

# Director's Introduction



On December 20, 2021, I took an oath to support and defend the Constitution of the United States of America when I became the eighth Director, Operational Test and Evaluation. Since then, the security environment has changed in ways few expected. Full-scale war returned to the European continent for the first time in decades, fully exposing the consequences of Russian aggression; and the very real need for, and strength of, our alliances and partnerships in Europe and around the globe. Simultaneously, the People's Republic of China continued to expand rapidly its military capacity and capability, as well as its economic reach. As the 2022 National Defense Strategy (NDS) states, China will remain "our most consequential strategic competitor" for decades to come. In addition to China and Russia, other threats, including Iran, North Korea and non-state actors, persist and continue to expand their capabilities. The extensive proliferation of advanced threat capabilities makes for a more uncertain world and increases warfighter risk.

Our national defense depends on adept and agile Armed Forces, equipped with superior technology, training, and

tactics, all of which must continue to improve over time in ever-shorter cycles. The conditions described above amplify the urgency of ensuring that our women and men in uniform have exactly what they need, when they need it. The test and evaluation community must find new ways of performing our duties to support faster fielding of combat-relevant capability.

Independent operational and live fire test and evaluation that focus on the effectiveness, suitability, survivability, and lethality of evolving and innovative capability are integral to fulfilling my obligation to the warfighter. Strategic decision makers, tactical planners, and warfighters can only execute their missions with confidence when armed with the knowledge that system performance has been tested in operationally representative scenarios. As noted in the NDS, to sustain and strengthen deterrence, DOD must "design, develop, and manage a combat-credible U.S. military fit for advancing our highest defense priorities." Determining that we have weapons that work – evaluated independently and without bias – is the heart of DOT&E.

## TESTING TO DETERMINE HOW WEAPONS WORK, FASTER

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Building on the assertions I made in last year's DOT&E Annual Report, we must continue to change and modernize how we perform test and evaluation. We have redoubled our efforts to transform as a central leader in the T&E ecosystem. As Secretary Austin said in the 2022 NDS, "business as usual at the Department is not acceptable." With this challenge firmly in mind, DOT&E, with our DOD and Services partners, took a hard look at development and acquisition methods, the associated technology pipelines, concepts of operation, threat intelligence, and plans for improving capabilities in ways that can keep up with warfighters' needs. Based on rigorous research and informed by our communities' experience, we sought to better understand how to be effective testers when all these things are evolving rapidly and continuously. We have resolved that, to fulfill our obligations to the warfighter and the Congress, test and evaluation must embrace innovation to address broad and deep change.

The Joint Force, with international partners, will engage increasingly adaptive and technologically sophisticated adversaries in multi-domain operations. They will rely upon systems of systems and kill webs that require reliable, resilient interoperable capabilities, informed by all-domain command and control. They will both use, and need to counter, a plethora of technologies, such as hypersonic weapons, systems based on artificial intelligence, machine learning and autonomous action, swarming un-crewed systems, offensive and defensive cyber operations, and space-based systems – with many more new capabilities and novel employment methods certain to come on ever-shorter intervals.

Timely, thorough assessment of new capabilities requires the right infrastructure, the right tools, and a workforce of the right size with the right expertise. What is "right" is not static. It changes as warfighting environments, technologies, innovative capabilities, and novel tactics (both ours and our adversaries') change. In order to be adequately prepared, the T&E community must develop test methods and a test

ecosystem that can rapidly adapt to warfighter needs, new technologies, and fluid tactics – now and well into the future.

## 2022 DOT&E STRATEGY UPDATE

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The 2022 DOT&E Strategy Update I signed in June lays the foundation for how the T&E enterprise will address the operational test and evaluation challenges we face and continue to be the key to weapons that work, delivered faster than ever before. Its objectives are a combination of commonsense changes and fresh initiatives.

**Test the Way We Fight.** Testing the way we fight encompasses the fundamental requirement for operationally representative T&E that determines, with confidence, whether a system will be effective, suitable, survivable, and lethal in the hands of a warfighter facing a thinking enemy. It means architecting T&E around current, validated mission threads; accurately replicating the anticipated operating environment; and employing realistic warfighting tactics, techniques, and procedures during testing. All of these elements are dynamic. T&E infrastructure, tools, and processes must be able to scale and adapt quickly to reflect changes when they arise and efficiently evaluate kill web and system-of-systems performance.

**Accelerate Delivery of Weapons That Work.** Operational T&E must contribute to accelerating delivery of weapons that work. In the near term, OT&E will achieve the biggest gains through automation and more widespread use of digital technologies. The 2022 DOT&E Strategy Update addresses establishing enterprise-level T&E data management. Test and evaluation activities generate enormous quantities of data. At the individual program level, sharing data among all stakeholders can be cumbersome and time-consuming, slowing analysis and, ultimately, acquisition decision making. In the aggregate, the Department risks losing knowledge that could dramatically affect research, development, testing, and acquisition. We do not have a clear view of the test related data that exists across the entire DOD, and have identified the need to improve access to that data in order to extract new insights. Automated

networked computing infrastructure that collects, hosts, and conducts streaming analysis of test data across all of DOD – while adhering to DOD’s data strategy – will accelerate the fielding of robust, combat-credible capabilities.

#### **Improve Survivability in Contested Environments.**

While U.S. forces remain dominant, no warfighting domain is uncontested. Improving survivability in these environments is an ever-changing area of our practice that is paramount to the Nation. Cyber, electromagnetic spectrum (EMS), and space threats are examples of tremendous current challenges to warfighting forces. In the near term, the T&E ecosystem must improve and expand its means of testing cyber and EMS survivability in mission scenarios, and replicating the space environment and space threats, both kinetic and non-kinetic. The acquisition community must dedicate more programmatic time and resources to assessing performance in contested environments.

#### **Pioneer T&E of Systems Built to Change Over Time.**

The practice of increasing warfighter capability by improving our existing systems is an affordable and effective way of delivering winning performance – especially for those that are software-intensive. This is an increasingly dominant aspect of DOD’s inventory of weapon and combat-supporting systems. Seemingly simple changes to a system already in the field may alter operational effectiveness, suitability, survivability, and lethality. These changes may also impact how it and other systems interoperate and function within the kill web. We must therefore “look right” into the life cycle of a system as we work on new ways to pioneer T&E of systems built to change over time. To assure continued combat credibility, we will work with the T&E community to determine how and when to test systems that have evolved substantially after fielding. This is especially important for the operational and responsible performance of systems that incorporate artificial intelligence, autonomy, and machine learning.

One important step is to develop a framework to evaluate iterative software improvements and their impact to a system’s role in and interoperability with the kill web. At the same time, the T&E community must broaden its development and use of new

testing methods, such as digital twins. This and other best practices will help us keep pace with the rapid and frequent changes we both encourage and expect, such that we can test them safely with minimal disruption to warfighting units. With the user and acquisition communities, we will have to work together to set parameters for continuous monitoring of the operational performance of interoperable sets of fielded systems. Digital twins will aid, but not obviate, the need for live operational and live fire T&E events. In particular, any model we utilize needs to be validated, verified, and accredited (VV&A) for its intended use to reflect, as accurately as possible, the real world. When the results of testing via a digital twin diverge substantially from what we observe in the field, careful examination of the VV&A of those models will be necessary and likely require a live operational or live fire T&E event to reconnect us to an accurate reflection of the operating environment.

#### **Foster an Agile and Enduring T&E Enterprise**

**Workforce.** Evolving the craft of operational test and evaluation to the vision articulated above is contingent upon having a creative, highly skilled, and deeply knowledgeable workforce. As the NDS attests, people are DOD’s “most valuable resource” and “to recruit and retain the most talented Americans, we must change our institutional culture and reform how we do business.” The final pillar of DOT&E’s strategy therefore focuses on fostering an agile and enduring T&E enterprise workforce. Looking at today’s environment and into the near future, our most significant human resource gaps lie in the use of automation, cyber survivability, data management, artificial intelligence, and digital engineering. There are at least three moving parts we need to keep in mind: the tools used to create new capabilities are changing rapidly; we are using those rapidly changing tools to quickly improve and deliver new capabilities for our weapon systems; and the underlying T&E technologies and practices we must employ to practice our craft are also constantly in motion. To remain effective in this environment, our personnel must broaden their knowledge and take advantage of training opportunities. DOT&E will apply available training and development resources to improve our diverse workforce. In addition, we will pursue NDS suggestions for bringing in new perspectives through

fellowships, internships, and rotational assignments, including with the private sector. Creating a wide array of collaboration opportunities and expanding our range of experience will help to bring the best practices into our community.

## BRINGING THE 2022 DOT&E STRATEGY UPDATE TO FRUITION

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DOT&E is working to bring the 2022 Strategy Update to fruition. A prescient reorganization that occurred before I joined the team established a new deputate focused on strategic initiatives, policy, and emerging technologies (SIPET). Accompanied by the incorporation of live fire T&E into our warfighting domain deputates, DOT&E now has the right structure to achieve the NDS's call to "modernize the systems that design and build the Joint Force, with a focus on innovation and rapid adjustment to new strategic demands." The SIPET deputate, in close collaboration with the T&E community, is leading development of the 2022 DOT&E Strategy Update Implementation Plan, which we expect to publish in FY23.

To do a better job of testing as we fight, DOD will need to improve our capacity to test in a realistic, joint, multi-domain environment – to include with international partners where possible. This will entail a geographically dispersed yet integrated, cross-service, live-virtual-constructive T&E infrastructure that can scale and adapt as technologies and concepts of operations change. Devising and implementing an architecture for collaborative and synergistic testing across these facilities will require some investment.

Test realism also depends on threat accuracy which is an area that constantly needs improvement. The adversary cycle of capability change is shorter than ever, yet representation within the test environment often takes three to five years. We will need to continue to innovate on the use of simulation and/or emulation of threats in representative environments to ensure that weapon systems will be effective when called upon.

Cooperation across multiple disciplines and communities is required to remedy this threat realism

gap. To ensure we can adequately test throughout a system's entire life cycle, the acquisition and sustainment communities will need to work with the intelligence community to understand the collected threat data and to identify missing pieces of the threat/capability overmatch puzzle. A threat reference framework along with threat-agnostic models would facilitate threat simulation and emulation. DOT&E will be exploring the application of artificial intelligence to create threat models over shorter timelines.

Testing of mission systems must also move away from the classic "System Under Test" construct. Warfighting is executed jointly and across multiple domains. Capability is now generated through interoperability of systems of systems, to include platforms in different domains – not individual systems operating in disconnected silos. DOT&E will be looking for ways to routinely assess interoperability as it is affected by the introduction of a new capability, or modification to an existing capability, on those kill webs.

These reforms and advances will require collaboration with other T&E stakeholders, the acquisition, intelligence, and sustainment communities, and the Congress. The amount of change necessary for OT&E to remain credible and trusted cannot happen tomorrow. But we need a concerted effort now – heavy investment in individual brainstorming; collaborative brainstorming among government entities, the private sector, and academia; and smartly timed planning and programming in the amounts required.

## COVID-19

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At no point since March 2020, when the full impact of the COVID-19 pandemic hit, have the dedicated women and men of DOT&E allowed our mission to falter – accepting risk to themselves to ensure support to our warfighters. For that, the Department and the Nation owe them a debt of gratitude. After another year of medical advances, the fight against COVID-19 has progressed dramatically. Though it has not been eradicated, and the possibility of infection remains, vaccines have allowed most people to resume daily life with prudence.

As a science-based organization that seeks and follows data, DOT&E used what we learned from this experience to refashion our workforce approach. We continue to pursue new ways of connecting our analysts with T&E and warfighting environments in order to provide them the maximum ability and flexibility to do their critical work. We also have revised our internal cadence, taking better advantage of the remote work tools available to DOD. Taking full advantage of these practices will aid in retention and improving our workforce's depth of experience, which is paramount to our success.

## ONE ANNUAL REPORT

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Many may remember that last year DOT&E issued two Annual Reports: one that contained controlled unclassified information, per statute, regulations, and program-specific classification guides; and the other one fully cleared for public release. Issuing two documents allowed DOT&E to be more transparent with congressional and DOD personnel, while maintaining the integrity of information related to programs under oversight. This year, in consultation with Congress, we produced a single, publicly releasable report. Doing so complies with both the spirit and letter of the legislation governing the Annual Report. This 2022 report reflects careful consultation with the program offices that determine the classification of information about systems under DOT&E oversight, and contains the maximum detail permitted. As always, the DOT&E team is ready and available, on request, to assist members of Congress

and their staff in understanding the performance of systems in the DOD acquisition pipeline at higher levels of classification.

## SUSTAINMENT OF INTEGRITY IN OPERATIONAL TEST OVERSIGHT

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Prior to this report being finalized, on November 15, 2022, I was nominated by the President for the position of Assistant Secretary of the Navy (Research, Development, and Acquisition). While the confirmation process is under way, I directed the establishment of a File for the Record of all decisions related to Navy acquisition programs until my confirmation process runs its course as I continue to serve as the Director, Operational Test and Evaluation, the position for which I was appointed by the President and confirmed by the Senate.

As Director, I continue to uphold the highest standards of ethical conduct and ensuring that the transparency and integrity of OT&E decisions are sustained in the Department's independent assessments. The responsibilities of my office, as the independent voice of the warfighter, to the Secretary and to the Congress continue to be held to the highest level of integrity.



Nickolas H. Guertin  
Director