
Director, Operational Test and Evaluation

**Assessment of the Programs Selected for
Development and Implementation of Digital
Technologies for Survivability and Lethality
Testing**

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This report identifies the programs selected to participate in the activities required to develop and demonstrate the use of digital technologies needed to enable full spectrum survivability and lethality evaluations. Full spectrum survivability and lethality evaluations are intended to expand the survivability and lethality testing of covered systems to include testing against not only kinetic threats but also non-kinetic threats such as cyber, directed energy weapons, electromagnetic spectrum fires, and chemical, biological, radiological and nuclear threats. Full spectrum survivability and lethality evaluations are also intended to leverage digital technologies to enable the evaluation of survivability and lethality throughout the lifecycle of the system as both, the fielded system and the threat continue to evolve over time.

This report is written in response to the FY 2022 National Defense Authorization Act (NDAA), Section 223 requesting that the Secretary, in coordination with covered officials, develop: (1) digital technologies to enable the modeling and simulation of the live fire testing required under Section 2366 (now 4172), of Title 10, United States Code, and (2) a process to use data from physical live fire testing to inform and refine such digital technologies. The Secretary, acting through the Director, Operational Test and Evaluation (DOT&E), shall assess and select not fewer than three to participate in the demonstration activities required under this directive. More specifically, the Director shall select: (1) at least one such program from the Army; (2) at least one such program from the Navy or the Marine Corps; and (3) at least one such program from the Air Force or the Space Force.

To meet this congressional directive, DOT&E surveyed the covered systems designated for live fire test and evaluation. DOT&E assessed that the covered programs for live fire test and evaluation that were already using digital technologies would be best positioned to: (1) successfully demonstrate how full spectrum survivability and lethality evaluations could be achieved using digital technologies, and (2) identify any shortfalls that need to be resolved to successfully establish full spectrum survivability and lethality evaluation processes using digital engineering, as the future standard for live fire test and evaluations. As a result, DOT&E selected the following four programs to participate in the activities required to develop and demonstrate how digital technologies could enable full spectrum survivability and lethality evaluations:

1. Future Long-Range Assault Aircraft, which meets the congressional requirement to include at least one such program from the Army. The Future Long-Range Assault Aircraft program is working on delivering a digital model of this aircraft as well as an emulator of its cockpit both of which are assessed as enablers for full spectrum survivability evaluation. The program intends to use digital twins throughout the acquisition lifecycle that could support an assessment of the processes for supporting continuous evaluation of survivability as, both the system and the threat evolves. The program has also implemented the System Theoretic Process Analysis that could be used in developing an advanced mission based risk assessment for full spectrum survivability evaluation. This program is an example of a Middle Tier of Acquisition pathway and could showcase how full spectrum survivability could be implemented regardless of the acquisition pathway. Lastly, this program is in its initial development stages allowing for

the early development of the full spectrum survivability evaluation concept and enabling its execution as the program progresses through its various milestones.

2. LGM-35A Sentinel (Ground Based Strategic Deterrent), which meets the congressional requirement to include at least one such program from the Air Force. LGM-35 program is applying several digital technologies that could be leveraged to demonstrate both, full spectrum survivability and lethality evaluations. For example, this program has been developing highly-sophisticated digital twins as part of its Digital Engineering System designed to integrate engineering diagrams, requirements, and software/hardware architectures into a unified modeling environment. This Digital Engineering System is considered a great enabler for full spectrum survivability and lethality concepts. The program is also known for its use of System Theoretic Process Analysis that could be used in developing an advanced mission based risk assessment for full spectrum survivability evaluation.
3. DDG Flight III, which meets the congressional requirement to include at least one such program from the Navy or the Marine Corps. This program offers an opportunity to assess those digital technologies and processes that need to be developed to meet unique ship, full-spectrum survivability and lethality evaluation requirements. Moreover, this program has also been implementing commercial virtualization technologies that will be further explored for the purposes of supporting full spectrum survivability evaluations.
4. F-35 is a joint program that has heavily relied on modeling and simulation to include the complex Joint Simulation Environment to support the evaluation of operational performance. This program and its digital technology enablers will be further exploited to demonstrate full spectrum survivability and lethality evaluations.

These four programs are assessed to capture the spectrum of potential challenges and benefits of using digital technologies in support of full spectrum survivability and lethality evaluations across the acquisition lifecycle. The programs span a range of land, sea and air-based platforms across all Services while considering both, full spectrum survivability and lethality evaluations. The list of programs also includes the very complex, joint F-35 platform that includes historical, survivability and lethality data that could be used as a baseline assessment to further highlight either the value added or the challenges associated with the use of digital technologies in full-spectrum survivability and lethality evaluations.

DOT&E expects full cooperation from these four programs in successfully developing the full spectrum survivability and lethality test and evaluation concepts. These concepts will be used to determine the feasibility of and risk associated with integrating digital technology into traditional live fire test and evaluation, areas of further technology development to further enable these concepts, and a process that will support more continuous testing of survivability and lethality of each covered system against kinetic and non-kinetic threats throughout the life cycle of such system. Full spectrum survivability and lethality evaluations are critical to the future Joint Force and to the success of the DOD mission in very dynamic, multi-domain operating environments.