

S. HRG. 115–674, PT. 2

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

HEARINGS

BEFORE THE

**COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE**

ONE HUNDRED FIFTEENTH CONGRESS

SECOND SESSION

ON

S. 2987

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

**PART 2
SEAPOWER**

MARCH 6, 20; APRIL 17, 2018



Printed for the use of the Committee on Armed Services

U.S. GOVERNMENT PUBLISHING OFFICE

42–589 PDF

WASHINGTON : 2020

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CONTENTS

MARCH 6, 2018

	Page
NAVY AND MARINE CORPS AVIATION PROGRAMS	1
Grosklags, Vice Admiral Paul A., USN, Commander, Naval Air Systems Command	4
Addendum A	15
Questions for the Record	46

MARCH 20, 2018

MARINE CORPS GROUND MODERNIZATION	73
Walsh, Lieutenant General Robert S., USMC, Deputy Commandant for Combat Development and Integration; Commanding General, Marine Corps Combat Development Command; and Commander, United States Marine Forces Strategic Command	77
Smith, Jimmy D., Deputy Assistant Secretary of the Navy for Expeditionary Programs and Logistics Management	78
Questions for the Record	102

APRIL 17, 2018

NAVY SHIPBUILDING PROGRAMS	105
Geurts, The Honorable James F., Assistant Secretary of the Navy for Research, Development, and Acquisition; Accompanied by Vice Admiral William R. Merz, USN, Deputy Chief of Naval Operations for Warfare Systems (OPNAV N9); 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	109

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

TUESDAY, MARCH 6, 2018

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

NAVY AND MARINE CORPS AVIATION PROGRAMS

The Subcommittee met, pursuant to notice, at 2:31 p.m. in Room SR-232A, Russell Senate Office Building, Senator Roger F. Wicker (chairman of the Subcommittee) presiding.

Subcommittee Members present: Senators Wicker, Cotton, Rounds, Tillis, Sullivan, Hirono, Blumenthal, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER F. WICKER

Senator WICKER. This hearing will come to order.

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

Our Subcommittee welcomes three distinguished witnesses: Vice Admiral Paul A. Grosklags, Commander of Naval Air Systems Command; Lieutenant General Steven Rudder, Deputy Commandant for Marine Corps Aviation; and Rear Admiral Scott Conn, Director of Air Warfare at the Department of the Navy.

Our Subcommittee is grateful to each of you gentlemen for your service to our nation.

I would like to offer a special welcome to Admiral Conn and General Rudder who are testifying to this Subcommittee for the first time. And there is speculation, Vice Admiral Grosklags, that you are testifying before the Subcommittee for the last time. Is that correct?

Vice Admiral GROSKLAGS. There is a rumor, sir.

Senator WICKER. There is a rumor to that effect. Well, we will see about that.

Last year Subcommittee hearings on naval aviation programs were productive. Since then, the Department of Defense has articulated a bold, new National Defense Strategy. In particular, the NDS focuses on preparing for long-term security challenges, notably the ability to wage high-end fights against near-peer competitors such as China and Russia. I look forward to hearing how Navy

and Marine Corps aviation will meet the direction of this new strategy.

Years of continuous combat operations and inadequate funding have put the Navy and Marine Corps aviation into a hole from which they are only now beginning to recover. Congress shares the blame, but we are beginning to turn things around. The 2-year budget agreement signed by President Trump in February will help provide much needed stability and relief. In a matter of weeks, Congress should take the next by ending the cycle of continuing resolutions with an fiscal year 2018 appropriation bill that funds the Department of Defense at much higher levels. DOD's [Department of Defense] fiscal year 2019 budget request also matches the fiscal year 2019 level set by the budget agreement.

Our witnesses should address how the budget helps restore full spectrum readiness and supports modernization. Secretary Mattis, Secretary Spencer, and General Neller have stated that improving readiness should occur simultaneously with efforts to modernize forces for future challenges.

This afternoon, our Subcommittee will examine five key areas relating to Navy and Marine Corps aviation programs.

First, physiological episodes. The Subcommittee remains deeply concerned by the continued occurrence of physiological episodes within the military aviation community. We recognize naval aviation's mitigation efforts particularly in the T-45 trainer aircraft, but we remain frustrated by the overall pace of progress. The Subcommittee is eager to understand how the Navy and Marine Corps are handling the continuing problem and how the President's Budget request advances efforts to discover root causes while implementing mitigations and solutions. The safety of our Navy and Marine Corps aviators is of course paramount.

Next, aircraft readiness. The Navy and Marine Corps continue to fall short in the required number of ready basic aircraft. Witnesses should outline the steps the Navy and Marine Corps are taking to arrest and reverse the decline in aircraft readiness.

Next, strike fighter shortfall. Our Subcommittee would also like to learn more about gaps in the Navy fighter fleet and the Navy's plans to close them, including through legacy Hornet retirement, new Super Hornet procurement, and preparations for the service life extension program for existing Super Hornets.

Next, joint strike fighter operations. The Subcommittee also wants to understand the development and operations of the F-35B and F-35C joint strike fighter. Last year, the Green Knights of VMFA [Marine Fighter Atlantic Squadron] 121 permanently changed their home station to Iwakuni, Japan and just completed the first F-35 shipboard deployment. The Joint Program Office is currently revamping its plan for F-35 modernization and is examining how to make the sustainment of the aircraft affordable. The Subcommittee looks forward to hearing an update on the F-35 operations and the challenges associated with modernization and sustainment.

And then finally, munitions shortfall. Our Subcommittee would like an update on the status of the Navy and Marine Corps' air-launched munitions inventories. We remain concerned that inventories of many of our weapons are critically low. At the same time,

technological advances by our potential adversaries require us to modernize our munitions to remain relevant. The Subcommittee needs to understand if we have enough munitions and, more importantly, if we have enough of the munitions required to fulfill the National Defense Strategy to be prepared for the high-end fight.

So a lot to talk about, and once again, I want to thank our witnesses for their service and for appearing before us today.

I am delighted to recognize at this point our ranking Member and my teammate in this regard, Senator Hirono.

STATEMENT OF SENATOR MAZIE K. HIRONO

Senator HIRONO. Thank you, Mr. Chairman.

Welcome to our witnesses. Thank you all for your service.

In today's discussion, we will examine how the Department of the Navy's fiscal year 2019 budget request for Navy and Marine Corps aviation programs would help increase readiness, address shortfalls in munitions, pilots and maintenance personnel, and modernize our maritime strike and expeditionary power projection capability, all of which have already been mentioned by the chairman.

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 from bases in Hawaii. We face a number of complex threats around the world, and we need to consider the best way to get the Navy and Marine Corps the resources they need to confront these threats. At the same time, it is critical that any increase in these resources does not come at the expense of important domestic programs that families, including our military families, rely on every day.

In this request, the administration has submitted a budget that is consistent with the top line agreement for fiscal year 2019. As we meet today, we still do not have a final appropriation for fiscal year 2018. This is unacceptable, and we need to return to a more normal appropriations schedule and process.

As we consider the 2019 budget, we also need to consider the significant challenges we face in naval aviation. In particular, we need to hear more about how the new National Defense Strategy will impact the Department of the Navy's aviation programs.

Navy and Marine Corps pilots have been experiencing problems with the environmental control system in certain aircraft, mainly F-18's and T-45's, that have resulted in what is referred to as physiological episodes, also referred to by the chairman.

In recent years, naval aviation has been challenged to meet current demands by a high operational tempo and uncertainty in the fiscal environment. We need to hear from the services what progress is being made to address these problems.

I would also like to discuss what the Department of the Navy is doing to address corrosion, a significant issue that costs the Department \$20 billion a year. I was happy to see in the fiscal year 2019 budget a request including a military construction for a \$66 million corrosion control hangar at Marine Corps Air Station Kaneohe Bay. I will continue to support efforts to help prevent and treat corrosion to mitigate its impact on the readiness of our forces.

This hearing will also provide a chance to discuss some of the ongoing issues in the F-35 program, particularly how testing is proceeding and the timing of the Navy's initial operating capability declaration. I am also interested in learning more about how the Navy and Marine Corps view the F-35 Joint Program Office's plans to modernize the F-35 fleets.

At a time when we face a major shortfall in the Navy's strike fighter inventory, I would like an update on any progress the Navy is making to address this situation. A few years ago the Navy responded to forecasts of a shortage of almost 200 aircraft by trying to better manage the remaining life of the existing aircraft. They have done this by redistributing aircraft within the force, designing a series of maintenance and rehabilitation measures, including a service life extension program, or SLEP [Service Life Extension Program], for older aircraft and buying 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 do with fewer aircraft. This puts a strain on the whole system. We need some clarity about what actions the Navy is taking to improve the situation.

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

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

Senator WICKER. Thank you very much, Senator Hirono.

We will begin with testimony from Vice Admiral Grosklags.

**STATEMENT OF VICE ADMIRAL PAUL A. GROSKLAGS, USN,
COMMANDER, NAVAL AIR SYSTEMS COMMAND**

Vice Admiral GROSKLAGS. Thank you, Mr. Chairman. The intent is to make a single opening statement for the entire panel.

Senator WICKER. Well, I am glad I called on you first.

[Laughter.]

Vice Admiral GROSKLAGS. Well, I could have passed it on to somebody else.

[Laughter.]

Mr. Chairman, thank you, and Ranking Member Hirono and distinguished Subcommittee Members. Along with myself, General Rudder, and Rear Admiral Conn, we appreciate the opportunity to be here today to talk about naval aviation and our President's Budget 2019 budget request.

We believe that President's Budget 2019 budget request is very well aligned with and supportive of the National Defense Strategy. Our ability to achieve this alignment is greatly facilitated by the additional budget flexibility provided by the recent bipartisan budget agreement. The lethality which naval aviation brings to bear in support of our nation's interests will be greatly enhanced by the increased procurement numbers for aircraft, weapons, increased investment and development of new and advanced capabilities, and increased funding for our critical readiness and sustainment accounts. Our alliances and partnerships will continue

to be strengthened through an ever-increasing number of international cooperative and FMS [Foreign Military Sales] programs such as P-8, Triton, V-22, and H-1, F-35 certainly.

And the need to transform our business and acquisition processes is being directly addressed with investments in agile, accelerated capabilities-based acquisition, leveraging authorities provided by the Congress in the fiscal year 2016 through 2018 NDAA's and investment in naval aviation sustainment Vision 2020, which will leverage commercial tool sets and best practices in making fundamental changes to the processes by which we plan and execute aviation sustainment activities.

And while this is a fiscal year 2019 budget hearing, it is important to note that the additional funding which appears will be provided in the fiscal year 2018 budget is just as critical to our ability to align with the National Defense Strategy, and while this is broadly true for the entire Department, it is especially critical for naval aviation, specifically the support for additional aircraft, such as F-18's, F-35's, V-22's, H-1's, 53 helos, P-8's, KC-130J's, additional weapons such as LRASM [Long-Range Anti-Ship Missile], Sidewinder, Harpoon block 2-plus, and additional funding for our critical readiness accounts, such as spares, depot maintenance, program-related logistics, will put us on the proper glide slope to National Defense Strategy alignment.

However, it is important to note that we must get this funding soon for it to be most effectively utilized during this fiscal year, although I also note with appreciation that there are many Members of this Subcommittee who have requested some additional flexibility be provided by the appropriators in our execution of those dollars in fiscal year 2018.

I would also be remiss if I did not mention the continuing challenge we face with physiological episodes that both of you mentioned in your opening statements. This remains naval aviation's top safety issue and has our full attention. While we have made clear progress in some areas, solutions to the broader problem still remain frustratingly illusive.

In parallel with pursuit of root causes, we are continuing implementation of hardware, software, and procedural mitigations. We are conducting additional flight testing and system characterization, and following NASA's [North American Aerospace Agency] independent review of last year, we have a greatly increased focus on aircrew physiology and the operational environment.

Full funding of the President's Budget 2019 PE request is critical to continuation of these efforts, and we will continue to keep the Subcommittee informed on our progress until this issue is resolved.

In closing, thank you again for your efforts in reaching the current budget agreement and for your continuing support of our sailors and marines. And we look forward to answering your questions.

[The joint prepared statement of Vice Admiral Grosklags, Lieutenant General Rudder, and Rear Admiral Conn follows:]

JOINT PREPARED STATEMENT BY VICE ADMIRAL PAUL GROSKLAGS, LIEUTENANT
GENERAL STEVEN RUDDER AND REAR ADMIRAL SCOTT CONN

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 the Department of the Navy's (DON) fiscal year (FY) 2019 aviation programs. Our budget request aligns to the current National Defense Strategy which identifies a more complex global security environment characterized by overt challenges to the current international order and the resurgence of long-term, strategic competition between nations. This request recognizes that we are emerging from a period of strategic atrophy that has resulted in the erosion of some of our competitive military advantage.

DON aviation remains highly capable today and we are prepared to respond as the nation requires. The Navy-Marine Corps team provides a maritime strike and expeditionary power projection force that is continuously forward-deployed. We provide the persistent presence and multi-mission capabilities that represent a majority of U.S. influence across the global commons. To protect our Nation and support our allies and partners, Naval Aviation programs require your continued support. As we prioritize our preparedness, we request your assistance to improve the resilience of our current force posture, modernize key capabilities, and accelerate technological advancements to address new adversary challenges in every domain.

Our fiscal year 2019 investments are focused, balanced and prioritized to deliver a ready, capable, global sea-based and expeditionary force. We request your support for the continued transition of the major components of the Carrier Air Wing (CVW), Expeditionary Strike Group, Amphibious Ready Group, and land-based Expeditionary Wings. We ask you to help us expand on the assimilation and teaming of manned and unmanned systems and the further integration of advanced platforms, sensors, networks, the electromagnetic spectrum and long-range strike weapons that provide the necessary military advantage over those challenging the global posture.

As part of our enduring commitment to fiscal responsibility and accelerating delivery of advanced capabilities to the warfighter, the Department continues its pursuits of accelerated acquisition and business process reforms.

We are maturing accelerated acquisition authorities Congress provided under the fiscal year 2017 National Defense Authorization Act (Sections 803, 804 and 806). These 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. As part of these efforts, we are actively promoting innovation, government/academia partnerships, and the transition of key manufacturing technologies and processes with investments focused on affordability and those most beneficial to the warfighter.

Our business reform measures include new focus on achieving full auditability of operations, improving financial control systems, and providing advanced tools to our workforce to better understand, manage and reduce cost. We intend to reform our business operations and leverage savings to improve readiness and increase the lethality and capacity of Naval Aviation.

The strategic environment continues to be complex, uncertain, and technologically advanced; the proliferation of modern conventional and cyber weapons from state and non-state actors is anticipated to propagate as rival states and organizations attempt to contest our influence. With the sustained support of Congress we can begin to restore our competitive naval advantage, enhance global deterrence, and ensure Naval Aviation remains uncontested in an increasingly complex global security environment.

TACTICAL AVIATION

Strike Fighter Inventory Management Overview

The Naval Aviation Enterprise continues to actively manage strike fighter inventory challenges. The President's fiscal year 2019 budget request puts us on track to reach our desired force structure no later than fiscal year 2022 (est.). The key enabler will be stable, on-time funding over multiple years to achieve the desired results.

The fiscal year 2019 request addresses the strike fighter shortfall with procurement of 20 F-35Bs, 9 F-35Cs, 24 FA-18E/F Block III Super Hornets and additional aircraft across the FYDP. In tandem with these procurements, Service Life Mod-

fication (SLM) initiatives and capability upgrades enhance our inventory by maintaining the tactical relevance of the F/A-18 E/F and legacy F/A-18 A-D aircraft.

Based on current requirements and inventory modeling, we will maintain a portion of the Navy and Marine Corps F/A-18 A-D aircraft to meet operational requirements through the fiscal year 2030 timeframe. Navy will expedite its divestiture from the legacy Hornet—7 years ahead of schedule—with the last Navy active component squadron transitioning to the F/A-18E/F in 2018. As the Navy divests legacy F/A-18 A-D, the “best of breed” aircraft will be transferred to the Marine Corps, Naval Warfare Development Center, Blue Angels, and the Naval Reserves. The fiscal year 2019 request will allow the DON to completely divest from the legacy A-D Hornets no later than the fiscal year 2030 timeframe.

F-35 Joint Strike Fighter

The F-35 Lightning II will form the backbone of U.S. air combat superiority for decades to come. Whether the mission requires the execution of strike, close air support (CAS), counter air, escort, or electronic warfare (EW), both the F-35B and F-35C are vital to our future as they become the lethal cornerstone of our naval air forces. The Navy and Marine Corps will transition 25 squadrons over the next 10 years as we replace our aging legacy fleet. Delivering this transformational capability to front-line forces as soon as possible remains a top priority.

The DON is committed to reducing F-35 costs. The Department’s goal is to reduce the flyaway cost of the Marine Corps F-35B to be no greater than \$104 million dollars and the Navy F-35C cost to be no greater than \$98 million dollars no later than Low Rate Initial Production (LRIP) Lot 14. We are also working to decrease operation and sustainment costs by 30 percent over current projections.

The baseline program has delivered over 250 aircraft to test, operational, and training sites. The F-35 program continues to mature with base stand-up, sustainment of fielded aircraft and maturation of a global sustainment enterprise.

The fiscal year 2019 President’s Budget requests \$4.2 billion in Aircraft Procurement funds (APN) for 20 F-35B and 9 F-35C aircraft, modifications and spares.

F-35 Continuous Capabilities Development and Delivery (C2D2)

As the F-35 program looks to close Block 3F System Development and Demonstration, we must continue to modernize the aircraft with advanced capabilities to maintain the advantage over advancing adversary fighters and ground-based radar threats.

Towards that end, the Department is restructuring the original Block 4 Follow-on Modernization acquisition strategy into a more agile Continuous Capabilities Development and Delivery (C2D2) model. The C2D2 approach leverages commercial practices, develops capability in smaller, more easily managed increments, and accelerates delivery of warfighting capability. The approach also advances Departmental goals of reducing C2D2 risk and lowering cost. In support of fiscal year 2019 C2D2 ramp-up we request \$644.0 million in Research, Development, Test, and Evaluation funds (RDT&E).

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

Service Life Extension Plan (SLEP) efforts extended the F/A-18 A-D beyond its original service life of 6,000 hours to 8,000 hours, and in select aircraft, up to 10,000 flight hours. Along with flight hour extensions, these aircraft require capability upgrades to maintain tactical relevance as the Marine Corps plans to fly a portion of the legacy F/A-18 A-D fleet through the fiscal year 2030 timeframe to bridge the transition gap to an F-35B/F-35C fleet.

The fiscal year 2019 budget requests \$273.2 million in APN to implement aircraft commonality programs, enhance capability, improve reliability, and ensure structural safety of the F/A-18 A-D inventory, and \$67.0 million for the continuation of the Hornet SLEP.

F/A-18E/F Super Hornet

The F/A-18E/F Super Hornet will be the numerically predominant aircraft in CVWs into the mid-late 2030s. Continued investment in new aircraft and capability upgrades and flight hour extensions significantly improves CVW lethality.

The fiscal year 2019 President’s Budget requests \$1.99 billion in APN for procurement of 24 F/A-18E/F Super Hornet aircraft and \$301.4 million of RDT&E for Block III, Infrared Search & Track (IRST) development/test, F/A-18E/F SLM initiatives and RADAR upgrades.

AV-8B Harrier

The fiscal year 2019 budget requests \$46.4 million in RDT&E funds to continue design, development, integration and test of platform improvements. These improve-

ments include continuation of an Engine Life Management Program, Escape System upgrades, Joint Mission Planning System updates, Link-16 Digital Interoperability (DI) integration, Operational Flight Program block upgrades (mission and communication systems), navigation improvements, weapons carriage updates, countermeasure improvements, and updates to an Obsolescence Replacement/Readiness Management Plan.

The fiscal year 2019 budget also includes \$58.6 million in APN to continue the incorporation of Obsolescence Replacement/Readiness Management Plan systems, electrical and structural enhancements, LITENING Pod upgrades, F402-RR-408 engine safety and operational changes, DI upgrades that include Link 16, and inventory sustainment and upgrade efforts to offset obsolescence and attrition.

Next Generation Air Dominance (NGAD) Family of Systems

The Department is continuing a Next Generation Air Dominance (NGAD) Analysis of Alternatives (AOA) to address the anticipated retirement of the F/A-18E/F and EA-18G aircraft beginning in the mid-2030s.

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 is considering 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. We anticipate the NGAD AOA to report out in fiscal year 2019.

AIRBORNE ELECTRONIC ATTACK (AEA)

EA-18G Growler

The EA-18G Growler is a critical enabler for the Joint force as it brings fully netted electronic warfare capabilities to the fight, providing essential capabilities in the Electromagnetic Maneuver Warfare environment.

The EA-18G program will complete deliveries in fiscal year 2018, with a total procurement quantity of 160 aircraft. This fulfills current Navy requirements for Airborne Electronic Attack (AEA) for nine CVWs and five expeditionary squadrons plus one reserve squadron.

The fiscal year 2019 President's Budget requests \$147.4 million of RDT&E for additional modernization to ensure the EA-18G maintains its edge in the electromagnetic spectrum domain.

EA-6B Prowler

The Marine Corps currently has one remaining operational EA-6B squadron to support joint AEA operational requirements through fiscal year 2018. These organic AEA capabilities include the Intrepid Tiger II EW pod, which provides communications electronic attack and support for the Marine Air-Ground Task Force (MAGTF). The fiscal year 2019 President's Budget request includes \$18.5 million in RDT&E and \$11.5 million in APN for Intrepid Tiger II updates and procurement.

Next Generation Jammer (NGJ)

The NGJ is the follow-on to the legacy AN/ALQ-99 initially fielded in 1971. The ALQ-99 has reached capability limits both technologically and materially and is challenged against modern state-of-the-art digital surface-to-air missiles systems. NGJ will 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 become the Defense Department's only comprehensive tactical airborne electronic attack platform and is essential to counter current and emerging threats.

NGJ will be implemented in three increments: Mid-Band (formerly known as Increment 1), Low-Band (formerly known as Increment 2), and High-Band (formerly known as Increment 3). The April 2017 NGJ-Mid-Band Critical Design Review revealed deficiencies in the design of the pod structure that necessitated a redesign effort to meet air worthiness requirements. The information available to date about this redesign indicates a potential for a schedule impact of more than six months. A collaborative government/industry analysis effort to redesign the structure is expected to complete in April/May 2018. Once the redesign of the pod structure is complete, we will realize the full impact to the NGJ-Mid-Band program. Independent of the structural issue, the design, integration, manufacture, and testing of all other pod components, sub-assemblies (such as the arrays, power generation, cooling, com-

mon electronics unit), and software continue. Platform integration efforts remain aligned to the EA-18G H16 System Software schedule; the next Generation Jammer Low Band program is investigating possible accelerated acquisition strategies to accelerate Initial Operating Capability (IOC).

Our fiscal year 2019 budget requests \$459.5 million in RDT&E to maintain Mid-Band schedule, continue procurement and assembly of the Engineering and Development Models, and commence developmental flight testing. In addition, we also request \$115.3 million RDT&E to complete Low-Band technology feasibility studies and initiate technology demonstration efforts.

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 a cornerstone of the Naval Integrated Fire Control—Counter Air system of systems capability.

The fiscal year 2019 President's Budget requests \$223.6 million in RDT&E for continuation of added capabilities, to include Aerial Refueling, Secret Internet Protocol Router chat, Advanced Mid-Term Interoperability Improvement Program, Counter Electronic Attack, Multifunctional Information Distribution System /Joint Tactical Radio System Tactical Targeting Network Technology, Sensor Netting, and Data Fusion, Navigation Warfare, Fighter to Fighter Backlink, ALQ-217 Electronic Support Measures, and Crypto Modernization/Frequency Remapping.

In the first year of what will be a 24 aircraft Multi-Year Procurement contract covering fiscal years 2019–2023, the budget also requests \$983.4 million in APN for four Full Rate Production (FRP) Lot 7 aircraft and Advance Procurement for fiscal year 2020 FRP Lot 8 aircraft.

ASSAULT SUPPORT AND LOGISTICS SUPPORT AIRCRAFT

MV-22B /CMV-22B

The fiscal year 2019 President's Budget requests \$143.1 million in RDT&E for continued product improvements and development of the Navy variant, the CMV-22B; \$843.2 million in APN for seven Lot 23 CMV-22Bs, procurement of long lead items for fiscal year 2020 (Lot 24) aircraft; and \$214.8 million to support 'Operations and Safety Improvement Programs' (OSIPs). Planned OSIP efforts include the correction of deficiencies, readiness improvements, common configuration modernization, aerial refueling, and avionics improvements.

C-2 Greyhound

As the DON recapitalizes the long-range aerial logistics support and Carrier On-board Delivery (COD) capabilities with CMV-22B, the C-2A fleet will continue to provide critical COD support for operations worldwide until the fiscal year 2024 timeframe. The fiscal year 2019 budget request provides for \$11.32 million in APN and \$0.8 million in RDT&E to manage remaining C-2A aircraft mission systems obsolescence, including critical Center Wing Section repair kits to maintain sufficient capacity and readiness to safely complete the transition to CMV-22B.

CH-53K Heavy Lift Replacement Program

The fiscal year 2019 President's Budget requests \$326.9 million in RDT&E to continue the CH-53K Engineering Manufacturing Development phase and \$1.3 billion in APN for procurement of eight Lot 3 LRIP aircraft, including Advance Procurement and initial spares.

During fiscal year 2019, the program will continue to execute developmental test flights including propulsion testing, initial shipboard testing, avionics qualification testing, service ceiling testing, and hot/high altitude testing.

CH/MH-53E

To keep the CH-53E and MH-53E viable through their remaining services lives, the fiscal year 2019 President's Budget requests \$52.0 million in APN and \$17.0 million in RDT&E. The funding will provide for Condition Based Maintenance software upgrades, cockpit upgrades, Embedded Global Positioning System/Inertial Navigation System, T-64 engine reliability improvements, survivability upgrades, satellite communications kits, and Phase I of CH-53E's Degraded Visual Environment capability. These critical safety and avionics upgrades are essential to address obsolescence issues within the cockpit, increase overall situational awareness, and maintain mission effectiveness.

Maintenance on both variants of the H-53E becomes more challenging as they approach 30 years of service. The unprecedented operational demand of the CH-53E degraded the material condition of the heavy lift assault support aircraft sooner than expected; therefore, modernization to the CH-53K King Stallion is vital. The MH-53E will continue to perform its primary mission of airborne Mine Countermeasures as well as transport of cargo and personnel until it is replaced by the Littoral Combat Ship (LCS).

ATTACK AND UTILITY AIRCRAFT

AH-1Z/UH-1Y

The fiscal year 2019 President's Budget requests \$907.9 million in APN for 25 AH-1Z aircraft and system improvements and \$58.1 million in RDT&E for continued product improvements/upgrades.

The H-1 upgrades program integrates a DI environment established throughout the MAGTF. H-1 DI and Full Motion Video efforts have expanded this capability for both the Venom and the Viper. With the integration of Intrepid Tiger II, the Marine Corps' Light Attack Helicopter Squadron community provides MAGTF Commanders multi-domain maneuverability.

MH-60R/S

The fiscal year 2019 President's Budget requests \$130.7 million in APN and \$23.4 million in RDT&E. APN funds support safety related systems improvements, correction of deficiencies, warfighter upgrades, and obsolescence issues such as Mission Computer modernization and procurement of kits for the Helmet Display Targeting System and Advanced Data Transfer System. RDT&E,N is requested to support development efforts that include MH-60S Service Life Assessment Program, software integration of the Advanced Off-board Electronic Warfare pod, and implementation of Link-16 J11 and J12.6 series messages that will enabling the helicopter to provide in-flight target updates to Net Enabled Weapons.

EXECUTIVE SUPPORT AIRCRAFT

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

The fiscal year 2019 President's Budget requests \$23.6 million of APN to continue programs that 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 platform 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 2019 President's Budget requests \$245.1 million in RDT&E to continue Engineering Development Model (EDM) activities, to include, contractor test for airworthiness certification and modifications of EDM and System Demonstration Test Article aircraft. Additionally, \$649.0 million of APN is requested to procure six LRIP Lot 1 aircraft and associated support.

FIXED-WING AIRCRAFT

KC-130J (USMC)

The fiscal year 2019 President's Budget requests \$270.4 million to procure two KC-130Js and spares as part of a proposed multi-year procurement (MYP III) and \$78.1 million in APN for targeted improvements. Key improvements include increased survivability through advanced electronic countermeasure modernization and obsolescence upgrades to the Harvest HAWK Intelligence, Surveillance and Reconnaissance/Weapon Mission Kit. The obsolescence upgrade includes compatibility with additional Hellfire variants and an improved full motion video data-link. Today, the KC-130J remains in high demand, providing tactical air-to-air refueling, assault support, CAS and Multi-sensor Imagery Reconnaissance capabilities in support of Special Purpose MAGTFs and deployed Marine Expeditionary Units.

KC-130J (Navy)

New in the fiscal year 2019 President's Budget, Navy has started a recapitalization effort for its legacy C/KC-130T aircraft. This initiative creates a uniform DON

procurement of KC-130J model aircraft. To support the plan, we request \$12.0 million in fiscal year 2019 APN (Advance Procurement) to pay for up-front costs needed to support the multi-service KC-130J MYP III. This effort begins the recapitalization of a 25 aircraft program of record.

MARITIME SUPPORT AIRCRAFT

P-8A Poseidon

The P-8A Poseidon recapitalizes the wide area Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASuW) and armed ISR capabilities of the aging P-3C Orion. The P-8A combines the proven reliability of the commercial 737 airframe with modern avionics that enables the integration of modern sensors and robust military communications.

In fiscal year 2019, we request \$1.98 billion in APN for ten aircraft and \$197.7 million in RDT&E for aircraft updates to include the addition of Networked Enabled Weapons capabilities, satellite communications, track management and sensor fusion capability.

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 2019 budget request includes \$0.8 million to manage P-3C aircraft mission systems obsolescence and \$2.13 million to fund the P-3 Fatigue Life Management Program to maintain sufficient airframe safety margins and capacity to complete transition to P-8A.

EP-3 Aries

The EP-3E Aries is currently 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 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. To support these efforts, we request \$9.0 million for the EP-3 program as we transition Navy's maritime ISR.

C-40A

The C-40A is a military variant of the Boeing 737-700C, a combination passenger/cargo aircraft, with military avionics and aircraft survivability equipment. In fiscal year 2019, we request \$206 million in APN to procure two C-40As for the Marine Corps.

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 2019 President's Budget requests \$14.4 million in RDT&E to continue Triton baseline development activities; \$219.9 million in RDT&E for Multi-INT modernization; and \$719.4 million of APN for procurement of the fourth lot of LRIP aircraft and spares, retrofit of the LRIP Lot 1 aircraft to the Multi-INT configuration, and procurement of long-lead materials for the fifth lot of LRIP aircraft.

MQ-25 Stingray

MQ-25 will deliver the Navy's first carrier-based UAS to function primarily as a mission tanker to extend the range, reach, and lethality of the CVW, with secondary recovery tanking and ISR capabilities. MQ-25 will reduce current use of F/A-18E/Fs as CVW tankers, freeing F/A-18E/Fs to execute strike fighter missions, effectively increasing strike fighter capacity within the CVW. The fiscal year 2019 President's Budget requests \$718.9 million in RDT&E for MQ-25 development activities.

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 airframe that uses the same mission control system, avionics and payloads as the MQ-8B. Both systems are designed to operate from any suitably-equipped air-capable ship, carry modular mission payloads, and operate using the Tactical Control System (TCS) and Line-Of-Sight Tactical Common Data Link.

In fiscal year 2019, we request \$9.8 million of RDT&E to continue hardware and software modifications, payload integration, cyber vulnerability closure and safety capability improvements and \$92.7 million in APN to procure four MQ-8 mission control systems and three MQ-8C Active Electronically Scanned Array radar kits. Included in the procurement request is support for ancillary shipboard equipment, trainers/aircraft support equipment, technical support, and the logistics to outfit suitably-equipped air-capable ships and train the associated Aviation Detachments.

Tactical Control System (TCS)

The fiscal year 2019 President's Budget requests \$8.5 million in RDT&E for the MQ-8 System's TCS. TCS provides a standards-compliant open architecture with scalable command and control capabilities for the MQ-8 Fire Scout system. In fiscal year 2019, we will continue the transition of the Linux operating system to a technology refreshed mission control system, enhance the MQ-8 System's Automatic Identification System and sensor track generation integration with ship systems, overcome hardware obsolescence issues with the Solaris based control stations, provide lower cost software updates using DOD common application software, and enhance collaboration with the Navy's future UAS Common Control System.

RQ-21A Blackjack

The fiscal year 2019 President's Budget requests \$16.3 million in RDT&E (\$5.4 million USN, \$10.9 million USMC) and \$21.8 million in APN for support of Marine Corps and Naval Special Warfare forces to address ISR capability requirements.

MAGTF Expeditionary UAS (MUX)

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

The fiscal year 2019 budget requests \$20.4 million in RDT&E for the MUX program to conduct an AOA and begin development of an acquisition strategy; \$4.9 million in RDT&E for KMAX operations (i.e. CQ-24A Cargo UAS Experimentation and Support Services) in support of MUX technology demonstrations and Concept of Operation development (included under the MUX line).

Common Control System (CCS)

The fiscal year 2019 President's Budget requests \$49 million in RDT&E and Other Procurement Navy (OPN) for continuation of Common Control System (CCS) activities. 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 architecture and will integrate with MQ-8B/C in fiscal year 2019 with future integration of MQ-4 and Large

Displacement Unmanned Undersea Vehicle. CCS VM (Increment 1) was delivered to the MQ-25 program office in fiscal year 2017 and planned updates are being accelerated to maintain alignment with the MQ-25 schedule. In fiscal year 2019, CCS/Increment 1 will conduct VM integration and test in both MQ-25 and MQ-8. Concurrently, CCS, Increment II will continue to develop MM/MP capabilities to meet platform operational requirements with the first release planned for mid-2020.

STRIKE WEAPONS PROGRAMS

Cruise Missile Strategy

The Department's Cruise Missile Strategy (CMS) provides for the development of stand-off attack capabilities from air, surface, and undersea platforms against both Surface and Land Domain targets. The key CMS tenets are:

1. Maintain and upgrade legacy cruise missiles.
2. Pursue advanced near/mid-term capabilities.
3. Plan and develop next generation integrated solutions.

Tactical Tomahawk (TACTOM) Block IV Cruise Missile

The fiscal year 2019 President's Budget requests \$282.4 million in RDT&E, \$98.6 million in Weapons Procurement Navy (WPN) and \$92.9 million in OPN.

RDT&E will be used for development/test of navigation and communications upgrades to improve TACTOMs performance in Anti-Access/Area Denial environments (A2/AD), development/test of Maritime Strike Tomahawk (MST), development/test of a Global Positioning System M-Code capability, development/test of the Joint Multiple Effects Warhead System and Fuse, and associated Tactical Tomahawk Weapon Control System (TTWCS) and Tomahawk Mission Planning Center (TMPC) updates that support all upgrades and address usability, interoperability and information assurance mandates.

WPN is required for the transition from a missile production to a missile recertification phase, production line shutdown, procurement of 112 A2/AD kits and completion of 87 missile recertifications.

OPN is required for procurement and installation of TMPC and TTWCS hardware/software modifications to address evolving security requirements, critical program information protection, obsolescence updates, and modern computing architecture improvements.

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

OASuW Increment 1 (LRASM) will provide Combatant Commander's 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 sanctuary of maneuver against 2018 to 2020 threats. The program is scheduled to achieve Early Operational Capability on the Air Force B-1B by the end of fiscal year 2018 and Navy F/A-18E/F by the end of fiscal year 2019.

The fiscal year 2019 President's Budget request \$143.1 million in RDT&E for LRASM development and testing and \$81.2 million in WPN to purchase 25 LRASM All-Up-Round weapons.

Offensive Anti-Surface Warfare (OASuW) Increment 2

OASuW Increment 2 is required to deliver the long-term, air-launched ASuW capabilities to counter 2028 threats (and beyond). The Department continues to plan for OASuW Increment 2 to be developed via full and open competition. To inform the long-term path forward, the DON will leverage Next Generation Land Attack Weapon (NGLAW) AOA results to inform the required ASuW capabilities. Due to Increment 2 budget marks, Navy requests support for an incremental upgrade to LRASM to bridge the gap until an OASuW Increment 2 program of record can be established. Increment 2 IOC is now planned for the fiscal year 2028 to 2030 timeframe.

Next Generation Land Attack Weapon (NGLAW)

NGLAW will provide the next generation of long-range, kinetic strike capability 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 both surface and sub-surface platforms. NGLAW initially complements, and then eventually replaces the Tomahawk Weapon System. IOC is planned for the 2028 to 2030 timeframe (est.). The fiscal year 2019 budget requests \$16.9 million to begin the transition of NGLAW to a program of record.

Sidewinder Air-Intercept Missile (AIM-9X)

The fiscal year 2019 President's Budget requests \$40.1 million in RDT&E and \$78.3 million in WPN. RDT&E will be applied toward the Engineering Manufacturing Development of critical hardware redesign driven by obsolescence; developmental test of System Improvement Program missile software (Version 9.4); and design and development of Insensitive Munitions (IM) improvements (Joint Chiefs of Staff IM mandate).

WPN funding is requested to procure a combined 192 All-Up-Rounds and Captive Air Training Missiles and associated missile/trainer related hardware.

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

The fiscal year 2019 President's Budget requests \$32.5 million in RDT&E for continued software capability enhancements and \$212.2 million in WPN for 141 All-Up-Rounds and associated missile/missile-related hardware.

RDT&E resources support the development and test of an Electronic Protection Improvement Program and a System Improvement Program to counter emerging electronic attack threats.

Small Diameter Bomb II (SDB II)

The fiscal year 2019 President's Budget requests \$104.4 million in RDT&E for continued development/test of the SDB II weapon, the BRU-55 bomb rack modification (required for IOC onboard F/A-18E/F aircraft), and the BRU-61 bomb rack modification (required for the F-35B/C platform launch). The DON also requests \$91.3 million in WPN to procure 750 All-Up-Round weapons.

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

The fiscal year 2019 President's Budget requests \$6.3 million of RDT&E for AARGM Foreign Material Assessment; \$15.3 million for AARGM Global Positioning System M-Code development, AARGM Derivative Program transition, and Block 1 follow-on development; \$99.2 million of RDT&E for AARGM Extended Range development; and \$188.0 million of WPN for production of 257 AARGM Block 1 modification kits for integration into All-Up-Rounds and Captive Training Missiles.

Joint Air-to-Ground Missile (JAGM)

The fiscal year 2019 President's Budget requests \$6.8 million in RDT&E to complete JAGM integration onto the Marine Corps AH-1Z platforms and \$24.1 million in WPN to procure 71 tactical missiles and four captive air training missiles.

Advanced Precision Kill Weapon System II (APKWS II)

APKWS II has become a weapon of choice in current operations as it provides an unprecedented precision guidance capability to the DON rocket inventories, thereby significantly improving accuracy and minimizing collateral damage.

The fiscal year 2019 President's Budget requests \$108.8 million in PANMC for procurement of 3,686 APKWS II guidance section kits for use on both rotary-wing and fixed-wing platforms.

Direct Attack Weapons and General Purpose Bombs

Fully funding General Purpose Bombs and the Joint Direct Attack Munition (JDAM) line items are critical to building the DON's direct attack weapons inventory. In the last forty-two months of ongoing contingency operations DON aircraft have expended nearly two times the number of 500 pound JDAM kits than we have taken delivery of during the same period.

The fiscal year 2019 President's Budget requests \$142.4 million in PANMC for Direct Attack Weapons and General Purpose Bombs and an additional \$180.9 million to procure 7,594 JDAM kits to enhance readiness and prepare for future contingencies.

CONCLUSION

Naval Aviation continues to operate forward—fully prepared for conflict in the full range of military operations while managing near-term service-life, mid-term capability improvements and long-term investments in research and development for delivery of future capabilities. We are building and sustaining a lethal, resilient force through balanced investments across readiness, capability and capacity. Naval Aviation is actively pursuing and seizing innovation and advantage wherever it can as we implement our vision to provide the right capability in the hands of the warfighter, on schedule, and in the most affordable manner possible.

Addendum A

SAFETY (PART 1 OF 2)

Physiological Episodes (PE)

All Navy senior leadership views the occurrence of Physiological Episodes (PE) in our tactical aircraft and trainers as our number one aviation safety priority until we fully understand all causal factors and mitigate PEs as a risk to flight operations. To date, we have identified multiple interrelated causal factors but the entirety of the root cause(s) of physiological episodes remains unidentified. Mitigation efforts currently in place, to include software modifications, personnel education, and equipment changes are positively affecting the PE rate for all Type/Model/Series aircraft but most notably in T-45s. With these mitigations, Naval Aviation is currently meeting operational requirements and personnel are working in an operational environment with an acceptable level of risk.

For our T-45 aircraft we have reduced the overall PE rate substantially with over 30,000 flight hours flown and only seven minor events since the return to flight. Five of the seven cases post return-to-flight were attributed to human factors; in all T-45 cases, negligible contaminants were found in the monitoring devices, all well below Occupational Safety and Health Administration standards. Beyond mitigating the identified flow problem from the engine, we are integrating an Automatic Backup Oxygen System (ABOS) to improve oxygen generating system performance overall.

In our F/A-18 aircraft, we continue to implement changes that are improving the Environmental Control System, increasing system stability of failure modes and improving the cockpit environment for our aviators. More work remains to be done, but mitigation and redesign efforts are producing positive results in all FA-18 variants. We are collaborating across the DOD to leverage research efforts to help characterize the cockpit environment to ensure we reach a long-range, holistic solution rather than interlaced mitigations in both current and future aircraft. We have investigated every line of inquiry recommended by the NASA report to include measuring breathing gas quality at the mask. We are drafting a request for proposal for a new MIL-STD-3050 compliant On Board Oxygen Generating System (OBOGS) concentrator designed to replace the existing well performing but less capable concentrator currently in the F/A-18 and EA-18 aircraft. This effort will provide digital data logging of performance, increased reliability and oxygen scheduling in compliance with the MIL-STD. The replacement OBOGS concentrator will be the first in the DOD inventory to comply with the MIL-STD that was created in 2015.

We have also assigned a Flag Officer to oversee a Physiological Episodes Action Team (PEAT). Together, our engineers, industry partners, physiologists and outside support from groups as diverse as the National Aeronautics and Space Administration and Naval Medical Research Units are working diligently to find a solution to the physiological episodes issue.

RDML Joyner, the Department's PEAT lead, recently testified to the House Armed Services Committee on February 6, 2018. Her formal statement provides a comprehensive update on all PE efforts to-date and the hearing transcript provides additional relevant data. Both can be found at: <https://armedservices.house.gov/legislation/hearings/addressing-physiological-episodes-fighter-attack-and-training-aircraft-0>

SAFETY (PART 2 OF 2)

Class A, B, and C Aviation-Related Safety Issues Summary

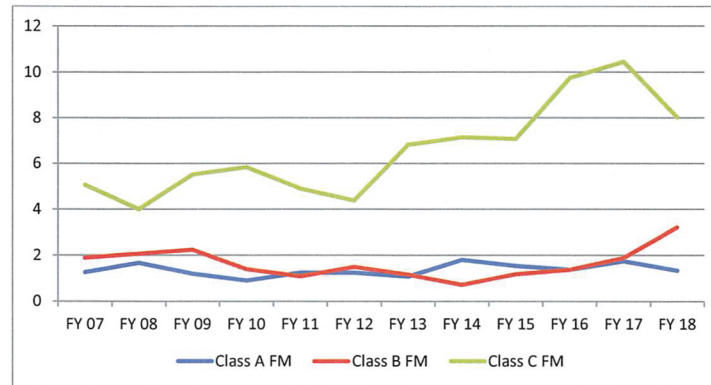
A summary of all Naval Aviation Class A, B and C aviation-related safety issues, including recent mishaps, trends, and analysis from October 2015 through December 2017 follows. The rates presented in the table are based on total mishaps per 100,000 flight hours and include Flight, Flight-Related and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

Table 1. Plan Choices for Military Beneficiaries Compared to Federal Civilians

Year	Flight Hours	Class A	Class A Rate	Class B	Class B Rate	Class C	Class C Rate
Fiscal year 2016	1,098,519	18	1.64	26	2.37	216	19.66
Fiscal year 2017	1,072,156	25	2.33	33	3.08	242	22.57

The most recent (fiscal year 2017–14 February 2018) DON flight Class A mishaps include:

- 11 December 2017 (Tinker AFB, OK): E-6A struck birds during descent, leading to number 4 engine flameout.
 - 04 December 2017 (NAS Fallon): FA-18A right leading edge flap departed aircraft in flight and hit the vertical stabilizer.
 - 22 November 2017: (Philippine Sea) C-2A ditched while inbound to CVN with 11 onboard. Three fatalities.
 - 11 October 2017: (Futenma MCAS, Japan) CH-53E engine fire in flight, emergency landing. No injuries.
 - 01 October 2017: (Monroe County, TN) T-45C crashed on low-level training route. Two fatalities.
 - 28 September 2017: (Syria) MV-22B crashed on landing during support mission.
 - 12 August 2017: (Bahrain) F/A-18E departed runway during landing after a ship to shore divert due to an engine malfunction. Pilot ejected. No injuries.
 - 09 August 2017: (25 Miles South of Key West, FL) F-5N went down over water. Pilot ejected safely.
 - 05 August 2017: (15 nm off NE Australia IVO Shoal Water Bay) MV-22B struck LPD flight deck on final approach and then crashed into water. Three personnel are missing and presumed deceased. 23 recovered.
 - 05 August 2017: (North Island NAS, CA) F/A-18F struck round down with right horizontal stabilator upon landing. Diverted successfully.
 - 16 July 2017: (Bay of Bengal) F/A-18F engine borescope plug backed out in flight causing hot air to burn to engine bay and aircraft skin.
 - 10 July 2017: (Indianola, MS) KC-130T crashed on logistics flight from Cherry Point to El Centro. 16 fatalities.
 - 27 April 2017: (Off the Coast of Guam) MH-60R collided with water on initial takeoff from ship. No injuries.
 - 21 April 2017: (Philippine Sea) F-18E lost on approach to landing on carrier. Pilot ejected without injury prior to water impact.
 - 05 April 2017: (Yuma, AZ) CH-53E landed hard and rolled on day training flight. Crew of five uninjured.
 - 28 March 2017: (El Centro NAF) HH-60H main rotor blades contacted tail rotor driveshaft on landing.
 - 17 January 2017: (NAS Meridian, MS) T-45 crashed following a BASH incident on takeoff. Both crewmembers ejected. No fatalities.
 - 12 December 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 five evacuated with injuries.
 - 07 December 2016: (Off the Coast of Iwakuni MCAS, Japan) F/A-18C crashed into the water while conducting a night mission. One fatality.
 - 21 November 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 November 2016: (Off the Coast of San Diego) Two F/A-18As were conducting basic flight maneuvers and had a mid-air collision. One aircraft crashed in the water. Pilot ejected successfully. One aircraft landed with significant damage.
 - 27 October 2016: (MCAS Beaufort, SC) F/A-35B had an inflight weapons bay fire followed by an uneventful landing. No injuries.
 - 25 October 2016: (Twentynine Palms, CA) F/A-18C crashed on final approach. Pilot ejected successfully. No injuries.
 - 20 October 2016: (Yuma, AZ) CH-53E main rotor contacted building causing damage to the aircraft.
- DON Class A aviation ground and Flight Related mishaps (AGM and FRM):
- 17 August 2017: (NW of San Clemente Island) MH-60R lost SONAR transducer at sea. (FRM)
 - 11 July 2017: (New River MCAS, NC) Maintenance personnel struck by lightning on the flight line while working on MV-22B. One fatality. Two others were treated and released. (AGM)
 - 25 June 2017: (MCAS Miramar, CA) Two Marines injured and F/A-18A damaged after flammable material in drip pan caught fire. (AGM)
 - 19 January 2017: (NAS Norfolk, VA) Three E-2C aircraft damaged in an engine oil related event. (AGM)
 - 18 December 2016: (Kadena AFB, Japan) Tow bar separation resulted in aircraft/tow collision with damage to nose gear and lower fuselage of P-8A. (AGM)
 - 15 December 2016: (NAS Whidbey Island, WA) Canopy on EA-18G exploded/jettisoned resulting in severe injuries to two personnel. (AGM)

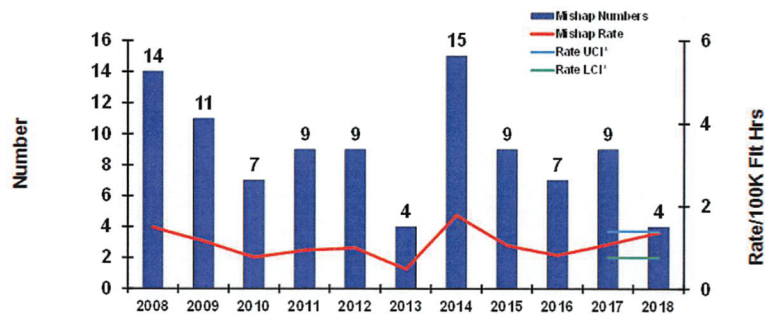


DoN Historical Mishap Rate Trend per 100K Flight Hours per Mishap Class
(As of 14 Feb, 2018)



CLASS A FLIGHT MISHAPS

Manned Aircraft Only



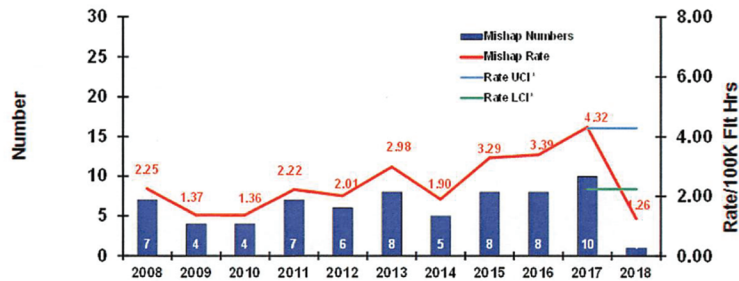
	14-Feb-18	14-Feb-17
CLASS A MISHAPS/MISHAP RATE FY COMPARISON:	4/1.36	2/0.67
FY17 MISHAPS/MISHAP RATE:	9/1.07	
10-YEAR AVERAGE (FY08-17) MISHAPS/MISHAP RATE:	9.40/1.05	

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



CLASS A FLIGHT MISHAPS

Manned Aircraft Only



	14-Feb-18	14-Feb-17
CLASS A FM/FM RATE FY COMPARISON:	1/1.26	6/7.80
FY17 MISHAPS/MISHAP RATE:	10/4.32	
10-YEAR AVERAGE (FY08-17) MISHAPS/MISHAP RATE:	6.70/2.51	

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 A

Senator WICKER. Thank you very much, Admiral.

Let us talk then about the budget. Tell us what this added flexibility would do for you, and how is the additional funding going to assist the Navy and Marine Corps in modernization and readiness restoration? What will you be able to do extra that you have not been able to do? And please give us some specific examples.

Vice Admiral GROSSELAGS. Mr. Chairman, I will give it a start and let my colleagues join in as well.

So a couple of things. On the modernization front, you could use MQ-25 as an example, our carrier-based refueling platform. We added an additional \$250 million approximately over what we had planned in 2018 to our fiscal year 2019 request. That allows us to accelerate the initial operational capability of that platform by 2 years. That is a specific example on modernization.

On the readiness front, our readiness accounts are funded in the President's Budget 2019 request to between 92 and 100 percent, which is across the board a level at which they have not been funded for over a decade. There is significant progress we are going to be able to make in terms of improving our facilities at our depots, in terms of making sure that the publications and the support equipment that our sailors and marines need to maintain the aircraft on the flight line are up to date and of the highest quality. And we have also been able to initiate the funding for Vision 2020, our sustainment plan for the future, which I mentioned in my

opening statement. Those are additional things that we are doing in fiscal year 2019 that we did not have in previous years.

Senator WICKER. Lieutenant General Rudder, what can you add?

Lieutenant General RUDDER. Senator, thank you.

Simply put, I think what it allows us to do is the things that Admiral Grosklags talked about. But what it does, if you look at, as you appropriately stated, the Commandant's priorities as far as modernization and readiness and doing them at the same time, is just that. Before we were underfunding our readiness accounts to buy new airplanes, and we were not buying enough new airplanes.

With the budget that this committee and Congress is providing now, it allows us to do both. And it allows us to do both, modernizing our depot, hiring the right people, getting the right people in the right place at the right time in our depots. It allows us to train. It allows to buy the spares, fully fund our spares accounts, our parts, which they have never been funded to the levels before. But it also allows us to buy F-35's and CH-53K. For us, as we begin to ramp out of MV-22 and H-1's, we begin to ramp up into these new airframes to fulfill the new National Defense Strategy, it increases our lethality certainly with those particular airframes.

While this is being done, it allows us to do this in stride. And in stride means that we have sailors and marines currently right now in combat operations and forward in Asia that are conducting high tempo operations. We have, for example, MAG-31 right now out of South Carolina. They have two squadrons. One squadron is in Asia. One squadron is in CENTCOM [Central Command] theater, and one squadron is on the ship. And I have two squadrons that are getting ready to go. That flight line for a period of time will be empty. The readiness accounts to make sure those jets and pilots have the right flight time to get out the door. And that is exactly what this budget this past couple years, starting with the RA in 2017, has allowed us to do.

Senator WICKER. Rear Admiral Conn?

Rear Admiral CONN. Thank you, sir.

I would say the overall funding level has taken us away from simply managing risk to now to have the funds available to manage the opportunities that are presented to us.

For some specifics in terms of what the funding level has provided, additional funding, our MQ-25 in 2019, has allowed us to pull that IOC [Initial Operational Capability] to no later than 2026 and potentially as early as 2024. We have been able to get our CMV-22 replacement aircraft in line, getting out of the C-2 aircraft earlier, up to be divested of that aircraft by 2024 which has divested 28 PMIs that we need for that airplane, \$8 million in engines, totaling \$60 million that outside the FYDP [Future Year Defense Program] what we are able to roll into the CMV-22 program.

It has also afforded us an opportunity to put \$240 million into our next training system, live virtual constructive, which will offer us a new way to train to fight and win that high-end fight that you described earlier.

Senator WICKER. Thank you very much.

Senator HIRONO?

Senator HIRONO. Thank you.

General Rudder, Admiral Grosklags, and Admiral Conn, we all have been concerned, as both of us have mentioned, about aircrews experiencing physiological events apparently caused by aircraft environmental control systems. I understand that you are still trying to isolate or to identify the causes of these problems. Can you describe what progress you are making in solving these physiological problems? And what can you tell us about the fact that the Air Force grounded the T-6 trainer aircraft, but the Navy chose not to ground its T-6 trainer aircraft? Why did the Air Force ground that aircraft and you did not?

Vice Admiral GROSKLAGS. Senator, I will start and again let my colleagues jump in here.

I go into T-6 first where you ended. During the month of January and early into February, the Air Force had 19 physiological events—I believe that is the correct number—in their T-6's, which is why they grounded the aircraft. During that same time period, the Department of the Navy had a total of two. So we are staying in very close contact with the Air Force.

We are taking steps with our T-6's to make sure we understand the environment, both the cockpit, the quality of the air in the cockpit both on the ground and in flight. So we are doing testing with that both at our fleet sites, as well as Patuxent River. And we are also working with the Air Force to replace a component in the oxygen generating system that will give the system greater reliability and also allow us to do some actual in-flight monitoring.

We did not have the same problems of incidence that the Air Force had. So we are watching it closely and working very closely with them to make sure we stay in sync.

Senator HIRONO. Do I understand you to say that because the Air Force experienced many more physiological events, that you are also looking at what was going on with their aircraft in the environment in their aircraft as different from the environment of the aircraft in the Navy?

Vice Admiral GROSKLAGS. No, ma'am. We are looking at our aircraft specifically. The Air Force is doing the same type of testing, evaluation of the air quality in their T-6's.

Senator HIRONO. But is it not the same aircraft, though?

Vice Admiral GROSKLAGS. It is. They fly primarily the A model. We fly primarily the B model. But the oxygen generating system and the environmental system is essentially the same.

Senator HIRONO. My point is that you are learning from whatever the experience was with regard to the Air Force.

Vice Admiral GROSKLAGS. Yes, ma'am. Both ways.

Senator HIRONO. The safety of our crew is very important.

Vice Admiral GROSKLAGS. On the T-45 front, we are back at full flight operations since September of last year on T-45's. Since September, we have had a total of seven incidents, seven physiological episodes since we resumed flying, basically one per month since then. That is the same rate we were experiencing back in 2012, 2013, and 2014 when we started monitoring this issue closely. Of those seven, it is important to note two of them were mechanical failures of the aircraft. One was flight in a regime that was a known issue where we get low flow through the aircraft. One was a pilot error, and three were human physiological issues where the

pilot was either sick, had a sinus condition or some other condition. The important point there is that we know what is occurring in that aircraft for each one of those, and within 24 to 48 hours, we are able to provide that feedback to the entire population of T-45 pilots so that they understand exactly what occurred and what we are doing about it.

Senator HIRONO. Thank you.

Senator WICKER. Senator Hirono, I am going to give you plenty of time.

You are not saying, Admiral Grosklags, that we have gotten to root cause of what is going on with the T-45's.

Vice Admiral GROSKLAYS. Senator, one of the things that we found out, the primary thing we found out before we resumed flying last fall, was that there are certain environments, conditions during flight where if the power is reduced to too low of a setting in flight, that it reduces the flow of breathing gas from the oxygen generating system to the aircrew. We did not know that until we had put an additional sensor in the aircraft last summer while we were in the operational pause. Now that we know that, we can actually see when this is occurring in the aircraft. So that was one of the root causes, was that the pilots were not getting sufficient flow not specifically of oxygen but entire breathing gas was not getting sufficient pressure to flow to the masks.

Senator WICKER. Okay. It sounds like you believe that you all have put your finger on the root problem in the T-45's.

Vice Admiral GROSKLAYS. Yes, sir, in the T-45. But we have not stopped trying to further mitigate the risk of operating in that environment. We are doing things today such as turning up the wick on the engine so it operates at a little higher percentage so that the opportunity for the pilots to get into a flight condition where they get this low flow scenario is further reduced and further mitigated.

Senator WICKER. Okay, Mazie, go ahead and take another 2 minutes because I cut in on you here.

Senator HIRONO. Earlier this year, Secretary of Defense Mattis announced a new defense strategy that would shift the focus for planning defense capabilities from one focusing on smaller regional contingencies to one focusing on being able to deal with near-peer competitors like Russia and China. Secretary Mattis also told the Armed Services Committee that the fiscal year 2019 budget had been adjusted to reflect this change in strategy.

Could each of you describe how the Department of the Navy aviation programs have been changed to reflect the new strategy?

Lieutenant General RUDDER. I think when the new defense strategy came out, we looked at that being developed as something that we had to place all of our forward-deployed assets, sailors and marines, that technically if you look at the principles behind that, the contact, blunt, and surge kind of principles and foundation of it, as the Marine Corps inside force, we are technically for the most part in a contact phase on a regular basis.

We had to think about that in a way that we had been thinking about for quite some time. The F-35's that just flew on the USS *Wasp* a few days ago that are now out there deployed for the first time—this is a concept of having a forward force that has the capa-

bility to maintain contact and actually be able to use its new capabilities against a higher-peer competitor. The same with blunt and surge as far as looking at how we do the larger scale operations, how we rethink our exercises to begin to conform to a higher-end threat.

We have been doing that over the past couple of years. The F-35 is one aspect of that. If we look at being able to do distributed operations in a contact or blunt force where we have to be able to maneuver the battle space, the MV-22 does that, but also the heavy lift CH-53K will do that for us as well to begin ramp-up production on that.

This year, you will see \$20 million in for our group 5 unmanned system, the MUX, and that is designed to provide—to come off our amphibious ship to provide that forward ISR, forward early warning to be able to connect the network of the amphibious force.

Senator HIRONO. Do either of you have anything to add, Admiral Grosklags or Admiral Conn?

Rear Admiral CONN. Yes, ma'am. I think the National Defense Strategy in terms of impacting the Navy's budgeting, by recognizing a return to a great-power competition, as well as articulating the maritime responsibilities within that strategy and then the development of the Navy the nation needs, which is the maritime expression of that strategy for the CNO [Chief of Naval Operations], within naval aviation, just as a caveat, within a carrier air wing allows us to build a bigger air wing. It allows us to build a better air wing with F-35C, block 3 Super Hornets, MQ-25 in the future, CMV-22's, E-18G's with next generation jammer. It is those family of systems that network together that is going to give us greater combat power and lethality operating from the sea.

Senator HIRONO. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you.

Senator Rounds?

Senator ROUNDS. Thank you, Mr. Chairman.

I want to just focus on the F-35 to begin with for just a little bit. And I am just curious. I have seen the review that we did that the F-35C—you are going to be purchasing 9 in 2019 and 16 in fiscal year 2020. And then the F-35B, which is the short takeoff and landing version—you are looking at 20 in 2019 and 20 in fiscal year 2020. And I am just curious. I am presuming the Marines are using the short takeoff and landing, the B's. Is that correct that those will all be yours, sir?

Lieutenant General RUDDER. That is correct. And out of the F-35C's, we have two Marine Corps because we are buying both variants.

Senator ROUNDS. Of the 35C's, how many are you buying of the carrier version, the F-35C's? How many are the Marine Corps purchasing in 2019 and 2020?

Lieutenant General RUDDER. In fiscal year 2019, we have two out of that nine, and I believe we will have four or five or more, depending upon what the 2020 budget looks like, in 2020, with a total of 67, which will allow us to have four carrier squadrons to fulfill our tactical air integration responsibilities with the Navy. Those aircraft will be in a cycle of carrier deployments as well.

Senator ROUNDS. My assumption is the Navy will be primarily purchasing the F-35C's. Is that correct, sir?

Rear Admiral CONN. That is correct, Senator.

Senator ROUNDS. Of the 35C's, how many are you intending then to purchase in 2019 and in 2020?

Rear Admiral CONN. 2019 is seven, and 2020, depending on the 2020 top line, will be approximately 10 to 12 airplanes.

Senator ROUNDS. Does that fall in line with trying to get to the—I am just thinking a lot about the production rate. Is that how many you want, or is that how many you can afford? Or what is the process for determining the number that you are going to put into effect?

Rear Admiral CONN. Sir, the F-35C is a new platform. You have to transition a squadron. It takes up to a year, 9 months for a pilot, almost a year to train those sailors. As you are growing a new type model series, you have to do it on a very deliberate pace where you first build your infrastructure, if you will, and your fleet replacement squadron is the squadron that trains those aviators and in some sense trains some of those maintenance so that when they are complete with that transition, they are ready to start the optimized fleet response plan in terms of being able to prepare for a deployment.

Senator ROUNDS. Are you on board—is the Navy on board the F-35C as the right aircraft long term for the Navy's needs?

Rear Admiral CONN. Yes, sir, we are.

Senator ROUNDS. So your goal is to acquire in such a fashion as to keep the price down. The more we buy and keep up to an appropriate production rate, the better off we are going to be in terms of the actual price we are paying. I think we are in agreement on that?

Rear Admiral CONN. Yes, sir, we are.

Senator ROUNDS. And is the F-35 being produced in the block numbers and with the appropriate anticipated software installed that you would have wanted, or is the manufacturer ahead of or behind in that regard?

Rear Admiral CONN. For us to declare our initial operating capability, the aircraft has to be configured in block 3F and it has to be going through its IOT&E with the weapons and various sensors that have to perform in a threat-representative environment to the standards identified in the operational requirements document. When those conditions are met, we will declare IOC which will be well before the first deployment of the FA-47 in fiscal year 2021.

Senator ROUNDS. Do you feel like you are on target with regard to the deployment of the F-35C?

Rear Admiral CONN. Yes, sir, we do.

Senator ROUNDS. Okay, good.

Lieutenant General RUDDER. Just one comment, Senator. We just accepted the first three 3F configured production model, VF-62 out in Yuma. So those are coming off the flight line right now, and I think this spring/early summer we will be able to insert 3F into most of our jets that are technical refresh to capable.

Senator ROUNDS. Thank you.

I am just curious, and this is just as much so that you have a chance to tell the story. The MQ-25—can you share with the Sub-

committee the need and the value of that MQ-25 and how valuable it is to the long-term operations?

Rear Admiral CONN. Thank you for the question, Senator.

The value of the MQ-25—and I will be brief. It is going to expand the operational reach of the air wing in light of the potential scenarios that we may be engaged with as an in-flight refueling tanker, being able to give a certain amount of gas up to 500 miles away from the ship so those strike fighters can go forward, coupled with its ISR capabilities in terms of persistent stare, if you will, being able to collect information, process, and disseminate it back to the commanders to have a better operational picture that is operating around the carrier.

Senator ROUNDS. Fair to say it is just a very large Pacific Ocean.

Rear Admiral CONN. That is correct, sir.

Senator ROUNDS. Thank you, Mr. Chairman.

Senator HIRONO. On behalf of the chairman, I call on Senator King.

Senator KING. Senator Hirono, did you say that we spend \$20 billion a year on corrosion?

Senator HIRONO. Yes.

Senator KING. That gives new meaning to the old rock song, "Rust Never Sleeps." It is unbelievable.

Under Secretary of Defense for Acquisition and Sustainment Ellen Lord has said that the sustainment costs for the F-35 will become unaffordable. I had a meeting recently with the Deputy Secretary of Defense. He said the same thing. Why is the F-35 so expensive to keep flying? Does anybody want to tackle that? Admiral?

Rear Admiral CONN. I will start. From a warfighting perspective, we need the airplane.

Senator KING. No doubt about that. I am just asking why does it cost so much to keep it going.

Rear Admiral CONN. From an affordability aspect, we have to drive down the operating and sustainment costs. There is a 30 percent reduction goal within 10 years—

Senator KING. I understand that too. My question is, why is it so expensive? What is it about the airplane that is costing so much?

Rear Admiral CONN. I think the fifth generation airplane in and of itself is an expensive airplane to procure.

Senator KING. I know that. So I am going to ask again. This is your fourth time. Why is the F-35 so expensive to maintain?

Vice Admiral GROSSE. Sir, I think I can help a little bit here.

The aircraft is very expensive. Period. A lot of the parts on that aircraft are very expensive. If a component fails, the repair costs at this time are quite high. We are still having to go back to the original equipment manufacturers for the repair of most of those components because the program collectively—the collective was laid to stand up things like organic depot level repair capability. We are just now starting to stand up intermediate level capability. We are actually just starting to fund it in President's Budget 2019. That is one of the new things in 2019.

The reliability of some of the components is not as high as we expected it to be at this point in time. So we have more failures.

Senator KING. Is the manufacturer responsible for those failures? What do we get for a warranty?

Vice Admiral GROSKLAGS. There is no warranty, sir.

Senator KING. There is no warranty?

Vice Admiral GROSKLAGS. No, sir.

Senator KING. You mean a product can be delivered to us that costs 100 million bucks, and if it fails, it is on us?

Vice Admiral GROSKLAGS. There are some criteria in the contract, sir. There is actually congressional language that dates back many, many years about the government paying industry for warranties. We actually have to get special permission to pay industry for warranties on things we buy.

Senator KING. Well, we will talk about that I guess. I am astounded.

Senator WICKER. The aircraft would have cost even more had we insisted on a warranty.

Vice Admiral GROSKLAGS. Yes, sir. There are very few exceptions. I will give you an example of an exception. H-60's we were able to buy with a warranty because that was a standard Sikorsky used at the time for their commercial practices, and they just rolled it over to the government. But in the vast majority of cases, that is not true.

Senator KING. Well, perhaps we could have some discussion of this. I can argue it both ways, but the idea of buying something like this and having parts fail and having the manufacturer, the OEM [Original Equipment Manufacturer], not responsible strikes me as an odd way to procure most anything.

Let me ask a different question.

Senator WICKER. Admiral, that goes back to what year?

Vice Admiral GROSKLAGS. It is a long time, sir. I would have to go back and look.

Senator WICKER. Even before Senator King. Well, if you would supply that to us because there is some interest in the room obviously there.

Vice Admiral GROSKLAGS. Yes, sir.

[The information follows:]



DEPARTMENT OF THE NAVY
 NAVAL AIR SYSTEMS COMMAND
 RADM WILLIAM A MOFFETT BUILDING
 47123 BUSE ROAD BLDG 2272
 PATUXENT RIVER MARYLAND 20670-1547

March 14, 2018

The Honorable Roger F. Wicker
 Chairman
 Subcommittee on Seapower
 Committee on Armed Services
 United States Senate
 Washington, DC 20510

Dear Mr. Chairman:

Thank you for the opportunity to testify before the Subcommittee on Seapower of the Senate Armed Services Committee. It was a privilege to discuss the Department of the Navy's Fiscal Year 2019 aviation programs with you, Ranking Member Hirono and the other distinguished Subcommittee members. I wanted to provide clarification regarding my response concerning warranties while addressing Senator King's questions concerning the reasons for the F-35's high sustainment costs.

During the exchange, I noted there was no warranty, that there was congressional language dating back many years regarding the use of warranties, and that we had to "get special permission" to include warranties in the contracts for our major defense programs. Below provides clarification of my response and some background information.

Specific to the F-35, there are no warranties included in the contracts for the aircraft/systems as we procure them today. There are contract terms addressing correction of deficiencies. For example, the JSF Lot 8, 9 and 10 contracts include a clause addressing the bulkhead in the F-35B, which testing determined to be under-designed and subject to cracking. A change was made to the design for incorporation into subsequent aircraft. As part of the settlement of this issue with Lockheed Martin, the clause was put in place to address correction of this individual component on the Lot 8, 9 and 10 aircraft that were delivered to the government prior to the incorporation of this design change.

In general, part of my response referred to previous "congressional language" and the current requirement for "special permission" to include warranties in our contracts – perhaps leaving the impression with the subcommittee that it was permission from the Congress that was required for inclusion of a warranty. This is not the case. The FAR identifies specific requirements that must be met prior to inclusion of a warranty in the procurement of non-commercial items and identifies the Chief of the Contracting Office for the contracting activity as the approval authority.

Prior to 1997, there was a statutory requirement for major weapon system contracts to include a warranty per 10 U.S.C. § 2403. After a 1996 General Accounting Office report found that the Department of Defense (DoD) received \$1 of direct warranty benefits for every \$19 paid for warranty coverage, the requirement to include a warranty was repealed in 1997.

As a result of the repeal, Federal Acquisition Regulation (FAR) Part 46.7 was revised to state that use of a warranty is no longer mandatory. Rather, negotiated warranties may be included in awarded contracts provided the requisite approval to do so has been obtained. FAR 46.703 details the relevant criteria which must be considered when assessing whether a warranty

is appropriate for a specific acquisition. There is also a DoD guidebook detailing how to justify inclusion of a negotiated warranty, which specifically includes guidance on how to assess the value of a warranty to ensure the projected costs do not outweigh the expected benefits. In addition, the FAR addresses warranties for particular types of contracts as follows:

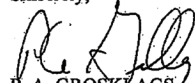
For commercial item, the government will obtain the same warranty offered by the vendor to non-government commercial customers.

For cost reimbursement, the inspection and acceptance clause in FAR 52.246.3(f) automatically provides a warranty allowing the government to require a contractor to repair/replace items found to be defective after acceptance. This cost reimbursement warranty, however, is only good for six months after the date of acceptance and costs incurred by the contractor in meeting this warranty obligation are allowable under the contract.

The final option available to DoD is addressed under Defense Federal Acquisition Regulation Supplement (DFARS) 246.407, which provides a mechanism to have nonconforming materials/services corrected when they are: 1) discovered after acceptance; 2) are determined to be the fault of the contractor; and 3) for which all contractual remedies (such as a warranty) have been exhausted or expired. If those criteria are met, the contracting officer "shall request that the contractor repair or replace the material or perform the service at no cost to the government" or, alternatively, authorizes the contracting officer to accept in kind consideration to include accepting a refund. This DFARS section rests upon a latent defect rationale. Latent defect is defined in FAR 2.101 as follows: A defect that exists at the time of acceptance but cannot be discovered by a reasonable inspection. Successfully obtaining repair/replacement of delivered items under a latent defect rationale is often difficult for the government as there are a myriad of defenses a contractor can positively raise. As a consequence, it is not common to seek remedy pursuant to DFARS 246.407.

I trust this clarification of my response and the associated background information better explains the use of warranties in major defense acquisition programs. As always, we appreciate this Subcommittee's steadfast support of Naval Aviation. If I can be of further assistance, please let me know.

Sincerely,


P. A. GROSKLAGS
Vice Admiral, U.S. Navy
Commander

Copy to:
Ranking Member Mazie Hirono
Senator Angus S. King

Senator KING. But I would be interested in the overall question of the sustainment costs and why they are so high because, as I say, Ellen Lord said they are unaffordable. That is a fine—unaffordable means we ain't going to be able to do it, and we have got to figure that out.

Quickly, in the Air Force we have had a lot of work on the pilot shortage. Is there a pilot shortage in the Navy and the Marines as well? We are talking about acquiring aircraft here. Do we have the pilots to fly them? General Rudder?

Lieutenant General RUDDER. We are a couple of percentages below where we should be. So we are not in as dire of a pilot shortage as what I think we were seeing on the Air Force front.

But it is no secret that the airlines are hiring, and we are working our pilots hard. So we are working on a few different fronts. I will give you some examples.

The Marine Corps and the Navy, along with our Air Force—we started up pilot bonuses again. We had not done this since 2011, and we were probably at the low end of that. We were with a 2 years' bonus, \$20,000 per year for TACAIR, 88-B, F-18, F-35, and V-22 too because we were worried about our tow brother because they are a high value item out in the market as well. So far we had a 68 percent take on that. So 33 out of our 35 F-35 pilots took the bonus, 123 out of 169 V-22's took the bonus.

With that we are still watching it closely, and I tell you we watch it every day. In a normal 10-year program, pilot retention, attrition rates, probably around 8.9 percent. We are probably at about 10.5 percent TACAIR-wide. What it means is we are putting as many folks as we can in our squadrons and maybe some of the B billets for fighter pilots maybe are not filled in some cases and we keep people in the squadrons longer. But we are looking at throughput to make sure we keep up the pilot rate because for us and as the Navy, we both are in this thing together transitioning to the F-35. We have to be able to stand down F-18 squadrons to stand up the F-35 squadrons. So we got to make sure we are transitioning those people to those squadrons while we are still maintaining our legacy fleet as well.

Senator KING. Admiral Conn, I am over my time, but how is the Navy doing on pilot retention?

Rear Admiral CONN. For our department heads and post-command commanders, we are not meeting our goals. The bonuses may provide some opportunities to address some of those. My focus in my position is on readiness, to get the aircraft up and get those pilots flying, to make sure that lack of flight time is not a distracter.

Senator KING. I would commend to both of you—Senator Cotton and I on the Airland Subcommittee had an informal roundtable with a group of Air Force pilots to talk about this issue without a lot of officers and press or anybody. And it was very interesting because what we heard was that it was not necessarily about money. It was more about OPTEMPO [Operational Tempo], time with family, and interestingly, time to fly, that the pilots did not want to be at desks and on different tracks. The Air Force is doing some serious work on this. I would urge you to talk to them about it because they are sort of—I was about to say they are at the front

edge of this. That is not a good place to be, but they are working on it.

Thank you, Mr. Chair.

Senator WICKER. What do you think about that, Admiral Conn? Does that make sense to you? Those Air Force conclusions.

Rear Admiral CONN. Yes, sir. We are in a competition for talent, and it is not just with the airlines. I had the privilege of working out of Fallon, Nevada, and I had a lot of enterprising junior officers, top gun JOs, Havoc, which is the Growler equipment, just marvelous people to have to command. But it is not just the airlines. They are going to med school. They are going to law school. They are trying to get their MBA [Masters of Business Administration]. There are a lot of choices for them out there.

Senator WICKER. Well, Senator King says they are having to sit at a desk a lot, but the OPTEMPO is killing them too. What do you say to that?

Rear Admiral CONN. The OPTEMPO for our aviators for a department head that is deployed on a carrier—all he knows is combat operation during his entire career.

Senator WICKER. Senator Sullivan?

Senator SULLIVAN. Thank you, Mr. Chairman.

To Senator King's point, is the big issue not they are just not flying enough? I mean, they come to the Marine Corps and the Navy to fly. They get their wings. I think there was some anecdote that the Chinese pilots and the Russians are flying more hours monthly, way more, than our men and women. I mean, is that not it? Do they not want to fly? Is that not why they became naval aviators? And how do we fix that? We all want to fix that.

Rear Admiral CONN. Senator, that is a valid point. These young aviators wear the wings proudly. They want to get in the air.

Senator SULLIVAN. I mean, is there a way we can help you with that, General?

Lieutenant General RUDDER. You are, Senator Sullivan. And I will tell you about 3 years ago when I was out of 1st Marine Air Wing in Okinawa, we had F-18 squadrons come out to Iwakuni. There was a time where those squadrons had maybe six or seven airplanes on the flight line maybe a couple months before they were getting ready to deploy, maybe not all their pilots. And that Marine air group cobbled together that squadron to get them out the door to forward deploy them at a 1 to 2 dwell rate. That means you were deployed for 6 months and home for a year.

Today, through a lot of the strike fighter management, we have been able to fill those squadrons up. So everybody is going out the door with 12 airplanes now. We have more trained crew. We are seeing from 3 years ago when we first started getting into the 2017, we are seeing some spikes and positive movement in both readiness levels in those particular organizations through funding of the depot. The good news is last year we got 70 airplanes, 70 F-18's, out of the depot. The bad news is we still had to work on them to fix them in the squadron. We are correcting that inside the depot, the depot ready initiative.

As the Navy begins to divest out of this legacy Hornet for us, we are able to take advantage of the high lot number, lot 15 and above

F-18's. And we are going to manage those within the squadrons so they have the best fighters they have available.

Senator SULLIVAN. You say the trends on training, you know, stick time, is getting better?

Lieutenant General RUDDER. For the F-18 community in particular. Maybe 8 hours a month was the average per pilot. Now it is up to 13.5. Marine Corps-wide, it is up to 17 hours.

Senator SULLIVAN. Is that the same in the Navy, Admiral?

Rear Admiral CONN. We are looking at about 14 to 16, but averages can be deceiving. The folks that are operating forward are getting over 30 hours a month. It is the folks that are on the bench that we need to get in the air.

Senator SULLIVAN. But we all agree that we need to keep that trend line going in the right direction.

Rear Admiral CONN. Absolutely.

Senator SULLIVAN. Let me ask real quick a couple other questions.

General, on the Osprey, I noted last year there were three hard landings. One of those crashes killed three marines in Australia. I know that that aircraft has a pretty solid track record. It started out wobbly, as we all know. But should we be concerned about its overall reliability? Are you concerned about its overall reliability? And is there anything we can do on that?

Lieutenant General RUDDER. No. I think the readiness funding that we are getting is going to allow us to initiate some readiness initiatives, for example. The aircraft itself is safe, and it has been safe for years. I think although a lot of those investigations are still being worked through, in the past, the ones that I will talk about, for the most part the aircraft was operating as designed.

But back to your point, we have run these aircraft hard. They are, I will not say, the Marine Corps' centerpiece but they are DOD's centerpiece. They are on standby around the world as we speak, whether you are off the ship supporting special operators or supporting folks in both the CENTCOM, EUCOM [European Command], and AFRICOM [African Command] AOR [Area of Responsibility]. So we have run them hard.

We have just put our two first aircraft—it will be three total this year—up into a common configuration, refit up in the Boeing plant up in Philadelphia, and we are going to refit most of our airplanes. We had 75 different configurations of that aircraft overall, the lot numbers. We are going to get that down to five. We are also going to redesign the cell because that is where most of our readiness issues are. Although the third multiyear will allow us to buy out, the Navy to buy in, the Japanese to buy in because they are going to get their first MV-22 this November, but now we are focusing a lot of our funds on readiness for that particular airplane.

Senator SULLIVAN. Thanks.

Let me ask one final question on training, a little parochial for me. I had the Commandant of the Marine Corps up in Alaska about a year and a half ago. We got a brief on finishing up a Red Flag exercise at Eielson. When we got there early on Sunday morning, there was I think 10 or 11 Marine Corps Hornets there. The squadron commander was with the aggressor squadron commander of the F-16 squadron out at Eielson. The Marine Corps squadron

commander called it the best training he had ever done in his entire Marine Corps career. As you know, JPARK out there has airspace bigger than Florida.

And yet, the Red Flag and even Northern Edge is kind of, in some ways, dominated by the Army and Air Force. We would welcome the naval aviation component represented here to come out to Red Flag exercises at JPARK, to Northern Edge exercises. That is great training to get a carrier battle group out there. I just want to put that in your ear. The Commandant heard that his squadron commanders view that as the best training they have ever done, and if you gentlemen can take a look, that would be good for the nation.

Lieutenant General RUDDER. We have sent many a squadron up there. And they do. I would agree with you. It is great training. We also sent a radar up there, a TPS-59, to a place called Bear Mountain, which actually lives up to its name my marines found out.

Senator SULLIVAN. Thank you, Mr. Chairman.

Senator WICKER. Senator Sullivan, can you see all the way to Russia from there?

Senator SULLIVAN. Those marine and naval aviators probably fly closer to Russia than anybody. As you know, our F-22's up there intercepted I think at least Bear bomber incursions into U.S. airspace last year. So we are quite familiar with the Russians in Alaska.

Senator WICKER. Thank you.

Senator Blumenthal?

Senator BLUMENTHAL. Thanks, Mr. Chairman.

Welcome to all of you and thank you for your long and distinguished service.

Lieutenant General Rudder, I want to begin with your most important qualification. I seem to recall that you are a native of Canton, Connecticut.

Lieutenant General RUDDER. That is right, Senator.

Senator BLUMENTHAL. I hope you, if you still have family, give them my best there.

The CH-53K King Stallion has been funded in this fiscal year. I was pleased to see that the Marine Corps requested to accelerate funding to increase the production ramp rate in fiscal year 2019 by one helicopter. I do not need to tell you, but maybe you should say for the record why you think the King Stallion is so important to the Marine Corps as a heavy lift capability.

Lieutenant General RUDDER. Yes. Thank you, Senator.

This aircraft is mechanically and technologically amazing. It fits directly into the National Defense Strategy as far as heavy lift for distributed operations in whatever theater you are talking about.

We have got about 800 hours on the airplane right now in the test sequence, and we are working through all reliability issues early on. We have front-loaded reliability and spares of this airplane. Quite honestly, it gets the marine and naval force off our amphibious ships or wherever you are in a manner which cannot be accomplished by any other aircraft in DOD. We have a KPP for 110 nautical miles lifting at 27,000 pounds. We have met that. As a matter of fact, we just lifted 36,000 pounds with this airplane the other day. That is the highest—now, I do not want to argue with

our Russian counterparts because they have got a helicopter that might have lifted more than that. But in the free world, that is the largest lift of any helicopter that we have done. It is performing to that level that allows us, as we look at the things that we are buying like the JLTV [Joint Light Tactical Vehicle]—and we just lifted one the other day that was 19,000 pounds. We are able to lift that with ease. We are able to dual lift HUMVEES, full-up armored HUMVEES. That capability allows maneuver on the battlefield.

I think another thing I will say just for the logistic experts in here is we built that thing to be able to slide in four 63-L pallets. Those are the standard DOD pallets. You can park a C-17, C-130 tail to tail with this thing and just roll pallets off right into the back of this helicopter, and you cannot do that with any other system.

Thanks for asking the question, Senator.

Senator BLUMENTHAL. I hate to put you on the spot, but ideally how many more of the CH-53K's would you like to see funded in fiscal year 2019?

Lieutenant General RUDDER. I think there is capacity. You know, as we always look at this thing, sometimes we are thinking about what is going to happen in 2018 and how that brings forward and whether we are going to overrun our interested partners. But I think there is capacity for two more.

Senator BLUMENTHAL. And I read about that test that you recently cited that involved lifting 36,000 pounds hovering for, I think, a 100 feet for about 10 minutes. And one of the comments made afterwards was that it was extraordinarily stable, indicating its safety. Is that consistent with your view?

Lieutenant General RUDDER. It is. It is a composite. It is fly-by-wire. It is one of those helicopters you can fly hands off. And it is really going to help us in another area that we have challenges with over the years, and that is a degraded visual environment and conditions in the desert. That stability of that helicopter will help us greatly in that environment.

Senator BLUMENTHAL. I want to ask a more general question of all the witnesses talking about unmanned helicopters. What do you see as the future for this program? As you know, in Connecticut, Command is one of the companies doing research and development in this area. Could you give me your assessment of how you think that program is going?

Vice Admiral GROSKLAGS. Senator, I think that there is going to be an increased demand for unmanned vehicles of all types, not just for aircraft, but rotorcraft will be in that family. You are well aware we already have MQ-8's throughout the Navy, and we are spreading them through LCS. As we get into the future vertical lift discussion with our contemporaries in the Air Force and the Army, as well as the Marine Corps, I think we will see some of those future vertical lift platforms will also be unmanned or perhaps alternately manned depending on the mission that they need to execute.

Senator BLUMENTHAL. The reason we are not moving more quickly on that program.

Vice Admiral GROSKLAGS. On future vertical lift?

Senator BLUMENTHAL. Yes.

Vice Admiral GROSCKLAGS. I think it is really a question of setting the requirements. As you know, we are still in the process across Navy and Marine Corps acquisition of recapitalizing. We are still buying new V-22's and new H-1's, and we just finished production of H-60's, as you are well aware. I think we need to now nail down the requirements for the next set of aircraft that we want to go after now that we have recapitalized our current inventory.

Lieutenant General RUDDER. I think there were two parts to that, but just to build upon the Command and KMACS, we bought two of those. The operational test squadron that I own, VMX-1 in Yuma, Arizona—we own some. Once the 2018 budget gets signed, we are going to pull those out and begin doing more unmanned logistics resupply experimentation. We already had those two in Afghanistan for a time. We are going to pull those back out again with 2018 funds and build upon 2019 funds to fly those some more.

Rear Admiral CONN. Sir, I think the funding levels in 2019, if they continue and it provides an opportunity to look at the right time to go to either an MHXX or a future vertical lift with respect to the Navy's rotor wing. And part of that may be unmanned teaming that is mapped to the 355-ship Navy that we are trying to build to.

Senator BLUMENTHAL. Thanks.

Senator WICKER. Senator Tillis?

Senator TILLIS. Thank you, Mr. Chairman.

Gentlemen, thank you for your service.

General Rudder, I will start with you. I want to get an update on the 94 airframes that are scheduled for Cherry Point, the 35B in, I believe, October followed by 22. Are they still on track?

Lieutenant General RUDDER. I think we have got to work through some depot modifications, but right now it has got to stay on track for that. FRC [Fleet Readiness Center] East is going to be a key point for the F-35B or F-35 in general for rework and depot level maintenance.

Senator TILLIS. Well, actually I wanted to get a quick update. We made progress in the prior NDAA's on the lift-fan facility, the security fence, all the prerequisites for standing up the lift-fan capability, which I guess today is gated by the Rolls Royce plant in Indiana, if I am not mistaken. Are we still tracking to have that capability down there along with building out our depot capabilities?

Lieutenant General RUDDER. We do. So lift-fan—MILCON was in the fiscal year 2018 budget, so we are waiting for that budget. That is one of those restrictions. But it is. I mean, that is in the budget. We funded it. We are going to build it.

Typically once you get the plan and design done, which I believe is pretty close—typically with any MILCON [Military Construction] project, it is a 2-year build. Then you have got to get your tooling in there, which is 12 months and then qualification of your depot level artisans or your maintainers to be able to do that. But for lift-fan maintenance, 2021 is when we start to incur kind of a demand signal for lift-fan rework that will have to go back—

Senator TILLIS. Back?

Lieutenant General RUDDER. Just because we will not have the FRC East production. But that is not to say that we are not pressing forward to having that capability. This is back to, broadly

speaking, F-35 and taking organic intermediate depot maintenance and getting it closer to the flight line. We must do that and we will do that.

Senator TILLIS. That also speaks to the question I think Senator King asked about the expense of operating these machines over time. Until we have that organic capability, you are going to pay a part of a premium. And I think that FRC East is going to be an important part of achieving that downward curve on maintenance over time. Do you agree with that?

Vice Admiral GROSKLAGS. Yes, sir, it absolutely will be. What we are doing working with the Joint Program Office right now, both ourselves and the Air Force are trying to accelerate the standup of the depot capability. Typically we would work that through the OEM, in this case Lockheed Martin, but we are actually trying a new way of doing it where we are going back to the actual vendor of the part, the component. In this case, you are talking about Rolls Royce. In other cases it may be whoever makes the wing or the EOTS or whatever component that happens to be on the aircraft to accelerate that standup capability.

Senator TILLIS. The reason I asked the question about the 94 airframes is we had heard some of the deliveries to some of our partners shifting to the right. I wonder if you could infer from that some of our own domestic deliveries were delayed for supply chain or other reasons.

Vice Admiral GROSKLAGS. I do not know that we have had any aircraft delivery delays of that magnitude. The last three lots of aircraft across the board—

Senator TILLIS. So you do not see a general trend of deliveries shifting to the right.

Lieutenant General RUDDER. I think that if you look at the past couple years, we did not buy at the rate that we wanted to. Again, back to the budget scenario that is presented to us today, we are ramping back up again—

Senator TILLIS. Got it because you have the certainty.

Lieutenant General RUDDER. Our international partners—we believe there is all in. There are probably going to be a few more that jump in. There are a lot of countries involved for buying this—

Senator TILLIS. Well, anything we can do with the help and support of the efforts for FRC East, count me in. We even had the legislature weigh in. They appropriated money at the State level to kind of lay the groundwork for some of the outfit I think outside of the complex. And we will continue to work with you.

My last question in the time remaining really relates to tactical aircraft. One of the last times that I was down at Cherry Point, we had a lot of aircraft on the flight line, and they were due for certain maintenance that I had described to me the challenge had less to do with the ability to repair the aircraft and more to do of having funding in the underlying accounts that were necessary for them to actually complete the repairs. Does any of this make sense to you all? Because we were trying to figure out if we have had the funding depleted over time, with the new spending are we replenishing those accounts and is that in any way going to improve getting the shortfall based on the requirement. I think we currently

have a shortfall in the requirement for tactical aircraft. Is that right? For the Hornet in particular.

Vice Admiral GROSCKLAGS. We would have to get specifics. The funding request in President's Budget 2019 basically gets the depots to the point where they can execute all the aircraft, specifically production requirements, with the exception of a handful of aircraft, and those are spread across a number of different type model series.

For F-18 A through D specifically, today we have the requisite number of in-reporting aircraft. So the Navy and Marine Corps has a requirement for X number of airplanes on the flight line available to them. They have those, in other words, out-of-reporting versus in-reporting. The number of in-reporting aircraft are what is required to support the fleet. We still have issues with those in-reporting aircraft in getting them mission capable, whether it be repairs, spares, whatever it happens to be.

The same is largely true on the E/F side of the house. There is not a backlog of E's and F's Super Hornets in the depots either at this point in time. We had that challenge 2 years ago, but we are past that point. And actually the requirement for F-18 A through D's drops dramatically over the next couple of years.

Senator TILLIS. Thank you.

Senator WICKER. Thank you, Senator Tillis.

Senator KAINE?

Senator KAINE. Thank you, Mr. Chair, and thanks to the witnesses.

Just a foundational question I have been sort of thinking about a little bit. All of our service branches, Marine, Navy, Army, Air Force, have aerial platforms, and we are in this development of a lot of unmanned aerial assets. As you see the development going forward, do you see kind of philosophical differences between the four service branches and the mixture of manned versus unmanned? Is the Air Force more wedded to human pilots and other branches less so? Or do you think the sort of mixture of manned and unmanned is something that is really more at the OSD level and there will be some consistency among the service branches?

Lieutenant General RUDDER. I think you are seeing the unmanned technology grow at a rate that is creating such opportunities that you are seeing, whether it is rotary wing unmanned like the MQ-8, obviously the Reapers, MQ-4—you are seeing this wave of unmanned technology kind of present the services with a lot of opportunities. And they are growing so fast that we are trying to keep up with it.

As a matter of fact, we talked about this logistics capability for unmanned systems. That is something that we are pursuing. My counterpart in I&L is pursuing unmanned logistics resupply. We did it in Afghanistan. We are going to do it in the future.

Very shortly, we will be pursuing with industry what you see in our budget this year with the MUX, the MAGTF [Marine Air Ground Task Force] unmanned systems. You are going to see us put out a group 5 requirement to industry to be able to fly off the amphibious ships. Right now, what we have is RQ-21, which is a group 3, smaller item that we use on a regular basis on every deployment now. So you are seeing that.

And what is really exciting about the unmanned is—a lot of it is physics. If you have a runway, it is good. If you have it come off expeditionary, you got to have some sort of vertical lift. But the exciting part of this is, one, they are presenting ourselves with a way to network ourselves better, persistent networks. They are also presenting with the optics, the EO optics, the synthetic aperture radars a way to have this sensor out there in many different waveforms.

In that sense, there are so many ideas out there that I think we are connected. Network-wise we are beginning to connect each other. But how you get to that and the ability to get up in the air is still technology, and every time we turn around, an industry partner comes up with a new idea. It is very exciting.

Senator Kaine. Can I ask, Admiral Grosklags, as you are seeing the different service branches tackle it—and all the branches use aviation assets in slightly different ways—do you think there will be different philosophies about manned and unmanned?

Vice Admiral GROSKLAGS. The biggest philosophy difference I have seen today between us and the Department of the Navy and the Air Force is in how we operate them. I think as you are aware, the Air Force basically has a pilot in the loop for most of their unmanned systems. We have a pilot but we are not flying it. We are pushing buttons, so it is more of a touch screen. We are not even sure in the future we need aviators to do that. We need somebody with the right training to do that. It does not necessarily need to be somebody wearing pilot wings. That is a different philosophy from the Air Force right now.

In terms of what we use the aircraft for, I am not sure there is a huge gap. If you look at the ISR assets that both services are fielding today, there is a lot of commonality between them not only in the airframe types, if you will, but also in the sensors that we are using.

Senator Kaine. Let me ask this. It is kind of an extension on the question. Sometimes we can go for complexity and stumble over simplicity. The more we rely on unmanned and the more we rely on data link dependent weapon systems—there are fight environments that require restricted electronic emissions for safety or to be covert. How do we grapple with that security challenge with all these interlinked systems?

Vice Admiral GROSKLAGS. I will make two comments and then ask my colleagues here.

One is that we are very intent on dealing with cybersecurity issues for our data links particularly for unmanned aircraft for the reasons you just stated.

We also have a number of efforts underway for what I will generically call low probability of intercept data links, more secure data links that will help us prevent intrusion by, say, unwanted actors. I probably cannot go into a whole lot more detail in here. But those are things we are working across services.

Senator Kaine. Admiral Conn, would you want to add in to that? I think my time is about up. But, yes, please.

Rear Admiral CONN. I think the comment about low probability of intercept, low probability of detection is an important point to make. It is not only for the cyber protection but it is also not nec-

essarily revealing your location. Even with the expanse of the Pacific on a maneuvering ship, there are some things you need to consider in terms of how you are going to operate.

Senator KAINE. Thank you, Mr. Chair.

Senator WICKER. Thank you, Senator Kaine.

Senator Cotton?

Senator COTTON. Thank you, and thank you, gentlemen.

Admiral Conn, I would like to talk about antisubmarine warfare. Very stealthy diesel submarines continue to proliferate around the world. It is increasingly a platform of choice of a lot of friendly nations but some not so friendly as well. And then obviously China and Russia have very high-end capabilities. While our airborne platforms seem to be where we want them to be, the sonobuoy technology and the Mark T-4 torpedo are pretty old school. Can you talk to us about those systems and the state of antisubmarine warfare if we were to be in a fight especially against high-end adversaries like Russia and China?

Rear Admiral CONN. I think with the P-8, the existing P-3, our MH-60 Romeos and the capabilities they bring to bear in terms of finding, fixing, tracking, targeting, and engaging submarines, they have significant value in that mission set. As with all weapons, this is against a pacing threat. We will continue to look at what we need to modernize based on that pacing threat and make the investments that we need to make to ensure that we have the lethality we need in that specific mission set.

Senator COTTON. Do you think we need to modernize the buoy and the torpedo technology?

Rear Admiral CONN. I think for now we are good, but sometimes there are threats out there that move faster than we do. We just need to keep tune with the intelligence community and make the decisions at the right time.

Senator COTTON. Admiral, you look like you would like to add something on that point.

Vice Admiral GROSKLAGS. Yes, if I might. If you are familiar with multi-static active coherent, it is a capability that we introduced to the P-8 a couple years ago. That is an initial capability for certain water conditions. That is a new family of sonobuoys.

There is a follow-on effort that we have been trying to get started for the P-8 as part of their increment three, which is enhanced multi-static active coherent. That is particularly useful against diesel submarines and submarines difficult to detect, very quiet nuclear-powered submarines in deep water. We need the support of this Subcommittee and others in order to keep that funding in the budget because it is one of the areas for P-8 that is continually being marked as our budget comes forward.

Senator COTTON. And by support of this Subcommittee, you mean money.

Vice Admiral GROSKLAGS. Yes, sir.

Senator COTTON. Is there anything else you mean?

Vice Admiral GROSKLAGS. No, sir. That is it specifically. It is P-8 increment three and the two ECPs associated with it.

Senator COTTON. We can usually manage money. I think we can do that. Thank you.

General Rudder, when the last Prowler squadron sunsets in 2019, the Marine Corps, as I understand, will have no more dedicated airborne electronic attack aircraft. Is that correct?

Lieutenant General RUDDER. That is correct.

Senator COTTON. What is the Corps going to do through MAGTF EW system of systems to replace electronic surveillance, electronic attack capabilities that we currently have through the Prowler?

Lieutenant General RUDDER. The E/A-6B for many years, like all the electronic airborne platforms that we have, really has been a joint asset. The last deployment that it does in fiscal year 2018 will fulfill that mission. We have one squadron left with six airplanes.

As far as looking at airborne high-end mission set for DOD, we have 160 Growlers currently. That is what the program is. When the E/A-6B goes away, much like we are doing at the weapons and tactics course that we are going to put on here in a few months, the Growlers are going to come down, and we are going to work with those particular airplanes.

Aside from DOD airborne electronic warfare, electronic support, we are buying jamming pods called Intrepid Tiger 2 that we are going to put on our AV-8B's, our F-18's, and actually are on our Hueys. And they are actually deploying on the MEUs [Marine Expeditionary Unit] jammer system.

For a larger extent, the F-35B and C for that matter will provide not all the bands that it needs to provide as far as what the Growler can do and what the joint force can do, but that will be a very capable platform and that will fill a fairly significant gap really throughout DOD and certainly for the Marine Corps.

For that aspect of electronic attack, I think we are going to be okay with the F-35B with our Growler counterparts.

Senator COTTON. Thank you, gentlemen.

Senator WICKER. Admiral Grosklags, the F-35 is an amazing aircraft. Looking back knowing what you know, was it a good idea? How much longer you got in the service?

[Laughter.]

Vice Admiral GROSKLAGS. I do not know. It may depend on my answer.

Yes, sir. I mean, we absolutely need that capability.

Senator WICKER. Why do you not take a deep breath?

Vice Admiral GROSKLAGS. We needed that capability 10 years ago, quite honestly. We still need it today but we needed it 10 years ago. And that is where my deep breath comes in. It is, I think, disappointing to all of us that it has taken us so long to get that aircraft into the hands of the fleet, notwithstanding the fact the Marines have had it out in their first deployment on a ship starting yesterday. But it has taken too long to get into the hands of our warfighters. That is the biggest issue I have with that program.

Senator WICKER. When did we know that it was going to take so long? When should we have known?

Vice Admiral GROSKLAGS. Sir, I think it is like many of our programs where as they evolved over time, you incur a year delay, you incur another year delay, and it adds up over the years. In a case like this, it has been—and I do not even know anymore what the

original initial operational capability was intended to be. But it has grown over time. The delays have just added on top of each other.

Now, I will say, if I could, that since they re-baselined the program back in the 2012 time frame, they have largely maintained that schedule for the last 5 or 6 years. That was, I will say, a watershed event. And since then, they have——

Senator WICKER. Explain that to us.

Vice Admiral GROSCKLAGS. I believe it was 2012 time frame when they re-baselined the program. They reestablished all the intent for the IOC [Initial Operating Capability] for all three services. The totality of the program is probably within 6 to 12 months of that re-established baseline from 2012. I believe it was 2012.

Senator WICKER. Admiral Conn, the NDAA for fiscal year 2017 gave the Navy temporary reprieve from the requirement to maintain and fully staff 10 carrier air wings until additional deployment aircraft carriers can fully support a 10th carrier air wing or October 1st, 2025, whichever comes first.

How does this budget request begin to lay the groundwork to fully equip and man the 10th carrier air wing? And are the procurement profiles outlined in the FYDP [Future Years Defense Program] for Super Hornets, Joint Strike Fighters, Hawkeyes, Growlers, Seahawks, and CMV-22's built with the requirement for 10 air wings or only 9?

Rear Admiral CONN. Sir, first and foremost, we will comply with the law. The 10 carrier air wing piece or having 10 carriers to be able to host 10 carrier air wings is not going to be really available anytime soon. We are looking at the 1 October 2025. We are going to march down that path.

There will be opportunities with the 110 Super Hornets that are in the budget, 97 JSF [Joint Strike Fighter] that are in the budget. But those lines are still hot based on future investments that will probably need to be made, including manpower, but that is a little early to need right now with respect to that 2025 timeline, sir.

Senator WICKER. Thank you.

Senator HIRONO?

Senator HIRONO. Thank you.

Vice Admiral Winter, the head of the F-35 Joint Program Office, has laid out a strategy to modernize the F-35 by transitioning the F-35 software to an open systems architecture with new capabilities being released every 6 months or so.

What is the Navy's plan for having the F-35 logistics software autonomic logistics information system, or ALIS, interface with other logistic systems within the Department of the Navy? Which ever one of you gentlemen can best answer this question.

Vice Admiral GROSCKLAGS. Senator, I am not sure. Were there two questions there? Because the C2D2 [Continuous Capability Development Delivery] plan that you described, the 6-month software release, is both for ALIS [Autonomic Logistics Information System], as well as for the core aircraft software.

Senator HIRONO. Let us focus on the ALIS.

Vice Admiral GROSCKLAGS. It is certainly our desire and our plan at some point to be able to interface ALIS with the rest of our naval aviation sustainment systems, DECKPLATE, AMSRR, those types of things that we use for all of our other aircraft.

One of our challenges right now, quite honestly, is us, the government, gaining insight into the software and the coding within ALIS. Right now, much of that is held as proprietary, and we have very limited rights and access to the data coming out of ALIS. That is one of the challenges that Admiral Winter is tackling in his new role as head of the JPO [Joint Program Office].

Senator HIRONO. What kind of time frame are you thinking of in order to be able to interface these systems?

Vice Admiral GROSKLAGS. I would have to get back with you with an answer on that.

Let me refer back to what I thought you were going to go with the question originally, which was for the core software on the aircraft. A similar scenario where we, the Air Force and the Navy, are ready to stand up our software sustainment activities, which could include ALIS software, as well as the operational software program in the airplane. We have been ready to do that for a couple of years. To date, we have not been given the access to the software required for our folks to get the required insight and understanding of how the software is developed and the code itself so that we can take on part of that responsibility from industry.

Senator HIRONO. Can someone? Do you have to get this access—

Vice Admiral GROSKLAGS. It is a contractual issue, Senator.

Senator HIRONO. Contractual issue.

Vice Admiral GROSKLAGS. Yes, ma'am.

Senator HIRONO. Are you working on that part?

Vice Admiral GROSKLAGS. That is something that Admiral Winter is working on in the JPO. And quite honestly, the plan for follow-on development in this 6-month period just so you have software releases will not be possible without the government getting additional insight from Lockheed Martin into the software development. It is not just about the sustainment. It is about our ability to quickly turn it, test it, and deploy it to the fleet. If we do not have that insight, it will not work.

Senator HIRONO. Well, keep working on it. We will check in with Admiral Winter.

Admiral Grosklags, one of the fundamental questions that we face on a program like the F-35 is when we think we have fixed a problem and we are surprised to hear new, unpleasant information. And of course, would be completely risk-free, otherwise it would not be development. It would be production.

I am especially concerned about the delays in regard to the software development. This is sort of in line with the other question too. The Marine Corps has declared initial operating capability, or IOC, for F-35 2 years ago with a version of the software called block 2B. And the Air Force declared IOC last year with a version of the software called block 3I with basically the same capability as the block 2F software.

It is hard to keep track of all of these I have to say.

[Laughter.]

Senator HIRONO. To achieve full operational capability for the Marine Corps and the initial operating capability for the Navy, the F-35 program will have to deliver a newer version of the software called block 3F. The Navy had been planning to declare IOC of the

F-35C in 2018, and now it appears that the completion of operational testing could extend well into 2019.

Admiral, will the Navy's IOC declaration be event-based, or is this declaration being driven by the calendar?

Rear Admiral CONN. For the IOC declaration, it has been pretty consistent from the Navy that we are event- and capability-based not calendar-driven. And we are holding firm on that. Although IOT&E has slid to the right, we expect the IOT&E to begin in September, to be complete sometime—

Senator HIRONO. September of this year?

Rear Admiral CONN. Correct, and to be complete early 2019. And when we get the results or get informed that the aircraft has met all the requirements set forth in the original requirements document in terms of how the aircraft tasks perform with the sensors and weapon systems that are on it, then we will declare IOC, which is plenty of time before fiscal year 2021 first deployment.

Senator HIRONO. Thank you. And you do not expect any further delays. You will meet the fiscal year 2021—

Rear Admiral CONN. That is correct, Senator.

Senator HIRONO. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Senator Kaine?

Senator KAINE. Just briefly. I want to follow up, Admiral Grosklags, on your long pause when you answered the question about the F-35 worth it and your answer that we needed it a long time ago. It is demonstrating great capacity now.

Just in terms of kind of lessons learned for us, I paid a lot more attention to the carrier programs than the F-35. I am from Virginia. You know, we build carriers. It seems like the delays there, as you look backward at them—one of the main reasons for the delay was, you know, it was not just a completely redesigned ship and a lot of the systems on the ship, arresting gear and the propulsion and communication systems, were also being all redone sort of at the same time. When you are building in class, you are trying to do it all at once, so we kind of learned some lessons from that.

I am a little curious with the F-35. You were building an advance platform for the different service branches to spread costs and to improve interoperability, including a lot of allied nations and trying to get them to commit in advance to purchase this.

As you look at the overall delay in the F-35, if you want to simplify it, was it more on the technical changes along the way or was it more trying to design a platform for all the different branches and also other nations? How would you characterize kind of the lesson learned from the delay that we might try to improve on going forward?

Vice Admiral GROSKLAGS. This is probably a personal opinion, but it was both. There were certainly technological hurdles with that aircraft largely driven by software. That has been the, I will say, Achilles' heel for the most part on a timeline.

But there are also tremendous challenges brought to bare by the joint nature of the program and the influence of the partner nations, which is a good thing. It is a great partnership, but it creates a decision-making morass in some cases where it is very hard to

get decisions made in a timely manner to move forward with the things that need to be changed or need to happen.

Senator KAINE. Right. So you gained in interoperability. You probably gained in some cost sharing by dealing with other nations. But it makes the decision process, which sometimes we are not good at anyway, much more cumbersome.

Vice Admiral GROSKLAGS. Yes, sir. I will be honest. That is not just an issue with our international partners. Quite often that is just an issue internal to the United States Government between our services when we have different priorities and different requirements, and getting through the process of coming to a consensus that, okay, we are going to move forward collectively along this line is a very time-consuming process and made more so, as you noted, by bringing the partners into the discussion and making sure that we are also addressing their equities.

Senator KAINE. It gives me a lot of thoughts about the ways we could look at programs like this in the future. But I really appreciate that answer.

Thanks, Mr. Chair.

Senator WICKER. General Rudder, let us talk about light attack. The Air Force appears to be on the cusp of procuring a fleet of light attack aircraft to conduct operations against violent extremist organizations in a more fiscally sustainable way to free up their fighter aircraft to focus on training for the high-end fight.

Has the Marine Corps considered pursuing a light attack aircraft of its own? And why or why not?

Lieutenant General RUDDER. Thank you, Senator.

We have been watching, tracking, and participating with the Air Force on this same program. As a matter of fact—

Senator WICKER. Participating?

Lieutenant General RUDDER. We have a pilot ready to go in case they were to deploy that airplane, and he is actually anxious to go. But that is another story.

We are looking at this right along with the Air Force. And I think if you look at what that particular turbo prop platform is doing around the world as far as foreign military sales, it is doing well in some of those environments. I think in that aspect, it is very good. We are going to evaluate. We are going to continue to look at it. What we have for our light attack is our H-1 Zulu that can carry 16 Hellfire. We are kind of happy with the physics and the dynamics of what that airplane can do.

But back to your point, we are going to continue to track this particular program. The one thing that we have to always consider when it connects to the National Defense Strategy is can I self-deploy this airplane and will it go on a ship. And some of those things and as far as that environment, all the airplanes—and we went through with the OB—10 years ago with survivability and ability to go on ships and how it operates with the marine air-ground task force. We have to take that in kind of a holistic account. That is some of the things we look at when we talk about that particular airplane.

Senator WICKER. Could the Air Force light attack go on a ship?

Lieutenant General RUDDER. They have prototype aircraft today that they are actually flying and testing, and we are tracking to

see what they do on that. We are actually tracking some variants that they have actually put into the field with some of our partner countries.

Senator WICKER. Would it not save money for the Marine Corps?

Lieutenant General RUDDER. It depends what variant you are talking about.

Senator WICKER. Well, because if it would not save money, there is no point in discussing it. Is there?

Lieutenant General RUDDER. I think in the mission sets, if I were to review what we do in the world today—for example, we have an F-18 squadron in CENTCOM theater right now. When it takes off, it has a defensive counter-air mission, a counter-UAS mission, and it is going to drop some fairly significant weapons in support of ground forces on the ground. And it has got to get there fairly quick out of an airfield that is not necessarily close to the battlefield.

In Asia, in that type of fight, I am not sure it is survivable. If you are talking about Africa special operations and some of the countries that is in right now, I think you have a cost effective means to do that. For our TACAIR [Tactical Air] right now and where we are, we are not necessarily in an environment where that particular, as it stands today, fits in there. Yet, for our partner nations that are using it, it is doing quite well.

Senator WICKER. Well, further comparing what you all are doing to the Air Force, Admiral Conn, the Air Force has opted to cancel its JSTARS [Joint Surveillance Target Attack Radar System] recapitalization plan, arguing that the proposed replacement was not able to survive a high-end fight. The Navy, on the other hand, has invested heavily in the E-2D advanced Hawkeye and P-8 Poseidon, which both have similar vulnerability concerns as the proposed JSTARS recap program.

So what about this? What is the Navy's approach and why have you seemingly come to a different conclusion from the Air Force?

Rear Admiral CONN. Sir, I cannot answer on behalf of the Air Force.

I will say for the E-2D and the airborne early warning mission that it does as an elevated sensor up and away from the carrier, there is nothing I am aware of right now that can replace that capability with a persistent capability providing airborne command and control, as well as some of the higher fidelity aspects of the E-2D and how it contributes to kill chains. I am not aware of anything else that can provide it.

Senator WICKER. Okay, but does this have any affect on the Navy and Air Force jointly executing airborne battle management in a high-end fight?

Rear Admiral CONN. No, sir, I do not believe it does.

Senator WICKER. Thank you.

Two more questions.

Admiral Conn, give us an update on efforts to replace the Navy's TH-57 training helicopters.

Rear Admiral CONN. To replace the 115 TH-57 helicopters, we are taking a new approach. We are going for commercial off-the-shelf aircraft that is going to be competed, and we are going to, then after the competition, buy those aircraft. And we are still

working through the actual maintenance plan, certification plan. But that is the approach that we are taking. We are not building a new military aircraft. We are going to take a commercial aircraft and put it into that mission of training the next generation of rotary wing pilots.

Senator WICKER. What is your schedule on that, sir?

Rear Admiral CONN. You will see that next year, sir.

Senator WICKER. Finally, Admiral Conn and General Rudder, as the Department focuses increasingly on the high-end fight, how important are adequate training ranges and supporting equipment in ensuring our aviation forces are adequately prepared? Are there areas where our training infrastructure needs to be improved in terms of airspace, equipment, and other elements?

Please describe efforts by the Navy and Marine Corps to increase and improve the use of live, virtual and constructive LVC training and how these efforts are interoperable within and among all the services.

Who wants to go first? Admiral Conn?

Rear Admiral CONN. In terms of investments in the training environment of the future, there are four key attributes to any successful training program. The first one is you have to have an environment itself that is reliable, realistic, relevant, and recordable. That could be a live environment or it can be a virtual constructive environment in which to train it.

Then you need a syllabus that has defined standards of performance that you measure against.

Then you need an instructor to teach that syllabus to those standards in that environment.

And then you need truth data to be able to record the event just like NFL [National Football League] plays or NFL game tapes where they look not only at the offense and defense but down to specific players on the field. That is the capability that we are developing.

In terms of the live side, we do need to upgrade our ranges, specifically the Fallon range training complex, getting it out of the Cold War era and into the 21st century, and those investments are starting to be made.

In terms of building a virtual constructive environment where we do our high-end training, that is being done at Fallon as well in an integrated training facility. We are doing that for a number of reasons. One, our live ranges themselves. We are running out of real estate measured in terms of the physical size and space of those ranges and our ability to access and control spectrum the way we are going to do it in combat.

The other part of that is from OPSEC. There are things we want to do and things we must train to, but we do not want to do it in the open air. That is why we are making those investments in integrated simulator facilities with F-18's, with F-35's, with E-2D, with Aegis, with MQ-25 to be able to train to the high-end fight at an integrated level.

Senator WICKER. General, what do you say?

Lieutenant General RUDDER. To build upon that, just for airspace in general, we have to protect it as much as we can. We have

encroachment issues around the world quite honestly and certainly in the United States. We need to protect the ranges.

The F-35 brings a different dimension in the ranges where you would take off in an F-35 or a legacy aircraft, you would fly within a certain distance from each other. You would fly with a wingman that you could either see or he is not that far away, you might be 10 or 15 miles apart between airplanes and maybe 50 or 60, 70 miles apart between a flight of four. That type of airspace needs to be protected.

The ranges, our weapon systems for the range of our weapon systems that require the safety zones required for drop zones—we need to be able to protect the air-to-ground piece as well because we still have a requirement for the high-end fight. Although we talk a lot about air-to-air, we talk a lot about this maritime environment, we have to be able to train with our maneuver elements on the ground.

Finally, for new systems, we rely on places like Fallon or places like Northern Edge, that exercise in Alaska, or Red Flag or Nellis or China Lake for them to have the most updated systems. We have to maintain updated systems. So when our airplanes fly against a high-end threat, they are actually flying against those high-end systems.

The simulation. I think all the services are in the same drive to make sure that we have our simulators that are networked together. Even on MEU, marine expeditionary unit, missions today, we can actually fly in Cobras, Hueys, V-22's, AV-8B's, and we can link those systems together to be able to fly those missions. We endeavor to do that with the F-35 and all our strike assets. But that high-end fight is something that, as a matter of fact, we are going to do it in Fallon and we are going to do it at Red Flag, and we are practicing that at our next weapons and tactics course.

Senator WICKER. All right. We are going to try to give you a Seapower title that gives you what you need.

Admiral Grosklags, do you have anything you need to add in this, your final testimony before this Subcommittee? You have the last word, sir.

Vice Admiral GROSKLAYS. Sir, I will only say—I will reiterate what I said at the start, that the additional funding that is likely to be made available in fiscal year 2018 and fiscal year 2019 is absolutely critical to increasing our lethality, but just as critical to making sure that we can get our readiness back up on step because we can only be lethal if we have ready, available airplanes. That is absolutely critical.

We appreciate the Congress's in general but this Subcommittee's, in particular, support for getting there. I would just again reiterate that we are almost halfway through fiscal year 2018, and we need to get those dollars available to us as soon as possible so we can execute them as efficiently and effectively as possible.

Thank you.

Senator WICKER. Well, I hope we can have a signing ceremony the evening of March 23rd.

Thank you, gentlemen. Appreciate it.

This hearing is closed.

[Whereupon, at 4:09 p.m., the Subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR ROGER F. WICKER

NATIONAL DEFENSE STRATEGY

1. Senator WICKER. Vice Admiral Grosklags, Rear Admiral Conn and Lieutenant General Rudder, how does the President's Budget request for Naval and Marine Corps aviation align with, and support, the National Defense Strategy and its emphasis on preparing for the high end fight? Please provide specific examples.

Vice Admiral GROSKLAGS and Rear Admiral CONN. The DON President's Budget 2019 budget request aligns to the current National Defense Strategy which identifies a more complex global security environment characterized by overt challenges to the current international order and the resurgence of long-term, strategic competition between nations. Our budget request reflects this national security environment and prioritizes the high-end fight. This is demonstrated by our request for appropriations that procure advanced fighter aircraft, expands the assimilation and teaming of manned and unmanned systems, integrates advanced platforms, sensors, networks, and the electromagnetic spectrum, and advances the development & procurement of long-range strike weapons that provide the necessary military advantage over those challenging the global posture.

Specific examples include procurement of additional 5th generation F-35 aircraft, development of the first carrier-based Unmanned Aerial System; improvements to the E-2D and kill-chains, initiation of a new start for a next generation long-range strike weapon (NGLAW), procurement of a new advanced ASuW weapon (LRASM), and development of A2/AD improvements for as Tactical Tomahawk.

Our modern expeditionary force requires fixed-wing aircraft capable of flexible basing ashore or at sea in support of our Marine units. A top priority is the F-35B and F-35C. Other priorities for aviation include investing in lethal, persistent, multi-role intelligence, surveillance, and reconnaissance (ISR) Vertical Take-Off and Landing (VTOL) UAS like our MAGTF Unmanned Expeditionary (MUX) program; modernizing key lift capabilities with the CH-53K; supporting capabilities such as electronic attack; implementing robust strike weapons programs; creating manned-unmanned teaming capabilities; and pursuing other sustainable modern aviation platforms ultimately increasing our competitive advantage against current rivals.

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DOD BUDGET

2. Senator WICKER. Vice Admiral Grosklags, Rear Admiral Conn and Lieutenant General Rudder, congress recently passed a 2-year budget agreement providing additional funds to the Department of Defense in fiscal years 2018 and 2019. How will the additional funding aid Navy and Marine Corps aviation's modernization and

readiness restoration and ability to meet the National Defense Strategy? Please provide specific examples.

Vice Admiral GROSKLAGS and Rear Admiral CONN. All of Congress's efforts to provide the Navy and Marine Corps stable and predictable funding allow us to maximize every taxpayer dollar and increase our purchasing power. With a two-year budget, it will enable the DON to improve our current force posture, modernize key capabilities and accelerate technology advancements. Each of these key areas contributes to and supports the National Defense Strategy. With regard to our force posture, stable resources help us recover readiness by funding flight hours, depot maintenance and procurement of spare/repair parts. With regard to modernization and technology advancements, predictable resources enable the maturation of multiple weapon system modernization programs, to include F/A-18E/F BLK III upgrades; F-35 Continuous Capabilities Development and Delivery upgrades; incremental updates to Next Generation Jammer; updates to the MQ-4 Triton to a Multi-Int configuration and modernization of various strike weapons such as LRASM, Tomahawk and Harpoon BLK II+.

Lieutenant General RUDDER. Congress's efforts to provide the Navy and Marine Corps stable and predictable funding allows the Department to maximize every taxpayer dollar and increase our purchasing power. The 2-year BBA and associated budget increase enables the DON to simultaneously improve our current force posture, modernize key capabilities and accelerate technology advancements. Each of these key areas contributes and supports the National Defense Strategy. With regard to our force posture, stable resources help us recover readiness by funding flight hours, depot maintenance and procurement of spare/repair parts. With regard to modernization, predictable resources enable modernization of key capabilities by procuring platforms like F-35 and CH-53K. Advancements in technology include maturation of multiple weapon system modernization programs, such as lethality and survivability upgrades for legacy F/A-18A-D and BLK III upgrades for F/A-18E/F; F-35 Continuous Capabilities Development and Delivery upgrades; incremental updates to Next Generation Jammer; updates to the MQ-4 Triton to a Multi-Int configuration, investments into MAGTF Unmanned eXpeditionary (MUX), and modernization of various strike weapons such as LRASM, Tomahawk and Harpoon BLK II+.

3. Senator WICKER. Vice Admiral Grosklags, Rear Admiral Conn and Lieutenant General Rudder, 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 primary budgetary challenges you are facing in the wake of the recently agreed to 2 year budget deal?

Vice Admiral GROSKLAGS and Rear Admiral CONN. The current President's Budget 2019 budget is sufficient to meet Naval Aviation readiness and modernization goals. The challenge is that multiple years of insufficient resources cannot be corrected in one or two budgets. The DON requires stable, predictable funding over multiple years to achieve sustained positive results.

Lieutenant General RUDDER. The current President's Budget 2019 budget is sufficient to meet Naval Aviation readiness and modernization goals. The challenge is that multiple years of insufficient resources cannot be corrected in one or two budget cycles. The DON requires stable, predictable funding over multiple years to achieve sustained positive results.

4. Senator WICKER. Vice Admiral Grosklags, Rear Admiral Conn and Lieutenant General Rudder, the Defense budget request includes zero real growth in spending from President's Budget 2020 to 2023.

Given the state of readiness and military capabilities today, how will Navy and Marine Corps aviation sufficiently rebuild to meet the requirements of the National Defense Strategy after fiscal year 2019, without additional funding?

If the Department is responsible for funding internal savings to help pay for additional capability and capacity, please provide specific examples of what those savings will be in the aviation accounts.

Vice Admiral GROSKLAGS and Rear Admiral CONN. The National Defense Strategy calls for sustained and predictable funding over multiple years to improve readiness, restore program balance and build capacity/lethality. Future budget requests will be informed by ongoing or pending DON and DOD weapon system investment assessments that will identify out-year real growth requirements.

To achieve the desired savings, the Department will create new initiatives and/or emulate ongoing self-funding initiatives, to include: divestiture of less capable legacy capabilities (e.g. early Navy divestiture of legacy F/A-18 A-D Hornet aircraft), block-buys and multi-year procurement contracts (e.g. F-35 block-buy and

KC-130J multi-year procurement contract), repurposing of existing capabilities (e.g. V-22 for the Carrier On-Board mission vs. development of a new aircraft), and application of accelerated acquisition processes to reduce weapon system development cycle-times (e.g. the Long-Range Anti-Ship Missile (LRASM) accelerated acquisition program). The projected estimated cost savings and/or cost avoidance amounts will be determined via financial analysis as each initiative is matured.

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INDUSTRIAL BASE

5. Senator WICKER. 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 GROSKLAGS. As delineated in DOD's 2017 industrial capabilities report to Congress, overall, the general defense industry remains viable and relatively competitive. The aircraft sector is financially strong and defined by robust teaming and supplier relationships. The long-term outlook for the defense aircraft market is stable, although world-wide budget issues continue to drive short-term uncertainty. The large U.S. commercial aircraft and engine industries are healthy and have stable backlogs over the next decade. Military sales are more difficult to project as numerous governments have announced plans to reduce defense spending. Overall, the Aerospace and Defense (A&D) sector supporting Navy and Marine Corps aviation programs continues to outperform the broader markets. Major A&D prime system integrators (and significant subsystem suppliers) are profitable, showing positive Earnings Before Interest Taxes Depreciation and Amortization (EBITDA) margins.

A key risk to the A&D sector is attracting and retaining a qualified workforce. The need for talent across the defense industrial base is recognized by both industry and government as a major concern. Personnel shortages in hardware and software design/test continue due to increasing retirements, limited platform knowledge transfer, and a high demand for software engineers that is outstripping supply. A highly skilled workforce is essential to basic research, future weapon system development, advanced manufacturing/robotics, the progress of affordable sustainment strategies for complex Naval Aviation weapon systems and overall innovation in the A&D sector.

The Subcommittee must be particularly mindful to the fact that a healthy defense industrial base is essential to U.S. economic strength and U.S. national security—and losing our innovation and technological edge would have far-reaching negative national security implications.

MULTIYEAR PROCUREMENT OR BLOCK BUY AUTHORITIES

6. Senator WICKER. Vice Admiral Grosklags and Lieutenant General Rudder, 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 GROSKLAGS. The E-2D and F/A-18/EA-18G programs have both submitted legislative proposals requesting multiyear procurement authority from Congress. The AIM-9X program is studying the viability of a future multiyear. The Department of Navy is also participating in a proposed multiyear procurement legislative proposal submitted by the Air Force for the C-130 program.

Lieutenant General RUDDER. If conditions permit, an MV-22 7-Year Multi-Year contract would save the DON \$152 million across the FYDP, allow us to concentrate on improving readiness in the near years (which is critical), and make the program more attractive to our foreign partners that are considering the aircraft. If we were forced to buy to the POR inside the 5 year multi-year, we would have to balance the spending increase with our planned CCRAM and nacelle improvement readiness initiatives.

PHYSIOLOGICAL EPISODES

7. Senator WICKER. 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 GROSKLAGS. The Navy's most recent efforts to mitigate physiological episodes (PEs) consist of a multi-faceted approach (warn the aircrew, fix the machine, protect and prevent) involving close coordination and cooperation between a

broad swath of internal and external partners, including subject matter experts from United States Air Force (USAF), National Aeronautics and Space Administration (NASA), Federal Aviation Administration, industry, academia, medical, and dive communities. The Navy and Marine Corps are directly targeting the effects of PEs in our F/A-18/EA-18G and T-45 aircraft. Formed by the result of a Comprehensive Review ordered by the Chief of Naval Operations (CNO), the Physiological Episode Action Team (PEAT) serves as the singular source of coordination between the CNO, Commander, Naval Air Forces, Naval Air Systems Command (NAVAIR), Bureau of Medicine and Surgery, Naval Safety Center, private industry, and academia. Most of the PEs have occurred in two basic aircraft, the T-45 Goshawk and the F/A-18 (to include F/A-18 A-D Hornet, F/A-18 E/F Super Hornet, and EA-18G Growler). While there is cross-talk between all tactical air and training platforms on common problems and solutions, the strategies for T-45 and F/A-18 are slightly different and described separately below.

In the T-45, a variety of actions have been undertaken to address the occurrence of predominately hypoxia-type PEs. Training and procedures were updated to optimize crew posture for PE recognition, response, and avoidance. Air sampling using sorbent tubes and hydrocarbon detectors were installed on aircrew to monitor breathing gasses, and contaminant levels have shown values less than that of ambient air, and are well below Occupational Safety and Health Administration standards. CRU-123 solid state oxygen monitoring units were fielded, which provide aircrew alerting if delivery pressure falls, and its data recording capability have provided invaluable insight into the performance of the T-45 oxygen system while increasing system confidence with the aircrew. A draft request for proposal for a new oxygen concentrator was released, the GGU-25, and it will include increased reliability and data logging, delivering an increase in capability over the 1980s era concentrator that is currently in the T-45. Additional redundancy will be provided by the implementation of an Automatic Backup Oxygen System.

In the F/A-18, the PEAT believes that hypoxia and decompression events are the two most likely causes of recent physiological episodes. Because symptoms related to pressure fluctuations, hypoxia and contamination overlap, discerning a root cause is a complex process. A variety of actions have been undertaken to address the occurrence of PEs in the F/A-18 to include: new maintenance rules for handling the occurrence of specific Environmental Control System (ECS) built-in test faults; forward deployment of transportable recompression systems to immediately treat aircrew in the event they experience pressure-related symptoms; mandatory cabin pressurization testing on all F/A-18 aircraft every 400 flight hours; mandatory ECS pressure port testing is performed on all F/A-18A-D aircraft every 400 flight hours; improved overhaul and aircraft servicing procedures for ECS components; revised and expanded emergency procedures; annual hypoxia awareness and biennial dynamic training using a Reduced Oxygen Breathing Device to experience and recognize hypoxia symptoms while operating an aircraft simulator. In addition, aircrew are provided portable barometric recording watches to alert them when cabin altitude reaches preset thresholds or exceeds fluctuation thresholds. Internal components of the F/A-18 On-Board Oxygen Generation System (OBOGS) have been redesigned to incorporate a catalyst to prevent carbon monoxide from reaching the pilot and provide an improved capability molecular sieve material (oxygen filter). These new OBOGS components have been installed in 92 percent of the in-service F/A-18 fleet so far. F/A-18 A-Ds are undergoing a two-phased ECS overhaul; Phase 1 is the incorporation of Air Frame Bulletin (AFB)-821 to replace seven of the most critical ECS components; Phase 2 is currently under development and is intended to replace valves, duct lines, couplings and brackets to restore ECS system integrity and provide aircrew with a stable cockpit environment.

Common (F/A-18 and T-45) actions include: an increased capacity for the emergency oxygen bottle is under contract for both F/A-18 and T-45; leveraging sorbent tube assembly data to identify breathing gas contaminants; and construction of an ECS laboratory. To date, the levels of contaminants measured in OBOGS breathing gas are well below published limits known to cause human impairment. SlamStick data is downloaded post-flight and synchronized with aircraft maintenance data for rigorous analysis, increased aircrew awareness, and post PE investigation. Future projects include systematic evaluations of technologies to monitor and detect physiological symptoms for both F/A-18 and T-45.

Across the Naval Aviation Enterprise, every effort has been made to share information and rapidly develop a shared solution. Data management and collection has been enhanced through initiation of a new data management plan. New test procedures have been developed with OBOGS and ECS bleed air contaminant testing conducted on fleet aircraft to establish measurement thresholds and foment a predictive system performance methodology. Also, new test sets have been developed

to assess oxygen system degraded performance. As stated in the report commissioned by NASA, PEs happen to people, not machines. The most capable experts in aeromedical research have been consulted. PMA-202, who specializes in aviation life support and human systems at NAVAIR, is working with Naval Aviation Medical Research Unit—Dayton (NAMRU-D) to actively research multiple topics where medical understanding is immature. NAMRU-D is a key member of the Aviation Environmental Safety Advisory Board (AESAB), tasked with providing recommendations on multiple physiological issues. NAMRU-D enjoys a strong partnership with the USAF 711th Human Performance Wing (HPW) providing complementary capabilities for aeromedical research while supporting cross service collaboration in both research and experimentation. Oxygen cross talks bring specialists from NAVAIR, the 711th HPW and academia altogether to share research and expertise to optimize life support systems for all of our platforms.

Based upon the Navy's mitigation strategy, no supplier constraint has been identified to date that would impede equipment modification efforts, and industry can produce enough specialized components.

8. Senator WICKER. Vice Admiral Grosklags, how much funding does the budget request include for addressing physiological episodes in Navy and Marine Corps aircraft? Please describe specific examples of items or efforts that are funded in the budget.

Vice Admiral GROSKLAYS.

APN, P-1 #30, PE/BLI 0204136N/0525 (APN5)
 APN, P-1 #45, PE/BLI 0804745N/0569 (APN5)
 APN, P-1 #48, PE/BLI 0204161N/0575 (APN5)
 APN, P-1 #64, PE/BLI 0204161N/0605 (APN6)
 OPN, P-1 #92, PE/BLI 0204161N/4268
 RDTEN, R-1 #103 PE/PU 0603208N/3367
 RDTEN, R-1 #106 PE/PU 0604264N/0606
 RDTEN, R-1 #219 PE/PU 0204136N/1662
 OMN, 1804, PE/LI 0708012N/1A4N (PRL)
 OMN, 1804, PE/LI 0702207N/1A4A

President's Budget 2019	APPN	Fiscal year 2019 (\$M)	Fiscal year 2020 (\$M)	Fiscal year 2021 (\$M)	Fiscal year 2022 (\$M)	Fiscal year 2023 (\$M)
Aircrew Systems						
1A4A	OMN	11.4	5.5	0.0	0.0	0.0
PE 0604264N	RDTEN	2.7	2.8	2.5	1.5	1.4
BLI 4268	OPN	2.2	2.0	2.0	3.9	0.7
BLI 0575	APN-5	15.9	38.3	38.05	41.7	2.8
F/A-18						
1A4N	OMN	13.3	13.7	14.0	14.4	14.7
PE 0204136N	RDTEN	28.0	2.5	1.5	1.5	1.5
BLI 0525	APN-5	30.1	25.8	15.8	24.9	16.8
T-45						
A4N	OMN	13.3	13.5	13.7	14.0	14.0
PE 0603208N	RDTEN	6.1	5.1	0.8	0.8	0.8
BLI 0569	APN-5	40.4	48.3	5.4	1.6	1.6
BLI 0605	APN-6	8.7	5.1	0.0	0.0	0.0

Specific examples of items or efforts that are funded in the budget include Enhanced Emergency Oxygen System (EEOS), Automatic Backup Oxygen Systems (ABOS), flight tests, pilot physiological testing, and data analytics.

9. Senator WICKER. Vice Admiral Grosklags, are T-45s back flying at their full envelope?

Vice Admiral GROSKLAYS. Yes, the T-45 is flying at full envelope. The fleet returned to full envelope On-Board Oxygen Generation System (OBOGS) on 18 July 2017 with fully reconfigured OBOGS aircraft.

10. Senator WICKER. Vice Admiral Grosklags and Lieutenant General Rudder, have the Navy or Marine Corps experienced any physiological episodes in their F-

35s recently? What is being DONE to combat physiological episodes in Navy and Marine Corps F-35s?

Vice Admiral GROSKLAGS. Since 2012, there have been a total of 15 physiological episodes that have occurred on F-35Bs and F-35Cs, with seven events transpiring on the F-35B and eight events on the F-35C (as tracked by the Naval Safety Center). The most recent PE event happened on August 24, 2017 at MCAS Beaufort, SC and was the result of a pre-existing condition with the pilot.

To combat PEs on Navy and Marine Corps F-35s, a thorough understanding of their root cause(s) must be obtained prior to developing potential changes to the aircraft and/or life support system. It must be noted that the life support system on the F-35 is the same on all F-35 models. Extensive laboratory testing of Onboard Oxygen Generation System (OBOGS) units involved in May 2017 Luke AFB PEs on F-35A models recently completed in February 2018 at Wright-Patterson AFB. The tests confirmed that the OBOGS was not a contributor to PEs on the F-35. The testing demonstrated a high level of repeatability and statistical robustness, providing a high level of confidence in the following conclusions: in-flight oxygen concentrations recorded by F-35 aircraft provide reasonable estimates of the oxygen concentrations delivered to the pilot, there is no evidence of undetected oxygen concentration disruptions, the life support system appropriately detects and reacts to failures, and the OBOGS delivers oxygen levels well above minimums required to prevent hypoxia. There is some evidence to suggest that operator breathing technique influenced the results from these OBOGS tests and will be explored during subsequent testing. This next round of testing will include the OBOGS and all other components of the F-35 Life Support System (LSS), shifting the emphasis toward understanding the behavior of the breathing regulator, backup oxygen system, pilot interface connector, and oxygen mask/hoses to fully characterize all components of the F-35 LSS and its performance across representative F-35 flight envelopes. Once this latest round of testing is complete and the data analyzed, sufficient information should be in-hand to support any additional mitigation activities.

Lieutenant General RUDDER. Since 2011, there have been a total of nine (9) physiological episodes (PEs) that have occurred on F-35Bs and F-35Cs, with four events transpiring on the F-35B and five events on the F-35C. The most recent PE event happened on August 24, 2017 at MCAS Beaufort, SC and was the result of a pre-existing condition with the pilot.

To combat PEs on Navy and Marine Corps F-35s, it must be noted that the life support system on the F-35 is the same on all F-35 models. Extensive laboratory testing of Onboard Oxygen Generation System (OBOGS) units involved in May 2017 Luke AFB PEs on F-35A models recently completed in February 2018 at Wright-Patterson AFB to confirm that the OBOGS was not a contributor to PEs on the F-35. The testing demonstrated a high level of repeatability and statistical robustness, providing a high level of confidence in the following conclusions: in-flight oxygen concentrations recorded by F-35 aircraft provide reasonable estimates of the oxygen concentrations delivered to the pilot, no evidence of undetected oxygen concentration disruptions, the life support system appropriately detects and reacts to failures, and the OBOGS delivers oxygen levels well above minimums required to prevent hypoxia. There is some evidence of other issues suggesting the influence of operator breathing that were seen during OBOGS testing that will be explored during additional testing. This next round of testing will include the OBOGS and all other components of the F-35 Life Support System (LSS), shifting the emphasis toward understanding the behavior of the breathing regulator, backup oxygen system, pilot interface connector, and oxygen mask/hoses to fully characterize all components of the F-35 LSS and its performance across representative F-35 flight envelopes.

FUTURE CARRIER AIR WING

11. Senator WICKER. Rear Admiral Conn, what is your vision for the future carrier air wing?

Rear Admiral CONN. As carrier aviation looks to the future, it is evident we are facing a rapidly evolving threat capability baseline requiring a substantial force modernization to pace the threat in both the near term as well as the 2024-2030 timeframe. This will require investments in the industrial capacity and advancements in capabilities to outpace the threat. The future Carrier Air Wing is one that needs complementing 4th and 5th generation aircraft; manned and unmanned capabilities; and netted sensors, systems, and weapons to ensure the Air Wing is able to decisively defeat increasingly advanced near peer threats.

The Air Wing will be composed of 4th and 5th generation strike fighters to provide the required complementary capacity and capability to counter threats through the 2030s. The strategy of sustaining and recapitalizing strike fighter inventory is

reliant on fully funding readiness sustainment accounts, managing strike fighter utilization, and procuring of additional F/A-18E/Fs and F-35Cs. Our current assessments balance requirements and fiscal constraints in an effort to pace the threat. With that, the future Air Wing will be composed of two F-35C Lightning II squadrons and two F/A-18E/F Super Hornet squadrons totaling a minimum of 44 Strike Fighters with continued modernization efforts. This makeup provides the best balance between capability, capacity and affordability.

This 4th and 5th generation mix is complemented by the only dedicated tactical electronic attack airframe in the Department of Defense inventory, the EA-18G Growler. The Growler has 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 to pace future threats. As the threat becomes more technologically advanced there is a requirement to have multiple Growlers airborne and therefore we anticipate a requirement for seven EA-18G aircraft in the Air Wing.

We are currently conducting the Next Generation Air Dominance Analysis of Alternatives (AOA). The AOA will provide recommendations across a family of systems to replace the capabilities of the F/A-18E/F and the EA-18G as those platforms reach the end of their service lives. We are considering the widest range of trades to balance capability, capacity, affordability, and survivability across platforms, sensors, weapons, and networks. The AOA team has been working closely with government and industry to ensure we properly assess those future technologies which will have the greatest impact on Strike Group lethality.

As a result of initial AOA findings, we are investing in propulsion technologies to benefit both legacy and future platforms. Not only do we require increased range and speed, but also improvements to the power and thermal management systems to support future technologies. Those technologies include advanced missions systems, on-board and off-board sensors, weapons, and the potential benefits of increased autonomy and manned/unmanned teaming.

We will continue to align with the demands and availability of future technologies. As unmanned and autonomous systems become more available and affordable, we will leverage unmanned capabilities now and in the future. This includes providing communications relay nodes; intelligence, surveillance, reconnaissance, targeting (ISR&T); refueling; and logistics. Integration of such systems with manned systems will reduce risk to the force, provide access to areas otherwise denied to manned platforms, increase force capability and capacity while lowering costs and providing distributed intelligent battlespace awareness. Future unmanned assets will augment manned tactical aircraft beginning with the MQ-25 Stingray. This, along with other capabilities, will provide the Carrier Air Wing the ability to blend legacy air platforms with 5th generation fighters and other autonomous capabilities to achieve the desired warfighting effect.

The Air Wing of the future must not rely on a single targeting sensor, system, or weapon in order to be successful. Instead, they must be able to rapidly share multi-spectrum sensor and target information across the battlespace while countering the threat's sensor and weapon capabilities. In order to do this, the Air Wing of the future will rely on 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. In order to counter the advanced threat and process the tremendous amounts of information being collected and transmitted across the battlespace, the requirement for multiple E-2Ds to be airborne simultaneously is increasing and thus we will require five to six E-2D Advanced Hawkeyes to meet this mission demand. Follow on efforts from the 2016 Force Structure Assessment continue to review the optimal force structure to include options for six aircraft per squadron.

These systems and platforms will be complemented by a variety of support aircraft. The oldest aircraft currently operating from the flight decks is the C-2 Greyhound. In fiscal year 2018, the Navy begins procurement of the new CVW 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.

Additionally, the Navy has multi-mission combat helicopters, the MH-60R and the MH-60S. The MH-60R is a multi-mission combat helicopter that conducts Anti-Submarine Warfare, Anti-Surface Warfare, Naval Surface Fire Support, Search and Rescue, and Logistics Support. Future Air Wings will continue to deploy with 11 aircraft HSM squadron—five of which embark the CVN, and six of which embark the Strike Group's Cruisers and Destroyers. By 2025, the MH-60R will be approaching its Service Life Extension Program (SLEP) and Mid-Life Upgrade (MLU)—processes

that will update the airframe, its sensors, and its mission systems to extend the service life and improve its tactical utility.

The MH-60S is a multi-mission combat helicopter that conducts Anti-Surface Warfare, Personnel Recovery, Naval Special Warfare Support, Search and Rescue, and Logistics Support. Future Air Wings will continue to deploy with an eight-aircraft HSC squadron—six of which embark the CVN, and two of which embark a supporting auxiliary ship. By 2025, the MH-60S will be well into its Service Life Extension Program (SLEP) and Mid-Life Upgrade (MLU)—processes that will update the airframe and its mission systems to extend the service life and improve its tactical utility.

12. Senator WICKER. Rear Admiral Conn, 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 CONN. 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.

10TH CARRIER AIR WING

13. Senator WICKER. Rear Admiral Conn, the NDAA for fiscal year 2017 gave the Navy temporary reprieve from the requirement to maintain and fully staff 10 carrier air wings until additional deployable aircraft carriers can fully support a 10th carrier air wing, or October 1, 2025, whichever comes first.

How does this budget request begin to lay the groundwork to fully equip and man the 10th carrier air wing?

Are the procurement profiles outlined in the FYDP for Super Hornets, Joint Strike Fighters, Hawkeyes, Growlers, Seahawks and CMV-22s, built with the requirement for 10 air wings or 9?

Rear Admiral CONN. The President's Budget 2019 DON Aviation plan investment funding includes procurement of aircraft, initial spares, and research and development. This plan is consistent with the Secretary of Defense's President's Budget 2019 focus on recovering warfighting readiness while increasing capability and lethality. This procurement plan puts the Navy on a path to meet the 1 Oct 2025 requirement

STRIKE-FIGHTER SHORTFALL

14. Senator WICKER. Rear Admiral Conn, please update us on the Navy's strike-fighter shortfall, efforts to alleviate it, and the biggest challenges to overcome.

Rear Admiral CONN. The Naval Aviation Enterprise is actively managing strike fighter management challenges in the near term that will require several years to correct. The fiscal year 2019 request effectively helps us address the strike fighter shortfall with procurement of 9 F-35Cs, 24 FA-18E/F Block III Super Hornets and additional aircraft across the FYDP. In tandem with these procurements, Service Life Modification (SLM) initiatives, capability upgrades, concurrent engineering, and innovative manufacturing techniques enhance our inventory by maintaining the tactical relevancy of the F/A-18 E/F and legacy F/A-18 A-D aircraft as we transition to new, more modern tactical aircraft.

The President's Fiscal Year 2019 Budget request puts us on track to reach our desired force structure and readiness. The key enabler and biggest challenge to managing the strike fighter inventory will be stable, on-time funding over multiple years to achieve the desired results.

LEGACY HORNET DIVESTITURE

15. Senator WICKER. Rear Admiral Conn, the Navy intends to divest all Legacy Hornets from its active component squadrons by 2019, with full department divestiture complete by 2030.

Please explain the rationale for the Department's Legacy Hornet divestiture plan.

The divestiture plan includes the Blue Angels transitioning to Super Hornets in 2020, while the Reserve squadrons do not transition until 2028. Please explain why the Blue Angels would be a higher priority to transition than the Reserve squadrons, Naval Aviation Warfare Development Center, the test squadrons or the general fleet inventory, which has been severely challenged for a number of years.

Rear Admiral CONN. In October 2017, a decision was made by NAE to put the transition timeline for the Navy Fleet Demo Team (Blue Angels) from Legacy Hornets to Super Hornets on hold. This decision was based on a Navy plan to divest of Legacy F/A-18 Hornets from the four remaining active Navy Fleet squadrons between 2017–2019. These four operational squadrons will transition to Super Hornets in an effort to bring the best capability to the operational Navy fleet as early as possible. The decision required the Navy to delay the transition of the Blue Angels into Super Hornets until a later date. The NAE is looking at procurement/delivery, current inventory and the Service Life Management plan to identify the aircraft to be modified to support the Blue Angel team. Current timeline for the Blue Angel transition is TBD with a modified plan expected in late fiscal year 2018.

16. Senator WICKER. Lieutenant General Rudder, please explain how the Department's Legacy Divestiture plan affects USMC aviation readiness and combat capability.

Lieutenant General RUDDER. The Navy's decision to transition its Schedule A F/A-18C squadrons earlier than originally planned has allowed for the transfer of Lot 15 and above legacy Hornets, essentially the latest and most capable models, to the Marine Corps. This will allow the Marine Corps to operate all Lot 15 and above Hornets in their Schedule A squadrons in 2019. It will provide the Marine Corps more commonality and better combat capability within its F/A-18 fleet. "Best of Breed" aircraft recapitalized from divestment will be reallocated based on priority: 1. operational USMC squadrons, 2. NAWDC, 3. Reserves. More F/A-18A-D aircraft will be added to strike lists until USMC is complete with the F/A-18 to F-35 transition in 2030.

F/A-18 SERVICE LIFE EXTENSION

17. Senator WICKER. 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 GROSKLAGS. The Navy's initiative to restore capacity and throughput at the Navy's aviation depots has yielded improvements in capacity which now meets the F/A-18A-D PMI requirements. The Navy increased artisan and engineering manpower on the F-18 lines and has ongoing efforts to address throughput constraints associated with material and analysis delays. The Navy continues to maximize the F/A-18A/B/C/D/E/F workload at the depots through the use of Critical Chain Project Management (CCPM); improved Bill of Materials and Workload Standards; and Planned Maintenance Interval-X ("PMI-X") which reduces requirements by combining depot events which results in significantly lower forecasted depot inductions. Naval Air Systems Command (NAVAIR) Engineering has implemented improvements in the speed of engineering dispositions, the priorities assigned to disposition requests, and the amount of engineering resources available.

Lessons learned from legacy Hornet have resulted in a significantly different approach for Super Hornet service life extension program. Material supply challenges and non-standardized repair requirements driven by material condition challenges have hampered legacy Hornet life extension efforts. 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. 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.

F/A-18 SUPER HORNET BLOCK III

18. Senator WICKER. Rear Admiral Conn, can you please describe the Navy's plan and timeline for upgrading its Super Hornet fleet? What capabilities are being added to maintain the Super Hornet's relevancy in the high end fight?

Rear Admiral CONN. The F/A-18E/F will be the Navy's predominant strike fighter platform into mid-2030s. President's Budget 2019 requests procurement of 24 F/A-18E/F aircraft in fiscal year 2019 (FY19) and an additional 86 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.

F/A-18E/F Block III capability upgrades consist of five Engineering Change Proposals (ECPs):

- Advance Cockpit System (ACS) for improved situational awareness and obsolescence fixes
- Digital Networking Infrastructure for advanced targeting and growth
- Low Observable (LO) signature enhancement for improved survivability
- Conformal Fuel Tanks for increased range and on station time
- 9,000+ flight hour service life to sustain capacity and lower lifecycle costs.

Block III capability will be incorporated into production aircraft starting in fiscal year 2019 (for fiscal year 2021 delivery). Starting in fiscal year 2023, F/A-18E/F Block II aircraft will be inducted into Boeing facilities for Service Life Modification (SLM) to increase service life to 9,000+ flight hours and incorporate the Block III capabilities. Block II aircraft inducted for the structural portions of SLM prior to fiscal year 2023 will receive the remainder of the Block III upgrade at a later time.

E-2D ADVANCED HAWKEYE

19. Senator WICKER. Rear Admiral Conn, given the new capabilities the E-2D is, and will be, fielding and the new tactics and concepts of operations they are enabling, what, in your view, is the appropriate number of E-2Ds that should be allocated to each carrier air wing?

Rear Admiral CONN. Current program of record is 5 E-2Ds per squadron. The Navy periodically analyzes the right mix of aircraft to maximize Strike Group weapons system capabilities. This analysis along with deck space and budgetary implications will need to be studied further.

20. Senator WICKER. Rear Admiral Conn, given the new capabilities the E-2D is, and will be, fielding and the new tactics and concepts of operations they are enabling, is there a need for expeditionary squadrons of E-2Ds? Why or why not? What would be some of the benefits and/or drawbacks of establishing expeditionary E-2D squadrons, such as we have for EA-18G Growlers?

Rear Admiral CONN. If required, E-2Ds could potentially support expeditionary operations, as well as augment a Marine Expeditionary Unit's composite air wing. The extent of additional capability they would bring would depend upon the specific mission requirements and would also be impacted by availability of suitable airfields. The current program of record does not support expeditionary operations (only enough aircraft to support CVW operations) and would require additional costs to stand-up the capability.

AIRBORNE BATTLE MANAGEMENT

21. Senator WICKER. Rear Admiral Conn, the Air Force has opted to cancel its JSTARS recapitalization plan, arguing that the proposed replacement was not survivable in the high-end fight. The Navy, on the other hand, is investing heavily in the E-2D Advanced Hawkeye and P-8 Poseidon, which both have similar vulnerability concerns as the proposed JSTARS recap program. Please explain the Navy's approach to airborne battle management and how the Navy and Air Force intend to jointly execute airborne battle management in a high-end fight.

Rear Admiral CONN. The Navy intends to use its most survivable manned and unmanned platforms in the high end airborne fight and will perform battlespace management of airborne platforms, netted sensors, net-enabled weapons using and advanced Concept of Operations (CONOPS) that will extend the reach and survivability of these netted airborne platforms. The E-2D was built for this reason.

The E-2D APY-9 radar is a two-generation leap in detection and tracking capability over the E-2C. Improved detection and tracking allows E-2D to operate forward in any environment providing enhanced situational awareness, expanded reach and improved effectiveness across the kill chain. The E-2D is a critical enabler of the Carrier Strike Group (CSG) air and surface warfare missions, including power projection, theater air and missile defense (TAMD) and cruise missile defense (CMD) in an anti-access/area denial (A2AD) environment. As a core pillar of the Naval Integrated Fire Control-Counter Air (NIFC-CA) construct, the E-2D extends organic AEGIS and fighter missile kill chains by providing long-range weapons qual-

ity surveillance data via Cooperative Engagement Capability (CEC) and Link-16. Increased capacity of E-2D significantly increases effectiveness of the entire CSG.

The P-8A performs an entirely different mission set than the E-2D or JSTARS or AWACS platforms. The P-8A is primarily an ASW and ASuW system dedicated to preserving the safe haven and Strategic Lines of Communication in the high end fight. It is not designated to perform airborne battle management missions or participate in the high end air to air battle. Through incorporation of its Increment 3 sensors and systems, it will be a full participant/node in the Navy's future battlespace awareness CONOPS. Incorporating advanced sensors with greater reach such as the Advanced Airborne Sensor (AAS), coupled with its advanced track management system (Minotaur), the P-8 Inc-3 brings a generational leap in battle space awareness over the P-3C. P-8 will conduct the majority of its strategic and operational ASW, ASuW and ISR warfighting objectives outside the major threat ranges of our adversaries. Through the use of advanced sensors and netted C4I systems and prudent Battle Group CONOPS, the P-8 will remain away from the high end airborne fight.

JOINT STRIKE FIGHTER OPERATIONS

22. Senator WICKER. Lieutenant General Rudder, please provide an update on F-35B operations since VMFA-121 moved to Japan?

Lieutenant General RUDDER. The Marine Corps permanently stationed an F-35B squadron in Japan in 2017, and the first two F-35B MEU deployments will occur in 2018. F-35Bs on the 31st MEU just landed on the amphib today (Planned 121 fly-on date is, 5 March 2018). This summer, we will have two MEUs simultaneously deployed with F-35Bs.

In August last year, to demonstrate solidarity with our allies in northeast Asia, four F-35Bs from Marine Corps Air Station Iwakuni in Japan, two B 1Bs from Andersen Air Force Base in Guam, two Japan Air Self-Defense Force F-15Js, and four Republic of Korea Air Force (ROKAF) F-15Ks flew together over the waters near Kyushu, Japan, and the United States and ROKAF aircraft continued on and few across the Korean Peninsula.

Last October, the U.S. Marine Corps participated in Exercise Dawn Blitz where U.S. Marine Corps F-35B Lightning II, assigned to Marine Fighter Attack Squadron 211 conducted operations aboard the USS *Essex* (LHD-2) to test the ability to conduct amphibious operations and completing thirteen (13) carrier qualifications.

The Marine Corps' transition plan is on track. VMFA-314, the UCMS's first F-35C squadron, transitions to the F-35C in 2019—ready for expeditionary operations in 2021 and deployment on a carrier in 2022.

23. Senator WICKER. Lieutenant General Rudder, 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 RUDDER. Our L-Class ships are behind where we would like to be, but the Navy is in full support and we are improving those ships as fast as possible. Three of our L-Class big decks now have the new Capstone Ship Self Defense System (SSDS) which brings the Cooperative Engagement Capability and Link 16 to the platform. There are 5 LHD's which are scheduled to be upgraded over the next 5 years. This system provides a critical combat capability which will be integrated with F-35 over Link 16.

The Navy just installed a system called Radiant Mercury on the USS *Wasp*, which enables post flight data from the F-35 to be sanitized and convert data to a generic secret level. This will lead to a much smoother dissemination of information to battle field commanders and leadership for expeditious debrief, validation, or follow on operations.

We also plan on operating the Marine Corps Common Aviation Command and Control System (CAC2S) on the *Essex*. This is a new capability being used by USMC tactical air defense controllers and air control electronics operators. It integrates information from various aerial and ground-based radar systems and sensors to enable a common, real-time tactical picture. This system will bring a Marine Corps Command and Control capability to the ship that can seamlessly integrate with the F-35, allowing the F-35 to transfer real time data from onboard systems and data links back to the ship. Effectively the aircraft now becomes a forward sensor for the

command elements embarked on MEU/ARGs bringing greater situational awareness and faster decision making.

With the embarkation of F-35s on L-Class ships, one major change to the ships were the designation of special access program facilities (SAP-Fs). These rooms of elevated classification allow for F-35 operational planning on classified F-35 systems. The SAP-F spaces modernize facilities on the ship, elevate the classification and capability of rooms for F-35 planning or other Special Access Program enablers, and introduce new connectivity in spaces where that ATO did not exist before, overall enabling warfighter operations overall.

24. Senator WICKER. Rear Admiral Conn, what do you view as the biggest challenges to successful integration of the F-35 into the carrier air wing?

Rear Admiral CONN. One of the largest challenges to F-35C Carrier Strike Group (CSG) integration is aligning F-35C capability procurement with investments in other current and future CSG platforms. Fully integrated F-35C ensures critical battlespace awareness and dominance across all spectrums of naval operations. Not only do we want to integrate the F-35C with 4th generation aircraft in the carrier air wing (CVW), but the other platforms in the CSG as well. The biggest challenge is effectively and efficiently sharing the information gathered by the F-35C across various secure warfighting networks. The Navy needs these capabilities to fight and win against a near peer threat.

25. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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?

Rear Admiral CONN. 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 cost over the life of the system.

The joint program is funding the stand up of organic depot capabilities to provide cost-effective aircraft support by augmenting the Original Equipment Manufacturer (OEM) repair capacity. While OEM production requirements remain high, acceleration of depot capabilities will ensure efficient production and maintenance of aircraft. In addition, funding has been allocated for Intermediate Level maintenance facilities aboard our aircraft carriers first and then at shore fleet concentration areas to more rapidly analyze and repair 29 key air vehicle components at a reduced cost.

Efforts within the 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.

Lieutenant General RUDDER. In President's Budget 2019, the Navy and Marine Corps programmed money to begin standing up our own Intermediate Level maintenance capability. The Marine Corps is currently working with the Program Office to develop a right-sized I-Level capability for F-35 which will enable us to test parts on station and fix complex components—improving readiness and driving down the cost of the supply chain.

We are leaning forward on procuring the right level of spares, but it will take time to get up to speed—there is a delay between our investment and the return. In the meantime, we continue to work through a prioritized list of parts reliability in order to identify and improve parts which have the greatest impact on readiness. We have found that the mission systems are creating the biggest hit to readiness, so we have scrubbed everything in that area to include improving the fiber optics backbone and the system that tests and repairs it.

The new sustainment contract that the Program Office is helping us negotiate with the prime contractor target specific performance metrics such as Supply Chain Response Time in order to incentivize improvements to specific readiness drivers.

26. Senator WICKER. Lieutenant General Rudder, is the current projected mix of Marine F-35B and F-35C aircraft optimal to support achieving the goals of the National Defense Strategy?

Lieutenant General RUDDER. The current F-35C procurement plan allows the USMC to sustain four F-35C squadrons that meet the Tactical Air Integration (TAI) commitment the USMC has with the USN to include the Navy Master Aviation

Plan (MAP) deployment requirements on CVN Carrier Strike Groups. Due to the extensive pre-deployment training regimen or USN Fleet Readiness Training Plan (FRTTP) for carrier strike groups, and multiple enduring deployment commitments from the same squadrons to the same Command Air Groups (CAGs), an overall commitment from a USMC TACAIR squadron to TAI or a CVN deployment can span nearly three years when accounting for the work-up/training period and back to back deployments. The USMC has planned for the requisite amount of F-35Cs and F-35C squadrons that continue the USMC requirement to the USN and TAI as well as mitigate and help manage the overall force (USMC and USN) deployment to dwell goal. Should the TAI

The F-35C also brings other unique warfighting capabilities to the USMC and the MAGTF. Simple fact being the F-35C is larger than the F-35B allowing for more fuel, longer legs or flight time, and the capability to carrier a larger class of weapon (500–1,000 pounds larger than weapons on the F-35B), along with other organic unique capabilities in this series of aircraft. Even without an enduring TAI commitment the F-35C can integrate and deploy for all USMC global force commitments except Marine Expeditionary Unit deployments which require vertical landing capability aboard L-Class ships.

The current POR for F-35 overall allows for the appropriate number of aircraft in the case there is attrition of aircraft within the fleet inventory, ensures there is iron on the flightline to fly and fight during periods of planned modifications and aircraft system upgrades, and cover all USMC enduring global force commitments.

F-35 FOLLOW-ON MODERNIZATION

27. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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 Continuous Capability Development and Delivery (C2D2)?

Rear Admiral CONN. The Navy is constantly concerned with the costs associated with modernizing any of our warfighting platforms. As we modernize the F-35C through the C2D2 process we will continuously work through the JPO and with industry to deliver the required capabilities to maximize the combat effectiveness of the Carrier Air Wing at the most affordable cost possible. The C2D2 plan is aggressive and will require constant oversight and communication to be successful. It needs to be in order to meet the aggressive capability developments of our adversaries. Budget delays and multiple marks against the F-35 Modernization Program Element have delayed necessary pre-engineering contract work which continues to delay capability delivery to the warfighter. This adversely impacts our ability to adequately pace the threat resulting in increased warfighting risk.

Lieutenant General RUDDER. The F-35 partnership, through the leadership at the Joint Program Office, recently re-structured the original Block 4 Follow-on Modernization (FOM) strategy into a more agile Continuous Capability Development and Delivery (C2D2) program. This approach leverages existing commercial practices and develops capabilities in smaller, more managed increments which will accelerate the delivery of warfighting capability.

While this strategy delivers the capabilities required to fight and win against emerging threats, it necessarily includes emergent expenses. A series of requirements decomposition efforts have validated the current C2D2 plan and identified areas in which costs can be reduced. This work indicates that C2D2 has accurately captured the requirements needed to keep the F-35 on the tactical and operational edge; however, accurate capability requirements must be balanced with budget realities. There are ongoing efforts that are attempting to find efficiencies across the C2D2 enterprise to reduce overall costs.

F-35 PROGRAM MANAGEMENT

28. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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?

Rear Admiral CONN. The Office of the Under Secretary of Defense Acquisition and Sustainment is in the process of coordinating with the Services to staff, research and institute a more efficient and responsive alternate management structure to coordinate activities through the Joint Program Office. The United States Navy will fully support those efforts.

Lieutenant General RUDDER. The Marine Corps needs to see a reduction in the cost-to-own and operate the F-35 and we are working with the Joint Program Office and industry to drive down those costs. The Department is currently reviewing a re-structuring of the Program Office. This initiative is in response to an OSD AT&L review of established management structure. The review specifically focuses on how we can make efficiencies within the existing structure of the organization through a re-design of the current management structure. We are still a long way from implementation, but all of the Services are actively reviewing this with the intent to drive down the cost of the program.

EA-18G GROWLER REQUIREMENT

29. Senator WICKER. Rear Admiral Conn, 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.

Given the new Growler tactics and concept of operations being developed, what is the optimal number of Growlers assigned to an air wing? Why?

Do you believe the Navy requires more Growlers to fulfill the needs of the joint force?

Rear Admiral CONN. The Navy has a sufficient number of EA-18G Growlers to support current joint force requirements. The current planned inventory supports seven aircraft per carrier air wing for nine air wings. Additionally, it supports six aircraft for each of the five expeditionary squadrons and five aircraft for the reserve squadron. The above distribution represents the best balance of capability for air wing and expeditionary operations and provides flexibility to augment with additional aircraft from within current inventory if needed. At this time, the Joint Staff has not identified a need for additional aircraft.

ELECTRONIC WARFARE—NEXT GENERATION JAMMER

30. Senator WICKER. , Rear Admiral Conn, the Navy is currently developing an advanced electronic warfare system, the Next Generation Jammer (NGJ), currently planned to only be carried by the EA-18G Growler. How does the Navy envision operating these Jammers? Given the rapid rise in the number and capability of threat radars, is the currently planned number of Growlers sufficient to effectively employ the NGJ?

Rear Admiral CONN. The Next Generation Jammer (NGJ) will be an advanced modern state-of-the-art computerized electronic warfare technology designed to provide full-spectrum dominance with the ability to jam multiple frequencies with higher radiated power and precision, at greater stand-off ranges against surface-to-air missile systems. NGJ will provide significantly increased protection to our fighter, strike and stealth forces and weapons enabling closer penetration to the intended targets while increasing the probability of mission success.

The Navy has a sufficient number of EA-18G Growlers to support current joint force requirements. At this time, the Joint Staff has not identified a need for additional aircraft.

MARINE AIR GROUND TASK FORCE ELECTRONIC WARFARE (MAGTF EW)

31. Senator WICKER. Lieutenant General Rudder, 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 and planning gap for the Marines, particularly in light of the renewed focus on the high end fight?

Lieutenant General RUDDER. The MAGTF never possessed a “dedicated” Airborne Electronic Attack (AEA) capability. While the Marine Corps owned and operated EA-6B Prowlers, these assets were not organic to the MAGTF—they provided a capability to the joint force. The Marine Corps currently has one operational EA-6B squadron of six aircraft which will support joint AEA operational requirements through fiscal year 2018. Navy EA-18G expeditionary squadron capacity, which has replaced Marine Corps EA-6B squadron capacity for the joint force, will continue to serve as the Department of Defense’s sole joint tactical AEA platform.

Marine Corps aviation EW capabilities include the Intrepid Tiger II EW pod, the EW capabilities inherent to F-35B, the AGM-88 High-Speed Anti-Radiation Missile/Advanced Anti-Radiation Guided Missile (HARM/AARGM) for the F/A-18, and the

AARGM in future F-35B blocks. The F-35B brings a powerful combination of EW, weapons, sensors, and reduced signature to the MAGTF. F-35B electronic warfare support (ES) capabilities include emitter geolocation, identification, and parametric data sharing via Link16. F-35 electronic attack (EA) is provided by the Multi-function Array. Intrepid Tiger II is an EW pod providing organic communications EA and ES for the MAGTF. Intrepid Tiger II deploys with each AV-8B MEU detachment and has also completed three MEU deployments with UH-1Y detachments. Future aviation platforms prioritized for Intrepid Tiger II integration include the MV-22B and KC-130J. Development of an Intrepid Tiger II counter-radar capability began in fiscal year 2016 and is planned for fielding on the MV-22B beginning in fiscal year 2021. The lack of dedicated AEA aircraft community will not create a capability or planning gap for the Marine Corps.

AIRBORNE DATA LINK PLAN

32. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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.

Rear Admiral CONN. The Navy is the lead service for the Link 16 network and coordinates with other services, Department of Defense (DOD) agencies and foreign partners to ensure interoperability of this network. The Link 16 network remains the foundation for Joint Tactical Data Links (TDL) for the foreseeable future.

Ten thousand Link 16 terminals are integrated in the Navy, the Marine Corps, the Army, the Air Force, and 47 partner nation's combat systems. Seamless network integration in a combat environment is achieved through a common configuration for all Link 16 end users. All Navy and Air Force tactical aircraft either have Link 16 or are in the process of being upgraded to this capability. For combat systems that do not operate Link 16, the Navy ensures backward compatibility between current systems, embedded systems and non-program of record terminals that utilize the Link 16 waveform. Link 16 can be data forwarded to any classified Internet Protocol (IP) network by adding an IP "wrapper" around the Link 16 message. This capability is called Link 16 Joint Range Extension Application Protocol-C (JREAP-C).

The Navy uses a number of TDLs that fulfill requirements different from Link 16 attributes and capabilities. Radio Frequency (RF) spectrum diversity, higher throughput, lower latency, and different mission requirements from the Link 16 specification are some of the reasons 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 on DON platforms only, but could be integrated on other services' platforms. TTNT is a low latency, high bandwidth tactical data link that integrates commercial industry standards such as Internet Protocol (IPv4) for its transport mechanism and uses commercial industry message formats such as JPEG, HTML and XML. Common applications and common messages among TTNT platforms ensure interoperability.

Lieutenant General RUDDER. The United States Marine Corps is leveraging the capabilities of industry and DOD agencies to integrate our networks and connectivity. Everything from programmable radios to hosting multiple waveforms capable of translation between networks.

We are also maturing a "gateway" technology that enables our service to exchange data between dissimilar networks, analogous to how we can all access the internet via different equipment—For example, Windows computers, Apple Computers, Android devices, all types of cellular communications devices but only on a tactical network framework.

Finally, Marine Aviation is working closely with NSA to overcome the challenges of handling the multi-level security challenges that this approach levies. Our efforts to date have been promising and we've taken significant steps forward toward that goal.

USMC AVIATION READINESS

33. Senator WICKER. Lieutenant General Rudder, 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 RUDDER. Aviation's readiness crisis is on the mend. Sequestration, under-resourced readiness enabler accounts, and an uncertain fiscal environment combined with an aging legacy fleet forced the Marine Corps to balance current readiness with procurement (future readiness). These under-resourced accounts degraded legacy fleet readiness and resulted in lower aircrew flight hours. The enacted fiscal year 2017 budget, President's Budget 2018 and President's Budget 2019 submissions fully fund these enabler accounts to their maximum executable requirement. As there was a delay from sequester to a decline readiness, there is a delay from increased funding to a return on investment. Right now, our flight lines are healthier in the aggregate. Some specific aircraft are still challenged. We are increasing flight hours for our aircrew compared to previous years. Our recovery plan is working and we still anticipate a recovery to T2.0 training standards in fiscal year 2020 and a Ready Bench in fiscal year 2022 provided the service receives stable, predictable and timely funding.

CH-53K KING STALLION

34. Senator WICKER. Lieutenant General Rudder, please provide an update on the progress of CH-53K testing.

Lieutenant General RUDDER. We are making good progress on CH-53K testing. To date we have ~800 flight test hours on our (4) Developmental Test aircraft and another 800 on our ground test vehicle. We are continuing envelope expansion and system qualification testing. We have performed our KPP mission of 27,000 pounds for 110nm and lifted a 36,000 pound load (heaviest load this aircraft will lift). We have also lifted a ~19,000 pound JLTV. This is the most powerful helicopter this country has ever built.

35. Senator WICKER. Lieutenant General Rudder, what is the Marine Corps doing to ensure the CH-53K is affordable?

Lieutenant General RUDDER. The Cost of the CH-53K is within the Marine Corps TOA and well within our affordability caps. With that being said we have a multi-pronged approach to target cost reduction.

- 1) Targeting production cost through continuous senior leader engagement with OEM on labor rates while leveraging a proven Program Cost Affordability Team (PCAT).
- 2) Seventy percent of the lifecycle cost of the CH-53K is in O&S. We are targeting O&S cost by attacking reliability issues early, driving repair capability to the lowest possible level of maintenance, establishing phased organic depot capability, and proactively ensuring data accessibility for organic capability.

36. Senator WICKER. Lieutenant General Rudder, could you describe Marine Corps input to the Future Vertical Lift program? Is it possible that heavy lift solutions developed in the FVL program might solve capability gaps the CH-53K is meant to address? If so what might be the impacts to the CH-53K program?

Lieutenant General RUDDER. The Marine Corps has a heavy lift requirement that only the CH-53K can provide. FVL Capability Set 3 can't even begin to address the lift requirement for the CH-53K. There are simply no similarities of requirements between the CH-53K and FVL Capability Set 3 other than both can transport troops.

Regarding FVL, the Marine Corps teamed with the U.S. Army on Future Vertical Lift Capability Set 3 (CS3) in fiscal year 2016. The Army kicked off the CS3 Analysis of Alternatives (AOA) in fiscal year 2017 (New Start) after the MDD. Currently, we are working with the Army on collaboration model building for scenarios population. U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) and HQMC CD&I are the source of analysis for this effort. HQMC Aviation has completed the CONOPS and has begun working vignettes for CD&I modeling efforts. Fiscal year 2018 was the earliest HQMC could influence the POM funding process towards CS3. This program is considered a "New Start" for the USMC, therefore certain elements of the AOA are on hold due to the current Continuing Resolution. Our efforts are currently on track; NAVAIR Engineering efforts will begin as soon as the budget has been approved and funding received.

37. Senator WICKER. Lieutenant General Rudder, using organic, over-the-horizon C2 and ISR platforms, how does an Expeditionary Strike Group (ESG) conduct early warning? Does the Marine Corps currently, or have plans to, incorporate any air-

borne early warning (AEW) platforms into the ESG construct (i.e., E-2D Advanced Hawkeye, MH-60R employing the British model of AEW)?

Lieutenant General RUDDER. The ESG is capable of conducting early warning via TACAIR. Other aircraft with a limited ability include H-60S, the MQ-8C Firescout, and RQ-21 Blackjack. Future systems include MAGTF Unmanned Aircraft System Expeditionary (MUX), which has early warning as its top capability requirement. A sea-based platform, MUX will be networked and support over-the-horizon early warning, identification, cueing, and defense against enemy air (fixed-wing, rotary-wing and UAS), cruise missile, low radar cross section threats and indirect fires systems at maximum range in support of the MAGTF.

Use of CAC2S in the MAGTF and on amphibious shipping to share a common data picture. Using the TPS-80 G/ATOR as a contributor to the shared operational picture.

38. Senator WICKER. Lieutenant General Rudder, do you believe that Marine Expeditionary Units would benefit from organic airborne electronic warfare and elevated sensor capabilities? If so, what efforts are being made to accomplish their introduction? If not, why not?

Lieutenant General RUDDER. Yes, MEUs would benefit from organic airborne EW capabilities. The primary organic EW capability for MEUs will be the F-35B. Initial MEU F-35B support will be sourced from VMFA-121 for the 31st MEU and in the summer of 2018 VMFA-211 will support a West Coast MEU. The F-35B brings a powerful combination of EW, weapons, sensors, and reduced signature to the MAGTF. F-35B electronic warfare support (ES) capabilities include emitter geolocation, identification, and parametric data sharing via Link16. F-35 electronic attack (EA) is provided by the Multi-function Array and by the AGM-88 Advanced Anti-Radiation Guided Missile (AARGM) in future F-35B blocks. Additional organic EW capability for MEUs includes the Intrepid Tiger II EW pod. Intrepid Tiger II is an EW pod providing organic communications EA and ES for the MAGTF. Intrepid Tiger II employs with each AV-8B MEU detachment and to date has completed three MEU deployments with UH-1Y detachments.

39. Senator WICKER. Lieutenant General Rudder, the Marine Corps has made an effort to integrate command and control (C2) and intelligence, surveillance, and reconnaissance (ISR) capabilities to the squad level, while enhancing C2 and ISR at the battalion/squadron level and above. With the National Defense Strategy (NDS) shift in focus towards near-peer competition how must Marine Corps' aviation C2 and ISR capabilities, currently predicated on uncontested environments, adapt to facilitate power projection and theater asset-integration against Anti-Access/Area Denial (A2/AD) threats?

Lieutenant General RUDDER. The Marine Corps is focused on denied, degraded, and contested environments where use of any domain (land, sea, air, space, and cyber) is not assumed in accordance with the NDS. For the past several years, the Marine Corps has been conducting experimentation in these environments both in training and operationally. MEU deployments, LSEs, and Tactical Demonstrations have focused on innovative and iterative approaches to improving the capability of existing systems and leveraging the latest in commercial technology. The Marine Corps recognizes the key and critical differences between tactical-type networks that are characterized by dynamic access points, low bandwidth, and unassured connectivity and enterprise-type networks that are characterized by static access points, high bandwidth, and assured connectivity. In addition, the Marine Corps' ongoing MAGTF digital interoperability effort identified a requirement for either standardizing or translating the way digital data is handled to ensure that our connections are truly interoperable not only within the MAGTF, but also within the Naval Service and the Joint Force.

With these critical understandings, the Marine Corps continues to build resiliency through mesh networking and new capabilities that are focused on the latest cyber security risk mitigations developed in conjunction with industry and NSA. Concepts in development include Minotaur and Maven to meld big data from operational and strategic platforms; integrated ASE to provide data from existing self-protect sensors on board our aircraft; MAGTF Agile Network Gateway Link (MANGL) that provides network management, aircraft sensor integration, data services, gateway services, and network and spectrum agility.

40. Senator WICKER. Lieutenant General Rudder, what organic aviation capabilities are necessary for an ESG to successfully operate in contested environments?

Lieutenant General RUDDER. The ESG requires 5th generation platforms like the F-35B/C as well as relevant legacy aircraft such as F/A-18 A-D and AV-8B until

the transition to the F-35 is complete. The ESG also requires H-1s, MV-22s, CH-53K, H-60S, our UAS and CUAS systems, and expeditionary enablers such as aviation electronic warfare, Expeditionary Air Basing Operations, Low Altitude Air Defense, and Tactical Air Control Elements. By fiscal year 2023 every Marine Corps platform will have multiple standardized links available that can be used to flexibly meet IERs across all MAGTF mission threads. Every platform will be a sensor, shooter, EW node, and sharer through digital interoperability. Digital interoperability is the seamless integration of systems and exchange of data, across all domains and networks throughout the MAGTF, naval, joint, and coalition forces, to include communication in degraded or denied environments, to rapidly share accurate information, provide greater situational awareness, accelerate the kill chain, and enhance survivability in order to outmaneuver and defeat the threat across the ROMO.

41. Senator WICKER. Lieutenant General Rudder, the Air Force appears to be on the cusp of procuring a fleet of light attack aircraft to conduct operations against violent extremist organizations in a more fiscally sustainable way and to free up their fighter aircraft to focus on training for the high end fight. Such a capability seems ideally suited to the Marine Corps. Has the Marine Corps considered pursuing a light attack aircraft of its own? Please explain why or why not.

Lieutenant General RUDDER. USMC has a ship-based, expeditionary, level-of-effort light attack capability with the HMLA. Investments in FW LA assets would require additional funding or offsets from current acquisition programs and any offsets would negatively impact AVPLAN initiatives to include: legacy to F-35 transition, H-1 upgrade and transition to Future Vertical Lift, and the MAGTF Unmanned Expeditionary program.

USMC UNMANNED ROADMAP

42. Senator WICKER. Lieutenant General Rudder, discuss the roadmap for Marine Corps unmanned systems, and in particular L-class ship-based unmanned systems, including the Marine Unmanned eXpeditionary (MUX) program.

Lieutenant General RUDDER. The RQ-21A Blackjack has deployed in support of Marine Expeditionary Units aboard L-Class ships since 2016. Both east and west coast MEUs are supported by an RQ-21 systems consisting of 5 air vehicles, a GCS integrated with the ships systems and a launch and recovery system. The Blackjack provides over 10hrs of day / night FMV, with a laser pointer and comm-relay capabilities for the MEU & ARG out to 50 nm.

The MUX requirement will address capability gaps particular to Marine aviation's inability to provide organic persistent multi-role mission coverage out to 350 nautical miles and beyond from sea-based and expeditionary airfields.

43. Senator WICKER. Lieutenant General Rudder, the discussions about requirements for MUX seem to indicate a desire for it to conduct a wide variety of missions, endangering the executability of the program and its ultimate combat effectiveness. In your view, what are the key capabilities that MUX needs to provide?

Lieutenant General RUDDER. The following capability requirements point to solutions needed to fill capability gaps particularly USMC aviation's inability to provide organic, persistent multi-role mission coverage to 350 nautical miles and beyond. These are listed in priority:

Tier 1

1. *Early Warning.* Support over-the-horizon, networked, early warning, identification, cueing and defense against enemy air (fixed wing, rotary wing, and UAS), cruise missile, low radar cross section threats and indirect fires systems at maximum range in support of the MAGTF.

2. *Intelligence, Surveillance, Reconnaissance.* Conduct long range, wide-area, persistent air reconnaissance and surveillance, capable of providing overlapping and cross-cued data from multiple sensors directly to operations and intelligence functions and networks.

3. *Electronic Warfare.* Conduct long range, persistent, penetrating, responsive, airborne electro-magnetic spectrum operations against threats in the air, land, maritime and cyberspace domains.

4. *Communications Relay.* Provide a long range, survivable, airborne digitally-interoperable secure communications Network Bridge between MAGTF elements, joint forces and coalition partners. This capability seamlessly connects multiple air, sea, and ground networks for command and control, communications, target detection, cueing, tracking, and engagement.

Tier 3

5. *Offensive Air Support.* Conduct long range, day, night and all-weather, persistent, time sensitive targeting and strike, high value target attack, fires coordination, battle damage assessment, and kinetic lethal offensive air support.

The following capabilities are important but may be allocated to other systems:

6. *Aerial Escort.* Provide long range armed aerial escort to assault support missions during infiltration, execution, and exfiltration of ground forces, tactical recovery of aircraft and personnel (TRAP), maritime interdiction operations, visit board search and seizure, emergency extract, airfield seizure, landing zone / route inspection, amphibious landings and raids, and ground convoy operations. (This may be performed by the Future Vertical Lift program)

7. *Cargo.* Reduce tactical transportation risk for small unit sustainment. Risk reducing, responsive, logistics transportation system for delivery to (and retrograde from) distributed tactical level units (battalion, squadron and below sized elements) into small, disbursed delivery zones. This includes distribution of ammunition, water, rations, repair parts, fuel, medical supplies, mail, and other commodities. (Manned aviation, Joint Precision Air Drop, or cargo specific UAS).

MQ-25 CARRIER BASED UNMANNED AIR SYSTEM

44. Senator WICKER. Vice Admiral Grosklags, the Navy has designated the MQ-25 one of the first Maritime Accelerated Capabilities Office (MACO) programs. Please describe the specific steps NAVAIR is taking to ensure this is in fact a rapid program.

Vice Admiral GROSKLAGS.

- NAVAIR has taken the following steps to ensure MQ-25 is in fact a rapid program:
 - o In August 2017, the MACO Business Rules for the MQ-25 Unmanned Carrier-Based Capability were approved and signed by PEO(U&W), PMA-268, and NAVAIR Leadership. The MACO Business Rules define the framework, procedures, and set a common understanding between PEO(U&W), the Program Manager, (PMA-268) and NAVAIR to ensure accelerated acquisition of MQ-25, through the following:
 - A short, empowered, chain of command with approval authorities delegated to the lowest possible level: MQ-25 government staff is lean, empowered, and adheres to an agile staffing concept. Members of our program are empowered by their competency and program leadership to make decisions at the lowest levels. The program's industry and external government partners are expected to take a similar approach.
 - The empowered program team will seek waivers and deviations from any encumbering practices, procedures, policies, directives, regulations or requirements in order to execute rapidly and affordably.
 - NAVAIR leadership acknowledges and accepts that MQ-25 is high priority within NAVAIR for resource allocation, to include reach back personnel, which will result in quicker surge capability when warranted.
 - Reliance upon industry processes and procedures to the maximum extent possible to achieve and meet the intent of the Government's goals without adding schedule or undue costs.
 - Leverage maximum existing Department of Navy programs of record for existing capability to expedite schedule and reduce technical risk.
 - A small, empowered, government team in place at the Contractor facility: The intent of the Government Embedded MACO Acceleration Team (GEMAT) is to provide overall insight, not oversight, and involvement/participation in daily Contractor engineering, test, logistics, and programmatic decisions and activities to achieve accelerated capability delivery. The GEMAT will be staffed by personnel empowered by leadership with decision authority.
 - Real-time collaboration through a Common Digital Environment (CDE): The CDE enables both Government and Contractor to see information in real-time and allows for a single authoritative source of data. The CDE allows for transfer of data between the Government and Contractor and ensures accurate configuration management is maintained while eliminating the need for duplicative licensing between the Government and Contractor.
 - A test strategy leveraging Capabilities Based Test & Evaluation (CBT&E), Modeling and Simulation, and integrated contractor, developmental and

operational test operations from day one. The MQ-25 Integrated Test Team will use derived requirements from the MQ-25 System Design Specification (SDS) and apply CBT&E methodologies to evaluate testable capabilities and requirements. Additionally, operational test requirements will be interwoven into campaign/mission test requirements to provide a comprehensive CBT&E test plan. Developmental and Operational testers will be part of the GEMAT at the contractor's facility.

- Reduced requirements: In support of accelerated acquisition, the MQ-25 SDS requirements have been derived at a performance level to focus on a minimum set of "shall" statements and verification requirements to support airworthiness, CVN suitability, interfaces with Government Systems and mission execution.

NAVY AND MARINE CORPS AIR-LAUNCHED MUNITIONS

45. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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?

Rear Admiral CONN. The Navy's President's Budget 2019 budget represents the best balance of investments in capacity (quantity) and capability (modernization and future upgrades). This also applies to the Navy's approach to procurement of munitions. In President's Budget 2019, all major weapons acquisition programs remain consistent or increase from fiscal year 2018 to fiscal year 2019 and support the Department's goal of increased capacity and capability. The procurement of some munitions are limited by industrial capacity and capability, multi-year procurement contracts and parts obsolescence. For example, AIM-120 AMRAAM production is at capacity due to parts obsolescence. Where there are capacity shortfalls, the DON relies on legacy weapon variants and conducts yearly inventory analysis and establishes risk mitigation strategies to support Combatant Commander operational requirements. While carefully managing current inventories to support warfighting requirements, President's Budget 2019 invests heavily in new capabilities. Fiscal year 2019 provides \$32.5 million in RDT&E funding for continued AIM-120D software capability enhancements and \$212 million to procure 141 missiles to support warfighter requirements. Similarly, President's Budget 2019 provides funding to procure the Joint Air-to-Ground Missile (JAGM) Low Rate Initial Production of 75 missiles. JAGM, the replacement for Hellfire, utilizes multi-mode seeker technology providing advanced line-of sight and beyond-line-of-sight capabilities. The Long Range Anti-Ship Missile (LRASM), the next generation anti-surface warfare missile, will provide precise, discriminating, and lethal long-range air-launched capabilities. Fiscal year 2019 invests \$143 million in RDT&E for LRASM improvements and \$81 million to procure 25 LRASM All-Up-Round weapons.

Lieutenant General RUDDER. Current air-launched munitions inventories are sufficient to support Defense Strategic Guidance, however, the munitions expended in support of Operation Inherent Resolve (OIR) significantly strained global inventory levels.

The Marine Corps and the other services with similar inventory issues, are increasing procurement of PGMs through baseline and OCO funding. In addition, CENTCOM has been directed to use their best judgment in an effort to manage expenditure rates without losing focus on providing the maximum support to the warfighter.

Both training (readiness) and contingency operations require live expenditures that cannot be replaced using baseline funding alone. USMC Aviation is relying on OCO funding to replace the high rate of expenditures in the current fight while simultaneously investing baseline funding in critical precision strike capabilities to win the future fight.

LONG RANGE ANTI-SHIP MISSILE

46. Senator WICKER. Rear Admiral Conn, now that the Offensive Anti-Surface Warfare Increment 2 has been terminated, what is the long-term plan for the Long Range Anti-Ship Missile? Does the current program of record provide sufficient capability and capacity to support the NDS priority of China and Russia?

Rear Admiral CONN. The DON accepts the intent of Congress to delay development of an OASuW Increment 2 material solution as demonstrated by lack of Congressional support in multiple prior year budget submissions (via formal budget marks). As a result, we are adjusting our mid- and long-term OASuW strategy.

The Long-Range Anti-Ship Missile (LRASM) is the OASuW Increment 1 material solution to address near-term capability gaps as delineated in a PACOM Urgent Operational Need Statement. To address the mid-term OASuW capability gaps brought about with OASuW Increment 2's delay, our fiscal year 2019 budget request includes an increase in LRASM program procurement for an additional 25 missiles across the FYDP; and an increase in RDT&E funding to support LRASM capability improvements. This RDT&E funding provides for the development, integration and test of classified LRASM improvements, beyond line-of-sight communications, integration of baseline JASSM-ER capabilities, obsolescence correction and implementation of cost reduction initiatives. All LRASM capability improvements directly support the SECDEF approved National Defense Strategy (NDS) prioritizing efforts that address a resurgence of long-term strategic competition between nations (China and Russia).

Even with the planned LRASM capability improvements and increased missile procurement quantities, the DON needs to reassess the need for a long-term air-launched OASuW Increment 2 program of record. Our plan is to leverage the ongoing Next Generation Land Attack Weapon (NGLAW) Analysis of Alternatives (AOA). The NGLAW AOA is investigating a long-range surface and submarine-launched strike weapon that addresses both the land attack and ASuW mission areas. Our plan is to leverage NGLAW AOA analysis (gaps, technology readiness, etc.) to determine what, if anything, should be pursued for long-term Naval Aviation ASuW. The NGLAW AOA is scheduled to out-brief no later than the 4th quarter of fiscal year 2018.

ADVANCED ANTI-RADIATION GUIDED MISSILE

47. Senator WICKER. Rear Admiral Conn, the recent DOT&E report for the Advanced Anti-Radiation Guided Missile (AARGM) Program stated that the missile was "not operationally suitable," and that "AARGM will likely be ineffective against advanced surface-to-air missile threat systems, particularly in an Anti-Access and Area Denial (A2AD) environment." Given that the NDS emphasizes the Services prioritize capabilities suitable against China and Russia, why is the Navy deciding to increase funding to the program when DOT&E has found it not operationally effective for those scenarios?

Rear Admiral CONN. The Department of the Navy (DON) is procuring AARGM because the weapon system meets all Joint Chiefs of Staff (JCS) approved/validated Key Performance Parameters (KPPs). The DOT&E concerns were with AARGM software stability and Non-Key Performance Parameters (Non-KPP) attributes. The DON and DOT&E agree that follow-on testing completed under an AARGM/BLK 1 test program meets all JCS validated KPPs and makes improvements to the baseline AARGM (BLK 0) performance.

The DON's request for increased RDT&E funding supports development of AARGM/BLK 1 software updates to address evolving Red Force time-critical strike threats and high-value targets as delineated in the SECDEF approved National Defense Strategy.

ADVANCED WEAPONS

48. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, 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? Please provide specific examples, including research and development efforts.

Rear Admiral CONN. To ensure that we have relevant and effective munitions, the DON has increased our weapons RDT&E funding compared to President's Budget 2018. The Department is working aggressively to field next-generation weapons technologies; using Accelerated DOD and Navy Acquisition policies to rapidly migrate DARPA and Navy S&T efforts to programs of record. Examples include improvements to the DARPA developed Long Range Anti-Ship Missile (LRASM) program, and transition of the Strategic Capabilities Office (SCO) Miniature Air Launched Decoy demonstration (MALD-X). The DON has also accelerated other Navy weapons programs like: improvements to AIM-120D missiles that increase their combat effectiveness and counter advanced threats and Electronic Attack (EA) techniques through 2027 and expanding the Advanced Anti-Radiation Guided Missile (AARGM) and AARGM-Extended Range (AARGM-ER) capability against time sensitive high value targets in fiscal year 2019.

Lieutenant General RUDDER. 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.

TH-57 REPLACEMENT

49. Senator WICKER. Rear Admiral Conn, please provide the committee an update on efforts to replace the Navy's TH-57 training helicopters.

Rear Admiral CONN. The Navy has initiated an effort to replace its legacy TH-57 training helicopters. The plans consist of a procuring a commercial-off-the-shelf (COTS) helicopter through an open competition starting in fiscal year 2020. The COTS acquisition will allow the Navy to obtain a suitable replacement trainer, free of development costs, at the best value to the Navy. We have conducted extensive market research, and we are now in the process of understanding what industry has to offer. This information will be used to help us draft a Request for Proposal (RFP) which we expect to release early next year. The goal of this program is to rapidly and efficiently replace the TH-57 with a better, more modern helicopter by leveraging the capabilities and capacity of industry.

TRAINING INFRASTRUCTURE

50. Senator WICKER. Rear Admiral Conn and Lieutenant General Rudder, as the Department focuses increasingly on the high end fight, how important are adequate training ranges and supporting equipment to ensuring our aviation forces are adequately prepared?

Are there areas where our training infrastructure needs to be improved, in terms of airspace, equipment or other elements? Please provide specific examples.

Please describe efforts the Navy and Marine Corps are making to increase and improve the use of Live, Virtual and Constructive (LVC) training, and how those efforts are interoperable, within and among all the services.

Rear Admiral CONN. Replicating a realistic and stressful combat environment at the advanced level requires investment in training range systems and infrastructure to ensure blue force, opposition force (OPFOR), and instrumentation systems deliver a relevant, modern, and recordable training environment. For example, a robust electronic warfare atmosphere saturated with offensive and defensive weapon systems poses unique de-confliction challenges similar to what is experienced in modern conflicts. For naval aviation, the Fallon Range Training Complex (FRTC) in Nevada must be preserved to allow for such combat systems to assess unit training shortfalls and assign mitigation measures before deployment. Naval aviation strike tactics and capabilities have outpaced the constraints of the FRTC as it has remained relatively static since the 1970's. Despite these challenges, naval aviation is working to achieve a mitigated solution that preserves security of operations and training competencies, but will not compromise the ability to survive and prevail in combat. Live, Virtual, Constructive (LVC) training offers a robust environment to integrate live aircraft, simulators, and constructive threats for modern, realistic training. For LVC design to be effective, high fidelity simulators and models are required in addition to an architecture that can integrate and distribute live and synthetic systems. Nevertheless, live training on contemporary, accessible ranges for validation remains critical to confirm our ability to defeat a modern adversary in the high end fight. LVC training is not a separate, standalone program, but the compilation of capabilities and investment across the training enterprise to create a "training environment." The Navy Continuous Training Environment (NCTE), or tactical training network, forms the "backbone" to connect LVC entities among disparate ranges, simulators, and platforms. While initial Navy LVC efforts focus on

providing improved USN training capabilities and system interoperability, the NCTE allows access to the Joint Training Environment, the Joint National Training Capability (JNTC) as well as to USA, USAF, and combatant commander training infrastructures. The Navy understands to execute effectively and swiftly with the other services is one of the U.S. military's strategic advantages. In support of a LVC event during exercise Northern Edge 2017, the USN and USAF directly integrated our two tactical training networks, the NCTE and the Distributed Missions Operations Network (DMON), allowing USN F/A-18 training devices to interact with USAF simulators in real time with live aircraft and ships operating in Alaska Commands area of responsibility.

Lieutenant General RUDDER. Of course, they are critically important. We have to train like we fight. The only place and manner in which we can prepare to face a near-peer competitor at the high end fight, fully integrated as a MAGTF, is in a properly instrumented range with the space to operate at the edge of our envelope and go full speed in the air and on the ground. It must be properly instrumented so we can gain the most learning from our training and fully explore the effectiveness of our systems and our tactics. In fact, adequate and properly instrumented ranges are absolutely required, or we aren't preparing for the high end fight.

The areas of improvement should focus on newer threats and emitters representative of current nation/ non-nation state weapons capabilities and accurate aircraft tracking weapons solutions along with battle damage assessment. The end state desire would also include score-able targets to assist in weaponeering, integrated calls for fire, and weapons performance analytics to support RDT&E.

Marine aviation is moving forward to expand Aviation Distributed Virtual Environment (ADVTE) to 1st and 4th MAW and enhance 2nd and 3rd MAW ADVTE capabilities to have a full ACE virtual training environment. Marine Aviation is also working with NAVAIR/PMA-205 on aircraft LVC integration of live training combined with virtual (i.e. simulator training). In addition, Aviation is working with TECOM for LVC integration training with GCE and LCE as part of USMC LVC-TE (Live, Virtual, Constructive Training Environment). Once ADVTE is fully operational it will provide connectivity to the other services simulation training.

QUESTIONS SUBMITTED BY SENATOR MIKE ROUNDS

F-35C

51. Senator ROUNDS. Vice Admiral Grosklags, during the 6 March hearing, Rear Admiral Conn described how the transition of a squadron to the F-35C would take up to a year, due to Fleet Replacement Squadron training and maintenance constraints. Has the Navy examined courses of action to increase transition throughput in order to accelerate F-35C fielding? If so, are any of the courses of action viable, given current resource allocations? If not, what can the Congress do to help the Navy accelerate F-35C fielding?

Vice Admiral GROSKLAYS. From start to finish, a year is not an unusual amount of time for a squadron to transition to a new aircraft. The limiting factor is generally the time it takes for maintenance personnel to develop enough experience with the new aircraft to independently conduct maintenance operations. This timeline fits well within the normal Navy training cycle between deployments.

AIRBORNE BATTLE MANAGEMENT

52. Senator ROUNDS. Rear Admiral Conn, the Air Force is walking away from re-capping the JSTARS and AWACS because they are not survivable in the mid or long term—are there similar survivability issues for P-8 and E-2D—if not why not?

Rear Admiral CONN. The Navy used the most relevant and in-depth threat analysis provided by our national Intel communities when they instituted the P-8A and E-2D programs. These deliberations were fully informed and encompassed all known and anticipated threats for each platform within their Concept of Operations (CONOPS).

The Navy intends to use its most survivable manned and unmanned platforms in the high end airborne fight and will control the battlespace management of these airborne platforms via national and battle group netted sensors, net enabled weapons and advance CONOPS that extends the reach and survivability of these platforms.

As a core pillar of the Naval Integrated Fire Control-Counter Air (NIFC-CA) construct, the E-2D extends organic AEGIS and fighter missile kill chains by providing long-range weapons quality surveillance data via Cooperative Engagement Capability (CEC) and Link-16. The E-2D will leverage the capability of other pillar plat-

forms/programs through concept of employment options and also employ additional onboard/offboard capabilities to ensure mid and long-term survivability. The Navy is also continuing to evaluate future E-2D capabilities to stay ahead of advanced threats.

The P-8A performs an entirely different mission set than the E-2D or JSTARS or AWACS platforms. The P-8's primary missions are ASW and ASuW, dedicated to preserving the safe haven and Strategic Lines of Communication in the high end fight. It is not designated to perform airborne battle management missions or participate in the high end air to air battle. The P-8A will leverage both concept of employment options and onboard/offboard capabilities to ensure its mid and long-term survivability. Through incorporation of its Increment 3 advanced sensors and systems it will be a full participant/ node in the Navy's future battlespace awareness Concept of Operations (CONOPS). Incorporating advanced Sensors with greater reach such as the Advanced Airborne Sensor (AAS), coupled with its advanced track management system (Minotaur), the P-8 brings a generational leap in battle space awareness over the P-3C. P-8 will conduct the majority of its strategic and operational ASW, ASuW and ISR warfighting objectives outside the major threat ranges of our adversaries. Through use of advanced sensors and netted C4I systems and prudent Battle Group CONOPS, the P-8 will remain away from the high end airborne fight.

INFRARED SEARCH AND TRACK (IRST)

53. Senator ROUNDS. Rear Admiral Conn, is your IRST program linked to USAF IRST program? When will IRST be available for Super Hornets? How can we move the IOC/FOC date to the left?

Rear Admiral CONN. Although not a joint effort, the Navy and Air Force IRST programs have synergies and inform one another to enhance the design and development of each service's independent sensor program.

President's Budget 2019 supports a 4th quarter fiscal year 2021 IOC for IRST Block II.

Pulling IRST Block II IOC further left is difficult as the schedule for release is aligned with the release of F/A-18 Software Configuration Set (SCS) H16. Critical Block II risk reduction efforts are underway using IRST Block I systems with F/A-18 SCS H14.

Accelerating IRST FOC is possible through changes to the currently approved Block II LRIP ramp up and by increasing FRP rates. This would require additional APN-5 investments in fiscal year 2019 through fiscal year 2024.

QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

U.S. NAVY HELICOPTER REPORT

54. Senator BLUMENTHAL. Vice Admiral Grosklags and Rear Admiral Conn, in last year's NDAA, this Committee endorsed the Navy's Force Structure Assessment seeking a 355-ship Navy. With this increase in shipbuilding, we also need to consider what demands this places on the size of our rotary wing aircraft to support new ships. That is why this Committee included a reporting requirement in last year's NDAA that required the Secretary of the Navy to submit a report by March 30, 2018 that describes and assesses the capacity of the Navy to increase production of anti-submarine warfare and search and rescue helicopters. Do I have your commitment that this helicopter force structure assessment report will be delivered to Congress on time at the end of the month?

Vice Admiral GROSKLAGS and Rear Admiral CONN. The rotary-wing Report to Congress was signed by the Secretary of the Navy on March 28, 2018, and delivered to the congressional defense committees.

CH-53K

55. Senator BLUMENTHAL. Lieutenant General Rudder, replacing the legacy CH-53E remains crucial as low numbers of flyable aircraft is impacting the current state of Marine Corps aviation readiness. In addition to bringing the cost down quicker, what are the other benefits of increasing the current production ramp rate for Marine Aviation?

Lieutenant General RUDDER. Increasing the CH-53K ramp rate will allow the Marine Corps to transition its HMH squadrons to the CH-53K faster, but only up to a certain rate. The Marine Corps—and Sikorsky—could support two additional CH-53Ks (10 total) if they were included in the fiscal year 2019 budget. In 19, 20 and 21 industry can support production of 10, 18 and 24 aircraft, respectively.

There could be additional cost savings through increased procurement beginning in fiscal year 2021 when industry can support full rate production. Currently, the Marine Corps' POR is 200 CH-53K aircraft, and the average recurring flyaway cost of the aircraft is \$87.6 million over the life of the program. The Cost of the CH-53K is within the Marine Corps TOA and well within our affordability caps. With that being said we have a multi-pronged approach to target cost reduction.

1) Targeting production cost through continuous senior leader engagement with OEM on labor rates while leveraging a proven Program Cost Affordability Team (PCAT).

2) Seventy percent of the lifecycle cost of the CH-53K is in O&S. We are targeting O&S cost by attacking reliability issues early, driving repair capability to the lowest possible level of maintenance, establishing phased organic depot capability, and proactively ensuring data accessibility for organic capability.

F-35

56. Senator BLUMENTHAL. Vice Admiral Grosklags, what is your plan for increasing F-35C procurement to close the Navy's gap with its tactical aircraft shortfalls, and get fifth generation capabilities to carrier air wings as quickly as possible?

Vice Admiral GROSKLAGS. The Navy's F-35 procurement ramp as submitted in President's Budget 2019 is adequate to meet the planned transition schedule for the first 4 Navy F-35C squadrons. The Navy is investigating the costs associated with accelerating the ramp and the transition of additional squadrons. Consideration to the global demand for forward deployed Naval Aviation combat capability and the availability of fleet squadrons to execute a nearly 12 month transition process weigh heavily in any procurement ramp discussion. The Navy will continuously evaluate these and other relevant factors to refine the procurement ramp to optimize efficiency, maximize cost savings, and accelerate 5th generation capability to the fleet when possible.

57. Senator BLUMENTHAL. Vice Admiral Grosklags, on 12 January, Secretary Lord provided this committee with the F-35 Modernization Continuous Capability Development and Delivery (C2D2) report to meet fiscal year 2017 Congressional Reporting Requirements. The report stated, "The services have not made a decision on what Lot 2 and beyond aircraft will be brought up to a block 4 configuration." Can you provide an estimate on when the Department of the Navy will come to a decision with retrofitting its LRIP lot 2-10 F-35B and F-35C aircraft to a Block 4 configuration?

Vice Admiral GROSKLAGS. The United States Navy will continue to assess mission assignments, sustainment costs, training requirements and return on investment based on remaining airframe life when evaluating the decision to retrofit LRIP lot 2-10 aircraft to a Block 4 configuration. Currently RDT&E funding is focused on bringing the Block 4 capabilities required to meet a near peer threat to the production line. Once the Navy has begun to field Block 4 aircraft in our fleet squadrons the determination will be made concerning retrofits of the older airframes.

NAVY'S CYBER UNFUNDED REQUIREMENTS

58. Senator BLUMENTHAL. Vice Admiral Grosklags, according to the Navy's fiscal year 2019 unfunded requirements list, several cyber initiatives totaling nearly \$100 million are listed? Why are so many cyber defense programs listed on the Navy's Unfunded Requirements list—some of which affect naval aviation—instead of being on the Navy's fiscal year 2019 budget request?

Vice Admiral GROSKLAGS. The Navy's fiscal year 2019 budget submission represents the best balance for Navy requirements. Cybersecurity is a top priority. Our President's Budget 2019 request includes \$352 million in fiscal year 2019 and \$2.1 billion across the FYDP for cybersecurity to improve our operational defense-in-depth capabilities across the Navy enterprise and invests substantially in the resiliency of our networks. President's Budget 2019 added \$30 million in fiscal year 2019 and \$448 million across the FYDP for cyber resiliency efforts and there is an additional \$49 million in fiscal year 2019 for cyber vulnerability assessments.

President's Budget 2019 funds the Navy's highest cybersecurity priorities in fiscal year 2019 and has programmed funds in the Future Years Defense Plan for cybersecurity programs. Should additional funding become available in fiscal year 2019, the Navy would accelerate these activities to enhance our ability to counter network threats and increase cyber resiliency.

59. Senator BLUMENTHAL. Vice Admiral Grosklags, should additional funding become available, what additional capabilities will naval aviation gain from an increase in dollars for these cyber defense programs?

Vice Admiral GROSKLAYS. Naval aviation will be able reduce the adversary's attack surfaces by accelerating cyber-resiliency investments into fiscal year 2019 and through the FYDP. These include the segmentation of the Aviation Land and Launch Enclave (ALLE), remediation of assessed issues on the E-2D Advanced Hawkeye and Portable Electronic Maintenance Aides (PEMA), and cyber resiliency and integration of Common Control Station (CCS).

The Aviation Land and Launch Enclave incorporates several ALRE and ATC CVN systems into a centrally managed enclave environment to enhance network segmentation, device hardening, increased cyber situational awareness and cyber incident response within the enclave.

ALLE implements boundary defense and cyber resiliency as well as re-architecting some network foundations to allow effective follow-on patches for changing threats.

E-2D cyber remediations and protections include fixes to Vulnerability Assessment Report (VAR) outcomes; supply chain risk mitigations, including efforts related to the 1553 bus; Avionics Flight Management Computer (AFMC) and Network File System (NFS) cyber resiliency efforts; and patch management improvements to enable a more responsive identification and deployment process.

The Portable Electronic Maintenance Aides (PEMA) remediations address enterprise-wide solutions for standardized software and address cyber deficiencies identified during cyber risk analysis. These are also tied to a broader investment plan to increase the number of PEMAs across the Naval Aviation enterprise, as part of Sustainment Vision 2020.

Common Control Station (CCS) efforts include cybersecurity certification requirements.

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

TUESDAY, MARCH 20, 2018

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

MARINE CORPS GROUND MODERNIZATION

The Subcommittee met, pursuant to notice, at 2:33 p.m. in Room SR-232A, Russell Senate Office Building, Senator Roger F. Wicker (chairman of the Subcommittee) presiding.

Subcommittee Members present: Senators Wicker, Rounds, Sullivan, Hirono, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER F. WICKER

Senator WICKER. Good afternoon. The Senate Armed Services Subcommittee on Seapower convenes this afternoon to examine Marine Corps ground modernization initiatives.

This afternoon, our Subcommittee welcomes two distinguished witnesses: Mr. Jimmy Smith, Deputy Assistant Secretary of the Navy for Expeditionary Programs and Logistics Management, and Lieutenant General Robert Walsh, Deputy Commandant for Combat Development and Integration.

Gentlemen, thank you very much for your attendance today, and for your decades of service.

Mr. Smith, I understand you are testifying before this Subcommittee for the first time. Is that correct?

Mr. SMITH. That is absolutely correct, Senator.

Senator WICKER. Well, we welcome you all the more, and we are eager to hear what you have to say.

As the military's force in readiness, the Marine Corps has unique crisis response roles and missions. According to the new National Defense Strategy, globally deployed marine units will continue to serve as front-line forces postured against potential adversaries. Although the NDS [National Defense Strategy] sets new priorities, it does not change the Marine Corps' role as the military's tip of the spear. Today, this Subcommittee will learn about the state of marine ground forces and the efforts underway to restore readiness and modernize these forces. I look forward to hearing how the Na-

tional Defense Strategy is shaping the Marine Corps' perspective on readiness, operations, and modernization for ground forces.

Since the NDS release, Marine Corps leadership has discussed the current and future challenges faced by amphibious forces. Sophisticated sensor arrays, space and cyber weapons, drones, electronic warfare, mines, and highly capable air and missile threats all greatly complicate amphibious operations and power projection from the sea. The Marine Operating Concept 2025 offers warfighting concepts such as sea control, littoral operations on a contested—in a contested environment, and expeditionary advanced base operations to help the marines meet many of these challenges.

I hope our witnesses will explain how the fiscal year 2019 budget request translates strategic direction and operational concepts into the rapid development and acquisition of capabilities.

Many Marine Corps modernization programs have suffered from a drawn-out—from drawn-out development timelines, shifting and unrealistic requirements, and cost overruns. These factors have frequently conspired to prevent the fielding of replacements for aging systems, leaving our marines short of critical capabilities. Years of budget instability have increased the damage, and that's on us, sitting around this table. However, the recently passed 2-year budget agreement provides a window of stability and operation for the Marine Corps. This Subcommittee is confident that the Marine Corps can develop and field more lethal and agile ground forces to prevail in the high-end fight.

This afternoon, our Subcommittee will examine five key areas relating to Marine Corps ground programs:

First, long-range precision fires. The Subcommittee is eager to hear about efforts to field longer-range rocket artillery and missile systems and—that can do a better job of targeting adversary combat formations and supporting naval maneuvers. In support of this effort, the Marine Corps will activate a second High Mobility Artillery Rocket System, HIMARS, Battalion at Camp Lejeune, North Carolina, this year. The Army faces similar lethality and range gaps. We've got some Army people in the room today, and we appreciate their service also. We expect both services to work collaboratively to address shortfalls in their tube and rocket artillery and surface-to-surface missile systems.

Secondly, mobile short-range air defense. United States ground forces have not experienced enemy attacks since the Korean War. However, I am concerned that manned and unmanned aircraft, rockets, artillery, and missiles pose an increasing danger to marine units and installations worldwide. The Marine Corps has not updated its air defense capability since the early 1990s. Our witnesses should explain ongoing efforts to rectify this shortfall. I understand that the Army also faces many of the same challenges.

As with long-range precision fires, this Subcommittee believes that the two services should work together to meet similar requirements. Although the Army and Marines seem to be collaborating on short-range systems, fielding a medium-range system is a more challenging issue. So, we might want to ask why that is. The Subcommittee would like a better understanding of the Marine Corps'

requirements and plans to deploy longer-range air defense capabilities.

Next, close combat lethality. Secretary Mattis recently established a Pentagonwide task force to improve the lethality, survivability, and resiliency of close combat formations. I've heard concerns that the Marine Corps may have prioritized readiness recovery efforts on aviation units, to the relative detriment of close-combat units. So, we'll ask about that.

The Subcommittee believes that the Marine Corps must make a balanced readiness and modernization effort across aviation and ground programs. We look forward to hearing from today's witnesses about Marine investments in its core infantry formations.

Next, very shallow water mine countermeasures. Historically, mines have created serious difficulties for maritime forces, particularly amphibious units. Potential adversaries, such as North Korea and Iran, may employ large numbers of mines to deny access to strategic waterways and approaches. The Navy's littoral combat ship and several airborne platforms have countermine capabilities, but they are focused on operations in deeper water, away from shore. The Marine Corps needs to counter—needs countermine capability from ship to shore, including in very shallow water and on the shore. Given that the Navy and Marine Corps recently agreed to produce joint countermine doctrine, our witnesses should address how the Marines will deal with mine threats on shore and in regions with very shallow water.

Finally, combat vehicle obsolescence. Our Subcommittee would like to discuss the state of major Marine Corps ground combat vehicles. The light armored vehicle first entered service in the mid-1980s; the amphibious assault vehicle, in the late 1970s; and the Abrams tank entered service in the early 1990s. The Marines clearly need more modern combat vehicles.

The Subcommittee is interested in the Marine Corps' plan to modernize, replace, and upgrade its legacy ground platforms. The recently released National Defense Strategy requires all of the services to adjust to revised security priorities. The Marine Corps is no exception. The new guidance will require the Marines to make difficult decision, especially concerning ground programs.

The emerging security environment presents significant challenges to the ways in which the Marine Corps has traditionally operated. It is imperative that the Subcommittee and the Marine Corps continue to work closely together to ensure the success of its ground program modernization initiatives.

I, once again, thank you for your service to the country and for appearing today.

I'm delighted to recognize my teammate and Ranking Member, Senator Hirono.

STATEMENT OF SENATOR MAZIE K. HIRONO

Senator HIRONO. Thank you, Mr. Chairman.

I join you in welcoming General Walsh and Mr. Smith to testify today on the fiscal year 2019 budget request for Marine Corps ground modernization programs. We thank you for your testimony and for your service to our country.

The 2018 National Defense Strategy, NDS, states that the primary challenge facing our Nation is the reemergence of long-term strategic competition with Russia and China, near-peer competitors. The men and women who serve in Marine Corps Base Hawaii and marines serving throughout the PACOM area of responsibility are vital to protecting our strategic interests in the Asia-Pacific regions and—region—and our national defense. Our marines support military operations around the globe, and we must ensure that they remain ready and capable to address contingencies at a moment's notice.

A vital part of supporting readiness capability is ensuring that our marines have access to combat equipment that will support them in this mission. To achieve this goal, the fiscal year 2019 budget request makes targeted investments in the ground combat and tactical vehicle portfolio of the Marine Corps. It includes a total of 2.9 billion for Marine Corps procurement and 850 million for research, development, test, and evaluation.

One of the most important Marine Corps ground modernization programs is the amphibious combat vehicle, ACV [Amphibious Combat Vehicle]. The ACV program will replace the assault amphibious vehicle, AAV [Amphibious Assault Vehicle], which has been in operation for over 40 years. As the Chairman has noted, we need to modernize our combat vehicles.

As part of the ACV acquisition strategy, the Marine Corps has awarded contracts to two vendors, each tasked with building prototypes for testing and evaluation. This summer, the Marine Corps will select one of these vendors to be the prime contractor for the program. The fiscal year 2019 budget request includes 167 million for the prime contractor to build 30 vehicles for the ACV 1.1 program. In addition, the Marine Corps will begin designing and developing the ACV 1.2 variant. Unlike the ACV 1.1 program, which has limited amphibious capability, the ACV 1.2 will be a fully amphibious vehicle. The fiscal year 2019 budget request includes 55.8 million in research, development, test, and evaluation funding for the new ACV 1.2 program. I welcome an update from our witnesses on the status of the ACV program.

As the ACV program moves forward, the Marine Corps continues to upgrade assault amphibious vehicles, AAV. The Marine Corps first fielded the AAV more than four decades ago, and marines will continue to rely on these vehicles until they are replaced by new ACV vehicles. In order to protect our men and women who rely on the AAV, the Marine Corps is modernizing a portion of AAVs with survivability upgrades.

The final Marine Corps vehicle program I want to highlight is the joint light tactical vehicle, JLTV [Joint Light Tactical Vehicle]. JLTV is a joint Army and Marine Corps program that will replace the high mobility multi-wheeled vehicle, better known as the Humvee. The fiscal year 2019 budget includes 607 million to procure 1,642 JLTV vehicles. Over the course of the program, the Marines intend to replace roughly one-third of their legacy Humvee fleet.

In addition to the major vehicle modernization programs, the Marine Corps has prioritized two other programs in the fiscal year 2019 budget to support our marine forces:

The first is the ground-air task-oriented radar, or GATOR [Ground/Air Task Oriented Radar]. The GATOR is an expeditionary radar system that will replace legacy radar systems currently fielded by the Marine Air-Ground Task Force. The Marine Corps plans to procure six systems in fiscal year 2019.

The second program is the high-mobility artillery rocket system. Like the Army, the Marine Corps has capability gaps in long-range artillery and rocket systems. To address these shortfalls, the budget request includes 134 million to acquire new high-mobility artillery rocket systems for the 5th battalion 10th marines, which is being reactivated.

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

Senator WICKER. Thank you very much, Senator Hirono.

Gentlemen, you submitted a joint written statement. Who would like to summarize that, in about 5 minutes?

Lieutenant General WALSH. I think I can do it in less than that, Senator Wicker.

Senator WICKER. We're delighted to have you—

Lieutenant General WALSH. I'll take that.

Senator WICKER.—General Walsh.

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

Lieutenant General WALSH. Thank you, Chairman Wicker, Ranking Member Hirono, and Senator King and Kaine. Thank you for the opportunity to testify.

The Marine Corps ability to serve as our Nation's crisis response force is largely due to this committee's support, and we thank you for that strong support, on behalf of all our marines. A fully resourced defense budget, in conjunction with the long-term budget stability that we're getting through the Bipartisan Budget Act, will send a strong signal to our allies, partners, and all potential adversaries, that the U.S. is fully committed to preserving a free and open world.

As the Commanding General of the Marine Corps Combat Development Command, I have the tremendous honor of leading over 18,000 marines, sailors, and civilians spread over commands across the country. We are the Marine Air-Ground Task Force's capability developers and integrators, which means our job comes down to one sentence, getting the right capabilities at the right time to the warfighter as the best that the Nation can provide.

I'm honored to serve daily with these men and women. Over the last year, the Marine Corps has been focused around the globe, providing combined armed teams to crises or places where crises may occur to meet the Congress's mandate to be ready to suppress or contain international disturbances, short of war. You mentioned the National Defense Strategy. We believe that we're key players in the contact, blunt, and surge forces. So, out of the four layers that are in that, we see ourselves as players in that.

But, as you said earlier, as we look at today's situation, the threats that are out there, looking to compete strategically, as we look at our marines that are out there, and sailors operating every day as—in part of those contact-and-blunt forces, those forces must be a lethal combat-credible force oriented on warfighting to be able to provide that credible deterrence.

During the last several budget cycles, we've been focused heavily on improving readiness of the force. The increase in defense spending and improved budget stability provided by Congress today allows us to place greater emphasis on modernization. Specifically, within our total obligated authority, we've increased, in 2019, by 7 percent. To show you that—the step that we're making towards modernization with that 7-percent increase, we're increasing our modernization accounts by 32 percent. This increased signal in modernization shows our sense of urgency and the threats that we face via the National Defense Strategy.

The Marine Corps fiscal year 2019 budget aligns five budget priorities of information warfare, long-range precision fires, air defense, command and control in a degraded environment, protected mobility, and enhanced maneuver with the Secretary of Defense's direction to increase lethality, resilience, agility, and build a flexible and dynamic force.

Additionally, I want to emphasize our close coordination with the Army. You mentioned that earlier. I think we've got close coordination in full alignment, in many case. In fact, the Commandant's direction to me is to align them in every single case that we can. I think you'll see, over today's hearing, that we're trying our best to do that.

My prepared statement contains greater detail on each of these five priorities, but I thank you for the opportunity, and with—along with my partner, Mr. Smith, to testify before you today.

Thank you.

Senator WICKER. Thank you, General.

Mr. Smith, do you wish to make an opening statement?

Mr. SMITH. Yes, Senator. I'll make a brief opening statement.

Senator WICKER. Wonderful. You're recognized.

**JIMMY D. SMITH, DEPUTY ASSISTANT SECRETARY OF THE
NAVY FOR EXPEDITIONARY PROGRAMS AND LOGISTICS
MANAGEMENT**

Mr. SMITH. Senators, I appreciate the opportunity to be here before the Senate Armed Services Committee on Seapower and U.S. Marine Corps ground programs.

I've been in the role as the Deputy Assistant Secretary of the Navy for Expeditionary Programs and Logistics Management for just about a year now, and I can tell you, I am very impressed with the capability that I see coming forward through the Marine Corps with our industry partners until—and research and development efforts paying off in the future. I look forward to your questions and hopefully returning next year to promote more transparency and show what we're doing in support of this Nation's National Defense Strategy.

Thank you, Senator.

[The joint prepared statement of Lieutenant General Walsh and Mr. Smith follows:]

JOINT PREPARED STATEMENT BY LIEUTENANT GENERAL ROBERT S. WALSH AND MR. JIMMY D. SMITH

MARINES—CONTRIBUTION TO NATIONAL DEFENSE

Introduction

As set forth by the 82nd Congress and reaffirmed by the 114th, the purpose of our Corps is to provide maritime expeditionary combined arms air-ground task forces that are “most ready, when the Nation is least ready.” We are a naval force whose mission requires us to be ready—a fight-tonight, forward deployed, Next Generation force—able to respond immediately to emergent crises around the globe either from the sea, forward bases, or home station. The new National Defense Strategy (NDS) has further prioritized major power competition, in particular reversing the erosion of the United States military advantage in relation to China and Russia. Amphibious forces, in competition against the full range of potential adversaries, have significant roles in three of the four layers of the global operating model (contact, blunt and surge layers). While our organization, training, and equipment must continually adapt to meet changes in the operational environment, our fundamental purpose remains unchanged.

Globally Engaged, Force in Readiness

Combatant commander (CCDR) demand for marines and tailored Marine Air-Ground Task Forces (MAGTFs) continues to drive an aggressive operational tempo. We consistently maintain about 35,000 marines, or one-third, of our operating forces forward deployed across the globe. Our current posture encompasses several global tasks: Marines supporting multiple CCDRs with offensive air support and strikes from our Amphibious Ready Groups / Marine Expeditionary Units (ARG/MEU) afloat; building partner capacity in both Iraqi and Afghan Armies confronting Islamic State and Taliban fighters; providing critical fixed-wing and artillery fire support to coalition-enabled Syrian Democratic Forces as they fought to clear the Islamic State from Raqqa, Syria; providing tailored military combat-skills training and advisor support to foreign forces as part of Marine Corps Forces Special Operation Command (MARFORSOC); deterring provocations in the East and South China Seas through the forward posturing of 5th Generation aircraft within the Pacific; providing immediate disaster response from our ARG/MEU and Special Purpose Marine Air-Ground Task Force (SPMAGTF) to Americans in the wake of four hurricanes; supporting continued efforts to ensure freedom of navigation through the Bab al-Mandab strait; and enabling full spectrum cyberspace operations while supporting Joint and Coalition Forces as part of Marine Forces Cyber Command (MARFORCYBER). Marines are continuing to evolve as an inside force by fostering and strengthening relationships with our allies and partners, demonstrated by executing 62 joint, bilateral, and multinational exercises last year.

A Strategy Driven Budget

The National Defense Strategy (NDS) prioritizes major power competition, and in particular, reversing the erosion of the United States military advantage in relation to China and Russia. The Marine Corps’ fiscal year 2019 budget aligns budget priorities with strategy and guidance enabling the Corps to compete, deter, and win in the future operating environment. The request fulfills DoD and DON objectives by addressing Secretary of Defense direction to increase lethality; resilience; agility; and the building of a flexible and dynamic force. Guided by the NSS and NDS, the Marine Corps made specific decisions about the fiscal year 2019 budget that support a more capable, ready, and efficient force.

The surest way to prevent war is to be prepared to win one under the most difficult of circumstances. Doing so requires new operational concepts, an aggressive approach to force development and a consistent, multiyear investment to restore warfighting readiness. The goal is to field a more lethal, resilient, and agile force. We have focused on preventing and deterring conflict by providing combined-arms task forces to theaters either already in crisis or at the risk of crisis to meet the Congress’ mandate to be “... ready to suppress or contain international disturbances short of large-scale war.”

As stated, your Marine Corps already provides key elements within three of the four layers of the global operating model described in the NDS—contact, blunt, and surge. Our forward deployed forces are part of the Nation’s contact and blunt Layers—that competitive space where the military element of national power preserves

the alignment of shared interests with our partners and allies—while the balance of Marine Corps forces are prepared to rapidly deploy as part of the Surge Layer, as one would expect given our role as an expeditionary-force-in-readiness. Our competitors, however, are continuously seeking to challenge us in new ways within the littorals, advancing their ability to locate, track, and attack the naval fleet and associated amphibious forces. Thus, future amphibious contact, blunt and surge layer operations will require many capabilities to allow us to be effective within the most likely future operating environment. Our wargames and experiments indicate that the current gap in requirements between today's force and environment. Our wargames and experiments indicate that the current gap in requirements between today's force and environment. Our wargames and experiments indicate that the current gap in requirements between today's force and environment.

This statement aims to do two things: 1) Broadly describe how your Marine Corps is adapting to increase its competitive advantage and reduce the vulnerability against pacing threats ; 2) Explain how our ground programs budget priorities for the President's Budget Fiscal Year 2019 submission will result in a more lethal force that is better postured to deter conflict, while remaining ready to prevail if one ensues.

ADAPTING TO INCREASE OUR COMPETITIVE ADVANTAGE

Unlike experiences following past major U.S. military campaigns, where the world was generally stable enough that our Corps' overseas commitments decreased in quantity, today's Marines are employed more frequently, more widely, in more complex missions, and in smaller units than ever before. In recent years ARG/MEUs have been forced to operate in an increasingly disaggregated fashion, often times spread out over thousands of nautical miles in order to prosecute varied missions in littoral regions. This disaggregation strains the traditional capabilities of these units as currently organized and forces us to consider a wide variety of future ship mix and type options. Additionally, the proliferation of advanced weapons technologies, mass urbanization and migration, regional conflict and the challenges of the information age all combine to further drive the need for a properly manned, trained and equipped next generation Marine Corps.

Your Marines continue to innovate and build this next generation Marine Corps—a lethal, adaptive, and resilient Corps that implements combined arms and conducts maneuver warfare across all domains. This transformation began in 2016 with the implementation of the Marine Corps Operating Concept (MOC). The MOC represents our institutional vision for how the Marine Corps will operate, fight, and win despite the challenges described above. While the Corps' fundamental purpose does not change, our concepts—and the organization, training, and equipment changes they drive—must adapt to effectively accomplish it. The MOC provides the foundation and context for subordinate operating and functional concepts—like Littoral Operations in a Contested Environment (LOCE) and Expeditionary Advanced Base Operations (EABO)—and it guides our analysis, wargaming, and experimentation. Further, the MOC drives the evolution of our Service doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) through a detailed and thorough Concepts Based Requirements System.

The development and acquisition of long-range precision weapons by our Nation's chief rivals—China, Russia, North Korea, Iran, and Violent Extremist Organizations (VEO)—have placed many of our forward deployed forces within the effective range of their weapons systems, or “threat rings.” Forward deployed and stationed Marines are now vulnerable to attacks in ways we have not considered for decades. Forward positioned forces require a resilient, dispersed basing posture with sufficient forward stockpiles of logistics and a reliable command and control (C2) networks. Conversely, most of our forward bases and stations lack sufficient resilience against long-range kinetic and non-kinetic attacks; thus, jeopardizing our ability to prepare, project, and sustain combat power. Efficiencies in the construction and configuration of these bases, made possible by a previously existing security environment have now created risks to forward deployed forces. The President's Budget 2019 begins to remedy these problems. Remediation efforts include increased dispersion of our forward elements, additional hardening of our existing facilities, to include aircraft hangars and command posts, the capability to rapidly repair damage to our air stations, effective counters to precision guided munitions and advanced integrated mobile air-defense capabilities. Many of these remedies will also prove effective to sea-based forces and to forces positions on expeditionary advanced bases.

Increasing the Lethality of Our Corps

In addition to increasing the survivability and resilience of our forward forces, we must also strive to make all forces more lethal. Building a more lethal force is not

defined solely by hardware; it requires change in the ways the Marine Corps readies, postures, employs, and develops the force. The rapid changes in the character of warfare and the problems presented by current and future pacing competitors create fundamental challenges to ground programs, the associated concepts of employment, and the personnel that will operate the systems. We have discovered that key enablers such as unmanned systems, Manned/Unmanned Teaming, networked sensors/weapons and C2, and AI-enabled systems will all shape the next generation force's lethality. Some or all of these elements will appear in all future ground systems. We must prioritize modernization of ground programs to support our new operating concepts, regain lost competitive space and fully leverage capabilities that other elements of the MAGTF and the Joint Force are fielding.

GROUND PROGRAMS BUDGET PRIORITIES

Modernizing—The Foundation of Our Future Readiness

What we desire to achieve is a Corps capable of exploiting, penetrating, and destroying advanced adversary defenses in all domains in support of naval or Joint Force operations. To do that, we must be afforded the flexibility to experiment with new technologies available on the market, determining what will work best in the future operating environment, and then delivering those capabilities to the force quickly to mitigate the rapid rate of technological change. Our newly chartered Marine Corps Rapid Capabilities Office (MCRCO) accomplishes that end, seeking emergent and disruptive technologies to increase our lethality and resiliency. The MCRCO leverages fiscal year 2016 and fiscal year 2017 NDAA provisions and partnerships to accelerate the acquisition process—with the consistent and steadfast support of Congress—we will continue to fund this office. Accelerated modernization is the most effective remedy to our long-term readiness problems and we must abstain from burying our modernization efforts under cumbersome acquisition processes—we have to get this right.

The President's Budget 2019 investment approach is synched with the implementation of Marine Corps Force 2025, specifically investing in ground systems that enhance our capabilities in areas such as: Information Warfare (IW), Long Range/Precision Fires, Air Defense, Command and Control in a Degraded Environment, and Protected Mobility/Enhanced Maneuver. These capability areas support building a Next Generation Marine Corps across the Active and Reserve components of the force. Additionally we have foundational efforts which are critical to modernization efforts (such as infrastructure, training sustainment, and manpower) that enable that enable our warfighting capabilities. This approach includes changes to the structure of our into equipment sets that balance affordability with the need for a networked, mobile, and expeditionary force.

Information Warfare (IW)

We continue to prioritize the integration of information capabilities throughout the MAGTF. Within the Command Element, investments in the Marine Intelligence Program allowed the formation of the MEF Information Group (MIG). The MIG establishes IW coordination centers for MAGTF commanders, filling the IW gap at the operational level. Additionally, we have increased funding to MARFORCYBER to man, train, and equip cyber forces and conduct full-spectrum cyberspace operations. The coordination, integration, and employment of information and cyber capabilities will enable the MAGTF commander to facilitate friendly force maneuver and deny the enemy freedom of action in the information environment.

The Marine Corps is making rapid progress in the use Small Unmanned Aerial Systems (SUAS). We are currently fielding to every infantry battalion in the Marine Corps 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. 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.

Long Range/Precision Fires

The Marine Corps must advance its long range and 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 with the Army the ability to modify Guided MLRS rockets from

aboard ships and modifications to the rockets to enable engagement of moving targets.

Technological advancements have also made it possible to operate precision guided munitions at lower echelon units. In this area, the Marine Corps has fielded Loitering Miniature Aerial Munitions (LMAM) as part of an urgent requirement to operating forces for use on the battlefield. Also, in conjunction with ONR is working on the Advanced Capability Extended Range Mortar (ACERM) Future Naval Capabilities (FNC) program. This partnership looks to utilize the existing 81mm mortar tubes to increase range of the system through the development of a precision guided gliding munition. Considering the changes in the complexity of the battle space and increased congestion due to the increase prevalence of SUAS and LMAMS, the Warfighting Laboratory is experimenting with various air space planning tools and procedures to assist operators in planning and executing of fire missions. They are also exploring the use of SUAS and Radio Frequency geolocation to cue and target threats at increased ranges.

Air Defense

To modernize our air defense systems and capitalize on our current investments in the Ground Air Task Oriented Radar (G/ATOR) and Common Aviation Command and Control System (CAC2S), the Marine Corps is pursuing a Ground Based Air Defense (GBAD) kinetic means to defeat the latest threat. The rapid rise in threat air platforms requires the Marine Corps to rapidly modernize its GBAD capabilities in both Short Range Air Defense (SHORAD) and Beyond Visual Range (BVR). These modernization efforts began in 2017, and will protect our forces from an array of emerging air threats including: unmanned aerial systems (UAS); aircraft; and cruise missiles.

The first of these initiatives is the Marine Air Defense Integrated System (MADIS). MADIS is a maneuverable JLTV mounted short range air defense capability that is being designed to detect, track, identify and defeat emerging threat UAS, as well as Fixed Wing (FW)/Rotary Wing (RW) capabilities. The MADIS program is directly leveraging the Army's Program Director Counter Rockets, Artillery, Mortar (PD CRAM) developmental efforts. MADIS is designed to protect both ground maneuver forces and fixed sites. Future modernization efforts will include integration with G/ATOR and CAC2S as well as beyond visual range systems.

Command and Control (C2) in a Degraded Environment

President's Budget 2019 invests in our C2 capabilities needed to build the Next Generation Marine Corps that will dominate the information domain.

Critical to the success of the MAGTF ashore is our ability to coordinate and synchronize our distributed C2 sensors and systems. Our modernization priorities in this area are the Ground/Air Task Oriented Radar (G/ATOR) and the Common Aviation Command and Control System (CAC2S). These systems will provide modern, interoperable technologies to support real-time surveillance, detection and targeting and common C2 suite to enable the effective employment of that and other sensors and C2 suites across the MAGTF.

G/ATOR ensures no other service is more capable than the Marine Corps for controlling MAGTF airspace. It serves as the foundation for Commander, Joint Force Air Component delegation of airspace control to the future MAGTF, and provides MAGTF commanders the freedom of action to employ organic surface and air fires.

CAC2S provides the tactical situational display, information management, sensor and data link interface, and operational facilities for planning and execution of Marine Aviation missions within the MAGTF. CAC2S will eliminate the current stove-piped, dissimilar legacy systems and will add capability for aviation combat direction and air defense functions by providing a single networked system. CAC2S will be the primary C2 system that integrates MAGTF aviation operations with Joint, combined, and coalition aviation C2 agencies.

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.

Protected Mobility/Enhanced Maneuver

Our Ground Combat and Tactical Vehicle Strategy (GCTVS) provides a framework for portfolio management and enterprise decision support. The Marine Corps is investing approximately 29 percent of its modernization resources into GCTV systems

within the FYDP [Future Year Defense Program]. The overarching combat and tactical vehicle investment priority is the modernization of Assault Amphibian capability through the Amphibious Combat Vehicle (ACV) program as the means to incrementally replace the legacy AAV.

The first phase and increment of the ACV program (ACV 1.1) is on schedule for Milestone C decision and down-select to a single contractor in June of 2018. It is successfully performing at or above the required performance parameters with both vendors demonstrating the capacity to meet objective requirements for ship-to-shore water mobility. Both manufacturers have delivered their required number of vehicles and are currently undergoing rigorous developmental testing including water mobility and under-vehicle blast protection tests as well as operational testing with the user community. ACV 1.1 is on track to meet an fiscal year 2020 initial operation capability target and has set the conditions for a seamless transition in the production of second increment (ACV 1.2) personnel carriers and supporting mission role variants for command & control and maintenance & recovery. Finally, ACV 1.2 is resourced to also deliver an initial active protection system capability and a lethality upgrade to improve support by fire to the infantry.

The second highest priority for combat and tactical vehicle investment remains the replacement of the legacy high mobility, multi-purpose, wheeled vehicle (HMMWV) fleet beginning with that portion which is most at risk; those trucks that perform 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 (JLTV) program to ensure affordability in conjunction with the execution of the ACV program. This approach enables an affordable, incremental, and simultaneous modernization of the two most stressing gaps within the GCTV portfolio.

In this budget year, we are also beginning to look at a replacement for our legacy Light Armored Vehicles (LAV), the Marine Corps' current light armored reconnaissance platform. The Office of Naval Research (ONR) is leading the effort develop revolutionary technologies that will inform requirements development for what we are calling the Armored Reconnaissance Vehicle (ARV). This effort will identify the "realm of the possible" for the LAV replacement and will help accelerate movement to the acquisition phase within the next four to five years. The research will explore advanced technologies within size, weight, time and price point limitations, as well as generation-after-next-technologies using size and weight constraints only.

A subset inherent to our Protected Mobility/Enhanced Maneuver efforts is the requirement to increase Close Combat Lethality. We have made great strides in several areas such as; enhancing small arms and ammunition; virtual training tactical decision kits; sensing Unmanned Air Systems (UAS) and Unmanned Ground Systems (UGS); small situational awareness devices for Distributed Operations and decentralized decision making; loitering munitions; lightening the individual Marine's load and addressing power needs; Electronic Spectrum and Signature Management; and Active Protection Systems.

The Marine Corps rifle squad currently possesses a tactical advantage with its small arms overmatch capabilities for ranges up to 500 meters. To maintain relevance against recent small arms capability advancements made by potential adversaries, significant modernization efforts are planned within the next decade.

The Marine Corps is pursuing capability improvements to small arms with the goals of increased lethality and improved mobility. For lethality, the Marine Rifle Squad requires the ability to accurately engage and neutralize threats out to 600 meters. For mobility, Marines require the ability to move efficiently and effectively while carrying a standard combat load and weapon in order to accomplish combat related tasks.

The Marine Corps has also been supporting DARPA's Squad X program by providing personnel for testing. Squad X is maturing key technologies, developing system prototypes, and refining the prototypes to maximize the squad's performance against emerging threats. Squad X looks to develop a multi-domain combined arms squad through the integration of shared situational understanding, optimized resource management, synchronized action and increased lethality.

Further, the Marine Corps is working with the Army in regards to ground robotics with the future CRS-I program. It is also expects to participate more significantly in the Army's Leader Follower, Robotic wingman and Squad Multi-purpose Equipment Transport efforts to develop CONOPS, interface standards, open software architectures, and better define capability requirements. We are looking at its applicability with our EOD and engineer functions.

Modernization Foundational Effort—Training

As our capabilities continue to expand and the threat continues to adapt, our ability to train the MAGTF is challenged. As we implement the Marine Corps Operating

Concept, we must modernize our synthetic training environment, making it more integrated and adaptable. Our units must be able to conduct collective training and mission rehearsals wherever they are; not only in training areas and simulation centers, but in barracks, in headquarters, at service-level training centers and while forward deployed on ships or in country. Our Live, Virtual and Constructive Training Environment Program will improve our ability to exercise multiple elements of the MAGTF from disparate locations as if they were collocated on the same battlefield. Neither live training nor synthetic training alone is sufficient. The strategy that will offset our readiness beyond that of our opponents involves multiple synthetic repetitions leading to highly effective live training exercises and evaluations, followed by continual live, virtual, and constructive sustainment events.

Weapons proficiency, weapons employment, and the integration of combined arms and maneuver through live-fire training remain core components of our combat readiness. To meet these demands, our operating forces must rely on access to safe, modernized, and well maintained training ranges. The Marine Corps' range modernization efforts are designed to provide realistic training environments that simulate contemporary and future operating environments. Ongoing modernization efforts include a new generation of interactive targets that move autonomously, expanded military operations in urban terrain capabilities, improved instrumentation technologies, realistic threat representations, and scoring systems.

The Marine Corps' current and future immersive training environments are designed to enhance our Marines' abilities to make sound tactical and ethical decisions in chaotic, stressful and complex environments. These venues are equipped with contracted role players, the Tactical Video Capture System, battlefield effects simulators, special effects, and range instrumentation equipment that facilitates detailed after-action reviews. These training capabilities enable unit commanders to assess tactics, techniques and procedures in real time and to provide learning points for follow-on training. The expanded procurement and utilization of advanced force-on-force training will further allow Marines to improve their decision making abilities through engagement against a thinking, adaptive enemy.

SUMMARY/CONCLUSION

The Marine Corps' Ground programs Modernization strategy will ensure the individual Marine enjoys a qualitative military edge over any adversary. Our goal is not to man the gear, but to adequately equip the Marine to ensure we can provide combat formations capable of closing with and destroying the enemy. In the near-term, our first priority is to increase capability and competency within the information environment, while concurrently actualizing structure design, leader development and training with corresponding updates to doctrine and policy. Equipment enhancement in the near-term will consist of balanced investment in existing capabilities while exploiting technological advances. In the mid-term, Marine Corps modernization targets increasing naval integration, expeditionary power projection, lethality, and protection; the results of which will address restoration of multi-domain combined arms overmatch against peer and near-peer adversaries. In the long-term, the Marine Corps seeks new capability development and investment to enhance the next generation MAGTF, exploiting Science and Technology and applied research to attain significant improvements in capabilities, addressing identified warfighting challenges, capability gaps, and requirements to achieve asymmetrical advantages.

In future competition for international stability and security, the Marine Corps will provide a globally responsive expeditionary force that includes forward deployed, rapid response, and surge force elements. This expeditionary force is designed to maintain contact, blunt emergent aggression, and surge to prosecute a major campaign, thereby providing a wide range of options to command authorities to message, deter, combat, or defeat those that would attack the global order or threaten the global commons. As Marines have always done, when our Nation calls upon us, we will fight and win regardless of the dimension or domain.

Senator WICKER. Thank you very, very much.

Okay, well, let's start off, then, with a few things that you touched on, General Walsh, but I'll let you elaborate.

With regard to the increasing danger and the need for updated air defense capability, I assume you agree with my statement that it's been since the early 1990s when—since we really took a look at changing this capability. You said, in your oral statement, that you're working with the Army. My statement said that the two services should work together, and that it seemed that short-range

systems collaboration was a matter where there was a little more progress than medium-range systems. So, if you could comment on that, and help us understand.

Lieutenant General WALSH. I think close coordination with this—you know, as we moved out of Iraq and Afghanistan, a lot of our focus had been on the ground side, but we started to look at this counter-UAS [unmanned aerial system] threat. And so, I think we've been focused on the counter-UAS threat, and now, as we get the new defense strategy, we're starting to see—looking at aircraft and going against cruise missiles.

So, the program that we've really got is our ground-based air-defense future weapon system. In that, that's based around a JLTV concept. We've got several vehicles with a radar, which is the radar that the Army uses, integrating that same radar that you're using with Maneuver SHORAD, their short-range air defense, using a Stinger missile that we currently have in our LAAD battalions, integrating that Stinger missile with the radar. We're also putting on a EW capability onto that vehicle, along with the kinetic kill capability.

Senator WICKER. For those people listening in, what does that mean?

Lieutenant General WALSH. Electronic warfare. I'm sorry. Electronic warfare. So, it's a capability—

Senator WICKER. Senator Hirono and I fully understand—

Lieutenant General WALSH. Right, I'm sorry. I'm sorry.

So, electronic warfare. We're also trying to integrate—we've got a developmental program on a laser, to be able to put a laser on that. We're currently testing that with the opportunity to rapidly deploy that and demonstrate that capability.

So, those are, kind of, the things that we've got in there in this program. I see the way that, this all moving very quickly, that we would continue to bring on, in an incremental fashion, more capabilities into that ground-based air defense, which is more in that maneuverable, shorter-range capability.

In the near term, though, we see that the—the shortness we've got, or the area of significant lack of capability in—more against going to cruise missile capability. So, what we're looking at right now is research and development, working with the Army in that area to be able to get a capability integrated onto our systems much quicker, demonstrate a capability—it could be a commercial off-the-shelf capability—try to integrate that in while we continue to work the—with the Army on the long-range—excuse me—the IFPC2 [Integrated Fire Protection Capability] program, which is the Army's long-range program that we're integrated with them with research and develop into that, into the midterm year.

So, I think, between the short-range program that we've got, the near term to do some demonstration here in the very quick term—near-term year to two, on a ground-based air defense, along with the IFPC Block 2 program that we're working in 2021 and 2022 with the research-and-develop money with the Army, I see us coming together long term on that IFPC air defense program with the Army.

Senator WICKER. When do you think you might be making an announcement about your decision there?

Lieutenant General WALSH. On the near-term piece or the long-term—

Senator WICKER. Well, how about both?

Lieutenant General WALSH. On the long-term, we've got the money into the research and development with the Army on the IFPC program. So, that part, we're long-term with them. On the near-term capability, we're looking at, right now, besides the capability that we've got in that GBAD, how we could get a program quicker. And so, we're looking at—

Senator WICKER. And so, you're looking at—

General WALSH.—that right now.

Senator WICKER.—at possibly off-the-shelf.

Lieutenant General WALSH. We're looking at—

Senator WICKER. And so, when would you let us know that?

Lieutenant General WALSH. We're looking at it right now, and, in the—I would say, in the next year, as we look at what's out there, to be able to try to see how we can demonstrate something quickly. One of the significant things is, is trying to move the community that really has doing—been doing security force operations for many years, that have just been using shoulder-held surface-to-air missiles. We used to have Hawk batteries that had this longer-range missile capability that we don't have. So, getting something now, early, and demonstrating that, would get the community of air defense moving towards that higher-end capability quicker.

Senator WICKER. Thank you, General.

Senator HIRONO.

Senator HIRONO. Thank you, Mr. Chairman.

Over the course of the past several months, our committee has heard testimony and received briefings detailing the increasing lethality gaps between the U.S. military and our near-peer competitors. In fact, the recently released National Defense Strategy highlights this disparity and makes addressing the lethality of our forces a priority.

Can you identify or detail the investments that the Marine Corps made in the fiscal year 2019 budget request that will allow the Corps to address the gaps in lethality and allow us to compete with a near-peer competitor?

Lieutenant General WALSH. I think the—you know, the areas for lethality crosses a lot of areas across the Marine Air-Ground Task Force. I think, you know, probably starting with things like the F-35 and bringing that aircraft online that's currently deployed in the western Pacific. Our HIMARs are our long-range rocket systems that we've got with the Army, putting research and development money into that, along with the Army, to be able to increase the long—to get the longer ranges that we need, along to—along with trying to hit targets—moving targets. We've also developed programs and fielded programs with airborne loitering munitions, and continuing to put money in, working with the Army, on research and development for a naval strike missile, which would allow our marines to be able to contribute more effectively with the Navy and the sea control mission, according to the National Defense Strategy.

Then continuing to work with the Army on their long-range precision fires capability. So, we're partnered with them on LR—their

LRPF [Long Range Precision Fires] program, which would increase their capability beyond what we have with the TACMS [Tactile Missile Systems] program that the Army currently has. Then also R&D [Research & Development] efforts with the Army on the high-velocity projectile program.

Senator HIRONO. So, General, there's no question that China, for example, is very much modernizing their military assets as well as—just by sheer numbers. So, by the listing that you gave, are you doing enough to address the lethality gap?

Lieutenant General WALSH. I think, Senator, as we've talked to you be—in the past, you know, 16 years of combat in Iraq and Afghanistan, we kind of had our heads down against this kind of threat. So, what we're looking at is, as we start to look at the new National Security Strategy and the National Defense Strategy, is looking at that strategic competition, which, really, competing in that strategic area will hopefully be the deterrent effect that we need. But, as we look at that—you know, we're well behind in a lot of areas, as the threat has watched us very closely over the last few years, what our advantages are and where our weaknesses are. They've invested in areas, like long-range precision fires, that we have not. So, as we come out of that, the first thing, I think, that we're looking to do is, How can we repurpose the current capabilities that we have? How can we make them more effective? Like the HIMARS [High Mobility Tactile Rocket System] rockets, how can we get them longer-range while we work together closely with the Army to develop a developmental program, a longer-range program, like the long-range precision fires program that we're working with the Army? So, near-term—

Senator WICKER. What's their range now?

Lieutenant General WALSH. What's that?

Senator WICKER. What's their range?

Lieutenant General WALSH. The HIMARS capability we've got is about 70 kilometers. We'd like to get that well out, way past that range, probably triple, four times that range.

In fact, the goal with the LRPF program is really 499 kilometers, which is really based on treaty that allows us, on land-based, to only stay below 500 kilometers.

Senator HIRONO. General, as you noted that you spent almost 17 years doing the counterterrorism fight, so do you still see a need for us to keep those kinds of warfighting skills up to date? So, as you turn toward the—addressing the near-peer competition that we now face, how will you ensure that the counterinsurgency warfighting skills that you have honed during the nearly 17 years do not atrophy as our strategy shifts to a high-end fight with near-peer competitors?

Lieutenant General WALSH. The marines that are out there today—I mean, they're combat veterans. Our young marines, NCOs, and young officers, they've had a lot of combat time. So, as you said, How do we keep those capabilities and those skills? So, they're combat vets, they're very good at what they do. So, I think that the thought we have is to keep our eye on that, but we've developed very great, good capabilities across for that skillset. What we believe is, is the higher end, though, that we don't have—

Senator HIRONO. Yes.

General WALSH.—that we've got to develop that. We think a lot of those capabilities that we developed for the higher end can also be applied to the lower end. But, I think we're out of balance right now, because, over the years, we've focused on the lower end. Very good at that. Now we've got to shift to the higher end. We think, in a lot of those cases, they can be very applicable to the lower end. But, the lower end was not applicable to the high end.

Senator HIRONO. Okay.

Lieutenant General WALSH. In most cases.

Senator HIRONO. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Senator Sullivan.

Senator SULLIVAN. Thank you, Mr. Chair.

Gentlemen, thank you. Good to see you. Thanks for testifying today.

General, I wanted to just talk a little bit—you know, we—you talk a lot about the focus, in the last several years, in Iraq, in Afghanistan. Also, you know, we did cut defense spending, unfortunately, I think, pretty dramatically. As you know, in the Army, in the Marine Corps, I think a lot of the members of the infantry are still handed the book "This Kind of War" by T.R. Fehrenbach, and talks about Task Force Smith and other units in the United States military that were decimated during the Korean War because we did not have a military that was ready.

Are we ready for some kind of, you know, fight like that, where it would be high intensity as—we're talking about—it's a pretty sobering look at a—an army that—in a, you know, military that, in 1945, was the most fearsome one in the history of the world, and, 5 years later, couldn't stop a Third-World peasant army. What's your sense on that, General?

Lieutenant General WALSH. Senator, I think that if you look across our portfolios—you know, one of the things the Commandant wants us to do is to develop a next-generation Marine Corps. As we look at what is that next-generation, we've come across our portfolios. There are certain areas that we've invested very well in that we think, you know, are—would operate in that environment very well—F-35, our GATOR radars, some of our signals intelligence capabilities. There's areas there where, if you look—like a scenario, like, say, if you take Ukraine, and how would marines today operate in that environment today, I think there's areas where we've got the weakness where I've—weakness areas where I've talked about as we need to engage more in information warfare. We talked about long-range precision fires, air defense, which we've not had, really, to deal with in many, many years, communications and command and control in a degraded environment. As you take a look at what the Russians and what the Chinese have invested on when it comes to cyber warfare, electronic warfare, those areas. Along with protected mobility. Our ground vehicles are something we've not invested in, in a long time, along with some of our heavy-lift aircraft, like the CH-53K program. So, I think that focus—if you took us right now in that environment, there's a lot of areas I would say we're behind in.

Senator SULLIVAN. Okay.

Lieutenant General WALSH. But, the money that the Congress has given us, I think we're investing to be able to move very quickly in that direction to be able to be a—more of a competitive force and deter aggression.

Senator SULLIVAN. What about just the issue—you know, again, in that book, it was also a lack of training, a lack of hard training, a lack of difficult training. Are there concerns right now that we're not meeting—you know, I think all of us want what's best for our forces, but, to be realistic, we need to make sure they have the hardest, most difficult, most challenging training in the world. Are you confident that that's what our Marines and Army are getting now?

Lieutenant General WALSH. Senator, I think we're in a big shift to move in that direction. As Ranking Member Hirono looked at that piece on—as we look at that, as we shift towards this higher end—we're a very good combat-proven force at the lower end. So, when it comes to the training, not only is it part of getting the right equipment as you're hitting on the training, when we look at our training and readiness syllabuses, what we train a unit to, what we train individuals to, a lot of these areas, we haven't focused on in a long time.

Senator SULLIVAN. Yeah.

Lieutenant General WALSH. A key focus area is out at 29 Palms for MAGTF Training Center, where all our units go through to get certified before we deploy. Out there, Major General Mullen, who's out there, is upping the game, really, against what the Red Force does and what our Blue Forces are encountered in. We start looking at electronic warfare, long-range precision fires, counter-air. We have not done that in many years. So, the focus is moving in that area. It's going to take a long time, just like it did back in the—

Senator SULLIVAN. You mentioned—

General WALSH.—Korean War.

Senator SULLIVAN.—29 Palms. Let me ask another—you know, when you talk about the high-end fight and the National Defense Strategy and the focus on China and Russia and North Korea, near peers, a lot of those places have in common difficult terrain, mountainous terrain, cold-weather terrain, large-scale ops, not just kind of small, you know, squad-size or company-size. I notice that there's a good number of marines right now up at Arctic Edge, in a State that I happen to care a lot about—that's Alaska—that also has probably—well, certainly some of the best training—cold weather, mountain. JPARC [Joint Pacific Alaska Range Complex] is the biggest training area in the country, by far, probably the best training in the world.

I've talked to the Commandant a lot about this. Forces that are in Alaska, already forward-deployed, they're, you know, ready to go in—to Korea or any other place. Can you tell me a little bit about what the Marines' future is with regard to, not just Arctic Edge, but looking at Alaska as a place where you can get very realistic training—cold weather, mountain—forward-deployed to go in the fight tonight if you had to, and combined arms capability—you know, the JPARC, the airspace there is bigger than Florida. With the fifth-gen aircraft, that's going to be needed. Can you talk a little bit about that, and future focus there?

Lieutenant General WALSH. Senator, like you said, we have not focused on that area for a long time. We used to train to cold weather all the time, in the cold war days. The Commandant has set—sent up teams up to Alaska to look at the training areas up there. They're phenomenal. They're great size, both air and ground integration. As we know, on the air side, we've been training up there an awful lot with, you know, our F-35 and with the Air Force, and certainly our F-18 aircraft. But, what we're also seeing is, on the ground side, as we now refocus down on the ground, and this cold-weather area that we haven't trained. We're buying a lot more equipment, but the training piece is key. Like you said, there's a lot of places we can go and train at the company level. This is an area we can go and train at a much higher level.

Senator SULLIVAN. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Sullivan.

Senator Sullivan, I wonder, when you were in basic training, if there some gray-headed guy sitting around a conference table asking if training was hard enough.

[Laughter.]

Senator SULLIVAN. I believe in hard training——

Senator WICKER. Well, I'm sure you——

Senator SULLIVAN.—Mr. Chairman.

Senator WICKER. I appreciate——

Senator SULLIVAN. Go to the Marines——

Senator WICKER. I appreciate your service.

Senator SULLIVAN.—and the Army. I think so. But, if you haven't read the book "This Kind of War," I'll make sure you get a copy.

Senator WICKER. Yeah, we've got—well, I would be glad to do it.

Senator KING.

Senator KING. What State were those big training areas in again? I didn't catch that.

[Laughter.]

Senator SULLIVAN. Those would be in the biggest State in the Union.

[Laughter.]

Senator KING. General, a much more general question. Are amphibious assaults feasible in today's combat environment, or do we need to think in a whole new way about storming a beach?

Lieutenant General WALSH. That's a great question. When you look at this contested environment, new weapons, new threats, new capabilities that we've not had to look at in a long time, I think you're right, we have to look at it in a completely different way. In fact, really over the last year, I think, really, with Mr. Smith's team, we've worked a lot of, What is the problem statement? How are we going to operate in a different way? One thing I would say is, the Marines are focused—first, as the Commandant says, we're going to have to fight to get to the fight. How can we support, work with the Navy when it comes to that sea control mission to be able to get to the point where we get to power——

Senator KING. Particularly if it's a peer adversary. They're going to have missiles that can hit you 100 miles at sea.

Lieutenant General WALSH. Right. So, we're working a lot of—a lot of concepts, a lot of our exercises, a lot of our war games are focused exactly on this problem.

But, one thing we really did last year, we did an advanced naval technology experiment. It was a weeklong experiment out of Camp Pendleton that really led up, over a year's time period, working with industry, academia, our warfare centers, on, How are we going to conduct operations in the future? Just as you say, it's not going to be storming the beach, just as you see a—pictures of Iwo Jima or Inchon. What we saw when we got done of taking all that industry work together, we demonstrated over 100 different types of technologies. I think the thing that amazed me was, when we looked out at that amphibious assault as we were conducting, really, probably the first 15 minutes of it or so was completely unmanned. We had unmanned surface vehicles—surface vehicles that were unmanned, in the air, sensing, trying to figure out where the enemy may be, where the enemy is not, deception capability. Through that, we took a lot of these capabilities and moved them forward into demonstrations into fleet exercises on both the East and West Coasts, and put it in the hands of our sailors and marines. We learned a lot through that, and we're continuing to work with that, with the Navy in littoral operations in the contested environment. We're seeing it's not going to look like it does in the past, it's going to look completely different. A lot of technology in the unmanned systems allow us to do that.

I don't know if Mr. Smith has anything to add to that.

Senator KING. Your thoughts, sir.

Mr. SMITH. Actually, I was there at the exercise that General Walsh spoke about, where we're—have unmanned vehicles coming ashore. I'm actually standing on the cliff at Camp Pendleton, standing next to the Commandant, and I'm watching this assault force come in from the ocean. I looked at the Commandant, and I said, "Are we really going to do this again? Is this, like, a flashback to 1940?" But, to my surprise, those were unmanned vehicles coming ashore. An unmanned vehicle actually popped out a UAV, established a network so that the computers, sensors, and all things can tie into it. I had to take a step back, because that wasn't the old fight. This was using capability we have today, augmenting it so that we can get down and get at the next fight.

So, making best use of what we have today, the Marines are experts at that. Tailoring it with our industry partners and warfare centers to get extra capability from what we're accustomed to having just brings a different fight to this capability.

Senator KING. Well, that's exactly the answer I was hoping for, and I appreciate that.

I know you're talking about replacing the light-armored vehicle and are looking at alternatives. Mr. Smith, I hope you're starting with off-the-shelf alternatives, like the Stryker or other weapon systems around the world, and not designing a new system from the ground up.

Mr. SMITH. That's absolutely correct, Senator. We're starting with off-the-shelf technology. But, the U.S. Marine Corps has its specific needs, and we need to make sure that our requirements are going to be met. We have a couple of industry partners going

through a competition right now to give us capability we need. They're meeting their key performance parameters. Testing is going well. Schedules are intact. So, I think we can provide that——

Senator KING. But, you——

Mr. SMITH.—foot forward.

Senator KING.—know the history, for example, in the Army, of the Future Combat System. I mean, I'd rather see an 80-percent solution that was timely, cost-effective, and effective, rather than a 100-percent solution that failed, in the end. I hope that's the attitude, because we've gotten in trouble designing things from the ground up and imposing more and more requirements. For example, I understand, in the new ARV [Armored Reconnaissance Vehicle], we're talking about unmanned vehicles, sensors, renaissance network. Again, we want to get the 80-percent solution. I—you're nodding, General. I hope you agree.

Lieutenant General WALSH. I agree, Senator, but I'll just—I guess I look at it this perspective is—there are certain areas where we look at a problem and go, Is the technology that we have there today going to fulfill the need? So, when it comes to reconnaissance—and we're studying this real hard—what is reconnaissance today, and counter-reconnaissance? It's hugely different than what it's been over history. I would argue, over history, our Army's calvary or our light-armored reconnaissance (LAR), battalions have operated many, many ways the same way calvary or reconnaissance have operated over, you know, not centuries, but over the last 100 years. The technologies that we're seeing, though, is—we're trying to figure out, What is reconnaissance? What Mr. Smith talked about is, What is reconnaissance going from ship to shore? We see that, really, a wide-open area. So, when we took a look at, What is out there today in industry that can give us a vehicle that would give us the 80-percent solution with the technology on it? We really aren't seeing that from industry today. I see it on the aviation side. When I go to look at Skunk Works and Phantom Works and stuff like that on the aviation side, there's a lot of industry R&D that's going into those programs, and we see what they're doing to be able to move in that direction. I'm not seeing the same thing on the ground side.

So, what we've really done is, we've partnered with the Office of Naval Research, we really had a—to work with them on, What type of—looking at that problem statement again—What is reconnaissance in the future, and what technologies are going to be available in the future? So, ONR, working with our warfare centers, research labs, and industry. What type of capabilities would be able to go onto a vehicle—the truck, the platform—that would be able to do this? But, we certainly see a vehicle today—we've got squads of marines launching their own hand-held UAVs. Why wouldn't we be able to launch that same type of thing off of a vehicle, you know, into the future?

So, I think it's kind of both ways, that we have to go slow, but we—we would rather have the 80-percent solution that's available today, but, in a lot of—in some cases, it's not.

Senator KING. I'm out of time, but one way to deal with that issue is modularization so that you can easily upgrade on the plat-

form. You don't have to start all over again with new, just because your—a new technology is developed.

Thank you very much, gentlemen, I appreciate it.

Senator WICKER. Thank you, Senator King.

Senator Rounds.

Senator ROUNDS. Thank you, Mr. Chairman.

First of all, gentlemen, thank you for your service to our country.

I'd like to follow up in a little bit different format, but along the same lines as Senator King has started with.

General Walsh, on February 8th, Secretary Mattis sent a memorandum establishing a Close Combat Lethality Task Force to senior leaders across DOD, the joint force, and the Military Departments. The stated goal of this task force is to improve the preparedness, lethality, survivability, and the resiliency of our close combat ground forces, which have historically received about 90 percent of our casualties. What are your thoughts on the changes in personnel policies, training methods, and equipping strategies that you believe that this task force should be looking at? I think it goes along similar lines as what Senator King was talking about. But, I'd like to have you expand on that a little bit, please.

Lieutenant General WALSH. Thank you, Senator Rounds.

One thing I would say that we've been involved in is our Sea Dragon experiments over the last, really, year and a half. We took 3rd Battalion 5th Marines, an infantry battalion, and we took that organization and reorganized them completely different. They're three line companies, organized them completely in a different—each one differently, gave them completely different equipment, gave them unmanned systems—unmanned ground, unmanned air—trying to do exactly what the task force really is after. How do we up that game?

We looked at a lot of cases as what our special operators do, and we've learned a lot from Marine Corps Special Operations Commands, and we've gotten much more developed in that area, on, How do we raise the game up to a higher level?

I think you're exactly right, the casualties that our close combat forces take. So, that program took about a year and a half. We took that back to the Commandant, and I think, out of probably the 40 different recommendations they made, we've probably already now programmed probably 20 of those recommendations. In fact, we met with the Commandant this morning for about 2 hours to go over a lot of them.

How does that tie in to the task force? All of those members that are down at the Marine Corps Warfighting Lab have been involved with the Close Combat Strategic Portfolio Review done by Secretary of Defense that's now turned into this Close Combat Task Force. In fact, our experiment lead who was leading our experiment division, we gave up to go work for the Secretary of Defense on this, to help continue to move our things forward.

But, a lot of those things that you—you know, you're exactly talking about, that we put into that area of, you know, improving their fires, improving their communications, improving their protection, lots of different systems—UAS—out of the experiment, we've now fielded over half of the squads in the Marine Corps with unmanned aerial systems. Unheard of before that we would give a

unmanned aerial system to a squad. Now, in a matter of 4 or 5 months, every squad in the Marine Corps will have that. So, that's just an example.

You're exactly right, that's where we need to put the focus. The Commandant's an infantryman. That's where he's got the focus. I think we're completely aligned with where the Secretary of Defense has taken us.

Senator ROUNDS. Well, let's take one more step, then, and let's talk a little bit about—Major General Reynolds reported that, as of January 2018, and ahead of the 30th of September mandate, all 13 U.S. Marine Corps Cyber Mission Force Teams reached full operational capability. Were there lessons learned? If so, how would the Marine Corps Combat Development Command learn from this effort? How will the Marine Corps incorporate these lessons learned into the training and doctrine?

The reason why I ask is, the Army's been placing offensive and defensive cyber capabilities down to the Brigade Combat Team level. What's the Marine Corps' view on the proper echelons to deploy offensive and defensive cyber capabilities? Does the current force structure accommodate this view? It sounds like you're moving in that direction. You've done a little bit of it. Can you talk a little bit about where you see that at and where the cyber component should be incorporated, as well?

Lieutenant General WALSH. If I could, Senator Rounds, in—look at it just a little bit outside of just cyber, but what we call information warfare. So, expand outside of that to signals intelligence, our sensor capabilities that we've got in the air and on the ground. What we really looked at through—we started with our operating concept, and then moved into Marine Corps Force 2025, which is our way to experiment and figure out what we really need.

The big thing that we saw was, this whole area was the area that we were behind the threat in. So, what we decided to do after the experimentation that we did was to move structure first. So, we moved structure and manpower into our MEFs [Marine Expeditionary Force], which are our large warfighting headquarters, and we stood up what we call our MEF Information Warfare Groups, or MIGs. One is in each MEF headquarters we've got now. The structure, we moved all in there, and now we're moving in the capabilities, which are unmanned systems, intelligence systems, signals intelligence. Electronic warfare is a big area in there, along with the cyber. So, what we're doing is bringing that all into the MEF Information Groups, and then we're pushing those teams down, structure down, all the way down into the company level. So, well down below—you know, down division, but all the way down, regiment, battalion, into the company level. We kind of view it as the way we've got—we've done a very good job over the years with our air-ground integration, where we've got air officers that are planners and executors that are down at the company level, that can plan, reach back for support, and bring capabilities down, and help that infantry commander plan down at that lower level. We're now bringing that entire information warfare area down to the lowest level. One of the things the Commandant also did is, he stood up a Deputy Commandant for Information just to focus on this problem set.

Senator ROUNDS. Thank you. Thank you. My time is expired, but I most certainly appreciate the comments that you've made here today.

Senator WICKER. Thank you, Senator—

Senator ROUNDS. Thank you, Mr. Chairman.

Senator WICKER.—Rounds.

Senator Kaine.

Senator KAINE. Thank you, Mr. Chair.

Thanks, to our witnesses.

Three questions about, sort of, future—looking ahead. The Chair and I and others have really focused on the 355-ship Navy requested by the Navy. It became part of the NDA last year, but, given that the Marines are an expeditionary force that are often shipbound, as we're trying to decide what the 3—with the right mix of the 355 is—surface and sub and, you know, manned and unmanned—it has effects on marine personnel organization, too. So, how close are you having that discussion with the Navy as they're doing their planning about 355, because it affects the ground side of the Marine operation, as well?

Mr. SMITH. Well, as you know, Senator, the auxiliary fleet, the amphibious fleet that the Navy has, the Marine Corps basically needs a ride to the fight. Thirty-eight ships would be optimum, and we have, I believe, 31, 32 in the—32 in the budget. We're going to make best use of that capability. Getting to the fight, we're working together.

I'm actually a Navy employee, as the DASN to the Marine Corps, so I'm closely tied to big Navy, and I'm working on the green side to make sure the capability comes forward to unify both forces together. Because we are one Navy, one force—one naval force.

Thank you, sir.

Senator KAINE. Please, General.

Lieutenant General WALSH. If I could, your—over the last few years, I think we've focused really on readiness, maintenance—is really that focus. The Navy fleets have been run really hard. OPTEMPO has been high. There hasn't—

Senator KAINE. Yeah.

General WALSH.—been a lot of stability and predictability, so we've focused on maintenance and readiness.

The next piece, I think, that we've been focused on is capacity. I think right now, with the shipbuilding plan, we're moving in the right direction. Obviously, the CNO's got to plan if we could increase that. You know, we've got—know what the yards can do, the availabilities, how we can increase that. So, that's part of that surge force, if we can increase that capacity.

The one thing I will say, though, is, what we really are looking at, too, is readiness, capacity, but the capability of the ships. When you go back to operate against this high-end threat, do the ships have the right capabilities? So, not only the—you know, the ships that are out there as part of the carrier strike groups, but also our cruisers, destroyers. When you start putting F-35s out on amphibious ships, that's a tremendous capability to the battle force. How do we use that capability? What the sensors and weapons capabilities on the amphib ships to be able to contribute to that littoral ops in a contested environment?

Senator Kaine. Another sort of future issue that my staff brought to my attention is, there is a Marine Corps Times article last month about thinking about the size of the marine rifle squads. So, traditionally, it's been 13. Could it be 11? Could it be 12? Could it be 14? Then that has downstream consequences, too. You know, the size of a helo that you use to take a squad from here to there would change if it were 14 over 13. So, talk a little bit about that thought process and what's the status of it right now. Is it factoring in to, sort of, acquisitions thought, as well?

Lieutenant General Walsh. It is. It's—you know, so it's one of those things is—we experiment. Things go fast. Things change quickly. So, we did a lot of experimentation with the ground force and what should be the right size of that squad. So, the Commandant right now—in fact, we spent this morning—I was kind of smiling because we spent this morning with him for about 2 hours on this, in an area that he's an expert on, and really drilling in that. I think the part that changes is, when you bring in all this technology, in the experiments that we've been using, in some ways it puts almost an increased burden on the squad, because now they have more capabilities. So, I'm trying to get it to where you can integrate these capabilities, like you do, say, in an F-35, and you're using the sensors—

Senator Kaine. Right.

General Walsh.—it's making it easier for the pilot. How are we, you know, able to do that on the ground side? So, as we're changing looking at the different squad sizes, it does affect when you get into longer-term programs, like your amphibious combat vehicle. So, I think one of those things that's going to be ever changing. I think we have to be flexible with this. We can't lock ourselves down that, you know, if you have a larger-size squad or a smaller-size squad, you're going to have to kind of go and adapt with whatever capability you're already procuring.

Senator Kaine. One other future capability issue that's an exciting one is—there's been a lot of stories recently about expected advances in battery technology, so batteries are really pushing ahead, and then that would give, you know, opportunities for a forward-deployed, you know, platoon or battalion to, maybe, stay out longer, less backing and forthing, you know, bringing energy to a forward-deployed unit. Talk a little bit about how you guys are using advances in battery technology to potentially augment your capability.

Lieutenant General Walsh. Yeah. Last year, we focused our whole experimentation effort in Sea Dragon, which is our experimentation effort on the infantry. This entire year, we're focused on the logistics combat element. So, a major part of that is reducing the load for the infantry, but it's how—what are we doing with hybrid electric capability, our ability to forage for power and use dirty power in different ways. So, a lot of effort is going on into that, and we're seeing the benefits of a lot of the capabilities that we're out there testing experimental. We think that we're going to be able to reduce a lot of the battery requirements in the future by significant amounts—

Senator Kaine. Yeah.

General WALSH.—by the technology that's out there, which is going to allow us to be much more maneuverable.

Senator KAINE. Great. Thank you.

Thanks, Mr. Chair.

Senator WICKER. Thank you, Senator Kaine.

We're going to take another round. I'll go last. So, Senator Hirono, you're next.

Senator HIRONO. Thank you.

In November 2015, the Marine Corps awarded two contracts for the manufacture and test of 32 prototype ACV vehicles. Since that time, the vendors have each built 16 vehicles for testing, and the Marine Corps is on track to select a single vendor in June 2018. Given that the program remains on track for a vendor award, what lessons, if any, can the Marine Corps apply to future acquisition programs, based on the ACV acquisitions strategy?

Mr. SMITH. I'll take that one—

Senator HIRONO. Mr. Smith.

Mr. SMITH.—Senator.

From an acquisition perspective—I'm the acquisition guy on the team—to get a good deal from our industry partners is key and foremost. Keeping the taxpayers' dollars down to minimum, but provide—

Senator HIRONO. We're all for that.

Mr. SMITH.—capability is what we strive for. Getting the good deal is my main objective. Providing the capability folks need in order to fight missions and do the things that the Marine Corps does, that's what we're here for. So, lessons learned, going forward: competition works. Competition drives industry partners to compete to—with one another, provide the capability we need. We're seeing and reaping great benefits from that competition alone.

Senator HIRONO. So—

Mr. SMITH. Things are on track.

Senator HIRONO. I assume that the two vendors that are in competition, though, while—as they develop their prototype vehicles, I mean, do we pay them for that—

Mr. SMITH. Absolutely.

Senator HIRONO.—development so that—they're not out of pocket, are they? So—

Mr. SMITH. Absolutely. The—

Senator HIRONO.—what you want to do is encourage this participation, their best efforts, and then they get the contract—

Mr. SMITH. Correct.

Senator HIRONO.—if they come up with a good vehicle. So, this is a—would you be following this kind of procurement method, going forward?

Mr. SMITH. Absolutely. This is how we should do business, going forward. Sole-source contracts—and I think we've proven, from the EFV [expeditionary fighting vehicle] vehicle that was before, they—they're very hard to control an industry partner with costs when they're a sole source. But, competition works, flying off to meet requirements are achieving the results that we're here to receive.

Senator HIRONO. On the other hand, do you think that this kind of competition is—it's very expensive. If we were to apply it to sub-marines or—you know, that gets a little trickier, doesn't it?

Mr. SMITH. Absolutely. Having grown up in the submarine acquisition world, 2 and a half billion, 3 billion a copy to pay for that twice, to——

Senator HIRONO. Yes.

Mr. SMITH.—run off 16 vehicles wouldn't be——

Senator HIRONO. Yeah. So, this kind of competition for the—is good in certain——

Mr. SMITH. For—from a unit-cost standpoint——

Senator HIRONO. Yeah.

Mr. SMITH.—I think it makes a great deal of sense for how we're operating the business. Absolutely.

Senator HIRONO. So, is that—if that works for the Marines, I hope that the other services are also learning from you guys to use that process.

General, I was very curious. You used the term “information warfare” just now. How do you define that term?

Lieutenant General WALSH. It's—we've kind of brought it in, in really all the different domains that had—have to do with information. So, when it could be psyops, psychological operations, getting information out there in that environment, electronic warfare, where we're sensing what's out in front of us. So, in some of the experiments, we put capabilities in the hands of our marines that we haven't used really since the 1980s, early 1990s, where they could sense who was on a radio out in front of them, who is operating on what channel. If we located where they were at, we could jam them or attack them. Cyber warfare is in that area. So, all the intelligence we've grouped into that MEF information group, all those areas that have to do with that information, electronic warfare, signals intelligence, radio-frequency-type capabilities is what we've put into that area.

Senator HIRONO. So, are you saying that—for example, it is very clear that Russians engaged in information warfare in interfering with our elections. So, are you saying that the Marines are developing a capability to counter information warfare from near-peer competitors such as Russia and China?

Lieutenant General WALSH. From the—you know, we've always had information capability. If you look at some of the things that we've done in Iraq and Afghanistan, some of it's winning the hearts and minds, getting information out there, leaflet drops, those sort of things, that's all been part of it. But, now, taking it to that higher level—I go back to the next-generation capability. We've got capabilities that we can put out that'll push information out—radio, television, broadcasting—but it's going to go a lot higher-level capabilities that we've got, that we'd have to talk in a different forum. But, those exactly are the type of things that we'd be talking a lot—which kind of ties in also some of our cyber capabilities we're developing.

Senator HIRONO. So, the—so, you're developing, or you always had that capability in the kind of situation where—during World War II, for example. But, what happens in a civilian context, in a—in an election-year environment? Who's responsible for countering information warfare from Russia?

Lieutenant General WALSH. I—that's probably an area outside of my expertise, Senator. I probably would have to turn that over—

you know, on—you know, in the combat environment—in fact, it's one of the areas that we're starting to have to deal with. You know, when you talk about long-range precision fires, some of those long-range precision fires are coming from the cyber area. As you know, we're trying to work into those areas. What is considered the battle space? How do we define that?

Senator HIRONO. Yes.

Lieutenant General WALSH. You know, when you've got capabilities that are back in the continental United States, that we have reachback capability. You know, before, it was looking at UAS video feeds that we could look at back in continental United States and help offensive capability forward. We're seeing the same thing in some of these areas, where signals intelligence, information operations, or cyber, that we're having to kind of understand, in the future, how we're going to be able to use this.

Senator HIRONO. Yeah, I think you—you point out one of the reasons that I don't think we have a very cohesive strategy for countering the ongoing Russian efforts to interfere with our elections and our democracy.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Senator Sullivan.

Senator SULLIVAN. Thank you, Mr. Chairman.

Since you mentioned it, I thought I would go back to this issue of training, hard training. General, I was——

Senator WICKER. You said it.

Senator SULLIVAN.—I heard, recently, that the standard—and I don't know when this was dropped, but, as you know, the Marine Corps infantry battalions used to go through an annual training exercise, where one of the elements of what they had to complete was a 26-mile hump, force march. When you think back to, again, some of the high-end conflicts that our country's been in, and how we're starting to focus on that world again, are we going to start looking at—back at those kind of training standards that are, you know, long foot maneuvers that we used to do a lot of and now I guess we're not doing those at all?

Lieutenant General WALSH. Senator, I'd probably have to take that—let me take that for the record, exactly what are in our Marine Corps combat readiness evaluations, which are our certification exercises before units deploy forward.

[The information referred to follows:]

Infantry battalions are evaluated, to standard, on the conduct of a forced march as a part of the Marine Corps Combat Readiness Evaluation.

The standard is contained in Navy/Marine Corps publication 3500.44B Infantry Training and Readiness Manual, and is used to evaluate infantry battalion's ability to conduct a foot-mobile displacement without external support.

The conditions under which infantry units must perform include marching a distance of 20km in a time limit of 5 hours, with 95 percent of the force remaining mission capable while carrying an approach march load of 90 pounds (+/- 10 percent) with additional organic weapons and mission essential equipment.

Senator SULLIVAN. Right.

Lieutenant General WALSH. As I think about this, a lot of the things that we were doing, in Afghanistan especially, was marines humping a long distance with heavy gear, carrying that. So, a lot of our standards were focused on hikes in what were in our train-

ing and readiness standards for hikes. So, I'll have to take that back and see—now, as we're now trying to look at higher-end conflict, how are our training and readiness and our certification exercises changing specifically in that hike area.

Senator SULLIVAN. Okay.

Lieutenant General WALSH. Back to your earlier piece, what I do know, though, we're doing is looking at our units where—is anybody emitting on frequency? Are they all silent? Are they able to operate in a mission control? What are they doing against air threats? We've got capabilities now, where we're using multiple UASs out there against the force. So, we're trying to up the game in that area. When it comes to the hike standard, I'll have to get back to you on that, specifically.

Senator SULLIVAN. Okay, thank you.

I also wanted to talk—just kind of broadening the aperture much further now. You know, I know the Commandant and the leadership of the Marine Corps has been looking at the issue with some of the other services, particularly the Air Force, on the force posture in the Asia-Pacific. If you look at, you know, where the Marine Corps is really postured, a lot of it—and the Army—a lot of it is actually, kind of, you know, if you take a snapshot at the end of World War II, and a snapshot at the end of the Korean War—and there hasn't been a lot of, kind of, redeployment and thinking of, you know, where our forces in the Asia-Pacific should be deployed. I know we've had this deployment to Darwin. My understanding is, you know, there are elements of that that may have had kind of a—an idea from the NSC [National Security Council], not driven by the Marine Corps or the DOD, but a, you know, more political idea during the Obama administration to do the Darwin deployment.

I mean, how are we looking at the forces in Okinawa, forces in mainland Japan, forces on Guam, in terms of the next 50 years? I mean, we need to get it right, and it does seem, to a number of us—and, you know, Senator McCain's taken a lot of interest in this issue, I have—that we haven't, kind of, looked at the future and said, "Hey, where should we be?" Particularly given the new National Defense Strategy that has China as the facing threat with regard to the Asia-Pacific, in terms of our national security.

Lieutenant General WALSH. That's probably fair to say, that the strategy is new. How does, say, the DPRI [Defense Policy Review Institute], the agreed-to Pacific laydown, how does that match up against that? I'd have to take that for the record to see how senior leadership is matching up the current agreed DPRI. I've not heard of any changes to the DPRI—

Senator SULLIVAN. Right.

General WALSH.—to match up against what the strategic new National Defense Strategy is. What it—so, I—I'll take that part for the record.

[The information referred to follows:]

With the publication of the new National Defense Strategy (NDS) the Marine Corps continues to refine how it intends to implement the new strategy. This will be a deliberative process as the Marine Corps strives to ensure it is postured in a manner to best respond to threats within the strategic environment. This posture includes forward stationed, forward deployed and CONUS based capabilities.

In the broader Asia Pacific, consistent with the NDS, our forward deployed Marines, as part of the Navy-Marine Corps team, operate within the contact and blunt layer to compete more effectively below the level of armed conflict. Should hostilities ensue, combat credible contact forces will set the conditions for the naval forces deploying as part of the war-winning surge force.

Additionally, the Marine Corps continues to further strengthen our alliances and attract new partners through our forward presence and readily available forces to engage with partners and allies.

With regard to the Defense Policy Review Initiative, it is the largest on-going posture initiative. At the Security Consultative Committee (2+2) meeting in August 2017, Secretary Mattis and Secretary Tillerson, along with the Japanese Ministers of Defense and Foreign Affairs, reaffirmed our governments' mutual commitment to implement the realignment plan for United States Forces in Japan, including Okinawa. In noting the progress being made in implementing the Guam relocation, they confirmed our mutual determination to steadily implement the Guam International Agreement.

It is natural to regularly review the progress of plan implementation and consider whether adjustments are necessary. Since the plan's inception in 2006, we have consistently worked with our Japanese partners to ensure we have the best operational laydown and make adjustments. At this time, there has been no determination to seek changes to the plan.

Lieutenant General WALSH. What I would say, though, is, looking at the strategic competition with, say, China in the Pacific is—much of what we're doing now is focusing on allies, partners, working with them closely. A lot of it is in the higher-end combat area, building those capabilities as partnerships and alliances, differently than we probably would have before we had the National Defense Strategy.

Senator SULLIVAN. Great. Okay, thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Sullivan.

Gentlemen, did it offend or surprise either of you to hear me say that I'd heard concerns that the Marines may have prioritized readiness recovery on aviation, to the detriment of combat?

Lieutenant General WALSH. I think, over the last, probably, couple of years, Senator, there's been a lot of metrics associated with our aviation readiness. So, the good thing I would say about aviation, it's a very technical area, and it's very easy—I shouldn't say easy, but it's an area where we have a lot of focused attention on readiness. We can grade that work very closely. A lot of it has to do with mishaps over the years that we've occurred—that have occurred, to not focusing on readiness and the right equipment at right place and time. So, I think looking at, over the last 2 years, how much we've ridden our aircraft so hard that we could see that the readiness had gone down, and a lot of our industrial capacity wasn't there. So, I think we've improved that over the last couple of years, and now, I think, as the focus goes from the readiness side, I think our reset on the ground side is going very well. It's almost complete. So, I would say our readiness on the ground side is not something that's as a high concern as much as the modernization capability of the equipment that we have not put a lot of money into ground future readiness versus current readiness.

Senator WICKER. Okay. Then, let me ask you—I don't think we got around—back around to very shallow mine countermeasures. So—I mean, I brought that up in my opening statement—so, how are we doing on that? The situation is that we've done pretty well with our deep water, but not so good on the full ship-to-shore. So, who'd like to take that.

Mr. Smith?

Mr. SMITH. Yes, I'll take that one, Senator. Thank you.

The Navy and Marine Corps continue to work together on their mine countermeasure doctrine. Very shallow water into the surf zone, into the—what's—what we're going to call the clearance coordination line, getting to that point, the clearance coordination line, that's the Navy's responsibility, to get the Marine Corps to that point and clear mines in that path. It's the Marine Corps' responsibility from the clearance coordination line on to that inward target, to clear mines from that standpoint, on—once they're on shore. The Navy and Marine Corps, as I said, are working very closely, jointly to make sure that that mission still concurs. But, the doctrine hasn't changed for decades. But—

Senator WICKER. Well, do we have a deficiency, when it comes to shallow water countermeasures?

Mr. SMITH. We have challenges in that area, Senator. From a physics-based standpoint, there are certain things that you just can't do, and technology today may not get you there solely. Not yet.

Senator WICKER. What about that, General?

Lieutenant General WALSH. It's—I think, like Mr. Smith said, this is a hard problem. To try to find mines in surf in that beach zone, very shallow water, is a difficult, difficult problem. What I will say is—you talked about the littoral combat ship, and how that is focused on deeper water, but I wouldn't say deep water—I'd have to go back into what the Navy terminology is—very shallow water—but, where I would say the Navy has put a lot of effort on is getting capabilities in the hands of the Naval Expeditionary Combat Command, outside of the littoral combat ships. I know I—I talked to Admiral Merz about this—over the FYDP [Future Year Defense Program]—who's the N9 over at OPNAV—the Navy's put over a billion dollars into mine countermeasures over the Fiscal Year Defense Plan. So, a lot of effort's going in there, because I think the technology is getting much better with unmanned systems that can cover much more of the water area—the water column.

Still, the surf zone in that beach zone is a real difficult problem. One of the things the Commandant had me working with JIEDO, who is focused on mines on land, what capabilities and technology do they have that can help us in that beach zone, surf zone? So, it's a tough problem, but I think technology's getting better, and certainly the Navy investment is increasing tremendously.

Senator WICKER. Thank you, gentlemen. We appreciate your testimony, and we appreciate your service.

This hearing is closed.

[Whereupon, at 3:43 p.m., the Subcommittee adjourned.]

[Questions for the record with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR RICHARD BLUMENTHAL

LASER WARNING RECEIVER SYSTEM

1. Senator BLUMENTHAL. Mr. Smith and Lieutenant General Walsh, since 1994, the Marine Corps has had a requirement to incorporate a laser warning receiver system to protect Marine Corps combat vehicles from threats. The requirement was part of a joint effort between the Marine Corps and the Army, and included the

M1A1 Main Battle Tank, the Marine Corps' Light Armored Vehicle (LAV), and Assault Amphibious Vehicle (AAV). The requirement continues to be unfunded in the budget year after year—while Russian and Chinese ground vehicles already possess laser warning receiver systems. Why has this laser warning receiver system requirement not been fielded? Are you working toward fielding it in the near term? What are the obstacles?

Mr. SMITH and Lieutenant General WALSH. A Laser Warning Receiver System (LWRS) for the M1 Main Battle Tank (MBT) was tested in a developmental program in 2012. At that time, the system was found to be insufficiently mature for integration onto the M1. Specifically, the LWRS was not able to achieve the required accuracy needed to provide the crew with effective battlefield situational awareness. Given this limitation, other more operationally effective modernization projects were prioritized and resourced. The Marine Corps, in coordination with the U.S. Army's Vehicle Protection Suite (VPS) Office, will pursue the maturation of LWRS capability in the near-term with the intention to transition and integrate this capability onto several combat platforms, to include the M1 MBT. The Marine Corps, in close coordination with the U.S. Army, will continue to make best use of common M1-based subsystems to improve our combat vehicle capabilities.

2. Senator BLUMENTHAL. Mr. Smith and Lieutenant General Walsh, what capability can a laser warning receiver system bring to Marine Corps ground systems?

Mr. SMITH and Lieutenant General WALSH. An effective LWRS integrated onto a combat vehicle system increases the situational awareness of the vehicle crew and improves system survivability. An LWRS provides the vehicle crew with a warning when they are lased by threat weapons that possess laser range finders such as main battle tanks, or laser guidance systems such as advanced anti-armor weapon systems. An LWRS is best exploited as part of an integrated vehicle protection suite that employs this sensor capability in conjunction with other system survivability technologies such as active protection and rapid obscuration systems.

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

TUESDAY, APRIL 17, 2018

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

NAVY SHIPBUILDING PROGRAMS

The Subcommittee met, pursuant to notice, at 2:32 p.m. in Room SR-232A, Russell Senate Office Building, Senator Roger F. Wicker (chairman of the Subcommittee) presiding.

Subcommittee Members present: Senators Wicker, Cotton, Scott, Hirono, Shaheen, Kaine, and King.

OPENING STATEMENT OF SENATOR ROGER F. WICKER

Senator WICKER. Good afternoon. The Senate Armed Services Subcommittee on Seapower convenes this afternoon to examine Navy shipbuilding programs.

We welcome our three distinguished witnesses: the Honorable James F. Geurts, Assistant Secretary of the Navy for Research, Development, and Acquisition; Vice Admiral William R. Merz, Deputy Chief of Naval Operations for Warfare Systems; and Lieutenant General Robert S. Walsh, Deputy Commandant of the Marine Corps for Combat Development and Integration.

Gentlemen, thank you very much for being here. This is the first appearance of Secretary Geurts and Admiral Merz before this Subcommittee, so let me extend a special welcome and thanks for your decades of service to our Nation to all three of you.

The Navy's fiscal year 2019 budget request includes 10 new construction ships, which is one more than the number requested last year. The 2019 request also details plans to build 11 additional ships over the next 5 years, as compared to last year's request. The Navy battle fleet currently stands at 282 ships.

In 2016, the Navy increased its minimum requirement to 355 ships. This Subcommittee took that requirement seriously. In fact, every Member of this Subcommittee cosponsored legislation that I introduced last year, the SHIPS [Servicing the Homeland by Increasing our Power on the Seas] Act, to make achieving 355 ships the official policy of the United States. The SHIPS Act was included in the fiscal year 2018 National Defense Authorization Act.

I want to give due credit to our colleagues at the other end of Capitol Hill. Members of the House Subcommittee and committee were also entirely supportive.

This act was signed into law by President Donald Trump in December.

A 355-ship fleet is not just a requirement. It is the law. We take it seriously, and we believe the Navy should take it seriously also.

The Navy's long-awaited 30-year shipbuilding plan accompanied the fiscal year 2019 budget request. In its current form, the shipbuilding plan does not reach the 355-ship requirement in the next 30 years. In 2048, the last year of the plan, the fleet would have just 335 ships. This is unacceptable.

My phone is talking to me, so I am trying to turn it off.

This is unacceptable. In this light, though, we have good news. I am pleased that the Navy announced plans last week to extend the service lives of the entire class of *Arleigh Burke*-class destroyers.

I understand that this move will accelerate the time to reach 355 ships from the 2050s to the mid-2030s. This is good news, and we look forward to seeing destroyer life extensions included in future budgets and shipbuilding plans.

The current shipbuilding plan, as I said, increases the fleet size to 326. After the first 5 years, however, according to the plan, we see a dip in fleet size, where it declines before modestly increasing in the 2030s and 2040s. As mentioned, the Navy's recently announced plan to extend the Burke class destroyers should reduce or hopefully eliminate the dip and keep the fleet on an upward trajectory.

More can be done, and this Subcommittee wants to be a partner with you, gentlemen, to move this as quickly as possible.

The shipbuilding plan contains three assumptions that are central to the speed at which the Navy can reach 355 ships. Let's explore each of these assumptions.

Assumption A, limited ship service life extensions planned after the first 5 years. Beyond the five *Los Angeles*-class submarines and the *Burke*-class, the Navy should identify future candidates for service life extensions. Amphibious ships and *Nimitz*-class aircraft carriers should be reviewed in detail.

Assumption B, overall shipbuilding funding levels will decline significantly after 2035. The plan includes a sharp drop in projected shipbuilding funding from roughly \$24 billion in 2035 to \$16 billion in 2036, and it remains below \$20 billion per year until the mid-2040s. The drop in funding is related to the end of the *Columbia*-class procurement. However, the plan provides no justification for why the shipbuilding account should decline so significantly and never recover. How much faster could the Navy achieve the 355-ship requirement for our Nation's security if shipbuilding funding remained at roughly \$24 billion per year?

Assumption C, unspecified supplemental funding for *Columbia*-class submarines. The shipbuilding plan discusses the general need for supplemental funding related to the *Columbia*-class but does not provide specific dollar amounts. In 2013, the Navy told Congress it needed about \$4 billion per year in supplemental funding over 15 years, totaling \$60 billion for *Columbia*. Absent supple-

mental funding, Navy officials further stated that *Columbia's* pressure on the shipbuilding account would cause the elimination of about 32 other ships from its 30-year shipbuilding plan. Congress needs clear and specific estimates of the supplemental funding needed to avoid drastic reductions to the rest of the shipbuilding portfolio.

In addition to discussing A, B, and C of the shipbuilding plan and the above assumptions, the Subcommittee would like to hear our witnesses' views on four other key issues.

First, industrial base vitality. Reaching the Navy's 355-ship objective is not possible without the unique skills, capabilities, and capacities inherent to our new construction shipyards, repair facilities, and dedicated suppliers. The witnesses should describe the budget request's effects on the shipbuilding industrial base.

In this regard, I was pleased to see the Navy recently released a request for proposal that would enable a block buy or combined procurement of two aircraft carriers.

Second, best use of taxpayer resources. This Subcommittee will continue to conduct oversight of shipbuilding programs to ensure the Navy is making the best use of taxpayer dollars. Congress expects Navy shipbuilding programs to deliver promised capability on time and on budget. Schedule delays and cost growth put additional strain on the legacy platforms that these new ships will replace.

Third, building the future force. This Subcommittee also has a duty to shape the future of our Navy. Notably, 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 and their associated munitions.

Fourth, amphibious ships. I am interested in the 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 32 amphibious ships. The witnesses should discuss the Navy's ability to efficiently procure the next amphibious assault ship now called a Flight II LPD. Given the Flight II LPD is a close derivative of the Flight I LPD, I would like to know if the Navy believes Flight II LPDs are ready for so-called block buys or multiyear procurement.

We are also interested in options to accelerate the next big deck amphibious ship, LHA-9.

So there is a myriad of things to discuss.

There is no time to waste. As the new National Defense Strategy states, we are engaged in a great power competition. This is serious business for the security of our Nation and its citizens. If we do not take action, the consequences will be dire. Our maritime warfighting edge is eroding. If we fail, I fear 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."

So thank you, gentlemen, for being here. I now turn to my good friend and Ranking Member, Senator Hirono.

STATEMENT OF SENATOR MAZIE K. HIRONO

Senator HIRONO. Thank you, Mr. Chairman. You have certainly kept a laser-beam focus on getting to a 355-ship Navy.

He is very persuasive. That is how he got all of us to sign on to the bill, which became law.

So I certainly join you, Mr. Chairman, in welcoming all of our witnesses. We are grateful to each of you for your service to our country. We are also grateful for your families, because when you serve, your families also serve.

Our witnesses face significant challenges as you strive to balance the need to support ongoing operations and sustained readiness with the need to modernize and maintain technological advantages that are critical to military successes, especially as we know what the Chinese and Russians are doing, particularly the Chinese, to modernize their military.

These threats require us to consider how we can ensure that the Navy and Marine Corps have the resources they need. However, any increase in resources cannot come at the expense of important domestic programs that families, including our military families, rely on every day.

Navy shipbuilding 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. From where I sit, I think that America is basically a naval power, and we understand that very well at Pacific Command.

With that in mind, this Subcommittee has focused on improving acquisition stewardship and ensuring that we are getting good value for every shipbuilding dollar that we spend. Last year, we were pleased with the Chief of Naval Operations' new force structure assessment, which recommended that we move toward a 355-ship Navy.

While the new 30-year shipbuilding plan that the Navy submitted with the fiscal year 2019 budget request would lead to increasing the size of the fleet, it would not meet that 355-ship goal, as noted by the chairman. This 30-year plan would meet the attack submarine force goal of 66 boats in 2048. However, in the same year, we would have a force of nine aircraft carriers compared to the goal of 12 carriers, and 92 large surface combatants versus the goal of 104. We need to understand the steps that the Navy will be taking to address these shortfalls.

A significant factor that bears on our discussions this year is that Secretary Mattis has published a new defense strategy that is intended to guide force structure development and modernization programs to increase capability. It is reasonable to speculate that the implications of this new defense strategy of the Department of the Navy could yield increased demand for naval forces and complicate the Navy's plans to achieve its force structure goal.

Whatever the case, I am very encouraged that the Navy is focusing on a vital component of maintaining a ready and capable fleet, and that would be the Navy shipyards.

The Navy is planning to establish a program of record for modernizing the shipyards; will name a full-fledged program manager to oversee the program; and, later this year, will publish a master plan to guide this modernization. For too long, the Navy has been

ignoring the vital contribution of the public shipyards and its highly trained work force in places such as, of course, Pearl Harbor Naval Shipyard.

I look forward to working with the Navy to ensure that the shipyard modernization program stays on track and to hearing your testimony this afternoon.

Thank you, Mr. Chairman.

Senator WICKER. Thank you very much, Senator Hirono.

Now I am told that, Secretary Geurts, you will make a verbal statement, and that will stand for all three of our witnesses. Is that correct?

Secretary GEURTS. Yes, sir.

Senator WICKER. You are now recognized.

STATEMENT OF THE HONORABLE JAMES F. GEURTS, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT, AND ACQUISITION; ACCOMPANIED BY VICE ADMIRAL WILLIAM R. MERZ, USN, DEPUTY CHIEF OF NAVAL OPERATIONS FOR WARFARE SYSTEMS (OPNAV N9); 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

Secretary GEURTS. Thank you, sir. Chairman Wicker, Ranking Member Hirono, distinguished Members of the Subcommittee, thanks for the opportunity to appear before you today to address the Department of the Navy's shipbuilding plans.

I am joined today by Vice Admiral Bill Merz, Deputy Chief of Naval Operations for Warfare Systems, and Lieutenant General Bob Walsh, Deputy Commandant for Combat Development and Integration.

With your permission, I intend to provide brief opening remarks for the three of us and submit our formal statement for the record.

Senator WICKER. Without objection.

Secretary GEURTS. As detailed in the 2018 National Security Strategy and the 2018 National Defense Strategy, it is imperative that we continuously adapt to the emerging security environment in order to retain and expand our competitive advantage, and to do so with a sense of urgency.

This requires the right balance of naval readiness, capability, and capacity, as well as budget stability and predictability. It requires a Navy of at least 355 ships.

The fiscal year 2018 Bipartisan Budget Act and the fiscal year 2019 President's budget chart a course to begin building this larger, more capable battle force the Navy and the Nation need.

Strong congressional support in the 2018 Bipartisan Budget Act funded 14 ships in fiscal year 2018, an increase of five ships, including the lead Flight II LPD-17 class amphibious ship. It also includes strong support for the critical industrial base, a key element to our national security.

Thank you for that unwavering support.

The 2019 budget further builds this larger and more capable force and reflects the continued commitment to produce a 355-ship

Navy. When compared with the 2018 President's budget, the 2019 request adds 11 more battle force ships over the FYDP [Future Year Defense Program] for a total of 54 ships, with three additional ships in 2019, as well as advanced procurement for the Columbia SSBN.

As stated up front in the shipbuilding plan, the Navy continues to aggressively pursue options to accelerate the achievement of the 355-ship Navy. Executing ship construction profiles in the FYDP coupled with extending the service life of the DDG-51 class and targeted service extensions of up to five SSNs provides an achievable strategy to reaching our goal of 355 ships on the 2030s.

As this service life analysis work continues across all classes of ships, you will see adjustments to our timelines in subsequent shipbuilding plans. As we accelerate growing our Navy to meet the 355-ship requirement, we will also be working to ensure we deliver the best mix of our overall naval capabilities to meet the National Defense Strategy, including additional focus on the logistics fleet and hospital ships.

We look forward to continuing to work closely with this Subcommittee on the options and opportunities to achieve the Navy the Nation needs urgently and affordably. We thank you for the strong support this Subcommittee has provided to the Department of the Navy and the opportunity to appear before you today to discuss this important topic. We look forward to answering your questions.

[The prepared statement of Mr. Geurts follows:]

JOINT PREPARED STATEMENT BY THE HONORABLE JAMES F. GEURTS AND
LIEUTENANT GENERAL ROBERT S. WALSH AND VICE ADMIRAL WILLIAM R. MERZ

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 seapower programs. First we would like to thank Congress for your support of the Bipartisan Budget Act of 2018. Enactment of this legislation will help provide the predictability and stability in funding that is critical to our success and will support building the Navy the Nation Needs, the maritime component of the National Defense Strategy.

The strategic environment continues to become more sophisticated, uncertain, and technologically charged. The proliferation of modern conventional and cyber weapons to a broader range of state and non-state entities, along with the erosion of our competitive advantage in areas where we have long enjoyed relative superiority, is likely to continue as rival states attempt to contest our influence. Competition for natural resources, violent extremism, natural disasters, social unrest, cyber-attacks, regional conflict, and the increase of advanced weaponry create a range of challenges for a globally responsive force.

As detailed in the 2018 National Security Strategy and the 2018 National Defense Strategy, in order to retain and expand our competitive advantage, it is imperative that we continuously adapt to the emerging security environment—and do so with a sense of urgency. This requires the right balance of readiness, capability, and capacity, as well as budget stability and predictability. Together, we can ensure our military's capability, capacity, and readiness can continue to deliver superior naval power around the world, both today and tomorrow.

As part of our enduring commitment to accelerating delivery of advanced capabilities to the warfighter, the Department continues its pursuits of accelerated acquisition and business process reforms. We are utilizing accelerated acquisition authorities Congress provided under the Fiscal Year 2017 National Defense Authorization Act including implementation of accelerated acquisition policies for Rapid Prototyping. We are actively promoting innovation, government/academia partnerships, and the transition of key manufacturing technologies and processes with investments focused on affordability and capabilities most beneficial to the warfighter.

As part of the Joint Force, the maritime dimension of the National Defense Strategy is to increase American naval power by building the Navy the Nation Needs

(NNN). The Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2019 is the roadmap to attain a 355-ship fleet, prioritizing three elements that the Navy will pursue to grow the force: (1) Steady, sustainable growth and an establishment of minimum baseline acquisition profiles that grow the force at a stable, affordable rate. This includes the sustainment of the industrial base at a level that supports affordable acquisition, predictable and efficient maintenance and modernization, and an appropriately sized workforce for more aggressive growth if additional resources become available. (2) Aggressive growth that more rapidly attains the same warfighting requirements as increased resources and industrial capacity permit. (3) Service Life Extensions (SLEs) that evaluate the potential additional service life that can be gained through restoration and modernization based on capability improvement costs versus unit replacement criteria. By balancing long-term growth profiles with targeted SLEs and aggressive growth options, the Navy will be able to stabilize the industrial base and set the foundation for growing the force towards its warfighting requirement.

Similarly, to increase its competitive advantage over pacing threats, the Marine Corps will rapidly adapt and modernize in an affordable way, which depends greatly on predictable funding. In anticipation of the changing threat, the Marine Corps began implementation of the Marine Operating Concept (MOC) in 2016, codifying the long-term vision for how the service will operate, fight, and win in the future. This concept identified the need for a more lethal, resilient force able to contribute to all domain access, sea control, power projection, maritime security and therefore deterrence in any threat environment. The MOC is directly in line with the recently published National Defense Strategy which highlights the requirement for increased strategic flexibility and freedom of action. The MOC and its implementation prepare the Marine Corps to operate as part of the Contact, Blunt, and Surge forces identified in the National Defense Strategy, specifically as part of the naval force. Marines operate regularly within these three layers today, making the modernization priorities highlighted in the Fiscal Year 2019 President's Budget all the more critical.

The Fiscal Year 2019 President's Budget Request

The Fiscal Year 2019 President's Budget was informed by the 2018 National Security Strategy and the 2018 National Defense Strategy and charts a course to building a larger, more capable battle force the nation needs.

The 2018 National Defense Authorization Act supports Navy's validated NNN requirement for 355 Battle Force ships, which is based upon analysis and acceptable strategic and operational risk, to address the evolving and increasingly complex responsibilities. The Fiscal Year 2019 President's Budget request builds towards this larger and more lethal force and reflects the continued commitment to produce a 355 ship Navy with the correct mix of ships; a commitment that increasingly values speed, lethality, stealth, information, and design margin for modernization as key attributes for future platforms—providing warfighting commanders capabilities in increasingly contested environments across all phases of warfare.

When compared to the Fiscal Year 2018 President's Budget request, the Fiscal Year 2019 President's Budget adds 11 more Battle Force ships over the Future Year Defense Program for a total of 54, with three additional ships in Fiscal Year 2019. The Fiscal Year 2019 request includes procurement of ten ships in Fiscal Year 2019: two SSN 774 *Virginia*-class attack submarines; three DDG 51 *Arleigh Burke*-class destroyers; one Littoral Combat Ship (LCS); one Expeditionary Sea Base (ESB); two *John Lewis*-class fleet oilers (T-AO); and one Towing, Salvage and Rescue ship (T-ATS). The Fiscal Year 2019 President's Budget provides for SLEs on 11 Battle Force ships including six Cruisers, four Mine Countermeasure ships, and one Improved *Los Angeles*-class SSN. The Fiscal Year 2019 President's Budget request also includes funding for SLEs on 21 vessels in the Ready Reserve Force (RRF) and the Military Sealift Command surge fleet. The Fiscal Year 2019 President's Budget request includes funding for procurement of two used commercial auxiliary vessels in fiscal year 2021 and 2022, as authorized in the Fiscal Year 2018 National Defense Authorization Act.

With sustained funding provided in a timely manner and the execution of qualifying SLEs, the Fiscal Year 2019 President's Budget as described in the NNN ship-building plan puts the Navy on a path to 326 ships by Fiscal Year 2023 and 355 ships by the early 2050s. The plan promotes a stable and efficient industrial base that encourages industry investment in capital improvements, capital expansion, and a properly sized world-class workforce. It is a realistic plan that reflects the imperative to remain balanced across investments in readiness and advanced capabilities in an era of unpredictable funding levels. By setting conditions for an enduring industrial base as a top priority, working together with Congress, the Navy is postured to aggressively respond to more investment in any year, which if received in

all years, combined with SLEs and strong industry response, could attain the warfighting NNN target of 355 ships as early as the 2030s—balanced, credible and sustainable.

SUMMARY

The ascendant threats posed by revisionist powers and rogue states require change—we must become more lethal, resilient and as a consequence, a more capable deterrent. The Navy-Marine Corps team is re-evaluating our contributions to all domain access, sea control, power projection, maritime security, and deterrence knowing that we must consider the tactical and operational details of a contingency—and how our contributions could shape the strategic environment to prevent conflict. Modern sensors and precision weapons with expanding ranges and lethality are redefining how we assess our posture and relative combat power.

The Department of the Navy continues to increase capacity, lethality, and availability with the shipbuilding, aviation, and expeditionary programs. New capabilities are continually being delivered to the fleet and retrofitted on existing platforms to provide enhanced lethality and survivability to the warfighter. In addition, the Department is aggressively pursuing efforts to accelerate acquisition timelines 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. Continued congressional support of the Department's plans and budgets will help sustain a viable industrial base, as will timely enactment of appropriations, avoiding costly Continuing Resolutions. This request lays the ground work for growing warfighting capabilities in the Fiscal Year 2020 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 2019 President's Budget.

Programmatic details regarding Navy and Marine Corps capabilities are summarized in the following section.

U.S. NAVY AND MARINE CORPS SEAPOWER CAPABILITIES SHIPS

Aircraft Carriers

The aircraft carrier is the centerpiece of the Navy's Carrier Strike Groups and central to Navy core missions 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.

We continue to see progress in the testing of new systems aboard USS *Gerald R. Ford* (CVN 78). As of this January, CVN 78 has completed six underway events and conducted over 700 catapult launches and arrestments with Navy jets, including over a hundred launches and recoveries in one day on two separate occasions. These fixed wing operations were successfully supported by a number of aviation systems, while others will require continued refinement as they continue to support ongoing shipboard testing. The *John F. Kennedy* (CVN 79) is over 40 percent complete with launch planned in late 2019 and delivery in the fall of 2024. The Navy is pursuing contracting actions necessary to continue fabrication of *Enterprise* (CVN 80) in Fiscal Year 2018 and preserve the delivery date to achieve significant cost reductions.

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. USS *George Washington* (CVN 73) began her mid-life recapitalization in August 2017 with re-delivery planned in summer 2021 to accomplish refueling of the ship's reactors, modernization, and repair of ship systems and infrastructure. The USS *John C. Stennis* (CVN 74) RCOH advance planning contract award is scheduled in summer 2018.

Submarines

Ballistic Missile Submarines, coupled with the *Trident II* D-5 Strategic Weapons System, represent the most survivable leg of the Nation's strategic arsenal and provide the Nation's most assured nuclear response capability. The *Columbia*-class program is on track to start construction in October 2020 and deliver to pace the retirement of our current ballistic missile submarines, deploying for its first patrol in fiscal year 2031. Topline relief will be required for the Navy to fund serial production of the *Columbia*-class SSBN.

The Fiscal Year 2019 President's Budget supports the funding required to achieve a target of 83 percent design completion at construction start in Fiscal Year 2021.

In September 2017, the Navy awarded General Dynamics Electric Boat a \$5.1 billion contract for the design completion, technology development, and prototype manufacturing for the *Columbia*-class program. The contract leverages the authorities contained within the National Sea-Based Deterrence Fund and incentivizes construction readiness, affordability and supplier base capability and capacity. The Fiscal Year 2019 President's Budget request also funds Continuous Production of Missile Tubes and will support Advance Construction of long lead time material. Both efforts 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 2019 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 long-term strategy for our attack submarines and future payload submarine is the Tactical Submarine Evolution Plan, or TESP, which features the *Virginia*-class SSN. The *Virginia*-class program is continuing to deliver submarines within budget and with increased capability in each block. The Navy will be building on past success by awarding a Block V Multiyear Procurement (MYP) contract for 10 ships in Fiscal Year 2019. Starting with the second ship in Fiscal Year 2019, these submarines will introduce the *Virginia* Payload Module and Acoustic Superiority.

In 2016, the Navy established the Integrated Enterprise Plan to provide a framework for an integrated approach to support *Columbia*, *Virginia*, and *Ford*-class construction. This long-term government and contractor effort will guide the execution of these nuclear-powered platforms affordably, on time, to specifications, in the necessary quantities, and with acceptable risk.

Large Surface Combatants

The *Arleigh Burke*-class (DDG 51) program remains one of the Navy's most successful shipbuilding programs with 65 ships delivered to the Fleet. The Fiscal Year 2018 to 2022 MYP maximizes affordability, stabilizes the industrial base, and has the flexibility to add additional ships. All ships in this MYP will incorporate Integrated Air and Missile Defense and provide additional Ballistic Missile Defense 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, its entry into the Production and Deployment phase, and Fiscal Year 2017 Flight III awards to both shipbuilders.

Complementing the DDG 51, the DDG 1000 *Zumwalt*-class guided missile destroyers are an optimally crewed, multi-mission surface combatant designed to provide long-range, precise, naval surface fire support. The DDG 1000 ship is nearing completion of industrial work in preparation to activate its combat systems in its homeport of San Diego. DDG 1001 has successfully completed acceptance trials and is scheduled for delivery from the building yard in spring 2018 and construction on DDG 1002 is over 70 percent complete. After a comprehensive review of *Zumwalt*-class requirements, the Navy decided in November 2017 to refocus the primary mission of the *Zumwalt*-class Destroyers to Offensive Surface Strike. This change in mission adds lethality and offensive capabilities by providing fires against targets afloat and ashore.

Small Surface Combatants

The 2016 Force Structure Assessment revalidated the warfighting requirement for a total of 52 small surface combatants, including the LCS and the future, more capable Guided Missile Frigate (FFG(X)). The Navy will continue to refine the FFG(X) Conceptual Design with industry through fiscal year 2019 to support a full and open competition with a single source award in fiscal year 2020. The Fiscal Year 2019 President's Budget includes one LCS in fiscal year 2019 to sustain the viability of the industrial base until the FFG(X) award in fiscal year 2020. The FFG(X) will expand the competitive field of our shipbuilding industrial base.

The Program of Record (POR) requirements for LCS Mission Packages (MP) have been updated. The new MP POR requires 10 Surface Warfare (SUW), 24 Mine Countermeasures (MCM), and 10 Antisubmarine Warfare (ASW) for a total of 44 deployable MPs. Due to the expeditionary and modular nature of the MCM MP this capacity can be fielded by both LCS and other Vessels of Opportunity. The Navy plans to leverage the modularity and flexibility of elements of the ASW and SUW

MPs for the FFG(X) design, however these elements will not be complete MPs nor will they be included in the LCS MM POR quantity of deployable MPs.

The LCS MP program continues the development of the SUW, MCM, ASW capabilities, delivering individual mission systems incrementally as they become available. This past year LCS 4 deployed with the first installation of an over-the-horizon missile capability added to the SUW MP. The Surface-to-Surface Missile Module with Longbow Hellfire will add more lethality to the SUW MP. It is currently in testing with Initial Operational Capability (IOC) planned for fiscal year 2019.

The ASW MP Escort Mission Module (EMM) uses a continuously active Variable Depth Sonar, integrated with a Multi-Function Towed Array to provide a revolutionary surface ship anti-submarine capability. Development and integration of the EMM, Light Weight Tow, and Torpedo Defense Module are ongoing. The ASW EMM and is on track to fully integrate with the LCS to support IOC with the ASW MP in fiscal year 2019.

The Navy has scheduled three MCM systems for developmental tests (DT) and two for operational assessments (OA) this year, with Milestone C production decisions of the first two expected before the end of fiscal year 2018. The MCM Unmanned Surface Vehicle (USV) is the tow platform for minehunting operations, and is based on the USV already used in the Unmanned Influence Sweep System program. The Navy's plan is to conduct MCM MP DT/OA in fiscal year 2020 and achieve IOC in fiscal year 2021.

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 the preponderance of our naval response in humanitarian assistance and disaster relief. The operationally available inventory of amphibious warships and connectors remains below the 38 ship force structure requirement. The Navy is exploring service life extensions of existing ships and the acceleration of the LX(R) program to mitigate this shortfall.

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) deployed as the centerpiece of *America* Amphibious Readiness Group/Marine Expeditionary Unit, while USS *Tripoli* (LHA 7) is on schedule to deliver in December of 2018. The Detail Design and Construction contract was awarded in June 2017 for LHA 8 and delivery is planned for fiscal year 2024. LHA 8 will include a well deck to increase operational flexibility and includes a reduced island structure that increases flight deck space to enhance aviation capability.

The *San Antonio*-class (LPD 17) provides the ability to embark, transport, and land elements of a landing force by helicopters, tilt rotor aircraft, landing craft, and amphibious vehicles. USS *Portland* (LPD 27) will commission in April 2018 and the USS *Fort Lauderdale* (LPD 28) keel was laid in September 2017, with expected delivery in fiscal year 2021. 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. LPD 29 was awarded in February and will continue with the LPD 28 design, but add the Enterprise Air Surveillance Radar (EASR) among other improvements.

LX(R) will be a flight upgrade to the LPD 17 class. Contract actions are in process for Detail Design and Construction award of the fiscal year 2018 ship.

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 has been fielded on cruisers and destroyers and continues to deliver unprecedented offensive and defensive capabilities, including, offensive ASW and simultaneous air and ballistic missile defense on destroyers and Air Defense Commander capability on cruisers. AEGIS Baseline 10 will add the AN/SPY 6(V) AMDR providing significant performance improvements over the AN/SPY 1D(V) radar and expanding the sensor coverage and enhancing the Navy's ability to perform the Integrated Air and Missile Defense mission. The Navy is leveraging the investment in AMDR to produce the EASR that will become the primary Air Search Radar for large deck ships and the Guided Missile Frigate. By using a common design and support strategy, we are enabling significant life cycle cost reduction for the Navy's surface radars.

The Ship Self-Defense System provides ships with greater capability to defend against anti-ship cruise missile attack and supports a myriad of mission areas on Carrier and large deck Amphibious Class Ships.

The Department continues to aggressively pursue affordable systems that are employable from multiple platforms. Under the Surface Electronic Warfare Improvement Program (SEWIP), the Navy is replacing aging analog electronic warfare systems first fielded in the early 1970's with new, digital systems. SEWIP Block 1 and 2 systems are in Full Rate Production and continue to be installed across the fleet. The SEWIP Block 3 program completed its Critical Design Review in 2017 and is on track for Milestone C in fiscal year 2018. The Navy continues to deliver enhanced surface Undersea Warfare capability through the AN/SQQ-89A(V)15 aboard cruisers, destroyers, and LCS Mission Packages.

The Submarine community continues to successfully deliver improvements in Anti-Submarine Warfare utilizing bi-annual hardware Technology Insertions on even years and software Advanced Processing Builds on odd years. Leveraging commercial off-the-shelf (COTS) technologies via the Acoustic Rapid COTS Insertion (ARCI) program mitigates COTS obsolescence while providing more capability improvement at lower costs.

Auxiliary Ships, Expeditionary, and Other Vessels

Support vessels such as the ESB, Expeditionary Transfer Dock (ESD), and the Expeditionary Fast Transport (EPF) provide additional flexibility to the combatant commanders. ESBs are flexible platforms capable of hosting multiple mission sets with airborne, surface, and subsurface assets. The USNS Lewis B. Puller (ESB 3), the first Afloat Forward Staging Base variant of the ESD, joined the U.S. Fifth Fleet in the Persian Gulf in the Fall of 2017. ESB 4 delivered in February 2018 and ESB 5 is scheduled for delivery in May 2019. The Navy accepted delivery of the 9th EPF this past December and EPF 12 will start fabrication this year.

The Combat Logistics Force (CLF) consists of T-AOE fast combat support ships, T-AKE dry cargo and ammunition ships, and T-AO fleet replenishment oilers. CLF 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 start of construction for the first T-AO 205 is scheduled for September 2018.

The Department has begun procurement of a combined towing, salvage, and rescue (T-ATS) ship to replace the four T-ATF 166 class fleet ocean tugs, which reach the end of their expected service lives starting in 2021, and the four T-ARS 50 class salvage ships, which reach the end of their expected service lives starting in 2025. Fabrication is expected to begin in early fiscal year 2019.

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. The detail Design and Construction Request for Proposal has been released with proposals due at the end of fiscal year 2018. Based on this effort, the Coast Guard expects delivery of the first icebreaker as early as 2023.

Surface Ship Modernization and Service Life Extensions

The fiscal realities facing the Navy make it imperative that we modernize our in-service ships to achieve their expected service lives and also to extend the service lives through modernization of our ships to achieve a 355 ship Navy. The Navy and industry are collaborating on innovative approaches to conducting modernization of Cruisers and Dock Landing Ships. The Fiscal Year 2019 President's Budget includes funding for the modernization of five 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 over the Future Years Defense Program (FYDP) for modernization of seven cruisers to ensure long-term capability and capacity for purpose-built Air Defense Commander platforms. The remaining four cruisers, which have Ballistic Missile Defense capability, will receive modernization to their hull, mechanical and electrical systems to support their operation through their engineered service life.

Unmanned Undersea Vehicles

The Navy is expanding its global reach through the development of unmanned capabilities to ensure maritime dominance and power projection. This requires per-

sistent global presence in all maritime domains, the ability to deny our adversaries safe haven in the world's oceans, and the capability to generate kinetic and non-kinetic effects at the time and place of our choosing. The Navy executes multiple missions in and from the Undersea Domain including Strategic Deterrence; Intelligence, Surveillance, and Reconnaissance (ISR); ASW; Anti-Surface Warfare (ASuW); Strike; Naval Special Warfare; and Mine Warfare. The Navy is using a Family-of-Systems strategy to develop and employ unmanned undersea vehicles to conduct a spectrum of undersea missions that complement and relieve stress on the manned force. The Family leverages small and medium-sized commercial vehicles, and is developing large and extra-large vehicles.

Snakehead is the Large Vehicle which is the most critical member of the family for overall family development and tactical operations. Orca is the Extra Large Vehicle that is being designed to launch from a pier or large surface ship and operate for weeks or months at a time.

Ready Reserve Forces (RRF)

The Navy has coordinated planning options with the Office of the Secretary of Defense, U.S. Transportation Command (USTRANSCOM), and the Department of Transportation's Maritime Administration (MARAD) and developed a strategic sealift recapitalization strategy that includes a three-phased approach. The strategy includes the SLE of select Surge Sealift vessels, acquiring used vessels, and a new construction, common-hulled shipbuilding program. The Navy's long-term strategy advocates that new construction common hull vessels be assigned to the Maritime Prepositioning Force (MPF) as delivered, ensuring the Fleet has the latest capabilities to support employment across the full range of military operations. Existing MPF ships would rotate to surge, preserving capability and maintaining the requisite square footage to meet USTRANSCOM sealift capacity requirements.

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 its range in the counter-air mission. SM-6 Block I declared Full Operational Capability in December 2017 and the Navy plans to award a MYP contract for up to 625 SM-6 missiles in fiscal year 2019. The MYP will span from fiscal year 2019 to fiscal year 2023, is projected to achieve over 10 percent savings vice annual procurement, and aligns with the potential SM-3 Block IB MYP in fiscal year 2019.

The Evolved Sea Sparrow Missile (ESSM) provides another layer to the Navy's defended battle-space. ESSM Block 2 is on track to achieve IOC for AEGIS platforms in fiscal year 2020 and Ship Self-Defense System platforms in the 2022 to 2023 timeframe.

The inner layer of the Fleet's layered defense is the Rolling Airframe Missile (RAM) designed to pace the evolving anti-ship cruise missile threat and improve performance against complex stream raid engagement scenarios. The RAM Block 2 is on track to receive a Full Rate Production Decision in fiscal year 2018.

The Fiscal Year 2019 President's Budget includes funding to continue upgrades to the Standard Missile-2 (SM-2) inventory with active guidance utilizing accelerated acquisition authorities. This investment provides an affordable, integrated fire control capable, area defense missile to counter stressing threats.

UNITED STATES MARINE CORPS EXPEDITIONARY WARFARE

Expeditionary Warfare

The principle of Expeditionary Warfare is to operate forward, to exploit the seas as maneuver space as a base for global power projection, and to be ready to maneuver to shore when so ordered. Our ability to deploy from the sea in austere environments at a time and place of our choosing gives us significant tactical, operational and strategic advantages over potential adversaries. That ability is provided through the combination of connectors that move forces from the sea base to the objective sites and sustain the organic capability of those forces to maneuver and fight on the objective.

The Navy/Marine Corps team provides the Combatant Commanders and our Nation the options needed to engage with our partners, to deter our adversaries and, when needed, to fight and win. That capability is underpinned by our disciplined, well-trained and motivated Sailors and Marines equipped with the "right" amphibious ships, aircraft and weapons in our arsenal. Unique to our expeditionary warfare capabilities is the ability to exploit the sea as maneuver space and conduct op-

erations in international waters and airspace. Tactically, the ability to project multiple elements of a landing force ashore via multiple entry points using both vertical and surface means gives us greater flexibility in maneuvering into positions of advantage over an adversary. Our service capstone concept, the Marine Corps Operating Concept, envisions a future Marine force fighting at and from the sea to gain and maintain sea control and enable freedom of maneuver within an Advanced Naval or Joint Task Force as directed through the National Defense Strategy and Defense Planning Guidance.

Connectors

Ship-to-shore connectors move personnel, equipment and supplies, maneuvering from a sea base to the objective. These are critical enablers for any naval force by closing the last “tactical mile” with the adversary. Modern aerial connectors, such as the MV-22 Osprey and CH-53K King Stallion, extend operational reach and lift capacity, revolutionizing our ability to operate from the sea, austere locations, and previously damaged airfields within a contested environment. Aerial connectors alone do not suffice; the Navy is in the process of modernizing the surface connector fleet by replacing the aging Landing Craft Air Cushion (LCAC) and the 50-year-old fleet of Landing Craft Utility (LCU). This system of surface and aerial connectors will enable the Joint Force to establish a web of sensor, strike, decoy, and sustainment locations based on land and sea that complicates the strategic and operational decision-making of our most advanced rivals, thus attacking their Anti-Access/Area Denial (A2AD) strategies. Continued funding of the modernization, maintenance, and service life extension programs of our existing fleet of connectors is critical to enabling our success in future security environments.

The Fiscal Year 2019 President’s Budget includes 37 LCAC 100 class air cushioned vehicles. The Ship to Shore Connector program will replace aging LCACs, which have undergone a Service Life Extension Program (SLEP) and a Post-SLEP Extension program. Additionally, the Fiscal Year 2019 President’s Budget includes the procurement of 18 LCU 1700 class craft, which will recapitalize, in part, the aging LCU 1610 class. Both variants still require additional funding for post-delivery and outfitting efforts to provide Fleet craft which are capable of supporting operational tasking.

These platforms are essential in connecting the combat power and logistics sustainment the seabase provides to expeditionary forces operating in the littorals. 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, capacity, and force interoperability.

Senator WICKER. Thank you very, very much, Secretary Geurts. I will direct this question to you and Admiral Merz.

Of course, you heard my opening statement expressing concern about the shipbuilding plan, but very, very positive about the recent announcement on the Burke class destroyers. I believe we can go faster.

Can you address each of the points that I raised in my opening statement? I noticed you nodding your head a lot. So I will let you do that on the record. And how might changing these assumptions get us to a 355-ship Navy faster, specifically completing other ship service life extensions for years 6 through 30 of the plan, maintaining overall shipbuilding funding levels with inflation adjustments through the year 2048, and being specific about supplemental shipbuilding funding needed in fiscal years 2021 through 2035?

Secretary GEURTS. Yes, sir. I will start out, and then I will ask Admiral Merz to jump in with me.

So again, in the shipbuilding plan upfront, when we built the first plan, we had some analysis complete and we had a lot of analysis ongoing, in terms of service life extensions and class extensions. In most interest to us, we are extending the class of the ship, because that not only benefits the ships you have but also the ships you build will then be able to extend out.

So the DDG-51 was our first priority, and that is where we spent the most effort and just kind of worked through that analysis. As

you heard last week, that has a profound impact on filling that hole we have in the mid-years of the 2030s timeframe.

Senator WICKER. Very positive developments.

Secretary GEURTS. Yes, sir.

On the submarines, it is not quite as easy. We have five reactor cores, so we think we can extend the service life of up to five submarines. That will still cause a dip, so we will have to continue to work the submarine force specifically.

And then, as Admiral Merz will address for you, we need to look at the mix of ships to make sure not only do we have the ship count we need, but do we have the right mix. And for that, I look to him to help guide us in terms of what is the highest priority there as we go through.

To your point on *Columbia*, we are going to be challenged in the year when we are producing the *Columbia* submarine. That will be our number one priority, so without supplemental funding, that will take a hit to our current shipbuilding plan. So we look forward to working closely with you on the specific numbers and how we might mitigate some of those impacts.

But the shipbuilding account, as currently funded, will not be able to maintain pace with also producing *Columbia* simultaneously at the current funding level we have in the shipbuilding accounts.

Senator WICKER. On that, let's keep our thinking caps and look for innovative approaches.

Secretary GEURTS. Yes, sir. Part of it is, where do we have opportunities to drive costs down? You mentioned block buys of the LPD-17 Flight II. We are looking at two carrier buys. How do we reduce or get more for the dollars we have in the shipbuilding account? Because there will be tremendous pressure as we go into the future with *Columbia* being produced along with us growing the 355-ship Navy.

Senator WICKER. Admiral, he has tossed it to you.

Vice Admiral MERZ. Yes, sir.

So the 355, first, just to set the bar on 355, it is a derived number. We start with the old plans. We work it all the way down to the specific types of ships, the capabilities on those ships, and then, of course, the numbers of ships for each class, add those all up, and that is how we got 355. So a very deliberate process to get to that number.

I tee it up with that as I talk a little bit about the DDG-51. As Secretary Geurts mentioned, extending an entire class is, by far, the most beneficial way to approach a life extension, because that allows us to plan the maintenance, the modernization, really handle it within stride of what we are already doing with that class, as opposed to the alternative to taking individual ships, reviewing it, figuring out what maintenance has to be done, and then going ahead and completing that. So a much more efficient, much more affordable option is to extend the class.

This is not without precedent. We did it with the Ohio class. There probably are not any other classes right now. They are all to new. Virginia may be a candidate, depending on her fuel usage over her life. Then, of course, the small surface combatants are all relatively new. That may be another candidate later on in the ship-

building plan, as we get more data back on how the ship is performing.

Arleigh Burkes, a very solid ship, we are a big fan of that ship. We went after that. We did not think this would be a big technological challenge, and we were able to complete it.

That said, going back to my opening remarks on the correct mix, we do hit 355 much sooner, and we laid that out in the shipbuilding plan as a candidate option. We just had not finished the analysis yet. But it does not give us the correct mix.

Senator WICKER. You had to read the footnotes.

Vice Admiral MERZ. Yes, sir. So it does get us to the mid-2030s at 355, but not the correct mix, although not a bad mix. If you have to have extra ships, DDGs are good ones to have more than you need while you fill in the rest of the requirement underneath it.

You mentioned the dip beyond the FYDP. We are scrubbing that hard. Where we sit today is we cannot build ships and deliver them in time to fill in that dip. However, extending the class of the DDG-51 is the only lever we pull so far. We are still looking at candidate years for a third SSN. And then all the other ship lines that we identified excess capacity, working with Congress, we may be able to continue to bolster those lines more rapidly. It will help recover from the dip, but there will still be a dip outside the FYDP, to a degree.

Just the DDG-51s have accelerated the nadir of that dip by 2 years, so that is already a good-news story. Then we will continue to look at individual ships that we may be able to extend as we go forward.

SSNs are very difficult. We only have five cores, so that is how we capture the life extensions of those. We do not really hold a lot of hope for doing a class-wide extensions on the 688s. They are already pretty old. But we are going class-by-class, ship-by-ship, and every ship does get evaluated for a life extension.

Senator WICKER. Thank you. Before I recognize Senator Hirono, thanks for pointing out that the requirement is not just something that was arrived at by the seat-of-the-pants. This came in as requirements from all of the admirals and generals who have responsibilities around the globe, what is the requirement for getting their mission done. So I appreciate you once again helping us to emphasize that.

Senator Hirono?

Senator HIRONO. Thank you.

Admiral Merz, the CNO's unfunded priority list for fiscal year 2019 includes a request for an additional \$176 million to accelerate shipyard investment. This could include modernization, other elements. This would be in addition to \$197 million in the Navy's budget request, indicating that shipyard investment is a significant priority, since the CNO's list does not ask for additional funding for any shipbuilding programs.

How would the Navy use the additional funds to modernize our public shipyards?

Vice Admiral MERZ. Yes, ma'am. I will give the OPNAV view, and then I will pass it over to Secretary Geurts. That really is more in his lane.

So NAVSEA has put out a pretty detailed plan on the recovering of the maintenance capacity within the shipyards. It is a \$21 billion plan over 20 years. It is very detailed. It includes dry docks, recapitalization, and refacilitizing of the yards.

Regarding the unfunded priority list, coming out of the last 10 years of our readiness deficit, we have become very committed to a balanced budget of readiness capability and capacity. So we think we have put us on a trajectory to 355 ships, particularly with the life extensions of the DDGs. There are still readiness challenges that we are trying to recover from, and there is also the capability focus where we can turn capability much quicker than we can turn the size of the fleet.

So we are trying to balance investments in advanced development, hypersonics, directed energy, the unmanned vehicle systems, as we kludge all that together to make sure we have a balanced, capable Navy as we grow.

With that, I will turn it over to Secretary Geurts.

Senator HIRONO. Mr. Secretary?

Secretary GEURTS. Yes, ma'am. That is to help us accelerate this \$21 billion ship optimization plan. So as we grow the fleet, we have to be very cognizant that we are growing the maintenance capability of the fleet, because naval power is a combination of the number of ships you have, how capable the ships are, and how ready those ships are to fight.

So the shipbuilding plan also helps us look very specifically at that public shipyard infrastructure, to make sure that we have that ready to work off backlog that we have had previously. We are in pretty good shape of working off existing backlog. Now we have to be ready for the growing fleet.

Senator HIRONO. I completely agree. As we look at modernizing our four public shipyards, and I have met with many of our workers in our shipyards, they want to have the modern tools. They want to have the capability to maintain the ships we already have, not to mention the new ones that are coming online.

So they very much care about their own productivity. It is not just the training that we provide to these people but the equipment that they use.

So how do you determine which shipyards would get what kind of modernization dollars?

Secretary GEURTS. Yes, ma'am. You are absolutely right. I mean, when you walk the yard, they are a very proud work force. They are proud of what they are doing. They are proud of their contribution. We owe it to make sure they are in world-class facilities with world-class tools and equipment, and we are not at world-class across our public yards right now.

So what we look at is we look at all four yards, and we look at this 20-year plan. So it is not just a year-by-year plan, but how do we optimize the flow? How do we look at what equipment we need? Are there new machines? How is the status of the machine? And then, how do we leverage the digital age to really allow us to not only give them modern equipment, give them modern tools that will, I think, allow them to do more and more?

So we look at that across all four yards. We have a ship optimization plan that balances that for each yard, and then works the priority.

So it is not going to be one yard and then another yard. It is going to be all four kind of in parallel.

Senator HIRONO. Right. I was going to ask whether you are going to make sure that there is a kind of fair distribution of the modernization dollars across all four shipyards, because while they support each other, there is a bit of competition going on.

Secretary GEURTS. Absolutely. We need them all to be productive and ready to roll.

Senator HIRONO. So they are not unfavorably compared to each other.

In my opening statement, I referred to the Navy's new plan for modernizing the public shipyards, of course, after years of neglect. There have been military construction projects and various upgrades over the years, but the Navy has pursued these without a comprehensive plan. That is what we are moving toward with what we are talking about today, a comprehensive plan.

Will the Navy be releasing additional details regarding the implementation of the shipyard optimization plan? If so, when can we expect to see them?

Secretary GEURTS. Yes, ma'am. We will continue to refine that plan, so the first plan we give a report to Congress kind of lays the overall strategy out. Now we have to get to year-by-year, facility-by-facility planning, because the challenge will be, we cannot stop doing all the work we are doing now, so we will have to get very detailed in planning how we build a new facility as we are executing the existing work. You will see that continue to get refined over the coming year.

Senator HIRONO. So when will we get the next report on your shipyard optimization plan?

Secretary GEURTS. Ma'am, I do not know if there is a requirement for an annual report, but I am happy to give you updates on an annual basis or whenever you need, to show you where we have gone.

So the first one was the plan. Now we should lay out how we are executing the plan, and then what the plan is going forward. So we are happy to give that to you.

And we will give you an annual update or more often, as required.

Senator HIRONO. Thank you.

Senator WICKER. Thank you very much, Senator Hirono.

Senator Scott?

Senator SCOTT. Thank you, Mr. Chairman.

Thank you all for being here. Thank you for your service to the country as well.

When I first got on the Armed Services Committee about a month or two ago, I sat down with Secretary Spencer. We had an interesting conversation about my time in business, which I suggested that certainty and predictability are always necessary tools. For any business to do what they do really well, they need a long-term plan. He suggested and then reinforced it with actual proof

that continuing resolutions over the many years has cost the Navy at least, quantifiably, \$9 billion.

Would you talk about the importance of meeting our 355 goal as it relates to having certainty and predictability with a long-term view, from your perspective?

Secretary GEURTS. Absolutely, Senator. It goes back somewhat to the conversation we just had.

It is hard to do facility planning when you have a plan and then you get to re-plan it five times during the year on the acquisition side. It is very challenging. We negotiate contracts, but then we cannot award them because we do not have all the money, so then we have to negotiate bridge contracts.

So it just adds delay and nonvalue-added work in here.

So the Bipartisan Budget Act is very useful, because now we can build a shipbuilding plan at least for the next 2 years. Getting certainty years out will really help us, then, avoid what has kind of been characterized as boom or bust cycles we have had in shipbuilding, which is both hard on the business side and very hard on the public shipyards side.

Senator WICKER. And it has everything to do with national security.

Secretary GEURTS. Absolutely, sir.

Senator SCOTT. Nine billion dollars, depending on the mix of ships, and he was talking about since 2011, I believe it was, helps us get to that goal a lot faster. Chairman Wicker suggested that you should be creative and do some things that will help us get there faster.

I wanted to ask you this question. Based on your previous job as acquisition executive for Special Operations Command, I understand you oversaw innovative programs that brought unique, frequently off-the-shelf material solutions to our special operations forces in record time. As I understood it, your team had permission to fail in their search for a particular material solution, as long as it did it quickly and did not fail at the same task twice. The result has been a superbly quick force that America depends on every single day.

I also understand you did this without any special exemption from the Federal Acquisition Regulations, the dreaded FAR. But it is safe to say that the scale and cost of programs like the Ford class aircraft carrier do not lend themselves to that fail quickly mentality.

So my question for you, since you are now overseeing acquisition programs with timeliness measured in years, sometimes even decades, what lessons from your previous position at Special Operations Command are you able to leverage with the Navy? And are you finding the Navy receptive to that approach?

Secretary GEURTS. Yes, sir. Absolutely. I think a couple different things.

One is, speed of decision-making and unity of command. So in that command, we were focused on outcomes and made rapid decisions. The 355-ship plan is a great outcome focus. We all have a target. We can all move toward that. That is a key.

I think as I approach the Navy, I am looking to do what I call maybe the four Ds. One is decentralize, so empower folks to get the

job done at the lowest capable level. Differentiate, so have lots of different ways—so how we acquire an aircraft carrier may not be the same way we acquire a piece of software or an algorithm or a quick off-the-shelf piece of equipment. So we have to be able to do all of those well. Digitize, so you are seeing the power of the digital age across the entire fleet, from shipbuilding to how we are doing our daily job. And then develop people, so how do we attract, recruit, train, and retain?

All of that is within the authorities that Congress has given us. So I am actually very positive the way that the Navy and the Marine Corps are responding to that. Each have their own strengths and challenges, but with a portfolio approach, we can really, I think, get acceleration and innovation at scale.

Senator SCOTT. When you think about the goal of getting the 355 ships, you said by extending the Burke class destroyers, you can get there by mid-2030s. When you look at the current portfolio, where do you see the greatest risks?

I know that one of the things I read was the importance of, by 2030, in the 2020s, having attack submarines that will be available for use in the Pacific theater. If you look at your current mix and where you think we are heading, where do you see the greatest vulnerability for that mix?

Secretary GEURTS. Sir, I will give you kind of a quick perspective, and then Admiral Merz from the OPNAV operational perspective.

Where I see the risk is, if we do not figure out how to rapidly modernize this fleet and be able to rapidly put in new technology quickly into these 50-year ships, then we are going to be challenged, because then you are forced to try to pick now what is going to last forever.

Where I think the Navy is doing an extraordinary job is on submarines. We can roll in new technology consistently into the submarines even though the design is pretty stable. You are starting to see that in our surface fleet now where we decouple the combat system from the ship. In that way, we can rapidly evolve the combat system on the ship as new needs or threats evolve, or technologies, but having a ship that we have strengthened.

So, to me, the key is our ships with a lot of margin, a lot of power, a lot of weight. Then we can go from there.

Bill, I do not know if you want to jump in?

Vice Admiral MERZ. Yes. Thank you, Secretary.

Senator WICKER. Please, go ahead.

Vice Admiral MERZ. Yes, sir.

So back to your certainty and predictability, I would tell you that probably the greatest risk is funding and continuing resolutions and the predictability of that funding. The BBA was a huge relief for us. It certainly gives us the opportunity, if nothing else, to roll over at a level that we can continue to execute the program.

The 355 is not without risk. All plans have risk. The longer we go without the correct mix of the ships at the correct number, the longer we carry that risk as we push that ahead.

The \$9 billion is a nice round number. That is three submarines, and that is the class of ship that we are furthest away from our

requirement. That is the last one to arrive on time, as far as the right mix of ships within that 355.

So a very deliberate pick up a number that has real math behind it. It matters to us.

Senator SCOTT. Thank you.

Senator WICKER. Thank you, Senator Scott.

Senator King?

Senator KING. Thank you, Mr. Chairman.

Secretary Geurts, in the National Defense Act of last year, the committee report talked about the force structure assessment of the 355 ships, and it included this language: The committee believes that the Navy should maintain the two proven shipbuilding sources of large surface combatants. The committee emphasizes that the acquisition strategy for the next multiyear procurement contract should help sustain the dual-source large surface combatant shipbuilding base.

I think my question is, are you and Secretary Spencer committed to the DDG-51 multiyear, which I understand the bids have just been submitted, an outcome that will sustain both yards and the large surface combatant?

Secretary GEURTS. Yes, absolutely, sir. Our whole strategy was built around securing enough base in both shipyards, yet enabling competition, so that the taxpayer gets the most for the dollar.

But I am convinced, in any outcome of that strategy, there is plenty of work to keep all those shipyards producing for the Navy.

Senator KING. And in the long run, it is certainly in the taxpayers' interests to have those two shipyards.

Secretary GEURTS. Absolutely. Having two yards for that fleet is critical.

Senator KING. Admiral Merz, I was very interested in the whole life extension issue. You probably saw the article in SEAPOWER.

My question is, number one, what are we talking about here in the way of work? Are we talking about repainting, or are we talking about rebuilding? And how substantial? For example, how long would a DDG-51 be in the yard for its renovation?

Vice Admiral MERZ. Sir, that is another benefit of doing a class-wide extension. So based on their performance and their maintenance periods to date is what we base the class life extension on. So there are no specific yard periods required to extend these ships to their 45 year. Some are extended 5 years. Some are extended 10 years, depending on what flight they were built.

All the DDGs are already planning to be modernized. We will see if that modernization is sufficient to get them to their 45 years. We typically just pace the threat with our modernizations.

Senator KING. Where would the modernization be done? At the two shipyards that we have been talking about or at public yards? What is the thinking on that?

Vice Admiral MERZ. All the modernizations are already planned. The modernizations for the DDGs are done in private yards, not the public yards. Whether they require an additional yard period, additional modernization, we will have time to forecast that and to plan that.

Quite frankly, the current modernization schedule may be sufficient. It really depends on how we pace the threat, what we want these ships to do, and how we foresee them holding up.

Senator KING. And I take it that this life extension program does not affect the schedule for new acquisitions?

Your colleague just shook his head rather vigorously.

Vice Admiral MERZ. That is because achieving and sustaining 355, it is absolutely fundamental that we sustain those shipbuilding profiles underneath the life extensions, or, when those ships go away, we will be worse off than when we started.

Senator KING. So, Mr. Geurts, you agree that this is a separate issue. We are not talking about replacing the new ships coming on?

Secretary GEURTS. No, sir. Again, in my opening statement, I want to be very frank, we have to both maintain the production profiles we have as well as do this class extension. Or as Admiral Merz says, we can delay the problem a little bit, and then you are going to have a much worse problem, because you will fall off a cliff. So it is really have the production growth profile we have in the shipbuilding plan, and then the service life extension helps us draw that 355 in as well as lessen that dip.

Senator KING. Turning to the frigate program, bearing in mind the language that I read from the committee report, do you anticipate the frigate program being a two yard acquisition?

Secretary GEURTS. Sir, our current plan for those 20 is to be a single downselect.

Senator KING. One yard for the new frigate. Would that be a multiyear? How many ships are we talking?

Secretary GEURTS. We are talking 20 ships, sir, right now in the current plan. Right now, we have five competitors that are in design study contracts. In 2019, we will do a competitive downselect, right now planning to one yard, to build those 20 ships under the current planning.

Senator KING. Whichever one of those five competitors. And they are all working—this is not a clean ship. We are working off existing design.

Secretary GEURTS. Yes, sir. They have to have a parent ship, a proven parent ship design.

Senator KING. Admiral Merz, could you describe, in a few seconds, or maybe we can get back to it—my question is too broad for 20 seconds, so I think I will hold it for the next round, Mr. Chairman. Thank you.

It will be about the re-missioning of the Zumwalt, so you can think about that.

Senator WICKER. So you can study ahead.

[Laughter.]

Senator WICKER. Thank you, Senator King.

Senator Cotton?

Senator COTTON. Thank you, gentlemen, for your testimony today. I want to tie a couple bows on issues that came up earlier.

Secretary Geurts, you said that our submarine programs are better, are faster at integrating new technology right now than our surface ships are. Our surface ships are learning from that.

Can you explain why you see that difference?

Secretary GEURTS. Sir, again, I am about 120 days now into the Navy, but in looking back in time, from my analysis, 10, 15 years ago, there was a realization that the submarine fleet was not modernizing its combat systems at the pace of the threat. So it was a very deliberate action over a number of years to create the acquisition strategy where you can continually roll on new capabilities to the submarine while holding the design of the ship itself constant and improving.

So I think that is a good model for these long-lasting structures. You want to have a good structure with a lot of margin that you have confidence that is reliable, but then have a way to roll on combat systems and new technologies and new algorithms as quickly as you can to pace with the threat.

Senator COTTON. Thank you.

Admiral Merz, you said that funding certainty is your biggest risk. You are grateful for the 2-year budget received earlier, but if you need funding certainty, I assume that you need a DOD appropriations bill passed this year.

Vice Admiral MERZ. Yes, sir, we do.

Senator COTTON. Not filibustered this summer.

Vice Admiral MERZ. No, sir.

Senator COTTON. And the Budget Control Act remains in effect for fiscal year 2020 and 2021. So if either that law is not repealed this year or the Congress does not pass a 2-year budget next year, as we have each of the last three 2-year cycles, you will once again face your biggest risk, which is funding uncertainty.

Vice Admiral MERZ. Yes, sir.

Senator COTTON. Thank you for that.

Let's move on to a few other topics.

Admiral Merz, we have 11 littoral combat ships. A story recently in Naval Institute said that zero of those will deploy this year in 2018.

Could you talk about why that is the case?

Vice Admiral MERZ. Yes, sir. So the total number is 32. We barely have a third of the class. The typical deployment model is 3 to 5 ships to 1, to keep one deployed. So this is really just math. There are going to be gaps that will fill in over time. We are not concerned about it.

We are learning a lot about the maintenance of the ship. We are going to a dual-crew model over the next several years.

So we feel like it is on track. We are not concerned about not deploying in 2018. That is going to catch up over time as we fill in the rest of the class.

Senator COTTON. Was that anticipated for this year?

Vice Admiral MERZ. Yes, sir, absolutely.

Senator COTTON. Let's turn to fast attack submarines. Admiral Harris of PAYCOM has testified that he gets half of his fast attack submarine requirements met. Over the next decade or so, we will reach the point where we are retiring fast attack submarines faster than we are building them.

What is the Navy's plan to mitigate this issue? Because if it affects him, it likely affects General Scaparrotti in European Command as well.

Vice Admiral MERZ. Yes, sir. Every combatant commander is at about that batting average for the attack submarines they would like to have in theater. The unfortunate reality is that there is not much we can do to recover that plan to get to 66, other than adding a third maybe SSN in candidate years. We are looking at that very hard, and we are working very closely with the shipbuilders on their ability to fill that in.

Even 66 is probably going to leave some gaps. I would not be surprised to see that number go up over time as we do assessments in the future. But that will just add to the length of time it takes to get there.

So that is the ship today that is furthest away from its requirement, and it is the last ship to achieve its requirement in the 30-year shipbuilding plan.

Senator COTTON. Thank you. It is disappointing we have reached this position.

Secretary GEURTS. Sir, one thing we are going to add is we do have five cores available. So we have funded one this year. We have identified the ship. So we think we can extend the life of five of those.

So that will not solve the problem. It will mitigate a little bit the worst part of the dip. So that is something we are studying closely, in addition to what Admiral Merz had mentioned.

Senator COTTON. Okay. Thank you.

Senator WICKER. You are studying that, and you intend to make a report at what point?

Secretary GEURTS. Sir, we have the first one funded this year. I would expect you will see those come in, in the budget. I am fairly confident that we will add—again, given the criticality of that shortfall, that would be a very attractive way to at least add some service life through the worst part through that dip.

Senator COTTON. Thank you, gentlemen.

Senator WICKER. Thank you very much, Senator Cotton.

Senator Kaine?

Senator KAINE. Thank you, Mr. Chair.

Thank you to our witnesses today. I want to begin by thanking both Mr. Geurts and Vice Admiral Merz for your help. I am pulling together a session in Hampton Roads, Virginia, on the 8th of June called the 355–Ship Navy. It is a discussion about work force, so it is all with the community colleges, the apprenticeship program, the local K-12 systems. The Navy has indicated that they will have a witness. It might be one of you. I am not sure yet that there has been a designee.

But I appreciate your willingness to help on that, because I think we talk about what 355 means for budget, and there is a whole series of issues there, but there is a real work force need. That need is, folks who are going to be building these ships are in pre-K right now. We are going to have to make sure that they are getting the skills as they go through their educational lives that will equip them to do the work in all the centers of shipbuilding around the country.

So I appreciate the Navy working with me on that.

I wanted to ask you about a recent announcement. The Navy recently expressed interest in block buy of aircraft carriers—you

talked about that briefly—made a request to Huntington Ingalls to give information so that they could potentially, I guess, decide on—or that would inform the potential decision.

The authority to do a block buy would need to be included in an NDAA. We are working on the markup right now this month and next.

When do you envision that the Navy will be making a decision about this? Because I want to make sure that your timetable and the committee's timetable, in terms of what we are working on with respect to the NDAA this year, match up.

Secretary GEURTS. Yes, sir. So we have issued a formal request for proposal to the contractor, Huntington Ingalls. We expect that back here in the next couple weeks. So I would think by early summertime, we will have a good look at the numbers. We will have a good understanding of those numbers. We have asked the contractor to sharpen a pencil and really look at how we can be aggressive in thinking our way through this.

So I think that would position us well early this summer to have that conversation, to look at the savings. It will take congressional authority to support it. I am happy to support that dialogue with you.

So early summer, I think, we will be ready for that, and then we can make a decision on whether that is included in the 2019 way ahead.

Senator Kaine. I would love to maintain the dialogue, because it is likely, based on the timing, that you would not be ready to make an ask until the committee work is already done. The NDAA may not be done on the floor of the Senate. The conference may not be done. There may be an opportunity to reflect whatever your decision is in a later document, but the timing may be a little bit off with respect to at least the committee work on the NDAA.

Secretary GEURTS. Yes, sir. And I think we will get an early look by the early part of May. We will at least have the initial look at it. We will have some follow-on analysis.

So we will work closely with your staff on everything we have and support your process.

Senator WICKER. Would the savings be in the nature of \$1.7 billion?

Secretary GEURTS. Sir, until I see the actual number back, I would hesitate to put a specific number. But in previous times when we have done this, we have seen large savings on the order of 10 percent.

The other thing I would tell you is, we are in parallel looking—about a third of a carrier is government-furnished equipment, or not through the shipyard. There is also savings potential on that side. So we are completing that analysis in parallel.

But there is large potential. We are a little late in the process, because CVN-80 is already under construction. But I think there is certainly a large potential of savings that warrant this very close look.

Senator WICKER. It certainly has people's attention.

Senator Kaine. Yes. I think Secretary Spencer once told us before the entire committee that: I will only do it if I think it will

save me a whole lot of money. I will not do it if it just saves me a little bit of money.

So I think that we have certainly seen that magnitude of savings in the past.

Secretary GEURTS. I would expect it will be a lot of money.

Senator KAINE. Yes.

Secretary GEURTS. I just do not want to put a number yet until I have had a chance to work with the shipyard.

Senator KAINE. The other thing I just wanted to mention, we have had a couple hearings about the shipyard infrastructure modernization plan. I am the Ranking Member on the Readiness Subcommittee. We talked about it in the Readiness hearing we had last week.

But it was interesting that the material conditions of the four shipyards were all poor or failing. That just speaks to me of kind of long-deferred maintenance and a real catch-up obligation we have.

So if we are going to get to 355, then we have to make those capital investments in the shipyards to get them from poor or failing to better. Then that will increase our ability to do the 355 in a more efficient way.

I know you responded to Senator Hirono's question that it is not like there is a next report regularly scheduled, but I think all of the committee is going to be interested, because absent that modernization to improve the current status of the shipyards, we are not going to be able to hit the 355 number in a way that any of us want. So we will continue to dialogue about that as you are making the capital investment.

Secretary GEURTS. Yes, sir. Secretary Bayer on the installation side and I are working hand-in-hand. So we will bring that composite look to you of both the facility and all the machines and the work force. All three of those are critical components that we have to synchronize and bring up to the modern age.

Senator KAINE. Great. Thank you so much.

Thanks, Mr. Chair.

Senator WICKER. Secretary Geurts, do you think the yards have a clear concept of what needs to happen at those yards?

Secretary GEURTS. Yes, sir. I mean, again, as Senator Hirono said, the yards know where there is opportunity. They are motivated to get there. We just need to help resource them and then, at the secretariat level, manage that work.

So we are setting up a governance structure to make sure we have the right senior oversight to keep that effort on track. It is a collection of a multitude of small things, but if we can enable the work force with modern tools, put the development programs in there to have a sustainable work force, then I think we can see great improvement.

We are going to need that improvement, if we are going to sustain this 355-ship Navy.

Senator WICKER. There is plenty of capacity there, isn't there?

Secretary GEURTS. Yes, sir, but it is aged infrastructure. It is not the most modern tools. And we are growing the work force. It is a relatively young work force, to some degree. So we have to make sure we have the training pipelines.

Again, back to the question, my biggest fear is boom or bust budget cycles, that really rings out—you cannot have a growth plan when you were starting and stopping all the time.

Senator WICKER. You cannot say that often enough.

Secretary GEURTS. Yes, sir.

Senator WICKER. Senator Shaheen?

Senator SHAHEEN. Thank you, Mr. Chairman. I would say, I agree, certainly, with Senator Hirono and with Secretary Geurts. At least the Portsmouth Naval Shipyard is very clear on what they need. Their question is whether Congress and the Navy is as clear on what they need. So I think saying it often is very important.

I want to follow up on the work force issue that Senator Kaine raised, because as we add capacity, how is the Navy going to ensure that the work force is there to address what shipyards need? What we are seeing at least at the Portsmouth Naval Shipyard that Senator King and I are both interested in, where we have a very low unemployment rate in New Hampshire, one of the lowest in the country, finding the skilled STEM workers to fill those shipyard jobs is challenging. So how do you ensure that we have the workers that we need?

Secretary GEURTS. Yes, ma'am. I think there is a whole multitude of ways to get there. One of them is having some certainty, or at least some confidence, that we have a long-term plan and we are going to execute to it, so that the work force does not feel like they are going to come, but they are not sure if the job is going to be there 6 months from now.

So I think that is the single biggest one. And then, again, do we have a world-class facility that attracts world-class talent that we value, and we train and retain that world-class talent? So I think that is a challenge for us all to execute to get there. Otherwise, we are going to struggle with retention rates, with productivity, and with all the pieces that will not allow us to maintain the readiness.

Senator SHAHEEN. I had the opportunity last week to visit something called the SeaPerch Challenge. Are you familiar with that? That is a wonderful underwater robotics competition. The Portsmouth Naval Shipyard sponsored it with the University of New Hampshire and a lot of volunteers.

It was very impressive to watch the middle school and high school teams that were there manipulating the robots through a very challenging course underwater. I was interested to hear that, 2 years ago, the team that won was a team that got special dispensation to be able to join the competition. They were fourth-graders, and they beat not only the middle school but Phillips Exeter, which, as you know, is a prestigious private school, which came in third.

So the talent is there among young people. We need to think about how we capture that, so that we get those kids excited to fill into those jobs as they are looking at what their futures might be.

So I would encourage the Navy to continue to support those kinds of activities. I think they are really important.

Secretary GEURTS. Yes, ma'am. Absolutely. There are so many tremendous jobs available to help defense out. We need to continue to do a great job to connect the population to those activities, and

then leverage those ideas when we find them, have an acquisition system that can capture them.

Senator SHAHEEN. Last year, Acting Secretary of the Navy Stackley testified to the importance of small businesses for the Department of the Navy. One of the things he talked about was not only their importance in providing innovation and being able to bring up, as he said, a very friendly cost structure, but he also pointed out that they have challenges working with the bureaucracy of our military.

So can you talk about what more we can do to try to encourage small businesses and help them get into doing work for the Navy and for the military in general?

Secretary GEURTS. Yes, ma'am. When I left SOCOM, I think we had over a third of our work that went directly to small business, so I am a huge fan of the agility and the robustness they bring.

We have not talked much about supply base when we talk shipbuilders. The supply base is really the enabler for us, not just the shipyard, and most of that is driven by small business.

Last week, I did a Facebook Live event with small business to try to communicate that the Navy is open for business with small business. We have assigned our deputy program managers for all our programs as a small business advocate to drive small business thinking even into larger programs. So it is certainly a focus area for me.

I think the work to go is creating mechanisms where it is easy, if they have ideas, to get them into the Navy. And the bureaucratic friction to get them on contract and whatnot, we have to reduce all that, because the really capable ones are not going to stand for waiting. Their business will not survive if they have to wait 2 years to get on contract.

Senator SHAHEEN. Absolutely. Most of them cannot afford it.

The fact is, I visited a small business last week also that was doing work. One of the things that they complained about was virtually every agency they deal with has a different form that they have to fill out, and why can't we at least in the Navy, or across DOD in certain areas, have one form that, once they fill out and qualify, then they qualify for everything?

Secretary GEURTS. Yes, ma'am. So as those come up, feel free to have them engage myself and the Navy small business. I need to know where those friction points are, and then we will tackle those friction points.

Senator SHAHEEN. We will certainly get that to you. Thank you.

Vice Admiral MERZ. Ma'am, I would just add that the discussion we had with Senator Cotton on that submarine modernization program, that was a small business initiative. It continues to be a small business melting pot, to get those capabilities.

Senator SHAHEEN. Great. Thank you.

Senator WICKER. Thank you, Senator Shaheen.

I am guessing that third-place entry by Phillips Exeter was not too shabby in and of itself.

We are going to take a second round.

Secretary Geurts, the Navy recently released a notice stating that the amphibious replacement ship requirement will be fulfilled by a San Antonio class Flight II with LPD-30 as the lead ship. Con-

gress authorized and appropriated the Flight II lead ship in the fiscal year 2018 spending bill.

Moving forward, Flight II will help remedy the shortfall of amphibious ships while leveraging a hot production line and supplier base.

First, what is the Navy's acquisition strategy for the LPD Flight II program? And then, as you know, we use multiyear procurement authorities to achieve significant savings and predictability for the industrial base and programs, such as the Virginia class submarines and DDG-51 destroyers.

With the design and requirements set, what is the most affordable way to contract for the next several LPD Flight II ships? Would it be helpful to procure long lead time material in a block buy in fiscal year 2019? And if so, do you believe the statutory requirements for a multiyear procurement contract could be met for LPD Flight II ships that would be procured beginning in fiscal year 2020?

Secretary GEURTS. Thanks, sir. So thank you very much Flight II ship in fiscal year 2018. That will be kind of the lead ship for that Flight II. But again, it is a derivative design, so that will be a high-confidence acquisition.

Our current strategy is award that 2018 ship as quickly as we can to ensure we support General Walsh and the Marine Corps. Then I think we will look closely. It would appear to me that the serial production opportunities for the continuous production of that LPD-17 would be ripe for either a multiyear or a block buy. Currently, our next buy is in 2020. We did not request any money in 2019. At the time, the 2018 ship was coming in.

If you were to add some economic order quantity or long-lead funding in 2019, that could accelerate delivery of those. If that is not available, we could do a block buy or in multiyear in fiscal year 2020. Putting some money in 2019 would help schedule a little bit, but we can execute in either manner.

Senator WICKER. Very good.

General Walsh, how important are training ranges for testing and integrating unmanned platforms? We included a provision in the fiscal year 2018 authorization act that requires the Navy to examine its current test and training range infrastructure. Can you give me an update on this issue?

Lieutenant General WALSH. What I will say is that so much of what we are doing on the surface, in the air, and under the surface, so much is moving toward the unmanned. I mean, that area, as everybody knows, is just a booming industry, but certainly from a warfighting capacity. So our ranges are one of those things, too.

I think one of the challenges we run into is manned capabilities, it is one thing on our ranges, but when we have to transition from, say, a base to a range with an unmanned capability, it is a different problem that we have not really had much in the past.

So I think it is something that we are looking at in our ranges, but it is something we are going to have to tackle, because so much of our warfighting area is moving toward the unmanned area.

Senator WICKER. Okay. Take a moment to discuss ship-to-shore connectors, General Walsh. There is a budget request for five. How

do they fit into the Marine Corps concepts of amphibious operations?

Lieutenant General WALSH. We appreciate the support we are getting on the ship-to-shore connector program, because our LCACs are getting so old. But the first LCAC 100 just this year, just recently in the last month or so, really just got flying, as we call them. They are very much like aircraft in a lot of ways, even though they go on the water. But it is critical to get the landing force from those ships to shore.

Getting the critical capability to be able to get these new craft that can carry more weight and go longer distances is so important to our concept of operations, to be able to go ship to the objective. These are going to allow us to do that and rapidly grow the capability to meet the requirements we need in these new contested environments to go longer and faster.

Senator WICKER. Thank you.

Senator HIRONO?

Senator HIRONO. Thank you.

I am very intrigued by what you just said, General Walsh, that so much of our training is now in the unmanned capability area. So what does that do in terms of the number of people that you need to be in your service? What kind of impact does going toward an unmanned capability have on the Marine Corps, as well as on the Navy?

Lieutenant General WALSH. One of the things we are looking at, working with Secretary Geurts' team, we learn a lot through our experimentation process. We do something with the Department of Navy called advanced naval technology experiments.

Last year, we did one that was on ship-to-shore maneuvers, so it was looking at the area of how we get to shore differently. I think the thing that amazed us was, when we did this project, we had probably more than 100 industry technologies that were demonstrated at this weeklong event that we did at Camp Pendleton going from ship-to-shore. The amazing thing was probably the first 15 minutes of that evolution was all unmanned. It just shocked us with how technology is allowing us to operate completely differently.

We just completed one 2 weeks ago where we did it in an urban environment. It was not at sea, but it was urban. I think if you are a Marine from Vietnam or World War II and you went into watching what the Marines were doing, you would have just been lost at what was going on with the amount of unmanned ground systems, vehicles that were in the air, and Marines now leveraging unmanned subsurface capabilities that we were learning from the submarine community to be able to allow us to do sensing, surveillance, and some weapons in cases, to be able to conduct unmanned operations.

Senator HIRONO. So what does that do to the need for training facilities? For example, on the Big Island, I think the Marines use it, we have Pohakuloa, and for the Army as well. What does that do, in terms of the kind of training facilities we need and what takes place at these facilities?

Lieutenant General WALSH. I think, in a lot of ways, we are a little bit behind in trying to figure that out, because what we are

running into is a lot of the restrictions or orders that we have are looking at how we would do it for manned systems. So in a lot of ways, when we try to integrate into with the unmanned systems, it is like you cannot do it because there is a rule or a reason why you cannot. It is a lot of the things you see today and why we are unable to deal with unmanned air systems that would be operating over our bases. How do you deal with that and try to protect our bases in the same way?

So I think it is an area we are working through. It is a challenge now. It works well in, as I was saying earlier, our restricted training areas. But where you have to go from a base to a training area is where it is more of a problem.

Vice Admiral MERZ. Ma'am, I would add, from the Navy side, getting back to Secretary Geurts' initial acquisition strategy discussions about having many tools, that is one of the things we ran into head on. We only manned system acquisition requirements for unmanned systems. So we have done a lot of work to relax some of those, taking advantage of the fact that there is no danger to a human there, no direct danger.

The training ranges, in general, they need some work. Those fell on the category of hard decisions over the last 10 years. We are being very deliberate about recovering those. We have done some structural things in the resourcing world. We have a centralized resource sponsor to cover all our unmanned vehicles. We are centralizing our program elements.

So this is very much becoming mainstreamed. One of the reasons is to get your larger question of manning, maintaining. They do not come without cost. You think unmanned, no people. Less people, but still people. And they still need to have a total ownership cost-like approach to how we man and field those.

Senator HIRONO. And they need different skillsets.

I am aware that we need to move our Marines out of Futenma, and that as they go through Guam, we need training facilities for them.

General Walsh, you know that we are, as far as I know, still negotiating to get a training area on CNMI, Confederated Northern Mariana Islands. So I am probably going to want to follow up with you as to how that is going, in light of maybe you are going to change the kind of configuration or the kind of training that you intend to do there, because it is not as though the CNMI Government is welcoming that kind of live-fire training facility with open arms either.

Lieutenant General WALSH. What I can add to that, Senator, is the Pacific Commander out there has looked at that training range that the Marine Corps is responsible. He is the executive agent for looking at that for the Joint Force, ensuring that it is meeting all the Joint Force needs. We stood up a working group now across the services to try to decide what that training range needs to be able to meet all the services' needs.

Senator HIRONO. Thank you.

Thank you, Mr. Chairman.

Senator WICKER. Thank you, Senator Hirono.

Senator King?

Senator KING. Thank you, Mr. Chairman.

Admiral Merz, to go back to the question I telegraphed, describe, please, the thinking that went into the re-missioning of the Zumwalt, where you see its functionality, where it is headed.

Vice Admiral MERZ. Yes, sir. So the Zumwalt is a very progressive ship virtually in every element of its capability. So what we found was the advanced gun system has become a particularly hard challenge to get through, not so much the gun but the projectile.

Senator KING. The projectiles were too expensive. Wasn't that part of the problem?

Vice Admiral MERZ. Too expensive, and they were not meeting the range. So even at the high cost, we still were not really getting what we had asked for. So what we have elected to do is to separate the gun effort from the ship effort, because we really got to the point where now we are holding back the ship. That ship is very capable with or without the gun. The gun, of course, would make it more capable.

So what we have elected to do is to proceed ahead with the ship delivered to the fleet as a strike platform. It does have 80 vertical launch cells. They are the larger variety cells, so that opens up opportunities for advanced development on our weapons side also.

Her combat system is very good, and her inherent ship capability. I can certainly brief you on a more classified level.

Senator KING. And it is stealth capabilities are important.

Vice Admiral MERZ. Yes, sir, very, very important.

So we think the ship is very well built and ready to join the fleet. We are very excited to get her, and we will continue to develop the rounds for the gun in parallel.

Senator KING. We may have to go into a different setting. What about directed energy, based upon the enormous power that that platform generates?

Vice Admiral MERZ. Yes, sir. We are very committed to directed energy. We have a family of lasers that we have moved into the accelerated acquisition arena. They are categorized by the power of the lasers. We are looking to field a handful of these over the next year, both our low- and medium-powered lasers, as we continued to develop—

Senator KING. Is this a possible option for the Zumwalt?

Vice Admiral MERZ. It is a possible option for all ships. So whether or not that would eventually replace the ship, right now, we have not given up on the projectile for the advanced gun system.

Senator KING. But you are not going to wait for it, I think is what you are saying.

Vice Admiral MERZ. No, sir. The ship is going out. Whether or not the directed energy is an ultimate replacement for that, time will tell on how we deal with the projectile. But it is a candidate option for all ships.

Senator KING. Mr. Geurts, you are talking about cruiser replacement. Is that also going to be an existing hull form? Are you looking in that direction?

Secretary GEURTS. Sir, I think as the CNO has described, and I will pass over to Admiral Merz because it is in his lane, we are going to look at those requirements closely. We are going to look

at what the requirements are, and then how that matches up with the existing hull forms or new hull forms.

But I would say, certainly, our experience as we are working through frigate—

Senator KING. That is what I was going to ask, if there are lessons learned there.

Secretary GEURTS. Yes. So seeing the speed, de-risking the program, delivering with high confidence, having the existing hull form provides a lot of benefits in those areas.

So we will look at how the requirements process comes together, what comes out of Admiral Merz's shop, and then we will marry that with what that looks like in terms of available platforms. That is a process we have planned for the future.

Bill, if you want to add?

Vice Admiral MERZ. Yes, sir. Really quickly, we are immersed in this future service combatant requirements review. It is going from large to small, manned and unmanned, to optionally unmanned. It is going to be a very comprehensive plan on how we transition out of the cruiser, for one, but, ultimately, the DDG, and what would follow the frigate.

The shipbuilding plan lays out very steady shipbuilding profiles. That is just to secure the commitment for these types of ships over time. They just secure the capability in those years. This plan will fill in those capabilities and when we need to do a phased shift to those.

Senator KING. You are talking about life extension on the DDGs. That could be an upgrade of capabilities, could it not?

Vice Admiral MERZ. Yes, sir. It certainly could be.

Senator KING. This is a bit of an off-the-wall question, but I spent yesterday morning with Joint Force in Key West on drug interdiction.

The startling numbers are these. For every 100 drug shipments they know about, they have the capacity to interdict 25. In other words, 25 percent of what we know about through our intelligence is being interdicted. The rest is getting through. This is a gigantic detriment to our country.

The short question is, got any spare ships?

[Laughter.]

Senator KING. Are there mothballed frigates? Are there other ships? Because this is national defense. People are dying because we are not interdicting these ships. If these were terrorists coming in, I daresay we would figure out a way to stop them. And yet, people are dying because of these illicit drugs.

Is there any possible conversation that could go on between the Coast Guard and the Navy, in terms of assets, training, those kinds of things?

Vice Admiral MERZ. Yes, sir. These conversations are ongoing and endless. Rolling back to Senator Cotton's question about the combatant commander demands, everybody is stressed, so it becomes a priority sourcing on what we have.

I will tell you that we are in the middle of what we call a requirements evaluation team look at intertheater missions. That is one of them that we are evaluating. This involves Expeditionary

SURTASS, Expeditionary Medical, SOF support, the lift, and drug interdiction.

So all these requirements we are putting on the table to see if there is something out there for a future small surface combatant that we can potentially start filling some of these holes.

Senator KING. I would urge you to think creatively, because we are fielding a lot of capability, for example, in the Western Pacific because of someone who may attack us, and yet, we are not adequately responding to someone who is attacking us.

Thank you very much, gentlemen.

Thank you, Mr. Chairman.

Senator WICKER. Thank you very much, Senator King.

Secretary Geurts, in February, I introduced a bill with Chairman McCain called the Surface Warfare Enhancement Act. This legislation expands the principal duties of your position to include sustainment and maintenance of ships, aircraft, and other weapons systems. The intent is to make a single Senate-confirmed civilian official responsible for sustainment, which has historically accounted for approximately 70 percent of the total lifecycle cost of a weapons system.

What is your view of such a change?

Secretary GEURTS. Sir, I think there is an absolute link between the acquisition and the sustainment piece of things. As we build the 355-ship fleet, we are going to have to really work hard on the sustainment because that is, again, 70 percent of the cost.

So if that is the view of Congress to put that all under the RDA hat, I think there is opportunity to leverage that all under one hat. Even short of that, I would tell you——

Senator WICKER. Is it a good idea?

[Laughter.]

Senator WICKER. Or do you want to take issue with Senator McCain and——

Secretary GEURTS. I do not want to take any issue with Senator McCain.

I think it is good to look at it holistically. I guess what I was going to say is, we are doing that already, Admiral Merz and I.

I think in the next version of the shipbuilding plan, we are going to try to look at the sustainment piece, not just the new build of that. So we are doing that. If that gets codified in law, that just makes it clearer.

But I am committed to spending as much energy trying to get our arms around the sustainment, whether it is the shipbuilding yards or contracting strategies or our programmatic approaches to sustainment as I am on the front end of programs.

Senator WICKER. Thank you very much.

Senator King, I might point out that we had exactly precisely the same testimony in the Commerce Committee today about drug interdiction and the fact that so much of what we know is out there is simply unenforceable, because we do not have the assets. So I appreciate you mentioning that.

If there is nothing further, we thank the witnesses very, very much for their testimony.

We will leave the record open for the customary 3 days for questions for the record, and we ask our witnesses to get their answers back to us as quickly as possible.

Senator WICKER. If there is nothing else, this hearing is adjourned. Thank you.

[Whereupon, at 3:50 p.m., the Subcommittee adjourned.]

