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Before the

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

F-35 JOINT STRIKE FIGHTER PROGRAM

Tuesday, April 26, 2016

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U.S. Senate
Committee on Armed Services
Washington, D.C.

The committee met, pursuant to notice, at 10:04 a.m., in Room SD-G50, Dirksen Senate Office Building, Hon. John McCain, chairman of the committee, Presiding.

Present: Senators McCain [presiding], Inhofe, Sessions, Wicker, Ayotte, Fischer, Cotton, Rounds, Ernst, Tillis, Sullivan, Lee, Reed, McCaskill, Manchin, Shaheen, Gillibrand, Blumenthal, Donnelly, Hirono, Kaine, and King.

OPENING STATEMENT OF HON. JOHN McCAIN, U.S. SENATOR FROM ARIZONA

Chairman McCain: The committee meets today to consider the status of the F-35 Joint Strike Fighter program as we review the fiscal year 2017 budget request.

I welcome our witnesses, Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall; director of Operational Tests and Evaluation, Dr. Michael Gilmore; program executive officer for the F-35, Lieutenant General Christopher Bogdan; and director of Acquisition and Sourcing Management for the Government Accountability Office, Michael Sullivan.

The F-35 Joint Strike Fighter program is the largest and most expensive acquisition program in Department of Defense history. The full capabilities this aircraft will eventually provide are critical to America's national security, our ability to deter our potential adversaries around the globe, and, if necessary, respond with overwhelming force to any future conflicts that may require military intervention.

At the same time, the F-35 program's record of performance has been both a scandal and a tragedy with respect to cost, schedule, and performance. It is a textbook example of why this committee has placed such a high priority on reforming the broken defense acquisition

system.

The F-35 schedule for development has now stretched to more than 15 years. Costs have more than doubled from original estimates. Aircraft deliveries amount to no more than a mere trickle relative to the original promises of the program.

The original F-35 delivery schedule promised 1,013 F-35s of all variants would be delivered by the end of fiscal year 2016. In reality, we will have 179. Because the Air Force, Marines, and Navy were all counting on the F-35s that never appeared, combat aircraft and strike fighter capacity shortfalls in all three services have reached critical levels, severely impacting readiness and ultimately limiting the department's ability to meet the requirements of the defense strategy.

In the department's fiscal year 2017 budget request, dozens more aircraft are being deferred from the future years defense plan, resulting in a situation where the last F-35 will be delivered in 2040.

I cannot fathom how this strategy makes any sense, purchasing combat aircraft with a 40-year-old design in light of all the testimony this committee has received about how our potential adversaries are rapidly catching up with and, in some cases, matching America's military technological advantages.

Those F-35 aircraft being delivered are not being delivered as promised. They have problems with maintenance, diagnostic software, radar instability, sensor fusion shortfalls, fuel system problems, structural cracks from service-life testing, engine reliability deficits, limitations on the crew escape system that caused pilot weight restrictions, and potential cyber vulnerabilities. This list is as troubling as it is long.

At long last, we are approaching the end of the long nightmare known as "concurrency," the ill-advised, simultaneous development, testing, and production of a complex and technologically challenging weapons system that the department estimates will end up costing the American taxpayers $1.8 billion.

But many questions remain, such as the total number of these aircraft the Nation should buy or can even afford, the cost of future upgrades to keep these aircraft relevant in the face of an ever-evolving threat, and the management and administration of a so-called joint program that General Bogdan himself has admitted consists of aircraft that have only 20 percent to 25 percent commonality across the three variants as compared to the original goal of 70 percent to 90 percent.

The F-35A, F-35B, and F-35C are essentially three distinct aircraft with significantly different missions and

capability requirements. The illusion of jointness perpetuated by the structure of the F-35 joint program stifles the proper alignment of responsibility and accountability this program so desperately needs.

There are also questions as to when the system development and demonstration phase, or SDD, will actually be completed so that initial operational tests and evaluation can begin. Originally scheduled to conclude in 2017, we have every indication that schedule pressures will likely extend SDD well into fiscal year 2018.

I am very concerned the department may attempt to take shortcuts by deferring mission capability content into later block upgrades and, by doing so, shortchange the warfighter once again by delaying necessary capabilities.

The F-35 was designed to replace multiple aircraft of all three services, the A-10, the F-16, the F-18, and the Harrier. That is why the operational testing and evaluation must be of such high fidelity.

There can be no question in the minds of the American people that their gigantic investment in this program will pay off with greatly improved capabilities that far surpass the mission capabilities of all these individual combat aircraft. The Congress will not likely allow any more of these legacy aircraft to be retired from service until there is no doubt the F-35 can adequately replace them. Nor is

the Congress likely to entertain a "block buy" or other multiyear procurement scheme until the initial operational test and evaluation is completed and a positive milestone decision is made to commence full-rate production, both of which I understand are scheduled to occur in fiscal year 2019.

The department appears to be considering managing the F-35 follow-on modernization, which is estimated to cost over $8 billion for the first block upgrade within the overall F-35 program. This is incredible given the department's dismal track record on these upgrade programs as the F-22A modernization and upgrade debacle showed.

I have seen no evidence that DOD's processes have improved to a level that would remove the need for a separate major defense acquisition program that would enable close scrutiny by Congress. Moreover, I expect the department to use fixed-price contracts for the F-35 modernization effort in order to protect taxpayers.

Despite this programs many stumbles, there are some positive signs for the F-35. The Marines declared initial operational capability, or IOC, last July in Yuma, Arizona, and are preparing for their first F-35B overseas deployment next year.

Air Force personnel at Hill Air Force Base in Utah who fly and maintain the aircraft are preparing for Air Force

IOC this fall. They report that the latest lots of F-35As are flying very well with a significant jump in reliability in warfighting capability as compared to earlier aircraft.

General Bogdan has steadily pushed down aircraft procurement unit costs; reliability metrics are on the rise; and each lot of aircraft deliveries possess increasingly effective warfighting capabilities.

All of this is a testament to hard work of military and civilian personnel inside this program today. They are doing their best to overcome misguided decisions taken long ago, and they are having success in important areas.

However, there is a lot of development left to complete in this program, and with it comes the potential for more problems, schedule delays, and increased costs. This committee will remain steadfast in its oversight responsibilities to ensure our warfighters get the capabilities they need on time and at reasonable cost.

Since a quorum is now present, I ask the committee to consider a list of 920 pending military nominations. Included in this list are the nominations of General Vincent K. Brooks, USA, to be commander of United Nations Command, Combined Forces Command, U.S. Forces Korea; General Curtis M. Scaparrotti, USA, to be Commander of U.S. European Command and Supreme Allied Commander Europe; and General Lori J. Robinson, USAF, to be Commander, U.S. Northern

Command, Commander North America Aerospace Defense Command.

All these nominations have been before the committee the required length of time.

Is there a motion to favorably report these 920?

Senator Reed: So moved.

Chairman McCain: Is there a second?

Senator Ayotte: Second.

Chairman McCain: All in favor, say aye.

The motion carries.

Senator Reed?

STATEMENT OF HON. JACK REED, U.S. SENATOR FROM RHODE ISLAND

Senator Reed: Thank you very much, Mr. Chairman.

Let me join you in welcoming the witnesses today. We are grateful for your service. So thank you very much, gentlemen.

Today, we will seek a better understanding of the progress the department is making in fielding the Joint Strike Fighter; what actions the department has taken to ameliorate problems with the program; what is the best judgment available of how effective these actions will be in preventing problems with the program, including additional cost overruns and delays.

Overall, the production program has been delivering on expected cost reductions on aircraft lots. However, we still have to complete the system development and demonstration, SDD, program that is expected to deliver complete warfighting capability of each of three variants of the F-35. We may not have seen all the potential schedule changes in SDD, since not all the program difficulties are behind us.

Quoting from Dr. Gilmore's prepared testimony, "Although the Marine Corps has declared initial operational capability, IOC, and the Air Force plans to do so later this calendar year, the F-35 system remains immature and provides

limited combat capability, with the officially planned start of initial operational test and evaluation, IOT&E, just over 1 year away."

Dr. Gilmore also says assesses that the F-35 program will not be ready for IOT&E until calendar year 2018 at the soonest, and these assessments are of concern.

Several years ago, we required the department to estimate the dates for initial operating capability, IOC, of the three variants to the F-35. The Marine Corps declared IOC last year in July. The Air Force is scheduled to declare IOC later this year. And the Navy is scheduled to clear IOC in 2018.

The Marine Corps IOC was based on a version of the program software called the Block 2B. The Air Force's declaration of IOC will be based on the Block 3i software. The Navy's declaration of IOC will be based on the Block 3F software version.

Until recently, in order to support the IOC dates, the program office has been working on versions of both Blocks 3i and 3F of the software simultaneously. The Block 3F software depends on having a stable baseline for the Block 3i software.

With the contractor team working on multiple releases of software, correcting deficiencies and achieving software stability has proved elusive. Working on the two software

packages simultaneously was intended to save time, but that time was lost when the project had to be redone because of mistakes stemming from concurrency.

Within the past year, the program executive officer halted work on the Block 3F software until the problems with the Block 3i software could be sorted out. We need to understand what effect this altered approach may have on the overall program schedule.

Beyond that, we are planning for sizable upgrades in F-35 capability through spiral development efforts to the Block 4 program. The Block 4 program will likely be a multibillion-dollar effort. We want to make sure that we do not repeat past mistakes.

Beyond the SDD program, there is an even larger issue of the cost to sustain the F-35 once we have bought it. These estimates were at one point as large as $1 trillion. We need to understand what the department is doing to reduce these potential costs. If we do nothing, we run the risk of allowing increased costs to sustain and support the F-35 to reduce the funds available for investment in the future force.

This committee has been a strong supporter of the JSF program from the beginning. However, we must continue our vigilance on cost so there is a proper balance between F-35 and other important DOD acquisitions.

Thank you very much for calling the hearing, Mr. Chairman.

Chairman McCain: Thank you.

I welcome the witnesses.

Secretary Kendall?

STATEMENT OF HON. FRANK KENDALL III, UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS

Mr. Kendall: Thank you, Chairman McCain. Chairman McCain, Ranking Member Reed, members of the committee, I am happy to be here today with Lieutenant General Bogdan, the program executive officer for the F-35 program, as well as with Dr. Gilmore and Mr. Sullivan, to discuss the status of the program and the President's budget request for fiscal year 2017.

In my opening comments, I would like to discuss my own involvement with the F-35. Lieutenant General Bogdan will provide more detail on the current state of the program.

My first exposure to the F-35 was in the fall of 2009, as I was awaiting confirmation to be the Principal Deputy Under Secretary for AT&L. I was briefed by a member of Dr. Gilmore's staff, and my reaction at the time was one of surprise at the extremely long period of low-rate initial production, approximately 10 years, and at the very high amount of concurrency in the program, as you mentioned, Mr. Chairman, concurrency being the overlap in this case between development and production. It was one of the highest and, therefore, most risky that I had ever seen.

Production was started in 2007, well before the stability of the design could be confirmed through testing. I later called the decision to start production so early

acquisition malpractice, a phrase which seems to have stuck.

In early 2010, also before I was confirmed, the program manager was replaced. The new program manager was Admiral David Venlet, a very seasoned and competent professional. At that time, the F-35 went through a Nunn-McCurdy review, as a result of the cost increases. As a result of the review, the program was rebaselined under Admiral Venlet to the baseline that it is operating against now and has ever since.

In 2010, my predecessor, Dr. Carter, ended the use of cost-plus contracts for production, starting with Lot 4.

In the fall of 2011, I became the Acting Under Secretary. One of my early decisions was to bring Lieutenant General Bogdan in to replace Vice Admiral Venlet.

Lieutenant General Bogdan has proven to be highly competent and professional program executive officer.

In the fall 2011, based on an early operational assessment report from Dr. Gilmore's office, I commissioned an independent review of the technical status of the program focused on the design stability of the program. At that time, the extent of the open design issues and the risk of high concurrency costs for retrofitting aircraft that had already been produced with fixes that were found later led me to seriously consider halting production. Based on several considerations, I made the decision to hold

production constant at 30 aircraft per year for the next 2 years, and to assess progress before increasing production at that point.

Under Lieutenant General Bogdan's leadership, the program has made steady progress for the past 4 years. Cost and development have remained within the baseline. Production costs have steadily decreased, beating the independent cost estimate each year. The cost of sustainment has also been reduced by approximately 10 percent since the program was rebaselined.

There have been a few months of schedule slip primarily due to software complexity.

While I do continue to monitor progress monthly and conduct annual program deep-dive reviews, the F-35 is no longer a program that keeps me up at night. There are some design issues that still need to be resolved. The test program is about 90 percent complete, and I do expect additional discovery, but I will be surprised if a major design problem surfaces at this point.

Our task now is to complete the test program, achieve IOC for the Air Force later this year and the Navy in 2018, complete OT&E, and support our many partners and foreign sales customers as they become operational over the next few years.

We also need to move forward with the follow-on

development. I appreciate this committee's support for authorizing and funding that important work.

The F-35 is a game-changing, state-of-the-art weapons system. But our potential adversaries are not standing still. Threat advances in areas like integrated air defense systems, air-to-air weapons, and electronic warfare must be continuously countered. We must continuously improve the weapons system to keep pace with emerging threats.

I thank the committee for its support and look forward to your questions.

[The prepared statement of Mr. Kendall follows:]

Chairman McCain: Thank you.

General Bogdan?

STATEMENT OF LIEUTENANT GENERAL CHRISTOPHER C. BOGDAN, USAF, PROGRAM EXECUTIVE OFFICER FOR THE F-35 LIGHTNING II JOINT PROGRAM

General Bogdan: Thank you, sir. Chairman McCain, Ranking Member Reed, distinguished members of the committee, thank you for the opportunity here today to discuss the F-35 Lightning II program.

My purpose here today is to provide you an honest, balanced assessment of where the program stands today. That means I will tell you the good, the bad, and the ugly about the program, and tell you what my team is doing to reduce costs, improve F-35 performance, and meet our scheduled commitments.

The F-35 Lightning II is of vital importance to the security of the United States. And as the program executive officer and program director, I am committed to delivering an affordable, reliable, and sustainable fifth-generation weapons system to our warfighters and those of our international partners and foreign military sales customers.

Overall, the F-35 program is executing well across the entire spectrum of acquisition to include development and design, flight test, production fielding, base standup, maintenance and support, and building a global sustainment enterprise.

The program is at a pivot point. It is now rapidly

changing, growing, and accelerating. We will be finishing our development program in late 2017 and begin a transition to a leaner, more efficient follow-on modernization program. We will see production grow from delivering 45 aircraft in 2015 to delivering over 100 airplanes in 2018, and up to 145 by 2020.

Additionally, in the next 4 years, we will continue the standup of 17 new operating F-35 bases all over the world. We are also accelerating the creation of our heavy maintenance and repair capability and supply chain in the Pacific, European, and North American regions, creating a truly global sustainment capability.

However, the program is not without risks and challenges, as these come with any program of this size and complexity. But I am confident the current risks and issues we face can be resolved, and we will be able to overcome future problems and deliver the F-35's full combat capability.

I have often said that the mark of a good program is not that it has no problems but rather that it discovers problems, implements solutions, improves the weapons systems, and at the same time keeps the program on track. I believe we have been doing that for a number of years now.

Let me highlight a few of our recent accomplishments.

Last year, we began U.S. Air Force and partner pilot

training at Luke Air Force Base in Arizona where a blend of U.S. and partner F-35 instructor pilots are helping to train U.S. Air Force and other partner pilots. The Air Force is now receiving F-35As at Hill Air Force Base in Utah, and training is underway to ready its first combat-coded F-35 squadron to be operational later this year.

Also, the United States Marine Corps is successfully flying and deploying to austere sites for training, and dropping and shooting live weapons with the F-35B today.

In addition, industry committed to and then successfully delivered 45 airplanes last year, including the first aircraft produced in the Italian assembly facility in Cameri, Italy. From a production perspective, we have delivered a total of 176 of our test, operational, and training aircraft to date.

On the cost front, the price of purchasing F-35s continues to decline lot after lot, a trend I believe will continue for many years. I expect the cost of an F-35A with an engine and fee in then-year dollars to be less than $85 million in fiscal year 2019.

As I said before, the program is changing, growing, and accelerating, but it is not without its issues, risks, and challenges. Let me highlight some of these areas and what we are doing about them.

On the technical front, we have a number of risks I

would like to mention. At the top of my list are both aircraft software and our maintenance system known as the Autonomic Logistics Information System, or ALIS. We have seen stability issues with our Block 3 software. However, we believe we have identified the root cause of these problems and have tested solutions in the lab and in flight test, and are now completing our flight tests with these solutions.

Our initial indications of this flight testing was positive, and we see software stability improved to two to three times better than what we have seen in the past. By the end of this month, I am encouraged that we will have an enough data to consider this problem an issue closed.

We have also experienced schedule issues with the development of our next version of ALIS, version 2.0.2. I am prepared to discuss this issue as well as topics such as our egress system, U.S. Air Force IOC, initial operational test, and recent U.S. Air Force and U.S. Marine Corps deployments, and the status of our partners and FMS customers during the questions and answers.

In summary, the F-35 program is moving forward, sometimes slower than I would like, but moving forward and making progress nonetheless. We are nearing the completion of development and flight test in 2017. We are ramping up production, standing up new bases, and growing a global

sustainment enterprise. We have also stabilized and reduced the major costs on this program.

As with any big, complex program, new discoveries, challenges, and obstacles will occur. The F-35 is still in development, and this is a time when challenges and discoveries are expected. However, we believe the combined government and industry team has the ability to resolve our current issues and any future discoveries.

I intend to continue leading this program with integrity, discipline, transparency, and accountability. It is my intention to complete this program within the resources and time I have been given, and I intend on holding my team and myself accountable for the outcomes on this program.

We never forget that someday your sons and daughters, your grandsons or granddaughters, will take an F-35 into harm's way to defend our freedom. Delivering them the best possible weapons system is a responsibility I and my team take very seriously.

Thank you again for the opportunity to discuss the program. I look forward to your questions.

[The prepared statement of General Bogdan follows:]

Chairman McCain: Thank you.

Dr. Gilmore?

STATEMENT OF HON. J. MICHAEL GILMORE, PH.D., DIRECTOR OF OPERATIONAL TEST AND EVALUATION, DEPARTMENT OF DEFENSE

Dr. Gilmore: Mr. Chairman, Senator Reed, members of the committee, I will focus my remarks on readiness for initial operational test and evaluation, and achievement of full combat capability.

My estimate is the program will not be ready to begin operational test and evaluation until mid-calendar year 2018 at the earliest. That is about a 1-year delay relative to the program's objective date and 6 months relative to the threshold date.

There are a number of reasons that that is my assessment. The most complex mission system testing remains, as does verification of fixes to a number of significant problems. In-flight stability of mission systems with the new Technical Refresh 2 processor has been poor, but there is recent indication of significant progress in achieving stability, although those stability issues while they were being fixed led to delays in Block 3F development, which provides full combat capability. Nonetheless, there is good news on the stability front.

Significant ground startup instabilities persist, however. Inadequate fusion of sensor information from sensors on a single aircraft, as well as among a four-ship of aircraft, resulted in cluttered and confusing displays

and are still a problem. Four-ships will be frequently used in combat to enable key multi-ship sensor applications that are necessary to deal with the increasingly complex and stressing integrated air defense systems potential adversaries began fielding in the middle of the last decade.

Shortfalls in electronic warfare and electronic attack, geolocation, electronic countermeasures persist. There are shortfalls in the performance of the distributed aperture system, including missile warning and situational awareness; long aerial refueling times up to two to three times those of legacy aircraft; lack of viable moving target capability, which is crucial for successful conduct of close-air support and other missions; lack of display to pilots of failures in critical mission systems components, which is unacceptable in combat; and there are other issues that are classified.

Regarding mission systems, the program has now changed its approach, as has been discussed, from executing parallel schedule-driven software releases to a serial capability-based approach, which does take longer. But that approach has been validated in the recent achievement of improved stability with the TR2 processor. That approach, the new approach, allows the extra time needed to actually fix problems and, as I mentioned, has been validated by the progress recently seen.

Stealth aircraft are not invisible. Mission systems

infusion must work in some reasonable sense of that word. They do not have to be perfect, but they have to, in some sense of the word, work to prevail in combat against the modern, very capable, and mobile integrated air defense systems potential adversaries have been fielding since the middle of the last decade. The ability to prevail against these threats is a key rationale for this $400 billion program.

To continue with other reasons that there may be a delay in operational testing, time is needed to complete and certify full weapons usage throughout the full flight envelope. The most recent test community estimates are October 2017 for F-35A, February 2018 for F-35C, and May 2018 for F-35B. These estimates assume an increase in the rate at which weapons tests are accomplished that may be a challenge to achieve.

As has been mentioned, there are problems that continue with the Autonomic Logistics Information System, or ALIS, which remains immature, requiring problematic and resource-intensive workarounds not acceptable in combat. Under the program's current schedule, the final version of ALIS 3.0, the full capability production version required for IOT&E and full combat capability, will not be released until the first quarter of calendar year 2018. But this schedule could be delayed by the ongoing problems with ALIS version

2.0.2, which attempts to integrate the engine data and incorporate other functionality and fixes.

Concurrency-driven extensive modifications would be required. The early lot aircraft that originally had been bought for IOT&E when IOT&E was planned to begin in 2013. The current unmitigated schedule for accomplishing those modifications, including those for the gun, which is turning out to be very problematic on all variants, extends into the third quarter of 2019. The program is working on a multipronged approach to pull those modifications to the left. That includes taking production aircraft slated for operational use and taking hardware from recently fielded aircraft, and a definitive decision on that approach is needed now.

There are inadequacies that remain in U.S. reprogramming laboratory that are precluding the ability to generate combat-effective mission data files, enabling aircraft to deal with the air defense threats I mentioned. And they are only going to worsen in the future.

The current schedule shows USRL hardware upgrades required to handle current threats extend into calendar year 2020. The program can and has delivered mission data files, but they are not optimized or fully tested to handle the current threat because of the hardware and software deficiencies in the USRL.

The program's optimistic schedule for delivery of a validated but probably inadequate MDF to support IOT&E is the first quarter 2018. But this assumes USRL receives the functional lab version of Block 3 this month, which may be problematic.

For all these reasons, delays to IOT&E and full combat capability are likely. I want to remind everyone that IOT&E will constitute the most realistic and stressing test of JSF that will be performed. Therefore, discovery of new, significant deficiencies during IOT&E, as was the case with F-22, is pretty much assured.

Thank you.

[The prepared statement of Dr. Gilmore follows:]

Chairman McCain: Mr. Sullivan, welcome.

STATEMENT OF MICHAEL J. SULLIVAN, DIRECTOR OF ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Mr. Sullivan: Thank you, Chairman McCain, Senator Reed, members of the committee. I have a written statement for the record, but I would like to just take this time to briefly highlight what we consider to be the most important challenges facing the program moving forward.

In addition to my written statement, my report to this committee and others, which was issued on April 14, contains more details on the program's progress to date.

First, although the program has managed costs very well since it is Nunn-McCurdy breach and subsequent rebaselining in 2012, it still poses significant future affordability challenges for the department and Congress. As the program begins procuring more aircraft, the department is expected to spend on average about $13 billion per year over the next 22 years, until all planned purchases are complete in 2040.

These annual funding levels will present challenges as the program stacks its funding priorities against other large acquisitions, including the B-21 bomber, KC-46 tanker, the Ohio class submarine replacement, the new carrier, and many more.

Second, the department now plans to add new capability known as Block 4 to the F-35 that is beyond its original

baseline capability, and it is planning to manage that effort as part of the existing program, rather than establishing a separate business case and baseline for that effort. This has significant implications as far as Congress' ability to provide oversight and holding the program accountable.

The new work has a projected cost of about $3 billion over just the next 6 years, and that price tag alone would qualify it as a major defense acquisition program in its own right. We believe it should be managed as such, with its own separate business case to allow for transparency and accountability.

Third, the F-35 software development is nearing completion, but the program faces challenges in getting all of its development activity completed on time for operational testing, as we just heard Dr. Gilmore talk about. It has completed over 80 percent of its developmental flight tests and is now working to close out flight testing of its final block of software, Block 3F. This final block is critical as it will provide the full warfighting capability to the aircraft.

Program officials have estimated as much as a 3-month delay right now to completing Block 3F testing, and our own analysis indicates that it could be closer to 6 months. I think Dr. Gilmore's analysis, as he just stated, has it more

than that. Getting that developmental testing done is critical, of course, to getting operational testing done and IOCing the aircraft.

With regard to technical risk, the program has found fixes for earlier problems, problems such as the helmet display and the engine, and it is working now to find solutions for two other challenges, the ejection seat problem and the carrier variants wing structure. There are cracks in the wing structure.

Perhaps the biggest outstanding technical risk for the program today, though, as has been discussed already, is the Autonomic Logistics Information System known as ALIS. As you know, ALIS is a complex system that supports operations, mission planning, supply chain management, maintenance, and many other processes.

In our companion report also issued on April 14, we documented several issues with ALIS, most importantly concerning its inability to deploy right now and the lack of needed redundancy at this point that could result in operational and schedule risks in the future.

Finally, manufacturing and production data continue to show a positive trend toward more efficient production, and that is good. The amount of labor hours to build each aircraft continues to go down. The engineering changes that are coming out of the test program have been reduced

significantly. And the contractor is now delivering aircraft on time or, in some cases, ahead of schedule.

We continue to monitor the measures for aircraft and engine reliability and maintainability. While they still fall short of expectations, they continue to improve, and there is still time to achieve the program's required goals in that area.

I will close with that, Mr. Chairman. I look forward to your questions.

[The prepared statement of Mr. Sullivan follows:]

Chairman McCain: Thank you very much. I thank the witnesses.

General Bogdan, how many military, government civilians, and full-time equivalent contractor positions are assigned to the Joint Program Office? And what is the annual cost to operate the office?

General Bogdan: Sir, today, if you include the test force at Pax River and the test force at Edwards Air Force Base, which are not necessarily part of my program office but I pay for them, just like I do support contractors, the number is about 2,590. The annual cost to operate the JPO is on the order of about $70 million a year. That includes pay for salaries. That includes leasing facilities and space, computers, IT, everything wrapped up.

Chairman McCain: The information that I have is that it is nearly 3,000 and the cost is $300 million a year, but $70 million a year to run an office of a program is pretty disturbing.

Secretary Kendall, last year's NDAA included report language that directed the Secretary of Defense to either revalidate the F-35 total by a quantity of 2,443 for all variants or submit a new number by May 25, 2016. Does the department intend on meeting this requirement on time?

Mr. Kendall: Mr. Chairman, as far as I know, yes, we are.

Chairman McCain: I was interested, Dr. Gilmore, you said that the IOC is likely to be delayed. Have you any idea how long that delay would be in the IOC?

Dr. Gilmore: Are you speaking, Mr. Chairman, about the IOC for the Air Force with Block 3i?

Chairman McCain: Yes.

Dr. Gilmore: I think it is unlikely the Air Force will meet its objective date, which is mid-2016, but it could meet its threshold date, which is later in the fall.

Chairman McCain: In this issue, Mr. Sullivan, of pursuing a block buy, can you provide any examples of a program pursuing a block buy or multiyear procurement strategy prior to a full-rate production decision?

Mr. Sullivan: You are referring to the proposal right now to buy aircraft on a 3-year buy?

Chairman McCain: Yes.

Mr. Sullivan: I do not have any examples of that. The only example I know of a block buy situation is our usual multiyear procurements, which require a lot of criteria to show that the industrial base is stable, the design is stable, they are ready to produce. Usually, it comes much later in a production line.

I do not think there is even any criteria for that kind of block buy.

Chairman McCain: Dr. Gilmore, in your statement, you

said the limited and incomplete F-35 cybersecurity testing accomplished to date has nonetheless revealed deficiencies that cannot be ignored. Can you elaborate on that?

Dr. Gilmore: I would be happy to do so in the appropriate forum. It would require the discussion of classified information. We treat cyber vulnerabilities, the details of them, as classified. But they are significant, in my judgment.

Chairman McCain: General Bogdan, Dr. Gilmore believes that there will be a delay in the IOC of the Air Force version. What is your response?

General Bogdan: Sir, there are many things that the Air Force needs me to deliver to them before they can declare IOC. All of the things that are necessary for them to make that decision are on track for a 1 August 2016 declaration, with the exception of ALIS. I believe ALIS is approximately 60 days behind. And, therefore, I would put ALIS delivery, which is a criteria for them, at about 1 October 2016, as opposed to 1 August.

They have until December, which is their threshold date, so I think they will meet their IOC criteria within that period, but not exactly on 1 August.

Chairman McCain: The fiscal year 2016, General, limited funds for the procurement of F-35As until Secretary James certified that the F-35A aircraft delivered in 2018

will have the full combat capability with Block 3F hardware, software, and weapons carriage.

Have you recommended or do you intend to recommend to Secretary James that she make the certification?

General Bogdan: Yes, Senator. I am preparing the package now to forward to the Secretary of the Air Force with my recommendation that she make that certification. I needed a few pieces of information before I could feel confident asking her to certify. One of those pieces was that the software stability issues that were spoken about before were behind us. I believe they are now. Therefore, I believe that 3F will be delivered in fiscal year 2018, with the full capability, so I will forward the package to her now.

Chairman McCain: Finally, Dr. Gilmore, given the size and cost of Block 4, would you believe it should be treated as a separate program for Nunn-McCurdy purposes or just as part of the F-35 program?

Dr. Gilmore: Senator, I remind you that is not my decision. However, in taking a look at what I have seen in the current plans for Block 4, as I mentioned in my written statement, they need to be scrubbed, rigorously, in my view. So anything that will help in that rigorous scrub and bring clarity to desired performance and cost would be useful. So I think that would be a good idea, but again, I hasten to

say it is not my decision.

Chairman McCain: Senator Reed?

I thank the witnesses.

Senator Reed: Mr. Chairman, with your permission, I would like to yield to Senator Donnelly. He has a pressing engagement elsewhere.

Senator Donnelly: Thank you, Mr. Chairman.

I want to thank the witnesses.

Secretary Kendall, from 1996 to 2007, as the F-35 was under development, DOD supported an alternate engine program. The push for the F136 engine was controversial in later years, but I am interested to hear from you, and others who have thoughts on this, do you believe the alternate engine program was a smart strategy in those early R&D years?

Mr. Kendall: The question of the alternate engine, and I was in my position for the last couple years of that debate, was really a question of the economics associated with it. Basically, a decision was made that the economic case was not there to carry a second engine. That entailed taking some risk, of course, when you only rely on one. That has proven out.

The engine of the F135 is performing. We are getting cost out of that, not as quickly nor as much as we would like, but we think that the strategy that we have embarked

on is working.

We are also funding some advanced development for follow-on engines. It is competitive development at this point. They could be cut into the production several years from now, if we can fund the EMD program for that. But affordability has been a major constraint on the program overall, including on the engines.

Senator Donnelly: General Bogdan, I am particularly concerned about the performance of the F135, given that Pratt & Whitney was recently selected to build the engine for the B-21. I am concerned that looking back on the history of the F-35, the F-16, and others, there are performance issues, and I quote from the Department of Defense annual report, "recurring manufacturing and quality issues" that have been an issue with Pratt & Whitney for the F-35. Could you comment on that, please?

General Bogdan: Yes, sir. The quality issues that you are talking about are primarily not at the Pratt & Whitney level. They are at their suppliers' level. Nonetheless, Pratt & Whitney is responsible for those suppliers.

Over the last few years, we have improved our on-time delivery of engines significantly. But early on in the program, you are correct, sir, that we were seeing quality escapes and manufacturing issues with the lower tier suppliers. I think at this point in time, the manufacturing

of the engine is much more mature than it was a few years ago.

Relative to the performance of the engine, today, the F135 engine has about 52,000 fleet hours on it, and it is maintaining about a 94 percent full mission capable rate. That is a very, very good number. In the endgame of the program, we were shooting for 95 percent, so here we are less than a quarter of a way through the full maturity of the airplane, and we are just about achieving that reliability we are looking for.

However, that is not to say that there are not issues. We are dealing with the engine right now and changes we are making to make it more affordable, more producible, and increase the reliability.

But from that perspective, I have been fairly happy with the performance of the F135.

Senator Donnelly: Mr. Sullivan, they have said that their engines are well ahead of the 2020 requirements, but in your report last month, GAO wrote that the F-35A and F-35B engines are at about 55 percent and 63 percent of where the program expected them to be. Can you explain the difference in that assessment, sir?

Mr. Sullivan: I do not know that I can explain the cause of that, but we have found that the engine reliability and the measurements that we look at in terms of coming up a

reliability growth curve for an engine during development, Pratt & Whitney has been pretty consistently below where they were expected to be, but I would say they have been improving in the last 2 or 3 years, in that respect. It seems like they are beginning to retire some of that risk.

Senator Donnelly: This is to all the panelists. What is the top lesson you have learned through the F-35 acquisition process that can inform future major acquisitions across the services?

Mr. Sullivan, I would like to start with you.

Mr. Sullivan: I think, obviously, the first thing that we have learned with this is that you should not concurrently develop technology with a product, and you should not concurrently buy aircraft while you are still developing them. That is the number one thing.

Senator Donnelly: Dr. Gilmore?

Dr. Gilmore: The F-35 was an extreme example of optimistic if not ridiculous assumptions about how a program would play out.

The decision to begin production before much of development had really been accomplished was a very bad one, as Mr. Kendall has discussed. But although an extreme example, it is not unprecedented because the department is typically very optimistic about schedules and costs, which then sets up the program managers who are put in charge of

these programs to look like failures from the outset, which is a terrible thing to do to them.

Senator Donnelly: Thank you. I would love to hear the other two, but I am out of time.

Thank you, Mr. Chairman.

Chairman McCain: Senator Inhofe?

Senator Inhofe: Thank you, Mr. Chairman.

I think the question that I was going to ask may have been answered in the second sentence in your opening statement when you said the F-35 will form the backbone of the U.S. air combat superiority for decades to come.

We keep hearing things to the contrary. You might remember when Secretary Hagel, just in February 2014, he said, "American dominance in the seas, in the skies, and in space can no longer be taken for granted." General Frank Gorenc, the USAFE commander, said, just in September last year, this is his quote, "The advantage that we had from the air I can honestly say is shrinking. This is not just a Pacific problem. It is as significant in Europe as it is anywhere else on the planet. I do not think it is controversial to say they have closed the gap in capability."

General Bogdan, do you agree with that?

General Bogdan: Sir, I would agree with that. Our adversaries today are full speed ahead and accelerating the

development of significant military capabilities to thwart ours, both in air-to-air and air-to-ground.

I believe that F-35 is absolutely necessary now and in the future to give you and the Nation options to take an airplane and go anywhere on the face of the Earth at a time of our choosing and be survivable and hit a target. I do not believe there is any other airplane in the world that can do that today. However, the F-35 can do it and will do it for many years.

Senator Inhofe: You are talking about some fifth generation aircraft from both Russia and China. You have the T-50 and then the Chinese have the J-20. I think they also have the J-31 or something like that, maybe lagging behind a little bit.

Now, when you compare those, normally they talk about we are going to be stealthier; we are going to have better radar. Why don't you give us an idea of what the opposition is doing right now, and specifically in what areas that we are better?

General Bogdan: Senator, I will try to do that without walking across the line of sensitive information or classified.

One of the things that folks like to think about when they look at those adversary airplanes is that they look a lot like ours. That is a true statement. Much of the

design of those airplanes came on the outer mold line from what we developed in our F-22s and F-35s.

Senator Inhofe: I understand that. Yes.

General Bogdan: What makes us better and special is what is on the inside of these airplanes. Our radar, our multi-sensor fusion, our ability to take information in the battlespace and provide it to the pilot in such a way that he knows everything that is going on 360 degrees around him --

Senator Inhofe: Okay, that is good.

General Bogdan: -- and the weapons to employ that knowledge are what makes it different.

Senator Inhofe: That is good.

Recently, some pretty high individuals are talking about the fact on the F-22s, they are really using those a lot more than we anticipated. This is for anybody here. Yet in your presentation, you talk pretty specifically about the numbers of copies we are going to have, the As, the Bs, and the Cs.

Most of us here on this side of the table remember we went through this thing with F-22s. Originally, it was going to be 750, then it was going to be 380-some, then 187 ultimately. Now that is quite a deterioration from the original numbers.

Is there a reason that you do not believe we are going

to experience the same thing with the F-35?

General Bogdan: Sir, I cannot assume in the future what the U.S. services will do. But what I will tell you is that the major difference between an F-22-type program and the F-35 program are significant in that we have many FMS and foreign partners who are also buying the airplane. And if they continue to buy the airplane, the price will continue to come down. So that stabilizes --

Senator Inhofe: And that is where you come up with the $85 million ultimately, taking that into consideration.

General Bogdan: Yes, sir.

Senator Inhofe: One last thing, we were all a little disturbed 2 years ago when we thought we were going to have a B model at Farnborough and at the last minute we had to bag it. Of course, we did not have anything at France, in Paris. Are you pretty confident it is going to make the Farnborough this year?

General Bogdan: Yes, sir. We are planning a deployment of five F-35s to Farnborough and RIAT, two A models and three B models, one of those being a U.K. airplane.

Senator Inhofe: How many of those will be flying?

General Bogdan: We will fly all of those airplanes at Farnborough and RIAT.

Senator Inhofe: I look forward to it.

Thank you, Mr. Chairman.

Chairman McCain: Senator Reed?

Senator Reed: Thank you very much, Mr. Chairman.

Dr. Gilmore, I just want to clarify one your comments. You were talking about, I think, the difficulty of operating with four aircraft and, essentially, the multi-sensor fusion of the four aircraft operating together. That seems to be the preferred form of operation. Is that an accurate recollection?

Dr. Gilmore: Yes. Four-ship will often be used because that will provide information from four aircraft that must be fused in order to provide the situational awareness that General Bogdan just mentioned is so critical to dealing with future threats and current threats.

Senator Reed: And there is a current difficulty in making those systems, even if they operate in a single aircraft, operate effectively together?

Dr. Gilmore: Fusion has been a challenge to make work well. It will, based on what I have seen, continue to be a challenge. It is a very hard problem. It does not surprise me that it is turning out to be a hard problem, to make the fusion work well, because you get information from different sensors on the same aircraft as well as from different aircraft. You have to have software that then sorts through all that and says, "Oh, this signal that I got from this

sensor is from the same target as this sensor on another aircraft." That is a very hard physics problem. It is not a matter of just simply writing code for graphical user interface. It involves detailed understanding of physics, of the propagation of the signals, and so forth, and the errors in the signals.

So that is going to continue to be a challenge, and it will require a lot of iterative test-fix-test where you guess at solutions and then use subject-matter experts to guess at solutions, try to implement them, test them to see how they work. That is a time-consuming process.

Senator Reed: Just a clarification, in the IOC status, do you really get into that multi-aircraft fusion issue? Or is that just simply the aircraft being able to fly?

Dr. Gilmore: The Air Force is the one, just as the Marines did for their own initial operational capability, the Air Force sets the standards for determining what constitutes sufficient performance for IOC.

I cannot remember the details of what the Air Force has said about fusion, but obviously the more fusion capability they have, the better. It will be limited because Block 3i provides the same basic capability that Block 2B did with the new processor, and there were fusion shortfalls in Block 2B that Block 3F is meant to surmount.

Senator Reed: Thank you very much.

Mr. Secretary, from your perspective, what do you think the most significant challenges are? I know General Bogdan talked about ALIS as a key issue in terms of resolution. Any others that you would identify, that you are focused on, and your approach to deal with them?

Mr. Kendall: I think ALIS is the leading problem in terms of achieving IOC for the Air Force on time. The issue that was mentioned earlier on stability I think was a concern, but that seems to be getting under control.

There are a number of concerns with just the pace of testing and how much has to be done. I know some steps General Bogdan is taking to alleviate some of that schedule pressure that he has.

So I think it is a suite of a lot of things that have to happen. At the end of the day, the Air Force will make the decision as to when they think it is ready to clear IOC.

My experience with the Marine Corps, I think the Air Force will be exactly the same. They are not going to do that until they are comfortable with the product that they have.

Senator Reed: One of the major issues, long term, is the sustainment cost of the aircraft, which seemed to be quite significant. Can you describe steps that you and General Bogdan are taking to lower those costs? We want to lower the cost of the platform, but we certainly would like

to lower the cost long term of maintenance and operation.

Mr. Kendall: So far, we have been able to take about 10 percent out of the cost estimate at the time of the rebaselining in a variety of things to do that. We are looking at various ways to structure the business case, if you will, for the sustainment. That is a work that is still in progress. We do not want to remain in a sole-source environment for any more of that than we possibly have to. So introducing competition is a big part of it.

We are looking for creative ways to work with our partners so that we do things together as opposed to separately, because there are cost efficiencies associated with that.

General Bogdan I think probably has a very long list he could give you in addition to that.

Senator Reed: Can you give me your top two or three, General, in my time?

General Bogdan: Yes, sir. We started a fully funded reliability and maintainability program about 2 years ago, where we looked at each and every component on the F-35 to determine if it was maintaining its performance on the airplane at the pace at which we needed it. That has proven to be very cost-effective for us, so we are going after those pieces and parts on the airplane that are not preforming well.

We also have a cost war room, where we look at every idea that comes from the field on how to better maintain the airplane. A perfect example of that is the original concept for tires, wheels, and brakes on this airplane was to ship all that off to a contractor somewhere. The U.S. Air Force, the U.S. Navy, the U.S. Marine Corps have that capability today with their legacy systems at their bases, so we are moving all of that work to them. That reduces about 40 percent or 50 percent of the cost and the turn time of fixing things like that. So we are going about systematically trying to get every piece of cost out of the program.

Senator Reed: Thank you.

Thank you, Mr. Chairman.

Chairman McCain: Senator Ayotte?

Senator Ayotte: Thank you, Chairman.

General Bogdan, I wanted to ask you, recently, General Welsh came before our committee and said that the mission capability of the A-10 will not be replaced by the F-35, yet the Web site for the Joint Strike Fighter program says that the F-35 will replace the A-10. So can you answer this question for us? There is an inconsistency there, and I would like to know, is General Welsh right or is your Web site right?

General Bogdan: Thank you for that question, ma'am.

First, the force structure of the U.S. Air Force and its fighter inventory is well beyond my purview. So I will not try to explain what General Welsh said or what the decision-making processes for the Air Force on replacing their fighter inventory.

Senator Ayotte: But, General, I think this is an important question. If General Welsh comes before our committee and says the F-35A is not going to replace the A-10, and yet the Joint Strike Fighter Web site says that the F-35A will replace the A-10, it is pretty important as we think about the capabilities of the A-10.

Secretary Kendall?

Mr. Kendall: I cannot speak for certain for General Welsh, but I think what he was trying to say was that we will in fact -- first of all, I think both statements are correct. We will, in fact, replace the --

Senator Ayotte: Both statements cannot be correct.

Mr. Kendall: Well, we will, in fact, replace the A-10s with F-35s. That is the plan. But the F-35 will not do close-air support mission the same way the A-10 does. It will do it very differently.

The A-10 was designed to be low and slow and close to the targets that it was engaging, relatively speaking. We will not use the F-35 in the same way as the A-10. So it will perform the mission very differently.

Senator Ayotte: So let me ask, Dr. Gilmore, it is going to perform the mission very differently. Is it not important that we understand how the two compare? So I would ask you, will there be comparison testing, not just with the A-10 but with other comparative airframes that the F-35 is going to replace? And how will the operational testing, comparing the close-air support capabilities of the F-35A and A-10, be conducted?

Dr. Gilmore: Senator, if I could just point out, I have here the operational requirements document for the F-35. On page 2, it says the F-35A will rely primarily upon the F-22 for air superiority and will assume the current F-16 role as the low end of the USAF high-low fighter mix strategy and the A-10 role.

So that is in the operational requirements document.

Senator Ayotte: Okay. So if it is going to perform the A-10 role, it is a pretty darn important role to our men and women on the ground. So what about the fly-off? How will that go down?

Dr. Gilmore: We are going to do a comparative test of the ability of the F-35 to perform close-air support, combat search and rescue, and related missions, with the A-10. We are also going to do a comparison test as integral part of operational test and evaluation of the ability of F-35 to perform suppression and destruction of enemy air defenses

with the F-16 and F-18. This operational requirements document has numerous citations to the performance expected in F-35 in relationship to the aircraft it is going to replace, so that operational testing is entirely consistent with the operational requirements document.

The comparison testing is also not unprecedented. There was comparison testing between the F-22 and the F-15, and there has been comparison testing as part of other operational tests, including things like tactical vehicles, like the Joint Light Tactical Vehicle and the Humvee.

So to me, comparison testing just makes common sense.

Senator Ayotte: Of course.

Dr. Gilmore: If you are spending a lot of money to get improved capability, that is the easiest way to demonstrate it, to do rigorous comparison tests.

With regard to CAS, we are going to do it under all the circumstances that we see CAS conducted, including under high-threat conditions in which we expect F-35 will have an advantage, and other conditions requiring loitering on the target, low-altitude operations, and so forth, in which there are a lot of arguments that ensue about which aircraft might have the advantage, the A-10 or the F-35. But that is what the comparison test is meant to show us.

Senator Ayotte: I think that is really important, so that we can understand the capability comparisons there.

So, General Bogdan, I wanted to ask you, I had asked a question of General Welsh in March as to when you expect the SDB II to achieve demonstrated full-mission capability for the F-35A.

General Bogdan: Ma'am, our program of record has the SDB I coming in, in the end of Block 3F, which is in the 2017 timeframe. But SDB II, which is a much more enhanced capability for that precision weapon, is planned for the first increment of our Block 4. That is approximately in the 2021-2022 timeframe.

Senator Ayotte: I think that is an important issue as well because the SDB II provides F-35A an ability to kill multiple targets in adverse weather, which is something that, obviously, the A-10 has capability on. So I hope that is taken into consideration as we look at this comparison.

Dr. Gilmore: The comparison testing will be done with mobile targets and targets in close proximity to buildings and civilian structures, in particular with mobile targets.

As I mentioned, right now, the mobile target capability of the F-35 is problematic, and how much it will be corrected as we get to Block 3F remains to be seen. SDB II in 2022 will provide a weapon that can actually follow the target.

Before that, in 2020, laser JDAM also may help in that regard, but the current moving target capability is limited.

Senator Ayotte: I know my time is up, but one of the things that continues to worry me is, under the Air Force plan, the A-10s are all retired by 2022. It seems to me that these are still important questions that remain, that very much matter to our men and women on the ground.

Thank you.

Chairman McCain: Senator Manchin?

Senator Manchin: Thank you, Mr. Chairman.

And thank all of you for your service.

General Bogdan, the GAO report recommends an approach in which new development efforts are managed as separate acquisition programs. GAO recommended this type of separate acquisition program for the F-35 Block 4 follow-on modernization efforts. However, DOD has not concurred with the GAO recommendations and plans to include the F-35 Block 4 follow-on modernization efforts under the existing cost-plus contracts.

So if DOD did not adopt GAO's recommendation, would that help eliminate cost-plus for the Block 4 phase of the program? Why would they not? I do not know why any of us do not pay attention to GAO, but why the Department of Defense does not makes no sense at all.

General Bogdan: Sir, at a strategy level, I am going to defer to Mr. Kendall to answer that.

Senator Manchin: Mr. Secretary, I am sorry.

Mr. Kendall: Senator, I think we are talking about a distinction here that may not have a difference. The label MDAP, or major defense acquisition program, brings with it a lot of statutory and mandatory oversight.

Senator Manchin: Sure.

Mr. Kendall: What we plan to do with Block 4 is ensure that it is accounted for separately, that we have an independent cost estimate, that we manage it very intensively, that there is full transparency and visibility into what we are doing.

Senator Manchin: I am saying that --

Mr. Kendall: All the things that I think are being asked for will be supplied. But if we add to that the label of a major defense acquisition program, that is going to bring a lot of additional bureaucracy and cost. I was hoping to avoid that.

Senator Manchin: I agree. We do not want to put any more bureaucracy on top of you than you already have.

But then I would ask, Mr. Sullivan, why would GAO make that report, if you thought it was going to throw more bureaucracy on top of it?

Mr. Sullivan: We would not want to see any bureaucracy on top of that either. In fact, we did a report last year, we kind of call it our efficiency report. I know the Under Secretary is familiar with it, and agrees with a lot of it,

I think.

So one of the things we are also attacking when we attack these kind of accountability questions is, let's reduce some of that bureaucracy that they have to deal with if they become an MDAP.

But the reason we think it is important here is, number one, the dollars involved are such that, even according to current law, they meet the threshold for an MDAP program. The other thing is, on the F-22 program, we saw something very similar to this. When they decided to baseline new capabilities into the program, they did it under the existing program, and very quickly, a $2 billion estimate for development of those new capabilities became about $11 billion, and there was no accountability over it because it was in with the baseline program.

Senator Manchin: First of all, I appreciate the job the GAO does. I really do.

Mr. Sullivan: Thank you.

Senator Manchin: I have to make apologies as to why we do not take your recommendations more seriously. You must have considered the bureaucracy versus the cost, as far as the contract versus cost-plus. It had to be significant savings.

Mr. Sullivan: Yes. We sympathize with the desire to not have to go through so many reviews and so many offices

and comments and everything else. We did the report on that, and it was eye-opening for us to see what they have to go through. But to me, they said if they had to go to a major defense acquisition program, it would cause a year's delay in getting that development effort going. I just do not understand why that would be the case. They are doing many of the things they would be required to do under MDAP anyway.

Senator Manchin: Thank you. Let me go on.

Yesterday, it was announced that we are sending 250 special operations forces to Syria. I understand that it costs us approximately $1 million to $1.5 million to train one special operator, equaling to roughly $375 million for the 250.

General, you have indicated recently that the F-35 currently costs $108 million per aircraft. I know it is going to come down to $85 million, you are hoping, by 2019.

Conceptually, if we traded in 10 jets, just 10, we could increase the size of our special forces community by over 650. This is after General Milley came here and said we are about 220,000 short of end-strength ground troops. So we are looking for ways to make sure that we can meet the threats that we have.

The F-35 pilot helmets alone cost $400,000. That is $10 million for 2,500.

As we look at the costs associated with F-35, and considering the current threats we are facing and how most of it is ground threats that we are facing and fighting, does it make sense to spend so much money on the F-35 while we currently depend so much more on our special ops forces around the world, since we have to make some choices?

General Bogdan: Senator, what I will tell you is that the department has many different kinds of choices they have to make and try to balance their requirements with the resources that they have.

I will tell you that the F-35 is a long-term investment in the defense of this Nation. Our future adversaries are not sitting still. And in the next 10, 20, 30 years, we may very well need the capabilities that the F-35 will provide us to maintain our leadership in the world. So I consider the F-35 as an investment in the future.

Senator Manchin: I appreciate that. My time is up, but I am saying we have 2,500 scheduled to be built, correct? Is that the number?

General Bogdan: The U.S. services will build about 2,443, sir.

Senator Manchin: So for 10 less aircraft, we could put 650 special ops people on the frontlines right now.

General Bogdan: I believe your math is right, sir.

Senator Manchin: Okay. Thank you, sir.

Chairman McCain: Senator Fischer?

Senator Fischer: Dr. Gilmore, in your prepared testimony, you state that cybersecurity testing has revealed deficiencies and that full testing of the logistics operating unit and the logistics information system has not been permitted.

Can you give us an overview of the planned cybersecurity tests and whether, based on the deficiencies discovered so far, you believe the testing will be adequate?

Dr. Gilmore: If we execute the plan that my office has been working on with the joint operational test team and the program office over the next couple years, that will be a very thorough, rigorous set of cybersecurity tests. The problems that we are running into, as you mentioned, are that the program is reluctant to let us test on the live systems for fear that we might damage them, and they had not made provisions for backup if the systems went down, although they are working on that now.

So up to this point, and in the immediate future, we will have to test on surrogate systems and laboratory systems. The program office is making those available to us. That is certainly better than forgoing all testing, and we are learning from that, as was mentioned in my annual report and in my statement.

But we need to do much more than that. We need to test

on live systems. We are also going to have to find a way to do some sort of cybersecurity assessment of Lockheed's information systems because ALIS is plugged into the Lockheed corporate network.

We are working through all of those issues. Over the next couple years, I expect that we will have done very adequate, rigorous, testing. But we are just at the beginning of it.

Senator Fischer: General, how is the program office working to address these issues? The doctor mentioned some accommodations there, but there is still the need for live testing. How are you addressing all of this?

General Bogdan: Yes, ma'am.

What I will tell you today, ALIS, our logistics information system, is operating on the DOD networks. In order for me to be able to allowed to put that ALIS system on the DOD networks, it has gone through, over the last 3 or 4 years, vigorous cybersecurity testing and certification from agencies outside the JPO, to include the NSA and DISA.

So the idea that the ALIS system today is somehow untested is not an accurate statement. However, having said that, Dr. Gilmore is correct. I was hesitant last year to give the operational test community the authority to test end-to-end the operational system, because we did not have redundancy in part of the system. If the testing were to

knock off that part of the system, I did not have a backup.

We are building that backup today. As soon as that backup is in place, we will give the operational test community full authority to test the system as it operates in the field today. That should happen before the end of the year.

Senator Fischer: Before the end of the year?

General Bogdan: Before the end of the year, ma'am.

Dr. Gilmore: I would like to comment, Senator, that we do cybersecurity testing as an integral part of operational testing of systems that have been through DIACAP certifications and NSA certifications, and we get into them every time.

So I am not arguing against those certifications, which are specification-based kinds of assessments. They are certainly necessary, but they are hardly sufficient.

Commercial organizations such as Microsoft have said in their advice, the advice they provide to their customers, assume that you have been penetrated and do continual red teaming, which is what we do in our operational tests.

So the certifications that the general talks about are certainly necessary, but they are hardly sufficient.

Senator Fischer: Mr. Secretary, overall, what are the lessons learned from this process? What are we applying to other acquisitions? And how is cybersecurity going to be

included in the requirements process? Basically, what are we doing to integrate requirements for cybersecurity into the whole acquisitions process?

Mr. Kendall: Cybersecurity is both a ubiquitous and basically an omnipresent problem. Our guidance to the acquisition work force basically is that you have to take cybersecurity into account throughout every phase of the product, development of product lifecycle, and every aspect of it.

The department is maturing its capabilities in this area, but I am in agreement with Dr. Gilmore on this, we still have a long way to go.

Some of our older systems in the field were not designed with cybersecurity in mind. We have to go back and assess those and take corrective action on those. All of our systems like the F-35 that are in development, we have to integrate into the design process as we go, as well as into all of our business practices.

It is a pervasive threat, and I worry particularly about loss of unclassified information, which is much easier to extract and attack. In a logistics system, that is a particular problem because you want to connect to the Internet somehow so you can order parts and so on.

So we are working this problem very, very hard. It is not going to be cheap to fix it, and it is not going to be

quick to fix it, but we have to do so.

Senator Fischer: Thank you, Mr. Chairman.

Senator Reed: On behalf of the chairman, Senator Cotton, please?

Senator Cotton: Thank you.

I know that Senator Donnelly asked about lessons learned from the F-35 program and what we might take forward in other programs, given that some of the challenges of this program go back to some members' high school years. I think we only got through Mr. Sullivan and Dr. Gilmore, though. I would like to hear the answer to that question from Secretary Kendall and General Bogdan.

Mr. Kendall: I was thinking, as my colleagues were answering, I think it is a combination of things. But at the end of the day, having a successful program depends on a handful of things, but they are all incredibly difficult and complicated. It starts with reasonable requirements. Then you have to have professional management that is empowered to do its job. You have to have adequate resources. You have to have a system that basically will support people doing the right thing.

In our system, as I think others mentioned, there is a very strong bias that is sort of built into our incentive structure towards optimism. It is easier to get a program funded if it costs less. People want everything faster, and

they want it cheaper, and they want it to be able to do more.

Most of the problems I have seen in acquisitions stem from being in a hurry and being convinced, for whatever reason, that things will be cheaper, better, faster than they will actually be or that history would indicate they would be.

My office was formed in 1986 because this problem was so pervasive. I think we have had, frankly, a mixed record of success. One of the things that I hope I have done over the last several years is to put in more realism and to structure programs with a more highly likelihood of success.

A lot of the things that we to, like F-35, are incredibly complicated and difficult. Development is inherently very risky. When you create something that has never been created before, and you do it with cutting-edge technology, that is a process that inherently has a lot of unknowns in it, no matter how much risk reduction you do ahead of time.

So I think support for sound management, ensuring professionals are in place, resisting the tendency to spend the money just because it is in your budget and you are afraid you will lose it if you do not spend it, which is I think exactly what happened when we started production on the F-35, is something that has to be reinforced throughout

the chain of command, starting with the Secretary of Defense.

Senator Cotton: General Bogdan?

General Bogdan: Thank you, Senator.

I will not elaborate. The concurrency and the optimism piece are given. I will give you two other things, sir.

When you set up a large acquisition program like this, you must ensure that the risk between industry and government is balanced appropriately. If the risk is all on the government, or if the risk is all on industry, you will get bad behaviors from both sides, so it is very, very important to make sure you have the incentive structures right and the risk balanced appropriately between the government and industry. We did not get that right at the early part of the F-35 program.

Mr. Kendall, under his leadership, I have been trying to do that for a number of years now, and it has proven to be helpful.

The second thing I would tell you that people do not talk about much is leadership continuity. If you have a very large program and very complex, like the F-35, it will do you no good to put leaders in place that are there for only 2 or 3 years. It takes them a year just to understand what is going on.

I would tell you our bigger acquisition programs need

stable leadership at the top for many, many years to help.

Senator Cotton: Are you talking about uniformed leadership or civilian leadership?

General Bogdan: Either one, sir. I believe government civilians and military personnel are both very capable acquisition leaders. You just have to leave them there in place for enough time to make a difference.

Senator Cotton: To the extent it is uniformed leadership, is that an acquisition challenge or is that a personnel challenge?

General Bogdan: It is both, sir. It is absolutely both. How do you provide the incentives for a military person to continue moving up in rank if you leave him in a job for 5 or 6 years? But that is sometimes what is necessary for very big, complex acquisition programs.

Senator Cotton: I have heard from some of our partners overseas, and I do not mean just partners in the Joint Strike Fighter, but our security partners generally, when talking about acquiring certain weapons systems that, because they are small compared to the United States, they worry about being a plane with a country rather than a country with a plane.

What is the risk that some of the partners in this program face in terms of the cost of this aircraft and the ability to acquire the number of aircraft needed to

contribute meaningfully to the program? How many Joint Strike Fighters need a country acquire to have a meaningful contribution to their defense?

General Bogdan: That is an interesting question, Senator. I think it really goes to what each country cares about in terms of its resources and what they care to defend.

What I will tell you is that even our smallest nations on the F-35 program are looking at least two squadrons of F-35s. The idea that the partnership will be working together to sustain, maintain, and train the airplanes is a huge deal for them, because otherwise they could not afford a fifth-generation capability like they are today.

Senator Cotton: Thank you.

Senator Reed: On behalf of the chairman, Senator Rounds?

Senator Rounds: Thank you, sir.

Dr. Gilmore, I am concerned by your testimony that the Marine Corps found they were not able to achieve aircraft repair capabilities at the unit or intermediate levels that would support expeditionary warfare. Can you expand on this and give your assessment as to whether ALIS, or the Autonomic Logistics Information System, is mature enough to support the sustained operations with a land- or ship-based forward-deployed squadron of F-35s at this time?

Dr. Gilmore: At this time, it is not sufficiently mature. There are a number of improvements that are planned, as the program moves forward to what is called ALIS 3.0, the fully capable version that is meant to be available for operational testing and full operational capability. If those improvements are realized, they will address a number of the issues that are mentioned in my testimony.

But currently, there are immaturities in the system. There are lots of time-consuming workarounds that are required in order to keep aircraft flying. There is a heavy reliance on having contractors present.

When we move forward to ALIS 3.0, the plan is to fix many of those problems. There is also a concern that I think General Bogdan alluded to when he was talking about tires that there is still too much reliance on sending parts back rather than repairing them closer to the frontlines.

But again, the program is working on those issues, so we will see how well ALIS 3.0 does when we get to operational testing. My estimate will be in 2018.

Senator Rounds: Lieutenant General Bogdan, can you comment on Dr. Gilmore's assertion that with the current number of aircraft planned for testing use, an 80 percent aircraft availability rate is needed to efficiently accomplish the integrated operational test and evaluation on schedule. What would you assess is the current aircraft

availability rate? And does the JPO current projections estimate that the aircraft availability rate will be up to 80 percent by the time that IOT&E is scheduled to start? It seems as though right now you are not making that, and yet you are going to have more challenges between now and then to meet that.

How are we going to meet the testing guidelines that are laid out in order to meet the deadlines that you have laid out? It does not appear as though it is possible. Can you comment on that and give us your thoughts, please?

General Bogdan: Yes, sir. I am not quite sure where the 80 percent comes from.

Senator Rounds: Well, in order to have the number of aircraft, just for the number of hours and number of tests you have to do, you have to have 80 percent of them operational. You have not done that yet.

General Bogdan: To finish IOT&E in a year, you are correct, sir. I do not believe we will, by the time IOT&E starts, get anywhere near 80 percent.

Today, the fleet is hovering around 60 percent aircraft availability. The best we have seen so far are the U.S. Air Force airplanes at Hill Air Force Base. When they deployed to Mountain Home this winter, they achieved about a 72 percent aircraft availability rate.

What we have seen is our newer airplanes are doing much

better. But I will tell you it is very unlikely that we will get to 80 percent. So what that means is IOT&E may take longer than we anticipated. That would be the major result of that.

Senator Rounds: We talked a little bit, and I am going to follow up on Senator Ayotte's question a little bit, considering the A-10. As I look back to the information that has been provided for us, if you compare the two aircraft today, the A-10 time on-station is an hour to 1.5 hours; F-35B, and this is from what I can see the planned operational capabilities, of 25 minutes to 40 minutes on-station. With weapons, the A-10, four air-to-surface weapons; F-35B under the 2B software, two air-to-surface weapons, under the 3F, six air-to-surface weapons. The fuel burn under the F-35 A and B, 10 percent to 20 percent than F-16, 50 percent to 70 percent higher than A-10, which would suggest that we are also going to need additional capabilities just to service them close by those areas.

On the gun itself, the F-35, and this is the way it was designed in the first place, apparently, the F-35, apparently, was not designed with a gun in mind, a lightweight 25 mm cannon, 402 rounds total, or about a four-second burst; A-10, a 30 mm cannon, 1,150 total rounds, 17 seconds, and an A-10 round is double the weight of that carried by the F-35.

Clearly, when we talk about having a similar mission, we are talking about doing the job in completely different ways. Would that be a fair assessment?

Dr. Gilmore?

Dr. Gilmore: Yes, the F-35, when you talk about close-air support, it will do it much differently than the A-10. We are going to do those comparison tests, the ability to perform CAS, between the A-10 and the F-35 as an integral part of operational testing.

We are not going to say that that F-35 has to perform CAS the same way the A-10 does. We are going to let the F-35 pilots take advantage of the systems on that aircraft, deal with some of the limitations you mentioned as well as they can, and see how well the missions are carried out in terms of the ability to strike targets in a timely manner, and accurately, and then report on that.

There are numerous arguments about how well each aircraft will do under different circumstances and different threats. Clearly, the F-35 should have an advantage in higher threat environments than the A-10 does. So the comparison testing and our report will illuminate all of that.

Senator Rounds: Mr. Chair, I am out of time, but Secretary Kendall looks like he wants to respond. I think, in fairness, we ought to give him an opportunity.

Mr. Kendall: Thank you, Mr. Chairman.

I am a huge proponent and fan of the A-10. I am an Army officer. It was purposely designed to be a close-air support aircraft, and it was a very good design for that purpose. But if you estimate time to do air-to-air, it is hopeless. The F-35 is designed as an aircraft that can do a variety of missions, air dominance, strike, and close-air support.

It does close-air support differently. It does not have the features that you mentioned. Those are all real world numbers that I think you gave. But what is different now than the time the A-10 was conceived is the use of precision munitions and the ability of a wide variety of aircraft to put a munition like a small-diameter bomb exactly where they want it to go.

So the Air Force today does close-air support with B-1 bombers, for example, something that traditionally would not have been possible. So times have changed.

If we could afford it, I think everybody would like to keep the A-10 in the inventory because it is such a good special purpose aircraft for that one mission. But given the constraints we have on both the size of our force structure and the financial resources that we have, maintaining a one-mission aircraft in the Air Force was not something that could fit into the balance that we were

trying to achieve.

Senator Rounds: Thank you.

Thank you, Mr. Chairman.

Senator Reed: On behalf of Chairman McCain, Senator Lee, please?

Senator Lee: Thank you, Mr. Chairman, for calling this hearing.

And thanks to all of the witnesses for your testimony today.

The Utah delegation has had the opportunity to witness firsthand the rollout of the F-35 in the Air Force as the 388th and the 419th fighter wings at Hill Air Force Base in Ogden, Utah, prepare to reach initial operating capacity, or IOC, later this year.

We have also been able to see the development of the logistics and maintenance functions of the F-35A at the Ogden Air Logistics Complex, which has been so effective that they have been called to assist both the Marine Corps and the Navy in meeting the modernization goals for their respective variants of the F-35, and we are very proud of that.

The men and women who are working to train on, test, and to keep these jets in the air are models of American ingenuity and hard work and patriotism and dedication at its very best. I hope this Congress will provide them with the

resources that they very much need in order to continue succeeding in their mission.

General Bogdan, one of the main obstacles for the F-35A reaching its IOC goals this year, of course, involves the continued development of ALIS, which is, of course, used to manage the logistics and supply chain for maintaining the F-35, not just now during the rollout, but throughout its lifetime.

Can you tell me how is the Joint Program Office working with industry to ensure this capability is functional and fully integrated into this weapons platform in a timely and effective manner?

General Bogdan: Thank you, Senator.

The ALIS system right now that the Air Force needs at Hill Air Force Base is on track to be about 60 days later than we planned. The biggest issue we have right now is getting the maintenance and supply chain and configuration management of the engine, the F135, integrated into the ALIS system. That has proven to be more difficult than we had anticipated, because it requires both Lockheed Martin and Pratt & Whitney's backend ERP, enterprise resource planning systems, to talk to each other and to connect with ALIS.

We have worked with Lockheed Martin across the whole company as well as some of their teammates, and we have brought in some software experts from within DOD to try over

the last few months to figure out where those difficulties lie. The good news there is we understand where the difficulties are. Now we just have to go and execute.

Like I said, I think we are probably going to be about 2 months late getting that done, but I think we, from a technical standpoint, will be able to get it done.

Senator Lee: Okay, that is good to know. It is good anytime you can at least contain a delay and look forward and conclude that you have a known quantity.

Because of budget reductions and the inability to retire the A-10, the Air Force is concerned about a potential shortfall of experienced uniform maintainers to transition to F-35 units and keep those weapons safe and keep them functional.

So, General Bogdan, has the Air Force been able to resolve this problem in the short term? And what long-term complications do you see that might still exist for ensuring that a generation of maintainers is being trained to keep pace with the process of integrating the F-35 into the Air Force?

General Bogdan: Yes, sir.

In the short term, when the Air Force was faced last year with a shortage of maintainers for their IOC capability at Hill Air Force Base, they asked the program office to populate an entire squadron at Luke Air Force Base with

contractor logistics support personnel. We did that. The 62nd squadron at Luke Air Force Base today on the flight line is maintained with approximately 110 contractors as opposed to blue suit maintainers. That gave the Air Force the flexibility to take those maintainers that would have been at Luke Air Force Base and transfer them to Hill Air Force Base for IOC.

That is just a Band-Aid, though, and that is a short-term fix. In the long term, I believe the Air Force needs the ability to move maintainers around for the growing fleet of F-35s. We are committed to working with them to increase the throughput of maintainers through the schoolhouse and to work with our partners and to work with the Guard and Reserve in the Air Force who can provide some of that manpower.

I will defer to the Air Force on those solutions, though, sir.

Senator Lee: Let me ask you one more question as my time is expiring.

Can you tell me, did the Department of Defense originally intend the F-35 to be a direct replacement for the A-10 in close-air support missions? Or was it designed to work with other Air Force and joint force systems to fulfill the department's needs as far as close-air support goes? And what is your assessment of how the services will

be able to work together to meet close-air support needs through integrated and joint operations?

General Bogdan: Sir, what I will tell you is, over time, the evolution of the way we conduct close-air support in the Department of Defense has evolved. It is no longer a single airplane out there talking to a ground controller and dropping a single weapon. It is a much more integrated fight. It is much more reliant on multi-platforms and multiple communication systems with both the ground and the air.

Given that, the F-35 in the future, today and in the future, will have the capabilities to seamlessly integrate into that network to perform close-air support.

Senator Lee: Thank you very much.

Thank you, Mr. Chairman.

Senator Reed: Thank you, Senator Lee.

The chairman is on his way back from the second vote. I am also told that Senator Blumenthal and Senator King are coming for questioning.

But at this point, if I may, on behalf of the chairman, take a short recess, perhaps for just a few moments until the chairman returns. We will stand in recess until the chairman returns. Thank you.

[Recess.]

Senator Reed: Let me once again, on behalf of Chairman

McCain, call the hearing to order and, at this time, recognize Senator King for his questions.

Senator King?

Senator King: Mr. Gilmore, one of the concerns that I have, and it has been touched on in this hearing, is the length of time this platform is expected to serve, roughly 20 years from now, 30-plus years from initial inception. I think back to any product I may have bought in 2004. I was originally thinking of Senator Graham's flip phone. I would not want to be flying that in 2040.

Are we building upgradability into this airplane so that it can keep up with the times? In other words, is it designed with that in mind?

Dr. Gilmore: That question is to me, Senator?

Senator King: Yes, sir.

Dr. Gilmore: Well, I will defer the details to General Bogdan. This aircraft is going to be much more upgradable than the F-22s was. But having said that, we have already identified the need for an upgrade from the now being installed Technical Refresh 2 processor, which provides additional capability relative to the processors that have been in the aircraft to this point. We have identified a need for an upgrade to that, a Technical Refresh 3 processor.

In this program, moving from one processor to another

is not nearly as arduous a problem as in the F-22, where there was a lot of software that was developed with features that were tied very specifically to the processors in order to maximize capability. But it is still not a trivial matter, as has been demonstrated recently by the stability problems that we now hope have been resolved with the Technical Refresh 2 processor.

So upgradability is being built in, but that does not mean it is going to be trivial to execute.

Senator King: General Bogdan? Quickly, because I have several of the questions. But what is your thought, are we going to be able to upgrade this airplane so that is not going to be obsolete in 2025?

General Bogdan: I believe we will, sir. There are a few points I will make.

One is, when we do replace the next version of the computer or the brains in the airplane, we are requiring open standards and modular open system architecture, which will allow for the incorporation of new sensors and new capabilities much easier.

Second, when we first originally designed the airplane, we knew many of our partners and FMS customers would want to put unique weapons on the airplane, so we have created a system that will allow us to integrate multiple kinds of weapons on the airplane, not trivial, but in an easier way.

So from both those perspectives, I believe the airplane is adaptable and growable.

The third is, many of the capabilities inherent in the airplane today that make it special are software-based. Therefore, in the future, as new capabilities come on, like electronic warfare and electronic attack, we will be able to upgrade the software in an easier way than you would the hardware.

Senator King: I think this has to be an important part of our whole acquisition process as we are buying 40-year assets, the Ohio class submarine, the B-21, on and on.

Secretary Kendall, was the attempt at jointness in this project a mistake in retrospect?

Mr. Kendall: It is a good question, Senator. I think the honest answer is I am not sure.

I was present at the inception of F-35. It started out as a technology program that was instituted by one of my predecessors when I was on the staff.

We are now thinking about the follow-on aircraft for the Navy and the Air Force. I do not think we are going to repeat this. First of all, I think the design parameters are going to be quite different for the follow-on aircraft for the two services. We did get some benefit from commonality, but there is very little commonality in the structure. So I think we still could get some of those

benefits without having to have a single program.

Senator King: You could get benefits in terms of?

Mr. Kendall: Common avionics, common sensor systems, and so on. So I think those still could be achieved without having a common program, necessarily.

I think you would have to make that decision kind of as your plans for modernization and acquisition became more real and material as to whether or not it paid off or not. I think it is astonishing to me, frankly, that we have been able to keep this program together for so long, keep the three services fully committed, and keep all of our international partners fully committed. We have two that are on the fence right now. But at this stage of the game, everybody is still in.

Pulling all that off is not a small achievement. That is very hard to do. So I think we have to think very carefully about that. The more complexity you have in a program, the more risk you have. I do not know that the savings are necessarily worth that complexity and the risk that goes with it.

Senator King: Thank you.

Thank you, Mr. Chairman.

Senator McCain: Senator Blumenthal?

Senator Blumenthal: Thanks, Mr. Chairman.

I thank you all for your being here today and for your

insights on this very challenging program. It is as complex as it is critical to our national defense, and we should expect on this committee, and the American public should anticipate, that a weapons platform of this complexity will also have bumps in the road in its development and research. I take it none of you would disagree with that basic preposition.

Despite that bumpy road, at some point, the F-35 as a whole has already made significant advancements in a number of areas. In particular, the F135 program provides truly a fifth generational power capability to the fleet.

Every low-rate initial production LRIP contract, as I understand it, for the F135 has been on or below cost. The recent announcement of the LRIP lots 9 and 10 will bring the price down another 3.4 percent from the LRIP 8.

To date, the F135 conventional takeoff and landing engine cost has been reduced by 47 percent since the initial flight test engines. The STOVL engine cost has been reduced by 34 percent in the same time period. These are real achievements.

In addition, Pratt & Whitney has already identified technology improvement options that will increase the thrust, durability, and fuel efficiency that could ultimately save billions of dollars for this program.

The F135 is meeting the key fiscal year 2020 milestones

-- again, my understanding -- for mission capability and engine reliability.

Are those facts accurately stated, so far as the panel knows?

General Bogdan: Sir, they are very accurate.

Senator Blumenthal: Thank you.

All that said, I know that questions have been raised, General Bogdan, about the F135 performance. I take it from your testimony that quality has not been an issue, so far as the Pratt & Whitney supplier performance has been concerned?

General Bogdan: Sir, 2 or 3 years ago, I would have told you that I was worried about that. I will tell you that Pratt & Whitney has done a good job of standing up a quality organization within Pratt & Whitney Military Engines that has dug down deep into their supply chain and helped improve that significantly.

Senator Blumenthal: Thank you.

Their supply chain, a lot of it is based in Connecticut. I can tell you from my experience in Connecticut that our suppliers and manufacturers have recognized the challenge we face for this century, literally. This weapons platform will be critical to our national defense throughout the century.

We can look back and draw lessons, and we should, from the challenges that caused that improvement to take place,

and maybe even the overall conceptual framework, as you suggested, Secretary Kendall. Should there have been more individualization of the platform for different services? But I can well recall that the conventional wisdom not so long ago was that the services ought to get together and collaborate and buy a single fighter. And that was the wisdom du jour of contracting in its day, and now maybe lessons point in a different direction.

So I hope that we will learn lessons from this procurement experience, but I think there has to be a recognition that this weapons platform will do things that no fighter engine or platform has done in the past.

Would you agree, Dr. Gilmore?

Dr. Gilmore: The investment ranking is large, and the need that we have is large to deal with the threats that currently exist. If the F-35 does not succeed, we will be in a pickle.

Senator Blumenthal: We have a common national interest in making sure it succeeds?

Dr. Gilmore: Yes.

Senator Blumenthal: Would you agree, Mr. Sullivan?

Mr. Sullivan: Yes, I would. We definitely need to have this moving forward. This is the fifth generation.

Senator Blumenthal: Thank you.

Thank you, Mr. Chairman.

Chairman McCain: Let me just say, in summary, it has been a scandal and the cost overruns have been disgraceful. And this committee, in our authorization responsibilities, will take whatever actions we can to prevent a reoccurrence. It should not take 15 years and still not have an aircraft IOC, and with cost overrun after cost overrun.

So I guess my question, finally, Mr. Sullivan, do you think that we have learned the lessons and taken sufficient measures to prevent a reoccurrence? Or do we need to do some more?

Mr. Sullivan: I think there is always room to do more. I do not think we have learned all the lessons yet. But I would say that if you go back 5 or 6 years, or go back to, say, 2010, we are not seeing as many F-35s or these big programs with requirements that are not achievable. So I think we are learning some lessons that way.

Some of that could be because of budget constraints. Some of it is from the work that Congress has done. Frankly, I think the department has done a good job of trying to implement and drive down into the culture some better practices that talk about better buying power initiatives.

We have a long way to go, though. I mean, there is still way too much cost growth on these programs. We are not using enough looking at requirements in an incremental

way, using open systems, as Senator King was talking about. There are a lot of things that we can to do create more efficiencies.

Senator McCain: Dr. Gilmore?

Dr. Gilmore: I think Block 4 will be a good test of whether we have learned lessons. As mentioned in my written statement, I see a number of unrealistic assumptions with regard to Block 4. So I hope, as Secretary Kendall and General Bogdan take a look at how to structure that program, that they take a look at those issues. That will be a good test.

Senator McCain: Secretary Kendall and General Bogdan, I hope you will pay attention to Dr. Gilmore's words, particularly given his responsibilities to the Department of Defense as well as to the Congress.

I thank the witnesses. I believe that most of the takeaway from this is that we are making progress, that we have challenges that lie ahead, but there have been some significant improvements, as opposed to some years ago.

So I thank the witnesses for their hard work.

This hearing is adjourned.

[The information referred to follows:]

[COMMITTEE INSERT]

[Whereupon, at 11:54 a.m., the hearing was adjourned.]