

Stenographic Transcript
Before the

Subcommittee on Emerging Threats and Capabilities

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

Hearing to
Receive Testimony on Accelerating New Technologies to
Meet Emerging Threats

Wednesday, April 18, 2018

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U.S. Senate

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Subcommittee on Emerging

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Threats and Capabilities

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Committee on Armed Services

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Washington, D.C.

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12 The subcommittee met, pursuant to notice, at 2:32 p.m.
13 in Room SR-232A, Russell Senate Office Building, Hon. Joni
14 Ernst, chairman of the subcommittee, presiding.

15 Committee Members Present: Senators Ernst [presiding],
16 Fischer, Perdue, Heinrich, and Peters.

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1 OPENING STATEMENT OF HON. JONI ERNST, U.S. SENATOR
2 FROM IOWA

3 Senator Ernst: Good afternoon. The Subcommittee on
4 Emerging Threats and Capabilities meets today to receive
5 testimony from Dr. Michael Griffin, Under Secretary of
6 Defense for Research and Engineering, on accelerating new
7 technologies to meet emerging threats.

8 Welcome, Secretary. It is good to have you here.

9 The National Defense Strategy acknowledges that our
10 increasingly complex security environment is defined by
11 rapid technological advancements, which have the potential
12 to change the very character of war. These technologies
13 include advanced computing, Big Data analytics, artificial
14 intelligence, autonomy, robotics, directed energy,
15 hypersonics, and biotechnology.

16 Moreover, their development is increasingly dispersed,
17 expanding both to near-peer competitors and other actors
18 with the means to use these technologies against our
19 warfighters.

20 These technologies also represent major opportunities
21 for our own forces, and innovation has always been a major
22 strength of the Department of Defense's research and
23 engineering enterprise, which includes the DOD laboratories
24 and organizations like DARPA and the Strategic Capabilities
25 Office.

1 However, getting these technologies in the hands of our
2 warfighters can sometimes be challenging for the Department
3 of Defense, which has struggled to bridge the so-called
4 "valley of death" for new technologies. This valley refers
5 to the space between the research and engineering community
6 and the acquisition community, which are responsible for
7 fielding operational systems.

8 In his confirmation hearing, Secretary Griffin
9 testified that this transition is the "hardest problem we
10 have." I will look to Secretary Griffin to understand how
11 he will use his own newly established position to help
12 bridge this gap.

13 The fielding of these critical new technologies
14 contained within the National Defense Strategy demands
15 urgent attention and new approaches to ensure that our
16 forces are postured to fight and win. Broadly, I look to
17 Secretary Griffin to see how he plans to fulfill his charge
18 as chief technology officer for the Department of Defense to
19 sustain and expand U.S. technological superiority in the
20 future.

21 Specifically, I hope to understand specific examples of
22 research and technology efforts aimed at ensuring our forces
23 are organized, trained, and equipped to succeed in our
24 increasingly complex environment.

25 Opening comments, Senator Heinrich?

1 STATEMENT OF HON. MARTIN HEINRICH, U.S. SENATOR FROM
2 NEW MEXICO

3 Senator Heinrich: Let me start by thanking Senator
4 Ernst for holding this important hearing on technology
5 transfer and the ways that we can move technologies and
6 systems more rapidly into the hands of our operational
7 forces.

8 Welcome, Secretary. It has been almost 2 months since
9 you were confirmed for this job, so you may not have fixed
10 everything yet, but we hope that you are making good
11 progress.

12 I hope that today's hearing will help us to better
13 understand the barriers to the smooth transition of next-
14 generation technologies, whether they are from the funding
15 point of view, legal, regulatory, cultural, or other things
16 that we have not thought about.

17 We know that we are in a race to build future
18 technologies and systems that our military will need to
19 execute its missions against peer threats as well as
20 emerging threats. We also know that the United States is
21 still home to the world's most innovative companies, small
22 businesses, research universities, and government labs.

23 The State of New Mexico alone is proud to host two
24 national security laboratories, the Air Force Research
25 Laboratory, White Sands Missile Range, and a number of high-

1 tech small businesses, each employing some of the best and
2 brightest minds in the country.

3 Yet, one of our Nation's biggest challenges remains in
4 determining how we can best connect those innovators to the
5 real current and future challenges facing our military, and
6 how to move the best new technologies into the hands of our
7 warfighters as quickly and effectively as possible.

8 All of the members of this committee have heard
9 frustrating stories of companies with great ideas or
10 universities and government labs performing cutting-edge
11 research that cannot seem to get traction and fight through
12 the Pentagon's arcane and bureaucratic procurement and
13 funding processes, only to get stuck in that valley of death
14 that Senator Ernst spoke about.

15 This committee has taken a number of steps to help
16 transition technologies, including strengthening science and
17 technology prototyping efforts; emphasizing weapons of the
18 future, like directed energy; supporting the Small Business
19 Innovation Research program; and trying to cut back on the
20 red tape and bureaucracy that slows this process. But I
21 certainly believe we can do more.

22 Tackling the issues that prevent the transition of
23 technologies is a key emphasis of your work, Dr. Griffin,
24 and you have an excellent opportunity to do so as our
25 Nation's Under Secretary for Research and Engineering.

1 Dr. Griffin, I hope we can hear today your early
2 estimate of the biggest challenges to effectively transition
3 technology and learn what steps you are beginning to take to
4 address them and how we can help. I also look forward to
5 hearing what hurdles you are encountering in terms of
6 setting up your organization and staffing in the Pentagon,
7 and deconflicting authorities with the services and other
8 parts of the Pentagon.

9 Finally, I hope to learn what steps this committee and
10 other committees in Congress can take to assist in these
11 efforts. Our military's technological edge may not depend
12 solely on your success, but your success can greatly alter
13 the ability of our military to stay ahead of our
14 adversaries.

15 I look forward to your testimony and learning more
16 about how we can help.

17 Senator Ernst: Go ahead, Secretary. Thank you.

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1 STATEMENT OF HON. MICHAEL D. GRIFFIN, UNDER SECRETARY
2 OF DEFENSE FOR RESEARCH AND ENGINEERING

3 Dr. Griffin: Chairwoman Ernst, Ranking Member
4 Heinrich, Senator Peters, Senator Fischer, Senator Perdue,
5 thank you for being here. I really appreciate this
6 opportunity to talk to you about these issues. I am going
7 to offer a very brief opening statement and ask that you
8 submit my written testimony for the record.

9 Senator Ernst: Without objection.

10 Dr. Griffin: So the recognition of the erosion of U.S.
11 technological superiority, which was once unquestioned in
12 the world, is what led the Congress to establish the
13 position that I now hold, the Under Secretary of Defense for
14 Research and Engineering. Our mission is to ensure that we,
15 if necessary, reestablish and then maintain our technical
16 advantage. I am honored to be here today.

17 Now, frankly, my involvement with the national security
18 community is of long standing, and so I feel that I come to
19 this position reasonably well-versed in the threats that we
20 face, and I am, therefore, concerned.

21 We are in constant competition, and the pace of that
22 competition is increasing. In a world where everyone pretty
23 much today has equal access to technology, innovation is
24 important, and it will always be important, but speed
25 becomes the differentiating factor. How quickly we can

1 translate technology into fielded capability is where we can
2 achieve and maintain our technological edge. It is not just
3 about speed of discovery. It is about speed of delivery to
4 the field.

5 So this is a key tenet of my mission as Under
6 Secretary. My organization will focus on closing the gap on
7 current and emerging threats, on driving the disruptive
8 innovation that provides the technical dominance on the
9 scale and timeline called for in the National Defense
10 Strategy.

11 In this role, I fully intend to establish the technical
12 direction for the Department of Defense. This is more than
13 just recommending the path forward. My organization must
14 ensure that the future force has what it needs by working
15 with warfighters to develop new concepts of operation
16 through mission analysis and experimentation.

17 I believe that it is critically important for the DOD
18 to utilize intelligence products, technology forecasting,
19 and our own analysis to inform decisions on where we will
20 invest, what we will prototype, what experiments we will do,
21 and what emerging capabilities and concepts of operation
22 will help us to succeed. To this end, we have established a
23 strategic intelligence analysis cell within the organization
24 that will help us do that.

25 I will focus on establishing processes and methods to

1 drive effectiveness and affordability by examining our
2 acquisition, testing, and sustainment processes in the
3 system design phase by setting and adhering to open
4 architectures and interface standards while implementing
5 good system engineering and cyber resiliency. Ultimately, I
6 plan to establish and embrace a collaborative culture
7 focused on piloting new acquisition pathways for speed and
8 providing capability to the future force.

9 The department continues to push research into new
10 technologies such as autonomous and unmanned systems;
11 artificial intelligence; biotechnology; microelectronics;
12 cyber warfare, both offense and defense. These technology
13 areas are not just important to the Department of Defense.
14 They are, in fact, the focus of global industry, something
15 we must learn to leverage.

16 The department is not short of innovators. We are
17 short of time, and we lack expertise in adapting commercial
18 market advances to military needs. We need to strike a
19 balance between bringing in new technology and getting
20 current technology out to the field. We need to deal with
21 conquering Senator Ernst's valley of death between
22 innovation and real applications.

23 One crucial step in this is a comment that the Deputy
24 Secretary made recently. He said, and I am quoting,
25 "Everyone wants innovation, but innovation is messy. If the

1 department is really going to succeed at innovating, we are
2 going to have to get comfortable with people making
3 mistakes."

4 Increasing the use of prototyping, demonstration, and
5 experimentation will help the department more rapidly mature
6 technology to assess the impact that innovative technologies
7 can have on the future force. Building prototypes and
8 testing them with operators allows the department to speed
9 innovation by driving down technical and integration risk.
10 It also enables us to refine requirements, evaluate new
11 concepts, and get warfighter feedback before we commit to a
12 major program.

13 Those are the obvious benefits. The less obvious
14 benefits include stimulating industry design teams with new
15 challenges, contributing to new methods of manufacturing,
16 and increasing the likelihood of a successful program by
17 ensuring that we better understand what the requirements are
18 to deliver a real system.

19 While our adversaries are presenting us with the
20 challenge of a sophisticated, evolving threat, we are
21 prepared to meet this challenge and restore the technical
22 overmatch of the United States Armed Forces through focus,
23 innovation, and rapid delivery to the field.

24 Thanks again for this opportunity to testify before you
25 on these important issues. I do look forward to your

1 questions.

2 [The prepared statement of Dr. Griffin follows:]

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1 Senator Ernst: Wonderful. Thank you very much, Mr.
2 Secretary.

3 We will go ahead and get started with the questions,
4 and, hopefully, we will get a couple rounds in.

5 We were just talking a minute ago about the National
6 Defense Strategy. It was recently released by Secretary
7 Mattis, and it focused on competition with near-peer
8 adversaries.

9 Dr. Griffin, how do you envision your position helping
10 DOD to address the technical shortfalls in specific fields
11 like A2/AD and other high-end capabilities being developed
12 by our near-peer challengers, like China and Russia? What
13 can we do there, in your position?

14 Dr. Griffin: Our adversaries have taken advantage of
15 what I have referred to as a holiday for the United States.
16 It has not been exactly that, but with the fall of the
17 Berlin Wall -- I was in the Pentagon when the wall came down
18 and when the Soviet Union broke up. We had won the Cold
19 War, and we had no major adversary in the world. We
20 declared a peace dividend, and we felt we had won.

21 The winners never learn anything, and the losers always
22 do. So over the course of the 25 years since that has
23 happened, China has understood fully how to be a superpower.
24 We gave them the playbook, and they are executing. Russia,
25 after a period of very difficult times for them, is now

1 resurgent in the world of global competition, great power
2 competition. These are the things that our National Defense
3 Strategy calls out.

4 We have been occupied for 15 years in the Mideast
5 dealing with the urgent problem of terrorism and nonstate
6 warfare, and other very, very difficult problems, but
7 problems which are not existential for the United States.
8 They are difficult; they are important; they are concerning;
9 but they are not existential.

10 Our global power adversaries are existential threats,
11 and this is what the National Defense Strategy is saying. I
12 am tremendously pleased with that strategy. I regret to say
13 I did not offer a contribution to it, but I am delighted
14 with what they have put forth, and I think that should be
15 our bible.

16 Senator Ernst: Then in your position, how do we use
17 the expertise that you have to catch up to those near-peer
18 adversaries?

19 Dr. Griffin: Well, in certain areas, like you
20 mentioned A2/AD, anti-access/area denial, China has fielded
21 or can field, is close to fielding, hypersonic delivery
22 systems for conventional prompt strike that can reach out
23 thousands of kilometers from the Chinese shore and hold our
24 carrier battle groups or our forward-deployed forces on land
25 that we have bases, can hold those power groups at-risk.

1 We, today, do not have systems that can hold them at-risk in
2 a corresponding manner, and we do not have defenses against
3 those systems.

4 Should they choose to employ them, we would be, today,
5 at a disadvantage. It is among my very highest priorities
6 to erase that disadvantage, creating our own systems to hold
7 them at-risk and to provide defense.

8 We will never win a man-to-man conflict with the
9 Chinese, should that come about. We can only win by
10 employing technical overmatch.

11 So, for example, in the areas of missile defense or air
12 defense, or even with our ground forces, in order to deal
13 with things like swarming drone attacks, we have to finish
14 the development of directed energy weapons, which we, this
15 country, started and some years ago decided we did not
16 really need. Well, we need to decide that we really do need
17 them and fund them to completion.

18 We need to have 100-kilowatt class weapons on Army
19 theater vehicles. We need to have 300-kilowatt class
20 weapons on Air Force tankers. We need to have megawatt
21 class directed energy weapons in space for space defense.
22 These are things that we can do over the next decade, if we
23 can maintain our focus.

24 Senator Ernst: I appreciate that. We do need to
25 maintain our focus.

1 With that, we will go to Senator Heinrich.

2 Senator Heinrich: Secretary, yesterday, you testified
3 before the House Armed Services Committee, and I saw a
4 little bit of that. I believe you said that the powers
5 afforded to you in this new position are more like "broad
6 and sweeping powers to offer advice."

7 Can you tell me a little bit more about exactly what
8 you meant by that? And what do you think should be your
9 authority and relationship with service research and
10 engineering programs and activities?

11 Dr. Griffin: Well, that is a leading question, sir,
12 but I will take a swing at it.

13 Senator Heinrich: It was meant to be.

14 [Laughter.]

15 Dr. Griffin: Yes, sir. The authorities that the
16 USD(R&E) has do not include the ability to direct funding.
17 They do not include the ability to direct programs or
18 program direction. So, therefore, the office is persuasive
19 or advisory in nature, and I think that is what I said
20 yesterday. If not, it is what I should have said.

21 So, let me be clear. I think that in the NDAA 2017 and
22 2018 legislation that was passed, I personally believe it
23 was a very good idea to delegate programs back to the
24 services to run on a day-to-day basis, except for those few
25 programs that the Secretary has determined should be held at

1 the OSD level. I am an unabashed supporter of that plan.
2 OSD, generally speaking, is not the place you want to run
3 programs.

4 However, the industry analogy, which I have used, might
5 be that OSD is what you might call in industry the vice
6 president for programs, for all programs. You are not
7 running the program, but if a given program or a given
8 program manager gets off track, in industry, there is no
9 fuzz on this. There is a vice president somewhere who will
10 say, "What you are doing is not okay. I am not replacing
11 you. You still have the program, but you cannot do what you
12 are doing, and you are going to do this other thing instead,
13 and the reason is because I am the boss and I said so."

14 In industry, one's very existence depends upon being
15 able to do that. The wrong decisions can put you out of
16 business. I have run two companies, and we did not run them
17 on the committee system.

18 So that, I think, gives you a flavor of the kind of
19 authority that we need to have. We do not in OSD, in my
20 opinion, need to be running programs. But we need to be
21 able to control the funding and the overall direction of
22 those programs in a way that is collaborative, but in the
23 end, when a decision is made, the decision is made.

24 Senator Heinrich: I think we agree that you should not
25 be meddling in the day-to-day management, but we want to

1 make sure that the strategic direction that you set is how
2 these programs execute.

3 I am also concerned that the services have not always
4 prioritized the modernization of the testing infrastructure,
5 which is incredibly important, if we are going to maintain
6 our position in the world.

7 If you just look at one example that I am familiar
8 with, White Sands Missile Range went 18 years straight
9 without receiving a single milcon project. And it is not
10 unusual. White Sands is not alone in seeing that sort of
11 dynamic among our test ranges.

12 So I am curious, how can you help to ensure that Test
13 Resource Management Center is not only planning for testing
14 but planning to make sure that we are maintaining our test
15 ranges, that we are investing milcon in them, and that we do
16 not ignore that resource and expect it to be there forever?

17 Dr. Griffin: Senator Heinrich, you have hit one of my
18 hot buttons. I was just speaking about conventional prompt
19 strike and hypersonics and the need to develop both
20 offensive and defensive capabilities.

21 I would tell you right now that DARPA, which reports to
22 me and has done some of the most significant hypersonics
23 work in the country, has basically one wind tunnel that they
24 can use for hypersonic research today. It is at NASA
25 Langley in Virginia. This is an unacceptable situation.

1 Your test range at White Sands that has not received
2 milcon funding in 18 years, I could tell that story about 20
3 other test ranges, test facilities, and 20 is an undercount.

4 The Nation must invest in renovating our test
5 facilities, our research facilities, and bringing them up-
6 to-date. We must do that.

7 Now, it is not glamorous. But when I come to you with
8 a budget that asks for money to renovate our test
9 facilities, I really want you to take me seriously. It is
10 not nice to have. We really need to bring these things up-
11 to-date.

12 Senator Heinrich: These are fundamentals.

13 My time is up, but I look forward to continuing --

14 Dr. Griffin: I am sorry. I was possibly too long-
15 winded, but you asked me things that I am passionate about.

16 Senator Heinrich: We are going to have a couple
17 rounds, I hope.

18 Senator Ernst: Yes, absolutely. Thank you.

19 Senator Perdue?

20 Senator Perdue: Thank you, Dr. Griffin. I appreciate
21 you being willing to take on this job.

22 Dr. Eric Schmidt yesterday testified that, if there
23 were one variable to solve for, it would be speed. You
24 mentioned speed this morning several times. I just got back
25 from a trip to China, and I saw firsthand how they are

1 leapfrogging entire industries.

2 They put \$152 billion, the government did, into
3 creating a chip industry. They bypassed their entire
4 telecom industry. There are no hardwired cables, et cetera.
5 It is all moving to 5G.

6 We saw corporate businesses and their research aligned
7 with defense research all under one umbrella inside the
8 Chinese structure.

9 The way they are set up is entirely different from
10 ours. They are able to build things and move more quickly
11 than we are in a democratic society.

12 General Mattis said constrained budgets and acquisition
13 regulations have limited our ability to keep pace with rapid
14 changes that sustain our competitive advantage.

15 Combine that with the Defense Innovation Unit-
16 Experimental releasing its report recently, it really
17 concerns me because of having seen their ability to move
18 very rapidly and our ability to build a 2-foot tall set of
19 requirements to buy a new pistol for the Army.

20 So the question I have for you is, within our DOD
21 procurement system, our DOD requirements system, and the
22 ability to innovate within a system that has been choked up
23 by all the things that you are talking about -- China is
24 buying technology from us; they are stealing technology from
25 us; and they are innovating on their own today at a level

1 that we have not seen.

2 When you look at the two domains, in space and in
3 cyber, particularly, I am worried about whatever advantage
4 we might have dreamed we had may have been dissipated
5 already.

6 So my question is, in that environment, how do we
7 develop, from your point of view in R&D -- I hear
8 infrastructure first. I get that. What are the ways, in
9 integrating with business -- you read the Defense Innovation
10 Board report. What ways can we accelerate the innovation
11 that we obviously have to have to be able to defend our
12 country in this new technical world that we live in?

13 Dr. Griffin: That is a great question. Of course, I
14 testified yesterday with Dr. Schmidt, and we did not pre-
15 coordinate our views, but he and I are about as closely
16 aligned as I think two people from very different
17 backgrounds could be about what is needed.

18 So one of the things that we have both said is that,
19 and I will use my words, we cannot punish people who take
20 risks and break something. We should reward them.

21 I will offer the view, which may not be popular, that
22 it is not actually, generally speaking, our laws and
23 regulations that restrain us from moving more quickly. It
24 is the cultural view of our -- and it is not even just
25 within the Department of Defense. I saw many of these same

1 things at NASA, and I worked in the intelligence community.

2 It is the view that we have taken in recent decades
3 that any mistake that is made in the course of a new
4 development is a punishable offense. So, therefore, any
5 rational program manager, whether wearing colonel's eagles
6 or an SES civilian, will do everything possible not to allow
7 any step of the development to turn out wrong because they
8 will be punished.

9 Senator Perdue: Do you think the new generation of
10 military leadership at the top recognize that?

11 Dr. Griffin: I think that they do. The people that I
12 work with every day recognize the cultural barrier that
13 avoidance of risk has created for us. But I need your help
14 as legislators to make sure that our people understand that
15 failure is not okay, but failure is failure to reach the end
16 goal.

17 If I fail to give you a 100-kilowatt laser weapon for
18 an MRAP within a few years, you should ding me for that.
19 You should not ding me if we go out into the desert and try
20 a couple laser concepts, and one of them does not work, and
21 we have to back up and try another. That is not failure.
22 Failure is if I do not get to the goal.

23 All too often, we punish program managers because they
24 take something out to the desert and they flight test it and
25 it breaks.

1 Until I was 40, I was closely involved with hardware
2 development. I will tell you, it is really hard to get it
3 right the first time.

4 You have to have that freedom to take on new
5 challenges, take new risks, let things break, figure out
6 why, and move on to the next step without punishing the
7 young folks who you want to learn all those lessons.

8 There is no more critical step than that to me, sir.
9 That is how we can establish a new culture of speed and
10 innovation.

11 Senator Perdue: Is that inside DOD? It is also in the
12 procurement area as well, right?

13 Dr. Griffin: It is in the procurement area. It is
14 inside DOD. It is really all across government. It really
15 is.

16 You have given us a lot of new legislative permissions.
17 And you know what? As Eric Schmidt said yesterday, you
18 should ask us to keep count of the number of times we are
19 using other transaction authorities instead of the regular
20 FAR. You gave us permission to use them. You should
21 require us to do so. You should not allow us to fall back
22 on what we are culturally familiar with.

23 Another point that I will make, and I realize I am over
24 time, another point that I will make is that the whole
25 purpose of carving out or separating R&E and A&S from the

1 former acquisition, technology, and logistics was to provide
2 an organization which could do advanced development before
3 it got into the major production cycle.

4 So let us make our mistakes. Let us learn our
5 developmental lessons when it does not cost much. Let's not
6 learn it when the carrier is already in production. I am
7 not picking on carriers. You pick your system. Let's not
8 learn it when the system is in production. Let's learn it
9 while people are still experimenting.

10 That is a critical step. I am sorry I have overstayed.

11 Senator Ernst: That is okay. Good discussion. I
12 appreciate it.

13 Senator Perdue: Thank you, Madam Chair.

14 Senator Ernst: Senator Peters?

15 Senator Peters: Thank you, Madam Chair.

16 Thank you, Dr. Griffin, for being here. Your
17 discussion about failure as part of the process, as you are
18 talking, I am just reminded of Thomas Edison. I cannot
19 remember the exact quote, but I think he said that he spent
20 most of his career with failed experiments. But the ones
21 that worked were pretty big and changed the world.

22 Dr. Griffin: Well, the knowledge that a particular
23 approach does not work is every bit as valuable a piece of
24 knowledge as the knowledge that something does work.

25 Senator Peters: Absolutely, yes.

1 Dr. Griffin: And I am not suggesting that we embrace
2 stupid decisions. I am not going to that place at all.

3 What I always tell my people is, every mistake you
4 make, I want it to be a new mistake. Make a new mistake.
5 Just do not repeat the old one, and we are good.

6 Senator Peters: Right. As long as you are learning
7 from it.

8 I wanted to pick up on your comments related to speed
9 as well. I think the other thing that I think was
10 significant was where you said that everybody has access to
11 this technology, which has changed so dramatically. The
12 area that I have spent a lot of time on, being a Senator
13 from Michigan, is self-driving vehicles and autonomy, which
14 is moving I think a whole lot quicker than people realize as
15 well. The race with the Chinese, Senator Perdue comments, I
16 know they are at full speed on this as well.

17 What has been told to me is the power of the self-
18 driving cars is that, in order for it to work, you need to
19 have further advances in artificial intelligence and machine
20 learning that is able to process the massive amount of data
21 that is coming in. In fact, it was described to me, in some
22 ways, self-driving cars is the moonshot for AI. When AI can
23 pilot that car through a street here in Washington or New
24 York City safely with all of those inputs, that means AI is
25 ready for prime time in every single industry and will

1 likely change everything about our world. That also means
2 the future of warfare as well. I know the Chinese are
3 working on that at a feverish pace as well.

4 So I wanted to ask you about reports that I have seen
5 that the DOD and the intelligence community are working to
6 create a Joint Artificial Intelligence Center that will
7 hopefully move us along quicker with some of these kinds of
8 developments.

9 I am currently working on some language for the NDAA
10 provision that will create some flexibility so that we can
11 move forward with AI and incorporate all that we are seeing
12 on the commercial side into applications that will change
13 the face of warfare in ways that I do not know that we can
14 fully appreciate at this time.

15 So my two questions are, first, can you speak to the
16 reports of this joint AI center, and how we can help here on
17 the committee to make that kind of effort a reality where we
18 are coordinating our activities and taking advantage of what
19 is available commercially?

20 Dr. Griffin: In answer, sir, to that question, yes,
21 the Secretary in his testimony, I believe just last week,
22 committed to the development of a joint AI center, meaning
23 across the services.

24 Really, there will be elements of it across government.
25 I think the DOD will take the lead. The organization of all

1 that has not been finally decided, as you might appreciate.
2 But the Secretary and the Deputy, I believe, had made the
3 decision that there will be such as center. I am working
4 right now with folks on my staff to answer questions, like
5 should who should lead it, where should it be, what projects
6 should it do, and, most importantly, how does such a center
7 fit into the overall AI strategy for the department and the
8 Nation, because there are 592 projects, I was told, in the
9 department, which have AI as some piece of them. They do
10 not all belong in the new AI center that we will create, but
11 some of them do.

12 We have things all the way from foundational research
13 to practical applications to put in theater tomorrow. So we
14 have to parse all that.

15 We owe the Congress a report, I think about 2 months
16 from now, on what our AI strategy will be. The JAIC, the
17 Joint Artificial Intelligence Center, will be a part of that
18 overall strategy.

19 I better asked than answered your question.

20 Senator Peters: No, it is good. Is there anything
21 that we should be doing here in Congress to move this along?

22 Dr. Griffin: No, I think we can do this with the
23 authorities that we have. If we stumble across a regulatory
24 issue where we need your help, I will be back on your
25 doorstep in a heartbeat, because I agree, this is a critical

1 area of research. If there is going to be a leader, we need
2 to be that leader. We are not going to let this slip
3 through the cracks.

4 Senator Peters: Like most technologies, being first is
5 a significant competitive advantage. But I understand, with
6 artificial intelligence, it is beyond a significant
7 competitive advantage. It may be everything, in a lot of
8 ways.

9 Dr. Griffin: Yes, I do not want to be in danger of
10 getting overly occupied with the new shiny object. I think
11 AI is critical.

12 I think, frankly, we are going to have self-driving
13 vehicles in theater for the Army before we will have self-
14 driving cars on the streets. But the core technologies will
15 be the same. We in the DOD absolutely must leverage, I do
16 not want to get into corporate names, but what the various
17 companies are doing in developing self-driving cars.

18 I will give you an example that I have heard the
19 Secretary use, and I will put numbers on it. In theater, 52
20 percent of our casualties have been from soldiers basically
21 delivering the mail, not literally the mail, but food, fuel,
22 logistics, things like that. You are in a very vulnerable
23 position when you are doing that kind of activity. If that
24 can be done by an automated, unmanned vehicle with a
25 relatively simple AI driving algorithm where I do not have

1 to worry about pedestrians and road signs and all that, why
2 wouldn't I do that? Well, I will.

3 We do not have that capability yet, but that is the
4 kind of thing that we could bring to bear fairly easily.
5 And if you will forgive the expression, we do not have to
6 solve world hunger with AI to be able to deliver a system
7 that can deliver fuel.

8 So that might be an early win for us. That is just one
9 example.

10 Senator Peters: Thank you. I appreciate it.

11 Dr. Griffin: Thank you, sir. I thought that was a
12 great question. Thank you, sir.

13 Senator Ernst: That was very good.

14 And thank you, Senator Peters.

15 While we are talking about commercial technology as
16 well, this is a nice segue. During World War II, as well,
17 we saw that the United States needed to rapidly leverage the
18 commercial industry to meet its wartime needs, and we were
19 able to do that in World War II. The phrase "battle of
20 production" encapsulated our ability to outproduce many of
21 our adversaries. That was critical in securing our Allied
22 victory.

23 In future conflicts, the ability to out-innovate those
24 adversaries -- we have named Russia; we talked about China -
25 - they will be just as important. And we still do have a

1 world-class tech sector. We really do.

2 So what we would like to see is that we are able to
3 take full advantage of that world-class tech sector. But
4 unfortunately, there seem to be some gaps there where we are
5 not able to tap into some of those technologies.

6 So the department is starting to make an effort to
7 engage the commercial sector and get into that innovation
8 coming from places like Silicon Valley. We will not name
9 any names out there. But they are trying to do that through
10 organizations like the Defense Innovation Unit-Experimental,
11 DIUx -- you mentioned them earlier -- and the department's
12 Silicon Valley outreach office.

13 So as we are trying to do that, what are the biggest
14 barriers that you see with being able to reach that goal of
15 utilizing those technologies that have been commercially
16 developed?

17 Dr. Griffin: One of the barriers that we have is that,
18 whether in AI or any other kind of information technology
19 type of thing, or whether in fundamental material science or
20 microelectronics, most of the innovators are innovators in
21 small companies. Most of those companies fail.

22 I used to run In-Q-Tel. I would split time between
23 Washington, D.C., and Silicon Valley. I had it an office on
24 Sand Hill Road. In-Q-Tel, of course, is the CIA's venture
25 capital company, if you want to put it that way.

1 Nine out of 10 of these entrepreneurial companies fail,
2 and that is a real statistic. They should fail. They were
3 experiments that tried and did not work. But the ones that
4 succeed become things like Google Earth or other huge
5 successes that become household names.

6 Well, the benefit for the department and for the U.S.
7 Government more broadly is to be able to tie in on the front
8 end of some of these things, because several of us have
9 talked about how technology today is really pretty instantly
10 available everywhere. Well, we do not want to be behind our
11 adversaries in adopting the technology that we, this Nation,
12 create.

13 So the earlier we can get into the tech cycle in
14 whatever field and work with those people and bring them
15 into department utility, the quicker we will transition to
16 the field. Well, how do we do that with young companies?

17 You asked what the barriers were. The barriers are
18 they are small, young companies. They cannot possibly
19 afford the overhead of dealing with the DCAA accounting
20 system. They cannot possibly afford the barriers of dealing
21 with the DCMA for contracts. I mean, it takes a full-time
22 staff of a good-sized company to deal with that.

23 So we have to have ways of interfacing with them that
24 recognize where they are in the corporate lifecycle. They
25 are not a large prime. If we want to take advantage of what

1 we can bring, we have to work with them on their terms.

2 That is what, for example, DIUx strives to do, but DIUx is a

3 few tens of millions of dollars a year.

4 This is really a cultural issue. We need, across the

5 department, to learn how to become user-friendly in our

6 contracting and financing, so that any piece of our

7 department can work effectively with a new high-tech

8 provider.

9 Now U.S. Special Operations Command is an artist at

10 this. SOCOM absolutely knows how to do this. DIUx is an

11 excellent idea. I am fully supportive of it. But they are

12 not the only place in the U.S. Government or even in the

13 department that knows how to do this.

14 These are the kinds of lessons that we need to

15 promulgate.

16 Senator Ernst: Very good. Thank you. My time is

17 expiring, so, Senator Heinrich?

18 Senator Heinrich: Secretary, I really appreciate your

19 awareness that so many of these challenges are baked into

20 culture as much as anything else.

21 I want to give you an opportunity to talk a little bit

22 about directed energy. I know you are passionate about it,

23 as am I. I have a bunch of questions, but at the front end,

24 I just want to provide you an open opportunity to tell me

25 what you are excited about right now, where you think things

1 are going, and how we are going to finally make that
2 transition from R&D into procurement.

3 Dr. Griffin: Thank you, Senator. I do appreciate the
4 opportunity. So let me answer the last part first.

5 The way to get from experiments into procurement of
6 real live weapons systems is to say that is what we are
7 going to do, appoint people to run those programs, and hold
8 them accountable for delivery, and ask them every day, "What
9 is in your way that I can clear out?"

10 The technology is there or almost there. I used an
11 example earlier: Let me have 300-kilowatts on an Air Force
12 tanker so that the tanker can defend itself, because that is
13 a critical function in our maintenance of air superiority.

14 And there are others. I am neither picking on the Air
15 Force nor otherwise. It is just an example.

16 I do not have a 300-kilowatt laser today. I have been
17 in the directed energy community, at least on its periphery,
18 for 3 decades. The people that I talk to who are domain
19 experts today, and from my own background, I can tell you
20 that if we can persist for 5 or 6 years, we can have that
21 laser. If we can persist for 10 years and maintain our
22 focus, we can have the megawatt class space laser that I
23 want. If I can persist for just a few years, I can have the
24 laser that goes on an Army combat vehicle.

25 You will notice that the key word there is "persist."

1 We have to set our goals and move toward them and weed out
2 the funding for interesting ideas but which are not on the
3 mainline of development and have people stick.

4 So that is what it takes. That is the cultural
5 behavior that it takes to get things to the field.

6 I have already alluded to what level of performance we
7 can have. Today, we have two very promising approaches,
8 diode-pumped alkali laser that are being developed at
9 Lawrence Livermore lab by the DOE. I keep talking about
10 across government. It is not just the department. The DOE
11 is our ally in this. And we have fiber combined lasers
12 being developed both by industry and by government
13 laboratories. In particular, Lincoln labs has demonstrated
14 35 kilowatts of controlled power.

15 You are getting very close there to something that will
16 allow us to defend our forces.

17 So we have good technology paths. We have good
18 laboratories. We have a good industrial base. And you have
19 somebody with me who wants to bring that to our troops.

20 When I interviewed for this job with the Secretary,
21 there was a comment he made that, until I either die or get
22 Alzheimer's, I will not forget. He said to me, he said,
23 when I was in theater, I never had to have a fair fight.
24 And he said, you are in charge of making sure that the
25 future force never has to have a fair fight.

1 To me, directed energy weapons are one of those ways
2 that we do not have to have our guys, our partners, our
3 allies have a fair fight.

4 Senator Heinrich: That is right. This is the third
5 offset, in terms of technology.

6 As you identify those obstacles in the way, make sure
7 that we know, so that we can help remove those obstacles.

8 Dr. Griffin: You can count on it, Senator. Thank you.

9 Senator Heinrich: In a related question, I want to ask
10 you about the role of requirement setting.

11 To put it simply, I think that the current requirements
12 process is not designed for new ideas or new weapons
13 systems. It is almost designed to impede the movement from
14 well-established systems to the next step. So talk to me
15 about that a little bit.

16 I guess I am running out of time.

17 Senator Ernst: Go ahead.

18 Senator Heinrich: How do you think the current process
19 actually works? To me, it seems like it slows down our
20 progress into these new systems. How do we fix that?

21 Dr. Griffin: Well, from an engineer's point of view,
22 we have requirements and capabilities backwards.

23 If you are in the DOD acquisition cycle, the DOD
24 Directive 5000, et cetera, you have to have requirements
25 before you can put out an RFP, before you can, before you

1 can, before you can, move down the road. But the reality is
2 that engineers really do not know what the requirements
3 ought to be until they have built and tested something.

4 Frankly, whether it is a piece of software or a new
5 combat vehicle or a new pistol or whatever, you have to
6 build it and try it out and fool around with it a little. I
7 am sorry to be so colloquial, but that is how engineers
8 really work in the real world.

9 You are an engineer by training. I know you know what
10 I mean.

11 When I know about what the capabilities are that the
12 current generation of technology will allow me to have, and
13 when I have tried it out with a real operator, then I can
14 sit down for you and write some requirements. But if I have
15 to write the requirements first -- despite what some think,
16 I am not actually stupid. I am never, ever going to write a
17 requirement for something that I do not already know I can
18 do. Why would I do that? I am going to write a requirement
19 for something I cannot get? That is just insane.

20 So the requirements before capabilities process, what
21 that does to you is it constrains your ability to innovate,
22 to get anything that you do not already have, because you
23 must be so conservative in your process. That is at the
24 root of our difficulties.

25 Senator Ernst: Mr. Secretary, we will do one more

1 round. We have a couple more questions.

2 We have talked about some of our adversaries, near-peer
3 adversaries, and the technology that they have developed
4 over the course of the last several decades. What can we as
5 the United States be doing to make sure that we are tracking
6 the advancements in technology that they have, as well as
7 developing our own?

8 What we really need to see is that the United States
9 is, again, staying ahead of our near-peer adversaries. You
10 just stated that we do not want to see our warfighters in a
11 fair fight. So what can we do to make sure that we are
12 outpacing our adversaries?

13 Dr. Griffin: Well, certainly, our intelligence-
14 gathering apparatus is critical to that. I met yesterday
15 with some of my Title 50 colleagues. We need to take a
16 whole-of-government approach on this.

17 Within the USD(R&E), we have a group who are focused on
18 protecting our own technology, making sure that foreign
19 acquisitions are appropriately vetted against strategic
20 considerations. We have to protect what we have while not
21 impeding our ability to have our companies compete in the
22 real world, because we cannot wall ourselves off and stay
23 inside. We have to be prepared to compete. At the same
24 time, we have to protect ourselves, and we have to do that
25 in balance.

1 But if you ask what we need to do to regain and
2 maintain a technological advantage on our adversaries,
3 frankly, we have to work harder; we have to run faster; we
4 have to have more focus on what we want to do.

5 No adversary of ours at present has directed energy
6 systems of the type of which I was just speaking. We should
7 be the first. We should be putting them in a position to
8 catch up with us.

9 I have mentioned you can find in public literature many
10 references to the Chinese hypersonics capability
11 development. Frankly, we were the leaders in that 10 and 15
12 years ago, and we just let it drop. We need to get started
13 again.

14 We need to shorten our test cycle timelines. I
15 referred yesterday to an experiment called Flight
16 Experiment-1 that the Navy did, a long-range conventional
17 prompt strike experiment. It was, frankly, an experiment.
18 It is not a weapons system yet. They did a brilliant job
19 with it. I mean, I will not quote numbers, but I will just
20 say that the impact accuracy was quite impressive.

21 So in chatting with my colleagues at the senior levels
22 of the Navy, I said, well, when can I have FE-2? When can I
23 have FE-3? Why not next August? Why not this August?

24 I mean, we need to finish the development of these
25 systems, and it cannot be done at a leisurely pace, because

1 our adversaries are not working at a leisurely pace. As
2 much as anything else, it is the sense of urgency, Senator,
3 that we really must get to this.

4 Senator Ernst: Very good. I will just make a brief
5 comment. I think we have talked a little bit about some of
6 the issues, and what we have described as the Valley of
7 death, actually taking that technology and getting it
8 fielded for our warfighters. It seems like the overarching
9 theme seems to be the persistence and funding.

10 Would you state that that is accurate?

11 Dr. Griffin: Senator, absolutely. Persistence in
12 reaching the goals, knowable funding to reach the goals.

13 I can deal with budget cuts. What I cannot deal with
14 is surprises. Or I can, but the surprises become very
15 expensive for you and insert delays for me.

16 The other thing that I guess I would offer is we have
17 to regain a cultural awareness that we have, as the National
18 Defense Strategy states, global superpower competition
19 again.

20 I was once labeled by a political adversary as an
21 unreconstructed cold warrior. I took that as a compliment,
22 actually, though it was not meant that way. Much of my
23 early career was in the Cold War. We understood for decades
24 that we had an existential threat from a peer competitor,
25 and Democrats, Republicans, did not matter, did not matter

1 which presidential administration, we had for decades a
2 united policy across government that we were going to
3 contain the Soviet Union and we were going to win. And if
4 we can restore that kind of thinking to a renewed global
5 power competition, then we will actually never have to
6 fight, because our adversaries will not want to take us on.

7 So that is the kind of culture, those are the kinds of
8 comments that I hear coming out of my leadership, which I
9 would like to promulgate as well.

10 Senator Ernst: Thank you. I appreciate it.

11 Senator Heinrich?

12 Senator Heinrich: Thank you for bringing a sense of
13 urgency to all of this, because I very much agree that has
14 oftentimes been the missing piece to all of this.

15 I wanted to follow on to the question that Senator
16 Perdue asked you. You did a really good job of articulating
17 why testing is so important, and why you want to do testing
18 very early in the process and not after you have a product
19 that is supposed to work perfectly for folks in the field.

20 Can you talk a little bit, too, just about how early
21 and effective developmental testing also speeds up
22 acquisition by discovering challenges early in the lifecycle
23 and not after the fact?

24 Dr. Griffin: Sir, I think you have pretty much done it
25 for me. The truth of the matter is -- Senator Ernst was

1 just asking about persistence and funding, and how to get
2 through the valley of death. My quick answer to that is,
3 take your prototypes up to the level of being operational
4 prototypes, not something I am going to produce but
5 something a real operator can work with and help wring out
6 the bugs so that I know what I want to produce.

7 The more quickly that I can do that, and I will say
8 outside the acquisition cycle -- although, of course, it
9 still is Federal acquisition of stuff with taxpayer money,
10 but it is not in the production cycle. The quicker I can do
11 that and figure out what I really want, then the speedier
12 the whole acquisition process will be.

13 The most expensive and time-consuming place to discover
14 a mistake is after I have delivered a weapons system to the
15 field.

16 So when one has spent the most enjoyable part of one's
17 life as an actual engineer, you become humbled by the fact
18 that you just almost never do anything right the first time.
19 It is a bit embarrassing because there are very few stupid
20 engineers around, and all of us have advanced education, and
21 you would like to believe that you can get something right
22 the first time. You just cannot.

23 Senator Heinrich: Experience does not support that.

24 Dr. Griffin: Yes. So wring the mistakes out as early
25 as possible. Work with us. Talk with us. Call us up to

1 the Hill frequently and say, "Hey, how are you doing on that
2 Flight Experiment-2 that you just talked about with the
3 Navy? How is that coming along?"

4 Senator Heinrich: You mentioned a laser that DOE is
5 developing. Before we let you go, is it easy enough to work
6 across government? If DOE or the NNSA, the national
7 security labs, are developing something that has direct
8 application in DOD, do the authorities and the current ways
9 of interfacing, do they support being able to work together?
10 Or are there things that we need to change in the NDAA to
11 make it easier to do that kind of work?

12 Dr. Griffin: Senator, if I come across something that
13 should go in the NDAA, that would enhance our ability to
14 work across government, I and the department will come to
15 you with a legislative proposal. I have spent decades in
16 various agencies working with other agencies, to include at
17 various times in various places NASA, National
18 Reconnaissance Office, DOE, CIA, DOD, of course, working in
19 and with these various components of the government. When
20 you get below the very political level and you start dealing
21 with people whose focus is on the mission, I have never had
22 any trouble at all.

23 Senator Heinrich: That is good to hear.

24 Dr. Griffin: It works well. I am not saying there are
25 not stumbling blocks. It is always difficult for people to

1 work together. But my experiences have been good ones, I
2 will just say that, over the years.

3 Senator Ernst: Thank you so much, Mr. Secretary. It
4 has been a pleasure to have you in front of the committee.
5 We appreciate you taking on these challenges for our men and
6 women, whether they are on the frontlines or working in
7 various places around the globe.

8 We look forward to utilizing your expertise in the
9 upcoming years, and I am anxious to see some of the great
10 developments that will come through your work.

11 Dr. Griffin: Well, you have given us a wonderful
12 budget, and you have given us good regulatory authorities,
13 and we have a great team. It is on us, and we hope to
14 deliver.

15 Senator Ernst: Outstanding. Thank you. This
16 concludes the Emerging Threats and Capabilities
17 Subcommittee.

18 [The information referred to follows:]

19 [SUBCOMMITTEE INSERT]

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1 [Whereupon, at 3:30 p.m., the hearing was adjourned.]

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