

Stenographic Transcript
Before the

Subcommittee on Airland

COMMITTEE ON
ARMED SERVICES

UNITED STATES SENATE

HEARING TO RECEIVE TESTIMONY ON
ARMY MODERNIZATION

Wednesday, March 22, 2017

Washington, D.C.

ALDERSON COURT REPORTING
1155 CONNECTICUT AVENUE, N.W.
SUITE 200

WASHINGTON, D.C. 20036

(202) 289-2260

www.aldersonreporting.com

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

HEARING TO RECEIVE TESTIMONY ON
ARMY MODERNIZATION

Wednesday, March 22, 2017

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

The subcommittee met, pursuant to notice, at 3:31 p.m. in Room SR-222, Russell Senate Office Building, Hon. Tom Cotton, chairman of the subcommittee, presiding.

Subcommittee Members Present: Senators Cotton [presiding], Wicker, Cruz, King, and Donnelly.

1 OPENING STATEMENT OF HON. TOM COTTON, U.S. SENATOR
2 FROM ARKANSAS

3 Senator Cotton: The hearing will come to order.

4 Today we are going to discuss how to prepare our Army
5 for the battlefield of the future or what we might call Army
6 modernization.

7 Even though our Army is second to none, our rivals are
8 catching up. Russia and China have made big gains in the
9 last 15 years. We are falling behind in long-range
10 artillery, integrated air defense, cyber warfare. The list
11 goes on. If we again face a major conflict with a great
12 power, this capability gap can put our troops' lives at
13 risk. Just weeks ago, the Vice Chief of Staff told Congress
14 that the Army is, quote, outranged, outgunned, and outdated.
15 And you can understand why.

16 For years, we pulled the Army in two different
17 directions. On the one hand, we have increased our
18 commitments overseas, which require more troops, but on the
19 other, we have cut defense spending dramatically. As a
20 result, the Army leadership has had no choice but to focus
21 primarily on short-term readiness, that is, the war they are
22 fighting right now, not future conflict.

23 But we must prepare for the future to protect our
24 national security and do right by tomorrow's soldiers. That
25 is why with this hearing, we want to focus on some basic

1 questions. Who is leading the modernization effort? What
2 do they think of the potential for emerging technologies?
3 And how do they think combatant commanders can make use of
4 them? This is a lot of ground to cover, so I will give just
5 three examples.

6 First, active protection systems. We bought different
7 models from different suppliers, and now we are trying to
8 figure out how to adapt them for Abrams, Bradleys, and
9 Strykers. Where are we on this? How long will it take to
10 deploy these systems across the force? How might this
11 technology change future combat vehicle design?

12 Second, the Distributed Common Ground System-Army, or
13 DCGS-A. We have poured billions of dollars into this
14 program for over a decade, and yet it is still not ready for
15 battle use. According to one report, even under laboratory
16 conditions, soldiers and commanders, quote, did not consider
17 it to be very helpful. End quote. Last year's NDAA
18 directed the Army to seek a commercial solution for this
19 problem. There are many domestic companies that might
20 provide one. What is the current plan?

21 Third, the Warfighter Information Network-Tactical, or
22 WIN-T. We are on track to spend \$14 billion on this
23 program, and yet there are still many problems with it. We
24 need to know can it actually provide secure communications
25 on a contested battlefield. Could enemy forces use its

1 electronic signature to detect Army units? Are there any
2 commercial solutions we can use to improve the program?

3 Finally, we need to look at how the Army is organized.
4 Should we reorganize the Army to make sure it stays focused
5 on modernization? How do we ensure a united effort
6 throughout the organization? Who will supply the vision
7 that will underpin it? Should this be a responsibility of a
8 command or a staff element in the headquarters of the
9 Department of the Army? These are all pressing questions,
10 but regardless of the ways and the means, it is clear the
11 Army must modernize for a warfighting future that is
12 different from the past and develop a strategy to give it
13 purpose and direction.

14 To explore these and other topics, I welcome our
15 distinguished witnesses: Lieutenant General Joseph
16 Anderson, Deputy Chief of Staff for Operations, Plans, and
17 Training; Lieutenant General John Murray, Deputy Chief of
18 Staff for Army Programs; Major General Robert Dyess, Acting
19 Director of the Army Capabilities Integration Center; and
20 Brigadier General Promotable Robert Marion, Army Deputy
21 Acquisition and Systems Management. Thank you all for your
22 service to our country. I look forward to your testimony
23 and our hearing.

24 Senator King?

25

1 STATEMENT OF HON. ANGUS S. KING, JR., U.S. SENATOR
2 FROM MAINE

3 Senator King: Thank you, Mr. Chairman.

4 Before I begin my remarks, I want to welcome to the
5 audience in our hearing Mr. Ted Jordan and his students from
6 Cape Elizabeth High School in Maine, one of the great
7 classroom teachers I have ever known. We are awfully glad
8 to have you here, Mr. Jordan.

9 Mr. Chairman, thank you very much for holding today's
10 hearing. I would also like to welcome all of our witnesses
11 this afternoon. Thank you for your testimony and
12 particularly for your service to our country.

13 Last week, this subcommittee held a very informative
14 hearing on the future of warfare. It will come as no
15 surprise to our witnesses that the previous panel
16 underscored that our military must be prepared for conflict
17 across the full spectrum of operations. In the near term,
18 our forces will remain engaged in counterterrorism and
19 stability operations, but we also must be ready for high-end
20 conflict with near-peer competitors such as China and
21 Russia.

22 Likewise, U.S. forces will contend with anti-
23 access/area denial threats, as well as hybrid warfare
24 tactics, and given the proliferation of advanced technology
25 and weapons around the globe, it is highly likely that our

1 military will confront advanced Russian and Chinese arms on
2 the battlefield even if we do not face their forces
3 directly.

4 The pointed language in your written statement that our
5 Army is rapidly reaching a point where we will be outgunned,
6 outranged, and outdated -- by the way, that was reminiscent
7 of Hamilton. I think in Hamilton, General Washington said
8 we are outgunned, outmanned, and outplanned. Very close.
9 Outgunned, outranged, and outdated when compared to our most
10 capable potential adversaries. This deserves attention and
11 action on our part to ensure that modernization efforts
12 effectively address this challenge.

13 Finally, we must also acknowledge that our adversaries
14 are capable of causing great harm to our country without
15 directly engaging our forces in combat. As I stated last
16 week, Russia has achieved extraordinary success in
17 undermining Western democratic values and destabilizing its
18 neighbors during the last several years, in many cases
19 without firing a shot. As you know, the intelligence
20 community concluded that Russia actively interfered in our
21 recent presidential election, and they appear to be using
22 some of these same tactics right now in France and Germany.

23 It is clear, therefore, that our strategy for
24 countering the Russian influence, as well as other countries
25 that adopt similar tactics, has to include more than a

1 military response.

2 While today's hearing is not explicitly about the
3 future of warfare, the testimony from our witnesses
4 regarding the Army's modernization strategy does signal how
5 the Army is preparing for warfare in the future. Resources
6 are never unlimited, and the Army must make investments
7 based on near-term risks, as well as future threats, to
8 procure new weapons, upgrade existing platforms, and fund
9 research and development accounts.

10 Furthermore, due to the spending caps mandated by the
11 Budget Control Act, the Army has had to make very tough
12 resource allocation choices. The Army has prioritized
13 rebuilding full spectrum readiness and maintaining end
14 strength levels, which puts a strain on fully funding
15 modernization and procurement accounts. We must ensure that
16 our troops are trained and ready for today's fights while
17 also ensuring our modernization strategy supports the Army's
18 ability to fight future battles against advanced
19 adversaries.

20 Last year, a Center for Strategic and International
21 Studies report illustrated how the Army's current
22 modernization challenge is exacerbated by two trends.
23 First, the Army is relying upon weapon systems initially
24 fielded in the 1980s, such as the Abrams main battle tank
25 and the Bradley fighting vehicle. And secondly, the Army

1 has a mixed record of developing new acquisition programs to
2 replace these weapon systems resulting in truncated or
3 canceled programs and the loss of billions of dollars.

4 Therefore, as this committee considers funding the Army
5 modernization efforts, we must ensure that resources are
6 devoted to programs that will enable our soldiers to prevail
7 in future fights.

8 I would like our witnesses today to address how Army
9 procurement accounts have been adversely impacted by the
10 reduction in funding over the past several years and if
11 these actions have added substantial cost and risk to
12 modernization programs.

13 In addition, I hope we can discuss actions the Army is
14 taking to ensure program requirements are realistic so we
15 can prevent future programs from being canceled due to cost
16 growth, requirements creep, and schedule delay. As we
17 consider increasing Army end strength and restoring
18 readiness, we cannot afford for our future modernization
19 programs to meet the fate of recent Army programs that were
20 canceled such as the future combat systems, the Comanche
21 helicopter, and the Crusader artillery system.

22 Finally, we must remember that resources are never
23 unlimited, as I mentioned. Increasing defense spending at
24 the expense of other core elements of national power will
25 not guarantee a more effective fighting force. The

1 administration has not yet released their final 2018 budget
2 request, but they published a budget document detailing top
3 line funding for the Department of Defense. According to
4 this document, the Army will focus on rebuilding readiness
5 and reversing the reductions in end strength levels. But
6 both efforts have implications for Army modernization.

7 In addition, the administration has submitted a \$30
8 billion supplemental request for the Department of Defense
9 for this year, of which \$8.3 billion is set aside for Army
10 requirements.

11 Increased funding will help America rebuild readiness
12 and begin the long-term effort to modernize the force.
13 However, I am concerned that the administration has also
14 proposed dramatic cuts to the Department of State, USAID,
15 and other agencies. In my view and that of virtually every
16 witness who has recently appeared before the Armed Services
17 Committee, that approach is shortsighted and would risk
18 seriously compromising our national security.

19 It is my hope that we can responsibly increase the
20 defense budget while ensuring the other critical elements of
21 national power are also adequately funded. And as we plan
22 the future force structure of the Army, we must remain
23 mindful that end strength, readiness, and modernization are
24 deeply intertwined and adjustments to each should be
25 carefully synchronized and calibrated to ensure our Army is

1 guaranteed to never face a fair fight even against our most
2 capable adversaries.

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

5 Senator Cotton: Thank you, Senator King.

6 General Anderson?

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 STATEMENT OF LIEUTENANT GENERAL JOSEPH ANDERSON, USA,
2 DEPUTY CHIEF OF STAFF, G-3/5/7, UNITED STATES ARMY

3 General Anderson: Thanks, Chairman Cotton, Ranking
4 Member King, distinguished members of the subcommittee.
5 Thank you for the opportunity to testify on the state of
6 your U.S. Army.

7 I appreciate your support and demonstrated commitment
8 to our Army and look forward to discussing Army
9 modernization with you today.

10 My experience has allowed me to witness significant,
11 lasting detrimental effects to Army readiness and
12 modernization caused by sequestration and continuing
13 resolutions. The abrupt implementation of fiscal year 2013
14 sequestration significantly impacted every aspect of our
15 Army, from training to readiness through delayed
16 modernization, sequestration compelled the Army to take
17 drastic measures. Continuing resolutions compound
18 resourcing solutions and greatly affect the Army's ability
19 to generate readiness and execute its modernization
20 strategy.

21 Our competitors have studied our doctrine, made
22 revisions to their own, and are rapidly modernizing their
23 militaries. We now face the prospect of fighting in complex
24 anti-access/area denial environments against threats
25 equipped to overmatch several of our current capabilities.

1 This strategic environment requires a trained and ready Army
2 that has both the capacity and capability to meet current
3 and future challenges and prevail against a full range of
4 military activities.

5 Today the Army remains globally engaged with over
6 185,000 trained and ready soldiers helping combatant
7 commanders shape today's security environment. The
8 operation tempo required to meet current and emergent demand
9 consumes readiness as fast as we can supply it. This places
10 the Army's ability to meet wartime contingency requirements
11 at high risk.

12 Resourcing NDAA 2017 end strength authorizations is
13 absolutely necessary to bridge gaps within our current
14 formations and is the first step required to meet readiness
15 objectives. The Army will mitigate some manning shortfalls
16 by optimizing its available resources to maximize total
17 force readiness, filling the holes in current formations,
18 and strengthening our armored brigade combat teams.
19 Additional end strength increases will build greater
20 quantities of critical unit types and develop crucial
21 capabilities in long-range fires and air missile defense
22 formations required to adequately prepare for major
23 contingencies.

24 Readiness does remain our number one priority I think
25 as you very well know. We must stand ready at a moment's

1 notice to defend the U.S. and its interests. With your
2 assistance, the Army will continue to resource the best
3 trained, best equipped, and best led fighting force in the
4 world.

5 We thank you for the steadfast support of our
6 outstanding men and women in uniform, and I look forward to
7 your questions.

8 [The prepared statement of General Murray, General
9 Anderson, General Dyess, and General Marion follows:]

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 Senator Cotton: General Murray?
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 STATEMENT OF LIEUTENANT GENERAL JOHN M. MURRAY, USA,
2 DEPUTY CHIEF OF STAFF, G-8, UNITED STATES ARMY

3 General Murray: Chairman Cotton, Ranking Member King,
4 distinguished members of the Subcommittee on Airland. On
5 behalf of our Acting Secretary, the Honorable Robert Speer,
6 and our Chief of Staff, General Mark Milley, I pretty much
7 look forward to discussing Army modernization with you
8 today.

9 Today the Army has roughly half the funding for
10 modernization and equipping the force it had just 8 years
11 ago. We have focused our resources on generating and
12 maintaining the best trained and equipped forces that
13 resources would allow.

14 We now find ourselves in a situation where our most
15 capable enemies are closing quickly. Senator, as you
16 mentioned, we are losing overmatch in every domain, land,
17 air, maritime, space, and cyberspace. In the words of
18 General Allen during his most recent testimony, Senator,
19 once again as you mentioned, we find ourselves outgunned,
20 outranged, and outdated in some very critical war fighting
21 capabilities.

22 The Army's current modernization strategy is to upgrade
23 today's equipment, focusing limited modernization dollars on
24 the equipment that will have the greatest impact against
25 near-peer threats and can quickly be in the hands of our

1 soldiers. For the last 10 years, we have focused on the
2 immediate, providing the equipment necessary for our
3 soldiers to fight in Iraq and Afghanistan along with
4 incremental upgrades to existing combat platforms. That
5 strategy forced us to defer the development of new combat
6 capabilities. We have now reached a point in time where we
7 can longer afford to do one or the other. We must find a
8 way to do both, improve the equipment we have and begin
9 investment into next generation capabilities.

10 Near-term security challenges will be met with the
11 equipment we have today, and it must be improved to ensure
12 our current soldiers have the best that we can provide.
13 Tomorrow's security challenges will be met with the
14 equipment we develop and procure over the next several
15 years, and we owe our future soldiers the equipment they
16 will need to fight and win on some very complex
17 battlefields.

18 We urge Congress to provide fiscal stability, funding
19 that is sustained, long-term, and predictable so we can
20 maintain our current warfighting readiness while
21 simultaneously beginning to build a more modern and capable
22 force for the future.

23 I would like to thank you and the entire committee for
24 your unwavering support of our soldiers, our Army civilians,
25 and our families. Thank you very much, and I look forward

1 to your questions.

2 Senator Cotton: General Dyess?

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 STATEMENT OF MAJOR GENERAL ROBERT W. DYESS, JR., USA,
2 ACTING DIRECTOR, ARMY CAPABILITIES INTEGRATION CENTER

3 General Dyess: Chairman Cotton, Ranking Member King,
4 distinguished members of the subcommittee, thank you for the
5 opportunity to speak with you about the urgent need to
6 invest in Army modernization.

7 To develop the Army, we must think clearly about the
8 future of armed conflict. This requires a consideration of
9 threats, enemies, and adversaries, our missions,
10 consideration of trends in technology development, and
11 historical observations to anticipate the changing character
12 of war and how that will evolve to affect tomorrow's
13 battlefields.

14 Based on these factors, we envision a future
15 environment that is characterized by increased competition
16 amongst peer states that aim to challenge the post-World War
17 II security order. Future forces of the Army will likely
18 confront the advanced militaries of peer states with
19 advanced and sophisticated capabilities, as well as elusive,
20 yet capable non-state actors that employ unconventional and
21 hybrid strategies that threaten U.S. security and vital
22 interests.

23 There is an urgent need to modernize existing equipment
24 and undertake developmental programs to replace the
25 workhorses that have provided overmatch and served our

1 Nation so well. We must do both.

2 To operate in this emerging environment, Army forces
3 must innovate and develop new ideas to fight in and across
4 all five domains, air, sea, land, space, and cyberspace. To
5 address future challenges, the Army and the Marine Corps
6 began the development of a multi-domain battle concept.
7 This concept involves combined arms, to include not only
8 capability of the physical domains, but also cyberspace, the
9 electromagnetic spectrum, the information environment, and
10 the cognitive dimension of warfare by accounting for the
11 changing character of war. When complete, this multi-domain
12 battle will enable land forces operating as part of a joint
13 force to create windows of opportunity and advantage,
14 restore capability balance, and build resilient formations.

15 To mitigate mounting military risk and operate as part
16 of the joint force in the future, the Army must undertake
17 innovative and ambitious modernization efforts. There is an
18 urgent need right now. Preparing for war is expensive, but
19 the price of losing is far greater. Our Army and our Nation
20 requires your continued support. It is time to renew the
21 commitment to sustaining the U.S. Army's tactical overmatch.

22 Mr. Chairman and distinguished members, thank you for
23 the opportunity to speak with you today, and I look forward
24 to your questions.

25 Senator Cotton: General Marion?

1 STATEMENT OF BRIGADIER GENERAL PROMOTABLE ROBERT L.
2 MARION, USA, DEPUTY OF ACQUISITION AND SYSTEMS MANAGEMENT,
3 OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY FOR
4 ACQUISITION, LOGISTICS AND TECHNOLOGY

5 General Marion: Chairman Cotton, Ranking Member King,
6 and distinguished members of the Subcommittee on Airland,
7 thank you for the invitation to meet with you today and
8 discuss Army equipment modernization.

9 Mr. Chairman, Army modernization is the primary means
10 by which we provide our soldiers with cutting-edge
11 technologies and the latest in systems capabilities to
12 empower, unburden, and protect them. In a global security
13 environment that is increasingly uncertain and complex, the
14 threats and challenges of tomorrow will be overcome with the
15 equipment we develop, modernize, and procure today.

16 Stable funding and continuity of effort take on
17 increased importance in the world of acquisition. Starting
18 and stopping programs based on available funding prevents
19 momentum in research and lengthens the timelines for
20 discovery and innovation. Operating under continuing
21 resolutions and the pressures of sequestration increase risk
22 in our procurement programs and cause delays in getting
23 necessary equipment into the hands of our soldiers.
24 Declining budgets drive difficult choices. Sustained, long-
25 term, and predictable funding is essential for the Army to

1 build and sustain current readiness and a more modern
2 capable force.

3 In the current environment, we are focused on five
4 things: protecting science and technology investments,
5 selectively investing in new capabilities, incrementally
6 modernizing existing systems, resetting and sustaining
7 equipment, and divesting excess systems.

8 Equipping is a critical component to readiness. We
9 cannot put our soldiers at risk by not providing them with
10 the right equipment at the right time at the right place to
11 accomplish their assigned missions.

12 Finally, limited resources in the Army's modernization
13 account continue to present significant challenges for the
14 defense industrial base, especially for companies that
15 cannot leverage commercial sales and for small companies
16 that must diversify to quickly remain viable. When
17 developing our equipment modernization strategy, we
18 carefully assess risk across all portfolios to ensure
19 balanced development of new capabilities, incremental
20 upgrades to existing systems, and the protection of critical
21 capabilities in the commercial and organic industrial base.

22 Mr. Chairman and distinguished members of the
23 subcommittee, thank you for your steadfast and strong
24 support of the outstanding men and women of the United
25 States Army, our civilians, and their families.

1 This concludes my opening remarks, Mr. Chairman. I
2 look forward to your questions.

3 Senator Cotton: Thank you all, gentlemen.

4 I think one consistent theme of all four statements we
5 have heard here today from four Generals and two Senators is
6 that Congress has done no small part to hamstring the Army
7 over the last 5 years due to the Budget Control Act and
8 sequestration and the stop and start nature of our
9 appropriations process.

10 Just maybe if we can start down the line with General
11 Anderson and going down the line. As Senator King said, the
12 budget submitted last week focuses primarily on end strength
13 and on readiness. Does it cause you concern that the budget
14 this time around again seems to skimp on modernization?

15 General Anderson: I think, Senator, that modernization
16 will keep being the bill payer. So it allows us to maintain
17 that \$1.018 million baseline that we are trying to achieve
18 here based on the NDAA. And it does enhance some of the
19 readiness capabilities we have and some of that is going to
20 fill the hole from the readiness side. Getting formations
21 back up to about 100 percent is a good thing, and it buys
22 back some of the capabilities that we were about to lose and
23 it buys us a couple other capabilities like shore ad and
24 fires battalions. But above and beyond that, we are kind of
25 status quo in terms of improvement.

1 Senator Cotton: Thank you.

2 General Murray?

3 General Murray: Senator, just for clarification, you
4 are talking about the 2018 budget?

5 Senator Cotton: Yes.

6 General Murray: I agree with General Anderson. We
7 make a pretty significant dent in 2017 with the \$30 billion
8 that OSD asked for the Army. And, Senator King, you
9 mentioned this. It is actually about \$4.5 billion goes
10 directly towards modernization of equipment and investment
11 in the future. But once again, 2018 basically sustains
12 mostly the force structure the NDAA gave us.

13 Senator Cotton: General Dyess?

14 General Dyess: Senator Cotton, the organization that I
15 am in looks at the future. We are really looking at 2025 to
16 2040. We are really close to that. As we developed the
17 1923 POM, we will be very close to that, having that force
18 by the time that POM comes to fruition. So I am concerned
19 that we are moving in a way that takes us to a more modern
20 force in which we both modernize existing equipment and
21 develop those replacements for those workhorses that were
22 fielded in the 1980s that Senator King mentioned earlier.

23 Senator Cotton: Thank you.

24 General Marion?

25 General Marion: Sir, I concur with my colleagues,

1 especially the remark General Murray made about forgoing
2 long-term development of systems for the incremental
3 upgrades that we have to afford today, we have to pay for
4 today, to ensure we have near-term readiness. So some of
5 those incremental modernization activities that we have
6 continued to carry on with those platforms -- I think of
7 Blackhawk as an example -- we are going to be at a point
8 where we cannot continue to incrementally modernize them
9 anymore. And from an affordability standpoint, we have got
10 to get to a point where we can make a leap ahead in
11 technology and a leap ahead in the other systems just like
12 in Blackhawk.

13 Senator Cotton: Thank you.

14 As we think about the long term, General Dyess, you
15 said in your testimony you cannot modernize effectively
16 without the future of armed conflict. And you are talking
17 about the window of 2025 to 2040. As you look ahead to the
18 future of armed conflict, what are the main capability gaps
19 in the Army right now that concern you for the future?

20 General Dyess: Thank you, Senator.

21 In this way, we are very in line with what the Chief
22 has established as his priorities based on both high
23 fidelity modeling, as well as what we have seen in our
24 Russian new generation warfare study. We have seen
25 primarily that we have a need for a mobile, short-range air

1 defense. We have a need for long-range precision fires. We
2 have combat vehicles, active protection, as you mentioned
3 before, assured communications, position navigation and
4 timing. All of those things are consistent with what we see
5 that we need to work on now but also will take us into the
6 future.

7 Senator Cotton: Thank you.

8 General Murray, as you think about those capability
9 gaps, has the Army published a strategy to address those
10 gaps and how we are going to get to the end state that we
11 need?

12 General Murray: Before I get to that, Senator, the one
13 thing I would add is munitions, which we talked about
14 yesterday. There is a critical shortage.

15 Your answer specifically is not yet. So we have
16 published modernization strategies for the last few years.
17 It has been very much resource-constrained. So it talks
18 about incremental upgrades to the current systems, investing
19 in new development only when we absolutely have to like the
20 AMPV for the 113 replacement. General Dyess down at ARCIC
21 is working on a strategy that gets after a parallel path. I
22 am also working on a short piece for the Chief that is in
23 his hands right now for him to approve and we hope to have
24 over with the 2018 budget if not before.

25 Senator Cotton: Thank you all, gentlemen.

1 Senator King?

2 Senator King: When I was governor, I had an adjutant
3 general, and he taught me the term "after action review."
4 And I am wondering what the Army has done in the way of an
5 after action review of the disastrous results of
6 modernization efforts prior to today, over \$20 billion
7 spent, no new fighting capability. What lessons have we
8 learned and how can we take advantage of those lessons to
9 not repeat the problems that plagued the Army modernization
10 efforts 20 years ago?

11 General Dyess: Senator, I will start. The last one
12 that you mentioned as far as time in the recent was the FCS
13 program, which was 2008-2009 time frame. I think that in
14 the interim period of time, we have had less money, but we
15 worked on the requirements I think very hard in order to
16 have a requirements process that develops equipment that we
17 can afford. My organization inside of TRADOC works with
18 General Murray's organization inside of the G-8 requirements
19 and resources, and we work with Bob's organization inside
20 the acquisition community in order to not reach too far,
21 stabilize our requirements, and then work towards achieving
22 them.

23 Senator King: 80 percent solutions instead of 100
24 percent.

25 General Dyess: Sir, absolutely.

1 Senator King: General?

2 General Marion: Sir, one of the very specific things
3 -- and by the way, that after action term is something that
4 we have done just exactly on those programs that you
5 mentioned to try to get at the question that you asked. How
6 do we get better in the future? That is the key thing.

7 So when we look at from an acquisition standpoint, we
8 mature technologies to a point, and then we integrate them,
9 build them into a system, and then we test them, and then we
10 buy them in procurement. Each program is different.

11 Senator King: Where did it break down?

12 General Marion: Exactly, sir. So each program is
13 different, but one common theme -- there are actually two
14 common themes that we have seen. One is we have gotten to
15 that point where we believe the technology was mature enough
16 to begin to integrate into a final end item and then build
17 it and test it, but the technology was not as mature at the
18 component and sub-component level. It was not as mature as
19 we thought, or in some cases we knew the risk of moving, but
20 we wanted to develop that capability and deliver it as soon
21 as possible. So we went forward into the integration phase,
22 the build phase, and the test phase too soon.

23 Senator King: Well, that is exactly the experience of
24 the Air Force and to some extent the Navy of doing R&D while
25 you are building. And it makes it more expensive, and you

1 are not sure what you are going to get at the end. It
2 sounds like that is a common thread.

3 General Marion: That is exactly correct, sir. And I
4 will give you an example with JLTV on how we learned our
5 lesson.

6 So we only went past that phase where we were
7 integrating technologies once we knew that those
8 technologies were sufficiently mature at the component and
9 sub-component level before we integrated them into an entire
10 vehicle and before we took it to test and before we made our
11 procurement decision. And so now we are into a low-rate
12 initial production, an LRIP, phase on JLTV where we got to
13 an 80 percent solution and we went forward with a
14 procurement decision, and we believe that is the way to
15 focus our activities in the future.

16 Senator King: Now, has the Army made institutional
17 structural changes to deal with these issues? Because I do
18 not want this knowledge and memory to retire with you guys
19 and then we have to learn the lessons all over again.

20 General Marion: So, sir, the second point is once you
21 get to that point and you are ready to build and integrate
22 and test, then the institution has to be very disciplined
23 about how we allow changes to occur. We cannot allow design
24 changes to occur because of changes in funding, changes in
25 requirements, the technology does not mature. We have to be

1 very disciplined about that. And we have instituted
2 processes that originate with the Chief of the Staff of the
3 Army. Once we lock a requirement, he is the authority. So
4 we have instituted this Army Requirements Oversight Council
5 where once the Chief locks a requirement, that is the
6 requirement.

7 Senator King: I think that is very important that we
8 do not forget those lessons, that they are embedded somehow
9 in the formal process and in the structure.

10 One of the things that we are talking about in the Air
11 Force and in the Navy is -- of course, it takes a while to
12 procure and develop a new weapon system. It is going to be
13 obsolete the day it is launched. We know that. It is just
14 like buying a computer. But the key is, it seems to me,
15 building these things in a modular way that can be upgraded,
16 particularly with software and those kinds of things, so
17 that you do not have to build a whole frame all over again.
18 Is that something that you are looking at?

19 General Marion: Yes, sir. That is exactly what we are
20 looking at.

21 General Murray: I think a lot of the things you
22 pointed out, Senator, have driven us almost to the
23 incremental upgrade approach because we actually do pretty
24 well in incrementally upgrading systems. So the big five
25 you mentioned in your opening statement, the tank and the

1 Bradley specifically, are not the same tank and Bradley that
2 rolled off the production lines in the 1980s.

3 Senator King: The frame may be the same.

4 General Murray: The frame may be the same, but they
5 are significantly more capable. And with the next upgrade
6 we are looking at, they will be significantly even more
7 capable. So we have kind of focused on that with limited
8 new developments, as I mentioned.

9 One of the new development items that we are looking at
10 -- it kind of gets to some of your points I think -- is
11 mobile protected fire power. So for lack of a better term,
12 it is a lightweight tank for at least our airborne forces
13 and potentially all of our IBCTs. So we are doing this
14 process significantly different. So this is not something
15 the Army is trying to start from a clean sheet of paper with
16 the build. So we have gone to industry, looking for non-
17 developmental systems, in other words something that
18 currently exists or a chassis and a turret that can be put
19 together so it is all in existence. So it is not brand new
20 technology. It gets back to your what is good enough
21 quickly comment.

22 The Chief has been involved with that, along with the
23 other four-stars, in personally approving every requirement
24 we put against that vehicle. He sat down with industry for
25 6 hours, and the Vice followed up with another 4 hours in 1

1 day for industry to come back and talk to him about what was
2 tough about the requirements that we laid out, what were the
3 trades he would need to consider. And then we will lock the
4 requirements within 8 months of actually saying this was an
5 Army requirement. And then as General Marion said, anything
6 that changes will have to go back to the Chief for changes.
7 We are after a good enough quickly to get capability in the
8 hands of our soldiers.

9 Senator King: And the first requirement would be that
10 the requirements be expressed in no more than 10 pages.
11 Just pick a number.

12 In any case, thank you, Mr. Chairman. We will have
13 more questions.

14 Senator Cotton: Senator Donnelly?

15 Senator Donnelly: Thank you, Mr. Chairman.

16 Generals, I would like to commend all of you and your
17 staff for the time, the energy, and effort you have put into
18 two important Army fleet readiness programs: the Army
19 National Guard HUMVEE modernization program and the HUMVEE
20 ambulance modernization program. Even after JLTV is fully
21 fielded, HUMVEEs are going to make up the majority of the
22 Army's tactical wheeled fleet until at least 2030.

23 Meanwhile, with each passing day, the HUMVEE fleet is
24 aging. The average age of HUMVEE ambulances is now 28
25 years, more than a decade beyond the expected useful life.

1 According to the Army's own assessment, these vehicles are
2 in urgent need of either recapitalization or replacement.
3 This is a perfect example of an area where modernization and
4 readiness needs converge.

5 Congress has provided significant support to HUMVEE
6 modernization efforts and the model public-private
7 partnerships between Army depots and industry that do the
8 work.

9 I know we are mostly talking about the fiscal year 2017
10 and 2018 budgets today, but I want to jump ahead 1 year.
11 This committee has urged the Army to expedite planning and
12 funding in fiscal year 2019 for a long-term program of
13 record on HUMVEE modernization. And this is for whoever
14 wants to take a shot at it. When do you think we can expect
15 to see a comprehensive modernization plan with an associated
16 program of record?

17 General Murray: I will start with that, Senator, and
18 thank you. And you mentioned this. So the help that this
19 committee and really the Congress as a whole has given
20 specifically to the Guard and Reserve in terms of HUMVEE
21 recapitalization, specifically the ambulance piece, has been
22 exceptionally helpful.

23 We believe we have a decision point on HUMVEEs at large
24 in 2018 and it really comes down to what you said in your
25 comments, that we are going to have to make a decision on

1 either we are going to have to buy more JLTVs to replace
2 HUMVEEs or we are going to have to start recapping the
3 HUMVEE fleet we have. It is about a 50/50 mix, as you know,
4 between the total requirement between JLTV and the HUMVEE.

5 So the average age of the HUMVEE fleet right now is
6 about 9 and a half years. We try to maintain less than 15
7 years. So we are in good shape for another couple years in
8 terms of the age of the HUMVEE fleet. But we think the
9 decision point is in 2018 whether or not we have to fund a
10 HUMVEE recapitalization or we have to purchase more JLTVs to
11 replace the HUMVEE fleet.

12 And then the ambulances. I mean, we are looking very
13 hard at the purchase of the A-3 vehicle to get after some of
14 the issues you are talking about.

15 Senator Donnelly: Can one of you elaborate on the
16 Army's stated desire to not only grow and modernize its
17 armored force but also to accelerate modernization of the
18 Army's combat vehicles? What combat vehicle programs are
19 you talking about modernizing?

20 General Anderson: Senator, I will start with the
21 armored capability. So against the war plans we are
22 planning against we are short. So the Chief made a decision
23 here about 6 months ago to convert 15. There are nine ABCTs
24 in the active component. There are five in the Guard. He
25 had a decision to convert one IBCT, a light brigade, to an

1 armored brigade. And he has just decided to go with another
2 one. And that is trying to enhance the capability so we can
3 support the war plans to meet the requirements.

4 General Murray: In terms of the modernization piece
5 you asked about, so it is really across the entire fleet.
6 So Abrams tank -- we start this September in terms of an
7 upgrade from the B-2 to the B-3, the latest generation
8 Abrams tank. On the Bradley, we start this year on an
9 upgrade from the A-3 to an A-4. The Stryker you are
10 familiar with. With a lot of help from Congress, the
11 lethality package that we will field to the second SER is
12 actually ahead of schedule in 2018, and then the Paladin PIM
13 program when we go from the A-6 version of the Paladin to
14 the A-7 version.

15 Senator Donnelly: And that ties in a little bit to my
16 next question which is how do your current plans for
17 incremental modernization of vehicles like the Abrams tank
18 and the Bradley fighting vehicle that date back to the Cold
19 War -- how does that mesh with your projected requirements,
20 particularly given the changing dynamics we are seeing
21 almost on a daily basis in Europe?

22 General Murray: So it really gets down to -- and
23 General Dyess can talk more about this -- is the Chief is
24 firmly convinced that there is a very real chance we will
25 see a change in the character of war in the next 10 or 15

1 years. And what you have kind of highlighted is the
2 fundamental issue that we have is maintaining readiness for
3 today so our soldiers have the best capability we can
4 provide them, and we have programs to do that today, and
5 finding the money to invest for 2025, 2030, for instance.

6 Right now, if you look at how we invest in next
7 generation vehicles, given the resources we have for
8 modernization, is I have got to finish upgrading a vehicle.
9 Let us just take the tank, for instance. So I got to finish
10 upgrading the tank before I can free up enough resources to
11 start procuring next generation -- I can do some of the
12 development -- before I can really starting buying in a big
13 way.

14 Based upon the resources we have got, we have stretched
15 out procurement and modernization production lines to a
16 point of almost being silly. So to upgrade an ABCT with
17 what I just laid out, it takes 3 years. One ABCT, 3 years.
18 So to do five of them, that is 15 years. So what you find
19 is, given the resources we have, we never finish the upgrade
20 because in 15 years, there will be another upgrade available
21 that we are going to have to invest money it.

22 So that is why I say we have got to start looking at
23 the development, and we have. I mean, there is work going
24 on at Fort Benning right now on the next generation combat
25 vehicle. So the limited money it takes to start developing

1 requirements and do some early prototyping -- we can do
2 that.

3 Where we run into problems is I can never afford to buy
4 it until we finish the upgrade we got. That is where
5 predictable funding, even if it is less than ideal,
6 predictable, so I can kind of look year to year to year to
7 figure out when we can do that would be very helpful.

8 General Dyess: Senator, in a couple weeks, we are
9 going to commemorate the 100th anniversary of the U.S. entry
10 into the war to end all wars. We did not seek that war. It
11 sought us. And the Army ordered 4,400 tanks on the entry of
12 war for delivery a year later in 1918. Now, production did
13 not start on those tanks until June of 1918, and they
14 delivered 300 tanks to the U.S. forces in Europe.

15 We have had tanks in development since that time, since
16 1917. We have no future tank in development at this time.
17 We are working to start, as General Murray mentioned, a next
18 generation combat vehicle, which will be a Bradley
19 replacement, starting at Benning, just a nascent program
20 with small amounts of money. But this is the part about the
21 big five, and then what is the next generation and how are
22 we going to replace them? And so modernizing existing,
23 keeping readiness, but also moving into modernization of all
24 those programs that we counted on so much across the years.

25 Senator Donnelly: Thank you.

1 Senator Cotton: Senator Sullivan?

2 Senator Sullivan: Thank you, Mr. Chairman.

3 Gentlemen, thank you for your testimony and your
4 service.

5 A number of us worked on the NDAA last year to increase
6 the Army's end strength. What are the numbers that you are
7 looking at right now in terms of your assumptions on
8 planning going forward, and what do you think the optimal
9 number would be from an end strength standpoint?

10 General Anderson: Hi, Senator. Good to see you.

11 Senator Sullivan: You too, General.

12 General Anderson: Growing that 1.013 is the sweet
13 spot, Senator Sullivan. What did I say? \$1.018 million is
14 the sweet spot. That is the 476 in the active to 343 in the
15 Guard and the 199 in the Reserves. And the priorities are
16 to get to those numbers. It is then to fill -- I spoke
17 earlier about trying get our units back manned up to 100
18 percent, sir. So we are hovering about 95 and the non-
19 available is down in the 80s. And then we are trying to buy
20 back some more combat capabilities that were scheduled to go
21 away. And then we are trying to buy some other
22 capabilities, light fires and air defense, shore enablers
23 that we need from the European plan.

24 Senator Sullivan: Just following up on the previous
25 testimony, when you look at the Air Force, they are always

1 talking about fifth gen in terms of fighters. Right? So
2 F-35's, F-22's, and obviously those have been developed to
3 take on a fifth gen adversary, China or Russia, in their
4 development.

5 So are you saying that in terms of the main weapon
6 system for the Army, the Abrams tank -- we do not have any
7 kind of next gen battle tank that we have envisioned or
8 planning or working on? What is the Army's equivalent of
9 the F-35? And maybe that is not a great analogy because
10 that did not come off so well. But I think now the
11 capability in terms of what that aircraft and the F-22's are
12 able to do is pretty darned impressive. Is there an Army
13 analog in terms of a big, kind of a next gen platform that
14 we need and that we know the Russians and the Chinese are
15 developing similar advances in technology in main battle
16 systems?

17 General Murray: There are those out there that will
18 disagree with me. I think for the very near term I think
19 the Abrams is still towards the top of its class in terms of
20 combat systems, in terms of tanks.

21 Senator Sullivan: Towards the top, General?

22 General Murray: I think we have parity. I think there
23 is parity out there. I do not think we have overmatch.

24 Senator Sullivan: We do not want a fair fight.

25 General Murray: I would agree with you, Senator.

1 Now, General Dyess mentioned next generation combat
2 vehicle development going on at Benning. That is the start
3 of it. But the problem we have is it is just not the tank.
4 So the infantry carrier, the next generation combat vehicle.
5 We have got to figure out what comes after Patriot, Avenger,
6 THAAD in terms of layered air defense systems. We have
7 begun some work on FVLs. As you know, that is a program
8 that is progressing for our aviation fleet. The replacement
9 for the 113 is starting to go into low-rate production.
10 That is AMPV. And you mentioned this -- and the F-35 is no
11 exception -- it is time. So it is time. So it is really a
12 balancing of resources, risk, and time so you deliver the
13 right solution.

14 One of the problems we have with heavy armor right now
15 is this next upgrade of the Abrams will, once again,
16 increase the weight. And we are just about reaching the
17 limits of what we can do with the Abrams. So it is time for
18 us to start looking at next generation tech.

19 What I worry about is there is nothing on the near
20 horizon that indicates a fundamental breakthrough in
21 technology where we can come up with a lighter tank. And I
22 think we would be mistaken to build another 75-ton tank as
23 long as protection requirements are where they are. So we
24 are not waiting on that technology. Let us go back to your
25 point, Senator, we need to be very careful about what

1 technologies we count on when we go down this path so we do
2 not end up with another program that cannot deliver.

3 Senator Sullivan: Thank you.

4 I have two more quick questions. Now that we have
5 deployed with the European Reassurance Initiative, it is a
6 very kind of different kind of deployment than we have been
7 doing, say, in Iraq and Afghanistan. Are we seeing
8 capabilities, now that we are on the ground there, that we
9 need to kind of refine or get back the muscle memory? That
10 is kind of big Army deployments, looking across the plains
11 of Europe, serious potential adversary. How are we thinking
12 about that?

13 General Anderson: I will start and Mike can follow up,
14 sir.

15 That is what we kind of knew before we got there. So
16 with the brigade brought, obviously, enhanced armor, but the
17 issue has become again the long-range precision fires and
18 that gap that we have been trying to fill here for quite a
19 while in all things air missile defense. And the way we are
20 getting around that is with our NATO partners just like the
21 Romanians that are going to send a battery to join our EFP
22 formations starting here next month. So through the synergy
23 of NATO, we will build some of those capabilities, but
24 again, the issue becomes the longer-term plans to enhance
25 those capabilities.

1 General Dyess: I would like to add on that probably
2 training and leader development may be the thing that is the
3 best investment at least in the short term because we have
4 not exercised the muscle memory of full spectrum operations.
5 We are starting that in our combat training centers. And so
6 what we are seeing is that the colonels and higher have
7 exercised that before, but below that, lieutenant colonels
8 and below have not exercised in that and have, rightfully
9 so, spent their resources to protect soldiers' lives, take
10 soldiers to combat, bring them back in the last 15 years.

11 Senator Sullivan: Well, I am out of time. General
12 Anderson, I would not end a hearing without mentioning the
13 425 and the appreciation we have had for you guys
14 reevaluating that. And I want to make sure you do keep in
15 your training continued focus on the cold weather ops in the
16 Arctic. I mean, if the North Korea -- the balloon goes up
17 there, we are going to need soldiers who know how to operate
18 in extreme temperatures in a mountainous terrain. That unit
19 is doing a great job in those kind of environments. Thank
20 you.

21 Senator Cotton: Cold weather mountainous training in
22 the Ozark Mountains of Arkansas, which I strongly support.

23 [Laughter.]

24 Senator Cotton: General Murray, you said that the
25 Abrams is near the top and at parity. Whose tracked

1 vehicles are near the top with the Abrams?

2 General Murray: I think the Israelis, the Merkava,
3 would be one. I would say that the T-90 is probably pretty
4 close. I mean, people talk about the Armada tank, and it is
5 still in my mind not completely fielded. Probably the
6 British tank is pretty close. I would not say that we have
7 the world class tank that we had for many, many years. I
8 will be the optimist and say that we are at parity with a
9 lot of different nations.

10 Senator Cotton: Thank you.

11 Senator Peters?

12 Senator Peters: Thank you, Mr. Chairman.

13 Thank you, gentlemen, for being here and your
14 testimony. Thank you for your service.

15 As we are talking about kind of the future of warfare
16 and new systems that are being developed, I am from Michigan
17 and we are in the process right now of a transformation of
18 the auto industry in ways as every bit as big as when the
19 first car came off of the assembly line with Henry Ford, and
20 that is in self-driving autonomous vehicles, which is
21 happening much quicker than I think anyone anticipated,
22 especially with Ford Motors announcement of having a
23 production self-driving car by 2021, just a few short years
24 from now, but certainly many vehicles before that.

25 At the President's address, my guest was Dr. Paul

1 Rogers who is Director of TARDAC, the Army's tank automotive
2 research and development facility, which I know you know
3 very well. They are doing some incredibly innovative work
4 in autonomy and looking at how that might change how we
5 fight wars. Certainly from a logistics standpoint, given
6 the fact -- my understanding is -- we had more casualties in
7 logistics in Iraq than in combat because it is pretty
8 dangerous to drive a fuel truck and other types of vehicles
9 with mines and attacks along that route.

10 I just want to kind of get a sense from you as to where
11 do you see autonomy self-driving in either combat vehicles,
12 logistics vehicles. Are we able to build some partnerships
13 with the auto industry and work with some of the incredible
14 engineering talent we have in the greater Detroit area where
15 I see both the Department of Defense and the private sector
16 working in ways that could be very transformative, kind of
17 get your vision of where you see autonomy when it comes to
18 land combat vehicles and logistics vehicles.

19 General Murray: Thank you, Senator.

20 As you know, we already do this in the air, so the man-
21 to-man teaming concept. And we are looking at something
22 very similar. So in terms of concepts, robotic wingmen for
23 ground systems. And so you have potentially a manned combat
24 system paired with one or more unmanned system in the
25 future. We fundamentally think that at some point in time

1 as we progress, that we should never send a soldier into the
2 most dangerous thing that soldiers do, for instance,
3 breaching obstacles, first man into a room, you know, if you
4 are clearing a building, et cetera, et cetera.

5 And there are two specific programs I am sure Dr.
6 Rogers has talked to you about. The one TARDAC is working
7 on right now is called leader-follower technology. And that
8 is one leader vehicle up to seven follower vehicles. It is
9 a little bit more complicated than what is going on in the
10 civilian industry right now because we are talking off-road,
11 cross-terrain. So it is a little bit more difficult than
12 I-75 in Michigan, in my home State.

13 And then the other piece we are working on is ESMAT.
14 It is a mule which we have had forever. It is an equipment
15 carrier that is fully automated to follow an infantry squad.
16 It can carry up to 1,000 pounds of ammunition, water, their
17 rucksacks, their batteries. It recharges batteries. So we
18 working that. And we have take both of these to AROC.

19 The problem I have got right now is the cost. And you
20 tied in the auto industry. So when we looked at the ESMAT
21 going online and found that for what we think we need to pay
22 for, what we are being told it is going to cost us to
23 develop, et cetera, et cetera, I could buy a brand new
24 Mercedes for a lot cheaper than I could buy basically just a
25 four-wheel cart that is going to carry 1,000 pounds of

1 equipment, which does not seem reasonable to me.

2 So we are going back and we are working more closely
3 with industry. We are working with some partners, DIUx. We
4 are working with some other partners to find out how we can
5 do this faster and how we can do this cheaper because if it
6 is just one, I can afford it. If I am going to put one of
7 these in every infantry squad across the entire regular
8 Army, the National Guard, it is going to be billions of
9 dollars we would end up spending on this. So I have got to
10 figure out how to get the price point down.

11 General Dyess: Senator, I sponsored a RAND study about
12 4 years ago, and one of the biggest obstacles to fielding
13 robotic capability in formations is trust and culture. I
14 think the tipping point is going to be the sergeant 1st
15 class, the E-7. As soon as he can adopt that in, I think
16 that will be the tipping point for us.

17 Now, that does not mean that we will back away from
18 ground robots. I think it is going to be part of our
19 future. We just got the approved robotics autonomous
20 systems strategy from the Vice Chief of Staff, and we are
21 starting to work that and publicize that now. So I think
22 robotics are going to be part of our future. Obviously, air
23 is already there. Ground I think will be in the future as
24 well. But I think we have to overcome a trust and culture.

25 Senator Peters: Yes, certainly. I think that is in

1 the civilian sector as well. Folks who like to drive
2 automobiles to be able to sit back and let that automobile
3 drive you and your family down the highway will take some
4 time to get to that point. So certainly it is the same in a
5 combat situation.

6 But actually, General Murray, I was up in Michigan Tech
7 who I know is working with TARDAC and with others to take
8 these vehicles through a forest situation which is much more
9 complicated than the I-75 drive with gulleys and the like.
10 But I am pretty impressed with the work that is being done.
11 It has happening very quickly. And as far as the cost
12 element, obviously, the civilian world has to worry about
13 that too to make these production ready and probably
14 initially will be in fleets like the Ubers and Lyfts and
15 others. But as they produce more, those costs will go down
16 and I am sure will be working hand in glove with you as well
17 to make sure that happens with your vehicles.

18 But thank you. Thank you for the comment.

19 Senator Cotton: Senator Warren?

20 Senator Warren: Thank you, Mr. Chair.

21 So for thousands of years, human beings have been
22 fighting wars, and for thousands of years, there has been
23 one constant and that is how much stuff can a person carry.
24 That just has not changed. And today we can put gear in the
25 hands of a soldier that would have been undreamed of even a

1 decade ago. But every time we do that, we load that soldier
2 down, and that means less mobility, getting tired faster.

3 And so I want to focus on that part when we are talking
4 about equipment, and that is I am really interested in the
5 research that is going on now that makes what a soldier does
6 both more effective but also lighter, more manageable, how
7 much stuff they are carrying around.

8 I am interested in this because I have had a chance to
9 go multiple times now to the Natick Soldier Systems Center
10 in Natick, Massachusetts. And it is this incredible
11 facility that is doing this cutting-edge work on fabrics,
12 for example. It is amazing stuff. Lightweight fabrics now
13 that can monitor a soldier's vital signs, batteries that can
14 generate power from soldier's own movements, lightweight
15 helmets that are both more comfortable and more bulletproof
16 than in the past.

17 So I just wanted to ask a question -- I thought I would
18 start with you, General Marion, but I want anybody to weigh
19 in on this that has some ideas -- about speaking to one or
20 two areas in personnel equipment that you think right now
21 show the most promise or areas where you think the greatest
22 need is in terms of development and testing.

23 General Marion: Well, thank you, ma'am.

24 I think the single area that I would talk to most is
25 lightweight body armor. The research, development, and

1 engineering was done at Natick labs. So what we have been
2 able to find through testing recently is that we had the
3 same level or greater protection for up to 26 percent less
4 weight. And that is weight that we cannot off board to a
5 mule or something else. That is protecting a soldier. So
6 water, food, things like that, we can, but we do not want to
7 do that with body armor.

8 So some other things that we have done --

9 Senator Warren: Can I say before you leave body armor
10 -- I just want to get a little pitch in here too because for
11 the first time I have seen a body armor that is different
12 for women than for men and how much more comfortable that is
13 and how much more effective that is.

14 General Marion: Yes, ma'am. The vest that the soldier
15 wears that these armored plates go into -- those vests are
16 now being designed from the smallest stature soldier we
17 have, the 5th percentile female, up to the largest stature
18 soldier we have, the 95th percentile male. So we have a
19 variety of sizes of vests. And because of that, we can size
20 the plates appropriately so a soldier does not have to carry
21 a larger plate than they should be. So I think we are
22 making all the movements in the right directions, and the
23 testing is going well for those specific lightweight body
24 armor components.

25 And by the way, we just awarded yesterday a contract

1 for that lightweight Army combat helmet that you just
2 referenced. So we are on the right track there too.

3 Senator Warren: Good. Anything more? I think I may
4 have distracted you. Were you about to go to another one?
5 So we are on body armor. Right? Good.

6 Anybody else want to add anything? General Anderson?

7 General Anderson: Ma'am, it has been a problem since I
8 was a lieutenant. So the issue becomes again -- and it goes
9 back to what Bob is talking about. There are certain things
10 besides PPE. So as we watched over all these years when we
11 went to Iraq back in 2003 as all this stuff kept getting
12 added to us like a Christmas tree, side plates, groin
13 plates, neck plates. All of a sudden, you are becoming a
14 robot.

15 So we will keep working what Bob just described. I
16 think all of us as we keep working -- your basic combat
17 level. Like you said, yes, you have to have the PPE because
18 it protects you, but when it comes to your life support,
19 obviously, your weapon, your night vision devices, your
20 communications equipment, all the efforts we have done in
21 terms of power, you talk about things that can take vital
22 statistics, but batteries, munitions, all those types of
23 things over the years have all come down.

24 But the bottom line is, you know, just being the corps
25 commander at Bragg, we are still throwing guys out of

1 airplanes with 135-140-pound rucksacks coming out of an
2 airplane. So that is not good. That is too bulky. That is
3 too onerous. And when they try to get out of that airplane,
4 they cannot get out of the airplane when you throw on things
5 like a parachute.

6 So we have got to keep working all the parts of your
7 fighting load above and beyond your personal protective
8 equipment, and that is just going to have to be -- you know,
9 Natick has been doing that for a long time, but that is
10 everything from aluminum type magazines to now the new
11 plastic type. So many different examples, but we have to
12 keep working on that effort.

13 Senator Warren: Anything more anybody want to add?

14 General Murray: I would just say the integrated head,
15 neck, face protection -- I think you asked for probably the
16 most promising, the ability to really monitor the vital
17 signs of a soldier, because we cannot do that right now. So
18 a soldier goes out for heat injury. The first time you find
19 out he is going out for heat injury is when he falls flat on
20 his face. So the ability to monitor vital signs so you can
21 get a little of a warning. I think those would be the two
22 most promising.

23 Senator Warren: I have seen some of this stuff in
24 development. Just amazing what it looks like they are going
25 to be able to do on this.

1 Anything more that you want to add?

2 It is very helpful because I realize what we are trying
3 to do here is we are trying to solve for two variables at
4 the same time. We want greater effectiveness, but we also
5 want greater safety. And we want to maximize both of them,
6 and I realize sometimes there are tradeoffs.

7 General Anderson: Soldier effectiveness is what you
8 are talking about. At the end of the day, that soldier has
9 to be able to walk quite a few kilometers with that load and
10 be able to get the job done when he gets there. And if we
11 do not give him the kit to be effective -- but he has got to
12 be able to get there.

13 Senator Warren: I have one other question I want to
14 ask you about. Last week, we had a panel of experts who
15 told this subcommittee that our adversaries are improving
16 their cyber and electronic warfare capabilities. And they
17 are developing the ability to disrupt our communications
18 systems. So that is the other part I want to ask about,
19 about what plans the Army currently has to make sure that
20 communications networks are resilient and they will be able
21 to remain both operational and secure in adverse conditions.
22 Could you say something about that?

23 General Dyess: I will just start, ma'am.

24 Senator Warren: Please.

25 General Dyess: So as we look at the future of a multi-

1 domain battle, we think that we are going to be contested in
2 all those domains, space, cyber space, for example,
3 electromagnetic spectrum, et cetera. That is going to be
4 increasingly lethal. It will be increasingly complex with
5 the urban environment. But we are going to have to operate
6 degraded. So I think we are putting that in our concept
7 work so that will help give us a point of direction to
8 travel in. So it is going to inform the people who make
9 requirements and inform the people who do the doctrine and
10 organization and training and leader development building
11 for requirements. So that is one thing we are putting in to
12 define the operational requirement. That is going to be a
13 tenet of a future battlefield for sure.

14 General Murray: So that near term, in the future,
15 ma'am, so it will not come as a surprise to anybody that our
16 adversaries have the ability to do cyber attacks. And the
17 EW piece, the ability to affect our system right now, that
18 is not a future capability. They have that right now. So
19 we are getting after that several ways.

20 So in terms of a defensive standpoint, so assured P&T,
21 the ability to use GPS signals is very, very important to
22 us. And so we are working about five different lines of
23 effort to make sure we can guarantee that our systems can
24 continue to rely upon --

25 Senator Warren: So this is about resilience and

1 about --

2 General Murray: It is resilience.

3 Senator Warren: -- duplication in effect. So if they
4 knock out one way to do it, we are right back on line with a
5 second or a third or a fourth.

6 General Murray: We are looking at little things like
7 the atomic clock. So if we lose GPS, the atomic clock has
8 the ability to provide the same type of timing that GPS
9 does.

10 We are also looking at in terms of -- so a COMSEC
11 modernization piece of it so to make sure we can have the
12 secure communications.

13 There is also a big training piece of this that we have
14 not really worried about this for the last 15 years. So how
15 do you operate in that type of environment?

16 And we are also looking at offensive capabilities so we
17 do not have a radiation-seeking warhead right now. So we
18 are looking at development of a radiation-seeking warhead
19 and the ability to identify where that jamming is coming
20 from in terms of EW and be able to address that through an
21 offensive role too.

22 Senator Warren: Good.

23 General Dyess: One other thing is experimentation. We
24 need to be able to experiment with these things. At Fort
25 Bliss, White Sands, we own the entire electromagnetic

1 spectrum. So there are some capabilities that we are going
2 to find on the future battlefield that we are not going to
3 be able to replicate at home stations or even at our CTCs
4 because it is on the flight path into LAX. We cannot turn
5 it on.

6 Senator Warren: You cannot do that in Boston.

7 General Dyess: Exactly. So simulations I think is
8 going to be important. So brigade commanders and division
9 commanders understand the capability. But to be able to now
10 experiment -- I always thought it was not right to attack a
11 brigade combat team with cyber at a national level and not
12 have a national defense capability out there. So the last
13 year, we sent out a defense capability. They identified a
14 machine that was attacking the network, isolated it. The
15 brigade commander wanted that machine back in the fight
16 because that is part of his combat power. And so we were
17 not able to do that 2 years ago, but last year we were able
18 to do it. And you have to be able to experiment with this.

19 Senator Warren: I appreciate the point you make about
20 hardware and about training and just how people conceive of
21 the problem. Good.

22 Anything more?

23 General Anderson: So you know, ma'am, we do do two EW
24 cyber rotations at the National Training Center per year.
25 The goal is to be able to do that every rotation. But those

1 are massive focused. It takes a lot of enablers to come out
2 there and do that. But how you try to operationalize cyber,
3 EW because most commanders do not understand it and do not
4 have the capabilities like Bo is talking about. So those
5 are phenomenal opportunities to have them perform in a
6 degraded environment.

7 But the bottom line boils down to how are you able to
8 go from digital to analog. Mike is talking about GPS. You
9 have got to be able to land nav the old-fashioned way, read
10 a map. You got to be able to track a battle the old-
11 fashioned way on an acetate map. And that is the way we
12 move forward. And so places like Muscatatuck in southern
13 Indiana have actual cyber. It is actually cyber facility
14 where you can shut off power grids and you can shut off
15 water. You can pick locks inside of a prison, et cetera.
16 And that is the way commanders can learn.

17 But, Senator King, the sad thing about your AAR comment
18 is what Bo was talking about. We do have the facilities at
19 White Sands but the problem we have at NIE, our network
20 integration exercise, and our experimentation stuff -- the
21 problem was because of the demand on forces. We did learn
22 back around 2009-2010 it was worth having a direct dedicated
23 unit to do testing. Well, the reality of the demand I was
24 explaining to you earlier -- we cannot afford to keep that
25 armored brigade team at Fort Bliss to do that anymore. So

1 we have to train rotational units to come back to do the
2 testing. But we did learn how to fix it. But the reality
3 of the world, based on particularly Russia, caused us to
4 have to go heel to toe in Europe, and there goes that test
5 brigade.

6 Senator Warren: Thank you very much. I recognize we
7 cannot be effective, we cannot be safe if we cannot
8 communicate when we have got people out in the field and the
9 importance of the R&D on resilience but also the importance
10 of training. I appreciate the work you are doing. Thank
11 you.

12 Thank you, Mr. Chairman.

13 Senator Cotton: I would like to return to some of the
14 questions I raised in my opening statement.

15 Does the Army need a modernization command, unity of
16 effort, agility to stay ahead of the threat and innovation?
17 General Anderson, do you want to take swipec at that?

18 General Anderson: Sir, it is something we talk about
19 all the time. It is what TRADOC is all about, Senator. I
20 think that is why it exists. When you look at what the
21 centers of excellence are doing as subsets of TRADOC, I
22 think the problem has become -- a lot of those have become
23 stovepiped entities. And I think the issue becomes the
24 integration -- and Bo and I were just talking about that
25 today about how you have the operators. You have the TCMS

1 and the operators. Who is figuring out what the requirement
2 is? But I do not think a modernization command is the
3 answer. I think within TRADOC we have between what CAC
4 does, what ARCIC does, and the center of excellence does. I
5 think the issue is how do you get better collaboration
6 between them and then between the operational force.

7 Senator Cotton: General Murray?

8 General Murray: Sir, I am with General Anderson on
9 this primarily. And when we have looked at this in the past
10 -- and I have thought about it extensively -- I would be
11 fearful that you would lose focus on what soldiers need
12 right now and you would become almost solely focused. So it
13 would be almost a change 100 percent of the problem we have
14 right now. We would be worried about 2035, 2040, and then
15 we would find ourselves short in the near term because that
16 was always my dilemma is if you got requirements being built
17 in this modernization command, who is doing the work that
18 ARCIC is doing right now in terms of looking at right now.
19 I am not saying it could not work. I am not convinced of
20 what the problem is we would actually fix with standing up a
21 new command.

22 Senator Cotton: General Dyess?

23 General Dyess: And I think what General Murray said is
24 on problem statement and problem identification is
25 important. We have identified 20 first-order problems, the

1 solutions to which would make the Army better. Those are
2 the Army warfighting challenge. You keep it out of the
3 stovepipes. You put the Army warfighting challenge --
4 number one is develop situational understanding. Now, that
5 is not a Huachuca intel problem and that is not a Fort
6 Benning maneuver problem. It is not a Fort Sill fires
7 problem. It is everybody's piece of the solution. So that
8 is how we are trying to address it, Senator, is put the
9 warfighting challenge on the table and then develop cross-
10 cutting solutions to answer that.

11 Senator Cotton: General Marion, I think I would like
12 turn to you to DCGS-A as I raised in my opening statement,
13 billions of dollars. The NDAA in fiscal year 2017 directed
14 the Army to start seeking a commercial solution, and that
15 was the compromise softer, weaker version of the provision.
16 Where do we stand on DCGS-A?

17 General Marion: Yes, sir. In the Army, we are clear
18 on the path ahead on DCGS-A. In the fiscal year 2017 NDAA,
19 section 113 referenced using commercial, off-the-shelf
20 products, the prescription for firm fixed-price contracts,
21 and timelines directly to initial operational capabilities
22 and full operational capabilities. So we are exactly
23 tracking the intent of section 113 and also section 220, the
24 specific reference to post-increment one activities and the
25 requirement to restructure the program and also use of COTS

1 as well.

2 So our Chief of Staff is intimately involved in what we
3 are doing to restructure the program. We are clear on the
4 requirements from both sections of the NDAA, and the Chief
5 has taken several briefings and is coming to a decision
6 point on how we are going to move forward on restructuring
7 DCGS-A to meet the requirements and also the provisions of
8 the NDAA.

9 Senator Cotton: Is that at every echelon level?

10 General Marion: Yes, sir. That is battalion and below
11 at the tactical echelons. And of course, section 220 says
12 everything beyond increment one.

13 General Murray: Senator, I think you are tracking what
14 we are doing at battalion and below almost right now. So we
15 have gone out to industry with basically just a list of
16 requirements -- they are not the approved requirements for
17 the solution -- and invited industry to come in with what
18 they have commercial, off-the-shelf that they think can meet
19 the requirements.

20 Very soon here then this month, beginning of next
21 month, they will show up. About nine, I think, vendors will
22 show up at Fort Huachuca, and we will take them through a
23 series of tests using real soldiers, both officers, warrant
24 officers, and enlisted, each vendor individually just to
25 prove out what they said they can meet in terms of the

1 requirements. Then we will kind of figure out really what I
2 think is -- the real intent of prototyping is what the exact
3 requirements are we need in the future and whether or not
4 there are civilian solutions or off-the-shelf solutions out
5 there that can meet the requirements. And if there are not,
6 do we need to change the requirements before we go after a
7 developmental program.

8 Senator Cotton: Thank you.

9 Senator King?

10 Senator King: I am a great believer that structure is
11 policy. If you have a messy structure, you end up with a
12 messy policy. And so I keep coming back to how is the
13 procurement process structured. Just a few thoughts.

14 One question. When you are setting requirements, are
15 construction engineers or representatives of the industrial
16 base involved in defining the requirements?

17 General Murray: Well, industry is involved, yes, sir.
18 So what we are trying to do right now --

19 Senator King: I am just wondering if there is somebody
20 at the table who says that is impossible or --

21 General Murray: In the past, the answer would be no.
22 So what we are driving right now is when a requirement gets
23 written at Fort Benning, Georgia, it is more than just
24 somebody understands -- so it is our S&T folks. They
25 understand TRL levels, the technology readiness levels,

1 associated with what we are talking about. It is the
2 acquisition people. So they understand the acquisition
3 process. As we write the requirements, it is the testers.
4 So they understand as you write requirements, the testing
5 requirements, so we do write a requirement that is going to
6 take 2 years to test --

7 Senator King: So the answer to my question is yes.
8 Practicality and buildability is part of the requirements
9 process.

10 General Murray: Yes, sir.

11 Senator King: You mentioned several times off-the-
12 shelf. You also mentioned or one of you mentioned in your
13 testimony other good tanks. The Israelis I think you
14 mentioned, the British. I understand there is not
15 necessarily a tank but a fighting vehicle the Germans make
16 called the PUMA. What about buying the design and building
17 them here? I mean, why do we have to reinvent and do all of
18 our own if there is a really good top-range vehicle out
19 there that meets our needs? That would be another way to
20 accelerate this process instead of going through 5 years of
21 design and requirements. If the Israeli tank or the German
22 tank is 80 or 90 percent of what we want -- I do think it
23 should be built here, but it could be licensed and built
24 here. What about that as an option?

25 General Murray: We have looked at it not necessarily

1 in the tank. And I will talk about the PUMA. So, for
2 instance, we have got some munitions gaps, and we went to
3 the Germans in this case and looked at specifically their
4 munitions. And it came down to a capacity issue, and it
5 came down to the cost was exorbitant in terms of what the
6 munition would cost primarily because of the capacity. It
7 was a cold production line. And then applied it to the
8 PUMA.

9 Specifically the PUMA, I think we do not understand
10 yet, sir, what the requirement is for the combat vehicle.
11 So as you move to this fundamental change in the character
12 of the war, one thing that General Milley is convinced is
13 that we will absolutely be fighting in dense urban areas.
14 So as we looked at the mobile protected fire power platform,
15 one of the key things that is driving him is how wide is it,
16 how tall is it, how long is it. If you look at the PUMA,
17 specifically the PUMA is wider, taller, and longer than our
18 current infantry fighting vehicle. And we are trying to go
19 the other direction. That is just one example.

20 For the MPF, we did have foreign competitors, foreign
21 manufacturers come in and bid -- or not bid yet, but present
22 proposals for MPF.

23 And if we go through the requirements process and there
24 is a foreign manufacturer that can produce inside the United
25 States, we will be absolutely thrilled to get them into the

1 competition.

2 Senator King: A couple of other points. At our
3 hearing last week, we had testimony that Silicon Valley
4 basically will not deal with the Pentagon, too cumbersome,
5 too long, too aggravating. That is a real problem. I mean,
6 if our most creative, innovative sector of our whole economy
7 says I just do not want to deal with this procurement
8 system, it seems to me that in itself is something that
9 should make us rethink it or meet with them. What is the
10 problem so we can try to try to improve it? We cannot
11 afford to lose that level of creativity and inventiveness
12 because our systems are so slow and cumbersome and
13 burdensome. I just commend that to you. I would suggest a
14 summit meeting in San Jose about what are the issues and how
15 do we improve this program.

16 I am worried about the industrial base and the length
17 of time these things take. And there is a danger to the
18 industrial base. And this one is partially on us because of
19 this herky-jerky budget process that we have. You cannot
20 predict. And it seems to me the budget process that we have
21 hurts modernization probably more than any other area
22 because you cannot --

23 General Anderson: Installations too, sir.

24 Senator King: Is that true?

25 General Anderson: Installations too. So if

1 installations are going to be a power projection base, which
2 they are, but you are going to have crumbling taxiways,
3 runways, ranges, simulators, et cetera, it is pretty
4 comparable.

5 But on DIUx, we did order a team out there in 2015. We
6 went to them, sir. So, obviously, you are right. Tough
7 coming to us, but we are just one subset of the Pentagon.
8 So we did establish a liaison team there, started with three
9 with a goal to grow to about 10. And the issue is again how
10 do they help us sort through and see things through on
11 software, cyber, autonomous systems, artificial
12 intelligence, et cetera.

13 Senator King: But I would also add to that list of
14 items the process itself as it relates to their ability to
15 interact with the Pentagon.

16 General Anderson: No argument. We need to figure that
17 out. But a bridge to that solution was to at least get
18 embedded with them so we did not lose the opportunity.

19 Senator King: Another opportunity -- and I hate to
20 raise the word "joint" because it does not have a very good
21 history in military procurement. But if you are doing body
22 armor, for example, should you not be working with the
23 Marines on that project? The same thing with the fighting
24 vehicle. And I know there were efforts on a joint fighting
25 vehicle. But to the extent that that can be done without it

1 ballooning the requirements and ending up with a vehicle
2 that will not work, I hope that that is still part of the
3 picture.

4 General Murray: It is, Senator. So we do have a
5 quarterly Army-Marine Corps board to focus. That is when we
6 talk mostly about multi-domain battle, so you know, a
7 concept. But most of those boards are joint development.
8 So JLTV is a joint program. In terms of small arms
9 ammunition, we are working with the Marine Corps. In terms
10 of future vertical lift, Cape Set 3, we are working with the
11 Marine Corps. So we work very, very closely. Body armor is
12 another one. We discussed about specifically the female
13 body armor about 6 months ago. So we do, about every 3
14 months, get together, and those types of conversations
15 normally drive the agenda.

16 Senator King: Good. Well, we are really just
17 beginning the discussion here. But my time has expired.
18 But I want to thank you and urge you to maintain contact
19 with the committee and with us as we work toward the new
20 National Defense Authorization Act to try to capture what
21 you need, other than regular funding. I understand that is
22 important, but other areas of reform, structural reform,
23 whatever we can do to try to accelerate this process because
24 I do not want to face an adversary and have somebody say,
25 well, we would have been ready but we could not work

1 together or whatever the barriers were. We have got to get
2 this right. Thank you very much, gentlemen.

3 Senator Cotton: Thank you all, gentlemen, for your
4 testimony today and your many years of service to the
5 country.

6 The hearing is adjourned.

7 [Whereupon, at 4:48 p.m., the hearing was adjourned.]

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25