



DoD INSTRUCTION 5000.98

OPERATIONAL TEST AND EVALUATION AND LIVE FIRE TEST AND EVALUATION

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Purpose: In accordance with the authority in DoD Directive (DoDD) 5141.02, this issuance:

- Establishes policy, assigns responsibilities, and prescribes procedures for operational test and evaluation (OT&E) and live fire test and evaluation (LFT&E) of DoD systems and services (referred to in this issuance as “DoD systems”) acquired via the Defense Acquisition System or via other non-standard acquisition systems.
- Supersedes information regarding OT&E and LFT&E located in DoD Instruction (DoDI) 5000.89.

TABLE OF CONTENTS

SECTION 1: GENERAL ISSUANCE INFORMATION	4
1.1. Applicability.	4
1.2. Policy.	4
SECTION 2: RESPONSIBILITIES	6
2.1. Director of Operational Test and Evaluation (DOT&E).....	6
2.2. Under Secretary of Defense for Research and Engineering (USD(R&E)).....	6
2.3. Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)).....	6
2.4. DoD Chief Information Officer.	7
2.5. USD(I&S).	7
2.6. Chief Digital and Artificial Intelligence OfficeR.	7
2.7. DoD Component Heads.	7
SECTION 3: OT&E AND LFT&E OVERVIEW	8
3.1. Science- and Technology-Based OT&E and LFT&E.	8
3.2. OT&E and LFT&E Across the Acquisition Life Cycle.....	8
3.3. OT&E.....	11
3.4. LFT&E.....	15
3.5. Certifications.....	18
3.6. M&S.....	19
3.7. Program Management.....	20
a. Program Manager.....	20
b. T&E WIPT/ITT.	22
c. OTA.....	23
d. LFT&E Organizations.	24
3.8. Data Management.	24
3.9. DOT&E Oversight.	26
SECTION 4: OT&E AND LFT&E PROCESS	28
4.1. Test Planning.	28
4.2. Test Preparation.	30
4.3. Test Execution.	30
4.4. Analysis and Evaluation.	31
4.5. Test Reporting.....	32
SECTION 5: OT&E AND LFT&E FOR ADAPTIVE ACQUISITION FRAMEWORK PATHWAYS.....	34
5.1. General Procedures.	34
5.2. OT&E and LFT&E for the Urgent Capability Acquisition Pathway.	34
5.3. OT&E and LFT&E for the MTA Pathway.	36
5.4. OT&E and LFT&E for the MCA Pathway.....	37
5.5. OT&E and LFT&E for the Software Acquisition Pathway.....	38
5.6. OT&E and LFT&E for the DBS Pathway.	39
5.7. OT&E and LFT&E for the Acquisition of Services.	40
GLOSSARY	42
G.1. Acronyms.....	42
G.2. Definitions.....	43
REFERENCES	53

FIGURES

Figure 1. T&E Across the Acquisition Life Cycle. 9

Figure 2. Adaptive Acquisition Framework. 34

Figure 3. OT&E and LFT&E Aligned with the Urgent Capability Acquisition Pathway
Decisions..... 35

Figure 4. OT&E and LFT&E Aligned with MTA Pathway Decisions. 36

Figure 5. OT&E and LFT&E Aligned with MCA Pathway Decisions. 37

Figure 6. OT&E and LFT&E Aligned with Software Acquisition Pathway Decisions. 39

Figure 7. OT&E and LFT&E Aligned with DBS Acquisition Pathway Decisions..... 40

Figure 8. OT&E and LFT&E Aligned with Acquisition of Services Pathway Decisions..... 41

SECTION 1: GENERAL ISSUANCE INFORMATION

1.1. APPLICABILITY.

This issuance applies to:

- a. The OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (referred to collectively in this issuance as the “DoD Components”).
- b. DoD systems acquired via the Defense Acquisition System, pursuing any adaptive acquisition framework pathway, in accordance with DoDD 5000.01 and DoDI 5000.02.
- c. DoD systems under special access controls, in accordance with DoDD 5205.07.
- d. Non-standard acquisition systems (e.g., Missile Defense System).

1.2. POLICY.

The DoD will plan, fund, execute, and report on OT&E and LFT&E of DoD systems acquired via the Defense Acquisition System, including special access programs and non-standard acquisition systems.

- a. OT&E and LFT&E planning, execution, analysis, and reporting activities will use the latest advances in science and technology to determine, with scientific rigor, the operational effectiveness, suitability, survivability, and lethality (as applicable) of DoD systems as they mature across the acquisition life cycle.
- b. OT&E and LFT&E stakeholders will coordinate with the relevant contractor test and evaluation (CT&E), developmental test and evaluation (DT&E) activities, and the end user to maximize the use of CT&E and DT&E in support of meeting independent OT&E and LFT&E and end user objectives.
- c. OT&E and LFT&E planning will include risk-based level of testing and mission-based risk assessments (MBRAs) to determine a defensible scope of OT&E and LFT&E.
- d. OT&E and LFT&E planning will start in parallel with the development of the acquisition strategy to inform the development of:
 - (1) Measurable and testable program requirements.
 - (2) Acquisition contracts.

(3) A test and evaluation master plan (TEMP), test and evaluation (T&E) strategy, or equivalent document, referred to in this issuance as “TEMP/T&E strategy.”

e. OT&E and LFT&E planning will consider the time and resources required to:

(1) Support the correction of deficiencies and vulnerabilities identified before and during OT&E and LFT&E.

(2) Verify the corrections before proceeding with testing or the next acquisition decision.

f. OT&E and LFT&E planning, execution, analysis, and reporting will use the latest Intelligence Community knowledge and will be conducted in operationally representative and relevant, contested, congested, and constrained multi-domain environments that include the full spectrum of kinetic and non-kinetic threats and targets, as applicable, within the program’s expected life cycle, including:

(1) Kinetic.

(2) Cyber.

(3) Electromagnetic spectrum (EMS) including directed energy weapons and doctrinally appropriate force structures to evaluate congested and constrained environments.

(4) Chemical, biological, radiological, and nuclear (CBRN).

(5) Other operationally relevant kinetic and non-kinetic threats and targets including, but not limited to, artificial intelligence (AI)-based threats and data storage targets.

SECTION 2: RESPONSIBILITIES

2.1. DIRECTOR OF OPERATIONAL TEST AND EVALUATION (DOT&E).

Pursuant to Sections 139, 4171, 4172, 4231, and 181 of Title 10, United States Code (U.S.C.) and Section 223 of Public Law 117-81, and in accordance with DoDD 5141.02, as the principal official and advisor to the Secretary of Defense (SecDef) on all DoD matters related to OT&E and LFT&E, the DOT&E:

- a. Designates select DoD systems for OT&E and LFT&E oversight and publishes and manages the joint T&E Oversight List.
- b. Monitors, reviews, and independently reports on all OT&E and LFT&E activities and resources for DoD systems on the T&E Oversight List.
- c. Serves as an advisor to the Joint Requirements Oversight Council on matters within DOT&E authority and expertise to inform and influence requirements, concepts, capabilities-based assessments, and concept of operations.
- d. Reviews and makes recommendations on all budgetary and financial matters relating to OT&E and LFT&E, including OT&E and LFT&E resources.

2.2. UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (USD(R&E)).

Pursuant to Section 133a of Title 10, U.S.C., the USD(R&E):

- a. Designates select DoD acquisition programs for DT&E oversight and adds them to the T&E Oversight List.
- b. For acquisition category (ACAT) ID programs on T&E oversight for DT&E, assesses the adequacy of and approves DT&E strategies documented in TEMPs/T&E strategies. For all other acquisition programs under DT&E oversight, advises the milestone decision authority (MDA) by conducting an independent analysis of test data, reports, modeling and simulation (M&S) results, and the adequacy of the DT&E plan in the TEMP/T&E strategy.

2.3. UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND SUSTAINMENT (USD(A&S)).

Pursuant to Section 133b of Title 10, U.S.C., the USD(A&S):

- a. Establishes policy directing acquisition decision authorities and program managers to implement the intent and requirements of this issuance for all acquisition programs over which they have cognizance.

b. When serving as the MDA, considers OT&E and LFT&E activities and reports to inform program acquisition and sustainment risk decisions, in coordination with the DOT&E.

2.4. DOD CHIEF INFORMATION OFFICER.

The DoD Chief Information Officer coordinates with the DOT&E, USD(R&E), USD(A&S), and Under Secretary of Defense for Intelligence and Security (USD(I&S)) to synchronize the OT&E and LFT&E processes in this issuance with the DoD Cybersecurity Program and the DoD Strategic Cybersecurity Program.

2.5. USD(I&S).

The USD(I&S) oversees intelligence support to the acquisition life cycle and advises the DOT&E concerning intelligence supportability requirements that affect OT&E and LFT&E.

2.6. CHIEF DIGITAL AND ARTIFICIAL INTELLIGENCE OFFICER.

The Chief Digital and Artificial Intelligence Officer issues guidance, methodologies, and best practices on T&E for AI capabilities in DoD systems and coordinates with the USD(R&E) and DOT&E on developing and using common tools and infrastructure for T&E and verification and validation (V&V) of AI capabilities in DoD systems.

2.7. DOD COMPONENT HEADS.

The DoD Component heads:

- a. Plan, fund, execute, and report on OT&E and LFT&E of DoD systems through:
 - (1) Component acquisition executives.
 - (2) Program managers.
 - (3) LFT&E organizations.
 - (4) Their designated operational test agency (OTA) or operational test organization (referred to collectively in this issuance as “OTA”).
- b. Establish an OT&E and LFT&E readiness review process for determining and certifying a program’s readiness for OT&E and LFT&E events (see Paragraph 4.2. for additional information on the readiness review process).
- c. Governs management or acquisition program records in accordance with DoDI 5015.02.

SECTION 3: OT&E AND LFT&E OVERVIEW

3.1. SCIENCE- AND TECHNOLOGY-BASED OT&E AND LFT&E.

a. OT&E and LFT&E planning, execution, analysis, and reporting activities will use the latest advances in science (e.g., design of experiments, statistical inference methods, or big data analytics) to:

(1) Provide the live data, M&S results, and knowledge to DoD system stakeholders required to:

(a) Determine, with scientific rigor, the preliminary and final operational effectiveness, suitability, survivability, and lethality (as applicable) of DoD systems.

(b) Characterize and quantify, where possible, any risk to acquisition programs, the warfighter, mission engineering outcomes, and DoD operations.

(2) Enable effective coverage of the operationally relevant, multi-domain operational conditions in OT&E and LFT&E and appropriately scope defensible OT&E and LFT&E.

b. OT&E and LFT&E planning, execution, analysis, and reporting activities will use the latest advances in technology (e.g., M&S, digital engineering, digital tools, data management tools, modern predictive analytics tools using AI and machine learning, or other automation and AI-enabled tools). Advanced technologies may provide authoritative sources of models, simulation, data, and test artifacts to enable automation and reuse of test artifacts gaining greater accuracy and efficiency across OT&E and LFT&E.

c. Science and technology-based OT&E and LFT&E will enable efficient use of data from multiple data sources (e.g., contractor test (CT), developmental test (DT), operational test (OT), and live fire test (LFT) data or M&S results). Improved sequential testing using Bayesian or similar inference methods, paired with improved data management methods, are critical to dynamically optimize the planning, execution, analysis, and reporting of integrated T&E, OT&E, and LFT&E across the acquisition life cycle.

3.2. OT&E AND LFT&E ACROSS THE ACQUISITION LIFE CYCLE.

a. OT&E and LFT&E activities across the acquisition life cycle will:

(1) Use data and results from integrated T&E events, as appropriate.

(2) Include dedicated OT&E events.

(3) Include dedicated LFT&E events.

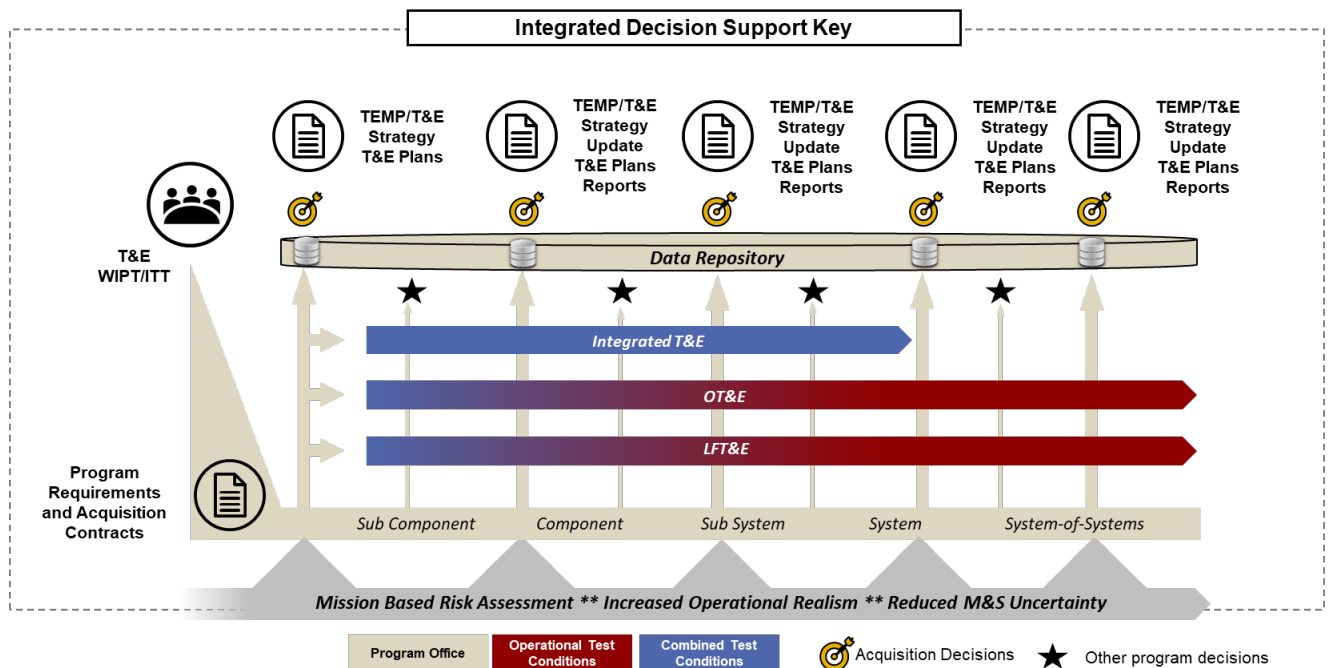
(4) Use M&S results, as appropriate.

(5) Use data and results from major command or Combatant Command exercises or flag events, as appropriate.

(6) Use other T&E events, as appropriate.

b. The complexity and the objectives of integrated T&E, OT&E, and LFT&E events will evolve as the DoD system matures from sub-components, components, sub-systems, system (including prototypes, early system configurations, and production- or fielding-representative systems) to systems-of-systems, as shown in Figure 1.

Figure 1. T&E Across the Acquisition Life Cycle.



(1) T&E working-level integrated product teams (WIPTs), which are also known as integrated test teams (ITTs), referenced in this issuance as “T&E WIPT/ITTs,” and chartered in accordance with Paragraph 3.7., will inform the program requirements and acquisition contracts and develop and update the TEMP/T&E strategy to support acquisition decisions.

(2) T&E WIPT/ITTs will plan and execute the risk-based level of test assessments and MBRAs to inform a defensible scope of T&E.

(3) The TEMP/T&E strategy will include an integrated decision support key (IDSX) to appropriately inform acquisition and program decisions; increase T&E efficiency; and optimize the evaluation of technical requirements and the learning campaign of operational effectiveness, suitability, survivability, and lethality (as applicable) of DoD systems across the acquisition life cycle by:

(a) Identifying the right CT&E, DT&E, qualified integrated T&E data, and independent OT&E and LFT&E data and the right amount of such data in support of each acquisition or program decision.

(b) Considering and maximizing the utility of the data and results collected during T&E activities in support of the previous acquisition or program decision(s) while also accounting for the opportunity to collect additional test data and results during future acquisition or program decision(s) to optimize the planning in support of the current decision.

(c) Enabling early and frequent coordination of OT&E and LFT&E stakeholders and M&S managers with CT&E and DT&E stakeholders to plan and execute integrated T&E events while meeting independent CT&E, DT&E, OT&E, and LFT&E objectives. Incorporating operational realism early in the test program is critical to improving the probability of identifying problems early when redesigns are more economically and technically feasible.

(d) Implementing advanced statistical inference methods, digital engineering, digital tools, and digital technologies, as appropriate, to maximize the knowledge gained from all relevant live data and M&S results and the benefit of collecting additional data and results.

c. OTAs and LFT&E organizations will maximize the use of relevant CT&E and DT&E events to support the planning and execution (as applicable) of integrated T&E events. Before starting integrated T&E data collection, OTAs and LFT&E organizations will develop a T&E concept that includes:

(1) The initial operational test and evaluation (IOT&E) and LFT&E design that will be updated at each acquisition or program decision as more data and M&S results become available. IOT&E and LFT&E are required to complete all OT&E and LFT&E requirements not satisfied by integrated T&E events.

(2) An approach identifying specific CT&E and DT&E events and measures that could meet OT&E and LFT&E objectives.

(3) A formal data scoring process and criteria to decide on the appropriateness of using data collected in integrated T&E and if such data are adequate to meet OT&E and LFT&E objectives. The scoring process will include a review process for previously qualified data that may have been inadvertently affected by subsequent system hardware and software changes.

(4) An OT&E and LFT&E reporting approach that is synchronized with acquisition and program decisions.

d. OTAs and LFT&E organizations will maximize the use of training, joint and operational exercises, and other synchronized test events to support OT&E and LFT&E objectives. IOT&E and LFT&E are required to complete all OT&E and LFT&E requirements not satisfied by these events.

3.3. OT&E.

a. OTAs must plan and execute OT&E to evaluate the operational effectiveness and suitability of DoD systems while taking into equal consideration survivability and lethality effects (as applicable).

b. OT&E must include the evaluation of the production- or fielding- representative system with trained operators including cyber defenders (e.g., cybersecurity service providers, cloud service providers, or defensive cyberspace operators), if applicable, in operationally relevant and representative conditions including:

(1) The full spectrum of natural and man-made environments including operationally relevant extreme conditions.

(2) The full spectrum, as applicable, of operationally relevant and representative kinetic and non-kinetic threats and targets expected within the program's life cycle.

(3) Operational scenarios derived from the concept of operations, joint warfighting concepts, kill webs, mission threads, joint mission essential task lists, or DoD Component-specific mission essential task lists by the T&E WIPT/ITT and the program manager.

(4) Operationally representative supporting systems with relevant interacting layers from components, DoD systems, units equipped with the DoD systems, single-Service forces, and joint forces that may affect the DoD system's operational interoperability in multi-domain operations, including:

(a) The ability of DoD systems, diverse units, and partner nations to collect, integrate, distribute, communicate, and interpret information and work together seamlessly in multi-domain and contested joint operations.

(b) The ability to achieve information advantage for decision making and to create effects on the information environment.

(c) The management and application of information, as well as its deliberate integration with other joint functions, to change or maintain perceptions, attitudes, and other elements that drive desired behaviors and to support human and automated decision making.

(d) Compliance with standards in the context of accurately defined interfaces, compatible systems, natural or friendly force interference, or intentional adversary interference (e.g., wireless signals, or cyberattack to wired communications).

(e) The ability of DoD managers at all levels to make decisions through organized information sharing across the DoD, joint capability areas, mission, component, and program boundaries.

(f) Interoperability degradation in the end-to-end execution of mission scenarios and the effect of such degradation on operational effectiveness, suitability, survivability, and lethality, as applicable.

c. Persons employed by the contractor for the system being developed will only participate in OT&E to the extent they are planned to be involved in the operation, maintenance, and other support of the system when deployed in real DoD missions and operations.

d. OTAs will integrate people, processes, and tools within the system development cadence across the acquisition life cycle to:

(1) Observe and collect applicable data from CT&E, DT&E, and LFT&E events.

(2) Support the planning and execution of integrated T&E.

e. OTAs will conduct OT&E of software-intensive systems and software embedded in systems in accordance with DoD Manual (DoDM) 5000.96.

f. OTAs will conduct OT&E of AI-enabled DoD systems in accordance with DoDM 5000.97.

g. OT&E events may be used to support full spectrum survivability and lethality testing in accordance with DoDM 5000.99.

h. OT&E events are categorized into five major types to tailor OT&E to the needs of different acquisition decisions:

(1) Early operational assessment (EOA).

(2) Operational assessment (OA).

(3) IOT&E.

(4) Follow-on operational test and evaluation (FOT&E).

(5) Operational demonstration (Ops Demo).

i. For each OT&E event, the OTA will generate a plan and a report. The OTA may generate a report, as appropriate, after the completion of an integrated T&E event.

j. OT&E may use a different nomenclature including but not limited to force development evaluation.

(1) EOA.

EOAs are primarily applicable to programs pursuing a major capability acquisition (MCA) pathway.

(a) The OTA will plan and conduct EOAs during the technology maturation and risk reduction phase to provide early input to the program manager and requirements authority on risks that could have a significant effect on operational effectiveness and suitability, if not mitigated. OTAs will take into equal consideration any survivability and lethality effects, as applicable.

(b) EOAs may be based on an analysis of available program and system artifacts as well as data from early CT&E, DT&E, and LFT&E; technology assessments; mission engineering analysis; M&S results; and program development and design reviews.

(2) OA.

(a) OAs may be conducted with pre-production or pre-fielding DoD systems. Multiple OAs may be necessary and planned as integrated T&E to increase the frequency, quantity, and quality of OT&E feedback with the added potential to increase OT&E efficiency.

(b) OAs will be conducted in operationally representative conditions with representative missions and trained units, including cyber defenders and maintainers, to the maximum extent possible.

(c) OAs may use a different nomenclature including, but not limited to, operational utility evaluations, limited user tests, and quick reaction tests. OAs are applicable to programs pursuing any acquisition pathway and could be used to support:

1. An interim acquisition decision. The OA will support preliminary evaluation of operational effectiveness and suitability, while taking into equal consideration survivability and lethality effects, as applicable. OAs may identify key performance shortfalls and risks that the program manager will address to reduce risk to the next phase of OT&E, the acquisition decision, the warfighter, and the DoD operations.

2. Minimal capability fielding or early fielding decisions. The OA will support the evaluation of the operational effectiveness and suitability of the minimal capability fielding or early fielding capability in the unique theater of employment, while taking into equal consideration survivability and lethality effects, as applicable, for that tailored use. OAs cannot be used to replace IOT&E for programs pursuing the MCA, software acquisition, and defense business systems (DBS) pathways.

(3) IOT&E.

(a) IOT&E must be conducted for MCA programs to determine operational effectiveness and suitability while taking into equal consideration survivability and lethality effects, as applicable, in support of the full-rate production decision.

(b) IOT&E must be conducted for software acquisition and DBS pathways in support of fielding and full deployment authority to proceed (ATP) decisions.

(c) IOT&E must use production or fielding DoD systems or production- or fielding-representative test articles for:

1. Hardware.

a. Hardware will be defined by the system-level critical design review, functional configuration audit, and system verification review, including correction of major deficiencies identified during prior testing as appropriate.

b. For hardware acquisitions, production- or fielding-representative articles will be assembled using the parts, tools, and manufacturing processes intended for use in fielding or full-rate production. The articles will have the intended production versions of software and operational logistics systems, including verified and validated drafts of maintenance manuals intended for use on the fielded system. The manufacturing processes to be used in full-rate production will be adhered to as closely as possible.

c. Any major manufacturing process changes that may affect the operational performance of the system will be reported to the MDA, OTA, and LFT&E organizations as well as the DOT&E for review to determine if the process changes will affect IOT&E or LFT&E plans.

2. Software.

a. Software will be defined based on the implementation to date and the associated product roadmap and will include life cycle system support (e.g., manuals, training, helpdesk, continuity of operations, and system upgrades).

b. For software acquisitions, a production- or fielding-representative system consists of the hardware and software intended for deployment with representative DoD information network operations and supporting cybersecurity capabilities.

(d) IOT&E must use trained operators including cyber defenders, if applicable, in dedicated field tests conducted under realistic combat conditions. Realistic combat conditions must include an operationally representative and relevant contested, congested, and constrained multi-domain environment, including operationally representative kinetic and non-kinetic threats and targets that the system is expected to encounter in operations.

(e) IOT&E must include end-to-end testing of system capabilities, including all interrelated systems needed to employ and support those capabilities in operationally relevant and representative multi-domain operations.

(4) FOT&E.

(a) FOT&E is applicable to acquisition programs pursuing most acquisition pathways. Notable exceptions include programs pursuing an urgent capability acquisition or the middle tier of acquisition (MTA) pathway.

(b) FOT&E supports the evaluation of any changes in operational effectiveness, suitability, survivability, and lethality, as applicable, of DoD systems in operations and sustainment due to either the system modifications, observed performance degradation, a new or emerging operational environment, new mission, or new kinetic or non-kinetic threats and targets. FOT&E may also be required to verify that deficiencies identified in previous tests have been corrected.

(c) More dynamic FOT&E will be planned and executed for DoD systems intended to evolve more dynamically over time (e.g., software intensive systems or AI-enabled systems). More dynamic FOT&E will also be planned and executed for DoD systems as the cyber, EMS,

and other adversarial threats and tactics, techniques, and procedures evolve more dynamically over time.

(5) Ops Demo.

Ops Demos are applicable to acquisition programs pursuing the MTA rapid prototyping and rapid fielding pathways. An Ops Demo may support an initial production decision. The scope and focus of Ops Demos will depend on whether the MTA outcome determination will support a transition to either another acquisition pathway or to operations and sustainment.

(a) If the MTA program will transition to another acquisition pathway (including the rapid fielding pathway for prototyping MTAs), the Ops Demo will support preliminary evaluation of operational effectiveness and suitability, while taking into equal consideration survivability and lethality effects, as applicable. The Ops Demo may identify key performance shortfalls and risks that the program manager may address to reduce risk to the next phase of OT&E, the program, warfighter, and DoD operations. Additional Ops Demos may be required to support subsequent production and expanded fielding decisions.

(b) If the MTA program will transition to operations and sustainment, the Ops Demo will be planned and executed as if it were an IOT&E to support the evaluation of the operational effectiveness and suitability of the fielding capability, while taking into equal consideration survivability and lethality effects, as applicable.

3.4. LFT&E.

a. LFT&E is applicable to any DoD system that can degrade, disable, deceive, or destroy forces or missions and is critical to DoD operations will include realistic, full spectrum survivability and lethality testing, as applicable.

b. Full spectrum survivability and lethality T&E will:

(1) Include operationally relevant and representative contested, congested, and constrained environments using live kinetic and non-kinetic threats and targets or their surrogates.

(2) Start on sub-components, components, sub-systems, and early system configurations, allowing time to correct any design vulnerabilities and limitations demonstrated by such testing.

(3) Include full-up system-level (FUSL) testing on a combat-loaded system unless a waiver package from such testing has been requested and certified by the Secretary of Defense and includes a report explaining how the Secretary plans to evaluate the survivability or the lethality of the system or program and assessing possible alternatives to realistic survivability testing of the system or program in accordance with Section 4172 of Title 10, United States Code.

(4) Continue throughout operations and sustainment.

c. A full spectrum survivability T&E will evaluate the survivability kill chain, including:

(1) Susceptibility of the system to an operationally relevant and representative kinetic and non-kinetic adversary attack, including, but not limited to, the evaluation of situational awareness, effectiveness of threat or intrusion detection capabilities, signature control, electronic protection and attack, deception, expendables, threat suppression, and offensive weapons.

(2) Early and frequent identification of:

(a) Mission critical vulnerabilities in the system design to live kinetic and non-kinetic attacks as well as the effectiveness of any survivability enhancement features.

(b) The effect of those vulnerabilities on operational effectiveness and suitability including training, tactics, techniques, and procedures.

(3) Recoverability from the live kinetic and non-kinetic attack, including, but not limited to, the training, process, timeliness, and ability to resume mission critical functions after the attack.

(4) Effect of the live kinetic and non-kinetic attack on user casualties (i.e., force protection), including, but not limited to:

(a) The evaluation of user casualties (e.g., the number, type, and severity of injury), the evaluation of the effectiveness of personnel protective equipment in accordance with DOT&E-established test operations procedures, and the potential operational impact of such casualties on the ability of the unit to accomplish its mission after the attack.

(b) The evaluation of crash and egress scenarios, even in cases where the platform cannot survive.

(5) Coordinated kinetic and non-kinetic threat attack effects, as applicable.

d. To scope full spectrum survivability T&E, the T&E WIPT/ITT will plan and execute MBRA to evaluate mission critical functions and the potential kinetic and non-kinetic threat effects that could affect those mission critical functions.

(1) MBRA will be conducted in the context of the missions (i.e., unit equipped with the system) and operationally relevant conditions to identify mission critical sub-components, components, sub-systems, systems, and interfaces that may be affected by the potential kinetic and non-kinetic threat effects.

(2) MBRA will be updated in support of acquisition decisions to incorporate any changes in design, environment, and threats.

e. Full spectrum lethality T&E includes T&E of kinetic and non-kinetic DoD offensive weapon systems, capabilities, and tools (referred to in this issuance as “offensive capabilities”) on operationally relevant and representative functional, physical, or information targets

configured for real world DoD operations. Full spectrum lethality T&E will include the evaluation of the adversary kill chain, including:

- (1) The characterization of the lethal mechanism or effect to deny, disrupt, degrade, or destroy kinetic and non-kinetic targets of interest.

- (2) Firing of production- or fielding-representative offensive capabilities against the kinetic or non-kinetic target that is operationally representative of the class of systems the weapon is designed to deny, disrupt, degrade, or destroy.

- (3) The evaluation of adversaries' susceptibility on DoD offensive capabilities' lethal effects.

- (4) Collection of live data and M&S results critical to support an evaluation of operational effectiveness, including an evaluation of:

- (a) The number of required weapons needed to achieve the desired lethal effect on the kinetic and non-kinetic target of interest.

- (b) Collateral damage effects, as appropriate.

f. Full spectrum survivability and lethality T&E are not mutually exclusive and, in the case of many DoD systems, the ultimate lethality is highly dependent on actions the DoD system must execute to survive. Offensive capabilities will require full spectrum survivability testing if an active defense is an expected enemy tactic.

g. Full spectrum survivability and lethality T&E must include FUSL testing. If FUSL is deemed unreasonably expensive and impractical, Section 4172 of Title 10, U.S.C. contains provisions for a waiver from FUSL testing and a requirement for an alternative strategy to support the full spectrum survivability or lethality evaluation that must use a combination of:

- (1) Sub-component-, component-, sub-system-, and system-level testing.

- (2) Verified, validated, and accredited M&S tools.

- (3) Combat data where appropriate.

h. If pursuing the FUSL waiver:

- (1) The program manager will:

- (a) Estimate the cost for both FUSL testing and the alternative full spectrum survivability or lethality T&E within the TEMP/T&E strategy to justify the need for a waiver.

- (b) Describe why FUSL is impractical.

- (2) The DoD Component acquisition executive will request, in writing via the DOT&E, the Secretary of Defense waive the FUSL testing requirement based on the input from the program manager. The TEMP/T&E strategy will accompany the waiver request.

(3) The DOT&E will:

(a) Review the cost estimates and the proposed TEMP/T&E strategy to certify if the alternative strategy is adequate to evaluate the full spectrum survivability and lethality of the system without conducting FUSL testing.

(b) Communicate the certification of the TEMP/T&E strategy to the Secretary of Defense and the MDA.

(4) The Secretary of Defense will submit a determination and certification, along with the corresponding TEMP/T&E strategy, to the chairs and ranking members of the congressional defense committees, informing them of the waiver decision.

i. DoD Components will plan, execute, and report on full spectrum survivability and lethality T&E in accordance with DoDM 5000.99 and the approved TEMP/T&E strategy.

3.5. CERTIFICATIONS.

Testing in support of certifications (e.g., safety, air worthiness, interoperability, or nuclear) must be planned in conjunction with all other testing.

a. The program manager is responsible for determining what certifications are required and when the certifications are required. The program manager will involve representatives of applicable certifying authorities in the T&E WIPT/ITT to ensure certification requirements are satisfied.

b. The program manager will provide certification data relevant to OT&E and LFT&E objectives to the MDA, DOT&E, OTA, and LFT&E organizations, as requested.

c. In accordance with DoDI 8330.01, TEMPs/T&E strategies must include interoperability and supportability requirements and serve as the basis for interoperability assessments and certifications.

(1) Programs that exchange data with an organization or site external to their DoD Component require a joint interoperability certification from the Joint Interoperability Test Command and will incorporate interoperability into OT&E and LFT&E, including M&S, as applicable. The DoD Interoperability Process Guide provides the procedures required to support joint interoperability test, evaluation, and certification.

(2) Interoperability must be evaluated early and with sufficient frequency throughout a system's life cycle to capture and assess changes affecting interoperability on a platform and in a joint, multinational, and interagency environment in operationally representative and relevant environments. Interoperability certification should be integrated into the software development pipeline, automated to the maximum extent practicable, and performed during development and operation. Fielded systems may be instrumented to monitor interoperability characteristics as needed to see that those characteristics continue to be met while in operation.

(3) Interoperability certification must be granted before fielding a new capability or fielding an upgrade to an existing capability.

(4) For DoD systems without joint interoperability requirements, the DoD Components will coordinate with their designated interoperability certification authorities to ensure OT&E and LFT&E are planned and executed to evaluate and confirm intra-service and intra-agency interoperability in operationally relevant and representative environments.

3.6. M&S.

a. M&S includes any physical, mathematical, or otherwise logical and digital representation of a system, entity, environment, phenomenon, or process used to deliver or support the delivery of results-for-record in lieu of required live data critical to meeting OT&E and LFT&E objectives. Examples include, but are not limited to:

- (1) Physics-based models.
- (2) Effects-based models.
- (3) Hardware-, software-, or human-in-the-loop simulations.
- (4) System integration labs.
- (5) Threat or target systems and environment models.
- (6) Live, virtual, constructive environments.
- (7) Digital engineering models.
- (8) Digital twins.
- (9) Any combination of these examples.

b. Models and simulations require a scientifically rigorous verification, validation, and accreditation (VV&A) that includes uncertainty quantification of M&S results using statistical methods.

(1) M&S VV&A will leverage science- and technology-based practices that depend on data-backed analysis including both statistical and systematic uncertainties and will be conducted in accordance with DoDM 5000.102.

(2) M&S will integrate with OT&E and LFT&E across the acquisition life cycle, including integrated T&E, as appropriate, in a series of model-test-validate and fix activities to feed applicable integrated test, OT, and LFT data back into the M&S to support the M&S VV&A and improvements.

(3) When used to support OT&E and LFT&E, M&S will not be accredited until a V&V has been completed. The accreditation authority will scope the accreditation plan for the intended evaluation in the intended domain or region of the operational envelope.

c. The M&S and the related VV&A strategy or master plan, including the required resources, will be outlined in the TEMP/T&E strategy.

d. See Military Standard MIL-STD-3022 for templates for the accreditation plan, V&V plan, V&V report, and accreditation report.

3.7. PROGRAM MANAGEMENT.

a. Program Manager.

The program manager will:

(1) Charter a T&E WIPT/ITT and its sub-groups at the initiation of the acquisition program and confirm that T&E equities are appropriately represented. The charter will clarify leadership roles and responsibilities within the T&E WIPT/ITT, identify the required sub-groups and their leads, and identify organizations responsible for LFT&E.

(2) Coordinate and ensure availability of other program managers and stakeholders whose systems are intended to interoperate with the system under test. Confirm interoperability and other critical information for all interfacing DoD systems outside the program system boundary are available for the program's T&E events.

(3) Include the T&E WIPT/ITT and its sub-groups in the development of the TEMP/T&E strategy, acquisition strategy, system requirements, requests for proposals, acquisition contracts, and related products.

(4) Direct the development and execution of the IDSK and the MBRA and resource the identified T&E, including any VV&A.

(5) Confirm the budget and schedule across the acquisition life cycle to allow for T&E activities that can:

(a) Accurately determine and compare operational effectiveness, suitability, survivability, and lethality, as applicable, with relevant technical and operational requirements.

(b) Determine preliminary and final operational effectiveness, suitability, survivability, and lethality, as applicable, in an operationally representative and relevant environment.

(c) Allow for correction of deficiencies and vulnerabilities identified in testing before proceeding to the next phase of testing.

(d) Ensure resources are available 30 calendar days before a formal T&E event begins.

(6) Integrate program intelligence requirements, priorities, and associated resources into the TEMP/T&E strategy and focus on the emerging or future projected threats or targets in accordance with DoDI 5000.86.

(7) Ensure early development and accreditation of threat and target surrogates to support adequate T&E.

(8) Leverage mission engineering, digital engineering, digital twins, smart documentation, and other available digital tools and technologies to increase T&E efficiency. Effectively communicate program changes and risks to cost, schedule, and DoD system's operational performance to the T&E WIPT/ITT as close to real time as possible.

(9) Develop a data management plan and establish and maintain a data repository with live test data, M&S results, and related metadata to enable maximum sharing, reciprocity, availability, and reuse of program artifacts (including T&E data) across the life cycle of the program, in accordance with:

(a) Part 117 of Title 32, Code of Federal Regulations.

(b) DoDIs 5230.09, 8500.01, and 8582.01.

(c) Volume 3 of DoDM 5200.01.

(10) Appoint a trusted agent who will, in coordination with test organizations, support the identification of test datasets required for independent DT&E, OT&E and LFT&E of AI-enabled and autonomous DoD systems.

(11) Maintain the interface management documentation (e.g., external interface control documents) and provide digital engineering and models, along with any associated documentation, to the test organizations.

(12) Ensure the T&E are planned and executed in accordance with approved TEMPs/T&E strategies and test plans and confirm that the system is ready for OT&E and LFT&E.

(13) Create a system deficiency and vulnerability report tracker as well as an M&S limitations and deficiencies tracker and conduct regularly scheduled deficiency review boards.

(14) In coordination with the OTA and LFT&E organizations, develop a process, metrics, and trigger criteria (e.g., passage of time or substantial alterations in the operational environment to include an operational mission change) to evaluate drift or degradation and other updates to operational effectiveness, suitability, and full spectrum survivability and lethality evaluation throughout operations and sustainment. Establishing clear and quantifiable triggering criteria will allow for more efficient and effective management of resources while ensuring

adequate understanding of the operational performance and limitations during operations and sustainment.

(15) Integrate OTA and LFT&E people, processes, and tools within the system development cadence across the acquisition life cycle to ensure identified OT&E and LFT&E requirements are considered in CT&E and DT&E activities.

(16) Coordinate the M&S V&V plans with the OTA and LFT&E organizations and deliver the final M&S V&V plans to the OTA and LFT&E organizations with sufficient time to influence M&S validation and accreditation decisions.

b. T&E WIPT/ITT.

T&E WIPT/ITTs will:

(1) Provide a forum for collaboration across key T&E organizations and confirm OT&E and LFT&E equities are appropriately represented in the TEMP/T&E strategy, test plans, and M&S events.

(2) Include:

- (a) OTA representative.
- (b) LFT&E organization representative.
- (c) System users and product support representatives.
- (d) Intelligence Community representative.
- (e) Requirements community representative.
- (f) Applicable certification authorities.
- (g) System safety officers.
- (h) Chief information officers.
- (i) Experts in cyber, M&S, EMS including directed energy, CBRN, interoperability, autonomy, AI, statistics, data analytics, and other fields, as appropriate.
- (j) DOT&E representative for programs on the T&E Oversight List for OT&E and LFT&E.
- (k) The chief developmental tester.
- (l) A DT organization representative.
- (m) USD(R&E) representative for programs on the T&E Oversight List for DT&E.

- (n) Human systems integration and behavioral analysts.
- (3) Include a set of sub-groups including but not limited to a(n):
 - (a) M&S working group.
 - (b) Full spectrum survivability and lethality working group, referred to in this issuance as the “LFT&E working group,” comprised of a cyber working group, an EMS (including directed energy) working group, a kinetic threat working group, a CBRN working group, and other threat working groups, as applicable.
 - (c) A joint reliability and maintainability evaluation working group.
 - (d) Other specialized working groups as appropriate.
- (4) Define T&E requirements to inform requests for proposals and acquisition contracts and access to required contractor-generated data, tools, support, test articles, and expertise.
- (5) Plan and execute the MBRA across the acquisition life cycle to inform the full spectrum survivability T&E scope.
- (6) Before developing the TEMP/T&E strategy, participate in the development of system requirements to confirm that the requirements are measurable, testable, justifiable, achievable, and relevant to the operational mission.
- (7) Advise program managers on T&E needs for AI-enabled DoD systems, to include algorithm, data, and model artifacts and access, as well as strategies for monitoring and testing AI components over the system life cycle.
- (8) Develop the TEMP/T&E strategy pursuant to DoDM 5000.100, including a plan for regression testing.
- (9) Develop and implement formal T&E data collection and scoring processes to increase the quantity and quality of OT&E and LFT&E feedback.

c. OTA.

The OTA:

- (1) Is a U.S. Government organization responsible for planning and executing OT&E to supply the data required for an independent evaluation and reporting of a system’s preliminary and final operational effectiveness and suitability. OTAs take into equal consideration survivability and lethality effects, as applicable.
- (2) Will work with the LFT&E organizations and related test teams to coordinate the collection of live data and M&S results needed to support full spectrum survivability and lethality evaluations.

(3) Is the accreditation authority for M&S tools used to support the evaluation of operational effectiveness and suitability while taking into equal consideration survivability and lethality effects, as applicable. OTAs will independently verify, validate, and accredit any automated test capabilities that will provide data supporting operational evaluations.

d. LFT&E Organizations.

LFT&E organizations will comprise the LFT&E working group responsible for:

- (1) Full spectrum survivability and lethality T&E.
- (2) Conducting LFT&E activities to support independent full spectrum survivability and lethality evaluations while informing operational effectiveness and suitability.
- (3) Accrediting M&S and supporting relevant V&V activities in support of full spectrum survivability and lethality T&E objectives. LFT&E organizations will independently verify, validate, and accredit any automated test capabilities that will provide data supporting operational evaluations.
- (4) Providing oversight of relevant contractor LFT&E planning and results.
- (5) Reporting full spectrum survivability and lethality live data, M&S results, analysis, and reports for integration into final determination of operational effectiveness, suitability, survivability, and lethality, as applicable.

3.8. DATA MANAGEMENT.

In conjunction with the test organizations, the program manager will implement DoD policy related to data management, including but not limited to the DoD Data, Analytics, and Artificial Intelligence Adoption Strategy and the five DoD Data Decrees established in the May 5, 2021, Deputy Secretary of Defense Memorandum and in accordance with DoDI 5015.02.

a. Program managers will prepare a data management plan and common T&E data and program artifact repository will make T&E data (including digital engineering models and related data) visible, accessible, understandable, linked, trusted, interoperable, and secure. A data management plan will:

- (1) Include descriptions of test environments and conditions to ensure commonality and usability by test, certification, and other applicable stakeholder organizations. All steps used to process data will be recorded to assure consistency of data processing.
- (2) Address data protection law and policy to include data sharing. Data protection schema will focus on environmental hardening, authorization, authentication, and access control. If informing data consumers regarding the provenance and processing of specific datasets, the data management plan may also include identification of:
 - (a) Third-party library and components.

- (b) Cloud services.
- (c) Software.
- (d) Hardware.
- (e) Firmware.
- (f) Development environment.
- (g) Development, security, and operations practices.
- (h) Developmental testing.

b. Datasets (including classified and proprietary) and process flow (e.g., procedures to extract, transform, store, and analyze data) will be promptly accessible to cleared and need-to-know stakeholders as data are made available by program managers.

c. Information will be accessible over networks in open and interoperable formats. The publication mechanisms include, but are not limited to, commonly available databases and application programming interfaces. Publication mechanisms will incorporate authentication, authorization, and access control, including need-to-know.

d. Datasets will include, but are not limited to, program records and T&E records. Data may be preliminary and will be identified as such, when practical. Proprietary formats will be avoided, when possible, in favor of commonly available and interoperable formats. If proprietary formats are required by the program to access the dataset, this will be explicitly stated and agreed upon in the program's TEMP/T&E strategy.

e. Data pedigree will be transparent.

(1) All relevant metadata (e.g., brief description of the data, the conditions and context in which it was collected, and deviations from agreed upon test plans) will be captured. A data dictionary with plain-English descriptions of each data field will be provided. Unique identifiers will be used for all entities captured in the data (e.g., platform or individuals).

(2) Data that has passed a data authentication group will be clearly marked, segregated from other data that has not been marked, and left unchanged.

(3) The metadata of a dataset will include an identified point of contact who is responsible for providing information about the data and for maintaining the dataset.

f. All data and records produced from T&E will be managed in accordance with approved records schedules.

3.9. DOT&E OVERSIGHT.

The DOT&E manages and publishes the unclassified joint T&E Oversight List. Programs may be placed on the list for either DT, based on the nature of the program or upon determination by USD(R&E), or for OT&E or LFT&E, based on the nature of the program or upon determination by the DOT&E, or for both DT and OT&E and LFT&E. Classified and sensitive programs placed on the T&E Oversight List for OT&E and LFT&E will be identified by the DOT&E directly to their MDAs. Service acquisition executives, Service T&E executives, and OTAs will provide the program's acquisition strategy and T&E concepts, if available, to the DOT&E to inform the oversight decision. The DOT&E will formally notify the DoD Components before adding a program to the T&E Oversight List.

a. Programs on the T&E Oversight List for OT&E and LFT&E include those programs that meet the statutory definition of major defense acquisition programs (MDAPs) in Section 4201 of Title 10, U.S.C., and those that are designated by the DOT&E for oversight pursuant to Paragraph (a)(2)(B) of Section 139 of Title 10, U.S.C., using these criteria:

(1) Program exceeds or has the potential to exceed the dollar value threshold for a major program, including, but not limited to, a major defense acquisition program.

(2) Program has a high level of congressional or DoD interest, including critical MTA programs pursuant to Section 804 of Public Law 114-92, and similar prototyping and fielding activities.

(3) DoD system provides or enables a critical mission warfighting capability or is a militarily significant change to an existing system.

b. The DOT&E will review and approve the TEMPs/T&E strategies and OT&E and LFT&E plans for programs on the joint T&E Oversight List for OT&E and LFT&E.

(1) Program office, OTA, and LFT&E organizations, as appropriate, will coordinate draft TEMPs/T&E strategies and OT&E and LFT&E plans with DOT&E staff early and often and will submit the final product for DOT&E review and approval no later than 30 calendar days before the decision point that the product is informing or the start of the test or M&S event. The timeline for the delivery of these products may be tailored with mutual consent among the DOT&E staff, OTA, LFT&E organizations, and program office.

(2) OT&E or LFT&E will not be conducted until the DOT&E has approved the adequacy of the test plan and TEMP/T&E strategy to which it is related and the required resources for conducting the OT&E or LFT&E.

c. The program office, OTA, and LFT&E organizations will coordinate draft M&S V&V plans and accreditation plans with DOT&E staff early and often and will submit the final products to the DOT&E for review within the timeframe specified in the TEMP to influence M&S validation and accreditation decisions.

d. DOT&E staff will review and provide a decision on concurrence on T&E concepts for OT&E and LFT&E. OTAs and LFT&E organizations will deliver the T&E concepts to DOT&E staff early enough to support the planning and execution of integrated T&E, OT&E, and LFT&E.

e. For programs on the joint T&E Oversight List for OT&E and LFT&E, the DOT&E will submit an independent report to the Office of the SecDef, the MDA, the Joint Staff, the congressional defense committees, the Military Services, and other key stakeholders in support of acquisition decisions.

SECTION 4: OT&E AND LFT&E PROCESS

4.1. TEST PLANNING.

OT&E and LFT&E planning will start with the acquisition program initiation, in parallel with the development of the acquisition strategy, to develop the initial TEMP/T&E strategy and inform the development of program requirements and contract.

a. OT&E and LFT&E planning will apply the latest advances in science and technology, including, but not limited to, human-centered design principles, in accordance with DoDI 5000.95, to accurately:

(1) Define user's needs.

(2) Characterize the multi-domain operational environment.

(3) Develop a science- and technology-based TEMP/T&E strategy and supporting test and M&S plans that enable the evaluation of the operational effectiveness, suitability, survivability, and lethality, as applicable, of the DoD system with scientific rigor.

b. OT&E and LFT&E planning will continue across the acquisition life cycle. Bayesian and similar statistical inference methods dynamically update OT&E and LFT&E planning products in support of key acquisition decisions and maximize available CT, DT, OT, and LFT data, and M&S results.

(1) TEMP/T&E Strategy.

The TEMP/T&E strategy:

(a) Supports the acquisition strategy and key decisions in developing, producing, and delivering capabilities to the user(s).

(b) Codifies the agreement between the program manager and the T&E WIPT/ITT on T&E focus, scope, and required resources. In sufficient detail to enable the determination of preliminary and final operational effectiveness, suitability, survivability, and lethality, as applicable, of DoD systems in support of acquisition decisions, it includes descriptions of:

1. T&E objectives.

2. The IDSK.

3. T&E methods.

4. Deliverables.

5. Responsible organizations.

6. Timelines.

7. Limitations.

8. Cost.

9. Resources.

(c) Is tailored using the risk-based level of test assessments, MBRA, and program-related products, including, but not limited to, the acquisition strategy.

(d) Is developed in accordance with DoDM 5000.100.

(2) Test and M&S Plans.

(a) In coordination with the T&E WIPT/ITT, the OTA and LFT&E organizations develop test plans for each OT&E and LFT&E event, relevant M&S events, and their accreditation plans in accordance with the approved TEMP/T&E strategy.

(b) Test and M&S plans will be developed using applied mathematics, statistics, inference methods, or related science-based test and analysis methods. The test and M&S plans, as applicable, will include operationally relevant conditions, information about the order of test event execution and test data collection, cost estimates, and relevant operating instructions that may impact test outcomes. At a minimum, test and M&S plans will detail:

1. The purpose of the test or M&S in relation to overall TEMP/T&E strategy and program life cycle.

2. Test schedule, location, and resources (e.g., personnel, targets, and threat).

3. Test data and M&S result requirements, to include the rationale and how the test team will collect and distribute data.

4. Test or M&S limitations and their projected effect on evaluation objectives.

(c) Test plans must consider the potential effects on personnel and the environment, in accordance with Section 4321 of Title 42, U.S.C. et seq. (also known and referred to as the “National Environmental Policy Act”) and Executive Order 12114. In coordination with the user(s) and the T&E WIPT/ITT, the program manager will provide relevant safety and human system integration products (e.g., system safety and occupational health risk acceptance) to the operational and live fire testers before any test that may affect safety of personnel or the environment.

4.2. TEST PREPARATION.

The OT&E and FUSL LFT&E test readiness review process will include:

- a. A review of CT&E, DT&E, and integrated T&E results and their qualification for OT&E and LFT&E purposes.
- b. An assessment of the system's progress against operational effectiveness, suitability, survivability, and lethality, as applicable.
- c. An analysis of identified technical risks to verify that they have been retired or reduced to the extent possible and to identify those that are still unaddressed and may influence OT&E and LFT&E.
- d. A review of system and safety certifications.
- e. A review of the OT&E and LFT&E entrance criteria specified in the TEMP/T&E strategy.
- f. A review of test objectives, schedules, test methods and procedures, scope, contingency plans, interoperability, safety hazards, configuration management, funding, and other relevant items.

4.3. TEST EXECUTION.

a. OTAs and LFT&E organizations will execute tests in accordance with approved test, M&S, and M&S V&V plans. All requirements of an approved test or M&S plan must be satisfied by the end of an OT&E, LFT&E, or M&S event. If an approved plan cannot be fully executed, the DOT&E must agree to any changes to OT&E, LFT&E, and M&S events before revised testing or M&S events are executed.

(1) The M&S will be accredited for the intended use before M&S results for record can be used in support of meeting OT&E and LFT&E objectives unless the DOT&E waives the requirement.

(2) Once testing or M&S has begun:

(a) Deviations from approved elements, to include any revisions or additions, will not be made without consultation with the OTA commander (for OT&E plans) or appropriate LFT&E organization (for LFT&E plans). The DOT&E must concur with revisions or additions for DoD systems on the joint T&E Oversight List for OT&E and/or LFT&E.

(b) The test lead will record and sign the revisions.

(c) If DOT&E on-site representatives cannot be reached before the changed event is scheduled to occur, the test lead may proceed with the revised test event but must inform the DOT&E of any deviations as soon as possible.

(3) If required data are lost, corrupted, or not gathered, then the test is not complete unless the DOT&E waives the requirement to which the data pertains.

b. In conjunction with the T&E WIPT/ITT and the program manager, the OTA and LFT&E organizations will:

(1) Confirm data collection tools are valid; operators and maintainers are trained; M&S and live, virtual, constructive hardware and software tools are properly integrated; and the system under test is configured as required to execute the test events and collect required data.

(2) Develop, validate, rehearse, and execute tests in an organized fashion to facilitate and ensure the collection and storage of required data in a format suitable for statistical analysis and evaluation.

(3) Control the test schedule to ensure timely execution of critical tasks, assigned resources, and project milestones to optimize collection of data in support of evaluation objectives.

(4) Confirm validity of collected test data to meet test objectives in support of planned analysis and evaluation.

(5) Verify all required and expected raw test data and the completeness of the collected data to support a system evaluation.

(6) Distribute data in accordance with the data management plan for analysis of test results in support of the evaluation.

4.4. ANALYSIS AND EVALUATION.

a. The OTA and LFT&E organizations will use:

(1) Digital tools, applied mathematics, statistics, inference methods, and other science-based analytical methods to analyze CT, DT, integrated test, OT, and LFT data and M&S results in as near real-time as possible, to the maximum extent possible.

(2) All relevant test data and M&S results to inform the evaluation of operational effectiveness, suitability, survivability, and lethality, as applicable, and characterize any risks to OT&E and LFT&E objectives, acquisition decisions, warfighters, mission engineering outcomes, and DoD operations. The evaluation will inform updates to the TEMP/T&E strategy as the DoD system matures across the acquisition life cycle.

b. The OTA and DOT&E staff will each conduct an independent analysis of the available test data and M&S results. The OTA and LFT&E organizations will:

(1) Determine the operational effectiveness, suitability, survivability, and lethality, as applicable, and evaluate any risk to the warfighter and DoD operations in support of full-rate

production, minimal capability fielding, or early fielding or deployment decisions using appropriate statistical analysis and evaluation techniques.

(2) Determine the preliminary operational effectiveness, suitability, survivability, and lethality, as applicable; evaluate any risk to the next phase of OT&E and LFT&E; and evaluate any risk to meeting operational effectiveness, suitability, survivability, and lethality requirements, as applicable, in support of interim acquisition decisions using appropriate statistical analysis and evaluation techniques.

(3) Confirm that the collected test data support the stated OT&E and LFT&E objectives and the established metrics.

(4) Confirm that M&S events met the objectives of the test plan and ensure adequacy of the M&S VV&A before the start of M&S runs for record.

(5) Evaluate interoperability as a system-of-systems designed to achieve the required capability.

(6) Evaluate, record, apply, and adapt lessons learned about the conduct of data collection, analysis, and evaluation processes to ensure improvement of methods and processes.

(7) Assess system safety hazards for both hardware and software.

4.5. TEST REPORTING.

a. OTAs and LFT&E organizations will store the data and M&S results throughout the OT&E and LFT&E planning, preparation, execution, analysis, and evaluation phases, in accordance with the data management plan, to support the delivery of OT&E and LFT&E reports in either paper or digital formats. They will generate the required reports for each of the events outlined in the TEMP/T&E strategy to support acquisition or program decisions.

(1) OTAs and LFT&E organizations may combine multiple T&E events in one report.

(2) Reports will capture test conditions, data collection methodology, test limitations, data, M&S results, evaluation, and actionable recommendations to support the acquisition decision and user needs.

(3) As applicable, a test report will also offer a list of lessons learned and areas for further investigation during a subsequent event.

b. OTAs and LFT&E organizations will deliver the report to the Military Service Chief, program manager, and the DOT&E for programs on the joint T&E Oversight List for OT&E and LFT&E as soon as practical after test completion, but in time to support the relevant program decision or the next phase of test.

c. For DoD systems on the joint T&E Oversight List for OT&E and LFT&E, the DOT&E will conduct an independent analysis of available test data and M&S results to deliver a report:

(1) In support of interim acquisition decisions. Such reports will summarize the evaluation of test adequacy and preliminary evaluation of operational effectiveness, suitability, survivability, and lethality, as applicable, including an evaluation of any risk to the next phase of OT&E and LFT&E, the acquisition program, warfighter, mission engineering outcomes, and DoD operations. The report will conclude with feasible recommendations that, if implemented, could improve the operational effectiveness, suitability, survivability, or lethality, as applicable, of the system.

(2) In support of production or fielding deployment decisions. Such reports will summarize the evaluation of test adequacy and evaluation of operational effectiveness, suitability, survivability, and lethality, as applicable. The report will conclude with feasible recommendations that, if implemented, could improve the operational effectiveness, suitability, survivability, or lethality, as applicable, of the system. An MDAP may not proceed beyond low-rate initial production until the DOT&E has submitted the IOT&E report to the SecDef and the congressional defense committees.

d. Reporting must take into consideration all applicable classification guidance when classifying and handling test data and reports.

e. The program manager, OTAs, LFT&E organizations, and DOT&E staff should provide the Defense Technical Information Center with all reports and the supporting data and M&S results.

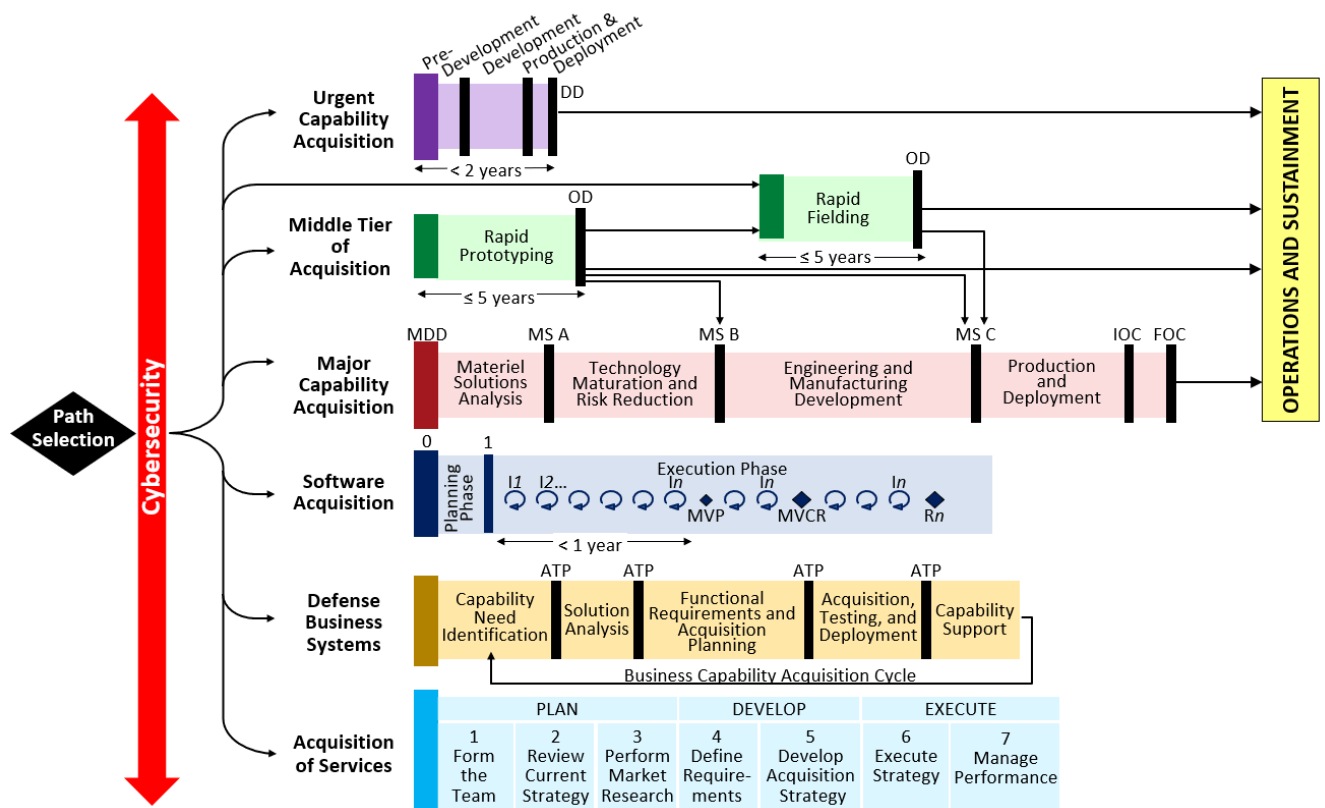
f. The program manager, OTAs, LFT&E organizations, and DOT&E staff will coordinate OT&E and LFT&E reports and data with the Office of the DoD CIO to inform the cybersecurity strategy.

SECTION 5: OT&E AND LFT&E FOR ADAPTIVE ACQUISITION FRAMEWORK PATHWAYS

5.1. GENERAL PROCEDURES.

Pursuant to DoDD 5000.01 and DoDI 5000.02, the program manager will develop an acquisition strategy for MDA approval that aligns with the specific policies and procedures highlighted in the DoDIs for each of the six acquisition pathways depicted in Figure 2. This section details the unique OT&E and LFT&E requirements for each of the six acquisition pathways.

Figure 2. Adaptive Acquisition Framework.



ATP: Authority to Proceed; DD: Disposition Decision; FOC: Full Operational Capability; I: Iteration; IOC: Initial Operational Capability; MDD: Materiel Development Decision; MS: Milestone; MVP: Minimum Viable Product; MVCR: Minimum Viable Capability Release; OD: Outcome Determination; R: Release

5.2. OT&E AND LFT&E FOR THE URGENT CAPABILITY ACQUISITION PATHWAY.

a. DoDI 5000.81 establishes policy for acquisition programs that provide capabilities to fulfill urgent operational needs and other quick-reaction capabilities that can be fielded in less than 2 years. To support the development milestone decision, the program manager will:

(1) Charter a T&E WIPT/ITT in the pre-development phase to inform the tailored acquisition strategy and acquisition program requirements.

(2) Develop the T&E strategy in accordance with DoDM 5000.100 and any required integrated T&E, LFT&E, and OT&E plans.

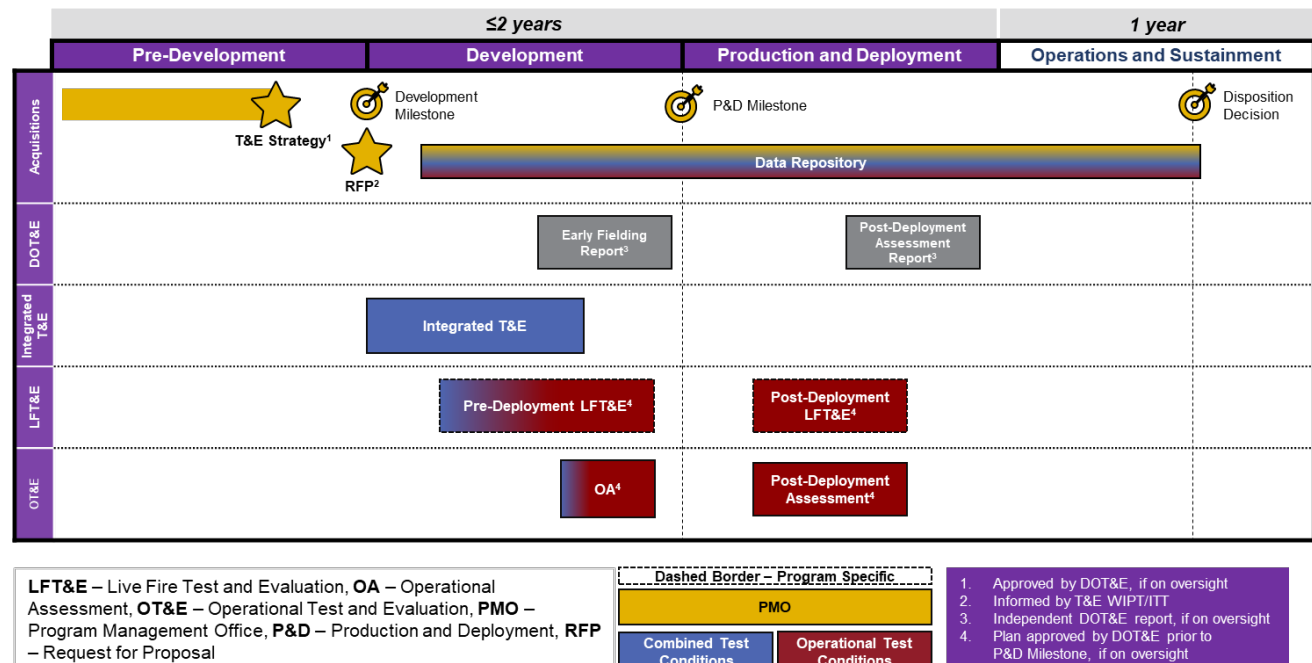
b. The T&E strategy will focus on the operational effectiveness, suitability, survivability, and lethality, as applicable, required to inform the production and deployment milestone decisions. The T&E strategy may be included as part of the acquisition strategy and will include:

(1) The scope for the OT&E and LFT&E of fielded capabilities, including a schedule and test plan for a post-deployment assessment and any remaining LFT&E to inform the disposition decision.

(2) User feedback to support design and operational use improvements and the program manager's plans to correct identified deficiencies.

c. The OTA and LFT&E organizations will coordinate planning, execution, and reporting on the respective T&E events shown in Figure 3 to support the production and deployment and the disposition decision.

Figure 3. OT&E and LFT&E Aligned with the Urgent Capability Acquisition Pathway Decisions.



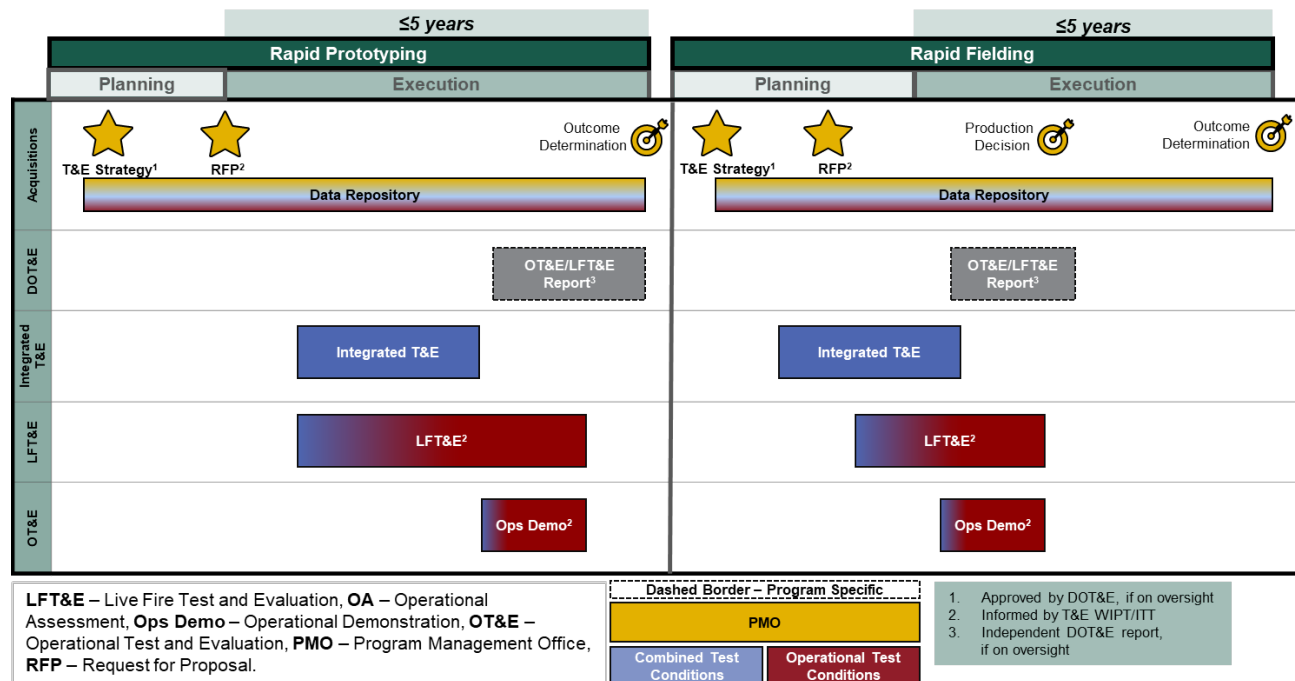
5.3. OT&E AND LFT&E FOR THE MTA PATHWAY.

a. DoDI 5000.80 establishes policy for the management of the MTA for rapid prototyping and rapid fielding, pursuant to Section 804 of Public Law 114-92. The intent for acquisition programs using the pathway is to accelerate capability maturation before transitioning to another acquisition pathway or to minimally develop a capability before transitioning to operations and sustainment. To support the transition plan and outcome determination, the program manager will charter a T&E WIPT/ITT in the planning phase to inform the acquisition strategy and acquisition program requirements and to develop the T&E strategy in accordance with DoDM 5000.100.

b. 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. To meet the condensed MTA pathway timelines, the T&E strategy and relevant test plans will be treated as entrance criteria to formally enter the MTA pathway and will be approved by the DOT&E by the end of the planning phase for DoD systems on the joint T&E Oversight List for OT&E and LFT&E. The T&E strategy may be included as part of the acquisition strategy and will consider the T&E requirements to support the transition plan.

c. The OTA and LFT&E organizations will coordinate the planning, execution, and reporting on the respective T&E events shown in Figure 4 in support of the outcome determination including the initial production decision, if applicable.

Figure 4. OT&E and LFT&E Aligned with MTA Pathway Decisions.



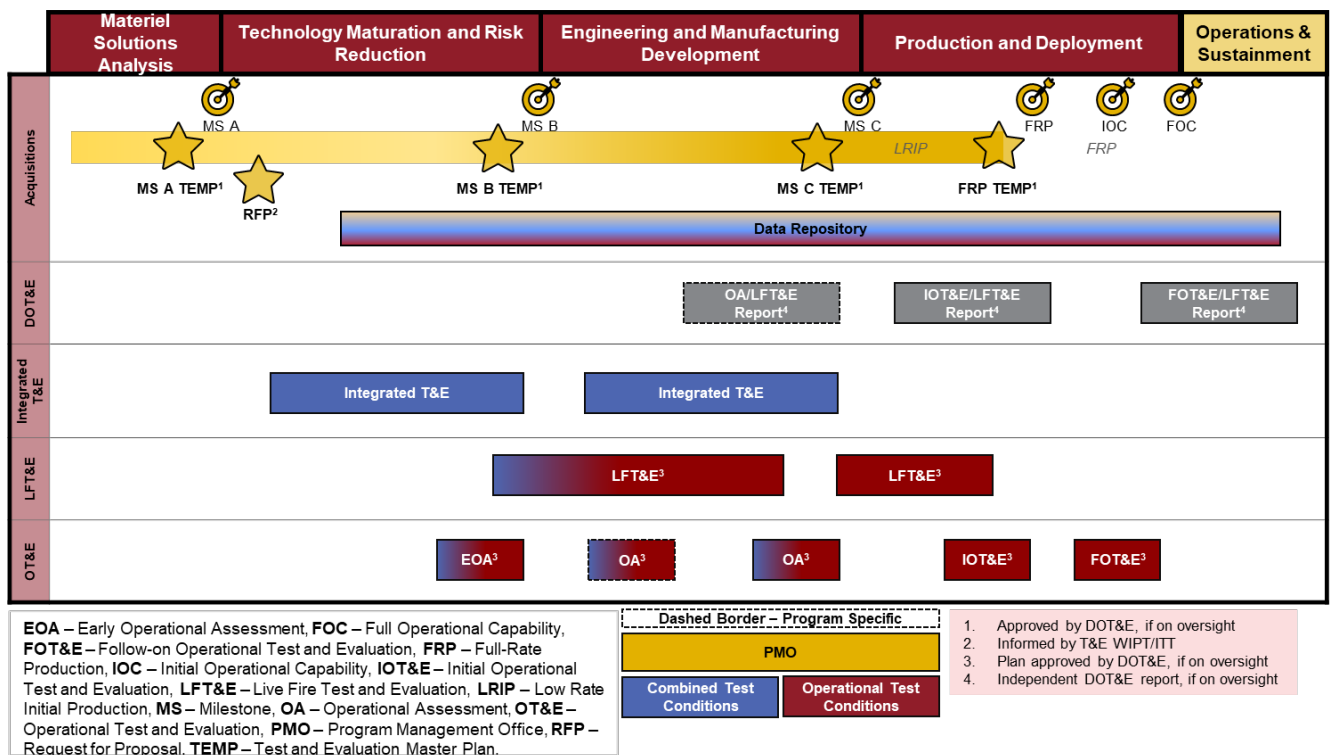
5.4. OT&E AND LFT&E FOR THE MCA PATHWAY.

a. DoDI 5000.85 establishes policy that guides the acquisition of MCA pathway programs, including MDAPs; other programs categorized as ACAT I; major DoD systems, usually categorized as ACAT II; automated information DoD systems (not managed by other acquisition pathways); and other capabilities developed via the MCA pathway. To support the Milestone A and subsequent MCA acquisition decisions, the program manager will charter a T&E WIPT/ITT in the materiel solutions analysis phase to inform the acquisition strategy and acquisition program requirements and to develop a TEMP in accordance with DoDM 5000.100.

b. The TEMP will support the evaluation of operational effectiveness, suitability, survivability, and lethality, as applicable, required to inform each of the MCA acquisition decisions. The T&E WIPT/ITT will leverage all available test data and M&S results to update the TEMP in support of the next decision.

c. The OTA and LFT&E organizations will coordinate the planning, execution, and reporting on the respective T&E events shown in Figure 5 before proceeding to the next milestone decision.

Figure 5. OT&E and LFT&E Aligned with MCA Pathway Decisions.



5.5. OT&E AND LFT&E FOR THE SOFTWARE ACQUISITION PATHWAY.

a. DoDI 5000.87 establishes policy for the management of the software acquisition pathway used for timely acquisition of software capabilities developed for the DoD. Programs using the software acquisition pathway are required to deliver the first increment of the minimum viable product and effective capability no later than 1 year after funds are obligated, after which new capabilities must be delivered to operations at least annually to iteratively meet requirements, but more frequent updates and deliveries are encouraged where practical. To successfully transition to the execution phase, the program manager will charter a T&E WIPT/ITT in the planning phase to inform the capabilities needs statement, acquisition strategy, acquisition contracts, and intellectual property strategy, and to develop a T&E strategy in accordance with DoDMs 5000.96 and 5000.100.

b. The T&E strategy will focus on the operational effectiveness, suitability, survivability, and lethality performance, as applicable, of the capabilities and features in support of the delivery of the minimum viable product, minimum viable capability release (MVCR), and subsequent releases. The T&E WIPT/ITT will leverage all available data and M&S results, as well as any updates to the capability needs statement, to update the T&E strategy in support of the next decision.

c. The OTA and LFT&E organizations will coordinate the planning, execution, and reporting on the T&E products and events shown in Figure 6 in support of the delivery of the minimum viable product, MVCRs, and subsequent releases pursuant to DoDM 5000.96. The OT&E in support of MVCRs may take the form of an OA or IOT&E, depending on the mission criticality of the incremental capability decided by the OTAs and approved by the DOT&E for programs on the joint T&E Oversight List for OT&E and LFT&E. To embed OT&E within the development process, OTAs will participate, as resources allow, in the activity of the software pipeline or factory to include:

(1) Monitoring the tests that occur throughout the development pipeline to understand and trust the automated and manual test results. For each increment, even those not intended for deployment, the OTA will:

(a) Observe testing to determine the applicability of the data for OT&E, including the mapping of that data to the critical assessment areas.

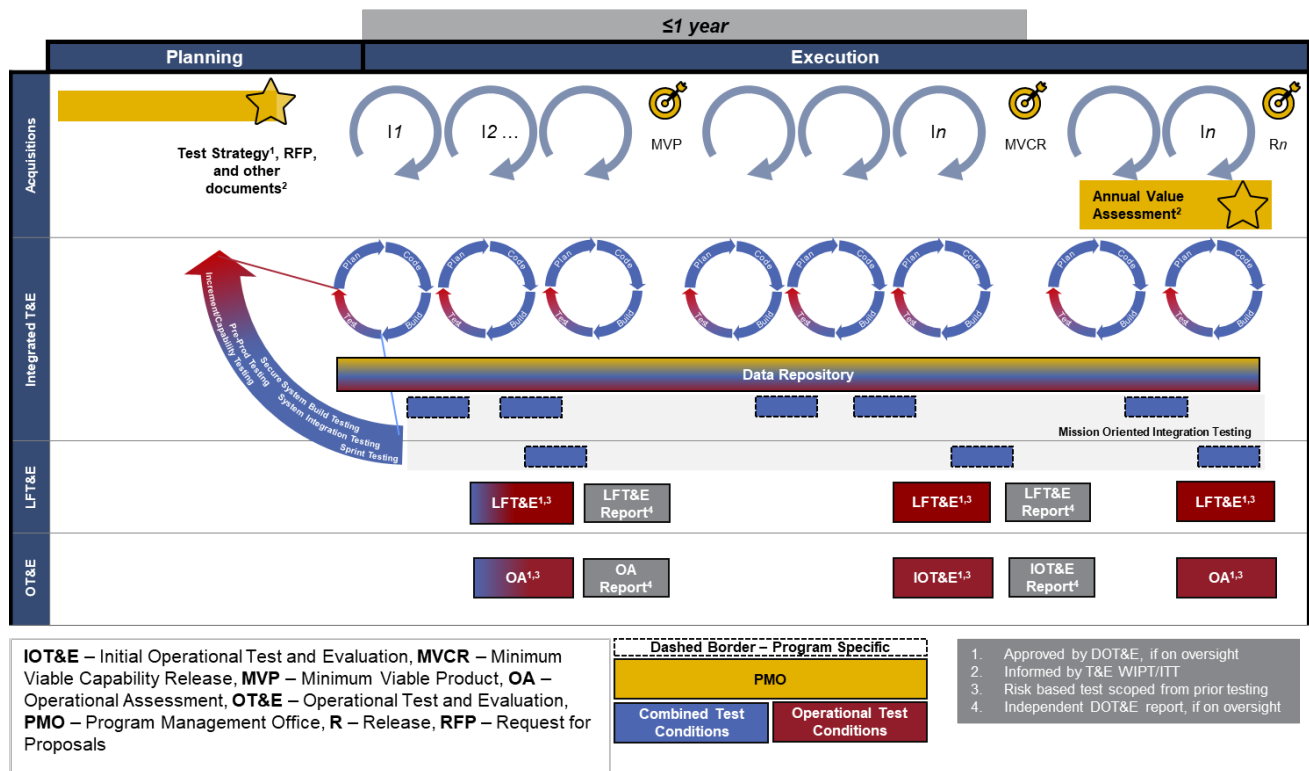
(b) Identify gaps in data that will inform test planning for future iterations.

(2) Confirming that the pedigree of test processes establishes the trust for integrating across different types of testing.

(3) Monitoring the deployment of new software to the production or live environment to inform the evaluation of capability deployment.

(4) Confirming that the presence and performance of deployment procedures provides for continuity of operations, especially for programs deploying software in short time frames, such as continuous delivery strategies.

Figure 6. OT&E and LFT&E Aligned with Software Acquisition Pathway Decisions.



5.6. OT&E AND LFT&E FOR THE DBS PATHWAY.

a. DoDI 5000.75 establishes policy for the use of the business capability acquisition pathway for DoD business systems requirements and acquisitions. To support the limited deployment ATP and the full deployment ATP decisions, the program manager will establish a T&E WIPT/ITT during the capability need identification phase to inform the capability and information requirements and acquisition strategy and to develop a TEMP/T&E strategy in accordance with DoDM 5000.100.

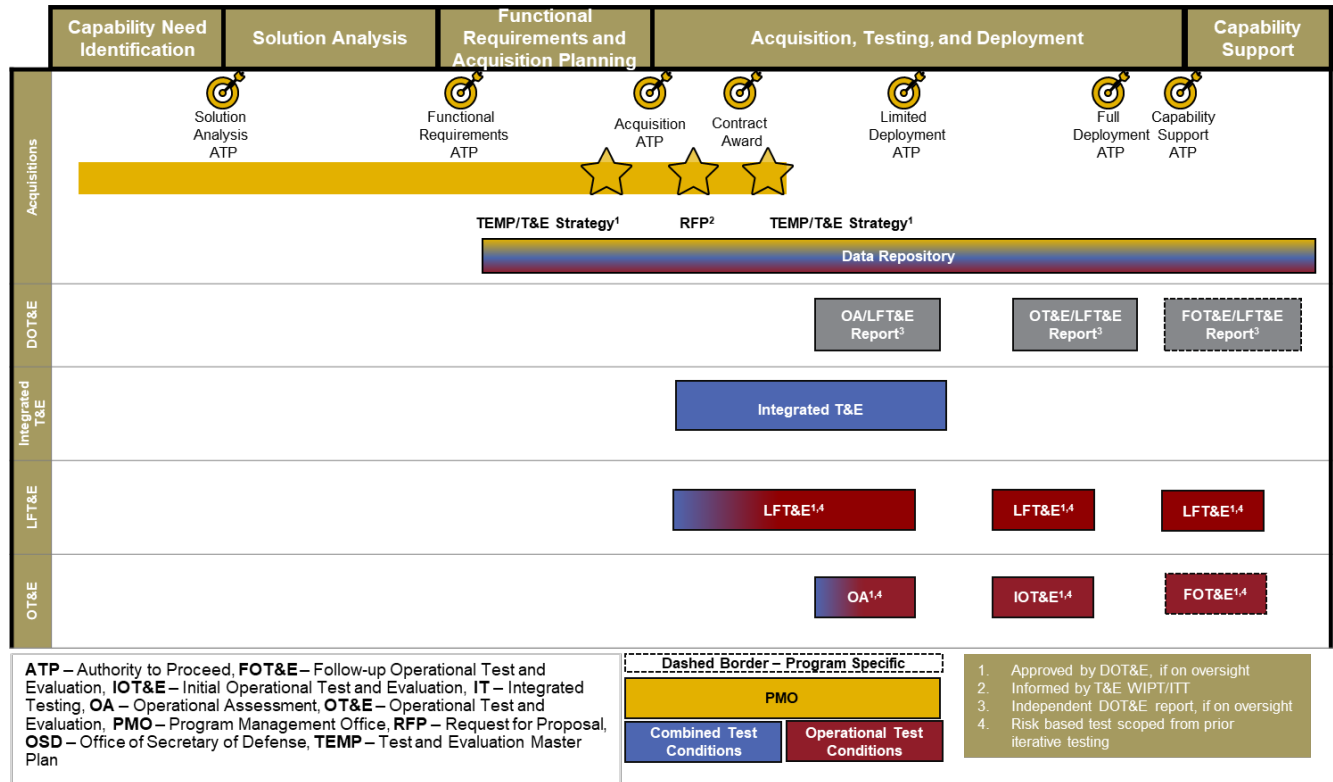
b. The TEMP/T&E strategy will enable evaluation of the operational effectiveness, suitability, and survivability performance required to inform limited deployment ATP and full deployment ATP decisions.

c. The OTA and LFT&E organizations will coordinate the planning, execution, and reporting on the respective T&E events shown in Figure 7 before deploying a business system solution.

(1) Business operations testing will confirm the system is working properly before the go-live decision to support OT&E on the live environment and employ actual users on the test environment performing end-to-end business transactions.

(2) The OTA will execute an OA to support limited deployment ATP decision and an IOT&E event to support the full deployment ATP decision. FOT&E may be needed to address any problems identified during IOT&E or as additional capabilities are deployed.

Figure 7. OT&E and LFT&E Aligned with DBS Acquisition Pathway Decisions.



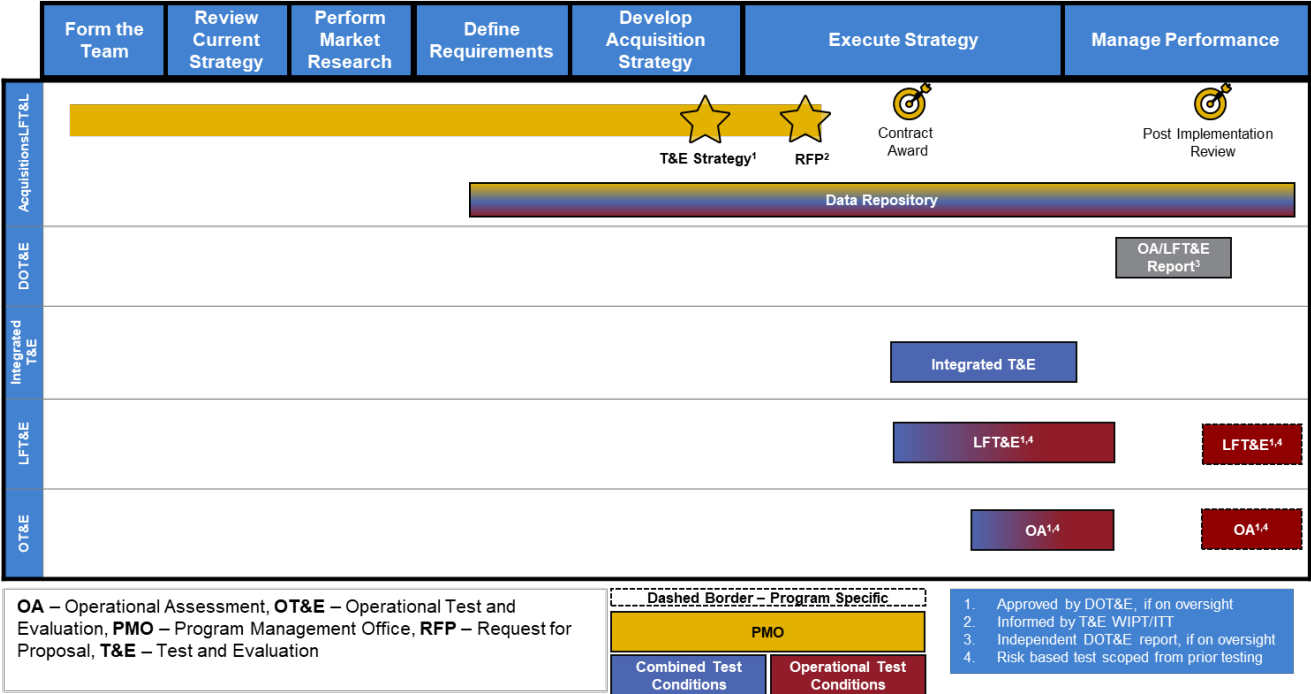
5.7. OT&E AND LFT&E FOR THE ACQUISITION OF SERVICES.

a. DoDI 5000.74 establishes policy for the use of the defense acquisition of services. OT&E and LFT&E for programs pursuing this pathway will be required if the service will be used to acquire capabilities that will affect the ability of the warfighter to achieve operational effectiveness, suitability, survivability, and lethality, as applicable.

b. The program manager will establish a T&E WIPT/ITT early to define the requirements and develop the acquisition and T&E strategies in accordance with DoDM 5000.100. The T&E strategy will primarily focus on evaluating cyber survivability and interoperability, including evaluation of their risk to digital capabilities.

c. The OTA and LFT&E organizations will coordinate the planning, execution, and reporting on the respective T&E events shown in Figure 8 to support the implementation of the service.

Figure 8. OT&E and LFT&E Aligned with Acquisition of Services Pathway Decisions.



GLOSSARY

G.1. ACRONYMS.

ACRONYM	MEANING
ACAT	acquisition category
AI	artificial intelligence
ATP	authority to proceed
CBRN	chemical, biological, radiological, and nuclear
CT	contractor test
CT&E	contractor test and evaluation
DBS	defense business systems
DoDD	DoD directive
DoDI	DoD instruction
DoDM	DoD manual
DOT&E	Director of Operational Test and Evaluation
DT	developmental test
DT&E	developmental test and evaluation
EMS	electromagnetic spectrum
EOA	early operational assessment
FOT&E	follow-on operational test and evaluation
FUSL	full-up system-level
IDSK	integrated decision support key
IOT&E	initial operational test and evaluation
ITT	integrated test team
LFT	live fire test
LFT&E	live fire test and evaluation
MBRA	mission-based risk assessment
MCA	major capability acquisition
MDA	milestone decision authority
MDAP	major defense acquisition program
M&S	modeling and simulation
MTA	middle tier of acquisition
MVCR	minimum viable capability release
OA	operational assessment
Ops Demo	operational demonstration

ACRONYM	MEANING
OT	operational test
OTA	operational test agency
OT&E	operational test and evaluation
SecDef	Secretary of Defense
T&E	test and evaluation
TEMP	test and evaluation master plan
U.S.C.	United States Code
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USD(I&S)	Under Secretary of Defense for Intelligence and Security
USD(R&E)	Under Secretary of Defense for Research and Engineering
V&V	verification and validation
VV&A	verification, validation, and accreditation
WIPT	working-level integrated product team

G.2. DEFINITIONS.

These terms and their definitions are for the purpose of this issuance.

TERM	DEFINITION
accreditation	The official certification that M&S results are acceptable for their intended use.
acquisition decision	A key acquisition decision outlined in each of the adaptive acquisition framework pathway policy documents, including interim acquisition decisions, outcome determination decisions, production decisions, and fielding decisions, also referred to as deployment decisions.
collateral damage effects	Damage from offensive capability effects beyond the intended target boundary.
combined test conditions	Test conditions during early sub-component, component, sub-system, and early system configuration testing when controlled, laboratory test conditions are combined with operationally representative conditions.

TERM	DEFINITION
congested environment	Caused by military and civilian systems that may crowd critical aspects of the operating environment (e.g., EMS) and increase the amount of unintentional interference or effects.
constrained environment	Caused by domestic and international regulations limiting the amount of operating environment (e.g., EMS, airspace) available for military access.
contested environment	Caused by enemy activities that detect, disrupt, exploit, degrade, deny, deceive, or destroy friendly capabilities for the purpose of military advantage in uncertain and hostile environments.
cyber defender	Anyone who actively participates in identifying, protecting, detecting, responding to, and recovering from cyberspace attacks on a system (e.g., operator, cybersecurity service provider, maintainer, or system administrator).
data authentication group	Provides a comprehensive review to ensure the data are complete, accurate, consistent, and representative of system performance within the tested operational environment. Identifies and analyzes anomalies in the system under test, instrumentation, test data, and M&S results to authenticate and validate the live data and M&S results for record. Ascertains whether the test team properly collected and reduced the data. The output is an authenticated database used for data analysis and reporting.
data repository	A general term used to describe a data library or data archive that may be implemented using a variety of technologies. A data repository is a sustainable and secure information infrastructure that provides long-term storage and access to data and results for analysis and reporting and analysis.
development, security, and operations practice	An application development practice that automates the integration of security and security practices at every phase of the software development lifecycle, from initial design through integration, testing, delivery, and deployment.

TERM	DEFINITION
digital capabilities	Capabilities acquired through the DoD adaptive acquisition framework that contain a component of information technology, including national security systems; networking; cybersecurity; EMS; or positioning, navigation, and timing; but excluding equipment acquired by contractors that is incidental to the performance of a DoD contract, such as telephones, computers, and facsimile machines.
digital engineering	A means of using digital models and the underlying data to support the development of a system. It uses the authoritative sources of truth for system's data and models across disciplines to support life-cycle activities from concept through disposal.
digital twin	A digital representation of a specific real-world system of interest that bi-directionally sends and receives updates between itself and its real-world counterpart at a frequency and fidelity befitting the use case. A digital twin can provide value throughout the life cycle (design, fabrication, operation, support, maintenance, and disposal) or the physical entity it represents.
FUSL test	A full spectrum survivability or lethality test of the production- or fielding-representative system configured for combat using live kinetic and non-kinetic threats or targets.
human-centered design	An approach to problem-solving commonly used in process, product, service or system design, management, and engineering frameworks that develops solutions to problems by involving the human perspective in all steps of the problem-solving process. The technique involves five core stages: empathize, define, ideate, prototype, and test.
human systems integration	The systems engineering process and program management effort that provides integrated and comprehensive analysis, design, and assessment of requirements, concepts, and resources for human factors engineering, manpower, personnel, training, safety and occupational health, force protection and survivability, and habitability. These domains are intimately and intricately interrelated and interdependent and must be among the primary drivers of effective, efficient, affordable, and safe system designs.

TERM	DEFINITION
IDSK	Product that aligns acquisition decisions and other program decisions, as needed, to test data and M&S results required to determine preliminary or final operational effectiveness, suitability, survivability, and lethality, as applicable, in support of those decisions. This connection between decisions and the data supporting them is intended to be a dynamic process that captures the evolution of the knowledge of the operational performance of the system as it matures across its life cycle, becoming more definitive as more data become available.
integrated T&E	T&E events that enable the program manager, the OTAs, and LFT&E organizations to use CT and DT events to generate data required to meet OT&E or LFT&E objectives, while preserving the primary CT or DT objective of the test.
interim acquisition decision	Decision intended to evaluate the progress of the system as it matures across the acquisition life cycle. Examples include Milestone C for the MCA pathway, transition to a different acquisition pathway for the MTA pathway, minimum viable product for the software acquisition pathway, limited deployment ATP for the DBS pathway, or the post implementation review for the acquisition of services pathway.
Joint Requirements Oversight Council	Process owner for the Joint Capabilities Integration and Development System. Uses the process to fulfill its advisory responsibilities to the Chairman of the Joint Chiefs of Staff in identifying, assessing, validating, and prioritizing joint military capability requirements.
kill chain	A sequence of actions performed by a specified threat to degrade or destroy the target.
kinetic threat	Types of weapon systems that physically engage targets.
LFT&E	Includes realistic full spectrum survivability testing of the DoD system configured for combat by firing kinetic and non-kinetic threats likely to be encountered in combat at it, or their accredited surrogates. Also includes realistic full spectrum lethality testing of DoD offensive capabilities configured for combat by firing it against kinetic and non-kinetic targets likely to be encountered in combat or their accredited surrogates. A DoD system configured for combat must include all hardware, materials, and software that may influence the measured performance.

TERM	DEFINITION
LFT&E organizations	Test organizations, agencies, or groups identified by the program manager to implement Paragraph 3.4. of this issuance.
live data	Any data (e.g., test, training, experiment, or combat) collected on physical systems.
live testing	The testing of a physical system or its sub-components, components, or sub-systems to evaluate their performance or generate V&V artifacts.
live, virtual, constructive environment	An integration concept that incorporates systems and environments that are live (involving real people operating real systems), virtual (real people operating simulated systems), and constructive (simulated people operating simulated systems).
MBRA	A structured process designed to evaluate and mitigate risks in DoD missions (i.e., unit equipped with the system) across the system's life cycle while informing OT&E and LFT&E scope. It is characterized by its adaptability, employment of both quantitative and qualitative analyses, and grounding in realistic mission and threat engagement scenarios that consider current and future adversarial kinetic and non-kinetic capabilities.
metadata	Contextual and descriptive information that outlines the attributes, collection methods, and organizational relevance of data and that serves as a comprehensive guide for its interpretation and usage.
mission engineering	Interdisciplinary process encompassing the entire technical effort to analyze, design, and integrate current and emerging operational needs and capabilities to achieve desired mission outcomes.
mission essential task list	Core activities that must be completed during the planning, execution, or analysis phases of an engagement operation.
mission thread	A sequence of end-to-end activities and events presented as a series of steps to achieve a mission.
model	A representation of an actual or conceptual system that involves mathematics, logical expressions, or computer simulations that can be used to predict how the system might perform or survive under various conditions or in a range of hostile environments.

TERM	DEFINITION
M&S VV&A	A science- and technology-based practice that depends on data-backed analysis to characterize uncertainty in the M&S output in support of the M&S accreditation for its intended use.
multi-domain operations	The employment of the joint capabilities of all combat power from each domain to accomplish missions at cost. The five domains are air, sea, land, cyber, and space.
non-kinetic threat	Unconventional threats including cyberattack, EMS threats including wideband radio frequency and directed energy weapons such as lasers and high-power microwave, or CBRN.
operational effectiveness	Degree to which the unit equipped with the system can execute and support the required missions in contested, congested, and constrained operational environments while taking into equal consideration survivability and lethality effects, as applicable.
operational suitability	Degree to which a system can be placed and sustained satisfactorily in field use, including contested, congested, and constrained environments, with consideration being given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human system interface, habitability, manpower, logistics, natural environmental effects and impacts, documentation, and training requirements.
operationally relevant	Environment or conditions expected to be encountered by the unit equipped with the DoD system in real-world operations including, but not limited to, operationally relevant terrain, vegetation, climate, and opposing (adversary) forces. It also includes operationally critical and stressing conditions.
operationally representative	System, threat, target, or environment the system may use or encounter in real-world operations or the real operational environment.
OT organization	A government organization (other than the service OTA) that conducts OT&E for programs within a niche commodity where sufficient capacity is not available within the service OTA. The lead command or lead agent may designate an OT organization, but it is not, by itself, an OT organization.

TERM	DEFINITION
OTA	An independent operational testing agency established by each Military Department that reports directly to the Service Chief to plan and conduct operational tests, report results, and provide evaluations of operational effectiveness, operational suitability, survivability, and lethality.
OT&E	Operationally realistic and relevant testing of the fielding- or production- representative system or service; their key components as integrated with other systems or services, under realistic combat conditions and using typical military users; and the evaluation of the results of such test.
preliminary evaluation	Includes an evaluation of the system's progress towards meeting operational effectiveness, suitability, survivability, and lethality, as applicable. Includes an evaluation of risk to the next phase of OT&E and LFT&E, risk to the acquisition program, mission engineering outcomes, warfighters, and DoD operations.
program decisions	Technical and engineering decisions and other decision points (e.g., key integration points, gate reviews, or M&S accreditation) critical to informing key acquisition decisions outlined in acquisition policy documents.
program manager	Designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM will be accountable for credible cost, schedule, and performance reporting to the MDA.
realistic full spectrum lethality	Degree to which an offensive (kinetic or non-kinetic) capability can deny, disrupt, destroy, or degrade the adversary (kinetic or non-kinetic) target's mission critical functions or induce a catastrophic event in a contested, congested, and constrained operational environment. Lethality includes the effect of the adversary's susceptibility, vulnerability, and recoverability from the attack as well as the evaluation of collateral damage effects.

TERM	DEFINITION
realistic full spectrum survivability	Degree to which a system and its users, if applicable, can survive and resume the mission in a contested, congested, and constrained environment following an engagement by a live kinetic threat, non-kinetic threat, and their combined effects, as applicable. Survivability includes susceptibility to attack, vulnerability if hit, recoverability from the attack, user casualties as applicable, and the effect of susceptibility, vulnerability, and recoverability on operational effectiveness and suitability.
recoverability	Ability of the system or the user to recover the denied, disrupted, destroyed, or degraded components or systems and restore the operational effectiveness and suitability during or after the mission to minimize combat losses and maintain combat advantage. This includes the evaluation of the time to recover and the level of operational effectiveness when recovered, as compared to full operational capability, as well as the evaluation of the effectiveness of the recoverability process and training.
risk-based level of testing	An assessment that determines how much independent testing is necessary to provide a defensible OT&E and LFT&E focus and scope given the acquisition strategy and decision and availability of relevant live data and M&S results. Periodic updates of this assessment throughout the life cycle provide a dynamic and evolving risk profile.
runs and results for record	M&S results that will be used in lieu of OT and LFT data to augment live data required for the evaluation of operational effectiveness, suitability, survivability, and lethality, as applicable, in support of acquisition decisions.
scientific rigor	Strict application of the scientific method to ensure accurate, comprehensive, efficient, and unbiased test design, methodology, analysis, interpretation, and reporting of results with a predetermined level of confidence. This includes full transparency in reporting test details so that others may reproduce and extend the findings.
simulation	A method for implementing a model over time. It is the synthetic environment in which actual systems or models of them and their actions propagate through spacetime. Simulation may include the use of analog or digital devices, laboratory models, or “testbed” sites. Simulations are usually programmed for solution on a computer; however, in the broadest sense, military exercises and wargames are also simulations.

TERM	DEFINITION
susceptibility	Ability of the system or users to avoid being seen or engaged by the kinetic or non-kinetic threat; frequently measured in probabilities. Examples include, but are not limited to, technology or cyber defenders to improve situational awareness and intrusion detection; signature control; electronic protection and attack; effective use of deception (e.g., decoys or honeypots); expendables; threat suppression; and offensive weapons.
system-of-systems	Collection of independent systems integrated into a larger system that delivers unique capabilities. The independent constituent systems collaborate to produce global behavior that they cannot produce alone.
T&E	Includes CT&E, DT&E, integrated T&E, OT&E, LFT&E, and relevant M&S.
T&E Oversight List	List of DoD systems acquired via the Defense Acquisition System that are being overseen by either the DOT&E for OT&E and LFT&E or by the USD(R&E) for DT&E, or both. The T&E Oversight List is a joint list, managed by the DOT&E on behalf of both organizations and is unclassified and published at https://www.dote.osd.mil/Oversight/ .
T&E resources	Includes test facilities; instrumentation; equipment; ranges; tools; threats; targets; test assets; interfacing systems; digital tools and their VV&A; test teams; related support (e.g., friendly and threat operational forces, data collectors, analysts, or subject matter experts); digital technologies (e.g., data repository); training materials; Federal, State, and local resources; and the funding needed to plan, execute, and report on OT&E and LFT&E.
uncertainty quantification	Estimates the accuracy and precision to which the M&S results have been confirmed to be consistent with the physical phenomena they represent. The primary aim is to assess the reliability of predictions; account for the effects of variability, randomness, and misspecification in M&S; and ultimately assist in decision making.
validation	The process of determining the degree to which a model or simulation and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model.

TERM	DEFINITION
verification	The process of determining that a model or simulation and its associated data accurately represent the developer's conceptual description and specifications.
vulnerability	A weakness in a system design or tactics, techniques, and procedures that an actor or event could exploit or trigger to cause user injuries or to degrade or diminish operational effectiveness and suitability, including security incidents and catastrophic effects. Examples include, but are not limited to, poorly designed system security procedures, internal controls, lack of mission critical component or system redundancies, component exposure and lack of physical or logical separation, lack of passive and active damage and malfunction suppression through hardening (e.g., shock hardening, coating, cybersecurity hardening such as host-based security system, or antivirus), lack of component and system capability recovery, or lack of component shielding.

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