

IS “FLY BEFORE YOU BUY” OBSOLETE?

The Need for Rapid but Disciplined Acquisition

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Operational test and evaluation has historically been based on an acquisition and discipline methodology known as “Fly Before You Buy.” Many years of difficult lessons learned and a need for discipline and structure led to organizing the acquisition process into a series of phases and milestone decisions.

Recent efforts to economize acquisition led to reevaluating this structure and the role of operational testing. Any reform effort, however, must not lose sight of disciplining the acquisition process through sound management, informed decision making and planning, as well as thorough test and evaluation.

Where We Stand Now

Many forces are driving us to speed the pace of acquisition reform—forces ranging from the highest levels in the Department of Defense to selected commanders in chief throughout the Services. Fortunately, systems now in development promise a dramatic military advantage. Further, some of the



The Navy Tactical Command System Afloat (NTCS(A)) terminal aboard the USS Kittyhawk (CV63).

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new systems are cheaper than systems they will replace.

Because of the rapid rate of technological advances and the need to economize, rapid acquisition is an

absolute requirement. The problem arises when the drive for speed bulldozes aside many of our acquisition discipline measures. Thus, we need *rapid* acquisition, but we also need *disciplined* acquisition.

Problems resulting from acquisition with inadequate discipline may be the loss of important programs, schedule slips, scandal, and systems that are ineffective and insupportable in the field. Initially acquisition planners tailored "Fly Before You Buy" to hardware-intensive systems that DoD developed to meet military needs—systems for which there were no equivalents in the commercial sector.

Now, many of our systems are software-intensive, and many of the



U.S. Navy photo

military's needs can be met in the commercial sector. The challenge is to impose the right new discipline on the acquisition of software-intensive systems without slowing or derailing efforts to reform and streamline.

Initially, the latest round of acquisition reform aimed at dramatic change. When that proved too hard, thinking focused on how to speed programs along by streamlining the processes prescribed by current law. To date, acquisition streamlining manifests the following principal characteristics:

- Considerable reliance on non-developmental items/commercial off-the-shelf (NDI/COTS) technologies.
- Advanced Concept Technology Demonstrators (ACTD).
- Deletion of the military specification library.
- Bypassing many of the old constraints that slowed but also disciplined acquisition.

Is Streamlining the Wave of the Future, or Are We Already Behind?

Acquisition reform and streamlining can improve many acquisition-related areas and current acquisition practices. Although ACTDs are still progressing from policy pronouncements to programs, many areas in the acquisition business are already streamlined from the operational tester's point of view. The Navy Tactical Command System Afloat (NTCS(A)) and the F-14D are examples of programs where new acquisition practices rendered our old discipline and our old operational test and evaluation philosophy obsolete.

Navy Tactical Command System Afloat

Recently, the Navy's Operational Test and Evaluation Force (OPTEVFOR) completed an operational evaluation (OPEVAL) on NTCS(A). The NTCS(A) is the Navy's primary command, control, communications and intelligence (C³I) system. The system receives, processes and displays an integrated fusion of

organic and inorganic tactical, surveillance and intelligence data, providing the afloat fleet commander with information necessary to direct the battle force.

Composed predominantly of COTS computers, the system resides in a distributed local area network throughout the command and control spaces. In an OPEVAL, OPTEVFOR examines the operational effectiveness and suitability of a system and makes a recommendation about introducing the system to the fleet. At the time of OPEVAL, the Navy maintained two versions of hardware and two of software on over 200 ships. Thus, a recommendation regarding fleet introduction was meaningless, and OPEVAL was too late to perform any kind of acquisition discipline or even to serve a quality assurance function.

F-14D

On the F-14D program, the Navy's purchase of the aircraft is complete, and two squadrons already completed their first deployment to the Indian Ocean and Persian Gulf. Yet, we still haven't started the phase of testing that should have released the funding for production. Our old testing paradigm said we could not conduct an operational test until all key systems were available to support a full system test. We have the F-14D, but we do not have four important subsystems, and thus have not gone to test.

Acquisition managers encountered significant delays with the subsystems, and since the F-14D has significant advantages over the older models, procurement authorities made the decision to field the aircraft. And although we made the decision to field the aircraft, our old philosophy said we should not go to test until all the subsystems were available.

Fielding a system like this, however, without complete testing, poses problems for fleet operators of the F-14D and for fleet commanders interested in the true state of their force



U.S. Navy photo

U.S. Navy F-14Ds fly in formation.

readiness. Fleet operators depend on the operational testers to generate initial tactical manuals and users' guides. The guides were an important and natural by-product of the discipline measures imposed on the old acquisition process.

Obtained from the results of disciplined testing on unique ranges where actual threat conditions are replicated, the guides are of considerable value. Measurement of system performance on these ranges is also important in assessing readiness. Here, readiness means a war-winning readiness—not (as commonly used) a measure of preparedness to go to war.

In situations like this, where a major system is ready for operational testing but some key subsystems are not, one solution could be a revision to the system requirements. Two reasons underlie the difficulty of this solution: (1) the extremely slow process of updating key program documents such as the Operational Requirements Document; and (2) our acquisition philosophy of "Fly Before You Buy."

Program managers typically find considerable resistance to do anything that looks like downscaling requirements. This resistance resulted from a key feature of the "Fly Before

You Buy" philosophy—a total absence of trust between the two sides of the acquisition process. The operational testers, DoD acquisition oversight agencies and the Congress were on one side; program managers, contractors and sponsors were on the other. This mistrust led to the impression that attempts to downscale requirements were dishonest activities by merchants who could not deliver what they promised.

Currently, "Fly Before You Buy" Doesn't Work With Streamlined Acquisition

Within the last several years, some DoD personnel began to appreciate the fact that the pace of advancing technology in the civilian sector, especially in communications and computers, had outstripped the capability of DoD acquisition processes to keep pace. The same personnel also believed acquisition strategies that could keep pace with the rate of technology advances were incompatible with our older, slower acquisition philosophy, "Fly Before You Buy."

As acquisition planners developed faster acquisition processes, they pushed the old discipline measures aside because these measures made acquisition too slow. Therein lies the real problem with streamlining to this

point. The old discipline measures were pushed aside, and no new discipline measures, compatible with streamlining, are in place.

Not all would agree that the "Fly Before You Buy" idea is outdated. Also, the concept probably means different things to different people. Usually, "Fly Before You Buy" includes the following principal characteristics:

- Many discipline measures that make up the philosophy were put in place because of lack of trust.
- Requirements, once approved, are viewed as "chiseled in stone."
- Full-rate production decisions are based on OPEVAL results.
- Only limited-rate initial production items can be acquired prior to OPEVAL.
- Test and evaluation events are driven strictly by program forces.
- Program documents are approved through a slow, laborious serial process.
- Systems are fielded only after demonstrating performance sufficient to pass mature thresholds.
- Most operational testing is quality assurance at the end of a development process.

Prior to declaring "Fly Before You Buy" obsolete, the kinds of weapons systems to be acquired in the future should be considered. In general, three categories can be defined: weapons; command, control, communications and intelligence (C³I) systems; and information systems. Currently, many systems in all three categories are software-intensive, posing special test and evaluation problems. The acquisition strategy and the discipline (including testing) philosophy should be matched to the specific program, depending on its category.

Two Processes That Do Work

Before considering new acquisition discipline measures, let's look at some acquisition processes that are working well. The first is the software development process in effect at the Weapon System Support Activities (WSSA) at China Lake and Pt. Mugu, California. These facilities develop software for the mission computers of tactical jet aircraft.

The development process consists of a module-by-module build. The laboratory assembles and tests the first module. Laboratory personnel then play the module on a Hardware in the Loop (HIL) facility where developmental and operational test pilots evaluate the module's performance. After module one performs satisfactorily, these same personnel add module two to module one, and again test in the lab and HIL facility.

This disciplined module-by-module process (build, test, fix, build, etc.) continues until the entire package of software plays satisfactorily on the HIL facility. Laboratory personnel then release the software for developmental test (DT) flight. After fixing DT deficiencies, they release the software for operational test (OT) flight and also to the fleet for training. This achieves two benefits over our previous test philosophy: an expanded database from which to evaluate the software's performance, and the fleet starts training early with new software.

Over the years, acquisition planners at the WSSAs developed confidence in the software development process, resulting in the simultaneous release of the software for both training and OT. In years past, when confidence in the development process declined, each new set of software required an OPEVAL prior to any release to the fleet.

During a visit to the UNISYS plant in Plymouth, Michigan, OPTEVFOR examined a second developmental process to gain insight into how in-

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dustry imposes discipline on its commercial product development. The UNISYS Corporation's main product line is machines to automatically read and process checks. Interestingly, UNISYS managers reported that the biggest problem for engineers and manufacturing personnel was in understanding the requirements. At this plant, the company brings the customer in at the start of a program, and the requirements are written. The engineers then immediately set to work to develop a prototype for the specific purpose of refining the requirements.

On most of their programs, the requirements are refined based on what they learn from the prototype about technical problems and cost/performance tradeoffs. Other disci-

pline measures at UNISYS consist of disciplined development of complex software packages, similar to the process used by the WSSAs, and early testing to find and fix problems as early and cheaply as possible.

Maintaining a High Level of Readiness is the Fundamental Goal

At times, acquisition can seem like an end unto itself. But acquisition does play on a larger field. For the Navy, the larger field is the Navy and Marine Corps strategic vision, "From the Sea." A singularly important aspect of "From the Sea" is that the Navy and Marine Corps must be able to fight unaided for the first two to three weeks of the next conflict. This means that the Navy's deployed forces must be at a high level of readiness and able to quickly transition from presence to combat operations. For readiness to be high, acquisition processes must work faster and more cheaply because of the following:

- Budgets were reduced.
- Technology is advancing rapidly in many areas, especially in C³I and other software-intensive systems. Many systems in these areas are important because they provide a combat effectiveness multiplier effect.
- The weapons technology available to the U.S. military, in some key areas, lags the technology of other countries.

As stated earlier, some streamlined acquisition processes are already devised. With the signing of the Federal Acquisition Streamlining Act of 1994, others will surely follow. No new discipline measures are in place, and some forces are working counter to discipline.

Many in the fleet, aware of available technology, call for high-technology systems faster. Battle group commanders call for command and control systems tailored to their indi-

vidual preferences. Occasionally, our acquisition process responded too readily, and with inadequate concern for discipline, to these calls from the fleet. As a result, we deployed some systems that were not thoroughly tested. Moreover, we have deployed carrier battle groups with immature command and control systems that require two months of grooming before the systems are fully functional after the start of a deployment.

Discipline is Essential to Readiness

Discipline in the acquisition process is exceedingly important. Without discipline we are in danger of losing credibility, and we endanger readiness. If we lose credibility with the oversight agencies and with the Congress, acquisition funding can be lost. We could also lose the gains made by streamlining to this point. Untested systems in the fleet and immature command and control systems reduce our readiness. The threat here is that acquisition with inadequate discipline can put us in a position where we can't deliver on our promises in "From the Sea."

Characteristics of a faster, disciplined acquisition process should reflect the following actions:

- Develop a less rigid, more sensible requirement-setting process. Requirements should iterate, and requirements refining processes (like the UNISYS model) should be used, where appropriate. For NDI/COTS acquisitions, the process of establishing requirements should follow these steps: the appropriate parties agree to the list of test parameters to be measured; then establish thresholds, if possible; establish goals where thresholds are not possible; and, if goals are not possible, then test and compare the results to existing system performance.
- Test early (including OT) to reduce risk and to prove the product using models, simulators and HIL facilities.

Acquisition with inadequate discipline can lead to loss of credibility that could result in loss of funding and loss of the gains made by streamlining.

- Use OPEVAL as a final proof-of-the-product test, but also as a proof-of-the-process test for software developers.
- Field new systems when they mature to the point where they exceed existing capabilities and are supportable. Then expand on system capability with hardware and software upgrades (evolutionary acquisition).
- Conduct OT prior to fielding using sensible thresholds.
- Develop and use software metrics.
- Test cheaply by doing more concurrent DT and OT. Work to do nonintrusive OT concurrently with fleet training.
- Speed the approval process of key acquisition documents by using concurrent review and approval, and electronic document transmission.

Summary

There is a direct link in "From the Sea," to readiness, to acquisition. "From the Sea" demands high readi-

ness and streamlined, disciplined acquisition. Because no such system was available in the commercial sector, we tailored "Fly Before You Buy," our traditional acquisition discipline methodology, to hardware-intensive systems requiring a dedicated development effort.

Today, most systems are software-intensive, and the commercial sector has much to offer to satisfy military requirements. To take advantage of the products available commercially, to economize, and to speed acquisition, the DoD launched a program to streamline acquisition. Streamlining efforts to date shunted aside many of the acquisition discipline measures from the original "Fly Before You Buy" philosophy, and no new discipline measures, tailored to match streamlined acquisition, are in effect.

Acquisition with inadequate discipline can lead to loss of credibility that could result in loss of funding and loss of the gains made by streamlining. It can also negatively affect readiness and imperil our ability to deliver on our promises in "From the Sea."

In order to bring the "Fly Before You Buy" philosophy in line with today's environment, we should acknowledge that we need a DoD acquisition disciplining strategy encompassing the following areas: more early OT to reduce risk; more trust between oversight and program management; more innovative thinking to devise more economic testing through combined DT/OT; more use of models, simulations and hardware in the loop facilities; and a more sensible approach to requirements.

This new approach could be called "Fly Before You Buy, SC (Streamline Compatible)." This is not a radically new approach, but it does alter the characteristics of the basic philosophy to remove those aspects that accomplished discipline by needlessly stretching the time for acquisition.