DoD

Automatic Test Systems

Handbook

2004

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Acronyms

ACAT	Acquisition Category
AMB	ATS Management Board
ASN(RDA)	Assistant Secretary of the Navy (Research, Development and Acquisition)
ARI	ATS R&D IPT
ATE	Automatic Test Equipment
ATS	Automatic Test Systems
BSTF	Base Shop Test Facility
CTAVR	Commercial Tester Acquisition Validation Request
ED	Executive Director, Executive Directorate
IFTE	Integrated Family of Test Equipment
ILS	Integrated Logistics Support
IPT	Integrated Product Team
JTA	Joint Technical Architecture
LRU	Line Replaceable Unit
MDA	Milestone Decision Authority
OEM	Original Equipment Manufacturer
OIPT	Overarching Integrated Product Team
OSD	Office of Secretary of Defense
OUSD	Office of the Under Secretary of Defense
PEO	Program Executive Officer
PM	Program Manager
SRA	Shop Replaceable Assembly
SRU	Shop Replaceable Unit
SSM+	System Synthesis Model Plus
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
TPS	Test Program Set
UUT	Unit Under Test
WIPT	Weapons System Integrated Product Team
WRA	Weapons Replaceable Assembly
WRU	Weapons Replaceable Unit

1. Introduction

What is the Purpose of This Handbook?

This Handbook is written for the Program Manager who is unfamiliar with automatic testing of electronic systems and the acquisition process for automatic test systems. Its purpose is to provide, in a simplified, non-technical format, all the information needed to make educated decisions concerning off-system automatic testing of electronic components in the PM's weapon system.

How Do I Know If My Program Needs Automatic Testing?

Quick answer:

If the answer to any of the following questions is "Yes", this handbook will be of help to you:

Does your acquisition include any complex or expensive electronic components?
Does your acquisition involve the implementation of electronic diagnostics?
Does your acquisition have electronic components that have potentially high failure rates?
Do you need to acquire additional automatic test capability for new electronic components being added to your weapon system?
Has your existing electronic automatic test system become obsolete or costly to continue to use?

Longer answer:

As part of the Logistics Support Analysis process associated with a weapon system acquisition, the Integrated Logistics Support (ILS) manager will perform a series of analyses for each component in the weapon system. Among these analyses are a maintenance task analysis and a Level of Repair Analysis (LORA). As part of the maintenance task analysis, the ILS manager determines the range and depth of ILS resources required, including automatic test systems (ATSs). The LORA, which is an economic model, determines the appropriate economic level of maintenance to support the electronics.

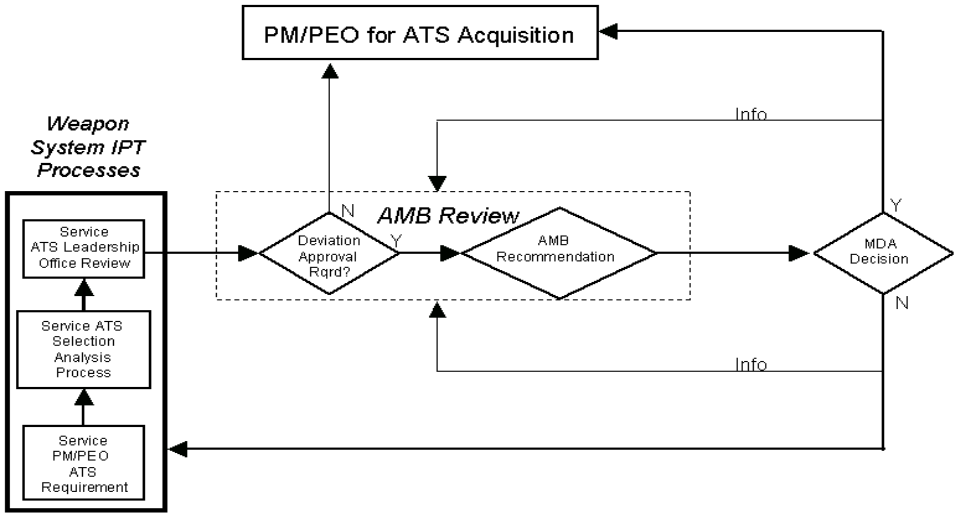
In a general sense, complex electronic components are expensive and inherently unreliable. Treating them as consumable items is usually not affordable, and using the Original Equipment Manufacturer (OEM) for remote depot support may not be practical or affordable. Establishing organic repair capability at some level of maintenance is usually necessary. When deployed, readiness requirements sometimes override affordability in support decisions.

The customary repair scenario is to

(1) test the failed item,
(2) fault isolate down to a part that can be replaced,
(3) remove/replace the failed part,
(4) re-test the item, and
(5) return the item to service.

In the early days of electronic system maintenance, a technician could troubleshoot and repair an electronic system using an analog volt-ohm meter, an oscilloscope and a soldering iron. Today's electronics are typically densely packed with high-speed digital multi-layer circuit boards that have many different failure modes. Manually testing all components and circuit paths in typical modern systems is virtually impossible. Computer-controlled automatic test equipment replaces the technician in performing the fault diagnosis phase of the repair cycle.

Who Approves My ATS Acquisition Strategy?



Simply put, the procedures agreed upon by the Service Acquisition Executives (see http://www.acq.osd.mil/ats/2004_Joint_ATS_MOA.pdf) provide that the PM and his/her Weapons Integrated Product Team (WIPT), with help from his/her Service's ATS Leadership Office, determine the ATS acquisition strategy appropriate for their program's needs. The information in this Handbook will help in determining the ATS acquisition strategy. If the ATS selection satisfies DoD ATS policy, the PM is free to conduct the acquisition (subject to typical milestone decision reviews by the PEO or the MDA). If the proposed ATS acquisition involves a deviation from the ATS policy, the ATS Management Board will review the acquisition and make a recommendation to the MDA who will either authorize the PM to initiate the acquisition or provide direction to the PM as appropriate.

2. Background

What is DoD Policy for Acquisition of ATS?

OSD's ATS policy (see http://www.acq.osd.mil/ats/atspolcy.htm) is:

"To minimize the life cycle cost of providing automatic test systems for weapon systems support at DoD field, depot, and manufacturing operations, and to promote joint service automatic test systems interoperability, Program Managers shall use approved DoD ATS Families as the preferred choice to satisfy automatic testing support requirements. Commercial-off-the-Shelf (COTS) solutions that comply with the DoD ATS Technical Architecture should only be used if the Milestone Decision Authority concurs that an approved DoD ATS Family will not satisfy the requirement. Automatic Test System selection shall be based on a cost and benefit analysis over the system life cycle."

The intent is to define an acquisition environment that makes DoD the smartest, most responsive buyer to meet our warfighters' needs while reducing the total cost of ownership. This will be accomplished through the use of ATS Families as the preferred choice to satisfy automatic testing support requirements. OSD has designated the following DoD ATS Families:

- Consolidated Automated Support System (CASS) - Navy
- Integrated Family of Test Equipment (IFTE) - Army
- Marine Corps Automatic Test System (MCATES) – USMC ground
- Joint Service Electronic Combat Systems Tester (JSECST) – USAF/Navy

Basically, the policy says to minimize the introduction of unique types of automatic test equipment by using DoD Designated ATS Families (preferred) or use commercial components that meet certain technical criteria (as discussed later in this Handbook). ATS selections are to be cost beneficial to DoD (not necessarily what is best for the individual project or Service) over the life cycle. When new systems are developed, an open system approach shall be followed.

OSD intends for ATS to be managed as a commodity within DoD. To implement the required management structure for this commodity area, DoD has established a DoD Executive Director for ATS whose job is to provide central coordination among the Services, monitor ATS acquisitions, and conduct ATS planning on behalf of OSD. The principal goals of the ATS ED are to:

- Reduce the cost of ownership of DoD ATS
- Provide greater warfighting flexibility with interoperable ATS functions
- Reduce logistics footprint
- Improve diagnostics capabilities

The Deputy Assistant Secretary of the Navy, Logistics (DASN(L)) was assigned the role of DoD ATS ED and in turn assigned NAVAIRSYSCOM PMA-260 as the DoD ATS

Executive Directorate to provide the day-to-day support, management and coordination needed. The DoD ATS ED has established several Integrated Product Teams as well as an O-6 level Joint Services advisory group called the ATS Management Board (AMB) to provide the necessary inter-Service coordination. The AMB is lead by the ATS Executive Directorate and is comprised of ATS representatives from the Army (AMSMI-TMDE-MP), Air Force (WRALC/LEAA), Marine Corps (MARCORSYSCOM PM-161, PM-TMDE), and Navy (NAVAIR PMA-260).

Exactly What Authority Do I Have?

DoD ATS policy does not diminish the PM's responsibilities or change established acquisition processes or authority. Rather, it provides a framework in which to satisfy system support ATS needs. If you have a compelling reason for acquiring an ATS that does not comply with DoD policy, your Milestone Decision Authority (MDA) has the authority to approve the acquisition.

Where Can I Find Out More?

Check the ATS ED's web site

The ATS Executive Directorate maintains a web site with background, relevant documents and links to Service ATS Leadership Offices. The address is http://www.acq.osd.mil/ats. Available at this web site are guides such as the DoD ATS Master Plan and the DoD ATS Selection Process Guide, as well as many other ATS-related documents.

Ask Your Service ATS Leadership Office

The Program Manager's primary source of information relative to automatic testing is his/her Service's ATS Leadership Office, but the DoD ATS ED staff is always available to answer questions and to help in any way possible. The first step in any potential ATS acquisition is to contact your Service's ATS Leadership Office. Appendix 1 lists names and addresses for the appropriate points of contact.

OSD AT&L Knowledge Sharing System

An excellent source of information is the AT&L Knowledge Sharing System (http://akss.dau.mil/jsp/default.jsp), an acquisition reference tool hosted by the Defense Acquisition University that provides DoD acquisition information for all Services across all functional disciplines. In addition to being a database of information relevant to the acquisition process, it also contains an extensive reference library that includes key acquisition documents such as DoDI 5000.1, DoD 5000.2R, the Federal Acquisition Regulation (FAR), and a multitude of Service-specific acquisition documents. It provides an easy-to-use information retrieval system and real-time access to the most current acquisition information.

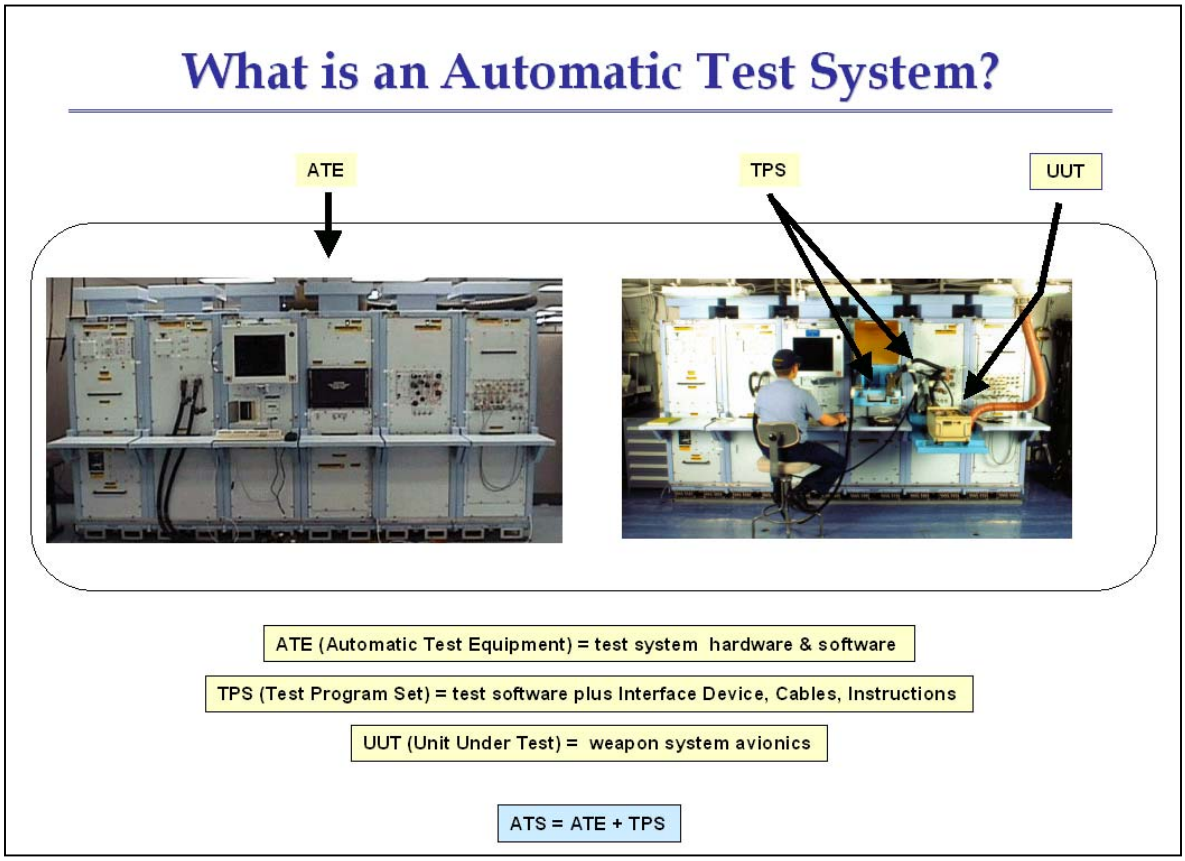
The AKSS contains many items of interest to a PM considering development of a commercial ATS. Specifically, document worth reading is “Buying Commercial and Non-Developmental Items: A Handbook" (available at http://www.dsp.dla.mil/documents/sd-2/default.htm)

3. Definitions

What is an Automatic Test System?

Automatic Test Systems are used to identify failed components, adjust components to meet specifications, and assure that an item is ready for issue.

An Automatic Test System (ATS) includes Automatic Test Equipment (ATE) hardware and its operating software, Test Program Sets (TPSs), which include the hardware, software and documentation required to interface with and test individual weapon system component items, and associated TPS software development tools. The term "ATS" also includes on-system automatic diagnostics and testing.



What is Automatic Test Equipment?

The term ATE refers to the test hardware and its own operating system software. The hardware itself may be as small as a man-portable suitcase or it may consist of six or more racks of equipment weighing over 2,000 pounds. ATE is often ruggedized

commercial equipment for use aboard ships or in mobile front-line vans. ATE used at fixed, non-hostile environments such as depots or factories may consist purely of commercial off-the-shelf equipment.

The heart of the ATE is the computer which is used to control complex test instruments such as digital voltmeters, waveform analyzers, signal generators, and switching assemblies. This equipment operates under control of test software to provide a stimulus to a particular circuit or component in the unit under test (UUT), and then measure the response at various pins, ports or connections to determine if the UUT has performed to its specifications.

The ATE has its own operating system which performs housekeeping duties such as self-test, self-calibration, tracking preventative maintenance requirements, test procedure sequencing, and storage and retrieval of digital technical manuals.

ATE is typically very flexible in its ability to test different kinds of electronics. It can be configured to test both black boxes (called either Line Replaceable Units (LRUs) or Weapons Replaceable Assemblies (WRAs)) and circuit cards (called either Shop Replaceable Units (SRUs) or Shop Replaceable Assemblies (SRAs)).

ATE is also used to test All-Up-Round weapons and weapon sections.

What is a Test Program Set?

A Test Program Set typically consists of

- test program software
- hardware, including interface devices, holding fixtures and cables
- documentation

The computer in the ATE executes the test software, which usually is written in a standard language such as ATLAS, C or Ada. The stimulus and measurement instruments in the ATE have the ability to respond as directed by the computer. They send signals where needed and take measurements at the appropriate points. The test software then analyzes the results of the measurements and determines the probable cause of failure. It displays to the technician the component to remove and replace.

Developing the test software requires a series of tools collectively referred to as the TPS software development environment. These include ATE and Unit Under Test (UUT) simulators, ATE and UUT description languages, and programming tools such as compilers.

Since each UUT likely has different connections and input/output ports, interfacing the UUT to the ATE normally requires an interface device (ID) which physically connects the UUT to the ATE and routes signals from the various points in the ATE to the appropriate I/O pins in the UUT.

An objective of the ATE designer is to maximize the capability inherent in the ATE itself so that IDs remain passive and serve to only route signals to/from the UUT. However, since it is impossible to design ATE which can cover 100% of the range of test requirements, IDs sometimes contain active components which condition signals as they travel to and from the ATE. The more capable the ATE, the less complex the IDs must be. An ATE with only scant general capability leads to large, complex and expensive IDs. Some IDs contain complex equipment such as pneumatic and motion sources, optical collimators, and heating and cooling equipment.

Wherever possible, test programs are bundled into groups of UUTs which use one ID. These are called Operational Test Program Sets (OTPS). A typical ATS acquisition might include 100 SRAs/SRUs in 15 OTPSs. Due to their complexity, WRAs/LRUs almost always have a unique ID and therefore are not included in an OTPS.

What Are Open Systems and How Do They Apply to ATS?

An open system is based on widely-used and commonly-accepted interface specifications as opposed to narrow Military Specifications or proprietary designs. The typical personal computer is an excellent example of an open system. While the motherboard may be proprietary to the designer, the integrator of the system can choose from a wide range of sources for other required interface devices such as the hard drive, memory, serial and parallel ports, modem, keyboards, and monitors. This is because the PC industry standardizes at the interface level instead of at the hardware level, leaving the integrator free to choose system components that satisfy his/her cost, reliability and performance requirements.

Similarly, an ATS open system uses the same strategy (defining requirements at the interface) which results in a wide range of benefits including:

- optimizing use of available commercial hardware and software to hold down costs,
- encouraging competition,
- providing flexibility in terms of hardware expandability and software interchangeability with no penalty to system requirements, and
- facilitating the future rehost and interoperability of TPSs.

An open systems approach to ATS design then is a business and engineering strategy to choose commercially supported specifications and standards for selected system interfaces (logical and physical), products, practices, and tools.

An open systems approach provides a foundation for lower life cycle costs and improved systems performance through the use of standards-based architectures and greater access to commercial electronics technology, products and processes. A framework for open systems implementation is achieved by addressing the key considerations of interfaces, architecture, risks and supportability.

OSD's Open Systems Joint Task Force (http://www.acq.osd.mil/osjtf/) has issued a guide (http://www.acq.osd.mil/osjtf/pdf/PMG_04.pdf) for implementing a Modular Open Systems Approach (MOSA) for use in all DoD acquisitions, including ATS. The five-step approach requires a modular design with the following characteristics:

1. functionally partitioned into discrete scalable, reusable modules consisting of isolated self-contained functional elements
2. rigorous use of disciplined definition of interface specifications
3. designed for ease of change to achieve technology transparency
4. makes use of commonly used industry standards for key interfaces

The DoD ATS ED has chartered the DoD Next Generation Test (NxTest) IPT to develop a standard ATS architecture framework based on a Modular Open Systems Approach. From this architecture, a PM will be able to derive a specific implementation for his/her automatic testing needs while gaining the advantages of using an open systems approach. The NxTest IPT has defined key ATS interfaces in terms of hardware, software and information frameworks, and as specifications for each of these key interfaces are approved, they are published by the DoD ATS ED and can be found at the DoD ATS ED Web Site.

How Does This Fit Into The DoD IT Standards Registry?

The Department of Defense Information Technology Standards Registry (DISR) defines the interfaces, standards (DISR elements), and standards profiles applicable to all DoD systems, including automatic test systems. The DISR replaced the Joint Technical Architecture.

Automatic test systems is a domain within the DISR Warfighting Service Area. The DISR has a specific set of mandated and emerging standards relative to automatic test systems. The DISR standards contain the interfaces, specifications and rules for use in defining an ATS built around commercial equipment that conforms to the open system architecture framework discussed above. For the latest information about the DISR, and to obtain the ATS-related standards, visit the DISR web site at http://disronline.disa.mil/VJTA/index.jsp.

4. Acquisition Processes and Procedures

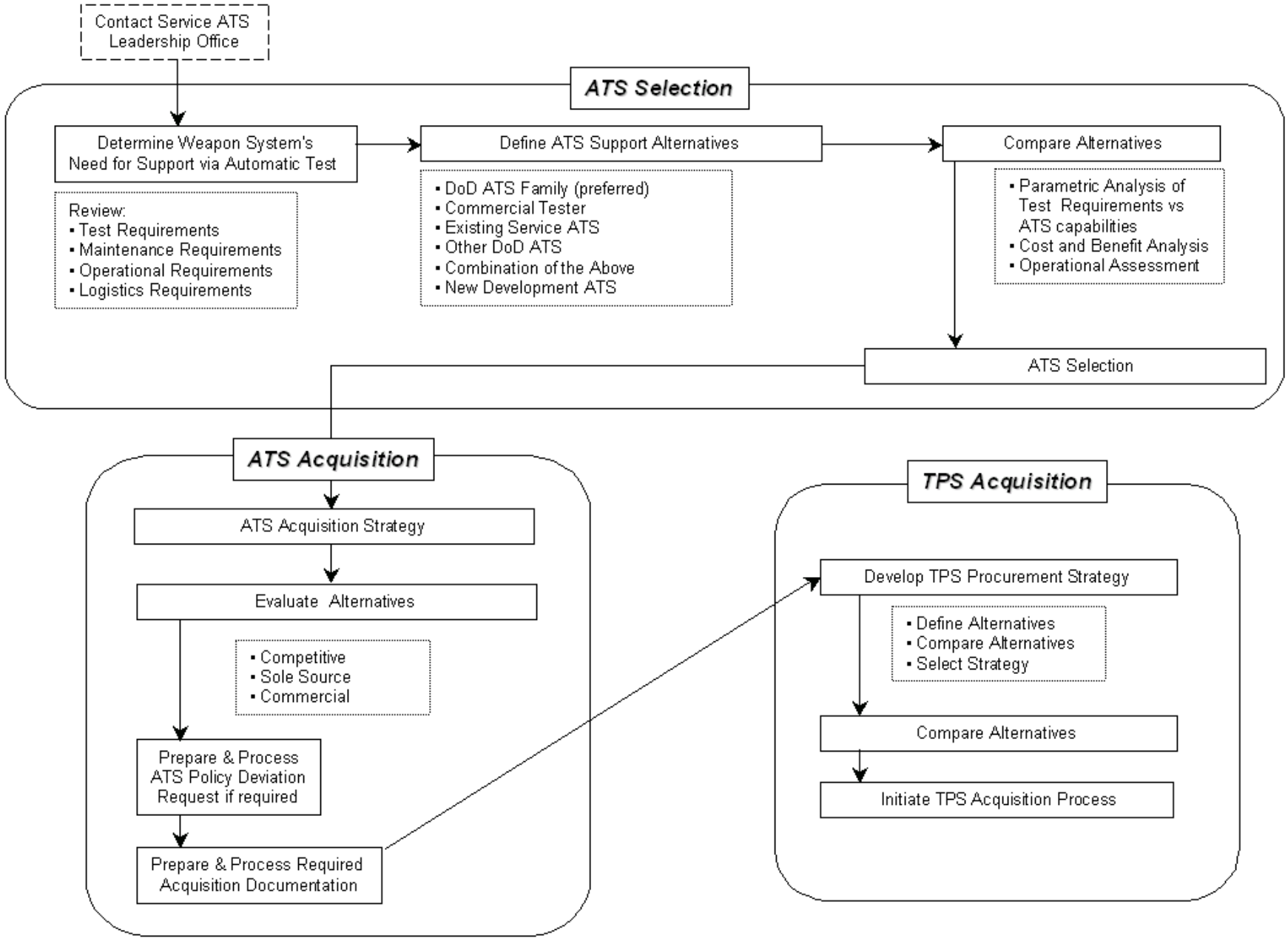
Overview of the Acquisition Process for Automatic Test Systems

The process for acquiring an ATS is similar to the process for acquiring a weapon system, except that there are specific requirements driven by the nature of the acquisition.

The PM's initial step is to contact the Service's ATS Leadership Office (Appendix 1) who will assist the PM as required at every step of the process, from initial requirements definition, through procurement and support of test program sets.

To satisfy weapon system testing requirements, there are normally at least two separate acquisitions: (1) the automatic test equipment and (2) the test program sets. Due to the highly specialized nature of these acquisitions, different vendors are typically used for each of these acquisitions, although occasionally the weapon system prime contractor may be contracted to manage and integrate the ATS and TPS acquisition.

A diagram depicting the ATS acquisition process is shown on the next page.



How Do I Know What ATS Support Alternatives I Have?

The PM's alternatives are determined mostly by the weapon system's test requirements. A technical data package is normally acquired with the weapon system. The parametric information contained in this package is used as an input to the ATS selection process.

Through your Service ATS Leadership Office, contact Sal Licci, the administrator of the System Synthesis Model Plus (SSM+), NAVAIR Lakehurst office (732 323-7734, e-mail: salvatore.licci@navy.mil). Representatives from this office will assist in compiling the necessary weapon system parametric technical information. Data such as frequencies, clock speeds, power requirements, busses, etc. are used as input to the System Synthesis Model Plus (SSM+) which compares system characteristics with the capabilities of DoD Family automatic test systems in order to determine the best match. The output of the SSM+ will provide the basis for selection of the appropriate ATS to satisfy weapon system testing needs.

The DoD ATS Selection Process Guide, available at the DoD ATS ED Web Site (http://www.acq.osd.mil/ats/selprogd.htm), provides detailed procedures and tools for the entire ATS selection process, along with a description of the SSM+, instructions for preparing the ATS cost and benefit analysis, and necessary forms. When steps in the Selection Process Guide are completed, the program will have a list of potential automatic testing solutions.

How Do I Develop a Solid Acquisition Strategy?

The PM's goal in selecting a support solution should be to minimize life cycle cost to the DoD. The implications of this statement are:

- All costs over the life of the acquisition must be considered, and
- The PM must think beyond his/her program and consider not what might be the cheapest or most expedient solution for his/her own program or service, but what is the best solution from the DoD perspective.

As discussed below, there is a range of support alternatives available for a weapon system support requirement:

DoD ATS Family

An ATS Family consists of ATSs that are interoperable and have the capability to support a variety of weapon system test requirements through flexible hardware and software architectures that permit addition or expansion of testing capability with minimal impact to the ATS logistics support profile, system software and TPSs.

The Army-managed Integrated Family of Test Equipment (IFTE), the Navy-managed Consolidated Automated Support System (CASS), the Air Force-managed Joint Service

Electronic Combat System Tester (JSECST), and the USMC-managed Marine Corps Automatic Test Station (MCATES) have been designated as DoD ATS Families. Further information on each of these ATS Families can be obtained from the points of contact listed in Appendix 1.

Selection of an ATS Family to satisfy automatic testing requirements is a preferred solution because of economies of scale, commonality of logistics support, low life cycle costs, low risk, existing infrastructure, ease of expansion, TPS transportability and operational flexibility.

The DoD ATS Families are:

- **Consolidated Automated Support System (CASS)** is the Navy standard ATE for support of electronic systems at ashore and afloat intermediate level maintenance activities and at Navy repair depots. The four basic CASS configurations are Hybrid; Radio Frequency; Communications, Navigation, and Identification (CNI); and Electro-Optical. The Reconfigurable Transportable CASS is man-portable to facilitate deployment in forward locations.

- **IFTE (Integrated Family of Test Equipment)** is the Army's standard ATE for support of all weapon systems. The IFTE family includes the Base Shop Test Facility, the Commercial Equivalent Equipment, and associated TPSs. IFTE provides a vertically integrated ATE capability for factory, depot, general support, direct support and intermediate levels of maintenance.

- The USMC's **Marine Corps Automatic Test Systems (MCATES)** is a DoD ATS Family with the Third Echelon Test Set (TETS), AN/USM-657, being the basic family member within MCATES. Designed to provide portable test capabilities on the forward edge of a battlefield area, the TETS test system consists of two compact, ruggedized chassis that can be mounted on the back of a HMMWV.

- **Joint Services Electronic Countermeasures System Tester (JSECST)** is a joint USAF-USN flight line electronic warfare systems tester which provides end-to-end functional testing capability to determine the status of electronic combat systems installed in or on operational aircraft. Capabilities include threat representative simulations and technique/signal response analysis.

Commercial ATS

Use of a commercial testers satisfies DoD's initiative to buy commercial whenever a DoD ATS Family will not satisfy the test requirement. However, since a commercial solution may involve introducing a unique new tester into the DoD inventory (and one of the OSD goals is to minimize introduction of unique ATSs), the proposed tester must be must be validated as policy compliant.

The commercial tester must meet defined critical interfaces and incorporate approved ATS interface specifications. Additionally, a description is required of any non-recurring efforts required to integrate components into the proposed test system and of any modifications that make the commercial end item unique to DoD. A simplified life cycle cost analysis must be prepared to demonstrate that the proposed commercial tester acquisition is the most cost effective solution.

The DoD ATS Selection Process Guide (http://www.acq.osd.mil/ats/selprogd.htm) provides the steps and form required to validate that a proposed commercial tester satisfies DoD policy requirements.

Other Testing Solutions

The PM may consider using an existing non-Family tester currently used by either his/her own Service or by another Service, or he may consider a combination of a DoD ATS Family member modified with commercial components. Potential advantages might include commonality of infrastructure, existing TPSs, and lower logistics costs. Again, the process in the DoD ATS Selection Process Guide will lead to a thorough analysis of this alternative solution.

New Design

Given the exhaustive capabilities inherent in the DoD ATS Families, as well as the significant costs of developing a new ATS, this option is obviously the last choice in the hierarchy of choices. However, if there is a compelling rationale for developing a new ATS, the MDA does have the authority to approve this option.

What is Unique About Contracting for an ATS?

Other than the fact that your ATS is an item of support equipment and not a weapon system, an ATS acquisition is basically just another acquisition. You will be buying some or all of the following items:

- The ATE
- Test Program Sets for the items to be tested on the ATS
  - Tools to be used by TPS developers
- Logistics support for the ATE
- Logistics support for the TPSs

DoD policy relevant to the use of specifications and standards is just as applicable to an ATS acquisition as it is to a weapon system acquisition.

If the ATS selection process yields a solution which requires design and development of a new or unique ATS, you will be faced with competing the acquisition (or justifying a sole source award) just as would be the case were this a weapon system acquisition. Expect to develop the standard acquisition documents which may include CBD announcements, Justification & Approvals, RFPs, Source Selection Plan, ILS

documentation, Technical Manual Contract Requirements, Test & Evaluation Master Plan, Environmental Compliance documentation, etc.

Depending on the scope of the Test Program Set acquisition involved and the availability of technical UUT data, competition normally produces a better product at a lower cost than simply awarding this work to the developer of the ATS or to the weapon system prime contractor.

Is there Anything Special About Acquiring Test Program Sets?

Yes, there are aspects to TPSs acquisition which are different from the typical hardware acquisition.

The need for a Test Program Set is determined by a support requirements analysis which determines whether or not a failed item should be repaired or discarded. The key elements are reliability of the unit and its cost. There is obviously no need to develop a test capability for a low cost item with a very high Mean Time Between Failure. Conversely, an expensive item which has a low MTBF will almost certainly require that a test and repair capability be implemented.

The ATS ED has chartered a Joint Service Test Program Set Standardization (TPSS) IPT to coordinate TPS development across the Services. This IPT developed and published MIL-PRF-32070 to serve as a guide to PMs acquiring TPSs. This document is available at http://www.acq.osd.mil/ats/mil_prf_32020.pdf.

There are two major challenges in a TPS development effort:

1. Obtaining the unit to be tested in the proper configuration. A typical problem encountered when developing test software for new or modified items is that the item's design changes until the very last minute, at which time users expect the TPS to be delivered. Test software development requires an item with a stable configuration and adequate lead-time to develop the software that matches it. Additionally, provisions must be made for repair of the unit when a failure occurs during the TPS development process.

2. Assembling the data needed by the TPS developer. This usually includes drawings and schematics, theory of operation, avionics prime item specifications, technical manuals, BIT data, test requirements documents, failure modes and effects report, and historical operational data.

The typical TPS procurement may have the following major milestones:

- Preliminary Design Review
- Critical Design Review
- Quarterly Program Reviews
- Test Readiness Review
- First Article Test

- TechEval
- Production Acceptance

The actual TPS development process ordinarily includes the following steps:

- Detailed test design
- Interface Device design
- Coding and compiling
- Integration
- Acceptance testing

Given the technical complexity of the TPS acquisition process, the PM's first step should be to contact the Service's ATS Leadership Office listed in Appendix 1 who will provide assistance and guidance throughout the entire acquisition.

Do I Have to Do a Test and Evaluation of My ATS?

DoD 5000.2-R requires a TEMP for ACAT I and IA programs, and other programs designated for OSD test and evaluation oversight. Although an ATS acquisition is normally well under the thresholds which would require that a TEMP be developed, sound program management of an acquisition of an ATS that is not already in Service elsewhere in DoD would include a Test and Evaluation program.

The objective of the T&E portion of the ATS acquisition is to ensure that the ATS is suitable for use in its intended environment and is logistically supportable.

An appropriately tailored TEMP should be developed to document the overall structure and objectives of the test and evaluation program. The TEMP will provide a framework within which to generate detailed test and evaluation plans and it documents schedule and resource implications associated with the test and evaluation program.

The PM can charter an IPT to develop, manage and conduct the T&E of the ATS being acquired.

A sample TEMP outline suitable for an ATS acquisition can be obtained from the DoD ATS Executive Directorate.

Do You Have Any Tips on Controlling Costs?

Costs for ATS acquisitions are typically divided into "non-recurring" (development) and "recurring" (production), and support. Selecting a DoD ATS Family or a COTS ATS significantly reduces the potential for high development costs for the test equipment itself. Additionally, using a DoD ATS Family keeps production costs relatively lower due to the economies gained by ordering in larger quantities. COTS ATS offers the inherently lower production costs gained from buying off-the-shelf items. Similarly, life cycle logistics support costs are lower with a DoD ATS Family or a COTS ATS solution

for these same reasons.

The TPS usually is unique to each WRU/SRU being supported and may have relatively high development costs. It is not uncommon to see non-recurring TPS costs of several hundred thousand dollars up to $1M for a WRU TPS, depending on the complexity of the unit being tested. SRU TPS development can cost up to $100K. The cost impact to a program can be significant if a large number of units must be tested. The PM will obtain the most cost-effective results by forming an IPT to manage the TPS acquisition. It should include representation from his/her Service's ATS Leadership Office listed in Appendix 1.

Life-cycle costs of supporting the ATS and the associated TPSs can be significant. A logistics manager should be part of the PM's ATS acquisition team from inception, and part of his/her mission should be to ensure that life cycle cost drivers are identified, and that the system is designed to minimize life cycle costs.

Essentially, the single most important way to control ATS costs is by relying on the ATS acquisition experience available in your Service's ATS Leadership Office. The staffs in these offices have been involved in many ATS acquisitions, understand all the cost elements involved, and have experience in minimizing cost to the individual program. Some specific techniques that can be useful in keeping ATS costs down are:

- Buying equipment which is already in DoD inventory
- Buying commercial equipment that is truly off-the-shelf and needs no additional design and development work
- Not designing any new ATE
- Modifying existing test programs for use on similar or related UUTs
- Including several years of options in production contracts
- Minimize organic support infrastructure for the tester and test software
- Reduce cost of spares by planning to have support in place for the ATS when the equipment is fielded
- When buying a COTS ATE, accept the contractor's logistics recommendations with little or no "reinventing the wheel"
- Include in the production contract a clause specifying FAR 52.217-7 Option for Increased Quantity - Separately Priced Line Item. This will give you flexibility in case additional units need to be bought later on
- Negotiate a warranty with the ATE purchased
- Consider buying COTS ATE and TPSs off GSA schedule (some industry companies are now available through GSA schedule)

Appendix 1: Points of Contact

Service ATS Leadership Offices

U. S. Army

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