**Advance Policy Questions for Michael Griffin**
**Nominee for Under Secretary of Defense for Research and Engineering**

## Department of Defense Reforms

**The National Defense Authorization Acts for Fiscal Year 2017 and 2018 included the most sweeping reforms since the Goldwater-Nichols Department of Defense Reorganization Act of 1986.**

1. **Do you support these reforms?**

   Yes

2. **What other areas for defense reform do you believe might be appropriate for this Committee to address?**

   With the leadership of this committee, the Fiscal Years 2016 and 2017 (FY 16 and 17) National Defense Authorization Acts (NDAAs) enacted by Congress present a unique opportunity to make major, meaningful reforms to the Department of Defense (DoD). I know that as we implement these reforms we will find other areas that may also offer benefits if changed. If confirmed, I look forward to working with Congress to implement properly the reforms already on the table, and to identify potential changes in other areas.

## Duties and Qualifications

3. **What is your understanding of the duties and functions of the Under Secretary of Defense for Research and Engineering?**

   The Under Secretary of Defense for Research and Engineering (USD(R&E)) is the principal staff advisor to the Secretary and Deputy Secretary of Defense for research and engineering matters. The USD(R&E) serves as the Chief Technology Officer for the Department of Defense.

4. **What background and experience do you possess that qualify you to perform these duties?**

   I believe my multidisciplinary background and long service in government, the private sector, and academia have prepared me well for this position.

   Prior to confirmation as NASA Administrator in 2005, I served as Space Department Head at Johns Hopkins University's Applied Physics Laboratory. I was previously President and Chief Operating Officer of In-Q-Tel, Inc., and also served as Chief Executive Officer of Orbital Science Corporation's Magellan Systems division, and General Manager of its Space Systems Group.

During my earlier career at NASA, I served as Associate Administrator for Exploration from August 1991 through March 1993, and then became Chief Engineer in March 1993 through January 1994. Before joining NASA, I served as Deputy for Technology at the Strategic Defense Initiative Organization, the antecedent of today's Missile Defense Agency.

In academia, from 2009-12 I held the King-McDonald Chair in Mechanical and Aerospace Engineering at the University of Alabama in Huntsville. Earlier in my career I was an adjunct professor at the University of Maryland, the Johns Hopkins University, and the George Washington University, where I taught courses in spacecraft design, applied mathematics, guidance and navigation, compressible flow, computational fluid dynamics, spacecraft attitude control, astrodynamics and introductory aerospace engineering.

5. **Do you believe that there are actions you need to take to enhance your ability to perform the duties of the Under Secretary of Defense for Research and Engineering?**

I believe that I have the necessary background, skills, and ability to perform the duties of the USD(R&E).

6. **If you are confirmed, what duties and functions do you expect that the Secretary of Defense will assign to you?**

If confirmed, I expect the Secretary to assign me duties and functions commensurate with those of a Chief Technology Officer, and any other duties the Secretary may deem appropriate.

**Relationships**

**Section 133a of title 10, United States Code, discusses the duties and powers of the Under Secretary of Defense for Research and Engineering. Other sections of law and traditional practice also establish important relationships outside the chain of command. Please describe your understanding of the relationship of the Under Secretary of Defense for Research and Engineering with the following:**

7. **The Deputy Secretary of Defense**

If confirmed, I would work closely with the Deputy Secretary to provide advice and assistance commensurate with the role of a Chief Technology Officer, including the development of new systems through the operational prototyping phase, demonstrating expedited approaches to the acquisition of new systems, transitioning technology to the field, prioritizing science and technology investments, supporting a culture of institutional innovation, and leveraging technology to enhance current and future military capabilities. The Deputy Secretary of Defense and I believe in the

Department's mission to American technological superiority, and I very much look forward to working with him on this effort.

**8. The Chief Management Officer of the Department of Defense**

If confirmed, I would work closely with the Chief Management Officer to ensure our programs are as cost-efficient as possible, so as to impose the least possible burden upon the American taxpayer.

**9. The Under Secretary of Defense for Acquisition and Sustainment**

If confirmed, I would work closely with the Under Secretary of Defense for Acquisition and Sustainment to ensure our research and engineering needs are synchronized with the Department's acquisition and sustainment processes so that we are best-positioned to accelerate the delivery of new warfighter capabilities.

**10. The Under Secretary of Defense for Intelligence**

If confirmed, I would work closely with the Under Secretary of Defense for Intelligence to ensure our research and engineering needs are synchronized across the Department. I believe intelligence on emerging adversary capabilities is critical to informing and shaping our defense research and engineering programs.

**11. The Under Secretary of Defense (Comptroller)**

If confirmed, I would work closely with the Under Secretary of Defense (Comptroller/Chief Financial Officer) to ensure that investments in research and engineering meet the overall priorities of the Department and are managed in accordance with DoD policy.

**12. The Under Secretary of Defense for Personnel and Readiness**

If confirmed, I would work closely with the Under Secretary of Defense for Personnel and Readiness to ensure that our current research and engineering workforce is ready to support the needs of the Department, and to ensure that the technical talent necessary for the future readiness of our forces would be available to the Department.

**13. The Service Secretaries**

If confirmed, I would work to foster a close working relationship with the Military Departments to support their research and engineering priorities and technology investments and to ensure that the overall Department research and engineering portfolio is aligned and balanced.

**14. The Service Acquisition Executives**

If confirmed, I would work closely with the Secretaries of the Military Departments and the Service Acquisition Executives on research and engineering matters that leverage technology for their missions on the development of new pathways and support joint capability development.

**15. The Service Science and Technology Executives**

The Service S&T Executives are responsible for developing and executing the science and technology programs for their respective Service. If confirmed, I would work to share technical insights and to ensure that the overall DoD S&T investment is coordinated across the department, and provides the best possible military capabilities and return on the taxpayer's investment.

**16. The Directors of Department of Defense Laboratories and Research Centers**

If confirmed, I would work closely, through the heads of the DoD components, with the Directors of Defense Laboratories and Research Centers to provide them with the guidance, resources, and support needed to deliver technology in support of DoD needs. I would also work to establish and maintain standards for laboratory and research center performance.

**17. The Director of the Defense Advanced Research Projects Agency**

As the Defense Advanced Research Projects Agency (DARPA) will fall under the purview of the USD(R&E), if confirmed, I look forward to providing guidance and direction to a team that champions the development of new technologies that have a profound impact on national security in accordance with DoD Directive 5134.10.

**18. The Director of the Defense Threat Reduction Agency**

If confirmed, I would work closely with the Director of the Defense Threat Reduction Agency to ensure we share our technologies in order to counter possible enemy attacks of mass destruction (chemical, biological, radiological, nuclear and high yield explosives).

**19. The Joint Staff**

If confirmed, I would work closely with the Joint Staff to consider technology options and alternate mission capability approaches to enhance DoD systems and ensure our warfighters are affordably equipped with superior warfighting capabilities.

**20. The Director of the Defense Test Resource Management Center**

The Defense Test Resource Management Center which strives to enhance national test and evaluation infrastructure, support sustained investment in the Major Range and Test Facilities Base, and explore modelling and simulation techniques to enhance the effectiveness and efficiency of test and evaluation of DoD systems will fall under the purview of USD (R&E). If confirmed, they will be part of my organization, and I look forward to leading the team in continuing this mission.

**21. The Director of Operational Test and Evaluation**

If confirmed, I would work with the Director of Operational Test and Evaluation, to include consideration of technology options and alternate procedures for enhancing the operational effectiveness, suitability, and survivability of DoD systems. I would also work to optimize test and evaluation activities to the greatest extent possible to eliminate duplicative testing, and expedite evaluations to bring systems to the warfighter cheaper and faster. I believe operational testing has a critical role in identifying weapon system vulnerabilities that jeopardize warfighter efficacy, before the department makes a full-rate production decision.

**22. The Department of Defense Chief Information Officer**

If confirmed, I will work closely with the Chief Information Officer (CIO) on cross-cutting joint information assurance and information management issues and ensure the CIO is engaged on the development of architectures encompassing critical information capabilities.

**23. The Director of the Defense Information Systems Agency**

If confirmed, I would work closely with the Director of the Defense Information Systems Agency to support the provision, operation, and surety of the Department's globally accessible enterprise information infrastructure, command and control, and information-sharing capabilities.

**24. The Director of the White House Office of Science and Technology Policy**

If confirmed, I would work closely with the Director of the White House Office of Science and Technology Policy to support the development of national technology strategy with areas relevant to national security.

**25. The Director of the Defense Innovation Unit Experimental**

Working with the Director of the Defense Innovation Unit Experimental, I will ensure that we promote outreach to non-traditional vendors as a key component of retaining technological superiority and more rapidly providing capability to the warfighter.

**26. The Director of the Strategic Capabilities Office**

Working with the Director of the Strategic Capabilities Office, I will ensure that DoD leverages new uses for mature technologies already demonstrated in either military applications or in the commercial sector in ways that produce near-term solutions.

**Relations with Congress**

**27. If confirmed, what actions would you take to create a productive and mutually beneficial relationship between Congress and the Under Secretary of Defense for Research and Engineering?**

Open and frequent communication is the bedrock of any good relationship. If confirmed, I will ensure that there is regular, frequent, open, and honest communication with Congress from within the organization. To the maximum possible extent, I will make myself available to the Congress for this purpose.

**Reorganization and Reform of the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics**

**If confirmed, you will be the first Under Secretary of Defense for Research and Engineering.**

**28. What is your vision for the Office of the Under Secretary of Defense for Research and Engineering? In what ways will it differ from its predecessors?**

I believe that the Chief Technology Officer (CTO) for the Department of Defense (DoD) should set the strategic technical direction for the Department -- a direction that will ensure that the United States retains its technical superiority throughout the world. The Chief Technology Officer should establish policies for and monitor all defense research and engineering, technology development/transition, prototyping, experimentation, and developmental testing. He or she should champion the DoD Science and Technology (S&T) Enterprise (comprised of DoD laboratories/engineering centers, Federally Funded Research and Development Centers (FFRDCs)/University Affiliated Research Centers (UARCs), industry, academia, and our allies as well as leverage relationships with industry both traditional and nontraditional to inform the defense industrial base about the Department's strategic direction while maintaining an awareness of industry internal research and development (IRAD) efforts.

Beyond the task of setting the strategic technical direction for the DoD, it is incumbent upon the USD(R&E) to bring the technologies and innovations that we champion out of the laboratory and into the field, through development and into the operational prototyping phase. Further, and using the expanded authorities provided to USD(R&E) by the FY17 and FY18 NDAAs, a key mission of the USD(R&E) is to demonstrate the efficacy and utility of expedited acquisition approach for systems under development, prior to approving them for transition to USD(A&S) as major acquisition programs.

**29. What staffing and resources do you believe the Office of the Under Secretary of Defense for Research and Engineering will require? Are you satisfied that the Under Secretary of Defense for Research and Engineering will be properly staffed and resourced?**

If confirmed, I will work closely with the current USD(AT&L) and determine the proper path to disestablish that organization and to establish the new USD(R&E) and USD(A&S) organizations, subject to the approval of the Secretary of Defense and the Deputy Secretary of Defense. This will require a robust examination of the existing resources and staffing and some carefully timed decisions as how to structure these new USDs to accomplish their missions. I have reviewed the draft reorganization report provided to Congress last August, and believe that it is a good starting point to guide the organizational decisions we must make. When these decisions are made, I am confident that the proper staffing and resourcing of the two new USD offices will occur.

**30. Which functions of the former Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics do you believe should be shared between the Office of the Under Secretary of Defense for Research and Engineering and the Office of the Under Secretary of Defense for Acquisition and Sustainment?**

I do not yet know. Most of the difficult decisions associated with the reorganization of USD(AT&L) into the new USD(R&E) and USD(A&S) involve determining the proper placement of existing personnel and organizations. In some cases, those existing organizations will need to be changed, or new offices created, to support the missions of these two new USDs. A working draft of the department's reorganization plan was provide to the Congress in August; I do not know that I have anything to add to that report at this point. However, if confirmed, I will work closely with the current USD(AT&L) to make logical choices as to how we restructure these two new USDs.

**31. If confirmed, how will you ensure effective collaboration between your office, the Office of the Under Secretary of Defense for Acquisition and Sustainment, and the Services?**

If confirmed, I will communicate frequently with both the USD(A&S) and the Services to ensure that we are providing our nation's warfighters with the best equipment and technology to defeat our adversaries. Furthermore, the structure we establish for the USD(R&E) and the USD(A&S) must promote and facilitate cooperation across the USDs, while working with the Services to deliver new technologies and new capabilities to the warfighter far more rapidly than is our present practice.

**32. What actions will you take to ensure that the Office of the Under Secretary of Defense for Research and Engineering is established for success beyond your tenure as Under Secretary?**

If confirmed, I will establish a clear mission as the lead for Research and Engineering in the Department of Defense. This mission must include determining the key technical areas upon which the department must focus, both in the near- and long-term, to setting the technical direction for the Department by implementing new acquisition approaches, taking risk, and ultimately driving down risk through more quickly paced experimentation and prototyping. To accomplish this mission I will staff the new organization to ensure that we have a deep bench of talent to support the enduring advancement of U.S. technological superiority.

**33. If confirmed, as Under Secretary of Defense for Research and Engineering you will have less directive and decision making authority than previous Under Secretaries for Acquisition, Technology, and Logistics. How will you guide the Defense Department's overall approach to technology with the authorities and tools available to you?**

If confirmed as the USD(R&E), I will set the technological direction for the Department of Defense and will shape our technology investments to meet future threats. Critical to this mission is the need to understand and embrace the taking of measured risks in order to develop the next generations of capabilities the department needs. This includes significantly leveraging prototype developments and experimental efforts, pushing innovative approaches to developing capability and, above all, working closely with operators to understand their real needs and to deploy new capability as rapidly as possible to the field.

**34. Section 855 of the National Defense Authorization Act for Fiscal Year 2017 calls for the Under Secretary of Defense for Research and Engineering to establish Mission Integration Managers (MIMs). What is your vision for a MIM and how would you implement that vision? How do you see MIM responsibilities compared to those of the Strategic Capabilities Office?**

By their very nature, significant missions are cross-cutting, involve multiple systems, operational elements, and usually lack a single proponent or manager. This results in

inefficient investments and stove-piped system outcomes, often requiring post-deployment fixes to meet operational mission needs. My vision for R&E is that it will play an important role as an integrator across individual programs, military departments, and requirements as well as acquisition and programming activities. If confirmed, I will establish within USD (R&E) the ability to perform mission assessments, engineering, and testing across critical mission areas and foster prototyping and experimentation to all the early evaluation of concepts and technologies in a mission context. To do this, R&E will collaborate with the Services, Joint Staff, COCOMS, other government agencies, and the new USD(A&S).

Regarding SCO, that organization essentially repurposes existing capabilities for application to new missions. This is a very exciting area of emphasis for me, and if confirmed, I will be actively involved with the mission engineering and assessments necessary to incorporate those advances and concepts into new mission capabilities.

**35. Many of the reforms passed in the National Defense Authorization Acts for Fiscal Year 2016 and 2017 are yet to be implemented and in many cases are overdue. What actions will you take to implement the reforms for which you are responsible?**

If confirmed, one of my first actions as USD(R&E) would be to review thoroughly the status of not only the AT&L reorganization effort, but also the implementation of reforms enacted in the FY16 and FY17 NDAAs within my purview. For those reforms yet to be implemented, I would work closely with DoD and Congress to bring the implementation process to a conclusion. As with any Congressional reform or request, I would communicate frequently with Congress to ensure proper implementation pursuant to Congressional intent.

## Major Challenges and Priorities

**36. Outside of the reorganization, in your view, what are the major challenges that will confront the first Under Secretary of Defense for Research and Engineering?**

The Department currently faces the most technically challenging future defense environment we have seen since the Cold War. I believe the critical task for the USD(R&E) will be protecting the technological edge of our U.S. forces, now and in the future, by ensuring that the warfighter can counter, mitigate, or defeat capability fielded by any potential adversary. The Department's Research and Engineering enterprise (comprised of the Service/Agency laboratories and engineering centers, academia, other government agencies, industry, and allies) provides the U.S. with the technological strength and stability that underpins U.S. conventional deterrence.

Our most pressing challenge will be to field new capabilities faster than our adversaries, and faster than has been the case for decades. As USD(R&E), I will be pursuing and piloting new ways of doing acquisition to ensure that we improve our "time to market" and beat our adversary to the field.

A second challenge involves ensuring that we can affordably deliver advanced capabilities in an efficient and effective manner, and to permit modernization to continue at pace, even in a fiscally constrained environment. This challenge motivates the use of novel technologies, approaches, and new system concepts and architectures that enable significant reductions in overall lifecycle cost.

A third challenge is the need to continually refresh the core technologies that support our defense advantage – the disruptive breakthrough capabilities that allow the U.S. to "leap ahead" of potential adversaries. To this end, I will be reviewing the health and welfare of the "discovery engine" that underpins our warfighting technologies (the Department's laboratories and engineering/warfighting centers). Our S&T enterprise offers a critical hedge against uncertainty, mitigates against technological surprise, and supports our system development efforts.

**37. If confirmed, what plans do you have for addressing these challenges?**

If confirmed, I would establish the technical direction for the Department, developing a strategy that ensures that the U.S. will retain technical dominance. This strategy will build upon the strengths of the Military Departments and Defense Agencies and leverage commercial industry and our allies where practicable to meet the needs of the warfighter. This strategy will emphasize opportunities for increased effectiveness and efficiency across the Department's research and engineering enterprise with a focus on taking risk early, to ensure that when we launch a Program of Record we know we have achievable requirements that result in a capability that meets the warfighter's needs.

**38. If confirmed, what broad priorities would you establish in terms of issues which must be addressed by the Under Secretary of Defense for Research and Engineering?**

If confirmed, my first priority as the new USD(R&E) would be to establish a new organizational structure that will support the USD(R&E) mission. Once the structure is established, each part of the organization must be properly staffed to accomplish their respective missions. As directed by Congress, setting the direction of the Department of Defense will be a key priority. To this end, I will align efforts across the Department and leverage developmental efforts in industry wherever practicable to ensure that we maintain U.S. military technological advantage over adversaries.

I will champion the use of prototypes and experiments to drive down technical/integration risk and refine requirements before committing to Programs of

Record and pilot new acquisition methods to expedite capability to the warfighter. All of these priorities, and associated efforts of USD(R&E), will be nested within the Secretary's priorities of lethality, collaboration with allies and partners, and organizational reform with the goal of greater efficiency and effectiveness.

**39. What defense technologies do you consider the highest priorities for development to enhance the Department of Defense's ability to pursue its designated missions?**

I believe that an effective research and engineering program must focus on balance between addressing near- and long-term capability gaps, and balance between pursuing technology that provides incremental capability improvement and technology with the potential for more revolutionary impact. There are many opportunities to leverage technology to provide capability advantage for U.S. forces. Today, near-term opportunities exist in many areas, including: hypersonics, autonomy, data analytics, communications, electronic warfare, propulsion, cyber-defense, undersea technologies, advanced manufacturing, and space technologies that can shape new systems concepts and operational architectures. Over the longer term, emerging ideas in areas such as quantum science, material science, biology, and new computational architectures will feed future capability opportunity.

**40. Which of these technology areas will your office focus on and which technologies do you believe are best managed by other offices and agencies outside of your purview?**

I do not yet know. If confirmed, I will review and analyze the current organizational structure in order to inform my actions to continue the reorganization of the former USD (AT&L) structure and the creation of the new USD(R&E) structure. I would also carefully analyze the status of our emerging technologies in order to determine how to optimize the new USD(R&E) structure to more capably and efficiently develop each technology, with the ultimate goal of attaining much more rapid and cost-effective delivery to the warfighter.

**41. What will be your strategy for developing these technologies in a manner to support needed defense capabilities in a timely and cost effective way?**

If confirmed, I would look at all available development strategies and evaluate them against the constraints of being timely and cost-effective. I believe that the future competitive national security environment will drive the Department to place increasing value on the pace at which we move technologically enabled capabilities from concept to field. To accelerate our pursuit and exploration of innovative concepts, the Department must make best use of its own in-house capabilities, those of academia, and those of industry – large and small. We must also be open to new

engagement with innovative non-traditional commercial entities and make better use of the global capabilities of our partners and allies.

**42. How will you connect your technology strategies and plans with the efforts of others across the Department of Defense?**

It is critical the new USD(R&E) ensures that both technology and development efforts executed by the Services are aligned with the Department's priorities and Joint warfighter needs. If confirmed, I would establish clear technology roadmaps for the development of capabilities and will work closely with the DoD Services/Agencies to ensure unintended duplication is eliminated and resources are efficiently utilized. As the USD(R&E), I would also lead the development of architectures and standards that will enable the development of Service systems and capabilities that can operate effectively in a Joint environment.

**43. What scientific fields do you consider the most important in shaping and developing the new technologies, concepts, and capabilities that will be most relevant for future warfighting and defense missions?**

I consider a wide range of technical fields critical in shaping and developing defense capabilities, ranging from foundational areas such as materials and computer science to specialty fields like hypersonics and systems autonomy. If confirmed, I will take an approach that not only develops the most important scientific fields related to those capabilities, but also employs rapid transition mechanisms to enable the U.S. and DoD to maintain a technology advantage. Continuing investments in autonomy, microelectronics, and artificial intelligence are critical to near future warfighting missions. I will leverage public and private investment in research and development, work with industry and academia to ensure the appropriate policies and incentives enable our innovators and industries to thrive here in the U.S., and collaborate with our international partners when appropriate.

**<u>Chief Technology Officer</u>**

**If confirmed, as Under Secretary of Defense for Research and Engineering, you will be the Chief Technology Officer (CTO) of the Department of Defense.**

**44. What do you see as the role of the CTO of the Department of Defense?**

The CTO of the Department of Defense will be the primary advisor to the Secretary and the Deputy Secretary of Defense for all things technology. The CTO sets the technical direction of the entire Department, providing guidance that helps to shape the DoD S&T investments and facilitating the development of technology options that result in joint capabilities for the Department. The CTO should also ensure that major acquisition programs are conducted with acceptable technnical risk consistent with the overriding need for a faster pace in our efforts.

**45. What experience do you have in your career that will enhance your ability to serve as the CTO of the Department?**

I hold seven earned academic degrees from six universities in five different technical and business fields. I have twice served as the CEO for successful corporate "turnaround" efforts. I served in academia as an adjunct or full professor for a total of fifteen years, teaching a wide variety of technical and management courses, mostly at the graduate level. I spent over a decade in two national laboratories, NASA's Jet Propulsion Laboratory and the Johns Hopkins University's Applied Physics Laboratory. I have personally served as the Chief Engineer on numerous first-of-a-kind, experimental space systems development efforts, without ever experiencing a flight failure. I have been president of In-Q-Tel, the CIA's "venture capital company", an enterprise with a host of technical innovations to its credit. As Deputy for Technology at the former SDIO, I directed a portfolio of technology investments and prototype developments across the range of kinetic energy interceptors, advanced sensors, and directed energy weapons. The fruits of these investments, a generation later, now sit in missile defense fields in California and Alaska. I have served as both the Chief Engineer and Administrator of NASA, an agency that lives on the frontiers of human technology. At NASA, I led the return-to-flight activities of the Space Shuttle system after the loss of Columbia, reorganized the deployment of the International Space Station to meet presidential and congressional deadlines for Shuttle retirement, and personally instantiated the use of commercial cargo delivery services to the ISS. I have been doing these things for nearly forty-seven years to this point, and have had a more fortunate and rewarding career than I could ever have imagined. I believe that I am as well prepared to establish and oversee this new DoD office as anyone could be.

**46. Given the growing role of information technology and software in military capabilities, what do you understand to be the differences in roles, responsibilities, and authorities between the Chief Information Officer and the CTO?**

As the Department stands up the new USD(R&E), the roles, responsibilities, and authorities of the CTO will be defined and refined. I see a strong connection between the research and development of information technology and cybersecurity capabilities (a CTO mission) and the development and implementation of policy related to these technologies (a CIO mission). I anticipate close collaboration between the CTO and CIO missions, as in many of these areas the rapidity of the technology development will, by necessity, drive the policy development for the Department.

**47. Do you believe the position of Under Secretary of Defense for Research and Engineering currently has adequate authorities to exercise the responsibilities of a CTO?**

The USD(R&E) has been granted the authorities to help set the direction for the Department of Defense from a technology perspective. However, FY17 NDAA Section 901 did not afford the USD with "…the authority to direct the Secretaries of the military departments and the heads of all other elements within the Department with regard to matters for which the Under Secretary has responsibility." This was a notable difference between the newly established USD(R&E) and the other new positions, the USD for A&S and the Chief Management Officer. I do not have any specific additional recommendations at this point, but if confirmed, I look forward to working closely with this committee to ensure that the authorities that have been granted are appropriate and/or those that may be needed are identified.

**48. What is the status of the Department's long-range research and development planning activities? What noteworthy results have been realized from that initiative so far?**

If confirmed, I look forward to being briefed upon and becoming more familiar with the study. It is my understanding that the Long-Range Research and Development Planning Program (LRRDPP) was an initiative undertaken in the 2015-2016 timeframe focused on identifying emerging technology and materiel opportunities that could strengthen DoD capabilities in a competitive future national security environment. I have been told that the LRRDPP study engaged technical experts across the Department's research and engineering enterprise, as well as academic, not-for-profit, and defense and non-defense commercial organizations, to identify emerging opportunities for future military innovation. This study has been used to help refine the investment strategy of the Services going forward.

**Investment in Science and Technology**

**49. If confirmed, what metrics will you use to assess the size and portfolio of investments made under the defense science and technology (S&T) program?**

I cannot yet know what metrics I might wish to use to assess these investments. If confirmed, I will examine the methods currently in use and make an evaluation as to their suitability going forward.

**50. What role should the Under Secretary of Defense for Research and Engineering play in the detailed development and coordination of Service and agency S&T investment strategies, programs, and budgets?**

If confirmed, it will be an early priority to understand the approach presently in use for development and coordination of service and agency S&T strategies, programs, and budgets. I look forward to working with my colleagues and with this committee to formulate plans going forward.

**51. What, in your view, are the role and value of S&T programs in meeting the Department of Defense's transformation goals and in countering irregular, catastrophic, traditional, and disruptive threats?**

I believe that the Department's S&T portfolio plays a vital role in producing and maintaining operational advantages for our force, in meeting the Department's goals for transformation, and in countering irregular, catastrophic, traditional, and disruptive threats. The DoD S&T program provides the foundation for all of the Department's capability development and, if confirmed, I look forward to strengthening this foundation. An investment in S&T that is balanced across near-term capabilities and long-term technological options ensures that critical warfighter challenges are met with effective, multi-domain solutions.

**52. What S&T areas do you consider underfunded by the Department?**

I do not yet know. If confirmed, I look forward to gaining better insight into the existing programs and budgets within the DoD S&T enterprise. It is premature for me to comment on a situation where I do not yet have full knowledge.

**53. In your judgment, will the funding levels in these areas affect the Department's ability to meet the threats of the future?**

I do not yet know. If confirmed as the USD(R&E), I look forward to gaining better insight into the future of the Department's S&T budget in a resource-constrained environment. However, I do know that critical research funding has recently been strained by immediate and near-term needs, and if confirmed I will make it a priority to communicate budgetary needs clearly to the Deputy Secretary and Secretary.

**54. Do you believe that the Department's current S&T investment strategy strikes the appropriate balance between funding innovative, disruptive technologies and addressing near-term operational needs and military requirements?**

To the best of my knowledge, yes. From what I have seen, I believe the current DoD S&T investment strategy strikes an appropriate balance between funding innovative, disruptive technologies addressing near-term operational needs and military requirements starting with basic research all the way through prototyping and experimentation.

## Basic Research

**55. Given the continuing nature of basic research and the broad implications and applications of discovery-focused and innovation-focused sciences, what criteria would you use, if confirmed, to measure the success of these programs and investments?**

DoD's investment in basic research has played, and continues to play, a central role in creating and preserving our military technological advantage. Today's fielded technologies are rooted in, and dependent upon, the basic research discoveries of past decades. Basic research introduces disruptive change, born of new knowledge and physical insight, but this change typically emerges over time.

If confirmed, I would continuously assess our investments in basic science and discovery in terms of the people we fund, the quality of their research, the transition of their efforts into applied research, and/or the influence they have in driving the development of technology options to meet warfighter needs.

**56. What concerns do you have, if any, about current levels of funding for Department of Defense basic research? If confirmed, how would you plan to address those concerns?**

Our historic national investment in basic research was one of the key factors in our advancement to world superpower stature. Other nations, and most especially China, fully understand this, and are making their own large investments in basic research. If confirmed, this is an area I will watch closely, with the goal of maintaining our technological superiority both now and in the future.

**57. If confirmed, how would you determine whether there is an adequate investment in basic research to develop the capabilities the Department will need in 2025?**

If confirmed, I would review recent studies of the Department's basic research activities and budgets and engage the S&T Executives to understand their approach to building the foundation for future warfighter capabilities.

**58. If confirmed, what steps, if any, will you take to increase efforts in unfettered exploration, which has historically been a critical enabler of the most important breakthroughs in military capabilities?**

If confirmed, I would reemphasize to the DoD S&T Executives my belief that basic research is a critical component of our future military capability, and that the Department, from its senior officials to its bench scientists, should engage with the nation's and the world's leading scientists and engineers. If confirmed, I would also support the Department's policy of minimizing restrictions on Department scientists allowing them the ability to perform and interact with external researchers in their fields of expertise.

## Coordination of Defense S&T Internally and with Other Agencies

**59. If confirmed, how do you intend to integrate the S&T programs of the Services and defense agencies to reduce redundancy, leverage investments, and promote**

**cooperation in order to achieve greater efficiency and technological advancement?**

If confirmed, I would expect to engage in efforts to integrate and coordinate Military Department and Defense Agency S&T programs. I will work to ensure that S&T efforts across the DoD components are coordinates so as to improve efficiency and effectiveness, enhance collaboration, and reduce undesirable duplication of effort.

**Do you believe the mechanisms of coordination between federal civilian agencies and the Department are adequate to ensure that the military can best leverage the advances of agencies such as the following:**

**60. National Science Foundation on defense needs for basic science, especially in social sciences**

DoD funds basic research in targeted areas deemed most critical for defense, but also relies heavily on complementary basic research funded by U.S. Government agencies such as the National Science Foundation (NSF). I believe that coordination between the DoD and NSF is critical to our overall success.

**61. National Aeronautics and Space Administration (NASA) on hypersonics and other space research and the viability and availability of testing facilities**

I believe that the current level of coordination between DoD and NASA is healthy. I have been told that NASA provides input for the DoD biennial Space S&T strategy report, and that the Department reviews draft NASA technology roadmaps for both Space and Aeronautics to identify areas for cooperative activities. This area is ripe for enhanced collaboration, however, as the Department begins to focus on a national initiative in hypersonics.

**62. National Institutes of Health on areas in which military medical research and vaccine development overlap with civilian medical needs**

I am told that the degree of collaboration between NIH and DoD in these areas is extensive. However, I am not personally familiar with the details, and if confirmed will need to assess whether our present efforts are adequate and effective. The focus of NIH investment (the broad health needs of the nation) and the focus of DoD health care S&T investment (the specific and unique medical needs of the warfighter) differ, but in areas where military and civilian research needs overlap, we need to ensure that our programs are complementary and mutually supportive.

**63. Intelligence Community in setting defense research priorities to prepare for future threat environments**

I believe the DoD must work closely with the Intelligence Community to inform defense research prioritization and planning. The August 1, 2017, Congressional Report in response to the FY17 NDAA Section 901, detailing the proposed separation of USD(AT&L) into the USD(R&E) and USD(A&S), was promising as it included the establishment of an analysis cell within the USD(R&E) in collaboration with both IC and DoD analysts. It is my understanding that this cell provides not only a clear understanding of the threat, but also of technology projections for the future. If confirmed, I would continue to pursue an open and transparent dialogue between the Department and the Intelligence Community.

**64. Department of Homeland Security on homeland defense and national security-related science**

I believe that a strong partnership with the Department of Homeland Security is essential to ensure national security. If confirmed, I will continue to coordinate our DoD efforts with the Department of Homeland Security, strategically leveraging the technology investments being made by the two Departments.

**65. If confirmed, how would you work with other federal agencies and the Office of Science and Technology Policy to improve coordination?**

If confirmed, I would engage leadership within the other federal agencies and Office of Science and Technology Policy (OSTP) to establish a better understanding of how to mutually support each other's missions. In these times of increasing threats and reduced budgets, it is incumbent upon leadership to ensure that we maximize the taxpayer's investment across all of our government agencies.

**Technology Strategy**

**66. What weaknesses, if any, do you see in the current Defense S&T strategic planning process?**

I do not know. If confirmed, I will certainly make it a priority to assess our current S&T strategic planning process. I look forward to working with the Services/Agencies to establish an overarching strategic plan can be used to help inform recommendations to support the Department's annual budget submission to the President.

**67. What do you believe are the key attributes for a good technology strategic plan that can be effectively used for programming and budgeting purposes?**

I believe that an effective technology strategic plan should include: (1) specific, measurable, and actionable recommendations for science and technology; (2) a clear transition between research, experimentation, and prototyping that has direct

relevance to the Department's overall mission; and (3) detailed metrics to inform progress.

**68. If confirmed, how would you work to ensure that strategic plans are utilized during the budget planning and programming process?**

If confirmed, I intend to put forth S&T strategic guidance to support the enterprise focusing not only upon specific technology developments, but also upon the infrastructure and people within the Department. Additionally, I plan to restructure processes where they can be enhanced and streamlined to make the Department the more efficient.

**Technology Transition**

**The Department of Defense's efforts to quickly transition technologies to the war fighter have yielded important results in the last few years. Challenges remain, however, in successfully transitioning new technologies into existing programs of record, fielded systems, and major weapons systems and platforms.**

**69. How would you assess the effectiveness of current transition processes and systems?**

This perpetual issue, the infamous "valley of death," has been a challenge for decades, with transition of technology into operational capabilities all too often dependent upon individual personalities. The current system, while improving, has a long way to go to be effective. If confirmed, I will work to drive efficient and effective processes and practices.

**70. What challenges exist in technology transition within the Department?**

A key technology transition challenge is finding the optimum balance between the risk acceptance posture of technology developers and that of acquisition program managers. Technology developers are motivated to take risk and to explore the art of the possible, while acquisition managers are motivated to minimize risk and to pursue stable, well-understood capabilities to minimize overall acquisition program risk. I believe that aligning incentives so as to motivate program managers to review technology options to improve performance and reduce cost, and to motivate technologists to harden, demonstrate, and de-risk emerging technologies, would significantly aid technology transition. Another key to successful technology transition is user involvement throughout the developmental cycle. Ongoing dialogue between operational users and developers assists in producing a viable capability; and, as the capability matures, facilitates development of concepts of operations for operational use.

**71. What would you do, if confirmed, to address these challenges?**

If confirmed, I would emphasize the need for modular open system architectures and champion initiatives that use prototyping and experimentation to demonstrate operational utility before committing to a Program of Record. I would also encourage the inclusion of technology insertion and technology refresh in all acquisition program planning. I believe these actions would help increase the Department's ability to transition research and development more quickly and effectively into operational use.

**72. What is the role of the Under Secretary of Defense for Research and Engineering in facilitating communication between technical communities, acquisition personnel, and end users to speed technology transition?**

I believe an effective USD(R&E) must continue to work closely with the requirements community, the acquisition community, the research and development community, and the operational communities to provide new technologies that sustain our technological superiority against potential future adversaries. The USD(R&E) must coordinate across this broad set of communities: coupling technical opportunity to emerging requirements, informing technology development with operational feedback and aiding transition of capabilities from research and development to acquisition. If confirmed, I would leverage existing forums to ensure an open dialog and sustain and strengthen ties between these diverse communities with the goal of speeding technology transition from concept to fielding.

**73. Do you believe that we need to change the manner in which we fund technology transition in the Department? If so, what changes would you recommend?**

I do not yet know. I must obtain further insight into the current practices to be able to answer properly. If confirmed, I will assess our present investments and processes to facilitate effective transition. Technology development is often challenged by the unavailability of non-program-specific funding used to mature technologically driven capabilities, to prototype and experiment with emerging system concepts, and to support bridging technology development to support the transition of technology to operational systems. While, as I say, I do not have detailed knowledge, it is my general impression that over the past decade the Department has protected S&T funding levels, but that advanced development and prototyping funds have been increasingly consumed by wartime demands, forcing the services to prioritize force structure and operational readiness investments over modernization.

## Using Commercial Technology for National Security Missions

**The Department of Defense's S&T and research and development (R&D) organizations have traditionally focused on developing new technologies internally, then transitioning those technologies into military capability and commercial technology. This model continues to be relevant, but the Department needs to develop new ways to leverage commercial technology with military relevance.**

**74. If confirmed, what changes would you pursue to current research and engineering, experimentation, and prototyping processes to make better use of commercial technologies?**

I believe that the use of certain commercial technologies presents opportunities for the Department to leverage the innovation, rapid design iteration, and advanced production capabilities found outside of DoD. In an increasingly global and interconnected marketplace, these technologies also carry risks. If confirmed, I would seek ways to make emerging technologies more secure, through red-teaming to discover new technologies' vulnerabilities that we can mitigate in our systems or exploit in adversary systems; and, through implementation of a trusted systems strategy, to better protect existing systems from a wide range of modern threats.

**75. How would you effectively transition the outputs of such processes to major defense acquisition programs or capabilities that are fielded at scale with the Services?**

Technology transition, including transition of commercial technologies, is most successful when the end transition partner or program office is involved early in the process of identifying and maturing or adapting the technology. I believe the acquisition and S&T communities must be strongly engaged and work closely throughout the process to compare program requirements to possible commercial technology solutions as they evolve through development. If confirmed, I would emphasize the need for close integration between the acquisition and S&T communities.

**76. Many of the Services have created their own organizations to make use of commercially available technologies. If confirmed, how would you ensure these offices coordinate and do not create unnecessary overlaps in investment?**

I believe there is an inherent strength to multiple organizations leaning forward to find existing commercial technologies that can help meet the needs and requirements of their individual programs. If I am confirmed, I will support existing S&T collaboration efforts, enable new forums for collaboration beyond S&T, work to de-conflict investments, and leverage commercial technology sources across the Department's research and engineering activities.

**There are a number of technology areas for which there is not yet consensus among defense experts on whether or not commercial markets exist or are appropriate for transfer for potential use in the commercial sector.**

**77. Which technology areas do you believe should remain inherently governmental?**

I lack the present knowledge to answer this question. If confirmed, I would first assess the critical capability requirements of the Department, and then identify the technologies which are of importance to the future. If confirmed, I expect to assess our technology gaps against the commercial market's ability to provide relevant technologies, compare those with our in-house capabilities, and leverage each as appropriate to achieve our objectives.

**78. How should the Department of Defense ensure that they remain so?**

I believe that by working closely with senior leadership within the Services/Agencies, we can identify and pursue those investment areas of greatest importance to the future and which are not served by the market, while minimizing investments in those areas where the commercial market will meet the Department's requirements.

**Specifically, what are your views on the appropriate roles for commercial entities, and methods for defense collaboration, in the areas of:**

**79. Offensive and defensive cyber security software**

I will encourage collaboration with commercial industry to create new innovative cyber capability of benefit to DoD and others. While much DoD cyber infrastructure will necessarily utilize commercial products, critical components demanding high levels of trust and assurance will remain an inherently governmental responsibility. Offensive cyber capability development will largely be a government responsibility, but may benefit from commercial activities in areas such as cyber vulnerability assessment and reverse engineering tools.

**80. "Big Data" to include collection, processing, migration, analytics, and visualization**

I believe the Department should leverage the large commercial investments and innovations in processing, migration, analytics and visualization. The DoD should continue to exercise its inherent and unique strengths in data collection.

**81. Cloud computing software and services**

The DoD is rapidly moving to the large scale adoption of commercial cloud services augmented with DoD specific capabilities for some particular applications and

securing its data and processes whether in public or private clouds. I support this direction.

**82. Artificial intelligence**

I believe the Department should leverage the considerable commercial investments propelling AI and Machine Learning advancements. However, this is an area where trust is necessary and challenging to attain. Accordingly, there will need to be inherently governmental development supplementing commercial capabilities.

**83. Microprocessors**

In large part, I believe that the DoD should continue to leverage commercial microprocessors and therefore continue to encourage commercial entities to provide stronger cyber security and protections for both code and data. In those applications requiring trust or special features such as radiation hardening, microprocessors may be fabricated through trusted foundries and can include special cyber hardening innovations.

**84. Quantum computing**

I am not informed as to the extent of any DoD assessment of the potential application of quantum computing and the present state of commercial offerings. I am told that the DoD is pursuing fundamental research in this potentially high pay-off area. Given recent demonstrations by China of long-distance secure communication enabled in part by quantum computing, if I am confirmed this will be a very high priority area of investigation for me.

**85. Synthetic aperture radar**

Given the unique SAR needs of the Department for wide area intelligence, surveillance and reconnaissance, I feel that the DoD should continue in a leadership role in developing these capabilities. However, I believe the DoD should monitor and leverage commercial advances is SAR capabilities when practical. Recently several concepts have surfaced for a commercially run constellation of satellites using SAR. If confirmed, I will work with industry to determine whether a viable business case can be developed that would allow DoD to benefit from such potential ventures.

**86. Micro satellites**

I believe the Department should continue to promote and leverage the considerable commercial investment in microsatellites and cubesats to facilitate research and enable resilience in areas such as sensing, environmental forecasting, and communications.

**87. Space launch**

I believe the Department should continue to work with new and existing commercial entrants in advancing launch capabilities and flexibility and lowering the cost of space access through promoting reusability and automation.

**88. Space-based capabilities generally**

Commercial entities, both independently and in collaboration with DoD (and other government organizations) are continually advancing space-based capabilities in areas including: command, control, communications, computers intelligence, surveillance and reconnaissance (C4ISR); micro-satellites and cubesats; propulsion; and positioning, navigation and timing (PNT). I believe that the DoD should continue to pursue collaboration with these commercial entities using streamlined mechanisms such as Other Transaction Authority (OTA) to assess, evaluate and capitalize on the potential of new technologies and capabilities in order to provide a cost-effective warfighting advantage.

**89. Robotics**

I believe that the DoD should heavily leverage commercial investments to simultaneously increase capability and affordability across a wide variety of department missions. In select missions requiring high levels of trust, some robotic development will remain inherently governmental, but must still informed by demonstrated commercial capability.

**90. Unmanned aerial systems**

I believe that the DoD should continue to leverage the myriad of UAS capabilities being introduced through the commercial sector for military purposes. Significant innovation exists within the commercial UAS community, but DoD will continue to be a contributor while protecting its national security-related interests.

**Systems Engineering and Prototyping**

**91. Do you feel that the Department of Defense has sufficient systems engineering expertise in its current workforce or contractor base?**

The need for systems engineering expertise to be resident in the DoD is growing; as technology evolves over time, the complexity of our systems is increasing. This has increased the Department's demand for professionals with effective SE and technical skills. Based on several GAO reports citing program cost and schedule overruns attributed to a lack of adequately applied SE processes, it is clear that the Department needs to do more. The DoD's workforce possesses strong technical capabilities, but

it will be important for this workforce to be technically refreshed as new challenges arise and technical disciplines mature.

**92. What will be the impact of further reductions in personnel to the ability to execute the systems engineering missions of the Under Secretary of Defense for Research and Engineering?**

Further reductions in DoD's overall technical workforce would be detrimental to the Department's ability to develop, field, and sustain advanced technologies. This workforce enables the U.S. to innovate, create and maintain warfighting systems that maintain U.S. technological superiority. Additionally, this workforce allows DoD to efficiently and effectively design systems and architectures that quickly adapt to evolving missions and threats.

A strong, competent engineering staff will be essential for the USD(R&E) to provide leadership of critical technical competencies and cross-cutting disciplines, expert engineering assessment of major investment and mission areas, and address engineering challenges systemic to DoD acquisition technology and logistics failures.

**93. What changes, if any, do you believe should be made in the Department's systems engineering organization and practices?**

I do not know. If confirmed, I must assess the state of our systems engineering practice and determine what, if any, changes should be made. I do know that the Department's engineering centers must attract, retain, and maintain organic engineering expertise, and the tools and methods to outpace our adversaries.

**94. What is the value of competitive prototyping in increasing the success of the Department's acquisition efforts?**

Competitive prototyping is most effective at increasing the likelihood of success of DoD acquisition efforts when it provides government customer representatives with insights into the offeror's technical concepts and drives real risk reduction in the actual product that the Department will acquire and field. Under the right conditions, competitive prototyping can be expected to have several benefits to DoD programs, including: reduction of overall technical risk; validation of cost; validation of design; evaluation of the manufacturing process; and refinement of program requirements.

The only real problem with competitive prototyping is that it imposes known and significant front-end costs, since the Department must carry multiple offerors far enough through the design process to produce prototypes for evaluation. These costs are imposed in exchange for the promise of back-end savings. The promise of long-term savings in exchange for the certainty of short-term costs is always a difficult case to make, and so this cost penalty often reduces the apparent advantage of competitive prototyping. Thus, competitive prototyping is most effective in cases

where the cost/benefit ratio is clearly advantageous, where multiple design options merit further exploration, or where the competitive environment drives early return on lifecycle cost.

**95. If confirmed, how will you work to increase the amount of systems engineering projects and competitive prototyping efforts that are undertaken by the Department and its contractor base?**

If confirmed, I will pursue with all possible vigor the goal of prototyping projects under the authorities provided by Section 804 of the 2016 NDAA and Section 806 of the 2017 NDAA to increase the number of such projects and transition of those projects through rapid fielding. I will also leverage existing systems engineering projects at the Systems Engineering Research Center (SERC) with the Department's engineering and R&D centers.

**96. What is your view on technical data rights and what rights the Department should retain from the prototyping phase into development?**

Government rights to technical data are necessary to foster competition, field best-of-breed technologies and concepts, facilitate testing and evaluation, ensure availability of spare parts, enable capability evolution, support sustainment, and to allow the government to pursue alternate acquisition paths when a supplier fails to perform. With regard to prototyping, I believe that Government sponsors must determine data needs based upon anticipated prototyping activities and outcomes, and consider these rights in the establishment of contracting and service level agreements. One of the biggest challenges is that specific data rights needs are often not known at the time of contract award, when there is the most leverage to negotiate the best price for, subsequent access to, and use of the IP. Accordingly, the DoD must move to a model that allows for negotiating options for access to IP during competition then exercising those options as needs are realized.

**Venture Capital Strategies**

**In recent years, some components of the Department of Defense have attempted to follow the lead of the intelligence community by using venture capital firms to make investments in developing technologies.**

**97. What role do you believe that venture capital firms should play in the Department's investments in developing technologies, including in the Small Business Innovation Research program?**

I believe that small, early-stage companies are a significant driver of innovation in our nation, leveraging U.S. strengths in entrepreneurship, acceptance of risk, and access to technical talent and smart capital to create businesses that are shaping the commercial technology landscape. I believe the Department needs to be engaged

with innovative early-stage firms throughout the country, to explore the relevance of applying cutting-edge commercial capabilities to meet the Department's needs and to encourage small innovative companies to see the Department as a smart and engaged potential customer for their ideas. The Department's Small Business Innovation Research program is a very effective means of engaging these companies. If confirmed, I would also explore additional means to reach out to these companies, such as by utilizing venture-capital-like approaches to engage companies early, with the objective that they consider the Department's requirements among the targets for their product development priorities.

**98. What advantages and disadvantages do you see in the use of venture capital strategies?**

Venture capital strategies could permit the Department to engage innovative companies in a natural way — by supporting their need for critical investment to enable the development of innovative capabilities. This could provide the Department with access to innovation that we might not be able to reach through other approaches. Venture capital strategies, however, are inherently risky. Most early stage companies likely will not achieve breakthrough innovations, and a venture capital strategy must be patient enough to accept the risk profile associated with making many investments with the goal of seeing only a fraction of them yield concrete benefit. Further, deal strategies must be implemented such that, if a company is successful, the Department receives something of value in return, whether this be additional product features, special use rights, cost or schedule preferences, etc. Venture capitalists seek financial returns; the Department must in any such deal establish carefully the returns it seeks on its investments.

**99. When the Department does decide to use venture capital strategies, what steps do you believe the Department should take to ensure that Department funds are invested in technologies and companies that properly reflect national defense priorities, avoid the potential for conflicts of interest by industry partners, and ensure that the Department's investments are not diluted?**

These were precisely the questions with which we grappled when I was president of In-Q-Tel. There is no "one size fits all" answer. It is critical to carefully evaluate investments made through a venture capital approach, and to assess whether a venture-capital strategy is truly the most effective and appropriate model for investing in a particular technology or engaging a particular company.

**100. What other strategies do you intend to employ, if confirmed, to ensure that the nation's most innovative companies work on the Department's research and engineering programs?**

If confirmed, I would continue efforts to reach non-traditional vendors and seek ways to simplify their engagement with the Department. I would assess how the

Department is using existing statutory authorities, such as Other Transaction Authority, to ensure that all tools are being used. Additionally, I would review our traditional contracting processes to ensure they are efficiently implemented and supportive of the most innovative companies working with DoD.

**International Research Cooperation**

**101. In your view, how should increased globalization of defense technology affect the Department of Defense's research and technology development and investment strategy?**

In my opinion, the increased globalization of defense technologies provides both opportunities and challenges for the Department. To the extent that the DoD can leverage technology developments in allied and friendly nations, DoD will be able to redirect resources to address other critical needs. This would also provide opportunities for the DoD to increase commonality with these nations, creating increased efficiencies for all. However, globalization of defense technology creates challenges to our technological superiority through the proliferation of advanced military capabilities.

**102. What is your assessment of the value of cooperative research and development programs with international partners?**

Our international cooperative research and development programs are based on equitable investment by all participants. In addition to reducing cost burdens, these cooperative programs enable us to interact with the best and brightest in many nations. Cooperative research and development programs deepen our defense relationships with our allies and other partner nations. Cooperative research and development programs with international partners also support Secretary Mattis' goal to expand and strengthen alliances and partnerships.

**103. In your view, what are the obstacles to more effective international cooperation, and, if confirmed, how would you address those obstacles?**

Successful international cooperative research and development programs require trusted partnerships between the nations involved in them. These require commitment by all parties, which includes providing adequate levels of funding and participation. In the end, such agreements will only bear fruit if each side perceives them to be transparent in their formulation, reciprocal in their obligations, and beneficial to each party. If confirmed, I would be attentive to ensuring our proposed international cooperative efforts address these commitments.

**104. How will increased international technology cooperation affect our domestic defense industrial base?**

International cooperative research and development programs can provide opportunities for the defense industrial base to work with and develop relationships in other nations. This can lead to increased business opportunities through the creation of trusted partnerships. It can also provide the Department with increased access to world-class research and researchers.

**105. How should the Department monitor and assess the research capabilities of our global partners and competitors, and of the global commercial sector?**

It is my understanding that the DoD maintains awareness of global S&T and commercial capabilities through our global technology watch efforts and through the Military Departments' regional and global international S&T offices. If confirmed, I would support and strengthen these critical tools for providing situational awareness of the competitive global S&T landscape.

**Test and Evaluation**

**106. What are your views on the adequacy and effectiveness of the Department of Defense's development and operational test and evaluation activities?**

Until and unless confirmed, I am not able to provide an adequate answer to this question. I have been involved in flight testing throughout my career, and I fully understand that thorough testing of a system in an operationally realistic environment is critical in informing acquisition decision making, to identifying programmatic opportunities for application of additional engineering and risk mitigation resources, and to ensuring operational readiness. If confirmed, I look forward to working with the committee to guaranteeing that our test activities are properly structured and implemented.

**107. What changes do you anticipate are warranted in the Department's developmental testing organization and capabilities?**

If confirmed, I will review and implement an appropriate organizational structure to ensure that developmental test and evaluation is properly staffed and resourced and given the right authorities in the Department.

**108. What role do you believe the Office of the Secretary of Defense should play in developmental test and what type of organizational structure and staffing is required?**

I believe the Department needs to execute enough testing to ensure warfighters are equipped with affordable, effective, suitable, and survivable systems. Such testing must be commensurate with the urgency of deploying a capability. If confirmed, I will review and implement an appropriate organizational structure to ensure that

developmental test and evaluation is properly staffed and resourced and given the right authorities in the Department.

**109. What modifications would you recommend to the test and evaluation processes in the Department to more efficiently and quickly develop and deliver operationally effective and suitable technologies to the warfighter?**

I cannot presently answer this question. If confirmed, I will review the current test and evaluations processes and make necessary recommendations. I believe the test community at both the OSD level, and within the Military Departments, must be engaged early and throughout program development to ensure that test events produce actionable information to inform programmatic decision making. If confirmed, I would support efforts to improve the test community's early and continuous engagement.

**Small Business Issues**

**The $1 billion annual Department of Defense Small Business Innovation Research (SBIR) program has shown great success in investing in innovative technologies and small businesses and transitioning products to acquisition programs and into operational use.**

**110. If confirmed, how would you work to ensure that the SBIR program serves a useful purpose in meeting the Department's research goals?**

If confirmed, I would work to ensure that the program remains focused on innovation and technology advancement and aligned with the Department's overall research goals. I believe that the SBIR / Small Business Technology Transfer (STTR) program has the potential to be a valued contributor to meeting the Department's research goals and warfighter needs.

**111. What recommendations would you suggest to the SBIR program to improve the transition of S&T capabilities into acquisition programs?**

Based upon my present level of knowledge, I cannot make a useful recommendation. However, if confirmed, I would work to simplify engagement with the Department so that small businesses are not so burdened by our existing processes. I will support the development of goals for our acquisition programs and incentives to industry to improve SBIR transition and would reinforce them with guidance, education, and training across the Department and the industrial base.

**112. What recommendations would you suggest to the SBIR program to improve its ability to attract non-traditional defense contractors, such as small startup companies, into the program?**

If confirmed, I would explore avenues to continue to improve the ability of DoD to attract non-traditional defense contractors through a comprehensive outreach and communication strategy.

**113. How would you work to ensure the Department effectively leverages small businesses, to include appropriate considerations of intellectual property?**

If confirmed, I would encourage the Research and Engineering community to continue to utilize small businesses for new or enhanced capabilities and will ensure the Department complies with all intellectual property considerations while protecting both the Government's interests and the health of the industrial base. I will support existing initiatives to continue to improve SBIR transition with guidance, education, and training across the Department, to include specific guidance on SBIR data rights and intellectual property.

**114. What guidance or direction do you consider necessary regarding the transition of research results of SBIR programs to major weapons systems and equipment?**

I do not presently know. If confirmed, I will review the current processes and guidance and make necessary recommendations.

**115. What emphasis would you place, if confirmed, on participation by the acquisition community in setting research priorities for the SBIR program and in accepting new solutions into existing programs of record?**

I believe that the acquisition and S&T communities must both be engaged in setting research priorities for the SBIR program to ensure the relevance of these efforts to the Department's research goals and to foster transition from SBIR to programs of record. If confirmed, I would emphasize these efforts.

**116. In your judgment, are modifications needed to the SBIR program to ensure it meets the Department's goals and is updated to support research costs of the small business community?**

I do not know, but if confirmed, I will review the current SBIR/STTR program to see how best to utilize this program to advance our nation's technical superiority. Upon completion of this review, I will be in a better position to determine what changes, if any, may be needed.

**117. How will your experience at In-Q-Tel shape and inform your efforts to improve the Department's ability to access innovative defense and commercial small businesses?**

My experience tells me that the small business industrial base is a major source of innovation within the U.S. Innovation that not only supports our national security but

also underpins our economy. If confirmed, I look forward to advocating for research opportunities available to small businesses and will support efforts to commercialize the results of their efforts.

**Defense Laboratories**

**118. What is your overall assessment of the technical capabilities and quality of Defense laboratories relative to their Department of Energy, Federally Funded R&D Center (FFRDC), industry, academic, and foreign peers?**

Based upon many years of experience working with our nation's laboratories, my sense is that the technical capabilities and quality of our Defense Laboratory workforce is excellent. However, if confirmed, I would assess the current quality, technical capabilities, and mission performance of the Defense laboratories, and make necessary changes. The DoD laboratories' mission-driven work, focusing on the warfighter and our nation's security, make them unique and irreplaceable assets. Defense laboratories play a critical and distinctive role in the Department's research and engineering enterprise. While the scientists and engineers from the Department of Energy, FFRDCs, etc. are equally capable scientifically, our workforce draws on the knowledge and experience of the DoD mission and operations necessary to evaluate and mold technologies developed by private industry or academia to meet DoD's unique needs.

**119. What are your views on the most effective management approach for personnel at these facilities?**

I believe that the most effective management approaches for the Defense laboratories are ones that provide laboratory leadership with the flexibility needed to shape their workforce to meet the rapidly changing needs of the warfighter.

**A review of Defense laboratories operations shows various deficits in personnel management, infrastructure renewal, physical plant recapitalization rate, support services adequacy, etc. Some analyses have indicated that these deficiencies result from excessive centralized control.**

**120. Do you support significantly increased delegation of operating authority to lab directors?**

I am currently unaware of a need to significantly increase delegation of operating authority to lab directors but, if confirmed, I will study this issue and recommend changes as appropriate. It is necessary to ensure some level of centralized coordination to minimize unintended duplication of work and to ensure that resources are being spent on those strategic directions that the Department intends.

**121. If confirmed, what steps, if any, will you take to improve the quality, technical capabilities, and mission performance of the Defense laboratories?**

If confirmed, I would assess the current quality, technical capabilities, and mission performance of the Defense laboratories. I would then work in collaboration with the heads of the DoD components and through the laboratories to implement any needed changes, and will communicate with Congress regarding significant changes.

**122. Would you support transitioning certain laboratory capabilities into FFRDCs or Government Owned-Contractor Operated facilities?**

I am currently unaware of any capabilities that should be transitioned to FFRDCs or Government Owned-Contractor Operated facilities. If confirmed, I would make any such recommendations as part of my assessment of laboratory capabilities.

**123. What is the appropriate balance for the Department of Defense in leveraging commercial R&D and government-exclusive R&D?**

Technology development is increasingly global and much of the base is commercial. As a result, the Department will need to ensure an appropriate balance between leveraging commercial R&D and government-exclusive R&D to meet our military needs. If confirmed, I will assess our internal DoD research strengths as well as those residing in academia, industry (commercial or defense) and among our allies. I firmly believe that to maintain the nation's technological edge, the DoD must make best use of its own in-house capabilities, those of academia, and those of industry.

**124. Do you believe there are research areas of which the Department should divest itself? If so, what are those areas and how can the Department leverage associated commercial efforts?**

I am currently unaware of any areas of research that the Department should divest. However, if confirmed, I will review the DoD research portfolio and make such recommendations as may be needed.

**125. Which R&D efforts do you believe should remain exclusively in the control of the Department's laboratories?**

While the commercial sector can and should be an important provider of technology and services to meet DoD needs, there are a number of technology areas where I believe that the DoD labs have unique capabilities or experience that are not of interest in the commercial marketplace and therefore not likely to be available in the private sector. These include areas such as chemical and biological weapons, warhead design, and energetic and protective materials, as well as the design, development, integration and testing of weapons systems and prototypes, that I believe should remain under the control of the Department.

**126. During your tenure at NASA, what were your greatest successes in strengthening the NASA research centers, which face many of the same challenges faced by Department of Defense laboratories?**

My approach to rebuilding the three NASA research centers was largely through actions I took in the personnel and contracting arena. When I took the helm at NASA in early 2005, we had approximately 3000 full-time-equivalent (FTE) civil service personnel on "overhead"; i.e., they did not have a charge number for real work being performed by the agency in accordance with congressional appropriations. However, at other centers, we had more work to do than could be done by personnel at those centers. After assessing the situation, I directed that prior to hiring more staff at centers that were short-handed, program managers and center directors must first turn to other centers where we had more people available than work to do at that center. I specified that if no one at another center was appropriately qualified for such work, then the overloaded center could hire or contract for additional staff. As one might expect, once a good-faith effort was made to find qualified staff at other centers to absorb the work needing to be done, there was little need for staff augmentation at the busier centers. By itself, this directive resulted in a reduction of our "excess capacity" from around 3000 people to about 300 personnel, in an agency of some 18,000 civil servants at that time.

A valuable additional benefit from this plan was that both the busier centers and the under-utilized centers were exposed to new people, new ideas, new work, and new challenges. All of this help to revitalize the agency in the aftermath of the loss of Space Shuttle Columbia, and to prepare the way for the then-planned American return to the Moon.

## Laboratory Personnel Management

**The Department of Defense's research and development laboratories perform unique functions in serving national security missions and do not readily fit into the general operational management structure.**

**127. Would you support increasing the flexibility of the laboratories on personnel matters?**

I firmly believe that the quality of the Department's research and development laboratories is completely dependent on the ability of the labs to attract, recruit, and retain top-notch technical talent with skill sets critical to military innovation. Increased flexibility in personnel matters is an important factor in recruiting and retaining the high-caliber workforce needed by the DoD's laboratory enterprise. I support making maximum use of available direct and flexible hiring authorities for

scientists and engineers, as well as allowing full use of all Science and Technology Reinvention Laboratory personnel authorities in order to compete to attract the best and brightest talent to the DoD laboratories.

**128. What particular workforce challenges does the Under Secretary of Defense for Research and Engineering have?**

Recruiting and retaining a world-class technical workforce is a pressing challenge for the defense research and engineering enterprise. The DoD mission requires specialized scientific and engineering skills and the Department needs to compete effectively to identify and leverage this limited talent pool. I believe that attracting, developing, and retaining talent with critical skills in domains such as advanced microelectronics, cybersecurity, embedded software development, and data analytics will be a significant challenge to the entire Department of Defense, to include the Office of the USD(R&E), over the next decade.

An additional long-term challenge for the defense research and engineering enterprise is the "graying" of the workforce, within the Office of the USD(R&E), across the Military Departments and Defense Agencies, and within the defense industrial base. The senior workforce possesses significant skill and experience, but over the near term the R&E enterprise will see an accelerated loss of experience as a significant portion of its workforce retires. If confirmed, I will be attentive to these challenges and implement change to impact the Department's future.

**129. How do the personnel flexibilities of the Office of the Under Secretary of Defense for Research and Engineering compare to those of the Defense Advanced Research Projects Agency (DARPA) or the Defense laboratories? Should the Office of the Under Secretary of Defense for Research and Engineering be permitted to use the same hiring flexibilities as these organizations?**

Personnel flexibility is critical for recruiting and retaining the best and the brightest in technical enterprises. DARPA and the Science and Technology Reinvention Laboratories (STRLs) have special authorities with regard to personnel flexibility that do not apply to the Office of the USD(R&E). If confirmed, I will assess the current authorities that are allowable within the USD(R&E) and determine if additional authorities/flexibilities are necessary. If so, I will communicate my assessment and recommendations to the Deputy Secretary, the Secretary, and the Congress.

**130. How will you work with the personnel policy and management communities within the Office of the Secretary of Defense and the Services to ensure that personnel flexibilities are delegated to lab directors and agency heads and are used to the maximum possible extent?**

If confirmed, I will coordinate with my counterparts in the OSD and Services personnel policy and management community to ensure that personnel flexibilities are delegated to lab directors and agency heads in a timely manner. I believe empowering individual leaders at the lowest appropriate level is part of the necessary flexibility for effectively managing both laboratories and development projects.

## Technical and Acquisition Workforce Issues

**131. In your view, does the Department of Defense have adequate technical expertise within the government workforce to execute its designated acquisition and technical development missions?**

If confirmed, I will assess the skills and overall health of the current R&E enterprise workforce to determine the ability to execute our acquisition and technical development missions. This assessment will inform my next steps. I will monitor workforce data to ensure the Department maintains its key technical workforce, and will create opportunities for both new and current workforce to expand their expertise. DoD will continue to compete with industry to attract and retain its employees, and will need the appropriate workforce management authorities and tools to remain a competitive employer. I believe it is critical for the Department to refresh, retrain, and upgrade the skills of its acquisition and technical development workforce through targeted education, training and experience.

**132. What is your assessment of the efficacy of the Defense Acquisition Workforce Development Fund?**

I see great value in a dedicated fund to ensure the acquisition workforce has what it needs to increase warfighter lethality. If confirmed, I will focus on leveraging the fund for highest impact and emergent technical workforce needs.

**133. If confirmed, how would you make use of this fund and what recommendations would you make to improve it?**

If confirmed, I would continue to use DAWDF to shape the capability and capacity of the technical workforce.

**134. What efforts will you undertake, if confirmed, to improve the technical capabilities of the Department in critical areas, such as systems engineering, information assurance, social and cultural sciences, and software engineering?**

As the new USD(R&E) organization takes shape, the Department will need to retain the outstanding talent that currently resides in critical areas such as system engineering and information assurance while gaining additional talent in areas where it currently has shortfalls. If confirmed, I look forward to ensuring that the

USD(R&E) is appropriately staffed to do the mission that Congress intends – to set the technical direction of the Department and to ensure that the U.S. retains technical superiority.

**135. If confirmed, you will be leading a newly created office. What new or different approaches will you take to staffing and workforce management within your office?**

If confirmed, it is important to ensure that the new USD(R&E) organization is properly staffed and structured to regain where necessary and then maintain technological superiority over our adversaries. We must be more agile and efficient, and foster an environment of innovation not only in the development of capability but also in how we staff and manage our workforce. We must leverage all available hiring authorities and programs, we must be creative in retaining the outstanding talent we already have, and we must add the additional talent we need to build a deep bench of experience and expertise to meet our goals.

**136. If confirmed, to what extent will you make use of term appointments and highly qualified expert hiring authorities?**

If confirmed, it is likely that I may identify a number of fast moving technical areas that would benefit from the use of term appointments, but I do not at present know specifically what these might be. I would work with the Services and Agencies to ensure that whatever flexible hiring authorities we possess are used to attract and retain the workforce needed to the support the specialized work conducted by the Department.

**137. Do you believe that program managers who are active duty military should remain in place in their jobs throughout the duration of an acquisition program?**

If confirmed, I would work closely with the Deputy Secretary and the USD(A&S) to ascertain whether this question would fall within my purview. If so, I look forward to assessing this matter. If not, I would work with and support the decisions of the Deputy Secretary and the USD(A&S) on this issue.

**138. Do you believe that the Department should make more use of senior, experienced civilian personnel in program management roles?**

If confirmed, I would work closely with the Deputy Secretary and the USD(A&S) to ascertain whether this question would fall within my purview. If so, I look forward to assessing this matter. If not, I would work with and support the decisions of the Deputy Secretary and the USD(A&S) on this issue.

**Space Issues**

**Section 1601 of the National Defense Authorization Act for Fiscal Year 2018 included a number of important reforms on space acquisition, management, and oversight. The accompanying Statement of Managers directed the Deputy Secretary of Defense to identify an organization or agency within the Department of Defense to be responsible for Major Force Program 12 (MFP-12). While the Committee does not believe the Under Secretary of Defense for Research and Engineering would be appropriate for the oversight or execution of MFP-12, the Committee recognizes that this position may have some space research and engineering equities that will have to be coordinated with the principal designated with the oversight and management of MFP-12.**

**139. If confirmed, how do you see your role with respect to national security space and how would you work with the individual designated with responsibility for overseeing MFP-12?**

Whether or not MFP-12 is assigned to the USD(R&E), if confirmed I would be responsible for setting the Department's technology strategy, addressing critical warfighting challenges, and enabling more rapid delivery of solutions to stay ahead of the threat for all warfighting domains, including space.

Space is a critical domain of operations essential to achieving our national security objectives, our adversaries understand this and have taken concerted efforts to deny this advantage. My challenge will be to adapt the Department's processes, incentives, and culture to deliver needed advanced technology and capabilities to maintain and enhance military superiority in space.

In this role, I will work with the designated MFP-12 oversight official to promote a common understanding of the strategy and architecture behind the Department's space-related research, technology, and engineering investments. I will support the alignment of Department resources to accelerate delivery options, such as advanced prototyping, on-orbit experimentation efforts, and incremental capability deliveries.

I will also work closely with the new USD(A&S) to ensure seamless transition between the two organizations.

**Defense Advanced Research Projects Agency**

**140. What is your view of the appropriate relationship between the Under Secretary of Defense for Research and Engineering and the Director of DARPA?**

I believe DARPA is an essential part of the R&E Enterprise, an organization prized for its long history of taking risks to achieve often disruptive, yet revolutionary,

capability for the warfighter. If confirmed as USD(R&E), I would look forward to developing a close relationship with the Director of DARPA. I see this organization as a cornerstone for challenging the status quo and pushing the boundaries and comfort level of the Department.

**141. What do you believe is the proper research mission for DARPA?**

Since its founding, DARPA has a long history of being an effective engine of transformative innovation. DARPA's ability to apply innovative solutions to address some of the most difficult problems that face the DoD, now and in the future, has been the cornerstone of its success. The agile, flexible, and inventive nature of the agency's organizational culture has been successful in driving the pace of technology development for the national security enterprise. I believe the proper role for DARPA is to conduct high-risk, high-payoff research for the Department, and to share that work with the Military Departments, industry, and others within the government.

**142. What adjustments do you expect to make, if confirmed, to the current style of DARPA research program management and investment strategy?**

Based on my current awareness of the DARPA research program and investment strategy, I do not presently see a need to make significant adjustments to the agency's current strategy. If confirmed, I would ensure that DARPA continues to contribute to the balanced technology portfolio across the Department.

**143. What do you believe are the key characteristics of an effective DARPA Director?**

I believe an effective DARPA Director should have the ability to develop and communicate a vision of the DARPA research portfolio, attract exceptional technical talent to the agency, motivate teams internal and outside the agency to take on challenges of national importance, connect agency research to the operational and acquisition community, and be prepared to take on the most critical technical challenges that face the Department.

**144. What, in your view, is the appropriate relationship between DARPA and the Service S&T programs?**

I believe that the DARPA and the Military Department S&T programs should be coordinated, supportive, and complementary. DARPA is particularly focused on pushing the envelope to develop high-risk, high-payoff, leap-ahead advances, while the Military Department S&T programs draw upon and further develop these and other technological advancements to maintain the broad and deep technology base required to develop innovative capabilities for the warfighter. DARPA's strategy allows the agency to pursue opportunistic thrusts to dramatically advance particular

technical capabilities, while the Military Department S&T programs seek a more balanced risk portfolio.

**145. What, in your view, is the appropriate relationship between DARPA and the Service laboratories?**

I believe the relationship between the Military Department laboratories and DARPA is one of being partners in developing technology solutions for the warfighter.

**Strategic Capabilities Office and Defense Innovation Unit Experimental**

**Recently created offices, like the Strategic Capabilities Office (SCO) and the Defense Innovation Unit Experimental (DIUX) have shown promising results while also being stymied by the existing bureaucracy.**

**146. Do you support the missions and work of these offices?**

I support the missions of the Strategic Capabilities Office (SCO) and the Defense Innovation Unit Experimental (DIUx). These offices play a distinctly different role, focusing on new uses for mature technologies already demonstrated in either military applications or the commercial sector (SCO), and outreach to non-traditional vendors (DIUx). They are both part of the broader research and development ecosystem that we as a Department rely upon. I am not at present familiar with any specific work being undertaken by either of these entities, but if confirmed, will make that assessment and implement any changes needed.

**147. What is your assessment of their efficacy in terms of the transition of capabilities into operational use?**

I am not in a position to assess the effectiveness of the Strategic Capabilities Office (SCO) and the Defense Innovation Unit Experimental (DIUx) efforts. I look forward to working with both offices to explore ways to potentially improve the transition of capabilities into operational use.

**148. What do you believe is the appropriate management framework for these organizations? Should they continue with current reporting arrangements or work within a new construct?**

While I have not had the opportunity to be a part of the discussions to date on the USD(AT&L) reorganization, it is my understanding that the major moves have been coordinated at the highest levels within the Department. If confirmed, I will work closely with the Deputy Secretary to ensure that any transition is seamless.

**149. What, in your view, is the appropriate relationship between the Under Secretary of Defense for Research and Engineering and the leaders of these two offices?**

If confirmed, I envision a close relationship with the leaders of both of these offices. I look forward to collaborating with them to deliver technology that transitions into operational use and gives the Department an edge in maintaining technical superiority, both rapidly and affordably.

**Science, Technology, Engineering, and Mathematics (STEM) Education**

**150. Do you believe that the Department of Defense specifically and the nation as a whole are facing a crisis in STEM education?**

Yes, the nation's and the DoD's future STEM capacity is at risk. In 2012, only 5 percent of U.S. bachelor's degrees were awarded in engineering; in China it was 32 percent. The Department of Labor predicts that in the next decade, 80 percent of jobs will require STEM skills, yet according to the Department of Education, less than 25 percent of college students pursuing bachelor's degrees will be specializing in STEM fields.

The Department of Defense is the government's largest employer of federal scientists and engineers. STEM education and the maintenance of a vibrant STEM workforce are national security imperatives. If confirmed, I will be a strong advocate for producing a capable, competitive talent pool in STEM fields.

**151. In your view, how will this affect the Department's ability to pursue its missions?**

The health of the STEM talent pool directly affects Department's ability to pursue its mission and goals. As much of Department's workforce approaches retirement, DoD and industry will face a significant challenge in attracting superior STEM talent. In addition, emerging mission requirements continue to pose great STEM workforce challenges for the DoD. If confirmed, I will engage other leadership within the R&E enterprise, to include our Defense Industrial Base, to ensure continued success at recruiting STEM talent, enhancing STEM education, and providing opportunity to the children of military families, ultimately assuring a STEM-capable workforce through strategic outreach.

**152. What role do you think the Department should play in supporting STEM education?**

I believe that the Department should be actively engaged at all levels across the STEM education continuum, and should work with the Office of Science and Technology Policy, the National Science Foundation, the Department of Education,

and other Federal components involved in national security, to generate a "whole of government" approach to address national security STEM workforce development.

**153. What role should the Department play in supporting STEM education opportunities for transitioning service members?**

Many transitioning service members have unique, real-world technical training and experience. As they transition out of the military, I believe the Department should encourage their continued STEM education and identify opportunities so these veterans can incorporate their military experiences into potential science and engineering careers, bolstering our STEM workforce.

**Health of R&D Enterprise**

**154. What is your assessment of the current health of the Department of Defense's R&D enterprise as a whole?**

I cannot fully assess the DoD enterprise in any meaningful way at present. If confirmed, I truly look forward to do so. However, from what I have seen from an external viewpoint, I believe the DoD R&D enterprise is in generally good health. That said, I believe that there are some areas that the Department must address to ensure that they can sustain the capabilities they have and will need in the future. The Department has an aging infrastructure in certain areas and a significant portion of our S&T workforce is nearing, at, or past its retirement eligibility. Budget pressures, and concerns over future budget instability, are putting stress on resources, including upgrading/replacing infrastructure as well as the hiring and retention of technical talent.

**155. Are rules currently in place to govern the Department's R&D conducive to a healthy enterprise?**

I believe that current statutory authorities, rules, and regulations are sufficient to sustain a healthy R&D enterprise, but we must continue to be innovative with the flexible use of authorities to hire and retain critical technical talent.

**156. The Department has recently taken criticism for not devoting enough funding to constructing and upgrading facilities for R&D. If confirmed, how would you address that issue?**

Maintaining and improving our R&D facilities is imperative, both from the perspective of allowing our scientists and engineers to do their work and continuing to recruit and retain the most talented. If confirmed, I will assess the effectiveness of existing authorities that address constructing and upgrading R&D facilities as well as any barriers that may hinder the implementation of those authorities.

**157. How would you work to reduce the overall costs of the R&D enterprise, while still maintaining the integrity and quality of the Department's R&D work? In which areas would you strive to build efficiency?**

At this time, I have not assessed the efficiency of the current R&D enterprise. If confirmed, I would strongly support efforts to make informed decisions that will reduce costs while ensuring the long-term viability and quality of our work.

**158. How do you think continued budgets under sequestration will affect the Department's S&T funding?**

I agree with Secretary Mattis that the lack of budget predictability affects our ability to improve readiness. Effective long-term science and technology (S&T) is a critical part of the Department's readiness. The Department has made efforts to prioritize and protect S&T funding as reflected in prior year budget requests. However, if the full effect of sequester were triggered in any year, I believe that we would face an immediate reduction in S&T budgets and suffer a long-term impact in opportunities lost. If confirmed, I would work with DoD and Congress to do my part to mitigate the harmful impacts of sequestration on our warfighters and technologies.

**Trusted Foundry Program**

**159. What is the status of the "Trusted Foundry" program for providing a secure source of microchips for sensitive defense systems?**

Though I am generally familiar with the effort, I do not yet know the current status of the Trusted Foundry program. If confirmed, I look forward to learning more about the DoD's assured microelectronics strategy which includes the trusted foundry capabilities. However, it is my present understanding that the Trusted Access Program Office functions were successfully transferred from National Security Agency to Defense Microelectronic Activity in 2016, and that it continues to aggregate U.S. Government orders and contract access to commercial, International Traffic in Arms Regulation and Trusted flows for up to Secret designs at GLOBALFOUNDRIES.

**160. How might the Department of Defense mitigate the risks of losing that capability to a company with foreign ownership?**

I believe the Department must modernize its trusted microelectronics strategy and foster new win-win partnerships with industry and academia to access microelectronics modernization and innovation, enhance the capabilities of our domestic foundry ecosystem, and lead disruptive technologies to define the future beyond Moore's Law. This is not a DoD-unique issue, but requires a whole of government engagement. DoD-focused efforts, if coupled with additional support from across the government, would allow for the support of public/private

partnerships with U.S. owned entities that could prevent the loss of Trusted Supplier and other industrial base capabilities to adversarial foreign owners.

**161. How does the Trusted Foundry program support a secure supply chain for field-programmable gate array (FPGA) chips?**

It is my understanding that the current Trusted Foundry program provides access to custom-manufactured Application-Specific Integrated Circuits (ASICs). FPGAs are frequently a more affordable alternative to ASICs, but unlike ASICs, they are commercial-off-the-shelf (COTS) items produced for a broad market of users. The Trusted Foundry model does not fully address supply chain risk management issues for COTS items. As FPGA components and subcomponents proliferate throughout DoD systems, the Department must revise its trust and assurance policies and work with FPGA vendors to address vulnerabilities inherent in these commercial items.

**162. Are you aware of the shortage of strategic radiation hardened microelectronics for the upcoming nuclear modernization, section 1670 of the National Defense Authorization Act for Fiscal Year 2018, and, if so, what are your views in correcting the unique deficiency?**

Yes, I am quite aware of this issue. The Department must ensure continued access to the strategic radiation-hardened electronics that are critical to national security. Additionally, the Department must work closely with the intelligence community and agency partners who share these technology needs, particularly the Department of Energy. If confirmed, I will assess these needs, the state of technology and industrial base options, and put in place necessary actions and investment to comply with the statute and secure technologies critical to nuclear modernization.

**Congressional Oversight**

**In order to exercise its legislative and oversight responsibilities, it is important that this Committee and other appropriate committees of Congress are able to receive testimony, briefings, and other communications of information.**

**163. Do you agree, if confirmed, to appear before this Committee and other appropriate committees of Congress?**

Yes.

**164. Do you agree, if confirmed, to appear before this Committee, or designated members of this Committee, and provide information, subject to appropriate and necessary security protection, with respect to your responsibilities as the Under Secretary of Defense for Research and Engineering?**

Yes.

**165. Do you agree to ensure that testimony, briefings, and other communications of information are provided to this Committee and its staff and other appropriate committees in a timely manner?**

Yes.

**166. Do you agree to provide documents, including copies of electronic forms of communication, in a timely manner when requested by a duly constituted committee, or to consult with this Committee regarding the basis for any good faith delay or denial in providing such documents?**

Yes.

**167. Do you agree to answer letters and requests for information from individual Senators who are members of this Committee?**

Yes.

**168. If confirmed, do you agree to provide to this Committee relevant information within the jurisdictional oversight of the Committee when requested by the Committee, even in the absence of the formality of a letter from the Chairman?**

Yes.