Contractors and Operational Testing

Some Involvement is Legal and Beneficial

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This article reflects the voice of the industrial members of the ICOTE (Industrial Committee on Operational Test and Evaluation) and their concept of what it would take to help decrease the cost and schedule, and improve the outcome for Defense Operational Test and Evaluation and the warfighter. On behalf of the Committee, Stoddart offers their insights and recommendations to stimulate dialogue between the government and contractor operational test community.

According to a popular myth, contractors, by law, can not be involved in any aspect of operational testing of their equipment. This misunderstanding, and the strict and inappropriate application of this myth to all areas of operational testing, is contrary to the principles of acquisition streamlining. It leads to longer acquisition periods, adds cost to the program, and weakens the close teamwork necessary to meet the challenges of providing the best equipment to the field.

The Law and Operational Test and Evaluation

The benefits of operational testing are obvious to everyone. It should be a common goal of the testers, the Program Manager, and the contractors to pass all tests, in a timely manner, providing the best possible system to the soldier, sailor, airman, or Marine. "An Operational Test

Retired Army Col. John Stoddart, Vice President, Oshkosh Truck Corp. Stoddart is standing in front of an MK23, the U.S. Marines' new state-of-the-art medium tactical wheeled vehicle, which evolved from the Medium Tactical Vehicle Replacement (MTVR) program, a joint remanufacturing effort between the Army, Marines, and Oshkosh Truck Corp.

Photo courtesy Oshkosh Truck Corp.

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and Evaluation is the field test, under realistic combat conditions, of any item of (or by component of) weapons, equipment, or munitions for the purpose of determining the effectiveness and sustainability of the weapons, equipment, or munitions for use in combat by typical military users; and the evaluation of the results of such test."[1]

The operational test is required, and the independence of the operational testers from the proponents or the systems being tested is recognized. "For ACAT [Acquisition Category] I and II programs for conventional weapons systems designed for use in combat, a beyond Low-Rate Initial Production [LRIP] decision *shall* be supported by completed independent initial operational test and evaluations as required by 10 U.S.C. 2399..."[2]

Congress has enacted laws to ensure the independence of the testers and the impartiality of contractor testing personnel.

"In the case of a major defense acquisition program ... no person employed by the contractor for the system being tested may be involved in the conduct of the operational test and evaluations required under subsection (a) of this code."[3]

Also, "A contractor that has participated in (or is participating in) the development, production, or testing of a system for a Military Department or Defense Agency (or for another contractor of the Department of Defense) may not be involved (in any way) in the establishment of criteria for data collection, performance assessment, or evaluation activities for the operational test and evaluations."[4]

Application of the Law

Nowhere in the law does it say that the contractor can not have some involvement in the operational test such as being allowed to observe the test; having access to copies of relevant documents like the Test and Evaluation Master Plan (TEMP), including the operational test portion; being allowed to participate as an observer in Integrating Integrated Process Teams and Overarching Integrated Process Teams; or even being provided early test data. These benign actions could give the contractor a better, more timely understanding of problems encountered, useful information for necessary improvements, or a head start on required fixes. It would reinforce the concept of a team trying to get the best product to the field.

Consequences of an Unnecessarily Strict Application of the Law

No contractor involvement in the operational test phase will hinder acquisition streamlining, because the recovery period after the test will be made longer. The contractor will have to wait until the end of the test before any fixes can be applied and tested. This will make the total test time longer and more expensive. The total acquisition period will also be longer, again raising total program cost.

The strict application of the law also places an unnecessary "veil of secrecy" on the whole process, creating an unhealthy "we vs. they" relationship among the testers, the Program Manager, and the contractor. This results in a counterproductive influence on the team's effort to bring the best equipment to the field.

Lifting the Veil

The contractor should be allowed to observe the test, albeit with no access to the systems or prototype being tested, but with knowledge of what is taking place. This will enable the contractor to get an early start on planned fixes and follow-on contractor tests. Again, it appears counterproductive to react to rumors that surround the test rather than actually learning first-hand as an observer.

The contractor's No. 1 concern is to field the best possible piece of equipment. With that in mind, before the test even starts, the contractor should have access to the TEMP and be afforded the opportunity to anticipate potential problems. Obviously, any advance knowledge of the planned testing will help in the design phase and contractor test phase. A piece of equipment rated *suitable* the first time saves time and money.

To integrate industrial members into the test and evaluation process to the point where they truly believe they are "one of the team," observer status in the working groups or Integrated Process Team meetings would be of great benefit, not only to the contractor, but also the group. The law does not prohibit this, and there

ICOTE Charter

PREAMBLE

The purpose of the Industrial Committee on Operational Test and Evaluation (ICOTE) is to provide a forum for the senior operational test and evaluation representatives from the Defense Department and senior executives of representative U.S. defense system manufacturers to periodically meet and review issues of common interest and concerns. Topics for discussion will include test and evaluation policies and procedures that impact military systems development, procurement, and use.

OBJECTIVES

The objectives of the ICOTE are to:

- Provide a forum for discussion and exchange of views.
- Gain feedback from senior industry representatives.
- Discuss Office of the Secretary of Defense and Service policies that affect relationships with suppliers.
- Discuss emerging issues in government and industry that affect the readiness and capabilities of U.S. defense system producers.
- Cooperate on various projects of mutual benefit to the ICOTE participants.

should be no secrets going into the test. The Program Manager could strictly enforce the "rules of observation."

The contractor should have access to early test data to "get a jump" on follow-on actions. The last thing contractors need is for the stockholders to hear of test problems before they do. If early test data were provided, fixes could be planned and mitigation efforts worked out before problems were surfaced.

Role of the Program Manager

Program Managers are in a position where they can act as an intermediary between the operational testers and the contractors to the benefit of everyone. They can assist in lifting the veil of secrecy of the testers, while simultaneously upholding the law and not allowing the contractor to be involved in the conduct of the test.

The Program Manager is responsible for developing the TEMP, including all of its contents and its preparation. The part of the TEMP that covers operational test and evaluation (OT&E) is the responsibility of the independent operational test organization, including its preparation, contents, and coordination. The Program Manager should establish early liaison with the operational testers to assist the Operational Test Director with the integration of OT&E requirements into the TEMP. This is frequently done using a test planning working group or Integrated Process Team. Keeping the contractor informed on the process and nature of the TEMP would not violate any law; rather, it would benefit everyone.

Responsibility of the Contractor

The areas of the operational test where the contractor would be allowed to be involved should be an agreement among the operational testers, the Program Manager, and the contractor. The contractor would be responsible for the education of contractor personnel to the extent they could be involved in the test. The contractor would also be responsible for policing the actions of contractor personnel to ensure compliance with those items of allowable involvement.

In the spirit of the law, contractors must ensure their personnel are not "participating in the conduct of the test." The observation of a test or the test site does not imply any interface with test personnel—it means *observation*. A copy of the TEMP would be provided for information, not for critique or comment. For a contractor to divulge any provided test data to anyone, other than contractor personnel, would be a violation of the partnership, and a good reason for the government to revert to a narrow interpretation of Title 10. Misuse of the data would also be a violation of the government's trust.

Likewise, observation of an Integrated Process Team would mean a seat in the room, without any participation in discussions unless asked a question.

Concurrent Developmental and Operational Tests

"A combined developmental test and operational test [DT/OT] approach is encouraged to achieve time and cost savings. The combined approach shall not compromise either developmental or operational test objectives. A final independent phase of operational test and evaluation shall be required for beyond Low Rate Initial Production [LRIP] decisions."[5]

A typical result of concurrent DT/OT is the successful completion of the developmental test, and a rating of unsuitable for the equipment based on the operational test. The developmental test is to determine whether engineering is complete, to identify design problems, to recommend redesign, to determine whether solutions are on hand, to support decision makers, and to provide a decision as to the readiness of the system to enter operational test.

Concurrent DT/OT, intended to save time and money, allows the equipment to enter operational test without the redesign and solutions to problems that result from the developmental test; therefore, a rating of *effective* results from the developmental test, and a premature rating of *unsuitable* results from the operational test.

With the veil of secrecy on the operational test, no changes such as those often found and made during the developmental test, are allowed to be made during the test; and with no early results provided from the operational test, the contractor loses valuable time in the application of solutions for the required follow-on operational test. The Program Manager should be able to serve as an intermediary between the operational testers and the contractor. The operational testers should try to find a way to accommodate reasonable changes during the test (changes made under their control), and to understand how they

can best accommodate other sources of data. These actions would further the spirit of acquisition streamlining.

Observation is Not Involvement

As stated in law (Title 10 U.S.C. 2399), **contractors may not be involved in the conduct of the operational test and evaluation** of their equipment. Nor should they be involved in the **establishment of criteria** for data collection, **performance assessment,** or **evaluation activities** for the operational test and evaluation.

Contractors, however, *should* have access to test planning documents, access to the test site to observe, be provided early test data and findings, and be included as observers on Integrated Process Teams.

In a random survey of ACAT I and II programs conducted by DOT&E, 40 percent of the Service programs did not furnish acquisition documents (Mission Need Statement, Operational Requirements Document, Operational Test Authority, Test and Evaluation Master Plan) to the contractor. In fact, the Navy has a regulation prohibiting transmittal of the TEMP to the contractor without Chief of Naval Operations' approval.

The veil of secrecy needs to be lifted. In the case of concurrent DT/OT testing, OT data should be provided early to allow for timely fixes prior to the required follow-on operational test and prior to production.

Although the operational testers are not members of the acquisition workforce, they are critical members of a team whose mission is to get the best equipment to the field, in the fastest time, at the best cost.

Editor's Note: The author welcomes questions or comments on this article. Contact him at **jstoddart@oshtruck.com**.

REFERENCES

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ICOTE Chairman John Stoddart Speaks Out on Improving T&E In Response to Tough Questions From DOT&E's Former Director, Philip Coyle

Q

Why do we have an increasing number of systems performing so poorly in OT [Operational Test] or rushing to OT while clearly not ready?

A

Notwithstanding immature technology, we believe some systems are hurried through design and development. Because of this, technological risk increases and places the successful outcome of various tests in jeopardy. Also, technological risk is not exclusive unto itself. Increased technological risk affects both cost and schedule. If the technology fails, there is a high likelihood the original schedule will be at increased risk. Cost risk will also increase with redesign and retest.

Poorly specified requirements, incomplete requirements, changing requirements, or a combination thereof exacerbate the acquisition process. Poorly specified requirements make design and development more difficult. Incomplete requirements guarantee the system not passing the test. And changing requirements bring about the need for redesign, which is especially unpleasant as the earlier design nears finalization.

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There is growing evidence that here is a linkage between the streamlining of the acquisition system and a decrease in systems readiness for OT. Test realism is viewed as too expensive, which places reliance on solutions such as Modeling and Simulation [M&S} to replace relevant development testing (DT with correlation to operational requirements). The new modernization documents appear to cause a rush to judgment, pushing systems into testing to support acquisition before they are ready. This rush, coupled with the insertion of technology anywhere prior to a production decision, also plays a role.

The decline in DoD program funding has resulted in a major impact to the required robustness of Service and OSD [Office of the Secretary of Defense] test agencies; in effect, the oversight capa-

bility in many agencies is at best marginal.

Finally, most program managers fear loss of funding. If a program exposes its problems, funding will immediately become an issue and could subject the program to significant fielding delay or cancellation. Therefore, there is no desire to ensure the areas of greatest uncertainty or those least understood are examined early in DT [Developmental Test], thus postponing problems too late in EMD {Engineering and Manufacturing Development] or into IOT&E [Initial Operational Test and Evaluation].

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Is DT being perceived as a PM's prerogative that is optional?

A

PMs perceive DT as required; however, developmental testing competes with design and development for funding. These competing demands in a resource-constrained environment require the PM to make a trade-off between design and test funding. These decisions are being made at a time that test agency oversight is limited, thus preventing a greater collaborative approach to appropriate testing.

Q

Why does the program focus on specification compliance in DT at the expense of performance-based DT?

A

In the design and development process, it is easier to focus on specification compliance instead of performance compliance. Some may think the specifications are more critical than performance in the early stages of acquisition. A common philosophy is, "There is always time to fix performance issues at a later date." The problem with the "fix it later" concept is that historical data may not exist, modeling may not be sufficient, and the PM may still decide to accept these performance risks.

Many of today's programs lack adequate early DT performance testing. Because of this, measures of effectiveness and performance are not normally available until the later phases of DT. The key to a well-developed DT program is determining the relevance of the DT being conducted and how well it correlates with the eventual operational issues.

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Is simulation a help or hindrance? Many simulation projects are so complex they should be a development in themselves. Are we underestimating the risks and costs? How has simulation contributed?

A

When simulation is viewed as just another tool in the T&E process and not a replacement for dedicated testing, it has great value. Some of the areas simulation has made a significant contribution are in developing users' needs, human factors data, designing meaningful tests, and in complementing tests in a high-cost test environment.

Some program managers have exhibited a desire to incorporate simulation into today's testing at the expense of common sense. The greater danger lies in trying to substitute simulation for testing in areas that lack historic data or have high risk associated with uncertainty in the technology.

To be properly employed, simulation plans must be able to answer these simple questions: Is the simulation mature? Is it validated and verified? If so, what information will it provide? How do I incorporate the results into my program? What risks are associated with the simulation approach?

Some simulation projects should be treated as a weapon system for purposes of OSD oversight. JMASS [Joint Modeling and Simulation System] is a good example. The models and simulations take on a life of their own, and every output becomes gospel unless they are independently looked at to see if they do represent reality.

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Commercial-Off-The-Shelf (COTS) – How do we resolve the challenge of the operational requirements without modifying the COTS product?

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First we need to recall the words of a wise, former USD(A) [Under Secretary of Defense for Acquisition]. "It's like buying a car; if the option you want is provided by the manufacturer, it's still COTS. However, if you have to go to the speed shop to get your required performance, it's not a COTS product." Given the USD(A)'s description of COTS, the following is offered.

Operational requirements can be satisfied in a number of ways: change in doctrine; change in training, techniques, and procedures [TTP]; and a change in equipment. The plan for use of a COTS product should carefully consider all three of these elements when addressing the capability to meet the operational requirements. Adjustments to TTP may allow a COTS product to meet requirements as a part of an integrated system of systems. However, whenever COTS products are being considered as an equipment replacement, or to meet an existing requirement, then COTS should receive the same scrutiny and oversight as a product undergoing development. The operational requirement does not change and should not be lessened just to accept a COTS product.

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Computers. How many of the new system reliability issues are due to the dimension of difficulty introduced by computers and our reliance upon them?

A

Systems are becoming more and more dependent on embedded processors and integrated computers. The sensor fusion requirements of many modern systems create a very difficult fault isolation problem. Embedded instrumentation and proper diagnostic capabilities are required. The largest challenge is in the systems integrating software. Hardware issues are more readily defined and resolved due to a lower set of variables. Software-intensive systems have been a major cost driver in most DoD programs experiencing cost overruns.

A potential solution is to ensure through Hardware In the Loop [HWIL] and sim-

ulation that the system software is stable and mature enough to proceed to the next milestone. Simulating the most demanding item of throughput, e.g., the Terrain Following/Terrain Avoidance radar in an HWIL simulation only postpones later surprises. Simulating equipment not available for the HWIL is a high-risk approach as too many programs have demonstrated previously.

Q

What is setting T&E back? What are the issues? Where can the greatest gains be made, and how?

A

The lack of adequate resources (funding and staffing) and commitment from senior leadership in the Federal Government. Inadequate resources limit the program's ability to do full-up, realistic, and robust system tests to determine the operational worth of a system. The government's test and evaluation expertise has declined to a point that some test agencies have only a caretaker level of capability. The cessation of the Cold War has created a false sense of security among Congress and our federal leadership to the point that there are few champions for ensuring the user has modern, well-tested, and effective equipment.

While the "we care" rhetoric is strong, the resource allocation and established priorities tell a very different story. The fall back on M&S has also provided a false sense of effective testing and a quick and less expensive way to say a system is effective and suitable.

The first sign of support for fielding more effective systems will be test agency staff increases, followed by more funding to reestablish OTA [Operational Test Agency] independence. How independent is an OTA when all their test support funding comes from the PM being evaluated?

Q

What impact has acquisition streamlining had on T&E readiness?

A

There is strong agreement amongst those supporting DoD test agencies that acquisition streamlining has had a very negative impact on T&E. With emphasis on speeding up the acquisition process, there has been a significant decline in well-documented testing and government oversight and analysis. The concept of speeding up the acquisition process is laudable, but not at the expense of test readiness and conduct. Delayed or late discovery of technical issues always impacts schedule and cost, often resulting in significant cost growth, schedule slippage, and delayed fielding.

Q

Does combined DT/OT cause a rush to failure? DT was previously accepted as a learning phase of development, whereas OT shortcomings were always viewed as failures. Can the two T&E events be combined without minimizing the DT scope?

A

DT should be a separate set of tests to look at technical compliance and technical issues to determine engineering readiness. Having OT involved in the DT testing is OK, but only as long as the results are not misinterpreted and used to wrongfully characterize a system before it is ready for OT testing. OT should be allowed to participate and pull data from the DT phase of testing, but clearly, only as long as the results are interpreted correctly. In those instances where the test is listed as a DT/OT event, often the focus shifts from test learning to test success, with parameters of the test adjusted as much as possible.

The two events could be combined if the tests are allowed to naturally merge into "smart" testing — smart meaning we are scheduling the events on the basis of program maturity, our required confirmation of capabilities, and not the DAB [Defense Acquisition Board] schedule.

Q

Does OT ignore DT findings? Is RAM [Reliability Assessment and Monitoring] stressed enough in DT and OT?

A

Staff officers responsible for OT oversight of a program in DT have relied heavily on the test findings. The key is in the use of available data. Results and supporting data from a DT test must be studied to ensure they are accurate and can support the correct interpretations for operational effectiveness.

RAM is not stressed enough in any testing, and due to the limited exposure the equipment has in OT under realistic operational conditions, will continue to present a higher program risk. Most reliability growth curves reflect desired readiness levels well after fielding. In a number of instances, the lack of system reliability has adversely impacted the fields' O&M [Operations and Maintenance] account, e.g., Apache and Apache Longbow.

Our current contracting process needs to be modernized to reward product developers who meet the reliability growth requirements and force those who don't to share the expense of developing higher component reliability.

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How can the gap be closed in the variance between system specifications, the TEMP [Test and Evaluation Master Plan] and ORD [Operational Requirements Document]?

A

The requirements must be developed from an operational perspective and then interpreted into believable, realistic specifications; in effect, reverse engineer the MAORs [Minimum Acceptable Operational Requirements]. The ORD should drive the whole process from the beginning; the TEMP lays out the test planning to meet the requirements derived from the ORD; and the system specifications are a true reflection of users' operational needs interpreted to systems' technical needs or specifications. The critical technical characteristics must therefore be relevant to, and have a high degree of correlation with, the operational requirements, while providing early insight for required performance.

Editor's Note: Stoddart welcomes questions or comments on this article. Contact him at **jstoddart@oshtruck.com.**