## Welcome to Management Processes

This lesson addresses various management processes used during the System Capability and Manufacturing Process Demonstration effort. The Life Cycle Logistician (LCL) must actively manage change and continuously refine the product support strategy to help ensure product performance.

**Popup Text**

**System Capability and Manufacturing Process Demonstration**

This effort is intended to demonstrate the ability of the system to operate in a useful way consistent with the approved KPPs [Key Performance Parameters] and that system production can be supported by demonstrated manufacturing processes. The program shall enter System Capability and Manufacturing Process Demonstration upon completion of the Post-CDR [Critical Design Review] Assessment and establishment of an initial product baseline. This effort shall end when the system meets approved requirements and is demonstrated in its intended environment using the selected production-representative article; manufacturing processes have been effectively demonstrated in a pilot line environment; industrial capabilities are reasonably available; and the system meets or exceeds exit criteria and Milestone C entrance requirements. Successful developmental test and evaluation (DT&E) to assess technical progress against critical technical parameters, early operational assessments, and, where proven capabilities exist, the use of modeling and simulation to demonstrate system/system-of-systems integration are critical during this effort. T&E should be used to assess improvements to mission capability and operational support based on user needs and should be reported in terms of operational significance to the user. The completion of this phase is dependent on a decision by the MDA [Milestone Decision Authority] to commit to the program at Milestone C or a decision to end this effort. (Source: DoDI 5000.02, Encl 2, para 6.c.(6)(d))

## Objectives

Upon completion of this lesson, you will be able to:

- Identify areas that may require the LCL to refine/change the product support strategy.
- Identify the characteristics of each support element in the product support strategy portion of the Acquisition Strategy.
- Identify the major logistic test points in the Test and Evaluation Master Plan (TEMP).
- Recognize the steps in refining the logistics test points in the TEMP.

## Demonstrating Operational Utility

During the System Capability and Manufacturing Process Demonstration effort, the operational utility of the system is demonstrated to ensure that the system will be able to meet its performance requirements in its intended operational environment. This is done through engineering demonstration models, system level developmental testing and evaluation, and operational assessments.

The LCL provides input related to supportability for these demonstration efforts and actively monitors the results to stay current with the design demonstrated in this phase of the life cycle.

**Demonstrating Operational Utility, Cont.**

There are three main areas that may significantly impact product support and necessitate refinements and/or changes to the product support strategy. Select each area to read the details.

- Estimates
- Performance
- Requirements

**Popup Text**

**Estimates**

The initial estimates of the inherent reliability and maintainability of a weapon system may change. The LCL should always be aware of this fact throughout the program life cycle.

**Performance**

The demonstrated performance of supportability enablers may be sub-standard. Examples of enablers are: weapon system information systems, diagnostics and prognostics, training aids to include simulators, maintenance aids to include technical information, the implementation of the unique identification of items, and supply chain management structures and processes.

**Requirements**

The warfighter's support performance requirements may evolve due to changes in military strategy, tactics, and/or budgets.

## Approach to Product Support

Below are key components of this section. Select each to read a description.

- Overview
- Performance Based Agreements
- PSI
- Requirements

**Popup Text**

**Overview**

The approach to implementing a Performance Based Life Cycle Product Support (i.e., Performance Based Logistics (PBL)) strategy is further detailed based on the demonstrated inherent supportability of the system and the results of the business case analysis that assesses various options for PBL implementation. The roles and responsibilities of both Government and Industry organizations are also specifically defined.

**Performance Based Agreements (PBA)**

The LCL leads the effort to develop the PBAs between the program office and the warfighting customer operational commands. The initial product support strategy is then refined to ensure that the warfighter's performance requirements will be met in an effective and affordable fashion. Through this collaboration, it is important to build warfighter confidence in the product support strategy by presenting results demonstrated to date.

For example, if built-in diagnostics have been demonstrated to have a high level of reliability, then the warfighting community may be more confident in a strategy that reduces the organizational level of maintenance manpower.

**Product Support Integrator (PSI)**

The product support strategy should also define the approach for the assignment of the PSI role. The justification and rationale for the selection of the PSI should be detailed. For example, if the original equipment manufacturer (OEM) is selected to serve as the PSI, then the benefits of synergy between these two roles can be demonstrated.

**Requirements**

It is also important to recognize that the approach to product support not only must be responsive to the

warfighter's support requirements as defined today, but also adaptable and flexible to accommodate changes in requirements, evolving system requirements, and changes to the government and industry organizations that are participants in the product support enterprise.

## Approach to Product Support - Consideration of Product Support Elements

Below are several product support elements the LCL should include in the demonstration of product support capabilities. Select each to read a description.

| Information System | Integrated Digital Environment (IDE) | Configuration Management (CM) | Product Support Planning | Product Support Resources | Training |
|---|---|---|---|---|---|

**Popup Text**

**Information System**

During the Support Capability and Manufacturing Process Demonstration effort, the information system that provides the weapon specific data—ranging from configuration data to the unique identification number of parts; to the reliability and maintainability estimates and actuals; to the operational information such as operating cycles—just to mention a few elements, must be demonstrated.

**Integrated Digital Environment (IDE)**

In order to leverage a knowledge based sustainment approach, it is also important to demonstrate that an IDE can be effectively implemented among the all activities and organizations providing product support.

**Configuration Management (CM)**

The process, roles and responsibilities for CM should be clearly defined in the product support approach. There needs to be complete alignment between the design, production, and support community to prevent fielding weapon systems that cannot be properly operated and/or maintained because the product support resources do not match the system configuration.

**Product Support Planning**

The process, roles and responsibilities for product support planning (to include sustainment engineering, reliability-centered maintenance/condition-based maintenance, software maintenance, and other maintenance planning) also needs to be specifically defined and, to the maximum extent possible, demonstrated during test and evaluation.

**Product Support Resources**

A key element in preparing for a Milestone C decision is clearly specifying the required product support resources to include manpower, facilities, test and support equipment, spare parts, training equipment,

etc. This information is essential to effective, programming, budgeting, acquisition, and delivery of the required product support resources when and where needed.

**Training**

The process, roles and responsibilities for training must also be defined. This should include operator, maintenance (all levels) and other support personnel training resources, such as information systems and training devices.

## Approach to Product Support - Consideration of Logistics Footprint

A key supportability performance parameter for most programs is logistics footprint. While design trade-offs can make certain assumptions about the resource requirements that will contribute to the logistics footprint, the demonstrated capability of the system design may prove some of those assumptions false. Thus, it is important that the LCL monitor and assess the potential growth of the logistics footprint.

The logistics footprint may be designed in, based on estimated logistics demand, but if inherent reliability and maintainability (R&M) is not achieved, the footprint will grow. The management of the logistics footprint is a continuous life cycle task.

Based on demonstrations that begin with developmental test and evaluation (DT&E), engineering development modules and operational assessments, reallocations of logistics footprint objectives may be required.

***Note: The approach for allocating the logistics footprint requirement must be defined.***

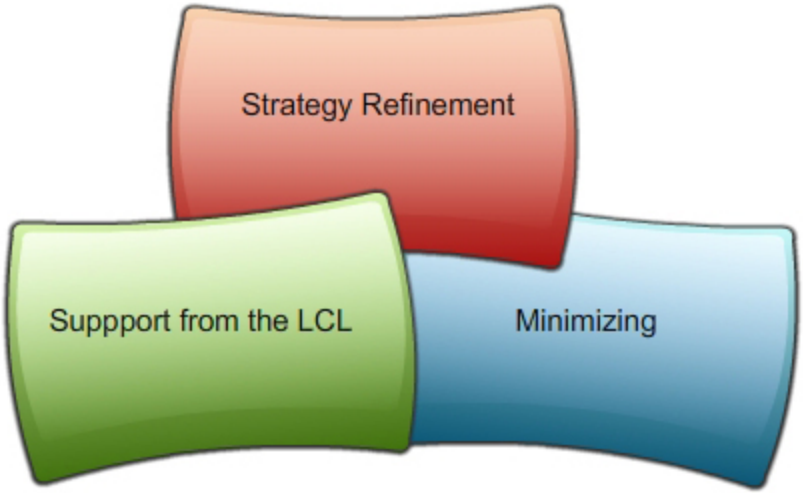
**Popup Text**

**Logistics Footprint**

The government/contractor size or “presence” of logistics support required to deploy, sustain, and move a weapon system. Measurable elements include inventory/equipment, personnel, facilities, transportation assets, and real estate.

**Approach to Product Support - Consideration of Logistics Footprint, Cont.**

The three logistics footprint elements that an LCL should consider are Strategy Refinement, Support from the LCL, and Minimizing. The following pages provide a more detailed description of each.



## Approach to Product Support - Consideration of Logistics Footprint, Cont.

### Strategy Refinement

As the product support strategy is refined to include sources of support and the flow down of performance requirements, it is important that these allocated logistics footprint objectives be maintained. For example, a support provider, incentivized to provide a set level of availability, may achieve this through more spares or additional support equipment, which would result in an increase in the logistics footprint.

During the process of refining the product support strategy, the approach for life cycle management of the logistics footprint needs to be defined. While availability may be one major component of readiness that can be incentivized through PBL, the logistics footprint is another component that must be continually balanced. It may be useful to focus on the key contributors to the logistics footprint for a specific weapon system and develop specific mechanisms to ensure that the footprint at least is maintained, if not reduced, through the life cycle.

## Approach to Product Support - Consideration of Logistics Footprint, Cont.

### Support from the LCL

The product support plan should demonstrate the LCL's intent to minimize the logistics footprint, or the physical space occupied by logistics support.

LCLs can best support evolving military strategy and provide forces with the best possible system capabilities by achieving program objectives while minimizing the logistics footprint throughout the life cycle.

## Approach to Product Support - Consideration of Logistics Footprint, Cont.

### Minimizing

To minimize the logistics footprint, a deployed system must lessen the quantity of support resources required, including personnel, supplies, and support equipment. To achieve these goals, the supportability posture of weapon systems needs to be designed-in. The "footprint problem" is best resolved through effective and early systems engineering–the opportunities for decreasing the logistics footprint decline significantly as the system evolves from design to production to deployment.

**Affordability Improvements**

Select each of the Affordability topics to view more information:

- Overview
- Modeling & Simulation
- Cost Drivers

**Popup Text**

**Overview**

Affordability is a key element of all weapon system programs. The strategy for ensuring affordability throughout the life cycle must be actively managed by the LCL in collaboration with the PSI. The results of incentives must be assessed and used to guide the refinement of LCC strategies for affordability.

**Modeling & Simulation**

Modeling and simulation (M&S) is a useful tool for addressing affordability throughout the life cycle. While design trade-offs often focus only on meeting performance within the procurement dollar thresholds for unit cost, the LCL focuses on total cost of ownership to include the Government cost of managing support. M&S can be used to monitor and assess the affordability of the product support package. The estimates of requirements for both non-recurring support costs (e.g., test equipment, support equipment, spares, etc.) and the recurring costs of spares (e.g., depot level reparables, manpower, information system support, software maintenance, etc.) must be actively managed.

**Cost Drivers**

In order to manage affordability, the LCL can develop a framework that focuses on the high cost drivers of support–often manpower and depot level reparables. The high cost drivers may be concentrated in certain sub-systems of the weapon system, such as propulsion or avionics. Demonstrations of support capability can be targeted to these high cost drivers and can be used to identify creative ways to minimize support costs in these areas to include the development of incentives.

## Sources of Support

Sources of product support include not only just the sources of repair, but also the sources of knowledge management. The PM (under their Life Cycle Management (LCM) responsibility) and the PSM (as the PM's agent for integrating all sources of support) are key decision-makers with regard to the sources of product support that will comprise the logistics enterprise. The sources of support range from organizational level maintenance personnel to supply chain managers to depot level repair to information system support and sustaining engineering, just to mention a few.

As system and support capabilities are demonstrated and the business case analyses are conducted, the sources of support decisions become clearer. It is important in a performance based business environment to align accountability with responsibility, authority and access to data. For example, if an OEM is held accountable for the life cycle availability of its item at a set level and price, then it must also have form, fit, and function interface authority and full visibility into operational data related to the item.

**Popup Text**

**LCM**

Under the life cycle management concept, the PM is responsible for the timely fielding of an effective product support package, measuring its effectiveness, and taking corrective actions when shortfalls are uncovered. The most effective time to catch problems is before the system is deployed, so including reliability, maintainability and supportability test requirements in the TEMP should be as important as other performance measures. Sustainment KPP/KSA driver metrics should be monitored thought out the test and deployment process to help provide confidence the system will achieve the sustainment objectives in an operational environment.

**Sources of Support, Cont.**

As the R&M of items are demonstrated, it may be useful to use the refinement and details of the product support strategy as a tool to incentivize OEMs to improve the R&M of their products. If OEMs can be confident that they will be paid a set dollar per unit usage, e.g., flight hour, miles driven, objectives achieved, etc., for the guaranteed availability of their item, then they may make a more concerted effort to ensure that reliability objectives are met sooner rather than later.

Last, but not least, it is important to address any Title 10 issues with regard to sources of support. Working in collaboration with the Service acquisition and logistics organizations, the LCL needs to ensure that the product support strategy will meet the organic core logistics capability and depot utilization requirements. Organic sources of support, however, will also be held accountable for meeting performance requirements.

## Human Systems Integration (HSI)

DoD policy requires the PM to include HSI requirements during weapon system design and development. For the LCL, demonstrations and operational assessments of the supportability of the system are essential tools for evaluating how well human factors have been addressed in the design process. Based on the results of demonstrated capabilities, design changes and procedural changes may need to be developed to address any shortcomings.

It is critical to identify any shortcomings in human factors at these early stages of demonstration. It becomes much more difficult and costly to address shortcomings that are identified in the later stages of a program.

More importantly, shortcomings at a later stage can significantly impact the warfighting community's confidence in the weapon system and its accompanying support strategy.

Use demonstrations and operational assessments to help ensure that human factors are effectively addressed in both the product support strategy and the system design.

**Popup Text**

**DoD Policy**

From DoD Directive 5000.01, E1.1.29: *The program manager shall apply human systems integration to optimize total system performance (hardware, software, and human), operational effectiveness, and suitability, survivability, safety, and affordability*.

From DoD Instruction 5000.02, Enclosure 8, paragraph 1: *The PM shall have a plan for HSI in place early in the acquisition process to optimize total system performance, minimize total ownership costs, and ensure that the system is built to accommodate the characteristics of the user population that will operate, maintain, and support the system.*

**HSI**

HSI is the interaction between people (operators, maintainers, and support personnel) and their systems. It is a key design consideration that has the potential to optimize total system performance, minimize total ownership costs, and ensures that the system is built to accommodate the characteristics of the user population that will operate, maintain, and support the system. The principle goal of HSI is to ensure a safe and efficient relationship between the user and the weapon system. HSI is a factor in:

- Acquisition
- Program Management
- Architectures/Concepts of Operations
- Systems Engineering
- Logistics/Supportability
- Programming and Budgeting
- Warfighting Readiness

**Use Demonstrations and Operational Assessments**

Ultimately, the goal of HSI is to integrate considerations of human capabilities and limitations into the

design decision-making process already being utilized for hardware and software. Integration of HSI analysis into the acquisition and systems engineering process is the key to achieving this goal. Just as it is prudent and necessary to perform analyses, testing, and verification for software and hardware integration, these same activities are required for integrating the human operator into the system. (Source: Dr. James A. Pharmer, The Challenges and Opportunities of Implementing Human Systems Integration into the Navy Acquisition Process, Defense Acquisition Review Journal, Vol. 14, No. 1, February 2007, pg. 279. Available at http://handle.dtic.mil/100.2/ADA485494)

## Environment, Safety & Occupational Health

The LCL must ensure that environment, safety, and occupational health (ESOH) issues are addressed both through necessary demonstrations and in the refinement of the product support strategy. If there are hazardous materials associated with support of the weapon system, then it is important to demonstrate the feasibility and safety of maintenance procedures for handling such materials. Additionally, you must address the environmental considerations of the facilities where support will be provided.

An approach to ensure that these issues are addressed systematically by all support providers, as required, should be developed as a key element of the product support strategy. In the performance based business environment, it is important to recognize that ESOH issues must be identified and effectively managed.

ESOH issues can also contribute significantly to the cost of support if proven procedures are not already in place. In cases where support requires the handling of hazardous material, it is important that the capability to ensure environmental safety and occupational health be demonstrated by the proposed support provider(s).

## Demilitarization and Disposal Planning

In refining the product support strategy, it may also be beneficial to consider alternative approaches to the demilitarization and disposal planning that traditionally has been performed by the service logistics organizations and the Defense Logistics Agency (DLA). While the experience and corporate knowledge resides with these organizations, the product support enterprise that is established to support the weapon system may also serve this function well.

From the very beginning of a program, it is important that program managers consider and plan for the ultimate system demilitarization and disposal once it is no longer militarily useful. The PM should minimize DoD's liability due to information and technology security, and Environment, Safety, and Occupational Health issues. During the systems engineering process as the design requirements are established, the PM should carefully consider the life-cycle impact of any hazardous material component requirements to minimize the impact on the end item regarding item storage, packaging, handling, transportation, and disposition.

The cost of demilitarization and disposal is an element of the total cost of ownership and as such, approaches that may reduce the cost of such efforts should be explored.

As new roles are defined for product support, traditional approaches to life cycle functions should be reassessed.

**Popup Text**

**Demilitarization and Disposal**

**From the Defense Acquisition Guidebook, Chapter 4, para. 4.4.5. Disposal and Demilitarization**.

The program manager should consider materiel demilitarization and disposal during systems engineering as part of the program manager's Total Life-cycle Systems Management responsibilities. The program manager should minimize the environmental risk associated with decontamination, decommissioning, demilitarization, and disposal of the system; all hazardous materials used on the system shall be identified, quantified, and mapped by location on the system. The program manager should coordinate with DoD component logistics and explosive safety activities and the Defense Logistics Agency, as appropriate, to identify and apply applicable demilitarization requirements necessary to eliminate the functional or military capabilities of assets and to determine reutilization and hazardous-property disposal requirements for system equipment and by-products (see DoD 4140.1-R; and DoD 4160.28-M-V1).

**Cost of Demilitarization And Disposal**

**From the Defense Acquisition Guidebook, Chapter 3, para. 3.1.3.4. Disposal Costs**.

Disposal consists of costs associated with demilitarization and disposal of a military system at the end of its useful life. It is important to consider demilitarization and disposal early in the life cycle of a system because these costs can be significant, depending on the characteristics of the system. Costs associated with demilitarization and disposal may include disassembly, materials processing, decontamination, collection/storage/disposal of hazardous materials and/or waste, safety precautions, and transportation of the system to and from the disposal site.

## Life Cycle Support Oversight

The LCL provides oversight of product support from program inception through disposal. The product support strategy details this process. Life cycle support oversight includes four major areas:

- The built-in/inherent supportability of a weapon system
- The design, development and implementation of support enablers such as corrosion control or unique identification.
- The customer relationship management of the warfighter's evolving requirements, resources and budgets
- The delivery of support capability for the entire life cycle.

During the System Capability and Manufacturing Process Demonstration effort of EMD, this approach is refined with details that will ensure that the PM's responsibility for LCM is effectively performed. The oversight approach should define the roles and responsibilities of the PM, the PSI, and the customer organizations in performing this function. The overall approach is one of performance management. Performance management is central to life cycle support oversight.

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**Popup Text**

**Long Description**

Light armored vehicle parked along a highway posting security in order to allow a convoy to pass and enter the highway.

## Post-Deployment Evaluation

Post-deployment evaluation begins at Initial Operational Capability (IOC). As soon as the system is delivered, evaluation of support performance begins. The measures of performance should have been determined and refined during the Engineering and Manufacturing Development phase, and now will be used starting at IOC. It is important to establish an approach to ensure that support performance can be evaluated in both quantitative and qualitative terms. There are also different levels and types of support performance that need to be addressed. Select the levels and types below to read more about them.


While the Demonstration phase may seem early for consideration of such issues, the development of evaluation approaches can help build warfighter confidence in the iterative nature of assessments.

**Popup Text**

**Initial Operational Capability (IOC)**

In general, IOC is attained when some units and/or organizations in the force structure scheduled to receive a system 1) have received it and 2) have the ability to employ and maintain it. The specifics for any particular system IOC are defined in that system's Capability Development Document (CDD) and Capability Production Document (CPD).

**Levels**

The levels of support performance include:

- The Program Office
- The PSI
- The various support providers

**Types**

The types of performance include areas such as:

- Training
- Support equipment
- Embedded diagnostics
- Information systems
- Maintenance aids and procedures
- Supply support

## Supportability Input to the Capability Production Document (CPD)

The CPD is the sponsor's primary means of providing authoritative, testable capabilities for the Production and Deployment phase of an acquisition program. A CPD is finalized after the critical design review and is validated and approved before the Milestone C acquisition decision. Lessons learned during the System Capability and Manufacturing Process Demonstration effort, e.g., risk reduction activities, T&E activities, modeling and simulation, trade studies, and affordability analyses, all contribute to the discussion of capability in the CPD.

The LCL provides input for the CPD. This includes input on supportability key performance parameters (KPP) and supporting key system attributes (KSA); a discussion of human systems integration (HSI) considerations that have a major impact on system effectiveness, suitability and affordability; and a description at an appropriate level of detail of the key logistics criteria that will help minimize the system's logistics footprint, enhance its mobility, and reduce the total ownership cost.

Knowledge gained from system capability demonstrations serves as a basis for the refinement of KPPs and KSAs in the CPD.

**Knowledge Review**

If there are hazardous materials associated with support of the weapon system, then it is important to demonstrate the feasibility and safety of maintenance procedures for handling such materials and to address the environmental considerations of the facilities where support will be provided. This process is addressed in which major section of the support strategy?

- [ ] Affordability Improvements
- [ ] Sources of Support
- [x] Environment Safety & Occupational Health

Check Answer

**Environment Safety & Occupational Health**, addresses demonstrating the feasibility and safety of maintenance procedures for handling such materials and to address the environmental considerations of the facilities where support will be provided.

**Knowledge Review**

Which section of the support strategy addresses how demonstrations and operational assessments of the supportability of the system are essential tools for evaluating how well human factors have been addressed in the design process?

- [ ] Affordability Improvements
- [x] Human Systems Integration
- [ ] Post-Deployment Evaluation

Check Answer

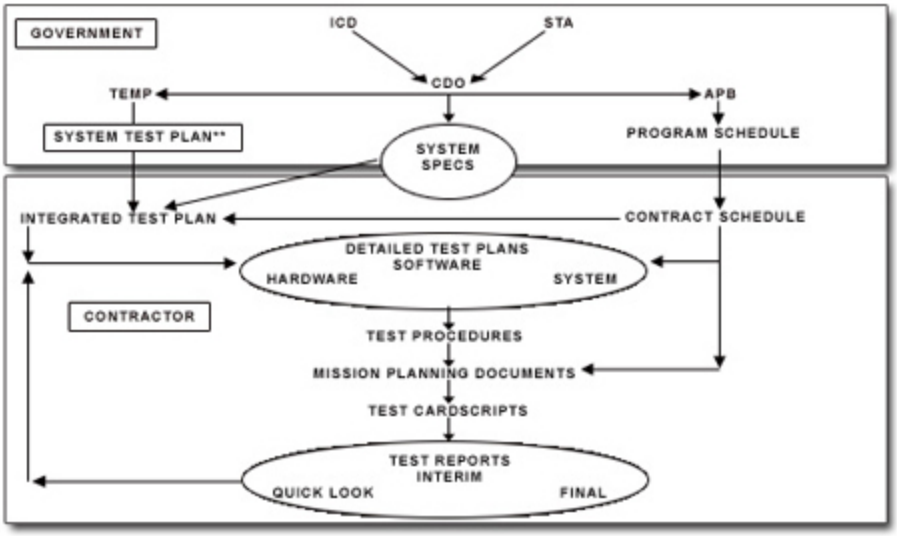
**Human Systems Integration** addresses how demonstrations and operational assessments of the supportability of the system are essential tools for evaluating how well human factors have been addressed in the design process.

## Reviewing the Logistics Test Points

Just as the product support strategy is refined, the logistics test points in the TEMP must be reviewed, refined, and brought to the appropriate level of detail to ensure that the T&E community clearly understands the schedule, metrics, and assessment approach.

Refinement of the logistics test points can be categorized into three major areas:

- The inherent reliability and maintainability of the weapon system
- The support elements of the weapon system that are acquired as part of the system, such as a weapon system information system, prognostics and diagnostics, training aids, etc.
- The support enterprise processes and elements, such as supply chain management, the IDE, transportation, public-private partnerships, etc.

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**Long Description**

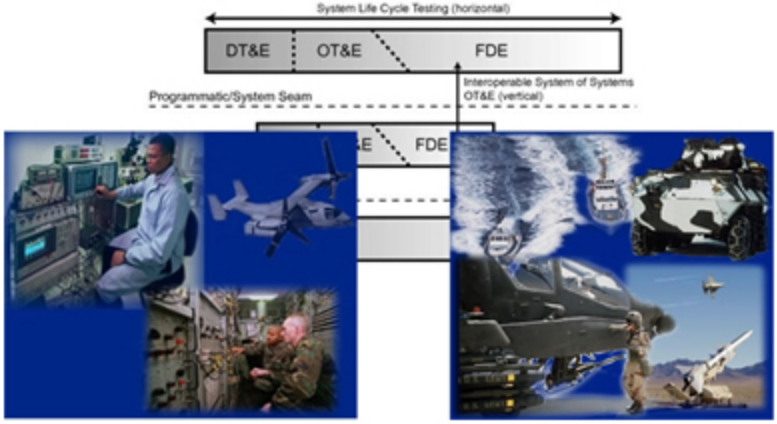
The graphic is Figure 5-3. Test Program Documentation, from the DAU *Test and Evaluation Management Guide*, January 2005. It shows how various requirements and program documents build upon each other resulting in the refined TEMP. The figure shows that:

- The ICD and the STA feed into the CDD.
- The CDD feeds the TEMP, the APB, and System Specs.
- The TEMP feeds the System Test Plan and the Integrated Test Plan.
- The APB feeds the Program Schedule, the Contract Schedule, and the Integrated Test Plan.
- The System Specs also feed the Integrated Test Plan.
- The Integrated Test Plan and the Contract Schedule feed Detailed Test Plans (hardware, software, and systems).
- The Detailed Test Plans feed Test Procedures which feed Mission Planning Documents which feed Test Card/ Scripts. (The Contract Schedule also feeds the Mission Planning Documents.)
- The Test Card/ Scripts feed Test Reports (quick look, interim, and final) which feeds back to the Detailed Test Plans.
- The Government is responsible for the ICD, STA, CDD, TEMP, APB, System Test Plan, System Specs, and Program Schedule.
- The Contractor is responsible for the Integrated Test Plan, Contract Schedule, Detailed Test Plans, Test Procedures, Mission Planning Documents, Test Card/ Scripts, and Test Reports.

## Establishing a Schedule of Key Support Decision Points

One of the first issues to address when refining the logistics test points in the TEMP is the schedule. In order to implement the product support strategy and effectively manage risk, it is important to define when better knowledge is needed in order to make informed decisions. In other words, much of the product support strategy is developed based on engineering estimates of reliability and maintainability, demonstrations of individual system support elements, and a series of assumptions about how the support enterprise will work together.

As a first step, it is useful to develop a schedule of key decision points related to supportability. This may include the schedule for support budget submissions (such as spares, test and support equipment, training aids and equipment); military construction (MILCON) budget submissions (for new or upgraded facilities); acquisition strategy decisions; support concept decisions for different sub-systems; manpower decisions; and core workload decisions.




The results from T&E can serve as a source of valuable knowledge to enable more informed decisions. The key is to align logistics T&E activities with the timetable for the required support, acquisition, and budget decisions.

## Explicitly Stating the Support Ground Rules and Assumptions

In the T&E process it is important that ground rules and assumptions be explicitly stated. The LCL can provide this input as a participant in the integrated T&E process. As part of the development of PBAs with the warfighting community, a series of terms and conditions, or boundaries, are defined.

These boundary conditions, along with the assumptions that guided both the development of the business case analyses and the product support strategy, should be provided as the ground rules and assumptions for T&E activities related to supportability.

## Developing and Refining Support Metrics

LCLs can provide input to the T&E process on support metrics, which will vary based on the area that is being tested. Higher level supportability performance outcomes such as mission reliability and logistics footprint will have specified threshold and objective values. The challenge is understanding all factors that impact these metrics and the interrelationships among those factors. Based on design changes, technology maturity and demonstrated capability, some of the thresholds and objectives for lower level support attributes may need to be refined.

The inherent reliability and maintainability of the system and its components are often measured in terms of metrics such as:

- Mean time between failures and/or critical failures,
- Mean time between removals and/or unscheduled removals,
- Mean time to repair,
- Maximum time to repair, and
- Direct maintenance man hours per operating hour.

The support elements of a weapon system have metrics that are tailored to each specific element. For example, a prognostics and health management (PHM) metric could be the mean time between false alarms.

The support enterprise's processes and elements also have metrics that are tailored to specific processes and elements. For example, supply chain management processes may be assessed by the availability of the right spares at the right time and at the right place. The challenge in the T&E process is being able to assess these elements through modeling and simulation that assumes specific actions based on a set of ground rules and assumptions or through war-games that include human/organizational elements.

## Identifying New Supportability T&E Requirements

The initial supportability input to the TEMP may not have included all support requirements. An operational assessment of a specific maintenance task may have suggested that the skill requirements were understated, but other confounding variables could have accounted for this finding.

If the implications of the understated skill requirements were significant, then it would be important to address this issue in further T&E. The LCL must consider the output from supportability demonstrations, modeling and simulation, operational assessments, and business case analyses in order to fully identify and address any new requirements for T&E. Any new requirements for T&E, including logistics T&E, must be documented in the TEMP before the T&E can occur.

**Popup Text**

**Confounding Variables**

An unforeseen, and unaccounted-for variable that jeopardizes reliability and validity of an experiment's outcome. (Source: http://writing.colostate.edu/guides/research/glossary/)

## Using War-Games to Test and Evaluate the Support Enterprise

T&E of the logistics support enterprise is challenging due to its scope, size, and dynamic nature. Recall that supportability is now represented in program requirements documents in the form of the mandatory sustainment KPP and supporting KSAs. Therefore, it is important to develop mechanisms to better assess the proposed product support enterprise, the associated roles and responsibilities of the participants and their inter-relationships, and the business rules and processes that will guide their operations. The development and conduct of war-games to assess how the proposed support enterprise would perform may be a viable approach.

The LCL may propose the use of support enterprise war-games to the integrated T&E community. Given time and resource constraints, the use of such war-games could be focused on some of the high risk and or cost areas. For example, the relatively new role of a system-level PSI could be assessed in a war-game that simulates the response from several support providers to an unanticipated support demand, e.g., surge support.

**Popup Text**

**Mandatory Sustainment KPP and Supporting KSAs**

There are three factors which are used to fully define system Sustainment:

1. Availability KPP. Availability will consist of two components: Materiel Availability and Operational Availability. The components provide availability percentages from a corporate, fleet-wide perspective and an operational unit level, respectively. The Operational Availability metric is an integral step to determining the fleet readiness metric expressed by Materiel Availability. The following provides guidance for development of both metrics:
    a. Materiel Availability. Materiel Availability is a measure of the percentage of the total inventory of a system operationally capable (ready for tasking) of performing an assigned mission at a given time, based on materiel condition
    b. Operational Availability. Operational Availability indicates the percentage of time that a system or group of systems within a unit are operationally capable of performing an assigned mission and can be expressed as (uptime/(uptime + downtime)).
2. Reliability KSA. Reliability is a measure of the probability that the system will perform without failure over a specific interval. Reliability must be sufficient to support the warfighting capability needed. Considerations of reliability must support both Availability metrics.
3. Ownership Cost KSA. Ownership Cost provides balance to the sustainment solution by ensuring that the operations and support (O&S) costs associated with Availability are considered in making decisions. For consistency and to capitalize on existing efforts in this area, the Cost Analysis Improvement Group O&S Cost Estimating Structure will be used in support of this KSA (https://acc.dau.mil/ILC_AKPP).

For additional information on the mandatory Sustainment KPP and supporting KSAs, refer to CJCSM 3170.01, *Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS)*, Appendix B, Enclosure B.

**Surge**

**Surge**. An increase in the production or repair of defense goods for a limited duration of time.

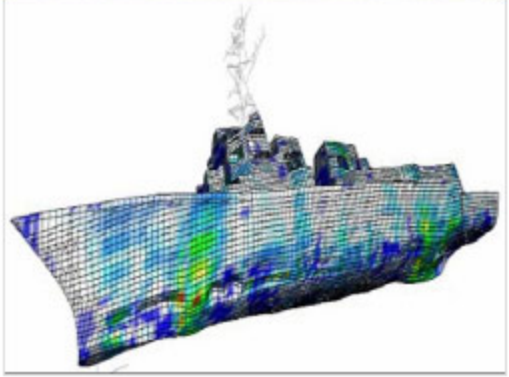
**Surge Production**. An increased rate of production necessary to meet demands for defense items due to a wartime or mobilization situation. This increased rate can be obtained by having excess production capacity
available or by utilizing multiple shifts of normal capacity machines. Source: DAU Online Glossary

## Utilizing T&E Results To Improve Product Support

In some instances, T&E results may identify deficiencies in the inherent reliability and maintainability of the system and its components. For deficiencies that adversely impact performance requirements, corrective actions to 'fix the problem' must be developed and implemented. Once a deficiency has been corrected additional T&E may be required. There should be ample time and resources planned for such contingencies.

In other instances, technology, time, or funding may limit the resolution options for a deficiency that impacts supportability. In such cases, it may be necessary to refine or modify some element of the product support strategy or approach to accommodate the deficiency.

This refinement or modification may also require additional T&E (which must, again, be documented in the TEMP). Understanding that both situations will probably occur, it is important to allow ample time and test resources.



**Knowledge Review**

The logistics test points must be reviewed, refined, and brought to the appropriate level of detail to ensure that the T&E community clearly understands the schedule, metrics, and assessment approach. This review will take place in which plan below?

- [ ] System Test Plan
- [ ] Integrated Test Plan
- [x] Test and Evaluation Master Plan
- [ ] Product Support Strategy

Check Answer

This review will take place in the **Test and Evaluation Master Plan**.

**Management Processes Summary**

You have completed Management Processes and should now be able to:

- Identify areas that may require the LCL to refine/change the product support strategy.
- Identify the characteristics of each support element in the product support strategy.
- Identify the major logistic test points in the TEMP.
- Recognize the steps in refining the logistics test points in the TEMP.

## Lesson Completion

You have completed the content for this lesson.

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