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

STATEMENT OF

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BEFORE THE

TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

OF THE

HOUSE ARMED SERVICES COMMITTEE

ON

F-35 PROGRAM REVIEW

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I. Introduction

Chairman Turner, Ranking Member Sanchez and distinguished Members of the Committee. Thank you for the opportunity to address this committee regarding the F-35 Lightning II.

The F-35 Lightning II is the Department of Defense`s largest acquisition program, and it is of vital importance to our Nation's security. The F-35 will form the backbone of U.S. air combat superiority for decades to come. It will replace the legacy tactical fighter fleets of the Air Force, Navy, and Marine Corps with a dominant, multirole, fifth-generation aircraft, capable of projecting U.S. power and deterring potential adversaries. For our international partners and Foreign Military Sales (FMS) customers, who are participating in the program, the F-35 will become a linchpin for future coalition operations and will help to close a crucial capability gap that will enhance the strength of our security alliances.

The F-35 program is executing well across the entire spectrum of acquisition, to include development and design, flight test, production, fielding and base stand-up, sustainment of fielded aircraft, and building a global sustainment enterprise. It is indeed a very big, complex, rapidly growing and accelerating program that is moving in the right direction. Our overall assessment is that the program is making solid and steady progress on all aspects and improving each day. However, this is not to say the program does not have risks, challenges, and some difficulties, but we are confident the program will be able to overcome these problems and deliver on our commitments. Today we will give

you a detailed update on the progress that has been made over the past year, providing a balanced look at where the program stands, pointing out both the accomplishments and the setbacks.

II. Development

Let us begin by discussing the development program. As you know, an independent team conducted a thorough technical baseline review in 2010, which allowed for the re-baselining of the development and test program in 2011 after breaching both the cost and schedule thresholds Congress put in place. Since that realistic baseline was created, the program has been executing to it for the past four years – on cost and on schedule.

Today, the program is nearing the completion of Block 2 software development and is close to completing all flight testing necessary to field our initial warfighting capability, also known as Block 2B. This block of capability will deliver to support the U.S. Marine Corps' Initial Operational Capability (IOC) this summer. Additionally, the program has begun flight test with our Block 3i software. We expect the 3i software, which is the Block 2B capability re-hosted on improved hardware, to be ready by the end of calendar year 2015. The U.S. Air Force will declare IOC with the Block 3i capabilities between August and December 2016.

The final block of F-35 development program capability, known as Block 3F, is planned for delivery in the fall of 2017. Block 3F testing has begun. However, as a result of the emphasis being placed on completing Block 2B and 3i testing, we have

slowed Block 3F testing. We expect to fully resume Block 3F testing this summer. As a result of this delayed flight testing, the program estimates there is a risk to completing Block 3F on time -- believing it is now about 4-6 months later than expected. This delay is not expected to impact U.S. Navy IOC in 2018 or other partner's capabilities, because: (1) the program has some time to improve on this schedule delay with better systems engineering and software process improvements; and (2) the program did build some realistic margin into the original schedule for the need date of this Block 3F software.

As for flight testing, the program will be complete with all Block 2B flight testing this spring, will continue Block 3i flight testing, and, as stated before, begin Block 3F flight testing this summer. There were numerous accomplishments this year in flight testing, most notably, completion of a very successful initial F-35C ship suitability sea trial aboard the USS NIMITZ, a large deck carrier. This initial sea trial was quite successful in proving that the F-35C can be embarked and employed on Navy carriers – an important step for our Naval warfighters. Our performance on the USS NIMITZ in terms of carrier landings, also known as "traps", was superb in that we made 124 traps out of 124 attempts without a single missed landing.

In addition to resolving the F-35C arresting hook issue, the program has resolved or has plans in place for resolution of other past lingering technical issues to include the Helmet Mounted Display System (HMDS), fly at night and Instrument Meteorological Conditions (IMC), Fuel Dump, and Lightning Protection.

As previously reported, in September 2013, during F-35B full-scale durability testing we experienced a significant bulkhead crack at 9,056 Equivalent Flight Hours

(EFH), which is 1,056 beyond its first lifetime. The A-model and C-model have not experienced such bulkhead cracking during testing, with the A-model at approximately 13,300 Equivalent Flight Hours (EFH) and the C-model at approximately 11,000 EFH. The durability testing was stopped on the B-model and a root cause investigation was conducted. The goal of durability testing is to apply cyclic loads to the airframe to simulate fleet usage. Durability testing is conducted early in the development of any new aircraft to avoid costly sustainment issues later in the life of the aircraft. We require 8,000 EFH of aircraft service life verified by testing of two lifetimes (16,000 EFH). Once root causes had been established, redesign efforts for the bulkheads began. A number of locations were identified as requiring redesign to meet the intended life, and most were addressed using standard techniques such as material thickening or cold working. However, as the redesign matured, two locations were identified that would not meet the full life requirement without significant redesign to the aircraft. An alternative service life improvement method (known as laser shock peening) that has been successfully used for the primary airframe structure on another legacy aircraft is currently being qualified to address these redesign shortfalls. This method will be available for both production and retrofit applications. The full-life design solution for the F-35B model bulkheads is scheduled to be available for production for LRIP 11 aircraft deliveries.

There was no immediate airworthiness concern for fielded and test aircraft because of the high hours accrued on this test article at the time of discovery. It will not

impact the U.S. Marine Corps ability to meet IOC in 2015. Additionally, due to the differences between the bulkhead forging materials of the F-35B (Aluminum) and the F-35A/C (Titanium), we have yet to see the same cracking issues with the A and C models at the equivalent flight hours.

As you are most likely well aware, the Director, Operational Test and Evaluation (DOT&E) performed another independent assessment of the F-35 Program. This was conducted with the F-35 Program Office's full cooperation and unfettered access to information on the F-35 Program. Although the report is factually accurate, we do not believe it tells the full story as not enough credit is given for progress that has been made in reducing risk on the program. There were no surprise findings in the report, in fact, we agree and have taken action on 6 of the 8 recommendations in the report and we are reviewing the other two for action.

With regards to F-35A Dual Capable Aircraft (DCA), we are continuing to execute a risk reduction strategy to prepare for DCA integration during Block 4 Follow-on Development. Our risk reduction efforts include developing a detailed planning schedule for B61 integration on the aircraft, maturing the nuclear architecture design, refining the cost estimate, conducting Nuclear Certification Requirements planning, and performing the initial Concept of Operations (CONOPS) documentation. To remain in sync with the B61-12 program, planning efforts are underway for the addition of several captive-carry, environmental flight tests of the B61-12 during Summer 2015, the results of which will be used to influence the design of the weapon. All F-35 DCA Risk Reduction activities, dealing with the weapons buy, will be complete by the Summer 2015. DCA integration begins as part of Follow-on Development. All software development, flight test, and nuclear certification activities will be conducted across Block 4 development, resulting in an F-35 design certification no later than 2023. The Air Force will

lead an operational certification process following design certification that is expected to be completed no earlier than 2025.

III. Production

In 2014, per our production plan, the program delivered 36 aircraft to our customers, and as of today has, delivered 130 aircraft to our test, operational and training sites. Today, the production line is running approximately two months behind schedule. But due to government/industry manufacturing management initiatives, production deliveries are improving and the current delays do not pose any long-term schedule or delivery risk to the program.

As the program increases production over the next four years, we are watching to make sure the supply base, as well as Lockheed Martin and Pratt & Whitney, are ready for this production ramp increase and conduct continuous production readiness reviews to reduce any production risks.

From a business perspective, the program recently awarded the contract for the 8th Production Lot of 43 airplanes and is preparing to begin negotiations on Lots 9 and 10, which will be negotiated together; much like was done for Lots 6 and 7. We are also looking forward to beginning negotiations for Lot 11 in 2016.

The price of F-35s continues to decline steadily Lot after Lot. For example, the price of a Lot 7 F-35A was 4.3 percent less than a Lot 6 F-35A aircraft and a Lot 8 F-35A aircraft was 3.6 percent less than a Lot 7 F-35A, including the engine and profit for both

contractors. Reductions are expected to continue into the future, leveraging the program's on-going affordability initiatives. By 2019, the expected price of an F-35A model, with an engine, and including profit, is between $80 and $85 million dollars, in 2019 dollars.

The program is also seeing the quality of the aircraft and engines improve and the number of hours required to build the aircraft and engines decline – although more progress needs to be made here. These have been important factors in the continued price reduction and future on-time delivery of aircraft and engines. The F-35 program is committed to providing a quality product to our warfighter, partner nations, and foreign military customers. This begins with establishing the appropriate contractual requirements and program plans, ensuring contractor flow-down to its supply chain, and monitoring execution through robust performance metrics. The program continues to work closely with the Defense Contract Management Agency and the prime contractors to address process discipline, attention to detail and adherence to established and robust procedures which are critical to product integrity.

On a final note concerning production, as you know, the program is also building two Final Assembly and Checkout Facilities (FACOs) – one in Italy and one in Japan. Today there are aircraft being built on the production line at the FACO in Italy and, sometime this year, the Japanese will begin building their own F-35s at their FACO in Japan. We are not anticipating problems with either facility at this time.

Continuing on this international theme, the nation of South Korea signed a

commitment to purchase 40 F-35A aircraft starting in Lot 10 and last year Israel added 14 more F-35As to their original 19-aircraft order, with a future additional purchase in two to three years. Additionally, Canada has decided to wait until after its national elections before it addresses its fighter replacement program, although it remains a full partner on the F-35 program. Also, Denmark, a full partner in the program, is expected to make its final fighter replacement selection sometime in the summer of 2015.

IV. Sustainment

As of April 1, 2015, the program has logged more than 29,000 flight hours and flown over 18,000 sorties since our first flight in 2006. Today over 130 operational, test, and training jets are operating at nine sites. Additionally, the program has completed all F-35A deliveries to Eglin Air Force Base (AFB), has started deliveries to Luke AFB, which is the main training base for the Air Force and partners, including Australia's first two F-35As. The program has also started F-35B pilot training at Marine Corps Air Station Beaufort. In the next four years we will add another seventeen operating bases to the F-35 enterprise across all three regions, North America, the Pacific and Europe.

One of the major areas of concern with maintenance and sustainment over the past 18 months has been the ability to have aircraft that are available and ready to fly. The metrics used to measure this are called Aircraft Availability and Mission Capable rates. Aircraft availability is a measure, in percentage, of how many aircraft are available in the hands of the warfighter on any given day – meaning they are not in maintenance or being

modified. Mission capable rate is the percentage of available aircraft that are capable of flying particular missions, having passed all their pre-flight maintenance and pilot checks. Typical aircraft availability rates for mature aircraft range from 60 to 75 percent, and typical mission capable rates for mature aircraft range from 70 to 80 percent. In 2013, these measures were not good; Aircraft Availability was around 35 percent and Mission Capable rates were around 40-45 percent. As a result, in 2014, we began a dedicated Reliability and Maintainability program, along with a focused look at our maintenance procedures known as "Operationalizing the F-35." These programs incorporated aircraft design improvements, repair improvements on parts that are broken, better maintenance procedures and manuals, and better, more available spare parts. All of this has resulted in steady improvements over the past year and a half. Our focused efforts improved Aircraft Availability and Mission Capable rates late last year, hitting levels of approximately 55 percent and 65 percent, respectively. Although we have more work to do to improve on these metrics, the current set of initiatives seems to have started a positive trend.

These programs have also had significant cost benefits and reductions in the long run when looking at the Program's overall life-cycle Operating and Sustaining costs. Along with these two programs, our team has also established a Cost War Room with a goal of reducing the overall Operating and Sustaining life-cycle cost of the program by 30 percent. The Cost War Room identifies, and then executes, cost reduction initiatives from across the entire spectrum of the program, including funding the design of newer,

less expensive, more reliable parts and tooling, improving maintenance procedures and manuals, and even looking at different places and different industry partners in terms of repairing parts. Since the Cost War Room was stood up in 2013, the program has reduced the overall life-cycle Operating and Sustaining cost estimate nearly 9 percent based on the Department of Defense Office of Cost Assessment and Program Evaluation estimates and we will continue to drive the life-cycle costs down.

The final topic concerning Maintenance and Sustainment we would like to address is the establishment of the Global Sustainment posture across Europe, Asia-Pacific, and North America. In 2014, the program began the process for assigning the repair capabilities to our partner and FMS customers across these three regions. The first of these assignments were announced at the end of 2014 and included the regional Maintenance, Repair, Overhaul, and Upgrade (MRO&U) capabilities for airframes and engines for both the European and Pacific Regions. These initial MRO&U assignments will support near-term F-35 airframe and engine overseas operations and maintenance and will be reviewed and updated in approximately five years. In the European region, F-35 initial airframe MRO&U capability will be provided by Italy by 2018. Should additional airframe MRO&U capability be required, the UK would be assigned to supplement the existing capability. In the European region, engine heavy maintenance will initially be provided by Turkey, also in 2018, with The Netherlands and Norway providing additional capability approximately 2-3 years after Turkey's initial capability. In the Pacific region, F-35 airframe MRO&U capability will be provided by Japan for the

Northern Pacific and Australia for the Southern Pacific, with both capabilities required by early 2018. For F-35 engine heavy maintenance in the Pacific, the initial capability will be provided by Australia by early 2018, with Japan providing additional capability 3-5 years later.

The program will continue this process in 2015 and 2016 with the Department of Defense assigning to our partners and FMS customers, other repair capabilities, such as landing gear, electrical and hydraulic systems, maintenance of support equipment, and warehousing for the global supply chain.

V. Risks and Challenges

Now we would like to shift gears and discuss some of the challenges and risks the program has encountered.

As a program, the biggest technical concern is still the development and integration of software. The aircraft alone has approximately eight million lines of code, with another 16 million lines of code on the off-board systems. This is an order of magnitude greater than any other aircraft in the world and represents a complex, sometimes tricky, and often frustrating element in the program. The discipline the program instilled several years ago in the way software is developed, lab tested, flight tested, measured and controlled by the program office, has produced much better and more predictable results over the past two years. The program is in the final stages of flight test for Block 2B software as stated before, and we are happy to say that the program will deliver Block 2B with the software capability that was promised, although

there are a number of workarounds and deficiencies that will need to be corrected in the future. Block 3i is on the same path to deliver the capabilities as promised, although technical issues have caused 3i to be delayed. However, the program had planned for some difficulties in Block 3i development and built margin into the schedule for this work. Currently Block 3i will deliver in time for production aircraft and to meet Air Force IOC. Block 3F has the most software risk facing the program today. The Block 3F software must take information from other sources, such as other non-F-35 aircraft, satellites, and ground stations, and fuse this information with F-35 information, giving the pilot a complete and accurate picture of the battlespace. This multi-platform fusion, as it is called, is the hardest thing the program has to accomplish with Block 3F, and it is being closely watched. The combination of starting Block 3F flight testing late and the technical challenges of this fusion software is the source of the program estimate that Block 3F may deliver 4-6 months late.

This past year presented some other significant challenges, including the engine failure that occurred last summer and our continuing efforts with our Autonomic Logistics Information System, known as ALIS.

On June 23, 2014, an F-35A on take-off roll experienced a failure to the third stage rotor, which "liberated" engine parts – sending them through a fuel tank, which caught fire. Thankfully, the pilot successfully aborted the take-off and exited the aircraft with no injuries. The entire fleet was grounded on July 3, 2014, but flight operations were restored in a limited capacity on July14, 2014. Return to flight imposed additional

restrictions on flight operations, including limiting maneuverability in certain parts of the flight envelope (specifically Mach and g-forces the pilot could demand of the aircraft), as well as inspections of the engine after every three flight hours. This additional workload and aircraft limitations slowed the pace of developmental testing and added to the maintenance burden in the operational units. Throughout the summer and into the fall, the Joint Program Office (JPO), Service System Commands and industry worked diligently to analyze the problem, prioritize test assets and open the flight envelope in a safe, methodical fashion. This enabled the enterprise to continue flight testing in portions of the envelope previously restricted, providing some relief to the maintainers in the field.

One key improvement was to increase the inspection interval from three to thirteen flight hours for the operational fleet. The program was able to determine root cause, and developed an interim solution: a "pre-trenched" rub material that will be implemented in the field starting later this year. Pratt and Whitney has agreed to cover the costs for the repairs to engines in the field and the cut-in of the solution to the production line, while the program office will pay for the design activity as per the development contract. The program continues its work on a long-term fix to the engine and expects to review and select from the design solutions this spring, followed by design and qualification testing, and finally, incorporation of the solution into the production line. This work is expected to be completed in 2015.

Another technical risk the program continues to monitor is ALIS. For too long, the program treated this crucial element of the F-35 weapon systems as a piece of support

equipment instead of the very complex, software intensive, total logistics and maintenance system it is. This is now being addressed by treating ALIS as if it were its own "weapon system". The program has added new disciplined systems engineering processes that include periodic design reviews, a new leadership structure, improved lab infrastructure and testing to include warfighter involvement, and a more structured software delivery plan and associated metrics. The program has seen solid improvements in ALIS over the past two years with better and faster incremental fixes, including updates made with the fielded versions of the software in 2014. In 2015, the program will field additional capability including a deployable version of ALIS in support of U.S. Marine Corps IOC and in 2016 will add capability which the Air Force requires for its IOC. To summarize, we remain confident that all these technical risks and developmental issues are on the path to successful mitigation and resolution, although the ALIS system as a whole remains behind schedule.

VI. Affordability

Affordability remains our number one priority. We have made it clear to the program management team and the F-35 industrial base that the program must finish development within the time and money the program has, must continue to drive the cost of producing F-35s down, and must continue to attack the long term life cycle costs of the F-35 weapon system. It is absolutely critical that we make this weapon system affordable. To that end, the program has engaged in a multi-pronged approach to reduce costs across production, operations and support.

First, the program has an agreement with our contractor partners Lockheed Martin, Northrup Grumman and BAE Systems on reducing aircraft production costs through an effort the program has termed the "Blueprint for Affordability," and reducing cost on the F135 engine through Pratt & Whitney's current "War on Cost" efforts and future planned Blueprint for Affordability activities. The goal is to reduce the flyaway cost of the F-35A to between $80 and $85 million dollars by 2019, which is anticipated to commensurately decrease the cost of the F-35B and F-35C variants. The effort involves the contractors investing funds upfront on cost reduction initiatives mutually agreed upon by the government and the contractor. This arrangement motivates the contractors to accrue savings as quickly as possible in order to recoup their investment, and the government benefits by realizing cost savings at the time of contract award. This arrangement also proves out the cost reduction initiative process before the government invests future money into this effort. The combination of Blueprint for Affordability, the Cost War Room efforts of the JPO, and the reliability and maintainability program have provided a viable path to reducing both the production cost of the aircraft and the long-term operations and sustainment costs of the F-35 weapon system.

VII. Conclusion

In summary, the F-35 program is showing steady progress in all areas – including development, flight test, production, maintenance, and stand-up of the global sustainment enterprise. We believe the program is on the right track and we will continue to deliver on the commitments the program has made to the F-35 Enterprise. As with any big,

complex development program, we will face challenges and obstacles. However, we believe the program has the ability to overcome any current and future issues, and the superb capabilities of the F-35 are well within reach for all of us.

Additionally, we intend to continue leading the program with integrity, discipline, transparency and accountability. We will hold ourselves and our program team accountable for the outcomes on this program. We recognize the responsibility the program has been given to provide the backbone of the U.S. and allied fighter capability with the F-35 for generations to come, and that your sons and daughters, grandsons and granddaughters may someday take this aircraft into harm's way to defend our freedom and way of life. It is a responsibility we never forget.

Thank you again for this opportunity to discuss the F-35. We look forward to answering any questions you have.