Department of the Army
Pamphlet 700–56

Logistics

Logistics Supportability Planning and Procedures in Army Acquisition

Headquarters
Department of the Army
Washington, DC
21 April 2006

UNCLASSIFIED

SUMMARY of CHANGE

DA PAM 700–56
Logistics Supportability Planning and Procedures in Army Acquisition

This administrative revision, dated 21 April 2006--

- o Corrects an omission to figure C-1.
- o Updates references in appendix A.

This administrative revision, dated 16 February 2006--

- o Corrects an omission in appendix C.
- o Adds missing fields to the Supportability Strategy Outline in figure C-1.

This new pamphlet, dated 5 December 2005--

- o Consolidates DA Pamphlet 700-55 and DA Pamphlet 700-29.
- o Provides procedures for performance-based logistics (para 1-5 and chap 7).
- o Adds procedures for ILS management of Joint Programs (chap 2, sec V).
- o Provides procedures for supportability planning throughout the life cycle (chaps 3, 4, 5, and 6).
- o Adds procedures for condition based maintenance (para 11-7 and chap 19).
- o Adds procedures for logistics demonstration (para 12-4; 12-5)
- o Adds procedures for software supportability (chap 14).
- o Provides procedures for supportability metrics (app B).
- o Adds procedures and format for the supportability strategy (app C).

Headquarters
Department of the Army
Washington, DC
21 April 2006

***Department of the Army**
Pamphlet 700–56

Logistics

Logistics Supportability Planning and Procedures in Army Acquisition

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the Secretary of the Army

History. This publication is an administrative revision. The portions affected by this administrative revision are listed in the summary of change.

Summary. DA Pamphlet 700–56 provides supportability planning and procedures in support of total life cycle system management and acquisition process. This pamphlet also provides information on integrated logistics support, identifying tools for integrated logistics support tasks and supportability planning in all phases of the life cycle. It emphasizes cost as an independent variable and addresses commercial and nondevelopmental items as well as procedures used to acquire training systems. This pamphlet consolidates the procedures used to plan, conduct, and report on the Army's integrated test and evaluation process and provides details on software supportability planning. In addition, it details the environmental, safety, and occupational health considerations in acquisition and addresses contractor support, post production support planning and reprocurement.

Applicability. This pamphlet applies to the Active Army, the Army National Guard/Army National Guard of the United States, and the U.S. Army Reserve unless otherwise stated.

Proponent and exception authority. The proponent of this pamphlet is the Assistant Secretary of the Army for Acquisition, Logistics and Technology. The proponent has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations. The proponent may delegate this approval authority, in writing, to a division chief within the proponent agency or its direct reporting unit or field operating agency, in the grade of colonel or the civilian equivalent. Activities may request a waiver to this regulation by providing justification that includes a full analysis of the expected benefits and must include formal review by the activity's senior legal officer. All waiver requests will be endorsed by the commander or senior leader of the requesting activity and forwarded through their higher headquarters to the policy proponent. Refer to AR 25–30 for specific guidance.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA, ASA(ALT), ATTN: SAAL-ZL, 103 Army Pentagon, Washington, DC 20310-0103.

Distribution. This publication is available in electronic media only and is intended for command levels C, D, and E for the Active Army, the Army National Guard/Army National of the United States, and the U.S. Army Reserve.

Contents (Listed by paragraph and page number)

*This pamphlet supersedes DA Pam 700–56, dated 5 December 2005.

Contents—Continued

Contents—Continued

Contents—Continued

Contents—Continued

Contents—Continued

Figure List

Glossary

Chapter 1
Section I
Introduction

1–1. Purpose
This pamphlet provides guidance to plan and acquire best value logistics support for Army materiel and information systems consistent with applicable acquisition, legal, and policy guidance.

1–2. References
Required and related publications and prescribed and referenced forms are listed in appendix A.

1–3. Explanation of abbreviations and terms
Abbreviations and special terms used in this pamphlet are explained in the glossary.

1–4. Logistics transformation
a. The Department of Defense (DOD) logistics management has developed a multi- faceted set of improvement initiatives in response to the global changes, management direction, and the needs of the 21st -century warfighter. Force-Centric Logistics Enterprise (formerly Future Logistics Enterprise) is the DOD comprehensive program to integrate logistics with operational planning and to meet warfighter requirements for more agile and rapid support. It consists of an integrated set of six initiatives:

(1) *Total life-cycle systems management (TLCSM).* This is the implementation, management, and oversight, by the designated program manager (PM), of all activities associated with the acquisition, development, production, fielding, sustainment, and disposal of a DOD weapon or materiel system across its life cycle. In addition, it assigns the program manager responsibility for effective and timely acquisition, product support, availability, and sustainment of a system throughout its life cycle. Supportability is coequal to cost, schedule, and performance for program management.

(2) *Depot maintenance partnerships.* An initiative to enable and empower DOD depots to develop and expand depot maintenance partnerships with the private sector to achieve better facility utilization, reduced cost of ownership, and more efficient business processes.

(3) *Condition-based maintenance plus (CBM+).* CBM+ is an initiative to insert technology which optimizes system maintenance and provides maintainers with the knowledge skill sets and tools to maintain complex systems in a manner which integrates logistics processes, maximizes readiness, and minimizes life cycle costs.

(4) *End-to-end distribution.* End-to-end distribution is an initiative to streamline warfighter support and facilitate the flow of materiel. The desired outcome is an integrated, synchronized distribution system for both materiel and information from the source of supply to the end user that meets warfighter requirements.

(5) *Enterprise integration.* An initiative to provide all members of the military logistics support team and the warfighter with near-real-time, actionable information provided by modern, commercially-based software implemented to enable reengineered logistics processes and business rules.

(6) *Executive agents (EA).* An initiative involves the formal assignment of logistics roles and responsibilities in support of warfighter requirements, including end-to-end support, rapid response to all deployments, and improved crisis/deliberate planning. The objective of the EA initiative is to improve logistics support by ensuring that EA resources and capabilities are responsive to the supported combatant commander.

b. Army Vision is to implement DOD logistics transformation by ensuring that Army forces are capable of rapidly deploying in support of current and future operations and that these forces can be effectively sustained in the full spectrum of Army operations. The Army must be more responsive, deployable, agile, versatile, lethal, survivable and sustainable. However, this must all be accomplished while reducing logistics footprint and reducing cost.

1–5. Performance-based logistics
a. Performance-based logistics (PBL) is the mandated approach for executing affordable product support so that the accountability and responsibility for the integration of support elements are linked to specific warfighter performance requirements for weapon system readiness and operational capability. PBL is the delineation of output performance goals/thresholds for acquisition system supportability and sustainment and the assignment of responsibilities and implementation of incentives for the attainment of these goals/thresholds, and the overall life-cycle management of system reliability, sustainability, and total ownership costs. The goal of PBL is to design and build a reliable system that will reduce the demand for logistics and a maintainable system that reduces the resources, such as manpower, equipment and time, required to provide the logistics support. The PM, as the TLCSM, must ensure that the system, as designed, maintained, and modified, minimizes the demand for logistics. The PBL approach is based on DOD managing and sharing risk with those who promise set levels of reliability and supportability (see chap 2, sec II).

b. For PBL, "performance" is defined in terms of military objectives using the following criteria:

(1) Operational availability, the percent of time that a weapon system is available for mission or ability to sustain operations tempo.

(2) Operational reliability, the measure of a weapon system in meeting mission success objectives (percent of objectives met, by weapon system). Depending on the weapon system, a mission objective would be a sortie, tour, launch, destination reached, capability, and so on.

(3) Cost per unit usage, the total operating costs divided by the appropriate unit of measurement for a given weapon system. Depending on weapon system, the measurement unit could be flight hour, steaming hour, launch, mile, driven, and so on.

(4) 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.

(5) Logistics response time, the period of time from logistics demand signal sent to satisfaction of that logistics demand. "Logistics demand" refers to systems, components, or resources, including labor required for weapon system logistics support. PBL metrics should support these desired outcomes.

1–6. Integrated logistics support

Integrated logistics support (ILS) is an integrated and iterative process for assuring supportability of an acquisition system. Supportability is the degree of ease to which system design characteristics and planned logistic resources, including logistics support elements, allow for the meeting of system availability and wartime utilization requirements. ILS is the process used by the Army to develop and implement product support, including all the mandatory acquisition logistics and supportability procedures as defined by DOD 5000.1, DOD Instruction (DODI) 5000.2, and Army Regulation (AR) 70–1, and covers all elements of planning, developing, acquiring, and sustaining Army materiel throughout its life cycle. The ILS process is governed by AR 700–127. All analyses and actions related to the supportability of Army systems can be considered part of the ILS process. The ILS process is used to influence generation of supportability requirements, to affect the design of Army systems, to optimize and simplify equipment operation and maintenance, and to integrate them in a way that minimizes total ownership costs and logistics burden on the Army. For maximum effectiveness, it must be applied from program inception as part of the systems engineering process. The ILS process ensures the readiness and supportability of Army systems from cradle to grave while considering environmental, safety, and occupational health (ESOH) responsibilities during development, production, deployment, sustainment, and disposal of Army materiel systems.

1–7. Supportability metrics

a. Army acquisition policy (AR 70–1) states that supportability is integral to the success of a system and will be considered equal in importance with cost, schedule, and performance. Additionally, DOD acquisition guidance and PBL require PMs to develop and implement a performance measurement system. Therefore, PMs and ILS managers (ILSMs)/product support managers (see Defense Acquisition Guidebook and the updated Product Support Guide) are required to develop and implement a supportability performance measurement system for use in evaluating a system's performance against established supportability goals and standards. The PM's responsibilities for oversight and management of the product support function are typically delegated to a 'product support manager (an overarching term characterizing various service function titles such as assistant program manager for logistics, system support manager, and so on) who leads the development and implementation of the product support and PBL strategies and ensures achievement of desired support outcomes during sustainment. The product support manager employs a product support integrator (PSI) or a number of PSIs, as appropriate, to achieve those outcomes.

b. The attainment of supportability requirements must be verified and based on quantitative measures or metrics and validated by operational testing supported by the user. Appendix B provides examples of supportability-related metrics.

Chapter 2
Integrated Logistics Support

Section I
The ILS Process

2–1. Purpose

a. The ILS process exists to ensure the Army acquires capable, supportable systems that are ready to perform the Army missions for which they are planned and are adequately supported throughout their life cycle.

b. Systems engineering and application of ILS pursue two thrusts simultaneously. The first is design for support, a focus on designs that minimize operation, maintenance, training, support tasks, and life-cycle costs while optimizing operational readiness. The second thrust is design of support, the design, development, funding, test, and acquisition of all support resources needed to assure optimum performance and readiness of the system in its intended operational environment and mission profiles.

c. The ILS process begins as soon as practical shortly after milestone A. It should play a key role during the Joint

Capabilities Integration and Development System (JCIDS) process. The engineers and scientists in academia, in science and technology programs, those working for contractors, and Army combat developers (CBTDEVs) need to consider all 10 ILS elements (para 2–2) as they supply input to the JCIDS process.

d. The CBTDEV and materiel developers (MATDEVs) ILS communities work together to generate cost-saving and logistics footprint-reducing improvements in readiness, support and supportability-related system design by—

(1) Jointly developing an early ILS program and draft supportability strategy (SS).

(2) Using supportability analysis (SA) and human systems integration analytical techniques to identify goals and constraints. This includes use of manpower, personnel, and training (MPT); environmental and supportability impacts from the studies and analyses of the requirements determination process; and other scenario-based analyses.

(3) Implementing changes to supportability-related doctrine, policies, and procedures to enchance program effectiveness and efficiency.

(4) Identifying contract incentives, system readiness and supportability metrics, and modification candidates.

(5) Reviewing program projections in the program objective memorandum (POM) and the Future Years Defense Program (FYDP).

(6) Emphasizing commercial, other service, and allied technical advances in supportability characteristics and techniques.

e. The CBTDEV establishes an integrated concept team (ICT) for all acquisition category (ACAT) I, II, and selected III programs to coordinate overall ILS and ESOH planning and execution until milestone B or program initiation.

(1) The CBTDEV will identify and document ILS requirements and constraints through studies and SA during the presystems acquisition activities. This document will serve as the initial SS.

(2) The ICT will include MATDEV representatives, supporting command representatives such as the Military Surface Deployment and Distribution Command (MSDDC), the Army Test and Evaluation Command (ATEC), the Army Corps of Engineers (COE), the Department of the Army (DA) acquisition logistician, the training developer, ESOH experts, and others as needed. Membership may be limited because of the scope of the effort in the concept and development technology (CTD) phase.

f. When a PM is selected, the MATDEV will assume the lead for the new program and the system development and demonstration (SDD) phase of the life cycle begins, unless a commercial item is selected and the program goes directly to milestone C and the production and deployment phase.

g. The MATDEV appoints an ILSM as a member of the management team to head up a working- level integrated product/process team (IPT) called the supportability IPT (SIPT).

(1) The SIPT picks up where the ICT left off, often with many of the same members, to update the SS to address the applicable elements of ILS (see appendix C for recommendations on preparing the SS). The SIPT adds experts from different functional areas as needed to cover all supportability concerns. Industry partners should be included. Participation of the Defense Logistics Agency (DLA) and Army staff agencies can help ensure a successful ILS program.

(2) The SIPT must work together with other program working level teams (for example, test IPT) to insure proper coordination and integration of efforts. ACAT III systems will have SIPT membership based on the system complexity and requirements.

(3) Both qualitative and quantitative techniques and methods will be used by the SIPT to perform ILS/supportability assessments (see appendix D for ILS assessment considerations). The Deputy Assistant Secretary of the Army for Integrated Logistics Support (DASA(ILS)), as the Army acquisition logistician, may call an ILS review for all ACAT I and II systems prior to each milestone decision review (MDR) (see appendix E for an ILS Review description and procedures).

2–2. Integrated logistics support elements

The 10 elements of ILS comprise the following:

a. Maintenance planning is the process conducted to evolve and establish maintenance concepts and support requirements for the life of the system. It encompasses levels of repair, repair times, maintenance procedures/techniques, support equipment needs and contractor or government responsibilities.

b. Manpower and personnel include the identification and provisioning for military and civilian personnel with the skills and grade levels needed to operate, maintain, and support a system over its life in both peacetime and wartime. PMs typically do not acquire personnel. The PMs should, however, work with force management to ensure that the proper positions are available within the required modified table of organization and equipment (MTOE) and tables of distribution and allowances (TDA) of the organization.

c. Supply support is all the management actions, procedures, and techniques used to determine requirements to acquire, catalog, receive, store, transfer, issue and dispose of secondary items. This encompasses provisioning for initial support and all end-to-end replenishment supply support and supply pipeline plans and activities. Supply support must be distribution based rather than inventory based and proactive rather than reactive.

d. Support equipment is all the management actions, procedures, and techniques used to determine requirements for and acquire the fixed and mobile equipment needed to support the operations and maintenance of a system. This includes materiel handling equipment (MHE); tools; test, measurement, and diagnostic equipment (TMDE); calibration equipment; prognostics/imbedded diagnostics; and automated test equipment (ATE). In addition, this element includes all plans and activities required to operate, maintain, and support all system support equipment.

e. Technical data are all the management actions, procedures, and techniques needed to determine requirements for and to acquire recorded system information, technical manuals and technical drawings associated with the system, its operation, its maintenance, and its support. Technical data for all support equipment are also included under this ILS element. Although computer programs and related software are not considered technical data, any documentation about computer programs and software support is considered technical data.

f. Facilities are all the management actions, procedures, and techniques used to determine requirements for and to acquire the permanent and semipermanent real property assets needed to support operation, maintenance and storage of a system and its support equipment. This element includes new and modified facilities, special environmental conditions, and utilities required.

g. Training and training support consists of the processes, procedures, and techniques to identify requirements for and to acquire programs of instruction, training facilities, and training systems/devices needed to train/qualify military and civilian personnel to operate and maintain a system proficiently. This includes institutional training, on-the-job training, new equipment training, sustainment training, and individual/crew training.

h. Computer resources support is all the management actions, procedures, and techniques used to determine requirements for and to acquire hardware, middleware, firmware, software, documentation and support supplies required to support and upgrade computer resources used in operation and maintenance of the system. This includes fixed and mobile facilities required for computer resources support.

i. Packaging, handling, storage, and transportation (PHS&T) includes the resources, facilities, processes, procedures, design considerations, and methods needed to ensure that all system equipment and support items are preserved, packaged, stored, handled, and transported quickly, safely, and effectively.

j. Design interface reflects the relationship of the various supportability parameters to other system design parameters. These parameters include human factors, system safety, energy management, standardization, interoperability, survivability, vulnerability, reliability, maintainability, environmental compliance, and affordability.

Section II
Supportability Risks and Criteria

2–3. Supportability risk management

a. With logistics transformation, supportability is getting increased attention during MDRs. Supportability risks may be associated with program cost, funding, schedule, and performance. Supportability risks and constraints must be identified and assessed as support plans are developed and acquisition program progress is evaluated. After supportability risks are identified, risk-management plans must be developed to reduce, control, or accept all risks that have been identified.

b. Phase or program specific exit criteria may be emplaced that require specific capabilities be achieved or risks mitigated before a program may be permitted to continue into the next phase of acquisition. Guidance for exit criteria may be found in DODI 5000.2.

2–4. Risk identification procedures

a. Data and information needed to identify system support risks are collected during systems engineering and acquisition activities and may include—

(1) Support risks associated with each support alternative and included in the SS.

(2) Support risks identified from analyses conducted by the system engineers, SIPT, or other members of the acquisition community to select the optimal support alternative.

(3) Support risks discovered during the test and evaluation (T&E) process.

(4) Support risks determined through the ILS/supportability assessment process.

b. Risk issues and required actions need to be identified by the system engineer, SIPT, and other members of the acquisition community any time there is a question about achieving objective or threshold capabilities within cost, schedule, performance, and supportability constraints (for example. there may be a risk of an inability to continue post-production support of a system at a reasonable cost if the technical data package (TDP) is not being obtained to support competitive procurement of additional systems or secondary items. Rationale for risks and associated impacts should be provided even when risks are considered low.

c. Potential support risks and recommended solutions must be brought to the attention of the MATDEV and the SIPT. Coordination with all IPT members to resolve the potential risks is strongly encouraged. Support risks and plans for resolving them are documented for all MDRs.

2–5. Exit criteria identification procedures

a. Any supportability requirements, acquisition tasks, T&E activities, and risk-reduction efforts that should be called out as exit criteria may be recommended by the PM, ILSM, or other members of the acquisition community. Supportability exit criteria are considered coequal and critical to sustainment of the system with cost, schedule, performance and supportability constraints. Incremental thresholds and key performance parameters are identified for each acquisition program phase when objectives must be achieved in stages into the next program phase.

b. Critical requirements directly related to the capabilities document (CD) with direct impact on achieving cost, schedule, performance, or supportability thresholds are documented as exit criteria that must be achieved before proceeding into the next phase. However, the exit criteria must not duplicate key performance parameters already being evaluated as entrance criteria to the next phase.

(1) Specific supportability constraints identified in the CD establish the baseline for exit criteria. The CD must include specific supportability goals needed to satisfy the operational requirement.

(2) Critical acquisition tasks delineated in program management documentation or in the acquisition contract that have a significant impact on the ability to sustain the system within cost, schedule, performance, and supportability constraints also provide a potential source for exit criteria. Satisfactory completion of these tasks should be identified as exit criteria. Interim thresholds should be identified for time-phased tasks that must be completed before continuing into the next acquisition program phase.

(3) Risk reduction measures identified in the MDRs also provide exit criteria. Efforts required to reduce risks to levels within cost, schedule, performance, and supportability constraints should be identified as exit criteria.

(4) Critical supportability-related T&E activities delineated in the test and evaluation master plan (TEMP) provide another potential source for exit criteria. Satisfactory completion of any critical tests or evaluations needed to ensure the system can be sustained within cost, schedule, performance, and supportability constraints may be identified as exit criteria.

c. Potential exit criteria must be brought to the immediate attention of the MATDEV for inclusion in the integrated program summary/modified IPS. Maximum coordination of potential exit criteria with other members of the acquisition community is strongly encouraged.

Section III
ILS Funding

2–6. Funding appropriations and integrated logistics support

a. Various funding appropriations may be used to finance an ILS program (for example, ILS management, supportability analysis and ILS products/deliverables during the system's life cycle).

b. Management of the ILS for any program falls into three broad areas:

(1) ILS management and program execution, which includes all ILS management functions associated with system engineering and program organizing, direction, coordination, and controlling.

(2) ILS product development, which includes the resource requirements to satisfy preparation and production of ILS deliverables (for example, technical publications; system support packages for test; technical manual (TM) validation and verification; logistics demonstration (LD); support equipment; TMDE; SA; and program documentation (such as SS and materiel fielding plan).

(3) System sustainment, which includes repair parts, maintenance personnel, other support personnel, technical school training, environmental compliance, petroleum, oils, and lubricants (POL), qualifying alternative materials/ processes, transportation, configuration management, environment, and other materiel support or personnel costs (such as recruitment, benefits, and retirement) charged to the system after initial fielding.

c. The program budget and funding structure consists of five appropriations:

(1) The research, development, test, and evaluation (RDT&E appropriation is a multiyear appropriation available for obligation for 2 fiscal years. Program funds are provided by the PM in support of the ILS program. These funds are used to plan, analyze, integrate, establish, and manage the development and acquisition of all logistic support elements required to support fielding of the proposed materiel system.

(2) Army procurement is funded from 5 separate multiyear appropriations: aircraft, missiles, weapons and tracked combat vehicles, ammunition, and other. These funds are available for 3 fiscal years and provide for total package fielding (TPF), installation of modification kits, new equipment training (NET), project and program salaries and benefits, interim contractor support (ICS), and first destination transportation. Approved engineering changes generated during the production phase that do not impact the performance envelope but that impact the logistics support documentation is Army procurement funded. Approved engineering changes that are incorporated into the logistics support documentation during the production phase are Army procurement funded (see DFAS–IN 37–100, chaps 2031 to 2035 for further detailed instructions on how Army Procurement funds are used).

(3) Operation and Maintenance, Army (OMA) appropriations are annual appropriations that fund operation and maintenance of all Army, organizational equipment and facilities, including maintenance of Army systems and materiel programs, supplies, training, and recruiting related to OMA. OMA funds sustainment support functions performed in support of fielded systems and operation of servicewide activities such as medical activities, operation of depots, schools, and training (including cost of training civilian employees in programs from which salaries are payable).

Morale and welfare, information, education, and religious activities, and expenses of courts, boards, and commissions are also included. In addition, if a modification program is applied to an out-of-production system or item resulting in no performance envelope changes, then OMA will finance the phase I engineering of the modification. These funds are used for costs associated with documentation changes or modifications that result in revisions being made to TMs. Also, a modification program on an out-of-production system or item that results in logistic support documentation being updated (phase III, application and data collection) is financed by OMA.

(4) Military Construction, Army (MCA) appropriations are multiyear appropriations available for obligation for 5 years. The term military construction includes any construction, development, conversion, or extension of any kind carried out with respect to a military installation. A military construction project includes all military construction work necessary to produce a complete and useable improvement to an existing facility (or to produce such portion of a complete and useable facility or improvement as is specifically authorized by law). The term facility means a building, structure, or other improvement to real property. The logistician coordinates the facility requirements with COE. The COE's functions are identified in the SA process. The COE will identify resource requirements in support of the PM's program and submit budget documents through appropriate channels.

(5) Military Personnel, Army (MPA) appropriations fund pay and allowances. MPA includes costs of retired pay accrual, individual clothing, subsistence, interest on savings deposits, death gratuities, permanent change of station (PCS) travel, and per diem portion of TDY (not to exceed one day between permanent duty stations) for active component Army members and U.S. Military Academy cadets, and expenses for the apprehension and delivery of deserters and prisoners. Because MPA is a significant portion of the Army budget, a goal of ILS is to minimize such costs through increased reliability and maintainability and a decreased logistic footprint. MPA costs are not usually addressed in the SS, but these costs are considered when operation and support (O&S) costs, and sustainment are included in the total logistic cost equation. If the materiel system or item of equipment has either an increase or decrease in support personnel, the O&S costs are directly affected.

d. AR 700–127, paragraph 3–7, states, "The costs associated with ILS execution will be planned, programmed, budgeted, funded, and monitored as an integral part of the acquisition program." ILS funding prior to type classification (TC) standard must come from RDT&E dollars. Army procurement appropriation dollars are used to pay for producing the system (and its support) until it goes out of production. OMA funds pay for any system sustainment during the operational life of the system as well as any new ILS-related efforts for the system. MPA dollars are used to pay the military personnel who maintain and support the system and its support system. Because MPA is a significant portion of the Army budget, a goal of ILS is to minimize such costs. MCA funding is needed to pay for new or modified facilities. It is important to keep in mind that military construction has a lead time in terms of years.

e. The program authority pays the cost of support personnel. Funds are required for support personnel who manage and execute the approved ILS program and for preparation of ILS documentation and support structure to assure that the system is adequately supported once fielded. ILS products that are required for support of a developmental, NDI, or modification are financed by the requesting program authority. These funds are also used for the processing of technical data to develop logistics management information (LMI) and TMs.

f. The initial and subsequent ILS cost estimates are provided to the PM for incorporation into the program cost estimates (PCEs) or the POM.

2–7. Program cost estimate

a. As described in AR 11–18, PCE is a generic term denoting a complete, detailed, and fully documented estimate of a materiel system life-cycle cost accomplished by the system proponent. The PCE is a dynamic document that serves as the principal cost estimate for the system and. throughout the acquisition cycle. The PCE for any given system must be tailored to the program and be allowed to expand as the program matures.The ILS program cost must be identified and provided to the PM for approval and PCE consolidation. The PCE is updated as the program matures and prior to each major milestone. The PM uses the PCE in POM submission. For additional information and program funding authority breakdown, see DFAS–IN Manual 37–100.

b. The specific elements of a PCE are organized and delineated based on a work breakdown structure. The specific Government and contractual cost elements and tasks for ILS will vary depending upon the acquisition schedule and complexity of the system being acquired. Those ILS elements and tasks to track should be determined principally from the PCE or whatever document is used to justify the cost of the proposed acquisition. Because no two programs are identical, each cost estimate should be tailored to meet the objectives of the proposed program. Functions and associated subfunctions identified in the work breakdown structure (app F) should be tailored by either deleting functions that are not required or by establishing new functions and sub-functions as appropriate.

Section IV
ILS Management of Joint Programs

2–8. Joint programs and joint logistics

a. Joint programs can be established when two or more services agree that a mutual or similar need or capability gap exists. The Joint Requirements Oversight Council was created by charter under the auspices of the Joint Chiefs of Staff to promote and facilitate the establishment and use of joint programs.

b. Each joint acquisition program will have a lead service assigned and an ILSM will be assigned to execute the overall ILS program. The involved services will comply with the individual ILS regulations of the involved services unless an impasse occurs. The order of precedence will be DOD-level guidance followed by joint service regulations and, finally, the lead service ILS regulation. The lead service will make every effort to accommodate the unique ILS requirements of the participating services. All involved services will standardize ILS requirements and data products as much as possible.

c. ILS coordination in early research and development is intended to cost effectively influence equipment design. Early consideration should be given to each service's different missions, operating concepts, and operating environments, as well as their standard practices, procedures and doctrines to ensure optimum logistics support for each service. Early involvement in all program planning is essential to ensure logistics requirements are planned, documented and coordinated among the participating services. Joint logistics planning begins at program inception and continues throughout all phases of the life cycle.

2–9. Joint service integrated logistics support managers

Each of the service ILS managers (ILSMs) should—

a. Influence program operational requirements, acquisition strategy, and system design to achieve and sustain established objectives of the ILS program while minimizing operating and support costs.

b. Ensure all elements of support are planned, programmed, budgeted, developed, tested, evaluated, acquired, and deployed prior to or concurrent with the system.

c. Ensure proper coordination with the ultimate users of the system and support equipment, resulting in an effective handoff to the user, and maximizing system and equipment readiness.

d. Assist the PM in ensuring compliance with policy, procedures, plans, and standards established for the effective acquisition and integration of logistics elements.

e. Improve system and associated logistics interoperability and standardization with DOD and allied nations.

f. Improve system and equipment affordability through the competitive bidding process, acquire TDP and reprocurement packages when appropriate, and require contractors to identify the actual hardware manufacturer.

g. Ensure the identification of all service-unique ILS requirements and the incorporation of these requirements into the Joint Supportability Strategy (JSS) and Joint Memorandum of Agreement (JMOA).

h. Ensure all service's comply with DOD-regulated safety standards and requirements in relation to equipment configuration.

2–10. Lead service ILSM

a. The lead service designates an ILSM prior to establishing an acquisition strategy, to execute the ILS program, and provide support to the joint PM in all matters related to the ILS program and to ensure that ILS considerations are properly included in the acquisition strategy. The ILSM must face the challenge of meeting the supportability requirements of more than one military service. Each service's unique supportability requirements need to be identified and provided to the program lead so they can be addressed.

b. The lead Service ILSM coordinates the joint logistics efforts of the joint program to—

(1) Ensure that each participating service designates an ILSM as a focal point to serve on and support the ILS program. The service ILSM is responsible for identifying service-unique requirements.

(2) Establish a joint SIPT to include representatives from each of the participating services and ensure coordination in all major ILS program decisions, actions, and planning efforts.

(3) Ensure ILS requirements are addressed in the Program JMOA and, if desired, prepare a separate ILS program JMOA in conjunction with participating services.

(4) Ensure a single set of ILS elements is identified and agreed to during the formulation of the ILS program and the JMOA.

(5) Ensure that procedures for determining sources of funding for participating Service-unique ILS requirements are included in the JMOA.

(6) Identify and document maintenance and support concepts. Ensure that the participating services' maintenance and support concept and deployment, transfer, or fielding requirements are identified, documented, and provided for incorporation into the JSS and JMOA. Ensure the planning process accommodates what is common and what is different in the service concepts.

(7) Ensure that operational requirements, acquisition strategy, solicitation, contractual, and other planning documents include ILS program requirements and ensure these requirements are consistent throughout all program management documentation. In conjunction with participating services, identify service-unique requirements, maintenance and support concepts, and data requirements for contractual application. Ensure equal service representation during the source selection process.

(8) Encourage joint use of centralized training facilities for common operator and maintenance training, to reduce duplication.

(9) Provide a joint ILS assessment and coordinate the assessment with the participating services for presentation at program decision review meetings. The assessment should meet the requirements of DODI 5000.2.

2–11. Procedures

a. The ILS program decisions are documented in the JMOA and will be used to formalize the responsibility and procedures for joint ILS program operation. The JMOA will also include procedures for resolving impasses between the services involved. Within the context of the DOD guidance, participants in a joint program negotiate specific ILS roles, activities, responsibilities, and fiscal support to be provided by the lead and participating services. The lead service ILSM obtains initial program instruction from the acquisition decision memorandum specifying the lead DOD component and provides explicit guidance regarding the responsibilities of the participating services.

b. A joint SIPT will be established as early as possible and meet as required to assist and support the lead service ILSM in accomplishing program related ILS functions. The joint SIPT will perform the same function as an Army SIPT, except membership will consist of members from each of the services and the SIPT will be chaired by the lead service ILSM. The SIPT requirements and joint participation in these teams will be defined in the ILS part of the JMOA.

c. The JSS should be initiated when the lead service ILSM is designated. The plan should be prepared by the lead service in conjunction with the participating services. The lead service will update and expand on the JSS as required. The ILS program JMOA is included as a required annex to the plan. If necessary, each service's unique ILS program planning information and requirements should be contained in a separate JSS annex.

d. The lead service ILSM will participate in the joint T&E IPT to ensure supportability T&E issues are identified and evaluated. The JSS should be used as the basis for the supportability issues identified in the T&E criteria to include detailed maintenance planning. The lead service ILSM should ensure participating services are included in developing supportability test issues and test plans for both hardware and software. Every effort should be made to avoid duplication of efforts and to use test assets as efficiently as possible while proving the operational effectiveness, and operational suitability, including testing required to prove a service-unique supportability issue for any services involved. Any separate service testing required to prove a service-unique supportability issue not being addressed in the T&E plan should be surfaced by the service ILSM and the lead ILSM as soon as possible. Additional independent Army testing will not be conducted unless there are unresolved test issues peculiar to the Army application or Army unique program requirements.

2–12. Unique service requirements

a. Each of the military services have unique processes for approving procurement funding for and fielding of acquisition systems. TC is the Army's process for verifying the acceptability of an acquisition system for procurement and introduction into the Army inventory (see AR 70–1). When the lead service for the program is not the Army, system requirements may not be consistent with the Army's process for TC. If the Army is not the lead service on a joint program, the Army service ILSM must ensure that the lead service ILSM is aware of this requirement and that provisions are made to meet the Army's TC requirement. If the reviewing authority who normally recommends TC for Army programs is not the same as the approving authority designated to oversee the program, provisions must be made as early as possible to establish a method for acquiring Army TC and document the plan of action. Development of the program schedule must consider the time constraints required to allow the completion of the Army TC prerequisites.

b. The Army's process for materiel fielding, TPF, will be used for the introduction of materiel into Army units. The introduction of a new materiel system in an Army operational environment differs from the other services. The lead service ILSM and the Army ILSM must consider these unique requirements and develop a detailed plan for how the Army's prerequisites for new equipment fielding will be met (see AR 700–142 and DA Pam 700–142). The program schedule must be built with the leadtimes needed to complete the Army prerequisites. If the Army is serving as the lead, other services' requirements must be considered. A clear understanding of each service's fielding terms (for example, first unit equipped date (FUED) versus initial operational capability (IOC)), should be established early in the program to avoid misunderstandings.

c. Unit set fielding (USF) and system of systems concepts provide a disciplined, synchronized approach that focuses on fielding system of systems configured in unit sets that will provide to units a fully integrated operational capability. The key to USF and system of systems is ensuring that all set components, to include warfighting equipment; digital hardware and software; support facilities; training aids, devices, simulators, and simulations; personnel; and associated support items of equipment (ASIOE), are present and integrated during the fielding process (see AR 700–142 and DA Pam 700–142). The complexity of such fieldings requires that all service requirements be identified as early in the program as possible and that production and fielding schedules be intensively managed to maximize warfighter capabilities and minimize the disruptions to units in all the impacted services.

d. Materiel release is the Army's process to assure that materiel is safe, operationally suitable, and is supportable before release for issue to users. The lead service ILSM and the Army ILSM must develop a detailed plan for how the Army's prerequisites for materiel release will be met (see AR 700–142 and DA Pam 700–142).

Chapter 3
Supportability Planning in Concept Refinement

3–1. Objectives and goals

The primary objective of concept refinement is to refine the initial concept and to develop an approved technology development strategy (TDS). A detailed list of objectives and goals in concept refinement along with the tasks and documentation to fulfill them is presented in table 3–1. Additional information is provided in paragraph 8–2 for supportability analysis.

Table 3–1
ILS in concept refinement (presystems acquisition)

Objectives and goals	Tasks and documents
Define and evaluate alternative concepts.	Conduct concept studies in accordance with ICD.
Assess and compare concepts.	Initiate the following documents: *Affordability assessment.*
Identify the most promising concepts.	*AoA.* *Exit criteria.*
Quantify the broad objectives for cost, schedule, performance, and supportability, software requirements, tradeoffs, overall acquisition strategy, and T&E strategy and describe a functional baseline.	*Market research and investigation.* *TDS.*

3–2. ILS management

Combat developer procedures comprise the following:

a. The CBTDEV uses analysis of alternatives (AoA) to develop the TDS and address the Army areas of doctrine, organization, training and education, materiel, leadership, personnel and facilities. All organizations having a significant interest in a warfighting capability or having critical support capabilities will be invited to participate with the ICT.

b. The CBTDEV, in establishing an initial logistics' framework of parameters, constraints, and data requirements, will establish logistics items for inclusion in early requests for proposals (RFPs) from industry and may establish desired parameters or goals such as fuel efficiency, system or component reliability, or operations cost (or total cost), desire for data rights, and other requirements. The goals of these requirements in the RFP are to support user requirements and Army goals, enable further decision, and begin the effort to control costs/reduce footprint and enable the process.

c. During CR, ILS issues, supportability deficiencies, and opportunities for improvements and efficiencies are evaluated by the CBTDEV using the capabilities determination process. Prior to program initiation, the CBTDEV will—

(1) Initiate manpower and personnel integration (MANPRINT) and logistics improvement and doctrine studies.

(2) Identify issues, constraints, and requirements concerning supportability, MANPRINT, environmental, and training.

d. ILS planning must lend specific weight to mission and logistics reliability.

e. The CBTDEV notifies the MATDEV and the following program participants when the ICD is approved and the CR phase begins.

(1) The materiel proponent.

(2) The U.S. Army Combined Arms Support Command.

(3) The U.S. Army Training Support Center (ATSC).

(4) The U.S. Army Nuclear and Chemical Agency.

(5) ATEC.

(6) Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) DASA–ILS, SAAL–ZL.

f. The materiel proponent designates an individual to serve as the MATDEV ILS representative and notifies the CBTDEV and ATEC. The ILS representative provides ILS support and interface to the CBTDEV.

g. The CBTDEV exercises lead responsibility for MANPRINT and identifies the tasks, analyses, tradeoffs, and decisions that address MANPRINT issues during the materiel development and acquisition process.

3–3. Materiel development procedures

During CR, the MATDEV and CBTDEV are involved in numerous activities to identify supportability deficiencies and find opportunities to improve Army systems and their support; the following are examples:

a. Examine ILS implications in technology base assessments and experimentation.

b. Ensure ILS concepts, issues and alternatives are fully considered in AoA.

c. Assist in formulating supportability-related objectives, thresholds and key performance parameters with special consideration to mission reliability, logistics reliability, and fuel efficiency as they impact on performance, total cost and footprint.

d. Utilize its knowledge base to identify performance, maintenance, and cost information, system assessments, engineering changes, incidents reports, simulations, and field-experience data to identify materiel, MPT, and logistics constraints and improvement opportunities.

Chapter 4
ILS and Supportability Planning in Technology Development

4–1. Objectives and goals

The primary objective of technology development (TD) is to reduce technology risk and to determine the appropriate set of technologies to be integrated into a full system, and develop an approved capabilities development document (CDD). A detailed list of objectives and goals in TD, along with the tasks and documentation to fulfill them, is presented in table 4–1.

Table 4–1.
ILS in TD

Objectives and goals	Tasks and documents
Define and evaluate alternative technologies. Refine user requirements. Assess technology maturity. Conduct tradeoff analyses for cost, schedule, performance, and supportability, software requirements, tradeoffs, overall acquisition strategy, and T&E strategy and describe a functional baseline. Obtain program start approval. Assess environmental risks	Conduct technology risk reduction studies Initiate the following documents: *Acquisition decision memorandum.* *CDD.* *CAIV.* *Exit criteria for milestone B.* *Acquisition program baseline (APB).* *Acquisition strategy.* *SS.* *STRAP.* *TEMP.* *Computer resources life-cycle management plan (CRLCMP).* *TR.* Update the following: *Market research and investigation.* *AoA.*

4–2. ILS management

Combat developer procedures include the following:

a. During TD, ILS issues, supportability deficiencies, and opportunities for improvements and efficiencies are evaluated by the CBTDEV using the capabilities determination process. Prior to program initiation, the CBTDEV will accomplish the following:

(1) Continue MANPRINT and logistics improvement and doctrine studies.

(2) Continue to identify the issues, constraints, requirements for logistics, MANPRINT, environment, and training and to provide input to ongoing RFP processes that will support the gathering of useful information during market research and beyond.

(3) Utilize results from experience with similar systems, advanced technology demonstrations and experiments to demonstrate the maturity and military utility of technologies and recommend best-value solutions.

(4) Use the guidance provided in MIL–HDBK–502 and MIL–PRF–49506 to identify the user's desired system support concept.

(5) Type I (feasibility) BCA development begins prior to milestone A and is further refined for initial submission to the PEO/Life-Cycle Management Command (LCMC) prior to milestone B.

b. The CBTDEV, in coordination with the MATDEV, prepares the SS during the initial phase of drafting the CDD. The SS ensures that only support analyses tailored to the program needs are accomplished for development of ILS element requirements and constraints and to identify the supportability design requirements. This information must be consistent with the ILS information contained in the ICD.

c. The U.S. Army Training and Doctrine Command (TRADOC) proponent provides the training developer (TNGDEV) requirements analyses for CDD development. The MATDEV performs system concept studies. All input contributes to the AoA used by the milestone decision authority (MDA) to support ACAT I and II program decisions. Each analysis identifies logistics support requirements to be considered in the program.

d. The CBTDEV ensures actions are initiated by the appropriate CBTDEV activity to develop, coordinate, and distribute the System Training Plan (STRAP). Through a coordinated effort, the CBTDEV and MATDEV ILSM ensure that the schedules and milestones outlined in the STRAP for the training system are integrated into other ILS plans and requirements. This includes scheduling the availability of the hardware and other resources to satisfy the requirements of the STRAP.

e. The CBTDEV, in coordination with the T&E IPT and the MATDEV ILSM, develops ILS test objectives, issues, and criteria for inclusion in the TEMP and ensures adequate scope and resources. Supportability is a critical factor of performance in evaluating test objectives, issues, and criteria, as well as in source selection evaluation. The CBTDEV ensures a complete set of ILS issues and criteria are included in the TEMP. The CBTDEV and the MATDEV ILSM define the required components of the system support package (SSP) to ensure availability for tests scheduled in the TEMP. The TEMP is reviewed to ensure the test concepts and planning information address the ILS issues and criteria.

4–3. Materiel development procedures

During TD, the MATDEV performs numerous activities to identify supportability deficiencies and find opportunities to improve Army systems and their support, including the following:

a. Preventing pollution, the Army's preferred approach to maintaining compliance with environmental laws and regulations. AR 70–1 and AR 200–1 require acquisition programs to incorporate pollution prevention throughout the acquisition process. PMs are required to prepare a programmatic environmental, safety, and occupational health evaluation (PESHE) as part of the weapon system's acquisition strategy. It is a living document required by milestone B that should include—

(1) Environmental, safety, and occupational health risks.

(2) Strategy for incorporating risks into the system engineering process.

(3) Methods for tracking progress in the management and mitigation of risks.

(4) Environmental, safety, and occupational health responsibilities

(5) Schedule for completing National Environmental Policy Act and Executive Order documentation

b. Evaluating ILS implications in technology base assessments and experimentation.

c. Ensuring mutually satisfactory resolution of CBTDEV ILS issues and concerns.

d. Developing crosswalks between the SS and other key documents, such as the acquisition strategy (AS), the TEMP, and the statement of work (SOW).

e. Ensuring that ILS considerations are fully addressed in developing the AS. The AS precedes or is prepared concurrently with the SS. The SS must also be compatible with the tailoring of acquisition processes established in the AS. The approved SS is based on the ILS content of the approved AS. The MATDEV ILSM coordinates the ILS input with the SIPT members who provide assistance in developing alternate ILS strategies and impact assessments.

f. Submitting a transportability report (TR) to the Military Surface Deployment and Distribution Command–Transportation Engineering Agency (MSDDC–TEA) no later than 90 days prior to each MDR. The TR describes the transportability characteristics of problem items designated by the MATDEV for development and evaluation during SDD. The TEA of the TR developed by MSDDC–TEA must be available prior to the MDR B.

g. The MDR B is held to ensure that the system concept is viable and that all required program management documentation has been developed and is available to base the decision to proceed to the next phase of development. The decision review level is based on system cost, importance to Army, congressional interest, and so on (see AR 70–1 for decision levels and specific criteria). An affirmative decision permits continued development and acquisition actions as described and appropriate for the SDD phase

Chapter 5
ILS and Supportability Planning in System Development and Demonstration

5–1. Goals

In SDD, the primary goals are system development, logistics support system development, and demonstration of both the system capabilities and supportability. The actions include efforts to—

a. Minimize program risk (including integration, supportability and manufacturing risk).

b. Select, build, and/or simulate prototypes.

c. Test prototypes and the support system in integrated developmental and operational tests.

d. Implement human systems integration

e. Reduce logistic footprint by appropriate consideration of mission reliability at systems and component level, logistics reliability, reliability growth, fuel or power efficiency, improvements in maintainability and other supportability issues, and so on.

f. Develop and update all LMI.

g. Select or develop the product baseline.

h. Ensure interoperability, and utility.

i. Design for producibility.

j. Conduct core logistics analysis/source of repair analysis.

k. Ensure affordability and minimize life-cycle cost.

l. Conduct the business case analysis (BCA) for PBL. The type I BCA is expanded into an initial type II (formal) BCA early in the SDD and is completed prior to milestone C.

m. Select the PSI.

n. Prepare draft PBAs.

5–2. Program establishment

a. Following a favorable MDR to enter SDD, the MATDEV/PM is chartered and a management team is built. The MATDEV designates an individual to serve as the ILSM for the program . The MATDEV ILSM chairs the SIPT and assumes the lead ILS management role for the materiel acquisition effort. The CBTDEV now assumes a supporting role and ensures that all ILS program actions are fully coordinated within the CBTDEV community. The CBTDEV ensures that required CBTDEV participants are advised and attend SIPT meetings, as necessary. The SIPT is the vehicle for keeping CBTDEV and MATDEV acquisition participants abreast of all the ILS issues, actions, and milestones that affect the ILS program including updates to the SS.

b. The SIPT ensures that the overall SA process is tailored to the system, reflects the current design configuration, and identifies and optimizes those logistics support and MPT requirements necessary to support the deployed materiel system.

c. The SIPT will assist the MATDEV in developing performance-based agreements (PBAs), solicitation documents and contracts.

(1) The SIPT will work in coordination with the MATDEV, warfighter/user, PSI, product support providers (PSPs) and other involved organizations to prepare PBAs to establish roles and system support performance requirements.

(2) The ILSM, through the SIPT, coordinates and establishes requirements for contractor-prepared data products. All ILS points of contact (POCs) submit their input to the MATDEV.

(3) The MATDEV coordinates the SOW or statement of objectives (SOO) for materiel acquisitions with SIPT members.

(4) The MATDEV, in finalizing the solicitation package, gives the SIPT recommendations full consideration and seeks to resolve all issues. However, ultimate responsibility for the solicitation package rests with the MATDEV.

(5) The SIPT will provide recommendations with regard to all proposed contract and PBA changes that impact supportability or ILS objectives.

5–3. Documentation

a. The following program and ILS documents are initiated during SDD (see table 5–1 for a portrayal of the objectives and goals, tasks and documentation addressed in SDD).

(1) The basis of issue plan feeder data (BOIPFD) is provided to the U.S. Army Force Management Support Agency (USAFMSA). In preparing the BOIPFD, the MATDEV uses the STRAP, the updated capabilities document (CD), results of SA ,and relevant baseline and constraint data.

(2) A draft maintenance plan and draft depot maintenance support plan (DMSP) prepared and provided to all involved organizations (see chap 18 for details on the DMSP).

(3) The new equipment training plan (NETP) is initiated. The ILSM ensures that the NET manager coordinates the NETP with the trainer and CBTDEV and the approved plan is provided to the CBTDEV and logistician and is included in the STRAP.

(4) A draft provisioning plan (PP) is developed to guide the MATDEV, SIPT, and PSP.
(5) A materiel fielding plan (MFP) is prepared using data in the CDD, AS, SS, PP, NETP, and DMSP.
(6) PBAs are developed and coordinated with the PSI, PSP, warfighter/user, and other affected organizations.
(7) A support facilities annex is prepared and coordinated with the COE.
(8) A BCA is conducted to determine if a PBL strategy is economically and operationally feasible for the system.

Table 5–1.
ILS in SDD

Objectives and goals	Tasks and documents
Promote engineering system development and logistics support development. Translate the most promising design into a stable, interoperable, producible, supportable, and cost-effective design. Demonstrate system capabilities through testing and modeling and simulation. Validate the manufacturing and production processes. Develop and validate supportability, to include evolutionary software development. Develop the product baseline.	Develop and test hardware, software, supportability, and interoperability. Initiate the following documents: *CPD.* *BOIPFD.* *DMSP.* *NETP.* *PP.* *BCA* *Support facilities annex (SFA).* *MFP.* *Draft equipment manuals.* *PPS plan.* *PBAs.* *Disposal plan..* Update the following documents: *Capability production document (CPD)* *Acquisition decision memorandum.* *Affordability assessment.* *AoA.* *CAIV.* *Exit criteria.* *APB.* *AS.* *Market research and investigation.* *CD, SS* *STRAP.* *TEMP.* *TR.* *CRLCMP*

b. The following documents are updated during SDD and each update should be identified using an issue number, a date, a revision letter or some other method to differentiate it from other versions:
(1) Acquisition decision memorandum, including—
(a) Affordability assessment over the projected life cycle.
(b) AoA.
(c) CAIV report.
(d) Exit criteria for the SDD phase.
(2) APB, including—
(a) AS.
(b) Current market investigation.
(3) CPD.
(4) SS (including the minimum required military support posture from CBTDEV).
(5) STRAP.
(6) TEMP.
(7) TR with transportability approval from MSDDC–TEA.

5–4. ILS tasks

a. The SIPT updates the SS to guide SDD and future life-cycle phase actions. The SIPT supports the materiel proponent in taking the required actions during SDD.

b. The AS should be updated concurrently with the SS as these two documents provide source information for each other.

c. The TEMP is updated to reflect the ILS test objectives, issues, and criteria (see appendix D) in test plans, LD, and test evaluation reports.

d. The T&E IPT includes ILS representation.

e. The SSP and NETP are developed and delivered within established milestones to support technical and user tests.

f. PBAs are developed to document the system sustainment strategy in terms of performance-oriented goals tied to metrics.

g. In coordination with the contractor, a post-production support (PPS) plan is developed that describes the management and support activities necessary to ensure readiness and sustainability objectives are met after the production line for the system shuts down.

h. During SDD, the SIPT coordinates and verifies logistics requirements on behalf of the MATDEV. Coordination and cooperation among all functional elements and integrators are critical to the success of the ILS program. The updated SS is the primary planning and execution document for ILS program management planning and coordination of ILS efforts.

i. ILS-related activities (for example, solicitations/contracts, funding, basis of issue plan (BOIP)/BOIPFD, and planning for training, and so on) accomplished in SDD are recorded in the appropriate documentation.

j. Work on the technical publications and equipment manuals begin.

k. SA and the resultant LMI define the requirements for each of the ILS elements to support system in the operational environment.

l. A reaffirmed transportability approval from MSDDC–TEA, in response to the materiel proponent's TR, is required prior to M/S C production decision. This transportability analysis should detail transportability in support of the operational mission mode summary not technical capability to place on a certain mode of transportation (will it arrive in a useful combat configuration or will it require support to resemble, fuel, load, and so on.)

m. Increased coordination with the gaining commands begins with the MFP, which prepares the MATDEV, warfighter/user, and other involved organizations for the fielding, deployment, operation and support in the rest of the life cycle. The SIPT ensures preparation and distribution of the initial MFP 25 months prior to the FUED. The CBTDEV input to the initial MFP is provided by the CBTDEV ILS POC, in the time frame established by the ILSM. Coordination guidance for all draft MFPs are as specified in DA Pam 700–142. The CBTDEV must monitor and assure the system is supportable before the FUED.

n. The TC prerequisites are addressed to verify that the system is producible and meets Army requirements before the production decision is made.

o. The materiel release prerequisites are addressed to verify, after production, that the system is safe, suitable, and supportable in its intended environment before it is released to soldiers.

Chapter 6
Supportability Planning in Production, Deployment, Operations, and Support

Section I
Production and Deployment

6–1. The production decision

a. Some systems may not meet the criteria for approval of full production. These systems may have a special review to allow for low rate initial production of the system. The systems will be used for testing, to verify production capability prior to full production authorization, or to provide a limited quantity of the system for urgent operational requirements. Equipment procured under the low rate initial production designation will be upgraded to meet the configuration of the system approved for full rate production.

b. When TC standard is granted (see AR 70–1) and all the exit criteria have been met, full rate production is approved. However the system will not be fielded to the Army in the field unless the materiel release process verifies that the system is safe, meets operational requirements, and is logistically supportable in the intended environment (see AR 700–142).

6–2. Goals

The primary goal in production, deployment, operations, and support (PDOS) is to achieve an operational, affordable, supported capability that satisfies mission needs. It entails the production and deployment of the system and logistics support for life of the system (see table 6–1). The actions will include—

a. Production contract award.

b. Configuration management (CM).

c. Publication of technical and equipment publications including electronic technical manuals and interactive electronic technical manuals.

d. Publication of the gaining units' table of organization and equipment (TOE) and MTOE or TDA.

e. Production tests and system acceptance.

f. Materiel release.

g. NET.

h. Materiel fielding.

i. IOC.

j. Implementation of PBAs for operation and support of the system throughout its useful life.

Table 6–1
ILS in PDOS

Objectives and goals	Tasks and documents
Production, fielding, operations and support. Finalize all documentation, train personnel for maintenance and operations. Verify authorizations, begin distribution and perform field exercises to achieve IOC.	Obtain materiel release approval. Initiate: *MFA.* *Post-production software support (PPSS) plan.* *PFSA.* Update and finalize MFA, MFP, SFA, DMSP, NETP, PBAs, engineering change proposals (ECPs), MTS, PPS plan, disposal plan.

6–3. ILS management

a. The SIPT ensures that solicitations and contract documents contain provisions for all ILS elements required to support initial fielding, deployment, and continuing operation and support of the new systems.

b. The CBTDEV/MATDEV coordinate with all schools having training responsibilities for operation and maintenance support Military Occupational Specialties (MOS) in order to assess institutional training for system sustainment beyond NET. The NET and institutional training schedules are synchronized to ensure successful fielding and sustainment operations.

c. The MATDEV and SIPT increase coordination with the gaining Army commands during PDOS. The final MFP is coordinated and then a materiel fielding agreement (MFA) is signed by the MATDEV and the gaining MACOM to ensure successful TPF. All TPF activity documentation is maintained in the Total Army Fielding System at the U.S. Army Materiel Command (AMC) Army Electronic Product Support Website.

d. The SIPT coordinates system supportability considerations with the materiel release review board in an effort to obtain materiel release certifications that the system is safe, compliant with legal requirements, meets operational requirements, and is logistically supportable in its intended environment.

e. Update PBAs to ensure the sustainment strategy is responsive to the users in the field. This includes coordination with users, product support integrators, and product support providers.

f. The type II (formal) BCA is validated and updated post-implementation whenever there are major programmatic changes or at least every 5 years.

6–4. Total package fielding

TPF is the Army's standard fielding process (AR 700–142 and DA Pam 700–142). The TPF process is designed to ensure thorough coordination among the MATDEV, CBTDEV, and the gaining Army commands and units in planning the system fielding. It also results in Army units receiving a complete system including all support equipment, manuals, and training required to operate and support the system. All TPF activity will be documented in the Total Army Fielding System Web site.

6–5. Unit set fielding

USF is a disciplined, synchronized approach that focuses on fielding a "system of systems" configured in unit sets which provide to units a fully integrated operational capability. USF is a shift from a focus on fielding "stand alone" systems. Full integration and synchronization of materiel fielding and materiel transfer plans and activities of the different systems are essential for successful fielding. In USF, all the various components must be brought together at the proper locations and at the right time, to include warfighting equipment, digital hardware and software, support facilities, supply support, personnel, and ASIOE. Successful USF also focuses on the corresponding installation infrastructure, training base, and training center modernization. The main benefit of USF is implementation of a full modernized warfighting capability with a minimum disruption to unit readiness. Unit set fieldings are sequenced according to operational priorities and the transformation campaign plan.

Section II
Operations and Support

6–6. Operations and support management I

a. The final PPS plan will be completed prior to production phase-out and schedules will be established for reviewing and updating PPS planning throughout the life cycle.

b. Following the fielding of ACAT I, II, or III level systems, equipment performance and readiness data will be gathered through Standard Army Management Information Systems (STAMIS) and at the Logistics Support Activity (LOGSA), who will monitor the data to collect information not available during development and acceptance testing. post-fielding support analysis (PFSA) can then be used to minimize support costs and develop modifications or new systems with improved supportability and reduced life-cycle costs.

c. After initial fielding to Army units several transitions may have to be planned. One transition will be from support while the acquisition system is in production to support after production has been terminated (this should be reflected in the SS) (see chap 17 for PPS planning). Another transition may be the changeover from ICS or contractor logistics support (CLS) to Army organic support (this should be included in the MFP and the SS). All transitions need to be planned far enough in advance to ensure no interruption in the programming and budgeting functions for life-cycle support resources.

d. In supporting Army equipment the planning process will assure the continuing sustainment and maintenance of systems and can include—

(1) Life-cycle savings through improved operations and support methods.

(2) Modernization through spares (MTS).

(3) Evolutionary acquisition/preplanned product improvements.

(4) Value engineering improvements.

e. A disposal plan must be developed prior to the end of the useful life of a system to identify demilitarization, disposition, and disposal requirements and ensure compliance with legal and regulatory requirements relating to safety, security, and the environment. This plan must be completed far enough in advance to minimize disposal costs. Although there is no specified format, the plan should contain the following elements:

(1) Identity and responsibilities of all organizations.

(2) Hazardous materials handling and demilitarization requirements.

(3) Security considerations.

(4) Description of the disposal process and individual activities involved.

(5) System disposal schedule.

(6) Disposal costs and funding.

6–7. Operations and support management II

a. The MATDEV, with the support of the SIPT, will use data collected from the field readiness and maintenance reporting systems and field-training exercises for analysis with the objective of continually improving the support structure and reducing O&S costs. Efforts will include identifying cost drivers due to failure rates that exceeded or increased costs of replacement parts, and performing level of repair analysis (LORA) to validate the established support structure. Automated tools such as the PFSA system can be used to process and analyze the field data against specified metrics.

b. In accordance with the provisions of the PBAs, the MATDEV will collect and evaluate the actual field data against the metrics specified in the PBAs. These data and evaluation results will be provided to all participating elements of the PBA(s) and corrective actions taken when required.

c. The MATDEV will institute a continual technology refreshment program and initiate system modifications, as necessary, to improve supportability, reduce ownership costs, and decrease the logistics footprint of the system.

d. PBAs will be updated as required throughout the operational life of the system to reflect revised system sustainment strategies in terms of performance-oriented goals tied to metrics.

Chapter 7
Performance-Based Logistics

7–1. Concept

a. PBL is a system support/sustainment strategy that delineates outcome performance goals of weapon systems, ensures that logistics support responsibilities are formally assigned, and provides metrics-based performance incentives for attaining these goals. The logistics requirements are stated as expected results (measurable outcomes) based on user/warfighter requirements. The responsibility and accountability for meeting these expectations fall on the PM's designated Product Support Integrator (PSI). The specific PBL responsibilities are stated in PBAs between the PM and the user/warfighter as well as between the PM and the PSI. As a minimum, PBL system support/sustainment management planning shall address:

(1) Integrated supply chain segmented support by system or subsystems.

(2) Responsive relationships with the warfighter based on system readiness.

(3) Best-value support based on long-term and competitive arrangements with product support providers (PSPs) and integrators (PSIs).

(4) Continuous support performance monitoring based on high-level metrics such as operational availability.

(5) Product affordability and mission reliability.

(6) Dedicated investment in technology refreshment.

b. DoD acquisition policy mandates that the PM, as the total life-cycle systems manager, implement a performance-oriented strategy to sustain systems throughout the system life cycle. The PM must work with the user/warfighter to specify support requirements, measurable outcomes, resources, and responsibilities and document them in PBAs. PBL will be implemented for ACAT I and II programs if PBL has proven to be both economically and operationally feasible. PBL may be applied to ACAT III programs with HQDA approval. For ACAT I and II programs, any PBL product support strategy requires approval by the Army acquisition executive.

c. The PM and SIPT must evaluate the most promising alternative support/sustainment strategies and carefully tailor each strategy and PBL approach. The PM and SIPT may determine that a PBL approach is operationally infeasible or unaffordable for a given system. The PM must keep in mind that every PBL initiative is unique. In the course of an acquisition program the PM and SIPT will encounter issues with no precedence. In addition, the support/sustainment strategy and PBL approach will evolve over the life of a system.

d. Under the PBL concept, an agency which is designated as the PSI will serve as the single source responsible to the PM and accountable for providing support to the user/warfighter for the assigned acquisition system. The PSI agency may be a commercial or government entity, or commercial and government partnership. The PSI should be a member of the SIPT. In fact, the PM may designate the PSI as co-chair of the SIPT as early as the Production and Deployment phase. While the product support manager (see the Defense Acquisition Guidebook) plans, monitors, and guides the ILS program, the PSI executes and evaluates provision of logistics support products and services to the user/warfighter in support of the acquisition system. Typically, a commercial entity PSI has a formal relationship with the PM and a less direct relationship with the user/warfighter. The PSI is the PM's agent for integrating all the different system support/sustainment functions and ensuring that the agreed upon PBL metrics are met. The relationship between the PM and a commercial PSI is normally contractual, while the relationship between a PM and an organic PSI is via a PBA.

e. Under the PBL concept, PSPs are any Government entity or contractor that provide system support/sustainment products or services for a given acquisition system. The PSI is responsible for negotiating PBAs and managing the performance of all involved PSPs such as the DLA centers, inventory materiel management centers, depots, and support contractors.

7–2. Determination and approval

a. Before PBL is implemented as a support/sustainment strategy for a given system, the PM must first make a determination that PBL will provide the maximum operational effectiveness for the user/warfighter at the minimum life-cycle cost:

b. The basic steps in PBL strategy determination and development are—

(1) Establish a PBL strategy team. This team will include the applicable SIPT members with partial support from contracting specialists, legal, cost analysis and other functional areas as required.

(2) Identify user/warfighter support/sustainment requirements. The requirements of the user/warfighter must be identified in measurable performance outcomes and must be fully understood in order to define the elements of the PBL strategy and develop alternatives for evaluation.

(3) Conduct market research/investigation/survey. This is a necessary step for identifying and evaluating potential sources for support/sustainment products and services. Market research may need to be conducted iteratively through PBL strategy determination and development.

(4) Identify alternative system support/sustainment strategies. It is important for the PM and SIPT to develop viable system support/sustainment strategies for evaluation. The PM should not predetermine a support strategy without analysis or on the basis of "how support was done before." Although there may be a large number of support alternatives from organic to full life-cycle contractor support and everything between, it is important to select a few of the most promising alternatives for further consideration.

(5) Conduct a risk assessment. All support alternatives must be assessed for risk and, as applicable risk mitigation efforts should be stated.

(6) Conduct supportability analyses. Supportability analyses should be conducted on each of the candidate alternatives in order to predict the resource requirements and the operational availability and readiness which would be achieved using the support alternatives.

(7) Conduct life-cycle cost analysis. Cost analysis should be conducted on each of the candidate alternatives to provide estimates of all support costs for each alternative over the life of the system.

(8) Determination of "core" issue. The PM must determine if the system should be identified as having a DoD organic depot maintenance "core" issue. If so, congressional notification is required.

(9) Conduct a BCA. The basic means of documenting the PM decision regarding PBL implementation for a given program is the BCA. Information from the previous studies and analyses is used as input to the BCA. The BCA provides a means of comparing different support alternatives including contractor support costs versus organic (Government) support costs. For ACAT I and II programs a BCA is required as supporting documentation for the PBL determination decision.

(10) Validate the BCA. For ACAT I and II programs, the economic analysis portion of the BCA must be validated by the Deputy Assistant Secretary of the Army for Cost and Economics (DASA(CE)). DASA(ILS), DASA(CE), and AMC will independently review and verify the BCA.

(11) Approve the PBL. For ACAT I and II programs, the PBL product support strategy or a decision to reject a PBL solution requires approval by the AAE.

7–3. Performance-based agreements

a. The development of the PBL strategy provides the basis for the details on implementing and managing the prospective PBL program for a system. These details on the PBL strategy along with PBL program requirements are documented in the PBA. Under the PBL approach, the PBA clearly assigns the authority and support/sustainment responsibilities for the PM, PSI, PSP, and the user/warfighter providing the required system support/sustainment.

b. The PBA is a signed agreement between the PM and the user/warfighter, as well as between the PM and PSI. There may be a single PBA among the PM, PSP, PSI, and user/warfighter; or there may be separate PBAs between the different parties. The PBA may take several differeent forms, such as a memorandum of understanding, MOA, contract, performance plan and agreement (PPA), MFP/MFA, and so on.

c. The PBA is developed by the PM in coordination with the SIPT and should be included as an appendix within the system SS.

d. At a minimum, the PBA should include the following information:

(1) Realistic and measurable metrics, which include the five overarching metrics—

(a) Operational availability.

(b) Mission reliability.

(c) Cost per unit usage.

(d) Logistics footprint.

(e) Logistics response time.

(2) Roles and responsibilities of all stakeholders in collecting, processing, analyzing, and reporting performance data.

(3) Roles and responsibilities of all stakeholders in programming and distribution of funds.

(4) Data requirements and data sources.

(5) Frequency and format for data reporting.

(6) Provisions for performance reviews.

(7) Dispute resolution process.

(8) Approval and signature of all stakeholders.

7–4. Implementation

a. Following approval of the PBL strategy, the details for implementing and managing the PBL strategy, the responsibilities of involved Government and/or commercial entities, and the support/sustainment requirements/metrics must be documented in the PBA and contractual arrangements. The basic steps of the PBL implementation process are—

(1) Prepare the PBA with agreement with all involved organizations.

(2) Obtain PBA approval from the ASA(ALT).

(3) Conduct the solicitation process with involved commercial entities.

(a) Prepare either a SOO or SOW with objectives, requirements, and performance measures

(b) Implement alpha contracting to provide a way to avoid the time-consuming, sequential approach to traditional contracting.

(c) Conduct the proposal evaluation process and conduct negotiations as required.

(d) If not already, done, announce PSI and PSP selection after contract award

b. After the PBAs are in place and activated the PM, with support from the SIPT, must ensure that the user/

warfighter receives the system support/sustainment needed to meet the system operational effectiveness and readiness requirements. PBL program evaluation is a continuous process involving the following tasks:

(1) Monitoring PSI and PSP performance. The actual performance is measured against metrics in the PBA and contract. The following can be used for performance monitoring.

(a) Periodic performance reports from the warfighter, PSI and PSP

(b) Data available in automated information systems

(c) Regularly scheduled PBL team meetings.

(d) Field visits to user/warfighter units and PSP facilities

(e) Review by independent evaluators

(f) Customer surveys

(g) Trend analysis on supply and maintenance data

(2) Administering the PBL provisions of the PBA and/or contract (such as incentives and penalties). PBL-based contracts should contain incentives (such as award fee, award term, cost sharing) and penalties (such as loss of options, charges for excess cost).

(3) Expeditiously resolving any support/sustainment issues that may be identified by the warfighter or PSP.

(4) Review the PBA annually for adequacy and revise it as required to promote responsive support to the warfighter.

(5) Validating and updating BCA prior to the exercise of a contract/BCA option period when there are significant changes during the performance period/terms of the contract or evaluation period.

Chapter 8
Integrated Logistics Support Analysis

8–1. Purpose of analysis

Army policy requires all PMs to consider performance, cost, schedule, and supportability as co-equal in importance. In order for system supportability to be adequately addressed it is necessary for ILS-related analyses to be conducted. As with other aspects of the program, analysis can be used to identify objectives, determine feasibility, assess risk, establish resource requirements, evaluate test results, and for many more purposes. Analysis of the ILS aspects of any program requires quantification of the factors being analyzed and employment of appropriate analyses. Use of supportability metrics provides a means for expressing ILS goals in quantitative terms. Appendix B provides a list of metrics for each element of ILS. Appendix H describes some of the automated tools of use in conducting analyses related to ILS.

8–2. Supportability analysis

a. SA is conducted to determine the optimum set of logistic resource requirements for a system to achieve an objective system effectiveness at the minimum life cycle cost while minimizing the total Army logistics footprint. SA must be an integral part of the overall systems engineering effort. It is important to avoid the acquisition of redundant data. The integrated analyses can include any number of tools, practices, or techniques to realize the goals. Examples of specific types of analyses include tradeoff analysis, repair-level analysis, risk analysis, reliability predictions, reliability centered maintenance analysis, failure modes, effects and criticality analysis, life-cycle cost analysis, maintenance task analysis, facilities analysis, sensitivity analysis, and others.

b. The SA process can result in the generation of massive amounts of data. Taken together, these data are called LMI and are used by both the Government and contractor to assess design status, conduct logistics planning, influence program decisions, and obtain required support resources. Guidance on the SA process and development of LMI can be found in MIL–HDBK–502 and MIL–PRF–49506. These data can also be used by the Government to verify that the contractor is meeting the system performance and supportability requirements as specified in contractual instruments. The LMI data must be verified by the Government. The results of the supportability analysis efforts may be reported in the form of supportability analysis summaries such as—

(1) Maintenance planning summary.

(2) Repair summary.

(3) Support and Test equipment summary.

(4) Supply support summary.

(5) Manpower, personnel, and training summary.

(6) Facilities requirements summary.

(7) PHS&T summary.

(8) PPS summary.

c. SA is expensive and time consuming; therefore, it is important to carefully tailor SA for each acquisition program. Logistics support resources must be identified in a time frame, which considers the schedule for developing the required program documentation or meeting program milestones. Where possible any previous validated SA results and data should be used. For example, support drivers may already have been identified and used as input to another program document. The quality and currency of the available results must be assessed, but if deemed adequate, the work already done may eliminate the need for further iterations or limit the effort to one of updating the available results.

d. The focus and level of detail for SA depend upon the acquisition strategy and how far along the system is in the acquisition life cycle. The design maturity of the total system hardware, software, and support system design is a basic consideration in deciding what supportability analyses should be performed. Typically, commercial and nondevelopment items (commercial/NDI) acquisitions offer the mature designs and most of the required data should already be available.

e. The supportability analyses conducted within any acquisition phase should be properly aligned with the specific objectives of that phase as defined by the acquisition strategy. During the TD phase, the design of a system is more flexible and provides the best opportunities for identifying alternatives and examining tradeoffs from a supportability standpoint (for example, discard versus repair). During the SDD phase, analyses are conducted to develop detailed information about required maintenance actions, spares, support equipment, training, and manpower. SA is also used to develop preliminary technical publications and all the details for the provisioning system. SA can also provide the information needed to assist in making program decisions such as selection of contractor versus organic support.

8–3. Level of repair analysis

a. Comprehensive and effective maintenance planning is heavily dependent upon LORA for optimizing the support system in terms of life-cycle cost (LCC) and materiel readiness. The Computerized Method for Predicting and Analyzing Support Structures (COMPASS) is the Army's standard LORA model. A well-conducted and timely LORA is a powerful tool to assist decision-makers in resolving a wide variety of ILS related issues such as-—

(1) Preferred maintenance concept.

(2) Optimum maintenance task distribution.

(3) Repair versus discard.

(4) Allocation of support equipment.

(5) Manpower requirements at each level of maintenance level.

(6) Alternative mixes of organic and contractor support.

(7) Extent and duration of interim contractor support (when applicable).

(8) Support required for materiel fielding.

(9) Warranty considerations.

(10) Host nation support requirements.

(11) Facilities requirements.

(12) Cost to achieve a target availability.

b. Any LORA must be carefully tailored to the specific acquisition program. The LORA must be tailored to the size, complexity, and life-cycle phase of the system. The extent of detail and accuracy of a LORA depends upon such things as the type of acquisition program, amount of design freedom, funding, schedule, and availability of data. A LORA requires an extensive amount of data, which will need to be obtained from different sources such as LMI, the logistics integrated data base (LIDB), other system engineering analyses, and historical files. LORAs previously conducted on similar/existing systems may be a good source of data.

c. LORA should be applied in an iterative manner with updates/revisions as the system matures and more reliable input data becomes available. During TD the main purpose of a LORA is to guide the design of the system for supportability (for example, repair versus discard). Data based on engineering estimates may be unreliable. Therefore, sensitivity analysis must be conducted to assess how variations in the LORA input parameters affect the baseline maintenance concept and impact associated risks. During SDD and production, LORAs are usually conducted to establish an optimal support or maintenance structure for the system (for example, development of the maintenance allocation chart or assignment of source, maintenance, and recoverability codes). A LORA can even be conducted on fielded systems to assess the current maintenance structure of the system. Fielded system LORAs are recommended when there is an ECP, a proposed major change in contractor support, or a dramatic increase in failure rates or support costs. Additional guidance, to include specific regulatory guidance, is in AR 750–1, chapter 6. During post-deployment evaluation (see AR 750–1, para 6–7), the LORA will be rerun no earlier than 1 year and no later than 3 years from first unit equipped date, using actual reliability data from fielded equipment. The LORA must be rerun every 5 years throughout the equipment life cycle. LORA files will be maintained in accordance with AR 25–400–2.

8–4. Life-cycle cost analysis

a. The majority of a system's life-cycle costs can be attributed directly to operations and support costs after the system is fielded. The LCC is a measure of the true cost of the system because it looks beyond the RDT&E and production costs and seeks to estimate total ownership cost through system disposal. Because these costs are largely determined by decisions made early in the system development period, it is important that system developers evaluate the potential operation and support costs of alternate designs and factor these into early design decisions. LCC analysis is most effective as a tradeoff tool rather than as a way to generate precise cost estimates. It is used to produce cost estimates for evaluating alternatives on a life-cycle basis. However, accuracy can be increased with careful selection of an appropriate methodology, use of validated algorithms, and a thorough data collection. It is also important to document assumptions and constraints (see the Cost Analysis Manual at the Army Cost and Economic Analysis Center).

b. There are many types of methodologies and models used for LCC analysis. Three of the major approaches are:

(1) The analogy or scaling models use historical costs from predecessor or analogous systems and either applies these directly to the new system or applies a scaling factor to account for physical, functional , or operational differences between the analogous and new systems. This approach is used during the concept phase.

(2) The parametric approach uses a set of standard cost estimating relationships for building cost estimates. This approach is also used early in the life cycle when limited actual cost data is available.

(3) The engineering or "bottom-up" approach involves the used of detailed algorithms which address the operational scenario, procurement strategy, and support concept of the system. This approach is used when a significant amount of data of the various aspects of the system and components is available during the SDD and production phases.

c. A LCC analysis is required early in the life cycle (CR phase). Although many of the data available during CR may not be very accurate, the benefits of performing the LCC analysis will outweigh the detractors. As the program progresses and data become more reliable, it will be possible to improve the accuracy and detail of the LCC analysis.

d. It is important for the LCC analysis to cover the entire planned life of a program rather than limiting it to a budget cycle or the 6 years in the FYDP. Also, all cost categories and all appropriation accounts (RDT&E; procurement; military construction; OMA; and military personnel) should be included. All elements of ILS should be addressed through system demilitarization and disposal.

e. Manpower and personnel constitute the largest component of the DoD budget. It is important to include cost data on military and civilian personnel based on the skills and grades required to operate and support the system. The acquisition system should be engineered to minimize both the quantity and skill levels of manpower and personnel required to operate and support the system over its planned life cycle.

f. Software and its sustainment costs are a significant portion of the total system cost. Software cost estimating involves a large degree of experienced judgment, from both a project management and cost analysis perspective.

g. The analyst should not use residual values to reduce LCC. These costs are sunk by the time residual values come into play. Residual value is a benefit that is very speculative. It does not represent savings, but does represent a potential value. Salvage value is usually negligible.

h. Historically speaking, the top 12 sustainment cost drivers have been—

(1) Materiel (major items, secondary items, spare/repair parts, floats, and war reserves).

(2) Munitions.

(3) POL.

(4) Facilities.

(5) Technical data (development and maintenance of technical data package, software and software documentation, technical publications, and TPS).

(6) Transportability/transportation (transportability T&E, first- and second-destination transportation, and OCONUS second-destination transportation).

(7) Supply support (supply operations at all echelons, supply and maintenance depot operations).

(8) Support equipment (test, service, training, and maintenance equipment).

(9) Training (training devices, aides, materials, and facilities).

(10) Packaging, handling, and storage (garrisoned and deployed).

(11) Maintenance (manpower and personnel, tools and test equipment, test measurement and diagnostic equipment, system technical support (lifetime), recapitalization, upgrade, overhaul, rebuild).

(12) Environmental (compliance and stewardship, which need to be budgeted for and will be included in assessments by the MATDEV, CBTDEV, and Army acquisition logistician.

8–5. Provisioning analysis

a. According to AR 700–18, the primary objectives of Army provisioning activities are to ensure that minimum initial stocks of support items and associated technical documentation are available at using organizations and at maintenance and supply activities and that logistics data are updated with field experience to assure sustainment throughout the acquisition process. The initial stocks are required to sustain the programmed operation of systems and end items until normal replenishment can be accomplished. Equipment will be provided to support the stated system availability or system readiness objectives (SRO). Support is to be provided at the least initial investment cost. MATDEVs primarily have responsibility for planning and applying an ILS program for assigned materiel acquisition efforts to ensure successful accomplishment of total provisioning.

b. Predicting the range of quantity of spare and repair parts requires extensive analysis. It is Army policy that the selected essential-item stockage for availability method (SESAME) model be used as the standard methodology to calculate initial provisioning requirements. SESAME is a multi-echelon, multi-indenture inventory model that determines the optimal range and depth of spare and repair parts at all locations where the system is fielded in order to meet either a system budget constraint or an operational availability goal. Although SESAME is typically used for new acquisition systems, it can also be used for follow-on provisioning (rebuy with the same contractor), reprovisioning (rebuy with a new contractor), or optimizing the mix of spares for a system already in the field.

8–6. Modeling and simulation

a. Modeling and simulation (M&S) allows the analysis of a system's capabilities, capacities, and behaviors without requiring the construction of or experimentation with the real system. The DoD 5000 guidance states that preference shall be given to the use of M&S for assessing the effectiveness and design maturity of acquisition systems. The Army position is that more aggressive use of M&S is needed in system development to reduce system cost, schedule, and development risk (AR 5–11). The U.S. Army Model and Simulation Office is an excellent source of information.

b. Application of M&S must be based on an integrated strategy and detailed planning. Army guidance states that MATDEV M&S support plans should be prepared in conjunction with the CBTDEV, operational and developmental testers, maintainers, and logisticians. Thorough coordination with these functional experts is needed to ensure M&S support plans lead to M&S that satisfy all the objectives. In addition, the PM should plan for the integrated use of M&S that maximizes the use of existing M&S before developing system unique products. Finally, M&S applications must be verified and validated before their results can be used.

c. M&S are seeing increasing application as tools to support all aspects and all phases of the acquisition process, and play a critical role in acquisition streamlining. Constructive (for example, war-gaming), and virtual (such as human-in-the-loop) simulations are used to aid in concept exploration. Virtual prototyping, synthetic environments, system stimulators, and hardware-in-the-loop simulation are useful in selecting, demonstrating and validating technologies and designs. Virtual factory design, logistics modeling, and testing with modeled operational scenarios and synthetic environments and stimuli, support efforts during SDD. Verification, validation, and accreditation are essential for M&S to be useful in program decisionmaking. Models are validated based on comparison of results with knowledge and experience gained from actual observation (live test or field experience).

d. There are many types of M&S tools from relatively simple software optimizing a specific aspect of the system, to the more complex virtual prototypes. The optimum use of M&S is the development and use of a virtual prototype—defined as a digital end-to-end model or suite of models that represents the whole system process. Virtual prototypes allow the PM to see in a virtual environment the entire system throughout engineering development. They also allow the PM to see the effect design changes have on cost, schedule, performance, and supportability. The integrated use and reuse of M&S among and between the Army's M&S domains are key to successfully implementing M&S-based acquisition.

8–7. Post-fielding support analysis

a. Acquisition systems must be sustained throughout their operational lives at an acceptable availability rate and minimum life-cycle cost. PFSA is a structured means of evaluating the readiness, supportability, and resource requirements of fielded systems. It is not a specific methodology but an integrated and detailed effort to continuously monitor the status of the entire ILS program for a fielded system. PFSA provides a mechanism for solving supportability-related problems, enhancing readiness, optimizing supportability, and reducing LCC. One benefit of PFSA is that many of the data can be collected and the analysis can be conducted without the need for actual field visits. Thus, PFSA may be less expensive than the former fielded system reviews. Nonetheless, management support and some resources are essential to the success of PFSA. PFSA must be applied iteratively as the end-item population ages because supportability is dynamic and involves many interrelated elements. A change in one of these elements of ILS will impact others.

b. PFSA planning should be conducted prior to fielding. This plan should specify the aspects of ILS to evaluate, define supportability metrics, identify the data to be collected, provide data sources, explain data collection methods, describe the analytical techniques to may be used, and detail how results will be translated into the implementation of improvements. The PFSA can be incorporated within the SS. PFSA plans should be completed and coordinated prior to fielding. Data collection for PFSA will begin during initial fielding. It may take up to 1 year to obtain data accurately representing the supportability characteristics of the system in the field. However, prior to 1 year, data should be used to track trends and pinpoint any major problems.

Chapter 9
Cost as an Independent Variable and Operating and Support Cost Reduction

Section I
Cost as an Independent Variable

9–1. Definition
Cost as an independent variable (CAIV) is a DOD mandate requiring that total cost of ownership be considered equally along with performance and schedule in ACAT I through III acquisitions. Nonmajor programs will use CAIV as a guideline. CAIV is a methodology for reducing total ownership cost and improving performance. According to DODD 5000.1, "Cost must be viewed as an independent variable, and the DOD Components shall plan programs based on realistic projections of funding likely to be available in future years. To the greatest extent possible, the DOD Components shall identify the total costs of ownership, and at a minimum, the major drivers of total ownership costs. CAIV involves developing, setting, and refining aggressive unit production cost objectives and O&S cost objectives while meeting warfighter requirements. It is vital to involve the user community in the tradeoff process from the beginning to achieve the best outcome for all parties involved and invest resources in the tradeoff analyses required in the requirement generation process. In addition, one of the most important aspects of CAIV requires investing in the training of key personnel and making sure the process is well understood. Consistent with the Chairman of the Joint Chiefs of Staff guidance on requirements generation, the user shall treat cost as a military requirement and state the amount the Department should be willing to invest to obtain, operate, and support the needed capability over its expected life cycle. Acquisition managers shall establish aggressive but realistic objectives for all programs and follow through by working with the user to trade off performance and schedule, beginning early in the program (when the majority of costs are determined)."

9–2. General discussion
a. CAIV identifies the cost objectives for a program or project. As such, cost needs to be managed and controlled as closely as performance, schedule, and supportability. The total costs including the operating and support costs are reflected in the capabilities document and are addressed as exit criteria at each program MDR.

b. "The CAIV methodology will be utilized throughout the entire life cycle of the acquisition process to ensure operational capability of the total force is maximized for the given modernization investment. CAIV methodology entails the consideration of cost along with required system capabilities; cost is neither dominant nor dependent, but rather a peer with other capabilities. Cost will be formally considered for all MDRs by conducting/updating an analysis that relates cost and all system capabilities to the system's battlefield contribution. This approach is not independent of other work to determine specific capabilities but is a part of it. Cost performance analyses will be conducted on a continuous basis throughout the life cycle (AR 70–1).

9–3. Procedures
The PEO/PM/MATDEV—

a. Documents and coordinates plans for cost-performance trade-off studies as directed by the overarching IPT (OIPT) or as identified by the working level IPT (WIPT).

b. Evaluates accomplishment of improvements against the estimated and actual O&S cost baselines.

c. Prepares sustainment budgets for each system that accurately reflect the true needs of the system and aligns the CAIV objectives with the schedule of implementing improvements from the annex.

d. Sets aggressive cost targets for development, procurement, O&S and disposal and reports on them during each MDR.

e. Includes cost-performance objectives and cost targets in procurement documents and SOWs.

f. Exercises performance tradeoffs, multiyear contracts, and cost-incentive contracts to achieve CAIV objectives.

9–4. Elements
a. CAIV focuses on requirements, performance, and cost tradeoffs to ensure that acquisition programs are timely and efficient and meet customer needs. By including the customer as part of the ICT and IPT throughout the program life cycle, the right mix of knowledge has been created to look at the tradeoffs in a dynamic environment. Adding in the powerful tool of simulation can better define the trade space, predict and benchmark performance, and enhance the cost goals.

b. CAIV goals are cost savings, reduced development time, and satisfaction of customer requirements. The program includes—

(1) Long-range (life-cycle) planning.

(2) Concurrent engineering through ICT and IPT participation.

(3) Customer participation throughout the life cycle.

(4) Metrics to track and evaluate performance.

(5) Training program included in delivery.
(6) Use of existing military or commercial hardware if possible.

Section II
Supply Management Army–Operating and Support Cost Reduction Program

9–5. Definition
The Supply Management Army–operating and Support Cost Reduction Program (SMA–OSCR) is an Army investment program that provides funds to accommodate engineering design efforts of secondary items to reduce the acquisition cost, extend the life, and/or improve reliability, maintainability and supportability. The goal is to minimize total LCC. Characteristics of potential SMA–OSCR initiatives include:
a. Items with high failure rates.
b. Items with high acquisition cost.
c. Items with high supportability or maintenance costs.
d. Unique items.

9–6. Criteria for selecting candidates
a. The criteria for SMA–OSCR candidates are—
(1) Affects a secondary item.
(2) Reduces sustainment costs.
(3) Reduces unit cost, extends the life of the item, or improves reliability, maintainability or supportability.
(4) Funds required will only be used for engineering design, prototype, and testing.
b. The SMA–OSCR will not fund—
(1) Assessing the feasibility of a candidate item.
(2) Documenting the study requirements.
(3) Preparing and awarding a contract.
(4) Managing and tracking SMA–OSCR initiatives.
(5) Assessing the finished product or conducting post-investment analysis.
(6) Purchasing or applying new or replacement items or kits.
(7) Updating technical or maintenance manuals.
(8) Purchasing or updating test equipment or office automation hardware and software.
(9) Implementing managerial improvements.
(10) Reconfiguring production or maintenance lines.
(11) Conducting item reduction and standardization studies.
(12) Conducting studies that do not physically impact the secondary items.
c. Cost reduction engineering efforts that change end items rather than secondary items fall under the purview of reliability, maintainability, and supportability initiatives and will not be funded by SMA–OSCR.

9–7. Initiative process outline
a. The steps in the SMA–OSCR process include—
(1) Identifying the OSCR candidate (submit idea to command OSCR office).
(2) Performing the preliminary proposal.
(3) Obtaining PM authorization.
(4) Performing and validating economic analysis.
(5) Submitting the initiative showing the cost to benefit ratio.
(6) Obtaining approval (less than $100K requires LCMC-level approval, more than $100K requires Headquarters (HQ), AMC approval).
(7) Obtaining funds for implementation.
(8) Implementing the OSCR initiative.
(9) Tracking and reporting on the OSCR initiative.
b. An example of one method used in the OSCR program is technology insertion (TI), which replaces obsolete, unreliable, costly, or difficult to obtain or maintain components with redesigned items using state-of-the-art technology. This includes reengineering the item if it will reduce support costs, increase reliability, or reduce maintenance time or complexity.
(1) If the item is a class IX item or a depot-level reparable (DLR), it can be a TI candidate.
(2) If the item is on a unit property book record as an end item or component of an end item, or the effort will change the nomenclature or model number of the item, then the effort will be handled as a modification rather than TI.
c. The flow of the process of TI is to identify candidate items, evaluate proposed technology for suitability,

determine cost benefits and supportability, obtain approval by the item configuration manager, and get funding approval at the integrated materiel management center level.

(1) Identification of candidate items for TI can come from any source. Normally the item manager and/or production and maintenance engineers will be involved. The engineers will identify items causing reliability or maintainability problems which need to be "designed out." They will also identify items using components that are becoming obsolete or are not readily available. The item manager identifies items with unusually high demands or procurement lead times. Other sources will include suggestions from users, value engineering proposals, or opportunities to switch to common components.

(2) TI candidates are evaluated in several steps to ensure the item is appropriate for redesign. The technical aspects are examined to ensure performance and reliability requirements are met and the best technical approach has been selected. An economic analysis is done to verify that a cost benefit will be realized.

(3) TI proposals are put into an ECP proposal format and are submitted to the configuration manager and the configuration control board.

(4) The item manager then has approval authority for the funding of TI proposals intended to reduce the operation and support costs for Army systems.

Chapter 10
Commercial and Nondevelopmental Items

10–1. Consideration

a. Use of existing, previously developed items, whether commercial or military, saves research and development costs, reduces response times to meet operation needs, shortens deployment times, and reduces the risks associated with new development. Acquisition policy recommends that determinations of acquisition strategies for materiel be considered in the following order of priority:

(1) Existing systems within DOD inventory.

(2) commercial/NDI existing systems from allies.

(3) Modifications to existing systems and new development programs.

b. Initial market research associated with a specific acquisition is conducted to help define the user's requirements by determining whether sources of commercial items are available to satisfy them. Items may satisfy those requirements either "as is" or with modification.

(1) This type of market research can also be used to determine whether the user's requirements could be modified, to a reasonable extent, to allow the use of commercial items.

(2) It can also help to establish whether commercial items can be included in the procurement as components. Additionally, it also provides information on existing products, new technologies, product performance and quality, commercial practices, industrial capabilities, and support options.

c. The continuous ongoing effort by acquisition and development activities and laboratories to remain abreast of advances, changes, and trends within commodity areas is also referred to as market surveillance. This knowledge of the market can help to develop and modify materiel and operational requirements and result in increased opportunities for commercial/NDI acquisitions.

10–2. Procedures for market investigations

a. More specific, detailed information from the market place may be required before a final decision is made to purchase commercial or nondevelopmental items. A market investigation (MI) responding to the specific requirement (user's need) is then conducted.

b. The PM is responsible for conducting the MI with input from the user, various functional engineers and technical experts, testers, LCC analysts, and logisticians (see para 10–5 for MI report format). MIs are a primary effort in the concept refinement activity leading toward an initial MDR to select or discard commercial/NDI as the acquisition strategy. MIs identify operational performance, reliability, supportability, cost effectiveness, manpower and personnel, ESOH, and other issues that must be addressed. The MI can also identify how logistic support should be provided, what additional testing should be conducted, and milestones necessary for inclusion in the acquisition strategy.

c. Market investigations may vary from informal telephone inquiries to comprehensive industry-wide reviews. The scope will depend upon the nature and complexity of the materiel solution under consideration. Data are collected to support a definitive commercial/NDI decision. This may include requests for information or announcements in the *Commerce Business Daily*, as well as letters to embassies and other information sources on foreign items. The request for information is a brief narrative description of a requirement inviting interested vendors to respond. Respondents should be sent draft performance specifications and a detailed questionnaire designed specifically to determine their product's ability to meet requirements. Care should be taken to avoid descriptions focusing on a particular materiel solution. MIs may include the purchase or lease of test samples or test items to conduct operational and combat suitability tests. These tests and the resulting data help build the functional purchase description or product specification.

d. Information to be obtained from the MI includes—

(1) Product availability data, to include—

(a) Demonstrated product quality, electromagnetic capability, reliability, and maintainability.

(b) commercial/NDI products and company services satisfying identical or similar requirements.

(c) Modifications to the commercial/NDI needed.

(d) Product descriptions used by other Government activities or in commercial specifications and standards.

(e) Stability of current configuration and technology.

(2) Industry data, to include—

(a) Number and competitiveness of manufacturers.

(b) Size and location of manufacturers and their current market.

(c) Product distribution channels.

(d) Business practices in sales and distribution from manufacturers to user.

(e) Production capacity.

(f) PHS&T requirements/practices.

(g) Length of time the product has been produced by a manufacturer.

(3) Commercial market acceptability data, to include—

(a) Average time between model changes parts support for phased out models.

(b) Contractor's quality controls (for example, statistical process controls).

(c) Warranty terms and practices.

(d) Need for preproduction or production qualification testing and quality assurance

(e) Product evaluation criteria (including life-cycle criteria, as applicable).

(f) Hardware, software, and manpower interface issues (for example, human factors and product safety).

(g) Capacity to meet a potential increase in production demands.

(4) Product support data, to include—

(a) Parts availability and lead times, documentation, pricing, and distribution.

(b) Customer service, installation, inspection and user maintenance instructions.

(c) Historical reliability, development, test, and evaluation (RAM) data.

(5) Requirements and provisions for manpower and personnel, to include—

(a) Competitive or sole source repair and support base.

(b) Training and training support requirements.

(c) Tools, test equipment, computer support resources, calibration procedures, operations and maintenance manuals.

e. Example format of a market investigation report is shown in figure 10–1.

10–3. Support considerations

a. Once the decision is made to buy commercial or nondevelopmental items, the AS will be tailored. Supportability planning for commercial/NDI must be an integral part of the MI. In concept refinement, MANPRINT is a major consideration in determining if a commercial/NDI can be fielded by the Army in a strictly commercial-off-the-shelf (COTS) configuration. ILS and MANPRINT both will also determine if modification is required, or if there is no viable commercial/NDI solution.

b. Tailoring of the commercial/NDI acquisition program can bring the following benefits:

(1) Lower LCC.

(2) Rapid deployment.

(3) Proven state-of-the-art technology and capability.

(4) Increased competition and a broader industrial base

c. Choosing the commercial/NDI acquisition strategy also provides the following challenges:

(1) The user may have to relax some performance requirements to accommodate the use of some commercial/NDI or components in production.

(2) Essential ILS activities must be accelerated and may require increased up-front funding.

(3) Proliferation of hardware, software, and support items may cause logistics support or training problems and unexpected O&S costs.

(4) Safety deficiencies may need to be approved as acceptable risks and procedural safeguards may need to be developed in lieu of modifying the system design.

(5) Authorization and documentation processes need to be accelerated to keep pace with the tailored acquisition.

(6) Evaluation of the commercial support packages and procedures is needed to ensure feasibility of military support.

(7) The PM must be prepared for CM problems.

1. Cover (Name of the product)
2. Activity conducting the investigation
3. Signature block for
4. Principal investigator
5. PM or center director
6. Nondevelopmental item advocate or program executive officer
7. Executive summary name of the product
8. Purpose and scope of the investigation
9. Significant results
10. General recommendations
11. Table of contents
12. Background reason for the investigation
13. Names and brief description of the product
14. Purpose and scope (general scope of the coverage)
15. Objective of the market investigation
16. Criteria list (criteria utilized to evaluate the product)
17. Data requirements
18. Requirements for testing
19. Data collection methods and sources (describe methods employed to collect data)
20. Describe data sources
21. Product summary (summary of each product's performance)
22. Analysis of products (compare product performance requirements versus criteria (use spreadsheets))
23. Compare production capability with production requirements
24. Compare product with operational, ILS, and special issue criteria
25. Show where requirements can and cannot be met
26. Summary (discuss viable alternatives, tradeoffs, cost-benefit analysis for each alternative, conclusions, and rationale for selection of recommendations)
27. Conclusions and recommendations. NDI is (is not) the correct acquisition strategy. Changes to requirements or special issues affecting acquisition strategy, additional testing, and logistics planning
28. Appendixes
29. Requirements documents
30. Criteria document or performance specification
31. Product and company data sheets
32. *Commerce Business Daily* synopsis

Figure 10–1. Sample market investigation report

10–4. ILS

a. As in any other acquisition program, a successful commercial/NDI ILS program can be achieved only through the joint efforts of the user, ILSM and SIPT, PM and contractor. Based on the logistics support knowledge gained during the MI, a tailored SS is prepared and documented to include a description of—

(1) Overall ILS requirements, including budget estimates.

(2) Initial support package based on the operational requirements.

(3) Level of repair.

(4) How to achieve initial support capability.

(5) Post-production support.

(6) How to transition to organic support within a reasonable time period if required.

(7) Requirements and detailed plans for each function and element of ILS using information obtained from the MI and supportability analyses.

b. The goal is to select the best logistics alternative consistent with cost, operational, and programmatic considerations. In planning ILS for commercial/NDI all the factors considered in preparing an SS for a developmental system are addressed (see app C),

c. The following are considered in developing the support concept:

(1) System performance requirements.

(2) Detailed operating parameters for hardware and software.

(3) ESOH requirements.

(4) Other tougher-than-commercial or military unique demands.

(5) Usage modes (fixed, airborne, tactically deployable, and so on).

(6) System interface and integration requirements.

(7) Speed, throughput, ports, memory and expansion potential.

(8) Radio transmission frequency requirements and rules for Government use of frequency spectrum.

(9) Use of Government open systems interconnection profile communications protocols.

(10) Use of latest generation software language tools.

(11) Compliance with American National Standards Institute standards.

(12) Software portability to other communications and computer systems.

(13) Ability to integrate into DOD or service communications computer environment.

(14) Operating duty cycle (24 hours, intermittent, and so on).

(15) Climate (operating, shipment and storage).

(16) Altitude (operating, shipment and storage).

(17) Shock and vibration thresholds (operating and shipment).

(18) Input power quality, (drops, surges, spikes, noise, and so on).

(19) Environmental stress screening requirement.

(20) Reliability requirements.

(21) Nuclear hardening requirements.

(22) Chemical/biological/radiological survivability.

(23) Electromagnetic interference/electromagnetic compatibility/telecommuncations electronics material protected from emanating spurious transmissions (TEMPEST) requirements.

(24) Electrostatic discharge protection.

(25) Maintainability requirements.

(26) Self-test/prognostics requirements.

(27) Organizational-level support equipment limitations.

(28) Planned maintenance echelons.

(29) Maintainer proficiency levels.

(30) Software maintenance plans.

(31) Limitations on evacuation of reparables (battlefield, underground, rough handling, and so on).

(32) Maintenance environment (weather, mud, and so on).

(33) Training needs.

(34) Technical data needs (completeness and usability of available commercial manuals.

(35) Warranty procedures and commercial repair capabilities.

(36) Documentation of manufacturer calibration, repair, and overhaul practices and capabilities.

(37) Manufacturer commitment to outyear support.

(38) TDP availability.

(39) Power sources and types.

(40) Transportability.

(41) Support equipment requirements (including TMDE and ASIOE).

d. In determining the availability of ILS, a potential supplier could be asked the following questions:

(1) What portions of the system or equipment do you intend to provide in the form of commercial/NDI?

(2) How will each item or assembly meet stated requirements?

(3) Must any of ILS be modified to meet requirements? Is the vendor willing to share design visibility and control with the government to ensure future support by the Government?

(4) How stable is the design of the equipment?

(5) How mature is the current design, and what are your criteria for measuring that?

(6) How long has the item been on the commercial market?

(7) How many are in commercial use?

(8) What are the prospects for product longevity?

(9) How long will you support it?

(10) Will the item accommodate the latest state-of-the-art equipment or can it be upgraded to incorporate the latest state-of the-art advancement?

(11) What is the reliability history of the product (for example, mean time between system aborts, corrective maintenance actions, and so on)?

(12) What are the maintainability features of the design (such as self-test features, accessibility, need for separate test equipment to verify failures, corrective maintenance actions, and so on)?

(13) What flexibility do you offer for Government maintenance (for example, allow the Government to acquire licensing and subscription services to enable organic or competitive maintenance)?

(14) What is the interoperability of your item with other subsystems, software, and so on and its impact on overall system integrity?

(15) Is there a competitive market for contract repair and support of the proposed item(s)?

(16) What are the warranty provisions?

(17) Identify at least three commercial or Government users of your product.

(18) What is your estimate of the product life-cycle cost?

(19) What training is needed to operate and maintain your product, and is such training available from sources other than yourself?

e. In addition to the above questions, the various functional discipline proponents and independent testers and evaluators, along with the technical experts, should provide questions to be answered by the MI process. Specific questions peculiar to the item to be procured (for example, performance, operation, and design features) need to be asked as they must be addressed in the TEMP.

f. The goal of commercial/NDI acquisitions is to provide reliable, supportable systems to the operational forces in a timely manner and at a reasonable cost. A commercial/NDI may achieve this goal with a significant overall reduction in time and cost.

Chapter 11
Design interface

11–1. Description and purpose

a. The PM must establish design interface parameters to influence the design of a system being procured, including the support structure associated with the new system. In the case of COTS procurements, the system specification will influence selection of the winning bidder rather than impact the design itself. The goal of design interface is simply acquisition of an effective, supportable and economical system.

b. Design interface is the ILS element best described as a relationship of supportability-engineering design parameters with its support requirements to the other system engineering disciplines. These design parameters are expressed in operational terms rather than as inherent values and specifically relate to system readiness and support costs. Design interface parameters expressed both quantitatively and qualitatively in operational terms and specifically relate to readiness objectives and the support costs of the system.

c. The ILS program encompasses many diverse, but interdependent elements which define the resources required to operate and support the system effectively and successfully in its intended operational environment. Development of all these support elements must be an integrated effort to insure appropriate tradeoffs are made during the design process. Thus, ILS design objectives are twofold:

(1) Design or selection FOR support.

(a) Influencing design of the materiel system itself from a support perspective requires that quantifiable and measurable goals or constraints be established as part of the requirements formulation process.

(b) The goal is to affect the hardware design to minimize resources required for system operation and support. This is accomplished by performing early analyses addressing the total system in its operational environment. These analyses must represent the interests of many functional specialties, and tradeoffs must be made in an integrated fashion. For example, constraining crew size may result in a task overload from a human engineering perspective, yet growth in the size of the crew may exceed established manpower constraints. Neither of these results is acceptable from a total system perspective.

(c) Potential solutions may include increasing the skill level requirements of the crew or the addition of software to reduce crew workload. It must be kept in mind that any such solutions may also cause a ripple effect impacting other ILS elements.

(d) A major challenge in influencing design for support is to prevent established supportability goals from being neglected as design efforts focus on meeting system performance goals.

(2) Design or selection OF support.

(a) The objective of designing effective and efficient support for the materiel system is aimed at reducing the overall logistics footprint for the Army.

(b) The operational environment, inherent reliability, and the number and allocation of maintenance tasks are the primary drivers in designing the overall support structure. Minimizing operator and maintenance tasks may reduce the manpower, training, technical data, repair parts, and tool requirements associated with them.

(c) Reallocation of a task may produce economies in these same areas by consolidating tasks with common resource requirements.

d. A smooth, seamless interface between logistics and all other related disciplines (such as systems and software engineering, T&E, manufacturing, life-cycle cost and financial resources) is essential to overall program success. SA, such as comparative analysis of predecessor systems or baseline systems, tradeoff studies, and market analysis of emerging technologies, can be used to influence design from the perspective of one engineering specialty, but may adversely impact another. Thus, an integrated approach is necessary to obtain a total system perspective.

e. Using reliability and maintainability (R&M) is an essential part of design interface.

(1) R&M are key design parameters that influence both the performance (mission effectiveness and system availability) and economics (support requirements and LCC) of the materiel system. R&M are true engineering design parameters and are usually managed as engineering disciplines. However, the performance aspects of R&M must be balanced with the economic aspects of R&M. Requirements limitations are to be documented in the CD and SS.

(a) Reliability is the duration or probability of failure-free performance under stated conditions, or the probability that an item can perform its intended function for a specified interval under stated conditions. Examples of metrics for reliability are mission reliability, mean time between failure (MTBF), and mean time between operational mission failure.

(b) Reliability should be considered as a key performance parameter in the CD where practical.

(c) Maintainability is the measure of the ability of an item to be retained in, or restored to, a specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each specified level of maintenance and repair. Examples of metrics for maintainability are mean time to repair (MTTR), maintenance ratio (MR), maximum time to repair, and mean active maintenance downtime (MAMDT) (see app B for more on metrics).

(2) R&M have a direct impact on both operational capability and survivability costs, and therefore are important considerations for the warfighter. A system must perform its mission without experiencing a mission critical failure (reliability). An item must be able to be repaired in a timely or efficient manner (maintainability). Poor R&M will unnecessarily consume warfighting resources and decrease the warfighter's ability to initiate and complete a mission. In addition, R&M characteristics of a system are major drivers of LCC and logistics footprint.

(3) The R&M effort for any acquisition program should emphasize—

(a) Understanding the performance requirements, readiness, physical environments (during operation, maintenance, storage, transportation, and so on), resources (people, dollars, and so on) available to support the mission, and associated risks. Once understood, these must be translated into system design requirements that can be verified.

(b) Managing the contributions to system R&M of hardware, software, and human elements of the system.

(c) Preventing design deficiencies (including single point failures), precluding the selection of unsuitable parts and materials, and minimizing the effects of variability in the manufacturing and support processes. Physics-of-failure based analyses can assist in preventing design deficiencies.

(d) Developing robust systems, insensitive to the environments experienced throughout the system's life cycle and capable of being repaired under adverse or challenging conditions.

(e) Incorporating prognostics and intelligent diagnostics to minimize turnaround time.

(4) There are various techniques and tools used to ensure R&M requirements are addressed.

(a) Fault tree analysis and failure modes, effects, and criticality analysis can be used to help identify where degradation or failure could compromise the mission or the safety of the operator or maintainer.

(b) Thermal, shock, vibration (including resonant frequency), corrosion, durability, highly accelerated life testing and other analyses or tests have proven beneficial design aids for electronic and mechanical equipment.

(c) Dormant reliability analyses should be done for explosives, rocket motors, and other items that have shelf-life (dormant reliability) requirements or are susceptible to long term storage degradation.

(d) Prevention and elimination of unverified indications of failure (false alarms, "could not duplicate," and so on) should be an integral part of the system design process.

(e) Past component history, physical and environmental stresses, component criticality, use of common parts should be considered in the part selection process.

(f) Battle damage and repair techniques should be developed concurrently with the system design to provide the user with field expedient solutions.

(g) Maintainability/supportability modeling can be used to identify supportability drivers, simulate maintenance downtime, and analyze resources required for system sustainment.

11–2. Design for manpower and personnel integration

MANPRINT is a comprehensive management and technical program that focuses attention on human capabilities and limitations throughout the system's life cycle and places the human element (functioning as individual, crew/team, unit and organization) on equal footing with other design criteria such as hardware and software. It must be considered in establishing supportability-related design constraints and readiness requirements. MANPRINT is the Army's implementation of a management and technical human system interface program required by DODI 5000.2. It was initiated in recognition of the fact that the human is an integral part of the total system. MANPRINT must also be considered in establishing logistics-related design constraints and readiness requirements. The entry point of MANPRINT in the acquisition process is through capabilities documents. The MANPRINT program is governed by AR 602–2.

a. MANPRINT involves the integration of seven human-related considerations (known as MANPRINT domains) with the hardware and software components of the total system. The DCS, G–1 exercises DA staff responsibility for the MANPRINT program.

b. Manpower addresses the number of military and civilian personnel required and available to operate, maintain, sustain, and provide training for materiel systems in for peacetime, conflict, and low intensity operations.

c. Personnel addresses the cognitive and physical characteristics and capabilities required to operate, maintain, and sustain materiel systems. Personnel capabilities are normally reflected as knowledge, skills, abilities, and other characteristics.

d. Training is defined as the instruction or education, on-the-job, or self-development training required to provide all personnel and units with their essential job skills and knowledge. Training is required to bridge the gap between the target audiences' existing level of knowledge and that required to operate, deploy/employ, maintain and support the system effectively.

e. Human factors engineering (HFE) maximizes the ability of an individual or crew to operate and maintain a system at required levels by eliminating design-induced difficulty and error. Human factors engineers work with systems engineers to design and evaluate human-system interfaces to ensure they are compatible with the capabilities and limitations of the potential user population.

f. System safety covers the design features and operating characteristics of a system that serve to minimize the potential for human or machine errors or failures that cause injurious situations. Safety considerations should be applied in system acquisition to minimize the potential for injury of personnel and mission failure.

g. Health hazards addresses the design features and operating characteristics of a system that create significant risks of bodily injury or death. Health Hazard categories include acoustic energy, biological substances, chemical substances, oxygen deficiency, radiation energy, shock, temperature extremes and humidity, trauma, vibration, and other hazards.

h. Soldier survivability addresses the characteristics of a system that can reduce detectability and the probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue. It focuses attention on those aspects of the total system that can minimize the loss of friendly troops' lives.

i. AR 602–2 prescribes policies and assigns responsibilities for the program. This guide provides a list of documents that contain MANPRINT relevant information (along with domain references) to include brief synopses. The MANPRINT Web site at www.manprint.army.mil is a valuable source of information and guidance.

j. The improved performance research integration tool can be an aid in the development of maintenance man hour requirements and can provide information such as maintenance ratio, frequency distribution of crew size, and manpower requirements by MOS.

11–3. Design for standardization and interoperability

a. Standardization and interoperability (S&I) is the process of achieving the most efficient use of total Army and DOD resources (money, manpower, readiness, time, facilities, and natural resources) and ensuring the Army can effectively and efficiently participate in combat and contingency and exercise operations with other military services and allied forces (for example, North Atlantic Treaty Organization (NATO) and American, British, Canadian, and Australian (ABCA)).

b. Standardization is the process of developing concepts, doctrines, procedures and designs to achieve and sustain effective uniformity in the management and use of Army resources and maximize proficiency and readiness among Army soldiers and units. Commonality is the ultimate goal of standardization. Interoperability is sought if commonality is not achievable. At a minimum, compatibility must be considered during design or market investigation. For supportability planning of Army acquisition of materiel systems, PMs and ILSMs must consider standardization in operation, maintenance, and support of their materiel systems. For example, maximum use should be made of standard items such as fasteners, components, tools, and support equipment. The benefits of standardization extend beyond the system itself and reduce the Army's logistics footprint. Standardized parts have lowered costs, reduced inventories, shortened logistics chains, improved readiness, and furthered civil-military integration.

c. Interoperability is often considered a subset of standardization. It is the ability of systems, units, or forces to exchange services, materiel, and information with one another to enable them to operate effectively together. Interoperability within and among United States forces and U.S. coalition partners is a key goal that must be addressed satisfactorily for all DOD systems so that the United States has the ability to successfully conduct joint and combined operations. To the extent possible, systems and software are to be designed, consistent with U.S. export control laws and regulations, to permit use in a multinational environment with provisions made for current and future information disclosure guidance and constraints. In order to foster interoperability with allies and coalition partners, consideration is given to procurement or modification of allied systems or equipment, or cooperative development opportunities with one or more allied nations to meet user needs.

d. The requirements community specifies key performance parameters and the acquisition and T&E communities adopts a family-of-systems management approach to ensure that their reviews of individual systems include a thorough understanding of critical system interfaces related to the system under review and the flow of consistent and reliable data, information, and services among systems in the battlefield.

e. Below are just a few of the S&I considerations critical to any materiel system acquisition program:

(1) Identify standard interfaces required to accommodate continuous technology refreshment during the life of the system.

(2) Identify data and data fusion requirements (data, voice, video), computer network support, and antijam requirements.

(3) Identify unique intelligence information requirements, including intelligence interfaces, communications, and data base support pertaining to target and mission planning activities, threat data, and so on.

(4) Identify requirements for joint service use, NATO cross-servicing, and so on.

(5) Identify procedural and technical interfaces, and communications, protocols, and standards required to be incorporated to ensure compatibility and interoperability with other services, NATO, and other allied and friendly nation systems.

(6) Address compliance with applicable information technology standards contained in the DOD Joint Technical Architecture.

(7) Address energy standardization and efficiency needs for both fuels and electrical power.

11–4. Design for environment, safety and occupational health

a. The focus of environmental and safety planning is to avoid the use of substances and procedures that can harm people, animals, or the environment. Therefore one of the primary considerations in system engineering and supportability planning is to eliminate, or failing that, to minimize ESOH hazards during all phases of the acquisition process. The CBTDEV and MATDEV must emphasize to the system engineers the types of supportability analyses needed to identify hazardous materials and waste, pollutants, and processes.

b. All potential or actual environmental impacts resulting from the system's operation, maintenance, and disposal must be identified, assessed, and documented. Materiel used or proposed for use in new systems is checked against the toxic release inventory list from the Emergency Planning and Community Right-to-Know Act, 42 USC Chapter 116. The toxic release inventory list can be found at www.epa.gov/tri. If any materiel used or proposed for use is on this list, studies should be made to find substitutes for them. Justification must be provided for continued use of these materials (AR 200–1 and AR 200–2). The environmental risk assessment should begin by reviewing the system being replaced by the new system or similar system to include the environmental assessments done for those systems. For the system being replaced or similar system, coordination with the developers, users, testers, and activity supporting those systems would help make sure environmental impacts that could effect the new system were identified and addressed during the decision making process. The risk assessment must documented in the PESHE that is reviewed during the milestone B decision process.

c. If ammunition is to be used, a study of the demilitarization explosive ordnance disposal (EOD) aspects of the system/end item is required. There is a mandatory requirement for the concurrent development of EOD procedures and equipment for the system. Of additional concern is the requirement for developing "render safe" procedures, the equipment to conduct them, and the design to allow access to munitions. Procedures are to be developed that will allow EOD personnel access to fusing and render-safe mechanisms located within the munitions items. Of particular concern is the need for EOD personnel to have access to munitions items through external packaging or containers designed to carry the munitions items (such as "wooden" rounds). In addition, maintenance (repair, renovation, and reconfiguration) procedures and requirements must be developed.

d. Maintenance and supply procedures that reduce environmental hazards, waste generation, and toxicity are planned. Increased shelf life, reuse, recycling, and reclamation all need to be planned. If it is determined that hazardous materials must be used in the new system, procedures must be developed to ensure personnel safety, and proper handling, operation, maintenance, storage, transportation, disposal, and demilitarization. Applicable warning and caution information must also be provided via on-equipment labels/software messages and included in technical manuals.

e. In the process of identifying, assessing, and documenting environmental and safety impacts, the area of packaging, handling, and storage must not be overlooked. Necessary storage and transportation data must be developed and used to ensure the maximum use of reusable, recyclable, or easily disposable packaging material.

f. Product stewardship is a comprehensive strategy to factor in ESOH considerations beginning in the design phase of the materiel system's life. In the design phase most of the costs to develop, manufacture, and deploy are determined. The decisions at this point can affect user safety, risks of hazardous substance release in the environment, and waste streams. The main components of product stewardship are—

(1) Identification and quantification of energy and raw materials inputs, outputs, and environmental releases to air, water, and land during the operational life of the system including its disposal.

(2) Technical qualitative and quantitative characterization and assessment of environmental consequences.

(3) Continuous evaluation and implementation of opportunities to reduce environmental burden from effluents, airborne emissions, and solid wastes associated with basic life-cycle processes of raw material acquisition, manufacturing, processing, distribution, transportation, operation, maintenance, recycling, and waste management.

g. Product stewardship extends throughout the logistics processes in all life-cycle phases. There are many options to consider in implementing product stewardship:

(1) Providing guidance on environmental, regulatory, waste minimization or recycling, and pollution prevention and compliance.

(2) Developing system safety literature and advisory publications and conducting safety seminars and provide technical assistance.

(3) Establishing a system for transporter screening, container recycling, packaging re-use, and safety information for handling and storage.

(4) Setting up a hotline to provide safety and emergency assistance and for product and process feedback.

(5) Developing a system of accountability for analysis and monitoring of ESOH concerns.

(6) Providing Internet addresses for guidance and information on ESOH.

Chapter 12
T&E

Section I
T&E Planning, Conduct and Reporting

12–1. General discussion

a. T&E is an essential part of the development and deployment of all Army systems. T&E results provide essential information for MDR. MATDEVs require test data to provide feedback on design elements in order to ensure adequate progress towards meeting the user's requirements. System contractors use T&E information to ensure conformity to technical data packages, and to detect manufacturing or quality deficiencies. Finally, T&E information can provide the confidence in their system's performance that users of deployed systems must have. The importance of structuring a sound T&E program during the system acquisition process cannot be overemphasized. T&E reduces downstream costs (for example, upgrade, retrofit, modernization, and so forth) by exposing problems that can be fixed before the production of large numbers of items.

b. ILS and system supportability is an integral part of any T&E program. DOD and Army policy require evaluation of system supportability and, when appropriate, supportability may be a key performance parameter. Operational test and evaluation (OT&E) policy mandates that system supportability be evaluated for suitability in the operational environment.

c. Planning, conducting and reporting of T&E are accomplished according to the policies and guidelines in AR 73–1.

12–2. T&E integrated process team

The T&E WIPT, chaired by the PM, plans all T&E to be conducted throughout the development and production of the system. A subgroup of the T&E WIPT, the supportability T&E WIPT, may be formed to coordinate the ATEC system team, the T&E WIPT and the program SIPT. Topics coordinated will include all supportability test issues and criteria, and all test and LD requirements contained in the TEMP.

12–3. U.S. Army Test and Evaluation Command system team

a. The ATEC system team is established as ATEC's IPT to perform the T&E mission in support of acquisition programs. The team is composed of representatives from ATEC's subcommands: the U.S. Army Developmental Test Command, the U.S. Army Operational Test Command, and the U.S. Army Evaluation Center. The T&E WIPT develops the TEMP and determines what T&E should be conducted during development and production of a system. The ATEC system team determines how to conduct T&E and documents the concept to obtain the measure of effectiveness and measure of performance level of detail needed in the system evaluation plan.

b. The conduct and reporting of all testing is integrated as much as possible. The ATEC system team coordination with the T&E WIPT develops a single system evaluation plan, containing the test and simulation execution strategy that leads to a single system evaluation report (see AR 73–1).

Section II
Logistics Demonstration

12–4. policy

a. DODI 5000.2 requires that analysis, T&E results, or independent reviews confirm the adequacy of the proposed maintenance plan and programmed support resources to meet objectives for peacetime readiness and wartime employment. It also requires that the ability to support any system be demonstrated before the system is placed in the hands of the user. The LD is conducted to confirm that support resources and tasks developed to sustain the system will function as intended. The LD data is supplemented by supportability related data obtained during developmental test and evaluation (DT&E) and OT&E to confirm the correct resources and tasks have been developed. AR 700–127 identifies the LD as a means for satisfying DOD requirements for all acquisition programs. A request for an LD waiver will be submitted by the MATDEV to Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) with supporting rationale and an alternate plan for accomplishing the LD.

b. The goals of the LD are to:

(1) Validate the supportability of the materiel design including transportability and MANPRINT.

(2) Validate the adequacy of maintenance planning for the system (such as maintenance concept, task allocation, maintenance procedures, troubleshooting procedures and test program sets (TPS), prognostics/embedded diagnostics, and support equipment).

(3) Validate the final SSP to include interface compatibility of the TMDE and support equipment with the materiel system.

(4) Review the technical publications.

(5) Validate and update the LMI.

c. LD for commercial/NDI programs may be abbreviated if existing supportability data can be obtained and adequately evaluated. Inclusion of a logistics specialist on the source selection evaluation board to evaluate such data is prudent. In some cases it may be necessary to perform a partial LD on commercial/NDI systems after source selection to verify the maintainability and supportability of the materiel design.

d. The LD is a validation process managed by the MATDEV. Maximum use should be made of existing qualitative and quantitative data such as when the item is used by another service, industry, or country. In order to minimize cost and schedule risk, existing qualitative and quantitative demonstrations, evaluations, analyses, simulations and tests should be used to meet LD requirements. The extent of the LD is based on the complexity and characteristics of the system (for example, there is no need to perform a maintenance demonstration if there are no maintenance tasks.) If major configuration changes are required between test articles and production software/hardware, it would be advisable to repeat the affected portions of the LD. This would include repeating portions of the TM verification.

e. The LD is conducted on an engineering prototype item for all developmental systems (hardware and software) or on a production item for commercial/NDI. Modified items and all new changed TMDE, training devices, and support equipment intended for support of the system may also require a partial LD.

f. The LD may be conducted at contractor's plant, Government maintenance engineering evaluation facility, or test sites. Whenever feasible, the LD should be conducted at an existing support facility similar to intended user facilities to verify facility adequacy or identify any facility deficiencies.

g. The LD is normally conducted on those tasks performed at field level and some sustainment level.

h. For ammunition items, the LD normally consists of verification of render safe and EOD procedures.

i. The requirements for an LD will be summarized in the system TEMP.

12–5. Procedures

a. Review of requirements. The ILSM and SIPT members review the CD, supplemental documentation, and contract specifications to ensure that the requirements are clearly defined and input data to the analyses are available and agreed upon.

b. Review of analyses. The results of the LORA, various supportability analyses, LMI, provisioning analysis (see AR 700–18), MANPRINT assessment (see AR 602–2), and transportability analysis (see DODI 4540.7) are reviewed to identify logistic resources, tasks, and issues to be addressed in the LD.

c. LD plan. The MATDEV with support of the SIPT prepares the LD plan based on the outcome of the requirements review and initial analyses of the system. The plan should address all opportunities for collection of data to confirm adequacy of the planned support.

d. Support resources. These need to be programmed to include use of existing data from the contractor or other users, TM validation and verification, maintainability and prognostics/embedded diagnostics demonstrations, transportability analysis and testing, MANPRINT assessment, TMDE evaluation, and software evaluation.

e. Conduct of the LD. Generally the LD is accomplished in increments. LDs may be conducted on system components and major subassemblies with a final system level LD to verify the component interface. Other tailored LD procedures may be required. In any event, the LD plan provides for a complete and adequate LD to verify the ability of representative support personnel to perform each new task with the support resources included in the SSP in an environment that approximates the expected operational profile. The LD normally consists of—

(1) Physical tear down. All operator tasks and specified field-level maintenance tasks contained in the TMs are performed by Target Audience Soldiers. This portion of the LD also serves to review the TM for accuracy/completeness. This portion of the LD also serves as the TM validation to meet the intent of MIL–STD–40051.

(2) Maintainability and prognostics/ embedded diagnostics demonstration. Maintenance and troubleshooting tasks as the result of operations or fault simulation or insertion are to be accomplished by typical user personnel to meet the intent of MIL–HDBK–470. Complex systems may require additional demonstrations prior to fielding of TPSs or other support capabilities that are not available for the initial fielding.

f. Packaging and handling evaluation. Packaging requirements are validated to meet the intent of AR 700–15.

g. MANPRINT assessment. MANPRINT assessments are conducted by the DCS, G–1 for ACAT I and ACAT II programs or by TRADOC for other programs to determine the status and adequacy of MANPRINT efforts and identify any unresolved issues or concerns (see AR 602–2). Based on DA Pam 73–1, the assessment of MANPRINT is an essential element of a system's evaluation strategy at each decision point. Also, AR 602–2 directs ATEC to include MANPRINT considerations in system T&E, of which the LD is an important source of data.

h. TMDE evaluation. TMDE requirements and supportability statement from the U.S. Army TMDE Activity is evaluated for interface compatibility during the LD.

i. Software evaluation. Prognostics/diagnostic software will be demonstrated during the LD by fault insertion. The faults inserted will include operator procedure errors and software processing errors that the operator and/or maintainer should be able to detect, fault isolate and correct. MIL–HDBK–470A may be used to determine fault insertion sample size. The designated center for software engineering conducts testing of software and evaluation of PPSS plans and capabilities.

j. Transportability engineering analysis. MSDDC–TEA conducts transportability analysis and determines transportability testing needed to ensure transportability requirements are met in accordance with DODI 4540.7. A transportability demonstration may be required if analysis are insufficient to prove otherwise.

k. TM/DMWR verification. Government personnel verify the contractor's previous validation effort if production version of the system is available. Verification may range from typical user personnel performing 100 percent of all operating and maintenance procedures in the publications, to witnessing the validation reviews performed by the contractor to meet the intent of MIL–STD–40051. Complex systems may require a verification of preliminary draft manuals prior to developmental tests/operational tests and a reverification of changes in the final draft manuals prior to fielding. The designated depot works closely with the MATDEV and SIPT to conduct the DMWR verification or pilot overhaul and reports on status and results.

l. Final evaluation and report.

(1) The PEO/PM/MATDEV prepares the final LD report with the SIPT.

(2) The LD report includes the LD strategy, details on the conduct of the LD, data collection, analysis results, all quantitative and qualitative findings, and a description of all necessary follow-on actions. LD report findings may come from data existing prior to the LD, development and operational test data, and data derived from the LD Corrective actions are incorporated and verified before the production decision.

(3) The LD report is completed at least 45 days prior to the next decision review and provided to the SIPT.

(4) The PM, with support from the SIPT, is responsible for the preparation of the LD Plan. The LD Plan is distributed prior to the SIPT meeting that will address the LD. The recommended format is—

(a) General.

(b) Scope.

(c) System description.

(d) LD strategy.

(e) Participating organizations, responsibilities, and milestones for delivery of SSP.

(f) Procedures, detailed plans, and milestones for demonstration activities.

(g) Reports (describe who will provide input and the due dates).

(h) References.

(i) Acronyms.

(j) Distribution.

Chapter 13
Training Systems and Devices

13–1. Overview

a. Training systems and devices (or trainers) are acquired to satisfy training deficiencies, reduce training costs, enhance training effectiveness or as an approved strategy in the Army's Combined Arms Training Strategy. They are broadly categorized as either system or nonsystem trainers.

(1) System trainers are designed for use with specific systems, family of systems, or items of equipment (for example, M1 Conduct of Fire Trainer). They may be standalone, embedded, component level, or appended training devices. System trainers may be either acquired by a system PEO/PM or the Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) for the PEO/PM. The requirement for system trainers must be documented in the system CD and prioritized and funded with the system.

(2) Nonsystem trainers are acquired by the PEO STRI to support general military training (for example, battle staff trainer); not to increase proficiency in operating or supporting a given weapon system. The requirements for nonsystem trainers are stated in training CDs and are prioritized and funded in the training mission area.

b. Training materials and training devices will be integrated into the total system using the procedures in DOD Directives 1322.18 and 1430.13. In accordance with these directives, a total STRAP should be developed by milestone B. The STRAP will include a description of the total training system and address the training and system development schedule.

13–2. Preacquisition procedures

a. The PEO STRI has the responsibility to conduct concept formulation for all training devices (system and nonsystem). The system PEO/PM normally provides funding for concept formulation for system training devices.

b. Concept formulation or AoA consists of a series of analytical or tradeoff studies performed by the PEO STRI in coordination with the SIPT, MATDEV, and TNGDEV to determine the best technical approach for developing and procuring the most cost-effective, proficiency-enhancing and operationally effective trainer. These analyses are performed for new systems, training devices identified as training subsystems, and for each nonsystem training device. The goal of AoA is to establish technical and economic specifications to satisfy the stated requirement.

c. System trainer requirements are analyzed as a part of new equipment acquisitions. The training system/device CD is prepared by the user in accordance with DODI 5000.2 and provided to the PEO STRI or ATSC for processing. ATSC functions as the the Deputy Chief of Staff, G–3 (DCS, G–3) executive agent for ensuring compliance with training system/device acquisition policies. ATSC will process the capability document in accordance with various TRADOC guidelines. ATSC is also responsible for procuring training devices and training aids that cost less than $15,000.

d. The CBTDEV representative for a given trainer will be based upon the materiel commodity or Army branch (for example, the Armor School for armor trainers and the Artillery School for artillery trainers). The CBTDEV initiates the acquisition process with PEO STRI support by preparing a CD based on identification of training deficiencies and needs.

e. CDs must contain complete training system/device strategies and supporting documentation and rationale to be approved. A thorough analysis of resource requirements must be accomplished to justify any life-cycle contractor support (LCCS) decision for maintenance and support of the trainer.

13–3. Acquisition procedures

a. Training system/device acquisitions must comply with DODD 5000.1, DODI 5000.2, AR 70–1, and AR 71–9. The PEO STRI will participate in initial requirements analysis and execute the complete acquisition of approved and funded training systems/devices.

b. PEO STRI has the mission for life-cycle management of all training systems/devices that are LCCS and must ensure that funding requirements are included in the POM. OMA funds are used for LCCS.

c. The PEO STRI management responsibility for acquisition of a given trainer is assigned based on trainer type and type of system simulated by the trainer. The PEO STRI PM is responsible for coordinating and preparing the program management and contractual documentation to actually accomplish the acquisition.

d. The required quantity of trainers will be based on the TRADOC-prepared training device fielding plan that identifies the quantities, sites, and organizations to receive the training devices. The final training device fielding plan must be approved by the DCS, G–3. Most training devices are assigned to the training support center (TSC) based on the types and quantities of Army units that will use the training systems/devices. The TSC is responsible for property accountability of the trainers and issues them to units as needed. Issue may be long term or on a "use and return" basis. The PEO STRI is the item manager for all training systems/devices including those supported by LCCS. Training devices may not be type classified nor listed.

e. During training device acquisition, the PEO STRI follows a tailored acquisition process based on the acquisition category of the program.

13–4. Training system/device fielding

a. In accordance with AR 350–38 and in conjunction with the TRADOC and MATDEV, Army training systems/devices are typically fielded based on a low-density TDA. In accordance with AR 350–38, operations, supply and maintenance support for system and non-system training systems/devices is obtained by the PEO STRI utilizing life LCCS agreed upon by the MATDEV or fielding command in cooperation with the DA Training Directorate (DAMO–TR). The gaining command is relieved of the requirement to train instructors, operators, or maintenance personnel or to purchase spare/repair parts, special tools, or test equipment. Exceptions are non-LCCS supported training devices transitioned to an AMC commodity command/item manager for life-cycle support and items procured or fabricated by TRADOC or other MACOM TSCs.

b. LCCS contractors work with the original equipment manufacturers in accordance with an associate contractor agreement to identify specific fielding and support requirements at the l system level (for example, availability, maintenance turn-around time, or customer satisfaction) versus specific program elements (repair parts, technical data, facilities, and so on). The PEO STRI will budget for LCCS of items validated by TRADOC and approved by the Director, DA Management Office for Training.

c. The Army's gaining commands are notified of pending training device fieldings by distribution of a memorandum of notification. After the memorandum has been released and acknowledged by the gaining command, then all support requirements are coordinated and agreed on through the use of an MFP. The MFP includes all responsibilities of the fielding command and the gaining command. A memorandum of notification, draft MFP, and distribution plan is provided to the gaining command. After review of the MFP, the gaining command provides the current MSP about 480 days (based on 18 months between contract award and FUED) before the FUED for inclusion in the MFP. At this point the fielding command will prepare initial support items lists. The final draft MFP, current distribution plan, and MFA are prepared by the responsible MATDEV or fielding command in accordance with the provisions of AR 700–142 and coordinated with all gaining commands. The gaining command provides the final MSP and signed MFA to the fielding command approximately 340 days prior to FUED. The fielding command will distribute the final MFP with approved MFA and coordinate the total materiel requirements list approximately 250 days prior to FUED.

13–5. Training system/device support procedures

a. The life-cycle cost of supporting a system exceeds the acquisition cost of the system and therefore must be thoroughly analyzed to effectively achieve training needs and minimize training and training support costs. The system support strategy is determined during the early phases of the acquisition life cycle and is refined as the acquisition cycle progresses. At the beginning of the acquisition cycle, it is essential that the proponent conduct analysis to compare alternative support strategies and select the best strategy.

b. Support analysis for training systems/devices must consider the following questions:

(1) What are availability requirements of the training device?

(2) How many trainers will be used at one time, at one range, at the unit?

(3) What is the required repair turnaround time?

(4) How many systems are needed weekdays, weekends, and so?

(5) What is the usage annually, monthly, weekly, daily?

(6) What are the maintenance and supply requirements?

(7) What are the personnel capabilities and availability?

(8) What support and test equipment is needed?

(9) What are the locations and proximity of the trainers?

(10) Where are the support facilities requirements?

(11) What are the transportation/transportability implications?

c. The results of the analysis will determine whether the support strategy will be life cycle organic support, organic support with ICS, LCCS, or combinations.

13–6. Life-cycle contractor support

a. LCCS is tailored as required to provide cost and training effective support for each training system/device. LCCS is frequently the approved support strategy for PEO STRI managed training devices

b. The support strategy for a trainer must be tailored to meet user requirements. The support concepts for different trainers require varying degrees of government and contractor involvement and responsibilities.

c. Repair procedures must be tailored to implement the approved support concepts. Support concepts must specify whether the Government or contractor will conduct specific actions such as fault identification, preventive maintenance checks and services, removal and replacement of defective parts or components, preparation for shipment to contractor facilities, and so on.

d. An onsite user representative may be required to serve as the contracting officer's technical representative or the technical oversight representative for ensuring the contractor performance meets the contract and user requirements.

13–7. Post-production software support

Computer software incorporated into training system/devices must be maintained and updated. The CRLCMP should be completed by the MATDEV, with support from the PEO STRI, before the milestone C decision to document the software support strategy. The PEO STRI budgets for PPSS to cover software maintenance; however, the cost of software upgrades or software enhancements is separate from software maintenance and must be budgeted and funded by the requiring agency.

Chapter 14
Software Supportability

14–1. Software support

a. Managing software development and ensuring software supportability are among the most difficult challenges facing the PM. Many of the factors contributing to this challenge are beyond the control of the PM (such as growing and changing requirements); however, software supportability must be effectively addressed.

b. Support of software is as important as support of the hardware. More than two-thirds of DOD's expenditures for software are for PPSS. No major weapon system can operate on today's battlefield without a software capability and no aspect of any soldier's life is untouched by software, whether it be eating in the dinning facility, firing on the rifle range, transportation of household goods, or performing in a combat environment.

c. As with the hardware, software supportability considerations include technical data, personnel, training, special support equipment and CM. However software support requires specialized expertise (such as a software engineering center and software support activity).

d. The PM, with support from the SIPTs, must ensure that the software is supportable in the operational environment by successfully implementing PPSS. PPSS is the sum of all activities required to ensure that a mission critical computer system continues to function properly in performing its operational mission, and readily accommodates both mission and production upgrades.

e. Most people involved with a given program are aware of the application software programs for system computers which may be embedded, stand alone, or networked. These are represented above the waterline on the software iceberg (fig 14–1). However, there are many support requirements (shown below the waterline in the illustration) for that software. The SIPT must ensure adequate software supportability, including adequate support equipment, maintenance software, technical data, personnel, resources and procedures, is available to facilitate—

(1) Modifying and installing software.

(2) Establishing an operational software baseline.

(3) Meeting user requirements.

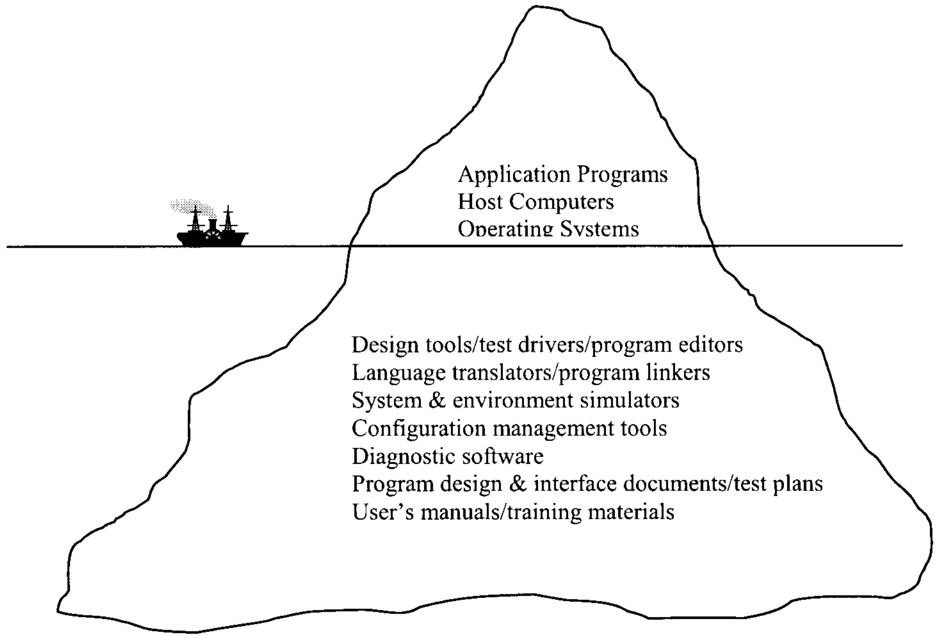

Figure 14–1. The software iceburg

f. Equipment such as software simulators, editors, compilers, test equipment, documentation, and other software tools must be procured with the system. It is the PM's function to ensure that the procuring documentation (for example, a SOW) includes all the necessary software support equipment.

g. The software support development process must include support requirements, design for supportability, and alternatives for lowering supportability risk and cost. The PM will need support from the SIPT, acquiring organization, software engineering activity, software support activity, and user.

h. Software support management and implementation documentation that should be developed prior to fielding include the software portion of the SS, CRLCMP, computer resources integrated support document, software support concept, software-related technical data, software quality evaluation procedures, and a software support transition plan.

i. In preparing for PPSS, consideration must be given to factors such as system and software criticality, anticipated software change profile, interface requirements, and characteristics of the user community. Critical constraints such as staffing to include personnel skill and manpower, facilities, organization, and budgetary limitations must be included.

14–2. Support of fielding software

Software logistics support should be considered in light of the maintenance concept to be implemented for the acquisition system. In particular it will be important to align the software support tasks with the appropriate maintenance levels. Typical support tasks at each level include—

a. Field level (organizational), to include—

(1) Software system version installation.

(2) Local adaptation database modification.

(3) Test verification.

(4) Report and identification of problems.

(5) Collection of supporting data.

(6) Provision of recovery service.

b. Sustainment level (intermediate DS/GS), to include—

(1) Creation and transmission of software version releases to operational units.

(2) Diagnostic support.

(3) System programming support.

(4) Database administration.

(5) Software support.
(6) Software documentation maintenance.
(7) Support of the software tool set.
(8) COTS software correction integration.
(9) Configuration management.
(10) System test.
c. Depot level, to include—
(1) Changes to COTS software (usually performed by the supplier).
(2) Changes to reuse code (usual performed by the original developer/contractor) or other customer program organization.

14–3. The computer resources life cycle management plan

a. The CRLCMP can be used as the primary planning document for computer resources throughout the system life cycle. It complements the SS and its purpose is to—
(1) Document the software support concept and the resources needed to achieve the support posture.
(2) Document the computer resources development strategy.
(3) Identify the applicable directives, regulations, operating instructions, TMs, and so on.
(4) Define any changes or new directives needed for the operation or support of computer resources.
(5) Define the scope of independent verification and validation.
b. Development of the CRLCMP is initiated during TD and coordinated with the user and supporting organizations. The CRLCMP is updated as required in each phase of the life cycle. After the transition to the user, the support activity assumes responsibility for the CRLCMP.
c. The CRLCMP provides information needed by the PM and SIPT. Some of the key areas that require special attention and intensive management include—
(1) Software support resources, which describes the software engineering effort and the test environments required to support the deliverable software.
(2) Facilities, which describes the types and functions of the facilities required to support the computer resources of the system.
(3) Personnel, which identifies the personnel required to support the deliverable software, including the types of skills, number of personnel, security clearance, and skill level.
(4) Training, which describes the plans for identifying needed training and the training curriculum for personnel who will manage and implement support of the deliverable software as well as the training schedule, duration, and location for all training provided and delineates between classroom training and hands-on training.
(5) Transition planning, which describes contractor plans for transitioning the deliverable software to the support agency (including the needed resources) and identifies the necessary resources and the procedures for installation and check out of deliverable software in the support environment.
(6) Software documentation, which describes all of the software and associated documentation required to support the deliverable software.
(7) Other resources, which identifies any other resources required for the support environment not mentioned elsewhere in the CRLCMP.
(8) Software integration and testing, which describes the procedures necessary to integrate and fully test all software modifications.

Chapter 15
Manpower Requirements Criteria

15–1. Purpose

a. The manpower requirements criteria (MARC) program provides a means of establishing and justifying the right quantity and mix of maintenance personnel for sustainment of Army materiel. MARC are HQDA-approved standards used to determine mission-essential wartime position requirements for combat support and combat service support (CSS) functions in TOE.
b. It is critical the initial MARC maintenance data be as accurate as possible to support Army decisions regarding acquisition and life-cycle costs of equipment. With accurate maintenance data the Army can determine if maintenance burdens are correct, whether equipment modifications are needed, and if action should be taken to reduce or increase maintenance personnel numbers. The Army might choose to modify the equipment design if the maintenance burden is too high and may also need to take action to prevent shortages or excesses of mechanics.

15–2. General discussion

a. The proponent for the MARC program is the DCS G–3. USAFMSA is the DCS, G–3 executive agent for MARC. Every 3 years USAFMSA prepares a list of systems that are candidates for MARC maintenance updates. The list is coordinated with the ASA(ALT), the Deputy Chief of Staff, G–4 (DCS, G–4), TRADOC, the U.S. Forces Command, and MATDEVs. The agreed-upon list of systems requiring update is then provided to the MATDEV to be included in their MARC maintenance update program. HQ AMC and ASA(ALT) maintain a structure to manage, maintain, record, and periodically review the Army's maintenance data.

b. MARC policy and guidance are contained in AR 71–32.

c. The objective of the MARC maintenance program is to provide accurate maintenance man-hour data for the determination of wartime maintenance personnel requirements for TOEs.

d. LOGSA and MATDEV organizations are responsible for establishing and maintaining an accurate and timely maintenance data collection and reporting system with data audit trails to support USAFMSA MARC maintenance requirements for both new and fielded materiel systems.

e. Maintenance MARC are composed of two categories of maintenance man-hour criteria: Direct productive annual maintenance man-hours (DPAMMH) and indirect productive time.

(1) DPAMMH are provided by the MATDEV and are composed of two categories of maintenance man-hours, initial and update. Initial DPAMMH criteria are established for new or modified equipment and are calculated by the MATDEV during development of the BOIPFD. The initial DPAMMH are derived from, but are not limited to, engineering estimates, supportability analyses, and/or test data. Updated DPAMMH are for fielded equipment and are derived from, but are not limited to, follow-on test data, actual field maintenance data, and/or sample data collection.

(2) The indirect productive time takes into account all nonmaintenance demands on a mechanic's time and is automatically applied by USAFMSA to the DPAMMH. The application of indirect productive time to the DPAMMH produces annual maintenance man-hours (AMMH). This particular data element is outside the scope of the MATDEV and is a USAFMSA-managed manpower planning factor.

f. The USAFMSA document integrators use the AMMH (DPAMMH plus indirect productive time) to determine the appropriate quantity and mix of maintenance personnel required to maintain equipment in an operational ready condition in Army TOEs.

g. DPAMMH data are provided to USAFMSA by the MATDEV via the BOIPFD and MARC updates through the LIDB. The LIDB feeds directly into USAFMSA's Force Management System, which contains the Army MARC Maintenance Data Base, the single source for determining Army maintenance manpower requirements for TOEs (see www.usafmsardd.army.mil/marc/ammh/contents.htm).

15–3. Procedures for initial development

a. HQ AMC and ASA(ALT) maintain a structure to manage, maintain, record, and periodically review the Army's maintenance data.

b. The MATDEV develops initial and updated DPAMMH. The DPAMMH are derived from engineering estimates, supportability analyses, test data, or, with justification, from a predecessor system. (It is Army policy that surrogate data be used only when analytical proof can be presented that demonstrates that use of surrogate data is reasonable and reflects the best estimate available for the system being acquired). The DPAMMH is transmitted to USAFMSA via the BOIPFD. The MATDEV maintains an audit trail for the life of the equipment to document how the initial and updated DPAMMH were developed and updated.

c. The USAFMSA adds the applicable indirect productive time to the DPAMMH to create AMMH, which are used to determine Army maintenance manpower requirements for TOEs.

15–4. Procedures for update

a. Every 3 years USAFMSA publishes a list of systems, as a result of analysis by LOGSA, that are candidates for MARC maintenance updates. The list is coordinated with the ASA(ALT), DCS, G–3, AMC, TRADOC, U.S. Forces Command, and MATDEVs. The agreed-upon list of systems requiring update is provided to the MATDEV for inclusion in their MARC maintenance update program.

b. LOGSA maintains the LIDB maintenance module as a centralized database for ground and air direct support (DS) and general support (GS) DPAMMH. These data are available for use by the MATDEV, USAFMSA, and other organizations. Beginning in fall 2004, system change packages were fielded that capture Unit-Level Logistics System DPAMMH and to make DS/GS DPAMMH mandatory entries in the STAMIS family. As a result, the LIDB maintenance module will begin receiving and storing organization level maintenance data in conjunction with DS- and GS-level maintenance data.

c. The MATDEV updates the initial DPAMMH using inputs from various sources such as unit, direct support, GS maintenance man-hour data from the LIDB, sample data collection, field exercise data collection, logistics assistance representative input, and recorded maintenance failure data. The data are then validated by the MATDEV SIPT, which includes the system maintenance support proponent, the CBTDEV, and the TRNGDEV. The updated DPAMMH is then provided to USAFMSA via LIDB for review. The MATDEV maintains an audit trail of all DPAMMH updates for the life of the equipment.

d. USAFMSA reviews the updated DPAMMH data and, if acceptable, replaces the initial BOIPFD in the Army MARC Maintenance Data Base. The TOE update process will then use the new data in the Army MARC Maintenance Data Base to adjust maintenance personnel requirements accordingly. If the DPAMMH data are not acceptable, they are returned to the MATDEV for further review and resubmission.

Chapter 16
Contractor Support

16–1. Selecting a support alternative

a. There are many support alternatives that can be applied to newly fielded systems. These range from a use and discard approach, to LCCS, to Army organic support, to joint support by several services or countries. The selected support concept might also be one consisting of elements selected from each of these support alternatives. The support alternative selected should be based upon trade-off analyses and must show that the selected alternative—

(1) Is the optimum among available alternatives.

(2) Will provide support during peacetime and wartime.

(3) Is the most cost effective.

(4) Is clearly in the best interest of the Government.

b. The best value alternative to the Government depends upon system complexity, system density, expected system life, availability of trained personnel, availability of spare parts, tools, and test equipment, and the availability of a commercial support system in the areas of the world where the system will be deployed. An NDI system is frequently required to be fielded as soon as possible and prior to the availability of organic support. During these instances, ICS is used to support the system as organic capability is being developed and phased into the support structure. Even in cases where LCCS is selected, there are instances where contractors decide to discontinue LCCS. The Army must seek other vendors or develop an organic capability to sustain these systems. Without a TDP, the Army may have an extremely difficult time providing cost-effective and timely support for such systems.

c. Almost any task the Army performs in maintenance and support of a piece of equipment can be purchased from private industry. Before selecting contractor support, determine if—

(1) The advantages of contractor support can be sustained in a wartime environment.

(2) There will be a requirement to transfer to organic support and how difficult this transition will be.

d. Army organic support is any logistics function provided by an Army or a DoD organization. Any logistics support provided by contractor personnel is contractor support. For instance, transportation of defense materiel within this country and in friendly countries where the Army maintains a presence is normally provided by contract with commercial shipping companies; this is an example of contractor support. On the battlefield, however, the same materiel transported on Army vehicles and handled by Army personnel would be considered organic support.

e. CLS will be used when it is in the best interests of the Government to employ it. CLS includes services, materiel, and facilities for the maintenance, repair, training, supply, distribution, software support, transportation, overhaul, or rebuild of Army systems.

f. In order for CLS to be chosen, supportability analyses should show that CLS provides the required support in both peacetime and war, is a cost-effective option for support, and is in the government’s best interest (best value). There are two types of CLS:

(1) ICS is any combination of logistic support functions supplied by contract for a specified time until organic support capability is established to replace it. Contractor support of initial fielding provides logistic support functions by contract for a brief period when a materiel system is first introduced. It relieves the Army of the initial workload associated with filling inventories of spare parts, repairing early failures, or providing initial training on the new systems. It is not intended as a replacement for the Army’s sustainment of the system.

(2) LCCS is any logistics support function supplied by contract for the life of the materiel system, with no intent to develop an organic capability in those areas.

16–2. Contractor support decisions

a. Operational tradeoffs must be made to determine the effects of support options on the ability of a materiel system to accomplish its mission in the intended environment. Tradeoffs may be needed in the areas of readiness requirements, sustainability, useful system life, manpower and personnel requirements, and the wartime mission of the system. For example, a tradeoff may be made to accept a decrease in operational availability from 99 to 95 percent in order to achieve a 5 percent decrease in personnel at the unit level by using contractor repair of a component at the sustainment level.

b. Economic tradeoffs are accomplished by comparing the total LCC of various options. In the case of trading organic versus contract support options, it is essential to use LCC as these two methods incur their major costs at different places in the life cycle. For instance, establishing an organic depot maintenance capability requires an early expenditure for product description data on the system (such as design drawings). If life-cycle contractor maintenance is chosen, these data may not be needed at all, but higher sustained costs for maintenance may be incurred as the system ages. All these costs must be assessed and played against one another as decisions on support are being made.

c. Technical tradeoffs must be made in relation to various support options. Such things as maturity of the technology or complexity of the individual components are weighed against the types of support available. If, for example, a very new technology is being used and the exact component design is likely to change after initial fielding, then ICS for provisioning and depot maintenance might be the best choice until the design stabilizes.

d. Given the need for some level of contractor support, there are still tradeoffs to be made over the depth, breadth and length of support to be provided. These would involve decisions of ICS versus LCCS and contracting for part of the logistic support functions versus all of them. Any of these decisions must be made in conjunction with the technical, economic, and operational tradeoffs addressed above. Tradeoffs also can be made among different logistic functions. A contract for component replacement during interim support instead of component repair may not mirror the planned component repair under organic maintenance.

e. One well-documented method of doing tradeoffs of various support alternatives is the Army depot source of repair decision tree logic. The source-of-repair decision (see AR 750–1) is a combination of the types of tradeoffs described above applied to the source of depot maintenance and overhaul. Decisions relative to depot level support alternatives must comply with public law. Another common tool is the LORA.

f. The impact of having additional contractor personnel on the battlefield must also be considered. Management and protection of civilian contractors on the battlefield and the associated conflicting operational and legal principles have become a difficult issue within the Army.

16–3. Planning and documenting contractor support

a. Any contractor support will be identified in the AS and detailed in all the appropriate ILS element sections of the SS and, if applicable, any standalone ILS element plans. If life-cycle depot maintenance is to be provided by a support contractor, then this must be reflected in the depot maintenance support plan, the plan for acquiring technical data, and the plan for supply support. It also would affect the LMI strategy and the support resource funds and would obviate the need for support transition planning for the depot level.

b. The MFP (AR 700–142) must describe all planned contractor support, including any contractor support of initial fielding and ICS. ICS must be coordinated in the MFP because early fielding may involve contractor support while later fielding may not.

c. Planning for transition from ICS to organic support is essential to continuous sustainment of the fielded system. Although a specific format for a transition plan is not specified, there are responsibilities for both developer and the sustainer of the materiel system. The content of a transition plan, which should be agreed to between the major parties, would include—

(1) Logistics functions included in the ICS.

(2) The length of time ICS will be required.

(3) Procedures for possible extension of the ICS.

(4) Funding requirements.

(5) Control structure for ICS.

(6) A checklist of actions to be completed before transition can take place.

(7) Milestone dates for major actions up to transition date.

(8) Tracking and reporting procedures for transition.

(9) Contract data on maintenance actions, repair parts consumption, and other data beneficial to establishing organic support.

d. Choosing some form of contractor support has implications for the planning, programming, and budget execution process. In some cases (such as for initial provisioning, depot maintenance plant equipment, or technical manuals) expenditures might be deferred or eliminated because of contract support. There are also implications for wartime support and each contract should address the possibility of contractors on the battlefield and the measures to be taken to reasonably ensure their compliance with wartime contractual provisions.

16–4. Contract content

a. In the prime contract for a materiel system, there are several areas which can be heavily influenced by the fact that contractor support has been chosen. Certain requirements (for example, technical data) may be pared back or eliminated in the case of LCCS or deferred under ICS, but care must be taken before making these cuts. As long as organic support is still a possibility there must be the option of buying technical data and analyses needed for organic support. Prime contract areas affected by and affecting contractor support are—

(1) TDP, which supports maintenance data requirements, spares data requirements, and CM. It can be tailored significantly in response to a contractor support decision, but can be entirely eliminated only in the case of LCCS.

(2) Product descriptions, which are all the technical material which describe the design of the materiel system, and allow for the manufacturing and quality control of the system. The requirement for these can be significantly altered by a contractor support decision; but care must be taken to tailor the requirements properly. For instance, if the decision is made to contract for all maintenance and spares for the life of the system, it would be prudent to buy an option to transfer design rights to the government in case the contractor backs out of the support agreement years later.

(3) Technical manuals, which can often be deferred in the case of ICS; some manuals can be eliminated with LCCS.

(4) Contractual requirements for tools, test and support equipment, repair parts, software documentation, reliability and maintainability, LMI, and manpower and personnel data, which can all be significantly altered by a decision to have contractor support. In all these cases care must be taken to tailor requirements rather than completely eliminating requirements in one or two functional areas.

b. The content of the logistic support portion of the contract must be specific in dividing the responsibilities between the Government and the contractor and address the issue of contractors on the battlefield. There is sometimes a difference between how a system is supported organically and how the contractor provides that support. For example, if the system design is too unstable to provide maintenance and initial provisioning for a new materiel system, then ICS will be required. The requirement on the contractor would be to maintain a specified availability of the system, not to perform specified maintenance functions and provide parts. The areas where the support contract must be specific regarding responsibilities of both the contractor and Government are—

(1) Maintenance—who does what, and does the contract specify maintenance tasks to be performed or does it specify allowable downtime?

(2) Supply—which supply functions is the contractor actually providing? The contract may include direct vendor delivery.

(3) Materiel management—the contractor may be controlling all the ordering and distribution functions under the contract, or may be working through the existing government system. The contract must be specific.

(4) Overhaul\rebuild—the contractor's function may be to perform the specified rebuild until a government depot maintenance facility is ready. Another option is LCCS for depot maintenance at a contractor or Government owned facility.

(5) Other services—these may be contracted either individually or as part of a larger support contract include engineering support, configuration management, facilities, software support, or data processing functions. In each of these, the contract should specify what functions will be performed, what services will be provided, and what is specifically required of the Government in support of the contract.

Chapter 17
Post-production Support Planning, Reprocurement, and Program Management Transition

Section I
Planning

17–1. Activities

a. PPS activities include those management and support activities necessary to ensure attainment of readiness and sustainability objectives within economic parameters after termination of the production phase.

b. Policy regarding PPS planning is contained in AR 700–127. PPS planning starts with supportability analyses to identify technological opportunities and evaluate design opportunities for improvement of supportability characteristics in new systems. This data gathering can start in MIs and take place in every phase of the acquisition life cycle. The goal will be a PPS plan to achieve effective and economical support throughout the expected service life of the materiel system.

c. For commercial/NDI systems, the PPS may be as simple as replacing the obsolete system with the next-generation commercial item. Developmental systems with life cycles from 20 to 50 years can involve planned upgrades of hardware and software, technology insertion, and depot rebuild programs to increase capabilities and reduce supportability resource requirements.

d. Planning should be reviewed and updated as long as the materiel system is in the active inventory.

17–2. Procedures

a. PPS planning is part of the system engineering function and is reflected in the early tradeoffs considered in system design. When an ILSM is assigned to a program, one of the functions within the IPT is to produce a working tool called the SS. An initial PPS Plan will be included in the SS, as an annex, by milestone C. The PPS plan must be completed prior to production phase-out and updated throughout the item's life cycle.

b. Designing for PPS begins with a technological opportunity analysis to identify any technology used in the design of the system that will probably be obsolete before the system has achieved its expected life. Thus evolutionary acquisition concepts should be applied to the design of the system to ensure growth paths to support block modifications or modularity to permit MTS. As technology advances are made in these areas, the new technology can be applied to the system. Such design minimizes problems encountered in supporting systems no longer in production.

c. The MATDEV should conduct PPS decision meetings prior to issuance of the final production order. All program participants should be represented. The meeting is designed to avoid major nonrecurring charges if follow-on production is later required. Points of consideration should include, but not be limited to—

(1) Obtaining technical data, drawings, and tooling to support post-production competitive procurements.

(2) Purchasing major investment items such as manufacturing structures, forges and castings, insurance items (to cover battle damage), proprietary data rights, and raw materials.

17–3. Content format

a. Section I is designated for management of the PPS program. List the agencies (both Government and contractor) responsible to plan and execute jointly the applicable elements of the PPS plan.

b. Section II is designated for PPS objectives and system and subsystem readiness objectives in the post-production time frame.

c. Section III is designated for known or potential PPS problem areas. Identify and assess the potential impacts of production phase out, technological change, and obsolescence on the materiel system and its support system. This assessment should be on a 10-year projection, unless it is known where the system will be disposed of prior to that time.

d. Section IV is designated for PPS strategies. Attach the PFSA plan, which includes the following—

(1) Alternative PPS strategies to accommodate obsolescence or production phase out such as second sources, support buyouts, preplanned product improvement, CLS versus organic support and substitution of new technology. Strategies for continuing systems engineering and effective configuration control of the end item and ASIOE for a 10-year strategy projection of support needs.

(2) Support strategy if the system life cycle is extended beyond the original projection.

(3) Support strategy of systems declared obsolete to U.S. forces but retained by friendly foreign countries and allies.

(4) Provisions for utilization, disposition and storage of Government-owned tools, equipment and contractor-developed tools, test equipment, and so forth.

e. Content of Section V is designated for required actions. List responsible agencies, actions, and milestones to include, but not be limited to the following:

(1) Resources and management actions and responsibilities required to satisfy PPS objectives and production of required government furnished materiel (GFM), listed by national stock number (NSN).

(2) Actions needed to obtain cost-effective competition of PPS requirements.

(3) Modifications to the SS to accommodate PPS needs.

Section II
Reprocurement

17–4. General discussion

a. Reprocurement or rebuy of Army systems is authorized when there is a continuing funded requirement and the system fulfills the performance specifications and program cost and schedule requirements. The CBTDEV provides a statement verifying the continuing need for the system and the MDA provides the authorization for the reprocurement. If there is more than a 2-year break in production, an MDR will be conducted and results will be reflected in the acquisition decision memorandum.

b. When a system is reprocured, the original CD will serve as the baseline. The purchase description or performance specification becomes the requirement document of record and is updated to reflect current performance, cost, and schedule requirements and state-of-the-art technology.

17–5. Rebuys

a. Rebuys using a new solicitation may result in delivery of different model than originally purchased, which requires that a new NSN be assigned. The new make and model must be registered under the original line item number (LIN). New models cause proliferation of spare and repair parts. Instead of disparate rebuys, it is preferable to use multiyear procurements or contract options to minimize the number of different models and potential growth of associated spare and repair parts.

b. Rebuys may be needed when original makes and models are no longer available or when technological improvements offer improved performance, safety, or environmental impact. These cases should require a minimum of documentation, but the MATDEV must assess the logistics impact of any re-procurement consistent with the management of cost, schedule and performance. In addition, the following documentation will need review and update:

(1) Market investigation.

(2) Purchase description/performance specification.

(3) SS.
(4) Test and evaluation master plan.
(5) Training and new equipment training plans.
(6) BOIP/BOIPFD feeder data.
(7) MFP.
(8) Health hazard and system safety assessments.
(9) Independent evaluation/assessment.
(10) Transportability peport.
(11) Environmental assessment.

Chapter 18
Depot Maintenance

18–1. Depot maintenance partnerships

a. Depot maintenance includes the overhaul, upgrading, or rebuilding of end items, parts, assemblies, or subassemblies and the testing and reclamation of such equipment as necessary (regardless of the source of funds for the maintenance or repair and irrespective of the location at which the maintenance is performed). It includes all aspects of software maintenance as well as interim contractor support or contractor logistics support (or any similar contract support), to the extent that such support is for the performance of the maintenance or repair outlined above. Depot maintenance includes the installation of parts for modifications; it does not include the procurement of major modifications or upgrades to improve weapon system performance or the parts for safety modifications.

b. Sustainment strategies shall include the best use of public and private sector capabilities through government/industry partnering initiatives, in accordance with statutory requirements. Depot maintenance partnerships are a key component of the DOD Force-centric Logistics Enterprise initiatives for logistics transformation. It is a logistics sustainment concept that focuses on establishment of cooperative agreements among the PM, DOD organic depots, and the private sector. The PM, with support from the SIPT and PSI, is responsible for identifying and describing opportunities for depot maintenance partnerships between the government and industry in the acquisition strategy. Although there have been limits in the past on the proportion of private sector participation allowed in the area of depot maintenance, there are various legislative proposals under consideration that would enhance partnering.

c. There are various types of partnerships that may be established, including work share agreements, facilities sharing arrangements, private or public depot equipment/facilities leases, and joint private-public contracts with a PM.

d. Some of the many benefits of depot maintenance partnering to the Government are—

(1) Increased depot maintenance productivity.
(2) Reduced total ownership cost.
(3) Reduction in excess infrastructure.
(4) Improved responsiveness to the warfighter.
(5) Built-in surge capability.
(6) Critical skill integration
(7) Workforce stability
(8) Focus on core competencies.
(9) Access to the most current business practices
(10) Shop processes and decreased technology investment in duplicative capabilities.

18–2. Recapitalization program

a. The Army recapitalization program is a key element in the modernization and sustainment of the Army’s legacy force and an essential enabler of the Army’s transformation to the objective force. The goals of recapitalization are—

(1) Extend system service life.
(2) Reduce growth in operating and support costs.
(3) Technology insertion.
(4) Increased reliability, maintainability, readiness and safety.
(5) Reduction in logistics footprint.

b. There are two types of recapitalization programs in the Army:

(1) Rebuild program, in which the system is restored to a like-new condition in appearance, performance, and life expectancy. Some new technology may be inserted to reduce life-cycle cost or improve readiness, supportability, or safety. In a rebuild program the restored system maintains the same model number.

(2) Selected upgrade program, in which the system is not only rebuilt, but also receives upgrades which provide

significant improvements in warfighting capability that are designed to address shortcomings in an approved capability document. Given the nature of the upgrades, the selected upgrade system receives a new model number.

c. If approved by the AAE and the Vice Chief of Staff for the Army, the PM must develop a recapitalization program baseline (RPB) for the system(s). The RPB serves as the management plan for the recapitalization program and includes a description of the "build to" configuration of the system along with the cost, schedule, performance, and supportability objectives. The RPB includes information in the following areas:

(1) Recap program description as approved.

(2) Funding schedule including unit cost and life cycle cost.

(3) Recap schedules in terms of rebuilds per year.

(4) Metrics for assessing the effectiveness of the recap process.

(5) Recap partnerships, and contracts including responsibilities.

(6) Test plans including facilities requirements and test dates.

d. The PBL approach is a critical component of the recapitalization program and includes performance plan/ agreements with product support providers and warfighters and the application of a performance measurement system.

18–3. Depot maintenance support plan

a. The DMSP—

(1) Provides the information necessary to plan, program, budget, coordinate, and schedule manpower, personnel, training, facilities, and equipment requirements for depot-level maintenance.

(2) Provides a forecast of depot-level maintenance workload, procedures for conducting the pilot overhaul or other first article test, and product assurance requirements.

(3) Contains a time-phased schedule for the development of depot-level (Army organic and/or contractor) maintenance capability.

b. Requirements for all depot-support options (that is, Army organic continental United States (CONUS) and OCONUS, interservice, host-nation support (HNS), and contractor) are described in the first portion of the DMSP (sections I through IV)

c. Specific plans and procedures for achieving Army organic depot maintenance support capability are described in the second portion of the DMSP (sections V through IX). These sections may also be used to define contractor, interservice, or combination depot support requirements.

18–4. Procedures

a. The MATDEV prepares, coordinates, and approves the initial DMSP in the SDD phase, or prior to the milestone C decision. Early development of the DMSP ensures the timely identification of resource requirements for depot level maintenance. The resources are normally required or procured during the production and deployment and O&S phases.

(1) A DMSP is prepared for each materiel system for which depot-level maintenance support is determined necessary during the maintenance support planning effort or approved LORA. The DMSP includes requirements for Army organic, CONUS and OCONUS, contractor, HNS, and interservice support as set forth in the depot maintenance study (DMS), depot maintenance inter-service (DMI) study, or SA efforts.

(2) The AMC national maintenance point and the materiel acquisition IPT participants are included in the coordination and evaluation processes for the initial DMSP and subsequent updates. The assigned depots provide vital capability data as well as technical evaluation of DMSP content.

b. The DMSP is part of the ILS planning process (see AR 700–127). The approved DMSP allows depot maintenance program implementation.

c. The DMSP is an Army-unique document and does not normally require coordination with the other services. However, for Joint service programs and those using interservice support, the MATDEV will coordinate the DMSP with the logistics representative(s) of the other services involved. A tailored coordination and distribution list will be developed and will be included as an annex to the DMSP.

d. The DMSP is a living document. Each section is updated by the MATDEV as new information becomes available to the IPT, the user, or the depot. This applies when changes warrant realigning manpower, personnel, training, or other depot maintenance support requirements. For systems developed without organic depot maintenance support, annual reviews of the DMSP considers whether supportability issues for the system warrant a change in the maintenance concept, including organic depot maintenance.

e. The MATDEV provides three copies each of the initial DMSP and subsequent revisions to the depot and one copy to each addressee on the tailored coordination and distribution list.

f. The preparing office retains copies of all iterations of the DMSP until the materiel system is fully supported as required by the approved maintenance concept. When system management responsibility is transitioned from the MATDEV to a supporting command, the supporting command assumes responsibility for maintenance of the DMSP; copies of all previous DMSP iterations prepared by the MATDEV is provided to the supporting command.

18–5. Contents of a depot maintenance support plan

A DMSP format contains the 10 sections listed below and any necessary annexes. The following provides detailed guidance on the contents of each section and segment of a DMSP.

a. Section I–Introduction.

(1) *Purpose.* Provide a brief statement on the anticipated uses of the DMSP. Summarize the planning actions to date that have been initiated or completed to establish a depot-level maintenance (DLM) capability. Include references to the DMS and SA level of effort.

(2) *Materiel system description.* Describe the overall materiel system being acquired. Provide a separate description for each major and secondary item that is a DLM candidate. Include nomenclature, NSN, LIN, and model number, as available. Identify any items being replaced by the new materiel system.

(3) *Key personnel.* Identify all participating organizations and provide POC information for individuals with a role in the development and execution of the DMSP. POC information will include individual's name; Email, message and mailing and e-mail addresses, defense switching network (DSN), Federal Telephone System, commercial telephone numbers, facsimile transmit/receive system number, and alternate POC information.

b. Section II–Scope.

(1) *Maintenance concept.* Describe the depot maintenance concept, the approved acquisition, and SS. Define the type of DLM to be performed (for example, repair, overhaul) and the extent of maintenance to be performed (such as complete overhaul, limited overhaul, inspect and repair as required).

(2) *Applicability.* Identify the organizations to which the DMSP applies including the MATDEV, national inventory control point, national maintenance point, depot(s) (CONUS and OCONUS), contractor(s), and other service participants. State the planning years to which the DMSP applies; at a minimum include the fiscal year that DLM capability is to be achieved plus 4 out-years.

(3) *Interservice support decision.* Indicate methods used to satisfy the requirements of the Joint Logistics Commanders' directions for DMI. Provide for the DMI process a milestone schedule that includes dates of DMI introduction, program/technical data availability, Army candidate depot designation, industrial activity capability and capacity response submission, DMI recommendation and decision, prime depot assignment, and preparation of depot maintenance interservice support agreement(s) (DMISA) (if applicable). Identify the DMI study number and DMISA number when assigned.

(4) *LCCS.* Describe any LCCS planned and verify that the depot maintenance source of repair decision tree analysis outlined in AR 750–1 has been used to select LCCS for the materiel system and that LCCS approval is contained in AR 700–127. Document LCCS approval authority and date. Summarize contingency planning for conversion to organic support. Sections V through X may be used to facilitate LCCS planning. Identify each DLR under LCCS by nomenclature, NSN, location of contractor facility responsible for complete repair, anticipated repair costs, efforts planned to develop competition for the LCCS, and expected Army organic depot actions.

(5) *ICS.* Describe any ICS planned for the materiel system. Fully document the circumstances that require the use of ICS. Sections V through IX may be used to facilitate ICS planning. Identify each DLR under ICS by nomenclature, NSN, location of contractor facility responsible for complete repair, IOC candidate depot, projected date when transition to Army organic depot support will be completed, and expected depot actions.

(6) *Transition.* Identify the required DLM capability dates for all options (for example, interservice to Army organic, LCCS sole source to LCCS competitive, ICS to Army organic). Attach detailed transition plans, including milestones, as an annex to the DMSP. Identify the candidate depot, if applicable.

(7) *DLRs.* List items identified through the SA process. Include in the identification of each item the nomenclature, NSN, supply, maintenance, and recovere (SMR) code, and, where possible, an illustration.

(8) *Warranty data.* Identify items covered by warranty, procedure for implementing and administering the warranty, and expected depot actions.

(9) *Licenses, approvals, agreements for special handling.* Identify any special licenses, approvals, or agreements required (for example, a Nuclear Regulatory Commission license for radioactive materiel). Indicate whether any of the technical data or procedures will be classified, and identify where that data may be obtained. Include unique disposition instructions for non-reparable, unserviceable components (for example, demilitarization, hazardous materials, or hazardous waste disposal).

c. Section C–References. Publications pertinent to the DMSP are listed in this section in the following sequence:

(1) Administrative publications.

(2) Directives. Include letters of instruction, MOA, and similar guidance.

(3) Sources of data. Identify any plans or other documents used to provide input to the DMSP such as the TEMP and the DMS. Cross-reference these sources to the appropriate section of the DMSP. Describe methods used to develop requirements, forecasts, costs, or other data in the DMSP from these sources.

(4) Technical publications. List the technical publication numbers of the TM and depot maintenance work requirement (DMWR) that apply to the materiel system. If no TM or DMWR is available, so state. If contractor manuals are to be used in lieu of DMWR, list the manufacturer's manual number, manual publication date, and source information.

(5) Equipment specifications. Include specifications required for overhaul and fabrication not provided in other technical documentation.

d. Section IV–Forecast of overhaul workload. Forecast of Army organic, contract, HNS, and interservice depot-level repair or overhaul (maintenance) workload is based on the SA and data sources documented in LMI. Sufficient detail is provided to establish the basis for DLM capability for—

(1) Peacetime. Include all projected DLM workload. As a minimum, project the workload for the fiscal year depot capability is to be achieved plus 4 out-years. For modifications, identify depot workload for modification or conversion and concurrent overhaul or inspect-and-repair programs. This is to be done in addition to the follow-on overhaul forecast.

(2) Mobilization. Determine mobilization maintenance workload at the depot-level in accordance with AR 700–90.

e. Section V–Facility requirements. Include electrical, mechanical, and industrial requirements necessary for the depot to repair line replaceable units (LRUs) and end items. Electrical requirements will state the power, voltage, phases, cycles, alternating current or direct current, and amperage. Mechanical requirements will state the hydraulic, pneumatic, cleanliness levels, clean room, and/or laminar flow necessities. Industrial requirements will include plant layouts, work station layouts, storage areas, square footage, height and material handling equipment necessary for LRU and end item repair.

(1) *MCA projects.* When no suitable existing facilities are available to satisfy the needs of the materiel system as determined in referenced documents, provide plans and schedule for new construction project processing, costing, reporting, and execution in accordance with AR 415–15 and AR 700–90. In a detailed funding profile in this section, identify the fiscal year of funding, type of funding, and category of funding. State whether the project is funded or unfunded. Include a cost summary in the consolidated funding profile (section IX). If not applicable, so state.

(2) *Modifications to existing facilities.* When use of existing facilities depends upon modification or conversion, provide plans and associated schedule for project processing, costing, reporting, and execution (see AR 415–15 and AR 700–90). In a detailed funding profile in this section, identify the fiscal year of funding, type of funding, and category of funding (such as alteration, conversion). State whether the project is funded or unfunded. Include a cost summary in section IX. Provide statement of impact of modification on ongoing operations at the facility. If not applicable, so state.

(3) *Expansion of facilities.* When the use of existing facilities depends upon expansion, provide plans and schedule for project processing, costing, reporting, and execution (see AR 415–15 and AR 700–90). In a detailed funding profile in this section, identify the fiscal year of funding, type of funding, and category of funding (for example, addition). State whether the project is funded or unfunded. Include a cost summary in section IX. Provide a statement of impact of expansion on ongoing operations at the facility. If not applicable, so state.

(4) *Flow chart/layouts.* Provide layouts depicting the facilities required for support of the system, and indicate the location of installed equipment within these facilities. Also provide flow charts depicting the movement of the system/component through the designated facilities during overhaul operations based on the workload projections in section IV

(5) *TMDE.* Identify TMDE items to be obtained with Army stock fund or procurement appropriations funds or from excess plant equipment stocks. Based on the approved 5-year maintenance workload projection given in section IV, identify the TMDE requirements by depot and include NSN, commercial and Government entity (CAGE) code and part number, unit acquisition cost, required quantity, and estimated utilization rate. When all or part of the TMDE requirement can be satisfied with existing equipment available at the depot or from excess sources, identify the quantity available. If the requirement cannot be totally satisfied through the reallocation of existing equipment, outline plans to procure the additional TMDE and identify those items in a detailed funding profile. Include a cost summary in the consolidated funding profile (section IX).

(6) *ATE.* Identify ATE requirements and list them in a detailed funding profile. Include a cost summary in section IX. If a waiver to the Army standard ATE policy is required, provide a milestone plan for obtaining the waiver from the Army EXECUTIVE DIRECTOR for TMDE. Include the waiver approval document as an annex to the DMSP.

(7) *Special tools.* Identify special tools (with quantities) required to perform tasks identified through the SA process. When all or part of the special tools requirement can be satisfied with existing tools available at the depot or from excess sources, identify the quantity available. Identify special tools to be fabricated by the depot and cite applicable technical documentation. If the requirement cannot be totally satisfied through the reallocation of existing tools, outline plans to procure the additional tools and obtain funding for tool fabrication. Identify those requirements in a detailed funding profile in this section, and include a cost summary in section IX.

(8) *TPS.* For each DLR requiring a TPS, identify the unit under test (UUT), the UUT/TPS maintenance concept, and supporting ATE system. Include the TPS management plan and TPS transition plan as annexes to the DMSP. When the depot is required to develop TPS from technical requirements documents, indicate action required to assure compatibility of computer software/hardware at depot with contractor-prepared technical requirements documents. Provide detailed funding profile in this section and include a cost summary in section IX.

(9) *Other software.* Identify required software changes to maintenance equipment and ICD required to test systems on existing test stands/benches. Identify the source of these requirements. Provide a detailed funding profile in this section, and include a cost summary in section IX.

(10) *MHE.* Identify required system-peculiar MHE required for all depot operations, including receipt, induction,

and issue. Indicate whether equipment is available at the depot or must be acquired. Provide a detailed funding profile in this section and include a cost summary in section IX. Indicate whether the requirement is funded or unfunded.

(11) *Calibration.* Define the requirement for TMDE calibration and the coordination that must be effected with the TMDE activities to obtain calibration support and acquisition approval in accordance with AR 750–43 and the supportability statement required for TMDE acquisition. Provide a detailed funding profile in this section and include a cost summary in section IX.

(12) *Industrial plant equipment.* Identify system-peculiar industrial plant equipment (IPE) to be obtained. Indicate if all or part of the required quantity is available from excess plant equipment sources (for example, Defense General Supply Center, Richmond). Identify items by plant equipment code and/or NSN, CAGE code with part number (if applicable), unit acquisition cost (including shipping and installation costs), required quantity, and estimated utilization rates. Provide a detailed funding profile for obtaining required IPE in this section. Include a cost summary in section IX.

(13) *Other special equipment.* Identify other system-peculiar equipment required to obtain full depot capability (such as laminar flow benches, laser welder, granite table, curing oven (autoclave)). Identify source for each item. Provide detailed funding profile in this section, and include a cost summary in section IX.

f. Section VII —Personnel and skill requirements. Identify requirements for training by depot including the number of personnel to be trained, course start and completion dates, course location, and cost and whether this training is funded or unfunded. Include a cost summary in section IX. Describe plans to ensure that depot training requirements are included in the NET plan. Describe unusual or special skill requirements identified during materiel development, such as electro-optic repair or composite material repair. Identify the specific source of these skill requirements (for example, LMI or MANPRINT documents).

g. Section VIII–Pilot program (performance of DLM on first asset inducted into the depot).

(1) *Pilot overhaul.* Provide plans, schedules, and costs to accomplish overhaul objectives. Include the following information for both the end item(s) and all secondary DLRs by depot: NSN, nomenclature, FY and type of funds, procurement request order number, work accomplishment code, direct labor man-hours per unit, direct labor cost per unit, material cost per unit, total unit cost, and total quantity. Provide detailed funding profile for the pilot program. Do not include costs previously identified in sections V through VII. Do not forget to include the pilot overhaul as a critical milestone in the time-phased milestone schedule (section X).

(2) *Confirmation of capability.* Successful completion of a pilot overhaul will certify depot capability. Define quality assurance requirements. Identify plans for correcting any deficiencies and assessing the impact on achieving depot capability.

h. Section IX–Consolidated funding profile. Provide a consolidated funding profile that summarizes the resource requirements identified in Sections V, VI, VII, and VIII. (Provide detailed cost data in the appropriate section (V through VIII) for each depot-level support element.)

i. Section X–Time-phased schedule. Establish a time-phased milestone schedule for development and implementation of sections V, VI, VII, and VIII, including any projected mobilization planning requirements.

j. Annexes. While sections I through VIII will be primarily in narrative form, detailed quantitative or tabular information is also often required to provide a meaningful document for planning and implementing DLM capability. Any detailed plans or other information needed to support any portion of the DMSP are placed at this point as annexes to the DMSP. Use of annexes to the DMSP will facilitate the publication of changes during updates.

Chapter 19
Condition-Based Maintenance Plus

19–1. Description

a. CBM+ is one of the six collaborative initiatives in the Force-centric Logistics Enterprise issue by the Deputy Under Secretary of Defense (Logistics & Materiel Readiness). CBM+ is the automated monitoring of the operational status of a system to report impending failures in the system, its subsystems or components. The CBM+ concept provides a more proactive basis for maintenance decisions than predecessor maintenance concepts, because the goal is to predict materiel failures or at least to observe them in the earliest stage possible. CBM+ maximizes operational availability, reduces life-cycle costs, increases system safety, and reduces the logistics footprint.

b. The purpose of CBM+ is to detect the early indications of a fault or impending failure to allow time for maintenance and supply channels to react to minimize impact on system operational readiness and life-cycle costs. CBM+ provides a means of greatly reducing scheduled maintenance requirements. The flexibility and optimization of maintenance tasks with CBM+ also provide potential for reducing requirements for maintenance manpower, facilities, equipment, and other maintenance resources.

19–2. Requirements for effective condition-based maintenance plus

a. A CBM+ system must have a health-monitoring system that provides the ability to react to system or component failure immediately. Component health is monitored through the use of sensors that feed inputs to the CBM+ system. CBM+ system must be able to evaluate the component's health based on these inputs and trigger appropriate supply, maintenance, and reporting actions as required. The CBM+ system must be able to consistently and correctly diagnose component health based on manual and autonomous inputs.

b. The systems engineering approach is used in order to determine CBM+ system structure and CBM+ system behavior from user/system requirements. On this basis, alternatives for CBM+ system design are developed and evaluated and must be validated by operational testing supported by the user.

c. Technologies used to achieve CBM+ capability includes various types of sensors for monitoring such parameters as vibration and temperature. There is also a requirement for sophisticated command and control software that features neural networks and fuzzy logic, dynamic modeling and simulation. Wireless data communications from the system to a central data processing system are also needed.

Appendix A
References

Section I
Required Publications

AR 700–127
Integrated Logistics Support. (Cited in paras 1–6, 2–6*b*, 12–4*a* 17–1*b* 18–4*b* C-3*b*(5)(j), C-3*c*(4)(e)1.)

DODD 5000.1
The Defense Acquisition System. (Cited in paras 1–6, 9–1, 13–3*a*.) (Available at http://www.dtic.mil/whs/directives/.)

DODI 5000.2
Operation of the Defense Acquisition System. (Cited in paras 1–6, 2–3*b*, 2–10*b*(9), 11–2, 12–4*a*, 13–2*c*, 13–3*a*.) (Available at http://www.dtic.mil/whs/directives/.)

Section II
Related Publications
A related publication is a source of additional information. The user does not have to read a related publication to understand this publication.

AR 5–11
Management of Army Models and Simulations

AR 11–18
The Cost and Economic Analysis Program

AR 25–30
The Army Publishing Program

AR 25–400–2
The Army Records Information Management System (ARIMS)

AR 40–10
Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process

AR 40–61
Medical Logistics Policies

AR 70–1
Army Acquisition Policy

AR 71–32
Force Development and Documentation — Consolidated Policies

AR 71–9
Materiel Requirements

AR 73–1
Test and Evaluation Policy

AR 75–15
Policy for Explosive Ordnance Disposal

AR 200–1
Environmental Protection and Enhancement

AR 200–2
Environmental Effects of Army Actions

AR 220–1
Unit Status Reporting

AR 350–1
Army Training and Leadership Development

AR 350–38
Training Device Policies and Management

AR 385–16
System Safety Engineering and Management

AR 415–15
Army Military Construction Program Development and Execution

AR 602–2
Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process

AR 700–15/NAVSUPINST 4030.28E/AFJMAN 24–206/MCO 4030.33E/DLAR 4145.7
Packaging of Materiel

AR 700–18
Provisioning of U.S. Army Equipment, Internal Control System

AR 700–90
Army Industrial Base Process

AR 700–138
Army Logistics Readiness and Sustainability

AR 700–142
Materiel Release, Fielding and Transfer

AR 710–2
Supply Policy Below the National Level

AR 750–1
Army Materiel Maintenance Policy

AR 750–43
Army Test, Measurement and Diagnostic Equipment Program

DA Pam 5–11
Verification, Validation, and Accreditation of Army Models and Simulations

DA Pam 70–3
Army Acquisition Procedures

DA Pam 73–1
Test and Evaluation in Support of System Acquisition

DA Pam 611–21
Military Occupational Classification and Structure

DA Pam 700–21–1
Department of the Army Test, Measurement, and Diagnostic Equipment Preferred Items List

DA Pam 700–142
Instructions for Materiel Release, Fielding, and Transfer

DA Pam 708–3
Cataloging of Supplies and Equipment, Army Adopted Items of Materiel and List of Reportable Items

ASA(FM&C) Resource Management Publications
Cost Analysis Manual. (Available at www.asafm.army.mil/pubs/pubs.asp.)

DFAS–IN Manual 37–100
Financial Management–The Army Management Structure. (Available at http://www.asafm.army.mil/budget/di/di.asp.)

DODD 1322.18
Military Training. (Available at http://www.dtic.mil/whs/directives.)

DODI 4540.7
Operation of the DOD Engineering for Transportability and Deployability Program. (Available at http://www.dtic.mil/whs/directives.)

Defense Acquisition Guidebook
(Available at http://akss.dau.mil/jsp/default.jsp.)

MIL–HDBK–470A
Designing and Developing Maintainable Products and Systems, Volume I and Volume II. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–HDBK–502
Acquisition Logistics. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–HDBK–881A
Work Breakdown Structures for Defense Materiel Items. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–PRF–49506 NOT 1
Logistics Management Information. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–STD–209K
Lifting and Tiedown Provisions. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–STD–1366D(1)
Transportability Criteria. (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–STD–40051–1
Preparation of Digital Technical Information for Interactive Electronic Technical Manuals (IETMS). (Available at http://assist.daps.dla.mil/quicksearch.)

MIL–STD–40051–2
Preparation of Digital Technical Information for Page–Based Technical Manuals. (Available at http://assist.daps.dla.mil/quicksearch.)

IEEE/EIA 12207
Standard for Information Technology–Software Life Cycle Processes. (IEEE guidelines may be obtained, free of charge to DOD organizations, from the Defense Automation and Production Service (DAPS). To request documents, prepare the request on organization letterhead and send it by FAX to (215) 697–1462 or mail to DAPS, 700 Robbins Avenue, Building 4, Philadelphia, PA 19111–5094.)

42 USC Chapter 116
Emergency Planning and Community Right-to-Know. (Available at http://www.gpoaccess.gov/uscode.)

Section III
Prescribed Forms
This section contains no entries.

Section IV
Referenced Forms

DD Form 250
Materiel Inspection and Receiving Report. (Available at http://www.dtic.mil/whs/directives/infomgt/forms/formsprogram.htm.)

DD Form 1423
Contract Data Requirements List. (Available at http://www.dtic.mil/whs/directives/infomgt/forms/formsprogram.htm.)

Appendix B
Supportability Metrics for ILS Elements

B–1. Supportability metrics
Tables B–1 through B–10 provide a list of various supportability metrics for each element of ILS. The metrics given here are not mandatory but serve as examples of the types of metrics available for use. Supportability metrics must be tailored for each individual acquisition program. There are other metrics not included in these tables. Paragraph B–2 provides definitions for each of the supportability metrics listed. Column 1, Supportability metric title' contains the name of the ILS or supportability metric.

a. Column 2, Evaluation phase, identifies the phase during which adequate data should be available and analysis/evaluation is conducted to determine if the supportability goals, set at program inception, have been or will be achieved. It is Army policy to address supportability throughout the development, acquisition, production, fielding, and operation phase of the system.

b. Column 3, Source document, provides likely places where the supportability requirement has been or will be documented. The requirements may be recorded in other documents.

c. Column 4 , Data source, indicates the best data sources for deriving the actual values of the supportability-related parameters being measured.

Table B–1.
Supportability metrics for maintenance planning

Supportability metric title	Evaluation phase	Source document	Data source
Mean time to repair	SDD	CDD/specification	LMI/LD/LIDB
Mean restoral time	SDD	CDD/specification	LMI/LD/LIDB
Maintenance ratio	SDD	CDD/specification	LMI/LD/LIDB
Max time to repair	SDD	CDD/specification	LMI/LD/LIDB
Repair cycle time	SDD	CDD/specification	LMI/History/APB
O&S cost/operating hour	SDD	AS/specification	LMI/LIDB
Maintenance task elimination	SDD	SS/specification	LMI
Maintenance downtime	PDOS	SS/specification	LIDB
Customer wait time—not mission capable–maintenance	PDOS	PM	LIDB
Repairs requiring evacuation	SDD	SS/specification	LMI/T&E/LIDB
Percent organic support	PDOS	SS/specification	LIDB
Maintenance test flight hours	PDOS	PM	LIDB

Table B–2.
Supportability metrics for manpower and personnel

Supportability metric title	Evaluation phase	Source document	Data source
Crew size	SDD	ICD/CDD/CPD	LMI/T&E/LIDB
Maintainer cost/operating hr	SDD	AS/Spec	LMI/T&E/LIDB
Skill level limit	SDD	CDD/SS/specification	LMI/T&E
Maintenance hours by MOS	SDD	CDD/specification	LMI/LIDB
Annual maintenance man-hours	PDOS	CDD/specification	LMI/LIDB
Personnel cost/O&S cost	SDD	AS/specification	LMI/LIDB
Personnel on-hand/rquired	PDOS	MFP/BOIPFD	LMI/BOIPFD
Personnel required/ authorized	SDD	SS/MFP/BOIPFD	LMI/LIDB
Mechanic utilization	PDOS	SS/PM	LMI/LIDB

Table B–3
Supportability metrics for supply support

Supportability metric title	Evaluation phase	Source document	Data source
Wait time–NMCS	PDOS	PM	LIDB
Parts availability	PDOS	SS/Spec	LMI/LIDB
Backorder rate	PDOS	PM	LIDB
Backorder duration time	PDOS	PM	LIDB
Controlled substitution rate	PDOS	SS/PM	LIDB
Failure FACTOR Accuracy	PDOS	SS/Spec	LMI/T&E/LIDB
Order ship time	PDOS	PM	LIDB
Spares cost to LCC ratio	PDOS	AS/Spec	LMI/LIDB
Unit load–supply	PDOS	CDD/Spec	LMI/T&E/LIDB
Parts standardization	SDD	SS/Spec	LMI
Float utilization rate	SDD	SS/PM	LIDB
Recyclability	SDD	AS/Spec	LMI/LIDB
Percentage part reduction	SDD	SS	LMI

Table B–4.
Supportability metrics for support equipment

Supportability metric title	Evaluation phase	Source document	Data source
On system diagnostics	SDD	CDD/SS/Spec	LMI/LD/LIDB
Unit load–support equip	SDD	CDD/Spec	LMI/T&E/LIDB
Diagnostics effectiveness	SDD	CDD/SS/Spec	T&E/LIDB
Tools effectiveness	SDD	SS/Spec	LMI/LD/LIDB
Support equipment reduction	SDD	CDD/SS/Spec	LMI/T&E/LIDB
Support equipment available	PDOS	SS/Spec/MFP	LMI/T&E/LIDB
ASIOE available	PDOS	SS/Spec/MFP	LMI/T&E/LIDB

Table B–5.
Supportability metrics for technical data

Supportability metric title	Evaluation phase	Source document	Data source
Technical manual quality	PDOS	SS/Spec	LMI/Val-Ver/LD
Percent on-board/embedded TMs	SDD	SS/Spec	T&E/LIDB
TMs effectiveness	SDD	SS/Spec	Validation and verification/LD/field
TMs available	PDOS	SS/Spec/MFP	T&E/LIDB

Table B–6.
Supportability metrics for training and training support

Supportability metric title	Evaluation phase	Source document	Data source
Time to achieve proficiency	SDD	NETP/STP	LMI/T&E/LIDB
Student failure percent	PDOS	STP/Spec	T&E/LIDB
Percent embedded training	SDD	STP/SS/Spec	LMI/T&E
Training costs	SDD	Spec/NETP	LMI/T&E/NET
No.trained/no.required	PDOS	NETP/BOIPFD	LMI/NET/LIDB
Training systems available	PDOS	STP/MFP	LMI/LIDB

Table B–7.
Supportability metrics for computer resources support

Supportability metric title	Evaluation phase	Source document	Data source
Defect or fault density	PDOS	CRLCMP/Spec	LMI/T&E/Field
Software reliability	SDD	CRLCMP	LMI/T&E/Field
Software modification costs	PDOS	CRLCMP	Contractor/LIDB
Computer RESOURCES AVAILABLE	PDOS	CRLCMP	Contractor/LIDB
Minimum PPSS requirements	SDD	CRLCMP/Spec	LMI

Table B–8.
Supportability metrics for facilities

Supportability metric title	Evaluation phase	Source document	Data source
Facilities limitation	SDD	SS/Spec	LMI/LIDB
Facilities funded	SDD	SS/Spec	Budget/Fund Docs
Facilities utilization rate	PDOS	SS/Spec	LIDB

Table B–9.
Packaging, handling, storage, and transportation

Supportability metric title	Evaluation phase	Source document	Data source
Percent damage free deliveries	PDOS	PM/Spec	QDRs
Percent packaging data	PDOS	SS/Spec	LMI/LIDB
Percent reusable container	PDOS	SS/Spec	LMI/LIDB
Minimize weight, cube	SDD	CDD/SS/Spec	LMI/T&E/LIDB
Minimize special storage	SDD	CDD/SS/Spec	LMI/T&E/LIDB
Reduced handling requirements	SDD	CDD/SS/Spec	LMI/T&E/LIDB
Hazardous materials limit	SDD	CDD/SS/Spec	LMI/T&E
Transport—load, unload time	SDD	CDD/Spec	LMI/T&E/LIDB
Min. transportability equipment	SDD	‘CDD/SS/Spec	LMI/T&E/LIDB
MSDDC rating—air transport	SDD	CDD/SS/Spec	LMI/T&E/MSDDC Rpt
MSDDC rating—ocean	SDD	CDD//SS/Spec	LMI/T&E/MSDDC Rpt
MSDDC rating—highway	SDD	CDD//SS/Spec	LMI/T&E/MSDDC Rpt
MSDDC rating rail	SDD	CDD//SS/Spec	LMI/T&E/MSDDC Rpt
MSDDC rating life/tiedown	SDD	CDD//SS/Spec	LMI/T&E/MSDDC Rpt

Table B–10.
Design interface

Supportability metric title	Evaluation phase	Source document	Data source
Reliability	SDD	CDD/Spec	LMI/T&E/LIDB
Mission success	SDD	CDD/Spec	LMI/T&E/LIDB
Operational readiness	SDD	CDD/Spec	LMI/T&E/LIDB
Availability (operational availability (Ao), achieve availability (Aa), inherent availability (Ai)	SDD	SS/Spec	LMI/T&E/LIDB
LORA progress	SDD	SS/Spec	LMI/progress report
LCC cost comparison	SDD	AS/Spec	LMI/history/APB
Extent of interoperability	SDD	ICD/CDD/CPD/Spec	LMI/T&E/field
Quality deficiency report rate	PDOS	PM/warranty	Quality deficiency reports

B–2. Supportability metrics definitions

a. Maintenance planning.

(1) *MTTR.* This is the basic measure of maintainability. It is the total corrective maintenance time (in hours) times divided by the total number of failures within a particular measurement interval under stated conditions. The measurement interval can be units of time, miles, rounds, cycles, or some other measure of life units.

(2) *Mean time to perform scheduled (preventive) maintenance.* This is a measure of the elapsed time when a system is down for schedule maintenance to the time the system is ready for operation. It is measured by the total scheduled maintenance hours divided by number of scheduled maintenance actions.

(3) *MTTR by echelon.* This is a basic measure of maintainability for a weapon system or end item. It is measured by the sum of corrective maintenance hours at a specific level or echelon of repair divided by the number of corrective maintenance actions at the level of repair.

(4) *MAMDT.* This is the average of the actual “wrenchturning” times for all maintenance tasks during a specified period of time (clock hours). The MAMDT is the weighted average of the MTTR and mean time to perform preventive maintenance (MTPM). When the number of corrective maintenance actions (NC) and the number of preventive

maintenance actions (NP) have been determined for a common reference item. It is measured by MAMDT = (MTTR x NC) + (MTPM x NP) NC + NP

(5) *Mean time to restore.* This is a mean of the elapsed times from the occurrence of a system failure or degradation requiring maintenance to the time the system is restored to its operational state. It is derived by dividing the sum of the elapsed times for all maintenance events by the total number of maintenance events. This metric includes more than just direct maintenance time. This top level metric embeds some logistics response times or an indication of the availability of supportability resources such as mechanics, support equipment, and facilities. It is measured by sum of times to restore the system divided by number of restoral events.

(6) *Mean time to restore (with PLL spares).* This is the average amount of time to restore the system when spares are available in the prescribed load list (PLL). To determine mean time to restore (with PLL parts), add military-induced repair delay time to the equipment MTTR. Repair delay time factors include nonavailability of personnel, the noncollocation of spares with equipment, and so on. It is measured by sum of times to restore system to operation when spares are available divided by number of restoral events.

(7) *MR.* This is the cumulative number of direct labor maintenance man-hours expended during a given period of time, divided by the cumulative number of end item operating hours, miles, or rounds during that same time period. The MR is expressed at each maintenance level and summarized for all levels of maintenance. Both corrective and preventive maintenance are included. The MR is a useful measure of the relative maintenance burden associated with a system. It provides a means of comparing systems and is useful in determining the compatibility of a system with the size of the maintenance organization.

(8) *Maximum time to repair.* This is the maximum corrective maintenance downtime within a specified percent (normally 90 or 95 percent), of all possible corrective maintenance actions for an end item..

(9) *Repair cycle time.* This is the elapsed time (days or hours) from the receipt of a failed item at a repair facility until the item is ready for reissue. The average elapsed amount of time from an item failure to the time the item failure is repaired and placed in stock or reissued. To determine repair cycle time, add the retrograde ship time (RST) to the maintenance echelon and the turnaround time (TAT) at the maintenance echelon. RST is the average elapsed time from an item failure to the receipt of the item by the maintenance echelon. TAT is the sum of total repair hours divided by number of repair jobs. Repair cycle time=RST + TAT.

(10) *O&S cost per operating hour.* This is the sum of all costs required to operate and support a system divided by the number of system operating hours. If more applicable, miles, cycles, or rounds can be substituted for hours. This metric may be used to compare the supportability cost rate for a planned system with a predecessor or similar system based on system usage. It may also be used to monitor the supportability cost rate for a given fleet of systems at different points during its operational life. A similar type of metric could be used to calculate maintenance cost per operating hour. The costs considered would be restricted to maintenance-related costs only. This cost would then be divided by the number of system operating hours.

(11) *Maintenance task elimination.* This metric provides an indication of the relative reduction in maintenance burden in terms of quantity of maintenance tasks when compared to the number of tasks required for the baseline comparative system (BCS). The metric is derived by dividing the number of maintenance tasks which are not required for the planned system by the total number of tasks required in the BCS. Goals for maintenance task elimination can be built into requirements and contract documentation. This metric must be used with caution since elimination of many minor tasks may not reduce maintenance burden as much as a single major task. But, generally, less maintenance is considered better.

(12) *Maintenance down time.* This is the total time during which a system/equipment is not in a condition to perform its intended function and includes active maintenance time, logistics delay time and administrative delay time. Logistics delay time LDT refers to that maintenance downtime that is expended as a result of delay waiting for a resource to become available in order to perform active maintenance. A resource may be a spare part, test or maintenance equipment, skilled personnel, facility for repair, and so on. Administrative delay time refers to that portion of maintenance downtime during which maintenance is delayed for reasons of an administrative nature (for example, other personnel duties, organizational constraint, transportation delays, labor strikes, and so on).

(13) *Repairs requiring evacuation.* This is the percentage of repair tasks which cannot be accomplished without system evacuation. This metric would be used to get an indication of the maintenance burden. Evacuation adds time to the repair process and consumes limited manpower and equipment resources.

(14) *Percent organic support.* This is a measure of the proportion of the system support, usually maintenance, that is being provided organically and conversely, the proportion of the support being provided through agreements with contractors. This metric may be used as a means of comparison of the strategy used for supporting the predecessor or a baseline system. The proportion of support being provided organically versus contractor support may also need to be tracked over the life of the system after fielding. One specific means of measurement may be used by dividing the number of work orders organically supported by the total number of work orders.

(15) *Maintenance test flight hours.* One means of determining if maintenance requirements are increasing in a fleet of aircraft is to track the number of test flight hours due to maintenance being flown per aircraft per month. This

number may be used as a means of comparison over a series of previous reporting periods to identify any trends within a fleet of aircraft.

b. Manpower and personnel.

(1) *Crew size.* The number of personnel required to operate a given system and perform all required mission functions. From a cost and supportability view, it is typically better to minimize crew size. This metric is typically used in a requirements or contract document to set an objective and/or threshold crew size required to operate and/or maintain a system. The quantitative goal is typically derived by comparing the crew size requirements for predecessor or similar systems.

(2) *Maintainer cost per operating hour.* This is used to obtain an indication of the cost of maintenance personnel for a given system. The total cost of maintainer personnel divided by the total number of operating hours. This metric may be used to compare the labor cost maintainers for a planned system with a predecessor or similar system. It may also be used to monitor the maintenance labor cost for a given system at different points during its operational life to identify any changes or revise budget requirements.

(3) *Skill level limit.* This is a measure of the level of expertise required for system operators to competently operate the system or for maintainers to competently repair or service the system. This metric is typically used in a requirements or contract document to set an objective and/or threshold reduction in the skills required to operate and/or maintain a system. The quantitative goal is typically derived by comparing skill level requirements for predecessor or similar systems.

(4) *Maintenance manhour requirements for each MOS.* This is the number of man-hours required to support the system for a given MOS. This metric gives an indication of the maintenance workload for a system by MOS. It would typically be used to compare the support of a planned system with that of a predecessor or baseline system.

(5) *Direct annual maintenance manhours.* This is the sum of the working time of each skill specialty code required for the performance of a unit of work on the system accumulated for a period of 1 year.

(6) *Mean maintenance manhours per operating hour.* This metric is derived by dividing the number of maintenance manhours required to keep a system operational by the number of operating hours of that system. This metric provides an indication of the maintenance burden of a system. It would typically be used to compare the maintenance burdens of similar systems or to track the maintenance burden of a given type of system over time.

(7) *Ratio of personnel cost to O&S cost.* This is an estimate of total cost for personnel (pay, benefits, and overhead) to operate and support the system divided by the total estimated operating and support costs of the system. The metric can be used to compare the relative cost of personnel between planned and current systems. It can also be used to identify changes in the relative cost of personnel for a given system at different points in its life cycle.

(8) *Number of personnel on hand versus number personnel.* This is the number of personnel of a given MOS on hand divided by the number of personnel of that MOS type required at the site of fielding to operate or support the system. This metric provides an indication of how well the system will be supported. Requirements for the same MOS horizontally across several different types of weapons systems/end items in the same unit must often be considered.

(9) *Number of personnel required versus authorized.* This is a comparison of personnel required to operate and support a materiel system to the number of personnel authorized for that system. This metric provides an indication of the capability of the system to be properly operated and supported.

(10) *Mechanic utilization.* This is a measure of the workload for a specified maintainer or group of maintainers. This metric can be derived by dividing actual hours worked by the total hours which the mechanic was available for work. This metric can be used to monitor changes in the utilization rates of maintenance personnel over time or as means of comparison with predecessor systems.

c. Supply support.

(1) *Customer wait time—not mission capable supply.* The time (days or hours) the system is inoperable due to delays in maintenance that are attributable to delays in obtaining parts.

(2) *Parts availability.*

(a) High-priority fill rate is a measure of the effectiveness of supply support. This metric can be calculated by dividing the number of high-priority requisitions filled (priority 01–04 based on Force Activity Designator) within a specified time limit by the total number of high-priority requisitions submitted. Any high-priority requisition must be met within the specified time limit to be considered a fill. This metric should concentrate on critical item stock availability (that is, maintenance and readiness drivers).

(b) Stock availability is a measure of the percentage of time that demands are satisfied from items in stock. The metric can be calculated by dividing the number of incidents when parts sought from the stock point were on hand by the number of total incidents when parts were requested from the stock point. This metric is similar to the old percent stock availability where 85 percent of all NSN items were required to be on hand.

(c) ASL percent fill is the percentage of time that demands are satisfied on the first pass from items on hand within the authorized stockage list (ASL) stocks. Divide demands successfully filled from the ASL by total ASL demands and multiply by 100. Or the percentage of parts in stock at the ASL location versus the required stockage level. Example: ASL = 10 main rotor blades ASL actual stock on hand = 9 ASL percentage fill 9/10 = .9 = 90 percent.

(d) Backorder rate is a measure of effectiveness of supply support. The number of repair parts or spares for a given

system/end item which are not in stock at the time they are requisitioned divided by the total demands for parts. This metric may be calculated by dividing the number of workorders awaiting parts by the total number of workorders which required parts. Backorders cause delays in maintenance.

(e) Backorder duration time is the average amount of time elapsed between a requisition placed for a spare not in stock to receipt of the spare part to fill the order. The backorder duration time accounts for the time to receive a procurement previously ordered, and the administrative and production lead times are contributing factors to this wait time.

(f) Controlled substitution rate is an additional means of identifying possible problems in supply is by tracking the total number of controlled substitutions per month for a fleet of vehicles. This number may be used as a means of comparison over a series of previous reporting periods to identify any trends in supply within a fleet of systems.

(g) Provisioning master record (PMR) failure factor accuracy is the number of changed failure factors during the two year period after (PMR) load compared to total number of PMR failure factors. This metric measures the accuracy of part usage predictions based upon failure factor data incorporated during the initial PMR build. The number of updates or changes of a given magnitude to PMR failures factors reflect the degree of accuracy of the provisioning process regarding determining the range and quantity of required spare and repair parts. This metric may be used as an incentive for a contractor to create an accurate PMR.

(h) Order/ship time is the time elapsed between the initiation of stock replenishment action for a specific activity and the receipt by the activity of the materiel. OST is applicable only to materiel within the supply system and is composed of the distinct elements, order time, and shipping time. It includes many segments such as order processing, shipping from depot to the consolidation point, consolidation point to the port of debarkation, intransit, arrival at destination port, distribution to a supply point, and finally delivery to the requiring unit.

(i) Spares cost to LCC ratio is the total estimated cost of spares and repair parts divided by the total estimated life-cycle cost for the system. This metric may be used to compare the supply support cost for a planned system with a predecessor or similar system. It may also be used to monitor the supply support cost for a given system at different points during its operational life to identify any changes or potential problems. A high proportion of spares costs may signal the need for reengineering or change to the support concept.

(j) Unit load-supply is the total weight, cube, or quantity of repair parts and spares required to support the system in a given type unit. This metric may be used to compare the supply support burden on a unit of a planned system with a predecessor or similar system in terms of extra materiel which a unit must manage, upload, and haul. It may also be used to monitor the supply support burden on a unit of a given system at different points during its operational life to identify any changes.

(k) Parts standardization is a measure of how well standardization criteria for use of standard parts/components have been met. One way of calculating this metric is to divide the number of standard new national stock numbers (NSNs) by the total number NSNs for the for the system. Compare the percent of new lines to the historical average minus an improvement factor (such as 5 percent) as a standard for judging improvement/accomplishment. The percent of new parts is equal to the number of new parts divided by total parts multipled by 100. Another way of calculating this metric is to divide the number of standard NSNs by the total number NSNs for the system.

(l) Float utilization rate is a means of optimizing the number of systems reserved as floats by tracking the percentage of time the float systems are on loan to customer units. The utilization ratio can be calculated by dividing calendar time during which the float items are on loan by the total amount of calendar time during which the float items are available. A low ratio may reveal that less float items are required. A high ratio may indicate the need for more float items.

(m) Recyclability may be used as a means of determining how well environmental design goals are being met. PMs are being encouraged to set recycling goals for their acquisition systems. Recycling helps reduce disposal problems for systems and components. Recyclability can be quantified by simply counting the number of parts or components which can be recycled. This number can be compared to the number of recyclable parts in similar or predecessor systems. If it is necessary to take into account the difference in total number of parts for the compared systems, then the percentage of recyclable parts can be used.

(n) Percentage parts reduction metric may be used as a means of determining if goals have been achieved reducing in the number of different part numbers applied to a given system. It is derived by comparing the number of part numbers required for supporting the system against the number of part numbers required to support a similar or predecessor system. This metric may also be evaluated by comparing the number of system part numbers with a specific threshold or a goal which represents a specific percentage reduction from the total parts count on a predecessor system.

d. Support equipment.

(1) *On-system diagnostics/prognostics.*

(a) Built-in test detectability level percentage. A built-in test consists of an integral capability of the mission equipment that provides an onboard automated test capability to detect, diagnose, or isolate system failures. The fault detection/isolation capability is used for momentary or continuous monitoring of a system’s operational health, and for observation/diagnosis as a prelude to maintenance action. Built-test subsystems may be designed as an analysis tool for

the overall system, integrated with several subsystems, or may be designed as an integral part of each removable component. Detectability level is the probability that the malfunction or failure of the UUT will be detected by built-in test.

(b) Percent built-in test fault detection. This is a measure of the percentage of total system fault diagnostic capability performed via built-in test equipment/software embedded within the system itself. Such diagnostic capability is typically computer-based and is often incorporated within the system along with other system software. This metric can be used to set threshold and objective goals for the percentage of imbedded diagnostics which should be incorporated into the system. A requirement may also be established for an increase in imbedded diagnostics over that contained within a similar or predecessor system. It is important to specify the level of ambiguity or the level of detail to which the BIT must diagnose faults.

(c) Percent prognostic aids. This is a measure of the percentage of total system prognostic capability which is performed via equipment/software embedded within the system itself. Such prognostic capability is typically computer-based and is often incorporated within the system along with other system software. This metric can be used to set threshold and objective goals for the percentage of imbedded prognostics which should be incorporated into the system. A requirement may also be established for an increase in embedded prognostics over that contained within a similar or predecessor system.

(2) *Unit load-support equipment.* This is the total cube or weight of support equipment required to maintain the system in a given type unit. This metric may be used to compare the maintenance burden on a unit of a planned system with a predecessor or similar system in terms of extra materiel which the unit must deal with. It may also be used to monitor the maintenance burden on a unit of a given system at different points during its operational life to identify any changes.

(3) *Fault diagnostic effectiveness.* Test accuracy ratio is a measure of the accuracy of TMDE calculated by dividing the number of system faults accurately diagnosed by the system TMDE by the total number of system faults tested by the TMDE. This metric is typically used in a requirements or contract document to set an objective and/or threshold level of performance for accurate fault diagnosis/isolation. The diagnostic performance is usually verified during development, operational, production verification, and follow-on T&E. It may be used as a means of comparison with a predecessor or baseline system.

(4) *No evidence of failure rate (NEOF).*

(a) The NEOF rate is a measure of the effectiveness of fault diagnostics and fault isolation. The number of components which were falsely diagnosed as faulty divided by the total number of components diagnosed. Another way of measuring this metric would be to divide the number false removal by the total number of removals. Excessive rates of NEOF cause unnecessary delays in maintenance and extraordinarily high demands for spares and repair parts. High NEOF can be a symptom of such shortcomings as poorly designed support equipment or ineffective training.

(b) This metric is typically used in a requirements or contract document to set an objective and/or threshold level of performance for accurate fault diagnosis/isolation. It may be used as a means of comparison with a predecessor or baseline system. It can also be used to identify changes in the NEOF rate for a given system at different points in its life cycle. Percent NEOF=number of NEOF items divided by the total number of items tested multiplied by 100. A comparison could be accomplished using the average number of NEOFs added for a large, medium, and small systems and could serve as an indicator of the adequacy of engineering and maintenance planning. Compare the percent of NEOFs to the historical average minus an improvement factor (that is, 5 percent) as a standard for judging adequacy of engineering and maintenance procedure designs.

(5) *Fraction of faults isolatable.* This is a measure of the fault isolation coverage of TMDE calculated by dividing the total number of system faults that can be consistently isolated by the system TMDE by the total number of system faults testable by that TMDE. This metric can be used in a requirements or contract document to set an objective and/ or threshold level of testability with regard to fault isolation. During system development, the isolation capability can be verified developmental T&E, operational T&E, and the logistics demonstration.

(6) *Tools effectiveness.* This is the total number of tasks performed successfully using the specified tools divided by the total number of tasks performed. This metric provides an indication of how well the tools contribute to the optimization of the maintenance task by reducing time and effort to accomplish the task. This metric can be used in a requirements or contract document to set an objective and/or threshold level of effectiveness for tools. Typically, the requirement should always be 100 percent effectiveness. It may be used as a means of comparison with a predecessor or baseline system. It can also be used to identify changes in the tools effectiveness for a given system at different points in its life cycle.

(7) *Reduce support equipment burden.* To minimize special tools and TMDE, this is an objective and threshold percentage or specified reduction in the number of different types of special tools and support equipment required to support an acquisition end item may be incorporated into requirements documents and contracts. This metric can be used to set a goal for special tools and TMDE required to support a materiel system. Some project managers have set a requirement for no special tools or test equipment. The quantitative goal can be derived by using the number of different types of special tools and TMDE requirements for predecessor or similar systems as a baseline.

(8) *Support equipment reduction.* The number of items eliminated during a given life cycle phase divided by the

total number of items at the start of the life-cycle phase. The support equipment recommendation data list may be used as the source document to collect the data for this metric. Support equipment can be reduced in terms of number of different types of support equipment and in terms of the ratio of number of a given item of support equipment required per end item supported.

(9) *Tools and TMDE available.* This is the total number of items of TMDE required compared to the total number of items of TMDE available. This metric would typically be used to set goals or requirements for percentage of range of quantity of TMDE available at the time of system fielding.

(10) *ASIOE available.* The total number of ASIOE required compared to the total number of ASIOE available. This metric would typically be used to set goals or requirements for percentage of range of quantity of ASIOE available at the time of system fielding.

e. Technical data.

(1) *Technical data accuracy.* TM quality an indicator of the quality of TMs and equipment publications can be obtained by comparing the number of change pages required to correct errors with the total number of TMs pages or the total number of change pages for all reasons. For electronic TMs it is necessary to track individual changes instead of change pages. Given the fluid nature of equipment publications, this metric may be difficult and noncost effective to track.

(2) *TMs quality (DA Form 2028s).* This is an indicator of the quality of TMs and equipment derived by tracking the quantity of DA Form 2028s submitted from the field used to correct errors in the TMs. As a practical matter, the users may not send in 2028s.

(3) *Documentation rewrite.* This is a measure of the quality of the TMs and equipment publications derived by tracking the number of hours spent rewriting documentation to correct errors as a percentage of original document preparation time. A high rate of rewrite would indicate poor quality.

(4) *Percentage of TMs onboard or embedded.* This is a measure of the percentage of the TMs and equipment publications which are available within the system itself. Such technical documentation is typically computer-based and may be incorporated within the system along with other system software. This metric can be used to set threshold and objective goals for the percentage of on-board or embedded technical documentation that should be incorporated into the system. A requirement may also be established for an increase in on-board or embedded technical documentation over that contained within a similar or predecessor system. The advantage of onboard and embedded technical documentation is that it is available to the user upon demand.

(5) *TMs effectiveness.*

(a) TMs effectiveness rate. This is the total number of tasks performed successfully using the specified TMs divided by the total number of tasks performed. This metric provides an indication of how well the TMs contribute to the optimization of the maintenance task by reducing time and effort to accomplish the task. This metric can be used in a requirements or contract document to set an objective and/or threshold level of effectiveness for TMs. Typically, the requirement should always be 100% effectiveness. It may be used as a means of comparison with a predecessor or baseline system. It can also be used to identify changes in the TMs effectiveness for a given system at different points in its life cycle.

(b) NEOF rate. The NEOF metric used for measuring the effectiveness of fault diagnostics and fault isolation with regard to support equipment can also be used as an indicator of problems with the equipment publications. High NEOF can be a symptom of such shortcomings as ineffective TMs, poorly designed support equipment, and ineffective training. This metric is further described under the support equipment ILS element.

(6) *Availability of technical data.*

(a) The total number of TMs available compared to the total number of TMs required. This metric would typically be used to set goals or requirements for percentage of range of quantity of TMs available at the time of system fielding.

(b) The total number of TMs produced versus the total number of TMs required. This metric would typically be used to set goals or requirements for percentage of range of quantity of TMs actually published and distributed at the time of system fielding.

f. Training and training support.

(1) *Time to achieve proficiency.* This is the average time required for operator and/or support personnel to become proficient in effectively, efficiently, and correctly performing the required tasks associated with operation or maintenance of the system. This metric would typically be used to compare the time to train operators and maintainers to perform tasks on a new system with the time required on a predecessor or baseline system. Care must be taken in using this metric. The goal is to provide effective training in all required tasks in the least amount of time.

(2) *Student failure rate or student pass rate.* This is the percentage of students who are not able to achieve or, conversely, who do achieve the training objectives after completion of the training course. This metric provides an indication of the effectiveness of the training in helping the target audience to learn the training objectives. This metric would typically be used to set threshold and objective goals for failure or pass rates. The content and length of programs of instruction should be determined based on the training required to prepare soldiers to successfully perform their MOS-related tasks with minimal on-the-job training in the field.

(3) *Percentage embedded training.* This is a measure of the percentage of total operator and/or support personnel training available within the system itself. Such training is typically computer-based and is simply incorporated within the system along with other system software. This metric can be used to set threshold and objective goals for the percentage of imbedded training which should be incorporated into the system. A requirement may also be established for an increase in imbedded training over that contained within a similar or predecessor system. The advantage of imbedded training is that it allows frequent review and is available to the user upon demand.

(4) *Ratio of training costs to LCC costs.* This is a simple measure of the relative cost of training to the total system life-cycle cost. The total training costs divided by the total life-cycle costs. This metric may be used to compare the relative cost of training between planned and current systems. It can also be used to identify changes in the relative cost of training for a given system at different points in its life cycle.

(5) *Number of personnel trained versus number required.* This provides a measure of the amount of training which has been accomplished for a given MOSs at the site where the system is being fielding currently. Calculate using number of trained personnel of a given MOS divided by the total number of personnel of that type MOS at the site of fielding.

(6) *Training systems available.* This is the number of training systems available at a given training facility versus the number of training systems required. This metric would provide an indication of how well training requirements can be met.

g. Computer resources support.

(1) *Defect density.* This is a measure of the number of errors found in newly developed software. The defect or fault density is derived by dividing the number of software faults which are identified by the number of lines of code in the software program. A specific defect density goal may be included in the software specification to provide a quantitative measure by which to determine whether the government will accept delivery of the software.

(2) *Software reliability.*

(a) The software mean time to defect is a basic measure related to the reliability of software. The total functional life (time, rounds, hours, cycles, events, and so on) of a population or fleet of end items is divided by the total number of software failures within the population during the measurement interval given the end items are operated within normal mission profiles and under specified operating conditions and environments.

(b) The software modification rate is a measure of the quality of the software development effort. The rate is derived by counting the frequency of system software modification over a specified interval of time. This metric may have some value when compared to a predecessor or baseline system. Caution must be used in using this metric. Software enhancements must be differentiated from software fixes and those driven by hardware modifications, and so on.

(3) *Ratio of software modification costs to LCC cost.* This is a simple measure of the relative cost of software modifications compared to the total system life cycle cost. The total software modification costs divided by the total life cycle costs. This metric may be used to compare the relative cost of software modification between planned and current systems. It can also be used to identify changes in the relative cost of software modification for a given system at different points in its life cycle. Caution must be used in using this metric. Software enhancements must be differentiated from software fixes.

(4) *Computer resources available.* This is the total range and quantity of computer resources (hardware, software, firmware, documentation, support items) available versus the total range and number of computer resources required. This metric would typically be used to set goals or requirements for percentage of range of quantity of computer resources available at the time of system fielding.

(5) *Minimization of PPSS requirements.* This is an objective and threshold percentage or specified reduction in the number of different types of support equipment, software, and firmware required to support the software of an acquisition end item after fielding. This metric may be incorporated into requirements documents and contracts. This metric can be used to set a goal for the PPSS burden required to support the software of a materiel system. The quantitative goal can be derived by using the support requirements for predecessor or similar systems as a baseline.

h. Facilities.

(1) *Facilities limitation.* This is an objective and threshold percentage or specified reduction in facilities requirements may be incorporated into requirements documents and contracts. This metric is typically used in a requirements or contract document to set a goal for facilities required to support the system. Some project managers have set a requirement for no new facilities. The quantitative goal is typically derived by analyzing the facilities requirements for predecessor or similar systems.

(2) *Facilities funded.* This is a metric used to determine if sufficient funding is programmed to support facility addition/upgrade. It is necessary to compare programmed funding to estimated funding requirements on a fiscal year basis. The formula is expressed as MCA programmed funding divided by facilities funding requirements.

(3) *Facilities utilization rate.* This is a measure of the workload for a specific type of facility. This metric can be derived by dividing actual capacity of the facility used by the total capacity available during a given time period. This metric can be used to monitor changes in the utilization rates of facilities over time or as means of comparing facilities utilization rates with that of predecessor systems. The type of units to be used for capacity will depend upon the type

of facility being tracked. For a storage facility, square feet may be the best measure of capacity. A maintenance facility may require capacity to be measured in terms of the number of hours a day during which the maintenance bays are filled with systems under repair. A more production-oriented facility may have capacity measured in units output per unit of time.

i. Packaging, handling, storage, and transportation.

(1) *Percentage of packaging data.* This is a measure of the percentage of repair parts (that will be used to support the end item in a forward deployed scenario) which have the packaging engineering data developed. It is the relationship between the number of repair parts provisioned to the number of repair parts with military packaging data. The quantitative goal is 100 percent.

(2) *Percentage long-life reusable container (LLRC).* This is a direct measure of the impact of the packaging methodology on the soldier. The higher the percentage, the less packaging training and equipment required by the soldier. It is the relationship between the number of repair parts that require evacuation for overhaul to the number of these parts provided with a LLRC. A high number is also a direct indicator of a lower life cycle cost for packaging and a lower environmental impact. The quantitative goal is 100 percent.

(3) *Reduced weight and cube.* An objective and threshold percentage or specified reduction in system weight and cube as well as the weight and cube of the system support package may be incorporated into requirements documents and contracts. This metric (or set of metrics) may be used to set a requirement for minimizing the transport burden of the system. The actual quantitative requirements are derived by analyzing the weight and cube of predecessor or baseline systems.

(4) *Reduced special storage requirements.* An objective and threshold percentage or specified reduction in special storage requirements may be incorporated into requirements documents and contracts. This metric is typically used to set a requirement or goal for conditions under which the system can be efficiently and effectively stored. Some project managers have set a requirement for no special storage requirements. The goal is typically derived by analyzing the special storage requirements for predecessor or baseline systems.

(5) *Reduced handling requirements.* Minimize preparation for shipment. An objective or specified reduction in time (manhours and total elapsed time) is required to prepare a materiel system for shipment. The quantitative goal is typically derived by analyzing the time required for preparation for shipment for predecessor or similar systems.

(6) *No special handling.* An objective and threshold percentage or specified reduction in special handling requirements may be incorporated into requirements documents and contracts. This metric is typically used to set a requirement or goal for the ease of handling for the system when being prepared for shipment. Some project managers have set a requirement for no special handling requirements. The goal is typically derived by analyzing the special handling requirements for predecessor or baseline systems.

(7) *Hazardous material limits.* Objective and threshold percentages set to represent reduction in types and/or quantity of hazardous materials associated with the operation, sustainment, or disposal of an acquisition system. The baseline may be a predecessor system. Total elimination of hazardous materials may be the goal.

(8) *Transportability.*

(a) Time to load/unload from transport vehicle. . A metric compares the load and unload times for a proposed system to the load and unload times of a predecessor or baseline system.

(b) Time to configure system for transport. A requirement of a time limit (such as one hour) within which the system must be able to be configured for transport by a given mode of transport (for example, air, ocean, or rail).

(9) *Minimize transportability equipment.* An objective and threshold percentage or specified reduction in transportability peculiar equipment required to prepare a materiel system for shipment. The quantitative goal is typically derived by analyzing the transportability peculiar equipment requirements for predecessor or similar systems.

(10) *MSDDC rating.*

(a) Transportability quantifiers are numerical determinations of the relative transportability of systems, based on predetermined values. These quantifiers measure the transportability of one system versus another to give a better idea to decision makers just how good or how poor is the transportability of various systems. The quantifiers are based upon a rating of 0 to 100 percent transportable for each of the methods of transport: fixed-wing air, rotary-wing air, ocean, logistics-over-the-shore, highway, and rail, as well as lifting and tiedown provisions.

(b) Tables B–11 through B–18 provide information on transport system ratings. Each of the methods has predetermined values based upon varying levels of transportability within each of the methods. These levels are based upon numbers of restrictions the item would face during transport as well as the number of transportation assets available to transport the item. The fewer the restrictions and the greater the number of available transportation assets, the higher the score.

(c) Transportability quantifiers only measure the ability of a single item to move through the Defense Transportation System. They do not measure the impact that an item will have on the deployability of the force. It is possible that an item can be as transportable as another item, yet have a completely different impact on the deployability of the force. Therefore, transportability quantifier values must not be used in a vacuum. They need to be used in conjunction with a deployability analysis.

Table B–11
Ratings for fixed-winged air transport

Item	Total number of aircraft	Rating
C–130 airdrop	366	100%
C–130 transport*	366	90%*
C–17 airdrop	102	36%
C–17 transport*	102	32%*
C–5 airdrop*	104	18%
C–5 transport*	104	16%
Not air transportable	0	0%

Note: *Subtract 10% if crew prep time is greater than 15 minutes for C–130 or 60 minuntes for C–17 and C–5; subtract 10% of value if equipment is required for loading or vehicle preparation; subtract 10% of value if approach or sleeper shoring is required.

Table B–12
Ratings for rotary-winged external air transport

Item	Total number aircraft	Rating
UH–60L: High-hot (6,630 lb. lift)	780	100%
UH–60L: 2k ft. AGL–70 (9K lb. lift)	780	74%
CH–47D: High-hot (16,644 lb. lift)	400	34%
CH–47D: 2k ft. AGL–70 F (23,396 lb. lift)	400	24%
No helicopter external lift	0	0%

Table B–13
Ratings for ocean transport

Item	Total number of aircraft	Rating
Container Ships	2	100%*
Breakbulk/Combination Ships	17	96%*
Roll-on/Roll-off Ships	38	67%*
Not Ocean Transportable	0	0%

Note: *Subtract 10% of value if length exceeds 432 inches; subtract 10% of value if width exceeds 180 inches; subtract 10% of value if height exceeds 132 inches; subtract 10% of value if weight exceeds 50 tons; subtract 10% of value if item can not negotiate a 15-degree ramp.

Table B–14
Ratings for logistics-over-the-shore transport

Item	Total number of aircraft	Rating
LCM–8	52	100%
LCU–1646	9	56%
LCU–2000	38	39%
LSV	8	7%
Not LOTS transportable	0	0%

Table B–15
Ratings for highway transport

Item	Total number of aircraft	Rating
M172 Series*	1,500	100%
M871 Series*	8,200	93%
M872 Series*	8,500	58%
M870 Series*	2,400	21%
M1000 Series*	2,300	10%
Not highway transportable	0	0%

Note: *Use only the highest applicable subtraction from the following four categories: Subtract 10% of value if permits required in NATO countries; subtract 20% of value if CONUS length or width permits are required; subtract 50% of value if CONUS height or weight permits are required; subtract 90% of value if certification as essential to national defense is required.

Table B–16
Ratings for self-deployable vehicles

Item	Rating
No highway permits required at gross vehicle weight, CONUS, or NATO	100%
No highway permits at gross vehicle weight in CONUS, permits for NATO	90%
CONUS length or width permits required	80%
CONUS height or weight permits required	50%
Certification as essential to national defense required	10%
Not highway transportable	0%

Table B–17
Ratings for rail transport

Item	Rating
Fits within Gabarit International de Chargement envelope*	100%
Fits within envelope B	85%
Fits within Association of American Railroads diagram	75%
Fits within DOD diagram	35%
Fits within width of DOD diagram and double stack	10%
Not highway transportable	0%

Note: *For GIC only, subtract 10% of value if length exceeds 492 inches; subtract 10% of value if width exceeds 101 inches; subtract 10% of value if weight exceeds 22 tons.

Table B–18
Ratings for lifting and tiedown provisions

Item	Rating
Lifting provisions meet MIL–STD–209 strength requirements plus	35%*
Lifting provisions meet MIL–STD–209 dimensional and location requirements plus	15%*
Tiedown provisions meet MIL–STD–209 strength requirements plus	35%*
Tiedown provisions meet MIL–STD–209 dimensional and locations requirements	15%*
Total value	100%

Table B–18
Ratings for lifting and tiedown provisions—Continued

Note: *Subtract 20% of total lifting values if common, lateral spreader bars are required; subtract 50% of total lifting values if special spreader bars are required; subtract 10% of total lifting values if special slings are required; subtract 10% of total lifting/tiedown values if provisions are removable; subtract 10% of total tiedown values if more than 4 tiedown provisions required; subtract 50% of total lifting/tiedown values if item is a cargo carrier and tiedown provisions do not meet the size, number, or strength requirements of MIL–STD–209.

j. Design interface.

(1) *Reliability measures.*

(a) Mission reliability is the probability that a system will perform mission-essential functions for a period of time under the conditions stated in the mission profile. Measures of mission reliability include only those incidents affecting mission accomplishment.

(b) Logistics reliability is the probability that no corrective maintenance or unscheduled supply demand will occur following the completion of a specified mission profile.

(c) MTBF is a basic measure of reliability for systems and end items. The total functional life (time, rounds, hours, cycles, events, and so on) of a population or fleet of end items divided by the total number of failures within the population during the measurement interval. Typically there is a requirement for the end items to be operated within normal mission profiles and under specified operating conditions and environments.

(d) Mean time between critical failure is a basic measure of reliability which provides an indication of the probability that the system will perform essential mission functions. The total functional life (time, rounds, hours, cycles, events, and so on) is a population or fleet of end items divided by the total number of critical failures within the population during the measurement interval. Typically there is a requirement for the end items to be operated within normal mission profiles and under specified operating conditions and environments.

(e) Mean time between maintenance actions (MTBMA) is the mean of a distribution of the time intervals between actions or groups of actions required to restore an item to, or maintain it in, a specified condition. This entry will be composed of the MTBF, mean time between maintenance (MTBM) induced, MTBM no defect, and mean time between preventive maintenance (MTBPM) values. MTBMA may be calculated by the following formula: MTBMA = MTBF + MTBM induced + MTBM no defect + MTBPM.

(f) Mean time between removal is a measure of the system reliability parameter related to demand for logistics support. The total number of operational units (for example, miles, rounds, hours) divided by the total number of items removed from that system during a stated period of time. This term is defined to exclude removals performed to facilitate other maintenance and removals for product improvement. Note: For a particular task to be applicable, it must meet ALL the following criteria:

1. It must be either a "remove" or a "remove and replace" task.

2. It must be categorized as either an "emergency" or an "unscheduled" task.

3. The task must be performed by "operator/crew/unit-crew" or "organizational/on equipment/unit-organizational" or by a maintenance contact team.

4. The task can not be performed to facilitate other maintenance or for product improvement.

(g) MTBPM is the mean of the distribution of intervals, measured in hours, rounds, and so on, between preventive maintenance actions. This is one of the four categories of maintenance events contributing to the mean time between maintenance actions value.

(2) *Mean time between mission failure.* Mean time between mission abort is the mean of the distribution of intervals, measured in hours, rounds, and so on, between events that render a system incapable of performing its mission. The emphasis for this metric is on system failures which directly impact the mission functions rather than non-mission critical failures or preventive maintenance actions.

(3) *Mean calendar time between mission failure.* This is the mean of the distribution of calendar hours between events causing a system to be less capable in performing its mission. The emphasis of this metric is on system failures that cause aborts or directly reduces mission effectiveness. In addition to mission aborts, this measure accounts for the loss of interoperability or loss of equipment use that improves the system capability to perform a mission without causing a mission abort.

(4) *Failure free operating period.* This is defined as a period of time (or appropriate unit of operation) during which no failures, resulting in a loss of system functionality occur. It is a measure of reliability which can offer the user an increase in system effectiveness and enhanced operational availability above that reflected in the traditional MTBF. The emphasis for this metric is on reducing the probability of system failures which directly impact the mission functions.

(5) *Mission completion success probability.* This is the probability that an end item will perform all essential mission functions and complete its mission successfully. This probability can be derived by dividing the number of missions successfully completed by the total number of missions attempted by the population of end items.

(6) *Combat rate.* This is the average number of consecutive scheduled missions completed before an end item

experiences critical failures. Number of successful missions = Number of scheduled missions divided by number of aborts

(7) *Operational readiness.* This is measure of a system's ability to perform all of its combat missions without endangering the lives of crew or operators. The metric is best used when comparing the readiness rates of a new system to rates of the predecessor (baseline) system.

(8) *Availability.*

(a) Ao is the probability that, when used under stated conditions, a system will operate satisfactorily at anytime. This differs from achieved availability in that Ao includes standby, administrative, and logistics delay times.

(b) Aa is the probability that when used under stated conditions in an ideal support environment, a system will operate satisfactorily at any time. This differs from Inherent Availability only in its inclusion of consideration for preventive action. Aa excludes supply downtime and administrative downtime. Aa may be expressed by the following formula: Aa = MTBM divided by MTBM + M where MTBM = (1/MTBF + 1/MTBM–ND + 1/MTBPM) -1.

1. M= Summation of the event tasks (ETi) multiplied by task frequency (TFi) for N tasks divided by the summation of TFi for N tasks.

2. M = Mean active maintenance downtime (both corrective and preventive actions).

3. ETi = Elapsed time for task i.

4. TFi = Task frequency for task i.

5. N = Total number of tasks performed.

6. Note: The measurement bases for MTBF, MTBM no defect, and MTBPM must be consistent when calculating the MTBM parameter.

(c) Ai is the probability that when used under stated conditions in an ideal support environment without consideration for preventive action, a system will operate satisfactorily at any time. The "ideal support environment" referred to exists when the stipulated tools, parts, skilled manpower, manuals, SE and other support items required are available. Ai excludes whatever ready time, preventive maintenance downtime, supply downtime, and administrative downtime may be required. Ai may be expressed by the following formula: Ai = MTBF divided by MTBF+MTTR.

(d) Training system availability is a measure of the reliability and maintainability of the training system(s) associated with a given acquisition system. This metric is a measure of how many mission hours that a training system is available. Trainer Availability = mission available time divided by (mission available time) + (mission non-available time)

(9) *LORA progress.* This is a measure of the rate of progress toward completion of all the LORA computer runs required for determining optimum allocation of repair candidate components and maintenance policies.

(10) *LCC comparison.* LCC differential is a measure of the LCC of a system compared with the LCC of its predecessor or baseline system. This metric is the projected LCC of the new system divided by the LCC of the current system or baseline system. Goals can be established for incorporation into requirements and contract documentation to reduce LCC for a new system.O&S cost comparison is the goal in fielding a new system should be that the O&S costs for the new system, generally, should be no more than the costs of the displaced system. Knowledge of the costs of the displaced system will provide a benchmark early on in the development of the new system that the developer can aim for in planning the new system. Although the O&S costs for the new system will be based on engineering estimates, having a benchmark will help the material developer to consider supportability more nearly equally with cost, performance and schedule. Historical data for the system to be displaced must be available.

(11) *Extent of interoperability.* Interoperability is the ability of systems to provide services to and accept services from other systems to enable them to operate effectively together. The goal of this metric is to provide a level of certainty that a given acquisition end item is able to support or operate with other predefined systems in specified functional areas. Interoperability is a difficult metric to measure quantitatively. Interoperability with other systems is verified through testing or simulation. Often, interoperability is measured simply by identifying whether or not the system is interoperable. A ratio for interoperability may be derived by dividing the number of systems with which the acquisition system is interoperable by the total number of systems with which the acquisition system should be interoperable. It may also be useful to compare the number of systems which the acquisition system is interoperable with the number of systems that the predecessor system was interoperable.

(12) *Quality deficiency report rate.* This is one means of identifying possible problems in the fielding process is to track the number of quality deficiency reports during a specified time interval (for example, each month). This number may be used as a means of comparison over a series of previous reporting periods to identify any trends in submission of customer/user complaints. This metric helps to confirm the effectiveness of the design effort. Number of quality deficiency reports/interval of time.

Appendix C
Instructions for Preparing the Supportability Strategy

C–1. Procedure

The SS is a working-level document used to plan and accomplish ILS tasks in each acquisition phase. Historically it has proved very helpful to the MATDEV to have the initial SS completed at least 60 days before the MDR A. This can be accomplished and coordinated using a SIPT lead by the ILSM. The SS can be updated 60 days before each subsequent MDR, when the program direction or the system configuration changes, when manpower, personnel, training, or logistics support plans change, or when changes are required to support a solicitation document. Minutes from the SIPT meetings can be a source to update the SS. The SS describes the overall ILS program and includes the ILS requirements, tasks, and milestones for the current and succeeding acquisition phases. The MATDEV, CBTDEV, supporting LCMC, T&E activities, and logistician are all primary users of the SS, but all members of the SIPT should have input to and receive the SS. The SS will also be coordinated with participating services and will include any service unique information as needed.

C–2. Content

The SS is a comprehensive document. Although there is no mandatory format for the SS, the following guidelines can be useful to tailor any SS to a specific acquisition program. A suggested outline for the SS is shown in figure C–1. Details on the topics to be addressed in the different sections and subsections of the SS are provided below.

i. Cover page
ii. Signature
iii. Table of contents
iv. Update and revision log

I. General
  a. Introduction
  b. System description
  c. Program management
  d Milestone schedule
  e. Applicable documents

II. Supportability in the Acquisition Program
  a. Operational and supportability requirements
  b. Acquisition strategy
  c. Performance based logistics
  d. ILS /Supportability funding
  e. Supportability Analysis strategy
  f. Supportability T&E

III. ILS element plans
  a. Design interface
  b. Maintenance
  c. Manpower and personnel
  d. Supply support
  e. Support equipment
  f. Technical data
  g. Training and training support
  h. Computer resources support
  i. Facilities
  j. Packaging, handling, storage, and transportation

IV. Supportability in fielding and operational life
  a. Initial fielding
  b. Program transition
  c. Post production support
  d. Post fielding support analysis
  e. Disposal

Figure C–1. Suggested outline for the supportability strategy

C–3. Outline and details

a. Section I of the SS provides general information on the acquisition program and top-level supportability issues.

(1) *Introduction.* A short introduction may be appropriate to introduce the reader to the purpose of the SS, provide any background, and describe the overall approach taken in development the document.

(2) *System description.* Describe the overall materiel system including its physical configuration and functional requirements. The SS may include pictures, tables, charts, graphs, and so on.

(3) *Program management.* The organization for managing the acquisition of the system should also be described. Identify the PM and all participating organizations along with the responsibilities of these organizations. Describe the different teams which may be involved with emphasis on the SIPT. Include specific POCs.

(4) *Milestone schedule.* The milestone schedule serves as a tailored map for the acquisition program. It shows where and when it started, where it is going, and how and when the ILS tasks will be completed. The milestone schedule should be updated before each MDR and anytime significant changes are made. A typical chart will show all

mandatory milestones and significant intermediate goals along the way. This section may contain selected milestones. A detailed schedule can be attached at the end of the SS.

(5) *Applicable documents.* This is also a good place to list the applicable documents which can provide additional information and guidance with regard to the acquisition program.

b. Section II of the SS describes strategies for attaining ILS objectives within the context of the overall acquisition strategy. This information is critical to the SIPT and other program participants. A description of the operational requirements, supportability objectives, AS, LCC and funding issues, SA strategy, and the supportability T&E concept will provide essential information to ensure that supportability is thoroughly planned. The SIPT needs to be familiar with the program plans and objectives below.

(1) *Operational and supportability requirements.* Briefly describe the mission scenarios and requirements, operational environment, transportability requirements, employment, concepts, deployment plans, and combat service support force structure. The CD should provide the needed details (for example, annual operating days, annual number of missions, mean mission duration) to input to the SA process. Define the proposed SROs and supporting RAM thresholds for both peacetime needs and wartime requirements. Specify anticipated Ao or fully mission capable (FMC) requirements. AR 700–138 and AR 750–1 provide definitions of these terms. Update SRO information to reflect requirements generated during studies and evaluations. As system designs mature and available technology is utilized, Ao and FMC requirements must be validated. Determine and indicate applicable readiness reporting system, forms and frequency in accordance with AR 220–1.

(2) *Acquisition strategy.* Describe the anticipated acquisition approach. Initially it may consist of several methods, depending on whether system requirements might be met by a system modification, a foreign materiel system, a new development, or commercial item. Define contractual approaches and incentives for these areas.

(a) Support risks. Identify risk associated with system support alternatives. As a minimum, the following areas should be addressed:

1. What are the effects of changing the level of maintenance/repair capability?

2. Are there items or subsystems in the inventory that can be used to reduce development risk/requirements? Will GFM be provided? Will it be available?

3. How will the proposed materiel system be integrated into the Army structure at maturation? (The system must be designed to fit into the Army support structure planned for the fielding time frame to reduce changes needed).

(b) MANPRINT requirements. Describe actions to reduce requirements for a high degree of skill to operate and maintain the system. Describe any anticipated approaches or incentives to reduce O&S cost requirements. Identify the goals and actions to reduce quantity and skill level of personnel operating and maintaining the materiel system. Data will be extracted from the System MANPRINT Management Plan (see AR 602–2).

(c) Source selection. Describe how ILS and supportability will be addressed in the source selection process. Include any plans to consider estimated cost of operation, maintenance, and support, in addition to anticipated acquisition cost, when making the source selection evaluation.

(d) Elements of support in acquisition. Briefly describe the ILS requirements which will be included in solicitation documents and contracts. If accelerated acquisition is a possibility (for example, preplanned product improvements or commercial items), identify those items that may need to be accelerated and how they will be accomplished. Identify any nonstandard budgeting or funding actions. Include planned or known requirements for ICS or LCCS.

(e) Planned deployment and employment. Describe the planned operational concepts.

(3) *ILS Funding.*

(a) Describe studies and investigations to be conducted and updated in determining, by ILS element, total life-cycle cost estimates to include an identification of the scope and depth of studies to be conducted. Include plans for transition of support to item managers and the sustainment command.

(b) State support models and modifications to be used in cost estimating and limitations and assumptions to be made in modeling.

(c) Provide coordination channels and reporting schedules.

(d) State results (dollars/type funds) of cost estimating, by ILS element, major function, and appropriation RDTE; OPA; OMA; operation and maintenance, Army Reserve; MCA; military construction, Army Reserve (MCAR); and so forth. Include total requirements by POM years funded and unfunded.

(e) Provide estimated funding impact on gaining MACOM. Make sure affected commands are notified of current status, to allow for the impact any changes may cause.

(4) *SA strategy.*

(a) Describe the SA to be conducted in the acquisition effort. Identify the specific types of analyses required. Identify how the SA process is being accomplished and any actual or potential problems.

(b) Include brief descriptions of the following:

1. SA required. Describe how the SA selected will be tailored to specific acquisition program needs and phases.

2. SA application to ILS elements. Describe how LMI will be used to provide input for development of ILS elements.

3. Structure of the LMI data products. Specify the hardware and software indenture level and level of maintenance for which the LMI will be generated and documented. Identify the planned degree of LMI tailoring.

4. Army-contractor interrelationships in conducting SA. Identify how data will be verified for adequacy and accuracy and who in the government will be responsible for such verification.

5. Identify the source of data for SA.

(c) Describe controls to assure the SA does not include duplicate or redundant data requirements.

(d) Describe results of the SA. This should summarize results of analyses performed in prior phases.

(e) Include the requirements for phasing the responsibility for data management, collection, updating and retrieval, and for transition from contractor to Army elements.

(5) *Supportability T&E concepts.* Briefly describe the planned supportability T&E concept, scope, and objectives, and how they will be met during DT&E and OT&E. List the organizations (for example, logistician, testers, MATDEV, independent evaluator, SIPT, and so on) that will identify supportability test issues. These issues and objectives will be summarized in the SS and incorporated into the TEMP (AR 73–1). Information developed should consider, but not be limited to the following:

(a) Peculiar test requirements that are directly related to the SS.

(b) Anticipated critical supportability issues and their impact on the support planning.

(c) Testing and evaluation necessary to assess actions taken to resolve critical issues.

(d) Training, manpower, and skills required to accomplish T&E.

(e) Dates for initiation and completion of actions required to resolve supportability issues.

(f) The interface between the LMI and the test data collection systems.

(g) T&E of built-in or supporting automatic operating, testing, and maintenance equipment (and associated software, if applicable).

(h) How completed test results will affect planned test actions, criteria, requirements, and so forth.

(i) Provide a summary of TEMP-significant actions and activities to include the following:

1. Proposed test locations.

2. Data collection procedures and data uses.

3. Organizations and responsibilities involved in the T&E efforts.

(j) Plans for the LD, verifying the LMI and components of the SSP, draft/final equipment publications, all TMDE, the maintenance allocation chart, the repair parts/special tool list, and so on (see AR 700–127 and AR 70–1). The LD should be accomplished as soon as feasible after a representative engineering development prototype is available (during military suitability or feasibility testing for NDI). LD must be completed in a timely manner so that the source and availability of the SSP components can be established prior to DT&E and OT&E).

(k) Identify the requirements and methods to be used for providing a system prototype for LD (for example, dedicated or on a time-phased sequential claimant basis).

c. Section III provides details on plans for each ILS element. The bulk of the SS will be in this subsection which explains issues and requirements in detail for each of the 10 ILS elements. Each ILS element needs full consideration in the SS. If the area is not applicable, so state, with supporting rationale. Each ILS element will include consideration of the relevant MANPRINT requirements and constraints. The ten elements of ILS are addressed below.

(1) *Design interface.*

(a) Describe how ILS and LCC will influence source selection, system design, and acquisition decisions. Explain design constraints related to ILS and any plans to ensure that ILS is fully considered in design proposals and proposed engineering changes. Describe the extent and nature of the ILS personnel participation in design reviews and tradeoff studies. List and discuss any factors that might influence design.

(b) Describe climatic, environmental, and energy constraints and initiatives and any related tradeoffs.

(c) Describe use of the Independent Research and Development Program or other supportability studies to identify new technologies

(d) Describe logistics-related durability and survivability (to include corrosion protection, long-term storage, nuclear, biological, chemical (NBC) resistance).

(e) Describe component and major item standardization and interoperability requirements.

(f) Describe applicability of experience with similar materiel systems or other lessons learned which might influence system design.

(g) Describe any other areas.

(2) *Maintenance planning.*

(a) Describe the maintenance concept (see AR 750–1) for the system including all levels of maintenance. Identify tradeoffs to be performed and maintenance considerations peculiar to the system.

(b) Identify maintenance tasks required to sustain the end item at a defined level of readiness, include all critical and high driver (MPT and fiscal resources) tasks. The LMI data product format can be used to provide part of the maintenance planning data.

(c) Describe the general overall support concepts contained in the CD or resulting from logistic studies. Identify proposed or actual skills, tools, TMDE, support equipment, and so on, to be available at each level of maintenance. Include analysis of possible design for discard of components and repair parts.

(d) Indicate strengths and weaknesses of each support alternative and the effect of the support concept on the system design, SRO, acquisition and O&S costs, and on affected ILS elements.

(e) Summarize known or planned inter-service support, HNS, ICS or LCCS, and contractor warranties. Identify proposed solutions to potential problems that may result during transition to organic support.

(f) Include information about planned organic depot maintenance. Summarize and cross-reference the DMSP. This plan is prepared by the MATDEV in the format shown in chapter 16.

(g) For systems being acquired for multiservice use, address the feasibility and desirability of centralized repair and supply support by a single service, the predominant user in a geographical area or the one with centralized support capability.

(h) Describe maintenance environment.

1. Describe the maintenance environment, limitations, constraints, and requirements projected for the deployment timeframes. Provide sufficient detail (turnaround time, direct productive annual maintenance man-hours (DPAMMH), MTBMA, MTTR, and MTBPM to support SA. Include logistic support parameters stated in the ICD/CDD/CPD or other requirements documents. Use LMI data when available.

2. State the nature and extent of maintenance to be performed by each level of maintenance to include battle damage expedient repair procedures in accordance with battlefield damage assessment and repair (BDAR) policy. Discuss alternative approaches when applicable. Identify tradeoff criteria used for selection of the preferred alternative.

3. Identify the organizational and logistic support structure of each divisional and/or non-divisional unit that will be responsible for providing direct and general supply support and maintenance support.

4. Identify depots, special repair activities, or other support activities scheduled for special support missions. Identify the depots that will be responsible for depot repair/overhaul of those components comprising the total system.

5. Identify the need for maintenance float items in accordance with policy in AR 750–1.

6. Identify all depot maintenance inter-service studies (by study number) applicable to the materiel system. Report the latest status of each of the studies. If studies have not been initiated, indicate plans to accomplish this task.

7. Describe efforts to minimize potential safety problems during maintenance.

8. Where applicable, describe maintenance concepts, requirements and procedures for—

a. Army prepositioned stocks (APS).

b. Nuclear hardness maintenance and surveillance procedures contemplated to assure the nuclear hardness of the system throughout its life cycle.

c. The NBC contamination survivability maintenance procedures must be maintained throughout the life cycle of the system.

(3) *MANPRINT.*

(a) Describe the operator and maintenance manpower and personnel impact (including burden on gaining commands) of the materiel system, and how manpower and personnel (number and skill level) will be provided to test proposed items. Include limitations, constraints, system-peculiar requirements, and man-machine interface. Assess projected force structure (at time of deployment) to meet both peacetime needs and wartime requirements. Provide potential BOIPFD (see AR 71–32) and MARC information needs. Data extracted from the system MANPRINT assessment provide a significant amount of information about this element.

(b) Describe plan for coordinating manpower and personnel requirements and milestones with TRADOC.

(c) Describe skill requirements for personnel necessary to operate, maintain, and support the end item. Consider the following:

1. Present skills and MOS (see PAM 611–21) that may be used with little or no retraining.

2. New skills and MOS required (skill evaluation and justification).

3. Assigned duties.

4. Task, skill, behavior, and man-machine (MANPRINT) interface analyses.

(d) Define coordination with all ILS functions, and use of LMI as data source for MOS needs. Define data requirements.

(e) Identify system safety and human factors constraints to help minimize problems with the human interface during system operation, maintenance, and transport. Include any system safety and hazard assessment requirements and results as applicable.

(4) *Supply support.*

(a) Describe the proposed supply support concept(s), supply support limitations, constraints, and system-peculiar requirements for not only the end item, but also for the support equipment and TMDE. Initiate and update the provisioning plan (see AR 700–18). Consider the following areas:

(b) Identify any potential deviation from standard Army supply support procedures. Evaluate the impact of deviation on readiness, cost, manpower, and so forth.

(c) Describe plan, as applicable, for cataloging, acquisition, packaging, preservation, receipt, storage, issue, and disposal of the following:

1. Repair parts, ammunition, POL, and so on.

2. Major components and secondary items.

3. Special and common tools and TMDE.

(d) Include plans for reviewing and adjusting the usage and failure factors based on SA/LMI, test data, and field experience data. Include support planning not only for the end items being procured for MTOE/TDA units at the unit identification code level, but for any of the following claimants receiving assets:

1. War reserves; operational projects, operational readiness float, and repair cycle float stocks.

2. Decrement stocks (to include early mission Reserve Components (primary mobilization)/ full Army mobilization war reserves).

3. The Medical Standby Equipment Program (see AR 40–61).

4. Other claimants designated by HQDA Staff.

(e) Include plans for—

1. Determining the range, quantity, and specific requirements for supply support elements needed in the SSP for T&E (see AR 700–127).

2. Identifying long lead-time items and vendor supplied items.

3. Identifying critical parts and equipment.

4. Reprocurement.

5. Identifying all Government-furnished equipment.

6. Identifying all nuclear hardness critical items for both initial provisioning and replenishment.

(f) Describe method and type of supply support (for example, piece part, assembly, module or fabrication concept of replacement of parts).

(g) Address possible need for interservice supply support agreements or HNS agreements.

(h) Assess the effect of the acquisition schedule on provisioning efforts.

(i) Provide necessary information to other supply supporting organizations (for example, DLA, General Services Administration (GSA), and other services), which will provide piece-part, bulk stockage items, and so on. Early submission of projected requirements is needed to permit increased stockage of these items.

(j) Identify requirements for basic sustainment material (BSM). BSM is the material consumed in the operation, and will include, but not be limited to, ammunition, POL, power sources (for example, batteries), data processing paper and tapes, war reserve requirements, and other consumable and bulk supplies. These requirements will include both those for initial fielding and those projected for annual unit consumption during peacetime (training) and wartime.

(5) *Support equipment.*

(a) Describe procedures used to identify requirements for support equipment.

(b) Identify requirements for investigation of existing Standard Support Equipment in the Army inventory. Describe procedures for maximizing selection of standard tools, TMDE, support equipment and ASIOE, to include vehicles, generators, and trailers. If modifications to current or planned materiel systems are needed, summarize plan to assure changes are completed by required time of need.

(c) Identify major items of support-related hardware, to include any requirements for scarce support resources.

1. Include the TMDE register (see AR 750–43) and preferred items list (see DA PAM 700–21–1) for mandatory use of specific items.

2. Define procedures for establishing TMDE requirements during SA.

3. Describe use of LMI for establishing materiel system unique support equipment requirements by maintenance level.

4. Identify requirements for TMDE registration and acquisition approval (see AR 750–43). Indicate direction to be given to the contractor regarding the use of common TMDE, including requirements for calibration and calibration support.

5. Identify calibration requirements of the system and its support equipment.

(d) Identify support equipment and TMDE peculiar hardware test, development, and support requirements. Identify any environmental and storage requirements needed for TMDE, ATE, and TPS.

1. Define support equipment and TMDE peculiar T&E objectives, and provide appropriate input to the TEMP (and coordinated test plan, if prepared).

2. Identify requirements (and materials needed) for local fabrication of tools, maintenance or test stands, or any other support items.

3. Identify software changes to maintenance equipment where required and interconnecting devices required to test systems on existing test stands.

(6) *Technical data.*

(a) Identify equipment publications concept.

(b) State requirements for publications updating and finalization. Coordinate scheduling with the system production schedule. Describe how the LMI will be used as source data in publication preparation to assure compatibility between the repair parts list, support equipment and tool lists, task allocation, skills, and the narrative operating and maintenance instructions of equipment publications.

(c) State evaluation criteria for validation and verification of publications, and indicate quantities and types required in support of testing

(d) Identify actions, events, milestones, and schedules for preparation and printing of final publications.

(e) State requirements for updating draft equipment publication (DEP) during SDD to incorporate changes that result from LD, DT&E, and OT&E. Schedule updates and finalize equipment publications for timely availability prior to the FUED.

(f) Describe plan for interservice coordination on technical data requirements for multiservice acquisition.

(g) Describe requirements for specifications and drawings to support the DEP, SA, and provisioning effort.

(h) Describe plan for determining if a TDP will be purchased, amount of data needed for example, no data or level 1 drawings for NDI with CLS versus level 3 drawings for organic maintenance/training), and what effect this will have on the acquisition strategy and acquisition plan.

(7) *Training and training support.*

(a) Describe how training and training device requirements will be met and who is responsible for meeting those requirements. Include description of Government and contractor responsibilities and of training T&E procedures. Provide information on training constraints and target audiences.

(b) Identify long-term training facilities programming requirements and coordination needed with the Office of Chief of Engineers (OCE), DA, and TRADOC.

(c) Describe plan for acquiring the required training and training devices. Include program for determining if NET will be needed (see AR 350–1). If so, summarize NETP actions required and identify organizations/individuals participating in the NETP development/execution. Identify the applicable NETP number.

(d) Describe institutional training requirements and plans unique to operation and maintenance of hardware, software, support items, and test equipment.

(e) Identify any nonstandard PHS&T training requirements for movement and storage of sensitive, classified, or hazardous components, parts, materials, ammunition, or TPSs.

(8) *Computer resources support.*

(a) Describe ILS requirements, constraints, issues, and management procedures unique to stand alone or embedded computer hardware or software.

(b) Describe plan for identifying computer resource requirements for the system to include—

1. Determining computer resource requirements for operation and maintenance of the end item or any of its components within the boundaries of the battlefield (Army battlefield automated systems).

2. Historical data review to assess suitability of existing computer resources.

3. Comparison of existing computer resources to requirements stated in the requirements document, system specification, and so on.

4. Determining computer resource limitations.

(c) Describing the plan to identify and test all peacetime and wartime hardware, software, and communications interfaces.

(d) Describing plan for determining software support and PPSS procedures, requirements, and responsibilities.

(e) Identifying requirement for preparation of a CRLCMP for inclusion as an annex to the SS. Emphasize computer hardware and software ILS requirements.

(f) Describing manpower and personnel requirements for developing and fielding computer resources and the training requirement to operate and maintain the computer resources.

(g) Describing method or plan to acquire, test, and evaluate computer software and software support and how software errors will be detected and corrected.

(9) *Facilities.*

(a) Describe all facility requirements for the use, storage, testing, training, maintenance, and disposal of the new system and its support equipment.

(b) Describe known or planned maintenance, calibration, storage, training, and personnel facilities requirements and constraints. Also, address utilities requirements. Use the LMI output summary for Special Facility Requirements (if available) and information from the SFA to the SS to provide requirements and justification for the construction of new facilities.

(c) Describe the adequacy or inadequacy of existing facilities (both fixed and mobile) for both the end item and its maintenance and support needs (for example, TMDE, ATE, TPS, and support item environmental and storage requirements).

(d) Describe any modifications necessary to existing facilities (both fixed and mobile) for inadequacies described above.

(e) Describe any new facilities requirements for personnel using, testing, training, operating, and doing field and depot maintenance.

(f) Identify program requirements (including responsibilities and funding) and schedules required to provide necessary modified or new facilities (fixed and mobile), and any MCA and MCAR requirements.

(g) Describe any special security requirements for storage and use of classified end items, components, manuals, TPS, and so on. Include quantity and volume of materiel, security level of materiel, and any electronic countermeasures or TEMPEST (measures to control compromising emanations).

(h) To assure that satisfactory lead times are provided for advanced funding planning (typically 5 to 7 years before occupancy), major gaining commands should be advised of projected new and modified facilities requirements following identification of the facilities programming and scheduling of required actions. HQDA, must also be expeditiously informed of facility requirements for input and budgetary requirements.

(i) Describe how the CONUS and host nation facilities requirements will be provided.

(10) *PHS&T.*

(a) Describe system-unique requirements, management responsibilities, and procedures used to ensure that PHS&T requirements are identified and met in a timely manner during the acquisition process.

(b) Describe anticipated PHS&T modes and constraints.

(c) Identify system, component, part, and test equipment/TPS environmental storage and climatic requirements (for example, humidity and static control and grounding requirements).

(d) Summarize actions necessary to resolve logistic problem areas identified, to include the following:

1. Tradeoffs of PHS&T requirements.

2. Tradeoffs of PHS&T risk areas affecting LCC.

(e) Describe PHS&T assets required and those expected to be available at first unit equipped.

(f) Identify current and projected changes of PHS&T systems and procedures. Determine the interface with PHS&T equipment undergoing parallel development or testing.

(g) Verify PHS&T test requirements have been identified and included in the TEMP.

(h) Identify PHS&T requirements for shipment of equipment and ASIOE to CONUS and overseas commands, including special PHS&T requirements of participating services.

(i) Identify special care required during PHS&T (that is, removal of sensitive components, calibration, special PHS&T requirements during repair and movement).

(j) Identify actions taken to determine if containers are or will be available for system shipment.

(k) List the supply bulletin number(s) of the storage serviceability standard that is appropriate for the materiel system. If none is required, so state.

(l) Describe any unique transportation and transportability responsibilities, requirements, and constraints, including those related to unit and force deployability. Identify required strategic and tactical transport modes and aircraft and rail/road/water vehicle type. Identify user transportability limitations and restrictions including container compatibility. When appropriate, discuss design or performance tradeoffs for mobility, transportability, and rapid deployment. This should also include transportation requirements for ASIOE, TMDE, parts, and BSM (ammunitions, POL, and so on).

(m) Identify requirements for development of a transportability request (using the LMI data, transportability engineering characteristics, and DODI 4540.7), to be submitted to the MSDDC Transportation Engineering Agency for approval. Include this request (and subsequent transportability approval) as an annex to the SS. Summarize actions necessary to resolve problem areas.

(n) Describe current transportation assets and those expected to be available at FUE and identify current and projected changes to transportation systems and procedures. Determine the interface with new equipment undergoing parallel development or testing.

(o) Identify transportability test requirements for inclusion in the TEMP.

(p) In coordination with MSDDC, record if a transportability guidance TM is required, and who will prepare the manual.

(q) For systems being acquired for multiservice use, the following apply:

1. Identify transportability requirements for shipment of equipment to CONUS and overseas commands, including special requirements of participating services.

2. Describe loading and unloading configuration layout by appropriate aircraft type when air transportation is to be used. Include weight and cube.

(r) Identify lifting/tie-down requirements and procedures to ensure these will be included in final system configuration.

d. Section IV describes how ILS will be implemented during initial fielding and throughout the operational life of the system.

(1) *Initial fielding.* Briefing describe planning for initial fielding and achieving initial operational capability. Summarize the procedure and schedule for preparation of all materiel fielding documentation. Provide information on how TPF will be implemented.

(2) *Program transition planning.* If applicable, provide a description of how and when the program will be transitioned from the PM office to an LCMC. Identify transition lessons learned applying to the current program. If ICS is being considered, describe how transition to organic support will be accomplished. Show how repair parts usage, skills, training, procedures, technical data, and so forth will be obtained and used. Provide sufficient detail to assure that all necessary data is provided in time to adequately provision, train, and maintain the system after transition to Government support.

(3) *Post-production support.*

(a) An initial PPS plan will be developed during the early part of the SDD or equivalent phase. It will document resources and management actions to ensure the sustainment of SRO requirements and logistic support at all levels following the cessation of the production phase for a system or equipment

(b) A schedule for updating the PPS plan will be developed to ensure the plan is maintained current. The PPS plan will be updated prior to the production decision, at production phase-out, and at any other time a significant change has occurred in the anticipated support timeframe.

(c) PPS planning applied to materiel made available under NATO standardization and interoperability criteria, through security assistance programs, will be consistent with PPS policies applied to Army materiel.

(4) *Post-fielding support analysis.* It is important to ensure high readiness while minimizing support costs for a system throughout its operational life. A plan must be developed for monitoring support of the system after it is fielded. Describe the readiness and support data to be collected; data sources; methods of data analysis; and procedures for using the results to correct ILS problems or to enhance the supportability of the system.

(5) *Disposal.* This portion of the SS is often neglected. It is important to plan for disposal even though the system is expected to have a long service life. Although salvage is of little economic concern, the potential environmental impact of system components is the driver for the emphasis on disposal planning. And disposal at any time during the life of a system if a catastrophic failure or accident results in the need to scrap it.

(6) *Summary of actions per acquisition phase.*

(a) Concept refinement. Under this action the following will be done:

1. ICD approved.

2. Market investigation conducted.

3. CAIV objectives defined.

4. AoA conducted

5. TDS prepared.

6. Initial SS prepared.

7. SA planning conducted.

8. Initial test strategy developed.

9. Milestone A approval to begin a new program.

10. Concept refinement exit criteria established.

(b) TD phase. Under this action the following will be done:

1. CDD prepared.

2. Acquisition strategy developed.

3. APB developed.

4. TDS updated.

5. AoA conducted.

6. SS developed

7. Initial test and evaluation master plan prepared

8. SA conducted.

9. LMI database developed.

10. TD phase exit criteria established.

11. Milestone B,approval to begin a new program.

(c) SDD. (See table 5–1 for ILS in the SDD phase.) Under this action the following will be done:

1. SDD solicitation document prepared and contract awarded.

2. Developmental line item number assigned as applicable.

3. BOIP feeder data and BOIPFD provided to the stakeholders and approval authority.

4. Initial TEMP developed.

5. SS updated as appropriate.

6. Analyses and tradeoffs conducted as needed.

7. Training for testing conducted.

8. Initial SFA developed.

9. Testing and tradeoff studies conducted as needed.

10. Initial STRAP developed and NETP distributed.

11. Initial CRLCMP developed.
12. Prototyping, testing, and simulations conducted as appropriate.
13. PHS&T requirements and procedures developed and validated.
14. Developmental and operational testing conducted.
15. Provisioning plan and documentation developed.
16. Operator and maintenance skills and procedures validated.
17. Logistics demonstration conducted.
18. Memorandum of notification and draft MFP distributed
19. Milestone C approval to begin production.
20. SDD exit criteria established as needed.
(d) PDOS. See table 6–1 for ILS in the PDOS phase. Under this action the following will be done:
1. Plans from previous phases updated as needed.
2. Production contract awarded
3. BOIP/BOIPFD published.
4. Technical manuals and DMWRs validated, verified, and published.
5. Resident and NET are made available.
6. Provisioning plan and documentation updated.
7. Depot maintenance support plan developed.
8. System transition plan developed.
9. MFP completed.
10. Physical configuration audit completed.
11. TC standard approval obtained.
12. MTOE published and TDA updated.
13. All test, measurement, diagnostic and support equipment are made available.
14. All software is tested and operational, and PPSS plan completed.
15. MFA signed.
16. First article test is complete, production items accepted.
17. Materiel release prerequisites met and approval obtained.
18. First unit equipped and NET complete.
19. Initial operational capability is achieved.
20. SROs met.
21. Engineering changes and modification work orders implemented as appropriate.
22. Life-cycle support cost objectives met.
23. Transition of the system to support manager is complete.
24. Post-deployment performance review
25. Disposal plan is in place.

Appendix D
ILS Assessment Considerations

ILS assessment considerations provide a logical thought process to assess the status of the ILS program for most systems. These considerations are broader in scope than the ILS elements, and the topical entries under each assessment heading are not all inclusive. The following issues should be considered during ILS assessments.

D–1. Maintenance planning

a. Maintenance concept.
b. Maintenance facilities.
c. Maintenance tasks.
d. Maintenance organizations.
e. Expenditure limits.
f. Maintenance standards.
g. Provisioning plan.
h. Operational readiness float.
i. Repair cycle float.
j. Contractor support.
k. Requirements to restore or sustain equipment serviceability.

l. HNS.
m. Interservice support agreements.
n. Depot maintenance support.
o. Intermediate maintenance (IM)/TDA maintenance support.
p. BDAR.
q. Direct exchange.
r. MANPRINT considerations.
s. Nuclear hardness maintenance requirements.
t. Warranty data.

D–2. Manpower and personnel
a. Numbers, skills, and grades.
b. MANPRINT considerations.
c. Retention constraints
d. Recruitment or literacy requirements.
e. BOIPFD.
f. Special skill requirements (operator, maintainer, support).
g. Hazardous skill requirements.
h. Human factors considerations.
i. Security clearance requirements.
j. Maintenance allocation chart requirements.

D–3. Supply support
a. Initial provisioning.
b. Spare or repair parts.
c. Supply facilities (fixed, mobile).
d. Basic sustainment materiel (POL, ammunition, consumables, and so on).
e. Handling equipment.
f. SMR/item management code coding.
g. DLA/GSA/ARMY/other service items.
h. APS.
i. War reserves.
j. BII/onboard spares.
k. Major or secondary items.
l. Cataloging (NSN assignments, and so on).
m. Use of metric measurements.
n. Sets, kits, and outfits.
o. Post-provisioning assessments or reviews.
p. Physical dimensions, to include weight, height, cube.
q. Container requirements.
r. Storage space.
s. Administrative support storage.
t. Nuclear hardness critical items.
u. Parts/components/end item serial number tracking.
v. Decontamination equipment/precautions.
w. Precautions for explosive/radioactive materiel.
x. Security requirements (system, parts, manuals, and so on).
y. Flight safety repair parts.
z. Contractor supply support.
aa. Mandatory parts list.
bb. Wholesale stockage.

D–4. Support equipment
a. TMDE (common and peculiar).
b. Calibration equipment and procedures.
c. ATE.
d. Support and handling equipment.

e. Electric generators.
f. POL and ammunition vehicles.
g. Tools and tool kits.
h. System major item components.
i. BOIP and MTOE/TDA.
j. Associated support items of equipment.
k. Recovery or evacuation equipment.
l. Mobile maintenance facilities (components).
m. TPSs.
n. MANPRINT considerations.
o. Installation units (communication, weapons, chemical detection, smoke, and so on).
p. Depot maintenance plant equipment.
q. Winterization, fording kits.
r. Support equipment and TMDE standardization.

D–5. Technical data
a. TMs.
b. Technical bulletins.
c. Transportability guidance TMs.
d. Identification lists.
e. Component lists (to include sets, kits, and outfits).
f. Repair parts and special tools list.
g. Maintenance allocation chart.
h. Supply bulletins.
i. Provisioning technical documentation.
j. Calibration procedures.
k. Drawings and specifications.
l. Test results.
m. Software documentation.
n. Skill and task analysis.
o. Facilities utilization.
p. Packaging procedures and materials.
q. DMWRs.
r. LMI.
s. Verification and validation.
t. ILS planning documentation and associated contractor deliverables.
u. Demilitarization procedures.
v. MANPRINT.
w. EOD procedures.
x. Logistics demonstration plan.
y. MSDDC–TEA lifting and tie down pamphlet/references.

D–6. Training and training support (AR 350–38)
a. Factory training.
b. Instructor and key personnel training.
c. NETP.
d. NET team requirements.
e. System training plan (replaces individual and collective training plan).
f. Resident school training.
g. Army training and evaluation program.
h. Training materials, aids, and devices.
i. Training ammunition.
j. Joint service training.
k. Displaced equipment training plan.
l. Training equipment.
m. Extension course training.
n. Student training requirements.

o. Field manuals.
p. Soldier manuals.
q. Skill levels and skill specialties.
r. Skill qualification test.
s. Training instructions.
t. Materials and lessons.
u. Joint service training agreements.
v. Training device support.
w. Depot training/training devices.
x. EOD training
y. MANPRINT considerations.
z. Embedded training requirements.

D–7. Computer resources support
a. System operational software.
b. ATE operational software.
c. Computer resources management plan.
d. PPSS cells.
e. PPSS product improvement.
f. PPSS test verification process.
g. Software storage, security requirements.
h. Program language standardization.
i. Data element and message format standardization.

D–8. Facilities
a. Training facilities requirements.
b. Depot maintenance facilities requirements.
c. Mobile maintenance facilities.
d. Fixed IM/TDA maintenance facilities.
e. Fixed and mobile storage facilities (including hazardous materials storage).
f. Testing and operational facilities.
g. Facility physical security requirements.
h. Facility utilities (common or unique organic/commercial power).
i. Special facility requirements.
j. Facility design requirements, lead-time, description, costs, housing and dining facilities.
k. Training ranges, targets, scoring equipment, safety fans, and so on.
l. SFA.

D–9. Packaging, handling, storage and transportation
a. Handling equipment.
b. SMR/item management code.
c. Security requirements (system, parts, manuals, and so on).
d. Disposal/demilitarization.
e. Sets, kits, and outfits.
f. Post-provisioning assessments or reviews.
g. Physical dimensions, to include weight, height, cube.
h. Container requirements.
i. Storage space.
j. Administrative support storage.
k. Preservation/packaging/handling/requirements.
l. Pallet/hardstand requirements, air delivery.
m. Decontamination equipment/precautions.
n. Precautions for explosive/radioactive materiel and hazardous material.
o. Packaging and handling constraints (including access for EOD render safe procedures).
p. Lifting and tie down requirements.
q. Packaging data sheets.
r. Shelf life.

s. Electrostatic discharge protection.
t. Rail, highway, water, and, air-weight and dimensional limits.
u. Width and height constraints.
v. Customs requirements.
w. Airdrop and helicopter requirements.
x. Transportation configuration preparation/loading requirements.
y. Special precautions.
z. Transportability report/approval.
aa. Unit mobility impacts.
bb. Container compatibility.
cc. Mobile maintenance and supply van configuration.
dd. TMDE and special tools transport requirements.
ee. Support equipment transport requirements.
ff. Testing.
gg. Transportability engineering analysis.
hh. Rail impact test/results.
ii. Strategic mobility.
jj. Tactical mobility.

D–10. Design interface
a. MANPRINT considerations.
b. Energy efficiency.
c. Hazardous materials usage or disposal.
d. Life-cycle cost.
e. HFE.
f. Safety.
g. Embedded diagnostics/prognostics.
h. Source selection or weighting.
i. Testing feedback or corrections.
j. Contractor incentives.
k. RAM-driven support costs.
l. System modification.
m. Transportability.
n. Facility limitations.
o. Nuclear hardening requirements.
p. Packaging/handling constraints.
q. Design for discard/testability.
r. NBC survivability and supportability.
s. Selected tracking of parts/components/end items by serial number.
t. Use of metric measurements.
u. Embedded training.
v. Scheduled maintenance/reliability centered maintenance.
w. Render safe procedures for explosive items.
x. Application of international standardization agreements.
y. Foreign dependency.
z. System family approach.
aa. Interoperable systems.
bb. Proven components and subsystems.
cc. Other Service, NATO, ABCA, allies interface.
d. Standardized components, subsystems, frequencies, and so on.
ee. Use of metric measurements.
ff. Fuels and lubricants standardization.
gg. Equipment cross servicing (other services, allies).

D–11. Reliability, availability, and maintainability
a. Reliability growth plan.
b. System readiness objectives.

c. Test planning.
d. Durability.
e. Test results.

D–12. Support management and analysis

a. SS.
b. Sample data collection.
c. Test data/evaluation.
d. Coordination of testing requirements/location.
e. Support analysis.
f. LMI.
g. Requirements document.
h. Configuration management.
i. Solicitation document.
j. T&E plans/data integration.
k. Logistic demonstration plan.
l. Support transition plan.
m. Post-fielding assessment.
n. Warranty consideration or utilization.
o. Post-production support planning.
p. Logistics evaluation.
q. ILS/MANPRINT integration.
r. Field data collection plans.
s. EOD plans for explosives.
t. Contractor incentives.

D–13. Cost analysis and funding

a. O&S cost.
b. Initial provisioning costs.
c. Acquisition TMDE/calibration.
d. Tools and support equipment costs.
e. Publications preparation.
f. Printing costs.
g. First and second destination transportation costs.
h. Special support services (warranty).
i. Depot and contract maintenance cost.
j. Technical assistance (contract/military/civilian).
k. Test training, training equipment/materials/devices.
l. Supportability analysis costs (contractor).
m. Secondary/stock fund parts support cost.
n. Expendable supplies support cost.
o. Maintenance expenditure limits.
p. Facility costs.
q. Test program set development and acquisition costs.
r. PPSS costs.
s. Research, development, production, support, and surge resources.
t. ILS cost elements.
u. ILS management resources.
v. Adequacy, availability, and timeliness of funds.
w. AoA.
x. Program cost estimate.
y. TPF.
z. Demilitarization and disposal costs.

D–14. Materiel fielding planning

a. Timing schedule.
b. Memorandum of notification.

c. MFP.
d. Joint supportability strategy (for multiservice systems).
e. Materiel release review.
f. Materiel fielding under total package fielding concept.
g. MFA.
h. Mission support plan.
i. Supportability assessment.
j. Coordination of personnel requirements.
k. Materiel transfer plan.
l. Materiel transfer agreement.
m. MOA.
n. Request for call forward.
o. Displaced systems.
p. AMRD input.
q. Total Army Authorization Documentation System documentation.
r. Availability of support equipment.
s. Surge and mobilization requirements.
t. Materiel fielding after-action reports.

Appendix E
DA ILS Reviews

E–1. General

a. The DA ILSR will serve as a final preparation for the DASA(ILS) and DCS, G–4 or the appropriate representative, for program MDR. The ILSR will be convened to resolve issues left open through the OIPT process. The ILSR will provide a forum to present the latest status of completed and current issues, and the impact on program status. The ILSR will also address strategies for subsequent phases to maximize supportability at acceptable levels of cost and risk and minimize environmental impacts.

b. This program applies to all ACAT I and II systems being acquired for the Army or other services when the Army is the lead in the acquisition effort. The DASA(ILS) and DCS, G–4 may request an ILS review for ACAT III systems, or for multiservice programs when the Army does not have the lead in the acquisition.

c. The Department of the Army logistics staff officer will develop the presentation for the ILSR in coordination with the system ILSM and other SIPT members. The ILSR will address each element of ILS, summarizing issues that have been resolved, detailing actions associated with ongoing actions. Innovative strategies will be highlighted, as will the use of commercial practices. Planning for transfer of a system being displaced will be given equal consideration during the ILSR.

d. The scheduling of the ILSR will reflect OIPT initiatives to resolve ongoing issues. The presentation will be coordinated with all participating agencies prior to the presentation to the DCS, G–4.

E–2. Participation

a. The DASA(ILS) will chair the ILSR.
b. Other ILSR participants will include a general officer or equivalent civilian-level representative from:
(1) ASA(ALT).
(2) Assistant Secretary of the Army, Financial Management & Comptroller.
(a) DCS, G–1.
(b) DCS, G–3.
(c) DCS, G–4.
(d) Deputy Chief of Staff, G–8.
(e) OCE
(f) Army Office of the Surgeon General
(g) CBTDEV.
(h) MATDEV.
(i) Materiel command.

c. Others, such as the TMDE manager, trainer, user, independent evaluator, depot support organization, and tester, may also be included.

Appendix F
Army Work Breakdown Structure

F–1. Summary

The following is a summary work breakdown structure (WBS) for common use for all Army systems and equipment (see MIL–HDBK–881 for detailed guidance). The WBS drives the accounting structure so the initial product should be constructed with cost accounting in mind.

a. Level 1 comprises the entire materiel system, such as a tank, truck, STINGER missile system, or airplane.

b. Level 2 covers subsystem and major components (hardware, not defined here). Examples include engines, cannons, radios (those not standalone Level 1), fire control, missiles, and airframes. Non-hardware areas are identified to correspond to the hardware items.

c. Level 3 includes subcomponents (that contain Level 4 or lower piece-parts that are the lowest level breakdown possible). Below Level 3 may be Levels 4 and 5, which eventually cannot be broken down further. Included in Level 3 are the nonhardware-related areas described in this appendix (see table F–1).

Table F–1
Summary work breakdown structure

Level 1, Army materiel system	Level 2, Subsystem/major	Level 3, Subcomponents
Weapon System	Program management	ILS element management
	System engineering	Reliability engineering Maintainability engineering Human factor engineering Other engineering specialties Supportability analysis
	Data	Technical publications Engineering data Management data Support data Data depository
	Training	Equipment Services Facilities
	Support equipment	Test/diagnostic equipment Handling equipment Tools Other support equipment
	Initial spares and repair parts	
	System test and evaluation	DT&E OT&E Mockups Test and evaluation support Test facilities Logistic demonstration
	Facilities	Construction/modification Utilities

F–2. WBS definitions

The following is a summary listing of WBS definitions applicable to all materiel systems regardless of type. Army materiel system refers to any and all equipment required to develop and produce the capability of employing a system or equipment in an operational environment to meet its technical or operational requirements as stated in an approved requirements document. Subsystem and major components (hardware, not defined here) include the following

a. System engineering and program management is defined as system engineering and technical control, configuration control, management, business management of particular systems engineering, and project management efforts.

(1) This element encompasses the planning, directing, management, and control of the definition, determination, and development of a system engineering effort. It includes the overall functions of logistics engineering and ILS management and ILSM functions, such as maintenance support, facilities, personnel, training, testing, and activation of a system and system engineering and project management efforts that can be associated specifically with contractual or engineering significance (like subcontractors).

(2) The element refers to the technical and management efforts of directing and controlling a totally integrated engineering effort and encompasses the system engineering effort to define the system and the integrated planning and control of the technical program efforts of design engineering and integrated test planning.

(3) It includes but is not limited to the system engineering effort to transform an operational need or statement of deficiency into a description of system requirements and leads to a preferred system configuration, the logistics engineering effort to define, optimize, and integrate the support analyses and insert logistics considerations into the engineering effort.

(4) It serves to ensure the development and production of a supportable and cost-effective system along with the technical planning and control effort for monitoring, measuring, evaluating, directing, and managing the technical program. It excludes the actual design and production engineering directly related to the products or services of a deliverable end item. Examples of system engineering efforts include—

(a) System engineering, the system design; design integrity analysis; system optimization; system cost effectiveness analysis; intra-system and intersystem compatibility and assurance; the integration and tradeoffs between reliability, maintainability, supportability; producibility, safety, transportability, and survivability; human factors, surety and security; configuration identification and control; quality assurance; value engineering; preparation of equipment and component performance specifications; design of tests; and LD plans.

(b) Engineering planning and management, the preparation of the system engineering management plan; specification tree; program risk analysis; system test planning; decision control process; technical performance measurement; technical reviews; subcontractor and vendor reviews; work authorization; technical documentation control; and so on.

(c) Logistic engineering, the disciplined, unified, and iterative work associated with the management, analysis, and technical activities required for ILS determinations. It includes the integration of all support considerations into the system design; all the analysis that causes support considerations to influence the system design; the final optimum system support package; and the efforts required to develop, plan, manage, and acquire all support requirements. It also includes defining optimum support requirements as they relate to design and to each other; identifying required organic or contractor support, those activities and efforts planned and performed to cause supply and maintenance to be performed at each appropriate level; and identifying and acquiring necessary support and test equipment, timely provisioning, distribution, inventory replenishment of spares and repair parts, and the repair of reparables. This element includes the functional requirements and actions necessary to ensure the capability to transport, preserve, package, store, and handle the system; and the planning and analysis activities to ensure that all required facilities are identified and available. It also includes defining requirements for trained operator and maintenance personnel; identifying the need for training, training devices and support instructions; defining computer and computer resource requirements (firmware and software); and generating manning plans. It excludes financial data and information related to contract administration.

b. Reliability engineering is the engineering process and series of tasks required to examine the probability of a device or system performing its mission adequately for the period of time intended under the operating conditions expected to be encountered in the fielded environment.

c. Maintainability engineering is the engineering process and series of tasks required to measure the ability of an item or system to be retained in or restored to a specified condition of readiness, using prescribed procedures and resources at specified levels of maintenance, using specified skill levels and tools and test equipment.

d. HFE is the engineering process and series of tasks required to define, as a comprehensive technical and engineering effort, the integration of doctrine, manpower and personnel, and operational effectiveness. It includes human characteristics, skill capabilities, performance, anthropometric data, biomedical factors, safety factors, training, manning implications, and other related elements into a comprehensive effort. It also includes the tasks required to provide supportable conclusions and recommendations, the analysis performed in support of the system development, and preliminary reviews and analysis of problems that may be sufficiently critical to preclude the system from proceeding into the next phase of the life cycle.

e. The non-ILS functions associated with system engineering allow for the establishment of a total system engineering budget, less the logistic analysis functions, and RAM and HFE elements, and for tracking the cost, schedule, performance, and supportability of the system specialty engineering efforts of NBC, nuclear survivability, environmental considerations, energy management, and all other system engineering specialties.

f. Supportability analysis is the process and series of tasks performed to examine all elements of the proposed system and equipment to determine the logistic support required to keep the system usable for its intended purpose, and to influence the design so that both the system and its required support can be provided at an acceptable cost. It includes all the generic tasks required for ILS element determination, the analysis required to verify the adequacy of the logistic support, and to provide the necessary logistic support.

g. ILS element management is the logistics task management and technical control effort and the management of particular elements of ILS. It encompasses the ISP, SIPT participation, and ILS evaluation and supportability assurance required for an affordable and supportable system. This element includes management of all the functions of logistics support: maintenance support planning; support facilities planning; support equipment; supply support; packaging, handling, storage, and transportation; provisioning requirements determination and planning; training system requirements determination; computer resource determination; organizational, direct and general support, and depot maintenance determination; and data management. It excludes the effort that can be associated specifically with the hardware, contract management, and system specialty engineering.

h. Program management is the business and administrative planning, organizing, directing, coordinating, controlling and approving actions designated to accomplish overall project objectives that are not associated with specific hardware elements and are not included in system engineering. Examples include cost, schedule, performance measurements, warranty administration, contract management, vendor liaison, contract WBS, funds status, financial management directly charged to the project, and other appropriate management tasks.

F–3. Data

The data elements are defined as all specific deliverable data required to be listed on a DD Form 1423 (Contract Data Requirements List) . The data requirements, selected from the DOD Index of Specifications and Standards and the Acquisition Management System and Data Requirements Control List, consist of elements that include only such efforts that can be reduced or will not be incurred if the data items are eliminated. If the data are Government peculiar, they include the efforts for acquiring, writing, assembling, reproducing, packaging, and shipping. They also include the efforts for redesigning into Government format (with reproduction and shipment) if the data are identical to those used by the contractor, but required in a different format. These data elements include value engineering change proposals, ECPs, and other configuration control management changes as a function of data management and data depository. These elements and their sub-elements exclude the overall planning, management, and task analysis functions inherent in the WBS element system engineering and program management.

a. Technical publications are those formal TMs and documents (as well as advanced, commercial, real property installed equipment, and miscellaneous manuals) for the installation, operation, maintenance, overhaul, and training of a system. Also included are references on hardware systems, computer programs, contractor instructional materials, inspection documentation, and historical records that may accompany individual items of equipment.

b. Engineering data are those engineering drawings, associated lists, specifications, and other documentation required by the Government. It includes, for example, all final plans, procedures, reports, and documentation pertaining to systems, subsystems, computer and computer resource programs, component engineering, OT&E, human factors, and other engineering analysis. It also includes the direct effort associated with the TDP for follow-on acquisitions (re-procurement package), and the completed TDP associated with the system itself.

c. Management data are those data items necessary for configuration control management, cost, schedule, contractual data management, program management, and so on, required by the Government. For example, this element includes contractor cost reports, cost performance reports, contractor fund status reports, schedule, milestone, networks, and ISPs.

d. Support data are those data items designed to support planning. It includes SA documentation and LMI maintenance and delivery; supply; general maintenance plans and reports; training and training support data; packaging, packing, handling, and transportation information; facilities data; data to support the provisioning process, and any other support data.

e. Data depository is a facility designated to act as custodian in establishing and maintaining a master engineering specification and drawing depository service for Government approved documents that are the property of the Government. As custodian for the Government, the contractor is authorized by approved change orders to maintain these master documents at the latest approved revision level. When documentation is called for on a given item of data retained in the depository, the charges (if charged direct) will be to the appropriate data element. This element represents a distinct entity of its own and includes all efforts of drafting, clerical, filing, and so on, required to provide the services outlined above. All similar efforts for the contractor's internal specification and drawing control system, in support of his or her engineering and production activities, are excluded.

F–4. Training

The training element is defined as the deliverable training services, devices, accessories, aids, equipment, and parts used to facilitate instruction, through which personnel will acquire sufficient concepts, skills, and aptitudes to operate and maintain the system with maximum efficiency. It includes all efforts associated with the design, development, and production of deliverable training equipment, as well as the execution of specific training services. It excludes the overall planning, management, and task analysis functions inherent in the system engineering and program management element.

a. Equipment are those distinctive deliverable end items of training equipment assigned by either a contractor or military service required to meet specific training objectives. This element includes, for example, operational trainers (simulators), maintenance trainers (maintenance training units), and other items such as cutaways, mockups, and models.

b. Services consist of those deliverable services, accessories, and aids necessary to accomplish the objectives of training. It includes, for example, training course materials, contractor-conducted training (including in-plant and service training), and materials and curriculum required to design, execute, and produce a contractor developed training program. It also includes the material, courseware, and associated documentation development necessary to accomplish the contracted-for objective of training (primarily the software, courseware, and training aids developed or constructed solely for the training mission). It encompasses the materials used for acquainting the trainees with the system or establishing trainee proficiency.

c. Facilities are the special construction planning and execution necessary to accomplish the training objective and include the rehabilitation of existing facilities used to accomplish the objective of training (primarily the brick-and-mortar type facility used or constructed solely for the training mission). Excluded is the installed building equipment used for acquainting the trainees with the new system and associated equipment or establishing trainee proficiency.

F–5. Common support equipment

Common support equipment is defined as those deliverable items and associated software and firmware to support and maintain the system. It will also support portions of the system, while not directly engaged in the performance of its mission and which are presently in the DoD inventory for support of other systems, or commercially common within industry. It includes all efforts associated with the design, development, and production of common support equipment required to support the system. It also includes the acquisition of additional quantities of the equipment caused by the introduction of the system into operational service use. For example, it includes equipment, tools, and so forth, used to refuel, service, transport, hoist, repair, overhaul, disassemble, assemble, test, inspect, or otherwise maintain the equipment in an operable condition. Excluded are the overall planning, management, and task analysis functions inherent in the System Engineering and Program Management element.

a. Test and measurement equipment consists of all items that are of a common and supplementary nature to test and measure a component or system. It consists of the groupings of TMDE, precision measuring equipment (PME), ATE, manual test equipment, automatic test systems (ATS), special test equipment (STE), TPSs, and their related software, firmware, and support hardware. It includes all common items or devices deliverable under the contract used to evaluate the operational condition of a system and to identify and isolate actual or potential malfunctions at all levels of equipment support. It also includes packages that enable an LRU, shop replaceable unit (SRU), printed circuit board (PCB), or similar item to be diagnosed using ATE, to include TPS packages, appropriate interconnecting devices, automated load modules, taps, or other equipment that allows an operator and maintainer to perform a diagnostics, screening, or quality assurance function at any level of system support.

b. Support and handling equipment consist of all deliverable tools (factory tooling is specifically excluded) and handling equipment used for support of the system, not defined as TMDE, ATE, MTE, or TPS. It would typically include support handling equipment and associated software identified as necessary to support and test the operational capabilities and availability of the materiel system for operating forces and supporting maintenance activities. This element consists of the group of tools or tooling assembled and issued for a specific support or maintenance purpose, of a common nature, used at any level of system or equipment support. It typically includes common ground support equipment, vehicular support equipment, powered support equipment, nonpowered support equipment, MHE, munitions MHE, IPE, BII and common tools.

F–6. Peculiar support equipment

Peculiar support equipment is defined as those deliverable items and associated software required to support and maintain a particular system, while it is not directly engaged in the performance of its mission. It includes, for example, vehicles, equipment, tools, and so on, used to refuel, service, transport, hoist, repair, overhaul, assemble, disassemble, test, inspect, or otherwise maintain the system. It also includes all efforts associated with the design, development, and production of PSE. It specifically excludes the overall planning, management, and task analysis functions inherent in the WBS element of system engineering and program management, and common Government and industry support equipment.

a. Test and measurement equipment is defined as a collection of peculiar or unique testing and measurement equipment that is distinctive and of a supplementary nature to a system or component. It consists of the grouping of test, TMDE, PME, ATE, ATS, STE, and their related software, firmware, and support hardware. It includes the deliverable peculiar testing and measuring equipment required by the contract, and that used at all levels of maintenance. It also includes packages that enable an LRU, SRU, PCB, or similar item, to be diagnosed using ATE. It includes TPSs, interconnect devices, automated load modules, tapes or diagnostics, screening or quality assurance functions at any level of system or component support.

b. Support and handling equipment is defined as the physically deliverable tools (factory tooling excluded) and handling equipment used for support of the system, which are not defined as ATE, TMDE, or TPSs. And it would typically include system-peculiar ground support equipment, MHE, IPE, BII, and special tools and equipment identified as necessary to support or handle operational capabilities and availability of the system for the operating force and maintenance activities at all levels of system support.

F–7. Initial spares and initial repair parts

a. The initial spares and initial repair parts element is defined as the deliverable spare components or assemblies used for initial replacement purposes in the system. It also includes the repairable spares and the repair parts required as initial stockage to support and maintain the newly fielded system during the initial phase of service, including pipeline quantities needed at all levels of maintenance and support. It excludes test spares, and spares provided specifically for use during installation, assembly and checkout onsite, and the overall management, planning, and task analysis function inherent in the system engineering and project management element.

b. Subsystem and sub-component, initial issue spares and initial repair parts is defined as the common or unique initial spares and repair items, components or assemblies, or replacement item for each subsystem, which together make up the system. In this element, common and unique spares and repair parts are captured and reported, by subsystem, at each appropriate indenture level and each level of support.

F–8. Systems test and evaluation

The systems T&E element is defined as the use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the materiel system. This element includes the detailed planning, conduct, support, data reduction and reports from such testing, and all hardware items consumed or planned to be consumed, in the conduct of such testing. It also includes all efforts associated with the design and production of models, specimens, fixtures, and instrumentation in support of the test program. Test articles that are complete units (functionally configured as required by the mission equipment) are excluded. Also excluded are development testing, component acceptance testing, and so on, that can be specifically associated with the hardware, unless these tests are of special contractual or engineering significance.

a. DT&E.

(1) The DT&E element is defined as those tests and evaluation conducted to—

(a) Demonstrate that the engineering design and development process is complete.

(b) Demonstrate that the design risks have been minimized.

(c) Demonstrate that the system will meet specifications.

(d) Determine the system's military utility when fielded.

(e) Determine whether the engineering design is supportable (practical, maintainable, safe, and so on) for operational use.

(f) Provide test data to examine and evaluate tradeoffs against system specification requirements, life cycle costs, and schedule.

(2) DT&E is planned, conducted and monitored by the development command. It includes, for example, such models and tests as wind tunnel, static, drop, fatigue, ground integration, sea integration, and aviation integration tests on—

(a) Air, ship, and land vehicles.

(b) Command and launch equipment.

(c) Integrated surface vehicle and command and launch equipment.

(d) Test bed and associated support equipment.

(e) Development test, test instrumentation, and test equipment, including its support equipment.

(f) Chase craft and associated support.

b. OT&E. OT&E is defined as that T&E conducted by agencies other than the development command to assess the prospective system's military utility, operational effectiveness, operational suitability, cost, and need for modifications. Initial OT&E conducted during the development of a materiel system will be included in this element. It encompasses such tests as integrated system tests, flight tests, sea trials, land trials, and so on, as required to prove the operational capability of the deliverable system. It also includes contractor support (such as technical assistance, maintenance, labor, materiel) consumed during this phase of testing.

c. Mockups. These are defined as the design engineering and production of system or subsystem mockups which have special contractual or engineering significance, or which are not required for the conduct of one of the above elements of testing.

d. T&E support. This element is defined as all support elements necessary to operate and maintain systems and subsystems during testing and evaluation that are not consumed during a particular category of testing. This element includes, for example, instrumentation, reparable spares, repair of reparables, test and support equipment, contractor technical support, drones, surveillance aircraft, land and sea tracking vessels not allocable to other T&E elements. Excluded are operator and maintenance personnel, consumables, special fixtures, special instrumentation, and so on, that are included, utilized and consumed in a single element of testing.

e. Test facilities. These are those special test facilities, sites, ships, or land bases required for performance of the various developmental tests necessary to prove the design and reliability of the system or subsystem. It includes, for example, test chambers, white rooms, and shakers. The brick-and-mortar type facilities allocable to industrial facilities are excluded.

f. Logistics testing. This is the specific testing performed to evaluate the logistic supportability of the system. Logistics testing is to be differentiated from support resources and services required for initiating and supporting a test. Logistics testing includes the efforts required to evaluate the achievement of supportability goals, such as the adequacy of tools, test equipment, technical publications, maintenance instructions, and personnel skill requirements. It is the verification of the selection and allocation of repair parts, tools, test equipment, tasks (to appropriate maintenance level), and the adequacy and accuracy of maintenance time standards. The SSP (composite of the support resources that will be evaluated, tested, and validated during the testing process) will be separately captured and reported, as will LDs. Specifically excluded are factory tooling and any costs directly associated with DT&E and OT&E.

Appendix G
Software Supportability Considerations in the 10 Integrated Logistics Support Elements

This appendix provides software considerations that pertain to each of the 10 ILS elements. This will enable the ILS manager and other acquisition and logistics professionals to understand how software impacts supportability planning.

G–1. Maintenance planning

a. Software maintenance concept.
b. Computer resources life-cycle management plan.
c. Transfer of information during transition phase.
d. Maintainability.
e. Preplanned product improvement.
f. Recertify reliability.
g. SMR code.
h. Contractor versus in-house support.

G–2. Manpower and personnel

a. Contractor and/or in-house.
b. Military and/or civilian.
c. Management and technology.
d. Skill mix.
e. Fix and enhance.
f. Process definition.
g. Automation processes.
h. Specifying in the contract skill levels.
i. Core software logisticians.

G–3. Supply support

a. Requirement (who gets it).
b. Firmware.
c. Write once, read many.
d. Erasable programmable read only memory.
e. Stock numbers for blank and programmed memory.
f. Communication transfer.
g. Security.
h. Inventory management.
i. Licensing.
j. CM.
k. Software cataloging.

G–4. Support equipment

a. Memory loader/verifier.
b. Reprogramming workstations.
c. Integration support facility.
d. At the depot and/or in the field.
e. Software tools.

f. Management.
g. Supportability analysis.
h. Current integrated logistics support tools.
i. Failure analysis/preventative maintenance.
j. Test hardware.
k. Simulation/simulators.
l. Actual hardware (hot mock-up).
m. Documentation tools.
n. Computer-aided software engineering tools.

G–5. Technical data

a. Specifications.
b. User's manuals.
c. Source listings.
d. Data dictionaries.
e. Operator procedures.
f. Continuous acquisition and lifecycle support.
g. Accuracy.
h. Currency
i. Accessibility.
j. Visibility.
k. Regulation conflicts (technical order and software data).
l. Proprietary.
m. Failure reporting.

G–6. Training and training support

a. Language training.
b. User training.
c. Documentation preparation tug.
d. System.
e. Software logistics.
f. Simulators.
g. Development methodology.
h. Computer-aided instruction.
i. Tutorials/help features imbedded.
j. Diagnostics.
k. Interface.
l. Human factors.
m. Supportability analysis.
n. Media for training.
o. Failure reporting training.
p. Trainer software.

G–7. Computer resources support

a. Integrated support facility.
b. Support environment.
c. Equipment.
d. Security partitioning
e. CRLCMP.
f. Support software.

G–8. Facilities

a. In-house or contractor.
b. Operational location or depot.
c. Special utilities requirements.
d. Foreign military sales support.
e. Security.

f. TEMPEST space planning.
g. Communications.
h. Human factors.
i. Backup provisions.

G–9. Packaging, handling, storage and transportation
a. Media.
b. Electronic/magnetic isolation.
c. Labeling.
d. Communication reliability.
e. Volume/scheduling.
f. Backup.

G–10. Design interface
a. Interoperability.
b. Open architecture.
c. Memory capacity.
d. Throughput capacity.
e. Exception handling.
f. Field versus depot.
g. Modularity.
h. Commercial items.
i. Process modeling.
j. Reuse.
k. Object oriented programming systems and object oriented design.
l. Test voids.
m. Maintainability.
n. Life-cycle costing.
o. Reliability.
p. Software Engineering.

Appendix H
Performance-Based Logistics Guide
Below is a list to help address all pertinent issues when considering PBL.

H–1. Warehousing
What organization will be responsible for warehousing (contractor or Government)?

H–2. Transportation
a. Will the contractor or government be responsible for system transportation?
b. Is the use of premium transportation envisioned?
c. Will the contractor or government be responsible for retrograde transportation?
d. Will transportation be freight-on-board origin or freight-on-board destination?

H–3. Asset reporting
a. What automated system will be used to report assets?
b. Will asset visibility be fully maintained in the Logistics Modernization Program?
c. Will all condition code changes be reported?

H–4. Requisition processing
a. Will all requisitions pass through the Logistics Modernization Program for referral to the contractor?
b. What organization will maintain the backorders?
c. What organization will be responsible to provide status to the customer?
d. What organization will followup?
e. If specific requisition exchange times are indicated, when does the clock start and stop?

H–5. Demand/sales
Will all demand and sales be recorded for both consumables and reparables?

H–6. Wholesale replenishment
a. What organization makes the decision to procure additional inventory?

b. What organization makes the decision on the quantity to be procured?

c. What organization funds the replenishment?

d. Are reparables and consumables handled differently, that is, delegate full authority to the contractor for consumables, yet retain decision making for reparables?

H–7. Contractor pools
a. Will a wholesale spares pool be required by the contractor to permit satisfaction of customer requisitions within the agreed to timeframes?

b. Does augmentation to the pool become the sole responsibility of the contractor?

H–8. Asset ownership
Who owns the wholesale inventory, the Army or the contractor?

H–9. Stratification
What organization performs this function for the items managed by the contractor?

H–10. Survey/disposal authority
Does the Army retain responsibility for survey/disposal decisions?

H–11. Maintenance plans
a. Will the current maintenance plan and designated levels of maintenance be retained?

b. If the maintenance plan changes, who is responsible for update of the technical data and manuals?

H–12. Configuration management
What organization will have CM authority?

H–13. Reliability
Will the contract proposal include a requirement to improve system?

H–14. Repair
a. Will a repair or overhaul concept be specified in the contract?

b. Is there an impact on organic “core” workload?

c. Are there licensing issues with the original equipment manufacturer/repair contractor?

H–15. Residual inventory
What provisions will be included to require contractor drawdown of existing government inventory, including DLA managed items?

H–16. Data base access
What access will the contractor have to Army files?

H–17. Contractor performance
a. For consumables, do we expect all customer requisitions to be satisfied within a specified timeframe?

b. For reparables, do we want a guaranteed TAT or satisfaction of customer requisitions within a specified timeframe, or both?

c. As alternative, should “power by the hour” or overall aircraft or system availability be considered as the more effective contractor performance option?

H–18. Incentives/negative incentives
Will the contract carry provisions for incentives and/or negative incentives based upon performance to the stated terms and conditions?

H–19. Performance monitoring
What is the plan to monitor contractor performance once the contract is in place?

H–20. Electronic commerce/electronic data exchange
Will the contract capitalize on expanded use of electronic commerce/electronic data exchange to do business?

H–21. Cost/ benefit analysis
a. How are all costs captured, that is, DLA warehousing, receipt and issues, transportation, and so on? This information is essential to judging the cost effectiveness of the contractor's proposal.
b. Does the contractor's proposal reduce Army or DLA inventory? Does it reduce infrastructure costs?

H–22. Termination
a. What process is specified to require a minimum time frame to divert responsibility back to the Army, if the arrangement becomes noneffective for either party?
b. What data will the Army need to re-establish organic capability?

H–23. Response time
a. What are the specified parameters that the contractor must meet?
b. Are these parameters definitive so that performance can be measured?

H–24. Surge provisions
How does the contract address support requirements in the event that the Army's operational requirements accelerate?

H–25. Packaging, preservation, and marking
a. Will commercial standards replace military packaging?
b. How are plastics and hazardous material addressed?

H–26. Contract type
a. Is a contract type other than firm fixed price being contemplated?
b. Was higher level contracting officer review and approval obtained prior to proceeding?

H–27. Waivers required
Are waivers necessary? Who has approval authority?

H–28. Asset type (piece parts/reparables)
Does the contract address both types? Are there different guidelines for handling each type?

H–29. Pricing structure
a. Is the establishment of traditional unit prices the best way to approach alternate support contracts?
b. If not, what alternatives are available and which are most advantageous in this particular instance?

H–30. Payment structure
a. If unit prices are not the basis for payment, has there been an analysis of the effects a periodical payment structure will have on budget execution plans?
b. Has the use of commercial-type payment systems been examined for applicability?

H–31. Data rights
How does the contract address this when technology insertion is authorized? What happens under the "Escape" provision?

H–32. Competition
Is there sufficient supporting data available to obtain the appropriate justification and approval for other than full and open competition?

H–33. Transition planning
a. How are Army assets passed to the contractor?
b. If assets have been passed, how does the "escape clause" handle their return?

H–34. Over and above costs
a. How are over and above repair or warranty scenarios going to be defined, addressed and administered?
b. Are there going to be any other types of contract price adjustments?

H–35. Small Business Administration participation

a. Has the Small Business Administration and/or the activity small and disadvantaged business specialist been participating with the team during the acquisition planning phase of contract development?

b. Can small business subcontracting plans be adequately developed, negotiated and approved?

H–36. Defense Logistics Agency involvement—repair parts

Does the contract allow access to DLA inventory?

H–37. Joint service issues

Are other services participating? If so, all the above questions need to consider the impact of all the services involved.

Appendix I
Data and Tools Related to Integrated Logistics Support

I–1. Policy and guidance

The AMC LOGSA supports preparation of ILS regulations, pamphlets, and handbooks. See appendix A for Army and DOD publications.

I–2. Operations and support data

LOGSA manages myriad data on fielded systems. These data can be used by PM, ILSM, and SIPT members to conduct analyses for system sustainment and modification or for developing/acquiring new systems. Most of the data can be obtained through the LIDB, which includes—

a. Maintenance master data file.

b. Commander's readiness profiles.

c. Customized task force visibility.

d. LIDB maintenance module (in which BOIPFD and MARC data are housed).

e. Real-time visibility of class VII items.

f. ASL and PLL.

g. Access to asset authorizations.

h. Equipment onhand information.

i. Velocity management efficiency.

j. Order ship times.

k. Major item in transit information.

l. Parts location in the pipeline.

m. Identify parts deadlining systems.

n. Maintenance and supply cost drivers.

o. Division maintenance summaries for end items.

p. Usage data in miles and years.

q. Rapid DOD address activity code update.

r. Online equipment publications are also available:

(1) Electronic technical manuals.

(2) Online sets, kits, and outfits.

(3) Other equipment publications online.

I–3. ILS planning and analysis software tools

A variety of ILS planning and analysis tools are available from different vendors. There are also some government-owned logistics support planning and analysis tools which are available at no (or very low cost). Some of these software tools are described below. Table I–1 displays the life-cycle phases during which these tools can be used.

Table I–1
Acquisition logistics support tools for all life-cycle phases

Logistics support tools	Concept refinement and technology development phase	SDD phase	Production and deployment phase	Operations and support phase
LOGPARS	X	X	X	X
ASOAR	X	X		
CASA		X	X	X
COMPASS		X	X	X
ACEIT		X	X	X
powerLOG		X	X	X
SESAME		X	X	
PFSA			X	X
Transportability modeling	X			

a. Logistics Planning and Requirements System (LOGPARS).

(1) LOGPARS is a Web-based expert system for assisting PMs in preparation of integrated acquisition and supportability planning documentation for materiel systems and end items. The extensive knowledge base incorporates the latest policies and procedures, training information, lessons learned and expert knowledge and experience. Current LOGPARS modules include:

(a) Acquisition strategy.

(b) SS.

(c) MFP.

(d) ILS SOW; transportability report.

(e) ILS performance specification; provisioning plan.

(f) Warranty clause.

(2) LOGPARS is available at no cost. Information is available from USAMC LOGSA, AMXLS–AI, Redstone Arsenal, AL 35898–7466, phone (256) 955–9883, or www.logsa.army.mil/alc/logpars.

b. Achieving a system operational availability requirement (ASOAR).

(1) The ASOAR model allocates an optimum Ao for end items being acquired from a given system readiness goal. ASOAR can be used in early enough in the acquisition process (concept and technology demonstration and early SDD phases) to impact generation of design requirements. Inputs for individual LRUs are not required. Early-on reliability and supportability tradeoff analyses can also be conducted. The outputs of ASOAR may then be used for inputs into the COMPASS and SESAME models.

(2) Information on ASOAR is available from USA CECOM, Systems Analysis Division, Ft. Monmouth, NJ; phone (732) 532–8752.

c. Cost analysis strategy assessment (CASA) model.

(1) The CASA model is a life-cycle cost decision support tool. CASA can present the total cost of ownership including RDT&E costs, production costs, O&S costs, and maintenance and training costs.

(2) CASA can perform LCC estimates, tradeoff analyses, production rate and quantity analyses, warranty analyses, spares provisioning, resource projections, reliability growth analyses, spares optimization for readiness, and support cost by individual LRU analysis, and more.

(3) CASA is available at no cost. Information is available from USAMC LOGSA, AMXLS–AL, Redstone Arsenal, AL 35898–7466, phone (256) 955–9782, or www.logsa.army.mil/alc/casa.

d. COMPASS.

(1) COMPASS is a systemwide LORA model. A LORA determines the most economic maintenance repair level where removal and replacement or discard of items should take place. Several maintenance levels can be analyzed concurrently, including contractor repair as a separate level. COMPASS will optimize both maintenance and supply to achieve a stated Ao. COMPASS output data can be used in developing the maintenance allocation chart and SMR codes.

(2) Reimbursable COMPASS support and training are available. Information is available from USAMC LOGSA, AMXLS–AL, Redstone Arsenal, AL 35898–7466; phone (256) 955–9835/9838, or www.logsa.army.mil/lora.

e. ACEIT.

(1) ACEIT is an automated framework for cost estimating and other analysis tasks. This tool has been used for over a decade to standardize and simplify LCC estimating. ACEIT is a generic, flexible, Windows-based system which

consists of several software tools for the cost estimating community. Core features include a database to store technical and (normalized) cost data, statistical package to facilitate cost estimating relationship development and a spreadsheet that promotes structured model development. It also has built-in inflation, learning, time phasing, sensitivity, risk and other analysis capabilities.

(2) ACEIT is available for a fee.

f. powerLOG.

(1) The powerLOG is a logistics support data management system used for acquisition logistics data management. It is a PC-based, single-user, stand-alone data base management system that satisfies the MIL–STD 1388–2B and MIL–PRF–49506 LMI specifications. powerLOG replaces and enhances the popular personal computer logistics support analysis record system. It is designed to assist the Army, Navy, Air Force, Marine Corps, and other Government agencies and contractors in developing and integrating supportability analysis data.

(2) The powerLOG is available at no cost. Information is available from USAMC LOGSA, AMXLS–AL, Redstone Arsenal, AL 35898–7466, phone (256) 955–8471, or www.logsa.army.mil/alc/powerlog.

g. Visual SESAME.

(1) Visual SESAME is a PC-based, user friendly multi-echelon, multi-indenture inventory model that determines the optimal range and depth of spare and repair parts at all locations where the system is fielded in order to meet either a system budget constraint or an operational availability goal. It is the Army standard model for initial provisioning decisions.

(2) Visual SESAME is available at no cost. Information is available from AMSAA, AMXSY–L, Aberdeen Proving Ground, MD 21005–5071, phone (410) 278–2475.

h. PFSA.

(1) PFSA is a joint service re-engineering logistics initiative aimed at improving logistics support for fielded systems. By using current logistics data from the operation and support of systems, IPTs can make adjustments to the support structure and procedures to improve readiness. Program offices can use PFSA to optimize the support, minimize costs, identify the need for major modifications and improve baseline logistics systems for major new starts.

(2) Information is available from USAMC LOGSA, AMXLS–AL, Redstone Arsenal, AL 35898–7466; phone (256) 955–9810, or www.logsa.army.mil/alc/pfsa.

i. Simulation software products. Simulation software products of three-dimensional transportability modeling and analysis can significantly reduce transportability testing costs. Using a 3–D model of the acquisition end item in conjunction with MSDDC–TEAs many models of transporters, and transportation constraints, MSDDCTEA engineers can conduct static (no motion), kinematic (motion only), and dynamic (motion and forces applied) analyses to determine transportability restrictions. Information is available from MSDDC–TEA, SDTE–DPE, 720 Thimble Shoals Blvd. Suite 130, Newport News, VA 23606, or www.tea.army.mil/DPE/model.htm.

j. Improved performance research integration.

(1) This program is a dynamic, discrete event, network modeling tool designed to help assess the interaction of soldier and system performance throughout a system's lifecycle. Task-level data are used to represent operational and maintenance missions to support a broad range of decision support analyses.

(2) The model can be used in the determination of man-hour requirements by MOS, Department of Army civilians, and CLS. The tool can also be used to determine maintenance ratios and frequency distributions of crew size. It is available at no cost. Information is available from Army Research Laboratory (ARL), HRED, Aberdeen Proving Ground, MD21005, phone (410) 278–5883.

Glossary

Section I
Abbreviations

Aa
Achieved availability

AAE
Army acquisition executive

ABCA
American, British, Canadian, Australian

ACAT
Acquisition category

ACEIT
Automated cost estimating integrated tools

Ai
Inherent availability

AMC
U.S. Army Materiel Command

AMRD
Army modernization reference data

AMMH
Annual maintenance man-hours

ASIOE
Associated support items of equipment

ASOAR
Achieving a system operational availability requirement

Ao
Operational availability

AoA
Analysis of Alternatives

AOAP
Army Oil Analysis Program

APB
Acquisition program baseline

APS
Army prepositioned stock

AR
Army regulation

AS
Acquisition strategy

ASA(ALT)
Assistant Secretary of the Army for Acquisition, Logistics, and Technology

ASL
Authorized stockage list

ATE
Automated test equipment

ATEC
U.S. Army Test and Evaluation Command

ATS
Automatic test systems

ATSC
U.S. Army Training Support Center

BCA
Business case analysis

BCS
Baseline comparative system

BDAR
Battlefield damage assessment and repair

BII
Basic issue items

BSM
Basic sustainment material

BOIP
Basis of issue plan

BOIPFD
Basis of issue plan feeder data

CAGE
Commericial and Government entity

CAIV
Cost as an independent variable

Commercial/NDI
Commercial and nondevelopmental items

CASA
Cost analysis strategy assessment

CBM
Condition-based maintenance

CBTDEV
Combat developer, development

CD
Capabilities document

CDD
Capabilities development document

CLS
Contractor logistics support

CM
Configuration management

COE
Corps of Engineers

COMPASS
Computerized optimization model for predicting and analyzing support structures

CONUS
Continental United States

COTS
Commercial-off-the-shelf

CPD
Capability production document

CR
Concept refinement

CRLCMP
Computer resources life-cycle management plan

DA
Department of the Army

DASA(ILS)
Deputy Assistant Secretary of the Army for Integrated Logistics Support

DEP
Draft equipment publication

DCS, G–1
Deputy Chief of Staff, G–1

DCS, G–3
Deputy Chief of Staff, G–3

DCS, G–4
Deputy Chief of Staff, G–4

DLA
Defense Logistics Agency

DLM
Depot-level maintenance

DLR
Depot-level reparable

DMI
Depot maintenance interservice

DMISA
Depot maintenance interservice support agreement

DMS
Depot maintenance study

DMSP
Depot maintenance support plan

DMWR
Depot maintenance work requirement

DOD
Department of Defense

DODD
Department of Defense Directive

DODI
Department of Defense Instruction

DPAMMH
Direct productive annual maintenance man-hours

DS
Direct support

DT&E
Developmental test and evaluation

EA
Executive agent

ECP
Engineering change proposal

EDI
Electronic data exchange

EOD
Explosive ordnance disposal

ESOH
Environmental, safety, and occupational health

FC
Fielding command

FMC
Fully mission capable

FUED
First unit equipped date

FY
Fiscal year

FYDP
Future Years Defense Program

GFM
Government-furnished materiel

GS
General support

GSA
General Services Administration

HFE
Human factors engineering

HNS
Host nation support

HQ
Headquarters

ICD
Interconnecting device

ICS
Interim contractor support

ICT
Integrated concept team

ILS
Integrated logistics support

ILSM
ILS manager

IOC
Initial operational capability

IPE
Industrial plant equipment

IPT
Integrated process/product teams

JCIDS
Joint Capabilities Integration and Development System

JMOA
Joint memorandum of agreement

JSS
Joint Supportability Strategy

LCC
Life-cycle cost

LCCS
Life-cycle contractor support

LCMC
Life-Cycle Management Command

LD
Logistics demonstration

LIDB
Logistics integrated data base

LIN
Line item number

LLRC
Long-life reusable container

LMI
Logistics management information

LOGPARS
Logistics Planning and Requirements System

LOGSA
USAMC Logistics Support Activity

LORA
Level of repair analysis

LRU
Line replaceable unit

M&S
Modeling and simulation

MACOM
Major Army command

MANPRINT
Manpower and personnel integration

MAMDT
Mean active maintenance downtime

MARC
Manpower requirements criteria

MATDEV
Materiel developer, development

MCA
Military Construction, Army

MCAR
Military Construction, Army Reserve

MDA
Milestone decision authority

MDR
Milestone decision review

MFA
Materiel fielding agreement

MFP
Materiel fielding plan

MHE
Material handling equipment

MI
Market investigation

MOA
Memorandum of agreement

MOS
Military occupational specialty

MPA
Military Personnel, Army

MPT
Manpower, personnel, and training

MR
Maintenance ratio

MSDDC
Military Surface Deployment and Distribution Command

MSDDC–TEA
Military Surface Deployment and Distribution Command–Transportation Engineering Agency

MTBF
Mean time between failures

MTBM
Mean time between maintenance

MTBMA
Mean time between maintenance actions

MTBPM
Mean time between preventative maintenance

MTOE
Table of organization and equipment

MTPM
Mean time to perform preventive maintenance

MTS
Modernization thru spares

MTTR
Mean time to repair

NATO
North Atlantic Treaty Organization

NBC
Nuclear , biological, and chemical

NC
Number of corrective maintenance actions

NDI
Nondevelopmental item

NEOF
No evidence of failure

NET
New equipment training

NETP
New equipment training plan

NP
Number of preventative maintenance actions

NSN
National Stock Number

O&S
Operations and support

OCE
Office of the Chief of Engineers

OCONUS
Outside the continental United States

ODCS, G–1
Office of the Deputy Chief of Staff, G–1

ODCS, G–3
Office of the Deputy Chief of Staff, G–3

ODCS, G–4
Officer of the Chief of Staff, G–4

OIPT
Overarching IPT

OMA
Operation and Maintenance, Army

OSCR
Operating and support cost reduction

OT&E
Operational test and evaluation

Pam
Pamphlet

PBA
Performance-based agreement

PBL
Performance-based logistics

PCB
Printed circuit board

PCE
Program cost estimate

PDOS
Production, deployment, operations, and support

PEO
Program executive office, officer

PESHE
Programmatic Environment Safety and Occupational Health Evaluation

PFSA
Post-fielding support analysis

PHS&T
Packaging, handling, storage and transportation

PLL
Prescribed load list

PM
Program/project/product manager

PME
Precision measuring equipment

PMR
Provisioning master record

POC
Point of contact

POL
Petroleum, oils and lubricants

POM
Program objective memorandum

PP
Provisioning plan

PPS
Post-production support

PPSS
Post-production software support

PSE
Peculiar support equipment

PSI
Product support integrator

PSP
Product support provider

R&M
Reliability and maintainability

RAM
Reliability, availability, and maintainability

RDT&E
Research, development, test, and evaluation

RFP
Request for proposal

RPB
Recapitalization program baseline

RST
Retrograde shipping time

S&I
Standardization and interoperability

SA
Supportability analysis

SDD
System development and demonstration

SESAME
Selected essential items stockage for availability method

SFA
Support facility annex

SIPT
Supportability IPT

SMA–OSCR
Supply management Army-operating and support cost reduction

SMR
Supply, maintenance, and recoverability code

SOO
Statement of objectives

SOW
Statement of work

SRO
System readiness objective

SRU
Shop replaceable unit

SS
Supportability strategy

SSP
System support package

STAMIS
Standard Army Management Information System

STE
Special test equipment

STP
Software transition plan

STRAP
System training plan

STRI
Simulation, training, and instrumentation

T&E
Test and evaluation

TAT
Turnaround time

TC
Type classification

TD
Technology development

TDA
Tables of distribution and allowances

TDP
Technical data package

TDS
Technology development strategy

TEMP
Test and evaluation master plan

TEMPEST
Telecommunications electronics material protected from emanating spurious transmissions

TI
Technology insertion

TLCSM
Total life-cycle systems management, manager

TM
Technical manual

TMDE
Test, measurement, and diagnostic equipment

TNGDEV
Training developer

TOE
Table of organization and equipment

TPF
Total package fielding

TPS
Test program set

TR
Transportability report

TRADOC
U.S. Army Training and Doctrine Command

TSC
Training support center

USF
Unit set fielding

UUT
Unit under test

USAFMSA
U.S. Army Force Management Support Agency

WBS
Work breakdown structure

WIPT
Working-level integrated product team

Section II
Terms
This section contains no entries.

Section III
Special Abbreviations and Terms
This section contains no entries.