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THE HOUSE ARMED SERVICES COMMITTEE
SUBCOMMITTEE ON TACTICAL AVIATION AND LAND FORCES

STATEMENT OF

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F-35 LIGHTNING II PROGRAM

BEFORE THE

TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

OF THE

HOUSE ARMED SERVICES COMMITTEE

ON

FISCAL YEAR 2022 BUDGET REQUEST OF THE DEPARTMENT OF DEFENSE FOR

FIXED-WING TACTICAL AND TRAINING AIRCRAFT PROGRAMS

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Introduction

Chairman Norcross, Ranking Member Hartzler, and distinguished Members of the Subcommittee, thank you for this opportunity to discuss the status and future of the F-35 Lightning II Program and allowing me to address how the F-35 is bringing exceptional capabilities to the Services' Tactical Aviation portfolios.

The F-35 Lightning II is the Department of Defense`s largest acquisition program, is perfectly aligned with our National Defense Strategy, and is of vital importance to our Nation's security. The F-35 is replacing, and will continue to replace, the legacy tactical fighter fleets of the Air Force, Navy, and Marine Corps with a dominant, multirole, fifth generation aircraft, projecting U.S. power and deterring potential adversaries. In the hands of our Joint and International warfighters, the F-35 we have today has demonstrated exceptional performance in real-world operations around the globe. Tomorrow's engagements, featuring threats of advanced Chinese and Russian warfighting, must be supported by novel operational concepts, and rapid weapons development and capability delivery timelines. Consequently, we need a capable, available, and affordable F-35 to outpace these key competitors and win the high-end fight. As we move forward with these three mandates – capability, availability, and affordability – as our guiding lights, the F-35 will increasingly serve as the backbone of U.S. and International Partner air combat superiority for decades to come.

Capability

The drive to maintain U.S. warfighter advantage is propelling the Department of Defense forward, creating a suite of networked capabilities, anchored around F-35 integration. This integration provides theater commanders with improved interoperability between platforms in all domains, a more robust intelligence picture, and a wider range of options in support of targeting.

We are seeing these benefits from F-35s deployed today and the impact of this aircraft will increase substantially as additional capabilities are released to the fleet.

The F-35 is delivering high-end, game-changing capabilities today. Lauded by pilots and operational commanders alike, the F-35 currently performs operations from land and from the sea. The F-35 program embodies the U.S. National Defense Strategy as it strengthens alliances and attracts new international customers; 11 services in nine countries have declared initial operational capability; and six services from five countries have conducted F-35 operational missions. More than 670 aircraft are operating today. The F-35 is being fielded into a dynamic, ever-advancing threat environment. In order to continue to provide the capability our warfighters need, the F-35 program continues to focus on software development and air system modernization and sustainment.

We at the JPO understand today's threats, deliberately engage with our warfighting customers to understand future threats, and actively assess the additional capabilities required to defeat them as part of a deliberate, rigorous, and continuous modernization process.

The first set of capabilities born of this process, Block 4, is the key capability set required to ensure the F-35 stays dominant in the late 2020s and beyond. We are simultaneously developing and incrementally delivering Block 4 capabilities today. Simply put, Block 4 capabilities ensure F-35 relevance in the high-end fight, enabled by a hardware suite upgrade of the mission computer, memory system, and display system known as Technical Refresh-3 (TR-3) – Full Block 4 capability will increase our ability to prosecute targets in contested environments, increase survivability, advance interoperability, and improve sustainment.

The developmental foundation – which includes both the synthetic and open-air resources and environments required to ensure the Block 4 hardware-enabled and software-defined capabilities are ready to go – was established to provide the bedrock to support continuous

delivery of future capabilities. Recent efforts have highlighted the need to focus the JPO on ensuring the aging F-35 System Development and Demonstration (SDD) fleet can continue to support flight test until newer replacement aircraft are available to the test enterprise. The JPO is actively engaged with U.S. Services, our International Partners, and Lockheed Martin (LM) to create an executable plan to ensure future flight test requirements are met. As part of that overarching effort, we are actively managing a test fleet viability program for those specialized test assets to ensure they are able to meet test requirements.

The F-35 Joint Program Office (JPO), LM, and critical suppliers are aligned on our commitment to capability delivery and cost control, and are focused on two critical priorities: the delivery of all Lot 15 aircraft in the TR-3 configuration, and the delivery of key elements of the Lot 17 hardware configuration to meet Block 4 capability requirements. As we have discussed previously, the TR-3 hardware suite has experienced schedule delays and cost overruns. Despite these delays, the Joint Program Office and LM team have worked together to stabilize TR-3 development, mitigate delays, and minimize the impact of these delays on critical TR-3 milestones, including Lot 15 aircraft delivery. Thanks to these efforts – and despite these challenges – TR-3 development and integration is making good progress. While there is still risk ahead in System Integration and Test, we are still forecasting delivery in Lot 15 in 2023, as required. We are actively implementing multiple risk mitigations to ensure this critical Lot 15 delivery while minimizing production line disruption.

The TR-3 development challenges resulted in Block 4 capability development delays in fiscal year (FY) 2021. These delays are being addressed through prioritized contracting actions to restart critical paused efforts and through careful and purposeful management of resources, including a request for an FY 2021 above threshold reprogramming action to reduce risk on the restart and re-staffing of Block 4 development as we transition into FY 2022. In addition to

managing Block 4 resource risks, we continue our deliberate management of Block 4 production hardware configurations to meet warfighter capability needs and minimize retrofit costs.

Availability

Last year, the overall Mission Capability rate for the F-35 Fleet continued its steady rise, increasing to an annual average of 68 percent through November, an improvement of 5.4 percent from calendar year 2019, while flying nearly 94,000 hours, which was over 18,000 more hours than in the year prior.

In October 2020, USAF F-35As completed 18 months of continuous Middle East combat, flying roughly 4,000 combat sorties and 20,000 combat hours, and employing just shy of 400 weapons while maintaining a 74 percent Fully Mission Capable rate. In March 2021, VFA-147, the first operational F-35C squadron, completed the longest at-sea period (approximately five weeks) by F-35Cs onboard USS Carl Vinson. VFA-147 completed missions in all warfare areas while reporting a 97.6 percent sortie completion and 80 percent Mission Capable rates.

At this stage in F-35 fleet maturity, our production line is stable, and aircraft rolling off the line are performing well. Many of our earlier lot aircraft require modifications, and we are working through retrofits with fleet customers to optimize the timing of these modifications to minimize operational impacts. Government and industry teams are working to accelerate an affordable long-term solution while maximizing near-term F-35 availability for training and operations. These changes are driving a steady increase in aircraft full-mission capable rates, and we anticipate fleet availability will continue to climb as F-35 maintenance systems and best practices mature.

The F-35 JPO is using four primary availability levers to achieve current and future readiness goals. First, we are taking action to keep parts on the aircraft longer. Improving reliability and maintainability is therefore our first lever, and this critical work is progressing

through our Reliability and Maintainability Improvement Program (RMIP) Projects. RMIP has validated 2.6 percent improvement to Mission Capable rates and we expect to achieve an additional 4.7 percent over the next three years.

Second, we are taking action to have parts "on the shelf" and available when required; we refer to this lever as improving our supply posture. We utilize strategic contracting and service level agreements to incentivize on time delivery of spares and to achieve target stock levels. We received a congressional plus up in funding in FY 2018 to procure four additional U.S. Marine Corps STOVL engines and those engines will continue to deliver through November 2021. Additionally, in FY 2019 and FY 2020 the JPO received congressional plus ups to increase the Global Spares Pool.

The third and fourth levers are repair capacity and repair velocity, and we are taking action to improve both. . Repair capacity and repair velocity are needed to rapidly repair those removed parts and get them back on the shelf and ready to go again, and are crucial to keeping us both available and affordable. Absent both capacity and velocity, we'll end up in a very expensive sparing posture to achieve the same levels of readiness.

Affordability

We understand that all F-35 customers have limits on the resources available to the program. If we, the F-35 Enterprise, do not meet affordability requirements, our customers will be forced to choose between buying less, flying less, or pursuing alternative solutions to meet their fighter force needs.

The F-35 JPO, U.S. Services, and Partners are working together to identify ways to drive down costs. In development, the program's focus is on cost control of TR-3 and other Block 4 capabilities, as well as reducing the cost of the test enterprise and other fixed development costs. In production, while the program is currently negotiating Lots 15-17, we are also planning

affordability projects to reduce the aircraft and engine unit costs for Lots 18-23, mainly through increasing competition and making strategic procurement decisions. From Fiscal Year (FY) 2014 to today, we have reduced the cost of a USAF A-variant aircraft by 26 percent – going from almost $108 million to $80 million for upcoming Lot 13 deliveries.

Despite the strong achievement on production costs, we vividly understand that the largest share of program cost is in sustainment; in fact, sustainment costs are projected to constitute 80 percent of the program's lifecycle cost. In sustainment, the primary affordability target provided by the U.S. Services is cost per tail per year (CPTPY) at steady state, which I'll discuss in further detail. The Enterprise also continues to pursue the "25x25" stretch goal ($25k per flight hour in 2025) that has also been a stated target of all the U.S. Services. The F-35 JPO recognizes the imperative to drive down the sustainment cost of the platform for all of our stakeholders, and we are doing just that. In fact, the JPO has driven down the cost per flight hour in base year 2012 dollars (USAF A-variant, O&S less indirects & mods, plus production support) from $86.0k in 2014 to its 2020 actual cost of $33.6k and CPTPY of $7.1M. The fleet metrics also reflect reductions to 2020 actuals of $37.3k CPFH and $7.3M CPTPY - a decrease from $38.3k and $7.1M, respectively, in 2019.

While we project a further decrease in sustainment costs over the life of the program as fleet size grows and the Department of Defense maximizes economies of scale, we understand there is still work to be done. The FY21-23 sustainment contract handshake with Lockheed Martin keeps us on the path to our affordability goals, but progress to date and scale alone will be insufficient. The program continues to look for alternative ways to solve this challenging problem, including increased reliance on synthetics both in the areas of training and test.

Sustainment costs may be broken into four major areas, which I recently described to the committee: 1) airframe parts and repairs; 2) engine parts and repairs; 3) organic manpower &

operations; and 4) sustaining support. In general, total aircraft inventory (TAI) and flight hours (FH) are the most significant drivers of these costs, but utilization rates and timeline of operations are also major components. Lower level drivers also exist and the JPO has initiatives underway to actively reduce or optimize the costs in each of these areas.

The first area of cost is airframe parts and repairs and refers to the LM costs associated with maintenance. It includes organizational maintenance and support (i.e. the cost of materials and other costs used to maintain the system) as well as costs related to component depot maintenance. The main cost drivers for this area are component repair and replenishment pricing, and part reliability. With LM, the Reliability and Maintainability Improvement Program (RMIP) identifies and selects parts and/or processes which, when improved, lead to increased aircraft availability and/or reduced cost. Reliability and Maintainability initiatives and examining both organic and contract logistics support options to reduce sustainment costs over the life cycle. F-35 lifecycle costs include, but are not limited to: personnel, maintenance, fuel, ordinance, training and simulation systems, reprogramming laboratories, physical infrastructure, and a global supply network that will keep a fleet of more than 3,000 domestic and international aircraft fully-operating, and contributing to the fight for decades to come. These maintenance related costs are expected to contribute 16% of the CPTPY metric at Steady State (DoD FY36-37) in CY12$.

The second area of cost is engine parts and repairs and refers to the Pratt and Whitney (P&W) costs associated with maintenance. For the P&W scope, the main cost drivers include scheduled engine overhauls and unscheduled repairs. These maintenance related costs are expected to contribute 18% of the CPTPY metric at Steady State (DoD FY36-37) in CY12$. The JPO has instituted several programs aimed at reducing these costs. A similar program exists for Propulsion, the Component Improvement Program (CIP), which drives reduction in parts

consumption by improving engineering performance. Additional projects are underway throughout the program to improve reliability, expand repair capacity and velocity, and reduce repair timelines.

The third area of cost is organic manpower and operations and refers to the cost of operators, maintainers, and other support labor such as security, logistics, safety, and engineering assigned to operating units. The other significant portion of this cost is unit-operating material, which is largely fuel. The main cost drivers in this area are the number of maintainers at the squadron level and fuel consumption. These unit level costs are expected to contribute 25% for manpower, and 16% for operations, of the CPTPY metric at steady state (DoD FY36-37) in CY12$.

The JPO, alongside LM, P&W, and the U.S. Services are actively working to enable the reduction of unit level (i.e. organic) manpower and fuel consumption required for the F-35. In winter of 2020, the JPO kicked off an initiative to examine the current levels of organic labor assigned to F-35 units. Specifically, business case studies are underway to understand prioritization of prognostic health management requirements to enable labor efficiency by providing a more user friendly and maintainable aircraft. The team is also examining the number of man-hours required to complete tasks with the focus on best practices across the F-35 enterprise that promulgate thru training and technical publication updates. The Services are also performing labor studies to understand how to optimize labor within the units. Lastly, the JPO and P&W are exploring key initiatives such as the Compressor High Efficiency 3-D Aero initiative which should improve durability in the compressor, combustor, and turbine and have a direct impact on fuel requirements.

The fourth area of cost is sustaining support, which provides the required support labor that enables aircraft operations and maintenance. A key driver in this area is shared labor to

support enterprise operations, sustaining engineering, and logistics and unique labor to support site and squadron operations. For the F-35, the bulk of these costs are found in the personnel on the flight line and are composed of LM and P&W field service engineers, field service representatives, and Autonomic Logistics Information System (ALIS) administrators, as well as instructors and training & course materials. These costs are expected to contribute 13% of the CPTPY metric at Steady State (DoD FY36-37) in CY12$.

The JPO is executing several initiatives across the enterprise aimed at reducing this portion of sustainment cost. One of the most important initiatives is the ALIS to Operational Data Integrated Network (ODIN) evolution, which aims to reduce the ALIS labor footprint and achieve higher levels of efficiency and availability on the flight line. Another example of a JPO program aimed at reducing costs is the development of the F-35's Next Gen Mission Planning Program. This critical development effort is focused on reducing the number of Offboard Mission Support (OMS) administrators through a deliberate reduction in the F-35's mission planning hardware footprint and on upgrading the aircraft's mission planning software architecture to make it easier for mission planning teams to program operational missions. Finally, the JPOis implementing an initiative to streamline training activity for F-35 pilots and maintainers called the Lightning Learning Environment.

The remaining areas of sustainment cost related to CPTPY support the cost of hardware and software updates that occur after fielding, and the government non-maintenance consumables, transportation & warehousing, demilitarization, and disposal. These costs are expected to contribute the remaining 12% of the CPTPY metric at steady state (DoD FY36-37) in CY12$.

Special Topics

The F-35 was designed to evolve at the speed of advancing threats. The capabilities we are delivering today are distinct from those conceptualized at the start of this program more than 20 years ago. The F-35 is leveraging new concepts in the technology environment, to include digital twinning, agile software development, cloud-based collaboration, and a process we refer to as Continuous Capability Development and Delivery, or "C2D2" to deliver Block 4 capabilities. Through close work with the operational requirements and test communities, the C2D2 process will continue to mature and deliver increments of capability over time to ensure our warfighting customers stay ahead of the threat well into the future. Block 4, enabled by TR-3, delivers the power of a modular open systems architecture to the F-35, with the instantiation of Open Mission Systems, the Future in Airborne Capability Environment, and Hardware Open Systems Technologies standards. By leveraging these industry-based standards for future capability insertion efforts, we will become increasingly nimble and responsive to emerging threats. F-35 electronic warfare (EW) upgrades are designed to defeat the modern advanced threat from stand-in locations in the most demanding air defense environment. The Block 4 hardware and software are designed to detect, identify, geolocate and defeat advanced threats without the need for an external podded system. The F-35 EW capabilities are complemented by low-and mid-band Next Gen Jammer Airborne Electronics Attack, providing a lethal combination of 5th generation stand-in F-35s, along with stand-off support from the Growlers.

As we discussed extensively in my last testimony, the F-35 Enterprise has historically struggled with the ALIS. ALIS is a complex system with numerous documented shortfalls and technical challenges. You will recall last year that we announced the start of a new system, known as the ODIN, to replace ALIS. ODIN will incrementally provide a modern, user-friendly integrated information system for the F-35. It will be comprised of multiple elements to include modern hardware, architectures, software development methods, and data environments. Our

approach must maintain our existing legacy business system (as operations continue to grow and scale) while simultaneously transitioning to a modern system – in other words, as we transition from ALIS to ODIN, it will be an evolution, not a hard switch.

Over the last 18 months, several ALIS improvements have addressed many of the challenges documented in Government Accountability Office reports. More frequent ALIS software updates addressing the users' top priorities, better electronic records data quality, and new hardware have led to a better user experience and praise from the users.

With the 42% reduction in FY 2021 Research, Development, Test, and Evaluation funding, we took the opportunity to "recalibrate" the ALIS-to-ODIN strategy based on lessons from 2020, approved users' requirements, and recent ALIS improvements. Instead of abruptly replacing ALIS with a new system, the recalibrated strategy is a phased approach addressing the most pressing ALIS challenges while simultaneously evolving to ODIN.

One of the successes from 2020 was the introduction of smaller, faster unclassified ODIN hardware designed to run the current ALIS software. The new unclassified "kit" is 70% smaller than the current ALIS hardware. Due to the overwhelming success of demonstrating the new "kit" at Marine Corps Air Station Yuma in Arizona, the Marines refused to return the kit and continue to use it to this day.

We have started procuring the new ODIN hardware for new sites and fleet technical refresh with the first units fielding in July 2021. This hardware will eliminate the oldest unclassified ALIS hardware from the fleet, hardware that was initially fielded in 2008. The processing power of the new hardware will allow us to host multiple squadrons located at a single operating location on a single kit which will yield a reduction in hardware procurement costs and administrators. Development and replacement of the classified hardware will begin in 2022.

We have initiated the development of an enterprise architecture, leveraging commercial and government best practices to document the stakeholders, business processes, data, and technology to build the transformational roadmap to migrate from ALIS to ODIN. We are strengthening our partnership with our industry partners, Lockheed Martin and Pratt & Whitney, as they have deep knowledge of the existing system, while also collaborating with the Navy and Air Force to leverage their ongoing development activities to maximize our alignment with their roadmaps.

Because of the complexity of evolving from ALIS to ODIN, we have also enlisted the help from both industry and government partners who have expertise in digital transformations, cloud migration, and modernizing legacy software. We are leveraging their expertise to support the migration of the ALIS software to a government-managed cloud infrastructure, where we will modernize the software architecture using industry standards which will foster future competition as we modernize the application portfolio. Based on lessons learned from the US Services, we intend to leverage commercial off the shelf, government off the shelf and service-provided solution reuse to the maximum extent possible to take advantage of previous Government investments and drive sustainment costs down. We are currently updating the ODIN development plan based on the updated strategy, available resources, as well as inputs received from our users. We look forward to continuing to update you on ALIS and the evolution to ODIN in the coming months.

The Joint Simulation Environment (JSE) is a government-owned, state-of-the-art simulation facility designed to support operational testing of the F-35, and in the future, other U.S. weapons systems. The JSE allows operational testers to assess the F-35's mission effectiveness in battlespace scenarios that cannot be conducted on open-air test ranges, including stressing, high-density threat environments. The F-35 Initial Operational Test and Evaluation

requires 64 mission trials to be conducted in the JSE and evaluated before the Director of Operational Test and Evaluation's Beyond Low-Rate Initial Production (BLRIP) report is written. The BLRIP report must be submitted to Congress before the Full Rate Production milestone can proceed. On 2 June, the JSF Operational Test Team accomplished the final Initial Operational Test and Evaluation open air trial. The Team, comprised of over 900 personnel from the United States, United Kingdom, the Netherlands, and Australia, conducted formal open-air trials from 2018 to 2021, which consisted of 139 test missions, 463 discreet test events, 16,436 flight hours, and used 23 F-35s of all variants. Test events included 355 simulated air-to-surface attacks, 280 simulated AIM-120 shots, and 207 live and inert weapons delivery events.

Development at the JSE has been delayed over the last year due to the combined effects of technical challenges and COVID-19. The challenges of the JSE include not only its unparalleled complexity and required fidelity, but also the technical challenges associated with the integration of high fidelity models from multiple external organizations to create a comprehensive, realistic threat environment. This development work is conducted in a classified, enclosed, close-quarters environment. Telework was and is not possible, and team size has been limited in the classified work spaces. The F-35 JPO and our Service teammates continue to forge forward to mitigate these challenges to ensure F-35 achieves its Full Rate Production milestone. The JSE team has made significant technical progress over the last six months and, with participation from the Operational Test Activities, is finalizing the JSE schedule to complete IOT&E and inform the new Acquisition Program Baseline. This updated schedule will be presented to the Defense Acquisition Executive in August 2021.

As we recently informed the Committees, the F135 Power Module repair in our depot enterprise has not been keeping pace with engine removals, resulting in degraded fleet availability. These production shortfalls were driven by delays in delivering required support

equipment and technical data, along with increased work scope of Power Module repairs. These factors impacted the ability of our sole heavy maintenance Power Module repair depot at the Oklahoma City Air Logistics Complex (OC-ALC) to scale production in order to meet demand and develop the proficiency of the depot workforce to support the required repair throughput. Over the past 6 months, the program office along with our industry partner Pratt and Whitney have made great strides and progress toward our Power Module recovery plan. This has been accomplished by increasing Power Module throughput at the Heavy Maintenance Center, by increasing and accelerating the global depot capacity growth, and by reducing demand through efforts aimed at increasing engine time on wing. Specifically at the Heavy Maintenance Center at Tinker AFB, the team has made vast process improvements that have resulted in decreased engineering disposition times and work-stops, decreased production Turnaround Time (TAT), increased number of Power Modules in work, improved technician technical data sets, and an increased quantity of required support equipment and tooling. The team has also reinforced on-site leadership with the establishment of local P&W executives and the Program Management Office Assistant Product Support Manager. Likewise, the Heavy Maintenance Center is on track to establish a full second shift by November of this year. As a result, the Heavy Maintenance Center had already produced more Power Modules by May of 2021 than all of last year and are on track to exceed their calendar year production goal. To further increase Power Module repair capacity we are working to accelerate the stand up of engine repair at the Fleet Repair Center South East in Jacksonville, FL. We are also leveraging excess commercial capacity, and are accelerating the standup of organic back shop repair to support a reduction in repair time at all of our CONUS and OCONUS depots. On July 1st, the Netherlands depot produced its first fully repaired and tested Power Module and became the first F-35 OCONUS Depot to achieve Initial Depot Capability (IDC). With test support from OC-ALC, the Australian depot produced its first

Power Module in May. These OCONUS productions are a monumental accomplishment and a key contributor to our capacity growth plan. We are also focusing heavily on engineering initiatives to potentially expand damage limitations as well as leveraging the Component Improvement Program to improve reliability and availability of engine components. The results of these initiatives will drive a reduction in fleet demand by increasing engine time on wing. The actions we have taken to date have begun to show benefit, as power module production at OC-ALC as well as our ONCONUS sites have increased significantly in the last year and the projected readiness impacts, while still above our requirement, have started to stabilize. As a result of the extensive nature of our F135 initial 2,000 hour overhaul inductions beginning in 2022, we anticipate cost growth in the propulsion enterprise through the Fiscal Year Defense Plan. We are continuing to work with P&W on steps to address the projected cost growth to ensure that the F135 Propulsion System remains affordable component of the F-35 Air System.

Conclusion

The F-35 is the premier multi-mission strike fighter of choice for three U.S. services, seven International Partners, and six Foreign Military Sales customers. The F-35 routinely demonstrates its unmatched capabilities at the hands of our joint and international warfighters, performing combat operations from land and from the sea. The F-35 is vital to our future, as they become the lethal cornerstone of the Air Force, Navy, and Marine Corp tactical aviation forces.

The whole of the F-35 enterprise is laser-focused on reduction of lifecycle costs. Cost is the common enemy on this program. Every F-35 stakeholder is aggressively engaged in identifying affordability initiatives. Our team is committed to continue working closely with Congress, our warfighting customers, and industry partners, and we take pride in developing, producing, and sustaining the world's most lethal fighter aircraft. We serve with the single-minded determination that the U.S. and its allies will have the capabilities they need to win the

fight, that our warfighters will return home safely from every engagement, and that our taxpayers get the absolute best capability for their defense dollar.