Senate Armed Services Committee
Advance Policy Questions for Dr. Amy Henninger
Nominee to be Director of Operational Test and Evaluation

Duties and Qualifications

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)?**

A: The DOT&E's responsibilities are delineated in Title 10 U.S.C. Sections 139, 4171, and 4172, as well as DoD directives and instructions. The role is pivotal in providing critical insights to acquisition authorities, strategists, and operators, supporting informed decision-making and contributing to the combat readiness and effectiveness of the U.S. armed forces.

The Director of Operational Test and Evaluation (DOT&E) serves as the primary advisor to the Secretary of Defense on matters related to operational test and evaluation (OT&E) and live fire test and evaluation (LFT&E). This role is crucial in the Defense Acquisition System, ensuring defense systems are thoroughly assessed for effectiveness, suitability, survivability, and lethality throughout their acquisition lifecycles.

Key Duties and Functions:

- Principal Advisor: Acts as the principal staff advisor to the Secretary of Defense on OT&E and LFT&E matters.
- Policy Formulation and Implementation: Develops and implements policies and procedures for OT&E and LFT&E, ensuring comprehensive and methodical planning and execution. This includes authorizing strategies and plans for systems under its purview.
- Oversight and Coordination: Provides oversight of the operational testing of major defense programs, major automated information systems, and other designated systems. Coordinates joint operational testing efforts across different military branches to ensure interoperability and effectiveness.
- Independent Assessments: Conducts independent and objective assessments of test results to validate the performance, reliability, and suitability of weapons systems in realistic operational environments. Differentiates OT&E and LFT&E from other testing activities by using realistic environments and threats, alongside trained personnel employing current tactics and procedures.

- Reporting to Congress: Submits an annual report to Congress summarizing OT&E and LFT&E activities, outcomes, and challenges. This report includes recommendations on resources, facilities, and funding. Additionally, provides Beyond Low-Rate Initial Production Reports, Early Fielding Reports for urgently needed systems, and Live Fire Reports, as well as responding to congressional requests.
- Budgetary Recommendations: Reviews and provides recommendations to the Secretary of Defense on all budgetary and financial matters related to OT&E and LFT&E, including test facilities. Identifies and articulates any resource deficits and prioritizes needs essential for conducting thorough evaluations. Ensures that transitioning to full-rate production in major defense acquisition programs is contingent on the DOT&E's reporting to Congress and the Secretary of Defense. These reports summarize independent assessments of testing sufficiency and the systems' operational capabilities in realistic military contexts.

The DOT&E ensures the testing process is transparent and accountable to Congress and other stakeholders, maintaining an independent stance to provide unbiased evaluations.

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

A: I bring to this role the breadth of experience and the technical depth required to lead at this moment. The systems we are testing now, and increasingly in the future, are highly software-intensive, AI-enabled, cyber-contested, complex distributed systems of systems that evolve rapidly, even after fielding. With over 30 years of experience in the national security enterprise, both in the private sector and in the public sector, my expertise in software, AI, cybersecurity, interoperability, distributed computing, synthetic environments, among many other computing technologies, aligns directly with these realities. Over many special government executive-level positions, I've worked across the entire RDT&E lifecycle—including in test and evaluation, where I served as the Senior Advisor for Software and Cybersecurity to the Director of Operational Test and Evaluation. In that role, I was good-naturedly known as the "SASC,", and I was proud to contribute directly to the office's mission: building strong working relationships with the Services, assessing the acquisition programs, and strengthening the test and evaluation workforce.

Prior to the start of government service, I held senior technical roles in private industry, including positions as an engineer at McDonnell Douglas (now Boeing) where I led the modeling and simulation of weapons systems; Staff Scientist at SAIC (now Leidos) where I led software development initiatives on Army Programs of Record; and artificial intelligence (AI), where I served as a senior scientist for a small AI startup spun out of the University of Michigan AI Lab. During that time, I also

served as adjunct faculty at universities, teaching undergraduate classes in software engineering and graduate classes in agent-based AI.

Across my career in government, I have been called on for term-limited executive assignments designed to address specific technical, organizational, or emerging threat challenges. I have been responsible for standing up new capabilities, leading cross-organizational efforts, and delivering actionable results that have often required balancing near-term mission needs with long-term strategic objectives. This extends to government service beyond the DoD, including Intelligence and Homeland Security enterprises.

My experience combines a broad base of analytic skills with focused expertise in advanced technology, further coupled with a demonstrated ability to lead the integration of emerging technologies into the T&E enterprise and strengthen the T&E workforce. I believe this background provides a strong foundation to serve as Director, Operational Test and Evaluation, and to help ensure that warfighters are equipped with systems that are safe, effective, suitable, and resilient against the full spectrum of threats.

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

A: The recommendations for changes in the duties, functions, and authorities of the DOT&E (Director, Operational Test and Evaluation) emphasize the need to transition from its original hardware-centric focus to a more contemporary approach that prioritizes software-centric and data-centric systems. This change presents new risk models for the Department, with the speed of technological delivery becoming a more critical component. As a significant risk factor, the ability to deliver advanced capabilities at the speed of relevance necessitates a transformation in how DOT&E operates. This shift is crucial as modern warfighting increasingly relies on the seamless integration of complex, interconnected systems and technologies across multiple domains.

Furthermore, it is important for DOT&E to establish an organizational framework that supports continuous evolution and adaptation to the rapidly changing nature of system development. This would involve fostering a culture of ongoing innovation and the integration of new technologies and methodologies into the test and evaluation processes.

If confirmed, I will work with the DOT&E team, Congress, the Secretary of Defense, and key test and evaluation stakeholders to examine how the test and evaluation enterprise is responding to the evolving aspects of system development and how we are addressing the operational performance of such systems in the context of joint warfighting concepts, kill webs, mission threads, and any other system-of-system scenarios.

Major Challenges

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

   A: If confirmed as the Director of Operational Test and Evaluation (DOT&E), I would confront several major challenges. The immediate challenge will be adapting to changes in the DoD acquisition system resulting from the NDAA provisions for acquisition reform. Balancing adequate testing with the desire for rapid development and fielding, while implementing greater use of credible models and simulations, will be crucial. It is essential that our testing accurately reflect how systems will be used in combat, especially as the adversary often iterates faster than we do. To win in conflict and deter adversaries, we must outpace them in developmental and operational investments and processes across all warfighting domains, including cyber threats and next-generation technologies like autonomy and AI-enabled equipment.

   Integrating emerging technologies such as generative AI and robust cybersecurity measures within operational testing frameworks is vital. Implementing the DoD data management strategy across the test and evaluation enterprise will enable data analytics and automation, accelerating data collection, analysis, and test planning. Achieving a balance between expedited deployment of defense systems and their thorough validation is critical. Ensuring mission effectiveness, suitability, survivability, and lethality without compromising thoroughness requires a nuanced approach to testing. Addressing the scale and complexity of new threats and capabilities, such as hypersonics and kill webs, requires modernizing the testing infrastructure. This includes scalable and adaptive representation of the multi-domain operating environment in tests and overcoming resource constraints like test range limitations.

   Cybersecurity must be embedded into every system from its inception, as an integral part of every phase of the development life cycle. It's essential that we promote cybersecurity testing that focuses on operational effectiveness and mission-based system-of-systems tests. Establishing a new paradigm where DOT&E's input is integral from the beginning of programs is crucial. Early consideration of operational test factors as we begin to define requirements and develop system architecture will help mitigate later integration issues. Additionally, it's essential we build and foster an agile workforce with the skills to accurately assess performance throughout DoD system lifecycles. This includes promoting continuous testing in middle-tier acquisition to identify and fix vulnerabilities early.

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

A: Addressing the multifaceted challenges described above requires a concerted effort across the Department. If confirmed, my initial agenda would include cultivating robust partnerships within the test and evaluation community, encompassing service test agencies, and the acquisition, R&D, requirements, and intelligence sectors. My aim would be to not only map out ongoing initiatives targeting these challenges but also to uncover potential new areas for improvement.

To adapt to changes in the DoD acquisition system and balance adequate testing with rapid development, I would, if confirmed, implement greater use of credible models and simulations. This will involve integrating emerging technologies such as generative AI and robust cybersecurity measures within operational testing frameworks. Implementing the DoD data management strategy across the test and evaluation enterprise will enable data analytics and automation, accelerating data collection, analysis, and test planning.

Ensuring our testing accurately reflects combat use will require close collaboration with the services to estimate their growing needs and prioritize the development of required tools, test environments, and capabilities. If confirmed, I would work closely with DARPA, USD(R&E), U.S. Cyber Command, the National Security Agency (NSA), and the services to increase visibility and make maximum use of available cyber ranges, red teams, tools, and models. I would also partner with the Defense Innovation Unit to bring the best commercial test and evaluation tools and services. This collaboration will help modernize the testing infrastructure to address the scale and complexity of new threats and capabilities, such as hypersonics and kill webs.

Cybersecurity must be embedded into every system from its inception, as an integral part of every phase of the system development life cycle. I would, if confirmed, promote cybersecurity testing that focuses on operational effectiveness and mission-based system-of-systems tests. Establishing a new paradigm where DOT&E's input is integral from the beginning of programs is crucial. Early consideration of operational test factors as we begin to define requirements and develop system architecture will help mitigate later integration issues.

It's essential that we build and foster an agile workforce with the skills to accurately assess performance throughout DoD system lifecycles. This includes promoting continuous testing in middle-tier acquisition to identify and fix vulnerabilities early. Engaging with Congress and the wider Department is a priority, as it is vital to foster these relationships and partnerships. Our collective efforts should be directed toward dismantling obsolete practices, streamlining processes, fostering integration and innovation, and training a future-ready workforce.

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

A: If confirmed, my broad priorities would focus on optimizing DoD testing through advances in multi-domain testing approaches, enhancing the T&E workforce,

promoting transparency with Congress and stakeholders, and providing thought leadership for a new DOT&E Concept of Operations (CONOPs) focused on accelerating advantage beyond merely validating programs.

First, I would prioritize advancing comprehensive multi-domain testing approaches for modern warfare. This includes reinforcing initiatives that facilitate precise simulation of interconnected battlefields and optimizing OT&E and LFT&E processes to enhance DoD's survivability in contested domains like cyberspace, electromagnetic spectrum operations, and space. Progress in this area can be measured by developing and integrating advanced physical, virtual, and combined/constructive testing capabilities, and by shortening the cycle from conceptual development to field testing.

Second, I would focus on optimizing DoD testing through advances in data management, technology, and training. Implementing the Department's data management strategy for T&E needs, creating and applying digital tools and analytics, and refining test planning, execution, analysis, and reporting processes are essential steps. This effort will support the Acquisition Pathways framework and ensure that innovative technologies, including autonomous systems, artificial intelligence, and cybersecurity measures, are effectively integrated into both operating and assessing defense systems. Additionally, I would prioritize building, training, and retaining a highly skilled DOT&E and T&E workforce. Progress would be measured by the successful integration of these technologies and the reduction in the time from conceptual development to field testing.

Third, promoting transparency with Congress and stakeholders is crucial. I would establish regular, clear, and detailed communications with Congress and other stakeholders regarding test findings and the statuses of different programs. Transparent reporting fosters a culture of continuous improvement and reaffirms our armed services as the world's preeminent fighting force.

Additionally, I would seek to address the continuous competing priorities between program resources and test adequacy by ensuring software and cyber T&E occur iteratively and incrementally throughout the life cycle. The strategic use of digital technology, including modeling and simulation, would 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.

Furthermore, I would provide thought leadership for a new DOT&E CONOPs focused on accelerating advantage beyond merely validating programs. This new CONOPs would require integration of DT and OT and emphasize proactive engagement in the early stages of program development, fostering innovation, and leveraging cutting-edge technologies to not only validate but also enhance the capabilities of defense systems. By driving forward-thinking strategies and fostering a

culture of continuous improvement, DOT&E can help ensure that the DoD maintains a competitive edge in modern warfare.

Finally, I would review the functions, processes, products, and staffing of the Office of the DOT&E to ensure alignment with the Secretary's objectives to rebuild a more lethal force. I would discuss any challenges identified with the Secretary and inform this committee of my findings and intended actions.

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?**

   A: If confirmed, I will prioritize open and transparent communication with Congress, ensuring timely and unbiased assessments on all aspects of Operational Test & Evaluation (OT&E) and Live Fire Test & Evaluation (LFT&E). I propose regular synchronization meetings with members of Congress and their staffs, keep defense committee leadership informed of significant results, and respond promptly to Congressional requests. My commitment includes providing independent and objective evaluations and maintaining a strong, collaborative relationship with Congress and Department of Defense oversight committees.

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?**

   A: If confirmed, I am committed to leveraging my unique access to provide objective, rigorous, data-centric evaluations of operational effectiveness, suitability, survivability, and lethality, as well as any other information of interest to this committee across all systems within my purview. The DOT&E's congressionally mandated requirement to provide unbiased assessments of a system's performance is critical to ensure that decisions made by Congress and this committee are fully informed by timely, accurate, and impartial data.

   The Director's independent access to Congress is a foundational aspect of DOT&E's mission, ensuring its activities are impartial and objective. I would provide transparent, succinct, and robustly substantiated evaluations of technical requirements and programmatic endeavors. These assessments will be instrumental in fulfilling oversight responsibilities and facilitating the legislative processes of this Committee.

   To facilitate continuous communication, I propose regular synchronization meetings with members of Congress and their staff, subject to their availability. These sessions would serve as platforms for periodic—or on-demand—reviews of technical and programmatic details, along with any other aspects pertinent to OT&E and LFT&E, ensuring that Congress is kept fully informed and engaged.

Independence and Objectivity

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?**

A: If confirmed, I would ensure my evaluations are wholly independent and objective by maintaining a clear separation from other DoD acquisition entities and retaining full independence in oversight decisions. Independence and objectivity are the bedrock of the Office of the Director, Operational Test and Evaluation (DOT&E). The effectiveness and credibility of DOT&E are a direct reflection of the integrity, independence, and leadership of the Director. I assure the Committee that I would provide Congress unvarnished assessments based solely on operational testing data, ensuring thorough analysis and consideration of all assumptions and limitations.

To maintain this independence, I would work in consultation with, but distinctly separate from, the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)), Under Secretary of Defense for Research and Engineering (USD(R&E)), and other acquisition entities in the DoD. I would ensure early and prompt communications with the military services and other program authorities to maintain transparency about my oversight decisions, but I will not allow these entities to influence those decisions.

I will equip DOT&E staff with the tools and training to independently evaluate a wide array of systems and the support simulations and threat models supporting those systems. This includes providing advanced digital tools that streamline routine tasks, freeing up resources to concentrate on more sophisticated analyses and evaluations. The competencies of DOT&E personnel will be regularly assessed and updated to meet the evolving demands of independent data examination, including live test data and simulated results.

A commitment to scientific rigor must underpin evaluations of operational effectiveness, suitability, survivability, and lethality. If I am confirmed, data integrity and evidence-based assessment would remain the foundation of all conclusions, using established data analysis methods while remaining open to diverse interpretations. Every finding would be the product of meticulous analysis, untainted by bias, and reflecting the true performance observed.

I will uphold the transparency and thoroughness of OT&E and LFT&E, using robust testing strategies that accurately reflect operational environments. Additionally, I will ensure prompt data processing and detailed analysis, transparently communicating all findings. My commitment is to provide balanced, impartial, and comprehensive evaluations, reflecting the full scope of rigorous testing processes. By implementing these steps, I would ensure that DOT&E's evaluations remain wholly independent and objective, providing reliable and unbiased information to Congress and other stakeholders' decision-making processes.

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?

A: If confirmed, I would take several specific steps to ensure that the assessments of major defense acquisition programs I provide to Congress are candid and complete. My assessments would be based solely on data collected during operational and other appropriate testing, ensuring that all information is thoroughly analyzed and that all assumptions and test limitations are considered and reflected in the final assessment. I would let the facts speak for themselves, providing balanced, neutral, and non-judgmental evaluations that cover all facts revealed by adequate operational testing.

To uphold the thoroughness and transparency of OT&E and LFT&E, I would ensure testing strategies and plans are robust enough to yield data that supports sound and operationally significant evaluations. This includes incorporating the most current intelligence to ensure testing reflects operational environments accurately, encompassing both kinetic and non-kinetic threats. Utilizing early testing phases conducted by contractors and during development will be key to achieving the independent objectives of OT&E and LFT&E.

I seek to equip DOT&E with the capabilities to promptly process and scrutinize vast datasets across various levels of classification, conducting stringent, scientifically grounded analyses of verification and validation plans for modeling and simulation. I would ensure DOT&E conducts detailed analysis, accounting for all assumptions and potential test limitations which our final evaluations will clearly communicate.

Furthermore, I would ensure the completeness of my assessments by requiring that the services' test strategies and test plans submitted for my approval be adequate to yield data that supports sound and operationally relevant evaluations. I would include any underlying assumptions and rationales for them, and report on any test limitations that may have affected the assessment of operational effectiveness, suitability, survivability, or lethality. My approach to presenting these assessments to Congress would be driven by evidence, ensuring commendable performance does not overshadow identified deficiencies, nor vice versa.

Section 4171 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)?

A: To ensure the independence and impartiality of contractor testing personnel and contracted advisory and assistance services, including those from Federally Funded Research and Development Centers (FFRDCs), I will enforce policies that prohibit employing contractors who have had a role in developing, producing, or testing any system under review. This will be supported by mandating that all DOT&E contracts include robust organizational conflict of interest clauses with effective mitigation strategies to ensure contractors and their subcontractors remain detached from developmental activities of systems they evaluate.

Collaboration with the Department of Defense Inspector General will be essential to verifying comprehensive measures are in place to ensure contractor neutrality. Additionally, if confirmed, DOT&E's civilian workforce will examine and validate all activities and outputs delivered by contractors to preserve the integrity and objectivity of evaluations and recommendations. For FFRDC partners, I will emphasize expectations for unbiased, professional behavior and continue the practice of having a DOT&E civilian review and approve all FFRDC activities and materials. If using waiver authority under Section 4171 paragraph (e)(2), I will seek recommendations from the DoDIG and OGC to ensure the impartiality and ethical participation of personnel. These measures collectively will help maintain the integrity and objectivity of the Department's evaluations and recommendations.

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?

A: If confirmed, I would manage disagreements with other elements of the Office of the Secretary of Defense and/or the military departments and services by prioritizing open and honest communication, transparency, and data-driven conclusions. I would ensure senior leaders understand the mission impacts of fielding systems when operational testing results indicate that further development is warranted. My assessments will be independent and based on rigorous analysis of the data revealed by testing, and I will make sure all stakeholders fully understand the underlying data and analyses that led to my conclusions.

To avoid or mitigate disagreements, I would communicate and coordinate early and frequently with the appropriate acquisition entities to align on expectations and share performance-based concerns. I will use findings from testing to provide timely, unbiased assessments and recommendations to the acquisition program, milestone decision authority, and the warfighter.

If data-driven discussions do not alleviate disagreements, I commit to informing this committee and members of Congress in a timely manner if an entity is seeking to progress or approve programs when the results of operational testing suggest further development, testing, or technical and engineering work is required. My commitment is to provide transparent, timely, and defensible assessments that reflect the true performance of the program or system as revealed by testing. By maintaining this approach, I would ensure my evaluations remain independent and objective, supporting informed decision-making for major defense acquisition programs.

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

A: In my view, the DOT&E should evaluate system capabilities and testing results to verify formal requirements established in a program, but only within a broader perspective that aims to characterize operational effectiveness, suitability, survivability, and lethality in real-world conditions. Formal requirements are essential as they guide system development, influence program decisions, and provide contractual specifications. However, it is crucial these requirements be measurable, testable, justifiable, achievable, and relevant to the operational mission.

That said, operational testing should not be focused on verifying compliance with formal requirements but only to the extent it impacts the assessment of how well a system performs in operationally realistic environments. This includes evaluating whether a unit equipped with the system can accomplish its intended mission, even if the formal requirements do not fully capture real-world operational metrics. Ideally, compliance with formal requirements and operational effectiveness 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.

Therefore, DOT&E should objectively evaluate systems against both their formal requirements and their operational performance. This dual approach ensures systems are not only compliant with specifications but also are effective and reliable in actual combat. By considering both formal requirements and real-world performance, DOT&E can provide a comprehensive assessment of a system's operational suitability and effectiveness.

14. **In your view, when evaluating system capabilities and testing results for a 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.

A: In my view, when evaluating system capabilities and testing results for a new system, the DOT&E should consider the capabilities of deployed, legacy systems the new system is designed to replace. This comparison is essential to determining whether the new system provides measurable and timely improvements in mission capability, materiel readiness, and operational support, as intended by the acquisition system.

The acquisition system is designed to acquire products and services that satisfy user needs with measurable improvements. To assess such improvements, DOT&E must consider the baseline capabilities of the legacy systems. This comparison helps evaluate if the new system offers greater mission capability, improves other elements such as reducing operator workload or easing the sustainment burden, or enables capability expansion and augmentation.

By comparing new capabilities to those of legacy systems, DOT&E can provide a comprehensive evaluation of the new system's performance, identifying areas where it enhances warfighter capability and any potential shortcomings. This approach ensures the new system not only meets its formal requirements but also delivers tangible benefits over the legacy systems it is intended 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?**

A: In my view, DOT&E should fully evaluate system capabilities and testing results against both known and expected threats across a system's operational lifecycle. Point-in-time testing is insufficient to inform leadership about the effectiveness, suitability, and survivability of a system amid ever-evolving threats, particularly for software-intensive systems. Understanding a system's capabilities throughout its lifetime is critical to ensure it remains relevant and effective, especially given increasing program delays and the rapid development of adversary weapon systems.

Evaluating DoD systems in operationally representative environments that include current and emerging adversary threats and targets, considering adversary tactics, techniques, and procedures, is also essential. OT&E and LFT&E must use the latest Intelligence Community knowledge and be conducted in multi-domain environments that encompass the full spectrum of kinetic and non-kinetic threats, including cyber, electromagnetic spectrum, directed energy weapons, and chemical, biological, radiological, and nuclear threats. When recreating a fully realistic threat environment is impractical, accredited modeling and simulation tools, anchored by live test events, should be used.

Combat credibility is the benchmark for DOT&E's assessment of new and evolving systems. Our capabilities must enable warfighters to succeed and survive against actual kinetic and non-kinetic threats, including cyber threats. This requires testing systems against the threats they are designed to address and ensuring operational testing represents real-world conditions and scenarios. Addressing revolutionary and evolutionary changes to T&E methods and processes, including threat emulation and simulation, is crucial for maintaining 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?

A: In my view, the DoD should design testing environments to mirror perceived denied and degraded environments to ensure that weapon systems can operate effectively under such conditions. This is particularly critical in the electromagnetic spectrum, cybersecurity, and adversarial and counter AI space, where systems are likely to face significant challenges. Designing testing environments that adequately stress the systems and operators will better ensure the suitability, survivability, and effectiveness of these systems.

A DoD testing environment that mirrors denied and degraded conditions is essential for evaluating operational performance and readiness in combat representative conditions. This environment should include state-of-the-art physical facilities, such as modernized open-air infrastructure, as well as virtual facilities, tools, and equipment needed for OT&E, LFT&E, training, and mission planning. The testing environment should enable an interconnected, interoperable network of ranges with geographically distributed live, virtual, and constructive systems capable of evaluating system interoperability, multi-domain kill webs, and emerging technologies in realistic environments.

The design of such testing environments should support dynamic upgrades to threats and targets to keep pace with advanced adversaries and persistent threats. This approach will ensure the T&E processes are positioned to enable rapid development and delivery of capabilities to the warfighter. Realistic testing environments that include accurate threats will allow us to understand the capabilities and limitations of our weapon systems, helping operational forces develop the right tactics, techniques, and procedures.

By incorporating both live, "open air" events and robust, validated, and accredited modeling and simulation venues where real operators are the testers, DoD can gather critical data sets. These data sets are essential for the acquisition system to correctly prioritize fixes and improvements to our weapon systems, ultimately enhancing the overall effectiveness and readiness of our military forces.

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

A: In my view, DOT&E must have comprehensive access to a wide range of information to support effective testing and evaluation. This includes all records and data within the DoD, including those from each military department, that are necessary for DOT&E to fulfill its duties as established by law. Specifically, DOT&E needs access to program artifacts such as system design data, requirements data and their rationale, concepts of operations and concepts of employment data, and acquisition strategy data. This information is crucial for adequately planning the tests needed to support program decisions.

Additionally, DOT&E must have 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 and vulnerabilities to include forensics on any cybersecurity breaches in the industrial base. To ensure the efficiency of the T&E program, DOT&E should also have access to all test data and information that would help scope the next testing phase. This includes the assessed accuracy, limitations, and assumptions associated with any modeling and simulation tools used to evaluate weapon system performance.

It is essential DOT&E receive all raw artifacts and processed data as soon as they are collected, to start independent data analysis and inform decisions in a timely manner. The responsibility for obtaining and maintaining access to this information should be collectively held by the program office, test organizations, test ranges, and model managers. These entities must ensure DOT&E has the necessary data to conduct thorough and effective testing and evaluation of defense systems.

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

A: If confirmed, I would take several specific steps to encourage information sharing among testing communities, program offices, and contractors. I would advocate for the transparency of data sharing. Access to data and data sharing are critical issues for DOT&E, and information should be accessible to all "need to know" stakeholders. All test and evaluation data and program artifacts that support a testing decision should be understandable, and accessible. Classified or confidential datasets should flow promptly to cleared and need-to-know stakeholders as soon as the data become available. Promoting a shared vision and culture of collaboration will improve the collaborative environment and ultimately enhance test quality.

I would also advocate for the implementation of a test and evaluation data management strategy at both the T&E enterprise level and the acquisition program level. This strategy would ensure all test and evaluation data and program artifacts,

including digital engineering models and related data, are visible, accessible, understandable, linked, trusted, interoperable, and secure. Data sets, including classified and proprietary information, should be promptly accessible to cleared and need-to-know stakeholders as soon as the data become available. Information should be accessible over networks in open and interoperable formats, such as commonly available databases with networked application programming interfaces (APIs) to those with authorized access. Data pedigree will also be transparent, and preliminary data will be identified as such.

Finally, I would be transparent about my expectations and the data needed to execute my Title 10 responsibilities. I would review my expectations and their rationale with the test community, program offices, and contractors, and work with them to develop the most robust T&E program for the warfighter. I would offer analytical support and advocacy to resolve test and evaluation challenges presented to the test community, program offices, and contractors. Additionally, I would 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.

The successful execution of these activities will require building trust with all T&E stakeholders to further promote collaboration and teamwork, facilitating progress at faster rates.

19. In your view, what is mission engineering and in what ways does it impact the T&E process, if any?

A: In my view, mission engineering is an interdisciplinary process that involves translating missions into requirements by identifying gaps, issues, and opportunities to inform decisions regarding requirements, architectures, and technologies needed to achieve strategic and tactical mission objectives defined by the combatant commands. This process encompasses the entire technical effort to analyze, design, and integrate current and emerging operational needs and capabilities to achieve desired mission outcomes.

Mission engineering affects the T&E process by ensuring test outcomes are more relevant to joint operations and kill web assessments and planning. By focusing on the operational performance of the Joint Force rather than individual systems or services, mission engineering provides a comprehensive understanding of how systems contribute to mission success. OT&E and LFT&E can directly inform mission engineering by providing operationally relevant data about mission outcomes, which can be fed back into the mission engineering process to improve and accelerate the development and use of joint warfighting concepts.

Additionally, integrating OT&E and LFT&E into systems development allows for better learning about systems' capabilities and how they support mission outcomes. This iterative feedback loop enables the T&E process to better define and interpret

requirements in the context of operational mission outcomes and update requirements as missions and threats evolve. Interoperability remains a challenge for DoD, as many systems fielded over the last several decades were not designed to communicate within their own service, let alone the Joint Force. Mission engineering helps address this challenge by promoting a more integrated and cohesive approach to system development and testing.

With an eye toward fully capitalizing on the Department's investments in mission engineering, I would relook and consider the reorganization of the Office of DOT&E around mission threads instead of traditional domain-focused deputies.

Interoperability remains a challenge for the DOD with a litany of systems fields over the last several decades fielded not designed to communicate within its own service, let alone the Joint Force.

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

A: If confirmed, I would work with the services, agencies, TRMC, and DDR&E to enable operationally realistic test environments for the T&E of the Department's highest priority Joint Force efforts, such as missile defense, JFN, NC3, and cyber operations. This collaboration would ensure interoperability across their architectures. I would review the data architecture for range infrastructure to identify and address data sharing, access, and integration gaps. Additionally, I would consider deploying advanced computing tools like machine learning and cloud computing to facilitate system-of-system testing.

I would emphasize the importance of testing new DoD technologies together in combat representative conditions to replicate the reality of multiple warfighting systems working together to gain battlefield superiority. Interoperability evaluation of networked systems must address both the ability of hardware, software, and networks to exchange data, as well as the doctrine, tactics, and training necessary to ensure users can accomplish their mission.

I would team up with the operational test agencies, particularly the Joint Interoperability Test Command, allies, partners, and DoD's joint test programs to review existing system-of-system capabilities and interoperability test standards. This collaboration would help provide a more detailed plan to construct test environments that ensure interoperability of command-and-control systems for the Joint Force.

Finally, I recognize 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. Therefore, I would advocate for increased investment 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.

21. What is the DOT&E role in the Department's Combined Joint All-Domain Command and control (CJADC2) development?

A: The role of DOT&E in the Department's Combined Joint All-Domain Command and Control (CJADC2) development is multifaceted and critical to ensuring the operational effectiveness, suitability, and survivability of these capabilities. DOT&E is closely monitoring the development of CJADC2 capabilities and placing elements of them on the T&E Oversight List. This involves developing joint test concepts to identify the necessary test and evaluation infrastructure, tools, methods, and processes required to support the operational test and evaluation (OT&E) and live-fire test and evaluation (LFT&E) of such complex systems.

A key component of CJADC2 is the Joint Fires Network (JFN), which serves as a pathfinder and top priority for the DoD. JFN aims to provide decision advantage to execute joint fires and close kill chains at speed for various combatant commands. The DOT&E Cyber Assessment Program (CAP) has been actively involved in assessing JFN, delivering reports on its operational effectiveness, suitability, and cyber survivability under realistic operational conditions. These assessments are conducted in close partnership with the JFN Technical Manager, USD(R&E), USD(A&S), and USINDOPACOM, and are reported to the Senate Appropriations Committee – Defense every six months.

DOT&E's involvement in JFN includes executing multiple assessments to keep pace with JFN's accelerated delivery schedule, identifying vulnerabilities early in the process, and enabling real-time mitigation. This collaborative model not only prepares JFN for its transition to a Program of Record but also informs operational test and evaluation plans, which will reduce costs and time in testing once JFN becomes a program of record.

If confirmed, I would continue to monitor the development of CJADC2 capabilities, ensuring adequate OT&E and LFT&E are planned and executed to enable credible evaluations in operationally relevant environments. This ongoing engagement would help ensure CJADC2 capabilities are thoroughly tested and validated, supporting the Department's mission to maintain a decision advantage in joint all-domain operations.

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

A: Yes, DOT&E needs to modernize and, in some cases, reform its approach to planning, executing, and assessing weapons system operational effectiveness, operational suitability, survivability, and interoperability. This modernization is necessary due to the development of increasingly complex, interconnected, and adaptive weapon systems, as well as the rising complexities of the multi-domain operational environment that changes rapidly in both space and time, all in the context of a need for increased speed of delivery.

One key area for reform is the use of innovative tools and advanced technologies to improve efficiency and operational realism in software and cybersecurity testing. The development of credible digital environments, digital models, and data architectures is essential to store, share, and best use test and evaluation data across all stakeholders. Partnering with the Defense Innovation Unit could unlock additional best-in-breed commercial test and evaluation tools and services. Leveraging the latest advances in science and technology can enhance the way OT&E captures and analyzes large volumes of data, promoting integrated testing and evaluation throughout the acquisition cycle.

Additionally, the ability to support the software development cadence is crucial for the adequate OT&E and LFT&E of software-intensive systems. AI-enabled systems will require continuous OT&E and LFT&E throughout operations and sustainment to evaluate any drift in performance and changes in survivability. Cyber T&E also needs innovative tools to meet the exponentially growing demand for such testing.

Furthermore, there is a need to examine and update the training and preparation of the T&E workforce. Introducing new techniques and training for using advanced tools and technologies will be essential to implement these reforms effectively. By addressing these areas, DOT&E can achieve increased flexibility and agility without compromising the credibility of its evaluations, ensuring that it remains capable of assessing the operational effectiveness and suitability of modern weapon systems in a rapidly evolving environment.

23. In your view, what additional test and evaluation (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?

A: To best position DOT&E to support digital transformation and modernization of warfighting capabilities and concepts in multi-domain environments, it is essential to implement enterprise-level solutions and coordinate efforts across USD(R&E), USD(A&S), the Intelligence Community, the Services, the Joint Staff, and Combatant Commanders. This coordination will help identify the requirements and resources needed to develop an adequate representation of the multi-domain operational environment, which hinges on the adequacy of virtual environments and digital twins, their interoperability, and expected threats. Evaluating the development and credibility of digital twins and their early incorporation into acquisition programs will

inform T&E plans and reduce overall risk. Additionally, it is critical that DOT&E work with USD(R&E) to build on digital engineering initiatives, including the development of a digital ecosystem and data architectures for storing, accessing, and analyzing T&E data. Another key initiative is the adoption of a digital model-based T&E master plan (TEMP) to facilitate a semi-automated transition from MBSE to T&E. Reviewing the Defense Science Board report on Digital Engineering Capability to Automate Testing and Evaluation will provide additional valuable insights.

Test and Evaluation for Complex Emerging Technologies

Emerging technologies, like artificial intelligence (AI), autonomy and quantum-enabled systems, are likely to pose challenges to DOD processes and capabilities for operational test and evaluation.

24. What shortfalls or challenges, if any, do you foresee in DOD capabilities (including funding, test infrastructure, manpower, and processes) for test and evaluation of systems and applications that leverage artificial intelligence?

A: Emerging technologies like artificial intelligence (AI) and autonomous systems pose several challenges to DoD processes and capabilities for operational test and evaluation (OT&E). One significant challenge is related to the data ecosystem. Ensuring a secure, rich, and well-managed data environment, along with a robust risk evaluation method, is critical for the development and integration of AI-enabled systems.

Another challenge is characterizing AI model performance. This is essential for evaluating operational performance and requires selecting operationally meaningful performance metrics and test data. To effectively test AI models, some form of Live Virtual Construct (LVC) may be necessary to simulate nearly real operational conditions, including human-system interactions. OT&E and Live Fire Test and Evaluation (LFT&E) must evaluate AI solutions within their intended operational environments and with representative users to ensure they achieve desired outcomes. The longevity and sustainment of AI models also present challenges. It is crucial to develop strategies for monitoring AI performance over time, including periodic recalibration, assessment, and eventual retirement or replacement of AI models. This requires a comprehensive sustainment plan that addresses the long-term viability of AI systems.

The OT&E community must be vigilant about testing for adversarial and counter AI scenarios, beyond traditional cybersecurity measures, where adversaries can take advantage of overly brittle AI algorithms to evade, out-maneuver, or deceive our warfighting systems and concepts or operations.

Finally, I expect that there are challenges related to test infrastructure and workforce. The DoD needs appropriate test infrastructure and a trained workforce capable of

producing suitable test inputs for AI systems and evaluating their outputs in operationally realistic combat environments. Ensuring the workforce is equipped with the skills and knowledge to handle these advanced technologies is vital for effective OT&E.

25. **How should the Department consider the T&E of AI systems to characterize complex or emergent behavior based on the continuous influence of new and interacting data? How will T&E evaluate changing behavior in such systems, including hallucinations or the effects of attempts to disrupt such systems through data poisoning or adversarial AI attacks?**

A: The Department should consider the T&E of AI systems by focusing on the entire data ecosystem, ensuring data integrity, and continuously assessing the system's behavior in response to new and interacting data. AI performance, reliability, and trustworthiness are directly tied to the adequacy and security of their training and operational data. Therefore, an operational evaluation must scrutinize not only the AI system itself but also the data pipeline and its security.

To characterize complex or emergent behavior in AI systems, the Department must establish procedures for ensuring that the data used for sustainment remains accurate, relevant, and not stale. This includes conducting continuous testing to monitor the quality and integrity of the data. The ability to gather and consolidate large data volumes with different formats and protocols has long been a challenge for data-driven systems and will continue to be so. An operational evaluation must include a plan to examine the adequacy of databases and the processes, technologies, and personnel used to protect them, detect anomalies, mitigate those anomalies, and restore the database as needed.

As AI-enabled systems enter the field, assessments of operational effectiveness, suitability, and survivability must be established to monitor user trust in the AI and any changes in the system's behavior. These assessments should include evaluations of data poisoning and adversarial AI attack techniques, tactics, and procedures to adequately prevent, mitigate, and recover from such attacks in operations.

To ensure survivability, T&E must incorporate adversarial and counter AI attacks, moving beyond passive testing or usual cybersecurity testing toward actively attempting to exploit the system's vulnerabilities. To the extent possible, the evaluation should be based on known adversarial TTPs to simulate realistic attacks. This rigorous testing is essential to ensure the system can prevent, mitigate, and rapidly recover from malicious attacks in a contested environment. Investments in specialized training or skillsets are required to augment the capabilities of DoD certified and accredited cyber red teams to conduct these types of evaluations.

In summary, the operational evaluation of AI systems must evolve to address the unique challenges of data-driven systems. By focusing on data integrity, continuous

assessment, and adversarial resilience, the Department can ensure that warfighters are equipped with trustworthy and effective AI systems.

26. In your opinion, how should the Department consider infrastructure and capability investments to ensure it is positioned to test systems when they become available?

A: To ensure the Department is positioned to test systems when they become available, it should consider infrastructure and capability investments by maintaining an accurate and common picture of existing and future range capabilities. This picture should be digitized and transparent to key stakeholders, including acquisition, test and evaluation, training, and intelligence communities. This approach will enable collaboration, avoid redundancies, and increase efficiency in capability delivery. Additionally, evaluating the efficiency of existing processes and providing data-backed recommendations will help ensure investments are made in the most efficient and effective manner.

27. What capabilities does the Department have in place to systematically evaluate commercially available systems to help inform commercial purchases (such as 5G/6G systems) or adoption of commercial technologies that do not require additional development?

A: If confirmed, I will assess the capabilities for evaluating these commercially available systems, such as 5G/6G systems, that do not require additional development. This includes establishing partnerships with the Defense Innovation Unit (DIU) to ensure that commercial technology acquired for military operations is effective in credible combat scenarios. Additionally, I would advocate for conducting adequate Operational Test and Evaluation (OT&E) and Live Fire Test and Evaluation (LFT&E) of critical commercial technologies to accurately assess any risks associated with their use in military operations.

28. In your opinion, what process changes should DOD consider to be better prepared to test and evaluate some of these emerging technologies?

A: In my view, emerging technologies and especially the implementation of emerging technologies have traditionally come with long lead times. The pace at which technology is evolving is accelerating that model. To better prepare for testing and evaluating emerging technologies, I would recommend a comprehensive review of existing acquisition and test and evaluation processes related to systems using emerging technologies for warfighter and DoD operations.

Additionally, I would advocate for the modernization of test infrastructure, including the development of synthetic test environments. These modernized infrastructures are essential for efficiently and comprehensively evaluating the operational performance of emerging technologies in combat-relevant scenarios. Coordination with key stakeholders, including USD(A&S), the services, agencies, and the Test Resource

Management Center (TRMC), would be crucial to implement these recommendations effectively.

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.

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

A: While there have been significant investments in recent years to modernize the Department of Defense's (DoD) test and evaluation (T&E) infrastructure and build new capabilities for emerging technologies such as hypersonics and directed energy weapons, concerns about the adequacy of funding for T&E capabilities, including infrastructure and workforce, remain.

The complexity and scale of modern and future threats, including software-intensive, autonomous/artificial intelligence-enabled systems, offensive and defensive cyber capabilities, space, and electromagnetic spectrum operations, require continuous enhancement and modernization of T&E infrastructure. Despite recent investments, I am uncertain as to DoD's T&E capacity, agility, and expertise to meet the demands of these advanced systems and threats. Additionally, the rapid advancement of adversaries' capabilities exacerbates these potential shortfalls.

Challenges persist in replicating adversary threats and targets in terms of capability, density, and timely upgrades. Building, sustaining, and accrediting virtual environments and digital tools to supplement live or physical infrastructure is a complex task that requires ongoing investment. This includes the implementation and sustainment of big data centers, data management infrastructure, and appropriate classified networks and workstations. Updates to physical ranges, threats, instrumentation, and connectivity are also necessary to represent realistic threat scenarios and enable system-of-systems testing and interoperability.

Moreover, the development of automated test tools for software, cyber, AI, and integrated T&E has not yet been fully resolved. A qualified workforce with expertise in digital engineering, software, electronic warfare, AI, big data science, and space operations is essential, but the DoD continues to compete with industry for this talent. If confirmed, I will work closely with the Test Resource Management Center (TRMC), the services, and USD(R&E) to address any potential shortfalls and ensure that our T&E enterprise can keep pace with new weapons technology and evolving threats. Additionally, I would focus on recruiting, retaining, and training a world-class T&E workforce to support both legacy and future warfighting capabilities. This

would include an attempt to reinstate TECCE (T&E Cyber Center of Excellence) which was a very successful initiative focused on recruiting and training rising seniors into the DoD T&E cybersecurity workforce.

30. 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?

A: Based on my current understanding, I believe the Department's T&E capabilities, including infrastructure and workforce, are not fully adequate to perform the full range of test and evaluation responsibilities for Department weapons systems and equipment. There are several areas that require significant modernization and investment to keep pace with emerging technologies and evolving threats.

One major concern is that potential adversaries are increasing their capabilities faster than the DoD's test infrastructure can adapt and realistically replicate them. This includes the need for advanced testing facilities and skills for hypersonic systems, as well as the ability to test systems in contested electromagnetic spectrum, cyber, and space domains.

To address these issues, the Department must make significant and steady investments in T&E infrastructure and the workforce. This includes developing accurate test surrogates across all domains to enable testing against realistic threats and targets. The ability to emulate and replicate complex, congested, and contested operational environments will be an enduring challenge, requiring continuous investments in targets, modeling and simulation environments, and threat systems.

Furthermore, the future fight will involve advanced technologies such as directed energy, AI, autonomous systems, and hypersonics. Ensuring that the T&E infrastructure and workforce can support the testing of these next-generation warfighting capabilities will require attention and potentially investments. This includes developing the digital infrastructure and modeling and simulation capabilities necessary for advanced digital testing of increasingly complex systems-of-systems capabilities.

If confirmed, I will review and assess the adequacy of the Department's current T&E capabilities and work closely with the Test Resource Management Center and the service T&E executives to identify, prioritize, and fund the necessary modernization efforts.

31. 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?

A: In my view, the Department of Defense (DoD) has been fairly effective in identifying where gaps in test capability exist, but there is still a need for a more proactive and collaborative approach to accurately project future test facility resource requirements and budget for these needs. My understanding is the DOT&E annual reports have identified emerging and extant test infrastructure shortfalls over the years. The time it takes to secure resources and develop new test capabilities makes it critical for the test and evaluation (T&E) community to take a holistic and comprehensive approach to sustain and modernize current infrastructure and develop new capabilities to test future weapon systems.

Accurately projecting future test facility resource requirements and budgeting for these needs is essential for conducting adequate OT&E and LFT&E and for determining combat credible operational effectiveness, suitability, survivability, and lethality. If confirmed, I will collaborate with USD(R&E) and its Test Resource Management Center (TRMC), the Director of Cost Assessment and Program Evaluation (CAPE), and the service T&E executives to review the current processes established to project future facility resource requirements and budget for these needs.

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

A: If confirmed, I will factor the sufficiency of investments in test resources and workforce into my assessments and review of proposed test plans and schedules for acquisition programs. Adequate test resources, infrastructure, and a qualified workforce are essential for planning, executing, analyzing, and reporting on tests. To ensure the adequacy of Test and Evaluation Master Plans (TEMPs), strategies, and test plans, I would closely review individual programs' planned test budgets and personnel for sufficiency.

I will partner with USD(R&E) and its Test Resource Management Center (TRMC) in their annual assessments of the test infrastructure budgets and proactively work with the Services to influence their investment decisions. In coordination with the Director of Cost Assessment and Program Evaluation (CAPE), I will annually assess the adequacy of available T&E resources and workforce to execute OT&E and LFT&E actions across the Future Years Defense Program. This includes ensuring that test resources are identified as early as feasible to support necessary investment and development.

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

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

A: In my view, adjustments may be warranted in the regulations and policies that govern the allocation of testing costs to test customers. The existing regulations and policies have been in place for many years, and a review is necessary to determine if they remain the most effective and efficient ways to support test and evaluation (T&E) today.

If confirmed, I will seek to better understand the current regulations and policies, assess alternative approaches, and consider piloting new processes and authorities to make them simpler, more responsive, and more effective. I would review the recommendations by the National Academies of Sciences, Engineering, and Medicine (NASEM), as well as recommendations of any similar reports, such as recent DSB reports on T&E.

Based on these analyses, I would explore potential revisions to existing regulations and policies that would promote more efficient and thorough OT&E and LFT&E, coordinating with appropriate stakeholders.

Data

34. 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?

A: If confirmed, I would undertake several initiatives to ensure that the Department of Defense collects, maintains, and provides appropriate access to relevant data derived from the development, testing, and operational use of systems and platforms to support acquisition, testing, and operations.

First, I would work with the T&E enterprise and other critical DoD partners, including USD(A&S), CDAO, USD(R&E), and DoD CIO, to meet the intent of the DoD Data Management Strategy. I would assess ongoing efforts within the Department to determine what data management platforms may already exist and are available to the T&E enterprise. Following this assessment, I would collaborate with the T&E enterprise to adopt common data practices and use common and secure data platforms to collect, store, and analyze data. Ensuring that data is available, visible, accessible, traceable, integrated, and secure is essential, especially in the context of the AI revolution and the need to manage data to enable large language models.

Additionally, I would support the development and implementation of advanced analytics capabilities for large data sets to further enhance OT&E and LFT&E. This includes making acquisition program artifacts and all test and modeling and simulation results accessible and in a consumable format, allowing them to be more effectively used to inform the evaluation of operational performance at all stages of the acquisition life cycle.

By working in partnership with USD(A&S), USD(RE), CDAO, and DoD CIO, I would 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. These initiatives will help create a robust data management framework that supports the Department's transformation into a digitally driven organization, enhancing the effectiveness and efficiency of acquisition, testing, and operations.

35. **For new AI systems, the data going into training the systems will be critical to achieving consistency of outcomes, and to ensuring behavior for such systems can be properly characterized and consistently enforced. In your opinion, how should DOT&E be evaluating the data going into testing, as well as the resulting data as an output of the process?**

A: In my opinion, DOT&E should place a strong emphasis on evaluating both the data going into training AI systems and the resulting data as an output of the process. Given the significant reliance of AI-enabled systems on data, it is crucial to ensure data quality, consistency, and security throughout the entire process.

DOT&E and the greater T&E enterprise must be equipped to evaluate any data used for training AI-enabled systems. This involves establishing rules, criteria, and standards to assess the adequacy and completeness of the data used to build AI, especially generative AI based models, such as large language models. Data ingestion, curation, normalization, and data quality processes are essential to ensure the reliable and accurate capture, organization, accessibility, and integrity of data. Data ingestion enables the movement of data across different environments without quality deterioration, while data curation involves structuring, indexing, and cataloging data to ensure its availability and usability. Data normalization ensures consistent representation across different systems, facilitating interoperability and reliable decision-making.

Machine learning techniques can be used to enhance data quality by leveraging algorithms to detect and correct data anomalies, outliers, or errors. Automation should also be considered to ensure efficiency in data quality processes. Strong data security practices are necessary to maintain data quality and protect against potential threats.

DOT&E should evaluate the data training pipeline as though it is part of the actual system itself. This includes understanding the breadth and quantity of data used for training the systems, as these data directly inform potential weaknesses and biases in the training process. Evaluating the data used for training helps identify the amount of

operational testing necessary to determine potential effects on warfighter use in combat.

Additionally, DOT&E should test how rapidly AI systems can be retrained on new data that become available from the field. This rapid retraining capability is crucial for quickly correcting any undesirable or unintended behaviors in the field, ensuring that AI systems remain effective and reliable in dynamic operational environments.

Office of the Director of Operational Test and Evaluation

In April 2021, 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.

36. 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?

A: If confirmed, I would take several steps to 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.

I would work with the services' Operational Test Agencies to develop and implement a comprehensive plan to recruit, retain, and develop our current and future operational test workforce. This includes collaborating with USD(R&E), services, and Congress to ensure we have the necessary authorities to recruit, hire, retain, and retrain a world-class operational test workforce. I would ensure we make the required investments in our people to be ready to effectively and efficiently test new technologies as they are incorporated into weapon systems. Annually, I would review the status of our operational test workforce with the Services to assess its competency, ability to perform the mission, and validate that it is properly resourced.

I would conduct a new or refresh an existing T&E workforce analysis to identify current and future military and civilian skillsets and gaps, and unique expertise requirements. Based on this analysis, I would develop hiring and training objectives to fill any identified needs. 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. Additionally, I will create and execute a plan to deliver continuous and structured training to the workforce.

Finally, if confirmed, I seek to continue the DOT&E scholarship, internship, and research and development programs and work with USD(A&S) to leverage its workforce development programs, like the Defense Civilian Training Corps (DCTC), to increase the interest and influx of talent from American universities and colleges into the field of OT&E and LFT&E.

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

A: If confirmed, I would undertake a comprehensive review of the DOT&E portfolio, scope, workload, workforce capacity, and skillsets to ensure that the office is adequately resourced to meet its mission requirements and the Department's strategic initiatives. This review would include assessing the personnel requirement for government civilians and military personnel to execute the inherently governmental functions of DOT&E, as well as the requirement for contractor support personnel to assist with research, data analysis, data evaluation, and reporting.

I would identify the competencies and skills needed to meet current responsibilities and future requirements, considering the rise of emerging technologies, the complexity of the operational environment, and the demands of adaptive acquisition framework initiatives. 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.

Additionally, I would evaluate the workforce ratio to confirm that the mix of government, military, and contractor personnel is appropriate to perform the work in the most efficient manner to sustain the current and projected workload. By striking the right balance across our government, military, and contractor workforce, I aim to ensure that DOT&E is well-positioned to execute its statutory responsibilities for program oversight and operational test and evaluation policy effectively.

38. 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.

A: In my view, the Office of DOT&E could benefit from unique personnel authorities similar to those available to DARPA, medical personnel, service academies, and defense laboratories to attract, recruit, and retain the workforce needed to perform its designated missions. The mission of DOT&E demands a highly trained, professional workforce, and its ability to attract and retain talent is critical to accomplishing the mission.

DOT&E regularly uses direct hire authority (DHA) to minimize mission disruption and ensure civilian billets are filled quickly by personnel with the right expertise. These DHA provisions include Sections 1101, 1125(b), 1599(h), 1643, and 1109, with a high percentage of all hiring actions leveraging these authorities. However, some of these authorities, such as Section 1125(b), have expired, and others, like Section 1109, are set to expire on September 30, 2025. If these authorities were terminated or allowed to expire, DOT&E would lose access to critical DHAs.

Given the increasing demand for people with expertise in emerging technology areas and the competitive nature of the talent market, it is essential to evaluate the existing authorities and assess if DOT&E is using them to the maximum extent. If confirmed, I would work with the Department and Congress to ensure DOT&E has the necessary authorities to attract, recruit, and retain a highly technical workforce with a detailed understanding of the DoD mission.

39. 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?

A: Based on my current knowledge, I do not see an immediate need for special acquisition or management authorities for the Office of DOT&E to more effectively and efficiently perform its designated missions. However, if confirmed, I will conduct a thorough assessment with my staff and other DoD stakeholders, including USD(A&S) and USD(R&E), to determine if any changes are necessary.

If this assessment reveals a need for special acquisition or management authorities, I will provide my best recommendations to the Secretary and Congress. Ensuring that DOT&E has the appropriate tools and authorities to fulfill its mission is critical, and I am committed to evaluating and addressing any potential gaps that may hinder its effectiveness and efficiency.

40. In your view, what role do some of the enabling organizations in DOT&E, like the Center for Countermeasures, the Test and Evaluation Threat Resource Activity or the Cybersecurity Assessment Program, play in providing foundational capabilities that can be leveraged across T&E organizations and test event?

A: In the past, these DOT&E managed activities have efficiently provided many foundational capabilities to the T&E enterprise across the department. For example, the CCM operates, sustains and makes available to the services mobile testing instrumentation capable of simulating arrays of threats to measure and evaluate the operational effectiveness of CMs employed by DoD and foreign weapon systems. The portability of CCM test tools and personnel provide the test agility and efficiency required by DoD to develop and field critical CMs at operationally relevant speeds,

minimizing the logistical burden on each program office and preserving schedules and resources.

The Cyber Assessment Program's (CAP) support to the combatant commands has not only improved the operational resilience of their headquarter networks. I also understand that CAP is supporting DOD efforts (special assessments) to address several of the most critical DoD priorities: JFN, crypto modernization, Zero Trust Architectures, Adversarial AI/ML and RF-enabled cyber operations. If confirmed, I would maximize these assessments to inform and improve cyber operational T&E methodology, policy, cyber adversary threat emulation to ensure operational resilience across the DoD's warfighting capabilities.

The Test and Evaluation Threat Resource Activity (TETRA) plays a central role in linking the intelligence community to the test and evaluation community to ensure a collective knowledge of the current and emerging threat environment and to advance our ability to represent that threat environment in support of adequate test and evaluation. For example, with the stand-up of the Space Force and greater attention being turned to space systems testing in a contested environment, TETRA has been leading the way in helping Space Force Guardians understand existing intelligence community capabilities and requirements processes, assessing gaps in our ability to represent space and counterspace threats to support testing, and developing architectures, roadmaps, and capabilities to fill those gaps.

TETRA has also been at the forefront of the test community to understand how emerging capabilities such as artificial intelligence and cognitive electronic warfare will impact blue weapon systems, drive the evolution of the threat environment, and influence future testing.

<u>Operational Test Agencies</u>

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.

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

A: To arbitrate shortfalls between program managers' limited funding and operational test agencies' independent test requirements, I would emphasize early and continuous collaboration among all stakeholders. Involving OT&E and LFT&E stakeholders from the program's inception ensures that test and evaluation requirements are clearly defined, aligning all parties on expectations and resource

needs. The Test and Evaluation Master Plan (TEMP) should document the T&E funding profile and timeline, with agreement from DOT&E, the program manager, and the operational test agency early in the program's life cycle. Additionally, moving operational test planning before the request for proposal allows OTAs to inform program managers of their independent assessment of T&E resource needs prior to contract awards, facilitating better resource management.

I would prioritize testing based on mission risk, informed by the warfighting community, ensuring that the most critical tests receive the necessary resources. Advocating for efficient testing methods, including leveraging test data from contractor testing, developmental testing, and military exercises, can help reduce costs. Furthermore, adopting the latest advances in science and technology will optimize available resources and reduce overall test costs. By fostering continuous dialogue between all stakeholders and supporting a collaborative, data-driven approach, we can effectively balance limited funding with the need for thorough and independent testing.

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

A: Yes, there are concerns about the independence of the operational test agencies (OTAs). Ensuring their independence is crucial, and this will always be a priority. While direct reporting to their respective service chiefs helps maintain OTA independence, caution must be exercised to ensure a clear separation between the OTAs and service acquisition executives. If confirmed, I will prioritize intense collaboration with the Service and Agency OTAs throughout all phases of a weapon system's acquisition cycle. I would also work through my staff to ensure DOT&E is positioned to assess and report on the independence of the OTAs. Additionally, I intend to continue DOT&E support in test strategy and plan development, monitoring critical OT&E events, and conducting independent analyses that consider Service/Agency OTA observations.

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

A: In my view, the DoD could benefit from standardized policies and procedures. Data formatting, collection, storage, analysis, and dissemination is one category of OT&E and LFT&E activity that would significantly benefit from standardization. This would enable easier access to data and enhanced use of data analytics to glean trends and lessons, to strengthen OT&E and LFT&E efficacy, and potentially reduce the time to conduct an adequate test. Standardization would also enable accelerated implementation of digital and smart documentation tools. However, each service has unique systems to test. A fair amount of flexibility and service- or program-specific customization is therefore necessary. If confirmed, I will seek to maximize standardization at the enterprise level, without introducing inefficiency into programs.

Operational 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.

44. How would you approach tailoring T&E strategies to ensure they are effective and efficient across these diverse pathways, particularly for programs requiring rapid prototyping and fielding?

A: Test and evaluation of systems acquired through rapid prototyping or rapid fielding requires a strategy that is both adaptable and opportunistic. Every milepost along the product's development should be considered as a potential opportunity to acquire integrated test data. If confirmed, I will ensure DOT&E is engaged as early as possible in rapid programs under DOT&E oversight with the aim of maximizing these data collection opportunities so that a tested system can be delivered quickly to the warfighter. I would also work with the program offices to ensure that when these systems transition to programs of record, they are already oriented for testing success as acquisition programs by leveraging data gathered during their development. That said, all these are short-term patches based on 20th Century risk models, to what will be a 21st Century enduring challenge. In my view, the ODOT&E requires a new CONOPS focused on accelerating warfighting advantage. If confirmed, one of my highest priorities will be the design and proposal of that new CONOPS.

45. Do you believe that current guidance adequately provides for tailoring of T&E strategies? If so, please describe in detail policies for streamlining test strategies for Middle Tier or Acquisition and Software Acquisition pathways.

A: I have not had a chance to fully digest the current DODI 5000.98 or companion policy framework but understand it provides some degrees of freedom for the tailoring of T&E strategies, based on the mission need and acquisition strategy. For example, the 5000.98 does not specify what types of events are required in Software Pathway Program OT&E but recommends testing that is dependent on the mission criticality of the incremental capability being released. The Software OT&E manual (DODI 5000.96) further highlights the need to use risk-based levels of test assessments and mission-based risk assessments (MBRAs) to inform the scope of OT&E within the context of the cadence of development, integration and deployment. The mission-based risk assessment concept was inspired by cybersecurity guidance I worked on in cooperation with the DTE&A office, and I believe there is good potential to use it across all of T&E, so am encouraged to see the Office move in that direction.

For MTAs, the instruction indicates that the T&E strategy will enable the evaluation of the operational effectiveness, suitability, survivability, and lethality, as applicable, tailored to the mission objective, acquisition strategy objective, transition plan, and outcome determination. If confirmed, I will engage the Department, Service and

Agency stakeholders to understand their thoughts on this subject and determine whether I should revisit any current guidance or publish additional guidance.

46. 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?

A: As I understand it, DoD's relatively new adaptive acquisition framework encourages conducting operational evaluations early in the acquisition phase, such as embedding intended users into early developmental tests. Such events provide early insights that can expedite an adequate evaluation. If confirmed, I would advocate for early operational evaluations to find and fix problems early, which will greatly increase the likelihood of operationally effective, suitable, survivable, and lethal capabilities being fielded as soon as possible. If confirmed, I would also advocate for the development and implementation of advanced tools, processes, and methods to accelerate data collection, sharing, analysis, and optimization of the use of all available data. I would ensure OT&E and LFT&E objectives and requirements are defined early and inform acquisition contracts to optimize the use of contractor data, skills, and resources. I would also foster the relationship with the Joint Staff and Combatant Commanders to fully understand the operational need and requirements for rapid deployment. I would ensure that DOT&E regularly engages with the Joint Staff, Service Secretaries, and acquisition executives to better understand the desired capabilities and fielding timelines, and to conduct independent assessments.

Importantly though, all of these are short-term patches based on 20th Century risk models, to what will be a 21st century enduring challenge. In my view, the ODOT&E requires a new CONOPS focused on accelerating warfighting advantage. If confirmed, one of my highest priorities will be the design and proposal of that new CONOPS.

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

A: I understand that DOT&E has initiated a major effort to establish a new policy for OT&E and LFT&E tailored to the needs of the adaptive acquisition framework and the emergence of new technologies such as AI-enabled and autonomous systems. If confirmed, I will deep dive the policy framework to ensure that it is focused on the acceleration of warfighting advantage.

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

A: I understand DOT&E has developed a policy for OT&E and LFT&E applicable to all DoD software-intensive systems and software embedded in systems including modern methods such as Agile and Development, Security, Operations (DevSecOps). I have been told the policy outlines the requirements and criteria intended to ensure an effective test and evaluation strategy and plans for such systems. For instance, OT&E and LFT&E organizations:

• Will use documented user agreements to engage users and employ operationally representative conditions across the acquisition life cycle to enable real-time feedback throughout software development.
• Will use a cadence that will align with the incremental software development cadence composed of a sequence of capability releases.
• May also leverage the acceptance criteria – prevalent in agile programs to identify conditions that need to be met for the requirements to be considered complete. OT&E and LFT&E could use these acceptance criteria to instill agreed upon test requirements into the development process and ensure an adequate test program.
• Should also integrate with the software factory processes to evaluate any effects on operational performance.

These are a handful of the types of adjustments made for rapid and/or agile acquisition programs.

Roles of Developmental and Operational Testing

While DOT&E oversees Operational Testing & Evaluation and Live Fire Test & Evaluation, the Under Secretary of Defense for Research and Engineering oversees Developmental Testing. The December 9, 2024, release of DoD Instruction 5000.98 superseded DoD Instruction 5000.89 by creating separate policies for OT&E and LFT&E and for DT.

49. What is your perspective on the relationship between developmental testing and operational testing? How might closer integration or alignment of these activities enhance the overall T&E process and improve outcomes for warfighters?

A: In my view, the relationship between developmental testing and operational testing should be collaborative and complementary. We must appropriately tailor alignment of developmental testing and operational testing to support an effective and efficient T&E process and to improve outcomes for the warfighters. The operational test and evaluation community should encourage early testing to be as realistic as practicable. Closer integration of these T&E activities will drive the efficient use of limited T&E resources; facilitate purposeful data collection to support timely decision making and to avoid wasteful redundancies; and keep problem discovery out of the hands of the warfighter by promoting earlier problem discovery when it is most times easier and less expensive to remedy problems.

50. Given the distinct objectives of developmental testing, such as verifying technical performance, and operational testing, such as assessing operational effectiveness, how would you define the boundaries and synergies between these functions to avoid redundancy and ensure complementary contributions to system development?

A: While developmental testing and operational testing may have distinct objectives, they share a common objective of facilitating purposeful data collection to support timely decision making by leadership as well as support development of tactics, techniques and procedures for capability employment by the warfighter. To better achieve this common objective, the traditional developmental testing and operational testing independent workflows must be improved to make way for a more collaborative and integrated approach to developing and executing test strategies and test plans, data collection and sharing, and data analysis.

51. Do you believe there is value of early operational insights to inform system development? If confirmed, how would you encourage the incorporation of operational perspectives into developmental testing?

A: In my view, there is utility in the early involvement of operational testers and operators, and the early conduct of testing in realistic/near-realistic intended operating environments, to inform system development and to affect meaningful early problem discovery. If confirmed, I will work with my OUSD R&E counterpart to create a single policy framework for OT&E, LFT&E and DT&E that would incorporate these operational perspectives into developmental testing, as early as practicable.

52. What strategies would you advocate to facilitate the sharing of test data between DT and OT organizations to improve efficiency and reduce testing costs

A: If confirmed, I will work to establish and foster a collaborative relationship with my OUSD R&E counterpart to create a single policy framework for OT&E, LFT&E and DT&E. The expectation would be that such a policy framework would drive more collaborative development and execution of T&E strategies and test plans; promote closer integration of these T&E activities to facilitate purposeful data collection and sharing to support timely decision making and to avoid unnecessary redundancies.

53. In your view, are T&E policies and practices sufficient to manage the pace of changing technologies and threats where the boundary between fielded systems and development environments has become increasingly porous? Please explain your answer.

A: In my view, we need to revisit current practices across the T&E enterprise, to ensure their relevance given the accelerated pace of change in technology and threats

to warfighting missions. Operational test and evaluation of complex software centric ecosystems present a particular challenge, as it demands iterative requirements development, advanced tool development to maximize potential data sources to inform operational assessments and streamlined innovative ways to provide key performance data to decision makers and operators in a timely manner. This doesn't mean less testing; it means more. The key to making it work is to be able to do more testing without requiring more people. If confirmed, I intend to work with the services and agencies to address this, as it will require investments in advanced tools, innovative data strategies, and unprecedented collaboration with industry.

Cybersecurity

54. If confirmed, how would you propose to improve cybersecurity testing of systems and technologies, including the security of commercial cloud services, other commercial off the shelf systems, or weapon systems?

A: If confirmed, I would propose several measures to improve cybersecurity testing of systems and technologies, including the security of commercial cloud services. First, I would advocate for embedding cybersecurity into every phase of the system development life cycle, ensuring it becomes an integral part of system design and testing from inception. This approach would shift the emphasis from mere cyber compliance to operational effectiveness, starting with operational readiness and tracing those requirements to cyber survivability, ultimately driving system design and test requirements.

I would promote mission-based system-of-systems tests and exercises to evaluate the operational effectiveness of systems in contested environments, recognizing that cybersecurity cannot focus solely on individual systems. I would also partner with the Defense Innovation Unit to bring the best commercial test and evaluation tools and services. Implementing continuous automated testing and leveraging technologies like digital twins and hardware-in-the-loop would enable ongoing testing during operations and sustainment.

To address the high demand and limited resources of NSA-certified red teams, I would advocate for additional resources and automation capabilities to ease their workload. Emulating enemy attacks using well-trained and equipped cyber red teams is critical for adequate OT&E and LFT&E. I would also emphasize the importance of additional training for DoD cyber test teams to operate in cloud environments and foster relationships with commercial cloud defenders to enhance defense mechanisms. I would also work to ensure they are provided at least as much intelligence data as our adversaries have to improve emulation of adversary capabilities.

Regarding commercial cloud services, I would work to ensure that DoD contracts with cloud vendors allow for independent assessment of cloud infrastructure security.

This would involve advocating for dedicated funding for advanced cyber testing tools, ranges, and workforce development to improve our ability to test the security of cloud infrastructure and other commercial off-the-shelf systems.

55. 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?

A: If confirmed, I would ensure the Office of DOT&E, program offices, and the military departments' and services' test agencies have the appropriate infrastructure for cybersecurity testing by embedding cybersecurity into every system from its inception, making it an integral part of every phase of the system development life cycle. I would promote cybersecurity testing that shifts emphasis from cyber compliance to operational effectiveness, starting with operational readiness and tracing it to cyber survivability requirements that drive system design and test requirements. Additionally, I would advocate for mission-based system-of-systems tests and exercises to evaluate the operational effectiveness of systems in their relevant contested environments.

To address the evolving and expanding cyberattack surfaces and sophisticated adversaries, I would work closely with the services to estimate their growing needs for testing and prioritize the development of required tools, test environments, and capabilities. Collaboration with DARPA, USD(R&E), U.S. Cyber Command, the National Security Agency (NSA), and the services would be essential to increase visibility and make maximum use of available cyber ranges, red teams, tools, and models. I would support ongoing efforts by USD(R&E) to expand and improve cyber test ranges and efforts by USD(A&S) to expand the infrastructure used for strategic cyber assessments.

Furthermore, I would advocate for DoD certified and accredited cyber red team resources to support the scale and speed of OT&E and LFT&E. Emulating enemy attacks using well-trained and equipped cyber red teams is critical to the testing adequacy of OT&E and LFT&E. I would encourage cyber red teams to be available during program development to ensure system design security and during program sustainment to maintain security against evolving cyber threats.

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

A: In my view, the appropriate time to conduct cybersecurity operational testing is not confined to a single point in the program lifecycle but should be a continuous process that begins in the earliest phases of development and continues throughout the system's operational life. Given the constant updates in modern software, cybersecurity testing must be embedded and iterative, starting early and persisting through the entire development and operational phases.

Cyber survivability testing, using cyber red teams to emulate enemy attacks, should start early in the program lifecycle and be integrated across the entire development process. Engaging DoD cyber red teams (DCRTs) during the design and development phases allows for the identification of vulnerabilities when they are easiest and cheapest to fix. This iterative and embedded strategy ensures that each software update or design change undergoes security scrutiny, building security into the system from the ground up rather than as an afterthought.

By shifting away from a "test at the end" mentality and adopting continuous cybersecurity operational testing, the DoD can ensure a system's survivability and effectiveness in the face of evolving threats. This approach not only enhances the security posture of the systems but also ensures that vulnerabilities are addressed promptly, maintaining the integrity and reliability of critical defense systems throughout their operational life.

57. In your view, should we be extending cybersecurity operational testing into the sustainment phase of a program, and if so how might we do that and who might best be assigned responsibility for that mission?

A: Yes, cybersecurity testing in sustainment is critical. Unlike traditional systems that continue to operate in the physical world with slower changes to new weapons capabilities, the cyber environment is continuously evolving and changing. The Cooperative Vulnerability Penetration Assessments and Adversarial Assessments are very effective tools in assessing programs leading up to the fielding of the system; however, with the evolving nature of cybersecurity and continuous software deliveries to systems in sustainment, it is necessary to continually evaluate systems even after Full Operational Capability.

I believe the service-level Operational Test Agencies should be focused on operationally testing systems before they reach the warfighter. I would want to refamiliarize myself with roles / responsibilities / resources of entities in the DoD before recommending an office of primary responsibility, but reasonable candidates include the Test Resource Management Center's National Cyber Range, the DOT&E Cybersecurity Assessment Program, and the service OTAs through their supporting red team organizations. Many might assume the CISO as a lead candidate, but cybersecurity assessments of weapons systems are very different from cybersecurity compliance assessments of networks. Whoever is the lead must bring both deep weapons and mission expertise, above and beyond the classic IT expertise.

58. If confirmed, what steps would you take to ensure DOD has the capability to emulate cyber capabilities of adversaries to ensure testing is responsive and realistic to evolving cybersecurity threats?

A: If confirmed, I would take several steps to ensure the DoD has the capability to emulate the cyber capabilities of adversaries, ensuring testing is responsive and realistic to evolving cybersecurity threats.

I would work closely with the Intelligence Community and DoD cyber red teams to conduct realistic testing of evolving cybersecurity threats. This collaboration is essential for understanding and emulating advanced cybersecurity threats to inform testing. I would advocate for increased investment in the services and agencies' Cyber red teams to help them keep pace with cybersecurity threats.

I would formalize a requirements matrix that identifies the most relevant cyber tactics, techniques, and procedures (TTPs) for threat-realistic combat conditions. Designated lead intelligence support centers should be identified by region to provide targeted adversary TTP intelligence, communicate intelligence gaps, and establish working groups to ensure DoD Cyber red team operations evolve alongside emerging threats.

I would adopt a standardized red team framework across all DoD certified and accredited red teams to ensure consistency in threat emulation and tool capability. This framework would support consistent, threat-informed emulation and enable the development of minimum capability and skill requirements for red team operators. Additionally, I would develop a shared red-team environment to host classified and unclassified TTPs and their associated exploits, promoting cross-service collaboration, streamlining resource sharing, and enhancing the survivability of acquisition systems under test.

Finally, I would advocate for the integration of agile development practices within accredited red teams. Many teams face staffing and resource constraints, leading to the repeated use of legacy exploits and limited evolution of emulation techniques. By integrating agile development, DoD cyber red teams can continuously iterate tools and techniques based on stakeholder feedback and verified threat intelligence. This approach would allow for real-time adjustments informed by the intelligence community, ensuring red team capabilities remain aligned with evolving adversary behaviors and more accurately reflect real-world cyber threats.

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.

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

A: In my view, the most significant challenges in testing incrementally developed information systems and software include synchronizing rapid development cycles with thorough testing and overcoming cumbersome traditional test planning processes. Coordination and approval timelines often exceed the rapid pace of incremental development, and securing system downtime for testing follow-on increments can be difficult.

To address these challenges, OT&E perspectives must be integrated early in strategic planning and requirements generation. Agile and streamlined testing processes, including the use of online and automated test management tools, are essential. Constructive Government/commercial teaming can enable quick issue resolution.

Additionally, adopting robust digital modeling capabilities, such as digital twinning, allows for testing in simulated environments. This approach, supported by partnerships like the one between DOT&E and USD(R&E), can automate T&E and ensure effective, suitable, and survivable systems. Along these lines, testers need training for emerging technologies and improved test reporting processes to match the pace of software development.

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

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

A: In my view, DOT&E should play a key role in overseeing the testing of software-intensive weapons systems, business systems, and enterprise information systems. Given the rapid evolution of technologies in these domains, it is essential to ensure the services perform adequate OT&E for these systems, even if traditional DOT&E oversight is not always applied.

If confirmed, I will ensure the services conduct effective OT&E for warfighter-critical software-intensive systems. One of my initial efforts would be to review the DOT&E oversight list to ensure the most critical systems remain under oversight and that DOT&E has the staff and contract support to perform effective oversight. For systems not under direct oversight, I would work with USD(R&E) and the services to ensure they perform effective OT&E.

Pending available resources, DOT&E must provide oversight of OT&E and LFT&E for all DoD systems acquired via the Defense Acquisition System, including software-intensive weapon systems, business systems, and enterprise information systems. Historically, DOT&E has focused on major capability acquisition programs and those of high interest to Congress. If confirmed, I would ensure the T&E Oversight List includes such programs and that DOT&E has established policy and guidance for OT&E and LFT&E for these systems. This includes addressing changes

in software requirements and the adaptability of OT&E/LFT&E planning and reporting documentation to handle evolving requirements.

Finally, DOT&E's role in any program on oversight 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 OT&E community tests systems after the software has been delivered in a formal baseline. However, modern software methodologies provide an opportunity to "shift left" and examine smaller pieces of completed software code as it becomes available, leading to earlier discovery of defects and a more active role in the "find, fix, verify" cycle. By embracing state-of-the-practice software development, which involves intended users early and often throughout development, testing, certification, and operations, feedback can be implemented more efficiently and effectively. This approach allows for the evolution of detailed requirements over time, and the OT&E community must understand how these requirements evolve to adjust testing accordingly.

61. 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?

A: My understanding is the test and evaluation community of the Department faces shortfalls in tools, test environments, expertise, staffing, and funding to adequately carry out its responsibilities for software-intensive systems. There is a particular need for enhanced test capabilities for operational test and evaluation (OT&E) and live fire test and evaluation (LFT&E) of data-centric systems incorporating machine learning and artificial intelligence. To address these gaps, it is necessary to improve tools and test environments, such as automation-based testing and embedded diagnostics, to keep pace with rapid software releases.

Additionally, there is a need for a larger and more robust pool of software and cyber expertise, which may require a combination of in-house human resources and an on-demand consortium of government organizations, academics, and commercial sector practitioners. Partnering with the Defense Innovation Unit could also bring additional commercial test and evaluation tools and services. Enhancing programs like the DOT&E internship, scholarship, and research and development program to include software engineering and science tailored to OT&E needs could also provide additional value. Overall, my sense is that improvements and investments are required to ensure the Department can effectively test and evaluate software-intensive systems, as it appears current approaches can only scale with manpower. This is not a sustainable model, in my view.

62. 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?

A: The operational test and developmental test community within the DoD needs comprehensive access to commercial information services, software, and systems to identify potential performance and security issues and confirm operational effectiveness and suitability before deployment. This includes the ability to review and validate all information technology capabilities, including cloud services, to ensure they are secure against supply chain attacks from adversaries. DoD must fortify existing programs and processes within the defense industrial base to eliminate or mitigate adversarial foreign influence.

Access to proprietary cloud infrastructures is essential to ensure the security of DoD's classified data. As the DoD increases its use of machine learning and artificial intelligence capabilities, access to proprietary algorithms for these capabilities is also crucial for adequate operational testing.

Finally, it is imperative that every contract for cloud services permit comprehensive testing of performance and security. DoD should be immediately informed of any breaches of commercial networks where products the Department uses were developed. Investigating commercial software test tools and services, such as network monitoring, commercial attack surface analysis, and static application security testing tools, is also necessary, and partnering with other organizations (e.g. DIU, JFAC, etc.) could bring additional cutting-edge commercial test and evaluation tools and services to the table. Providing a directory of vetted tools to test teams can help complete Operational Test and Evaluation (OT&E) more efficiently, reducing the time needed to prove each tool's fitness for purpose.

63. 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?

A: Commercial sector testing could play a complementary role in DoD testing and evaluation (T&E) of commercial information systems being modified to support defense needs. However, while commercial testing can offer a data-rich environment that supports operational test and evaluation (OT&E), it is not independent of development and thus cannot meet the standard of independent testing.

Moreover, commercial components are not tested to the same rigorous standards as military components, which could lead to failures under extreme combat credible conditions. Therefore, while commercial sector testing resources should focus on verification, the DoD's operational T&E community must lead the assessment of operational effectiveness, suitability, survivability, and lethality to maintain acquisition independence.

Successful integration of commercial sector testing requires more rigorous standards, sufficient contract specifications, and modular open system architectures to ensure that the systems meet the unique demands of military operations. Because of the need for independent testing, DoD contracts should specify that any commercial network, cloud, or system supporting critical DoD missions must be accessible to independent, DoD-sponsored test teams, including cyber red teams, to ensure adequate operational testing. This access is beginning to happen for some programs, and it should become the norm.

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.

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

A: Testing systems based on modular open systems approaches (MOSA) and verifying their compliance with interface requirements present unique challenges and imperatives. Many MOSA-based programs must develop numerous interfaces internally and with other products and legacy systems to be operationally effective. To ensure these interfaces work correctly, it is important to fund and perform adequate developmental testing in an environment that allows for continuous improvement and modification of system modules.

This environment should include operationally realistic interfaces and data flows to identify and mitigate performance and interface issues early. Programs that invest in such developmental test environments are more likely to succeed during operational testing and thus be deployed promptly. Conversely, programs that do not perform adequate developmental testing often face severe delays and cost overruns. Ensuring proper funding and development of these test environments is imperative for the successful implementation of MOSA-based systems.

Business and Cloud Computing Systems

65. 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?

A: If confirmed, I would work to ensure that our workforce is well-equipped and trained in DevSecOps and agile development methodologies. This includes working with the Services and agencies to embed instrumentation capabilities in software early on, enabling continuous data collection throughout the development and operational processes. Additionally, I would advocate for the automation of data

collection, reduction, storage, and analysis across the software development cycle and in operations, with a particular emphasis on anti-fraud testing of key business systems.

To further enhance testing capabilities, I would push for increased funding to support the development of realistic test environments. These environments should be operationally realistic to ensure that problems are identified and addressed early, thereby improving the chances of on-time delivery and keeping programs on schedule and budget. Recent DOT&E reporting indicates that business programs that invest in such environments early on tend to experience fewer cost and schedule problems. Moreover, I would implement best practices observed in successful Major Automated Information Systems, as outlined by DOT&E in previous reports. These practices include robust senior-level participation in resource allocation, shortened decision cycles, flexible and disciplined requirements management driven by user needs, early and continuous change management, adherence to the Department's Architectural Framework, and robust developmental testing with operationally representative interfaces and networks.

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

A: It is essential to address the inherent vulnerabilities and lack of visibility that DoD has into commercial cloud services. Many DoD stakeholders do not fully understand how cloud services work, and cloud vendors often own and maintain portions of the cloud that DoD cannot easily test. This lack of visibility makes it challenging to test cloud systems prior to deployment, as they are often built in the live, operational environment and already in use by operators for real-world missions by the time testing occurs.

Since adversaries are likely to focus on breaking into commercial clouds containing DoD capabilities, it is crucial to perform independent, threat-realistic cyber assessments of the commercial cloud infrastructure, especially those containing classified data. I am interested in seeing the results of Section 1553 of the FY23 NDAA, if confirmed, which mandated such assessments. If confirmed, I would work with industry and DoD leaders to expand the scope of cloud systems testing to include cyber red team assessments of the underlying infrastructure of those cloud offerings.

Automated testing of “software as a service” offerings should be continued and enhanced to assure performance, security, functional performance, interoperability, network performance, load, and stress testing. Issues such as data security, test complexity, and the distribution of tests to simulate actual distributed usage must be addressed. Using cloud testing capabilities within DoD and through commercial offerings can also improve the testing of cloud systems and services.

To enable all of these, it is important to address the limitations in DoD contracts that currently prevent independent DoD cybersecurity assessments of the commercially owned infrastructure of cloud systems. This severe limitation must be resolved to ensure that sensitive and classified data stored in such clouds are secure.

Finally, the biggest challenge to cloud computing operational suitability is determining cyber effectiveness and deployment agility. While rapidly deploying new features is a key benefit of the commercial cloud, commercial cyber practices are typically not up to DoD standards. DoD's stringent security requirements complicate the migration of DoD business systems to the cloud and limit the ability to conduct scalability testing. If confirmed and particularly in light of recent disclosures of foreign nationals supporting hyperscalers the DoD relies on, I will evaluate the Department's capabilities to assess the operational suitability of cloud computing systems and services.

67. 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?

A: In my view, the Department of Defense (DoD) faces several challenges in determining the operational effectiveness and suitability of commercial information services prior to their deployment and use. One major challenge is the inability to independently assess the cybersecurity of commercial cloud services due to contractual limitations that prevent such assessments on commercially owned cloud infrastructure. This limitation hinders the DoD's ability to ensure the security and reliability of these services.

Another significant challenge is the constant threat of cyberattacks on DoD information services, which are critical to warfighting capabilities. Historically, commercial information services were acquired without much concern for their cyber survivability. However, in today's environment, ensuring cyber survivability is paramount. This requires a cultural shift among DoD personnel involved in acquiring such services to adopt a "warfighting mindset" that emphasizes rigorous cyber survivability, operational effectiveness, and suitability testing.

Additionally, supply chain attacks pose a grave concern. The DoD must ensure that all information technology capabilities, including cloud services, are reviewed and validated as secure against supply chain attacks from adversaries, as we just saw in the recent discovery of foreign national subcontractors supporting hyperscalers DoD relies on. It is crucial we prevent adversaries from introducing malicious capabilities into products and services DoD uses by fortifying Defense Industrial Base (DIB) programs. More efforts are needed in this area to protect DoD information from falling into the wrong hands.

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.

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

A: To govern the developmental and operational testing of commercial hardware platforms, technologies, and systems, the Department of Defense should ensure that DoD contracts with commercial vendors permit independent cybersecurity assessments of commercially owned platforms, technologies, and systems. This policy would enable comprehensive testing, including vendor-managed portions, to identify and mitigate potential vulnerabilities. Adopting a Silicon Valley approach, the DoD should become an early adopter of commercial systems, deploying minimum viable products and iteratively developing features based on user feedback. Additionally, when acquiring commercial software developed specifically for the DoD, the Department should require the provision of software code and related documentation, provided it is not classified or export restricted. If confirmed, I will review and evaluate existing policies and practices, address any shortfalls with the Secretary, and inform this committee of my findings and intended actions. These steps will ensure that commercial systems are effectively tested and secure for defense use.

69. What best practices from the commercial industry can inform DOT&E's approach to evaluating defense systems?

A: Best practices from the commercial industry that can inform DOT&E's approach to evaluating defense systems include integrating agile principles into the evaluation process. This approach allows for early identification of issues and quicker remediation by iteratively testing subsystems as they are developed. Leading commercial companies use an iterative development structure that includes continuous cycles of design modeling, validation, and production, enabling them to bring products that combine hardware and software to market quickly. A recent GAO report from December 2024, "Military Departments Should Take Steps to Facilitate Speed and Innovation," highlights the effectiveness of these iterative processes in accelerating product development.

Another key practice from the commercial sector is the instrumentation of software executing in the operational environment to support real-time monitoring and diagnosis. This allows for continuous assessment and immediate identification of performance issues, security vulnerabilities, and other potential problems, facilitating faster and more effective responses.

70. What do you see as the test and evaluation needs for non-developmental or commercial items to ensure they can still meet the technical requirements and

the human factor needs of environments often more complex and demanding than commercial settings?

A: Before non-developmental or commercial items are issued to the warfighter for operational use there should be some level of verification of technical performance, and also some level of validation of operational effectiveness and human factors when used in the intended operating environment. During purchase, the U.S. government should make every effort to secure the rights to vendors' technical data to provide a basis for this verification and validation. If these data are not available, or are not conclusive, or are cost prohibitive, the appropriate stakeholders should conduct a tailored risk assessment to determine potential risks to the end user and mission accomplishment presented by the lack of such data, and then determine what testing would be required to mitigate or eliminate those risks.

The most valuable test and evaluation for commercial products is to put them in the hands of real operators in realistic scenarios and environments to understand how they perform. Service members must be able to setup, operate, and maintain these items.

71. **From the perspective of providing an independent analysis on testing, what are the limits you see in relying solely or primarily on contractor or commercially provided testing results in order to make recommendations on operational suitability and survivability?**

A: Most likely, contractor or commercially provided testing results will be of varying value. As such, these data and assessment results as well as the executed test plans that yielded them should be exhaustively examined to determine their integrity and applicability to support verification of technical performance validation of operational effectiveness, suitability and survivability. At a minimum, some degree of DT&E, OT&E, and LFT&E should be conducted by the government to verify and validate contractor or commercially provided testing results prior to their wholesale acceptance.

Additionally, contractor and commercial testing often lacks insight into classified threats that DoD systems will have to compete against. Including those threats in realistic testing scenarios provides the DoD the best opportunity to understand operational suitability and survivability. The usability of systems by service members is a key component to effective systems.

Finally, before initiating that kind of model, I would recommend a cost-benefit analysis or a pilot study on the approach, as I can foresee a need for more prescriptive CDRLs to adequately support the independent analysis.

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.

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

A: In my view, combining testing with scheduled training exercises can be beneficial for efficiency and effectiveness, but it comes with certain challenges that need to be addressed. Training exercises offer a unique opportunity to test systems in more realistic operational scenarios that replicate the density and complexity of modern warfare. They can provide critical operational test data on joint force interoperability, tactical employment, and the performance of systems in high-fidelity threat environments.

However, data-driven operational test objectives are not always compatible with training objectives. Training exercises are typically not designed to address the specific needs of testers and often lack the necessary instrumentation to generate high-quality data required to characterize system performance, determine mission outcomes, and identify root causes of system deficiencies. This limitation currently restricts the extent to which testing and training activities can be effectively combined.

Despite these challenges, there are significant advantages to integrating testing with training exercises. These include interoperability with real coalition partners, exposure to high-fidelity threat and red defensive systems, evaluation of high operational tempo maintenance procedures, and the opportunity to compare the capabilities of new and legacy systems. Additionally, user involvement in the development process during training exercises can help modify or experiment with new concepts of operations and tactics, techniques, and procedures, and provide earlier identification of system deficiencies.

If confirmed, I would advocate for addressing the challenges that limit the integration of testing and training. This includes ensuring training exercises are equipped with the necessary instrumentation and designed to meet training and testing objectives. By synchronizing test criteria and training objectives and adequately addressing safety issues, we can optimize combined events to meet some of the Operational Test and Evaluation (OT&E) and Live Fire Test and Evaluation (LFT&E) objectives, enhancing the overall effectiveness and efficiency of the testing process.

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

A: Combining testing with scheduled training exercises presents several barriers, but none that should be considered insurmountable. One key challenge is designing scenarios that allow for gathering the right test and evaluation (T&E) data while

conducting meaningful training exercises. Testing and training objectives can sometimes differ and even be philosophically opposing, making it essential to decide priorities early in the planning cycle.

Another barrier is the need for trained personnel and a relatively mature system under test. These resources and conditions are typically available only near the end of system development, which may limit opportunities for combined events. Additionally, differences in test and training objectives can complicate the integration of these events.

Spectrum management for data collection and training center activities is another challenge, as is the potential for significant safety issues when combining test and training assets. The lack of affordable, high-quality instrumentation common to both test and training systems further complicates matters. 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 capable of engineering and analysis to develop requisite tools and methodologies is also required to accurately assess the results of large-force exercise and/or test events.

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

A: To use training and testing ranges more jointly and efficiently, several steps can be taken to overcome existing impediments and leverage common capabilities. One major challenge is the cultural difference between testing and training, including how events are funded, the reduced budgets, overtaxed personnel, and scheduling conflicts on test/training ranges. These factors make joint testing and training difficult to accomplish despite its potential advantages.

Developing common, but tailorable, instrumentation systems, such as the Quick Reaction Instrumentation Package (QRIP) and Open Air Battle Shaping (OABS) systems, is essential. These systems enable the application of Big Data and Knowledge Management capabilities in both communities. High-quality data collection in training venues would significantly improve both testing and training, leading to more opportunities for combined activities.

Coordination of the development of test range capability requirements that support both test and training needs must occur early in the process. By aligning these requirements from the outset, it is possible to create synergies that benefit both testing and training communities. This approach would enable more efficient use of resources and better integration of testing and training activities.

75. In your opinion, what role, if any, should DOT&E have in experimentation events?

A: In my opinion, DOT&E should play a significant role in experimentation events. At a minimum, DOT&E should be monitoring these events, as they provide leading indicators of future warfighting capabilities. Being involved in experimentation events offers valuable insights into future test resource and range requirements, test strategies for upcoming programs, and analytical processing needs through the potential warfighter use of advancing technologies.

Additionally, DOT&E includes a Joint Test and Evaluation (JT&E) program that is particularly suited to support the planning, execution, analysis, and reporting of experimentation events. This involvement ensures the operational realism of such events, given their objectives and potential outcomes. If confirmed, I will ensure that JT&E is engaged to the maximum extent possible within the available resources, thereby enhancing the effectiveness and relevance of experimentation events in shaping future defense capabilities.

"System of Systems" Testing

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

A: The operational test and evaluation (OT&E) of Department of Defense (DoD) programs that are part of an overall "system of systems" presents several inherent challenges. One major challenge is the interdependence of DoD systems operating in a net-centric environment, requiring significant resources to verify and validate the performance of networks across an expanding set of mission systems. Evaluating groups of manned and autonomous systems operating together as one fighting force adds complexity, especially when integrating new and legacy systems with different cybersecurity standards.

Another challenge is coordinating among multiple system owners to agree on testing plans, schedules, and scope. This coordination is crucial for large-scale tests, such as those required for the Missile Defense System, which comprises numerous missile, sensor, and network systems that must work together during wartime. Obtaining appropriate venues and adequate funding to support operationally realistic testing further complicates the process.

Traditional system boundaries and program delineations also create significant challenges. A program office typically has control only over its own development program, impacting test schedules, operational realism, and system capability. This is particularly evident in cybersecurity testing, where the test boundary is often limited to the specific program undergoing operational test, despite the system's cybersecurity being inherently dependent on interconnected elements. Realistic message traffic and

understanding the mission impact of cyber vulnerabilities require participation from other elements within the system of systems, which may not always be available to support test schedules.
Finally, OT&E for systems of systems must continuously adapt to keep pace with emerging technologies and evolving missions. Rigorous metrics of effectiveness must be developed to accurately assess the performance and interoperability of these interconnected systems, both individually and how they contribute to mission success jointly. By addressing these challenges, the DoD can ensure that its systems of systems are thoroughly tested and capable of meeting the demands of modern warfare.

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

A: To assess the effectiveness of a "system of systems," it is crucial to test it as an integrated whole, with all its component systems deployed against operationally realistic threats. This comprehensive approach helps understand how the system will perform in combat. However, conducting such tests routinely poses significant operational challenges. Therefore, a combination of modeling and simulation, along with real-world testing, is recommended. The real-world testing should be designed to validate and accredit the modeling and simulation, ensuring that the simulated scenarios accurately reflect potential real-world conditions.

Interoperability is a key factor in this process. Each individual system should be assessed independently to ensure it functions correctly on its own before integrating it into the larger system of systems. Once connected, the systems must be interoperable with each other to facilitate effective testing and evaluation of the entire system.

The Department of Defense (DoD) has made progress in understanding "system-of-systems" testing and creating a robust infrastructure to integrate capabilities in a joint environment. Initiatives like the Joint Mission Environment Test Capability enable a distributed and networked testing environment. DOT&E has several initiatives to develop joint test concepts aimed at evaluating kill webs, mission threads, and other system-of-systems scenarios. These concepts help inform the requirements, infrastructure, tools, and measures needed to adequately scope OT&E and LFT&E tests, ultimately informing the operational performance of the joint force.

78. In your opinion, how should the Department adapt its processes to conduct T&E for an initiative such as CJADC2? Does the Department have the technology, processes, or people in place to conduct T&E for CJADC2?

A: In my opinion, the Department should adapt its processes to conduct T&E for an initiative such as CJADC2 by conducting a thorough assessment of the currently available technology, processes, and personnel. If confirmed, I will work with

Department Service and Component stakeholders to identify any shortfalls in these areas and collaborate with stakeholders and Congress to address them.

CJADC2 capabilities are being developed over time by multiple Services and organizations within the DoD, making it a complex initiative to test. For example, the Joint Fires Network, a key component of CJADC2, supports USINDOPACOM and involves a wide variety of systems that need to be available simultaneously over a large geographic area. To adequately conduct OT&E for such capabilities, a combination of live test events and modeling and simulation will be necessary.

I will advocate for the resources needed to ensure adequate OT&E of CJADC2 capabilities, ensuring that the Department has the technology, processes, and people in place to effectively test and evaluate these complex systems.

Similarly, the ability to conduct testing across mission threads or complex kill webs will require new approaches for T&E.

79. In your opinion, what are the challenges, to include technical, process, and infrastructure, for the T&E community in dealing with the test and evaluation of systems against mission threads, as well as requirements?

A: Real-world mission scenarios involve the use of multiple systems of varying complexities and pedigrees working together to achieve the desired lethal effect. The emergence of highly network-centric concepts, greater dependency on connectivity, and the use of large amounts of data from a wide array of shooters and sensors across multiple domains, at machine speeds, warrants a review of the T&E processes within individual acquisition programs. Evaluating warfighting capability is further challenged by asynchronous updates and continuous evolution of the various components that comprise these complex system-of-systems operations. This demonstrates an inherent need to continually characterize the interoperability of such systems and their effectiveness as would be employed by the Combatant Commands.

With the emergence of joint all domain command-and-control solutions and the concept of kill webs, it is important to define the process and the required T&E tools that would effectively measure the success rates of mission threads, concepts, and solutions. I understand that DOT&E has several initiatives underway to develop joint test concepts intended to provide guidance for evaluating kill webs, mission threads and other system of system scenarios. These concepts will help inform the requirements, infrastructure, tools, and measures needed to adequately scope OT&E and LFT&E of such tests and adequately inform the operational performance of the joint force. I know of no one in the DoD addressing the science behind measuring the effectiveness of these kill webs and, in my view, there should be. If confirmed, I would evaluate the status of these initiatives and inform the next course of action to operationalize such testing.

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.

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

A: As demonstrated by the continuing conflicts in Ukraine and the Middle East, the modern battlefield is increasingly complex, with an ever-evolving threat landscape that changes how we will fight and the types of threats our systems will face. Live fire testing must increasingly rely on modeling and simulation to support timely assessments, as design against any specific threat, tactic, or target is likely to be well out of date by the time the system is employed. If confirmed, I will support development of system-agnostic survivability and lethality modeling capabilities, including the modeling of non-kinetic threats. These models, when supported by rigorous validation testing, have the potential to improve the knowledge of our systems' performance earlier and with more specificity, enabling improvements up front and continued survivability and lethality assessments across the system's life cycle.

In my view, one of the primary challenges is implementing realistic survivability and lethality testing of covered systems, which includes testing against both kinetic and non-kinetic threats, as well as coordinated kinetic and non-kinetic attacks. This requires alignment of kinetic and non-kinetic kill criteria to ensure consistent assessment of survivability and lethality across all effects.

Another major challenge is ensuring that the live fire testing program is adequately resourced and staffed to stay ahead of current and expected threats. The survivability of new defense systems, including those in space and the electromagnetic spectrum environment, must be assessed against an operationally relevant spectrum of threats, encompassing both evolving kinetic threats and more sophisticated non-kinetic threats.

The modern battlefield, as demonstrated by ongoing conflicts in Ukraine and the Middle East, presents an increasingly complex and evolving threat landscape, which inspires an increased use of modeling and simulation to support timely assessments, as designs against specific threats, tactics, or targets may become outdated by the time systems are deployed.

Additionally, there is a need to define requirements for digital tool capabilities that support full-spectrum survivability and lethality testing and evaluation (T&E) across the acquisition lifecycle, including the operations and sustainment phase. Effect-specific test requirements to justify digital tool development and promote the creation of common digital tool interface standards, enabling different effects tools to be linked together, must also be considered.

Finally, the availability of a trained workforce with expertise in model-based engineering, data management, data analytics, software, artificial intelligence/machine learning, verification, validation, and accreditation (VV&A), including uncertainty quantification, and other relevant fields, is critical to the success of the live fire testing program. Ensuring that testing is conducted in realistic operational environments and that the results are reported accurately and objectively remains a priority focus for the DOT&E.

81. 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.

A: Live fire testing to determine whether weapons systems, vehicles, or personal protective equipment meet military and contract specifications for procurement is inherently governmental. This type of testing supports critical decisions such as fielding and full-rate production, which directly impact the safety and effectiveness of warfighters. Therefore, it is essential that such testing be conducted at government facilities or, under limited circumstances, at non-governmental facilities with strict government supervision.

While the government can use private certified labs to meet surge requirements or for research and development testing, any testing conducted at commercial facilities must have government oversight and adhere to a common standard appropriate for the intended use of the data. This ensures that all testing is consistent, reliable, and meets the rigorous standards necessary to make informed procurement decisions. By maintaining government control and oversight, we can ensure that the systems provided to our warfighters are thoroughly tested and meet the highest standards of performance and safety.

Modeling and Simulation

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

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

A: As a rule of thumb, the DoD should use M&S to test what we know and live T&E to test what we do not know. The exception to this rule happens in cases where safety and security dictate the use of M&S.

83. 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?

A: Yes, there are several areas in modeling and simulation (M&S) that need to be advanced to improve its utility as a tool for operational and developmental testing. Significant advancements are required in the modeling and simulation of space warfare systems and threats, complex software-centric enterprise capabilities, interoperability across kill webs, and a system's contribution to multi-domain operations. These advancements are crucial to credibly support operational assessments of DoD's most critical emerging warfighting capabilities.

The test and evaluation (T&E) enterprise is increasingly dependent on M&S to evaluate the efficacy and interoperability of DoD systems. To enhance the utility of M&S in OT&E and LFT&E, the DoD must develop and maintain expertise in advanced warfare, emerging threats, enterprise software architecture, and verification/validation/uncertainty quantification. This includes using the most modern quantitative methods and computing technologies to remix and fuse live data with M&S and physics inside "digital arenas" where complex joint warfighting scenarios can be comprehensively interrogated.

Advances in M&S are essential to support the evaluation of emergent technologies such as artificial intelligence, autonomous systems, directed energy, and hypersonics. For example, confidence in an autonomous system requires assessing its response to various 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 evaluate the decision-making of autonomous machines. Similarly, a comprehensive M&S environment is needed to assess ship self-defense capabilities against anti-ship cruise missiles (ASCMs), as evaluating these capabilities through live testing alone would be cost-, time-, and resource-prohibitive.

Additionally, M&S tools should be developed for cyber T&E as an analog to kinetic testing. For example, cyber load-testing M&S tools should be developed to stress software and identify coding flaws that can be fixed or redesigned before deployment. Similarly, LFT&E cyber tools should be developed to attack software-defined weapon systems to find vulnerabilities and confirm system survivability.

Furthermore, exploring the use of artificial intelligence (AI) to make the development and verification, validation, and accreditation (VV&A) of M&S better, faster, and cheaper is essential. AI can enhance the efficiency and accuracy of M&S processes, enabling more rapid and cost-effective development and validation of models and simulations. Finally, research in composability is in order. The community assumed a model many decades ago, and it's time to revisit those underlying assumptions to think through the fundamental science of modeling and simulation, particularly given the explosion in supercomputing capabilities.

84. Given recent advancements in modeling and simulation, and increasing interest in the Department's use of "digital twin" or model-based systems engineering technology to improve mission readiness and sustainment, where would you draw the line between the suitability of virtual testing and live testing?

A: Given recent advancements in modeling and simulation (M&S) and the increasing interest in the Department's use of "digital twin" or model-based systems engineering technology to improve mission readiness and sustainment, it is essential to strike a balance between virtual testing and live testing.

In my view, virtual testing enabled by digital technologies is becoming increasingly imperative to address the rapid evolution of emerging technologies, threats, and warfighting concepts. If confirmed, I would advocate for significant investment in the development, funding, and use of digital technology to enable virtual testing in OT&E and LFT&E. This includes working with partners in the DoD to ensure that contracts secure the proper technical data packages and source code needed to credibly emulate warfighting systems in digital environments. Additionally, sufficient developmental and operational test data must be used to develop any digital technology supporting warfighting system operational evaluations.

However, live testing will always remain a critical element of OT&E and LFT&E. Live testing provides the necessary data to inform and enhance digital technologies, including their verification, validation, and accreditation (VV&A). The credibility of M&S must be anchored by comparison to live test data to confirm representation of the real world. As confidence in M&S develops through validation, it is appropriate to lean more heavily on virtual testing. Nonetheless, live test events should continue to be part of the testing process to ensure operator confidence in combat systems, enable continued improvement and validation of M&S, and mitigate the inherent limitations of M&S.

In summary, while virtual testing through digital technologies is crucial for addressing modern challenges, live testing remains indispensable for ensuring the credibility and effectiveness of these technologies. By integrating both approaches, the DoD can achieve a comprehensive and reliable evaluation of system capabilities.

85. How can the data or other outputs from such technologies be used to complement, enhance, or reduce, the time for traditional T&E?

A: The data and outputs from advanced digital technologies, such as "digital twins," can significantly complement, enhance, and reduce the time required for traditional T&E in several ways. These technologies support assessments of advanced evolving capabilities across a wide range of operational scenarios in multi-domain environments. By automating data collection, reduction, and analysis, these tools can accelerate the rate and relevance of reporting on warfighting systems both during development and once fielded.

Modern model-based engineering, combined with adaptive inference processes, offers integrated and holistic approaches to generating and managing knowledge of system performance throughout the life cycle. Advanced performance inference techniques can carry forward data from early prototypes through the evaluation of production-representative systems. This approach can eliminate manual workflows through automation, enabling the generation and distribution of up-to-date dynamic reports on systems and their status in the acquisition life cycle.

Digital twins, which can be subjected to stressing conditions early and often, help developers and program managers improve system performance at the required pace. These digital models can incorporate real-time data sensed by the real-world object, enabling continuous monitoring of operational performance as systems evolve over time. This continuous feedback loop informs iterative development, allowing for rapid adjustments and improvements.

However, while digital twins create new opportunities for T&E to determine the performance of continuously evolving systems, they also introduce new verification, validation, and accreditation (VV&A) challenges. If confirmed, I intend to address these challenges by increasing collaboration with the T&E enterprise to develop and adopt advanced digital technologies. This collaboration will enhance the T&E community's ability to support capability fielding demands and ensure that digital technologies are used responsibly and effectively.

Encroachment and Environmental Issues

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

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

A: Encroachment and environmental requirements on and around test and evaluation ranges significantly affect the quality and quantity of the Department of Defense's (DoD) test and evaluation programs. The DoD has been proactively addressing these challenges through various initiatives, but the issues continue to grow and evolve. Residential and commercial development near military installations, along with increasing competition for land, airspace, and water access, constrain training, testing, and other military activities. DoD Reports on Sustainable Ranges and the Strategic Plan for DoD T&E Resources highlight these encroachment factors and their impact on research, development, test, and evaluation activities.

Maintaining open and proactive communication with community partners is crucial for achieving mutually beneficial solutions. The Test Resource Management Center

(TRMC) oversees these efforts, but it is important for all relevant DoD officials to sustain relationships with federal, state, and local governments, tribes, and non-governmental organizations. Collaborative outreach organizations, such as the Southeast Regional Partnership for Planning and Sustainability and the Western Regional Partnership, play a key role in addressing environmental issues associated with test ranges and surrounding communities.

If confirmed, I will ensure that DOT&E continues to support DoD oversight of test ranges, serve as a liaison to surrounding communities, and maintain support for key alliances. I will also advocate for expanding participation in environmental outreach organizations to improve situational awareness of environmental issues that could affect the Department's use of test ranges. By addressing these challenges through constant vigilance, proactive communication, and collaboration, we can mitigate the impact of encroachment and environmental requirements on DoD's test and evaluation programs.

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

A: If confirmed, I would address encroachment and environmental requirements while ensuring the quality and quantity of the Department's test and evaluation programs through a multi-faceted approach. I would work closely with government partners, the services, and agencies to better understand and address encroachment and environmental issues in the planning and execution of test programs. This includes incorporating these considerations into my review and approval of test and evaluation master plans, strategies, and plans.

Additionally, if confirmed, I will remain vigilant 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 to the senior leadership of the Department and document such issues in my annual report and program evaluations as appropriate. I would also communicate these matters to the Test Resource Management Center (TRMC) and other Department stakeholders to ensure a coordinated response.

By taking these steps, I aim to balance the need to address encroachment and environmental requirements with the imperative to maintain the quality and quantity of the Department's test and evaluation programs.

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.

88. **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.**
    A: Yes.

89. **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.**
    A: Yes.

90. **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.**
    A: Yes.

91. **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.**
    A: Yes.

92. **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.**
    A: Yes.

93. **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.**
    A: Yes.

94. **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.
A: Yes.