<u>**Senate Armed Services Committee**</u>
<u>**Advance Policy Questions for Mr. Nickolas Guertin**</u>
<u>**Nominee for Appointment to be Director of Operational Test and Evaluation**</u>

<u>**Duties and Qualifications**</u>

Section 139 of title 10, U.S. Code establishes the position of the Director of Operational Test and Evaluation in the Department of Defense. The law provides that [t]he Director shall be appointed without regard to political affiliation and solely on the basis of fitness to perform the duties of the office of Director.

1. **What is your understanding of the duties, functions, and authorities of the Director of Operational Test and Evaluation (DOT&E)?**

The duties for the DOT&E functions stem from Title 10, Section 139 and 236, and are refined through DoD Directives and Instructions. I understand that if confirmed, I would serve as the principal staff advisor to the Secretary of Defense for operational test and evaluation within the Department. I would also be required to provide Congress with an annual report summarizing the activities associated with operational test and evaluation. This report would include recommendations on associated resources to include facilities and funding. Matters concerning budget recommendations related to operational and live fire test and evaluation will be provided to the Secretary of Defense as well. Reporting would also include Beyond Low-Rate Initial Production reports, Early Fielding reports for systems that fall into the category of urgent need and would be deployed before completion of initial operational testing, Live Fire reports and also to respond to any request from Congress. If confirmed, I also would be responsible for crafting and implementing policy for operational test and evaluation and to provide oversight of operational testing of defense programs that meet specific thresholds (e.g. Major Defense Acquisition, Major Automated Information Systems) and programs that I would designate. Policy and procedures that I would be responsible for would include the conduct of live fire test and evaluation for monitoring, reviewing, and reporting on all operational and live-fire test and evaluation within the Department. I would also be responsible for coordinating joint operational testing.

2. **What experience and expertise do you have that qualify you for appointment to this position?**

I have a combination of technical and organizational change experiences that I feel give me the range of expertise to, if confirmed, bring the Departments OT&E efforts further forward into the future. I have four decades of operation, development, testing and organizational transformation experiences across a wide array of technologies and warfighting domains to leverage into this position. On the technical side, I have performed systems engineering for sensors, weapons, combat management and information technologies. I have also led prototyping initiatives for air, ground, and sea-based systems. Across all of these experiences, testing and coordination across technical disciplines and stakeholders had long been a central tenet. My experience in program management and change transformation related to the improvement of Defense acquisition may prove to be my most valuable asset especially in the areas fielding software-intensive systems

that were built to change and improve over time. More recently, while at Carnegie Mellon University's Software Engineering Institute, I learned a great deal about how to architect and develop systems, including the automation of testing and integration of artificial intelligence and machine learning to create robust, reliable, testable, and sustainable products that will evolve over the life of a program.

3. **What recommendations, if any, do you have for changes in the duties, functions, and authorities of the DOT&E?**

If confirmed, I will work with the DOT&E team to examine how we are addressing the evolving aspects of system development, both in the tools used to build the products and the capabilities being delivered to the warfighter. The nature of engineering, modeling, simulating, validating, and testing these systems is changing rapidly, and the operational test and evaluation community must both change to where we are today and ensure we have an organizational framework to continuously evolve. Testing the way we fight in the future will require evolutionary and revolutionary changes from where we are now. This will require teamwork throughout DoD, and with the Services and Agencies. It will require increased reliance on state-of-the art test infrastructure and tools, and a well-trained test and evaluation workforce that embraces constant change as a core equity in order to support faster and more effective evaluation of complex, interconnected systems in a joint, multi-domain operational environment. It will require reliance on innovative methods like credible virtual environments and modeling and simulation tools to complement on-range and laboratory testing. If confirmed, I am committed to working closely with Congress, the Secretary of Defense, our research and engineering community, acquisition programs, and the Services so that together, we can most effectively deliver capability to the Joint Force.

Major Challenges

4. **In your view, what are the major challenges that you would confront, if confirmed, as the DOT&E?**

The next DOT&E will be challenged to help the Department ensure that the way we test our systems accurately reflects the way we will use them to fight. The adversary often tests, learns, and iterates faster than we do. To win in conflict and to deter adversaries from initiating conflict, we must outpace them in every aspect of our developmental and operational investments and processes in every warfighting domain. We will be challenged to test, especially against cyber threats, and use next-generation technologies, such as autonomy and artificial intelligence-enabled equipment, in our warfighting systems. The Department must build a workforce that is ready to leverage the incredible amount of innovation that exists across this Nation, and to work collaboratively with the commercial and defense industries, universities, FFRDCs and UARCs, and allied partners.

5. **If confirmed, what plans do you have for addressing each of these challenges, and on what specific timeline?**

I believe it is important to determine what efforts are already under way in the Department and to assess existing manpower, including the staff of DOT&E and the test and evaluation (T&E) partners within the office of the Under Secretary of Defense for Research and Engineering (USD(R&E)) (including the Defense Advanced Research Projects Agency), the office of the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), and the Services. If confirmed, I will renew the strong working relationships among these organizations so that we can break down more barriers, identify and reduce redundancy, increase integration, and forge a workforce for the future.

6. **If confirmed, what broad priorities would you establish and how would you measure progress in achieving these priorities?**

In addition to building a T&E coalition in the Department and with our allies, I would seek to address the continuous competing priorities between program resources and test adequacy. As stakeholders place more value on test, the more they will incorporate mission-based, operationally relevant T&E activities earlier in the acquisition process. I would seek to bolster the adequacy of test programs by ensuring software and cyber T&E occur iteratively and incrementally throughout the life cycle, and not just during OT&E events. I believe that digital technology, including strategic use of modeling and simulation, should be used much more frequently to transform the testing of software-intensive and cyber-physical systems from linear, serial processes to iterative, incremental processes that build a body of evidence over time usable for operational assessments and evaluations.

Relations with Congress

7. **If confirmed, what actions would you take to sustain a productive and mutually beneficial relationship between Congress and the DOT&E?**

If confirmed, I commit to working collaboratively with Congress and Department of Defense oversight Committees and responding to Congressional requests in a timely manner. This includes informing Members and their staffs of critical updates and results of operational test and evaluation (OT&E) efforts in a timely and transparent manner. I commit to providing my independent and objective assessments, and will strive to maintain a strong relationship with Congress as DOT&E.

8. **If confirmed, specifically how would you leverage your unique and independent access to Congress better to provide technical and program information in support of this Committee's legislative and oversight processes?**

Serving as the Director, Operational Test and Evaluation rightfully demands close coordination and consultation with Congress. Independence and impartiality are paramount to executing that mission, and if confirmed, I assure the Committee that I will serve as a partner with Congress, providing clear assessments of technical demands and programmatic efforts both in response to oversight requirements, and in support of legislative processes.

<u>Independence and Objectivity</u>

  Congress established the position of DOT&E as an independent and objective lead for test and evaluation across DOD, including test and evaluation relating to major defense acquisition programs. Section 139 of title 10, U.S. Code, provides that "[t]he Director [of Operational Test and Evaluation] shall consult closely with, but the Director and the Director's staff are independent of, the Under Secretary of Defense for Acquisition and Sustainment, the Under Secretary of Defense for Research and Engineering, and all other officers and entities of the Department of Defense responsible for acquisition."

  9. **If confirmed, what specific steps would you take to ensure that your evaluations are wholly independent and objective?**

Independence and impartiality are paramount to executing the mission of Director, Operational Test and Evaluation. I assure the Committee that, if confirmed, I will rely on my technical and operational background to determine the adequacy of proposed test plans, relying on the scientifically validated and appropriate tools and methods to ensure their efficiency and operational credibility. I will look for evidence that modeling and simulation tools used to support an evaluation were adequately validated and accredited for their intended use.

I will follow the data and employ proven data analysis tools to draw conclusions, but will consider alternate findings and interpretations to ensure the quality of my own assessments. Every conclusion I make will be defensible and will accurately reflect observed performance. I will seek out the most technically savvy workforce, and will continue to coordinate with USD(R&E), USD(A&S) and other DOD entities responsible for acquisition to ensure that we collectively deliver the best weapon systems to the warfighter.

  10. **If confirmed, what specific steps would you take to ensure that the assessments of major defense acquisition programs you provide to Congress are candid and complete?**

If confirmed, my assessments will be based solely on the data collected during operational and other appropriate testing. I will ensure that the information collected has been adequately analyzed, and that all assumptions and test limitations were considered and are reflected in the final assessment. I intend to let the facts speak for themselves. I will not let demonstrated good performance overwhelm revealed limitations, and vice versa. I will be balanced, neutral, and non-judgmental in my assessments; and without exception, my assessments will cover all of the facts revealed by adequate operational testing. So that my assessments are complete and defensible and accurately portray system performance, I will ensure that test plans will provide the data necessary for authoritative and operationally meaningful evaluations.

  Section 2399 of title 10, U.S. Code, establishes certain requirements regarding the impartiality of contractor testing personnel and contracted-for advisory and assistance services used with regard to the test and evaluation of a system.

11. If confirmed, how would you ensure the independence and impartiality of contractor testing personnel and contracted advisory and assistance services, including when employing personnel from Federally Funded Research and Development Centers (FFRDCs)?

DOT&E relies on heavily on FFRDC partners, in particular the Institute for Defense Analyses (IDA). I have confidence in IDA's impartiality and integrity but, if confirmed, would be sure to emphasize to its director and division leads my expectations for completely unbiased, professional comportment and products. I would take the same approach with any FFRDC. In addition, I would continue the practice of having a DOT&E civilian review and approve all FFRDC activities and material.

Title 10 already sets the standard for use of contractor personnel in OT&E. If I were to avail DOT&E of the waiver authority granted in Section 2399 paragraph (e)(2), I would ask the DoDIG and OGC to recommend what steps to take to ensure the impartiality and ethical participation of those personnel.

Operational Testing Issues

12. If confirmed, how would you manage disagreements with other elements of the Office of the Secretary of Defense and/or the Military Departments and Services, that seek to progress or approve programs, notwithstanding the results of operational testing that suggests further development, testing, or technical and engineering work is required?

I believe in open and honest communication, transparency, and data-driven conclusions. If confirmed, I will forthrightly provide assessments of all systems under oversight that have undergone some level of operational testing. These assessments will be independent and reflect my evaluation of the data revealed by testing. I will ensure that other elements of OSD and/or the Military Departments and Services fully understand the underlying data and analyses that led me to my conclusions. If disagreements arise, I will listen to all counterpoints to ensure the quality and strength of my conclusions. As the warfighter's unbiased, objective representative, I will always share my findings and data analysis with the Congress, and the Secretary and Deputy Secretary of Defense.

13. In your view, to what extent should the DOT&E evaluate system capabilities and testing results against formal requirements established in the program? Please explain your answer.

Formal program requirements are necessary as they focus system development, influence program decisions, and provide contractual specifications. It is important to understand how delivered capabilities measure against these requirements, but operational effectiveness ultimately depends upon how well a unit equipped with the system accomplishes its mission. Ideally, these two would coincide, but that is not always the case. Such divergence occurs most frequently when formal requirements do not reflect real-world operational metrics.

As an example, the Joint Light Tactical Vehicle met its key performance parameter (KPP) for payload. However, that KPP focused on weight, and did not take into account physical space inside the vehicle, or the quantity of mission-essential equipment and supplies necessary for long-duration tactical missions. Operators were thus forced to store items in locations that were unsuitable for mission accomplishment. As a result, DOT&E concluded that, while JLTV satisfied the payload KPP as written, the vehicle could not accommodate operational reality; overall vehicle performance and reliability would be degraded.

If confirmed, I would objectively evaluate systems against both their formal requirements, and seek to ascertain whether a unit equipped with the system under test can accomplish the intended mission. Both factors must be considered to determine operational effectiveness, suitability, survivability, and lethality.

> **14. In your view, when evaluating system capabilities and testing results for new system, to what extent should the DOT&E consider the capabilities of deployed, legacy systems that the system undergoing testing is designed to replace? Please explain your answer.**

DoD Directive 5000.01 provides clear guidance on this matter: "The acquisition system will be designed to acquire products and services that satisfy user needs with measureable and timely improvements to mission capability, materiel readiness, and operational support, at a fair and reasonable price."

Inherent in delivering measureable improvements in comparison to legacy systems. Such comparisons are essential to determining whether: 1) the new system provides greater mission capability; 2) the new system's performance equals that of the legacy system, but it improves other elements of the effective-suitable-survivable-lethal metric by, for example, reducing operator workload or easing the sustainment burden (reliability, availability, maintainability); or 3) the new system performs equally well, but its design enables capability expansion and augmentation.

If confirmed, I intend to continue the practice of comparing new capabilities to the legacy capabilities they are supposed to replace.

> **15. In your view, to what extent should the DOT&E evaluate system capabilities and testing results against known or expected threats the system will face across its lifetime while in operational use?**

Combat credibility is the benchmark for DOT&E's assessment of new and evolving systems and platforms. Our capabilities must allow our warfighters to bring game-changing technologies to the fight, and to succeed and survive against the actual kinetic and non-kinetic threats that they will face, including cyber. The only way to determine whether our capabilities can do that is to test them against the threats that the systems are designed to address. This applies to how systems are modified to credibly address evolving threats.

This means that the Department must address how operational T&E and live-fire T&E will provide adequate oversight for evolving capability delivery. This includes addressing revolutionary and evolutionary changes to methods and processes associated with an evolving T&E infrastructure, including threat emulation and simulation, tools, and processes. DOT&E should ensure that operational testing represents the real-world conditions and scenarios warfighters will face. It will be difficult to determine the effectiveness, suitability, survivability, and lethality of our weapon systems – and create the opportunity to remedy deficiencies prior to actual combat – without a realistic and evolving T&E enterprise.

16. **In your view, how should the DOD design testing environments to mirror perceived denied and degraded environments? What benefit would such testing design yield the testing and evaluation (T&E) process?**

Our military cannot successfully deter or win wars without the ability to operate in all domains and environments, including denied and degraded. Our testing must realistically represent those environments and include accurate threats so that we can understand the capabilities and limitations of our weapons systems. For testing that accurately replicates denied and degraded environments, DoD needs facilities that permit live, "open-air" events, as well as robust, validated, and accredited modeling and simulation venues in which real operators are the testers. Both data sets are critical for our operational forces to develop the right tactics, techniques, and procedures, and for our acquisition system to correctly prioritize fixes and improvements to our weapons systems.

17. **In your view, to what information must DOT&E have access to support testing, and who is (and should be) responsible for obtaining and maintaining access to that information?**

DOT&E should have full access to all data and information needed to support adequate test and evaluation of programs under oversight, or to determine if a program should be placed under oversight. This information includes system design data, requirements data and their rationale, concepts of operations and concepts of employment data, acquisition strategy data, and decision timelines (in order to adequately plan the tests needed to support those decisions).

DOT&E also needs access to data that may affect the test and evaluation program, such as test and evaluation resource shortfalls, test asset or test range limitations, and known system design deficiencies. To ensure T&E program efficiency, DOT&E should have access to all test data and information that would help scope the next testing phase. DOT&E also must have access to the assessed accuracy, limitations, and assumptions associated with any modeling and simulation tools that are used to evaluate weapon system performance, particularly during OT&E phases (initial and follow-on). DOT&E should receive all raw artifacts and processed data as soon as they are collected in order to start independent data analysis, and to inform all decisions in a timely fashion.

18. If confirmed, what specific steps would you take to promote encourage information sharing among testing communities, program offices, and contractors?

If confirmed, I will be very transparent about my expectations and the data I need to execute my Title 10 responsibilities. I will review my expectations and their rationale with the test community, program offices, and contractors, and will offer to work with them to develop the most robust T&E program for the warfighter. I will offer analytical support and advocacy to resolve test and evaluation challenges presented to the test community, program offices, and contractors. I also will encourage and enhance the concept of agile, integrated testing and evaluation, as well as the use of digital technology tools, to make T&E part of the overall digital ecosystem, which will inherently promote information sharing. I will work on building trust with all T&E stakeholders to further promote collaboration and teamwork, and facilitate progress at faster rates.

Communications interoperability has been a challenge for the DOD for several decades.

19. If confirmed, how would you plan to construct test environments to ensure interoperability of command and control systems for the Joint force?

It is my understanding that the available test infrastructure is not currently robust enough to meet the demands of realistic testing in a joint command and control (C2) environment. Security and safety restrictions that limit electronic warfare against communications and data links, along with commercial spectrum limitations, also constrain testing. The Department needs to invest more heavily in range infrastructure that enables linking open-air results with operationally representative virtual and constructive test venues designed to assess the interoperability of joint C2 systems, including the Joint All-Domain Command and Control concept and supporting Service efforts.

20. In your view, does DOT&E need to modernize or reform its approach to planning for, executing, and assessing weapons system operational effectiveness, suitability, and survivability? If so, in what areas are reforms most needed?

I believe that DOT&E needs to modernize, and in some cases reform, its approach to T&E planning, execution, and data analysis. This is will be necessary given the development of increasingly complex weapon systems that are highly-interconnected and adaptive, and the rising complexities of the multi-domain operational environment that changes rapidly in both space and time. For example, software and cybersecurity T&E need innovative tools to improve efficiency and operational realism, and to meet the exponentially growing demand for such testing. DoD must pursue the development of credible digital environments, digital models, and data architectures to store, share, and best utilize test and evaluation data across all stakeholders. The use of the latest advances in science and technology should be leveraged to improve the way OT&E captures and analyzes the volumes of data. The Department needs new tools and methods that promote integrated testing and evaluation, and optimize the benefits of all data captured across the acquisition cycle. These points all lead to a need to examine the way we train and

prepare our T&E workforce for the future, to infuse new techniques and training for using the related tools and technologies that will be required going forward.

21. In your view, what additional T&E initiatives would best position DOT&E to support digital transformation and modernization of warfighting capabilities and concepts in multi-domain environments? What resources would be required to effectuate these initiatives?

Digital transformation and modernization of warfighting capabilities and concepts in multi-domain environments require enterprise-level solutions and coordination across USD(R&E), USD(A&S), the Intelligence Community, the Services, the Joint Staff, and Combatant Commanders. If confirmed, I will seek to coordinate an effort to identify the requirements and resources needed to develop an adequate representation of the multi-domain operational environment, which will depend on the adequacy of the virtual environment and digital twins of our systems, their interoperability, and expected threats. I will evaluate the development and credibility of digital twins and the feasibility of requiring digital twins early in an acquisition program to inform T&E plans and reduce overall risk. I will work with USD(R&E) to build upon their digital engineering initiatives, to include the development of a digital ecosystem and the data architectures needed to adequately store, access, and then analyze T&E data, the management of which is critical to the transformation of T&E efforts.

Test and Evaluation Funding

Concern over long-term support for and viability of the Department of Defense's test ranges and facilities led to the creation of the Defense Test Resource Management Center in 2002, as well as a requirement for direct funding of T&E facilities. Yet, almost 20 years later, concerns about test ranges and facilities remain.

22. Do you believe that the Department's T&E capabilities, including infrastructure and workforce, are adequately funded? Please explain your answer.

Though I am not currently fully privy to the condition of DoD's T&E enterprise, it appears that the department's T&E capacity, agility, and expertise are insufficient given the scale, frequency, and depth of testing necessary for the types of systems and threats expected (e.g., software-intensive, autonomous/artificial intelligence-enabled, offensive and defensive cyber, space, and electromagnetic spectrum) in the current and predicted multi-domain operational environment. Adaptive acquisition framework initiatives, which focus on quick delivery to the field of incremental capability, further exacerbate T&E shortfalls.

Moreover, our potential adversaries are improving and adding capabilities faster than DoD's test infrastructure and workforce can adapt and realistically replicate them. Those adversaries appear not to have the same level of concern or can take short-cuts about the safety of those systems and the appropriate operational use in a kinetic environment. Together, we hold our programs to higher standards. The complexity of integrated air defenses, space and cyber threats, cognitive threats, hypersonic threats, directed energy weapons, and various combinations thereof requires modernization of T&E infrastructure. If confirmed, I will continue DOT&E's working

relationship with the Test Resource Management Center, and support them as necessary, as they carry out their responsibility of assessing the adequacy of the Department's T&E capabilities, including infrastructure and workforce.

23. Do you believe that the Department's current T&E capabilities in the aggregate including infrastructure and workforce, are adequate to perform the full range of test and evaluation responsibilities of Department weapons systems and equipment?

I am not currently briefed on or have full knowledge of the conditions of the T&E enterprise, but it would appear that the Department's T&E capabilities may be out of date and if so, should be modernized to represent and capture the complexities of the operational environments of today and the future. Of particular importance is the sufficiency of T&E capabilities for emerging areas to support the testing of hypersonic systems, as well as the testing of all systems in contested electromagnetic spectrum, cyber, and space domains. The ability to adequately replicate adversarial threats and targets in both fidelity and realistic quantities is also a challenge.

To keep pace with emerging technologies and adequately test and train U.S. and coalition partner forces in projected multi-domain operational environments, the Department must make significant, and steady, investments in T&E infrastructure and the workforce. If confirmed, I will work with the Test Resource Management Center and the Service T&E executives concerning the prioritization and funding of modernization efforts..

24. In your view, how effective has DOD been in accurately projecting future test facility resource requirements and budgeting for these needs? How would you improve these processes, if confirmed?

In my opinion, accurately projecting future test facility resource requirements and budgeting for these needs is essential to conducting adequate operational and live fire testing, and determining operational effectiveness, suitability, and survivability. If confirmed, I will collaborate with USD(R&E), the office of Cost Assessment and Program Evaluation (CAPE), and the Service T&E executives to review the state of our facilities and adequately prioritize investments. This process will include identifying opportunities to leverage existing capabilities, and developing an investment strategy that keeps pace with our adversaries who have steadily invested in their T&E infrastructure over the last two decades.

25. If confirmed, how would the sufficiency of investments in test resources and workforces factor into your review and approval of proposed test plans and schedules for acquisition programs?

Human and financial resources are key factors in determining the adequacy of Test and Evaluation Master Plans (TEMPs) and test plans. These resources must be clearly defined and maintained throughout the development and acquisition cycle to ensure that operational and live fire OT&E are adequate. If confirmed, I will closely review individual programs' planned test budgets and personnel for sufficiency. Additionally, in coordination with CAPE, I will annually assess the adequacy of available T&E resources to execute test plans as agreed. I will leverage

the Department's data management strategy to ensure adequate data are collected to support such analyses. I will inform senior DoD leadership and Congress of test resource and workforce shortfalls so that they can be addressed in an operationally relevant and timely fashion.

26. In your view, should adjustments be made in the regulations and policies that govern the allocation of testing costs to test customers?

Existing regulations and policies have been in place for many years. I believe a review is needed to accurately establish how test costs are allocated to customers, and whether the policies and funding processes the Services are required to use are still the most effective and efficient ways to support T&E.

I also understand that DOT&E recently commissioned the National Academies of Sciences, Engineering, and Medicine (NASEM) to independently review the adequacy of DoD test ranges and capabilities. If confirmed, I would seek to understand the recommendations made by NASEM in this report, as well as the recommendations of any similar reports, and make all appropriate recommendations to the Secretary and this Congress on any potential revisions to existing regulations and policies that would promote more efficient and thorough OT&E.

Data

27. If confirmed, what initiatives would you undertake to ensure that the Department of Defense collects, maintains, and provides appropriate access to appropriate personnel for all relevant data derived from the development, testing, and operational use of systems and platforms to support acquisition, testing, and operations?

As the Department transforms digitally, we must make data visible (so we can easily locate it), accessible (so we can retrieve it when needed), traceable (so we can link conclusions to data sources), secure (so we can rely on it) and integrated (so we can track our performance and collaborate).

While DOT&E does not produce test data directly, the OT&E community does own a vast amount of information related to historical weapons systems performance. If these data were accessible and in a consumable format, they could be more effectively utilized to inform new programs of record; to improve our ability to identify, quantify, prioritize, and estimate DoD system vulnerabilities; and to help set future requirements. Advanced analytics capabilities for large data sets, in particular, have the potential to reduce T&E cost, time, and operational risk by identifying the highest risks in lethality and survivability during the test design phase, and by accelerating the evaluation phase.

If confirmed, I will work in partnership with A&S, CDO, and CFO, to ensure that DOT&E is both able to consume and provide data associated with T&E to support my role in informing other senior decision-making activities.

Office of the Director of Operational Test and Evaluation

In April 2021, the then-Acting DOT&E testified that the office faces numerous workforce challenges, including a limited number of civilian staff responsible for program oversight, and limited expertise in important emerging technology areas and in the use of advanced digital tools.

28. **If confirmed, how would you improve the operational testing workforce, particularly in light of the growing numbers of new technologies embedded in weapon systems and the desire to speed the acquisition and deployment of systems to the battlefield?**

People are our greatest asset, and the Department must continue promoting a culture of innovation and learning. It would be worthwhile to conduct a T&E workforce analysis to identify current and future military and civilian skillsets and gaps, and unique expertise requirements. If confirmed, I will seek to develop hiring and training objectives to fill any identified needs. As part of that process, I will work with USD(R&E) and USD(A&S) to refine, adapt, and develop new education and training curricula in specific technical areas, including cybersecurity, artificial intelligence, machine learning, data analytics, modeling and simulation development, and advanced scientific test design and analysis methods; and to create and execute a plan to deliver continuous and structured training to the workforce. I will advocate for detailee and rotational assignment opportunities within the T&E community, and identify avenues for recruitment of the future workforce, such as internships and memoranda of agreement or understanding with government laboratories, other agencies, academia, and industry.

29. **If confirmed, how would you determining the correct mix of government, military, and contractor personnel necessary to meet the missions of the Office of the DOT&E?**

If confirmed, I would review the DOT&E portfolio, scope, and workload to ensure that we are adequately positioned to meet the Secretary's priorities and fulfill the Department's strategic initiatives. I would identify the competencies and skills needed to meet current responsibilities and future requirements given the rise of emerging technologies, the complexity of the operational environment, and the demands of adaptive acquisition framework initiatives. I believe DOT&E will need a balanced mix of government, civilian, and contractor personnel to achieve these objectives. The number of personnel and types of skills should be based on the complexity and scope of DOT&E's oversight portfolio, ensuring we can keep pace with the acquisition community, our adversaries, and the operational environment.

30. **In your view, could the Office of DOT&E benefit from any unique personnel authorities, such as those available to DARPA, medical personnel, service academies, or defense laboratories, to attract, recruit, and retain the workforce needed to perform designated missions? Please explain your answer.**

It is my understanding that DOT&E regularly utilizes direct hire authority (DHA) to minimize mission disruption, and to ensure that civilian billets are filled quickly by personnel with the right expertise. These DHA provisions include Sections 1101, 1125(b), 1599(h), 1643, and 1109 in 63% of all GS hiring actions. DOT&E was leveraging the authorities in Sections 1125(b) and 1109; however, the temporary Section 1125(b) authority expired on September 30, 2021, leaving only Section 1109 authorities. If Section 1109 were terminated or allowed to expire on September 30, 2025, it is my understanding that DOT&E would no longer have access to any DHAs. If confirmed, I would welcome unique personnel authorities to attract, recruit, and retain the very technical workforce who must also have a detailed understanding of the DoD mission, a combination that is hard to find.

31. In your view, could the Office of DOT&E benefit from any special acquisition or management authorities to more effectively and efficiently perform its designated missions?

Based on my current knowledge of DOT&E, I do not yet see a need for special acquisition or management authorities at this time. If confirmed, I will reassess with my staff and the USD(A&S) and USD(R&E). If we determine changes are needed, I will provide my best recommendations to the Secretary and the Congress.

Operational Test Agencies

Operational Test Agencies of the Military Services are tasked with conducting independent operational testing and evaluation of acquisition programs. Recent demands on these organizations have increased to meet rapid acquisition initiatives, to demonstrate joint and advanced concept technology programs and commercial technologies, and to evaluate information assurance, information operations, and joint T&E requirements.

32. How would you propose to arbitrate shortfalls between program managers' limited funding and operational test agencies' independent test requirements?

Test and evaluation must be funded adequately from a program's inception. The Test and Evaluation Master Plan (TEMP) documents the T&E funding profile and timeline, and all relevant parties – DOT&E, the program manager, and the operational test agency – agree to that TEMP early in the program's life cycle. When the time to test arrives, Operational Test Agency requirements should never be a surprise, and all Service and agency resource and program managers should have allocated an appropriate amount of funding.

33. Do you have any concerns about the "actual" independence of the operational test agencies? Please explain your answer.

I have no concerns regarding OTA independence. The Director, Operational Test and Evaluation approves all test plans, and DOT&E and the OTAs independently evaluate the data collected during OT&E events. I am confident that the OTAs understand their role as the warfighter's

representative and are committed, with DOT&E, to providing unvarnished assessments of system performance.

34. Should policies and procedures governing the activities of the operational test agencies be standardized across the Department of Defense, in your view?

Where commonality exists, I believe that OTAs and DoD would benefit from standardized policies and procedures. Data formatting, collection, storage, analysis, and dissemination is one category of T&E activity that should be standardized. Doing so would allow DoD organizations access to others' data, and glean relevant information and lessons – which, today, often are inaccessible – to strengthen T&E efficacy and potentially reduce the time needed to conduct an adequate test. However, each Service has unique systems to test. A fair amount of flexibility and Service- or program-specific customization is therefore necessary. I will strive to seek a balance between maximizing standardization at the enterprise level, without introducing inefficiency into our programs.

Operational and Developmental Testing in the Adaptive Acquisition Framework

The Department of Defense recently implemented its Adaptive Acquisition Framework, which uses a series of six pathways, each designed for the unique characteristics of the capability being acquired. With the new framework, DOD encourages the use of Integrated T&E.

35. In your view, what value is provided to the department by the operational T&E community providing input into developmental testing?

When conducted in a program's early stages, and when adequately resourced across the acquisition cycle, operationally realistic T&E offers a unique opportunity to identify and correct deficiencies before the system matures. Typically, the later issues and solutions are identified, the more complex, expensive, and time-consuming the fixes are to implement. Early problem discovery may allow the program to better manage cost and schedule. Most importantly, addressing problems early in the T&E process mitigates the risk of discovery during operational test, after the system is in the field, or, worse, in combat.

By sharing OT&E feedback, the Program has an opportunity to development the system in a manner that allows OT&E to effectively and efficiently conduct its testing. This creates an OT&E event that ensures the system's capabilities with minimal resources in the most condensed timeline practical.

36. How, in your view, should the Department determine the appropriate point in concept development of a new acquisition program for incorporation of T&E planning and the integration of testing requirements?

In November 2020, DOT&E and USD(R&E) co-wrote DoD Instruction 5000.89, Test and Evaluation. It codified what I believe to be true: if done correctly, integrated testing provides

greater opportunity for early identification of concerns, allowing system design to be improved sooner, and potentially, allowing the engineering and manufacturing development phase to proceed more efficiently.

At the inception of a program, this policy instructs the program manager to charter an integrated test planning group early, allowing empowered representatives of test data producers and consumers (including all applicable stakeholders) to ensure collaborative development of a robust, efficient testing strategy that supports systems engineering, evaluations, and certifications throughout the acquisition life cycle. Conducting critical test activities earlier will enable the program manager to discover and remediate problems while the system is still in development, and likely avoid costly redesigns late in the acquisition life cycle.

This DoDI is a step in the right direction but may require additional improvements to optimize the benefits of this concept. For example, I believe that planning the aggregate test and evaluation program from the beginning (with developmental and operational objectives in mind) in a digital ecosystem would enable use of all available data and test events, avoiding redundancies while promoting early discovery.

37. What steps, if any, do you believe the Department should take to ensure that testing takes place early enough in the program cycle to identify and fix problems before it becomes prohibitively time-consuming and expensive to do so?

I firmly believe in the value of developmental testing and wide application of automation in testing. It is essential, however, that the rigor of developmental testing match the rigor of operational testing in order to ensure that operational testing is as efficient and effective as possible. Augmenting the authorities for developmental test oversight and placing more programs under developmental testing oversight would improve developmental T&E execution and, ultimately, acquisition program outcomes.

38. In your view, are there periods throughout the operations and sustainment portions of a program's life cycle where operational testing needs to be used to ascertain system effectiveness and suitability, given changing technologies and threats? Please explain your answer.

Yes. Today, the threat landscape changes very rapidly. When it comes to cyberattacks against both networks and individual, software-dependent platforms, our adversaries' skills and tools improve as frequently as every few weeks. At the same time, DoD more often adds capability not by fielding an entirely new system, but by upgrading an existing platform's software or a few of its individual components. These two factors mean that we must periodically update our assessments of effectiveness and suitability so that decision makers and warfighters understand the performance and limitations of the systems in actual use against the threats we expect them to face today and tomorrow, not last year or last decade. Just as the product is updated incrementally, the OT&E assessments should be performed in an incremental fashion where possible, so as to keep pace with the speed of relevance in getting capabilities in the hands of the warfighters. We must move to enable continuous monitoring of capabilities wherever we can to

be on par with commercial systems and facilitate a a rapid flow of knowledge and an associated dynamic assessments of systems.

39. If confirmed, how would you balance the tradeoffs between rapid deployment of new capabilities and the need to ensure that deployed capabilities are operationally effective and suitable?

If confirmed, I will defer to the Services and the Combatant Commanders to ascertain the operational need of a specific capability. By implementing the strategies contained within the DOT&E Science and Technology Strategic Plan, the Department will be postured to ensure that these fielding decisions are made with an understanding of the operational effectiveness, suitability, and survivability that the capability brings to the operational force. It would be my responsibility to ensure that DOT&E regularly engages with the Joint Requirements Oversight Council, Service Secretaries, and acquisition executives to better understand the desired capabilities and fielding timelines, and to conduct independent assessments.

40. If confirmed, what changes in DOT&E policies, processes, and practice to help DOD achieve its goal of timely delivery of weapon systems, while still ensuring that weapons are safe, effective, and lethal?

If confirmed, I will review existing polices, processes, and practices and identify opportunities to help meet operational demand without compromising our understanding of the capability headed to the field. I will advocate for modernization of T&E methods that will allow us to mitigate risks in test and the field, and adequately evaluate the performance in operationally relevant and realistic conditions.

Adaptation of T&E to Evolving Acquisition Strategies

The current Acting DOT&E has praised some Middle Tier Acquisition programs for incorporating integrated testing approaches, while acknowledging the stress that these rapid test-fix-test cycles have put on operational test agencies and developmental test organizations—in major part because of the resource constraints these agencies and organizations regularly experience.

41. If confirmed, how would you propose to achieve an appropriate balance among the desire to reduce acquisition cycle times, T&E resource demands and constraints, and the need to perform adequate testing and evaluation?

I believe a shorter overall acquisition process is necessary to deliver capability to the warfighter at the speed of relevance, but it cannot come at a cost of unexpected and unaccounted for weapons systems performance in combat. Neither DOT&E nor Congress should relinquish its oversight role, regardless of acquisition model. If confirmed, I would not shy from placing Middle Tier Acquisition (MTA) programs under DOT&E oversight, if necessary.

To ensure that capabilities obtained under MTA authorities are assessed appropriately, DoD should direct the Services and Agencies to execute integrated T&E programs that fully leverage mission- and model-based approaches, transformative digital technologies, and other innovative T&E tools and processes. The Department also must fund the formation of a more robust T&E workforce, with both more full-time in-house personnel and access, on demand, to experts in cutting-edge fields from academia, FFRDCs and the commercial sector.

If confirmed, I will engage with Service leadership, system developers, and developmental and operational testers to develop a test and evaluation strategy appropriate to the program, system, or capability that will: 1) effect the discovery of problems early in system development; 2) verify desired system functionality; and 3) facilitate planning and execution of adequate operational demonstrations of required capabilities, which must validate achievement of the intended capability and inform the decision whether to transition from a Rapid Prototyping effort to a follow-on program or, in a Rapid Fielding program, to start initial production.

42. **What requirements and criteria would you propose to ensure an effective test and evaluation program is established for rapid and/or agile acquisition programs?**

Adequate resourcing of the DOT&E workforce and supporting FFRDC funding and manpower is critical to ensuring these programs have early DOT&E involvement, independent oversight, and access to expertise and experience. The development and implementation of innovative test and evaluation methods to support more advanced T&E early and often would also be beneficial for such programs.

43. **What are your views on the important and timing of the testing and evaluation of systems under spiral, iterative, or agile development? When, in your view, should follow-on testing and evaluation be required?**

Regardless of the systems development approaches now available through the Adaptive Acquisition Framework – to include spiral, iterative, and agile development – adequate test and evaluation of systems is critical to fielding weapons that work. As is the case with all systems, T&E must be completed in a timely manner in order to provide the right information to those who need it to support funding and schedule decisions, system development and fielding decisions, and development of operator concepts of operations and employment and tactics, techniques and procedures.

Typically, follow-on T&E is conducted using fielded production systems with appropriate modifications, upgrades, or increments. I believe this should remain the case in programs that adopting a spiral, iterative, or agile development paradigm. The differences in follow-on T&E, due to the iterative nature of these methods, are twofold: 1) DoDI 5000.87 requires software to be instrumented such that it supports data collection during operations; and 2) the iterative process enables testers to collect data from tests over time, building a cumulative body of evidence over time.

In this model and with these enablers, follow-on T&E no longer needs to be considered a "big bang" testing event. Instead, it could be a data-collection activity that happens over time, and seen as an evaluation process that occurs when deemed necessary.

Cybersecurity

The current Acting DOT&E testified that of the programs DOT&E assessed in FY 2020, virtually none were survivable against relevant cyber threats. All can agree that a lack of program resilience in this regard is unacceptable.

44. If confirmed, how would you propose to improve cybersecurity testing of systems and technologies, including the security of commercial cloud services?

The only way to test whether a system can withstand an actual cyberattack is to actually conduct such an attack on the system in a test environment. It is my understanding that the Department uses NSA-certified red teams to do that during operational testing. Unfortunately, those teams are stretched very thin by high demand, and have limited resources. Additional resources for those teams, as well as automation capabilities to ease their workload, would improve cybersecurity testing. We also need to take advantage of the evolving body of research that is coming out of our FFRDC's that can inform the methods and tools for how we would do this work in the future.

Regarding commercial cloud services, upon which DoD relies more and more to store highly sensitive, classified data, the biggest limitation is that DoD's current contracts with cloud vendors generally don't allow DoD to independently assess the security of cloud infrastructure owned by the commercial vendor. Unless this burden is lessened, it is difficult to assess the security of those clouds.

45. If confirmed, how would you propose to ensure the Office of DOT&E, program offices, and the Military Departments' and Services' Test Agencies have the appropriate infrastructure for cybersecurity testing?

If confirmed, I would first seek to better understand any additional obstacles facing the Military Departments' and Services' Test Agencies when it comes to infrastructure for cybersecurity testing. I also believe that each entity should make use of the NSA-certified red teams during operational testing.

46. If confirmed, how would you propose to improve use of National Security Agency-certified red teams and other mechanisms for stress testing?

I believe that these red teams should be used early and often to conduct attacks on blue systems, and they need to be incorporated in all levels of testing from developmental through operational. Unfortunately, those teams are stretched very thin by high demand, and they don't have the resources or personnel needed to routinely mimic sophisticated nation-state attacks, such as those China or Russia have executed and will continue to do. Additional improvement in cybersecurity

testing should include integration of research, automation capabilities, evolving tools and resources for those teams to either ease or reshape their workload.

47. In your view, what is the appropriate time in the program lifecycle to conduct cybersecurity operational testing, particularly given almost constant updates in software?

Operationally realistic cyber testing should occur throughout the program's lifetime. Persistent Cyber Operations provide such testing periodically in a very operationally realistic way, for critical operational networks and systems. It is my understanding that DOT&E sponsors Persistent Cyber Operations in a number of Combatant Commands through its Congressionally-mandated Cyber Assessment Program. Additionally, the Department may consider expanding such operations to support critical missions, such as nuclear command and control and missile defense.

Information Systems and Software test issues

The Department of Defense's weapon systems, enterprise IT systems, and business systems are increasingly software intensive and software defined, requiring a fundamental shift away from a traditional "waterfall" acquisition process toward smaller increments fielded more frequently. This poses challenges for developmental and operational testing.

48. In your view, what are the most significant challenges unique to the testing of incrementally developed information systems and software?

The challenges of testing software-intensive systems or cyber-physical systems are robust, and will not be mitigated by the Software Acquisition Pathway (SWP) alone. The Department may require additional technologies, both for development and test, to meet these challenges. For example, I believe the Department must move to a more robust digital modeling capability, such as digital twinning, which will allow DoD to test the software in a simulated or emulated hardware environment.

I am also aware that DOT&E has partnered with USD(R&E) in the execution of NDAA 2020 Section 231, the use of Digital Engineering to Automate T&E. This effort is focused on demonstrating the utility of the digital engineering approach to deliver operationally effective, suitable and survivable software-reliant and/or cyber-physical systems. If confirmed, I would wholeheartedly support continuing this partnership to advance these capabilities.

Historically, DOT&E evaluates programs against requirements established at the beginning of system development.

49. What role do you believe the DOT&E should play in testing of software intensive weapons systems, business systems, and enterprise information systems?

DOT&E's role in any program on oversight, by statute, is to independently assess the effectiveness, suitability, survivability and, where appropriate, lethality of U.S. warfighting and business capabilities in operationally representative scenarios. Traditionally, the operational test and evaluation community is able to test systems only after the software has been delivered in a formal baseline that will meet program requirements, embedded in the hardware, and in a form where it could be executed in the context of the system and mission it supports. This is a validation-type activity, which is appropriate for the operational T&E community. While verifying software is inherently a developmental T&E function, modern software methodologies potentially provide operational T&E an opportunity to "shift left" and examine smaller pieces of completed software code as it becomes available, in the context of a mission. This could lead to earlier discovery of defects, and provide OT&E a more active voice in the "find, fix, verify" cycle early on, when software changes are less difficult to implement. State-of-the-practices software development embraces the involvement of the intended users early and often throughout development, testing, certification and operations. In this way, their feedback is implemented more efficiently and effectively, but also is likely to have an impact on some requirements initially set by the program.. Modern tools and methods provide a controlled mechanism by which detailed requirements evolve over time. The OT&E community will need to understand how those requirements are evolving so that we can to adjusted testing of high-level requirements that evolve in concert with user priorities.

50. **Does the test and evaluation community of the Department possess adequate tools, test environments, expertise, staffing, and funding to carry out its testing responsibilities as they relate to software intensive systems?**

Based on my current understanding of DoD's T&E ecosystem, I believe the Department must substantially improve its tools and test environments in order to handle the volume of software-reliant systems in the acquisition pipeline. Potential capabilities include automation-based testing that can keep pace with rapid incremental software releases, and embedded diagnostics that warn when software isn't behaving as it should. From a personnel standpoint, I believe DoD needs a much larger, robust pool of software and cyber expertise. Given the extremely competitive nature of the software and cyber fields, I believe a two-pronged approach will be required: human resources that reside in house, and an on-demand consortium of other government organizations, academics, and commercial sector practitioners.

51. **What access to commercial information services, software, and systems does the operational test and developmental test community need to identify potential performance and security issues, and confirm operational effectiveness and suitability prior to a system's use by the Department of Defense?**

It is imperative that DoD have the opportunity to evaluate the performance and security of all warfighting capabilities, including commercial information services, software, and systems. It is my understanding that currently, DoD cannot adequately test and evaluate the cybersecurity of any DoD capability hosted in the commercial cloud, to include software factories. I believe that going forward, every contract for cloud services should permit such testing. Moreover, the DoD should be informed immediately of any breaches of commercial networks where commercial products utilized by the department were developed.

52. What role, if any, should commercial sector testing play in the Department's testing and evaluation of commercial information systems that are being modified to support defense needs?

Out-of-the-box commercial components are not tested at the same level as military standard components, which could potentially create failures when operating at extreme conditions. I believe there is a T&E role for the commercial sector in this scenario, but successful execution requires more rigorous standards, sufficient contract specifications, and modular open system architectures. Commercial sector testing resources should be focused on verification efforts, with DoD's operational T&E community leading the assessment of operational effectiveness, suitability, survivability, and lethality in order to maintain acquisition independence.

Modular Open Systems Approaches and Interfaces

Congress has enacted legislation mandating the use of Modular Open Systems Approaches (MOSA) in systems acquisition and the delivery to the government of interface characterizations to enable interoperability.

53. What are the unique challenges and imperatives, if any, in testing MOSA-based systems and verifying compliance with interface requirements?

Many net-centric programs across the Department, including MOSA-based programs, have to develop dozens or even hundreds of interfaces internally, or to other products and legacy systems, in order to be operationally effective. To ensure that these interfaces work correctly, it is imperative that the program fund an adequate developmental test environment so that modules of the system can change and improve over time. This would include with operationally-realistic interfaces and data flows so that the program can mitigate performance and interface problems early. Programs that do so are much more likely to succeed during operational testing and are deployed soon after. Programs without an adequate developmental test environment usually experience severe delays and cost overruns.

Business and Cloud Computing Systems

54. If confirmed, how would you improve DOT&E capabilities to test and evaluate the operational suitability of business systems and the business processes they are intended to support?

I understand that recent DOT&E reporting shows that business programs that fund operationally realistic test environments early on, and use such environments to support both developmental and operational testing, typically have fewer cost and schedule problems than programs that choose not to fund such environments. I believe the best thing the Department can do to improve the testing and programmatic outcomes of business systems is to robustly fund operationally realistic test environments as soon as possible during program development.

55. How would you improve the capabilities to test and evaluate the operational suitability of cloud computing systems and services?

Determining the operational suitability of cloud computing systems and services has generally not been a problem to date. However, it is my understanding that DOT&E, and DoD in general, is currently unable to determine the cybersecurity of commercial cloud systems and services because DoD's contracts fail to permit independent DoD cybersecurity assessments of the cloud's commercially owned infrastructure. This is a severe limitation, which should be addressed in order to ensure that sensitive and classified data stored in such clouds are secure.

56. In your view, what are the challenges currently affecting DOD's ability to determine the operational effectiveness and suitability of commercial information services prior to their deployment and use?

It is my understanding that determining the operational effectiveness and suitability of commercial information services has not been a problem for the Department to date. The major challenge is DoD's inability to independently assess the cybersecurity of commercial clouds because DoD's contracts do not permit such assessments on commercially owned cloud infrastructure.

Testing of Commercial Hardware Based Systems and Technologies

The Department of Defense is making significant efforts to use more commercial hardware platforms, technologies, and systems.

57. What policies and practices should the Department establish to govern the developmental and operational testing of these kinds of commercial systems?

To enable adequate cybersecurity testing of commercial hardware systems, such as commercial clouds, the Department should establish policies that require DOD contracts with commercial vendors to permit independent, DOD cybersecurity assessments of commercially owned platforms, technologies and systems.

Combination of Testing with Training Exercises

Some hold the view that the most representative operational testing would be to allow operational forces to conduct training exercises with the system under evaluation.

58. In your view, should testing be combined with scheduled training exercises for efficiency and effectiveness?

Training exercises offer a unique opportunity to test in more realistic operational scenarios that better replicate the density and complexity of modern warfare. They can and should be leveraged

to provide critical operational test data on joint force interoperability and tactical employment. However, data-driven operational test objectives are not always compatible with training objectives because training exercises are not often intended to address, and do not include, the instrumentation necessary to generate the high-quality data needed to characterize system performance, and to determine mission outcomes and root causes of system deficiencies. It understand that DOT&E frequently observes training exercises in which developmental systems participate to gain early insights, but the aforementioned factors currently limit the extent to which these activities should be combined.

59. What are the barriers, if any, to doing so?

Combined test and training events require trained personnel, a relatively mature system under test, and agreed-to and compatible test and training objectives. These resources and conditions are typically available only near the end of system development, which may limit available opportunities. Differences in test and training objectives also make integration of these events difficult.

Another significant barrier is the lack of affordable, high-quality instrumentation that is common to both test and training systems. Installing modular, open-air battle shaping instrumentation systems on both test and training systems would enable both communities to leverage these events while applying emergent Big Data analytics and knowledge management capabilities to improve post-mission analyses. Standing up Big Data analytic teams that are capable of engineering and analysis to develop requisite tools and analysis methodologies is also required to be able to accurately assess the results of large-force exercise and/or test events.

60. How can training and testing ranges be used more jointly and efficiently, in your view?

Development of common, but tailorable, instrumentation systems, such as the Quick Reaction Instrumentation Package (QRIP) and Open Air Battle Shaping (OABS) systems currently in use for testing of several types of aircraft, is necessary to enable the application of Big Data and Knowledge Management capabilities in both communities. I support efforts to enable high-quality data collection in training venues, which would significantly improve both testing and training and lead to more opportunities for combined test and training activities.

"System of Systems" Testing

61. What inherent challenges exist for the operational T&E of DOD programs that are part of an overall "system of systems"?

A good example of such a system of systems is the Missile Defense System, which comprises more than a dozen different missile, sensor, and network systems, all of which must work together during wartime. Operational test challenges for such a system of systems include getting all system owners to agree on the testing plans, schedule, and scope; obtaining an appropriate venue for such a large-scale test; and obtaining adequate funding to support operationally

realistic testing. For the Missile Defense System, Congress has helped the DoD achieve more realistic testing by mandating that the Army and the Missile Defense Agency conduct joint testing of their individual missile defense systems.

62. How should a "system of systems" be tested to assess the effectiveness of the whole system? Please explain your answer.

The only way to truly understand how a system of systems will perform in combat is to test it as a system of systems, with all of its component systems deployed against operationally realistic threats. However, such tests are difficult to conduct routinely due to a variety of operational test challenges. Hence, the best way to assess the effectiveness of such systems is to use a combination of modeling and simulation and real-world testing, where the real-world testing is designed to validate and accredit the modeling and simulation.

Live Fire Testing

The live fire testing program is a statutory requirement enacted to ensure DOD assessment of the vulnerability and survivability of platforms, while also assessing the lethality of weapons against required target sets.

63. What are the major challenges facing the live fire testing program, in your view?

The live fire testing program must be resourced and staffed to be responsive to evolving designs while also staying ahead of current and expected threats. The survivability of new defense systems, including those in space and the electromagnetic spectrum environment, should be assessed against the operationally relevant spectrum of threats, including evolving kinetic threats and more sophisticated non-kinetic threats.

64. Is live fire testing to determine whether weapons systems, vehicles, or personal protective equipment meet military and contract specifications for procurement an inherently governmental function, a function that can be outsourced, or a function that can use a mix of government and commercial facilities? Please explain your answer.

Live fire testing that supports a fielding decision or full-rate production decision is inherently governmental. Warfighters should be provided systems that have undergone government testing at a government facility or, under limited circumstances, testing at non-governmental facilities with government supervision. The government could use private certified labs, as necessary, to meet surge requirements or to conduct research and development testing. When testing is conducted at commercial facilities, it must have government oversight and meet a common standard appropriate for the intended use of the data.

Modeling and Simulation

Advances in modeling and simulation have provided an opportunity to streamline the testing process, saving time and expense.

65. What do you believe to be the proper balance between modeling and simulation and actual testing of a developed product?

Testers must use models that are credible or risk providing warfighters incorrect information about their systems. Failure to identify system vulnerabilities during testing prevents correction or mitigation, and can create disastrous results in combat. Modeling and simulation (M&S) credibility is achieved through a process of verification, validation and accreditation. At its base, validation requires live data to confirm that the modeled performance is representative of the real world.

Modeling and simulation is an investment. There can be significant cost to developing and validating M&S. However, returns may include: 1) system evaluation in scenarios that cannot be achieved with live testing due to safety constraints, availability of threat surrogates and test range limitations; 2) less demand on Service assets; 3) shorter timelines due to its availability and speed of execution; and 4) significant repetitions at lower cost yet greater fidelity in performance assessment. The early costs of M&S may be high but it produces significant dividends in testing of the follow-on iterations of a system or a similar system. I strongly support a healthy investment in M&S for all systems.

The proper balance between modeling and simulation and actual testing changes with system and model maturity. For a new system employing emerging technology or significantly modified technology, there may be little to no representative live data. For initial evaluations, it is possible that the live data required to develop and validate models will exceed the amount of live data necessary to assess initial system performance. For follow-on iterations of the system, much of the previously attained data remains pertinent, which means less new live data is needed. As the system develops with each iteration, tester confidence in the M&S increases and enables greater reliance on M&S to assess the system's performance.

Sufficiently robust and validated models are not yet available that would preclude testing things like combat systems without some form of live events. Actual demonstration is essential to operator confidence. Further, all M&S has limitations. Continued system improvement depends upon some live testing, particularly testing that evaluates the system under its most stressing conditions. However, significantly less live testing is appropriate when supplemented with credible M&S.

66. Are there areas in modeling and simulation that need to be advanced in order to improve its utility as a tool for operational and developmental testing?

Advances in M&S are essential to support the evaluation of emergent technologies, such as artificial intelligence, autonomous systems, directed energy, and hypersonics. Confidence in an autonomous system, for example, requires an assessment of system response to a set of circumstances and combinations of those circumstances that would be cost- and time-prohibitive in live events alone. A virtual range is necessary to provide the data-rich environment needed to

have confidence in the decision-making of an autonomous machine. Further, decision making needs to balance between safe operations and mission accomplishment. For example, a system that over-maneuvers can never get to its objective. Developers need to be able to determine the threshold for response that supports the expected environment, which can be significantly different for each intended mission.

Another area for investment is a comprehensive M&S environment to assess ship self-defense capability against anti-ship cruise missiles (ASCMs). Threat ASCMs vary significantly in capability and employment. The same is true for the radar systems, intercept missiles, and combat systems on naval ships. Adequately evaluating the capability of the growing number of unique ships will be cost-, time-, and resource-prohibitive without an effective M&S environment that can credibly assess any combination of defense systems against any presentation of threat ASCM.

> **67. Given recent advancements in modeling and simulation, and increasing interest in the Department's use of so-called "digital twin" technology to improve mission readiness and sustainment, where would you draw the line between the suitability of virtual testing and live testing?**

Modeling and simulation must be credible, with its credibility anchored by comparison to live test data to confirm representation of the real world. As confidence develops in the M&S through validation, it is appropriate to lean more heavily on virtual testing. However, it is not appropriate to exclude all live testing. Smaller live test events, called demonstration events, should remain a part of testing to ensure operator confidence in their combat systems, to enable continued improvement and validation of M&S, and to mitigate the inherent limitations of M&S.

Science and Technology

> **68. What are your views on the appropriate level of investment in science and technology (S&T) programs to develop next generation testing capabilities?**

The complexity of DoD weapon systems and the multi-domain operational environment that is changing in both space and time warrant heavy reliance on science and technology investment to advance T&E tools and methods. Future T&E demands will require us to improve the way we collect, store and analyze data. If confirmed, I will seek to review the existing DOT&E S&T strategy, ensure that it is implemented in a timely and operationally-relevant fashion, and provide my best recommendations to the Secretary and the Congress.

> **69. If confirmed, what mechanisms would you employ to ensure the S&T portfolio is responsive to the Department of Defense's future test instrumentation needs?**

In annual reports to Congress, DOT&E has pointed out specific test areas where more S&T is required in order to ensure future OT&E adequacy. DOT&E has also historically prepared issue papers, which highlight particular test resource issues, including those related to S&T, for the Department's annual program and budget reviews. If confirmed, I will evaluate the Test

Resource Management Center T&E and S&T portfolio, discuss any shortfalls with the Secretary, and keep the Congress informed of my findings and intended actions.

> **70. In your view, in which areas should the Department's S&T program be investing with a view to improving the quality of current and future testing capabilities?**

S&T areas for potential investment include 1) a continuum of T&E for changing software capabilities, evolving interoperability, and cybersecurity threat response; 2) next-generation T&E capabilities, to include hypersonic weapons and defense, directed energy, contested space, cybersecurity, data analytics, electronic warfare, nuclear survivability, spectrum allocation, artificial intelligence-based system T&E, real-time casualty assessments, and telepresence (remote) T&E; 3) integrated T&E; 4) digital transformation in taking advantage of new model-based engineering tools to redesign how we perform T&E; and 5) workforce expertise and partnership. If confirmed, I will evaluate the progress in these areas, discuss any shortfalls with the Secretary, and keep the Congress informed of my findings and intended actions.

Encroachment and Environmental Issues

> **As is the case with military training, the Department of Defense's test and evaluation efforts must take into account encroachment requirements and environmental regulations, both on land and at sea.**

> **71. In your view, what is DOT&E's responsibility to the communities and environment near its test ranges?**

I believe it is vitally important to maintain open and proactive communications with our community partners to achieve mutually beneficial solutions. While I understand this authority is assigned to the Test Resource Management Center (TRMC), I will ensure that my views concerning the compatibility of the test ranges with neighboring communities, along with any impacts on the environment, are known to TRMC and leadership within the Department.

If confirmed, will also ensure that Department officials sustain longstanding relationships with federal, state, and local governments, tribes, and non-governmental organizations, such as the Western Regional Partnership, the Southeast Regional Partnership for Planning and Sustainability, and the Land Trust Alliance. This will enable full awareness of current and projected environmental requirements, and prospective encroachment issues that may affect the Department's test ranges, and in particular, the effective conduct of operational and live-fire T&E.

> **72. If confirmed, how would you address encroachment and environmental requirements, while ensuring the quality and quantity of the Department's test and evaluation programs?**

If confirmed, I will remain alert for environmental requirements and range encroachment that could adversely affect the ability to conduct adequate operational and live-fire T&E. I will not hesitate to bring any concerns that I have about the effects of environmental requirements and/or range encroachment on the ability to conduct adequate operational testing to senior leadership of the Department. Further, I will document such concerns in both my Annual Report and program evaluations, as appropriate. Where I am aware of any issues pertaining to encroachment and environment, I will bring such matters to the attention of TRMC as well as the leadership of other Department stakeholders.

Sexual Harassment

In responding to the 2018 DOD Civilian Employee Workplace and Gender Relations survey, 17.7 percent of female and 5.8 percent of male DOD employees indicated that they had experienced sexual harassment and/or gender discrimination by "someone at work" in the 12 months prior to completing the survey.

73. What is your assessment of the current climate regarding sexual harassment and gender discrimination in the office of the DOT&E?

Any sexual harassment or gender discrimination within DOT&E, or the Department as a whole, is deeply disturbing and entirely unacceptable; these actions foster a climate that is inconsistent with the dignity and respect that our workforce deserves. The Department should continue its efforts to eliminate sexual harassment and gender discrimination, ensure consistent incident tracking and responsiveness, and provide training to improve outcomes and workforce stability. If confirmed, I would review previous workforce assessments, including climate surveys, OPM Federal employee viewpoint survey results, and any other documentation that would give me insight into the DOT&E organization, and help me make informed decisions on next steps to eliminate sexual harassment, gender discrimination, and any other harassment within the Office of DOT&E.

74. If confirmed, what actions would you take were you to receive or become aware of a complaint of sexual harassment or discrimination from an employee of the Office of the DOT&E?

If confirmed, I would immediately reiterate to the workforce the importance of equality and diversity, the Department's zero tolerance for any form of harassment, and the expectations of professional conduct. I would take any complaint brought to my attention very seriously, and would immediately contact the appropriate office to initiate an investigation to gather all facts, conduct the necessary interviews, collect appropriate information, and address the complaint within the specified guidelines of DoD regulations and policies.

Congressional Oversight

In order to exercise legislative and oversight responsibilities, it is important that this committee, its subcommittees, and other appropriate committees of Congress receive timely testimony, briefings, reports, records—including documents and electronic communications, and other information from the executive branch.

75. **Do you agree, without qualification, if confirmed, and on request, to appear and testify before this committee, its subcommittees, and other appropriate committees of Congress? Please answer with a simple yes or no.**

Yes.

76. **Do you agree, without qualification, if confirmed, to provide this committee, its subcommittees, other appropriate committees of Congress, and their respective staffs such witnesses and briefers, briefings, reports, records—including documents and electronic communications, and other information, as may be requested of you, and to do so in a timely manner? Please answer with a simple yes or no.**

Yes.

77. **Do you agree, without qualification, if confirmed, to consult with this committee, its subcommittees, other appropriate committees of Congress, and their respective staffs, regarding your basis for any delay or denial in providing testimony, briefings, reports, records—including documents and electronic communications, and other information requested of you? Please answer with a simple yes or no.**

Yes.

78. **Do you agree, without qualification, if confirmed, to keep this committee, its subcommittees, other appropriate committees of Congress, and their respective staffs apprised of new information that materially impacts the accuracy of testimony, briefings, reports, records—including documents and electronic communications, and other information you or your organization previously provided? Please answer with a simple yes or no.**

Yes.

79. **Do you agree, without qualification, if confirmed, and on request, to provide this committee and its subcommittees with records and other information within their oversight jurisdiction, even absent a formal Committee request? Please answer with a simple yes or no.**

Yes.

80. Do you agree, without qualification, if confirmed, to respond timely to letters to, and/or inquiries and other requests of you or your organization from individual Senators who are members of this committee? Please answer with a simple yes or no.

Yes.

81. Do you agree, without qualification, if confirmed, to ensure that you and other members of your organization protect from retaliation any military member, federal employee, or contractor employee who testifies before, or communicates with this committee, its subcommittees, and any other appropriate committee of Congress? Please answer with a simple yes or no.

Yes.