

Problem Discovery Affecting OT&E

In 2011, Congress expressed concern that acquisition programs are discovering significant performance problems during operational testing that should have been discovered during developmental testing. Congress also expressed concern that programs were entering operational testing with known performance problems that previously should have been corrected. Since 2011, DOT&E annual reports have documented programs that either (1) have observed performance shortfalls during operational testing or (2) may soon begin operational testing with known performance problems that could affect the evaluation of their effectiveness, suitability, or survivability. This year, as in previous years, examples of both categories are present.

Operational testing identifies significant system performance problems, which provides opportunities for correction before systems are fielded or deployed.¹ In many cases, an operational environment or user is necessary to uncover the problem. However, performance shortfalls that can be discovered in developmental testing should more appropriately be resolved prior to operational testing. Resolving system performance problems before operational testing reduces the cost and schedule impact to the program if retesting is required and enables an accurate evaluation of the operational capabilities of the system under test in its final configuration. It is also a benefit to discover problems when the prime contractor is more accountable than the

government to correct them, such as before certain contractual decisions.

The following discussion provides a summary of the significant problems discovered or observed in analyses of operational test events conducted or reported in FY17. Detailed accounts of the problems are in the individual program articles in this report. Twenty-nine programs have discovered significant problems during early testing of systems that have a scheduled operational test in the next two fiscal years. If left uncorrected, these problems could negatively affect my evaluation of operational effectiveness, suitability, or survivability.

Figure 1 shows the breakdown of problem discoveries in FY17. This year's Annual Report includes 92 programs on the DOT&E oversight list with 114 operational tests conducted, reported, or planned between FY17 and FY19. Of those, 56 programs had a total of 64 operational tests or DOT&E reports issued in FY17. It is noteworthy that over 40 percent (27/64) of the operational tests did not observe significant problems. Of the 37 operational tests with problems significant enough to adversely affect my evaluation of the system, over one-third (15/37) observed previously known problems; less than one-third (10/37) observed newly discovered problems; and approximately one-third (12/37) observed both known and new problems.

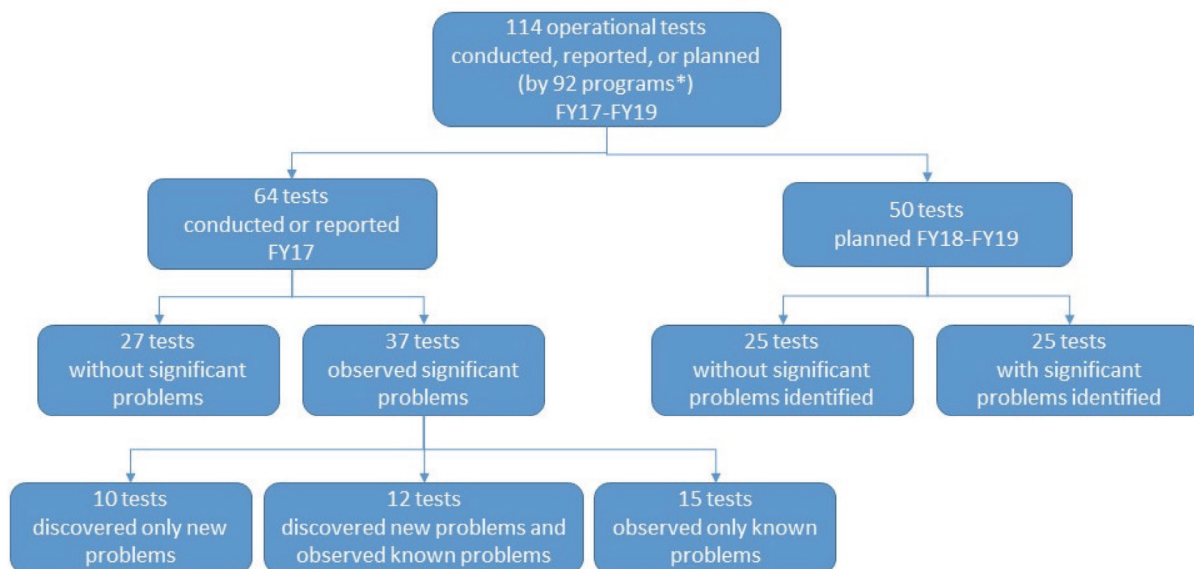


FIGURE 1. PROGRAMS UNDER OVERSIGHT WITH OPERATIONAL TESTS IN FY17-FY19

(Note: The number of tests is not the same as the number of programs because multiple programs have more than one operational test reported, conducted, or scheduled in FY17-FY19 and some operational tests feature multiple programs.)

¹ DOT&E Briefing, "The Value of Operational Testing and Evaluation," March 2016.

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The 37 tests with significant problems experienced 102 distinct problems across the 3 operational evaluation categories of effectiveness, suitability, and survivability. Approximately 70 percent of the problems (72/102) were known before operational testing. Figure 2 shows the distribution of the significant problems found during operational testing by area and whether the problem was known prior to the operational test.

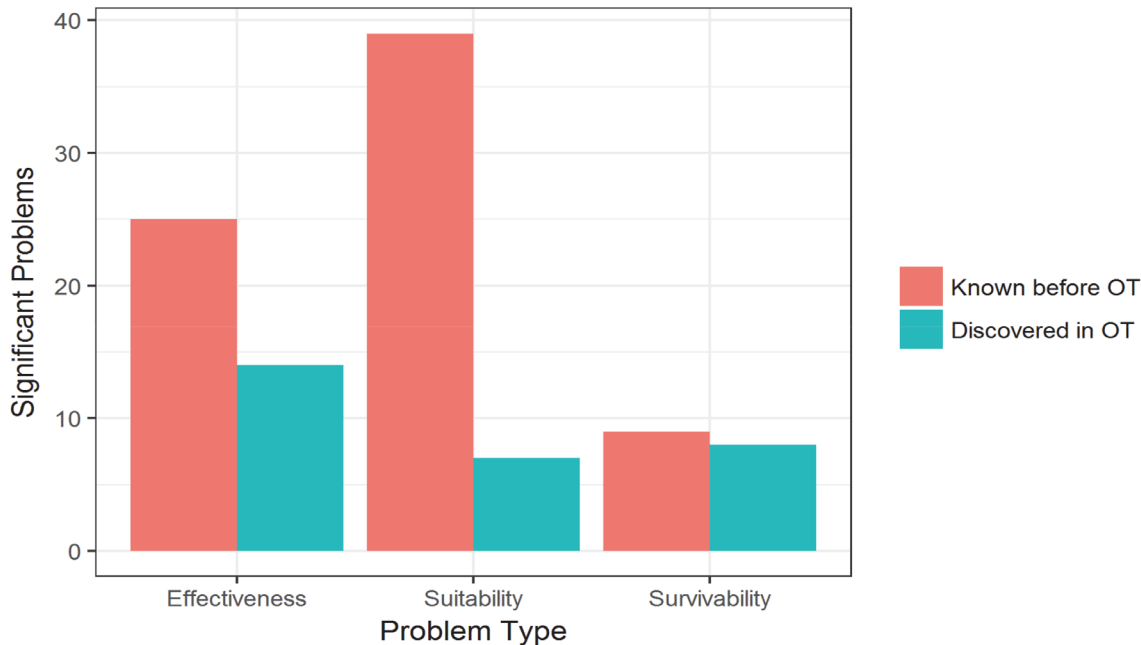


FIGURE 2. BREAKDOWN OF PROBLEMS BY TYPE AND WHETHER THEY WERE KNOWN PRIOR TO OPERATIONAL TESTING

As in previous years, it was common this year to find programs that either began operational testing with known problems or delayed testing due to a lack of allocated time or funding to fix problems that were discovered prior to the operational test. Approximately 40 percent (26/64) of operational tests began with known problems that adversely affected the system evaluation. In previous analyses of the reasons behind program delays, my office has reported that programs are commonly delayed by problems discovered in developmental or operational testing.² When programs are driven by a rigid schedule and the assumption that no major problems will be discovered during testing, they often run into delays and cost overruns when those schedules are adjusted to accommodate unforeseen additional development. For example, the Joint Regional Security Stack (JRSS) IOT&E was delayed in part because the Services and Defense Information Systems Agency did not have sufficient time to mitigate survivability problems that were discovered during a previous operational assessment. On the other hand, the APR-39 Radar Warning Receiver program displayed a significant reliability shortfall that was known from earlier integrated testing because it proceeded without delay into an operational assessment and an FOT&E. The Program Office had chosen not to update the software between test periods so as not to invalidate

the data from earlier test phases because it did not plan time or funding for any necessary post-fix regression testing.

In some cases, the Program Office identified a fix for the problem but did not plan for the time or funding to finish implementing it. For example, the Assault Amphibious Vehicle Survivability Upgrade (AAV-SU) program entered an operational assessment

with known reliability problems: the mean time between operational mission failures was below the requirement. Despite knowing these limitations, the Program Office decided to continue with the test so that a low-rate initial production decision could be made before a fiscal year deadline. Limited funding rather than time allowed known reliability problems to persist during the Spider Increment 1A Limited User Test. The Program Office chose not to make necessary software changes until after the IOT&E due to lack of funding.

Some problems can only be discovered during operational testing

because they are revealed only by the system's interaction with representative users and/or operationally realistic environments, which can include final operational configurations. For example, the Defense Agencies Initiative (DAI) program discovered suitability shortfalls when operational testing found that most agencies are experiencing additional staffing requirements for their own Tier 1 help-desk support. This problem was discovered only through discussions with DAI users at various defense agencies. Similarly, the DOD Healthcare Management System Modernization program's operational assessment revealed suitability problems with the system usability, due in part to inadequate training and outdated system manuals provided to end users. Troop egress problems in the AAV-SU were only discovered when the vehicles were fully loaded with troops in combat gear. Additionally, the Standard Missile-6 program was only able to discover problems with the seeker when up against operationally representative targets.

Cybersecurity problems often require operational configurations, users, and environments to be discovered. Thirteen of 17 survivability problems observed or reported this year are related to cybersecurity, 9 of which were discovered in operational testing. Specific problems will not be addressed in this

² IDA Briefing, "Reasons behind Program Delays – 2017 Update."

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unclassified report. In general, some cybersecurity problems are only found under realistic threat activity, such as that emulated in a Cooperative Vulnerability and Penetration Assessment and an Adversarial Assessment. In other cases, cybersecurity vulnerabilities emerge as the system software evolves through successive upgrades.

Although operational testing often provides the necessary conditions to discover problems, these conditions can also be used during developmental testing to promote earlier problem discovery, when it is less disruptive to a program to fix them. Developmental and integrated testing, when conducted under operationally relevant conditions to collect early operational data, provide an opportunity for early problem identification. For example, the Common Analytical Laboratory System – Field Confirmatory – Analytical Capability Set man-portable subsystem DT/OT tested the commercial off-the-shelf chemical identification instruments in high humidity and cold temperature conditions. The test revealed that one of the instruments could not reliably operate in the test conditions. This discovery

prompted changes in guidelines for use of the system in these environmental conditions prior to IOT&E. On the other hand, the M109 Family of Vehicles Paladin Integrated Management program had to suspend IOT&E due to suspected safety issues when cannon breech and bore evacuator problems, along with inadequate maintenance training, appeared to expose crew members to excessive amounts of toxic fumes from the explosive propellant. Developmental testing of the Paladin did not employ operationally realistic firing sequences with rates of fire and frequency using Modular Artillery Charge System charge 5H propellant increments.

Figure 3 breaks down the number of significant problems observed per operational test by each of the Services and other DOD agencies, including the 27 of 64 operational tests with no problems. These histograms show that, in general, the Services experience similar trends in observing only a few problems during a given operational test, with very few outliers that are labeled in the figure.

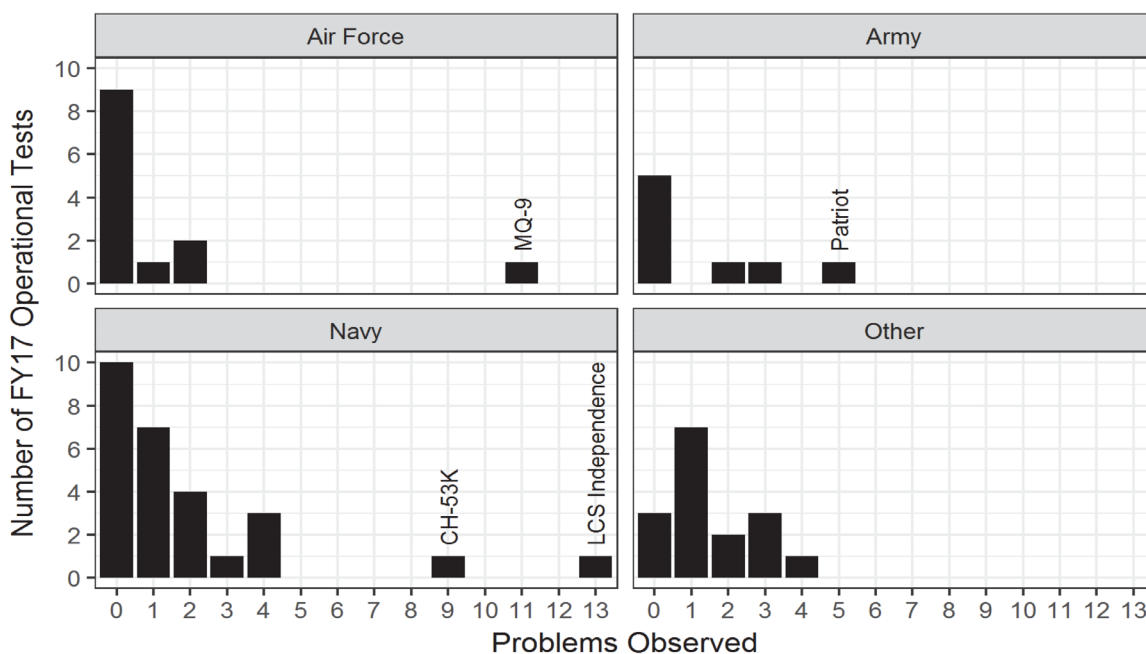


FIGURE 3. HISTOGRAM OF NUMBER OF PROBLEMS OBSERVED IN EACH OPERATIONAL TEST, BY SERVICE.

(Note: "Other" includes non-service branch DOD agencies such as U.S. Special Operations Command, Defense Information Systems Agency, or the Missile Defense Agency.)

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Tables 1 and 2 list the 64 operational tests discussed in this year's Annual Report. Table 1 lists the 27 operational tests that had no significant problems to report. Table 2 lists the 37 operational tests discussed in this year's Annual Report that observed

significant problems. Each row provides the name of the system and operational test and indicates which categories of problems were observed. For details on the problems observed, see each system's entry elsewhere in this report.

TABLE 1. OPERATIONAL TESTS IN FY17 WITH NO SIGNIFICANT PROBLEM DISCOVERY*	
System Name	OT Name
AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM) (pg. 235)	AIM-120C7 Tape 1 Initial Operational Test and Evaluation (IOT&E)
AMRAAM	AIM-120C7 Tape 2 IOT&E
Air Force Mission Planning Systems Increment 5 (MPS-5) (pg. 267)	Mobility Air Force Automated Flight Planning Service (MAFPS) IOT&E
Air Force MPS-5	MPS-5 C-17 IOT&E
Army Integration of the Department of the Navy (DON) Large Aircraft Infrared Countermeasures (LAIRCM) Advanced Threat Warner (ATW) system on the AH-64E, CH-47F, HH/UH-60M, and UH-60L (pg. 97)	DON LAIRCM ATW Integration on AH-64E
Battle Command System - Fixed (BCS-F) 3.2 (pg. 243)	BCS-F R3.2.4 Force Development Evaluation (FDE)
Common Analytical Laboratory System – Field Confirmatory – Analytical Capability Set (CAL5-FC-ACS) (pg. 19)	CALS-FC-ACS User Demonstration
Cooperative Engagement Capability (pg. 165)	Aegis B/L 9.C Combat System Follow-on Operational Test and Evaluation (FOT&E)
Defense Enterprise Accounting and Management System (DEAMS) Increment 1 (pg. 245)	DEAMS Inc 1 Operational Utility Evaluation (OUE)
DOD Healthcare Management System Modernization (DHMSM) (pg. 27)	DHMSM IOT&E
F-22A - RAPTOR Modernization (pg. 247)	F-22A Increment 3.2B IOT&E
Ground/Air Task Oriented Radar (G/ATOR) (pg. 179)	G/ATOR Block 1 and 2 Early Fielding Assessment
Javelin Close Combat Missile System - Medium (pg. 105)	Javelin Spiral 2 Missile Live Fire Test and Evaluation (LFT&E)
Massive Ordnance Penetrator (MOP) (pg. 263)	Enhanced Threat Response (ETR)-IV
Miniature Air Launched Decoy - Jammer (pg. 265)	MALD-J FDE
Modular Handgun System (XM17/XM18) (pg. 133)	Modular Handgun System IOT&E
Navy Multiband Terminal (NMT) (pg. 201)	NMT FOT&E
Next Generation Diagnostic System Increment 1 (pg. 79)	Next Generation Diagnostic System IOT&E
Offensive Anti-Surface Warfare (OASuW) Increment 1 (pg. 203)	Long Range Anti-Ship Missile (LRASM) Quick Reaction Assessment (QRA)
P-8A Poseidon (pg. 205)	P-8A Engineering Change Proposal (ECP) 2 OT&E
Rolling Airframe Missile (RAM) Block 2 (pg. 209)	RAM Block 2 IOT&E
Ship Self-Defense for LSD 41/49 Class (pg. 215)	Ship Self-Defense System MK 2 Mod 5 FOT&E
Soldier Protection System (pg. 121)	Integrated Head Protection System (IHPS) Limited User Test
SSN 774 Virginia-Class Submarine (pg. 217)	SSN 774 Virginia-Class Submarine Block III FOT&E
Standard Missile-6 (SM-6) (pg. 219)	SM-6 Block IA FOT&E
Surface Ship Torpedo Defense (SSTD) System: Torpedo Warning System (TWS) (pg. 223)	TWS/Countermeasure Anti-Torpedo (CAT) QRA
Warfighter Information Network - Tactical (WIN-T) (pg. 129)	WIN-T Increment 2 Tactical Communications Node – Lite (TCN-L) and Network Operations Security Center - Lite (NOSC-L) FOT&E

*Note: Several systems listed in Table 1 are currently in test. Their inclusion here indicates that no major problems have been discovered at the time of this report. Future DOT&E reports will update this assessment.

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TABLE 2. OPERATIONAL TESTS IN FY17 WITH DISCOVERY OF SIGNIFICANT PROBLEMS

System Name	Operational Test	Effectiveness	Suitability	Survivability
AC-130J Ghost rider (pg. 231)	AC-130J Block 20 Initial Operational Test and Evaluation (IOT&E)	X	X	
Aegis Modernization (pg. 139)	Aegis Baseline Upgrade Operational Test (OT)	X		X
Air Force Distributed Common Ground System (AF DCGS) (pg. 237)	3 different OT events			X
AGM-88E Advanced Anti-Radiation Guided Missile (AARGM) (pg. 143)	AGM-88 AARGM Block 1 Follow-on Operational Test and Evaluation (FOT&E)	X	X	
AN/APR-39D(V)2 Radar Signal Detection Set (RSDS) (pg. 147)	APR -39 Radar Warning Receiver FOT&E		X	
AN/BLQ-10 (pg. 149)	AN/BLQ-10 (Technical Insertion (TI)-10) FOT&E	X		
AN/BQQ-10 Acoustic Rapid Commercial Off-the-Shelf Insertion(A-RCI) Sonar (pg. 137)	A-RCI Advanced Processing Build 2013 (APB-13) variant FOT&E			X
AN/SQQ-89A(V)15 Integrated Undersea Warfare (USW) Combat System Suite (pg. 151)	AN/SQQ-89A(V)15 Advanced Capability Build 2011 (ACB-11) variant FOT&E	X		
Air Operations Center – Weapon System (AOC-WS) Initiatives 10.0 & 10.1 (pg. 239)	AOC-WS 10.1.13.3 assessment	X		X
AOC-WS Initiatives 10.0 & 10.1	AOC-WS 10.1.14E assessment	X		X
Assault Amphibious Vehicle - Survivability Upgrade (AAV-SU) (pg. 153)	AAV-SU Operational Assessment (OA)		X	
CH-53K - Heavy Lift Replacement Program (pg. 157)	CH-53K OA	X	X	X
Coastal Battlefield Reconnaissance and Analysis (COBRA) System (all variants) (pg. 161)	COBRA Block I IOT&E Test Period One	X		
Common Analytical Laboratory System – Field Confirmatory – Analytical Capability Set (CALC-FC-ACS) (pg. 19)	CALC-FC-ACS Man-portable chemical subsystem DT/OT	X	X	
Consolidated Afloat Networks and Enterprise Services (CANES) (pg. 163)	CANES Force-level variant FOT&E			X
CVN-78 <i>Gerald R. Ford</i> Class Nuclear Aircraft Carrier (pg. 167)	OT-B4 OA	X	X	
Defense Agencies Initiative (DAI) (pg. 21)	DAI IOT&E		X	
Defense Medical Information Exchange (DMIX) (pg. 25)	DMIX Cybersecurity Assessment and DHMSM IOT&E			X
DOD Healthcare Management System Modernization (DHMSM) (pg. 27)	DHMSM OA	X	X	
Global Command and Control System - Joint (GCCS-J) (pg. 61)	Joint Operation Planning and Execution System (JOPES) v4.2.0.3 Maintenance Release (MR) 4 OT	X		
Integrated Defensive Electronic Countermeasures (IDECM) (pg. 181)	IDECM Block 4/Software Improvement Program (SWIP) OA	X		
Joint Regional Security Stack (JRSS) (pg. 69)	JRSS IOT&E	X		
Key Management Infrastructure (KMI) Increment 2 (pg. 73)	KMI Spiral 2 Spin 2 Limited User Test (LUT)		X	
KMI Increment 2	KMI Spiral 2 Spin 2 OA		X	
LHA 6 (pg. 183)	LHA 6 IOT&E			X
Littoral Combat Ship (LCS) Seaframes, <i>Independence</i> Variant (pg. 187)	OT-C4 <i>Independence</i> variant with Increment 2 Surface Warfare (SUW) mission package	X	X	X
LCS SUW Mission Package (pg. 187)	OT-C4 <i>Independence</i> variant with Increment 2 SUW mission package	X	X	
M109A7 Paladin Integrated Management (PIM) (pg. 113)	PIM IOT&E 1	X	X	
MQ-9 Reaper Unmanned Aircraft System (pg. 269)	MQ-9 Block 5 Remotely Piloted Aircraft (RPA) Block 30 Ground Control System (GCS) FOT&E	X	X	X
Next Generation Chemical Detector (NGCD) (pg. 77)	NGCD Early OA		X	
Patriot Advanced Capability-3 (PAC-3) (pg. 119)	Post-Deployment Build-8 (PDB-8) IOT&E	X	X	X
Public Key Infrastructure (PKI) Increment 2 (pg. 81)	PKI Spiral 3 FOT&E	X	X	
PKI Increment 2	PKI Inc. 2 Token Management System (TMS) Release 4 LUT	X	X	X
Ship Self-Defense for LHA 6 (pg. 211)	Ship Self-Defense System FOT&E MK 2 Mod 4 OT-IIIH	X	X	
Spider XM7 Network Command Munition (pg. 123)	Spider Increment 1A LUT	X	X	X
Standard Missile-6 (SM-6) (pg. 219)	SM-6 Block I Verification of Correction of Deficiencies	X		
Terminal High-Altitude Area Defense (THAAD) (pg. 297)	Flight Test THAAD (FTT)-18		X	

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There are 57 programs that have 50 operational tests (including joint testing of multiple programs) scheduled to begin in the next two fiscal years, and I am aware of significant problems that, if not corrected, could adversely affect my evaluation of the effectiveness, suitability, or survivability of 29 of these systems

in 25 of the tests. Table 3 lists the upcoming operational tests for systems discussed in this year's Annual Report with identified problems (see individual system write-ups in this report for details on the problems).

System Name	Upcoming Test	Effectiveness	Suitability	Survivability
Aegis Ballistic Missile Defense (Aegis BMD) (pg. 291)	Flight Test Operational (FTO)-03 Event 1		X	
Aegis Modernization Program (pg. 139)	Advanced Capability Build (ACB)-16 Phase 0 Operational Test (OT)	X		
Air Force Distributed Common Ground System (AF DCGS) (pg. 237)	AF DCGS Operational Utility Evaluation (OUE)			X
AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM) (pg. 235)	AIM-120D System Improvement Program (SIP)-2 Initial Operational Test and Evaluation (IOT&E)	X		
AN/SQQ-89A(V)15 Integrated Undersea Warfare (USW) Combat System Suite (pg. 151)	AN/SQQ-89A(V)15 Advanced Capability Build 2013 (ACB-13) variant Follow-on Operational Test and Evaluation (FOT&E)	X		
Air Operations Center – Weapon System (AOC-WS) Initiatives 10.0 & 10.1 (pg. 239)	AOC-WS 10.1.15 assessment			X
Assault Amphibious Vehicle - Survivability Upgrade (AAV-SU) (pg. 153)	AAV-SU IOT&E		X	
Ballistic Missile Defense System (BMDS) (pg. 279)	FTO-03 Event 2	X	X	
BMDS Sensors/Command and Control Architecture (pg. 283)	FTO-03 Event 2		X	
Bradley Family of Vehicles (BFoV) Engineering Change Proposal (ECP) (pg. 101)	Abrams-Bradley FOT&E		X	
CH-53K - Heavy Lift Replacement Program (pg. 157)	CH-53K IOT&E	X	X	X
Defense Agencies Initiative (DAI) (pg. 21)	DAI Increment 2 FOT&E		X	
F-35 Joint Strike Fighter (JSF) (pg. 31)	F-35 IOT&E	X	X	
Ground-based Missile Defense (GMD) (pg. 287)	Flight Test, Ground-based Interceptor (FTG)-11	X		
Joint Space Operations Center Mission System (JMS) (pg. 255)	JMS Increment 2, Service Pack 9 and 11 OUE	X		
Joint Regional Security Stack (JRSS) (pg. 69)	JRSS Version 2.0 IOT&E	X		
KC-46A (pg. 259)	KC-46A IOT&E	X		
Key Management Infrastructure (KMI) Increment 2 (pg. 73)	KMI Increment 2 FOT&E	X	X	
LCS Anti-Submarine Warfare (ASW) Mission Package to include all associated vehicles, communications, sensors, weapon systems, support equipment, software, crew detachments, and support aircraft that are in development (pg. 187)	ASW Mission Package IOT&E		X	
M109A7 Paladin Integrated Management (PIM) (pg. 113)	PIM IOT&E 2	X	X	
MK 54 Lightweight Torpedo and Its Upgrades including High-Altitude Anti-Submarine Warfare Capability (pg. 195)	MK 54 Mod 1 FOT&E	X		
Modular Handgun System (XM17/XM18) (pg. 133)	Modular Handgun FOT&E		X	
Patriot Advanced Capability-3 (PAC-3) (pg. 119)	FTO-03 Event 2	X	X	X
Public Key Infrastructure (PKI) Increment 2 (pg. 81)	PKI Increment 2 FOT&E	X	X	
RQ-4B Global Hawk (pg. 273)	RQ-4B Global Hawk MS-177 OUE	X		
Spider XM7 Network Command Munition (pg. 123)	Spider Increment 1A IOT&E		X	
Surface Ship Torpedo Defense (SSTD) System: Countermeasure Anti-Torpedo (CAT) (pg. 223)	TWS/CAT Quick Reaction Assessment (QRA)	X	X	
Surface Ship Torpedo Defense (SSTD) System: Torpedo Warning System (TWS) (pg. 223)	TWS/CAT QRA	X	X	
Terminal High-Altitude Area Defense (THAAD) (pg. 297)	FTO-03 Event 2	X	X	X