ins.

Senator WICKER. We want to be teammates in this regard. Tell us what you need with regard to authority.

Ms. STILLER. Yes, sir. You have given us the authorities that we have asked for. We do not have additional authorities that we need this year, but we certainly know that we can come back and bring you additional authorities as we see them. We are continually challenging the team, the government-industry team, are there better ways to go procure that we would need additional authorities. Do not be constrained by current authorities. Right now, we have what we need, but we certainly will come back if we need additional ones.

Senator WICKER. Maybe some day we will look back on this little discussion and be able to pat ourselves collectively on the back that we did our part. But when we do something new and something big, Senator Cotton has raised a very legitimate concern. We acknowledge that.

Start Senator Blumenthal's time over, if you do not mind, Mr. Clerk.

Senator BLUMENTHAL. Thanks, Mr. Chairman.

Even though I do not have authorization to do it, I would like to invite you to visit Electric Boat.

Senator WICKER. I have been there and I will come back.

[Laughter.]

Senator BLUMENTHAL. I would just like to tell you that Ms. Stiller christened the USS *Mississippi*, one of the more recent *Virginia* attack submarines, in a dramatic show of force.

[Laughter.]

Senator WICKER. I am sure it was one of the highlights of her life.

[Laughter.]

Senator BLUMENTHAL. Well, she did very well, and she has done important service for our Nation. In all seriousness, we thank you and the other witnesses who are here for your service to our Nation. I hope that we can continue this conversation because it is critically important, and it is bipartisan.

With respect to authority, I know that in the NDAA fiscal year 2017, continuous production was authorized for the *Columbia*-class common missile compartment, which allows the industrial base to continue manufacturing that component. Are there additional authorities, just to follow up on the chairman's question, that you might need for other components or other aspects so that you do not have to, in effect, produce boat by boat and you can do continuously the production of things like missile compartments?

Ms. STILLER. We are looking very hard in different areas of the boat. Right now, we have not identified that we need the additional authorities, but we may come back to you and say we see merit in other areas. But right now, we are comfortable with the authorities that we have.

Senator BLUMENTHAL. Great.

Let me turn to the security clearance backlog. I know you are familiar with it. Secretary Stackley, recently called the decision to assign I think 10 reservists to some of the work that otherwise would be done by others, the result of the backlog for submarine construction clearances. I wonder whether the Navy will continue extending that detail if necessary and what can we do to help to end this backlog, which is really regrettable?

Ms. STILLER. Yes, sir. What Secretary Stackley has assigned 10 reservists to help clear within the Department of Defense—within the DOD [Department of Defense], to help clear getting these interim secret clearances so that workers can go and work in secret areas of the ship. The yard was having to fence off when they could not get people cleared for a long time. What that does not solve is getting their permanent clearances because that is at the OPM level, and we collectively have got to figure out how to correct that.

We did ask that this be a one-time, but we recognize the criticality to our industrial base, and so we will have to look at it as time goes on to see if we need to continue to supplement in that area.

Senator BLUMENTHAL. He called this assignment—I am quoting him—an extreme measure—

Ms. STILLER. Yes, sir.

Senator BLUMENTHAL.—which we would difficulty repeating. Although it sounds mundane, it is critically important to the work done at the yard, as you well understand. I hope that you will let us know whether there is anything we can do to help.

I understand that last week, the Navy approved Electric Boat's revised security plan, which seeks to allow non-cleared workers in certain parts of the shipyard, which is important, and a formal letter for approval is forthcoming. Is that correct?

Ms. STILLER. Yes, sir.

Senator BLUMENTHAL. I know you have been asked about maintenance and particularly about the Boise, which I understand is going to be done in a private shipyard because the public yards are so fully operational. They are operating at capacity. Is that going

to be a trend that we see expanded in the future, that is, the use of more private yards for maintenance?

I ask this question because not only the USS *Boise* has to be really returned to sea—right now, it is tied up pier side, cannot be used by the Navy—but also because of the skill challenges, the training, the capacity challenges that we face I think are the biggest obstacle in some ways to achieving the goals in timeliness and cost for *Columbia* and for the *Virginia*-class and for maintenance. If the maintenance burden is going to add to the private sector, it makes all the more important the skill training and building that defense industrial base capacity that right now is in jeopardy in my view. Let me invite your comments.

Ms. STILLER. Sir, we want to make sure we are doing the right things, we believe, to get the naval shipyards to the ability to handle the capacity for the depot work. You are right. With *Boise*, we have hit a stumbling block. We are now having to do the planning, and it will go to the private sector to do that availability.

I do not anticipate there will be a tremendous amount of work pushed to the private sector, but it is something—you are exactly right—that we have to carefully watch because the new construction, especially *Columbia*, is very vital that it stays on schedule. It is important that we have the workforce across the board. Your points are well taken. Right now, we do not see additional ships being pushed to the private sector, but it is something, if we see it happening, we need to make sure we are working private industry early so that they are aware of what is coming.

Senator BLUMENTHAL. Thank you.

Senator WICKER. Thank you, Senator Blumenthal.

Ms. Stiller, as we grow the fleet, we are going to need propellers. Is that correct?

Ms. STILLER. Yes, sir.

Senator WICKER. I understand the Navy is chatting with Rolls Royce in Pascagoula about this issue. Can you update me on these discussions?

Ms. STILLER. Yes, sir. Back in the 2014 time frame, I became aware that the Rolls Royce facility, the foundry, in Pascagoula was looking to shutter, and that caused us great concern because, as you know, a number of our ship propellers are cast and machined in that facility. The only other facility we have in this country that does the castings is the Philadelphia foundry, the naval foundry, and they work primarily on our submarine propulsors.

I have been talking in conversations with the Rolls Royce leadership for some time now, and we have done things to help to have them stay open. We advanced the CVN-80 propeller work to make sure that they have workload in the facility. We have been working with the Office of the Secretary of Defense's staff to figure out are there alternatives or things that we can do to help them invest in their facility to make it more productive.

They have come to us with a proposal. We have looked at title 3, the defense procurement authorities, which require presidential approval, and that is a lengthy process. But there is a program within the Secretary of Defense's Office called the Industrial Base Analysis and Sustainment (IBAS), program that might offer us an opportunity to work with the company, investment from the com-

pany, as well as investment from the government to help keep that facility more productive and give them the tools they need so that they can be there to help us grow our future fleet.

That is one example of a supplier base issue that we are tackling one at a time, but we need to make sure that we are doing that so that we have our critical suppliers there as we grow the force.

Senator WICKER. Well, keep us posted on that. I would point out to you that Pascagoula is, to my knowledge, the only city in America that rhymes with hallelujah.

[Laughter.]

Ms. STILLER. Yes, sir.

Senator WICKER. I give a hallelujah to your answer there.

Let me ask you then, Ms. Stiller, on the LX(R) scheduled for 2020. Given the need for 355 ships and including 38 amphibs, could this LX(R) be accelerated to 2019 and would additional funding be required?

Ms. STILLER. Yes, sir. You are correct. The LX(R) in our budget is a 2020 ship. The critical enabler to getting to an accelerated ship would be funding for detail design and advanced procurement of long lead time items. If that funding were available, the ship would more likely execute like a fiscal year 2019 ship than it would a fiscal year 2020 ship. But you would need that advanced work done to be prepared to do that.

Senator WICKER. Well, let us know what you need there.

Senator HIRONO?

Senator HIRONO. Thank you.

On the LX(R) program, which you say is a 2020 execution, the question was whether we can accelerate that because that would be good. Did you say that that acceleration is dependent on funding?

Ms. STILLER. Yes, ma'am. It is dependent on being able to do the detail design work so that the design is ready so that you can get into construction. Right now, all that funding is in fiscal year 2020. If part of that money was accelerated, you could execute that ship more like a fiscal year 2019 ship.

Senator HIRONO. We need to accelerate the funding to enable you to do the detail design work that is needed.

There was an earlier discussion about our submarines being in dry dock, and the number three was mentioned, three subs. I thought it was only the Boise that was in dry dock. Admiral?

Vice Admiral LESCHER. When you say in dry dock, meaning—

Senator HIRONO. Well, they are not deployable.

Vice Admiral LESCHER. For example, we have the USS *Montpelier* right now also in a private shipyard as well. That was a fiscal year 2017 avail that was rolled in and is being done now. I think as Secretary Stiller said, on a case-by-case basis where the capacity is not there, they are looking to bring them into the private shipyards.

Senator HIRONO. I am not sure I understand. There are three submarines right now that should be deployable except that they are needing to be repaired. That is not accurate. Is it?

Vice Admiral LESCHER. We will have to find out.

Senator HIRONO. I am not talking about bringing on a submarine that had already been—

Vice Admiral LESCHER. Right. Montpelier is in maintenance. Then in terms of an example like Boise where it has lost its certification to submerge, Boise is the one example of that right now.

Senator HIRONO. In terms of the capability of our shipyard workers, you mentioned, Admiral, that 50 percent of our shipyard workers have less than 5 years experience. I do not know how many years of experience will be necessary. I am sure that is not exactly something that you can just pinpoint. But are we doing certain things to accelerate their capabilities, their training, whatever we can do?

Vice Admiral LESCHER. Yes. That is a great question.

In each of our four public shipyards, you will see a tremendous focus on this training of the new hires. As a matter of fact, each of the four shipyards is participating in a community of excellence to share best practices on how you take new-levels and turn them into artisans and qualified to do the maintenance. That is investments both in those training programs. You will see investments in mock-ups so that the new hires can go to specific areas and go through the processes that they will have to do on the submarines as well. There is a very heavy focus on recognizing that and training our people properly, and I think we are really starting to traction on that.

Senator HIRONO. That is very good. Please keep that up.

Thank you, Mr. Chairman.

Senator WICKER. Madam Ranking Member, let us agree that members need to get their questions for the record in within five business days. Is that all right?

Senator HIRONO. Yes.

Senator WICKER. Without objection, that will be the rule in this case.

I do hope that things taken for the record—you could get back to us in 2 weeks after they are submitted.

I want to thank the witnesses and members of the subcommittee for a very informative and valuable hearing.

Unless there is further comment, we are adjourned.

[Whereupon, at 10:34 a.m., the subcommittee was adjourned.]

