

AD-A066 565

LOGISTICS STUDIES OFFICE (ALMC) FORT LEE VA
POLICIES TO REAPPRAISE ECONOMIC/USEFUL LIFE. (U)
JAN 79 P L MENTIS

F/6 15/5

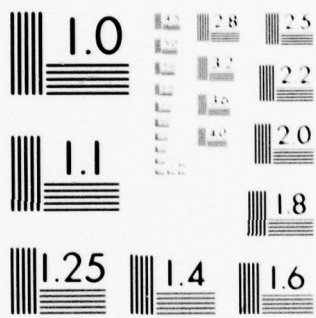
UNCLASSIFIED

NL

OF
AD
A066565



END
DATE
FILMED
5-79
DDC



MICROCOPY RESOLUTION TEST CHART
 NATIONAL BUREAU OF STANDARDS-1963-A

ADAO 66565

g **LEVEL #** *2*

LOGISTICS STUDIES OFFICE

PROJECT NO. 803

DDC FILE COPY,

POLICIES TO REAPPRAISE ECONOMIC/USEFUL LIFE

DDC
RECEIVED
MAR 29 1979

JANUARY 1979

g A

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited



U.S. ARMY
LOGISTICS MANAGEMENT CENTER
FORT LEE, VIRGINIA
23801

79 03 05 092

⑥
POLICIES TO REAPPRAISE ECONOMIC/USEFUL LIFE.

LOGISTICS STUDIES OFFICE ✓

PROJECT NO. 803

⑨
FINAL REPORT,
⑪ JANUARY 1979 ✓

⑫ 31 p.

⑩
BY: CPT PETER L. MENTIS ✓

ALme

LOGISTICS STUDIES OFFICE
US ARMY LOGISTICS MANAGEMENT CENTER
FORT LEE, VIRGINIA 23801

409161

79 03 05 092

AB

DISCLAIMER

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

ACCESSION NO.		
CLASS	White Section	<input checked="" type="checkbox"/>
DATE	Grey Section	<input type="checkbox"/>
UNAPPROVED		<input type="checkbox"/>
JUSTIFICATION		
<i>Not on file</i>		
BY		
DISTRIBUTION/AVAILABILITY CODES		
Dist.	AVAIL. and/or	SPECIAL
<i>A</i>		

ABSTRACT

This study considers useful life assignment and reappraisal policies to determine the responsibility and timing of these actions in the life cycle. This study is limited to major items less aircraft, weapons, combat vehicles, and ammunition. Definitions, reappraisal policy, and regulation changes are recommended to improve the Army Materiel Plan, budget, and replacement procurement based on accurate useful life data.

TABLE OF CONTENTS

	<u>Page</u>
Disclaimer	i
Abstract	ii
Table of Contents	iii
Executive Summary	1
Main Report	4
1. Statement of the Problem	4
2. Objectives	4
3. Limits and Scope	4
4. Authority for the Study	4
5. Purpose	5
6. Methodology	5
7. Definitions	5
8. Discussion	9
9. Findings and Conclusions	18
10. Recommendations	18
Notes	20
APPENDIX A - Acronyms	A-1
APPENDIX B - Bibliography	B-1
APPENDIX C - Recommended Changes to DA PAM 11-25 and DARCOM-R 11-27	C-1

EXECUTIVE SUMMARY

1. BACKGROUND. The US Army Materiel Research and Development Command (DARCOM) has been unable to justify some Army Materiel Plan (AMP) budget requests due to unvalidated original life expectancy estimates.

2. STUDY OBJECTIVE.

a. Develop a management and control procedure to be used during the operational and disposal phase of an item's life cycle to reappraise the validity of the economic/useful life estimate made at the time of development.

b. Recommend revisions to applicable regulations.

3. FINDINGS AND CONCLUSIONS.

a. DODI 7041.3, AR 11-28, and AR 310-25 are inadequate in regard to economic life and useful life terminology and definitions.

b. The term "useful life" is more meaningful than the term "life expectancy" because useful life, as defined in the study, estimates the time period an item will remain within cost and performance standards.

c. DA Pamphlet 11-25 and DARCOM Regulation 11-27 should be revised to provide adequate guidance and responsibility as to initial useful life assignment.

d. DA Pamphlet 11-25 and DARCOM Regulation 11-27 should be revised to assign responsibility for post-deployment performance of useful life reappraisals, and guidance as to when they should be performed.

e. Techniques are needed for revising the useful life estimate (as defined in this study) of items developed and/or managed by DARCOM.

f. Programmed washouts, replacement procurement, budgets, and AMP input may be based on incorrect useful life estimates unless such estimates are validated after deployment.

4. RECOMMENDATIONS. It is recommended that:

a. The definition of the term "Economic Life" (paragraph 7c(1)) used in this study be approved and published in DODI 7041.3, AR 11-28, and AR 310-25.

b. The definition of the term "Useful Life" (paragraph 7c(2)) used in this study be approved and published in DODI 7041.3, AR 11-28, AR 310-25, AR 710-60, and SB 710-1-1.

c. Use of the term "Life Expectancy" be discontinued.

d. DA Pamphlet 11-25 and DARCOM Regulation 11-27 be changed to require that initial assignment of the useful life estimate occur by the time the Concept Formulation Package is completed in the Conceptual Phase. (See Appendix C.)

e. DA Pamphlet 11-25 and DARCOM Regulation 11-27 be changed to require post-deployment useful life reappraisal. (See Appendix C.)

f. DARCOM Materiel Readiness Commands amend their respective Organization and Functions Manuals to assign reappraisal responsibilities to Project Managers and to the Integrated Logistics Support Office.

g. The US Army Materiel Systems Analysis Activity be tasked to formulate standardized methodologies for both the initial assignment and reappraisal of useful life estimates.

e. Techniques are needed for revising the useful life estimate (as defined in this study) of items developed and/or managed by DARCOM.

f. Programmed washouts, replacement procurement, budgets, and AMP input may be based on incorrect useful life estimates unless such estimates are validated after deployment.

4. RECOMMENDATIONS. It is recommended that:

a. The definition of the term "Economic Life" (paragraph 7c(1)) used in this study be approved and published in DODI 7041.3, AR 11-28, and AR 310-25.

b. The definition of the term "Useful Life" (paragraph 7c(2)) used in this study be approved and published in DODI 7041.3; AR 11-28, AR 310-25, AR 710-60, and SB 710-1-1.

c. Use of the term "Life Expectancy" be discontinued.

d. DA Pamphlet 11-25 and DARCOM Regulation 11-27 be changed to require that initial assignment of the useful life estimate occur by the time the Concept Formulation Package is completed in the Conceptual Phase. (See Appendix C.)

e. DA Pamphlet 11-25 and DARCOM Regulation 11-27 be changed to require post-deployment useful life reappraisal. (See Appendix C.)

f. DARCOM Materiel Readiness Commands amend their respective Organization and Functions Manuals to assign reappraisal responsibilities to Project Managers and to the Integrated Logistics Support Office.

g. The US Army Materiel Systems Analysis Activity be tasked to formulate standardized methodologies for both the initial assignment and reappraisal of useful life estimates.

MAIN REPORT

1. STATEMENT OF THE PROBLEM. The US Army Materiel Development and Readiness Command (DARCOM) Regulation 11-27, Life Cycle Management of DARCOM Materiel, currently contains no management and control procedures regarding periodic review or validation of materiel life expectancy. Life expectancy, once established, is normally revised based on budgetary constraints or experience, and is arbitrarily adjusted.

2. OBJECTIVES.

a. Develop a management and control procedure to be used during the operational and disposal phase of an item's life cycle to reappraise the validity of the economic/useful life estimate made at the time of development.

b. Recommend revisions to applicable regulations.

3. LIMITS AND SCOPE. This study is limited to major items (as defined in DARCOM Regulation 700-5, Major Item Management) with available life expectancy data as contained in the Standard Study Number system. Specifically excluded from this study by the study sponsor are aircraft, weapons, combat vehicles, and ammunition items. The scope of this study is limited to problem analysis and the development of policies/procedures for revising or validating original useful and economic life estimates. No attempt is made to develop techniques or models for the determination of useful and economic life estimates.

4. AUTHORITY FOR THE STUDY. In October 1977, this office was directed by Research and Technology Work Unit Summary (DD Form 1498), DAOM 4982, dated 7 October 1977, to conduct a study entitled "Policies to Reappraise Economic/Useful Life." The objective of the study was to develop policies

regarding the validation or reappraisal of the original estimated economic or useful life of equipment systems in the operational and disposal phases of the life cycle. A study plan was developed and submitted to the study sponsor, the Director for Materiel Management, DARCOM (DRCMM-RM), in October 1977, and approved in November 1977.

5. PURPOSE. The purpose of this study is to determine what policies (including suggested changes to existing regulations) are needed to validate or re-estimate the economic/useful life of major items, who should accomplish this analysis, and at what point(s) in the operational and/or disposal phase(s) of the life cycle this should be accomplished.

6. METHODOLOGY. The methodology employed in this study effort included:

- a. Bibliographic search and literature review.
- b. Data collection questionnaires.
- c. Telephonic and personal interviews.

7. DEFINITIONS. The examination of regulatory guidance exposed the lack of standardized definitions which contributes to obscuring the problem. Further evidence of this definitional problem was found through interviews and questionnaire responses.

a. Published Definitions. The following definitions of key terms are found in current publications.

(1) Economic Life is defined in DODI 7041.3 and AR 11-28, both titled "Economic Analysis and Program Evaluation for Resource Management", as "The period of time over which the benefits to be gained from a project may reasonably be expected to accrue to the Department of Defense. (Although eco-

conomic life is not necessarily the same as physical life or technological life, it is significantly affected by both the obsolescence of the investment itself and the purpose it is designed to achieve.)"

(2) Life Expectancy is defined in SB 710-1-1, Standard Study Number System and Replacement Factors, as the "Estimated useful life of an item (in years) to the Army. This is determined by experience with similar items considering present conditions and probable future developments."

(3) Useful Life is not defined in any Army regulation reviewed during the course of this study.

(4) Economic Analysis is defined in DODI 7041.3 and AR 11-28 as "a systematic approach to the problem of choosing how to employ scarce resources and an investigation of the full implication of achieving a given objective in the most efficient and effective manner. The determination of efficiency and effectiveness is implicit in the assessment of the cost effectiveness of alternative approaches and is accomplished by:

(a) Systematically identifying the benefits (and other outputs) and costs (inputs) associated with alternative programs, missions, and functions, and/or of alternative ways for accomplishing a given program (usually referred to as projects and activities).

(b) Highlighting the sensitivity of a decision to the values of the key variables and assumptions on which decisions are based, including technical, operational, schedule, resource availability (e.g., energy sources), environmental requirements, and other performance considerations.

(c) Evaluating alternative methods of financing investments, such as lease or buy.

(d) Using benefits and costs to compare the relative merits of alternatives as an aid in:

1. Making tradeoffs between alternatives;
2. Recommending the cost-effective alternatives; and
3. Establishing or changing priorities."

b. Definitional Problem. The definitional problem stems from four sources: 1) key terms are not defined in pertinent publications; 2) definitions are not standard or cross referenced in pertinent publications; 3) varying meanings were assigned to these terms by personnel interviewed in the course of this study; and 4) the definitions are not clear in the context of this study. The result of this shortcoming is that it helps to obscure the actual problem.

(1) Life expectancy is not defined in AR 710-60, Standard Study Number System and Replacement Factors, which provides the authority for SB 710-1-1 (where it is defined); in AR 750-1, Army Materiel Maintenance Concepts and Policies; AR 11-28; or DA PAM 11-25, Life Cycle System Management Model for Army Systems, all of which provide guidance in the area of item replacement. AR 310-25, Dictionary of United States Army Terms, also fails to define this term.

(2) The term "life expectancy" as defined in SB 710-1-1, includes the term "useful life". However, the term "useful life", although frequently used, is found without definition in regulations reviewed in the course of this study, leaving the term open to (mis)interpretation.

(3) The term "economic life", as defined in DODI 7041.3 and AR 11-28, is based upon a return of benefit(s). US Army Materiel Systems Analysis

Activity studies^{1,2,3} explain economic life as the point at which the average system cost (costs associated with the acquisition, shipping, and maintenance) per unit of output (miles in the case of the AMSAA vehicle studies) is minimized. This explanation parallels benefit-cost analysis required by DODI 7041.3 and AR 11-28.

c. Study Definitions. Due to the definitional shortcomings described in paragraph b above, the study team felt it necessary to redefine terminology to more accurately describe the reappraisal of the life of items. The following terms and definitions are suggested for use in initial determination and subsequent reappraisal of item life.

(1) *Economic Life (EL)* is that period of time (in years) from acquisition and continuing until average system cost per unit of output (costs associated with acquisition, operation, support, maintenance, transportation, and disposal) is minimum.

(2) *Useful Life (UL)* is that period of time (in years) from acquisition and continuing until an item reaches economic life or is unable to meet specified RAM (reliability, availability, maintainability) parameters, whichever occurs first. (Explanatory note: This definition basically means that useful life equals economic life unless the item is no longer capable of meeting operational standards. An item may be inexpensive to maintain, but not be available for its intended purpose, nor reliable to complete a mission. If an item is "down" (Not Operationally Ready Supply or Not Operationally Ready Maintenance), the average annual cost would continue to decrease over time, but the item is not operational and is

therefore useless with attendant adverse impact on readiness.) Further, the useful life of an item may be shortened by a change in threat or advance in technology.

(3) *Economic Analysis (EA)*. The definition of economic analysis contained in DODI 7041.3 and AR 11-28 and quoted above in paragraph 7a(4) is retained unchanged for use in this report.

8. DISCUSSION.

a. Background.

(1) Why is Reappraisal Necessary?

(a) With Congressional emphasis on sound economic policies, it is logical that the period of time an item will remain in the Army inventory be based on the economic life concept. Original life expectancy estimates made during the Conceptual Phase of the life cycle are often based on predetermined estimates for similar items (e.g., 15 years for all construction equipment), rather than on anticipated performance, durability, or maintenance and acquisition costs for the new item. If this original life expectancy figure is shorter than actual life experience and is not revised, washouts may occur too soon causing wasted expenditures of money. If the original estimate is too long, then unreliable equipment will be in use with a corresponding degradation in readiness. If the original estimate is inaccurate and there is no validation system, the Army Materiel Plan (AMP); Army procurement plans; depot maintenance programs; the Planning, Programming and Budgeting System; and readiness will be adversely affected.

(b) Equipment washouts are based on Maintenance Expenditure Limits (MELs) which limit the amount of one-time repair funds to a predetermined

percentage of the Standard Price published in the Army Master Data File. The MELs currently are based on the remaining life expectancy. The year in which zero maintenance expenditure limits are reached indicates the end of life expectancy, as noted in the Technical Bulletin (TB) 43 Series. Washout rates influence various aspects of replacement procurement, funding, depot maintenance programs, requirement determinations, and the AMP. Since washout rates are based upon MELs, which in turn are based upon estimates of life expectancy, the importance of life expectancy reappraisal is evident. Therefore, increased emphasis on post-transition reappraisal is required.

(c) The DARCOM management strategy as stated in paragraph D-VII.2, DARCOM-R 11-27 is:

"(a) ... to support the fielded equipment in a manner that achieves a high operational readiness posture while, at the same time, minimizing the operation, maintenance and support costs. A system or item should be retained in the Active Army inventory as long as it can satisfactorily perform its mission at a cost in total resources less that of an alternative system...."

In order to achieve the objectives of this strategy, useful life reappraisal techniques must be developed and used after systems are fielded.

(2) Current Reappraisal Policy/Procedural Void.

(a) DA PAM 11-25 and DARCOM-R 11-27 do not require or assign responsibility for pre-transition life expectancy, economic life, or useful life analysis. This major shortcoming continues in the post-transition phase of the LCMM by the lack of any life expectancy, economic life, or useful life reappraisal requirement. AR 11-28 requires periodic evaluation of

ongoing, as well as proposed, programs and projects. Costs of operation should be analyzed to identify those programs which should be modified, altered, or eliminated. The theory of economic life is documented in textbooks and studies and the requirement to "... focus continuing attention on both the effectiveness and efficiency of resource application" is noted in AR 11-28. However, neither Army nor DARCOM life cycle management policy documents provide guidance as to when economic life or life expectancy reappraisal should be performed once the item is transferred to the Materiel Readiness Commands (MRCs). With the lack of continuity between regulations and the failure to prescribe policy, materialization of command impetus cannot be expected.

(b) Post deployment effectiveness analysis is required by the Life Cycle Management Model (LCMM), in Block 883, Disciplined Reviews (DRs) and System Assessments, DARCOM-R 11-27. While DRs are conducted periodically, System Assessments (SAs) are, by DARCOM-R 11-27, a yearly requirement designed to track the status of field performance and support issues for an item. DARCOM-R 11-27 states that the "... objective of disciplined reviews and system assessments is to define corrections which would enable the extension of the useful life of the system or item to minimize logistical costs." Herein lies a major shortcoming in the evaluation of performance -- the lack of a post-deployment economic life reappraisal technique to determine if the item is the most cost effective method of accomplishing the functional requirement for the present and future time periods.

(c) The Baseline Cost Estimate (BCE) and the Logistic Support Analysis Record (LSAR) are both examples of methods to estimate costs prior to item transition and deployment and are both found in the graphic network of the LCMM in DARCOM-R 11-27. The BCE is revised periodically in the initial phase of the life cycle; however, the LCMM requires no post-transition cost estimation or evaluation. The LSAR, used mainly in the development phase of the life cycle, has application in the operational phase to evaluate the effect of proposed design changes and modifications on maintenance and support. In short, the LCMM fails to require post-transition evaluation of economic data.

(3) Factors to Consider in Useful Life Reappraisal.

(a) The terminology used for purposes of both the initial estimate and subsequent reappraisal should be easily understood. The currently used term "life expectancy" is not considered meaningful for reappraisal analysis and of little use in the original analysis of asset life projections. The term "useful life" is regarded by the author of this study report as more accurate and descriptive and the definition of this term, paragraph 7c(2), above is considered more easily understood than the definition of "life expectancy." Therefore, the term "useful life" replaces the term "life expectancy" for the purposes of discussion in the remainder of this study.

(b) The technique of item useful life reappraisal during the deployment and disposal phases of the life cycle must be multifarious. The technique must include considerations of RAM, cost effectiveness, technology, threat, and budgetary trends. Additionally, the methodology must be evaluated

in light of possible inherent mission essential maintenance requirements (i.e., maintenance required to keep the item functioning), non-mission essential maintenance (i.e., maintenance not required to perform the mission, example: headlight replacement), and catastrophic failure requirements. One very important factor in the acquisition of military equipment is the threat or requirement behind the design, manufacture and procurement of the equipment. AR 1000-1, Basic Policies for Systems Acquisition, contains basic guidance for the entire framework of acquiring materiel and states that "... consideration of threat and its implication for materiel development must be continuous throughout the life cycle of Army systems...." When the threat changes, the effect on the remaining life of the system must be determined. If the system has been rendered totally ineffective against the threat with no prospect for product improvement, the useful life should be shortened and the item should be replaced as soon as technology allows. Any change in useful life as a result of threat must be validated and supporting documents amended. Further, system performance throughout the life cycle must meet established standards. Therefore, annual system assessment is necessary to monitor UL and insure the item adequately counteracts the threat/fills the requirement.

b. Proposed Management System for Useful Life Reappraisal.

(1) Responsibility for Developing Reappraisal Techniques. The capabilities and expertise to develop techniques are found in AMSAA. The mission of AMSAA, as stated in AMSAA Regulation 10-1, is to provide the central

independent technical capability in DARCOM for the conduct of major systems analyses and cost effectiveness studies; to develop techniques and conduct analyses on the reliability, availability, and maintainability aspects of materiel systems; to assess the expected worth of existing and proposed Army materiel systems throughout their life cycle to provide a meaningful basis for major decisions concerning their design, development, acquisition, employment, and deployment. Based upon AMSAA's assigned mission, it should be tasked to develop useful life analysis techniques.

(2) Responsibility for Performing Reappraisal. The MRC must assume responsibility for useful life reappraisal after an item is transitioned from the Materiel Development Command. If an item is project managed, the project manager should be responsible for analyses required to insure cost effectiveness and efficiency. It is the materiel readiness project manager who coordinates with the Research and Development (R&D) elements on state-of-the-art/problem areas; who makes maintenance and acquisition decisions, both based on cost analysis and requirements; and who should have access to the data necessary to perform evaluations. Thus, the materiel readiness project manager should be responsible for the performance of post-transfer useful life analysis/reappraisal with assistance from the respective MRC Integrated Logistics Support (ILS) Office as necessary. For non-project managed items, the ILS office should be responsible for insuring performance of reappraisals. The mission of the ILS office includes serving as a principal advisor to the MRC commander and staff on the total life cycle process.

When useful life reappraisal is performed, the results should be disseminated to all other directorates impacted by the results.

(3) Scheduling Reappraisal. DR I occurs after 2-3 years of initial field experience and provides an established milestone for the performance of a thorough useful life reappraisal. DR II occurs at mid-life and again offers a logical milestone in the LCMM for evaluation of useful life. SAs, per DARCOM-R 11-27, are to be conducted annually to track the status of field performance and support issues for a system or item. Cost data should be monitored concurrently with system assessments. The result of such a program would be annual monitoring of effectiveness and economic life data and the establishment of two finite milestones at DR time in the LCMM for major management decisions concerning useful life.

(4) Data Needed for Reappraisals.

(a) Data collection may vary according to item and to reappraisal techniques employed and the activity developing the technique should address the types of data required. Evaluation of available data sources and types may indicate additional specific data is required. Any management or analysis technique is dependent upon accurate, timely, available, and useful data. The Materiel Readiness Support Activity collects data on MRC selected systems using the Sample Data Collection (SDC) methodology effected by Army Materiel Command (AMC) Supplement 1 to AR 750-37, entitled "Sample Data Collection: The Army Maintenance Management System (TAMMS)", which provides the procedures to be used in obtaining equipment RAM and logistic support data when

equipment performance is being evaluated. SDC plans should be prepared to satisfy informational needs of all functional and staff elements. As the reappraisal techniques are developed, it will be important to determine the data requirements and the collection method to be used.

(b) Realistic reappraisal requires adequate data based upon field experience. For most items, one or two years of performance data may be adequate for regression analysis and trend projection and the reappraising of useful life. Trends paralleling original estimates would indicate to the manager that the original useful life estimates are adequate. Trends diverging from the original estimate would signal a requirement for managerial evaluation within the Project Management or ILS offices as appropriate. The management decisions signaled by a cost and performance analysis may include useful life adjustment, adjustment of required maintenance funds and plans, and the initiation of R&D, procurement, or disposal actions.

(5) Benefits of Proposed Reappraisal System. The impact of the proposed reappraisal system is many-faceted. First, by joining reappraisal techniques to existing DR milestones, a more thorough evaluation policy is established. The proposed reappraisal system will provide finite guidance as to the timing and responsibilities for performance of useful life reappraisal. Second, it will provide a cost effective program evaluation by more closely approximating the useful life of an item or system. Excessive costs due to maintaining an uneconomical item or system can be greatly reduced. Third, a realistic basis for AMP and budgetary input will be available.

Inaccurate requests for replacement acquisition can be reduced and maintenance factors (i.e., washout, replacement, rebuild) can be refined. As a tool to answer Congressional allegations, this policy would be beneficial. However, its greatest benefit would be increased readiness. Equipment would become more cost effective, replacements could be better programmed, and currently wasted funds could be properly allocated toward other mission essential programs.

c. Other Considerations. A system for activity and milestone scheduling has been developed by the US Army Tank-Automotive Research and Development Command and is called the Life Cycle Management Program Planning Guide. As currently developed, this guide covers the life cycle through the Full Scale Development Phase; when completed, it will cover the entire life cycle. As an aide to life cycle management, this package contains software programs for Automated Gantt Charts, a modified Control Data Corporation Program Evaluation and Review Technique (PERT) package, automated project scheduling controls, and a Gantt/PERT interface. General guidance from DODI 5000.1 (Major System Acquisitions) and AR 1000-1 was incorporated in the design of the Planning Guide. As the software is developed for the Production and Deployment Phase, the methodologies become available and the policy published in appropriate regulations, useful life reappraisal milestones could be incorporated. This planning guide will provide a vehicle for transitioning item evaluation data from development phases to the post deployment phase. Therefore, the Guide warrants a thorough examination for DARCOM-wide use.

9. FINDINGS AND CONCLUSIONS.

a. DODI 7041.3, AR 11-28, and AR 310-25 are inadequate in regard to economic life and useful life terminology and definitions.

b. The term "useful life" is more meaningful than the term "life expectancy" because useful life estimates the time period an item will remain within cost and performance standards.

c. DA PAM 11-25 and DARCOM-R 11-27 should be revised to provide adequate guidance and responsibility as to initial useful life assignment.

d. DA PAM 11-25 and DARCOM-R 11-27 should be revised to assign responsibility for post-deployment performance of useful life reappraisals, and guidance as to when they should be performed.

e. Techniques are needed for revising the useful life estimate (as defined in this study) of items developed and/or managed by DARCOM.

f. Programmed washouts, replacement procurement, budgets, and AMP input may be based on incorrect useful life estimates unless such estimates are validated after deployment.

10. RECOMMENDATIONS. It is recommended that:

a. The definition of the term "Economic Life" (paragraph 7c(1)) used in this study be approved and published in DODI 7041.3, AR 11-28, and AR 310-25.

b. The definition of the term "Useful Life" (paragraph 7c(2)) used in this study be approved and published in DODI 7041.3, AR 11-28, AR 310-25, AR 710-60, and SB 710-1-1.

- c. Use of the term "Life Expectancy" be discontinued.
- d. DA PAM 11-25 and DARCOM-R 11-27 be changed to require that initial assignment of the useful life estimate occur by the time the Concept Formulation Package is completed in the Conceptual Phase. (See Appendix C.)
- e. DA PAM 11-25 and DARCOM-R 11-27 be changed to require post-deployment useful life reappraisal. (See Appendix C.)
- f. DARCOM Materiel Readiness Commands amend their respective Organization and Functions Manuals to assign reappraisal responsibilities to Project Managers and to the Integrated Logistics Support Office.
- g. The US Army Materiel Systems Analysis Activity be tasked to formulate standardized methodologies for both the initial assignment and reappraisal of useful life estimates.

NOTES

1. Bell, Mioduski, Belbot, Rosati, and Crow, "Vehicle Average Useful Life Study for Truck, Cargo, 2-1/2 Ton, 6x6, M35A2", US Army Materiel Systems Analysis Activity (October 1973)
2. Bell, Mioduski, and Belbot, "Vehicle Useful Life Study for Truck, 1/4 Ton, 4x4, M151A1/A2", US Army Materiel Systems Analysis Activity (NA)
3. Bell, Mioduski, and Belbot, "Vehicle Average Useful Life Study for Truck, 5 Ton, 6x6, M39A2 Series", US Army Materiel Systems Analysis Activity (June 1975)

APPENDIX A

ACRONYMS

AMP	Army Materiel Plan
AMSAA	US Army Materiel Systems Analysis Activity
AR	Army Regulation
BCE	Baseline Cost Estimate
DA	Department of the Army
DARCOM	US Army Materiel Development and Readiness Command
DD	Department of Defense
DOD	Department of Defense
DODI	Department of Defense Instruction
DR	Disciplined Review
EA	Economic Analysis
EL	Economic Life
ILS	Integrated Logistics Support
LCMM	Life Cycle Management Model
LSAR	Logistic Support Analysis Record
MEL	Maintenance Expenditure Limit
MRC	Materiel Readiness Command
PERT	Program Evaluation and Review Technique
R&D	Research and Development
RAM	Reliability, Availability, Maintainability
SA	System Assessment
SB	Supply Bulletin
SDC	Sample Data Collection
UL	Useful Life

APPENDIX B
BIBLIOGRAPHY

DOD PUBLICATIONS

DODI 7041.3 Economic Analysis and Program Evaluation for
Resource Management

DODI 5000.1 Major System Acquisitions

DODD 5000.28 Design to Cost

ARMY REGULATIONS

AR 11-28 Economic Analysis and Program Evaluation for
Resource Management

AR 310-25 Dictionary of United States Army Terms

AR 700-127 Integrated Logistic Support

AR 710-60 Standard Study Number System and Replacement
Factors

AR 750-1 Army Materiel Maintenance Concepts and Policies

AR 750-37 Sample Data Collection: The Army Maintenance
(With AMC Suppl 1) Management System (TAMMS)

AR 1000-1 Basic Policies for Systems Acquisition

DA PUBLICATIONS

DA PAM 11-25 Life Cycle System Management Model for Army
Systems

DARCOM PUBLICATIONS

DARCOM-R 11-27 Life Cycle Management of DARCOM Materiel

DARCOM-R 700-5 Major Item Management

Supply Bulletin Standard Study Number System and Replacement
710-1-1 Factors

Technical Bulletin Maintenance Expenditure Limits
43 Series

BIBLIOGRAPHY (Cont)

DARCOM PUBLICATIONS (Cont)

AMSAA-R 10-1

Mission, Organization and Functions
Regulation

BOOKS

John R. Canada, Intermediate Economic Analysis for Management and Engineers,
(Englewood Cliffs, New Jersey: Prentice-Hall, 1971)

STUDIES

Bell, Mioduski, Belbot, Rosati, and Crow, "Vehicle Average Useful Life Study
for Truck, Cargo, 2-1/2 Ton, 6x6, M35A2", US Army Materiel Systems Analysis
Activity (October 1973)

Bell, Mioduski, and Belbot, "Vehicle Useful Life Study for Truck, 1/4 Ton,
4x4, M151A1/A2", US Army Materiel Systems Analysis Activity (NA)

Bell, Mioduski, and Belbot, "Vehicle Average Useful Life Study for Truck,
5 Ton, 6x6, M39A2 Series", US Army Materiel Systems Analysis Activity
(June 1975)

Samuel E. Eastman and William K. Scheirer, "The Development and Application
of a Procedure for Estimating the Economic Life of Weapons Systems", the
Economic Sciences Corporation, Inc. (August 1970)

Majors John A. Reidy, Jr., and Donald A. Schneider, "An Evaluation of the
Replacement Criteria for Select Air Force Commercial General Purpose Motor
Vehicles", USAF (August 1974)

APPENDIX C.

RECOMMENDED CHANGES TO DA PAM 11-25 AND DARCOM-R 11-27
(Changes indicated by italics print)

A. The following changes to Appendix C, DA PAM 11-25, Life Cycle System Management Model for Army Systems (May 1975) are proposed.

1. Paragraph C-3.h., page C-4, to be changed to read.

h. Event 7: Preparation of Baseline Cost Estimate (BCE) *and Useful Life Estimate*

Responsibility: Materiel Developer.

Description: During the conceptual phase and prior to entering the validation phase, the materiel developer will prepare a Baseline Cost Estimate in as much detail as possible considering the data available at this state of development and in conformance with the work breakdown structure (WBS) established. *The materiel developer will establish a useful life estimate to facilitate a consistent economic basis for planning. The BCE addresses the costs of acquisition plus ownership (operating) and provides unit cost information for use in establishing the initial Design to Cost (DTC) goal. For ASARC systems, the Baseline Cost Estimate will be forwarded by the materiel developer to HQDA (DACA) for validation and independent assessment by the COA. The BCE provides cost inputs for the initial draft DCP and is periodically updated throughout the life cycle in conjunction with updating the DCP.*

References: DODI 7041.3, AR 11-18, AR 70-1.

2. A new paragraph be added between paragraphs ch. and ci., page C-20, to read:

Event 117a: Useful Life Reappraisal.

Responsibility: Materiel Readiness Command

Description: Following the transfer of responsibilities from the Materiel Developer to the Materiel Readiness Command, data collection and useful life reappraisal are established. Economic and performance evaluation will be used to enable maximization of the useful life of items and to minimize annual system costs. A reappraisal plan is developed by the respective materiel readiness command and implemented throughout the item life cycle.

References: AR 11-18, AR 11-28.

3. Figure C-1 be changed to illustrate narrative changes in paragraph A2 above.

B. The following changes to Appendix D, DARCOM Regulation 11-27, Life Cycle Management of DARCOM Materiel (30 June 1977) are proposed.

1. A new paragraph be added between paragraphs D-I.1c. and D-I.1d., page D-4, to read:

Reduce costs of applicable systems or items through post-transfer reappraisal of useful life.

2. Paragraph D-I.4g., Block 166, (page D-16) be changed to read:

Block 166 - Baseline Cost Estimate (BCE) and Useful Life Estimate -

This first full Baseline Cost Estimate by the PM or developer uses the cost data compiled to date and begins to expand on the WBS of Block 111. If the BCE is developed prior to contractor involvement, parametric costing techniques may be used to determine the range of costs that could apply to

the development. *A useful life estimate will be established to facilitate a consistent economic planning factor throughout development.*

3. Paragraph D-V.4h, Block 883 (page D-101), be changed to read:

Block 883 - Disciplined Reviews (DR) and System Assessments -

Disciplined reviews are complete analyses of the effectiveness and further product improvement potential of a system or item after it has been fielded. DR I occurs after 2-3 years of initial field experience, and DR II occurs at mid-life. *Concurrent with DR I and DR II, a thorough reappraisal of the useful life estimate is conducted.* System assessments are conducted annually to track the status of field performance and support issues for a system or item. *Useful Life estimates are monitored concurrently with System Assessments to insure investment maximization.* The objective of disciplined reviews and system assessments is to define corrections which would enable the extension of the useful life of the system or item or to minimize logistical costs.