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SOURCES AND NATURE OF COST ANALYSIS DATA BASE REFERENCE MANUAL

GREG SPOLARICH
OPERATIONS RESEARCH ANALYST

INTERIM REPORT (UPDATE)

MAY 1986

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U.S. ARMY AVIATION SYSTEMS COMMAND

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SOURCES AND NATURE OF COST ANALYSIS

DATA BASE REFERENCE MANUAL

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MAY 1986

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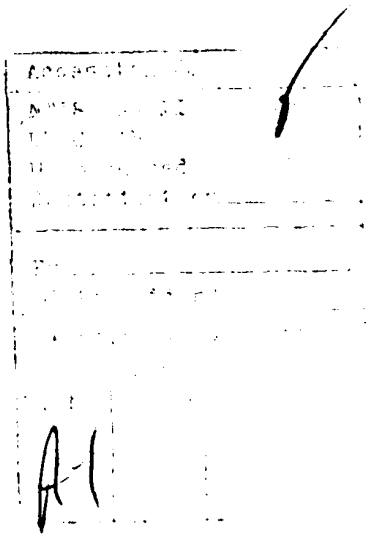
Data
Reports

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Citing specific examples, the report examines, evaluates, analyzes and portrays the sources and nature of the Cost Analysis data base emphasizing important interrelationships between process (gathering, normalization, evaluation), professional skill requirements, the planning of future report revisions, and the development of new data sources. For analysis, the main body of the report employs an expanded 13-step format. Entries on the format were obtained from personal interviews. The report is organized to permit future changes and to facilitate cross-referencing.

ACKNOWLEDGEMENTS

Appreciation is expressed to all personnel of the Directorate for Systems and Cost Analysis. Their assistance and cooperation helped make this effort possible. Mr. Ralph W. Lilge and Mr. William Crosby, as previous authors of this report, were of particular importance. I also wish to thank Mr. Brian Barry who contributed a great deal of information and assistance, and Mrs. Joan Kapp for her excellent editing and typing. Without the assistance of these people, this work would not have been possible.



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I. PURPOSE. To examine, evaluate, analyze, and portray, with specific examples, the sources and nature of the Cost Analysis Data Base emphasizing important interrelationships between processes (gathering, normalization, evaluation), professional skill requirements, the planning of future report revisions, and the development of new data sources; all of which intend to improve the data base.

II. INTRODUCTION. Data is defined as "facts, information, or statistics, either historical or derived by computation or experimentation, from which conclusions may be drawn." Without data, no conclusions could be drawn. Without data, the cost analysis activities could not perform their mission. In short, data is absolutely essential to analysis. Important as it is, however, little has been done, to now, to analyze its sources or nature. This report attempts to correct this deficiency. However, since no report can cover all possible data sources, this report presents a representative sampling of the more important sources used in cost analysis efforts. Such a sample is subject to continuous revision and expansion, for which this report represents the first phase. For this reason, the organization of this report has been designed to easily accept future changes.

III. BACKGROUND.

A. The basic objective of this technical memorandum is to provide the capability for a standardized, meaningful, comprehensive and valid posture in the conduct and presentation of cost analysis data. This data base will provide the necessary related data source on programs structure elements in a concentrated, accurate, up-to-date and readily accessible form.

B. It should be noted that no amount of sophisticated statistical analysis can compensate for gross inadequacy in the data base. Since the data problem is a fundamental one, analysts devote most of their time collecting data to make adjustments in the raw data to insure consistency and comparability.

C. Without an effective capability of collecting and storing data, it is virtually impossible to develop an operational, or cost estimating relationship. An estimating relationship requires a great deal of planning and many manhours of effort in development. A basic foundation of storing and collecting data is needed. In many instances gaps exist in data and some of the information is completely in the wrong format. It also may be incompatible from one agency to another.

D. The level of accuracy is determined by the supervisor. This means that the data should be checked before it is used in an estimate. Unfortunately little, if any, information is supplied in relation to the level of accuracy of data published or otherwise.

E. There are numerous sources of error that can arise in the collection of data. It has been found that these errors originate from several main sources:

1. Sampling methods.
2. Measurement errors.
3. Hidden information.
4. Poorly designed questionnaires/requirements.
5. Data aggregates.
6. Classification and definition.
7. The time factor.

These errors can arise in original data collection situations as well as in published data.

F. Tremendous interest is being generated in the establishment of a data base. This would allow collection of different types of variables stored in an easily accessible system. Three areas of interest in the estimating relationship field would include:

1. Data needed for existing requirement.

2. Data that is currently available but not currently required.

3. Data that may be required in the future, but not currently available.

This type of data base could be expanded at a minimal cost with little or no effort.

G. The basic approach in designing a data base system is to make a data base useful through an easy method of assessing, organizing, formulating, modifying and summarizing its informational content. The improvement of cost analysis studies and cost estimates is an adequate integrated cost data base within AVRADCOM.

IV. ORGANIZATION OF REPORT. The memorandum is to facilitate cross-referencing of data sources. First, data documents are divided into sections representing general categories of application. Then, within each section, data documents are arranged in order of sources preparing the data as follows:

Department of Defense

Department of the Army
- Comptroller of the Army
  - Directorate of Cost Analysis

US Army Materiel Command
- Comptroller
  - Budget Division
  - Cost Analysis Division
- Office of Project Management
- Individual Personnel Concerned

US Army Aviation Systems Command
- Comptroller
- Directorate for Advanced Systems
- Directorate for Engineering
- Directorate for Procurement and Production
- Directorate for Product Assurance
- Directorate for Readiness
- Directorate for Systems and Cost Analysis
- Should Cost Teams

Other Army Sources
- Training and Doctrine Command (TRADOC)
- US Army Test and Evaluation
- US Army Aviation Test Board
- Product/Program/Project Managers
- Depot Activities
- Field Activities

Defense Sources (Excluding Army)
    Defense Research Organizations
        Defense Technical Information Center

    Other Defense Sources
        Department of the Air Force
        Department of the Navy
        Defense Contract Audit Agency (DCAA)
        Field Operating Cost Agency

Government Sources (Excluding Defense)
    Research Organizations
        American Statistical Association
        General Research Corporation
        Institute of Cost Analysis
        J Watson Associates
            OPNAV Resource Analysis Group
        RAND Corporation
        Research Analysis Corporation
            Studies and Analysis Division
    Other Commercial Sources
        Publishers
            American Airlines
            Federal Employee's News Digest
            McGraw-Hill, Inc.
            Society of Aeronautical Engineers
            Ziff-Davis Publishing Company
                Public Transportation and Travel Division
            Contractors
        Authors and Editors
            Kenneth Munson
            John W. R. Taylor

Various

V. PAGE NUMBERING.

A. The system for numbering pages of the main body of the memorandum has been designed to:

1. Be consistent with the organization of the memorandum.

2. Permit further expansion of the memorandum without requiring a drastic change in page numbering.

B. The basic structure of the page numbering system consists of three numbers separated by decimal points as follows:

X.Y.Z

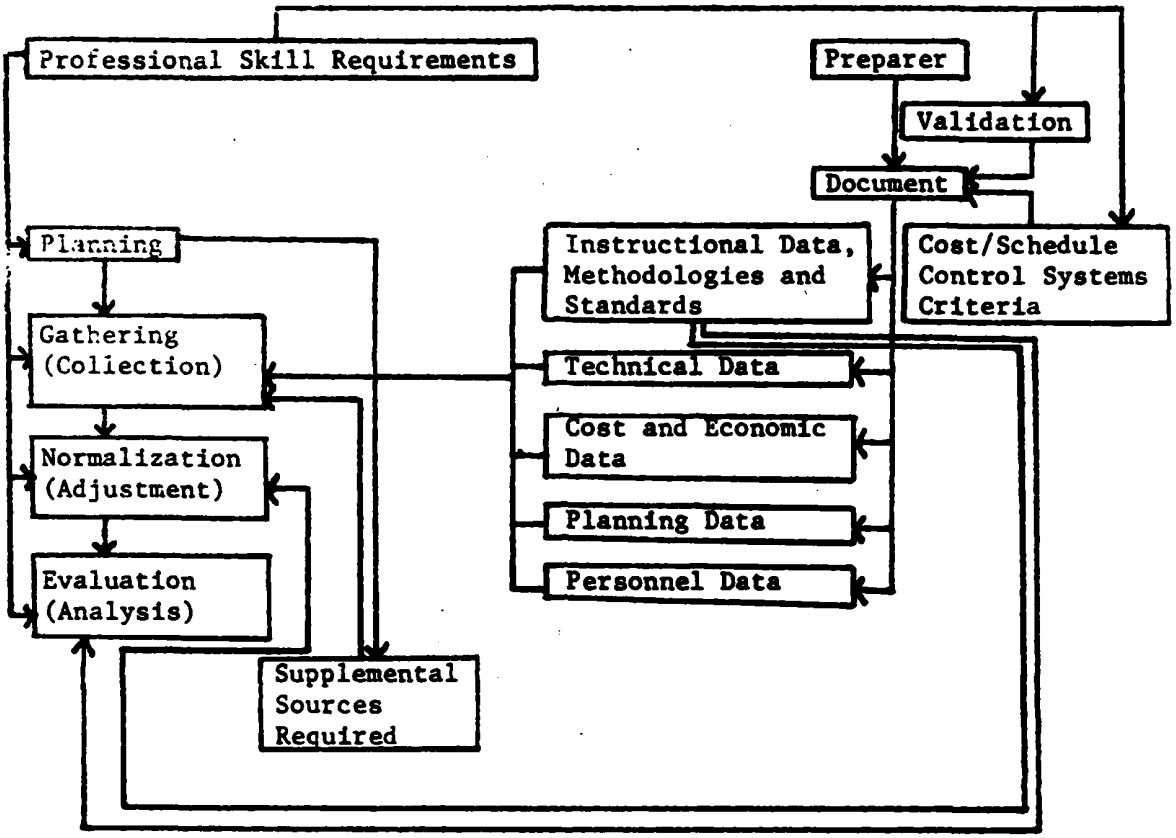
where

X corresponds to the section number.

Y is the sequential number representing the preparer source.

Z is the sequential number of the page within the group of pages reserved for a specific preparer source.

VI. DATA FLOW DIAGRAM.



VII. TABLE OF ACRONYMS*/ABBREVIATIONS.

AAA	- Army Audit Agency
AACB	- Aeronautics and Astronautics Coordinating Board
AAELSS	- Active Army External Load Stabilization System
AAH	- Advanced Attack Helicopter
AAO	- Authorized Acquisition Objective
AAWS	- Advanced Aerial Weapons Systems
ABC	- Advancing Blade Concept
A/C	- Aircraft
ACAP	- Army Cost Analysis Paper
ACO	- Administrative Contracting Officer
AD	- Advanced Development
ADEN/DEFA	- British/French 30mm Aircraft Cannon
ADF	- Automatic Direction Finder
ADO	- Advanced Development Objective
ADP	- Automated Data Processing
ADS	- Aeronautical Design Standards
AEFA	- US Army Aviation Engineering Flight Activity
AFC	- Airworthiness and Flight Characteristics
AFCS	- Automatic Flight Control System
AFDP	- Army Force Development Plan
AFPCH	- Army Force Planning Cost Handbook
AFPRO	- Air Force Plant Representative Office
AGARD	- Advisory Group for Aerospace Research and Development
AHT	- Attack Helicopter Team
AHW	- Aircraft Hourly Worker
AIDAPS	- Automatic Inspection Diagnostic and Prognostic System
AIDATS	- Army In-Flight Data Transmission System
ALT	- Airborne Laser Tracker
AMC	- US Army Materiel Command
AMCAWS	- Advanced Medium Caliber Aircraft Weapon System
AMMRC	- Army Materials and Mechanics Research Center
AMOS	- AVRADCOM Maintenance Operating and Support
AMRDL	- Air Mobility Research and Development Laboratory
AMPR	- Aeronautical Manufacturer's Planning Report
AMSAA	- US Army Materiel Systems Analysis Agency
APA	- Aircraft Procurement, Army
APE	- Army Preliminary Evaluation
APPS	- Analytical Photogrammetrical Position System
APU	- Auxiliary Power Unit
AQP	- Airworthiness Qualification Program
AQS	- Airworthiness Qualification Specification
AR	- Army Regulation
ARDPS	- Army Research and Development Planning System

*See AR 310-50, Authorized Abbreviations, Brevity Codes, and Acronyms, for additional acronyms and abbreviations.

ARMS - Aircraft Reliability and Maintainability Simulation
ARPA - Advanced Research Project Agency
ARRADCOM - US Army Armament Research and Development Command
ARRCOM - US Army Armament Materiel Readiness Command
ARS - Aircraft Rocket Subsystem
ASARC - Army Systems Acquisition Review Council
ASCOD - Army System Coordinating Document
ASE - Aircraft Survivability Equipment
ASF - Army Stock Fund
ASH - Advanced Scout Helicopter
ASOP - Army Strategic Objective Plan
ASPR - Armed Services Procurement Regulation
ASTD - Advanced Structures Technology Demonstrator
ASTIO - Advanced Systems Technology and Integration Office (AVRADCOM)
ATAFCS - Airborne Target Acquisition and Fire Control System
ATE - Automatic Test Equipment; Advanced Technology Engine
AVIM - Aviation Intermediate Maintenance
AVRADCOM - US Army Aviation Research and Development Command
AVSCOM - US Army Aviation Systems Command
AVUM - Aviation Unit Maintenance
AWLS - Airborne Weapons Locating System

BCE - Baseline Cost Estimate
BCT - Basic Combat Training
BED - Basic Engineering Development
BLS - Bureau of Labor Statistics
BOI - Basis of Issue
BTA - Best Technical Approach

CAA - Concepts Analysis Agency
CAB - Cost Analysis Brief
CACDA - Combined Arms Combat Development Activity
CAIG - Cost Analysis Improvement Group
CARDS - Catalog of Approved Requirements Documents
CCDR - Contractor Cost Data Reporting
CDEC - Combat Developments Experimentation Command
CDR - Critical Design Review
CECDC - Cost Estimating Control Data Center
CER - Cost Estimating Relationship
CERCOM - US Army Communications and Electronics Materiel Readiness Command
CFE - Contractor Furnished Equipment
CFP - Concept Formulation Package
CG - Center of Gravity
CICS - Control Integrated Checkout System
CIP - Component Improvement Program

CIR	- Cost Information Report
COA	- Comptroller of the Army
COB	- Close of Business
COEA	- Cost and Operational Effectiveness Analysis
CONUS	- Continental United States
CORADCOM	- US Army Communications Research and Development Command
CPO	- Complete Provisions Only; Civilian Personnel Office; Contractual Procurement Office
CPR	- Cost Performance Report
CPU	- Control Processing Unit
CRT	- Cathode Ray Tube
C/SCSC	- Cost/Schedule Control System Criteria
CSE	- Common Support Equipment
CSTA	- Combat Surveillance and Target Acquisition Laboratory
CTEA	- Cost and Training Effectiveness Analysis
CTP	- Coordinated Test Plan
CV	- Coefficient of Variation
CY	- Calendar Year
DA	- Department of the Army
DAES	- Defense Acquisition Execution Summary
DAPR	- Department of the Army Program Report
DARCOM	- US Army Materiel Development and Readiness Command
DASC	- Department of the Army System Coordinator
db	- Decibel
DCAA	- Defense Contract Audit Agency
DCAS	- Defense Contract Administration Service
DCP	- Decision Coordinating Paper; Development Concept Paper
DCPR	- Defense Contractor's Planning Report
DCSLOG	- Deputy Chief of Staff for Logistics
DCSOPS	- Deputy Chief of Staff for Operations and Plans
DCSPER	- Deputy Chief of Staff for Personnel
DCSRDA	- Deputy Chief of Staff for Research, Development and Acquisiiton
DDRE	- Director of Defense Research and Engineering
DEPSECDEF	- Deputy Secretary of Defense
D&F	- Determination and Finding
DGW	- Design Gross Weight
DIMAP	- Digital Modular Avionics Program
DOC	- Direct Operating Cost
DOD	- Department of Defense
DODD	- Department of Defense Directive
DODI	- Department of Defense Instruction
DP	- Development Plan
DPS	- Dynamic Propulsion System
DPROC	- Draft Preliminary Required Operational Capability
DS	- Direct Support

DSA	- Defense Supply Agency
DSARC	- Defense Systems Acquisition Review Council
DT	- Development Test
DTB	- Detection Time Variation
DTC	- Design to Cost
DTUPC	- Design to Unit Production Cost
EA	- Economic Analysis
ECCM	- Electronic Counter Countermeasures
ECO	- Engineering Change Order
ECP	- Engineering Change Proposal
ED	- Engineering Development
EDT	- Engineering Development Test
EM	- Enlisted Man
EMI	- Electromagnetic Interference
EARDCOM	- US Army Electronics Research and Development Command
EST	- Expanded Service Test
EW	- Empty Weight
EWL	- Electronic Warfare Laboratory
FAA	- Federal Aviation Administration
FBW	- Fly-By-Wire
FEBA	- Forward Edge of the Battle Area
FFH	- Fast Frequency Hopping
FH	- Flying Hour
FLIR	- Forward-Looking Infra-red
FMS	- Foreign Military Sales
FOD	- Foreign Object Damage
FORSCOM	- US Army Forces Command
FS CTEA	- Flight Simulator Cost and Training Effectiveness Analysis
FSP	- Full Scale Production
FY	- Fiscal Year
FYDP	- Five Year Defense Program
G or g	- Gravity
GAO	- General Accounting Office
GCT	- Government Competitive Test
GFAE	- Government Furnished Aircraft Equipment
GFE	- Government Furnished Equipment
GFM	- Government Furnished Materials
GFP	- Government Furnished Property
GLAS	- Gust and Load Alleviation System
GLLD	- Ground Laser Locator Designator
GNP	- Gross National Product
GPU	- Ground Power Unit
GS	- General Support
GSE	- Ground Support Equipment
GTV	- Ground Test Vehicle
GW	- Gross Weight
G&A	- General and Administrative

HE - Human Engineering; High Explosive
HELLFIRE - Helicopter Launch Fire and Forget Antitank Missile System
HF - Human Factors; High Frequency
HHLR - Handheld Laser Rangefinder
HLH - Heavy Lift Helicopter
HMD - Helmet Mounted Display
HMMS - Hellfire Modular Missile System
HOGE - Hover Out-of-Ground Effect

I^2 - Image Intensifier
IACS - Integrated Avionics Control System
ICE - Independent Cost Estimate
ICNI - Integrated Communication, Navigation, Identification
ICNS - Integrated Communication and Navigation System
ICTT - Intensified Confirmatory Troop Test
IFF - Identification, Friend or Foe
IGCE - Independent Government Cost Estimate
ILS - Integrated Logistics Support
IOC - Initial Operational Capability
IPCE - Independent Parametric Cost Estimate
IPF - Initial Production Facility
IPR - In-Process Review
IPT - Initial Production Test
IR - Infrared
IRCM - Infrared Countermeasures
ISHP - Intermediate Shaft Horsepower

JCS - Joint Chiefs of Staff
JCTG - Joint Commander's Technical Group

KTAS - Knots True Air Speed

LA - Low Altitude
LAH - Light Attack Helicopter
LARS - Laser Aided Rocket System
LCC - Life Cycle Cost
LCCE - Life Cycle Cost Estimate
LCCM - Life Cycle Cost Model
LINS - Laser Inertial Navigation System
LLLTV or LLTV - Low-Light-Level TV
LOA - Letter of Agreement
LOH - Light Observation Helicopter
LOI - Letter of Instruction
LOS - Line-of-Sight
LOTANS - Laser Obstacle/Terrain Avoidance Warning System
LPMES - Logistics Performance Measurement and Evaluation System
LR - Letter Requirement
LRIP - Low Rate Initial Production
LUH - Light Utility Helicopter
LWLD - Lightweight Laser Designator

M	- Millions
MACRIT	- Manpower Authorization Criteria
MARS	- Mid-Air Recovery System
MCA	- Military Construction, Army
MEA	- Maintenance and Engineering Analysis
MERADCOM	- US Army Mobility Equipment Research and Development Command
MIRADCOM	- US Army Missile Research and Development Command
MIRCOM	- US Army Missile Materiel Readiness Command
MLH	- Medium Lift Helicopter
MLS	- Microwave Landing System
MMH/FH	- Maintenance Manhour per Flying Hour
MN	- Materiel Need
MOS	- Military Occupational Specialty
MPA	- Military Pay and Allowances
MQT	- Military Qualification Test
MSC	- Major Subordinate Command
MSRS	- Materiel System Requirements Specification
MTBF	- Mean Time Between Failure
MTBR	- Mean Time Between Removal
MTI	- Moving Target Indicator
MTOE	- Modified Table of Organization and Equipment
MTTR	- Mean Time to Repair
MWFCS	- Multi-Weapon Fire Control System
MWO	- Modification Work Order
NARADCOM	- US Army NATICK Research and Development Command
NASA	- National Aeronautics and Space Administration
NAVCOM	- Navigation/Control Systems Project Manager (AVRADCOM, Ft. Monmouth, NJ)
NAVPRO	- Navy Plant Representative Office
NETT	- New Equipment Training Team
NICP	- National Inventory Control Point
NMIT	- New Materiel Introductory Team
NOE	- Nap of the Earth
NSN	- National Stock Number
NVL	- Night Vision Laboratories
O&S	- Operation and Support
OASD (I&L)	- Office, Assistant Secretary of Defense (Installations and Logistics)
OCM	- On-Condition Maintenance
OCS	- Optical Contrast Seeker
OGE	- Out of Ground Effect
OMA	- Operation and Maintenance, Army
OPA	- Other Procurement, Army
ORA	- Operations Research Analysis
ORG	- Organizational
ORSA	- Operations Research/Systems Analysis
OT	- Operational Test
OTEA	- US Army Operational Test and Evaluation Agency

PA&E - Program Analysis and Evaluation
PCS - Permanent Change of Station
PDR - Preliminary Design Review
PDS - Program Data Sheets
PEMA - Procurement of Equipment and Munitions, Appropriations
PEP - Producibility Engineering and Planning
PFRT - Preliminary Flight Rating Test (Sprint)
PINE - Pilot's Infrared Night Equipment
PIP - Product Improvement Program
PLO - Procurement Liaison Officer
PM - Product Manager; Program Manager; Project Manager
PMCS - Program Management Control System
PMSA - PM/Materiel System Assessment
POM - Program Objective Memorandum
PPBES - Planning, Programming, Budgeting and Execution System
PWD - Proximity Warning Device

QMR - Qualitative Materiel Requirement

RAM - Reliability, Availability and Maintainability
R&M - Reliability and Maintainability; Research and Methodology
RAM-D - Reliability, Availability, Maintainability, Dependability
RAMMIT - Reliability and Maintainability Management Improvement Techniques
R&D - Research and Development
RD&E - Research, Development and Engineering
RDTE - Research, Development, Test and Evaluation
RECAP - Review and Command Assessment of Projects
RFP - Request for Proposal
RMI/HSI - Radio Magnetic Indicator/Horizontal Situation Indicator
ROC - Required Operational Capability
RPAODS - Remotely Piloted Aerial Observation/Designation System
RPV - Remotely Piloted Vehicle
RSTA-D - Reconnaissance, Surveillance, Target Acquisition and Designation

SAG - Study Advisory Group
SAM - Surface to Air Missile
SAR - Selected Acquisition Report
SCAS - Stability and Control Augmentation System
SE - Standard Error
SFC - Specific Fuel Consumption
SFTS - Synthetic Flight Training System
SHP - Shaft Horsepower

SIC - Standard Industrial Code
SLAE - Standard Lightweight Avionics Equipment
SLS - Sea Level, Standard (Day)
SNAPAC - Steerable Null Antenna Processor for Airborne Communications
SOP - Standard Operating Procedure
SOTAS - Stand Off Target Acquisition System
SSEB - Source Selection Evaluation Board
SSG - Special Study Group
STA - Static Test Article
STF - Special Task Force
STOL - Short Takeoff and Landing
SWP - Space, Weight and Power

TACFIRE - Tactical Fire Direction System
TADS - Target Acquisition Designator System
TAERS - The Army Equipment Reporting System
TAMMS - The Army Maintenance Management System
TARADCOM - US Army Tank-Automotive Research and Development Command
TARCOM - US Army Tank-Automotive Materiel Readiness Command
TA/TF - Terrain Avoidance/Terrain Following
TBO - Time Between Overhaul
TDA - Table of Distribution and Allowance
TDY - Temporary Duty
TECOM - US Army Test and Evaluation Command
TMS - Type, Model and Series
TOA - Tradeoff Analysis
TOD - Tradeoff Determination
TOE - Table(s) of organization and equipment
TOW - Tube-Launched, Optically Tracked, Wire-Guided
TPP - Transients, Patients and Prisoners
TRACE - Total Risk Assessing Cost Estimate
TRANSANA - TRADOC Systems Analysis Activity
TRADOC - US Army Training and Doctrine Command
TROSCOM - United States Army Troop Support Command

UCR - Unit Cost Report
USAFR - US Air Force Regulation
UTS - Ultimate Tensile Strength
UTTAS - Utility Tactical Transport Aircraft System (now called BLACK HAWK)

VE - Value Engineering
VERT - Venture Evaluation and Review Technique
VROC - Vertical Rate of Climb
VTOL - Vertical Takeoff and Landing

WBS - Work Breakdown Structure
WPI - Wholesale Price Index

SECTION 1

INSTRUCTIONAL DATA, METHODOLOGIES AND STANDARDS

1.0.0

TABLE OF CONTENTS
SECTION 1
INSTRUCTIONAL DATA,
METHODOLOGIES AND STANDARDS

1. Source.

a. Document. DODI 4140.39, 17 July 1970, subject: Procurement Cycles and Safety Levels of Supply for Secondary Items.

b. Preparer. Department of Defense.

2. Application. Establishes methods, procedures, and standards for determining safety levels, estimating procurement leadtimes, and related statistics for secondary items of supply.

3. Status. Operational.

4. Nature of Data. Not applicable.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Understanding of determining factors causing variance in supply statistics, as well as a knowledge of the theory behind their development, estimation, and application.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Various Industrial Research Offices, RAND Corporation, and other technical studies and reports.

11. Use in Cost Analysis. Inventory analysis. Cost Analysis problems involving secondary items of supply.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Military Standard 881A, Work Breakdown Structure, 25 April 1975.

b. Preparer. Department of Defense.

2. Application. Provides guidance for developing in outline form a method of classifying the work tasks for a particular project.

3. Status. Operational.

4. Nature of Data. Provides representative Work Breakdown Structure for several systems.

5. Level of Detail. By Work Breakdown Structure elements, level III.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Unique Work Breakdown Structures must be designed for each project.

8. Limitations. Often difficult to compare WBS line items between different projects.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. AR 11-18, Weapon/Support Systems Cost Categories and Elements, 10 October 1975.

11. Use in Cost Analysis. Determines detail of estimate for Baseline Cost Estimate. In conjunction with AR 11-18 also provides organizational framework for other estimates particularly Independent Parametric Cost Estimates (IPCEs).

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. AR 37-100-XX, The Army Management Structure.

b. Preparer. Department of the Army.

2. Application. Standard for assigning budgetary codes.

3. Status. Operational. Updated annually or more frequently.

4. Nature of Data. Description of budgetary code accounts used, performance factors assigned, and other information.

5. Level of Detail. Determined by budgetary account.

6. Normalization Processes Required. When developing a cost data base, comparison with accounting codes used in previous years.

7. Evaluation Techniques Required. Coordination with accounting and budgetary officers to determine with certainty the exact accounting conventions followed.

8. Limitations. Not applicable.

9. Deficiencies. Frequent changes.

10. Supplemental Sources Required. AR 37-100, Account/Code Structure, 1 August 1980.

11. Use in Cost Analysis. Useful in analyzing some cost data.

12. Remarks. Not applicable.

13. Suggestions. None.

1. Source.

a. Document. AR 310-25, Dictionary of United States Army Terms, 15 November 1983.

b. Department of the Army.

2. Application. Standardization of terms used within the Army.

3. Status. Operational.

4. Nature of Data. Definitions for each term.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. AR 310-50, Authorized Abbreviations, Brevity Codes, and Acronyms, 15 November 1985.

11. Use in Cost Analysis. See Application above.

12. Remarks. In some cases, standard Army definition may vary from common civilian usage. Therefore, care must be exercised to insure that terms are not used loosely.

13. Suggestions. None.

1. Source.

   a. Document. AR 11-18, The Cost Analysis Program, 10 October 1975.

   b. Preparer. Comptroller of the Army.

2. Application. Provide organizational framework for cost estimate.

3. Status. Operational.

4. Nature of Data. See Application above.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. MIL STD 881A, Work Breakdown Structure, 25 April 1975.

11. Use in Cost Analysis. Organization of cost estimates, particularly Baseline Cost Estimates (BCEs) and Independent Parametric Cost Estimates (IPCEs).

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document.

(1) Department of the Army Pamphlet 11-1, Guide for Improved Use of Defense Documentation Center By Cost Analysts, January 1976.

(2) Department of the Army Pamphlet 11-2, Research and Development Cost Guide for Army Materiel Systems, May 1976.

(3) Department of the Army Pamphlet 11-3, Investment Cost Guide for Army Materiel Systems, April 1976.

(4) Department of the Army Pamphlet 11-4, Operating and Support Cost Guide for Army Materiel Systems, April 1976.

(5) Department of the Army Pamphlet 11-5, Standards for Presentation and Documentation of Life Cycle Cost Estimates for Army Materiel Systems, May 1976.

b. Preparer: Department of the Army.

2. Application. Guidance for preparation of documentation and presentations for weapon system Independent Parametric Cost Estimates (IPCEs), Cost and Operational Effectiveness Analysis (COEA) and Baseline Cost Estimates (BCEs).

3. Status. Operational.

4. Nature of Data. Textual narrative published in several volumes.

5. Level of Detail. Includes cost elements, methodologies, and reporting formats reflecting current costing techniques and includes direct and indirect operating costs.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Analytical judgment required. Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory. Understanding and application of Army Force Planning Cost Handbook, June 1977.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Cost data obtained from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control System Criteria Reports.

11. Use in Cost Analysis. Reference guide.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. DCA-P-92(R), Instructions For Reformatting the BCE/ICE.

b. Preparer. Directorate of Cost Analysis, Office of the Comptroller of the Army.

2. Application. Provides instructions for preparing Baseline Cost Estimates/ Independent Cost Estimates in the current proper format.

3. Status. Operational.

4. Nature of Data. Defines the current acceptable format for presentation of BCE/ICEs by relating it to the preceding format. Relates the "Big Three" format formerly in use to the current "Big Five" activity phases. Define the individual cost elements and presents the matrices to be used. Relates BCE to other functional documents.

5. Level of Detail. Quite detailed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Historical inflation indices, cost data.

11. Use in Cost Analysis. Defines the acceptable format to be used by the Cost Analyst in preparing BCE/ICEs.

12. Remarks. None.

13. Suggestions: None.

1. Source.

a. Document. Letter, AMCDE-PII, 5 September 1985, subject: Instructions for Preparation and Submission of September 1985 Unit Cost Reports (UCRs) and Defense Acquisition Executive Summary (DAES) Reports.

b. Preparer. US Army Materiel Command, Directorate for Development, Engineering, and Acquisition.

2. Application. Provide guidance for preparation and submission of Unit Cost Reports (UCRs) and Defense Acquisition Executive Summary (DAES) Reports.

3. Status. Operational. Regularly revised, as required, and annually.

4. Nature of Data. Contains narrative instructive material for preparation and submission of UCRs and DAES Reports.

5. Level of Detail. See above.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Proper interpretation of instructions and appropriate mathematical and cost estimating techniques.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Other guidance as published.

11. Use in Cost Analysis. Forms a basis for validation procedures of UCRs and DAES Reports.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Cost to Order Studies.

b. Preparer. Directorate for Plans and Analysis, US Army Aviation Research and Development Command.

2. Application. Estimating cost of ordering an item of supply and determination of optimum supply policy with respect to reorder frequencies.

3. Status. As needed.

4. Nature of Data. Manhour and Cost Estimates for Cost to Order. Also contains narrative material.

5. Level of Detail. By organization, type of cost, and dollar values of item ordered.

6. Normalization Processes Required. Analytical judgment required.

7. Evaluation Techniques Required. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory.

8. Limitations. Some values of report were estimated, thus limiting the accuracy of the published figures.

9. Deficiencies. See Limitations, above.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Used in certain cost estimates.

12. Remarks. None.

13. Suggestions. Report should be developed along standard report procedures, possibly automated to insure accurate measurement of values, thus negating the necessity for estimation.

1. Source.

a. Document. Assessment of Learning Curve Experience for DTUPC Estimates vs Actual/Current Estimates.

b. Preparer. US Army Aviation Research and Development Command, Directorate for Plans and Analysis.

2. Application. Specifies possible problems in using learning curves by comparing DTUPC contract provisions and current production unit costs.

3. Status. Operational.

4. Nature of Data. Narrative with charts, tables and graphs.

5. Level of Detail. Moderately detailed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. See Application, above.

12. Remarks. An interesting and informative analysis of predicted results, (costs), versus actual performance.

13. Suggestions. More of this kind of study would assist analysts to evaluate various prediction techniques.

1. Source.

a. Document. USAAVRADCOM Technical Report TM 83-F-4; LERNCURV: The Directorate for Plans and Analysis Learning Curve Program.

b. Preparer. Directorate for Plans and Analysis, US Army Aviation Systems Command.

2. Application. Generates a learning curve which "best fits" the data provided. It then uses the generated curve to predict costs for lots designated by the user.

3. Status. Published August, 1983.

4. Nature of Data. Allows the analyst to predict lot costs using historical data input by the user.

5. Level of Detail. Considerable; underlying theory is explained in detail.

6. Normalization Processes Required. Historical cost data, expressed in current year dollars, must be normalized into constant (base year) dollars before it is input.

7. Evaluation Techniques Required: Higher mathematical skills coupled with knowledge of theoretical applications.

8. Limitations. Applies only to recurring data associated with production.

9. Deficiences. Not applicable.

10. Supplemental Sources Required: User must know either a slope of the desired curve and the cost of a particular unit, b.slope of the desired curve and the average unit cost of a lot, the first unit, last unit, and average unit cost for each of several lots.

11. Use in Cost Analysis. See Application.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. USAAVSCOM Technical Report TR84-F-4, Historical Research and Development Inflation Indices for Army Fixed and Rotor Winged Aircraft.

b. Preparer. Directorate for Systems and Cost Analysis, US Army Aviation Systems Command.

2. Application. To be used in bringing a cost in prior years to a present year dollar value; and for evaluating inflation actually experienced.

3. Status. Published March, 1984.

4. Nature of Data. Data includes commodity sub-indexes by material normalized to either 1968 or 1983 constant dollars; also includes Labor Indices normalized to same year constant dollars and historical inflation indices representing various labor/material mixes expressed in 1983 constant dollars.

5. Level of Detail. Inflation indices are available for individual commodities.

6. Normalization Processes Required. Referenced constant year dollars must be normalized to desired year.

7. Evaluation Techniques Required. Some knowledge in economics is necessary; understanding of the concept of current year vs constant dollars.

8. Limitations. Indices are not provided beyond FY83.

10. Supplemental Sources Required. Relevant indices must be used in order to normalize data to FY83 dollars or forward to more recent years.

11. Use in Cost Analysis. Used to inflate (deflate) current year dollars into desired constant year dollars.

12. Remarks. None.

13. Suggestions. Current indices should be included in this technical report.

1. Source.

a. Document. USAAVSCOM Technical Report TR 85-F-5, AVSCOM Program Management Control System (PMCS)/Planning, Programming, Budgeting and Execution System (PPBES) Network.

b. Preparer. Directorate for Systems and Cost Analysis, US Army Aviation Systems Command.

2. Application. Provides overview of the Program Management Control System (PMCS), Planning, Programming, Budgeting and Execution System (PPBES), and their role in the AMC reporting system. Discusses specific documents which are used in this reporting system that should be familiar to cost analysts.

3. Status. Operational.

4. Nature of Data. Narrative discussion of PMCS/PPBES network, instructions for use by analyst in validating cost estimates.

5. Level of Detail. Fairly detailed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Provides the analyst with an overview of the PMCS/PPBES network, interrelationship of various cost documents.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Cost and Operational Effectiveness Analysis.

b. Preparer. Normally compiled by US Army Training and Doctrine Command (TRADOC).

2. Application. To analyze the cost and operational effectiveness of several alternatives proposed for a weapons system.

3. Status. Operational.

4. Nature of Data. Life cycle costs and operational effectiveness are analyzed. Data concerning advanced technology and perception of threat frequently carries a security classification.

5. Level of Detail. Variable.

6. Normalization Processes Required. Analytical judgment required.

7. Evaluation Techniques Required. Variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) or Product Improvement Programs (PIPs) require additional analysis. This technique requires the ability to track detailed cost data to previous estimates. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory.

8. Limitations. Data at too high a level of the Work Breakdown Structure (WBS).

9. Deficiencies. Lack of data source identification makes determination of proper supplemental sources difficult.

10. Supplemental Sources Required. Cost data obtained from such sources as Contract Cost Data Reports (CCDR) and Cost/Schedule Control Systems Criteria (C/SCSC) reports.

11. Use in Cost Analysis. Important source of data for methodology development and basis from which to develop other estimates, especially quick-reaction studies. Also useful as supplemental background material.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Handbook of Forecasting Techniques.

b. Preparer. Center for the Study of Social Policy Stanford Research Institute. Prepared for Institute for Water Resources U. S. Army Corps of Engineers.

2. Application. This report focuses on 12 basic techniques suitable for a wide range of technological, economic, social, and environmental forecasting.

3. Status. Not applicable.

4. Nature of Data. A narrative enhanced with charts, graphs and tables which deals with three major categories of long-range planning: Time Series and Projections; Models and Simulations; and Qualitative and Holistic Methods.

5. Level of Detail. By major category of techniques and specific techniques.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. The ability to read and understand charts and graphs. Also required is a knowledge of Algebra and Statistics.

8. Limitations. Examples basically apply to the Corps of Engineers. Some techniques might better apply to problems particular to those of the Corps. However, many of the techniques in the report can be applied to Cost Analysis.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Handbook of Forecasting Techniques Parts I and II.

11. Use in Cost Analysis. A useful guide to a number of forecasting techniques which can assist Cost Analysis.

12. Remarks. Appears to be a comprehensive analysis of various forecasting techniques.

13. Suggestions. None.

1. Source.

a. Document. TI-59 Handheld Calculator Aircraft Avionics Modification Cost Estimating Model User's Handbook.

b. Preparer. Directorate for Cost Analysis, Comptroller, Aeronautical Systems Division, U. S. Air Force.

2. Application. To make quick reaction cost estimates for avionics equipment modification programs.

3. Status. Operational.

4. Nature of Data. Not applicable.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. TI-59 required. Model may deal with fixed wing or jet aircraft.

9. Deficiencies. See Limitations.

10. Supplemental Sources Required. TI-59 Manual.

11. Use in Cost Analysis. With alterations could assist in estimating aircraft avionics modification costs.

12. Remarks. In order to use in cost studies on rotary winged aircraft the model will have to be purged of factors peculiar to jet and fixed winged aircraft and replaced or supplemented with aspects which deal with rotary wing aircraft.

13. Suggestions. See Remarks above.

1. Source.

a. Document. TI-59 Handheld Calculator Learning Curve Program User's Handbook.

b. Preparer. Directorate for Cost Analysis, Comptroller, Aeronautical Systems Division, U. S. Air Force.

2. Application. To simplify and facilitate cost analysis computations. To allow the analyst to quickly operate learning curve data using either unit or cumulative average learning curve theory.

3. Status. Operational.

4. Nature of Data. Not applicable.

5. Level of Detail. Not very detailed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Knowledge and understanding of learning curve theory and its applications.

8. Limitations. TI-59 calculator is required. For lot sizes greater than 100 units or where the number of the first unit of the lot is larger than 100 approximation formulas are used rather than exact formulas.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Manual for TI-59.

11. Use in Cost Analysis. See Application above.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. TI-59 Programmable Calculator Life Cycle Cost Model User's Handbook, September 1979.

b. Preparer. Directorate of Cost Analysis, Comptroller, Aeronautical Systems Division, U. S. Air Force.

2. Application. Provides a life cycle cost model which can be used at the analyst's desk by using a hand-held calculator.

3. Status. Operational.

4. Nature of Data. Not applicable.

5. Level of Detail. Fairly detailed as regards the operation and support phase of the life cycle cost model.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. The model deals more with the investment and operations and support phases of the life cycle cost model than the research and development phase. Model may apply more to fixed wing and jet aircraft. Requires a TI-59 calculator.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Manual for TI-59 calculator.

11. Use in Cost Analysis. With possible alterations, if necessary, can be used to derive life cycle cost estimates for aircraft.

12. Remarks. In order to use the model may have to be modified to eliminate aspects peculiar to fixed wing and jet aircraft and to add factors particular to rotary winged aircraft.

13. Suggestions. None.

1. Source.

a. Document. AFIT GSM/SM/76D-30, Application of a Bayesian Approach to Updating Airframe CERs.

b. Preparer. Air Force Institute of Technology.

2. Application. Provides a means of estimating the recurring cost of the next airframe.

3. Status. Operational.

4. Nature of Data. Textual narrative discusses techniques for minimizing errors due to differences in airframe types and equation errors.

5. Level of Detail. Considerable; this document is primarily concerned with statistical theory.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. High degree of familiarity with statistical theory; some higher mathematical skills needed.

8. Limitations. Not applicable.

9. Deficiences. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Reference Book.

12. Remarks. None

13. Suggestions. None.

1. Source.

a. Document. ESD TR-78-140. Software Acquisition Management Guidebook: Cost Estimation and Measurement.

b. Preparer. Prepared by contractor for Air Force Electronics Systems Division.

2. Application. Cost estimation of software costs.

3. Status. Operational.

4. Nature of Data. This report provides a basic understanding of relatively current methodologies used by both the government and contractors to prepare software cost estimates. It also provides insight into some of the problems (and their causes) associated with these estimates. Also discussed is the process for monitoring software costs and schedules, while providing the analyst with sources of additional reference information.

5. Level of Detail. Variable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Not applicable.

9. Deficiencies. Some more recent models and reference documents are omitted.

10. Supplemental Sources Required. Varies with application.

11. Use in Cost Analysis. Reference for acquainting analyst with software cost estimation.

12. Remarks. None.

13. Suggestions. Should be updated.

1. Source.

   a. Document. RADC TR-77-220. Software Cost Estimation Study.

   b. Preparer. Prepared by contractor for Rome Air Development Center.

2. Application. Software cost estimating reference.

3. Status. Operational.

4. Nature of Data. This study deals with the specific factors which create problems in generating software cost estimates, their impact on the actual estimates, and possible methods for minimizing their effects.

5. Level of Detail. Varies. Considerable time is spent in discussion of improving reliability of software cost estimates; much less on other topics.

6. Normalization Processes Required. None.

7. Evaluation Techniques Required. Assumes familiarity with statistical concepts, along with familiarity with regression techniques.

8. Limitations. Assumes some degree of familiarity with software.

9. Deficiences. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Enhances analyst's understanding of software development cost estimating technique.

12. Remarks. None.

13. Suggestions. Analyst should acquire general knowledge of software cost estimating techniques prior to using this report.

1. Source.

a. Document. AFWAL TR-82-1173. Avionics Software Support Cost Model.

b. Preparer. Contractor, for Air Force Aeronautical Laboratories.

2. Application. Model to be used in projecting annual software support costs of proposed avionics software configurations during early design phases of system development.

3. Status. Operational; model is not widely used within DA.

4. Nature of Data. Avionics Software Support Cost Model (ASSCM) is a model used for predicting the support costs associated with embedded computer software for avionics systems. It is applicable to: operational flight program software, airborne communications/electronics software, and airborne electronic warfare software.

5. Level of Detail. Quite detailed.

6. Normalization Processes Required. All costs are calculated in calendar year 1981 dollars; they require inflation to present year dollars.

7. Evaluation Techniques Required. Requires a relatively high degree of familiarity with software in order to utilize the subjective aspects of the algorithm.

8. Limitations. The model does not address software acquisition costs, nor costs incurred in operation by users. Utilizes only Air Force projects.

9. Deficiences. None apparent.

10. Supplemental Sources Required. Relevant forms must be used by people with knowledge in the field of avionics software support.

11. Use in Cost Analysis. Self explanatory.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. AFAL TR-73-441. Cost Analysis of Avionics Equipment.

b. Preparer. General Research Corporation for the U.S. Air Force Avionics Laboratory.

2. Application. Cost estimation of aircraft avionics.

3. Status. Operational.

4. Nature of Data. This report contains parametric cost estimating relationships (CERs) to assist in predicting the development, production and logistic support costs of avionics equipment before a detailed description of its physical makeup is available. These CERs are used for four types of avionics subsystems: fire control radar, inertial navigators, digital computers and doppler navigation radars.

5. Level of Detail. This study deals with equipment and life cycle costs at the aggregate level; it addresses the inability to establish precise definition of the cost elements. Development CERs incorporate a measure of the development program's state-of-the-art advance. Logistic support CERs are functions of equipment first unit cost or cumulative average cost.

6. Normalization Processes Required. All CERs are in FY 1974 dollars; they must be inflated to present year dollars.

7. Evaluation Techniques Required. Knowledge of standard regression analysis techniques.

8. Limitations. Inability to obtain any great level of detail among the cost elements is a shortcoming.

9. Deficiences. None apparent.

10. Supplemental Sources Required. Relevant system technical data is necessary to use these CERs.

11. Use in Cost Analysis. Self explanatory.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. BLS Handbook of Methods, January 1976.

b. Preparer. Department of Labor, Bureau of Labor Statistics.

2. Application. Reference book describing methodologies used in all BLS publications.

3. Status. Operational.

4. Nature of Data. See Application above.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Economic background helpful to aid understanding of economic terminology and concepts. Higher mathematical skills coupled with knowledge of theoretical applications.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Broadens understanding of various reports on economic time series prepared by Bureau of Labor Statistics, serves as an aid towards eliminating misinterpretation and minunderstanding of economic statistics. Also serves to guide methodologies for Cost Analysis use.

12. Remarks. Inaccurate estimates may result from indiscriminate application of analytical techniques.

13. Suggestions. None.

1. Source.

   a. Document. Guide to Industrial Statistics.

   b. Preparer. Department of Labor, Bureau of Labor Statistics.

2. Application. Reference book to assist users of industrial statistics published by the Government.

3. Status. Operational.

4. Nature of Data. See Application above.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. The ability to understand tabular statistical presentations.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Increases understanding of various statistical presentations published by the Government which pertain to Cost Analysis.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Journal of the American Statistical Association.

   b. Preparer. American Statistical Association.

2. Application. To present the latest developments in statistical analysis.

3. Status. Operational. Updated quarterly.

4. Nature of Data. Original articles submitted on statistical analysis. Articles consist essentially of two types: articles concerning new applications of existing statistical processes and articles concerning the development of new statistical processes.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Higher mathematical skills and in-depth academic statistical background.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Statistical texts and handbooks, publications referenced by article contributions.

11. Use in Cost Analysis. Development of statistical methodologies. Articles on time-series analysis and regression techniques particularly useful.

12. Remarks. Most articles are extremely difficult to comprehend, thus requiring a very advanced level of academic understanding.

13. Suggestions. An intensive effort to simplify the language of the contributed articles would tremendously improve their usefulness. Visual aids resembling the charts and graphs of Scientific American would also be of tremendous help.

1. Source.

a. Document. R-1693-1-PA&E, Parametric Equations for Estimating Aircraft Airframe Costs, February 1976.

b. Preparer. A report prepared for Assistant Secretary of Defense (Program Analysis and Evaluation).

2. Application. Cost estimation of fixed wing military aircraft.

3. Status. Operational. This report updates two previous RAND reports entitled "Cost-Estimating Relationships for Aircraft Airframes", RM-4845-PR, February 1966 and "Cost-Estimating Relationships for Aircraft Airframes", R-761-PR, December 1971.

4. Nature of Data. This report includes cost estimating relationships (CERs) for estimating development and production cost of fixed-wing airframes. Separate CERs are included for engineering, development support, flight test operations, tooling, manufacturing labor, manufacturing material and quality control. A set of CERs are also included for prototype production. Cost data from which the CERs were derived were obtained from 10 airframe contractors and are included in Appendix A of this report.

5. Level of Detail. The CERs are presented with a sufficient amount of detail and statistics. The cost data base used in developing the CERs on fixed-wing aircraft are provided by aircraft. For each aircraft the quantity of aircraft procured is subdivided by lot. For each lot, the following information is provided: AMPR weight, engineering hours, tooling hours, manufacturing hours, material cost in 1970 dollars, and deliveries per month.

6. Normalization Processes Required. All CERs are in calendar year 1970 dollars, therefore, they require inflation to present day dollars. The aircraft included in the data base are constructed primarily of aluminum alloy. If these CERs are to be used for estimating fixed wing aircraft with a different type of construction, i.e., titanium, advanced composite materials, adjustment may be required.

7. Evaluation Techniques Required. Application of standard regression analysis techniques can be applied to the actual fixed-wing data in the Appendix.

8. Limitations. The report only includes cost data on fixed-wing aircraft.

9. Deficiencies. None apparent.

10. Supplemental Sources Required. Other technical information may be required in developing CER's utilizing the basic data.

11. Use in Cost Analysis. The cost data on cargo fixed-wing aircraft have been utilized in developing CERs for airframe development and production. These CERs were utilized in establishing confidence in R&D cost estimates for the HLH and in evaluating the effect of low production rates for the HLH in the investment phase.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. TP-449, Cost Estimating Relationships Manual for the Army Materiel Command, May 1972.

b. Preparer. Studies and Analysis Division, Research Analysis Corporation.

2. Application. Develops documentation for CER methodology.

3. Status. Operational.

4. Nature of Data. Textual narrative. Provides technical guidance for CER developments.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Analytical judgment required.

7. Evaluation Techniques Required. Higher mathematical skills coupled with knowledge of theoretical applications. Monte Carlo simulation techniques frequently required. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Cost and performance data obtained from other sources. Table of learning curves.

11. Use in Cost Analysis. Reference book.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. DTUPC AH-64A.

   b. Preparer. Hughes Helicopter, Inc.

2. Application. Provides an example of methodology used to do a Design to Unit Production Cost.

3. Status. Operational.

4. Nature of Data. Prices of parts arranged in terms of the work breakdown. Structure for the AH-64A is presented.

5. Level of Detail. Fairly detailed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Contractor data may tend to be optimistic.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Serves as a model of a DTUPC study.

12. Remarks. Would be of greater value if compared to other similar studies.

13. Suggestions. None.

1. Source.

   a. Document. Software Engineering Economics.

   b. Preparer. Barry W. Boehm

2. Application. Software Cost Estimating Techniques.

3. Status. Not applicable.

4. Nature of Data. Allows the analyst to estimate software development costs; primarily through the use of the Constructive Cost Model (COCOMO).

5. Level of Detail. Considerable. Deals with much of the theoretical basis for software cost estimating. The most widely used reference for cost estimation of software.

6. Normalization Processes Required. Estimates are provided in man-months; analyst must use current labor rates to obtain cost estimates.

7. Evaluation Techniques Required. Regression techniques are used in this model. The analyst must be able to make qualitative assessments of the developing contractors personnel capabilities.

8. Limitations. The model gives an estimate of software development effort (in man-months) that is within 20% of the actual required effort 67% of the time. The model is not nearly as successful at estimating the maintenance effort required.

9. Deficiencies. Assumes that the analyst is familiar with the contractor's personnel capabilities. Not very useful in estimating software maintenance effort.

10. Supplemental Sources Required. Relevant labor rates are needed.

11. Use in Cost Analysis. Development of software cost estimates.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. The Pocket Encyclopedia of World Aircraft in Color, Helicopters and Other Rotorcraft Since 1907.

b. Preparer. Kenneth Munson.

2. Application. Handy reference guide for history of helicopters.

3. Status. Not applicable.

4. Nature of Data. Historical narrative. Data includes years and quantities or production. Helicopters are illustrated in color.

5. Level of Detail. By aircraft type.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. No cost data.

10. Supplemental Sources Required. Cost data.

11. Use in Cost Analysis. Useful as background supplemental material.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Learning Curve Tables.

b. Preparer. Various. Tables in common use have been developed by MICOM and RAND Corporation.

2. Application. Adjustment of production data (recurring costs, manhours) for quantity.

3. Status. Not applicable.

4. Nature of Data. Unit, cumulative averages, and cumulative totals in tabulated form. Mathematical equations also included.

5. Level of Detail. By unit.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Higher mathematical skills coupled with knowledge of theoretical applications.

8. Limitations. Applies only to recurring data associated with production.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Table of logarithms.

11. Use in Cost Analysis. See Application.

12. Remarks. Learning curves also called experience curves, progress curves, improvement curves, cost-quantity relationships.

13. Suggestions. None.

SECTION 2

TECHNICAL DATA

TABLE OF CONTENTS
SECTION 2
TECHNICAL DATA

1. Source.

a. Document. Engineering Design Handbooks, DARCOM Pamphlet 706-2XX Series.

b. Preparer. US Army Materiel Development and Readiness Command.

2. Application. Engineering design.

3. Status. Operational.

4. Nature of Data. Prescribes organization of Model Specifications, testing procedures, qualification requirements, design standards. Also provides technical guidance for helicopter changes.

5. Level of Detail. Published in several volumes. Very detailed guidance for engineering design.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Technical expertise required.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Requires. Cost data from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control Systems Criteria (C/SCSC) reports.

11. Use in Cost Analysis. Useful in determining the extent of test program.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Operational Test Reports (formerly called Service Test Reports).

b. Preparer. US Army Test and Evaluation Command, US Army Aviation Test Board.

2. Application. To determine the degree to which a prototype meets the specified mission stated in the Required Operational Capability (ROC) document. Emphasis is on field suitability rather than engineering.

3. Status. Operational.

4. Nature of Data. Variable. Contains technical parameters for estimating operating cost data. Also contains narrative material.

5. Level of Detail. Variable.

6. Normalization Processes Required. Estimates developed from prototype in a test environment. Technical expertise and identification of differences in accounting conventions; data may require some adjustments. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars.

7. Evaluation Techniques Required. Technical expertise required. Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory. Variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) or Product Improvement Programs (PIPs) require additional analysis.

8. Limitations. Data developed from a test environment, adapting data to operating environment may differ considerably.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Developing estimates for operating costs.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. 1980 National Survey of Compensation Paid Scientists and Engineers Engaged in Research and Development Activities, December 1980.

b. Preparer. U.S. Department of Energy, Division of Administration, Office of Industrial Relations.

2. Application. Provides information which could assist cost estimating a weapon system during the Research and Development (R&D) Phase.

3. Status: Operational.

4. Nature of Data: Provides data on salary levels for scientists and engineers in terms of level of education, occupational position and years since receiving a degree.

5. Level of Detail. See Nature of Data above.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Minimal ability to read and understand tables, charts and graphs.

8. Limitations. Any establishment employing fewer than 40 S&E's in R&D were omitted from the sampling frame.

9. Deficiencies. Those common to sampling techniques.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. See Application above.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Aviation Week and Space Technology. Aerospace Forecast and Inventory Issue.

b. Preparer. McGraw-Hill Inc.

2. Application. General technical information related to aerospace hardware.

3. Status. Operational. Updated annually.

4. Nature of Data. Provides technical and engineering data for aircraft, missiles and engines currently in development or production by the US, USSR and other international countries.

5. Level of Detail. The aviation items are divided into three geographical areas: US, USSR, and International. The aviation items produced by the US are subdivided into the following areas: Military aircraft, missiles, spacecraft, launch vehicles, RPV and Target Drones, VTOL and VSTOL aircraft, agricultural aircraft, rotary wing aircraft, reciprocating engines, gas turbine engines, commercial transports and research rockets. The aviation items produced by the U.S.S.R are subdivided into Military and Civil aircraft and missiles. The International category includes spacecraft, launch vehicles, missiles, aircraft, rotary wing aircraft, surface effect machines, gas turbine engines and research rockets. The US Rotary Wing aircraft are subdivided by manufacturer. An example of the information provided is as follows: name and address of manufacturer, popular name of aircraft, number of crew members, number of passengers, rotor diameter, maximum length of aircraft blades unfolded, maximum height, empty weight, normal gross weight, number of engines, engine model, horsepower, hover ceiling in ground effect, still-air range, and preceding aircraft models.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Only cost data included is for U.S. Business, Personal Aircraft.

9. Deficiencies. Technical information is presented per model only.

10. Supplemental Sources Required. Janes' All the World Aircraft can provide supplemental technical data.

11. Use in Cost Analysis. Data used in developing CERs.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Society of Aeronautical Engineer's Handbook, January 1975.

b. Preparer. Society of Aeronautical Engineers.

2. Application. Provides useful conversion factor, characteristics of physical matter, and other useful engineering data.

3. Status. Operational.

4. Nature of Data. See Application above.

5. Level of Detail. Variable.

6. Normalization Processes Required. Varies with application.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Varies with application.

11. Use in Cost Analysis. Varies with application. Develops basis from which to develop other estimates. Useful as supplemental background material. Enlargement of data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis (COEA) and other studies.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Critical Item Development Specification.

   b. Preparer. Contractor.

2. Application. Source document for detail specifications for components.

3. Status. Operational.

4. Nature of Data. Report applicable to components of systems and includes physical characteristic data, technical data, design criteria, deviations granted, narrative material, etc. Report similar to Prime Item Development Specification which is for systems.

5. Level of Detail. Very detailed.

6. Normalization Processes Required. Must insure incorporation of revisions into data. Contains estimated data which is frequently conservatively estimated since contractor must insure performance stated in the report.

7. Evaluation Techniques Required. Proposed variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) or Product Improvement Programs (PIPs) require additional analysis pending revision of data contained in the report.

8. Limitations. Some values are estimated by vested interests and therefore subject to bias. Estimates tend to be conservative for reasons stated in Normalization Processses Required above.

9. Deficiencies. Data not revised in a timely manner and therefore is frequently obsolete.

10. Supplemental Sources Required. Contract and contract modification cost data obtained from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control Systems Criteria (C/SCSC) Reports.

11. Use in Cost Analysis. Quick response studies and other cost estimates for critical items.

12. Remarks. None.

13. Suggestions. More timely revision of data needed.

1. Source.

a. Document. Prime Item Development Specification. (Detailed specifications for aircraft.)

b. Preparer. Contractor.

2. Application. Source document for detailed specifications for aircraft systems. Provides listing of detailed requirements, characteristics and description of aircraft.

3. Status. Operational.

4. Nature of Data. Physical characteristic data, technical data, listings of Government Furnished Material, design criteria, deviations granted, narrative material, etc.

5. Level of Detail. Very detailed.

6. Normalization Processes Required. Must insert incorporation of revisions into data. Report contains conservatively estimated data which may also require revision.

7. Evaluation Techniques Required. Proposed variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) or Product Improvement Programs (PIPs) require additional analysis pending revision of detailed specification.

8. Limitations. Some values are estimated by vested interests and therefore subject to bias. Estimates tend to be conservative because contractor must guarantee stated performance.

9. Deficiencies. Data not revised in a timely manner, frequently obsolete.

10. Supplemental Sources Required. Contract and contract modifications. Cost data from Contractor Cost Data Reports (CCDRs), Cost/Schedule Control Systems Criteria (C/SCSC) reports, and others.

11. Use in Cost Analysis. Provides weight and performance data which, in conjunction with historical cost data, form data bases for parametric estimates, quick-response studies.

12. Remarks. None.

13. Suggestions. Incorporation of aircraft Work Breakdown Structure into report. More timely revision of data needed.

1. Source.

   a. Document. Technical Manuals (TMs).

   b. Preparer. Normally prepared by contractor.

2. Application. Reference source for maintenance, engineering, and configuration of a system.

3. Status. Operational.

4. Nature of Data. Narrative,material concerning standard operating and maintenance procedure.

5. Level of Detail. As detailed as required by the system.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Technical expertise required.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Consultation with report preparer essential to the development of accurate estimates. Cost data obtained from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control Systems Criteria (C/SCSC) reports.

11. Use in Cost Analysis. Limited use. May be used in some instances where very specific configuration data is needed.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Jane's All The World Aircraft, January 1986.

b. Preparer. John W.R. Taylor, Editor.

2. Application. General reference work.

3. Status. Operational. Updated annually.

4. Nature of Data. Listing of aircraft manufacturers by country. Historical technical data on each aircraft model. Illustrated. Also contains narrative material. Contains data not available anywhere else.

5. Level of Detail. Performance and physical characteristics by model for each aircraft and engine.

6. Normalization Processes Required. None required.

7. Evaluation Techniques Required. Variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) and Product Improvement Programs (PIPs) require additional analysis. Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory. Technical expertise required.

8. Limitations. Current production aircraft frequently not included. More detail frequently needed, as for example, engine weight, AMPR weight, etc.

9. Deficiencies. See Limitations above.

10. Supplemental Sources Required. Cost data obtained from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control Systems Criteria (C/SCSC) reports.

11. Use in Cost Analysis. Enlargement of data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis (COEA) and other studies.

12. Remarks. Inaccurate estimates may result from indiscriminate application of analytical techniques. Analytical judgment required.

13. Suggestions. None.

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SECTION 3
COST AND ECONOMIC DATA

1. Source.

   a. Document. Historical Procurement Data.

   b. Preparer. Directorate for Procurement and Production.

2. Application. Procurement analysis.

3. Status. Operational.

4. Nature of Data. Cost and quantity data from previous procurements.

5. Level of Detail. Determined by needs of data. Presently, data and detail defined by form of computerized system.

6. Normalization Processes Required. Historical cost data, expressed in incurred (or current) year dollars, require stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars. Development of cost - and/or - manhour-quantity relationships through application of learning curves, also known as progress or experience curves, enabling adjustments for alternative procurement quantities, and improving the accuracy of time phased estimates.

7. Evaluation Techniques Required. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory for development of cost estimates.

8. Limitations. Data not continuously prepared, resulting in several gaps in the continuity of a particular procurement history.

9. Deficiencies. See Limitations above. Inability to portray costs and/or manhours because of late establishment of report procedures.

10. Supplemental Sources Required. Defense Contract Audit Agency data.

11. Use in Cost Analysis. Enlargement of data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis and other studies.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Business Conditions Digest.

   b. Preparer. Department of Commerce.

2. Application. Public economic information.

3. Status. Operational. Updated monthly.

4. Nature of Data. Contains many microeconomic time series by month or quarter.

5. Level of Detail. Very detailed.

6. Normalization Processes Required. Adjustments for inflation, and changes in productivity in some cases.

7. Evaluation Techniques Required. Economic background most appropriate.

8. Limitations. Occasionally, more detail is required.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Varies with application.

11. Use in Cost Analysis. Useful adjunct to data base for development and forecasting of inflation and productivity indices.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Employment and Earnings.

   b. Preparer. Department of Labor, Bureau of Labor Statistics.

2. Application. Public information.

3. Status. Operational. Updated monthly.

4. Nature of Data. Labor data including earnings.

5. Level of Detail. By industry subgroupings.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Same as for Producer Price Indexes. Adjustments required for changes in productivity.

8. Limitations. Administrative and other overhead labor rates not measured.

9. Deficiencies. See Limitations.

10. Supplemental Sources Required. Same as for Producer Price Indexes. Also, Producer Price Indexes are a supplemental source.

11. Use in Cost Analysis. Development of historical inflation indices for Airframe, Engine, and Avionics.

12. Remarks. Considerable errors can result from improper use of evaluation techniques.

13. Suggestions. None.

1. Source.

a. Document. Monthly Labor Review.

b. Preparer. Department of Labor, Bureau of Labor Statistics.

2. Application. Public economic information.

3. Status. Operational. Updated monthly.

4. Nature of Data. See Level of Detail below. Also contains technical and academic narrative material useful to economic analysis.

5. Level of Detail. Detailed. Wholesale, consumer price, employment, and earnings industry subgroupings.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Knowledge of higher mathematical theoretical basis for developing indexes---to include Paasche, Laspayre, and Fisher Ideal Indexes, seasonal adjustment methodology, trend, and time series analysis including Box-Jenkins autoregressive integrated moving averages, Fourier power spectra analysis, and methods for constructing averages including arithmetic, geometric, and harmonic means, and exponentially weighted moving averages (smoothing techniques). Also, how to develop transfer function models utilizing leading indicators. Economic background also essential.

8. Limitations. Greater level of detail often required.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Producer Price Indexes, Employment and Earnings.

11. Use in Cost Analysis. A useful one-source document to trace the historical behavior of certain economic time series particularly price indices. By contrast, Producer Price Indexes show price index level only for the month in question, requiring a considerable effort to search through volumes of pamphlets to trace the historical behavior of an index.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Producer Price Indexes, December 19XX.

b. Preparer. Department of Labor, Bureau of Labor Statistics (BLS).

2. Application. Public information.

3. Status. Operational. Updated monthly.

4. Nature of Data. Wholesale price and price indexes for specific commodity and type of industry groupings.

5. Level of Detail. Considerable. Commodities subdivided to specific item level identified by BLS developed code. Example of typical level of detail: "Aluminum Extrusion Rod, Circle Size 4 to 5 inches." Various levels of summarization also developed.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Application of various mathematical, statistical, economic, and econometric processes including weighted arithmetic and harmonic means, construction techniques for construction of price indices (including Laspayre, Paasche, typical year, and Fisher ideal indices), non-linear regression, time series analysis, autoregressive integrated moving average models, forecasting with leading indicators (transfer function models), supply and demand concepts, relationships to monetary and fiscal policy, relationships to international trade, effect of change of base and weighting factors to BLS published indices. Ability to distinguish between techniques requires understanding of theory as well as processes. Judgemental analysis and knowledge of helicopter construction required in identifying indexes which parallel historical cost behavior. Ability to perform statistical tests of hypothesis also required.

8. Limitations. Published BLS indices do not necessarily measure the same items, nor involve the same weighting factors as found in Army helicopters.

9. Deficiencies. Base price often not available for specific commodities.

10. Supplemental Sources Required. Textual material on statistics, time series analysis, economics, econometrics, Cost Information Reports (CIR), now replaced by Contractor Cost Data Reports (CCDR), utilized to develop weighting factors for AVRADCOM indices.

11. Use in Cost Analysis. Development of historical inflation indices.

12. Remarks. Considerable errors can result from the improper use of techniques previously discussed.

13. Suggestions. None.

1. Source.

   a. Document. CPI Detail Report.

   b. Preparer. Department of Labor, Bureau of Labor Statistics (BLS).

2. Application. Public economic information.

3. Status. Operational. Updated monthly.

4. Nature of Data. Consumer prices and price indexes for selected consumer goods.

5. Level of Detail. Considerable. Consumer goods subdivided to specific categories and service groupings. Two indexes are presented, the CPI for all Urban Consumers, (CPI-U), and the CPI for Urban Wage Earners and Clerical Workers, (CPI-W).

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Same as for Wholesale Price Indexes. Index bases updated periodically.

8. Limitations. The CPI is based on prices of food, clothing, shelter, fuels, transportation fares, charges for doctors and dentists, services, drugs and other goods and services that people buy for day-to-day living. As such, the index does not directly reflect changes in the cost of weapon systems components.

9. Deficiencies. See Limitations.

10. Supplemental Sources Required. Same as for Wholesale Price Indexes. Also, Wholesale Price Indexes, Producer Price Indexes, Employment and Earnings and Business Conditions Digest are supplemental sources.

11. Use in Cost Analysis. Development of historical inflation indices with projections for future escalation indices for engine, airframe and avionics.

12. Remarks. Primary usefulness of the CPI Indexes, (CPI-U, CPI-W), is how much they reflect over all price level changes and price changes in transportation and fuels.

13. Suggestions. None.

1. Source.

   a. Document. Current Wage Developments.

   b. Preparer. Department of Labor, Bureau of Labor Statistics.

2. Application. Public Economic Information.

3. Status. Operational. Updated monthly.

4. Nature of Data. See Level of Detail below. Also contains Wage Activities, (increases or decreases), for specific firms by industrial groupings. Also included are wage terms of negotiated contracts, (amount and duration).

5. Level of Detail. Moderately detailed. Grouping of data is by industrial categories and a sampling of firms within that grouping. For example, Transportation Equipment, Lockheed Aircraft Corp; Fabricated Metal Products, Aluminum Co. of America.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Same as for Wholesale Price Indexes.

8. Limitations. Coverage generally is limited to actions affecting 1,000 workers or more. Coverage of Public Employees is limited to those working for the Federal Government, States, and Cities with 250,000 inhabitants or more. The information presented is drawn mainly from secondary sources, such as Newspapers, Union Publications, and Trade Journals.

9. Deficiencies. See Limitations.

10. Supplemental Sources Required. Employment and Earnings, monthly Labor Review, and miscellaneous Contractor Cost and Manhour Data.

11. Use in Cost Analysis. Development of historical inflation indices for airframe, engine, and avionics.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Contract Cost Data Report (supersedes Cost Information Report).

b. Preparer. Contractor.

2. Application. Provides actual and estimated cost and other data for Army Helicopter systems. Designed as a DOD information system to provide agencies with engineering, development and procurement data necessary to develop estimates.

3. Status. Operational. Updated quarterly.

4. Nature of Data. Portrays recurring and non-recurring actual cost data to date and estimated costs to completion. Also provides production lot, direct manhour and direct cost data for progress curve.

5. Level of Detail. Costs by major WBS element are functional cost categories.

6. Normalization Processes Required. Application of inflation indices, learning curve adjustments, accounting adjustments for burden costs, breaks in production.

7. Evaluation Techniques Required. Regression analysis; knowledge to adjust for contractor accounting conventions.

8. Limitations. Inability to portray costs of older system because of late establishment of report procedures.

9. Deficiencies. Since data requested by form does not in each instance conform to contractor's accounting system, entries are frequently "best guesses". Cost data sometimes at too high of a WBS level. Data portrayed are often on inconsistent or incomparable WBS basis.

10. Supplemental Sources Required. Data Plan, Historical inflation factors, WBS dictionary.

11. Use in Cost Analysis. Cost Estimating Relationships (CER) and Cost-Quantity Relationships for Independent Parametric Cost Estimates (IPCE), Baseline Cost Estimates (BCE), and other studies. Used to develop weighting factors for development of inflation factors.

12. Remarks. Not applicable.

13. Suggestions. None.

1. Source.

a. Document. Cost Performance Reports (CPR).

b. Preparer. Contractors.

2. Application. Various.

3. Status. Operational, updated monthly.

4. Nature of Data. Cumulative and noncumulative actual expenditures, approved budget, and contractor estimate to complete for RDTE and Procurement appropriations.

5. Level of Detail. Work Breakdown Structure (WBS) Level III.

6. Normalization Processes Required. Varies with application. Costs are in incurred year dollars, requiring adjustments for inflation. Learning curve adjustments may be required for certain applications involving investment costs. Also, modifications for changes in scope of work may be required.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Data reflects direct costs only.

9. Deficiencies. Reasons for changes in estimates not always fully explained.

10. Supplemental Sources Required. Direct contact with Project/Product Manager's Office. Must explore reasons for change in estimates due to changes in scope of work and other factors.

11. Use in Cost Analysis. Development of Total Risk Assessing for Cost Estimate (TRACE) factors.

12. Remarks. This is one of the Cost/Schedule Control Systems Criteria (C/SCSC) reports. Good analytical judgement required to identify similar WBS elements for TRACE factor development.

13. Suggestions. Reasons for changes in estimates should be more explicitly stated.

1. Source.

   a. Document. Miscellaneous contractor cost and manhour data.

   b. Preparer. Contractor.

2. Application. Variable.

3. Status. Operational.

4. Nature of Data. Examples include prototype actual data, cost and direct labor manhours for material, subcontract, assembly and test.

5. Level of Detail. Varies with application.

6. Normalization Processes Required. Identification of differences in accounting conventions. Ability to adjust data base for these differences. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars. Similar stratification needed before applying escalation rates to estimate the effect of inflation on future costs. Development of cost and/or manhour-quantity relationships through application of learning curves, also known as progress or experience curves, enabling adjustments for alternative procurement quantities, and improving the accuracy of time phased estimates. Cost adjustments for differences or changes in the scope of work may be required. Trend analysis may be required for changes in such ratios as overhead or engineering to direct labor manhours and costs. Technical expertise required. Data base may require adjustments for changes in productivity between fabrication of prototype and first production unit.

7. Evaluation Techniques Required. Variations in configuration, such as modifications of armament, avionics, engine, or implementation of Engineering Change Proposals (ECPs) or Product Improvement Programs (PIPs) require additional analysis. Estimation factors must be developed to enable conversion of direct to total cost and/or manhour data. Higher mathematical skills coupled with knowledge of theoretical applications. Monte Carlo simulation techniques frequently required.

8. Limitations. Data frequently portrayed on an inconsistent or incomparable Work Breakdown Structure (WBS). Values are estimated by vested interests and therefore subject to bias.

9. Deficiencies. Possible inability to portray costs and/or manhours because of late establishment of report procedures.

10. Supplemental Sources Required. Defense Contract Audit Agency (DCAA) methodology for adjustment of changes in manufacturing techniques between prototype and first production unit.

11. Use in Cost Analysis. Develops basis from which to develop other estimates. Also enlarges cost data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis and other studies. Also useful in developing some analogy estimates.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. U.S. Cost Forecasting Service Long-Term Review.

b. Preparer. Data Resources Cost Forecasting Service, Washington, D.C.

2. Application. Provides complete current forecast tables for various commodity areas; both long and short term.

3. Status. Short term is published bi-monthly; long term is published quarterly (with some exception).

4. Nature of Data. Gives near-term control and long-term trend forecasts as they relate to various commodity areas; includes graphic illustrations of certain highlights. Appendices contain statistical details of the forecasts and related technical information.

5. Level of Detail. Considerable. Commodities subdivided to specific and product level.

6. Normalization Processes Required. None.

7. Evaluation Techniques Required. Application of various mathematical, statistical, economic, and econometric processes, including weighted arithmetic means, techniques for construction of price indices, non-linear regression, time series analysis, forecasting with leading indicators, supply and demand concepts, relationships to monetary and fiscal policy, relationship to international trade, effects of change of base and weighting factors. Ability to distinguish between techniques requires understanding of theory as well as processes. Judgemental analysis and knowledge of helicopter construction required in identifying commodities which parallel historical cost behavior.

8. Limitations. Published commodity forecasts don't necessarily measure the same items found in Army helicopters.

9. Deficiencies. Base prices often difficult to specify.

10. Supplemental Sources Required. None.

11. Use in Cost Analysis. Provides long and short term price forecasts for commodities and labor rates by region to be used in estimating future costs.

12. Remarks. None.

13. Suggestions. None.

SECTION 4

PLANNING DATA

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SECTION 4
PLANNING DATA

1. Source.

a. Document. AR 570-2, Organization and Equipment Authorization Tables -Personnel Tables, 22 July 1969, with Changes 1-10.

b. Preparer. Department of the Army.

2. Application. Determines personnel and equipment authorizations for specific Army functions.

3. Status. Operational.

4. Nature of Data. List of number of personnel authorized by job title and number and specific types of equipment for each Army mission.

5. Level of Detail. See Nature of Data above.

6. Normalization Processes Required. Conversion of personnel spaces to manhours of work utilizing standard factors for annual leave, sick leave, overtime, and nonproductive time. Analytical judgement required.

7. Evaluation Techniques Required. Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory. New estimating techniques are required to adapt historical data to the new three-level maintenance concept (MS+).

8. Limitations. Data frequently obsolete.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Army Force Planning Cost Handbook (AFPCH); FM 101-20; AR 570-2, Organization and Equipment Authorization Tables; Military Occupational Specialty Training Cost Handbook; specific Tables of Organization and Equipment (TOE).

11. Use in Cost Analysis. Development of operating cost estimating techniques for Baseline Cost Estimates (BCEs), Cost and Operational Effectiveness Analysis (COEA), Economic Analysis (EA), and other studies.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. FM 101-20, United States Army Aviation Planning Manual, 6 January 1984.

b. Preparer. Headquarters, Department of the Army.

2. Application. Aviation planning guide.

3. Status. Operational. Revised regularly.

4. Nature of Data. Gives aircraft authorizations, flying hour programs, attrition rate, standard aircraft characters, maximum allowable operating times for major components, ferrying and shipping, tools, fuel and oil used, maintenance manhours and categories, personnel requirements, costs per flying hour, unit flyaway costs, avionics and armament costs.

5. Level of Detail. By aircraft series and model.

6. Normalization Processes Required. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars. Development of cost and/or manhour-quantity relationships through application of learning curves, also known as progress or experience curves, enabling adjustments for alternative procurement quantities, and improving the accuracy of time phased estimates. In the development of Cost Estimating Relationships (CERs) for aircraft with material compositions differing from those constituting the data base, adjustments may be required. Application of standard accounting techniques such as depreciation. Data base may require adjustments for changes in productivity.

7. Evaluation Techniques Required. New estimating techniques are required to adapt historical data to the new three-level maintenance concept (MS+). Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory. Technical expertise required.

8. Limitations. Inclusion of wartime data distorts data base. PEMA parts cost excluded. No avionics or weapons maintenance statistics. Quantities of production for which standard unit prices are based are not shown. Depot labor statistics have been excluded.

9. Deficiences. None.

10. Supplemental Sources Required. Summary Cost Data Book for Army Managers, table of inflation indices, additional data to cover gaps explained in Limitations above, manhour and POL costs also needed. Cost data obtained from such sources as Contract Cost Data Reports (CCDRs) and Cost/Schedule Control Systems Criteria (C/SCSC) reports.

11. Use in Cost Analysis. Enlargement of data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis and other studies. Also used in creation of computer models.

12. Remarks. None.

13. Suggestions. Manual should include additional data covering gaps explained in Limitations above.

1. Source.

a. Document. The Army Force Planning Cost Handbook, October 1982, with Change 1.

b. Preparer. Comptroller of the Army.

2. Application. Gives direct and indirect operating cost and manhour factors for indirect costs. Contains data not available anywhere else.

3. Status. Operational. Regularly updated.

4. Nature of Data. See Application above. Also contains narrative material.

5. Level of Detail. Cost and manhours portrayed by appropriation, cost category, budgetary account, rank, aircraft model, flying hour, ton, year, or other performance factor.

6. Normalization Processes Required. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars.

7. Evaluation Techniques Required. Higher mathematical skills coupled with knowledge of theoretical applications. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions, and sampling theory.

8. Limitations. Data not portrayed in a Work Breakdown Structure (WBS) format. Lack of data source identification makes determination of proper supplemental sources difficult.

9. Deficiencies. None.

10. Supplemental Sources Required. Summary Cost Data Book for Army Managers; FM 101-20; AR 570-2, Organization and Equipment Authorization Tables; Military Occupational Specialty Training Cost Handbook; specific Table of Organization and Equipment (TOE).

11. Use in Cost Analysis. Development of operating cost estimating techniques for Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Cost and Operational Effectiveness Analysis (COEA), Economic Analysis (EA), and other studies.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Should Cost Report.

   b. Preparer. Should Cost Teams.

2. Application. Provides government with a firmer contractual negotiation position.

3. Status. Operational, as required.

4. Nature of Data. Detailed minimum, expected, and maximum estimates of contractor cost and manhours.

5. Level of Detail. Usually tailored to elements of contractor proposal.

6. Normalization Processes Required. Variable. Often accomplished within Should Cost Report.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Negotiated contract may not resemble Should Cost estimates.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Supplemental reports to Should Cost Report.

11. Use in Cost Analysis. Develops basis from which to develop other estimates.

12. Remarks. Not applicable.

13. Suggestions. None.

1. Source.

a. Document. Military Occupational Specialty Training Cost Handbook (MOSB), October 1983.

b. Preparer. US Army Finance and Accounting Center, Cost Analysis Division

2. Application. Provides actual data base for training costs by MOS.

3. Status. Operational. Updated annually.

4. Nature of Data. Depicts fixed and variable costs along with weighted average cost.

5. Level of Detail. By appropriation. Report does not identify costs and/or manhours expended by Military Occupational Specialty.

6. Normalization Processes Required. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars.

7. Evaluation Techniques Required. Ability to adapt given cost data to proposed Military Occupational Specialties.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Army Force Planning Cost Handbook; FM 101-20; AR 570-2, Organization and Equipment Authorization Tables; specific Tables of Organization and Equipment (TOE).

11. Use in Cost Analysis. Development of operating cost estimating techniques for Baseline Cost Estimates (BCEs), Cost and Operational Effectiveness Analysis (COEA), Economic Analysis (EA), and other studies.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Contractor Proposal.

   b. Preparer. Contractor.

2. Application. Source Selection Evaluation Boards (SSEBs).

3. Status. Operational.

4. Nature of Data. Prepared in several volumes. Technical specifications, detailed cost, management plant, capital machinery, tooling, requirements, plant space, and capability data.

5. Level of Detail. Variable.

6. Normalization Processes Required. Application of inflation indices, learning curve adjustments, and breaks in production.

7. Evaluation Techniques Required. Technical understanding of elements of proposal.

8. Limitations. Values are estimates. Contractor assessment therefore subject to bias. Data subject to variable and therefore noncomparable accounting systems.

9. Deficiencies. Data is at too high a Work Breakdown Structure (WBS) level.

10. Supplemental Sources Required. Historical inflation factors, Government evaluation of proposal, report of error, omission and clarification.

11. Use in Cost Analysis. A volume entitled "Historical Cost Data" can be used to develop Cost Estimating Relationships and cost-quantity relationships. Useful for applications of the analog method of cost estimating, Life Cycle Cost Estimating and Benefit Analysis.

12. Remarks. Not applicable.

13. Suggestions. None.

SECTION 5

PERSONNEL DATA

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SECTION 5
PERSONNEL DATA

1. Source.

   a. Document. Military Personnel Pay Tables.

   b. Preparer. Department of Defense.

2. Application. Determination of military pay.

3. Status. Operational. Updated annually or by legislation.

4. Nature of Data. Self-explanatory.

5. Level of Detail. By grade, years of creditable military service. Also includes special rates for hazardous duty, flight pay, combat pay, jump pay, etc.

6. Normalization Processes Required. May need to normalize for differences in grade structures when analyzing certain systems over time.

7. Evaluation Techniques Required. Must make accounting adjustments for special pay categories mentioned in Level of Detail above. Must also make necessary adjustments for pay-in-kind such as billeting, messing, medical care, reenlistment bonuses, uniform, transportation, etc. Also must make adjustments for leave, awaiting orders, overtime hours, non-productive hours, etc.

8. Limitations. None.

9. Deficiencies. None.

10. Supplemental Sources Required. Data on relative proportions of indirect support or pay-in-kind for military personnel.

11. Use in Cost Analysis. Develops method for estimating military pay costs from manhour data.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Table of Organization and Equipment (TOE).

b. Preparer. US Army Training and Doctrine Command (TRADOC).

2. Application. Develops authorizations for number and type of personnel and equipment for an operational unit.

3. Status. Operational. Periodically reviewed.

4. Nature of Data. Personnel authorizations by Military Occupational Specialty (MOS), grade authorized, and equipment authorizations by National Stock Number (NSN).

5. Level of Detail. See Nature of Data above.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Used as a basis for developing estimates of Operating and Support (O&S) costs.

12. Remarks. Analytical judgement required. Care must be exercised to avoid double counting when weapons systems compete for indirect support costs. Requires mathematical skills to apportion costs to competing systems.

13. Suggestions. None.

1. Source.

   a. Document. Civilian Personnel Pay Tables.

   b. Preparer. Civil Service Commission.

2. Application. Determination of civilian pay.

3. Status. Operational. Updated annually or by legislation.

4. Nature of Data. Self-explanatory.

5. Level of Detail. By grade and step.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Proper techniques to account for annual and sick leave, overtime, and nonproductive time. Methods for determining personnel benefits.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Provides means for development of costs from civilian manhour data.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. Federal Employees Almanac.

b. Preparer. Edited by Joseph Young, Federal Employee's News Digest.

2. Application. Handy quick reference quide concerning employee benefits and working conditions.

3. Status. Operational. Updated annually.

4. Nature of Data. Narrative and tabular material concerning take home pay, retirement, health, insurance, injury compensation benefits, jobless benefits, Social Security, labor-management relations, appeals, grievances, promotion procedures, veteran's preference, and many others.

5. Level of Detail. See Nature of Data above.

6. Normalization Processes Required. None.

7. Evaluation Techniques Required. None.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Civilian Personnel Regulations when more detail is required.

11. Use in Cost Analysis. See Application above. Useful in determining some estimates such as retirement, relocation, or severance costs and also as a quick guide for personnel matters.

12. Remarks. None.

13. Suggestions. None.

1. Source.

a. Document. World Aviation Directory.

b. Preparer. Public Transportation and Travel Division, Ziff-Davis Publishing Company.

2. Application. Public information.

3. Status. Operational. Updated semi-annually.

4. Nature of Data. Names and addresses of corporate officials, suppliers and manufacturers of aircraft systems.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Not applicable.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Provides points of contact for various estimates and studies. Also provides leads for other data sources.

12. Remarks. Not applicable.

13. Suggestions. None.

SECTION 6

DATA FOR MULTIPLE APPLICATIONS

TABLE OF CONTENTS
SECTION 6
DATA FOR MULTIPLE APPLICATIONS

1. Source.

a. Document. DTIC. Retrieval and Indexing Terminology.

b. Preparer. Defense Technical Information Center, Cameron Station, VA.

2. Application. To provide a referencing system to publications maintained by the Defense Technical Information Center.

3. Status. Operational. Updated annually.

4. Nature of Data. Provides a list of key words for computerized referencing of the publications contained at the Defense Technical Information Center.

5. Level of Detail. Not applicable.

6. Normalization Processes Required. Not applicable.

7. Evaluation Techniques Required. Familiarly, with outline structure employed, similar to a biological classification system. Ability to recognize and select applicable key words. Computer terminal operational techniques also required.

8. Limitations. Not applicable.

9. Deficiencies. Not applicable.

10. Supplemental Sources Required. Not applicable.

11. Use in Cost Analysis. Provides a useful tool for obtaining additional data, often in extraordinary amounts.

12. Remarks. Relevant data may be contained within the scope of a longer report for other purposes and consequently, not identified.

13. Suggestions. None.

1. Source. Defense Technical Information Center.

2. Application. Variable.

3. Status. Variable.

4. Nature of Data. Varies with application. Includes much technical and academic material including technical reports, master's thesis, doctoral thesis, composite models, and in-depth studies.

5. Level of Detail. Varies with application, although a trememdous amount of data on almost any military subject is stored here.

6. Normalization Processes Required. Varies with application.

7. Evaluation Techniques Required. Varies with application.

8. Limitations. Varies with application.

9. Deficiencies. Varies with application.

10. Supplemental Sources Required. Varies with application. Generally, a vast collection of inter-supporting documents can be obtained here.

11. Use in Cost Analysis. Varies with application.

12. Remarks. None.

13. Suggestions. None.

1. Source. Contacts with Defense Contract Audit Agency (DCAA) personnel.

2. Application. Varies with application.

3. Status. Not applicable.

4. Nature of Data. Varies with application.

5. Level of Detail. Varies with application.

6. Normalization Processes Required. Identification of difference in accounting conventions. Ability to adjust data base for their differences. Ability to identify and adjust for breaks in production. Historical cost data, expressed in incurred (or current) year dollars, requires stratification into classes of similar price behavior prior to selection and application of appropriate inflation indices which convert costs to constant (base year) dollars. Similar stratification needed before applying escalation rate to estimate the effect of inflation on future costs. Development of cost - and/or manhour-quantity relationships through application of learning curve also known as progress or experience curves, enabling adjustments for alternative procurement quantities, and improving the accuracy of time phased estimates. Data base may require adjustments for changes in productivity. Trend analysis may be required for changes in such ratios as overhead or engineering to direct labor manhours and costs.

7. Evaluation Techniques Required. The ability to track detailed cost data to previous estimates. Variations in configuration such as modification of armament, avionics, engine, or implementation of Engineering Change Proposals (ECP) or Product Improvement Programs (PIPs) require additional analysis. Higher mathematical skills coupled with knowledge of theoretical application. Intelligent application of standard statistical analysis techniques, such as correlation and regression analysis, analysis of variance, prediction interval estimation, sensitivity and uncertainty analysis, probability distributions and sampling theory.

8. Limitations. Variable.

9. Deficiencies. Variable.

10. Supplemental Sources Required. Varies with application.

11. Use in Cost Analysis. Enlargement of data base for development of Cost Estimating Relationships (CERs), Baseline Cost Estimates (BCEs), Independent Parametric Cost Estimates (IPCEs), Economic Analysis (EA), Cost and Operational Effectiveness Analysis and other studies. Also useful in developing some analogy estimates.

12. Remarks. None.

13. Suggestions. None.

1. Source.

   a. Document. Aircraft Cost Handbook, Cost and Characteristic Data.

   b. Preparer. OPNAV Resource Analysis Group, J. Watson Associates, Inc.

2. Application. Preservation of historical data base for reference purposes.

3. Status. Operational. Updated continually.

4. Nature of Data. Subject data is a compilation of the historical aircraft data maintained by the RAND Corporation. Includes much data destroyed by the services. Nature of data is variable; includes program costs by Fiscal Year and units produced in some cases, in other cases not. Also contains narrative material.

5. Level of Detail. By aircraft type. Further detail in some cases.

6. Normalization Processes Required. Inflate historical costs to constant dollars, learning curve adjustments. Need to assure that accounting standardization has been applied.

7. Evaluation Techniques Required. Regression analysis, analogy methods, etc.

8. Limitations. Variable.

9. Deficiencies. Variable.

10. Supplemental Sources Required. Cross-references whenever possible.

11. Use in Cost Analysis. Enlargement of Cost Estimating Relationship (CER) data bases. Also useful for some analogy estimates.

12. Remarks. See Supplemental Sources Required.

13. Suggestions. None.

1. Source.

   a. Document. The Journal of Cost Analysis.

   b. Preparer. Institute of Cost Analysis.

2. Application. Source of articles of interest to cost analysts.

3. Status. Operational.

4. Nature of Data. Provides the analyst with a variety of articles of varying relevance to Army systems.

5. Level of Detail. Varies with application.

6. Normalization Processes Required. Varies.

7. Evaluation Techniques Required. Varies; in general, the analyst should be very familiar with general statistical techniques, regression techniques, micro and macro economics and finance.

8. Limitations. Depends on article's sources.

9. Deficiencies. Irregular publication schedule.

10. Supplemental Sources Required. Depends on article.

11. Use in Cost Analysis. Provides analyst with latest trends in cost analysis.

12. Remarks. None.

13. Suggestions. None.

SECTION 7

GLOSSARY OF COST ANALYSIS TERMS

GLOSSARY OF COST ANALYSIS TERMS*

1. AERONAUTICAL MANUFACTURERS' PLANNING REPORT (AMPR) WEIGHT. See Airframe Weight. Source: Cost Information Reports for Aircraft, Missile, and Space Systems. Washington, D.C.: Department of Defense, 21 April 1966.

2. AIRFRAME WEIGHT.

a. Airframe unit weight for airplanes and rotorcraft is the weight empty, as configured in the aircraft detail specification and tabulated in Military Standard 1374, Parts I and II, minus the weight of items listed below regardless of their method of acquisition. The weight of useful load or alternate equipment items is not to be included in the airframe unit weight.

b. Items to subtract from empty weight include wheels, brakes, tires and tubes; engines - main and auxiliary; rubber or nylon fuel cells; starters - main and auxiliary; propellers; auxiliary power plant unit; instruments; batteries and electrical power supply and conversion; avionics group; turrets and power operated mounts; air conditioning anti-icing and pressurization units and fluids; cameras and optical viewfinders; trapped fuel and oil.

*See AR 310-25, Dictionary of United States Army Terms, for additional explanation of terms.

3. ALLOCATION.

a. An official piece of paper issued to a major command or other operating agency. It is a funding document and represents cash that you can commit and obligate.

b. The distribution of available resources to the various activities which must be performed in such a way that total effectiveness will be optimized. Allocation is necessary when there are limitations on either the amount of resources available or on the way in which they can be expended such that each separate activity cannot be performed in the most effective way conceivable. Also, an authorization by a designated official of a department making funds available within a prescribed amount to an operating agency for the purpose of making allotments.

4. ALLOTMENT. This is similar to an allocation except that it is issued by a major command or operating agency to its subordinate units.

5. APPORTIONMENT. A cut of an appropriation given to a department by the Office of Management and Budget. This cut may be all or only part of the dollars appropriated. An apportionment is an allocation at departmental level and represents the amount that can be committed or obligated, regardless of the amounts shown in the appropriation or financial plan.

6. APPROPRIATION. A fund authorization set up by an Act of Congress which permits a department or other governmental agency to obligate the US Government to pay money for goods or services. By itself, the appropriation does not cost the taxpayer a cent. Actually, the appropriation constitutes a hunting license for the department to obtain an apportionment (see definition above),

i.e., the administrative authority for the department to enter into contracts or otherwise obligate the Government. The Treasury raises the money to meet expenditures and expenditures take place only after there has been performance against an obligation. These are important distinctions. Appropriations may last for different periods of time. It may be for one year, called an annual appropriation, or for a continuing period, referred to as a no-year appropriation.

7. ARMY SYSTEMS ACQUISITION REVIEW COUNCIL (ASARC).

a. A council established by the Head of a Military Department as an advisory body to him and through him to the Secretary of Defense on major system acquisitions.

b. The ASARC provides key decisions on major Army programs. When a Defense System Acquisition Review Council (DSARC) is required, the ASARC provides the approval decision on proposed Army recommendations to the DSARC. Regular members of the ASARC are the Vice Chief of Staff of the Army (VCSA) (Chairman); Assistant Secretary of the Army (Research and Development); Assistant Secretary of the Army (Installations and Logistics); Deputy Under Secretary of the Army (Operations Research); Deputy Chief of Staff for Research, Development and Acquisition; Deputy Chief of Staff for Operations and Plans; Commander, US Army Materiel Development and Readiness Command. and the Commander, US Army Training and Doctrine Command. Special members of the ASARC who will attend on the call of the Chairman are: the Assistant Secretary of the Army (Financial Management); Deputy Chief of Staff for Logistics (DCSLOG); Comptroller of the Army (COA); Commander, US Army Operational and Test Evaluation Agency (OTEA); Commander, US Army Concepts Analysis Agency (CAA) and other Army staff agencies and major subordinate

commands when required for review of selected systems. The Executive Secretary of the ASARC is provided by the Deputy Chief of Staff for Research, Development, and Acquisition (DCSRDA). DCSRDA is responsible to the Chairman (VCSA) for administrative matters with assistance by the proponent Staff agency for the particular ASARC meeting. Such administration will include nomination of special ASARC attendees for VCSA approval.

8. BASELINE COST ESTIMATE.

a. A document prepared by the materiel developer, which is the first deliberate, detailed estimate of acquisition and ownership costs. This estimate is normally performed in support of costing required for high level decisions and serves as the base point for all subsequent tracking and auditing (provides traceability).

b. A detailed and fully documented estimate of materiel system life cycle costs prepared by the system proponent. It is dynamic, appropriately refined and updated, as a minimum, for each major decision point of the acquisition cycle. This estimate, subject to modification, if necessary, by the ASARC decision, serves as the principal cost estimate for that system.

9. BENEFIT COST ANALYSIS. An analytical approach to solving problems of choice. It requires the definition of objectives, identification of alternative ways of achieving each objective, and the identifications for each objective of that alternative which yields the required level of benefits at the lowest cost. It is often referred to as cost-effectiveness analysis when the benefits of the alternatives cannot be quantified in terms of dollars.

10. BEST TECHNICAL APPROACH. A document prepared by a Special Task Force (STF) or Special Study Group (SSG) or the materiel developer assisted by the combat developer. It identifies the best general technical approach(es) based on the results of the Trade-Off Determination (TOD) and Trade-Off Analysis (TOA) and an analysis of trade-offs among logistical support concepts, technical concepts, life cycle costs and schedules.

11. BREAK-EVEN POINT. The point in time at which the cumulative quantifiable benefits equal the cost of the investment required to produce the benefits.

12. CALENDAR YEAR. The period of time from January 1 through December 31: distinguished from fiscal year.

13. COMPOSITE INFLATION INDEX. An index which combines the effects of price level changes and outlay rates to convert constant year dollar costs to current year dollars. The effect of outlay rates is to account for the time difference between receipt of the obligation authority and expenditure of funds. And it is during this time difference that price levels may change; hence, this effect is included in the composite index.

14. CONCEPT FORMULATION PACKAGE. The documentary evidence that the concept formulation effort has satisfied the concept formulation objectives. The package consists of a Trade-Off Determination (TOD), Trade-Off Analysis (TOA), Best Technical Approach (BTA) and Cost and Operational Effective Analysis (COEA).

15. CONSTANT YEAR DOLLARS.

a. A phrase always associated with a base year and reflecting the dollar "purchasing power" for that year. An estimate is in constant dollars when prior year costs are adjusted to reflect the level of prices of the base year,

and future costs are estimated on the assumption that the future price level will remain the same as in the base year.

b. A statistical series is said to be expressed in "constant dollars" when the effect of changes in the puchasing power of the dollar has been removed. Usually the data are expressed in terms of some selected year or set of years.

16. COST.

a. Although dollars normally are used as the unit of measure, the broad definition of cost equates to economic resources; i.e., manpower, equipment, real facilities, supplies, and all other resources necessary for weapon and support systems and programs.

b. Goods or services used or consumed.

17. COST ANALYSIS. The systematic examination of cost (total resource implications) of interrelated activities and equipment to determine the relative costs of alternative systems, organizations, and force structures. Cost analysis is not designed to provide the precise measurements required for budgetary purposes.

18. COST ANALYSIS IMPROVEMENT GROUP (CAIG). A DOD level group which serves as advisor to the DSARC. This group presents its evaluation of the Military Service cost estimates of the program at each DSARC.

19. COST CATEGORIES. The three major categories of life cycle cost are Research and Development, Investment, and Operating and Support.

20. COST ELEMENTS. Cost elements are subdivisions of cost categories related to work areas or processes performed in developing, producing, and operating a weapon/support system. Includes such work areas as engineering, tooling, manufacturing, etc.

21. COST ESTIMATE CONTROL DATA CENTER (CECDC). A function which is located in the central cost analysis activity at each commodity command. This function entails:

a. Serving as the official point of registration and control for all costs generated in that command.

b. Serving as the review and validation point for all costs generated in that command.

c. Maintaining cost tracks on major materiel programs.

22. COST ESTIMATING RELATIONSHIP (CER).

a. A mathematical expression relating cost as the dependent variable to one or more independent cost driving variables. The expression may be represented by any of several functions, e.g., linear, power, exponential, hyperbolic.

b. A numerical expression of the link between a physical characteristic, resource, or activity and a particular cost associated with it; e.g., cost of aircraft maintenance per flying hour.

c. A functional expression which states that the cost of something may be estimated on the basis of a certain variable or set of variables. The relationship is derived by analyzing historical data on different systems to obtain a functional relationship between several system characteristics. The variable to be estimated is called the dependent variable, and the variables to which the dependent variable is related by the CER are called the independent variables.

23. COST FACTOR.

a. A CER in which the cost is directly proportional to a single independent variable.

b. A brief arithmetic expression wherein cost is determined by application of a factor such as a percent, e.g., initial spares percent, or a ratio as in pay and allowance cost per man per year.

24. COST MODEL. An ordered arrangement of data and equations that permits translation of physical resources into costs.

25. COST AND OPERATIONAL EFFECTIVENESS ANALYSIS (COEA).

a. A study which has the purpose of developing recommended rank ordering of candidate systems based on meaningful relationships between cost and operational effectiveness.

b. A documented investigation of: comparative effectiveness of alternative means of meeting a requirement for eliminating or reducing a force or mission deficiency; the validity of the requirement in a scenario which has approval of HQ TRADOC and HQ DA, and the cost of developing, producing, distributing and sustaining the alternatives in a military environment for a time preceding the combat application.

26. COST TRACK.

a. A historical record of selected cost information (estimated or actual) on a weapon system basis with written analysis which explains variance among cost entries.

b. A top level overview of the absolute value and trend of resources being allocated to (specific) activities.

27. CURRENT YEAR DOLLARS.

a. Dollars which reflect purchasing power current to the year the work is performed. Prior costs stated in current dollars are the actual amounts paid out in these years. Future costs stated in current dollars are the projected actual amounts which will be paid.

b. Also sometimes referred to as actual dollars, then year dollars, inflated dollars, or escalated dollars.

28. DEFENSE CONTRACTOR PLANNING REPORT (DCPR) WEIGHT. See Airframe Weight.

29. DEFENSE SYSTEMS ACQUISITION REVIEW COUNCIL (DSARC). A council within the Office, Secretary of Defense to advise the Deputy Secretary of Defense on the status and readiness of each major system under development to advance to a subsequent phase in its life cycle. Members of the DSARC include the Director of Defense Research and Engineering, the Assistant Secretary of Defense (Installations and Logistics), Assistant Secretary of Defense (Comptroller), the Assistant Secretary of Defense (Program Analysis and Evaluation), and for programs within their areas of responsibility, the Assistant Secretary of Defense (Intelligence), and the Director Telecommunications and Command and Control Systems (DTACCS). Normally, the DSARC reviews the Service Secretary recommendations:

initiative validation;

initiate full-scale development;

initiate low-rate production; and

begin full production. The SECDEF will decide whether a DSARC or revised DCP is required for procurement of long leadtime materiel or for evaluation of low-rate initial production.

30. DECISION COORDINATING PAPER.

a. A summary top-management document for the Secretary of Defense that presents the rationale for starting, continuing, reorienting, or stopping a major development program at each critical decision point. It identifies the issues in each decision and assesses the important factors, including threat, program plans, risks, full military and economic consequences, critical issues to be resolved by test and evaluation, acquisition strategy, costs and

performance parameters that influence a decision. Once the Secretary of Defense has approved the DCP, it is a "contract" between the Secretary of Defense and the implementing Service Secretary which defines the latitude of the Service in managing the program within the thresholds of cost, performance and schedule that have been mutally agreed upon. The DCP is updated prior to each DSARC review. The DCP will be prepared in accordance with DODI 5000.2 and OSD/HQDA correspondence. (The DCP was previously entitled Development Concept Paper).

b. A document prepared by the Director of Defense Research and Engineering (DDR&E) and coordinated with key DOD officials providing a summary management document for the Secretary of Defense. DCPs reflect the Secretary of Defense decisions on important development and engineering modification programs. The document serves as a source of primary information and rationale and for updating the FYDP.

31. DESIGN TO COST (DTC). A management concept wherein unit cost goals (production, operating and support) are established during development to guide hardware design and control program cost. Cost, as a key design parameter, is addressed on a continuing basis, and is an inherent part of the development and production process.

32. DESIGN TO COST GOAL. A unit cost goal to be achieved in the production phase of the life cycle and is based upon the existing best estimate of quantity, production rate, time frame, and, when available, cost-quantity relationships (learning curves). The DTC goal is expressed in constant dollars and will be established not later than entry into full scale development.

33. DESIGN TO UNIT PRODUCTION COST (DTUPC).

a. Included in development contracts, this design to cost goal is the anticipated unit production price to be paid by the Government for recurring production costs and is based upon a stated production quantity, rate, and time frame. This unit cost goal will be used by the contractor as a design parameter to control system cost. In general, the DTUPC goal should only include those cost elements that are under the control, or influenced by, the contractor.

b. Current implementation of the DTUPC concept within the DOD requires DTUPC establishment at two specific levels:

(1) The first level is a "contract" between the Army and the OSD. It is a program value representing the total procurement investment costs for the specific major system equipment items which collectively comprise the "flyaway" unit cost definition.

(2) The second level DTUPC is the contract between the Army and industry. This DTUPC is best described as that which is most appropriate for RFPs and contracts. It includes all the investment recurring costs associated with production of an end item. It normally does not include any in-house investment costs, GFE costs, contractor nonrecurring cost, and engineering change allowances. Some flexibility driven by judgement is allowed in the establishment of this DTUPC.

34. DISCOUNTING.

a. Discounting is a technique for converting various cash flows (cost streams) to economically comparable amounts at a common point in time, considering the time value of money. Once cost estimates have been generated, they must be time phased to reflect alternative expenditure patterns. The time value of money is considered by computing present value costs. Present

value costs are computed by applying a discount rate to each year's cost in a cost stream. The current discount rate specified by OSD is 10 percent. The present value cost is the sum of the discounted costs over time.

b. The purpose of discounting is to determine if the time value of money is, in any given case, sufficiently great to change the ranking of alternatives--a ranking that has been established on the basis of all other considerations.

35. DISCOUNT RATE. The interest rate used to discount or calculate future costs and benefits so as to arrive at their present value.

36. ECONOMIC ANALYSIS. A systematic approach to the problem of choosing how to employ scarce resources and an investigation of the full implications of achieving a given objective in the most efficient and effective manner.

37. ECONOMIC ESCALATION. That amount of additional dollars necessary to reflect changes in the price level (inflation) of goods and services being purchased over time; i.e., the difference between the constant dollar total and the current or projected year totals of the cost of goods and services purchased. Economic escalation may be historical (actual impact), projected (estimated future impact), or both.

38. EMPTY WEIGHT. Aircraft empty weight includes the weights of airframe, engines, integral avionics/electronics and weapons, and other equipment as identified by MIL-STD-1374. It excludes the weights of crew, fuel, oil (except trapped fluids) and payload.

39. ENGINEERING CHANGE PROPOSAL (ECP). A proposal to change the design or engineering features of materiel undergoing development or production.

40. FISCAL YEAR.

a. The twelve-month period between settlements of financial accounts.

Source: Webster's New World Dictionary.

b. In the Federal Government, the twelve-month period which begins 1 October of one year and ends 30 September of the next. (Prior to 1 July 1976, the Fiscal Year ran from 1 July of one year to 30 June of the following year.)

41. FIVE YEAR DEFENSE PROGRAM (FYDP). The official program which summarizes the Secretary of Defense approved plans and programs for the Department of Defense. The FYDP is published at least once annually and is also represented by a computer data base which is updated three times a year (following the President's Budget submission in January, POM submission in April/May and Service Budget submission in October/November).

42. FLYAWAY COST. This cost concerns the major system equipment items of the Work Breakdown Structure (WBS) exclusively; considers only the Procurement Appropriation supported costs; and encompasses both contract and in-house cost elements of the investment cost categories except for first destination transportation and modifications which are separate budget activities.

43. HARDWARE COST. Hardware cost concerns the major system equipment items of the Work Breakdown Structure (WBS) exclusively; considers the Procurement MCA, OMA and other appropriation supported costs; and encompasses both contract and in-house cost elements of the Investment Recurring Cost Category except for first destination transportation and modifications which are separate budget activities.

44. INDEPENDENT COST ESTIMATE. Any cost estimate developed in organizational channels separate and independent from program proponency channels and having the express purpose of serving as an analytical tool to validate or cross-check cost estimates developed in proponency channels.

45. INDEPENDENT GOVERNMENT COST ESTIMATE (IGCE). A presolicitation, in-house estimate of the probable price (estimated cost plus profit or fee) of a proposed procurement, and is based upon the scope of work and/or technical requirements, as appropriate, without reliance upon contractors' pricing estimates. Normally, the contracting office responsible for placing the procurement will determine when an IGCE is required.

46. INDEPENDENT PARAMETRIC COST ESTIMATE (IPCE). Highly aggregated, output (physical and/or performance parameter) related materiel life cycle cost estimate accomplished outside of the functional control of program proponents. The IPCE is developed to test the reasonableness of the proponent's Baseline Cost Estimate and to provide a second opinion as to the cost of a weapon system for consideration at key decision points in the acquisition cycle including ASARC and DSARC.

47. INFLATION. A rise in the general level of prices. Pure inflation is defined as a rise in the general level of prices unaccompanied by a rise in output (productivity). See Economic Escalation.

48. INVESTMENT COSTS.

a. Costs required beyond the development phase to introduce into operational use a new capability; i.e., to procure or to provide for major modification of an existing capability. Such costs are one-time in the life cycle and should include construction costs of facilities, major and minor equipment and an initial supply of fuel and parts. Initial costs of training operating and maintenance personnel is also a part of total investment costs. Source:

b. The sum of all costs resulting from the production and introduction of a materiel system into the Army's operational inventory, includes:

(1) All costs to the Government, defeined as contractor costs plus in-house costs, of products and services necessary to transform the results of R&D into a fully operational system consisting of the hardware, training and support activities necessary to initiate operations.

(2) Costs of both a nonrecurring and recurring nature.

(3) Costs of all production products and related services, irrespective of how such costs are funded.

49. LEARNING CURVE. The cost quantity relationship for estimating cost of equipment. Generally used to predict or describe the decrease in the cost of a unit as the number of units produced increases.

50. LETTER OF AGREEMENT (LOA). The LOA is a jointly prepared and authenticated document in which the combat developer and the materiel developer outline the basic agreements for further investigation of a potential materiel system. The purpose of the LOA is to insure agreement between the combat and materiel developers on the general nature and chatacteristics of the proposed system and the investigations needed to develop and validate the system concept, to define the associated operational, technical, and logistical support concepts, and to promote synchronous interaction between the combat developer and materiel developer during the conduct of these investigations.

51. LETTER REQUIREMENT.

a. The LR is an abbreviated procedures for acquisition of low value items and may be used in lieu of the ROC when applicable. Low value items are low unit cost, low risk developmental or nondevelopmental items for which the total RDTE expenditure will not exceed $1 million, and/or the procurement costs will not exceed $2 million for any fiscal year or $10 million for the 5-year program period. The LR is not appropriate for system components.

b. The LR is jointly prepared and authenticated by the combat developer and materiel developer as prescribed by AR 71-9.

52. LIFE CYCLE COST.

a. An approach to costing that considers all costs incurred during the projected life of the system, subsystem, or component being evaluated. The life-cycle cost of materiel includes the cost to acquire, operate, and maintain

the weapon over its useful life. Materiel system life cycle cost includes all costs associated with the three life cycle phases, research and development, investment and operations.

b. The summation of all expenditures required from conception of a system until it is phased out of operational use.

c. The total cost of ownership .... over the system life cycle including all research, development, test and evaluation; initial investment; and operating and maintenance costs.

d. Total appropriations for the entire work breakdown structure of MIL-STD-881A for all cost categories of AR 11-18.

53. MAJOR SYSTEM EQUIPMENT. The complete flyaway equipment, including airframe, engineer, and all other installed equipment. Same as air vehicle.

Sources: MIL-STD-881A and DARCOM Guide to Key Cost Analysis Definitions.

54. MATERIEL. Weapons, equipment, supplies, etc.; distinguished from personnel.

55. MATHEMATICAL MODEL.

a. The general characterization of a process, object, or concept, in terms of mathematical symbols, which enables the relatively simple manipulation of variables to be accomplished in order to determine how the process, object, or concept would behave in different situations.

b. Mathematical models are characterized by the exclusive use of equations to represent the characteristics of the system. The basis for such equations can range from pure hypothesis to the analysis of data. Mathematical models generally provide a great deal of flexibility, but often at the expense of simplifying the real world situation.

56. MODEL. A model is a representation of the reality of a situation or condition being studied. Ideally, it would represent the real situation

without error or uncertainty. (However, at best,) it can only simulate most . . . . of the real world. (It uses) exercises, simulations, gaming and mathematical representations, and supplies . . . . information on the effectiveness of the various alternatives under consideration.

57. NONRECURRING INVESTMENT. Those elements of investment cost which generally occur only once in the production cycle of a weapon/support system.

58. OBLIGATION: The estimate of the actual amount of the cost of an authorized service or article ordered. This estimate is carried in official accounting records, and reserves funds pending completion of the contract. This reservation is required by public law.

59. OPERATING AND SUPPORT COST. The sum of all costs resulting from the operation, maintenance and support (including personnel support) of the weapon system after it is accepted into the Army inventory.

60. OPERATIONS RESEARCH. A scientific approach which uses analytic methods adopted from mathematics to solve operational problems. The objective is to provide management with a logical basis for making sound predictions and decisions. Among the common scientific techniques used in operations research are mathematical programming, statistical theory, information theory, game theory, Monte Carlo methods, and queuing theory.

61. PRESENT WORTH (VALUE). See Discounting.

62. PROCUREMENT COST. This cost concerns the entire work breakdown structure; considers only the Procurement appropriation supported costs; and encompasses all contract and in-house cost elements for the complete investment cost category.

63. PRODUCT IMPROVEMENT PROGRAM (PIP). A proposed configuration change involving substantial engineering and testing effort on major end items and depot repairable components or changes on other than developmental items to increase system/combat effectiveness or extend the useful military life.

64. PRODUCTION COST. This cost concerns the major systems equipment items of work breakdown structure exclusively; considers the Procurement, MCA, OMA and other appropriation supported costs; and encompasses both contract and in-house cost elements of the Investment Nonrecurring and Recurring Cost Categories except for first destination transpo-tation and modifications which are separate budget activities.

65. PROGRAM COST. This cost concerns the entire work breakdown structure; considers all appropriations; and encompasses all contract and in-house cost elements for the complete Research and Development and Investment Cost Categories: Source: DARCOM Guide to Key Cost Analysis Definitions.

66. PROGRAM ACQUISITION COST. This cost concerns the entire work breakdown structure; considers the RDTE and Procurement appropriations only; and encompasses all contract and in-house cost elements for the Research and Development and Investment Cost Categories.

67. PROGRAM OBJECTIVE MEMORANDUM (POM). A memorandum in prescribed format submitted to the Secretary of Defense by the Secretary of a Military Department (e.g., Army) or the Director of a Defense Agency which recommends the total resource requirements within the parameters of the published Secretary of Defense fiscal guidance.

68. PROPONENT. An (Army) organization or staff which has been assigned primary responsibility for materiel or subject matter in its area of interest (e.g., proponent school, proponent staff agency, proponent center).

69. RECURRING INVESTMENT. Those elements of investment cost which occur repeatedly during production and delivery of a weapon/support system.

70. REGRESSION ANALYSIS. The association of one or more independent variables with a dependent variable. Under static conditions the analysis is called correlation. When used for predictive purposes, it is referred to as regression. The relationships are associative only; causative inferences are added subjectively by the analysts.

71. REQUIRED OPERATIONAL CAPABILITY (ROC). A HQDA document which states concisely the minimum essential operational, technical, logistical and cost information necessary to initiate full scale development or acquisition of a materiel system.

72. RESEARCH AND DEVELOPMENT COST. The sum of all costs (contractor and in-house) resulting from applied research, engineering design, analysis, development, test, evaluation and managing development efforts related to a specific materiel system.

73. SELECTED ACQUISITION REPORT (SAR). Standard, comprehensive, summary reports on major defense systems for management within the Department of Defense. SARs are submitted to OSD for transmittal to the Congress and other Government agencies.

74. SENSITIVITY ANALYSIS. Repetition of a (cost) analysis with different assumed quantitative values for selected cost driving parameters or other cost analysis assumptions in order to determine the effects of varying the values or assumptions for the purposes of comparison with the results of the basic analysis. If a small change in a value or assumption results in a large change in the results, then the results are said to be sensitive to that parameter or assumption.

75. SHOULD COST.

a. Initial Study. A Should Cost Study is an approach to cost analysis (ASPR 3-801.2(b)), that challenges a contractor's cost proposal, supporting data, and rationale, by integrating into a single fully-coordinated effort the auditing, pricing, engineering, and management analysis of a contractor's manufacturing and management operations, in order to determine a realistic cost estimate on what the item and/or services should cost, assuming reasonable achievable economics and efficiencies. This coordinated analysis is accomplished on-site, at the contractor's plant, by a multi-disciplined, highly qualified team of Government specialists, which reviews in-depth the contractor's activities (i.e., manufacturing, engineering, accounting, cost estimating, make-or-buy, purchasing, organizational structure and any other elements of cost and management control) required for contract performance. The in-depth analysis, which becomes the basis for the Government's negotiation position, is used to identify the contractor's historical cost on past or current contracts for the same or similar item(s), and to determine if his management controls and methods of operation reflect uneconomical practices and inefficiencies which can and should be eliminated The team findings and recommendations (improvement goals) may also be applied to aspects of the contractor's operation during and beyond the instant contract.

b. Follow-on Study. A streamlined Should Cost Study is a follow-on in-depth cost analysis which utilizes the initial and/or follow-on Should Cost study as the baseline for evaluation of the contractor's efforts and on-going performance, determines what benefits have accrued from improvements in the contractor's management and manufacturing operations, and compares this data against the contractor's cost proposal and supporting data for the purpose of establishing the Government's negotiation objectives. The team, preferably composed of members from the original team, performs an approximately 3-week

on-site in-depth analysis to determine what efforts the contractor has taken to eliminate/correct uneconomical practices and inefficiencies. The analysis is to re-examine improvement goals, if any, or establish new or additional goals to improve contract performance. The team composition and procedures for conducting the follow-on study is to be patterned in accordance with the Should Cost team concept.

76. SOURCE SELECTION EVALUATION BOARD (SSEB). A group of military and civilian personnel, representing the various functional and technical areas involved in a procurement, appointed by the Source Selection Advisory Council to direct, control, and perform the evaluation of proposals responsive to requirements, and to produce summary facts and findings required in the source selection process.

77. SPECIAL STUDY GROUP. A study group chartered by CG, TRADOC to conduct analysis, insure inclusion of all alternatives within an analysis, monitor experimentation, or undertake such tasks that may require the concentration of special expertise for a short duration.

78. SPECIAL TASK FORCE. Same as Special Study Group, except chartered by the Chief of Staff, Army.

79. SUNK COSTS. The summation of all past expenditures or irrevocably committed funds related to a given cost estimate. Sunk costs are generally not relevant to decision-making as they reflect previous choices rather than current choices.

80. SYSTEMS. An orderly study of a management system or an operating system using the techniques of management analysis, operations research, industrial engineering, or other methods to evaluate the effectiveness with which missions are accomplished, and to recommend improvements.

81. SYSTEMS ANALYSIS (SA). The application of a thorough, reasoned approach to the solution of complex military requirements, operations and management problems. The objective of SA is to provide a decision-maker with data and information (quantitative, insofar as possible) to assist his determination of which alternative policies or strategies best satisfy the definite objectives. SA can use management analysis, operations research, industrial engineering and other scientific or analytical disciplines to compare the competing courses of action.

82. TOTAL RISK ASSESSING COST ESTIMATE (TRACE). The expected total cost over a specified period of a materiel development program computer on the basis of the costs of accomplishing the work elements of the program's work breakdown structure, and including specific provision for the statistical estimation of probable program costs otherwise indeterminate. The TRACE should be that estimate having a 50/50 chance of producing either a cost overrun or an underrun.

83. TRADE-OFF ANALYSIS (TOA). A document prepared by a STF or SSG or jointly by the combat and materiel developers to determine which technical approach(es) offered in the TOD are best.

84. TRADE-OFF DETERMINATION (TOD). The document normally prepared by the materiel developer and transmitted to the combat developer and transmitted to the combat developer or to a STF or SSG to convey the apparent technical feasibility of a potential system, including technical risks associated with each approach, estimated RDTE, and procurement costs and schedules.

85. UNCERTAINTY ANALYSIS. A systematic analysis of the range of probable costs about a point estimate based on considerations of requirements uncertainty, cost estimating uncertainty and technical uncertainty. The intent of such an

analysis is to provide the decision maker with information which should improve the rationality of decisions based on point estimate, but rather to place it in perspective with respect to various contingencies.

86. (COST) VALIDATION.

a. Cost Estimate: Test of a cost estimate to confirm that it is sound, well-grounded on cost estimating methods and founded on fact or capable of being justified, supported, and defended. A valid cost estimate is to include the proper cost elements and have supportable rationale, or the validity is to be demonstrated by the comparison of the cost submission with the expected costs developed by the validator.

b. Cost Data: Resource data which are objectively analyzed and documented by the preparing agency and are coordinated with all those Department of the Army agencies with a functional responsibility for the data.

87. WEAPON SYSTEM COST. This cost concerns the major system equipment, training, peculiar support equipment, system test and evaluation, system/project management, data, operational/site activation, common support equipment and industrial facilities of the work breakdown structure; considers only the Procurement appropriation supported costs; and encompasses both contract and in-house cost elements of the Investment cost category except for first destination transportation and modifications which are separate budget activities.

88. WORK BREAKDOWN STRUCTURE. A management technique for subdividing a total job into its component elements, which then can be displayed in a manner to show the relationship of these elements to each other and to the whole. It is a product-oriented family tree, composed of hardware, software, services, and other work tasks, which results from project engineering effort during the development and production of a defense materiel item, and which completely displays the project/program.

SECTION 8

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