

THE LIFE CYCLE MODEL

1. Introduction. The life cycle model is the basis for understanding how Army systems are conceived, developed, tested, produced and fielded. These actions comprise the materiel acquisition process. Materiel acquisition is one of the most difficult and complex tasks facing the Department of Defense. Materiel acquisition's complexity is summarized by determining what military equipment and in what quantity is needed to neutralize a future threat to our national security. This includes:

- a. Determining what nation or organization will pose a future threat to the United States' national interest.
- b. Accurately projecting technological advances by our own industry, our allies, and potential enemies.
- c. Obtaining national resolve to provide adequate manpower and funding for defense projects. This task is even more difficult during times of relative peace when other important national programs compete with the military for Congressional funding. Program managers must continually battle for adequate resources throughout the materiel acquisition process.

2. Objectives. At the conclusion of this unit of instruction, you should be able to:

- a. Recite the two purposes of the life cycle model, how this model was created, non-materiel alternatives to initiating a materiel program, and the two commonly accepted reasons for starting a materiel program.
- b. Describe the principal materiel acquisition roles of the materiel developer, combat developer, tester, and program manager in the Army's system acquisition process.
- c. Discuss the objectives (sometimes referred to as scope or purpose) of each life cycle phase.
- d. Explain the purpose of milestone decision reviews and the criteria for assigning management oversight to a given program.

NOTE:

- Definitions of selected terms are in Appendix A.
- Milestone decision review boards are in Appendix B.
- References are listed in Appendix C.
- Appendix D is a diagram of the life cycle model.

3. What are the two purposes of the life cycle model? The life cycle model is a:

a. Master project planning tool used for checking the completeness of the program planning efforts. The program manager will develop an overall strategy. This strategy identifies critical events that must occur prior to fielding the eventual system. Each critical event must be completed as the program moves toward its fielding date.

b. Formal display of the critical program events from which subordinate events and processes are derived. Once the program manager has identified the critical events, functional experts will identify subordinate events and processes that support or implement the critical program events.

4. Before the Life Cycle Model Begins.

a. The Training and Doctrine Command (TRADOC) is responsible for preparing the Army for both present and future battles. TRADOC, the Army's primary combat developer (CBTDEV), uses the requirements determination process as its principal tool. Requirements determination provides the focus for developing doctrine, force design, training programs or identifying requirements for materiel. Requirements determination ensures a shared vision within the Army, identifies only critical future capabilities, speeds up the acquisition process, and guides science and technology investment and developmental efforts.

b. Non-materiel solutions. We first consider non-materiel alternatives before settling upon a materiel solution because (a) non-materiel alternatives are generally cheaper to implement and (b) they can be implemented faster. The Army has designated five options under the 'non-materiel alternative' umbrella. They are: (1) Doctrine, (2) Training, (3) Leader Development, (4) Organization and (5) Soldiers. These non-materiel alternatives must be addressed, analyzed and discarded before proposing a materiel solution. Additionally, acquiring a new materiel system may, in turn, affect one or more of the non-materiel alternatives. For example, a new, longer ranging artillery system could change both Army doctrine and training.

c. Materiel solutions. When the Army determines a materiel solution is required, a Mission Need Statement (MNS) is prepared. The MNS is a non-system-specific statement of operational capability need written in broad operational terms. The document should be no longer than five pages. It is sent to the Joint Requirements Oversight Council for their (1) approval and (2) recommendation on joint potential designator and the lead Service. Afterwards, the MNS will be forwarded to the Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) for consideration during the Defense Acquisition Board (DAB), or to the ASD (C3I) for consideration during the DoD Chief Information Officer (CIO) review.

d. There are two valid reasons for initiating a new acquisition program.

(1) Adopting new technology. As new technology is made available, the Army assesses this technology to determine its utility. We do not adopt technology just to have the "latest and greatest." We adopt technology to: (a) increase our combat capabilities, (b) increase system reliability, (c) reduce maintenance requirements or (d) reduce procurement cost. Examples are: Adopting very high speed integrated circuits (VHSIC) in military electronics equipment, using

personal computers for parts inventory, incorporating an automatic loader in an armored gun system, buying commercial items in lieu of designing unique military items, and printing technical manuals on compact discs.

(2) Reacting to a projected threat is the second valid reason for starting a materiel program. During the Cold War era (1950s through 1980s), most DoD equipment was designed to counter Soviet military equipment. The reasoning was, “If it defeats the Soviet threat, it will be adequate against any threat to the United States.” Examples of Cold War-era systems are: Trident submarine, B-1 bomber, Pershing II missile, M-1 tank and F-15 fighter. Since the breakup of the Soviet Union and the dissolution of the Warsaw Pact, the Department of Defense has a more difficult time defining threat. Using threat as justification for a new materiel system has become more challenging due to the wide diversity of threat. Unfortunately, the world is not at peace.

(a) Today, there are numerous conflicts being waged throughout the world, any of which the United States could find itself directly involved in an active role.

(b) A number of countries are performing advanced military research and development. New and more capable aircraft, tanks, missiles, submarines and other systems are being developed which may be used to bolster their own military capabilities or sold to nations or criminal organizations¹ unfriendly to the United States or our allies.

(c) Countries are finding it easier to incorporate newer technology into their existing weapons. In any future conflict, American forces can expect to confront an enemy with sophisticated weapons.

5. Milestone A. Approval to Enter the Concept and Technology Development Phase.

a. Milestone A approval can lead to Concept Exploration or Component Advanced Development depending on whether an evaluation of multiple concepts is desired or if a concept has been chosen, but more work is needed on key sub-systems or components before a system architecture can be determined and the technologies can be demonstrated in a relevant environment.

b. After the MNS has been validated and approved, the milestone decision authority (through an integrated process team) will review the MNS, consider possible technology issues (e.g., technologies demonstrated in advanced technology demonstrations), and identify possible alternatives before making a Milestone A decision, based on an analysis of multiple concepts to be studied, and considering cooperative opportunities. At Milestone A, the milestone decision authority approves the initiation of concept studies, designates a lead Component (e.g., Army), approves Concept and Technology Development exit criteria, and issues the Acquisition Decision Memorandum (ADM). The leader of the concept development team, working with the integrated test team, writes an evaluation strategy that describes how the capabilities in the MNS will be evaluated once the system is developed. That evaluation strategy is approved by the

¹Criminal organizations include terrorist groups and drug cartels.

Director of Operational Test and Evaluation (DOT&E) and the cognizant Overarching Integrated Product Team leader 180 days after Milestone A approval. A favorable Milestone A decision does not yet mean that a new acquisition program has been initiated.

6. Concept and Technology Development Phase. This phase is divided into two major efforts, Concept Exploration and Component Advanced Development.

a. One path into systems acquisition begins with examining alternative concepts to meet a stated mission need. This path begins with a decision to enter Concept and Technology Development at Milestone A. The phase ends with a selection of system architecture(s) and completing the entrance criteria into Milestone B and System Development and Demonstration Phase.

b. Concept Exploration typically consists of competitive, parallel, short-term concept studies. The focus of these efforts is to define and evaluate the feasibility of alternative concepts and to provide a basis for assessing the relative merits (e.g., advantages and disadvantages, degree of risk, etc.) of these concepts. Analyses of alternatives are used to facilitate comparisons of alternative concepts.

c. Appoint an Integrated Concept Team (ICT). While the Navy and Air Force may appoint a program manager at Milestone A, the Army prefers to wait until it is clear that an acquisition program is likely before appointing a program manager. TRADOC normally assembles an integrated concept team to lead the exploratory efforts during the Concept and Technology Development Phase. Appendix B contains a listing of potential integrated concept team members. After the materiel need has been thoroughly analyzed and a system solution identified, a program manager will be appointed. Afterwards, the ICT will be disbanded.

d. Award a development contract. Soliciting ideas from industry is an integral part of performing conceptual studies. "Applied research means effort that translates promising basic research into solutions for broadly defined military needs, short of major development projects. This type of effort may vary from fairly fundamental applied research to sophisticated breadboard hardware, study, programming, and planning efforts that establish the initial feasibility and practicality of proposed solutions to technological challenges. It includes studies, investigations, and non-system specific development efforts. The dominant characteristic of this category of effort is that it be pointed toward specific military needs with a view toward developing and evaluating the feasibility and practicability of proposed solutions and determining their parameters."²

e. The most promising system concepts are defined in terms of: (1) initial, broad objectives for cost, schedule, and performance; (2) identifying interoperability, security, technology protection, operational support, and infrastructure requirements within a family of systems; (3) opportunities for tradeoffs, and an overall acquisition strategy and a test and evaluation strategy.

²DFARS, Part 235, Research and Development Contracting.

f. Analysis of Alternatives (AoA). An AoA is evaluating operational effectiveness and estimating costs of alternative material systems to meet a mission need. The analysis assesses the advantages and disadvantages of alternatives being considered to satisfy requirements, to include the sensitivity of each alternative to possible changes in key assumptions or variables. The AoA assists decision makers in selecting the most cost-effective material alternative to satisfy a mission need. Training and Doctrine Command (TRADOC) normally conducts an AoA to assist the Milestone Decision Authority (MDA) determine whether any of the proposed alternatives to an existing system offer sufficient military or economic benefit to warrant a new program start. The MDA may direct updates to the AoA for subsequent decision points, if needed.

g. Threat support. “The purpose of threat support programs is to ensure that force, concepts, doctrine, training, organization, and materiel systems most effectively and efficiently respond to the evolving threat environment. Threat support must be timely, consistent, and continuous to achieve this purpose.

(1) Army analyses use computerized combat simulations. These analyses are used to evaluate capabilities and determine user and resource requirements.

(2) The System Threat Assessment Report (STAR) summarizes the approved threat provided to combat and materiel developers for a specific acquisition category (ACAT) I or II system. It provides an assessment of the capabilities of potential adversaries, as addressed in the MNS, and their ability to neutralize or degrade a specific U.S. systems or system concepts. It is the primary threat reference to be used in preparing threat portions of the Operational Requirements document (ORD) and Test and Evaluation Management Plan (TEMP).

(3) From the beginning of the acquisition process through Milestone Decision Review (MDR) B, the combat developer is responsible for STAR preparation; thereafter, it becomes the responsibility of the materiel developer.”³

h. Prepare an acquisition strategy. A program manager (or integrated concept team) develops and writes an acquisition strategy that serves as the roadmap for program execution from program initiation through post-production support. A primary goal is to minimize the time and cost of satisfying an identified, validated need, consistent with common sense and sound business practices. The acquisition strategy evolves through an iterative process and becomes increasingly more definitive in describing the relationship of the essential elements of a program. Essential elements in this context include, but are not limited to, open systems, sources, risk management, cost as an independent variable, contract approach, management approach, environmental considerations, modeling and simulation approach, warranty considerations, and source of support. The PM also addresses other major initiatives that are critical to the success of the program.⁴

i. Life cycle cost estimate is prepared. A life cycle cost estimate is prepared by the program office for all acquisition category (ACAT) 1 and 1A programs to support program initiation

³AR 381-11, Threat Support to U.S. Army Force, Combat and Materiel Development.

⁴DoDI 5000.2

(usually Milestone B). For all ACAT 1D programs and selected ACAT 1C programs, the DoD Cost Analysis Improvement Group (CAIG) prepares an independent life cycle cost estimate for the milestone decision authority at milestone reviews B and C. For programs with significant cost risk or high visibility, the Army Acquisition Executive may request that an Army cost analysis estimate be prepared in addition to the program office's life cycle cost estimate.

j. Initiate logistics planning. Integrated logistics support (ILS) planning activities must coincide with the development of the acquisition strategy, and the program is tailored accordingly. Infinite variations exist which mandate alternative approaches. However, the key objective of the ILS program, providing an effective support structure at the time of fielding, does not change.

(1) Supportability Strategy (Formerly ILSP). The Supportability Strategy is a Government prepared working document that defines the complete ILS strategy for a materiel system.

(2) The initial Supportability Strategy will be prepared by the MATDEV and coordinated with the CBTDEV, materiel command, logistician, the technical and operational evaluators, and other program participants. The Supportability Strategy will be available 60 days prior to Milestone B. The supportability strategy is updated when new program direction is received.

(3) A Supportability Strategy is not required for: (a) Re-procurement of systems for which a Supportability Strategy has been previously developed and is still current except when there is a new make, model, or manufacturer. (b) Engineering change proposals resulting in modification work orders that do not change system configuration. (c) Components having a minor logistic impact.

k. Initiate the System MANPRINT Management Plan (SMMP). Manpower and Personnel Integration (MANPRINT) is the Army's application of the DOD Human System Integration (HSI) requirements in systems acquisition. This is the Army's program to ensure that the "human" is fully and continuously considered in the development and acquisition of all systems and that human performance is always considered as part of total system performance.

l. Manpower estimates are prepared. The Army's manpower authority prepares a manpower estimate for ACAT 1 programs prior to Milestone B. For ACAT 1 programs, the milestone decision authority may not approve entry into a subsequent life cycle phase unless independent estimators have completed a full life-cycle cost and a manpower estimate for the program.

m. Interim milestone decision review. During Concept Exploration, the MDA may hold a decision review to determine if additional component development is necessary before key technologies will be sufficiently mature to enter System Development and Demonstration for one of the concepts under consideration. If the concepts do not require technologies necessitating additional component development, the appropriate milestone (B or C) shall be held in place of this review. The practical result of a preference for more mature technology is initiating individual programs at later stages of development, after determining technology maturity. As a consequence, most major defense acquisition programs will be initiated at Milestone B. On the rare occasions when an earlier program initiation is appropriate, it will take place at entry to or

during Component Advanced Development. At program initiation in advance of Milestone B, the MDA shall approve the (1) acquisition strategy, (2) acquisition program baseline, (3) information technology certification for Major Automated Information Systems, and (4) exit criteria for the Component Advanced Development work effort if not already established.

n. Component Advanced Development. The project enters Component Advanced Development when the project leader has a concept for the needed capability, but does not yet know the system architecture. Unless otherwise determined by the MDA, the component technology to be developed shall have been proven in concept.

o. Component development contracts may be awarded. "Advanced technology development is system specific (particularly for major platforms, i.e., aircraft, ships, missiles, and tanks, etc.) and includes advanced technology development that is used to demonstrate the general military utility or cost reduction potential of technology when applied to different types of military equipment or techniques. Advanced technology development also includes evaluation and synthetic environment and proof-of-principle demonstrations in field exercises to evaluate system upgrades or provide new operational capabilities."

p. The project exits Component Advanced Development when system architecture has been developed and the component technology has been demonstrated in the relevant environment or the milestone decision authority decides to end this effort. This effort is intended to reduce risk on components and subsystems that have only been demonstrated in a laboratory environment and to determine the appropriate set of subsystems to be integrated into a full system. This work effort normally will be funded only for the advanced development work.

q. Work effort will be guided by the validated MNS, but during this activity, an ORD is developed to support program initiation. Also, acquisition information necessary for a milestone decision (e.g., the acquisition strategy, program protection plan, etc.) is developed. Component Advanced Development is normally followed by entry into the System Development and Demonstration phase after a Milestone B decision by the milestone decision authority.

r. Prepare the Operational Requirements Document (ORD). The ORD is a formatted statement containing performance and related operational parameters for the proposed concept or system. It is prepared or updated by the user or user's representative at each milestone beginning with Milestone B.

s. Test planning is initiated. Test and evaluation planning begins during the Concept and Technology Development Phase. Both developmental and operational testers are involved early to ensure that the test program for the most promising alternative can support the acquisition strategy and to ensure the harmonization of objectives, thresholds, and measures of effectiveness (MOE) in the Operational Requirements document (ORD) and Test and Evaluation Management Plan (TEMP). Test and evaluation planning addresses: (1) MOE and measures of performance (MOP) with appropriate quantitative criteria, (2) test event or scenario descriptions, (3) resource requirements (e.g., special instrumentation, test articles, validated threat targets, validated threat simulators and validated threat simulations, actual threat systems or surrogates, and personnel), and (4) identifies test limitations.

t. Prepare the Acquisition Program Baseline. Every acquisition program has an Acquisition Program Baseline (APB) to document the cost, schedule, and performance objectives and thresholds of that program beginning at program initiation (Milestone B). Performance includes supportability and, as applicable, environmental requirements.

(1) The PM, in coordination with the user, prepares the Acquisition Program Baseline at program initiation. It is updated at each subsequent major milestone decision and following a program restructure or an unrecoverable program deviation. The milestone decision authority approves the Acquisition Program Baseline.

(2) The APB contains only the most important cost, schedule, and performance parameters. The most important parameters are “thresholds” that, if not met, the milestone decision authority would require a re-evaluation of alternative concepts or design approaches. The total number of cost, schedule, and performance parameters in an APB is limited. The parameters are:

(a) Performance. The detail and number of performance parameters evolve as the program is better defined. At Milestone B, performance parameters are defined in broad terms. Measures of effectiveness or measures of performance are used in describing needed capabilities early in a program. More specific program parameters are added to the APB as the program requirements become better defined. The total number of performance parameters is the minimum number needed to characterize operational effectiveness and suitability, schedule, technical progress, and cost. This minimum number includes the key performance parameters described in the ORD and validated by the JROC.

(b) Schedule. The schedule parameters include program initiation, major milestone decision points, initial operating capability, and any other critical system events. These critical events are proposed by the PM and approved by the milestone decision authority for each program.

(c) Cost. The cost parameters are limited to Research, Development, Test and Evaluation (RDT&E) costs; procurement costs; military construction costs; the costs of acquisition items procured with operations and maintenance funds, if applicable; total quantity (to include both fully configured development and production units); average unit procurement cost (defined as the total procurement cost divided by total procurement quantity); program acquisition unit cost (defined as the total of all acquisition related appropriations divided by the total quantity of fully configured end items); and any other cost objectives designated by the MDA, (e.g., life-cycle cost objective); all in base year dollars. As the program progresses through later acquisition phases, procurement costs shall be refined based on contractor actual (or return) costs from program definition and risk reduction, engineering and manufacturing development, or from initial production lots. In all cases, the cost parameters reflect the total program and are realistic cost estimates, based on a careful risk assessment and realistic appraisals of the level of most likely costs. The amount budgeted shall not exceed the total cost threshold estimated in the APB. For ACAT 1A programs, the ACAT 1 cost parameters apply, with the addition of military pay and the costs of acquisition items procured with Defense Working Capital Funds (DWCF).

7. Milestone B: Approval to Begin a New Acquisition Program. Milestone B is normally the initiation of an acquisition program. The purpose of Milestone B is to authorize entry into System Development and Demonstration. The Army should have completed its analysis and documented its findings in preparation for a program initiation decision at Milestone B. The milestone decision authority (MDA) may direct updates to the analysis for subsequent decision points, if conditions warrant.

a. Milestone B approval can lead to System Integration or System Demonstration. Regardless of the approach recommended, the program manager will continually assess program risks. Risks must be well understood, and risk management approaches developed, before milestone decision authorities can authorize a program to proceed into the next phase of the acquisition process. Risk management is an organized method of identifying and measuring risk and developing, selecting, and managing options for handling these risks. The types of risk include, but are not limited to, schedule, cost, technical feasibility, risk of technical obsolescence, software management, dependencies between a new program and other programs, and risk of creating a monopoly for future procurements.

b. At each milestone review, the milestone decision authority assesses the opportunities for cooperative development or procurement. The MDA makes this assessment based on whether or not a project or program similar to the one under consideration is in development or production by one or more major allies or NATO organizations; if such a project or program exists, determines if that project could satisfy, or be modified in scope to satisfy, U.S. military requirements; and assesses the advantages and disadvantages with regard to program timing, developmental and life-cycle costs, technology sharing, and interoperability with one or more major allies or NATO organizations.

c. At Milestone B the MDA confirms the acquisition strategy approved prior to release of the final Request for Proposal and approves the development acquisition program baseline, low-rate initial production quantities (where applicable), and System Development and Demonstration exit criteria.

d. The DOT&E and the Overarching Integrated Product Team Leader approve the Test and Evaluation Master Plan (TEMP) (including live fire test and evaluation (LFT&E) strategy, if applicable) for all OSD test and evaluation oversight programs. If full-up, system-level LFT&E is unreasonably expensive and impractical, a waiver is approved by the USD (AT&L), for ACAT 1D programs, or by the ASA (ALT), for programs where he is the MDA. An alternative LFT&E plan is approved by the DOT&E before entry into System Development and Demonstration.

e. For major acquisition programs, a revised Selected Acquisition Report is submitted at the Milestone B. All new information technology (IT) acquisition programs are registered with the DoD CIO before Milestone B approval.

f. The acquisition strategy defines not only the approach to be followed in System Development and Demonstration, but also how the program is structured to achieve full capability. There are two such approaches, evolutionary and single step to full capability. An evolutionary approach is preferred because it fields an operationally useful and supportable

capability in the shortest time. Evolutionary acquisition delivers an initial capability with the explicit intent of delivering improved or updated capability in the future.

g. Army Systems Acquisition Review Council (ASARC). “The ASARC is the Army's senior-level review body for acquisition categories 1 and 2 programs. The ASARC is convened at formal milestones to determine a program or system's readiness to enter the next phase in the materiel acquisition cycle, and make recommendations to the Army Acquisition Executive (AAE) on those programs for which the AAE is the MDA. An ASARC may also be convened at any time to review the status of a program. ACAT 1D programs are subsequently reviewed by the Defense Acquisition Board (DAB). The ASARC is co-chaired by the AAE and VCSA.”⁵

8. System Development and Demonstration Phase.

a. The purpose of the System Development and Demonstration phase is to (1) develop a system, (2) reduce program risk, (3) ensure operational supportability, (4) design for producibility, (5) assure affordability, and (6) demonstrate system integration, interoperability, and utility. Discovery and development are aided by using simulation-based acquisition and test and evaluation and guided by an Acquisition Strategy and Test and Evaluation Master Plan (TEMP). System modeling, simulation, test, and evaluation activities are integrated into an efficient continuum that is planned and executed by a test and evaluation integrated product team (T&E IPT). This continuum features coordinated test events, access to all test data by involved agencies, and independently evaluating test results. The PM or a designated test agency are responsible for modeling, simulation, and development testing. Results of early operational assessments are reported to the Chief of Staff, Army (CSA) by the appropriate operational test activity and used by the MDA in supporting decisions. The Operational Test and Evaluation Command (OPTEC) independently plans, executes and evaluates Initial Operational Test and Evaluation (IOT&E), as required by law, and Follow-on Operational Test and Evaluation (FOT&E), if required.

b. This phase can be entered either directly out of technology opportunity and user need activities or from Concept Exploration. The actual entry point depends on the maturity of the technologies, validated requirements (including urgency of need), and affordability. The MDA determines the appropriate entrance point, which shall be Milestone B. There is only one Milestone B per program, or evolutionary block.

c. Transitioning into System Development and Demonstration also requires full funding (i.e., inclusion in the budget and out-year program of the funding for all current and future efforts necessary to carry out the acquisition strategy), which is programmed when a system concept and design have been selected, a PM has been assigned, the ORD approved, and system-level development is ready to begin. In the case of a replacement platform, when its Milestone B is projected to occur in the first two years of the FYDP under review, the program shall be fully funded in that PPBS cycle. Full funding decisions are never made later than Milestone B, unless a program enters the acquisition process at Milestone C.

⁵ AR 70-1.

d. System Integration. The program enters System Integration when the PM has system architecture, but has not yet integrated the subsystems into a complete system. The program exits System Integration when system integration has been demonstrated in a relevant environment using prototypes (e.g., first flight, interoperable data flow across systems), a system configuration has been documented, the milestone decision authority determines a factor other than technology justifies forward progress, or the MDA decides to end this effort. System Integration is intended to integrate the subsystems and reduce system-level risk. The work effort will be guided by a validated ORD. System Integration will be followed by System Demonstration after a successful Interim Progress Review by the milestone decision authority or designee.

e. Award a system development contract. This contract should:

(1) Demonstrate the general military utility or cost reduction potential of technology when applied to different types of military equipment or techniques.

(2) Evaluate and conduct proof-of-principle demonstrations in field exercises of system upgrades or provide new operational capabilities.

(3) Evaluate integrated technologies in as realistic an operating environment as possible to assess the performance or cost reduction potential of advanced technology.

f. The system development contract is system specific and may include advanced technology demonstrations that help expedite technology transition from the laboratory to operational use.

g. Software development. The nature of software-intensive system development, characterized by a spiral build-test-fix-test-deploy process, may lend itself to combined system integration and system demonstration, rather than serial efforts more typical of hardware-intensive systems.

h. Interim Progress Review conducted. The purpose of an interim progress review is to confirm that the program is progressing within the phase as planned or to adjust the plan to better accommodate progress made to date, changed circumstances, or both. If the adjustment involves changing the acquisition strategy, the change must be approved by the MDA. There is no required information needed for this review other than the information specifically requested by the decision-maker.

i. The program enters System Demonstration when the PM has demonstrated the system in prototype articles. This effort is intended to demonstrate the ability of the system to operate in a useful way consistent with the validated ORD. This phase ends when a system is demonstrated in its intended environment, using engineering development models or integrated commercial items, meets validated requirements; industrial capabilities are reasonably available; and the system meets or exceeds exit criteria and Milestone C entrance requirements. Modeling and simulation is the primary method for assessing product maturity where proven capabilities exist. Testing should be used to validate modeling and simulation results. Completing this phase is

dependent on a decision by the milestone decision authority to commit to the program at Milestone C or a decision to end this effort.

j. In a single step to full capability approach, the full system capability is developed and demonstrated prior to Milestone C. Under this approach, any modification that is of sufficient cost and complexity that it could itself qualify as a major defense acquisition program or major automated information system shall be considered for management purposes as a separate acquisition effort. Modifications that do not cross the major defense acquisition program or major automated information system threshold are considered part of the program being modified, unless the program is no longer in production. In that case, the modification is considered a separate acquisition effort. Modifications may cause a program baseline deviation.

k. Initiating the Materiel Fielding Process. “Materiel fielding is the process of planning, coordinating, and executing the deployment of a materiel system and its support. Advance planning, coordination, and agreement between the materiel developer and the gaining MACOM characterize materiel fielding. Materiel fielding is designed to achieve an orderly and satisfactory deployment of a materiel system and its initial support, beginning with the first unit equipped (FUE) and extending until initial deployment to all units is complete.”⁶ A Materiel Fielding Plan (MFP) is drafted during the System Development and Demonstration Phase.

l. Initiating provisioning. Provisioning is defined as, “Determining the range and quantity of support items needed to sustain a system for an initial period.” Sophisticated calculations are made which predict the rate of parts consumption. Long lead items (LLI) are sometimes purchased in advance of the production contract award in order to assure the availability of parts when the weapons systems are eventually deployed. Other support items will be purchased and delivered after the weapon system production contract is awarded.

m. The materiel developer finalizes the Qualitative and Quantitative Personnel Requirements Information (QQPRI) and the Basis of Issue Plan Feeder Data (BOIPFD). These documents describe the number of end items per unit and the number and skill levels of personnel required to operate and maintain the new weapon system. Both documents are then given to the combat developer who will prepare the final Basis of Issue Plan (BOIP). This document provides vital information used in developing the Table of Organization and Equipment (TOE). All Army field units have a Table of Organization and Equipment. This document is modified and subsequently used as a requisitioning document. That is, Modified Table of Organization and Equipment (MTOE) authorize Army field units’ equipment and personnel.

9. Milestone C. Approval to Enter Production and Deployment Phase. The purpose of this milestone decision review is to (a) authorize entry into low-rate initial production for major systems, (b) into production or procurement (for non-major systems that do not require low-rate production) or (c) into limited deployment for MAIS or software-intensive systems with no production components. Regardless of the program’s entry point, approval at Milestone C is dependent on the following criteria being met:

⁶ AR 700-142, Logistics Materiel Release, Fielding and Transfer.

a. Technology maturity (with an independent technology readiness assessment), system and relevant mission area (operational) architectures, mature software capability, demonstrated system integration or demonstrated commercial products in a relevant environment, and no significant manufacturing risks.

b. An approved Operational Requirements Document (ORD).

c. Acceptable interoperability.

d. Acceptable operational supportability.

e. Compliance with the DoD Strategic Plan.

f. Demonstration that the system is affordable throughout the life cycle, optimally funded, and properly phased for rapid acquisition.

g. Acceptable information assurance to include information assurance detection and recovery.

h. A system must be demonstrated before DoD will commit to production (or procurement) and deployment. For DOT&E Oversight programs, a system cannot be produced at full-rate until a Beyond Low-Rate Initial Production Report has been completed and sent to Congress, the Secretary of Defense, and the USD (AT&L). The MDA shall make the commitment decision at Milestone C. Milestone C can be reached directly from pre-systems acquisition (e.g., a commercial product) or from System Development and Demonstration phase.

i. Milestone approval considerations.

(1) Prior to making the milestone decision, the MDA shall consider the (a) independent cost estimate, and, for major automated information systems, the component cost analysis and economic analysis, (b) the manpower estimate, (c) compliance with the Clinger-Cohen Act, (d) whether an application for frequency allocation has been approved (for systems that require the electromagnetic spectrum), (e) System Threat Assessment, (f) and an established completion schedule for National Environmental Policy Act (NEPA) compliance covering testing, training, basing, and operational support.

(2) The milestone decision authority approves the acquisition strategy prior to releasing the final Request for Proposal and approves an updated development acquisition program baseline, exit criteria for low-rate initial production (if needed) or limited deployment, and the acquisition decision memorandum.

(3) The DOT&E and OIPT Leader approve the TEMP for all OSD test and evaluation oversight programs. IT acquisition programs (regardless of acquisition category) that entered system acquisition at Milestone C shall be registered with the DoD CIO before Milestone C approval. For major programs, a milestone decision creates the need for submitting a revised Selected Acquisition Report.

(4) A favorable Milestone C decision authorizes the PM to commence low rate initial production (LRIP) or limited deployment for major programs and major systems. The PM is only authorized to commence full-rate production with further approval of the MDA. There is normally no more than one decision (i.e. either low-rate or full-rate) at the DAE-level for major programs.

(5) Type classification. Type Classification (TC) is the process through which the MATDEV identifies the degree of acceptability of a materiel item for Army use. Type classification provides a guide to authorization, procurement, logistical support, and asset and readiness reporting. Type classification is an integral part of the process leading up to the Milestone C production approval and eventual fielding of the item. Type classification is executed as part of the working level integrated process team under the control of the PM and will not duplicate any of the other functions associated with Milestone C. As with all facets of acquisition, documentation is held to an absolute minimum. Final approval of TC is the responsibility of the milestone decision authority and that approval is documented in the Milestone C Acquisition Decision Memorandum (ADM).

10. Production and Deployment Phase.

a. The purpose of the Production and Deployment phase is to achieve an operational capability that satisfies mission needs. The production requirement of this phase does not apply to major automated information systems. However, software has to prove its maturity level prior to deploying to the operational environment. Once maturity has been proven, the system or block is base-lined, and a methodical and synchronized deployment plan is implemented to all applicable locations.

b. Low Rate Initial Production (LRIP). This work effort is intended to result in (1) completing manufacturing development in order to ensure adequate and efficient manufacturing capability and to produce the minimum quantity necessary to provide production configured or representative articles for initial operational test and evaluation (IOT&E), (2) establishing an initial production base for the system; and (3) permitting an orderly increase in the production rate for the system, sufficient to lead to full-rate production upon successful completion of operational (and live-fire, where applicable) testing. The work is guided by the ORD.

c. Deficiencies encountered in testing prior to Milestone C shall be resolved prior to proceeding beyond LRIP (at the Full-Rate Production Decision Review) and any fixes verified in IOT&E. Operational test plans are provided to the DOT&E for oversight programs in advance of the start of operational test and evaluation.

d. LRIP may be funded by research, development, test and evaluation appropriation (RDT&E) or by procurement appropriations, depending on the intended usage of the LRIP assets. DoD 7000.14-R, *DoD Financial Management Regulation*, provides specific guidance for determining whether LRIP should be budgeted in RDT&E or in procurement appropriations.

e. LRIP quantities are minimized. The milestone decision authority determines the LRIP quantity for major systems at Milestone B. The LRIP quantity (with rationale for quantities

exceeding 10% of the total production quantity documented in the acquisition strategy) shall be included in the first Selected Acquisition Report after its determination. Any increase in quantity after the initial determination shall be approved by the MDA. The LRIP quantity shall not be less than one unit. When approved LRIP quantities are expected to be exceeded because the program has not yet demonstrated readiness to proceed to full-rate production, the MDA assesses the cost and benefits of a break in production versus continuing annual buys.

f. DOT&E determines the number of LRIP articles required for LFT&E and IOT&E of DOT&E Oversight Programs. For a system that is not a DOT&E Oversight Program, the Operational Test and Evaluation Agency determines the number of LRIP articles required for IOT&E.

g. Full-Rate Production Decision Review. Before making the full rate production and deployment decision, the milestone decision authority considers:

(1) The independent cost estimate, and for major automated information systems, the component cost analysis and economic analysis.

(2) The Manpower Estimate (if applicable).

(3) The results of operational and live fire test and evaluation (if applicable).

(4) Component cost analysis (CCA) compliance certification and certification for major automation information systems.

(5) Command, Control, Communications, Computers and Intelligence (C4I) supportability certification.

(6) Interoperability certification.

(7) The milestone decision authority confirms (a) the acquisition strategy approved prior to the release of the final Request for Proposal, (b) the production acquisition program baseline, (c) provisions for evaluating post-deployment performance, (d) the Paperwork Reduction Act, and (e) the Acquisition Decision Memorandum.

h. Achieving the First Unit Equipped Date (FUED). FUED is defined as, “The first scheduled date for handoff of a new materiel system in a MACOM.”⁷ The materiel fielding process is a principal means of ensuring that this date is met.

i. Training soldiers is the responsibility of TRADOC. Often, a combination of contractors, employees of the materiel developer, as well as TRADOC personnel will conduct initial training.

j. Attaining the initial Operational Capability (IOC). IOC is defined as, “The first attainment by a MTOE unit of the capability to operate and support effectively in the operational environment a new, improved or displaced Army materiel system.”⁸

⁷ AR 700-127. ⁸Ibid.

k. A full rate production and deployment decision requires the Selected Acquisition Report be updated.

l. Full-Rate Production and Deployment. The program enters Full-Rate Production (or procurement) and Deployment after (1) conducting IOT&E; (2) submitting the Beyond LRIP and LFT&E Reports (where applicable) to Congress, the Secretary of Defense, and the USD (AT&L); and (3) completing a Full-Rate Production Decision Review by the milestone decision authority (or by the person designated by the MDA).

11. Operations and Support Phase.

a. Sustainment. The objectives of sustainment are (1) executing a support program that meets operational support performance requirements and (2) sustaining systems in the most cost-effective manner for the life of the system. When the system has reached the end of its useful life, it is disposed of in an appropriate manner.

b. The sustainment program includes all elements necessary to maintain the readiness and operational capability of deployed systems. The scope of support varies among programs but generally includes supply, maintenance, transportation, sustaining engineering, data management, configuration management, manpower, personnel, training, habitability, survivability, safety, occupational health, IT (including National Security Strategy (NSS)) supportability and interoperability, and environmental management functions. This activity also includes executing operational support plans.

c. A follow-on operational test and evaluation program that evaluates operational effectiveness, survivability, suitability, and interoperability, and that identifies deficiencies is conducted, as appropriate.

d. Evolutionary Sustainment. Supporting the tenets of evolutionary acquisition, sustainment strategies must evolve and be refined throughout the life cycle, particularly during developing subsequent blocks of an evolutionary strategy, modifications, upgrades, and re-procurement. The PM ensures that a flexible, performance oriented strategy to sustain systems is developed and executed. This strategy includes consideration of the full scope of operational support, such as maintenance, supply, transportation, sustaining engineering, spectrum supportability, configuration and data management, manpower, training, environmental, health, safety, disposal and security factors. Using performance requirements or converting to performance requirements is emphasized during re-procurement of systems, subsystems, components, spares, and services after the initial production contract.

e. Disposal. At the end of its useful life, a system is demilitarized and disposed. The PM addresses demilitarization and disposal requirements in the Acquisition Strategy. The PM ensures that sufficient information exists so that disposal can be carried out in a way that is in accordance with all legal and regulatory requirements relating to safety, security, and the environment. The Defense Reutilization and Marketing Office (DRMO) execute the PM's strategy and demilitarize and dispose of items assigned to the DRMO.

f. Within the Army, disposal of a weapon system occurs when:

(1) The threat changes, which causes the system to be inadequate for its intended role.

(2) Newer technology is available that makes the existing system too expensive to operate or maintain. Once a decision is made to remove the system from the Army's inventory, the end items are sent to a central collection point. From here, the older systems are either sold to an allied customer or demilitarized. It is important to note that while an older system may no longer meet our needs, this system may be ideally suited for another country's needs.

h. Demilitarization (DEMIL) ends the life of the weapon system. However, if you think of the life cycle model as a continuous process, you can see that as one weapon system is being destroyed, its replacement is being fielded.

12. The Life Cycle Chart. A complementary flow chart of the life cycle model described in this document is available at Appendix D.

13. Tailoring the Life Cycle Model. Each materiel acquisition program is different. For example, there are many differences between acquiring commercial items and acquiring military unique items. Acquiring unique military items may entail extensive research and development, live fire testing, exhaustive threat intelligence collection, and employ intensive program management techniques. These requirements may not be prevalent in acquiring commercially available items. Having made this point about differences, you need to realize that many of the principles guiding the acquisition of these diverse items are identical. In summary, the life cycle model must be tailored for each acquisition program. With each acquisition, we select the strategies best suited for that program. The life cycle model that you have studied can be readily tailored to fit the needs of any materiel acquisition program. Consequently, the model may experience changes on an annual basis or sooner. This document is current as of July 2001.

Appendix A

System or Program Categories				
Acquisition Category (ACAT)	Type System	Milestone Decision Authority	Highest Review Body	Cost Thresholds (FY 2000 \$) or Other Criteria
ID	Major Defense Acquisition Program (MDAP) (hardware)	DAE – USD (AT&L)	DAB	<\$365m/RDTE or <\$2.190b/procurement
IC	Army MDAP (hardware)	AAE – ASA (ALT)	ASARC	Same costs as above
IAM	Major Automation Information System (MAIS)	ASD (C ³ I) (DoD CIO)	DoD IT OIPT	<\$32m/for any single year <\$126m/program cost <\$378m/life cycle costs
IAC	Major AIS	DISC ⁴ (Army CIO)	Army IT OIPT	Same costs as above
II	Major (hardware only)	AAE – ASA (ALT)	ASARC	\$140m/RDTE or \$660m/procurement
IIA	AIS	DISC ⁴	Army IT OIPT	\$10-30m/single year \$30-120m total program \$150-360m life cycle costs
III	Non-major hardware or AIS	PEO or Cdr of the materiel command	IPR	High visibility or special interest
IV	Non-major hardware or AIS	Cdr of materiel command	IPR	All other programs
Abbreviations	Meaning			
AIS	(Automated Information System) - A combination of computer hardware and software, data, or telecommunications, that performs functions such as collecting, processing, transmitting, and displaying information. Excluded are computer resources, both hardware and software, that are: physically part of, dedicated to, or essential in real time to the mission performance of weapon systems.			
CIO	Chief Information Officer			
DoD IT OIPT	Department of Defense Information Technology Overarching Integrated Product Team			
IPR	In-Process Review			
MDAP	Major Defense Acquisition Program			
Major system	A combination of elements that shall function together to produce the capabilities required to fulfill a mission need, including hardware, equipment, software, or any combination thereof, but excluding construction or other improvements to real property			
PEO	Program Executive Officer			

Appendix B

Defense Acquisition Board Membership

Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) - Chairman
 Vice Chairman of the Joint Chiefs of Staff (VCJCS) - Vice Chairman
 Principal Deputy (USD (AT&L))
 Under Secretary of Defense (Comptroller)
 Assistant Secretary of Defense (Strategy and Threat Reduction)
 Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD (C³I))/DoD Chief Information Officer (CIO)
 Director of Operational Test and Evaluation (DOT&E)
 Director of Program Analysis and Evaluation (PA&E)
 Director of Defense Research and Engineering
 Acquisition Executives of the Army, Navy, and the Air Force
 Cognizant Overarching Integrated Product Team (OIPT) Leader
 Cognizant Program Executive Officer (PEO)
 Program Manager (PM)
 DAB Executive Secretary

The DAB Chairman is also routinely supported by senior advisors, such as but not limited to: the Deputy Under Secretary of Defense (Industrial Affairs & Installations); the Deputy Under Secretary of Defense (Acquisition Reform); the Deputy Under Secretary of Defense (Environmental Security); the Deputy Under Secretary of Defense (Logistics); the Director of Systems Acquisition; the Director of the Defense Intelligence Agency (DIA); the Director of Defense Procurement (DP); the Director of Test, Systems Engineering and Evaluation (DTSE&E); the Chairman of the Cost Analysis Improvement Group (CAIG); and the Deputy General Counsel (Acquisition and Logistics). Other senior Department officials may be invited by the USD(AT&L) to participate in DAB meetings on an as-needed basis.

Joint Requirements Oversight Council (JROC)

Membership.

The Vice Chairman of the Joint Chiefs of Staff chairs the council.

JROC permanent members are:

- a. Vice Chairman of the Joint Chiefs of Staff
- b. Vice Chief of Staff, United States Army
- c. Vice Chief of Naval Operations
- d. Vice Chief of Staff, United States Air Force
- e. Assistant Commandant, United States Marine Corps

Army Systems Acquisition Review Committee (ASARC)
Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA (ALT)) Service (Army) Acquisition Executive and Chairman of the ASARC Vice Chief of Staff, Army (VCSA) Vice Chairman of the ASARC Deputy Under Secretary of the Army (Operations Research) DUSA (OR) Assistant Secretary of the Army (Financial Management) ASA (FM) Assistant Secretary of the Army (Installations and Environment) ASA (I&E) Assistant Secretary of the Army (Manpower and Reserve Affairs) ASA (MRA) General Counsel Director, Information Systems for Command, Control, Communications, and Computers (DISC ⁴) Deputy Chief of Staff for Logistics (DCSLOG) Deputy Chief of Staff for Operations and Plans (DCSOPS) Deputy Chief of Staff for Personnel (DCSPER) Deputy Chief of Staff for Intelligence (DCSINT) Chief, Army Reserve Chief, National Guard Bureau Commanding General, Army Materiel Command (CG, AMC) Commanding General, Training and Doctrine Command (CG, TRADOC) Commanding General, Army Test and Evaluation Command (CG, ATEC) Chief, Legislative Liaison Military Deputy to the ASA (ALT) Director, Program Analysis and Evaluation Comptroller of the Army Others, as needed (e.g., Chief of Engineers, Surgeon General, CG, Military Traffic Management Command, Chief of Public Affairs)

Integrated Concept Team (ICT) Membership

Members

1. TRADOC - Deputy Chief of Staff for Combat Developments (DCSCD) – Appoints ICT and provides staff oversight
2. Commanders, commandants, and directors of combat developments activities (CBTDEV) – leads the ICT
3. TRADOC Deputy Chief of Staff for Doctrine (DCSDOC)
4. TRADOC Deputy Chief of Staff for Training (DCST)
5. TRADOC, Deputy Chief of Staff for Intelligence (DCSINT)/Senior Intelligence Officer (SIO) for other major Army commands (MACOMs)
6. TRADOC Deputy Chief of Staff for Base Operating Systems (DCSBOS)
7. Director, TRADOC Analysis Center (TRAC)
8. TRADOC System Manager (TSM)
9. TRADOC Program Integration Officer (TPIO)
10. Directors of Battlefield Laboratories (Battle Labs)
 - Commanders, commandants, and directors of training developments activities (TNGDEV)
11. Commanders, commandants, and directors of doctrine developments activities (DOCDEV)
12. Branch Proponency Officers
13. Proponent (center/school) Threat Support Officer (TSO)
14. Commanders of materiel development activities, Program Managers, Project Managers, and Program Executive Officers (MATDEV)
15. Commander, U.S. Army Materiel Command (AMC) – provides S&T members and Provides MATDEV representation to ICTs through major subordinate command (MSC) and PM offices
16. Commander, U.S. Army Test and Evaluation Command (ATEC)
17. Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA (ALT))/Army Acquisition Executive (AAE) - Provides S&T members to ICTs

Participates in ICT as appropriate

- HQDA Deputy Chief of Staff for Intelligence (DCSINT)
- HQDA Deputy Chief of Staff for Operations and Plans (DCSOPS)
- HQDA Deputy Chief of Staff for Personnel (DCSPER)
- HQDA Deputy Chief of Staff for Logistics (DCSLOG)
- HQDA Director of Information Systems for Command, Control, Communications, and Computers (DISC4)
- HQDA Assistant Chief of Staff for Installation Management (ACSIM)
- HQDA Office of the Chief, Army Reserve (OCAR)
- Army Surgeon General/CG, Medical Command (MEDCOM)
- CG, Army Space and Missile Defense Command (SMDC)

Army MAISRC
<p>Director, Information Systems for Command, Control, Communications, and Computers (DISC⁴)</p> <p>Deputy Under Secretary of the Army (Operations Research)</p> <p>Deputy Under Secretary of the Army (International Affairs)</p> <p>Assistant Secretary of the Army (Financial Management & Comptroller)</p> <p>Assistant Secretary of the Army (Installations and Environment)</p> <p>Assistant Secretary of the Army (Manpower and Reserve Affairs)</p> <p>Commanding General, Army Materiel Command</p> <p>Commanding General, Training and Doctrine Command</p> <p>General Counsel</p> <p>Deputy Chief of Staff for Logistics</p> <p>Deputy Chief of Staff for Operations and Plans</p> <p>Deputy Chief of Staff for Personnel</p> <p>Deputy Chief of Staff for Intelligence</p> <p>Chief, Army Reserve</p> <p>Chief, National Guard Bureau</p> <p>Chief, Legislative Liaison</p> <p>Military Deputy to the ASA (ALT)</p> <p>Director, Program Analysis and Evaluation</p> <p>CG, OPTEC</p> <p>Army Inspector General (non-voting observer)</p> <p>Other attendees. The MDA will make the final decision as to attendance at the ASARC or Army MAISRC. The Assistant Chief of staff for Installation Management; Chief of Engineers; The Surgeon General; the CG, MTMC; the CG, U.S. Army Space and Strategic Defense Command; the Commander, Safety Center; and the Chief of Public Affairs and other organizations will be invited to attend if a significant issue is identified within their area of responsibility.</p>

In-Process Review (IPR) Membership
<p>Members will include designated representatives of the following:</p> <p>Functional Support Organization or Staff</p> <p>CBTDEV</p> <p>Logistician</p> <p>Trainer, if different from the CBTDEV</p> <p>Independent Evaluators</p> <p>Others, as determined by the IPR Chair</p>

Appendix C

References	
AR 381-11	Threat Support
AR 602-2	Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process
AR 700-127	Integrated Logistics Support
AR 70-1	Army Acquisition Policy
AR 73-1	Materiel Testing
CJCSI 3170.01A	Requirements Generation System
DA PAM 70-3	Army Acquisition Procedures
DFAR	Defense Federal Acquisition Regulations
DoD 5000.2-R	Mandatory Procedures for MADPs and MAIS Acquisition Programs
DoDD 5000.1	Defense Acquisition
DoDI 5000.2	Operation of the Defense Acquisition System
FAR	Federal Acquisition Regulation
MIL-HDBK 502	Acquisition Logistics
OMB Circular A-109	Major System Acquisitions

THE LIFE CYCLE MODEL