IDA

INSTITUTE FOR DEFENSE ANALYSES

Defense Cost Research Projects and Capabilities, 2001

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20011023 005

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IDA Document D-2611

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PREFACE

The Institute for Defense Analyses (IDA) prepared this document as part of a project that is jointly sponsored by IDA's Independent Research Program and the Office of the Director, Program Analysis and Evaluation, in the Office of the Secretary of Defense (OSD).

Every year, OSD's Cost Analysis Improvement Group (CAIG) reviews the status of DoD's ability to estimate the costs of forces and weapons at the DoD Cost Analysis Symposium. Later, CAIG meets with representatives from selected government offices, Federally Funded Research and Development Centers, and military universities to discuss ongoing and planned cost studies at the IDA Cost Research Symposium. Following these gatherings, the CAIG prepares an analysis plan that focuses on the areas of cost research needing the most attention given upcoming acquisition decisions.

This document contains material related to that process for the 2001 cycle. Its purpose is to make the material available to those who participated in the 2001 IDA Cost Research Symposium, and for other purposes deemed appropriate by the Chairman of CAIG. The material has not been evaluated, analyzed, or subjected to formal IDA review.

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TABLES

A. INTRODUCTION

Several Department of Defense (DoD) offices are responsible for estimating and monitoring the costs of defense systems and forces in support of planning, programming, budgeting, and acquisition decisions. For example, the Cost Analysis Improvement Group (CAIG) in the Office of the Secretary of Defense (OSD) provides independent cost estimates and reports on life-cycle costs of major defense acquisition programs (MDAPs) in Acquisition Category ID (see Reference [1]). Cost Agencies/Centers in the relevant defense components provide independent estimates for other MDAPs.

The OSD CAIG leads efforts by these and other offices and organizations to improve the technical capabilities of the DoD to forecast future costs. Near the beginning of each year, during the DoD Cost Analysis Symposium, the CAIG reviews the status of DoD's capabilities to estimate the costs of defense systems. Several months later, representatives from offices that sponsor defense cost research meet at the Institute for Defense Analyses (IDA) to discuss and exchange information on their ongoing and planned cost research projects.

The 2001 IDA Cost Research Symposium was held on May 17, 2001. The symposium, jointly sponsored by OSD CAIG and IDA, has been held every year since 1989 (see References [2 through 14]). This document describes the 2001 symposium and catalogs defense cost research projects in progress or planned at the time of the symposium.

B. AGENDA AND PARTICIPANTS

Table 1 is the agenda for the symposium, and Table 2 lists the offices and organizations that were invited to participate along with the names of people who represented them this year.

David McNicol, Chairman of the OSD CAIG, presented the keynote address, setting the tone and challenging participants. Following that, presentations were given that described the capabilities of the DoD to estimate the costs of weapon systems, highlighting topic areas that need additional research. These presentations were updates to similar presentations given at the 2000 symposium (see Reference [14]). Appendixes A through E contain annotated versions of these five presentations. The final set of invited presentations addressed topics of high interest to the DoD cost community.

Table 1. Agenda for the 2001 IDA Cost Research Symposium

Welcome—*Dr. Stephen J. Balut, IDA*
Keynote Address—*Dr. David L. McNicol, OSD CAIG*

Weapon System Cost-Estimating Capabilities
Demand for Estimates—*Dr. Matthew Schaffer, OSD CAIG*
Electronics, Ships, and Automated Information Systems—*Mr. Leonard Cheshire*
Fixed-Wing Aircraft and Space Systems—*Ms. Lynn Davis*
Rotary-Wing Aircraft, Missiles, and Land Vehicles—*Mr. David Henningsen*
Summary—*Dr. Matthew Schaffer, OSD CAIG*

Invited Presentations
Implications of New Manufacturing Methods on Learning Curve Slopes—*Mr. Gary Bliss*
Treatment of Industrial Base Issues in Costing—*Dr. J. R. Nelson*
Cost Data—*Colonel David Robinson*
Software Metrics—*Mr. Thomas Coonce*
Environmental, Safety and Occupational Health Costing Capabilities—*Mr. Ron Lile*
Recent Improvements in Force Cost Modeling—*Lieutenant Colonel Teresa Gerton*

Table 2. Participants in the 2001 IDA Cost Research Symposium

Office/Organization	Abbreviation	Representative
Office of the Deputy Director (Resource Analysis), Program Analysis and Evaluation	PA&E	Dr. David L. McNicol
Ballistic Missile Defense Organization[a]	BMDO	Mr. Lowell Neaf
Army Cost and Economic Analysis Center	CEAC	Mr. Robert W. Young
Army Materiel Command[a]	AMCRM	Mr. Kennith F. Freund
Army Tank-automotive and Armaments Command	TACOM	Mr. Richard S. Bazzy
Army Aviation and Missile Command	AMCOM	Mr. Frank T. Lawrence
Army Space and Missile Defense Command	SMDC	Mr. Jackson G. Calvert
Army Communications and Electronics Command[a]	CECOM	Mr. Howard P. Douglas, Jr.
Naval Center for Cost Analysis	NCCA	Capt. Christopher Owens
Office of Naval Research	ONR	Ms. Katherine Drew
Naval Air Systems Command	NAVAIR	Ms. Jan Young
Naval Sea Systems Command	NAVSEA	Mr. Mitchell Waldman
Naval Surface Warfare Center, Dahlgren Division[a]	NSWCDD	Mr. Alan Glazman
Naval Surface Warfare Center, Carderock Division	NSWCCD	Mr. John Trumbule
Air Force Cost Analysis Agency	AFCAA	Mr. Joseph T. Kammerer
Aeronautical Systems Center, Air Force Material Command	ASC/FMC	Ms. Kathy Ruffner
Electronics Systems Center, Air Force Material Command[a]	ESC/FMC	Col. Ron Phillips
Air Force Space and Missile Systems Center	AFSMC	Mr. Anthony E. Finefield
Ministry of Defence, Special Procurement Services/ Cost Forecasting	SPS/CF	Mr. Nick Pearse
Air Force Institute of Technology	AFIT/ENV	Lt. Col. William Stockman
Defense Systems Management College[a]	DSMC	Mr. John Horn
Aerospace Corporation	AERO	Mr. Carl Billingsley
MITRE Corporation	MITRE	Mr. Paul Garvey
RAND Corporation	RAND	Mr. Frederick S. Timson
CNA Corporation	CNA	Dr. Matthew Goldberg
Institute for Defense Analyses	IDA	Dr. Stephen J. Balut

[a] These offices/organizations did not submit any project summaries this year.

C. ONGOING AND PLANNED COST RESEARCH STUDIES

At IDA's request, participants prepared summaries of ongoing and planned cost research studies at their offices and organizations. These were supplied to IDA for use at the symposium and in this document.

1. Study Titles

The titles of the studies listed here are grouped according to the office or organization performing the study and are arranged in the order they were submitted to IDA. We assigned each title a number (e.g., PA&E-1) using the office/organization abbreviations listed in Table 2.

Office of the Deputy Director (Resource Analysis), Program Analysis and Evaluation

PA&E–1	Force and Support Cost (FSC) System
PA&E–2	Visibility and Management of Operating and Support Costs (VAMOSC) for Major Weapon Systems
PA&E–3	O&M Program Balance and Related Cost Drivers
PA&E–4	Facilities Assessment Database (FAD)
PA&E–5	Reducing Defense Infrastructure Costs
PA&E–6	Selected Acquisition Report (SAR) Cost Variance Analysis
PA&E–7	Improved Cost Estimating Relationships for BMD Systems
PA&E–8	System Engineering and Integration Costs for Navy Combat Systems
PA&E–9	Improved Methodologies for Estimating Development Costs
PA&E–10	IDA Cost Research Symposium
PA&E–11	Understanding the Sources of Cost Growth
PA&E–12	Cost of Developing and Producing Next Generation Tactical Aircraft
PA&E–13	Contractor Cost Data Reporting (CCDR) Clearinghouse/Repository
PA&E–14	Analysis of the Repair and Overhaul of Reparable Items

Army Cost and Economic Analysis Center

CEAC–1	Operating and Support Management Information System (OSMIS) Data Base Management
CEAC–2	Operating and Support Management Information System (OSMIS) Output Products
CEAC–3	ACEIT Help-Desk
CEAC–4	ACEIT Enhancements
CEAC–5	Communications and Electronics Cost Data Base/Methodology
CEAC–6	Army Tri-Service Missile and Smart Munitions Database
CEAC–7	Wheel and Tracked Vehicle Data Base and Methodology Development
CEAC–8	Aircraft Module Data Base and Cost Estimating Relationship (CER) Development
CEAC–9	ACEIT Standard Applications Interface
CEAC–10	ACEIT FCS O&S Cost CAIV
CEAC–11	Installation Status Report (ISR) Part I, AIM-HI Cost Factors

CEAC–12	Installation Status Report (ISR) Standard Service Cost (SSC) Part III
CEAC–13	Personnel Costing System
CEAC–14	Force and Contingency Cost Models Update
CEAC–15	PRICE Model Evaluation

Army Tank-automotive and Armaments Command

TACOM–1	Total Ownership Cost Reduction (TOCR) Model

Army Aviation and Missile Command

AMCOM–1	Future Transport Rotorcraft Cost Estimation Models

Army Space and Missile Defense Command

SMDC–1	Strategic Missile Model Update
SMDC–2	Strategic and Experimental IR Sensor Cost Model III
SMDC–3	Analysis of Government to Contractor Cost Relationships for RDT&

Naval Center for Cost Analysis

NCCA–1	Ship and Shipboard System Operating and Support Cost Analysis Model (OSCAM-Ship, OSCAM-Sys)
NCCA–2	Aircraft Operating and Support Cost Analysis Model (OSCAM-Air)
NCCA–3	Advanced Amphibious Assault Vehicle (AAAV) Operating and Support Cost Analysis Model (OSCAM-AAAV)
NCCA–4	Naval VAMOSC Database
NCCA–5	Aviation Maintenance Subsystem Database (AMSD)
NCCA–6	Cost of Manpower Estimating Tool (COMET v2.0)
NCCA–7	Navy Obligations Data Extraction System (NODES)
NCCA–8	COTS Shipboard Electronics Cost Factors
NCCA–9	Platform Integration Cost Database/Model for Shipboard Electronics
NCCA–10	Ship Construction Cost Database
NCCA–11	Weapon System Software Development Cost/Technical Database
NCCA–12	Weapon System Software Development Estimating Methodology
NCCA–13	Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology
NCCA–14	AIS Life Cycle Cost and Technical Database
NCCA–15	Hardware Deflator Methodology
NCCA–16	Automated Information System (AIS) Software Cost/Technical Database and Estimating Methodology

Office of Naval Research

ONR–1	Uncertainty Calculus to Minimize Total Ownership Costs for Ships
ONR–2	Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems
ONR–3	Technology Insertion Cost Estimation Comparison for Aircraft Carrier Systems
ONR–4	Research in Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems
ONR–5	Marine Composites Affordability—A Knowledgebased Approach

| ONR–6 | Composites Affordability Initiative Cost Analysis Tool (CAICAT) |
| ONR–7 | Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach |

Naval Air Systems Command

NAVAIR–1	Affordable Readiness Cost Model
NAVAIR–2	SLAP/SLEP Full Scale Testing Model
NAVAIR–3	Demilitarization/Disposal Model
NAVAIR–4	Aging Aircraft Study Cost Update
NAVAIR–5	Cost Growth Analysis
NAVAIR–6	Naval Aircraft Modification Model (NAMM) Update
NAVAIR–7	Force Level Economic Effectiveness Trade (FLEET) Model
NAVAIR–8	Engineering Investigations Cost Model (EICM)
NAVAIR–9	Avionics Database
NAVAIR–10	Rotary Wing Database
NAVAIR–11	Propulsion Database
NAVAIR–12	Environmental Costs of Hazardous Operations (ECHO) Model
NAVAIR–13	Analysis of Alternatives (AOA) Evaluation Tool
NAVAIR–14	Missile Database
NAVAIR–15	Cost Risk Methodology/Model

Naval Sea Systems Command

NAVSEA–1	Material Vendor Survey
NAVSEA–2	Technology Insertion Cost Estimates for Aircraft Carriers
NAVSEA–3	Theater Surface Combatant (TSC) Technology Refresh Cost Model
NAVSEA–4	"System of Systems" Technology Refresh Cost Model
NAVSEA–5	The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach.

Naval Surface Warfare Center, Carderock Division

NSWCCD–1	Product-Oriented Design and Construction (PODAC) Cost Model
NSWCCD–2	LEAPS Cost Support
NSWCCD–3	Oily Water Environmental Quality System Life-Cycle Cost Model
NSWCCD–4	Graywater Water Environmental Quality System Life-Cycle Cost Model
NSWCCD–5	Force Level Ship Environmental Cost Model

Air Force Cost Analysis Agency

AFCAA–1	ACE-IT/CO$TAT Enhancements
AFCAA–2	Military Aircraft Data and Retrieval (MACDAR) System Update
AFCAA–3	NAFCOM (NASA/Air Force Cost Model)
AFCAA–4	ACDB Missile Database Improvements
AFCAA–5	Air Force Total Ownership Cost (AFTOC)
AFCAA–6	Independent Verification and Validation (IV&V) of the Air Force Total Ownership Cost (AFTOC) System
AFCAA–7	Air Force Inflation Model Tool
AFCAA–8	Defense Contractor Overhead Rate Analysis

AFCAA-9   Aircraft Avionics Systems Database and Study
AFCAA-10   Joint Automated Information System (AIS) Automated Cost Database (ACDB)
                Framework
AFCAA-11   Missile Cost Estimating Relationship (CER) Development
AFCAA-12   COTS Electronics Database/Modeling
AFCAA-13   Cost Factor and Model Support
AFCAA-14   Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure
                Costs
AFCAA-15   Analysis of Cost Growth using Selected Acquisition Reports
AFCAA-16   Missile and Munitions Sufficiency Review Handbook
AFCAA-17   Phased Array Cost Database
AFCAA-18   Unmanned Air Vehicle Database
AFCAA-19   Commonality/Heritage Study

Aeronautical Systems Center, Air Force Materiel Command

ASC/FMC-1   Cost Communities of Practice (CoP) Portal

Air Force Space and Missile Systems Center

AFSMC-1   FY01 The Unmanned Space Vehicle Cost Model (USCM), 8th edition
AFSMC-2   FY 00 Passive Sensor Cost Model Data Collection

Ministry of Defence, Special Procurement Services/Cost Forecasting

SPS/CF-1   Software Support Cost Model Project (SSCMP)
SPS/CF-2   Software Of Unknown Pedigree (SOUP) in Safety Critical Systems
SPS/CF-3   Family of Advanced Cost Estimating Tools (FACET) – Unmanned Air
                Vehicles (UAVs) and UAV Ground Control Elements.

Air Force Institute of Technology

AFIT/ENV-1   The Concept of Best Value in the Source Selection Process
AFIT/ENV-2   A Model for Estimating Program Value during Cost of Delay Analysis
AFIT/ENV-3   Development of a Predictive Cost Model for Battle Management/Command,
                Control, and Communication Systems
AFIT/ENV-4   An Analysis of the Sustainability of Pope AFB C-130s through Their
                Programmed Service Life
AFIT/ENV-5   Analysis of the Costs Estimated and Incurred Due to the Transfer of C-5 and
                Engine Depot Workload Following the 1995 BRAC
AFIT/ENV-6   Utility of COMPARE Cost Estimates in A-76 Actions Directed at Highly
                Complex or Highly Specialized Institutions
AFIT/ENV-7   Controlling Housing Privatization with Planned Goals: Lackland AFB and
                Beyond
AFIT/ENV-8   Revising R&D Program Budgets when Considering Funding Curtailment with
                a Weibull Model
AFIT/ENV-9   Estimating C-17 Operating and Support Costs: Development of a Systems
                Dynamic Model
AFIT/ENV-10 Converting Tacit Knowledge into Explicit Knowledge in the Cost Analysis
                Knowledge Domain

AFIT/ENV–11 Estimating Budget Relationships with a Leontief Input-Output Model
AFIT/ENV–12 Development of a Model to Describe the Effects of a Loss of Learning in
                Defense Production Processes
AFIT/ENV–13 Source Selection Cost Support
AFIT/ENV–14 BRAC to the Future: An Analysis of Past Savings from Base Closings
AFIT/ENV–15 Relating Initial Budget to Program Growth with a Rayleigh Model
AFIT/ENV–16 Calculating Overhead Savings in Source Selections

Aerospace Corporation

AERO–1 Space Systems Costing Suite
AERO–2 Costs of Space, Launch, and Ground Systems
AERO–3 Ground Station Cost Model (GSCM)
AERO–4 Earned-Value Management Indicators for Space Systems
AERO–5 The Aerospace Corporation Small Satellite Cost Model (SSCM)

MITRE Corporation

MITRE–1 C4ISR Investment Strategies
MITRE–2 The Value of Return on Investment (ROI) Analysis to Non-Profit
           Organizations
MITRE–3 Integrating the Balanced Scorecard with Decision Analytics to Support IT
           Investment Decisions
MITRE–4 Public Sector Virtualization: Costs, Benefits, and Risks

RAND Corporation

RAND–1 Military Airframe Costs: The Effects of Advanced Materials and
           Manufacturing Processes
RAND–2 An Overview of Acquisition Reform Cost Savings Estimates
RAND–3 Understanding the Sources of Cost Growth in Weapon Systems
RAND–4 The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships
           and Cost Reduction Initiatives
RAND–5 Turbine Engine Costs: A Primer and Cost Estimating Methodologies
RAND–6 Advanced Airframe Structural Materials Operating and Support Costs"
RAND–7 Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure
           Costs
RAND–8 Aircraft Support Cost Estimating Relationships
RAND–9 Aging Aircraft
RAND–10 Analysis of Cost Growth using Selected Acquisition Reports
RAND–11 Understanding the Sources of Cost Growth in Weapon Systems

CNA Corporation

CNA–1 Restructuring DoN FYDP Program Elements
CNA–2 Acquisition Management Analysis
CNA–3 Military Hospital Cost Analysis
CNA–4 Improving Metrics for Acquisition Management
CNA–5 Competition, Innovations, and Productivity in the Ship Industry
CNA–6 Army Acquisition Management

Institute for Defense Analyses

IDA–1	Assessment of CCDR System
IDA–2	Economic Drivers of Defense Overhead Costs
IDA–3	Cost of Stealth
IDA–4	Costs & Benefits of Installation of Flight Safety Systems on F-22 Aircraft
IDA–5	Technical and Schedule Risk Assessments for Tactical Aircraft Programs
IDA–6	Aircraft Production Capacity Analysis at the Plant Level
IDA–7	Industrial Sector Capability Analysis
IDA–8	Support to F-22A Aircraft Production Readiness Assessment
IDA–9	Affordable Multi-Missile Manufacturing (AM3)
IDA–10	Portfolio Optimization Feasibility Study
IDA–11	Resource Analysis for Operational Test and Evaluation (OT&E)
IDA–12	Resource Analysis for Test and Evaluation—MRTFB
IDA–13	FYDP Related Studies
IDA–14	FYDP Improvement, Phase II
IDA–15	Defense Resource Management Cost Model
IDA–16	Defense Economic Planning and Projection Systems (DEPPS)
IDA–17	Major Defense Acquisition Program (MDAP) Analysis and FYDP Support
IDA–18	Workload Forecasting for the Veterans Benefits Administration
IDA–19	Evaluation of TRICARE Program Costs
IDA–20	Army Enlistment Early Warning System
IDA–21	DSCA Business Metrics
IDA–22	Force Modernization Metrics
IDA–23	O&M Program Balance
IDA–24	Active/Reserve Integration
IDA–25	Reducing Defense Infrastructure Costs
IDA–26	Management Headquarters Analysis
IDA–27	Cooperation with KIDA
IDA–28	Cost Analysis Education

2. Summaries

The summaries of ongoing and planned cost research studies that follow are grouped by office or organization (separated by tabs) in the order indicated by the list of study titles in the previous section. The first part of each subsection describes the office or organization (name, location, director,[1] size, etc.).[2] These are followed by the summaries themselves.

Near the end of each summary is a list of keywords the office or organization assigned to the study. (In some cases, keywords were modified for consistency.) These keywords were used in tabulating the numbers in Table 3. The rows represent keywords

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[1] Though their actual titles vary, we refer to the heads of the offices/organizations as "directors."

[2] If this description is blank, the office/organization did not provide one.

and the columns represent offices and organizations. The number at the intersection of a row and column is the number of studies by the office or organization that have that keyword assigned to them.

Table 3. Keyword Assignments

	PA&E	BMDO	CEAC	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCCD	AFCAA	ASC/FMC	ESC/FMC	AFSMC	SPS/CF	AFIT/ENV	DSMC	AERO	MITRE	RAND	CNA	IDA	Total
PERSPECTIVE																										
Industry	3	—	—	—	—	—	—	1	5	—	1	—	—	1	1	—	—	—	—	—	4	3	4	2	4	29
Government	12	—	17	—	—	—	—	15	5	1	3	—	5	18	3	—	2	3	—	—	3	1	6	3	22	119
CONTEXT																										
Estimating	9	—	12	—	—	—	3	10	6	5	4	—	4	13	3	—	2	3	16	—	4	1	5	—	9	109
Analysis	3	—	8	—	—	—	—	5	—	9	1	—	—	15	3	—	—	—	3	—	—	1	5	—	17	70
Reviewing/Monitoring	5	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	2	—	9
Policy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	9
Programming	5	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2	8	16
Budgeting	—	—	8	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	4	16
OBJECT																										
Forces	4	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	5	11
Weapon Systems	4	—	6	—	—	—	—	1	—	4	2	—	—	3	2	—	—	—	2	—	—	1	1	2	1	29
Aircraft	1	—	2	—	—	—	—	1	—	7	—	—	—	5	2	—	—	1	—	—	—	—	5	—	4	28
Helicopters	1	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Missiles	1	—	3	—	—	—	3	—	—	1	—	—	—	4	—	—	—	—	—	—	—	—	—	—	2	14
Ships	1	—	—	—	—	—	—	4	6	—	3	—	5	—	—	—	—	—	—	—	—	—	—	1	—	20
Land Vehicles	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Space Systems	—	—	1	—	—	—	—	—	—	—	2	—	—	2	—	—	2	—	—	—	5	—	1	2	—	10
Airframe	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
Propulsion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	1
Electronics/Avionics	1	—	—	—	—	—	2	—	—	—	—	—	—	1	2	—	—	—	2	—	—	—	—	—	—	10
Spares/Logistics	—	—	—	—	—	—	—	2	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	3
Facilities	4	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	6
Infrastructure	1	—	—	—	—	—	—	2	—	—	1	—	—	1	—	—	—	—	2	—	—	3	—	—	6	15
Manpower/Personnel	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	5
STAGE																										
Concept Development	1	—	—	—	—	—	—	—	5	—	—	—	—	1	—	—	—	1	—	—	2	—	—	—	—	10
Demonstration/Validation	1	—	—	—	—	—	—	1	—	—	2	—	—	2	2	—	—	—	1	—	1	3	—	—	—	6
EMD	3	—	1	—	—	—	—	1	3	—	2	—	—	2	2	—	2	—	—	—	—	—	2	1	5	20
Production	2	—	—	—	—	—	—	3	3	—	2	—	1	2	2	—	2	1	1	—	—	—	—	1	7	27
Test and Evaluation	—	—	—	—	—	—	—	—	—	—	2	—	—	1	—	—	—	—	1	—	—	—	—	—	2	2
Operations and Support	—	—	4	—	—	—	—	8	4	—	2	—	—	1	—	—	—	1	1	—	—	—	2	—	5	28
Retirement and Demilitarization	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
Life Cycle	1	—	—	—	—	—	—	2	4	—	—	—	—	9	—	—	—	—	—	—	3	—	2	—	4	25

Table 3. Keyword Assignments—Continued

	PA&E	BMDO	CEAC	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCCD	AFCAA	ASC/FMC	ESC/FMC	AFSMC	SPS/CF	AFIT/ENV	DSMC	AERO	MITRE	RAND	CNA	IDA	Total
FOCUS																										
Labor	1										1		1	5											3	11
Material	2										2		1	5									1		2	13
Overhead/Indirect	4												1												4	9
Engineering	1							1					1											1	1	5
Manufacturing											2		1												1	4
CPR/CCDR			2																							2
WBS			1					1			1		1				2						2		1	9
Fixed Costs													1												1	2
Variable Costs																									2	2
Production Rate																										0
Acquisition Strategy							3												13		4		1		4	25
Automation																									3	3
Advanced Technology								2	1						1											4
Risk/Uncertainty								2	4		2		1								1		1	1		12
Training														1												1
Readiness	1																								1	2
Reliability									3		1															4
Sustainability								3			2								1							6
Integration								1																	1	2
Modification								2			2															4
Security																										0
Environment																										0
Schedule	1							2							1										5	9
Size																										0
Software			1					4										2	1						1	9
APPROACH																										
Data Collection	1		4					9	5	8		1		13	2		2				3	3	1		13	65
Survey											2	1							2			3			1	9
Case Study					1			1											12		1	3				18
Mathematical Modeling	2							3											13		3	1	4		9	35
Economic Analysis			4								1	1	1									1			4	12
Cost/Production Function								1																1	1	3
Time Series																								1		1
Statistics/Regression								6						8			2		3		3			1	2	25

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Table 3. Keyword Assignments—Continued

PRODUCT	PA&E	BMDO	CEAC	AMCRM	TACOM	AMCOM	SMDC	NCCA	ONR	NAVAIR	NAVSEA	NSWCDD	NSWCCD	AFCAA	ASC/FMC	ESC/FMC	AFSMC	SPS/CF	AFIT/ENV	DSMC	AERO	MITRE	RAND	CNA	IDA	Total
Data Base	1	—	11	—	—	—	—	13	—	1	2	—	—	14	—	—	2	—	—	—	—	—	1	2	12	59
Review	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	3
Method	—	—	—	—	—	—	3	4	—	3	1	—	—	2	—	—	—	—	3	—	—	3	3	—	5	27
Mathematical Model	2	—	—	—	—	—	—	—	—	—	1	—	5	10	—	—	1	1	—	—	—	—	—	—	1	21
Computer Model	1	—	—	—	—	—	—	—	—	2	1	—	—	11	2	—	—	2	1	—	4	2	—	—	5	31
Expert System	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	6
Cost Progress Curve	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
CER	—	—	5	—	—	—	2	6	1	3	1	—	—	8	1	—	2	—	1	—	3	—	—	—	1	34
Study	2	—	—	—	—	—	—	4	—	—	—	—	1	21	—	—	—	—	—	—	—	—	6	6	13	53

Program Analysis and Evaluation (PA&E)

Name:	Office of the Deputy Director (Resource Analysis), Program Analysis and Evaluation
Address:	OSD(PA&E) 1800 Defense Pentagon Washington, DC 20301-1800
Director:	Dr. David L. McNicol, (703) 695-0721
Size:	Professional: 51 Support: 4 Consultants: 0 Subcontractors: 38
Focus:	Cost Analysis Improvement Group (CAIG); Life-Cycle Costs of Major Defense Acquisition Programs; Force Structure; Operating and Support Costs; Economic Analysis
Activity:	CAIG reviews and studies per year: 25–35 POM, budget, FYDP reviews: As required

PA&E–1

Title:	Force and Support Cost (FSC) System
Summary:	We have moved the FSC system (Army and Air Force models developed by RAND) to PA&E residence with UNISYS contractor support. UNISYS has assumed responsibility for model maintenance and data updates. In addition, UNISYS has developed Navy and Marine Corps models, and versions suitable for test and evaluation have been installed within PA&E, as well as at Navy and Marine Corps sites. We have started to develop our first infrastructure module, pertaining to installation support, which will support and improve indirect costing. A prototype installation cost module has been developed for the Army and is now being adapted for the Air Force.
Classification:	Unclassified
Sponsor:	OSD(PA&E) FICAD The Pentagon, Room BE798 Washington, DC 20301 Lance Roark, (703) 697-4312
Performer:	UNISYS

Resources:

FY	Dollars	Staff-years
96	$170,000	
97	$200,000	
98	$275,000	
99	$365,000	
00	$375,000	
01	$385,000	

Schedule:	Start	End
	Ongoing	

Data Base: None

Publications: To be determined

Keywords: Computer Model

PA&E-2

Title: Visibility and Management of Operating and Support Costs (VAMOSC) for Major Weapon Systems

Summary: Supports the VAMOSC Improvement and Enhancement Working (VIEW) Group as a forum for the exchange of ideas to improve the existing VAMOSC systems. Task includes assessment of Service VAMOSC databases and associated data sources, implementation of an OSD Web site that provides ready access to CAIG O&S policies along with links to Services' VAMOSC systems, and analysis of VAMOSC data for weapon systems.

Classification: Unclassified

Sponsor: OSD(PA&E)
FICAD
The Pentagon, Room BE798
Washington, DC 20301

Krysty Kolesar, (703) 697-0222

Performer: UNISYS

Resources:	FY	Dollars	Staff-years
	96	$275,000	
	97	$150,000	
	98	$170,000	
	99	$170,000	
	00	$200,000	
	01	$200,000	

Schedule:	Start	End
	Ongoing	

Data Base: None

Publications: None

Keywords: Government, Estimating, Reviewing/Monitoring, Programming, Forces, Facilities, Overhead/Indirect

PA&E-3

Title: O&M Program Balance and Related Cost Drivers

Summary: The objective of this effort is to support a comprehensive, global assessment of programmed operations and maintenance (O&M) funding. PA&E has a major initiative to collect O&M data that links program and budget, and provides visibility into major categories of O&M, including costs driven by equipment OPTEMPO, depot maintenance, and Base Operation Support (B)OS)/Real Property Maintenance (RPM).

Classification: Unclassified

Sponsor:	OSD(PA&E)		
	FICAD		
	The Pentagon, Room BE798		
	Washington, DC 20301		
	Krysty Kolesar, (703) 697-0222		
Performer:	IDA		
Resources:	*FY*	*Dollars*	*Staff-years*
	00	$230,000	
	01	$200,000	
Schedule:	*Start*	*End*	
	Oct 99		
Data Base:	None		
Publications:	None		
Keywords:	Government, Estimating, Reviewing/Monitoring, Programming, Forces, Facilities, Overhead/Indirect		

PA&E-4

Title:	Facilities Assessment Database (FAD)		
Summary:	This project facilitates the analysis of the Department's installation infrastructure. The FAD will provide access to data necessary to assess and validate component planning, programming, and budgeting input as well as facilitate force and infrastructure analyses. FAD will link installation, personnel, and weapon systems data. A prototype FAD model has been delivered that provides detailed real property inventory data that supports facilities related cost modeling and analysis to include support for the Facilities Sustainment Model (FSM), the Facilities Aging Model (FAM), and the Force and Support Cost (FSC) System. The goals of the current phase are to expand it to include personnel data, weapon system inventory data, and RPM/BOS costs. This will require research of existing DoD databases to link historic to present infrastructure data such as DFAS' RPM/BOS execution data. Personnel and weapon system inventory data from each Service's authoritative databases will be incorporated to FAD.		
Classification:	Unclassified		
Sponsor:	OSD(PA&E)		
	The Pentagon, Rm. BE798		
	Washington, DC 20301		
	LTC Keith Kaspersen, (703) 695-7710		
Performer:	UNISYS		
Resources:	*FY*	*Dollars*	*Staff-years*
	99	$250,000	
	00	$250,000	
	01	$250,000	
Schedule:	*Start*	*End*	
	Ongoing		
Data Base:	None		
Publications:	None		

PA&E-5

Title: Reducing Defense Infrastructure Costs

Summary: The Quadrennial Defense Review (QDR) necessitates the ability to evaluate force structure alternatives and the capability to understand the cost implications of infrastructure needed to support those alternatives. The study will analyze FYDP and other cost data from the Department and the commercial sector, as well as draw upon previous analysis such as that done for the Bottom-Up Review. It will use statistical methods to derive relationships between infrastructure spending by area and Service, and hypothesized determinants, including force structure.

Classification: Unclassified

Sponsor: OSD(PA&E)

FICAD
The Pentagon, Rm. BE798
Washington, DC 20301

Lance Roark, (703) 697-4312

Performer: IDA

Resources:

FY	Dollars	Staff-years
00	$300,000	

Schedule:

Start	End
Ongoing	

Data Base: None

Publications: None

PA&E-6

Title: Selected Acquisition Report (SAR) Cost Variance Analysis

Summary: The project will provide insight into the magnitude and sources of major defense acquisition program (MDAP) cost growth. The project will quantify the amount of MDAP cost growth that is attributable to policy decisions as well as the amount attributable to errors on the part of the acquisition community as a whole. The principal investigators will transfer historical cost data, cost variance data, and explanatory notes contained in SARs to an electronic spreadsheet. In addition to recording the SAR taxonomy of cost variances, the principal investigators will classify historical cost variances according to a new taxonomy, which will be provided by the project sponsor.

Classification: Unclassified

Sponsor: OSD(PA&E)
PFED
The Pentagon, Room 2C-282
Washington, DC 20301

Mark Daley, (703) 693-7828

Performer: NAVSHIPSO

Resources:	FY	Dollars	Staff-years
	00	$215,000	
	01	$215,000	

Schedule: Start   End

Ongoing

Data Base: *Title:*   SAR Cost Growth Database

Description: Collection of 130 MDAP programs with cost variances from SARs. Measurement of cost growth captured since program MS I, II, and III dates.

Automation: Electronic format. Developing web based user interface to access data files. Initial on-line availability anticipated in January 2002.

Publications: To be determined

Keywords: Industry, Government, Estimating, Weapon Systems, Review, Study

PA&E-7

Title: Improved Cost Estimating Relationships for BMD Systems

Summary: This task began in FY99 and is jointly sponsored with BMDO, Army, and Navy. The most current information on actual costs for BMD system elements will be used to develop new cost estimating relationships (CERs) to be used for estimating the costs of missile defense systems, such as missile interceptors and radar sensors. The Patriot PAC-3, THAAD, Navy Theater Wide, Navy Area, National Missile Defense, and Arrow program offices will provide actual cost information for use in the development of new CERs for missile defense systems.

Classification: Unclassified

Sponsors: OSD(PA&E) (BMDO, Army, and Navy are co-sponsors)

OAPPD
The Pentagon, Room BE829
Washington, DC 20301

Steve Miller (703) 692-8039

Performer: Technomics

Resources:	FY	Dollars	Staff-years
	00	$50,000	
	01	$100,000	

Schedule:	Start	End
	Jan 99	Dec 03

Data Base: None

Publications: None

Keywords: Government, Estimating, Missiles, Electronics/Avionics, Production, Mathematical Modeling, Mathematical Model

PA&E-8

Title: System Engineering and Integration Costs for Navy Combat Systems

Summary: This task, jointly sponsored by PA&E and NCCA, will collect information on the actual scope of effort and the cost experience for integrating Navy combat systems into Navy

platforms. Cost estimating relationships for system engineering and integration costs will be developed for use in estimating costs for programs such as LPD-17, DD-21, LHA(R), and JCCX.

Classification: Unclassified

Sponsors: OSD(PA&E) (NCCA is co-sponsor)

OAPPD
The Pentagon, Room BE829
Washington, DC 20301

Dr. Tzee-Nan Lo (703) 697-0317

Performer: Gibbs & Cox, Lockheed-Martin, Technomics

Resources:

FY	Dollars	Staff-years
01	75,000	

Schedule:

Start	End
May 00	Dec 03

Data Base: None

Publications: None

Keywords: Ships

PA&E-9

Title: Improved Methodologies for Estimating Development Costs

Summary: The state of the art in the estimation of the costs of the RDT&E phase of major defense acquisition programs is significantly less precise than other phases of major acquisition programs. Current models rely heavily on factors applied to recurring hardware costs to develop cost estimates for development efforts. Few attempts have been made to directly estimate the costs of development efforts. The goal of this task is to explore the possibility of using simulation techniques to directly estimate development costs by modeling the sequence of events that must occur during system development.

Classification: Unclassified

Sponsors: OSD(PA&E)   OAPPD
The Pentagon, Room BE829
Washington, DC 20301

Steve Miller (703) 692-8039

Performer: LMI

Resources:

FY	Dollars	Staff-years
01	100,000	

Schedule:

Start	End
Mar 01	Mar 03

Data Base: None

Publications: None

Keywords: Industry, Estimating, Weapon Systems, EMD, Mathematical Modeling

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PA&E-10

Title:	IDA Cost Research Symposium
Summary:	IDA conducts a cost research symposium to facilitate the exchange of information on cost research that is in progress and planned, thereby avoiding wasteful duplication of effort and providing for more informed research planning decisions by participating offices. The Chairman, OSD CAIG, cosponsors this symposium. The 1999 Symposium will focus on the status of the Military Departments' capabilities to estimate the costs of weapon systems. Documentation of the symposium includes a catalog of cost research projects recently completed or still in progress at participating offices.
Classification:	Unclassified
Sponsor:	IDA Central Research Program
	OD(PA&E)
Performer:	IDA
	Dr. Stephen J. Balut, (703) 845-2527

Resources:

FY	Dollars	Staff-years
00	$30,000 (PA&E share)	
01	$30,000 (PA&E share)	

Schedule:

Start	End
Oct 00	Sep 01

Data Base:

Title:	DoD Cost Research Projects	
Description:	Summary descriptions of cost research projects (an example is this description)	
Automation:	On the web in Acrobat Reader.	

Publications:	*The 2001 IDA Cost Research Symposium*, Stephen J. Balut, Document D-XXXX, Unclassified, August 2001.
Keywords:	Government, Reviewing/Monitoring, Forces, Weapon Systems, Life Cycle, Data Collection, Data Base

PA&E-11

Title:	Understanding the Sources of Cost Growth
Summary:	The project will assemble a database on cost growth as evidenced in Selected Acquisition Reports (SARs) and will permit rapid analysis of the extent and causes of cost growth in Major Defense Acquisition Programs.
Classification:	Unclassified
Sponsor:	OSD(PA&E)
	P&FED
	The Pentagon, Room 2C-282
	Washington, DC 20301
	Mark Daley (703) 693-7828
Performer:	RAND

Resources:

FY	Dollars	Staff-years
99	$180,000	
00	$165,000	
01	$25,000	

Schedule:	Start	End	
	Oct 00	Sep 01	
Data Base:	Title:	RAND Cost Growth Database	
	Description:	Database from 1996 has been corrected for errors and programs have been rebaselined from APB to MS dates	
	Automation:	Electronic spreadsheet	
Publications:	Report completed in 1996. No documentation update available.		
Keywords:	Government, Analysis, Weapon Systems, EMD, Production		

PA&E-12

Title: Cost of Developing and Producing Next Generation Tactical Aircraft

Summary: Over the next five years, DoD will be making funding decisions for tactical aircraft development and production, amounting to over $350 billion. CAIG is responsible for preparing independent cost estimates for these aircraft for cost certification to Congress. The existing tools do not address the cost of the new generation fighter aircraft. Design attributes of the next generation of tactical aircraft are not accommodated in existing cost estimating tools. Important attributes include low observable, advanced materials (both composites and metals), integrated avionics, and unique propulsion designs. These attributes are all evident in the F-22 and Joint Strike Fighter (JSF) programs. An urgent need exists to develop the necessary cost estimating tools to support these and future tactical aircraft programs. The objective is to collect, analyze, and exploit the latest available information to develop databases and methods for estimating the development and production costs of the next generation tactical aircraft.

Classification: Unclassified

Sponsor: OSD(PA&E)
WSCAD
The Pentagon, Room BE779
Washington, DC 20301

Gary Pennett, (703) 697-7282

Performer: IDA

Mr. Bruce Harmon, (703) 845-2501

Resources:	FY	Dollars	Staff-years
	97	$350,000	2
	98	$350,000	2
	99	$150,000	0.8
	00	$200,000	
	01	$200,000	

Schedule:	Start	End
	ongoing	

Data Base:	Title:	To be determined
	Description:	Cost and other data on contemporary aircraft programs, including F-117, B-2, YF/F-22, YF-23, F/A-18E/F, V-22, C-17
	Automation:	To be determined

Publications: None

Keywords: Government, Estimating, Analysis, Aircraft, EMD, Material, Demonstration/Validation, Engineering

PA&E-13

Title: Contractor Cost Data Reporting (CCDR) Clearinghouse/Repository

Summary: The DoD develops cost estimates of major weapon systems using historical data, the primary sources of which are the Contractor Cost Data Reports (CCDRs) provided by hundreds of defense contractors. CCDR data requirements have not been revised substantially since the system was established nearly two decades ago. In annual meetings at IDA on cost research, the directors of the major DoD organizations that do defense cost research noted that the CCDR system had not been meeting their needs. Since then, steps have been taken to improve the usefulness of the CCDR system, to include analysis and reengineering of the system. This effort addresses additional steps that will further improve the utility of the CCDR system. This includes the ongoing transformation of the current CCDR repository into an automated cost information management system (ACIMS) that will allow users to locate and retrieve a variety of documents and data useful in estimating the entire life-cycle cost of a program. The ACIMS will query multiple sources, both internal and external to the current CCDR-PO system architecture, to find pertinent cost-related information on requested programs and return the results to users over secure Internet connections. The types of information that may be included in the ACIMS are operations and support cost data, technical performance data, cost research studies, cost growth information, cost estimating relationship databases, and libraries of cost information currently stored at various DoD cost activities.

Classification: Unclassified

Sponsor: OD(PA&E), WSCAD
The Pentagon, Rm. BE779
Washington, DC 20301

Lt. Col. David Robinson, (703) 602-3301

Performer: VGS

Resources:

FY	Dollars	Staff-years
97	$150,000	
98	$220,000	
99	$ 75,000	
00	$230,000	
01	$510,000	

Schedule:

Start	End
Ongoing	

Data Base: None

Publications: None

Keywords: Government, Industry, Analysis, Labor, Material, Schedule, Study

PA&E-14

Title: Analysis of the Repair and Overhaul of Reparable Items

Summary: This project will identify how current processes for the management of reparables have contributed to the degradation of aircraft readiness. The study will focus principally on the processes for establishing requirements, developing plans and programs, the execution of these programs, and allocating resources to the repair and overhaul of reparable items. Of particular interest will be the infrastructure and cost implications associated with logistics process improvements that will provide necessary aircraft

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readiness at the lowest possible cost both in the near term and in the out-years as process improvements are implemented.

Classification:	Unclassified
Sponsor:	OSD(PA&E)
	FICAD
	The Pentagon, Room BE798
	Washington, DC 20301
	CDR James Workman, (703) 697-6393
Performer:	LMI

Resources:

FY	*Dollars*	*Staff-years*
00	$300,000	
01	$300,000	

Schedule:

Start	*End*
Oct 99	Oct 01

Data Base:	None
Publications:	None
Keywords:	Government, Programming, Infrastructure, Readiness, Aircraft

Army Cost and Economic Analysis Center (CEAC)

Name:	U.S. Army Cost and Economic Analysis Center
Address:	1421 Jefferson Davis Highway, Suite 9000 Arlington, VA 22201-3259
Director:	COL Kenneth E. Ellis, Acting Director; (703) 601-4200 DSN: 329-4200 FAX: (703) 601-4430
Size:	Professional: 52 Support: 10 Consultants: 0 Subcontractors: 1
Focus:	The focus of the Army's Centrally Funded Cost Research Program is to improve the capability of the Army to develop cost estimates and economic analyses. The main categories of concentration are: Data Base Development Methodology Development Costing the Effects of New Technology Software Support Systems PPBES Linkages The Commodity areas we cover are: Aircraft Systems Missiles and Space Systems Wheel and Tracked Combat Vehicle Systems Communications and Electronics Systems General Systems/Future Technology/Tools and Models Information Management Systems Force Unit Costing Operating and Support Costing Financial Management and Operations
Activity:	Number of projects in process: 6-10 Average duration of a project: 9-12 months Average number of staff members assigned to a project: 0.25 Average number of staff-years expended per project: 2 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by contractors: 90% Percentage of effort conducted by subcontractors: 5%

CEAC-1

Title:	Operating and Support Management Information System (OSMIS) Data Base Management
Summary:	OSMIS is a Management Information System designed to assist the Army in determining the historical operating and support costs of selected major fielded weapons systems through the production of cost data and cost factors based on actual usage data. The cost data generated from OSMIS is derived from existing Army Logistics Support

Management Information Systems. Develop annual data collection process, collect data from LIF, PMR, ULLS and other sources. Construct annual Materiel Systems Definition by system/Line Item Number. Generate and validate Weapon system to ammunition crosswalk tables, Unit tables and system asset tables, Cost Tables and OSMIS Cost Tables. Perform system maintenance and develop system documentation.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
Kathleen O'Brien, (703) 601-4155/DSN 329-4155

Performer: CALIBRE Systems, Inc.

Resources:

FY	Dollars
01	$1,821,000

Schedule:

Start	End
Ongoing	

Data Base: OSMIS

Publications: U.S Army Operating and Support Management Information System (OSMIS) online interactive relational database with 7 years of historical data.

Keywords: Government, Estimating, Analysis, Budgeting, Weapon Systems, Operations and Support, Data Base

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CEAC-2

Title: Operating and Support Management Information System (OSMIS) Output Products

Summary: OSMIS is a Management Information System designed to assist the Army in determining the historical operating and support costs of selected major fielded weapons systems through the production of cost data and cost factors based on actual usage data. The cost data generated from OSMIS is derived from existing Army Logistics Support Management Information Systems. This contract develops O&S Cost Factors for the POM, BES and President's Budget, Aircraft reimbursement rates, Class II and IV Cost Factors and management reports on data collected. The OSMIS processed data is used in other systems and models such as FORCES, REVOLVER, and the OSD VAMOSC System Interface Model. OSMIS also contains information on consumables, depot level reparables (DLRs), training ammunition, OPTEMPO, densities, depot maintenance, and petroleum, oil and lubricants (POL). This effort updates and maintains a relational database. Other special studies include; Increase OSMIS database coverage for Contractor Logistics Support, Integrated Sustainment Maintenance, IMPAC purchases and warranty demands. Create OCIE market basket to support PPBES, Investigate sources for PDSS information. Coordinate Master System Definitions with system PMOs for validation and verification. Investigate ULLS-G for additional useful data, Incorporate Army Modernization Reference Data into OSMIS database. Develop procedure for tracking Training Resource Model projections with historical OSMIS data. Investigate LIF/CDBB as sources of data and recommend necessary fixes/changes to improve databases. Develop methodology to account for age of the fleet tactical, combat vehicles and aircraft

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
Kathleen O'Brien, (703) 601-4155/DSN 329-4155

Performer: CALIBRE Systems, Inc.

Resources:

FY	Dollars
01	$703,997

Schedule:	Start	End
	Ongoing	

Data Base: OSMIS

Publications: "Cost Factors as required by the OPTEMPO Working Group to support the Presidents' Budget, POM and BES"; Aircraft Reimbursement Rates; Class II and IV Cost Factors

Keywords: Government, Estimating, Analysis, Budgeting, Weapon Systems, Operations and Support, Data Base

CEAC-3

Title: ACEIT Help-Desk

Summary: This project funds the Army portion of a joint effort of the U.S. Army Cost and Economic Analysis Center and the Air Force Electronic Systems Center and Air Force Cost Analysis Agency to meet the Army Cost Estimation Support Requirements. This funds dial up support for technical assistance when required for Army Cost Analysts and support contractors. It includes the update of annual Inflation Indices, problem resolution, bug fixes and configuration control for Army Acquisition Information/Databases

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
David Henningsen, (703) 601-4163/ DSN 329-4163

Performer: Tecolote Research, Inc.

Resources:	FY	Dollars
	01	$150,000

Schedule:	Start	End
	Ongoing	

Data Base: IBM PC Compatible

Publications: Tecolote ACE-IT Users Guide

Keywords: Government, Weapon Systems, DataBase

CEAC-4

Title: ACEIT Enhancements

Summary: This project funds the Army portion of a joint effort of the U.S. Army Cost and Economic Analysis Center and the Air Force Electronic Systems Center and Air Force Cost Analysis Agency to meet the Army Cost Estimation Support Requirements. This effort funds a long list of ACEIT enhancements requested or documented by Army cost analysts in Software Error and Enhancement Forms (SERFs). Some of the most significant new features are "CALC Trace Back", "Improved CALC Speed", "Variable Map", "Drag and Drop whole rows or selected cells", better report generation capability and similar requested features.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
David Henningsen, (703) 601-4163/DSN 329-4163

Performer: Tecolote Research, Inc.

Resources:	FY	Dollars
	01	$75,000

Schedule:	*Start*	*End*
	Ongoing	
Data Base:	IBM PC Compatible	
Publications:	Tecolote ACE-IT Users Guide	
Keywords:	Government, Weapon Systems, Data Base	

CEAC-5

Title:	Communications and Electronics Cost Data Base/Methodology
Summary:	This project will expand the Communications and Electronics Database. This effort will add additional Army communications-electronics systems to the database. The database module has developed a common Work Breakdown Structure (WBS) that describes a comprehensive set of communications systems from small radios to large network control stations. The database includes cost, technical and programmatic data for thirteen development programs for nine Army Communication systems. The database will support the investigation of future alternatives for wireless network connectivity; develop useful factors and investigate potential models supporting this new capability.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
Performer:	Technomics, Inc.

Resources:	*FY*	*Dollars*
	00	$125,000

Schedule:	*Start*	*End*
	Ongoing	

Data Base:	ACDB
Publications:	Communications and Electronics Cost Model, TR-9607-01, October 1996
Keywords:	Government, Estimating, Analysis, WBS, Data Base, CER, Data Collection

CEAC-6

Title:	Army Tri-Service Missile and Smart Munitions Database
Summary:	USACEAC developed a standard architecture for the acquisition of Weapon systems. USACEAC in conjunction with the Air Force and Navy Cost Communities has participated in the joint development and maturation of this Tri-Service database. The primary objective of this project is to collect missile cost data from CCDRs, CPRs, contracts or other sources which can be mapped and normalized to populate the Missile database. The database currently contains over 1000 raw missile cost records. The database contains technical and programmatic data and can be used to develop learning curves and cost factors.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
Performer:	Tecolote Research, Inc.

Resources:	*FY*	*Dollars*
	00	$125,000

Schedule:	*Start*	*End*
	Ongoing	

Data Base:	Automated Cost Data Base (ACDB)

CEAC-7

Title: Wheel and Tracked Vehicle Data Base and Methodology Development

Summary: This project will provide USACEAC continued support in the development of a Wheeled and Tracked Vehicle Module (WTVM) for the Automated Cost Database (ACDB). Support will consist of data collection and analysis, data base evaluation and management, and the development of cost relationships using collected data. The database is fielded at USACEAC, PEO–Ground Combat and Support Systems, and TACOM.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center

Performer: Science Applications International Corporation (SAIC)

Resources:

FY	Dollars
01	$100,000

Schedule:

Start	End
Ongoing	

Data Base: Automated Cost Data Base (ACDB)

Publications: None

Keywords: Government, Estimating, Land Vehicles, CPR/CCDR, Data Collection, Data Base

CEAC-8

Title: Aircraft Module Data Base and Cost Estimating Relationship (CER) Development

Summary: This project provides continued development and improvement of the Aircraft Rotary Wing Cost database. This project includes the transition of the Aircraft Module Database in Automated Cost Database (ACDB) to a new contractor to perform the Army Aircraft DBA tasks. The current database contains approximately 95% of the U.S. Rotary Wing Cost Data. This project is expected to add additional cost, programmatic, and technical data for programs such as the Comanche, Longbow Apache Airframe Modifications, Longbow Apache Fire Control Radar, ATIRCM/CMWS, Blackhawk, Improved Cargo Helicopter, and the V-22 Osprey EMD contract.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center

Performer: Ketron

Resources:

FY	Dollars
00	$125,000

Schedule:

Start	End
Ongoing	

Data Base: Automated Cost Data Base (ACDB)

CEAC-9

Title: ACEIT Standard Applications Interface

Summary: This project will develop an ACEIT standard interface to Engineering and/or effectiveness models. A prototype for a tactical missile performance based cost model will be developed.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center

Performer: Tecolote Research, Inc.

Resources:

FY	Dollars
99	$100,000

Schedule:

Start	End
Ongoing	

Data Base: IBM PC Compatible

Publications: None

Keywords: Government, Weapon Systems, Data Base, Economic Analysis

CEAC-10

Title: ACEIT FCS O&S Cost CAIV

Summary: This program funds the development of a CAIV capability to rapidly determine Operating and Support (O&S) cost early enough in the lifecycle costs to influence component trade-off, and component design. The study centers on vehicle data and analysis. OSMIS data was merged with ACDB data. The focus is on calculating reparables and consumables costs. O&S costs typically comprise 60% of a program's life-cycle costs and there is recent emphasis on the need for this capability.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
Bob Conley, (703) 601-4173/DSN 329-4173

Performer: Tecolote Research, Inc.

Resources:

FY	Dollars
1999	$250,000

Schedule:

Start	End
Ongoing	

Data Base: IBM PC Compatible

Publications: None

Keywords: Government, Weapon Systems, Data Base, Economic Analysis

CEAC-11

Title: Installation Status Report (ISR) Part I, AIM-HI Cost Factors

Summary: This project will develop Facility Category Group (FCG) cost factors for new construction, renovation and sustainment using the applicable cost methodologies to support the Installation Status Report and the AIM-HI Model.

Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
	Steve Barth, (703) 601-4150/DSN 329-4150
Performer:	Management Analysis Inc.

Resources:	FY	Dollars
	1999	$85,000
Schedule:	Start	End
	Ongoing	
Data Base:	IBM PC Compatible	
Publications:	None	
Keywords:	Government, Facilities, Economic Analysis	

CEAC-12

Title:	Installation Status Report (ISR) Standard Service Cost (SSC) Part III
Summary:	This project will develop cost factors/cost relationships for Installation services to support the Army BASOPS requirements generation model (AIM-HI) at the MACOM and Department of Army levels. Cost Factors will be based on historical cost, quantitative and qualitative data collected through ISR Part III and SBC Data collection efforts for FY 96, 97 and 98.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
	Cecile Batchelor, (703) 601-4145/DSN 329-4145
Performer:	Calibre Systems Inc.

Resources:	FY	Dollars
	00	$250,000
Schedule:	Start	End
	Ongoing	
Data Base:	IBM PC Compatible	
Publications:	None	
Keywords:	Government, Economic Analysis	

CEAC-13

Title:	Personnel Costing System
Summary:	The Personnel Costing System consists of two modules; 1) the Civilian Costing System (CCS) and Army Military-Civilian Cost System (AMCOS). The CCS is a model used to develop civilian personnel costs in support of PPBES. AMCOS is a model used to estimate military and civilian personnel costs in support of weapon systems acquisition and various analytical studies. This project funds the update of the models with the latest rate data.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
	Ralph Padgett, (703) 601-4148/DSN 329-4148
Performer:	Calibre Systems Inc.

Resources:	FY	Dollars
	01	$500,000

Schedule: Start — End

Ongoing

Data Base: IBM PC Compatible

Publications: None

Keywords: Government

CEAC-14

Title: Force and Contingency Cost Models Update

Summary: This project will update FORCES and include the Contingency Operations Cost Model (ACM) and develop a WEB based interactive capability for the FORCES and the Cost Factor handbook. The FORCES Cost Model will be available for download from the FORCES website with frequent updates for O&S and equipment cost factors.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
Joe Gordon, (703) 601-4147/DSN 329-4147

Performer: Management Analysis Inc.

Resources:	FY	Dollars
	00	$450,000

Schedule: Start — End

Ongoing

Data Base: IBM PC Compatible

Publications: None

Keywords: Government

CEAC-15

Title: PRICE Model Evaluation

Summary: The objective of this effort is to demonstrate the utility of the PRICE H (Hardware) model for estimating Army wheeled and tracked vehicle costs. This project will help CEAC to evaluate the PRICE model by calibrating existing vehicle data by subsystem. The project will collect data from ACDB, develop complexity factors for 13 subsytems, establish a database and write documentation.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center
Ron Anderson, (703) 601-4133/DSN 329-4133

Performer: PRICE Systems, Inc.

Resources:	FY	Dollars
	01	$58,000

Schedule: Start — End

Ongoing

Data Base: None

CEAC-16

Title:	Study on Airframe, Propulsion, Avionics Development Engineering
Summary:	This project will develop statistically CERS for selected airframe components such as airframes and propulsion systems. CER development will focus on near term estimating requirements (e.g., Comanche and Blackhawk).
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
Performer:	Ketron

Resources:

FY	Dollars
00	funded under ACDB effort

Schedule:

Start	End
Ongoing	

Data Base:	None
Publications:	None
Keywords:	Government, Estimating, Aircraft, Helicopters, EMD, CER

CEAC-17

Title:	Study on Rotary Wing Aircraft DLR CERs
Summary:	This project will develop statistically CERS for depot level reparables and consumables. CER development will extract and analyze data from the OSMIS database.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
Performer:	Ketron

Resources:

FY	Dollars
00	funded under ACDB effort

Schedule:

Start	End
	Complete

Data Base:	None
Publications:	None
Keywords:	Government, Estimating, Aircraft, Helicopters, CER, Operations and Support

CEAC-18

Title:	IAV CER Development
Summary:	This effort consisted of data collection and analysis, data base evaluation, and the development of cost relationships for use in estimating IAV development costs.
Classification:	Unclassified
Sponsor:	U.S. Army Cost and Economic Analysis Center
Performer:	Science Applications International Corporation (SAIC)

31

Resources:	FY	Dollars
	00	funded as part of FY00 database effort

Schedule:	Start	End
		Complete

Data Base: None

Publications: None

Keywords: Government, Estimating, Land Vehicles, CER

CEAC-19

Title: Update of Missile Production Cost Factors

Summary: The purpose of the task is to update an earlier report jointly written by the Cost Analysis Offices of the U.S. Army Missile Command (now the U.S. Army Aviation and Missile Command USAAMCOM) and U.S. Army Strategic Defense Command (now the U.S. Army Space and Missile Defense Command USASMDC). The original study provided cost estimating methodologies for 2.021 Manufacturing, 2.022 Recurring Engineering, 2.023 Sustaining Tooling, 2.024 Quality Control, 2.05 System Test and Evaluation (ST&E), and 2.06 Training, in the form of "declining factors." This study provides updated factors for the same categories using additional data points, and adds factors for 2.04 Systems Engineering/Program Management (SEPM), and 2.07 Data.

Classification: Unclassified

Sponsor: U.S. Army Cost and Economic Analysis Center

Performer: Tecolote Research, Inc.

Resources:	FY	Dollars
	00	$125,000

Schedule:	Start	End
		Completed

Data Base: None

Publications: None

Keywords: Estimating, Analysis, Missiles

CEAC-20

Title: THAAD Cost Research

Summary: The purpose of the task is to provide cost analysis, cost research, schedule analysis and program support to the THAAD Program Office. This narrative focuses on the cost research tasks. This effort will research and develop cost methodologies in the following areas: 1) re-certification of missiles considering the "certified round" concept for the THAAD missile, 2) software cost maintenance during the O&S phase and 3) impacts of computer obsolescence during the O&S phase.

Classification: Unclassified

Sponsor: THAAD Project Office/U.S. Army Cost and Economic Analysis Center

Performer: Tecolote Research, Inc.

Resources:	FY	Dollars
	01	

Schedule:	*Start*	*End*
	Ongoing	
Data Base:	None	
Publications:	None	
Keywords:	Estimating, Analysis, Missiles, Operations and Support, Software	

Tank-automotive and Armaments Command (TACOM)

Name:	Cost Analysis Division U.S. Army Tank-automotive and Armaments Command
Address:	AMSTA-CM-BV Warren, MI 48397-5000
Director:	Richard S. Bazzy, (810) 574-6665; E-mail: bazzyr@tacom.army.mil
Size:	Professional: 50 Support: 2 Consultants: 0 Subcontractors: 0
Focus:	Responsible for the preparation of Program Office Estimates, Life Cycle Cost Estimates, and Economic Analyses. Perform cost validation to determine the reasonableness of cost estimates. Support the Earned Value Management Process. Develop cost models and databases along with performing cost research. Support is provided to combat and combat support vehicle systems.
Activity:	Number of projects in process: 25 Average duration of a project: 3–20 weeks Average number of staff members assigned to a project: 1–3 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by subcontractors: 0%

TACOM-1

Title: Total Ownership Cost Reduction (TOCR) Model

Summary: Developed a model and process to evaluate the cost effectiveness of Total Ownership Cost Reduction Initiatives. Process involves the evaluation of an initiative initially at the component level and then at the total ownership cost level. Major improvement of this process is the capability to evaluate initiatives down to the component level, yielding greater reliability in the ability to effectively evaluate TOCR initiatives. The methodology has been applied to the Hercules and HMMWV programs to date.

Classification: Unclassified

Sponsor: US Army Tank-automotive and Armaments Command
AMSTA-CM-BV

Richard Bazzy, (810) 574-6665

Performer: US Army Tank-automotive and Armaments Command
AMSTA-CM-BV

Diane Hohn, (810) 574-6517

Resources:

FY	Dollars	Staff-years
00	$270,000	3.0

Schedule:

Start	End
Aug 99	Jul 00

Data Base: None

Publications: None

Keywords: Economic Analysis

Army Aviation and Missile Command (AMCOM)

Name:	Cost Analysis Division, Command Analysis Directorate U.S. Army Aviation and Missile Command (AMCOM)
Address:	AMSAM-CA-CA Redstone Arsenal, Alabama 35898-5000
Director:	Frank T. Lawrence, Director, Command Analysis, (256) 842-2817,DSN 788-2817, FAX (256) 876-4747, Frank.Lawrence@redstone.army.mil, Wayne S. Bruno, Chief, Cost Analysis Division, (256) 876-9801, Fax (256) 842-9933, Wayne.Bruno@redstone.army.mil
Size:	Professional: 41 Support: 1 Consultants: 0 Subcontractors: 0
Focus:	Provide cost estimation and analysis support to Aviation and Tactical Missiles Program Executive Offices, Program/Project Offices, and AMCOM organizational elements. Manage the PEO, PMO, and AMCOM Cost Analysis Programs. Develop, update or obtain Cost Estimating Relationships (CERs), cost factors, and mathematical/computerized cost models for estimating purposes. Develop cost estimates to support Analyses of Alternatives (AoA), tradeoff studies, and force structure estimates. Develop and prepare life cycle cost estimates, and conduct other related studies in support of weapon systems cost analysis. Perform cost risk analyses and cost risk assessments to support weapon systems program decisions. Provide certification/validation for cost estimates and economic analyses.
Activity:	Number of projects in process: 44 Average duration of a project: 3–26 weeks Average number of staff members assigned to a project: 1–3 Average number of staff-years expended per project: 1 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by subcontractors: 0%

AMCOM-1

Title:	Future Transport Rotorcraft Cost Estimation Models
Summary:	The objective of this program was to develop a process and model for AMCOM AMRDEC's Future Transport Rotor Craft design and acquisition solutions.
Classification:	Unclassified
Sponsor:	US Army Aviation and Missile Command AMSAM-CA-CA Wayne Bruno, (256) 876-9801
Performer:	US Army Aviation and Missile Command AMSAM-CA-CA Tom Rogers; Wallace Willard; Glenn Wolf (256) 955-0977

Resources:	*FY*	*Dollars*	*Staff-years*
	01	$65,000	< 1

Schedule:	*Start*	*End*	
	Nov 00	Aug 01	
Data Base:	*Title:*	To be determined	
	Description:	Army Aviation Systems, NASA parametric, PRICE-H	
	Automation:	PRICE-H, ACEIT	

Publications: N/A

Keywords: Government, Estimating, Helicopters, Concept Development, Mathematical Model

Army Space and Missile Defense Command (SMDC)

Name:	U.S. Army Space and Missile Defense Command (SMDC)
Address:	SMDC–SP–C 106 Wynn Drive, P.O. Box 1500 Huntsville, AL 35807
Director:	Col. Hendrickson, Deputy Chief of Staff for Strategic Planning and Analysis Mr. Jackson G. Calvert, Cost Performance and Analysis Division Chief, (205) 955-3612
Size:	Professional: 9 Support: 2.5 Consultants: Mavatech Corporation Subcontractors: Tecolote Research, Inc., Computer Sciences Corp.
Focus:	Systems Costs, Component Cost Analyses, Economic Analyses
Activity:	Number of projects in process: 2 Average duration of a project: 1 year Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 0.25 Percentage of effort conducted by consultants: 25% Percentage of effort conducted by subcontractors: 50%

SMDC-1

Title:	Strategic Missile Model Update
Summary:	Since the origination of the Strategic Missile Model, a number of new cost estimating methodologies have been developed. An updated model that would apply to a number of missile systems (e.g., THAAD, MEADS, PAC-3) is desired. The primary objective of this task was to update and expand the list of available missile cost estimating relationships (CERs), refine the data in the missile module of the Army Cost Data Base (ACDB) so that it is ready for downloading to CO$STAT for CER development, develop new CERs or factors, and implement the selected CERs into ACEIT using the latest version of the ACE Information Manager (AIM).
Classification:	Unclassified
Sponsor:	Jack Calvert, (205) 955-3612, (jack.calvert@smdc.army.mil)
Performer:	Tecolote Research, Inc.

Resources:

FY	Dollars	Staff-years
01	$125,000	0.1

Schedule:

Start	End
Aug 00	Aug 01

Data Base:

Title:	To be determined
Description:	DoD systems
Automation:	Strategic and Theater Automated Research (STAR)

Publications:	To be completed
Keywords:	Estimating, Missiles, Electronics/Avionics, Advanced Technology, Method

SMDC-2

Title:	Strategic and Experimental IR Sensor Cost Model III

Summary: There have been a number of recent developments in modern missile seeker technologies. The goal of this effort is to collect cost, technical, and other data required to develop cost estimating relationships, and update the Strategic and Experimental IR Sensor Cost Model II. CERs to be developed include those for optical telescope assembly/structure, focal plane array, cryogenic cooler, analog electronics, digital electronics, and gimbal/servo electronics/IMUs.

Sponsor: Jack Calvert, (205) 955-3612, (jack.calvert@smdc.army.mil)

Performer: Technomics, Inc.

Jack Calvert, John Horak, Jim Harbour, and W. Eugene Waller

Resources:

FY	Dollars	Staff-years
	$150,000	0.2

Schedule:

Start	End
Apr 99	Sep 00

Data Base:

Title:	To be determined
Description:	DoD systems
Automation:	Strategic and Theater Automated Research (STAR)

Publications: To be determined

Keywords: Estimating, Missiles, Electronics/Avionics, Advanced Technology, Method, CER

SMDC-3

Title:	Analysis of Government to Contractor Cost Relationships for RDT&E

Summary: This study updates an old Applied Research Incorporated study with recent data (including THAAD) and utilizes only data applicable to ballistic missile defense. The results provides the choice of a factor or cost estimating relationship (CER) for use as a sanity-check for the results coming from more detailed cost estimates. The subject factor or CER can also be used to develop a short turn-around estimate, or an estimate for a notional system prior to further system definition.

Sponsor: Jackson G. Calvert (256) 955-3612, (jack.calvert@smdc.army.mil)

Performer: Mark Glenn
Contact: Jack Calvert (256) 955-3612

Resources:

FY	Dollars	Staff-years
00	$0	0.20

Schedule:

Start	End
May 00	Sep 00

Data Base:

Title:	To be determined
Description:	DoD Systems
Automation:	Strategic and Theater Automated Research (STAR)

Publications: To be determined

Keywords: Estimating, Missiles, Advanced Technology, Method, CER

Naval Center for Cost Analysis (NCCA)

Name:	Naval Center for Cost Analysis (NCCA)
Address:	Nebraska Avenue Complex 4290 Mount Vernon Drive, NW Suite 18200 Washington, DC 20393-5444
Director:	Capt. Christopher D. Owens, USN Mr. Jack Smuck (Deputy Director) (202) 764-2430 (202) 764-2661
Size:	Professional: 34 civilian; 13 military Support: 31 civilian; 13 military Consultants: Subcontractors:
Focus:	Naval Center for Cost Analysis (NCCA) is responsible for assisting (via IPTs) in the preparation of life cycle cost estimates for DoN weapon and automated information systems, administering the DoN Contractor Cost Data Reporting (CCDR) program, managing the DoN VAMOSC Program and coordinating the DoN cost research program. The focus of the NCCA cost research program is the following: improved acquisition and operating and support (O&S) cost/technical data bases (e.g., VAMOSC, ACDB, etc.); improved methods for estimating direct and indirect O&S costs; improved methods for estimating software development/maintenance costs; improved methods for estimating specific E&MD cost elements, e.g., non-recurring engineering, system integration, government in-house support, etc.; methods for estimating the cost impact of acquisition reform initiatives.
Activity:	Number of projects in process: 16 Average duration of a project: 24 months Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 2 Percentage of effort conducted by consultants: 75% Percentage of effort conducted by subcontractors: 0

NCCA-1

Title:	Ship and Shipboard System Operating and Support Cost Analysis Model (OSCAM-Ship, OSCAM-Sys)
Summary:	These two models were developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables us to capture the dynamic behavior of a system while allowing for a flexible design, which can be easily enhanced and expanded. The model provides the flexibility for fast, top-level cost estimating, as well as the framework for analyzing possible policy decisions and their impact on cost and availability. Model outputs include both cost and availability. The inclusion of availability within the model is crucial because cost reduction policies need to be analyzed in conjunction with their impact on availability, and vice versa.

Classification:	Unclassified
Sponsor:	Naval Center for Cost Analysis (NCCA)

Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444

Ms.Wendy Kunc, (202) 764-2610

Office of Naval Research (ONR)

Ballston Centre Tower One
800 North Quincy Street
Arlington, VA 22217-5660

Ms. Katherine Drew

Specialist Procurement Services/Cost Forecasting (SPS/CF)

MoD Abbey Wood
P.O. Box 702
Bristol BS12 7DU
UK

Mr. Dale Shermon, UK, 011 44 117 91 32686

Performer:	NCCA in-house, UK MoD in-house and HVR Consulting Services, Ltd
	Mr. Jeff Wolfe, NCCA, (202) 764-2671
	Mr. Dale Shermon, UK, 011 44 117 91 32686
	Mr. Jonathan Coyle, UK, HVR CSL, 011 44 1420 87977

Resources:	*FY*	*Dollars*	*Staff-years*
	96	UK$ only	1.0
	97	UK$ only	1.5
	98	$123,000 + UK$	0.75
	99	$125,000 + UK$	0.5
	00	$ 96,203 + UK$	0.5
	01	$100,000 + UK$	0.5

Schedule:	*Start*	*End*	
	Jan 97	Nov 97	Version 1 development
	Dec 97	Feb 98	Version 2 development
	Aug 98	Apr 99	Version 3 development
	May 99	Apr 00	Version 4 development
	Jun 00	Sep 01	Version 5 development

Data Base:	VAMOSC/other cost data and technical data
Publications:	Mathematical model and supporting documentation accessible via www.ncca.navy.mil
Keywords:	Government, Estimating, Analysis, Operations and Support, Sustainability, Ships, Mathematical Modeling, Statistics/Regression, Data Base, Method, CER, Study

NCCA-2

Title:	Aircraft Operating and Support Cost Analysis Model (OSCAM-Air)
Summary:	This model is being developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables us to capture the dynamic behavior of a system while allowing for a flexible design that can be easily enhanced and expanded. Many questions posed today (e.g., How can the Navy reduce operating and support costs while maintaining readiness?) cannot be addressed with existing tools. The

model will provide the flexibility for fast, top-level cost estimating, as well as the framework for analyzing possible policy decisions and their impact on cost and availability. Model outputs will include both cost and availability. The inclusion of availability within the model is crucial because cost reduction policies need to be analyzed in conjunction with their impact on availability, and vice versa.

Classification:	Unclassified
Sponsor:	Naval Center for Cost Analysis (NCCA) Nebraska Avenue Complex 4290 Mount Vernon Drive, N.W., Suite 18200 Washington, DC 20393-5444
	Ms. Wendy Kunc, (202) 764-2610
	Office of Naval Research Ballston Centre Tower One 800 North Quincy Street Arlington, VA 22217-5660
	Ms. Katherine Drew
	Specialist Procurement Services/Cost Forecasting (SPS/CF) MoD Abbey Wood P.O. Box 702 Bristol BS12 7DU UK
	Mr. Dale Shermon, UK, 011 44 117 91 32686
Performer:	NCCA in-house, UK MoD in-house and HVR Consulting Services, Ltd
	Mr. Jeff Wolfe, NCCA, (202) 764-2671
	Mr. Dale Shermon, UK, 011 44 117 91 32686
	Mr. Jonathan Coyle, UK, HVR CSL, 011 44 1420 87977

Resources:

FY	Dollars	Staff-years
99	$100,000 + UK$	0.75
00	$105,000	0.75
01	$106,000	0.5

Schedule:

Start	End
Apr 99	Sep 99 (Prototype development)
Oct 99	Apr 00 (Version 1 development)
Jun 00	Sep 01 (Continuing development)

Data Base:	VAMOSC/other cost data and technical data
Publications:	Mathematical model and supporting documentation accessible via www.ncca.navy.mil
Keywords:	Government, Estimating, Analysis, Operations and Support, Sustainability, Aircraft, Mathematical Modeling, Statistics/Regression, Data Base, Method, CER, Study

NCCA-3

Title:	Advanced Amphibious Assault Vehicle (AAAV) Operating and Support Cost Analysis Model (OSCAM-AAAV)
Summary:	This model was developed using a "system dynamics" approach. This approach provides a structured methodology for dealing with complex systems having many interacting components. A system dynamics approach enables us to capture the dynamic behavior of a system while allowing for a flexible design that can be easily enhanced and expanded. Many questions posed today (e.g., How can the Marine Corps reduce operating and

support costs while maintaining readiness?) cannot be addressed with existing tools. The model will provide the flexibility for fast, top-level cost estimating, as well as the framework for analyzing possible policy decisions and their impact on cost and availability. Model outputs include both cost and availability. The inclusion of availability within the model is crucial because cost reduction policies need to be analyzed in conjunction with their impact on availability, and vice versa.

Classification:	Unclassified
Sponsor:	Direct Reporting Program Manager, AAAV

AAAV Technology Center
991 Annapolis Way
Woodbridge, Virginia 22191-1215

Mr. Jack Rothwell, (703) 492-3346

Naval Center for Cost Analysis (NCCA)

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4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444

Ms. Wendy Kunc, (202) 764-2610

Performer: AAAV Program Office, NCCA in-house, and HVR Consulting Services, Ltd

Mr. Jack Rothwell, AAAV DRPM, 703-492-3346

Mr. Jeff Wolfe, NCCA, (202) 764-2671

Mr. Jonathan Coyle, UK, HVR CSL, 142 087977

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$112,000	0.85
	01	$60,000	0.75

Schedule:	*Start*	*End*
	Apr 00	Sep 00 (Version 1 development)
	Oct 00	Sep 01 (Continued enhancements)

Data Base: VAMOSC/other cost data and technical data

Publications: Mathematical model and supporting documentation accessible via www.ncca.navy.mil

Keywords: Government, Estimating, Analysis, Operations and Support, Sustainability, Electronics/Avionics, Mathematical Modeling, Statistics/Regression, Data Base, Method, CER, Study

NCCA-4

Title: Naval VAMOSC Database

Summary: The Visibility and Management of Operating and Support Cost (VAMOSC) database displays Naval operating and support (O&S) costs and related information (e.g., operating hours or manning levels) about ships, aircraft, ordnance and tracked/wheeled vehicles. Depending on the specific commodity type and system, this Oracle relational database contains up to 17 years of data presented by fiscal year by alternative hierarchical cost element structures. Depending on the cost element, data for a particular commodity is available not only at the system level, but also at the subsystem and component levels. A five-year (FY99-03) improvement effort is underway to increase the breadth (i.e., weapon system and cost element coverage), depth (i.e., cost element visibility), timeliness and accessibility of the VAMOSC database.

Classification: Unclassified

Performer: NCCA in-house, PricewaterhouseCoopers, *Logistics Management Institute*

Ms. Wendy Kunc, (202) 764-2610

Ms. Colleen Adamson, (202) 764-2606

Mr. Dan Milano, (202) 764-2672

Lt. Greg Pederson, USN, (202) 764-2676

Mr. Al Leung, PWC, (703) 633-4305

Resources:

FY	Dollars	Staff-years
99	$4,900,000	5
00	$2,800,000	5
01	$2,035,000	5

Schedule:

Start	End
FY 99	continuing

Data Base: VAMOSC Ship, Air, Missile, Torpedo and Tracked/Wheeled Vehicle Data

Publications: Database and supporting documentation accessible via www.ncca.navy.mil

Keywords: Government, Operations and Support, Data Collection, Database

NCCA-5

Title: Aviation Maintenance Subsystem Database (AMSD)

Summary: The Aviation Maintenance Subsystem Database (AMSD) will display Naval aircraft maintenance related data. This aviation maintenance and material management (AV3M) derived database will provide insight into O and I level maintenance man-hours and replacement parts costs. Replacement parts include consumables used during maintenance as well as aviation depot level reparables (AVDLRS). This information will be provided at the individual aircraft level (BuNo) or for entire fleets of aircraft (T/M/S level) and is organized by aircraft work unit code (WUC). WUCs are an aircraft oriented structure used in AV3M reporting and range from two to seven digits. Two digit WUCs are major aircraft subsystems such as hydraulics, environmental control systems, or airframe structure and seven digit WUCs often identify an aircraft component or subassembly.

Classification: Unclassified

Performer: NCCA in-house, PricewaterhouseCoopers, *Logistics Management Institute*

Mr. Todd Andrews, (202) 764-2888

Mr. Al Leung, PWC, (703) 633-4305

Resources:

FY	Dollars	Staff-years
00	$800,000	0.5

Schedule:	Start	End
	Sept. 00	Aug. 01
Data Base:	VAMOSC Ship, Air, Missile, Torpedo and Tracked/Wheeled Vehicle Data	
Publications:	Database and supporting documentation accessible via www.ncca.navy.mil	
Keywords:	Government, Operations and Support, Data Collection, Database	

NCCA-6

Title:	Cost of Manpower Estimating Tool (COMET v2.0)
Summary:	COMET is a software (freeware) database and cost estimating tool which provides users with the Operating and Support (O&S) estimates for the costs (MPN and O&MN) of Navy manpower (active duty, reserve and civilian components) available. The "active duty" component identifies historic Cost Estimating Relationships (CERs) between the "direct" (MPN) costs our "deployable" forces (ships, squadrons and other "sea duty" personnel) and the "variable indirect" costs (MPN and O&MN) associated with "shore duty" personnel that recruit, train and support those "deployable" forces and themselves. The model presents the user with a high degree of cost granularity (encompassing 32 officer designators and 118 ratings and enlisted management communities) and additionally provides the user with easy-to-use screens (an "active duty tutorial" is free to download at the COMET website) to perform life-cycle cost and delta analysis comparisons. COMET is in use now by Program Managers and Contractors alike, in formulating intra-Navy Total Ownership Cost (TOC) plans and evaluating tradeoffs where different types of manpower options are compared or the affordability of embracing new technologies that will either generate or eliminate the requirement for manpower. Version 2.0 also incorporates a resident Ship's Manpower Document (SMD)Library that includes all current ship classes (.DAT files downloadable from the COMET website).

Classification:	Unclassified
Sponsor:	Naval Center for Cost Analysis Nebraska Avenue Complex 4290 Mt Vernon Dr NW, Suite 18200 Washington DC 20393-5444
	Ms. Wendy Kunc, (202) 764-2610
Performer:	NCCA in-house and SAG Corporation
	Robert Hirama, NCCA, (202) 764-2615
	Mr. Mark Dye, SAG, (703) 916-8330
Classification:	Unclassified

Resources:	FY	Dollars	Staff-years
	97	$119,000	0.1
	98	$77,000	0.25
	99	$75,000	0.25
	00	$75,000	0.50
	01	$100,000	0.5

Schedule:	Start	End
	FY97	FY97 (initial update/revision)
	FY98	FY00 (annual updates)
	FY00	FY01 (add sea duty .DAT files)
	FY01	FY02 (update coefficients, add manning docs.)

Data Base:	Revised Navy Billet Cost Factors/Model

NCCA-7

Title: Navy Obligations Data Extraction System (NODES)

Summary: This project is developing a detailed, fully integrated, total operating and support cost database accessible via the Internet that will complement the direct costs in VAMOSC. The Navy Obligations Data Extraction System (NODES), it includes all costs in the OMN and MPN appropriations and is consistent with Navy programming, budgeting and accounting systems. It will be enhanced to include more appropriations, more detail and better linkage between indirect costs and weapon systems.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis (NCCA)
Nebraska Avenue Complex
4290 Mt. Vernon Dr. NW Suite 18200
Washington DC 20393-5444

Ms. Wendy Kunc, (202) 764-2610

Performer: NCCA in-house, Mathtech, Inc. and Information Spectrum, Inc. (ISI)

Mr. Robert Hirama, NCCA, (202) 764-2615

Mr. Steve Taylor, Mathtech, (703) 294-5809

Resources:

FY	Dollars	Staff-years
96	$300,000	0.1
97	$85,000	0.1
98	$85,000	0.3
99	$200,000	0.3
00	$200,000	2
01	$150,000	1.5

Schedule:

Start	End
FY96	Continuing

Data Base: Navy Obligations Data Extraction System, in MS Access

Publications: Self-extracting database with integrated documentation (For Official Use Only)

Keywords: Infrastructure

NCCA-8

Title: COTS Shipboard Electronics Cost Factors

Summary: Develop factors for estimating commercial off-the-shelf (COTS) shipboard electronics costs as a function of military specification (MILSPEC) costs.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis (NCCA)

Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444

Mr. Jack Smuck, (202) 764-2661

Performer: Technomics, Inc. and Naval Surface Warfare Center (NSWC)/Crane Division

Resources:

FY	Dollars
00	165K

Schedule:	_Start_	_End_	
	Sep 00	Oct 01	

Data Base: Raw and normalized COTS and MILSPEC data

Publications: Report that includes raw and normalized data, methodology, and resulting factors

Keywords: Government, Estimating, Electronics, Ships, Production, Modification, Case study, Data Base

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NCCA-9

Title: Platform Integration Cost Database/Model for Shipboard Electronics

Summary: Develop a database and cost estimating methodology for projecting hardware/software integration costs for shipboard electronics and weapon systems. The database should include cost data, technical characteristics, and other relevant information (e.g., software size) for a variety of systems, including sonar, radar, fire control, and launching systems. The cost data should include relevant contractor and Navy in-house costs. This is projected as a multi-phased effort, with only Phase I currently funded. Phase I will concentrate on developing an integration work breakdown structure, identifying integration cost drivers, and initiating data collection.

Classification: Cost Data: Business Sensitive
Technical Characteristics: Classified

Sponsor: Naval Center for Cost Analysis (NCCA)
Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444

Mr. Jack Smuck, (202) 764-2661

Performer: Gibbs & Cox, Inc. and Lockheed Martin Corporation

Resources:

_FY_	_Dollars_
00	$325,000
01	TBD
02	TBD

Schedule:

	Start	_End_
Phase I	Sep 00	Sep 01
Phase II	TBD	TBD
Phase III	TBD	TBD

Data Base: Industry and government integration costs and technical characteristics of shipboard electronics and weapon systems

Publications: Report, including database, that presents shipboard integration cost estimating methodology/model

Keywords: Industry, Government, Estimating, Ships, Weapon Systems, Production, Operations and Support, Integration, Modification, WBS, Data Collection, Data Base

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NCCA-10

Title: Ship Construction Cost Database

Summary: Develop a normalized database of historical ship construction costs and technical characteristics.

Classification: Cost Data: Business Sensitive
Technical Characteristics: Classified

Sponsor: Naval Center for Cost Analysis (NCCA)

Nebraska Avenue Complex
4290 Mount Vernon Drive, N.W., Suite 18200
Washington, DC 20393-5444

Mr. Jack Smuck, (202) 764-2661

Performer: Tecolote Research, Inc.

Resources:

FY	Dollars
00	$300,000

Schedule:

Start	End
Sep 00	Oct 01

Data Base: Ship construction costs and technical characteristics

Publications: Report detailing methodology and including database

Keywords: Government, Estimating, Ships, Production, Manufacturing, Data Collection, Data Base

NCCA-11

Title: Weapon System Software Development Cost/Technical Database

Summary: This effort expands the NCCA software effort, schedule, labor rate, and SLOC growth databases developed for the NCCA *Software Development Estimating Handbook – Phase One* analysis. Data from all commodities is continuing to be collected from various DoD defense contractors. The near-term effort will entail performing various data analyses to develop a normalized database, which will be utilized to update the *Software Development Estimating Phase One Handbook.*

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive NW, Suite 18200
Washington, DC 20393-5444

Mrs. Cheri E. Cummings, (202) 764-2662

Performer: NCCA in-house and Upper Mohawk, Inc.

Ms. Pamela L. Johnson, NCCA, (202) 764-2685

Mr. Mike Tran, NCCA, (202) 764-2496

Mr. William Brundick, (717) 993-3501

Resources:

FY	Dollars	Staff-years
00	$220,000	

Schedule:

Start	End
Oct 00	Oct 01

Data Base: Separate NCCA software databases covering effort, schedule, labor rate and SLOC growth

Publications: To be determined

Keywords: Government, Analysis, Electronics/Avionics, Life Cycle, Software, Data Collection, Data Base, Schedule, Risk/Uncertainty

NCCA-12

Title: Weapon System Software Development Estimating Methodology

Summary: This effort will entail maintaining/updating the NCCA software effort, schedule, labor rate, and SLOC growth estimating methodologies developed for the NCCA *Software*

Development Estimating Phase One Handbook. Effort will include updating the current software development estimating tools and documenting the results. Additionally, effort will target the identification and assessment of commercially available software development estimating methodologies.

Classification:	Unclassified
Sponsor:	Naval Center for Cost Analysis Nebraska Avenue Complex 4290 Mount Vernon Drive NW, Suite 18200 Washington, DC 20393-5444
	Mrs. Cheri E. Cummings, (202) 764-2662
Performer:	NCCA in-house
	Ms. Pamela L. Johnson, (202) 764-2685 Mr. Mike Tran (202) 764-2496

Resources:

FY	Dollars	Staff-years
01	TBD	0.50

Schedule:

Start	End
To be determined	

Data Base:	To be determined
Publications:	Update of the NCCA *Software Development Estimating Handbook – Phase I*
Keywords:	Government, Analysis, Electronics/Avionics, Life Cycle, Software, Data Collection, Data Base, Schedule, Risk/Uncertainty

NCCA-13

Title:	Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology
Summary:	Software maintenance metrics and cost data are being collected on a variety of weapon systems, primarily shipboard electronic systems. Newly collected data will focus on avionics and aircraft software. This data will be used to develop software maintenance arrival/closure distribution curves and cost estimating relationships/factors. This effort is a continuation of the NSWCDD project entitled, "Software Maintenance Cost Process Model."
Classification:	Unclassified
Sponsor:	Naval Center for Cost Analysis Nebraska Avenue Complex 4290 Mount Vernon Drive NW, Suite 18200 Washington, DC 20393-5444
	Ms. Cheri Cummings, (202-764-2662
Performer:	NCCA in-house and Technomics, Inc.
	Ms. Pamela L. Johnson, (202) 764-2685
	Ms. Jennifer Echard (202) 764-2689
	Mr. Brian Octeau, Technomics (703) 415- 7505
	Mr. Jason Lee, Technomics (703) 415-1007

Resources:

FY	Dollars	Staff-years
96	$74,000	0.1
97	$50,000	0.1
98	$100,000	0.1
99	$0	0.15
00	$187,400	1.2

50

Schedule:	Start	End
	Feb 96	Dec 01

Data Base: To be determined

Publications: To be determined

Keywords: Government, Estimating, Software, Data Collection, Statistics/Regression, Data Base, CER, Operations and Support

NCCA-14

Title: AIS Life Cycle Cost and Technical Database

Summary: This effort entails developing a database of historical and estimated AIS program costs, program descriptions, cost methodology, programmatic/technical description, and an assessment of the database's utility.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive NW, Suite 18200
Washington, DC 20393-5444
Ms. Cheri Cummings, (202-764-2662

Performer: NCCA in-house and Technomics, Inc.
Ms. Pamela L. Johnson, (202) 764-2685
Ms. Jennifer Echard, (202) 764-2689
Mr. Mike Gallo, Technomics, (703) 415- 1004
Mr. Jason Lee, Technomics (703) 415-1007

Resources:	FY	Dollars	Staff-years
	00	$118,900	1.0

Schedule:	Start	End
	Oct 00	Dec 01

Data Base: To be determined

Publications: To be determined

Keywords: Government, Estimating, Data Collection, Statistics/Regression, Data Base, CER

NCCA-15

Title: Hardware Deflator Methodology

Summary: This effort entails collecting Navy AIS hardware cost and technical data to determine a methodology for estimating hardware over time. In addition, Navy and commercial data will be collected to determine the life of various types of technology and its applicability to the Navy hardware procurement process.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive NW, Suite 18200
Washington, DC 20393-5444
Ms. Cheri Cummings, (202-764-2662

Performer: NCCA in-house and Technomics, Inc.

Ms. Pamela L. Johnson, (202) 764-2685

Ms. Jennifer Echard (202) 764-2689

Mr. Jeff Cherwonik, Technomics, (703) 415-1006

Mr. Jason Lee, Technomics (703) 415-1007

Resources:	FY	Dollars	Staff-years
	00	$44,100	0.4

Schedule:	Start	End
	Oct 00	Dec 01

Data Base: To be determined

Publications: To be determined

Keywords: Government, Estimating, Data Collection, Data Base

NCCA-16

Title: Automated Information System (AIS) Software Cost/Technical Database and Estimating Methodology

Summary: This effort will: (a) collect AIS software development and maintenance cost data and associated metrics (e.g., number of function points); (b) create automated AIS software development and maintenance databases; (c) determine what metrics drive AIS software costs; and (d) develop cost estimating methodology. This effort will concentrate on developing tools for cost estimating in today's environment of 4GL, COTS, CASE tools, GUI builders, and open systems.

Classification: Unclassified

Sponsor: Naval Center for Cost Analysis
Nebraska Avenue Complex
4290 Mount Vernon Drive NW, Suite 18200
Washington, DC 20393-5444

Ms. Cheri Cummings, (202) 764-2662

Performer: NCCA in-house and Litton/TASC

Ms. Pamela Johnson, NCCA, (202) 764-2685

Ms. Sandi Enser, Litton/TASC, (703) 633-8300 ext. 8706

Resources:	FY	Dollars	Staff-years
	98	$100,000	0.1
	99	$90,000	0.1
	00	$107,000	0.15

Schedule:	Start	End
	FY98	Jul 01

Data Base: AIS Software Development and Maintenance Cost/Technical Databases

Publications: To be determined

Keywords: Government, Estimating, Demonstration/Validation, EMD, Operations and Support, Software, Statistics/Regression, Method, CER

Office of Naval Research (ONR)

Name:	Office of Naval Research (ONR)
Address:	800 N. Quincy St Arlington, VA 22217
Director:	Dr. Fred Saalfeld
Size:	Professional: Support: Consultants: Subcontractors:
Focus:	Research in Cost Analysis Methods
Activity:	Number of projects in process: 7 Average duration of a project: 3 years Research conducted by a mix of academia, industry syscoms, and navy labs. (See individual project descriptions for breakdown)

ONR-1

Title:	Uncertainty Calculus to Minimize Total Ownership Costs for Ships
Summary:	This project directly addresses affordability of ship systems by close collaboration with Navy programs to cooperatively develop mathematical models using uncertainty calculus to minimize Total Ownership Costs (TOC) for Navy ships. This efforts includes development of a Maintenance Cost model, development of a Technology Insertion model, and the development of a Geometry Cost Evaluation model. The research methods include data finding and knowledge elicitation, model construction using uncertainty calculus, and model validation/verification. This provides results immediately available to Navy program managers in the DD-21, NSSN, and LPD-17 programs with transition to other programs possible.
Classification:	Reports are Unclassified, Capability to Manage Data to SECRET Level
Sponsor:	Office of Naval Research 800 North Quincy Street Arlington, VA 22217-5600 Ms. Katherine Drew (703) 696-5992
Performer:	Louisiana Tech University PO Box 10348 Ruston, LA 71272-0046 CDR Alley C. Butler, USNR (318) 257-2359

Resources:

FY	Dollars
99	$246,000*
00	$24,000*
01	$24,000*
02	$19,000*

* Matching funds and in-kind contribution from State of
Louisiana and Louisiana Tech University total $362K

Schedule:	*Start*	*End*
	May 15, 1999	May 14, 2002

Data Base: Probability and Fuzzy Systems

Publications: Public Domain as appropriate

Keywords: Government, Estimating, Ships, Concept Development, Life Cycle, Risk/Uncertainty, Data Collection, Expert System

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ONR-2

Title: Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems

Summary: Maximum reduction of cost occurs early in ship design when there is significant uncertainty. In this environment, development of novel ship systems means historic and probabilistic data is absent, and uncertainty based systems are necessary. The hierarchical and extendable decision tool developed in this project uses uncertainty based heuristic methods. Maintenance, repair, and reconditioning (overhaul) represents major and difficult to predict components of Total Ownership Cost (TOC). By developing a fuzzy system and probabilistic methods to address maintenance cost, new capability can be developed, not possible with current historic and parametric cost models. This project included demonstration of decision making for maintenance, repair, and reconditioning of SSGTG's (Ship Service Gas Turbine Generators) on destroyers as an initial proof of concept. This research is conducted in collaboration with Ingalls Shipbuilding. This project also includes plans for software evaluation and development with provisions for interoperability with ASSET, VAMOSEC, and other models. This project develops a flexible and extendable tool providing automation and decision support for Navy S&T managers.

Classification: Reports are Unclassified, Capability to Manage Data to SECRET Level

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5600

Ms. Katherine Drew
(703) 696-5992

Performer: Cognition Corporation
209 Burlington Road
Bedford, MA 01730

Dr. Suresh Kalanthur
(781) 271-9300 ext 251

Ingalls Shipbuilding
PO Box 149
Pascagoula, MS 39568-0149

Mr. J. D. Philo
(228) 935-5225

Louisiana Tech University
PO Box 10348
Ruston, LA 71272-0046

Dr. Alley C. Butler, PE
(318) 257-2359

Resources:

FY	*Dollars*	
99	$70,000	STTR Phase I
00	$30,000	STTR Phase 1, Option

Schedule:	Start	End	
	June 1, 1999	Nov. 30, 1999	STTR Phase I
	Feb. 24, 2000	May 23, 2000	STTR Phase I, Option

Data Base: Probability and Fuzzy Systems with Inference

Publications: Sullivan, Kevin, Alley Butler, Suresh Kalanthur, Dale Anderson, Tommy Baldwin, Mohit Kashyap, Brian Glausser, Frank Sturges, Dave Philo, Melvin Corley, "Research in Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems, STTR Phase I Report under ONR Contract Number N00014-99-M-0241, 1 December 1999, 108 pages.

Kevin Sullivan, Brian Glauser, Alley Butler, and T. Dan Baldwin, "Research in Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems, STTR Phase I Option Final Report under ONR Contract Number N00014-99-M-0241, 23 May 2000, 19 pages.

Keywords: Industry, Government, Estimating, Ships, Concept Development, Production, Life Cycle, Operations and Support, Risk/Uncertainty, Reliability, Data Collection, Expert System

ONR-3

Title: Technology Insertion Cost Estimation Comparison for Aircraft Carrier Systems

Summary: With limited budgets for weapon procurement, operation, and support, affordability becomes a key issue. No longer are decisions based solely on the absolute performance of the system; system ownership cost is now a major factor. A large portion of total ownership cost (TOC) is determined by decisions made very early in the design cycle, when limited information is available. This project provides a method for determining a portion of the total ownership costs for an aircraft carrier program. The costs of technology insertion are determined at the early stages of design using an uncertainty calculus tool developed in a related DEPSCoR project. These cost estimates are compared to estimates obtained through conventional methods to "calibrate" or compare and thereby assess or determine the effectiveness and generality of the new cost tools. Significant participation by Newport News Shipbuilding and limited participation by NAVSEA is included.

Classification: Reports are Unclassified, Capability to Manage Data to SECRET Level

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5600

Ms. Katherine Drew
(703) 696-5992

Performer:

Louisiana Tech University	Newport News Shipbuilding
PO Box 10348	4101 Washington Avenue
Ruston, LA 71272-0046	Newport News, VA 23607
Dr. Alley C. Butler	Mr. Robert Schatzel
(318) 257-2359	(757) 688-2124

Naval Sea Systems Command (SEA 0176)
2531 Jefferson Davis Highway
Arlington, VA 22242

Mr. Irvin Chewning
(703) 415-4815

Resources:	<u>FY</u>	<u>Dollars</u>
	00	$164,000*, **
	01	$241,000*, **

* In-kind contribution from Louisiana Tech University total $ 8K
** assigned $30K for NAVSEA 017

Schedule:	<u>Start</u>	<u>End</u>
	Feb. 17,2000	Feb. 16, 2002

Data Base: Parametric and Fuzzy Systems

Publications: Public Domain as appropriate

Keywords: Industry, Government, Estimating, Ships, Concept Development, Operations and Support, Risk/Uncertainty, Data Collection, Expert System

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ONR-4

Title: Research in Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems

Summary: The need for new tools to evaluate maintenance costs is of pressing concern. In Phase I of the STTR, and initial Science and Technology Decision Tool (STDT) was designed and demonstrated containing two major components: Decision Support and Cost Estimation. Phase II pursues further development to provide a general decision tool that can manage multiple objectives and constraints defined by deterministic, probabilistic (stochastic, numerical) parameters, and possibilistic variables (linguistic, fuzzy representation). The Phase II effort permits refinement of the system's user interface, develops interoperability with existing Navy cost and ship feasibility systems, expands the Fuzzy Logic Inference engine developed in Phase I to include other methods for fuzzy decision making, implements the Phase I developed plan to apply Artificial Intelligence Techniques to improve data obtained from the Navy's Open Architecture Retrieval System (OARS) which can then facilitate the improvement of the Cost Estimation model, providing a more complete set of statistics, cost, and heuristic information. The Phase II effort also includes identification of technology barriers limiting system performance and/or limiting maintenance cost reduction. It is expected that the identification process can provide technology pointers, allowing prioritization of R&D efforts. Additionally, this project demonstrates methods for assessment of military utility and value.

Classification: Reports are Unclassified, Capability to Manage Data to SECRET Level

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5600

Ms. Katherine Drew
(703) 696-5992

Performer:

Cognition Corporation	Louisiana Tech University
209 Burlington Road	PO Box 10348
Bedford, MA 01730	Ruston, LA 71272-0046
Dr. Suresh Kalanthur	Dr. Alley C. Butler, PE
(781) 271-9300 ext. 251	(318) 257-2359

Ingalls Shipbuilding
PO Box 149
Pascagoula, MS 39568-0149

Mr. J. D. Philo
(228) 935-5225

Resources:	FY	Dollars	
	00	$100,000	STTR Phase II
	01	$20,000	STTR Phase II
	02	$10,000	STTR Phase II
	02	$5,000	STTR Phase II, Option
	03	$5,000	STTR Phase II, Option

Schedule:	Start	End	
	July 27, 2000	July 26, 2002	STTR Phase II
	July 27, 2002	July 26, 2003	STTR Phase II, Option

Data Base: Probability and Fuzzy Systems with Inference

Publications: Publications in the public domain are pending.

Keywords: Industry, Government, Estimating, Ships, Concept Development, Production, Life Cycle, Operations and Support, Risk/Uncertainty, Reliability, Data Collection, Expert System

ONR-5

Title: Marine Composites Affordability – A Knowledgebased Approach

Summary: With shrinking budgets, total ownership costs for ships must be reduced. Low cost methods are required for the design, manufacture, and maintenance of Naval ship components. One such application is the manufacturing of composite deckhouses. This project, focused on composite deckhouses, offers a means to rapidly assess the affordability of a ship's structure when it is designed using marine composites. This project uses a knowledgebase and an inference engine to query CAD files and provide Total Ownership Cost (TOC) on a component by component basis. Although this project represents an application to marine composites, use of this knowledgebased methodology can then be applied to other ship components in an analogous manner. This project includes participation by Louisiana Tech University, Avondale Industries, the University of New Orleans, and NSWC Carderock.

Classification: Reports are Unclassified, Capability to Manage Data to SECRET Level

Sponsor: Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5600

Ms. Katherine Drew
(703) 696-5992

Performer:

Louisiana Tech University PO Box 10348 Ruston, LA 71272-0046	NSWC Carderock 9500 MacArthur Blvd. West Bethesda, MD 20817
Dr. H. Dwayne Jerro (318) 257-2259	Dr. Milton Critchfield (301) 227-1769
Avondale Industries PO Box 50280 New Orleans, LA 70150	Univ. of New Orleans 913 Engineering Building New Orleans, LA 70148
Mr. John White (504) 437-3328	Mr. Will Lannes, PE (504) 280-7122

Resources:	FY	Dollars
	00	$20,000*
	01	$25,000*
	02	$31,000*
	03	$4,000

* in-kind contributions from Louisiana Tech University total $ 15K, from Avondale Industries total $ 56K, from Carderock total $147.5

Schedule:	Start	End
	Aug 17, 2000	Aug 16, 2003

Data Base: Knowledgebased System using Categorical and Probabilistic Methods

Publications: Public Domain as appropriate

Keywords: Industry, Government, Estimating, Ships, Concept Development, Production, Life Cycle, Operations and Support, Risk/Uncertainty, Reliability, Data Collection, Expert System

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ONR-6

Title: Composites Affordability Initiative Cost Analysis Tool (CAICAT)

Summary: Cost Model developed jointly by AFRL, NAVAIR, Northrop Grumman, Boeing Seattle and St. Louis, Lockheed Martin, and General Electric. The program has a goal of developing a credible, rapid cost evaluation system for an Airframe Structure to address state-of-practice, state-of-the-art, and merging design and manufacturing technologies. The Bottoms Up, Process-Based Model is incorporated in CAICAT software, which addresses all elements of direct and indirect costs. The software is intended to be used primarily as a trade study tool.

Classification: Unclassified

Sponsors: Air Force Research Laboratory
Materials and Manufacturing Directorate
Wright Patterson Air Force Base
Dayton, Ohio 45433

Office of Naval Research
800 North Quincy Street
Arlington, VA 22217

Performers: AFRL, NAVAIR, Northrop Grumman, Boeing Seattle and St. Louis, Lockheed Martin, General Electric, and Galorath, Inc.

Resources:	FY	Dollars
	98-00	$3.1 M (50-50 Cost Share by Government-Industry)

Publication: Quarterly Reports, SAMPE publication

Keywords: CER

ONR-7

Title: The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach

Summary: The introduction of new technologies often causes a temporary loss of productivity and leads to additional unforeseen costs over a system's life cycle. One of the reasons for this productivity degradation is that traditional systems engineering management fails to plan for the effects of technology procurement, implementation, and maintenance. The success of introducing new technologies for ship systems requires a high level of initial planning and cooperation among the customers (in this case the fleet), the suppliers (in this case the shipbuilder), and the government procurement organization. The capability of the

technology, the skills of the users of the technology, and the ship system structure and performance must be collectively evaluated and reconfigured to determine the best operational environment for the new technology. Establishing this operational environment will determine the affordability of future ship systems. This research defines the problem of introducing new technologies for ship systems and outlines how ship system performance can be predicted, evaluated, and controlled using a system dynamics (SD) modeling approach with an embedded optimization routine called Data Envelopment Analysis.

Sponsor: Office of Naval Research
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Ms. Katherine Drew, (703) 696-5992 Voice
(703) 696-4884 Fax

Performer: Virginia Tech
Department of Industrial and Systems Engineering
System Performance Laboratory

Dr. Kostas Triantis, Principal Investigator
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Newport News Shipbuilding
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(757) 688-2124

Naval Sea Systems Command (SEA 0176)
2531 Jefferson Davis Highway
Arlington, VA 22242

Mr. Irwin Chewning
(703) 415-4815

Resources:	*Year*	*Dollars*
	2000-2001	$105,206
	2001-2002	$170,827
	2001-2002	$163,858

Schedule:	*Start*	*End*
	May 2000	May 2003

Data Base: VAMOSC and other cost and technical data.

Publications: Technical reports, scholarly refereed publications, model documentation.

Keywords: Industry, Estimating, Ships, Advanced Technology, Mathematical Model

Naval Air Systems Command (NAVAIR)

Name:	Naval Air Systems Command Headquarters
Address:	Cost Department (AIR-4.2) 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Director:	Dave Burgess (301) 757-7810
Size:	Professional: NAVAIR HQ 52 NAWC-AD-LAKE 15 NAWC-AD-PAX 103 NAWC-WD-CL 14
Focus:	The Cost Department provides a wide variety of cost analysis products and services. The department's primary focus is to provide a clear and comprehensive understanding of life cycle cost and attendant uncertainties to be used in developing, acquiring, and supporting affordable Naval Aviation Systems. Besides life cycle cost estimates, the Cost Department provides source selection cost evaluation support, earned value management analysis, cost research, databases and various cost/benefit studies. The focus of NAVAIR cost research is: Total Ownership Cost initiatives; cost growth; modifications; cost/benefits; engineering investigations, and building comprehensive databases.
Activity:	Number of projects in process: 9 Average duration of a project: 1 year Average number of staff members assigned to a project: 1-2 Average number of staff-years expended per project: 1-2 Percentage of effort conducted by consultants: 50% Percentage of effort conducted by subcontractors: 0%

NAVAIR-1

Title:	Affordable Readiness Cost Model
Summary:	Produced an Affordable Readiness Cost Model and accompanying Manual. The model is a comprehensive tool designed to assist in the preparation of Affordable Readiness Initiative proposals. The model has five different modules that allow the users to address a wide range of initiatives:

- Reliability
- Maintainability
- Obsolescence
- Depot
- General

The model aids the user in organizing the cost elements (e.g., Organizational –Level Maintenance) and cost estimating factors (e.g., Organizational-Level Labor Hours per Removal) in order to prepare effective and credible Affordable Readiness and similar types of initiatives. In addition to creating the Initiative Profile, the model also provides detailed analytical spreadsheets of the cost and schedule aspects of the proposed initiative.

Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Ketron

Resources:	FY	Dollars	Staff-years
	99	$285,000	

Schedule:	Start	End
	May 99	Jan 00

Data Base:	None
Publication:	Technical Report
Keywords:	Estimating, Analysis, Method, Data Collection, CER, Computer Model

NAVAIR-2

Title: SLAP/SLEP Full Scale Testing Model

Summary: Use the results of existing technical information and inputs from class desk personnel supporting programs currently evaluating SLAP/SLEP efforts to build an estimating model approach to estimating SLAP/SLEP and associated testing efforts. Research cost history for past SLAP/SLEP programs to identify key costs and cost drivers and use existing AV-3M/VAMOSC data to assess airframe maintenance and service bulletin cost trends. Using results of technical inputs and cost data, develop a simple model to aid in quick turn around assessments of the costs and potential O&S benefits of these types of programs. Model delivered on schedule.

Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Tecolote

Resources:	FY	Dollars	Staff-years
	99	$50,000	

Schedule:	Start	End
	May 99	Jan 00

Data Base:	None
Publication:	Technical Report
Keywords:	Estimating, Analysis, Method, Data Collection

NAVAIR-3

Title: Demilitarization/Disposal Model

Summary: A report was prepared on the costs associated with removing Naval Aviation aircraft and related equipment from active service and the production of a model based on historical data to estimate future demilitarization/demobilization costs for a given Type/Model Aircraft. Since in many cases aircraft are removed from inventory and placed in long-term storage at AMARC, associated data and estimating relationships will also be incorporated into this model. Current model for the ongoing Environmental Consequences of Hazardous Operations (ECHO) project may be used in the development of this model.

Sponsor: Naval Air Systems Command
22347 Cedar Point Road, Unit 6
Patuxent River, MD 20670-1161

Performer: Naval Air Warfare Center—Aircraft Division

Lakehurst, New Jersey

Resources:	*FY*	*Dollars*	*Staff-years*
	99	$35,000	
	00	$7,000	

Schedule:	*Start*	*End*
	May 99	Mar 00

Data Base: None

Publication: Technical Report

Keywords: Estimating, Analysis, Aircraft, Method, Data Collection

NAVAIR–4

Title: Aging Aircraft Study Cost Update

Summary: AIR-4.2.5 developed and updated a 1995 study on aging aircraft cost impacts for 13 major T/M/S aircraft. Given that the data used for this study did not contain the last 3-4 years of usage/cost data (and the interest in aging as a process) the study was updated. This effort included researching and updating the data for the impacted elements: labor at "O" and "I" levels; consumable materials; Depot Airframe and Engine rework; Fuel usage and Aviation Depot Level Repairable; and developing updated trend projections for future forecasting.

Classification: Unclassified

Sponsor: Naval Air Systems Command
22347 Cedar Point Road, Unit 6
Patuxent River, MD 20670-1161

Performer: Ketron

Resources:	*FY*	*Dollars*	*Staff-years*
	99	$69,540	

Schedule:	*Start*	*End*
	May 99	Mar 00

Data Base: None

Publication: Technical Report

Keywords: Data Collection, Aircraft, Analysis

NAVAIR–5

Title: Cost Growth Analysis

Summary: This task investigates the cost growth experienced on historical Navy aircraft, weapons, and avionics programs. Data are being analyzed for specific NAVAIR programs, for NAVAIR commodity groups, and collectively for all NAVAIR programs including ACAT I, II, and III programs. The data are being organized in a cost growth database. The analysis will result in a conceptual approach for NAVAIR cost risk estimation.

Classification   Unclassified

Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161		
Performer:	Litton/TASC		
Resources:	*FY*	*Dollars*	*Staff-years*
	00	$69,000	0.5
	01	$30,000	0.2
Schedule:	*Start*	*End*	
	Mar 00	Jun 01	
Data Base:	*Title:*	*NAVAIR* Cost Growth Database	
	Description:	NAVAIR aircraft, weapons, and avionics programs cost growth	
	Automation:	To be determined	
Publication:	Technical Report		
Keywords:	Cost Growth, Aircraft, Weapons Systems		

NAVAIR-6

Title:	Naval Aircraft Modification Model (NAMM) Update		
Summary:	The task is to expand the coverage, functionality and usefulness of the existing NAMM database. Additional OSIP and modifications program data will be collected, normalized, and incorporated into the existing database of technical characteristics and program descriptions.		
Classification:	Unclassified		
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161		
Performer:	MCR Federal		
Resources:	*FY*	*Dollars*	*Staff-years*
	00	$74,101	0.75
Schedule:	*Start*	*End*	
	Dec 99	Aug 00	
Data Base:	*Title:*	*Naval* Aircraft Modifications Model (NAMM)	
	Description:	Technical, programmatic and cost data for modifications programs.	
	Automation:	Microsoft ACCESS	
Publication:	Technical Report		
Keywords:	Data Collection, Analysis, Aircraft		

NAVAIR-7

Title:	Force Level Economic Effectiveness Trade (FLEET) Model
Summary:	A model is being developed to provide quick and reasonably accurate life cycle cost estimates for all active Navy aircraft programs. A prototype model is being developed. The FLEET model will provide cost insights on deferring development of follow-on aircraft, evaluating aircraft production rate alternatives, identifying potential Type/Model/Series aircraft for removal from the inventory, and determining when requirements for increased O&S costs and platform critical modifications reach levels that will require either a replacement, major upgrade or retirement decision.

Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Tecolote

Resources:	FY	Dollars	Staff-years
	00	$70,000	0.5
	01	$100,000	0.8
	02	$50,000	0.3

Schedule:	Start	End
	Apr 00	Dec 01

Data Base:	Not applicalbe
Publication:	Technical Report, Model
Keywords:	Estimating, Analysis, Aircraft

NAVAIR-8

Title: Engineering Investigations Cost Model (EICM)

Summary: The Engineering Investigation Cost Model (EICM) provides Fleet Support Teams (FST) with a tool to evaluate the cost and potential cost avoidance of performing a routine engineering investigation. The EICM allows users to assess the economic merits of conducting an EI on an aircraft subsystem, support equipment item, or weapon. Based on a minimum number of required data inputs, the model allows FST members to estimate the initial cost of conducting the EI, to determine the potential cost avoidance associated with fixing the problem item, and to calculate the maximum remedial action investment available while still generating a return on investment (ROI) of 5 to 1.

Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Ketron

Resources:	FY	Dollars	Staff-years
	99	$75,000	
	00	$50,000	

Schedule:	Start	End
	Apr 99	Jul 00

Data Base:	Not applicable
Publication:	Technical Report, Model
Keywords:	Analysis, Aircraft

NAVAIR-9

Title: Avionics Database

Summary: A database of historical avionics cost, technical, and programmatic data is being developed. The database is being constructed to respond to ad hoc queries and to provide standard format reports.

Classification Unclassified

Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161		
Performer:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161		

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$100,000	0.75
	01	$100,000	0.75
	02	$100,000	0.75

Schedule:	*Start*	*End*
	Dec 99	Jul 02

Data Base:	*Title:*	Avionics Database
	Description:	Cost, technical, and programmatic data for historical avionics programs including IR, EO-IR, Comm/Nav, Radar, Inst/Proc
	Automation:	To be determined

Publication: Technical Report—Database Documentation

Keywords: Data Collection

NAVAIR-10

Title: Rotary Wing Database

Summary: A database of historical helicopter cost, technical, and programmatic data is being developed. The database is being constructed to respond to ad hoc queries and to provide standard format reports.

Classification Unclassified

Sponsor: Naval Air Systems Command
22347 Cedar Point Road, Unit 6
Patuxent River, MD 20670-1161

Performer: Naval Air Systems Command
22347 Cedar Point Road, Unit 6
Patuxent River, MD 20670-1161

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$100,000	0.75
	01	$50,000	0.3

Schedule:	*Start*	*End*
	Dec 99	Jul 01

Data Base:	*Title*	Rotary Wing Database
	Description:	Cost, technical, and programmatic data for historical Navy and Army helicopter programs.
	Automation:	Microsoft ACCESS

Publication: Technical Report—Database Documentation

Keywords: Data Collection

NAVAIR-11

Title:	Propulsion Database
Summary:	A database of historical propulsion cost, technical, and programmatic data is being developed. The database is being constructed to respond to ad hoc queries and to provide standard format reports.
Classification	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161

Resources:

FY	Dollars	Staff-years
00	$100,000	0.75
01	$30,000	0.2

Schedule:

Start	End
Dec 99	May 01

Data Base:	*Title:*	Propulsion Database
	Description:	Cost, technical, and programmatic data for historical propulsion programs.
	Automation:	TBD
Publication:	Technical Report—Database Documentation	
Keywords:	Data Collection	

NAVAIR-12

Title:	Environmental Costs of Hazardous Operations (ECHO) Model
Summary:	Perform a verification/validation of the ECHO model, which was developed by Tecolote. The model calculates the environmental costs incurred throughout the life cycle of a program. Costs include hazardous material purchase; hazardous material tracking, handling and storage; hazardous waste disposal; hazardous waste management; wastewater treatment; air emissions control; air emissions monitoring and reporting. The model will be populated with data for various weapons systems. New CERs will be developed to relate the data streams to the environmental costs. Changes to the model will be made to make it more user friendly and to allow easy tracking of input data.
Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point Road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Naval Air Warfare Center Aircraft Division Lakehurst, NJ 08733

Resources:

FY	Dollars	Staff-years
00	$130,000	

Schedule:

Start	End
Dec 99	Oct 00

Data Base:	Not applicable
Publication:	Validation Report, Software Users Manual

NAVAIR-13

Title:	Analysis of Alternatives (AOA) Evaluation Tool

Summary: AIR 4.2.4 Weapons Division continues its involvement in the formal AoA process and other analysis evaluating alternatives for weapon systems. The number of alternatives in an analysis is not set by policy, but typically ranges from a few to many (5 to 20). The AoA Evaluation Tool is an Excel-based tool used to organize and standardize the process used in the evaluation of each alternative. The tool assists the analyst in normalizing data for inflation, quantity, and learning and rate improvement curves.

Classification: Unclassified

Sponsor: Various

Naval Air Warfare Center Weapons Divison
China Lake, CA 93556

Performer: Naval Air Warfare Center Weapons Division
Cost Analysis Department
China Lake, CA 93556

Resources:

FY	Dollars	Staff-years
99	$150,000	1.0 MMC
99	$200,000	1.4 JDAM PIP

Schedule:

Start	End
Aug 99	Sep 00 MMC
Oct 99	Aug 00 JDAM PIP

Data Base: Not applicable

Publication: Cost Analysis section of technical report.

Keywords: Government, Analysis, Weapon Systems, Computer Model

NAVAIR-14

Title:	Missile Database

Summary: This task is to develop a PC-based relational database to store unclassified missile data. Actual cost, programmatic, and technical data will be included. The ability to query the database will be built into the system. This effort involves the collection of data and costs necessary to build more detailed cost estimating relationships (CERs) that can be used to provide both data and estimating support to NAVAIR 4.2 analysts.

Classification: Unclassified

Sponsor: Naval Air Systems Command
22347 Cedar Point road, Unit 6
Patuxent River, MD 20670-1161

Performer: Naval Air Warfare Center Weapons Division
Cost Analysis Department
China Lake, CA

Resources:

FY	Dollars	Staff-years
99	$87,000	0.8
01	$75,000	0.7

Schedule:

Start	End
Nov 99	Oct 01

Data Base:	Title:	Missile Database
	Description:	Missile cost, technical, and programmatic data.
	Automation:	Microsoft ACCESS application
Publication:	Functional Requirements, System Specifications	
Keywords:	Estimating, Analysis, Database, CERs, Missiles, Weapon Systems	

NAVAIR-15

Title:	Cost Risk Methodology/Model
Summary:	A methodology for quantifying technical, schedule and cost estimating risk is being developed. The methodology will address the major risk drivers specific to a particular program. It will also consider the cost growth experienced on historical programs.
Classification:	Unclassified
Sponsor:	Naval Air Systems Command 22347 Cedar Point road, Unit 6 Patuxent River, MD 20670-1161
Performer:	Litton/TASC

Resources	*FY*	*Dollars*	*Staff-years*
	00	$70,000	0.5
	02	$150,000	1.0

Schedule:	*Start*	*End*
	Apr 01	Jul 02

Data Base:	Cost Growth Database will support Cost Risk Model.
Publication:	Test Case Model with Documentation
Keywords:	Aircraft, Weapons Systems

Naval Sea Systems Command (NAVSEA)

Name:	Cost Engineering and Industrial Analysis Division, Comptroller Directorate Naval Sea Systems Command
Address:	2531 Jefferson Davis Highway Arlington, VA 22242-5160
Director:	Robert P. Draim, (703) 602-1209
Size:	Professional: 57 Support: 2 Consultants: 0 Subcontractors: 10
Focus:	O&S Cost Estimating; Total Ownership Cost Estimating; Commonality and Standardization of Ship Design and Construction Processes and of Ship Components or Sub-assemblies (impact on acquisition and O&S costs); Build Strategy Impact on Ship Costs; Ship Design Trade-Off Analysis Tools; Ship and Weapon System Cost Modeling
Activity:	Number of projects in process: 5 Average duration of a project: 2.2 years Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 1/2 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by subcontractors: 90%

NAVSEA-1

Title:	Material Vendor Survey
Summary:	The objective of this annual survey is to capture future price trends and last year's actual price change for material used in Navy ship construction. The survey samples over 900 shipboard material and equipment suppliers, requesting their price changes for the current year and their projections of future price changes for the next two years. The results are grouped according to Ship Work Breakdown Structure (SWBS- Cost Groups 1-9), and indices are calculated.
Classification:	Unclassified
Sponsor:	Naval Sea Systems Command (SEA 0177) 2531 Jefferson Davis Highway Arlington, VA 22242-5160 Janet Alberts, (703) 602-9150 ext. 145; DSN: 332-9150 ext. 145
Performer:	Naval Shipyard Norfolk Det. NAVSEA Shipbuilding Support Office 3751 Island Avenue, 3rd Floor Philadelphia, PA 19153 Joe Neumann

Resources:

FY	Dollars	Staff-years
Each year	$125,000	

Schedule:	*Start*	*End*
	Oct each year	Sep each year

Data Base: End use is MATCER Data File update. Backup data is maintained at NAVSHIPSO.

Publications: None

Keywords: Industry, Estimating, Ships, Material, WBS, Economic Analysis, Survey

NAVSEA-2

Title: Technology Insertion Cost Estimates for Aircraft Carriers

Summary: With limited budgets for weapon procurement, operation, and support, affordability becomes a key issue. No longer are decisions base solely on the absolute performance of the system; system ownership cost is now a major factor. A large portion of total ownership cost (TOC) is determined by decisions made very early in the design cycle, when limited information is available.

This project proposes to compare technology insertion cost estimates obtained using a conventional cost-estimating tool and those developed using an uncertainty-based tool. The comparison is based on the accuracy of the estimate, as well as the time and effort required for these estimates to be determined. The focus of the project is on technology insertion life cycle costs for aircraft carrier programs, particularly operations, support, and disposal costs. Presently, a reasonably accurate estimate of the procurement costs can be developed using conventional techniques, where the accuracy and level of cost detail is dependent on the available information. However, the costs for operations, support, and other post-procurement costs are not easily estimated for subsystems and major components. This project focuses on obtaining accurate estimates of these post-procurement costs with minimal information.

Classification: Unclassified

Sponsor: Office of Naval Research
Ballston Tower One
Arlington, Virginia 22217-5660
Katherine Drew, (703) 696-5992

Naval Sea System Command (SEA 017)
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Irv Chewning, Nicole Allen Ray, and James Moy (703) 602-0720/1306

Performer: Office of Naval Research, Louisiana Tech University, Newport News Shipbuilding, Tecolote Research, NAVSEA 017

Resources:	*FY*	*Dollars*	*Staff-years*
	2001	$29,348	

Schedule:	*Start*	*End*
	Oct 00	Sep 01

Data Base: Uncertainty-based tool developed for use with destroyer and submarine programs to an aircraft carrier program that provides an evaluation of the generality of the tool and permits a calibration of the tool. This calibration or comparison permits better understanding of the new tool's advantages, limitations, and strengths.

Publications: None to date

Keywords: Reliability

NAVSEA-3

Title: Theater Surface Combatant (TSC) Technology Refresh Cost Model

Summary: Under PEO-TSC policy and guidance for commercial and non-developmental item selection, acquisition, integration, and life cycle support, modeling plays a critical part in planning and budgeting. The objective of this cost research initiative is to adapt existing processes employed by NAVSEA Crane in commercial technology management to determine when and how often to conduct technology refreshes to Theater Surface Combatant systems. Those processes use a model of engineering activity associated with a technology refresh change and the labor and material costs at various levels of detail. The model will help to predict when various commercial parts will change and calculate when to make bridge buys to support the items through planned technology refreshes. In FY00 an interface with another TSC model relative to sparing requirements was developed. Currently in FY01 the model is being revised to include assessment of non-commercial components as candidates for commercial technology insertion initiatives, revise the method of inputting system data for analysis and to generate costing graphics for inclusion in a business case analysis. Future revisions will incorporate the model into a process for development of PEO TSC FYDP estimates for technology improvements and refresh initiatives, addressing total ownership costs for trade-off analysis of each initiative.

Classification: Unclassified

Sponsor: Department of the Navy
Program Executive Office for Theater Surface Combatants
2531 Jefferson Davis Highway
Arlington, VA 22242-5165

Performer: Naval Sea System Command
Crane Division (Code 6022)
300 Hwy 361
Crane, IN 47522-5060

Resources:

FY	Dollars	Staff-years
1999	$200,000	
2000	$100,000	
2001	$250,000	
2002	$285,000	

Schedule:

Start	End
Oct 98	Oct 03

Data Base: A database of commercial product supportability factors is used to provide key elements used by the cost model. The database is in Microsoft Access format and accessed via a Visual Basic interface. It is available through a local area network at NAVSEA Crane. Integrated to the process of estimating is SEER-H and SEER-SEM from Galorath and NAUTILUS Sparing Model.

Publications: None to date

Keywords: Government, Estimating, Budgeting, Ships, Weapon Systems, EMD, Production, Operations and Support, Labor, Material, Engineering, Acquisition Strategy, Risk/Uncertainty, Sustainability, Modification, Data collection, Survey, Data Base, Computer Model

NAVSEA-4

Title: "System of Systems" Technology Refresh Cost Model

Summary: In FY99, NAVSEA Crane has leveraged off of existing cost estimating and model efforts relative to electronics technology refresh to develop a beta version of a model to generate a

high level estimate of an aggregate of multiple military systems at the platform and battlegroup level. The goal of the modeling effort was to assist platform managers to establish budget thresholds for sustainment of systems' functionalities under today's ever-changing commercial marketplace by use of parametric estimating techniques to "model the existing model" used by NAVSEA Crane for technology refresh engineering changes. During FY01, the cost estimating relationships in the beta version are being updated based upon a greater of cost estimates for various system-level solutions. Additionally, the process of estimation using the model is being applied to the LPD-17 Amphibious Transport design to estimate the cost of technology refresh at the platform level.

Classification:	Unclassified
Sponsor:	NAVSEA 53/PMS317
Performer:	Naval Sea System Command Crane Division (Code 6022) 300 Hwy 361 Crane, IN 47522-5060

Resources:

FY	Dollars	Staff-years
2000	$20,000	
2001	$150,000	

Schedule:

Start	End
2000	2001

Data Base: Microsoft Excel was used to capture the sampling of technology refresh costs and applicable parameters for establishing cost estimating relationships. The Excel spreadsheets were copied into ACEIT and CoSTAT is being used to build appropriate CERs.

Publications: None to date

Keywords: Government, Estimating, Budgeting, Ships, Weapon Systems, EMD, Production, Operations and Support, Engineering, Acquisition Strategy, Risk/Uncertainty, Sustainability, Modification, Mathematical Modeling, Data Base, CER

NAVSEA-6

Title: The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach.

Summary: In this age of constant influx of new technologies, government organizations must continually adopt and exploit new technologies to ensure that the systems they procure and use meet changing performance requirements and long-term governmental cost goals. Unfortunately, adopting new technologies may bring unexpected consequences for the government organization, for the ship systems it procures and for the provision of the necessary services required for the ship systems' long-term sustainability. Unforeseen losses in productivity, degradations in quality and unexpected cost often plague most implementation efforts. These losses usually translate into increases of system life cycle costs. As a consequence many organizations never realize the full potential of the new technologies they choose to adopt.

The problem of adopting and implementing new technologies has obvious consequences for the system's affordability. In order to address the issue of system affordability, several questions were considered; When is the new technology needed initially?, How will the new technology affect the performance requirements of the system?, How and when should the new technology be implemented?, How and when should the new technology be maintained?, What is the effect of the new technology on the life cycle cost of the system and will projected congressional budgets sustain such costs? These questions are consistent with the objective of this research, to develop affordability measurement tools and techniques that evaluate hard-to-quantify affordability attributes.

The way this research is executed is to conduct team modeling exercises with key participants from NNS, NAVSEA017, VT (System Performance Laboratory). This ensures that all major stakeholders have input into the modeling effort.

Classification: Unclassified. *Proprietary* and *Business Sensitive* information will be captured and/or developed during the study but will be protected from disclosure.

Sponsor: Office of Naval Research
Ballston Tower One
800 North Quincy Street
Arlington, Virginia 22217-5660

Katherine Drew, (703) 696-5992

Naval Sea System Command (SEA 017)
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Irv Chewning, Nicole Allen Ray, and James Moy (703) 602-0720/1306

Performers: Office of Naval Research, Virginia Polytechnical Institute and State University (System Performance Laboratory), Newport News Shipbuilding, Tecolote Research, NAVSEA 017

Resources:

FY	Dollars	Staff-years
2001	$166,631	
2002	$166,630	
2003	$166,630	

Schedule:

Start	End
May 15, 2000	May 14, 2003

Data Base: The objective of this research is to develop a system dynamics modeling framework that will allow for the evaluation, prediction, and control of the procurement, implementation and maintenance of new technologies for ship systems. The system dynamics modeling framework will be illustrated for a selected technology and ship system

Publications: TBD

Keywords: Government, Estimating, Analysis

Naval Surface Warfare Center, Carderock Division (NSWCCD)

Name:	Systems Engineering and Analysis Department, Code 21 Cost and Economic Analysis Office, Code 211 Naval Surface Warfare Center, Carderock Division	
Address:	9500 MacArthur Boulevard West Bethesda, MD 20817-5000	
Director:	John C. Trumbule	
Size:	Professional:	12
	Support:	2
	Consultants:	0
	Subcontractors:	4
Focus:		
Activity:	Number of projects in process:	20
	Average duration of a project:	2
	Average number of staff members assigned to a project:	2
	Average number of staff-years expended per project:	4
	Percentage of effort conducted by consultants:	0
	Percentage of effort conducted by subcontractors:	20%

NSWCCD-1

Title:	Product-Oriented Design and Construction (PODAC) Cost Model
Summary:	This cost model will incorporate a Product Work Breakdown Structure and be sensitive to changes in shipbuilding strategies, ship construction process, use of common modules, zonal architectures, and equipment standardization. It will assist in assessment of the cost and affordability of design commonality alternatives that have potential for reducing acquisition and ownership costs of ships in conjunction with the NAVSEA Affordability Through Commonality (ATC) Program, the NAVSEA Ship Concept Advanced Design R&D Program and the Mid-Term Sealift Ship Technology Development Program (MTSSTDP). Concept exploration phase was completed with selection of a baseline from conceptual models developed by cost research projects—Development of Product-Oriented Cost Estimating Tools and Near-Term Prototype PODAC model. Partial functionality of the model was demonstrated in February 1997. Version 6.0 has been installed and implemented, by an integrated product team composed of Navy, shipyard personnel, and model developers, at the four surface shipyards and at NSWCCD. Cost model validation testing has been performed at two shipyards. A Data Analysis capability was added during FY 99, and is being evaluated at the shipyards. The focus of the cost model development is now primarily to support engineering tradeoff studies. Final Reports and evaluations are being completed.
Classification:	Unclassified
Sponsor:	Naval Sea System Command (SEA 05R2) 2531 Jefferson Davis Highway Arlington, VA 22242-5160

Performer:	Carderock Division, Naval Surface Warfare Center (Code 21) 9500 MacArthur Boulevard West Bethesda, MD 20817-5700

John Trumbule, (301) 227-5570; DSN: 287-5570
Robert Jones (310) 227-4012; DSN: 287-4012

Designers & Planners, Inc.; SPAR, Inc.; University of Michigan Transportation Research Institute; Avondale Shipbuilding, Inc.; Bath Iron Work, Inc.; Ingalls Shipbuilding, Inc.; National Steel and Shipbuilding Company; and Newport News Shipbuilding

Resources:

FY	Dollars	Staff-years	FY	Dollars	Staff-years
Prior FY	$295,000		99	$750,000	
96	$990,000		00	$550,000	
97	$862,000		01	0	
98	800,000				

Schedule:

Start	End	
Sep 94	Sep 95	Concept Exploration
Oct 95	Feb 97	Prototype Dem/Evaluation
Apr 97	Apr 98	Model Installation/Implementation at shipyards
Apr 99	Sep 00	Life Cycle Cost Capability
Apr 99	Dec 00	Engineering Tradeoff studies/ Model Evaluation
	May 01	Final Report

Data Base: Resident within cost model

Publications: *Production-Oriented Design and Construction (PODAC) Cost Model Plan of Action and Milestones and Functional Specification* (FY 96)

Cost Estimating Relationships Development Plan (1997)

PODAC Cost Model Validation Plan (1997)

Product-Oriented Design and Construction Cost Model (1998)

Product-Oriented Design and Construction Cost Model – An Update (1999)

Keywords: Government, Estimating, Ships, Production, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, WBS, Case Study, Survey, Cost/Production Function, Method, Mathematical Model, Study

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NSWCCD-2

Title: LEAPS Cost Support

Summary: Incorporate cost estimating and analysis capability into the Leading Edge Advanced Prototyping for Ships (LEAPS) integrated data environment. For selected cost analysis models, (1) provide lists defining the input variables required by the models, (2) provide definitions of the input variables, (3) provides lists defining the output information generated by the models, (4) provide definitions of the output, (5) support the focus object model from a cost perspective, (6) support the development of wrappers, and (7) document all results.

Classification: Unclassified

Sponsor: Myles Hurwitz, NSWCCD Code 26, (301) 227-1927, hurwitzmm@nswccd.navy.mil

Performer:	Carderock Division, Naval Surface Warfare Center (Code 21) 9500 MacArthur Boulevard West Bethesda, MD 20817-5700

Chris Whitacre, (301) 227-3003; DSN: 287-3003

Resources:	FY	Dollars	Staff-years
	2000	$50,000	0.3
	2001	$25,000	0.2

Schedule:	Start	End	Task
	Apr 00	Sep 00	Cost Model Inventory
	Apr 00	Sep 00	Input variable list and definitions
	Apr 00	Sep 00	Output information list and definitions
	Apr 00	Sep 01	IPT participation
	Apr 00	Sep 01	Focus object model development
	Apr 00	Sep 01	Wrapper Support (Software development)
	Apr 00	Sep 01	Document Results

Data Base: Resident within cost model

Publications: "Leading Edge Advanced Prototyping for Ships (LEAPS): An Integrating Architecture for Early Stage Ship Concept Assessment Software," 2nd ASNE Modeling, Simulation, and Virtual Prototyping Conference, Arlington, VA, Nov. 24-25, 1997, pp.135-141.

Keywords: Government, Estimating, Ships, Mathematical Model

NSWCCD-3

Title: Oily Water Environmental Quality System Life-Cycle Cost Model

Summary: A methodology and Price-H/spread sheet model was developed to estimate the life-cycle costs of oily wastewater treatment system. The methodology uses open system architecture approaches and prototype level data to estimate acquisition and life-cycle production level costs. The model also considers fleet implementation for new construction ships.

Classification: Unclassified

Sponsor: NAVSEA 05R24
Washington Navy Yard
Washington, DC 20003

POC: Ken Montgomery (301)-227-1007

Performer: Scott Clarke (301)-227-3671

Resources:	FY	Dollars	Staff-years
	00	$75,000	0.5
	01	$30,000	0.3

Schedule:	Start	End
	FY00	Ongoing

Data Base: Resident within Model.

Publications: None.

Keywords: Government, Estimating, Ships, Mathematical Model

NSWCCD-4

Title: Graywater Water Environmental Quality System Life-Cycle Cost Model

Summary: A methodology and Price-H/spread sheet model was developed to estimate the life-cycle costs of gray-water waste treatment system. The methodology uses open system architecture approaches and prototype level data to estimate acquisition and life-cycle production level costs.

Classification: Unclassified

Sponsor:	NAVSEA 05R24
	Washington Navy Yard
	Washington, DC 20003

Sponsor: NAVSEA 05R24
Washington Navy Yard
Washington, DC 20003

POC: Ken Montgomery (301)-227-1007

Performer: Scott Clarke (301)-227-3671

Resources:

FY	Dollars	Staff-years
00	$30,000	0.3
01	$30,000	0.3

Schedule:

Start	End
FY00	Ongoing

Data Base: Resident within the model.

Publications: None

Keywords: Government, Estimating, Ships, Mathematical Model

NSWCCD-5

Title: Force Level Ship Environmental Cost Model

Summary: A methodology and spreadsheet model is being developed to estimate the life-cycle costs of liquid & solid wastes for fleet level analysis. The model will input data from the Environmental Compliance database, the disposal cost model and the system level environmental quality cost models. Output will be forces level acquisition and life-cycle analysis.

Classification: Unclassified

Sponsor: NAVSEA 05R24
Washington Navy Yard
Washington, DC 20003

POC: Ken Montgomery (301)-227-1007

Performer: Ken Montgomery (301)-227-1007

Resources:

FY	Dollars	Staff-year
01	$75,000	0.5

Schedule:

Start	End
FY01	Ongoing

Data Base: *Title:* Environmental Compliance Database

Description: The Environmental Compliance Database is a tool to capture and organize cost and qualitative data for shipboard environmental systems. Data is inputted and reports are generated through a web-based user interface.

Automation: None

Publications: None

Keywords: Government, Estimating, Ships, Mathematical Model

Air Force Costs Analysis Agency (AFCAA)

Name:	Air Force Cost Analysis Agency
Address:	1111 Jefferson Davis Highway Suite 403 Arlington, VA 22202-4306
Director:	Mr. Joseph T. Kammerer, (703) 697-5312 Mr. Jay Jordan, Technical Director, (703) 604-0400 Ms. Deborah Cann, Research Chief, (703) 604-0402
Size:	Professional: 57 (authorized); 44 (assigned) Support: 4
Focus:	The Air Force Cost Analysis Agency supports the Air Force by providing thorough, effective independent cost analyses and special studies in support of weapon system programs. We provide quality analyses through research to develop superior analytical tools, models and databases.
Activity:	Number of projects in process: 19 Average duration of a project: 1 year Average number of staff members assigned to a project: 1 Average number of staff-years expended per project: 0.2 Percentage of effort conducted by consultants: 100% Percentage of effort conducted by subcontractors: 0%

AFCAA-1

Title:	ACE-IT /CO$TAT Enhancements
Summary:	ACE-IT

The purpose of this project is to continue to upgrade the current capabilities of ACE-IT. These improvements include dynamic equations, which will allow for multiple equation columns in an ACE session. Columns will then be referenced with their own ID or variables and the row/column intersections will be referenced using notations with a "dot" notation. Other planned improvements include implementing a Tree View of the WBS which will simplify WBS editing and debugging of indenture problems, and simplify navigation of sessions and methodologies.

CO$TAT

The primary purpose of this effort is to finish hosting CO$TAT cost analysis statistics and regression functions within an Excel spreadsheet. The end result will use an Excel GUI to drive the current CO$TAT calculation and reporting engine. Since the primary interface will be based on Excel functionality, this effort will improve the use of CO$TAT, incorporating better data manipulation and graphing functions as well as providing significant user interface improvements such as tabbed workbooks, zoom control, etc. In addition, this effort will also result in improved interoperability between CO$TAT and ACDB.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457 E-mail: Sandra.Cervantez@pentagon.af.mil

Performer:	Tecolote Research, Inc.		

Resources:		FY	Dollars
	Past Improvements	93–5	$646,000
	Improvements	96–8	$410,000
	Enhancements	99	$170,000
	Enhancements	00	$220,000
	Enhancements	02	TBD

Schedule:		Start	End
	Improvements	Jan 97	Sep 98
	Enhancements	Oct 98	Sep 02

Database: Not applicable

Publications: ACE-IT user manuals and supporting documentation

Keywords: Industry, Government, Estimating, Analysis, Weapon Systems, Life Cycle, Method, Computer Model

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AFCAA-2

Title: Military Aircraft Data and Retrieval (MACDAR) System Update

Summary: The objective of this project is to normalize and fully document previously collected Air Force and Navy cost and technical data. The database will be flexible enough to allow for either an analogy-based or CER-based approach for both recurring and non-recurring costs of aircraft systems. The database will contain functional hourly and cost information as well as technical information for each hardware WBS element. Sources of data and normalization rationale will be completely documented. FY00 efforts include extending the database to include the F-18E/F, and identification, re-normalization, and additional data collection to repair data shortages in the material cost categories. FY01 efforts will include continuing to add F-18E/F data as well as repairing holes in the material costs of the F-15, F-14 and F-16. FY02 effort will continue to add F-18E/F and other recent program actual data, as well as ensure the material costs associated with the AV-8B, F-14, F-15, F-16 and F-18 in the database are accurate and complete.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN 664-045
E-mail: Lynn.Davis@pentagon.af.mil

Performer:	Phase I	RAND
	Phase II	Tecolote Research Inc.
	Phase III-VI	Naval Air Systems Command
	Phase VII	Naval Air Systems Command

Resources:		FY	Dollars
	Phase I	93	$100,000
	Phase II	96	$225,000
	Phase III	97	$25,000
	Phase IV	99	$80,000
	Phase V	00	$120,000
	Phase VI	01	$119,000
	Phase VII	02	$100,000

Schedule:		Start	End
	Phase I	Complete	
	Phase II	Complete	
	Phase III	Apr 98	Oct 98

Phase IV	Oct 98	Sep 99
Phase V	Oct 99	Sep 00
Phase VI	Oct 00	Sep 01
Phase VII	Oct 01	Sep 02

Database: Excel (pivot tables)

Publications: Written report and data dictionary.

Keywords: Government, Analysis, Estimating, Aircraft, Airframe, EMD, Production, Labor, Material, Data Collection, Database

AFCAA-3

Title: NAFCOM (NASA/Air Force Cost Model)

Summary: This project develops and integrates specific Air Force requirements into the NASA Cost Model. The incorporation of Air Force requirements allows data and cost estimates to be displayed, analyzed, and used in a manner compatible with AF terminology and costing procedures. Phase II included incorporating Air Force specific cost drivers into the Complexity Generator development process. Phase III incorporated phasing, risk analysis, and further generation of complexity factors from Phase II. Phase IV allowed the completion and delivery of the next version of NAFCOM, and added additional features and utilities that will be contained in a subsequent release of the model. This task includes continuation and completion of the NAFCOM complexity generator, which provides fidelity into the technical cost drivers by major subsystem. The FY99 project included developing sound methodologies for separating hardware and software costs. Phase V included continuation of the complexity generators including propulsion and control and data handling subsystem parameters. Phase VI will contain a tool that allows for searches and export of the data for analysis. The contractor shall also provide AFCAA with cost model technical support and updated model documentation.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research & Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer: SAIC

Resources:

	FY	*Dollars*
Phase I	96	$150,000
Phase II	97	$150,000
Phase III	98	$150,000
Phase IV	99	$150,000
Phase V	00	$160,000
Phase VI	01	$100,000
Phase VII	02	$100,000

Schedule:

	Start	*End*
Phase I		Complete
Phase II		Complete
Phase III		Complete
Phase IV		Complete
Phase V	Oct 99	Sep 00
Phase VI	Apr 01	Apr 02
Phase VII	Apr 02	Apr 03

Database: NAFCOM Database

Publications: Normalized Database and NAFCOM Documentation

Keywords: Government, Estimating, Space Systems, Analysis, Life Cycle, Spares/Logistics, Data Collection, Data Base, Mathematical Modeling, Statistics/Regression, CER, Computer Model

AFCAA-4

Title:	ACDB Missile Database Improvements
Summary:	The objective of this project is to collect necessary data to perform periodic updates of the Automated Cost Data Base (ACDB) Missile Database. AFCAA and US Army CEAC fund this project on an alternating FY basis.
Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division
	Army Cost and Economic Analysis Center (CEAC) Mrs. Lynn Davis, (703) 604-0451; DSN: 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	Tecolote Research, Inc.

Resources:

	FY	Dollars
Phase I	97	$165,000
Phase II	98	$100,000
Phase III	99	CEAC
Phase IV	00	$100,000
Phase V	01	CEAC
Phase VI	02	$100,000

Schedule:

	Start	End
Phase I	May 97	Apr 98
Phase II	Apr 98	Oct 98
Phase III	Oct 98	Sep 99
Phase IV	Oct 99	Sep 00
Phase V	Oct 00	Sep 01
Phase VI	Oct 01	Sep 02

Database:	*Title:* Missile Automated Cost Data Base (ACDB)
	Description: Missiles and Munitions systems data
	Automation: PC in FoxPro
Publications:	User Manuals
Keywords:	Government, Analysis, Programming, Forces, Mathematical Modeling, Computer Model, Life Cycle, Labor, Material, Data Collection, Database, Missiles

AFCAA-5

Title:	Air Force Total Ownership Cost (AFTOC)
Summary:	AFTOC has expanded upon the Visibility and Management of Operating and Support Costs (VAMOSC) management information system. Costs are reported for all appropriations for aircraft, space systems and some C3I and munitions. Commodity level detail (by National Stock Number, MSD and GSD) is available for aircraft, by base and MDS, as well as for many subsystems. Munitions expenditure costs are now included as well as small missile expenditure and sustainment costs. Indirect costs are reported by installation. For registered users, standard data products are available on the AFTOC web site and a user accessible multidimensional database can be reached through an Excel plug-in. The registration page can be found at aftoc.hill.af.mil. Future activities include reengineering the database and standard product processes to improve efficiency, reliability, repeatability and fidelity.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Force Analysis Division
	Mr. Scott Belford, (703) 604-0462; DSN: 664-0462
	E-mail: scott.belford@pentagon.af.mil
Performer:	Battelle Memorial Institute, Litton-TASC, and OO-ALC/TISMD

Resources:

	FY	Dollars
Phase I	98	$425,000
Phase II	99	$3,776,000
Phase III	00	$3,427,000
Phase IV	01	$3,285,080
Phase V	02	$3,300,000

Schedule:

	Start	End
Phase I	Dec 97	Sep 98
Phase II	Oct 98	Mar 99
Phase III	Apr 99	Sep 99
Phase IV	Oct 99	Sep 00
Phase V	Oct 00	Sep 01

Database:	MS Access, Oracle, and SQL Server 7
Publications:	TBD
Categories:	II.A.2, II.C
Keywords:	Government, Reviewing/Monitoring, Aircraft, Space Systems, Missiles, Operations and Support, Labor, Material, Data Collection, Data Base, Infrastructure

AFCAA-6

Title:	Independent Verification and Validation (IV&V) of the Air Force Total Ownership Cost (AFTOC) System
Summary:	The AFTOC system provides Department of Defense users cost information for weapon systems and installation. Standard data products are available to approved users on the AFTOC website. An Excel plug-in tool called Essbase provides end user customer query capability. Source data is collected from over 14 Air Force financial and logistics systems. The contractor is tasked with testing AFTOC software applications and performing IV&V of the AFTOC databases to include metadata, and identifying potential data processing improvements.
Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research & Resource Management Division
	Mrs. Lynn Davis, (703) 604-0451; DSN: 664-0451
	E-mail: Lynn.Davis@pentagon.af.mil
Performer:	Logistics Management Inc. (LMI)

Resources:

FY	Dollars
99	$100,000
00	$450,000

Schedule:

Start	End
Jul 99	Jun 01

Database:	Excel
Publications:	Final Report
Keywords:	Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model

Title:	Air Force Inflation Model Tool
Summary:	This tool is used throughout the Air Force for making inflation conversion calculations and instructing personnel in the principles of inflation. It supports all cost analysis activities in AFCAA including aircraft weapon systems, computer, command and control, missile and munitions weapon systems, and space systems. The converter as well as the tutorial utilizes the use of Excel. The objective of this task is to support the use of the two applications described above to calculate and disseminate inflation information in a timely manner to the Air Force Secretariat, Air Staff, commands, and field operating agencies. Two areas of support include programming a custom generator report feature and updating the tool for new inflation indices. Increased funding for FY02 is in support of software reconfiguration to Microsoft Office 2000.
Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research & Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	TASC

Resources:

FY	Dollars
97	$41,000
98	$46,000
99	$20,000
00	$16,000
01	$16,000
02	$25,000

Schedule:

Start	End
Oct 96	Indefinite

Database:	Excel
Publications:	Not applib
Keywords:	Government, Estimating, Analysis, Database, Mathematical Modeling, Computer Model

Title:	Defense Contractor Overhead Rate Analysis
Summary:	The objective of this project is to provide a primer discussing methods of measuring and predicting business base changes for a prime weapon system contractor; then describing how to calculate alternate overhead rates given different assumptions of that particular contractor's future business base. This effort will allow normalization of current wrap rates to the historical data underlying an estimate; it will also allow normalization of the historical cost data to reflect current wrap rate calculations. This study compiles past CCDR DD1921-3 information, which shows historical cost pools and direct base expenses used in calculating overhead rates, and attempts to project the trends into the future. FY98 deliverables included the following contractors: Boeing, St. Louis; Hughes; TRW; Northrop Grumman and Lockheed Martin, Orlando. Last years deliverables included Lockheed Martin Missiles and Space, Sunnyvale; Lockheed Martin, Marietta, GA; Lockheed Martin, Fort Worth; Boeing Military Aircraft, Seattle; and Raytheon Defense Systems. For FY00 the contractors that are currently being studied are in the rotary wing area, which include Bell Helicopter, Boeing Helicopter, Sikorski Aircraft, and Sanders-A Lockheed Martin. Since some of the contractors are going through accounting changes this year, AFCAA decided to put off any new studies until Fiscal Year 02. The FY01 funding made available is to finish up three of the studies that started in FY00.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division
	Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457
	E-mail: Sandra.Cervantez@pentagon.af.mil
Performer:	Naval Air Systems Command

Resources:

	FY	Dollars
Phase I	98	$160,000
Phase II	99	$80,000
Phase III	00	$80,000
Phase IV	01	$22,000

Schedule:

	Start	End
Phase I	Oct 97	Oct 98
Phase II	Oct 98	Sep 99
Phase III	Oct 99	Sep 00
Phase IV	Oct 00	Oct 01

Database:	Excel
Publications:	Stand-alone documentation on each contractor site.
Keywords:	Government, Analysis, Estimating, Aircraft, Production, Labor, Material, Data Collection, and Database

AFCAA-9

Title:	Aircraft Avionics Systems Database and Study

Summary: The objective of this effort involves developing an avionics database that will be used to develop cost estimating relationships for estimating both federated and next-generation integrated avionics systems. However, the key element of the effort is to be able to make the bridge between federated and integrated avionics systems. There is an extensive data collection effort underway including programs such as F-22, Comanche, B-2, V-22 and JSF. This database is to include cost, technical and programmatic data for a wide range of systems across many different airborne platforms. Currently this task is using both a traditional CER approach and a methodology to estimate avionics costs from the board level cost and performance descriptions. This effort is being coordinated across service lines to assist in various cost estimating tasks. The FY01 effort will further augment data collection. FY02 effort will expand and update the current database. The contractor shall provide a supportable methodology to estimate integrated avionics systems through the CERs it develops that shall support AFCAA requirements to estimate development, production and integration costs for such systems.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research & Resource Management Division
	Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451
	E-mail: Lynn.Davis@pentagon.af.mil
Performer:	Tecolote Research, Inc.

Resources:

FY	Dollars
99	$212,000
00	$125,000
01	$100,000
02	$50,000

Schedule:

Start	End
Mar 99	Feb 00
Mar 00	Feb 01

Mar 01	Mar 02
Mar 02	Mar 03

Database: Excel

Publications: Final Report

Keywords: Government, Analysis, Electronics/Avionics, EMD, Production, Labor, Material, Data Collection, Data Base

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AFCAA-10

Title: Joint Automated Information System (AIS) Automated Cost Database (ACDB) Framework

Summary: The original objective of this effort was to provide support to the Air Force Cost Analysis Agency, in conjunction with DoD Automated Information System Database Working Group (Army, Navy, Software Engineering Institute, and Office of the Secretary of Defense (OSD), Program Analysis and Evaluation (PA&E)], in the development of an AIS database within the ACDB framework, and to coordinate with the Working Group to define processes for ongoing data collections and database expansion. Early in FY01, the scope of the project was revised to consolidate AIS data in the Open Software Model and C4I database, collect cost and technical data associated with AIS programs in the ACDB framework, and load the data into the Joint IT Database.

Classification: Unclassified

Sponsor: Electronic Systems Center

Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Sandra Cervantez, (703) 604-0457; DSN: 664-0457
E-mail: Sandra.Cervantez@pentagon.af.mil

Performer: Tecolote Research, Inc.

Resources:

FY	Dollars
99	$200,000
00	$100,000

Schedule:

Start	End
Oct 98	Sep 01

Database: IT ACDB Database

Publications: To be determined

Keywords: Government, Estimating, Analysis, Life Cycle, Spares/Logistics, Data Collection, Data Base, Mathematical Modeling, Statistics/Regression, CER, Computer Model

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AFCAA-11

Title: Missile Cost Estimating Relationship (CER) Development

Summary: This project will apply new missile data from the ACDB missile database to a comprehensive update of a previous study completed in 1994 that has proven very useful in recent cost analyses. This project will also utilize data from a recent Naval Center for Cost Analysis (NCCA) missile data collection effort. This data will then be used to develop CERs, factors and analogs for various missiles and ground based radars for both RDT&E and production. Other subtasks include collecting additional missile and munitions programmatic information, providing more detailed narratives of the database content, and including the detailed spreadsheets with raw and normalized data. Future effort will focus on getting total avionics systems costs, including missing integration costs, that can be used for prediction learning curves and updating CERs from previous years.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	Tecolote

Resources:

	FY	Dollars
Phase I	99	$50,000
Phase II	00	$130,000
Phase III	02	$75,000

Schedule:

	Start	End
Phase I	Jan 98	Dec 99
Phase II	Jan 00	Dec 00
Phase III	Oct 01	Sep 02

Database:	ACDB
Publications:	Updated final report showing all relevant analysis and CERs.
Keywords:	Government, Estimating, Analysis, Life Cycle, Spares/Logistics, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model, Weapon Systems, Missiles, Training

AFCAA-12

Title:	COTS Electronics Database/Modeling
Summary:	The purpose of this project is to continue developing a cost database to quantify COTS hardware costs encompassing different ruggedization levels. Additional data will be collected and risk parameters will be added for increased analysis capability. In order to capture different ruggedization levels, parameters such as radiation hardness levels, vibration levels, temperature levels, and altitude levels will be analyzed to understand how these parameters impact costs. An added benefit will allow the analyst to provide augmentation to design-to-cost analyses regarding system hardness capabilities of a design using COTS components. Also, the model will have the capability to predict integration and other programmatic support costs encountered in COTS programs as well as the capability of estimating other COTS hardware items not currently supported by the existing hardware relationships. The contractor is collecting data associated with AIS/C3I systems. The data will include hardware electronic components as well as various levels of non-hardware portions of the AIS/C3I programs. In FY01 the project became joint as the Navy Center for Cost Analysis (NCCA) also funded the continued developed of this effort. In FY02 emphases will be placed in collecting new types of electronic components and will be analyzed to validate and/or expend the statistical estimating relationships and risk parameters in the model.
Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457 E-mail: Sandra.Cervantez@pentagon.af.mil
Performer:	Mission Research Corp. (MRC)

Resources:

FY	Dollars
99	$80,000
00	$17,000
01	$150,000
02	$80,000

Schedule:	*Start*	*End*
	Sep 99	Indefinite
Database:	Excel	
Publications:	Final Report	
Keywords:	Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model	

AFCAA-13

Title: Cost Factor and Model Support

Summary: AFCAA annually supports the development of the Air Force Planning Projection model, which outlines the future force structure. We support this with Total Ownership Cost models on 50+ weapon systems. The data embedded in these models requires regular updates to maintain currency. In addition, we often add new weapon systems to the suite of models. AFCAA also developed a SABLE model for conducting a variety of analyses on aircraft squadron operating and support costs. AFCAA Contingency computes the costs associated with aircraft deployments under a wide variety of user-defined scenarios. Both models are data intensive containing numerous internal cost factors. The Agency also developed a Microsoft Access-based Cost Per Flying Hour tool.

The scope of this effort includes software development, software maintenance, cost analysis, database administration and general technical support to the Agency for these tools. The three primary objectives of this effort are creating a single electronic data repository for storing the annual cost information published in Air Force Instruction (AFI) 65-503 and the data used as inputs to AFCAA cost models; creating the capability for automatic generation of reimbursement rates and updates to AFCAA cost models using the data stored in the repository; and maintaining and updating the Cost Per Flying Hour application developed by the Agency.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN: 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer: Center for Systems Management, Inc. (CSMI)

Resources:	*FY*	*Dollars*
	01	$150,900
	02	$150,000
Schedule:	*Start*	*End*
	Nov 00	Oct 01
	Oct 01	Sep 02
Database:	Access / Excel	
Publications:	Final Report	
Keywords:	Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, and Computer Model	

AFCAA-14

Title: Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs

Summary: The objective of this project will be to analyze the nature of current non-air vehicle costs and trends likely to affect them in the immediate future, identify key cost drivers, normalize and document representative data, and develop a set of practical, documented cost estimating methodologies. These methodologies should be useful in developing

estimates in the early stages of a program, before detailed technical and programmatic information is available, as well as for cross-checks later in the weapon system development phase when there are more details available. The first phase of the study will examine aircraft and tactical missile test costs, then move onto the systems engineering/program management costs, etc. The study will be undertaken in four phases during FY2 2001-2004.

Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457 E-mail: Sandra.Cervantez@pentagon.af.mil
Performer:	RAND

Schedule:	*Start*	*End*
	Nov 00	Sep 04

Publications:	In-process
Keywords:	Government, Estimating, Aircraft, Concept Development, WBS, Method

AFCAA-15

Title:	Analysis of Cost Growth using Selected Acquisition Reports
Summary:	The objective of this study is to analyze the contents of the DOD Selected Acquisition Reports (SARs) from their inception through the SARs submitted as part of the FY 2001 President's Budget (December 1999 annual SARs). This analysis will categorize cost growth by Service, type of system, and growth from Milestones. The database contains a wide range of programmatic information for all MDAPs in a digital format. This analysis will improve understanding of cost growth in order to enable better-informed decisions regarding both specific weapon system acquisitions and future resource and acquisition policy decisions. Potential future work would include updating the database with the annual SARs.
Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457 E-mail: Sandra.Cervantez@pentagon.af.mil
Performer:	RAND

Schedule:	*Start*	*End*
	Mar 01	Oct 01
	Oct 01	Sep 02

Publications:	In-work
Keywords:	Government, Analysis, Weapon System, Study

AFCAA-16

Title:	Missile and Munitions Sufficiency Review Handbook
Summary:	The objective of this study is to provide a Missile and Munitions Sufficiency Review Handbook that will summarize basic cost estimating cross-checks for aircraft cost estimates. This handbook will assist AFCAA cost analysts in the performance of quick sufficiency reviews and will guide them in how to conduct checks for overall reasonableness of the cost estimating methodologies being reviewed.
Classification:	Unclassified

Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division
	Mrs. Lynn C. Davis, (703) 604-0451; DSN 664-045
	E-mail: Lynn.Davis@pentagon.af.mil

Performer: Tecolote

Resources:

FY	Dollars
01	$100,000

Schedule:

Start	End
Apr 01	Apr 02

Publications: In-work

Keywords: Missiles, Aircraft

AFCAA-17

Title: Phased Array Cost Database

Summary: The objective of this task is to provide AFCAA information necessary and sufficient to estimate phased array satellite payloads for design, performance and material composition. The task will most likely use an Excel model and design attributes to incorporate new phased array data in the form of contractor resources (cost and hours), technical and programmatic data into an approved Excel format. The phased array model will be capable of storing raw contractor data, data mapping and normalization routines, mapped and normalized data, contractor specific non-standard resource data, technical data (i.e. weights, performance characteristics and material type, etc), and quantity data. It is envisioned that AFCAA analysts will use the model to incorporate data from various phased array payloads to develop analogy type estimates, parametric CERs or cost factors. Information retrieved from the model will support AFCAA's requirement to increase its cost estimating expertise.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457
E-mail: Sandra.Cervantez@pentagon.af.mil

Performer: TBD

Resources:

FY	Dollars
01	$150,000

Schedule:

Start	End
May 01	May 02

Database: Excel

Publications: Final Report

Keywords: Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model

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AFCAA-18

Title: Unmanned Air Vehicle Database

Summary: Unmanned Air Vehicles (UAVs) are remotely piloted or self-piloted aircraft that can carry cameras, sensors, communications equipment or other payloads. There are two categories of UAVs: Tactical and Endurance. UAVs are considered the next generation of war fighter. These platforms and mission payloads can be remotely operated throughout the range of military operations; are capable of near-real time (NRT)

transmission of collected data; can operate up to 24 hours; and self destroy when captured.

Currently AFCAA does not have a UAV database to assist in estimating UAV systems. The objective of this project will be to collect and normalize UAV cost, technical and programmatic data and create a database. The database will be flexible enough to allow for either analogy-based or CER-based approach capable of supporting AFCAA requirements to estimate development and production costs for UAV systems. Sources of data and normalization rationale will be completely documented.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457
E-mail: Sandra.Cervantez@pentagon.af.mil

Performer: TBD

Resources:

FY	Dollars
02	$75,000

Schedule:

Start	End
Oct 01	Sep 02

Publications: Final Report

Keywords: Government, Data Base

AFCAA-19

Title: Commonality/Heritage Study

Summary: The objective of the study is to examine the impact to research and development dollars (i.e., potential savings) when there is commonality and heritage between satellites developed and in development.

Classification: Unclassified

Sponsor: Air Force Cost Analysis Agency, Research and Resource Management Division
Ms. Sandra Cervantez, (703) 604-0457; DSN 664-0457
E-mail: Sandra.Cervantez@pentagon.af.mil

Performer: TBD

Resources:

FY	Dollars
02	$150,000

Schedule:

Start	End
Oct 01	Sep 02

Database: Excel

Publications: Final Report

Keywords: Government, Estimating, Analysis, Life Cycle, Data Collection, Database, Mathematical Modeling, Statistics/Regression, CER, Computer Model

Aeronautical Systems Center, Air Force Material Command (ASC/FMC)

Name:	Aeronautical Systems Center, Air Force Material Command Cost Division, Comptroller Directorate
Address:	ASC/FMC Bldg. 14, Rm. 152 1865 4th Street Wright-Patterson AFB, OH 45433-7123
Director:	Ms. Kathy A. Ruffner, (937) 255-6483
Size:	Professional: 35 Support: 2 Consultants: 0 Subcontractors: 0
Focus:	Cost Estimating and Research, Scheduling, Resource Analysis (Source Selection Guidance and Cost Panel Support), Earned Value Management, and Integrated Risk Management
Activity:	Number of projects in process: 1 Average duration of a project: 9 mos. Average number of staff members assigned to a project: 2 Average number of staff-years expended per project: .1 Percentage of effort conducted by consultants: 70% Percentage of effort conducted by subcontractors:

ASC/FMC-1

Title:	Cost Communities of Practice (CoP) Portal
Summary:	The Cost CoP Portal will be a "yellow pages" for cost analysts supplemented by web-enabled collaboration tools. Major capabilities for the Portal will be as follows: cost related links, key word search, bulletin boards, "Ask an Expert", "Tell a Friend", calendar of events, automated ASC Cost and Schedule Data Center functions, and "Contribute to the Cost Workspace". "Contribute to the Cost Workspace" will enable analysts to submit cost estimates, best practices/lessons learned, and new web sites for inclusion in the Portal. The bulletin boards and "Ask an Expert" capabilities will enable cost analysts to collaborate on questions and items of interest across the entire. DOD cost community.
Classification:	Unclassified
Sponsor:	ASC/FMCE Mr Michael Seibel (937) 656-5491 Ms. Sandra McCardle (937) 255-7157
Performer:	Triune Software, Inc. (Prime)

Resources:

FY	Labor Hrs	Staff-years
FY00-FY01	450	1

Schedule:

Start	End
Sept 00	June 01

Data Base:	No databases were created as part of this project.

Keywords: Industry, Government, Estimating, Analysis, Policy, Reviewing/Monitoring,
Risk/Uncertainty, Schedule, CER

ASC/FMC-2

Title: PRICE Model Calibration Studies, F-15

Summary: The F-15 System Program Office sponsors PRICE Model calibration efforts for their program. FY98 effort provided a calibrated data set for utilizing PRICE H (Hardware) and PRICE S (Software) for estimating Group B Equipment. FY99 effort provided a calibrated data set for utilizing PRICE S for estimating object-oriented software. FY00 effort incorporated calibration of additional modification programs not included in the FY98 effort and revised FY98 calibration values to account for manufacturing process changes and PRICE model version changes.

Classification: Unclassified/Proprietary Information

Sponsor: ASC/FBAPF
Linda Williams, (937) 255-7502, Ext. 2548
Wright-Patterson AFB OH 45433

Performer: PRICE Systems, L.L.C.

Resources:

FY	Dollars
98	$59,930
99	$59,940
00	$59,920

Schedule:

Start	End
Jan 1998	Completed
Jan 1999	Completed
Dec 1999	Completed

Database: *Title:* PRICE Calibraton Database

               Description: F-15 Data

Publications: Not applicable

Keywords: Government, Estimating, Analysis, Weapon Systems, Aircraft, Electronics/Avionics, EMD, Production, Data Collection, Computer Model.

ASC/FMC-3

Title: PRICE Model Calibration Studies, B-2

Summary: The B-2 System Program Office sponsors PRICE Model calibration efforts for their program. FY99 effort provided calibrated values for electronic and structural complexity and global values for PRICE H (Hardware) and calibrated productivity factors and global values for PRICE S (Software). Calibrated programs included the B-2 Global Positioning System and the Military Strategic and Tactical Relay Satelline (MILSTAR) system. FY00 effort will provide calibration studies on the B-2 Joint Stand Off Weapon (JSOW) and the B-2 Generic Weapon Interface System (GWIS).

Classification: Unclassified/Proprietary Information

Sponsor: ASC/YSF
Michael Stroble, (937) 656-5174
Wright-Patterson AFB OH 45433

Performer: PRICE Systems, L.L.C.

Resources:

FY	Dollars
99	$192,800
00	$199,274

Schedule:	Start	End
	Apr 1999	Completed
	Jul 2000	Sept 2001

Database: *Title:* PRICE Calibraton Database

Description: B-2 Data

Publications: Not applicable

Keywords: Government, Estimating, Analysis, Weapon Systems, Aircraft, Electronics/Avionics, EMD, Production, Data Collection, Computer Model.

Air Force Space and Missile Command (AFSMC)

Name:	Air Force Space and Missile System Command (AFMC/SMC) Acquisition Cost Division (SMC/FMC)
Address:	2430 Vela Way, Suite 1467 Los Angeles AFB, CA 90245
Director:	Mr. Anthony E. Finefield (GS-15) Chief Acquisition Cost Division (310-363-1073)
	Maj. Bonnie Oakes, Deputy Chief (310-363-0048)
Size:	Professional: 18
	Support: 1 (Aerospace)
	Consultants: 0
	Subcontractors: 6 (Tecolote, EER Systems, MCR Federal, Mevatec, Systex, ACT-1)
Focus:	Satellites, Launch, and Network & Range
Activity:	Number of projects in process: 2
	Average duration of a project: 1 year
	Average number of staff members assigned to a project: 2
	Average number of staff-years expended per project: 0.3
	Percentage of effort conducted by consultants: 0
	Percentage of effort conducted by subcontractors: 95%

AFSMC-1

Title:	FY01 The Unmanned Space Vehicle Cost Model (USCM) 8th edition
Summary:	This model is to estimate spacecrafts and communication payloads. This effort is to complete the 8th edition update of the USCM7. The result will be the publication of USCM8 which includes cost estimating relationships (CERs) for subsystems and components.
Classification:	Unclassified (Proprietary database separately bound)
Sponsor:	SMC/FMC Ms. Phu Nguyen, (310) 363-0071; DSN: 833-0071 E-mail: Phu.Nguyen@Losangeles.af.mil
Performer:	Tecolote Research, Inc Aerospace Corporation

Resources:

FY	Dollars
97	$120,000
98	$120,000
99	$120,000
00	$200,000
01	$350,000

Schedule:

Start	End
Dec 00	Sep 01

Data Base: Excel and Access

AFSMC-2

Title: FY 00 Passive Sensor Cost Model Data Collection

Summary: This model for estimating space sensor payloads (passive sensors e.g. infrared) needs to be updated. Subsystems reviewed were: Focal Plane Arrays, Optical Telescope Assemblies, Cryogenics Coolers, Gimbals and Gimbal Control Electronics, Power Supplies, Star Sensors, and Sensor Integration, Assembly and Test. Sensor data collected is at the subsystem level.

Classification: Unclassified (Proprietary database separately bound)

Sponsor: SMC/FMC
Ms. Phu Nguyen, (310) 363-0071; DSN: 833-0071
E-mail: Phu.Nguyen@Losangeles.af.mil

Performer: Tecolote Research, Inc
Aerospace Corporation

Resources:

FY	Dollars
97	$100,000
98	$100,000
99	$100,000
00	$100,000
01	$100,000

Schedule:

Start	End
Sep 00	Sep 01

Data Base: Excel and Access

Publication: Passive Sensor Cost Model (2000) Space and Missile Systems Center/FMC

Keywords: Government, Estimating, EMD, Space Systems, Production, WBS, CER, Statistics/ Regression, Database, Data Collection, Electronics/Avionics.

Ministry of Defence, Special Procurement Services/ Cost Forecasting (SPS/CF)

Name:	Special Procurement Services/Cost Forecasting (SPS/CF) A Support Group of UK MOD Defence Procurement Agency	
Address:	Elm 1b #187 MoD Abbey Wood Bristol BS34 8JH UK	
Director:	Mr. A. N. Pearse	
Size:	Professional:	60
	Support:	4
	Consultants:	—
	Subcontractors:	8
Activity:	Number of projects in process:	160
	Average duration of a project:	8 months
	Average number of staff members assigned to a project:	3
	Average number of staff-years expended per project:	0.6
	Percentage of effort conducted by consultants:	—
	Percentage of effort conducted by subcontractors:	<30%

SPS/CF-1

Title:	Software Support Cost Model Project (SSCMP)
Summary:	The overall aim of the SSCMP was to develop a software package to enable procurers, managers and designers to estimate the costs of software support over the in service life. The Main Study is complete and an independent expert review has confirmed the validity of the results. A web enabled tool has been developed to implement the algorithms developed and training has been delivered to MOD users. Guidance on cost reduction has been issued. The project is now completed. The next phase of the work (subject to funding being available) is to define a standardised set of metrics to allow future data collection on MOD software intensive projects for all phases of the lifecycle.
Classification:	Unclassified
Sponsor:	Specialist Procurement Services—UK MOD Dr D A Thombs, 011-44-117-913-2754
Performer:	BMT Reliability Consultants Ltd, Fareham, UK

Resources:	*FY*	*Dollars*	*Staff-years*
	99/01	$250,000	1.0

Schedule:	*Start*	*End*
	Dec 95	April 01

Data Base:	Microsoft Excel and Access for data storage, Minitab for statistical analysis. Tool implemented in Java.

Publications:	Reports on specific activities, presentations, model and user guide. Cost reduction guidelnes.
Keywords:	Government, Estimating, Operations and Support, Software, Computer Model

SPS/CF-2

Title:	Software of Unknown Pedigree (SOUP) in Safety Critical Systems
Summary:	The aim of the project was to review the use of SOUP in Safety Critical Systems, develop an outline model to estimate the whole life costs for the software elements and to develop outline guidance to enable procurers, managers and designers to minimise the risks of using SOUP. The Study is complete. The next phase of the work is to validate the model and to develop the guidance documents.
Classification:	Unclassified
Sponsor:	Specialist Procurement Services – UK MOD Dr. D. A. Thombs, 011-44-117-913-2754
Performer:	Advantage, Farnham, UK

Resources:

FY	*Dollars*	*Staff-years*
00/01	$150,000	1.5

Schedule:

Start	*End*
April 00	April 01

Data Base:	Microsoft Excel
Publications:	Reports on specific activities, presentations, outline model and outline guidance.
Keywords:	Government, Estimating, Software

SPS/CF-3

Title:	Family of Advanced Cost Estimating Tools (FACET)—Unmanned Air Vehicles (UAVs) and UAV Ground Control Elements.
Summary:	These models are a sub set of the HVR-CSL FACET series. They cover: fixed wing UAVs of all sizes, used as targets, for artillery fire control, reconnaissance (tactical or strategic), in the suppression of enemy air defences and the Ground Control Station, Tactical Data Links, Launch and Recovery elements, vehicles and associated manpower.
	The model is used to provide estimates of cost from the earliest conceptual stages of a Project, i.e. when performance requirements have been laid down with some precision but characteristics of designs to meet those requirements are subject much uncertainty.
	Features of the models are the use of sizing rules and Bayesian techniques alongside "top down" parametric relationships. This allows flexibility of input as well as enhanced accuracy at the earliest stage of a project.
	A series of window based input screens convert raw data (single point or three point estimate if available) into Whole Life Cost information. This is presented in tabular or chart form, with a three-point estimate. This can be saved with the FACET database, converted into an Excel file or printed from the model.
Classification:	Unclassified
Sponsor:	Specialist Procurement Services/Directorate of Cost Forecasting/CF Air Section
Performer:	HVR Consulting Services Ltd.

Resources:

FY	*Dollars*	*Staff-years*
00/01	30,000	10 m/days–V&V

Schedule:	*Start*	*End*
	March 2000	January 2001
Data Base:	None	
Publications:	HVR User Guides	
Keywords:	Government, Estimating, Aircraft, Concept Development, Computer Model	

Air Force Institute of Technology
School of Engineering and Management (AFIT/ENV)

Name:	Air Force Institute of Technology School of Engineering and Management
Address:	2950 P Street (Bldg. 640) Wright Patterson AFB, OH 45433-7765
Director:	Dr. Robert Calico (Dean)
Size:	Professional: 100+ Support: 50+ Consultants: Subcontractors:
Focus:	Research and Graduate Education
Activity:	Number of projects in process: 300+ Average duration of a project: 1.5 yrs Average number of staff members assigned to a project: 3 Average number of staff-years expended per project: 2 Percentage of effort conducted by consultants: N/A Percentage of effort conducted by subcontractors: N/A

AFIT/ENV-1

Title:	The Concept of Best Value in the Source Selection Process
Summary:	This research focuses on the quantification of best value attributes in source selections to arrive at total evaluated cost. Through case study techniques, it details a variety of cost estimating methods needed to quantify a wide range of cost elements, both direct and indirect, and to consider cost risk in arriving at a total evaluated cost to the government.
Classification:	Unclassified
Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765 Attn: LTC William Stockman (937) 255-3636 ext. 4796
Performer:	AFIT/ENV (Lt Jason Borchers)
Resources:	Not applicable
Schedule:	*Start* *End* Mar 2000 Mar 2001
Data Base:	Not applicable
Publications:	Pending
Keywords:	Acquisition Strategy, Estimating, Case Study, Economic Analysis

AFIT/ENV-2

Title:	A Model for Estimating Program Value during Cost of Delay Analysis
Summary:	The purpose of this research is to develop a model for estimating value during the cost of delay analysis. The model will eliminate the ambiguity present in the current system. It

will provide step-by-step instructions on how to estimate value for incorporation into the analysis. Also, this research will offer a written structure for the entire cost of delay analysis approach. Research will be conducted on the various methods for analyzing value throughout various industries. A mix of various techniques will be formed to best model value in DoD settings. A comparison will be conducted with the model and past value analysis to determine the models effectiveness. It is anticipated that this model will quickly, accurately, and consistently identify the value of a program. It will be structured for easy use in program offices, and have immediate impact for cost of delay analysis.

Classification:	Unclassified
Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765
	Attn: LTC William Stockman (937) 255-3636 ext. 4796
	AF Cycle Time Reduction Office, POC: Maj. Ross McNutt (703)588-7278
Performer:	AFIT/ENV (Lt. Edward Cintron)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2001	Mar 2002

Data Base:	Not applicable
Publications:	Pending
Keywords:	Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model

AFIT/ENV-3

Title:	Development of a Predictive Cost Model for Battle Management/Command, Control, and Communication Systems
Summary:	The purpose of this study was to develop a parametric model using linear regression to estimate software development costs for Department of Defense Command, Control, and Communications systems. The developed model is unique in a few ways. First, the model is derived from Department of Defense command and control data. Most other traditional models use a broader spectrum of data to create models, and then rely on calibration to tailor the model for a specific use. Second, while traditional models require volumes of variables to create estimates, the developed model only requires a few key variables to estimate the amount of effort necessary to complete a project. The key variables were selected through analyzing common variables used in software cost estimating and performing regression analysis to focus in on the variables that have the greatest influence on expected effort.
Classification:	Unclassified
Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765
	Attn: LTC William Stockman (937) 255-3636 ext. 4796
	Also sponsored by Electronics System Command, Hanscom AFB
Performer:	AFIT/ENV (Capt. Anthony Fife)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:	*Start*	*End*
	Mar 2000	Mar 2001

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Weapon Systems, Method, Mathematical Model, EMD, Software, CER

AFIT/ENV-4

Title: An Analysis of the Sustainability of Pope AFB C-130s through Their Programmed Service Life

Summary: The purpose of this research is to find out exactly how large the sustainability problem is with Pope's C-130E. This study will determine whether the nation will lose some portion of its all-weather aerial delivery capability before or during the transition period to the C-130J at Pope. This research will be accomplished by obtaining cost data for maintenance and spare parts buys. This data will be extrapolated into the future and compared to budgeted amounts. In addition, data on the airframe will be run through an aircraft sustainability model. Data will be obtained from interviews and surveys with maintenance personnel at Pope AFB, weapon system mangers at AMC, and engineers and program managers at AFMC. The maintenance and planning personnel at Pope will be able to provide aircraft readiness data with personnel at AFMC and AMC providing data on current and future spare parts funding. In addition, the C-130E contractor will be contacted to ascertain the future availability of spare parts for the airframe. The results of this study will help determine if efforts underway today are enough to sustain Pope AFB's C-130E fleet until it is replaced.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

AMC/LG   POC: Lt. Col. Michael Privette (910) 394-5159

Performer: AFIT/ENV (Capt. Lance French)

Resources:	*FY*	*Dollars*	*Staff-years*
		$5,000	0.5

Schedule:	*Start*	*End*
	Mar 2001	Mar 2002

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model

AFIT/ENV-5

Title: Analysis of the Costs Estimated and Incurred Due to the Transfer of C-5 and Engine Depot Workload Following the 1995 BRAC

Summary: The purpose of the research is to compare the estimates on which the BRAC decision was based to the actual costs incurred during the transition and to the current "steady state" of the C-5 and PBA functions. The study will collect and analyze/compare of the cost data related to four aspects of the workload transfer.

1)   Baseline: Cost of C-5 depot maintenance and PBA prior to the BRAC decision;

2)   BRAC estimates of the costs once the closure of SA-ALC was complete;

3) Cost related to the transfer of workload and shut down of the facilities (related only to engine and C-5 portions of the ALC);

4) BRAC estimates for the cost of workload transfer and related shut down.

It is expected that the O&S savings predicted by the BRAC analysis have not been realized and that the costs for the closure and transition exceeded the estimates on which the decision was based.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

AFMC/FM

Performer: AFIT/ENV (Capt. Kenneth Garwood)

Resources:

FY	*Dollars*	*Staff-years*
	$5,000	0.5

Schedule:

Start	*End*
Mar 2001	Mar 2002

Data Base: Not applicable a

Publications: Pending

Keywords: Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model

AFIT/ENV-6

Title: Utility of COMPARE Cost Estimates in A-76 Actions Directed at Highly Complex or Highly Specialized Institutions

Summary: The purpose of this research will be to determine whether the use of COMPARE is appropriate for A-76 actions involving organizations with highly complex or technical labor pools. If it is determined that COMPARE is not appropriate for use, this study will identify those additional factors that should be considered in order to provide the best outsourcing decision possible. This research will utilize a qualitative and quantitative approach to analysis. A qualitative study will provide the necessary analysis to explain the complex environment of the A-76 process, in context of the target MEO. It will identify relationships and influencing factors that are key considerations in producing an accurate and useful MEO cost estimation. This research will also provide a quantitative analysis of factors that should be added or changed when undertaking A-76 analysis of a highly complex or skilled work force. Results from research will confirm the current model (COMPARE) or will provide the basis for support and development of a new cost model.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

SAF/AQC

Performer: AFIT/ENV (Major Chris Greiman)

Resources:

FY	*Dollars*	*Staff-years*
	$5,000	0.5

108

Schedule:	_Start_	_End_	
	Mar 2001	Mar 2002	

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model, Computer Model

AFIT/ENV-7

Title: Controlling Housing Privatization with Planned Goals: Lackland AFB and Beyond

Summary: The proposed research would study the operating cost results on the initial Air Force Housing Privatization effort at Lackland AFB to determine if the Housing Privatization goals are being met. The research should answer the questions: Is Housing Privatization working as originally planned and what are the actual costs? And do we have the right post-award cost monitoring system in place to ensure Housing Privatization is working as originally planned? This thesis will provide a quantitative report on the operating cost results and the control mechanisms use to control costs on Housing Privatization efforts. This thesis will assess the cost control mechanisms to ensure the Department's goals are being met at Lackland AFB. These control systems in turn can be used on future Housing Privatization efforts.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

The Competitive Sourcing and Privatization (CS&P) Office, AFCEE,

Lackland AFB, AFCEE

Performer: AFIT/ENV (Capt. Lawrence Kokocho)

Resources:	_FY_	_Dollars_	_Staff-years_
		$5,000	0.5

Schedule:	_Start_	_End_	
	Mar 2001	Mar 2002	

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model,

AFIT/ENV-8

Title: Revising R&D Program Budgets when Considering Funding Curtailment with a Weibull Model

Summary: This research develops an analytical technique to estimate the impact of funding curtailment on an R&D program. The method quickly produces a revised budget by year for an on-going R&D program when funding in one year is reduced. We assume program requirements remain unchanged. The program duration may be unchanged or "stretched" to a later completion date. We use the Rayleigh and Weibull functions to model expenditure profiles, which forms basis of the analytical approach. Our proposed methodology accounts for budget outlay rates and inflation. We validate the proposed analytical technique using historical cost data from several programs.

Classification: Unclassified

Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765
	Attn: LTC William Stockman (937) 255-3636 ext. 4796
	LTC Mark Gallagher (937) 255-6565 ext. 4335
	Also sponsored by OSD/PAE
Performer:	AFIT/ENV (Capt. Paul Porter)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2000	Mar 2002

Data Base:	Not applicable
Publications:	Pending
Keywords:	Estimating, Analysis, Acquisition Strategy, Economic Analysis, Mathematical Model, Statistics/Regression

AFIT/ENV-9

Title:	Estimating C-17 Operating and Support Costs: Development of a Systems Dynamic Model
Summary:	This research focuses on applying system dynamics models to O&S costing, specifically modeling aspects of the C-17 program. The model uses Fleetsight proprietary software and demonstrates that including causal relationships (modeled through differential equations) does a better job of predicting future O&S costs.
Classification:	Unclassified
Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765
	Attn: LTC William Stockman (937) 255-3636 ext. 4796
	Also sponsored by the C-17 Program Office, WPAFB, OH
Performer:	AFIT/ENV (Capt. Chris Purvis)

Resources:

FY	Dollars	Staff-years
	$2,500	0.5

Schedule:

Start	End
Mar 2000	Mar 2001

Data Base:	Fleetsight model database
Publications:	Pending
Keywords:	Estimating, Weapon Systems, Operations and Support, Sustainability, Method, Mathematical Model

AFIT/ENV-10

Title:	Converting Tacit Knowledge into Explicit Knowledge in the Cost Analysis Knowledge Domain
Summary:	Using a Knowledge Management framework, this study demonstrates a process to generate, organize, and develop expert knowledge as a means to minimize knowledge

loss due to turnover as applied to the cost career field. The methodology presented in this thesis is a four-step, tailored approach to identify tasks or processes important to the functioning of an organization, capture knowledge from experts pertaining to those tasks (generate content), convert that knowledge into a flowchart (organize content), and have experts critique the end product to ensure accuracy and usefulness (develop content). The methodology capitalizes on proven knowledge elicitation techniques for the generation of knowledge and a commercial-off-the-shelf software program, Microsoft Excel, for the organization and representation of knowledge in the form of a flowchart.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

Also sponsored by SAF/FMC and ASC/FMC

Performer: AFIT/ENV (Lt. Ryan Rueve)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2000	Mar 2001

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Case Study, Method, Expert System

AFIT/ENV-11

Title: Estimating Budget Relationships with a Leontief Input-Output Model

Summary: The Leontief Input-Output model has previously been used to model the Department of Defense's (DoD) budget, however that model was rejected for political reasons. We contend that the Air Force's budget should be able to be modeled using a similar technique. In order to maximize one part of the Air Force's budget, the interrelationships between that sector and the other sectors need to be known. In this research we look at different methods of how the functional areas might interact. We demonstrate our methodology on two data sets – DoD and the Air Force aggregate budget data. By looking at how the functional areas interact we hoped to be able to find a sound methodology that would provide assistance to Air Force leadership for determining appropriate levels of funding.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

LTC Mark Gallagher (937) 255-6565 ext. 4335

Also sponsored by OSD/PAE

Performer: AFIT/ENV (Lt. Guenever Shariff)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2000	Dec 2000

Data Base:	Not applicable
Publications:	Pending
Keywords:	Estimating, Analysis, Acquisition Strategy, Economic Analysis, Mathematical Model, Statistics/Regression

AFIT/ENV-12

Title:	Development of a Model to Describe the Effects of a Loss of Learning in Defense Production Processes
Summary:	Studies on the effects of interruptions in the learning process have been accomplished in the past, but no effective parametric models have been developed. Currently non-parametric models have a high degree of subjectivity. This study will result in a parametric model for ASC/FMCE that calculates the slope and T1 after the production break based on inputs from the user. The accuracy of the model will be assessed in the study. Currently, ASC/FMCE uses LEARN as a learning curve calculation tool. LEARN does not have loss-of-learning predictive capability. LEARN was developed at AFIT by a prior student and is a DOS-based program. Ideally, the researcher will transfer the LEARN program into a Windows environment and add loss of learning predictive capabilities to the program.
Classification:	Unclassified
Sponsor:	AFIT/ENV 2950 P Street (Bldg. 640) WPAFB, OH 45433-7765
	Attn: LTC William Stockman (937) 255-3636 ext. 4796
	Capt. Tony White (937) 255-3636 ext. 4524
	ASC/FMCE
Performer:	AFIT/ENV (Capt. Vincent Sipple)

Resources:	*FY*	*Dollars*	*Staff-years*
		$5,000	0.5

Schedule:	*Start*	*End*
	Mar 2001	Mar 2002

Data Base:	Not applicable
Publications:	Pending
Keywords:	Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model,

AFIT/ENV-13

Title:	Source Selection Cost Support
Summary:	The purpose of this research is to show that the current acquisition environment requires more innovative solutions and a better-educated source selection workforce to support future acquisition decisions. This research proposes to study major source selections over the past five years to determine the major issues that drove the final decisions and the required level of analytical support. The study would include the current support structure and workforce to see if adequate support is available. In addition, the study will show how to augment the current resources to bring better analytical support to source selection teams. This research will produce a qualitative and quantitative analysis report on the major challenges facing upcoming source selections. A key deliverable would be recommendations on analytic approaches and required resources to solve expected source selection challenges.
Classification:	Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

SAF/AQC

Performer: AFIT/ENV (Lt Anthony Smith)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2001	Mar 2002

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Acquisition Strategy, Economic Analysis, Mathematical Model

AFIT/ENV-14

Title: BRAC to the Future: An Analysis of Past Savings from Base Closings

Summary: This thesis uses regression to analyze the savings resulting from the previous four rounds of BRAC in terms of their affect on each of the Air Force budget appropriations. For each appropriation, while the number of major installations initially appears to be a significant determinant in explaining the change in the budget, the number of bases becomes insignificant if a surrogate for Air Force mission requirements is included as the explanatory variable. We tested three surrogate measures for mission requirements: number of flying hours, number of aircraft, and number of active duty personnel. In each case, we found the number of active duty Air Force members to be a better predictor of the budget level than the regression model that included the number of major installations. We conclude that mission requirements are a better indicator of the required funding than the number of major installations.

Classification: Unclassified

Sponsor: AFIT/ENV   Also sponsored by OSD/PAE
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WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

LTC Mark Gallagher (937) 255-6565 ext. 4335

Performer: AFIT/ENV (Capt. Charles Tapp)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2000	Mar 2001

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Infrastructure, Acquisition Strategy, Economic Analysis

AFIT/ENV-15

Title: Relating Initial Budget to Program Growth with a Rayleigh Model

Summary: Previous research on completed defense R&D shows that contract expenditures can be fit well with a Rayleigh model. With fixed outlay rates, as prescribed by the OSD

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comptroller, the budget profile must have most of the funds in the early years to produce Rayleigh-distributed expenditures. R&D program with more delayed funding profiles may also produce expenditures that a Rayleigh model fits through schedule slips and cost overruns. This research tests how well the initial funding profile produces Rayleigh-distributed expenditures can be related to the program's final cost overrun and schedule slips. Based only on the initial budget profile, we explain 53.3% of cost overruns and 51.1% of percent schedule slip in 37 completed programs.

Classification: Unclassified

Sponsor: AFIT/ENV
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Also sponsored by OSD/PAE

Performer: AFIT/ENV (Capt. Eric Unger)

Resources:

FY	Dollars	Staff-years
	$5,000	0.5

Schedule:

Start	End
Mar 2000	Mar 2001

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Analysis, Acquisition Strategy, Economic Analysis, Mathematical Model, Statistics/Regression

AFIT/ENV-16

Title: Calculating Overhead Savings in Source Selections

Summary: This thesis evaluated past source selections where overhead savings calculations were used. This study evaluated those cost estimating models, determined their weaknesses and developed a better cost model.

Classification: Unclassified

Sponsor: AFIT/ENV
2950 P Street (Bldg. 640)
WPAFB, OH 45433-7765

Attn: LTC William Stockman (937) 255-3636 ext. 4796

Performer: AFIT/ENV (Capt. William Ward)

Resources:

FY	Dollars	Staff-years
		0.5

Schedule:

Start	End
Mar 2000	Mar 2001

Data Base: Not applicable

Publications: Pending

Keywords: Estimating, Infrastructure, Acquisition Strategy, Economic Analysis

Aerospace Corporation (AERO)

Name:	Cost and Requirements Department, The Aerospace Corporation
Address:	2350 E. El Segundo Blvd., El Segundo, CA 90245
	Mail: M4-021, P.O. Box 92957, Los Angeles, CA 90009-2957
Director:	Mr. Carl Billingsley
Size:	Professional: 15 Support: 1 Consultants: 1,000 Aerospace Corporation Engineers Subcontractors: 0
Focus:	Space-system cost modeling and estimating, Relationship between requirements and cost, Cost-risk Analysis, Commercial practices, Statistical issues in cost analysis, Schedule analysis, ' cost/schedule/performance/design/architecture trade studies.
Activity:	Number of projects in process: 5 Average duration of a project: 1 year Average number of staff members assigned to a project: 2 Average number of staff-years expended per project: 1.0 Percentage of effort conducted by consultants: (Aerospace Corp. engineers) 20% Percentage of effort conducted by subcontractors: 0%

AERO-1

Title:	Space Systems Costing Suite
Summary:	Update of the existing Aerospace Corporation Satellite Cost Model. Future funding will be used for updating Aerospace Corporation's Launch Vehicle and Ground Systems Cost Models. Developments planned for the Space Systems Costing Suite includes new Infrared Sensor Payload and new Integrated Ground Stations Design and Costing Models.
Classification:	Unclassified
Sponsor:	The Aerospace Corporation's Internal Research and Development (IR&D) Program
Performer:	The Aerospace Corporation, P.O. Box 92957, MS: M4-903, Los Angeles, CA 90009-2957; Ron Hovden, (310) 336-5832, ronald.e.hovden@aero.org

Resources:

FY	Dollars	Staff-years
01	$100,000	0.2

Schedule:

Start	End
FY01	Ongoing

Data Base:

Title:	None
Description:	None
Automation:	None

Publications:	None as yet
Keywords:	Industry, Government, Estimating, Space Systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model

AERO-2

Title:	Costs of Space, Launch, and Ground Systems
Summary:	Historical costs of space, launch, and ground systems, including non-recurring and recurring costs of military and civil satellites and launch vehicles, payloads, launch processing, launch delays, launch failures, software, ground facilities, learning rates, and cost overruns.
Classification:	Contractor-Proprietary; Government/FFRDC Eyes Only
Sponsor:	The Aerospace Corporation's Internal Research and Development (IR&D) Program
Performer:	The Aerospace Corporation, P.O. Box 92957, MS: M4-021, Los Angeles, CA 90009-2957; Larry Sidor, (310) 336-1571

Resources:

FY	Dollars	Staff-years
01	$70,000	0.1

Schedule:

Start	End
FY87	Ongoing

Data Base:

Title:	Costs of Space, Launch, and Ground Systems
Description:	Contractor-Proprietary Historical Costs ("Actuals" only)
Automation:	Microsoft Excel spreadsheets

Publications:	"Costs of Space, Launch, and Ground Systems," The Aerospace Corporation, 270 Briefing charts and facing page text, September 2000
Keywords:	Industry, Government, Estimating, Space Systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model

AERO-3

Title:	Ground Station Cost Model (GSCM)
Summary:	Design and to develop a ground system model incorporating COTS equipment that includes cost data from various sources.
Classification:	Unclassified
Sponsor:	Several Aerospace Corporation Program Offices
Performer:	The Aerospace Corporation, P.O. Box 92957, MS: M4-903, Los Angeles, CA 90009-2957; N. L. Strang (310) 336-6797 and L. B. Sidor (310) 336-1571, laurent.b.sidor@aero.org

Resources:

FY	Dollars	Staff-years
00	20,000	0.1
01	180,000	1.0

Schedule:

Start	End
FY00	Ongoing

Data Base:

Title:	GSDOD Database
Description:	Cost database
Automation:	None

Publications:	None as yet.
Keywords:	Industry, Acquisition Strategy, Estimating, Space Systems, Concept Development, Case Study, Computer Model

AERO-4

Title:	Earned-Value Management Indicators for Space Systems
Summary:	Analyze space system data found in the OSD Defense Acquisition Executive Summary (DAES) database to determine "rules-of-thumb" for earned value management indicators and compare them to published research based on a broad collection of DoD contracts.
Classification:	Unclassified
Sponsor:	The Aerospace Corporation's Internal Research and Development (IR&D) Program
Performer:	The Aerospace Corporation, 15049 Conference Center Drive, MS: CH1-410 Chantilly, VA 20151; Jonathan Gayek, (703) 633-5148, jonathan.e.gayek@aero.org

Resources:

FY	Dollars	Staff-years
01	$50,000	0.1

Schedule:

Start	End
FY01	Ongoing

Data Base:	None
Publications:	None as yet
Keywords:	Space System

AERO-5

Title:	The Aerospace Corporation Small Satellite Cost Model (SSCM)
Summary:	Parametric (CER-based) cost model, including cost-risk analysis capability, for estimating the cost of developing and producing a small- or micro-satellite bus.
Classification:	Different forms of the model are releasable to government organization (e.g., DoD, NASA, NOAA) and to contributors of proprietary cost data on small- and micro-satellites.
Sponsor:	Several Aerospace Corporation Program Offices
Performer:	The Aerospace Corporation, P.O. Box 92957, MS: M4-021, Los Angeles, CA 90009-2957; Jim Summers, (310) 336-6802, perry.j.summers@aero.org

Resources:

FY	Dollars	Staff-years
01	$ 20,000	0.1

Schedule:

Start	End
FY87	Ongoing

Data Base:

Title:	The Aerospace Corporation Small Satellite Cost Model (SSCM)
Description:	Proprietary cost and technical data on current generation of small- and micro-satellite, low weight, single purpose, short lifetime, tactical, research or experimental satellites, including military, civil, commercial, university and foreign.
Automation:	Microsoft Excel spreadsheets

Publications:	P. J. Summers, N. Y. Lao, J. J. Muhle, "The Aerospace Corporation Small Satellite Cost Model," Aerospace Corporation Technical Report, May 2001
Keywords:	Industry, Government, Estimating, Space Systems, Life Cycle, Acquisition Strategy, Data Collection, Mathematical Modeling, Statistics/Regression, CER, Computer Model, Risk/Uncertainty, Concept Development, Demonstration/Validation,

MITRE Corporation (MITRE)

Name:	The MITRE Corporation The Economic and Decision Analysis Center (EDAC)
Address:	1820 Dolley Madison Boulevard McLean, VA 22102
Director:	Mr. Raymond Haller, (703) 883-7196
Size:	Professional: 100 Support: 6 Consultants: 0 Subcontractors: 0
Focus:	Cost and applied economic analysis, decision analysis, acquisition analysis, program management, risk management and analysis, life cycle management, logistics engineering, business process reengineering, business and technology case analysis, and information services and technology benchmarking.
Activity:	Number of projects annually: 180 Average duration of a project: 3-months Average number of staff members assigned to a project: 2 Average number of staff-years expended per project: 0.5 Percentage of effort conducted by consultants: 0% Percentage of effort conducted by subcontractors: 0%

MITRE-1

Title:	C4ISR Investment Strategies
Summary:	This project is developing a research roadmap for improving MITRE's methods, tools, databases, and guidance for C4ISR investment strategy decisions.
Classification:	Unclassified
Sponsor:	MITRE IR&D
Performer:	MITRE

Resources:

FY	Dollars	Staff-years
01	$177,000	

Schedule:

Start	End
Oct 98	Sept 01

Data Base:	*Title:*	US Weapon Systems and Cost Database
	Description:	A database of US weapon systems technical characteristics and costs to support C4ISR mission assessment and investment studies
	Automation	Excel initially with a migration to Access
Publications:		Weapon Systems Database, MTR 99W0000118, October, 1999
Keywords:		Government, Analysis, Forces, Weapon Systems, Mathematical Modeling, Economic Analysis

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Title:	The Value of Return on Investment (ROI) Analysis to Non-Profit Organizations
Summary:	MITRE is currently conducting research to determine how the government and other non-profit organizations can maximize benefit from ROI analysis. Through this research, MITRE will develop a guideline to help government agencies determine if and how ROI should be analyzed for particular investment options. This guideline will include a robust, scalable definition of ROI analysis that can more effectively be applied by government sponsors than existing methods and will promote a recommended standard approach for calculating ROI.
Classification:	Unclassified
Sponsor	MITRE IR&D
Performer:	MITRE

Resources:

FY	Dollars	Staff-years
01	$295,000	1.2

Schedule:

Start	End
Oct 00	Sept 01

Data Base:	None
Publications:	Final report will be written
Keywords:	Industry, Estimating, Infrastructure, Demonstration/Validation, Data Collection, Survey, Case Study, Method

Title:	Integrating the Balanced Scorecard with Decision Analytics to Support IT Investment Decisions
Summary:	MITRE and sponsors currently use the Balanced Scorecard approach (Kaplan and Norton, HBS, 1996) as a descriptive tool for understanding historical enterprise or project well-being. The objective of this research is to determine how the Balanced Scorecard can be enhanced with decision analytic methodologies to more effectively support sponsor CIO's in IT investment decision-making.
Classification:	Unclassified
Sponsor	MITRE IR&D
Performer:	MITRE

Resources:

FY	Dollars	Staff-years
01	$400,000	2.2

Schedule:

Start	End
April 99	Sept 01

Data Base:	None
Publications:	Final report will be written
Keywords:	Industry, Infrastructure, Demonstration/Validation, Data Collection, Survey, Case Study, Computer Model, Method

MITRE-4

Title: Public Sector Virtualization: Costs, Benefits, and Risks

Summary: In the past, "brick and mortar" investments—such as computers, software, and facilities—were required to obtain IT functionality. A more recent trend—virtualization—is to obtain the same functionality as a service. This service is typically delivered over a WAN, which may be the public Internet or, for enterprise critical functionality, over a VPN. The virtualization concept can be applied to both the functionality required for the enterprises' internal operation (this so called "back office" application such as payroll, accounting, logistics, and human resources) as well as the "front office" (the means by which the enterprises communicates with and services its end customers). This research will investigate virtualization costs, risks, and benefits from the perspective of a Federal agency. Both business and technical issues will be explored. The outcome will be guidance for Federal agencies that will help to quantify benefits as well as identify and provide mitigation tactics for dealing with the risks associated with this new service acquisition approach.

Classification: Unclassified

Sponsor MITRE IR&D

Performer: MITRE

Resources:

FY	Dollars	Staff-years
01	$150,000	

Schedule:

Start	End
Oct 00	Sept 03

Data Base: None

Publications: Three annual reports, as well as shorter white-papers, will be written.

Keywords: Industry, Infrastructure, Demonstration/Validation, Data Collection, Survey, Case Study, Computer Model, Method

RAND Corporation (RAND)

Name:	RAND Corporation Note: RAND has a center of excellence for cost analysis, but cost analysts also work on other, non-cost research projects within the various DoD-oriented divisions (Project Air Force, Arroyo Center, and National Defense Research Institute).
Address:	Main Office: 1700 Main Street Santa Monica, CA 90407-2138 Cost Research Office is located in the Washington office at: 1200 South Hayes Street, Suite 7310 Arlington, VA 22202-5050
Director:	Mr. Fred Timson, (310) 393-0411, ext. 7802 POC: John C. (Jack) Graser (703) 413-1100 Ext. 5293
Size:	Professional: 13 Support: 0 Consultants: 2 Subcontractors: 0
Focus:	Acquisition, force structure, and operations and support costing for aircraft, missile and space systems.
Activity:	Number of projects in process: 5 Average duration of a project: 1-2 years Average number of staff members assigned to a project: 1-3 Average number of staff-years expended per project: 0.5 to 4 Percentage of effort conducted by consultants: 15% Percentage of effort conducted by subcontractors: 0%

RAND-1

Title:	Military Airframe Costs: The Effects of Advanced Materials and Manufacturing Processes
Summary:	Military airframe structures are using increasing amounts of advanced materials such as composites, titanium, and aluminum lithium alloys instead of traditional aluminum structure in order to reduce airframe weight and increase aircraft performance capabilities. In addition, an evolution in fabrication and assembly processes has taken place which promises to reduce cost and improve product quality. These developments require that historical cost estimating methods be updated so that government and industry analysts can more accurately capture these innovations in their cost estimates of future aircraft. Consequently, the goal of the research was to develop a cost estimating methodology that uses historical data and adjustment factors to account for the extensive use of advanced material and modern fabrication techniques in military airframe structure. The study contains factors which can be used early in an aircraft development, when specific design information may be sketchy, as well as detailed part-level factors useful for both Milestone II and III estimates.
Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor

Air Force Cost Analysis Agency, Research and Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer:	RAND
Resources:	Project is complete
Schedule:	*Start* *End*
	Feb 1998 Mar 2001
Data Base:	None
Publications:	Final Report RAND MR-1370-AF
Keywords:	Industry, Analysis, Aircraft, Material, Study

RAND-2

Title:	An Overview of Acquisition Reform Cost Savings Estimates
Summary:	This report developed a taxonomy of acquisition reform measures, and presents a survey and assessment of publicly reported cost savings attributed to various categories of reform measures. In addition, it presents the views of numerous prime contractors on acquisition reform cost savings, based on a series of interviews conducted in 1998. Finally, it discusses some "rules of thumb" for adjusting cost models to reflect potential acquisition reform savings. The taxonomy of current major acquisition reform measures and initiatives was developed for the purpose of assigning estimated cost savings to specific elements. There are three major acquisition reform categories included in the RAND taxonomy: (1) reducing regulatory and oversight burden; (2) commercial-like program structure based on Cost As an Independent Variable (CAIV); and (3) multi-year procurement.
Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Project is complete
Schedule:	*Start* *End*
	Feb 1998 Mar 2001
Data Base:	None
Publications:	Final Report RAND MR-1329-AF
Keywords:	Government, Analysis, Acquisition Strategy, Study

RAND-3

Title:	Military Airframe Production Costs: The Effect of Lean Manufacturing
Summary:	Lean manufacturing offers a systematic approach to analyzing and removing sources of inefficiency and waste in production, while maximizing the synergies between functions and between manufacturers, their suppliers, and their customers. Advocates claim that implementing the lean system will result in better performance, improved quality and a lower price. The U.S. Air Force has encouraged aircraft manufacturers to implement lean manufacturing as part of an effort to make new weapons systems more affordable. This report includes a broad overview of lean manufacturing and many of the specifics that go into the system. Results from the initial implementation efforts at airframe manufacturers

are discussed. Areas where companies need to push harder are addressed, as well as suggestions about what else needs to be done, both by the companies themselves, and for their customer, the U.S. Department of Defense. Finally, recommendations on how to adjust for lean manufacturing initiatives in weapon systems cost estimates are included, as well as how claimed lean manufacturing savings should show up in CCDR categories.

Classification: Unclassified

Sponsor: SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor

Air Force Cost Analysis Agency, Research and Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer: RAND

Resources: Project is complete

Schedule: *Start*   *End*

Feb 1998   Mar 2001

Data Base: None

Publications: Final Report RAND MR-1325-AF

Keywords: Industry, Estimating, Aircraft, Production, Study

RAND-4

Title: The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives

Summary: This report covers the overall methodology, candidate cost driving parameters and other factors for developing CERs for future military aircraft avionics system production cost estimates. In addition, the report includes a set of component-level CERs by subsystem developed and tailored for a case study for the Joint Strike Fighter (JSF) avionics production baseline configuration defined during the program's Concept Definition Phase (CDP). The report is proprietary and classified confidential. Distribution is on hold until after the JSF Source Selection for EMD is complete in the Fall of 2001.

Classification: Confidential

Sponsor: SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor

Air Force Cost Analysis Agency, Research and Resource Management Division
Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451
E-mail: Lynn.Davis@pentagon.af.mil

Performer: RAND

Resources: Project is complete

Schedule: *Start*   *End*

Nov 1998   Mar 2001

Data Base: None

Publications: Final Report RAND DB-313-AF (Limited Distribution)

Keywords: Government, Estimating, Electronics/Avionics, Production, Mathematical Modeling

RAND-5

Title: Turbine Engine Costs: A Primer and Cost Estimating Methodologies

Summary: The last significant RAND turbine engine cost studies date from the late 1970s and early 1980s. ("Life Cycle Analysis of Aircraft Turbine Engines," R-2103-AF, published in 1977, by J. R. Nelson and "Development and Production Cost Estimating Relationships

for Aircraft Turbine Engines," N-1882-AF, published in 1982, by J. L. Birkler, et.al). The objectives of the study are :

In Phase I, develop a methodology to estimate development and production costs of future turbine engines, and evaluate the effects of DoD acquisition reform and industry affordability initiatives on engine costs. In Phase II, develop operations and support cost drivers and cost estimating methodologies for O&S costs.

Classification:	Unclassified
Sponsor:	SAF/AQ with Jay Jordan, (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 3.0 staff years

Schedule:

Start	End
Mar 2000	Jan 2002

Data Base:	None
Publications:	In work
Keywords:	Industry, Estimating, Propulsion, Life Cycle, Mathematical Modeling, Method

RAND-6

Title:	Advanced Airframe Structural Materials Operating and Support Costs
Summary:	This project will assess the impact on the operating and support costs of military aircraft of advanced airframe structural materials versus conventional aluminum. The research will focus on all operating and support costs related to the material characteristics of aircraft components as a function of age for a variety of Air Force and Navy aircraft. These include C-17, F-16, F-15, F-117, B-2, F-22, F/A-18 A/B/C/D and E/F, AV-8B. Costs addressed will include maintenance hours and materials at the organizational, intermediate, and depot level repair levels. The products from the research will be better methodologies for use by cost analysts in estimating organizational, intermediate, and depot maintenance labor and material costs. This will provide better estimates of maintenance costs for DoD Milestone reviews, as well as for developing operating and support budgets for the services.
Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 1.5 staff years

Schedule:

Start	End
Nov 2000	Jan 2002

Data Base:	None
Publications:	In work
Keywords:	Industry, Analysis, Aircraft, Operations and Support, Material, Study

RAND-7

Title:	Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs
Summary:	The objectives of this project will be to:

Analyze the nature of current non-air vehicle costs and trends likely to effect them in the immediate future, identify key cost drivers, collect, normalize and document representative data, and develop a set of practical, documented cost estimating methodologies. These methodologies should be useful in developing estimates in the early stages of a program, before detailed technical and programmatic information is available, as well as for cross-checks later in the weapon system development phase when these more of these details should be available. The first phase of the study will examine aircraft and tactical missile test costs, then move on to systems engineering/program management costs, etc. The study will be undertaken in four phases during FYs 2001-2004.

Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 1.5 staff years annually
Schedule:	*Start* *End*
	Nov 2000 Oct 2004
Data Base:	None
Publications:	In work
Keywords:	Industry, Estimating, Aircraft, WBS, Mathematical Modeling, Method

RAND-8

Title:	Aircraft Support Cost Estimating Relationships
Summary:	The objective of this study will be to develop Cost Estimating Relationships (CERs) for specific categories of Operating and Support costs. CERs will be developed for software maintenance, modification kit acquisition and installation, sustaining engineering, maintenance manpower, depot level reparables (DLRs), consumable supplies and depot overhauls. In the next phase, improved flying hour (FH) cost factors will be developed. In the third phase, base operating support (BOS) relationships will be estimated. Finally, in the last phase, an O&S Handbook will be developed.
Classification:	Unclassified
Sponsor:	SAF/AQ, with Jay Jordan, (AFCAA/TD) as Technical Monitor
	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 1.5 staff-years annually
Schedule:	*Start* *End*
	Nov 2000 May 2003
Data Base:	None

RAND-9

Title:	Aging Aircraft
Summary:	The objective of this study is to understand and quantify the causes and potential effects of increasing USAF aircraft fleet ages with particular attention to flight safety, aircraft availability and operating costs, then to identify effective ways to manage those effects.
Classification:	Unclassified
Sponsor:	Air Force Director of Maintenance Brigadier General Terry Gabreski, AF/ILM E-mail: terry.gabreski@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 5.0 staff years

Schedule:	*Start*	*End*
	Mar 1999	Oct 2003

Data Base:	None
Publications:	In work
Keywords:	Government, Analysis, Aircraft, Operation and Support, Study

RAND-10

Title:	Analysis of Cost Growth using Selected Acquisition Reports
Summary:	The objective of this study is to analyze the contents of the DoD Selected Acquisition Reports (SARs) from their inception through the SARs submitted as part of the FY 2001 President's Budget (December 1999 annual SARs). This analysis will categorize cost growth by Service, type of system, and growth from Milestones. The database contains a wide range of programmatic information for all MDAPs in a digital format. This analysis will improve understanding of cost growth in order to enable better-informed decisions regarding both specific weapon system acquisitions and future resource and acquisition policy decisions. Potential future work would include updating the database with the annual SARs.
Classification:	Unclassified
Sponsor:	Air Force Cost Analysis Agency, Research and Resource Management Division Mrs. Lynn Davis, (703) 604-0451; DSN 664-0451 E-mail: Lynn.Davis@pentagon.af.mil
Performer:	RAND
Resources:	Approximately 0.5 staff year

Schedule:	*Start*	*End*
	Mar 2001	Oct 2001

Data Base:	None
Publications:	In work
Keywords:	Government, Analysis, Weapon System, Study

RAND-11

Title:	Understanding the Sources of Cost Growth in Weapon Systems
Summary:	This project will deliver a database of cost, schedule and cost growth measures for Major Defense Acquisition Programs, as reported in the Selected Acquisition Reports, from the inception of the SARs through December 1998.
Classification:	Unclassified
Sponsor:	OD(PA&E)
Performer:	RAND
	Fred Timson, (310) 393-0411; Rob Leonard, (310) 393-0411

Resources: <u>FY</u>   <u>Dollars</u>   <u>Staff-years</u>

Schedule: <u>Start</u>   <u>End</u>

             Jan 91   Sep 01

Data Base: *Title:*   Major Defense Acquisition Program Cost Growth Database

             Description: Cost growth histories and assorted program data on 274 weapon systems or major elements, through December 1998 SARs

             Automation: PC (Excel)

Publications: *The Defense System Cost Performance Database: Cost Growth Analysis Using SARs*, MR-625-OSD, Jarvaise, Drezner, Norton, 1996, Unclassified

Keywords: Government, Analysis, Risk/Uncertainty, Data Collection, Database, Study

CNA Corporation (CNAC)

Name:	CNA Corporation, Cost and Acquisition Team
Address:	4825 Mark Center Drive
	Alexandria, VA 22311-1850
Director:	Dr. Matthew S. Goldberg, (703) 824-2455
Size:	Professional: 6
	Support: 3
	Consultants: 10
	Subcontractors: 5
Focus:	Cost estimation for DoD programs;, analysis of DoD acquisition policy; investigation of defense industrial base
Activity:	Number of projects in process: 6
	Average duration of a project: 10 months
	Average number of staff members assigned to a project: 3
	Average number of staff-years expended per project: 2.25
	Percentage of effort conducted by consultants: 5%
	Percentage of effort conducted by subcontractors: 20%

CNA-1

Title:	Restructuring DoN FYDP Program Elements
Summary:	This project will revise the DoN (USN and USMC) program element structure to make it more useful in planning, programming, and budgeting. The revised structure will be applicable at all echelons of command, while enabling distinctions between forces and infrastructure. It should also be sufficiently flexible to accommodate both present and future force requirements, while guarding against overlaps in resources. Finally, it should provide information needed by both OSD and DoN to support decision-making and resource-allocation analysis, and it should satisfy certain other requirements defined by Navy and Marine Corps leadership.
Classification:	Unclassified
Sponsor:	DoN FYDP Improvement Project Office (Office of the CNO, N8; USMC Programs and Resources)
Performer:	CNA Corporation, Cost and Acquisition Team
	Dr. Matthew S. Goldberg, (703) 824-2455

Resources:	*FY*	*Dollars*	*Staff-years*	*FY*	*Dollars*	*Staff-years*
	00	$485,000	2.2	01	$50,000	0.2

Schedule:	*Start*	*End*
	Mar 00	Sep 01

Data Base:	*Title:*	DoN Program Element Dictionary
	Description:	Definitions of new program elements for USN and USMC, with crosswalk to old program elements
	Automation:	Microsoft Access

Publications:	To be determined
Keywords:	Government, Programming, Budgeting, Study

Title:	Acquisition Management Analysis
Summary:	This project is creating corporate profiles of the largest DoN contractors. The information contained in each profile will include the corporate organization, income statement, balance sheet, debt structure, major product lines, teaming and subcontracting arrangements, and foreign military sales. Each profile will also document the recent history in terms of stock market performance, debt issues and bond ratings, as well as other newsworthy event such as results of operational tests. The profiles will also list the DoN and other DoD programs on which the contractor is currently working, bidding, or expected to bid.
Classification:	Unclassified
Sponsor:	Assistant Secretary of the Navy, Research, Development and Acquisition
Performer:	CNA Corporation, Cost and Acquisition Team
	Dr. Matthew S. Goldberg, (703) 824-2455

Resources:	*FY*	*Dollars*	*Staff-years*	*FY*	*Dollars*	*Staff-years*
	00	$225,000	1.0	01	$300,000	1.4

Schedule:	*Start*	*End*
	Apr 00	Sep 01

Data Base:	*Title:*	Defense Contractor Corporate Profiles
	Description:	Profiles of the 10 largest DoN contractors
	Automation:	TBD

Publications:	Report on mergers, acquisitions, sales of defense-related assets, and teaming arrangements between U.S. and European defense contractors; special emphasis on BAE Systems and Rolls-Royce.
Keywords:	Industry, Acquisition Strategy, Data Base, Study

Title:	Military Hospital Cost Analysis
Summary:	This project will estimate functions to predict the annual operating costs as each CONUS military hospital. It will also develop a database that describes the beneficiary population in each catchment region. The cost functions and population data will be organized into a relational database to assist the sponsor in conducting "make-buy" analyses, comparing the cost-effectiveness of care produced at military hospitals with care purchased from civilian providers.
Classification:	Unclassified
Sponsor:	Office of the Secretary of Defense, Director, Program Analysis and Evaluation
Performer:	CNA Corporation, Cost and Acquisition Team
	Dr. Matthew S. Goldberg, (703) 824-2455

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$225,000	1.0
	01	$225,000	1.0

Schedule:	*Start*	*End*
	Apr 00	Sep 01

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Data Base:	Title:	Military Hospital Population, Workload and Cost
	Description:	Military health-care beneficiary population by geographical region; automated regression functions to predict annual operating costs of military hospitals.
	Automation:	Microsoft Access

Publications: To be determined

Keywords: Economic Analysis, Cost/Production Functions, Statistics/Regression, Data Base, Study

CNA-4

Title: Improving Metrics for Acquisition Management

Summary: This project will survey the metrics that DoN currently uses to monitor acquisition programs, as well as metrics used by other military and executive-branch departments of the federal government and by private industry. We will examine the success of these metrics in predicting the performance of past and on-going acquisition programs. We will recommend improvements that can be made to these metrics.

Classification: Unclassified

Sponsor: Assistant Secretary of the Navy, Research, Development and Acquisition

Performer: CNA Corporation, Cost and Acquisition Team

Mr. Gary Christle, (703) 824-2693

Resources:

FY	Dollars	Staff-years
01	$180,000	0.8

Schedule:

Start	End
Feb 01	Sep 01

Data Base: None

Publications: To be determined

Keywords: Government, Reviewing/Monitoring, Weapon Systems, EMD, Production, Study

CNA-5

Title: Competition, Innovations, and Productivity in the Ship Industry

Summary: This project will describe shipbuilding productivity patterns in the U.S. and in other countries that are major participants in the world ship industry. We will consider differences in wages and subsidies, and the effects of competition and innovation. The study will consider possible incentives the government could use to promote competition in the U.S. shipbuilding industry.

Classification: Unclassified

Sponsor: Under Secretary of Defense (Industrial Affairs), Industrial Capabilities and Assessments

Performer: CNA Corporation, Cost and Acquisition Team

Dr. LaVar Huntzinger, (703) 824-2255

Resources:

FY	Dollars	Staff-years
01	$300,000	1.4

Schedule:

Start	End
Feb 01	Sep 01

Data Base: None

Publications: To be determined

Keywords: Industry, Ships, Manufacturing, Study

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Title:	Army Acquisition Management
Summary:	The study will critique the Army's material development process; assess the Army's alternatives to material solutions to solve validated deficiencies; review the Army's resource-management organizations; critique the Army's PPBS process; and review the Army's Science and Technology, Research and Development, and material acquisition organizations.
Classification:	Unclassified
Sponsor:	Under Secretary of the Army
Performer:	CNA Corporation, Cost and Acquisition Team
	Mr. Gary Christle, (703) 824-2693

Resources:

FY	Dollars	Staff-years
01	$1,000,000	4.5

Schedule:

Start	End
Oct 00	Sep 01

Data Base:	None
Publications:	To be determined
Keywords:	Government, Reviewing/Monitoring, Weapon Systems, Programming, Budgeting, Study

Institute for Defense Analyses (IDA)

Name:	Institute for Defense Analyses
Address:	1801 N. Beauregard Street Alexandria, VA 22311-1772
Director:	Dr. Stephen J. Balut, (703) 845-2527, E-mail: sbalut@ida.org
Size:	Professional: 50 Support: 5 Consultants: 40 Subcontractors: 1
Focus:	Cost of Weapon Systems, Forces and Operation
Activity:	Number of projects in process: 42 Average duration of a project: 1 year Average number of staff members assigned to a project: 2-4 Average number of staff-years expended per project: 2 Percentage of effort conducted by consultants: 30% Percentage of effort conducted by subcontractors: 2%

IDA-1

Title: Assessment of CCDR System

Summary: The OSD Cost Analysis Improvement Group (CAIG) maintains an integrated cost research program to improve the technical capabilities of the DoD to estimate the costs of major equipment. The CAIG works with DoD components to determine relevant costs, collect and make available related actual costs, and develop techniques for projecting them. An important part of the CAIG charter is to develop and implement policy to provide for the appropriate collection, storage, and exchange of information concerning improved cost estimating procedures, methodology, and data necessary for cost estimating.

During the past five years, the CCDR Project Office (CCDR-PO) has led an ongoing joint DoD and industry effort to re-engineer CCDR policies and business rules to improve the quality, relevancy, and availability of actual cost data. Significant progress has been made with the release of the CCDR Manual, changes to the DoD 5000.2-R, Mandatory Procedures for MDAPs and MAIS Acquisition Programs, revisions to the reporting formats, and deletion of the Plant-Wide Data Report requirement. While much has been done several critical areas still need to be addressed such as changing and integrating report formats, identifying new ways to access cost data from other sources (e.g., the Service Cost Centers), assessing the effect of new reporting requirements for software projects, and exploring alternative reporting approaches.

Classification: Unclassified

Sponsor: OSD (PA&E)
WSCAD/CCDR-PO
Suite 500, CGN
Arlington, VA

Lt. Col. Dave Robinson (703) 602-3169

Performer:	IDA		
	Mr. John Cloos (703) 845-2506		
Resources:	*FY*	*Dollars*	*Staff-years*
	FY99	$150,000	
	FY01	$150,000	
Schedule:	*Start*	*End*	
	Oct 96	Feb 02	
Data Base:	Not applicable		
Publications:	None		
Keywords:	Government, Industry, Analysis, Labor, Material, Schedule, Study		

IDA-2

Title:	Economic Drivers of Defense Overhead Costs
Summary:	The objective of this task is to identify the economic and regulatory factors that drive the overhead costs charged by defense firms. A theoretical model of overhead costs from an economic framework will be developed. The model will be used to analyze the relationship of economic factors and DoD regulations on contractor overhead costs under current business practices. The model will also assess how changes in DoD regulations impact the balance of economic forces.
Classification:	Unclassified/Company Proprietary
Sponsor:	OD(PA&E)
	The Pentagon, Rm. BE799
	Washington, DC 20301
	Mr. Gary Pennett, (703) 695-4348
Performer:	IDA
	Dr. Thomas Frazier, (703) 845-2132

Resources:	*FY*	*Dollars*	*Staff-years*
	95	$250,000	
	96	$250,000	
	00	$175,000	

Schedule:	*Start*	*End*
	Apr 95	Sep 01

Data Base:	*Title:*	IDA's Defense Contractor Overhead Data Base, Contractor Cost Data Reports
	Description:	
	Automation:	TBD

Publications:	"Renegotiation of Fixed Price Contracts on the F-16 Program," IDA Paper P-3286, December 1996.
Keywords:	Industry, Government, Estimating, Overhead/Indirect, Economic Analysis, Study

IDA-3

Title:	Cost of Stealth
Summary:	The objective of this task is to estimate the cost of obtaining signature reduction for tactical aircraft through (1) adaptation of experiences gained by accomplished programs; and (2) technologies that will contribute to reductions in cost or signature in the future.
Classification:	Top Secret/Proprietary Information/Special Access

Sponsor:	USD(AT&L)
	S&TS/AW
	The Pentagon, Rm. 3E1081
	Washington, DC 20301

Mr. Mutzelburg, (703) 695-0525

Performer: IDA
Dr. J. R. Nelson, (703) 845-2571

Resources:

FY	Dollars	Staff-years
Prior	$835,000	4.5
01	$100,000	0.5

Schedule:

Start	End
Oct 96	Continuing

Data Base: Not available

Publications: Final Draft Paper for sponsor review in June 2001.

Keywords: Government, Estimating, Analysis, Aircraft, EMD, Production, Operations and Support, Schedule, Data Collection, Data base, Methods

IDA-4

Title: Costs & Benefits of Installation of Flight Safety Systems on F-22 Aircraft

Summary: Investigate and assess the incremental life-cycle costs and benefits of potential flight safety-related investments for the F-22A aircraft.

Classification: Unclassified/Proprietary Information

Sponsor: USD(AT&L)
S&TS/AW
The Pentagon, Rm. 3E1081
Washington, DC 20301

Mr. Dean Gissendanner, (703) 695-7036

Performer: IDA
Dr. J. R. Nelson, (703) 845-2571

Resources:

FY	Dollars	Staff-years
99	$395,000	2.0

Schedule:

Start	End
Jan 99	Nov 99

Data Base: None

Publications: "Costs and Benefits of the Installation of Certain Flight Safety Systems on the F-22A Aircraft," IDA Paper P-3487

Keywords: Government, Estimating, Analysis, Aircraft, EMD, Production, Operations and Support, Schedule, Data Collection, Data base, Methods

IDA-5

Title: Technical and Schedule Risk Assessments for Tactical Aircraft Programs

Summary: This task supports Air Warfare/Strategic and Tactical Systems in providing independent program assessments of technical and schedule risks for tactical aircraft and missiles to the OIPT (Overarching Integrated Product Team) for DAB milestone reviews. This is a continuing project.

Classification: Secret/Proprietary Information

Sponsor:	USD(AT&L), S&TS/AW
	The Pentagon, Rm. 3E1081
	Washington, DC 20301

Mr. Dean Gissendanner, (703) 695-7036

| Performer: | IDA |
| | Dr. J. R. Nelson, (703) 845-2571 |

Resources:	*FY*	*Dollars*	*Staff-years*
	Prior	$610,000	3.5
	01	$40,000	0.2

| Schedule: | Start | End |
| | Feb 92 | Continuing |

Data Base: Not applicable

Publications: To be determined

Keywords: Government, Analysis, Aircraft, EMD, Production, Schedule, Risk/Uncertainty, Data Collection, Data base, Methods

IDA-6

Title: Aircraft Production Capacity Analysis at the Plant Level

Summary: This task characterizes military fixed-wing aircraft production sites, and collects and analyzes financial and technical data to determine the costs and capabilities of existing plants, and to identify opportunities to reduce cost in this defense industry sector.

Classification: Secret/Proprietary Information

| Sponsor: | USD(AT&L)/IA/ICA |
| | Washington, DC 20301 |

Ms. Christine Fisher, (703) 601-5008

| Performer: | IDA |
| | Dr. Thomas P. Frazier, (703) 845-2132 |

| Resources: | *FY* | *Dollars* | *Staff-years* |
| | Prior | $950,000 | 5 |

| Schedule: | *Start* | *End* |
| | June 99 | Sept. 01 |

Data Base: Defense Industry Aircraft Fixed-Wing Financial and Technical Data at Contractor Plants

Publications: Draft Paper in work

Keywords: Government, Estimating, Analysis, Aircraft, Production, Data Collection, Data base, Methods

IDA-7

Title: Industrial Sector Capability Analysis

Summary: Provide assessments of various weapon production sectors to support DUSD(IA) mission of ensuring that the defense industrial base can reliably provide affordable products and services to support defense needs. Assessments include characterization of the firms' capacity and capabilities, analysis of existing capacity as compared to expected demand, and other issues which might effect the industrial base. The current sector being analyzed is the development and production of guided missiles and precision guided munitions. The task also provides rapid turnaround assessments of breaking issues, such as an

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industrial impact assessment in support of the recent V-22 review panel, and an assessment of the impact of a proposed merger of defense contractors.

Classification: Unclassified Proprietary

Sponsor: DUSD(IA)/ICA
3300 Defense Pentagon (Room 3E1060)
Washington, DC 20301-3300
Ms. Christine Fisher (703) 681-8996

Performer: IDA
Mr. James Woolsey, (703) 845-2133

Resources:

FY	Dollars	Staff-years
01	$700K	3.7
02	$350K	1.8

Schedule:

Start	End
Jan 01	Jan 02

Data Base: N/A

Publications: TBD

Keywords: Industrial base, infrastructure, missiles

IDA–8

Title: Support to F-22A Aircraft Production Readiness Assessment

Summary: Support the F-22 DAB LRIP Production Readiness Assessment, which was originally scheduled for December, 1999, and is now scheduled for June, 2001. IDA effort includes analysis of the feasibility of the planned production and test schedules, including comparisons to historical programs. IDA is also providing an assessment of the program's general progress and current technical issues.

Classification: Unclassified Proprietary

Sponsor: DUSD(IA)/ICA
3300 Defense Pentagon (Room 3E1060)
Washington, DC 20301-3300
Mr. Martin Meth (703) 588-0189

Performer: IDA
Mr. James Woolsey, (703) 845-2133

Resources:

FY	Dollars	Staff-years
99	$30K	0.15
00	$80K	0.4
01	$80K	0.4

Schedule:

Start	End
Aug 99	Continuing

Data Base: Not applicalbe

Publications: To be determined

Keywords: Schedule, Production Schedule

IDA–9

Title: Affordable Multi-Missile Manufacturing (AM3)

Summary: IDA will support DARPA/DoD evaluation of missile industry cost reduction initiatives to be submitted in the form of Integrated Portfolio Benefit Analyses. As part of this support,

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IDA will provide guidance to the industry teams related to analytical ground rules and methods. IDA will comment on the realism of the proposed savings and, where appropriate, recommend adjustments. Summarized findings will be presented as a report, and will be used in the award of Phase III Factory Demonstrations.

Classification: Unclassified

Sponsor: Defense Advanced Research Projects Agency
3701 North Fairfax Drive
Arlington, VA 22203-1714

Dr. Bill Scherun, (703) 696-2224

Performer: IDA

Dr. Thomas P. Frazier, (703) 845-2132

Resources:

FY	Dollars	Staff-years
96	$200,000	1.25
97	$200,000	1.25
98	$325,000	2.25
00	$300,000	2.00

Schedule:

Start	End
Nov 95	Sep 01

Data Base: None

Publications: Final Report

Keywords: Industry, Estimating, Analysis, Missiles, EMD, Production, Operations and Support, Labor, Material, Overhead/Indirect, Engineering, Manufacturing, Acquisition Strategy, Automation, Integration, Data Collection, Mathematical Modeling, Statistics/Regression, Data Base, Review, CER, Study

IDA-10

Title: Portfolio Optimization Feasibility Study

Summary: This study began as an investigation of the feasibility of applying optimization technology for defense acquisition planning purposes. Initially we focused on exploring the feasibility of using optimization technology to develop a Master Production Schedule for 80 ACAT1 systems. An initial prototype model was developed for a Master Production Schedule of 8 systems. Beginning August 1999 the study progressed to development of an optimization system for the Master Production Schedule of 80 ACAT1 systems. This system was developed in September 2000 and has been deployed to OUSD(AT&L). The system is currently being modified for performance improvements and the addition of RDT&E.

Classification: Unclassified

Sponsor: OUSD(AT&L)
Dr. Nancy Spruill
Mr. Phil Rodgers (COTR)

Performer: IDA
Dr. Charles Weber (703) 845-6784

Resources:

FY	Dollars	Staff-years
98	$90,000	0.5
99	$450,000	2.4
00	$1,200,000	5.6
01	$450,000	2.4

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Schedule:	Start	End
	Jun 98	Continuing

Data Base: *Title:* Portfolio Optimization Model Database

Description: Production profiles and costs for over 80 ACAT1 and pre-MDAP systems and over 40 production facilities.

Automation: MS ACCESS

Publications: "Econometric Modeling of Acquisition Category I Systems at the Boeing Plant in St. Louis, Missouri", IDA Paper P-3548

"Econometric Modeling of Acquisition Category I Systems at the Lockheed-Martin Plant in Marietta, Georgia", IDA Paper P-3590 (Draft Final)

"Portfolio Optimization Feasibility Study", IDA #D-2325 (Draft Final)

Keywords: Estimating, Weapon Systems, Production, Acquisition Strategy, Mathematical Modeling, Mathematical Model

IDA-11

Title: Resource Analysis for Operational Test and Evaluation (OT&E)

Summary: Conduct resource analysis to aid DOT&E in determining the adequacy of OT&E resources in the Services' Program Objective Memorandum and the Future Years Defense Program. Conduct analysis to support reporting in the Director of Operational Test and Evaluation (DOT&E) Annual Report to Congress and for developing resource related policy recommendations throughout the PPBS cycle.

Classification: Top Secret

Sponsor: Deputy Director, Operational Test and Evaluation, Resources and Ranges
The Pentagon, Room 3D1067
1700 Defense
Washington, DC 20301-1700

Mr. John F. Gehrig, (703) 697-5552

Performer: IDA
Mr. Thomas A. Musson, (703) 578-2729

Resources:	FY	Dollars	Staff-years
	FY98	$200,000	1.2
	FY99	$100,000	0.6
	FY00	$400,000	2.5
	FY01	$400,000	2.5

Schedule:	Start	End
	Feb 98	Ongoing

Data Base: *Title:* OT&E Resources

Description: Programmed and Budgeted Funds, Manpower

Automation: Excel spreadsheets

Publications: None

Keywords: Government, Analysis, Policy, Programming, Budgeting

IDA-12

Title:	Resource Analysis for Test and Evaluation—MRTFB
Summary:	Analysis of resources devoted to the Major Range and Test Facility Base to include operating cost, investment cost, and personnel resources. Analyses include cost comparisons of alternative approaches to developing test and evaluation capability and realigning workload within existing infrastructure. Evaluation will include identification of efficiencies in management, operations, and resource processing.
Classification:	Top Secret
Sponsor:	Deputy Director, Resources and Ranges (DOT&E/RR) Director, Operational Test and Evaluation (DOT&E) The Pentagon, Rm. 3D1067 Washington, DC 20301 Mr. John Gehrig, (703) 697-5552
Performer:	IDA Mr. Dennis O. Madl, (703) 578-2718

Resources:

FY	Dollars	Staff-years
01	$2,500,000	14

Schedule:

Start	End
Oct 00	Jan 02

Data Base:

Title:	T&E Resources
Description:	Operating Cost, Investment Projects, Real Property
Automation:	Hard copy, floppies or hard disk

Publications:	"Relocating Jefferson Proving Ground Activities to Yuma Proving Ground," IDA Paper P-2413, August 1990. "Cost Comparison of the Navy's Air Combat Environment Test and Evaluation Facility (ACETEF) and the Air Force's Electronic Combat Integrated Test (ECIT)," IDA Paper P-2727, June 1992. "The Need for Unexploded Ordnance Remediation Technology," IDA Document D-1527, October 1992. "Test and Evaluation Reliance–An Assessment," IDA Document D-1829, June 1996.
Keywords:	Government, Analysis, Policy, Programming, Budgeting, Infrastructure, EMD, Test and Evaluation, Operations and Support, Acquisition Strategy, Labor, Overhead/Indirect, Economic Analysis, Study, Data Base

IDA-13

Title:	FYDP Related Studies
Summary:	This task supports the conduct of studies to improve the existing FYDP-related taxonomy of missions and infrastructure, to normalize prior years data for funding policy changes, and to maintain and utilize previously developed models for FYDP-related analyses.
Classification:	Unclassified work dealing with a classified database
Sponsor:	OD(PA&E), Force and Infrastructure Cost Analysis Division The Pentagon, Rm. BE798 Washington, DC 20301 Ms. Krystyna Kolesar (703) 697-0222
Performer:	IDA Mr. Ronald E. Porten, (703) 845-2145

Resources:	FY	Dollars	Staff-years
	92	$40,000	0.3
	93	$220,000	2.4
	95	$130,000	1.0
	96	$150,000	1.2
	99	$250,000	1.5
	00	$322,000	1.7

Schedule:	Start	End
	Sep 92	Oct 02

Data Base: Title: AMORD, FYDP, FYDP Normalization, FACS, and Force and Infrastructure Categories

Description: FYDP type data for all DoD programs to include Defense Mission Categories, Program Element, Force & Infrastructure Categories

Automation: FACS Model Updates

Publications: IDA Paper P-3543, "Normalizing the Future Years Defense Program for Funding Policy Changes, 2000", December 2000

Keywords: Government, Programming, Forces, Mathematical Modeling, Computer Model

IDA-14

Title: FYDP Improvement, Phase II

Summary: In August 1996, the Deputy Secretary of Defense directed that the responsibility for FYDP update, maintenance, and distribution be transferred to PA&E. Phase I of this process was completed in time for PA&E to produce the POM FYDP in August 1997. Phase II addresses systematic improvements to the FYDP data and structure. These changes are envisioned to be fundamental to the long-term success of the Defense Programming Database initiative to effectively integrate the FYDP and other defense data to better support the programming and budgeting processes of the department. The Department initiated the FYDP Improvement Phase II project to focus on developing a POM-less Program Review, work toward rationalizing data used for program review with data used for budget review, and strive to harmonize the view of data used by OSD with data native to the individual Services. The objective of this task is to analyze and document requirements, recommend improvements and assist with the implementation of FYDP Improvement, Phase II.

Classification: Unclassified work dealing with a classified database

Sponsor: OD(PA&E), Programming and Fiscal Economics Division
The Pentagon, Rm. 2C282
Washington, DC 20301

Dr. Bryan Jack, (703) 693-7827

Performer: IDA

Mr. Ronald E. Porten, (703) 845-2145

Resources:	FY	Dollars	Staff-years
	99	$400,000	2.1
	00	$179,000	.9
	01	$300,000	1.5

Schedule:	Start	End
	Aug 99	Oct 02

Data Base:	Title:	Defense Programming Database
	Description:	Gathers and Organizes Programming Data for the Departmental Headquarters
	Automation:	FYDP, MDAP
Publications:	To be determined	
Keywords:	Government, Programming, Forces, Infrastructure, Manpower/Personnel, Life Cycle, Automation, Data Collection	

IDA-15

Title:	Defense Resource Management Cost Model
Summary:	Develop a computer model that permits small—to medium-size countries to estimate the funding requirements of alternative, multi-year force compositions. The model provides cost estimates that are sensitive to the numbers and types of combat and support units; numbers and types of equipment; unit manning; peacetime training levels (OPTEMPO); equipment modernization; and WRM inventory changes. Users have convenient access to all characteristics of the model so they can adjust the model's use to their own practices. The model can be tailored to use the currencies, cost accounts, personnel classifications, and a wide variety of force and equipment configurations of any military force. Cost estimating features of the model provide the ability to estimate the direct and indirect personnel costs, fixed and variable operating costs, and multi-year procurement funding. Effort includes travel to foreign countries to implement the model as part of the Partnerships for Peace program. IDA will also work with selected PFP countries to help strengthen their overall defense resource management processes. During these visits, IDA will work with the host country to improve the processes and organization arrangements developed by the host country to institutionalize its defense resource management system.
Classification:	Unclassified
Sponsor:	OD(PA&E), Regional Assessment and Modeling Division The Pentagon, Rm. 2C270 Washington, DC 20301 Mr. Gary Morgan, (703) 697-6415
Performer:	IDA Mr. David A. Drake, (703) 845-2573

Resources:

FY	Dollars	Staff-years
93	$25,000	0.2
94	$288,000	1.9
95	$550,000	3.5
96	$800,000	5.0
97	$1,200,000	7.5
98	$1,100,000	6.9
99	$1,437,000	9.0
00	$1,690,000	10.6
01	$1,325,000	8.3

Schedule:

Start	End
Sep 93	Indefinite

Data Base:	None
Publications:	DRMM Cost Modules Users Manual
Keywords:	Government, Programming, Forces, Life Cycle, Fixed Costs, Variable Costs, Mathematical Modeling, Computer Model

IDA-16

Title: Defense Economic Planning and Projection Systems (DEPPS)

Summary: Maintain the currency of the Defense Translator within DEPPS by periodically updating the various sections of the translator associated with the appropriations accounts. The Defense Translator accounts for the distribution of defense spending among the industries producing the goods and services that DoD buys, and describes the commodity composition of defense demands.

Classification: Unclassified

Sponsor: OD(PA&E)/RA/EARPD
The Pentagon, Rm. BE798
Washington, DC 20301

Mr. Ron Lile, (703) 614-3840

Performer: IDA
Dr. Thomas Frazier, (703) 845-2132

Resources:

FY	Dollars	Staff-years
85	$122,000	1.0
87	$182,000	1.5
88	$40,000	0.3
90	$75,000	0.6
92	$60,000	0.5
93	$80,000	0.7
94	$160,000	1.1
97	$30,000	0.2
98	$30,000	0.2
99	$30,000	0.2
00	$30,000	0.2
01	$30,000	0.2

Schedule:

Start	End
Jul 85	Dec 01

Data Base: None

Publications: "A Comparison of the DEIMS and the Department of Commerce Translator Vectors," IDA Paper P-2647, T. P. Frazier, S. K. Welman, and R. H. White, March 1993, Unclassified.

"A User's Manual for the Revised Defense Translator Model," IDA Document D-796, T. P. Frazier and J. B. Tate, June 1990, Unclassified.

"The Revised Defense Translator," IDA Paper P-2141, T. P. Frazier, C. G. Campbell, and R. T. Cheslow, October 1989, Unclassified.

Keywords: Industry, Government, Analysis, Budgeting, Mathematical Modeling, Economic Analysis, Study

IDA-17

Title: Major Defense Acquisition Program (MDAP) Analysis and FYDP Support

Summary: This objective of this task is to investigate ways to improve the effectiveness of OUSD(A&T) participation in the PPBS process. The goal of this task is to provide more accurate and timely MDAP funding data to the acquisition community. This task will improve the process by which the acquisition community is made aware of funding information that is vital to the decision making process. This task will also develop algorithms that relate Congressional marks to individual RDT&E and Procurement line items and associate the marks to DMCs and OSD OPRs. Data displays will be designed to illustrate the impacts of congressional changes

on the investment program to senior decision makers. It will assist the Under Secretary of Defense for Acquisition and Technology in his primary responsibilities to safeguard acquisition investment resources.

Classification:	Secret
Sponsor:	OUSD(A&T)/API/AR The Pentagon, Rm. 3D765 Washington, DC 20301
	Mr. Steve Dratter, (703) 697-8020
Performer:	IDA Mr. David A. Drake, (703) 845-2573

Resources:	*FY*	*Dollars*	*Staff-years*
	99	$75,000	0.6
	00	$50,000	0.4
	01	$75,000	0.6

Schedule:	*Start*	*End*
	Jan 99	Indefinite

Data Base:	*Title:*	MDAPs
	Description:	FYDP type data for all DoD RDT&E and Procurement programs to include Defense Mission Categories, Program Element, Procurement Annex Line Item, MDAP Identifier, and OSD OPRs.
	Automation:	FoxPro, dBASE

Publications:	TBD
Keywords:	Government, Programming, Forces, Acquisition Strategy, Operations and Support, Mathematical Modeling, Statistics/Regression, Computer Model

IDA-18

Title:	Workload Forecasting for the Veterans Benefits Administration
Summary:	The objective of this task is to forecast the number of veterans who will apply or reapply for VA disability compensation benefits over a five-year horizon. Veterans are eligible for these benefits if they are disabled due to injury suffered or disease contracted while serving in the military. The forecasts will be used to determine the administrative staff required to adjudicate and process VA compensation claims.
Classification:	Unclassified
Sponsor:	Veterans Benefits Administration Ms. Leigh Ann Skeens, (202) 273-6979
Performer:	IDA Dr. David E. Hunter, (703) 845-2549

Resources:	*FY*	*Dollars*	*Staff-years*
	98	$300,000	2.0
	99	$150,000	1.0
	00	$150,000	1.0

Schedule:	*Start*	*End*
	Sep 98	Aug 00

146

Data Base:	*Title:*	Compensation Workload Forecasting Model
	Description:	Demographic data on the actual veteran population; projections of the veteran population for five future years; and factors for disability claim submission rates within demographic cells
	Automation:	Visual Basic interface with Microsoft Access database

Publications: IDA Paper P-3536 "Forecasting Compensation Workload for the Veterans Benefits Administration (VBA): Final Report"

Keywords: Government; Budgeting; Infrastructure; Data Collection, Mathematical Modeling; Data Base, Computer Model

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IDA-19

Title: Evaluation of TRICARE Program Costs

Summary: The DoD has implemented a congressionally mandated uniform health care benefit, including an HMO option, for beneficiaries eligible for military health care. This new program, called TRICARE, is designed to improve the access to and quality of health care, while not increasing costs to either the government or covered beneficiaries. The objectives of this task are: (1) to compare the costs, both to the government and to covered beneficiaries, of the TRICARE program with those of the traditional benefit of direct care and CHAMPUS; and (2) determine the impact of TRICARE on the out-of-pocket expenses of military retirees. IDA has been conducting an ongoing evaluation of the TRICARE program, which is administered on a regional basis. Last year's evaluation covered eight health service regions which had been under TRICARE for at least one full year in FY 1998. This year's study extends the evaluation to all eleven health service regions, covering FY 1999 TRICARE experience.

Classification: Unclassified

Sponsor: TRICARE Management Activity (HPA&E)
5111 Leesburg Pike
Suite 517
Falls Church, VA 22041

Lt. Col. Pradeep Gidwani, (703) 681-3636

Performer: IDA

Dr. Philip M. Lurie, (703) 845-2118

Resources:	*FY*	*Dollars*	*Staff-years*
	00	$427,800	1.9
	01	$783,000	3.6

Schedule:	*Start*	*End*
	Oct 00	Sep 01

Data Base: None

Publications: None

Keywords: Government, Analysis, Policy, Infrastructure, Manpower/Personnel, Test and Evaluation, Variable Costs, Data Collection, Survey, Mathematical Modeling, Economic Analysis, Data Base, Study

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IDA-20

Title: Army Enlistment Early Warning System

Summary: This task constructs an enlistment early warning system for the Services.

Classification: Unclassified

147

Sponsor:	Greg Wise, OSD, PA&E, Economic Analysis and Research
Performer:	IDA
	Dr. Lawrence Goldberg

Resources:	FY	Dollars	Staff-years
	2001	$400,000	2.0

Schedule:	Start	End
	Aug 2000	Sep 2001

Data Base:	None
Publications:	None
Keywords:	Government, Analysis, Manpower/Personnel, Mathematical Modeling, Method

IDA-21

Title:	DSCA Business Metrics
Summary:	The objective of this task is identify and quantify the business process steps being followed in each Service during FMS administration and to relate those efforts to the types of cases being managed. The ultimate goal is to provide the DSCA Comptroller with a way of quantifying the cost of administering each case and of performing additional functions that are not in support of specific cases (such as price and availability quotations). A preliminary objective is to learn more about Service operations by facilitating meetings with Service representatives where approaches to identifying and measuring business process metrics can be designed.
Classification:	Unclassified
Sponsor:	Defense Security Assistance Agency
	DSAA Comptroller
	Mr. Bill Johnson, (703) 604-6586
Performer:	IDA
	Dr. Thomas P. Frazier, (703) 845-2132

Resources:	FY	Dollars	Staff-years
	97	$300,00	2

Schedule:	Start	End
	Jul 99	Oct 01

Data Base:	None
Publications:	To be determined
Keywords:	Government, Estimating, Automation, Software, Study

IDA-22

Title:	Force Modernization Metrics
Summary:	In building the Defense Program Projection, which looks at prospective defense spending twelve years beyond the end of the FYDP, tools are needed to present ways in which the force will be evolving. Building such tools is the central job of this task. In addition to tracking force age and capital asset value, attention will be devoted to developing indicators of capability for various missions and classes of systems to allow projections of capability to be made for alternative defense programs. The recapitalization of defense facilities will also be addressed.
Classification:	Secret

Sponsor:	Deputy Director (General Purpose Programs) Program Analysis and Evaluation
	The Pentagon, Rm. 2E330
	Washington, DC 20301
	Mr. Will Jarvis, (703) 697-9132

Performer: IDA

Mr. Stanley A. Horowitz, (703) 845-2450

Resources:

FY	Dollars	Staff-years
97	$340,000	2.2
98	$360,000	2.3
99	$175,000	1.1
00	$158,000	1.0
01	$100,000	0.7

Schedule:

Start	End
Oct 96	Dec 02

Data Base: Equipment inventories over time and potential capability measures. Age and plant replacement value of facilities by type and location.

Publications: To be determined

Keywords: Government, Analysis, Review, Policy, Programming, Forces, Life Cycle, Data Collection, Time Series, Data Base, Computer Model, Study

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IDA-23

Title: O&M Program Balance

Summary: This project is designed to develop cost estimating relationships that can be used the gauge the adequacy of Military Service and Defense Agency funding for operations and maintenance. One aspect of the work will be to determine the kinds of data that are needed to develop and the models that will represent the relationships between operations and maintenance funding and key parameters.

Classification: Unclassified

Sponsor: Director, Program Analysis and Evaluation
The Pentagon, Rm. 3E836
Washington, DC 20301

Dr. Krystyna M. A. Kolesar, (703) 697-0222

Performer: IDA

Mr. Stanley A. Horowitz, (703) 845-2450

Resources:

FY	Dollars	Staff-years
00	$230,000	1.5
01	$200,000	1.2

Schedule:

Start	End
Sept 99	Dec 02

Data Base: To be determined

Publications: To be determined

Keywords: Government, Analysis, Policy, Programming, Data Collection, Data Base, Study

Title:	Active/Reserve Integration
Summary:	This work is designed to examine alternative ways to integrate active and reserve forces, particularly in the Army. For Army National Guard combat units, a key aspect of successful integration is being able to mobilize, train, and deploy for combat fast enough to effectively carry out its combat mission. The project has examined how long it would take Guard brigades and divisions to deploy. In addition it is looking at how best to provide command and staff training for National Guard combat units and the use of the Reserve Components to help shape the international environment.
Classification:	Unclassified
Sponsor:	Assistant Secretary of Defense (Reserve Affairs) The Pentagon, Rm. 2E515 Washington, DC 20301
	Ms. Karen McKinney, (703) 697-4223
Performer:	IDA
	Mr. Stanley A. Horowitz, (703) 845-2450

Resources:

FY	Dollars	Staff-years
96	$175,000	1.0
97	$250,000	1.4
98	$300,000	1.6
99	$300,000	1.6
00	$50,000	0.3

Schedule:

Start	End
Jan 96	Dec 01

Data Base:	*Title:*	49th Division Mobilization Plan
	Description:	Plan for mobilization, training, and deployment of a National Guard armored division.
	Automation:	Microcomputer zip drive

Publications: "Conference on Force Integration: Seeking Better Reserve Component Capability and Credibility, Institute for Defense Analyses", Document D-1849, May 1996.

"Detachment 1, 28th Infantry Division Artillery in Bosnia", Document D-2083, Institute for Defense Analyses, December 1997.

"An Assessment of the Role of the Reserve Component in Military Transformation," Office of the Assistant Secretary of Defense (Reserve Affairs), April 2000.

Keywords: Government, Analysis, Policy, Manpower/Personnel, Readiness, Data Collection, Data Base, Study

Title:	Reducing Defense Infrastructure Costs
Summary:	This project is designed to find better strategies for managing infrastructure, and thus reducing infrastructure costs. The initial focus is on installation support costs. Service initiatives for developing benchmarks involving the costs and output of different installation support services are being examined. Private sector and other governmental practices are also being studied. The goal is to recommend adoption of an information system and a set of metrics that will allow decision-makers more insight into how to provide the needed installation support at a reduced cost. In addition the project is investigating the nature of quantitative relationships between force structure changes and spending on various portions of the defense infrastructure.

Classification:	Unclassified
Sponsor:	Director, Program Analysis and Evaluation
	The Pentagon, Rm. BE798
	Washington, DC 20301
	LTC Keith Casperson, (703) 697-4311
Performer:	IDA
	Mr. Stanley A. Horowitz, (703) 845-2450

Resources:	FY	Dollars	Staff-years
	98	$600,000	3.2
	99	$300,000	1.6
	00	$300,000	1.6

Schedule:	Start	End
	Feb 98	Dec 01

Data Base:	To be determined
Publications:	To be determined
Keywords:	Government, Analysis, Policy, Infrastructure, Facilities, Overhead/Indirect, Data Collection, Cost/Production Function, Study

IDA-26

Title:	Management Headquarters Analysis
Summary:	This project is designed to help DoD respond to the requirements of the FY 2000 National Defense Authorization Act regarding the documentation and evaluation of management headquarters activity
Classification:	Unclassified
Sponsor:	Director, Program Analysis and Evaluation
	The Pentagon, Rm. 3E836
	Washington, DC 20301
	Mr. Bart Rhoades, (703) 695-4281
Performer:	IDA
	Mr. Stanley A. Horowitz, (703) 845-2450

Resources:	FY	Dollars	Staff-years
	00	$300,000	1.8

Schedule:	Start	End
	Nov 99	Dec 01

Data Base:	To be determined
Publications:	To be determined
Keywords:	Government, Analysis, Policy, Data Collection, Data Base, Study

IDA-27

Title:	Cooperation with KIDA
Summary:	IDA and the Korean Institute for Defense Analyses (KIDA) have been cooperating in the area of cost analysis for several years. KIDA is building a cot analysis capability of their Staff and assisting the MND in developing a similar capability in the Ministry. IDA is offering advice and assistance and cooperating on joint projects. Visits have been

exchanged. A Data Exchange Agreement has been established between the OSD and MND. Cost analysis projects are being conducted jointly by IDA and KIDA.

Classification: Unclassified

Sponsor: IDA
1801 North Beauregard Street
Alexandria, VA 22311

Dr. Stephen J. Balut, (703) 845-2527

Performer: IDA

Resources:

FY	Dollars	Staff-years
01	$45,00	

Schedule:

Start	End
Oct 00	Sep. 01

Data Base: None

Publications: Not applicable

Keywords: Estimating, Life Cycle, Case Study

IDA-28

Title: Cost Analysis Education

Summary: IDA and George Mason university (GMU) develop, improve and provide annually a graduate level course in Cost Analysis aimed at novice and intermediate cost analysts who work for or support the DoD. GMU grants credits to those who enroll and successfully complete the course. Government employees are allowed to attend free of charge but receive no credit. This course is one of two core courses in GMU's Master's Degree program in Military Operations Research.

Classification: Unclassified

Sponsor: IDA
1801 North Beauregard Street
Alexandria, VA 22311

Dr. Stephen J. Balut, (703) 845-2527

Performer: IDA

Resources:

FY	Dollars	Staff-years
01	$10,000	

Schedule:

Start	End
Jan 01	May 01

Data Base: None

*Publications:* Course material

Keywords: Estimating, Analysis

DEMAND FOR ESTIMATES

Five presentations on the DoD's capabilities to estimate the costs of weapons systems were presented at the 2001 IDA Cost Research Symposium. This appendix contains an annotated version of the first of those presentations. Presented at the symposium by Matthew Schaffer of OSD CAIG, it serves as an introduction to the topic.

Upcoming ACAT IC & ID
Milestone Reviews

OSD/CAIG

This briefing examines the anticipated milestone reviews for the major defense acquisition programs (MDAPs) over the next 6 years. It can be viewed as a look at the demand for cost research, focusing on the major commodity groups with a large number of expected milestone (and therefore cost) reviews.

MDAPs by Acquisition Category
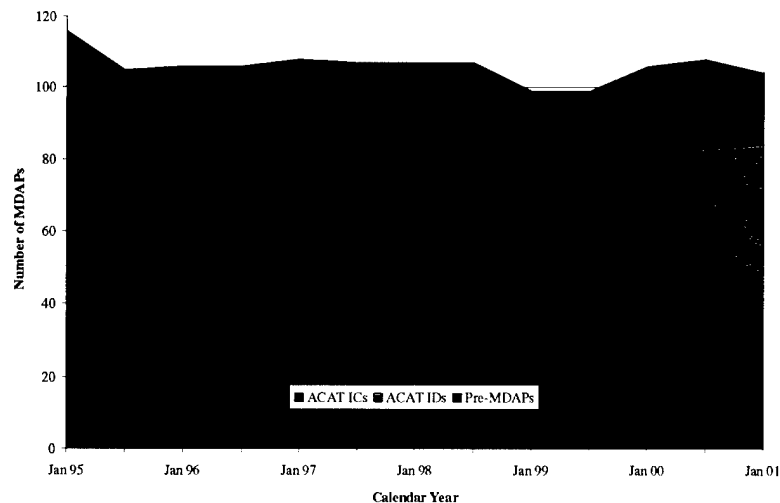
OSD/CAIG

This chart shows the history of the number of MDAPs over the past 6 years. The number of MDAPs has remained fairly constant at about 80 programs, roughly evenly split between Acquisition Category (ACAT) IC and ACAT ID programs. The Under Secretary of Defense for Acquisition, Technology, and Logisitics is the Milestone Decision Authority (MDA) for ACAT ID programs. For ACAT IC programs, the Component Acquisition Executive is the MDA.

The number of pre-MDAPs—those programs anticipating future ACAT I status—has also remained fairly constant at about 20 programs.

Currently Directed Reviews for ACAT IC and ID Systems
(Excludes pre-MDAP system reviews)

Most post CY02 reviews are not yet on the books: MS I's for current set of pre-MDAPs, MS I's for next set of pre-MDAPs, and program reviews for troubled systems.
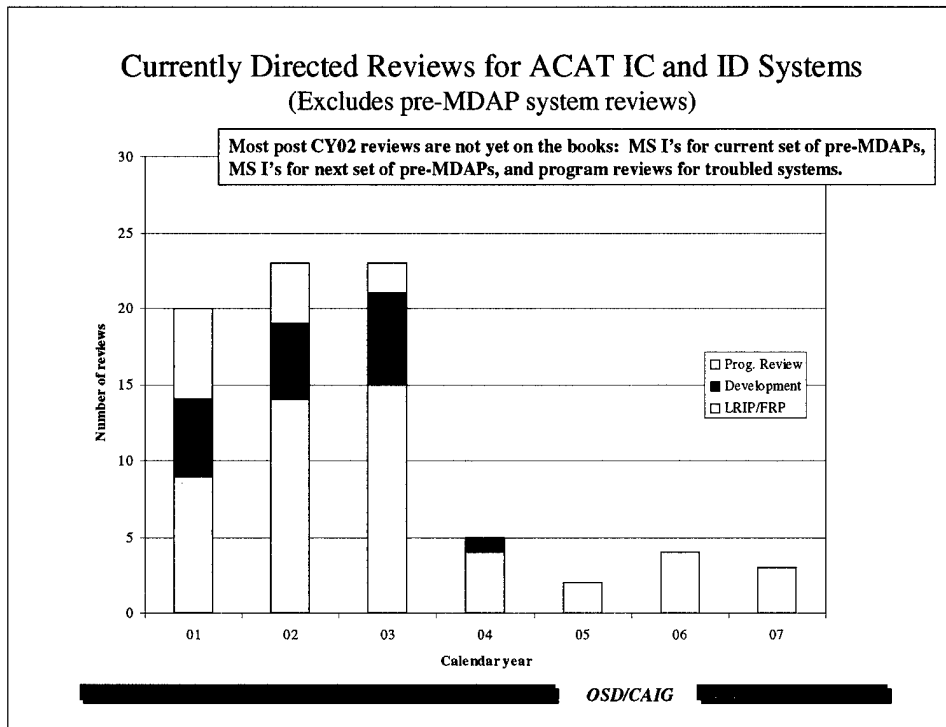
The graph provides a temporal view of upcoming milestone reviews over the next 6 years. As implied by the note to the figure, the number of programs requiring cost reviews will grow as new programs enter the review process and existing programs experience cost overruns and schedule slips.

Many of the reviews are production reviews—low-rate initial production (LRIP) or full-rate production (FRP). The remainder are development reviews or mid-milestone program reviews (PR).

Currently Directed CY01-07 MS I, MS II, & Program Reviews by Commodity Class

Bar chart showing Number of reviews (x-axis 0 to 8) by commodity class:
- Tactical Missiles: 2
- Surface Vehicles: 1
- Ships: 4
- Satellites: 5
- Rotary Wing: 1
- Other: 2
- Munitions: 2
- Strategic Missiles: 0
- Missile Defense: 7
- Infrastructure: 1
- Fixed Wing: 2
- Electronics: 2

Note: Excludes pre-MDAP systems

OSD/CAIG
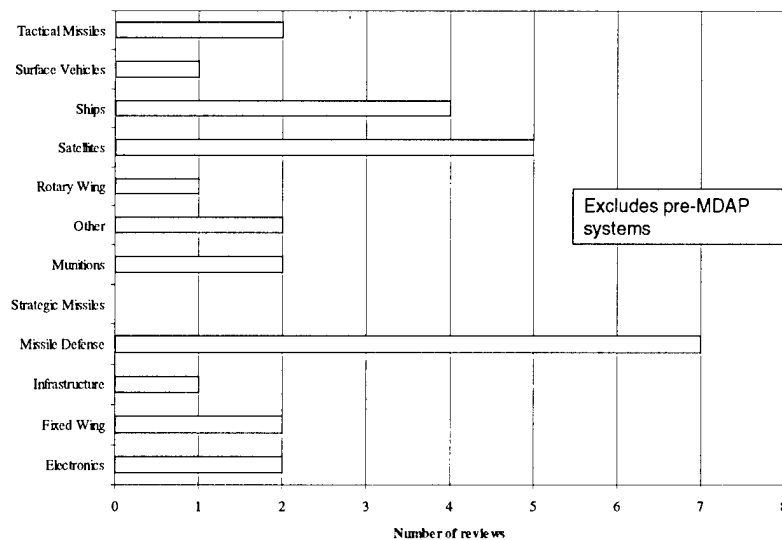
We now take a commodity view of upcoming milestones, grouping the upcoming reviews into eleven commodity classes.

We have focused on the pre-production reviews because these are the reviews for which our cost-research needs are greatest. There are two reasons for this choice. First, a review of historical cost growth in MDAPs shows that production cost estimates are more accurate than estimates for the research, development, test, and evaluation (RDT&E) phases of the program, even when measuring cost growth relative to Milestone II production estimates. Second, LRIP and FRP estimates are based, at least partially, on actual cost data for units produced in the Engineering and Manufacturing Development (EMD) phase of the program. RDT&E estimates, by contrast, typically have little or no actual program costs on which to base the estimate and instead rely on statistical measures of analogous, historical program costs.

The chart reveals that most programs with upcoming pre-production cost reviews (excluding the pre-MDAP programs, which have more uncertain demand) fall within the following three commodity groups: missile defense systems, satellites, and ships. In addition, although only two reviews are listed under the "electronics" commodity group, integration of electronic subsystems (radios, radar, GPS receivers, etc.) are a major cost contributor in almost all the listed commodity groups. Thus, cost research activity should be focused on these commodity groups, specifically in those areas with critical shortcomings.

A-4

ELECTRONICS, SHIPS,
AND AUTOMATED INFORMATION SYSTEMS

Five presentations on the DoD's capabilities to estimate the costs of weapons systems were presented at the 2001 IDA Cost Research Symposium. This appendix contains an annotated version of the second of those presentations. Presented at the symposium by Leonard Cheshire, it covers the state of cost-estimating capabilities for electronics, ships, and automated information systems.

**2001 IDA COST RESEARCH SYMPOSIUM
17 MAY 2001**

NAVY PRESENTATION: LEONARD CHESHIRE

**ELECTRONICS SYSTEMS
SHIPS
AUTOMATED INFORMATION SYSTEMS**

My presentation will cover electronics systems, ships, and automated information systems (AISs) within the Department of Defense. The assessments, cost information, and studies associated with these subjects represent the collective position of the Army, Navy, and Air Force.

Contributing Organizations

- Air Force Cost Analysis Agency (AFCAA)
- Naval Air Systems Command (NAVAIR)
- Naval Sea Systems Command (NAVSEA)
- Naval Center for Cost Analysis (NCCA)
- OSD (Program, Analysis and Evaluation) (PA&E)
- Army Cost and Economic Analysis Center (CEAC).
- Air Force Institute of Technology (AFIT)
- RAND Corporation
- Office of Naval Research (ONR)
- Naval Surface Warfare Center, Carderock Division (NSWCCD)

The organizations shown on this slide submitted cost research summaries relevant to the areas of interest. Studies from each of these organizations are referenced in this presentation.
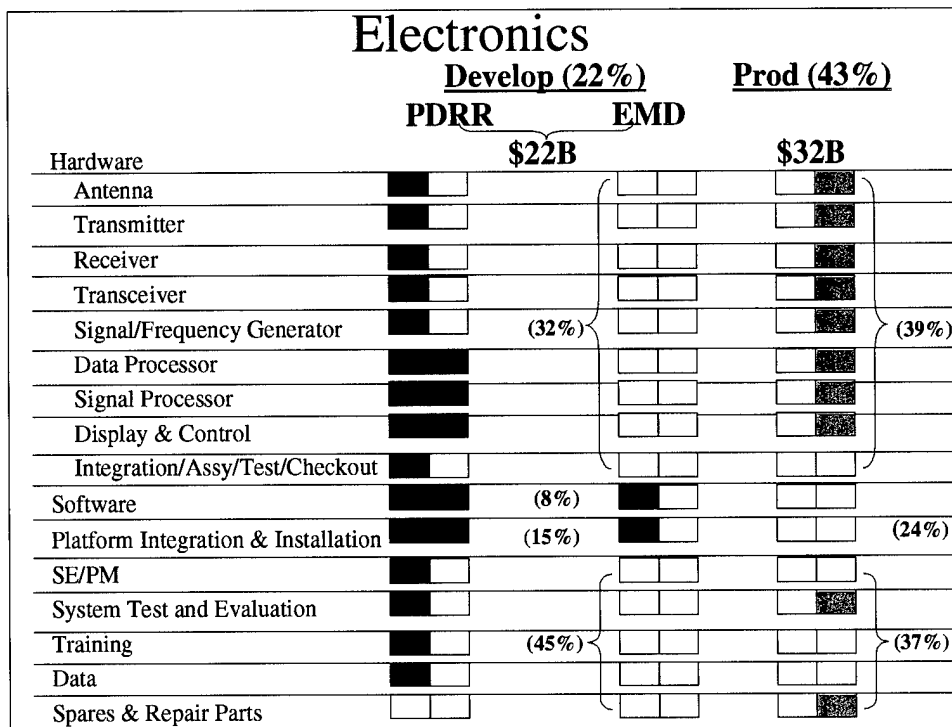
Electronics

Hardware	Develop (22%)		Prod (43%)
	PDRR $22B	**EMD**	**$32B**
Antenna			
Transmitter			
Receiver			
Transceiver			
Signal/Frequency Generator	(32%)		(39%)
Data Processor			
Signal Processor			
Display & Control			
Integration/Assy/Test/Checkout			
Software	(8%)		
Platform Integration & Installation	(15%)		(24%)
SE/PM			
System Test and Evaluation			
Training	(45%)		(37%)
Data			
Spares & Repair Parts			

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

This slide depicts the assessment of electronics cost-estimating capability. The assessment is based on input from representatives of eight DoD organizations.

- Air Force Cost Analysis Agency (AFCAA)

- Air Force Electronics Systems Center (ESC/FMC)

- Army Cost and Economic Center (CEAC)

- Naval Air Systems Command (NAVAIR)

- Naval Sea Systems Command (NAVSEA)

- Naval Surface Warfare Center (NSWC)/Carderock Division

- Naval Center for Cost Analysis (NCCA)

- OSD Cost Analysis Improvement Group (CAIG)

As of spring 2001, there are no apparent changes in the assessment since spring 1999. However, as discussed later, there are some ongoing efforts that should result in significant improvement within a few months. With a few exceptions, PDRR is rated red-yellow, EMD is rated yellow, production is rated yellow-green, and O&S is rated yellow. A couple of observations are in order. First, the pace of electronics technology evolution translates to cost models having short shelf lives (i.e., 2 to 5 years depending on the component). Second, and directly related to the first comment, it is imperative that electronics cost-estimating methodologies incorporate, to the extent possible, the impact of technology trends.

Before discussing ongoing studies that improve our electronics cost-estimating capabilities, it is important to understand the percentages and dollar values associated with this weapons area. The values shown on the charts are not intended to be precise portrayals of the monetary resources associated with the life-cycle cost (LCC) phases or the cost element structure. Rather, they are intended to give a general idea of the relative monetary importance of the different phases of the life cycle and of the different cost elements. The percentages at the top of the charts represent the phases' typical shares of LCC. On average for shipboard and airborne electronics, Development cost accounts for 22 percent and Production cost accounts for 43 percent of LCC. The dollar values at the top of the charts, which are unrelated to the aforementioned percentages, represent the services' budget projections for electronics across the years FY 1999 through FY 2005. The Development value is approximately $22 billion (in then-year dollars). For FY 1999 through FY 2005, Production cost for electronic systems is estimated to be $32 billion. The Navy's portion of the $32 billion is about $20 billion, and the Air Force's portion about $12 billion

The percentages associated with the cost elements are also important. These percentages, which sum to 100 percent for a given life-cycle phase and account for both contractor and government in-house costs, indicate a cost element's (or cost element group's) typical share of phase total cost. The intent of these percentages is to focus attention on the significant, from a dollar perspective, red and red-yellow cost elements.

<table>
<tr><td rowspan="2">[emblem]</td><td style="text-align:center"># Electronics
Development Phase</td></tr>
<tr><td>

- AFIT/ENG-3: "Development of a Predictive Cost Model for Battle Management/Command, Control, and Communications Systems"
- CEAC-5: " Communications and Electronics Cost Data Base/ Methodology"
- NCCA-8: "COTS Shipboard Electronics Cost Factors"
- NCCA-11: "Weapon System Software Development Cost Technical Database"
- NCCA-12: "Weapon System Software Development Estimating Methodology"
- PA&E-13: "Contractor Cost Data Reporting (CCDR) Clearinghouse Repository"
- NCCA-9: "Platform Integration Cost Database Model for Ships Electronics"

</td></tr>
</table>

AFIT/ENG-3. The purpose of this study is to develop a parametric model using linear regression to estimate software development costs for command, control, and communications systems. It uses only DoD data and analyzes common variables used in software cost estimating to choose only those variables that have the greatest influence.

CEAC-5. This effort, which will be put into the Automated Cost Database (ACDB) format, covers primarily ground-based electronics and includes both development and procurement data. It uses a mixture of return costs and contract prices and relies on Cost Performance Reports (CPRs), Contractor Cost Data Reporting (CCDR), internal program cost records, and contract values. No CERs will be developed in this study, only a database.

NCCA-8. The purpose of this study is to develop factors for estimating commercial off-the-shelf (COTS) shipboard electronics costs as a function of military specifications (MILSPEC) costs. It will use systems in which initial hardware was MILSTD and later upgrades or later installations used COTS. The final report will include raw and normalized cost data and will address the methodology and the resulting factors.

NCCA-11. This software development technical database collects objective metrics (i.e., source lines of code, effort, schedule, language, etc.) for weapon system programs, primarily Navy. The database is comprised of all platforms, including shipboard electronics and avionics. The database contains data from various contractors (i.e., Raytheon, COMPTEK, Lockheed Martin, etc.). All data are collected via an automated

data collection form that was developed in Microsoft Excel. The data range from the early 1980s to the late 1990s and cover various types of development processes.

NCCA-12. The weapon system software development estimating methodology will use data collected for the software development technical database. The methodology will update the current Software Development Estimating Handbook Phase I, as well as provide contractor-specific estimating methodology. The equations will have associated statistics to support all algorithms and factors.

PA&E-13. The purpose of this effort is to improve the utility of the CCDR system that has been in place for more than two decades. This study will transform the current CCDR repository into an automated cost information management system (ACIMS). The ACIMS will query multiple sources, both internal and external to the current CCDR system architecture. It will include O&S cost data, technical performance data, cost growth information, CER databases and libraries of cost information currently stored at various DoD cost activities. An effort is now underway to collect development software metrics (size, schedule, effort, and quality) on several pilot programs, including the JSF and JTRS. E-2C and MIDS may soon be added. The ultimate goal is to collect such data on all programs, including AISs.

NCCA-9. This study will develop a database and cost-estimating methodology for projecting hardware/software integration costs for shipboard electronics and weapon systems. The database will include cost data, technical characteristics, and other relevant information (e.g., software size) for a variety of systems, including sonar, radar, fire control, and launching systems. It will include both contractor and government in-house costs. This is a multi-phased effort, with Phase I to concentrate on developing an integration WBS, identifying integration cost factors, and initiating data collection.

- AFIT/ENG-12: "Development of a Model to Describe the Effects of a Loss of learning in Defense Production Processes"
- NAVAIR-5: "Cost Growth Analysis"
- AFCAA-9: "Aircraft Avionics Systems Database and Study"
- AFCAA-12: "COTS Electronics Database/Modeling"
- RAND-4: "The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives"
- RAND-10: "Analysis of Cost Growth Using Selected Acquisition Reports"
- NCCA-8: "COTS Shipboard Electronics Cost Factors"
- CEAC-5: "Communications and Electronics Cost Data Base/Methodology"

AFIT/ENG-12. This study will result in a parametric model that calculates the slope and T1 after the production break, based on input from the users. The present model in use (LEARN) does not have a loss-of-learning predictive capability.

NAVAIR-5. This effort investigates the cost growth experienced on historical Navy aircraft, weapons, and avionics programs. Data are being analyzed for specific NAVAIR programs, commodity groups and collectively for all NAVAIR programs (ACAT I, II, and III). The database will form the conceptual approach for eliminating NAVAIR cost risk.

AFCAA-9. The purpose of this effort is to develop an avionics database that will be used to develop CERs for both federated and next-generation integrated avionics systems. The data-collection effort is underway for F-22, Comanche, B-2, V-22 and JSF. The database will include cost, technical, and programmatic data for a wide range of systems across many different airborne platforms. The study embodies a traditional CER approach and a methodology to estimate avionics costs using board level costs and performance descriptions.

AFCAA-12. This project is to continue developing a cost database to quantify COTS hardware that encompasses different "ruggedization" levels. In addition to capturing different ruggedization levels, this effort will analyze parameters such as radiation, hardness, vibration, temperature, and altitude levels to determine how these parameters impact costs. Analysts will be able to provide design-to-cost analyses regarding hardness capabilities of systems using COTS components. Data are being collected from

AIS/C4I systems and will include electronic components as well as various levels of non-hardware portions of the ASI/C4I programs.

RAND-4. This study addresses the overall methodology, cost-driving parameters, and other factors for developing CERs for future avionics production cost estimates. It includes a set of component-level CERs by subsystem developed and tailored for a study for the JSF avionics production baseline configuration.

RAND-10. The purpose of this study is to analyze the contents of the DoD Selected Acquisition Reports (SARs) from their inception through their submission as part of the FY 2001 President's Budget. The analysis will categorize cost growth by service, type of system, and growth from milestones.

NCCA-8 and CEAC-5. These two studies, previously mentioned in the Electronics Development Phase, also have application to the Electronics Production Phase.

Electronics

O&S (35%)

Mission Personnel		(29%) ▨
Unit Level Consumption — Spares/Repair Parts(11%)		(13%) ☐☐
Intermediate Maintenance		(<1%) ☐☐
Depot Maintenance		(7%) ☐☐
Contractor Support		(included above) ☐☐
Sustaining Support — Mod Kits (25%) / Engr Supt(11%) / SW Maint(5%)		(41%) ▉☐
Indirect Support — Training (9%) / PCS (1%)		(10%) ▉☐

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

This slide depicts the assessment of electronics cost-estimating capability. The assessment is based on input from representatives of eight DoD organizations, including AFCAA, ESC/FMC, CEAC, NAVAIR, NAVSEA, NSWCCD, NCCA, and OSD CAIG.

This chart depicts the assessment of our cost-estimating capability for Electronics O&S. On average, O&S costs account for 35% of LCC. In general, this year's assessment of DoD's capability to estimate Electronics O&S cost is essentially the same as it was in spring 1999. With a couple of notable exceptions, Sustaining Support and Indirect Support, O&S is mostly yellow. Mission Personnel is rated green because estimation of the pay and allowances (P&A) for operators and maintainers is a straightforward exercise driven by quantity and average P&A.

Sustaining Support includes the following three major components: modification kits, engineering support, and software maintenance. The red-yellow rating is attributed to database and methodology weaknesses related to software maintenance and, to a lesser extent, engineering support. Indirect costs continue to be difficult to estimate because of longstanding database and methodology voids. However, several ongoing studies should improve our capabilities in Sustaining Support and Indirect Support.

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│   (seal)              Electronics                           │
│                       O&S Phase                             │
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├─────────────────────────────────────────────────────────────┤
│                                                             │
│   •  NAVSEA-3: "Theater Surface Combatant (TSC) Technology  │
│      Refresh Cost Model"                                    │
│   •  NAVSEA-4: " 'System of Systems' Technology Refresh     │
│      Cost Model"                                            │
│   •  NAVSEA-5: "The Effect of New Technologies on Ship      │
│      Systems: A Dynamics Cost Modeling Approach"            │
│   •  CEAC-10: "ACEIT FCS O&S Cost CAIV"                     │
│   •  NCCA-1: "Ship and Shipboard System Operating and       │
│      Support Cost Model (OSCAM)"                             │
│   •  NCCA-4: "Naval Visibility and Management of Operating   │
│      and Support Cost (VAMOSC)                              │
│   •  NCCA-6: "Cost of Manpower Estimating Tool (COMET)"     │
│   •  NCCA-7: "Navy Obligation Data Extraction System        │
│      (NODES)"                                                │
│   •  NCCA-13: "Weapon System Software Maintenance           │
│      Cost/Technical Database and Estimating Methodology"     │
│                                                             │
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NAVSEA-3. The purpose of this study is to adapt existing processes employed by NSWC Crane in commercial technology management to determine when and how often to conduct technology refreshes to "Theater Surface Combatant" systems. The model will help to predict when various commercial parts will change and calculate when to make bridge buys to support the items through planned technology refreshes. In FY 2000 an interface with another TSC model relative to sparing requirements was developed. In FY 2001, the model is being revised to include assessment of non-commercial components as candidates for commercial technology insertion initiatives. Future revisions will incorporate the model into a process for development of PEO TSC FYDP estimates for technology improvements and refresh initiatives, addressing total ownership costs for tradeoff analysis of each initiative.

NAVSEA-4. In an FY 1999 effort, NAVSEA Crane leveraged off existing cost estimating and model efforts relative to electronic technology refresh to develop a beta version of a model to generate a high-level estimate of an aggregate of multiple military systems at the level of the platform and battle group. The goal of the modeling effort was to assist platform managers to establish budget levels for sustaining functionalities in today's ever-changing marketplace. In FY 2001, the CERs in the beta version are being updated for various system-level solutions. The model is being applied to the LPD-17 design to estimate the cost of technology refresh at the platform level.

NAVSEA-5. Adopting and implementing new technologies have consequences for system affordability. The purpose of this study is to develop affordability measurement tools and techniques that evaluate hard-to-quantify affordability questions.

CEAC-10. The purpose of this study is to develop a CAIV capability to rapidly determine O&S costs early enough in the life cycle to influence tradeoffs in component design. Electronic components will be a significant part of this effort.

NCCA-1. OSCAM is systems dynamics O&S Cost Model that models dynamic behavior of complex systems (i.e., those factors tending to increase or decrease costs). It can use data extracted from VAMOSC or input data from other sources. OSCAM is used to generate O&S cost estimates for systems (PM estimates or ICEs). It is well suited for O&S tradeoffs and is an excellent tool for analyses of alternatives (AOAs).

NCCA-4. Navy VAMOSC collects O&S costs by platform and major system. System O&S is useful for estimating O&S costs of electronics. Ships and Ships Systems VAMOSC collect actual return direct costs by platform and major system with minimal allocations. Shipboard systems coverage began in FY 1986 and now covers 65 systems. EIC and ESWBS data are available in the detailed ship universe for most systems. EIC data (from 3-M) contain intermediate and organizational maintenance data. The ESWBS contains public shipyard maintenance data (not available for private shipyards).

NCCA-6. COMET provides detailed personnel costs by pay grade and skill area and addresses some indirect costs (variable personnel support costs). COMET contains three modules: Active Duty, Reserves, and Government Civilian Employees. Navy policy is to use variable indirect costs only for intra-Navy studies and analyses. Variable indirect costs are not to be used for analyses that go outside the Navy. COMET is a good tool for making tradeoffs or considering alternatives in an AOA. The variable indirect personnel costs in COMET are relevant only when there is an explicit or implied impact on Navy end strength (i.e., additions or subtraction to the number of people on active duty).

NCCA-7. NODES contains only Operations and Maintenance, Navy (O&MN) and Military Personnel, Navy (MPN). It uses a standard budget structure that includes Appropriation, Line Item (mission description force operations), and Claimant. Details are not found at headquarters level, but by UIC or Project Unit (SYSCOMS only). NODES provides end strength and details of resources used (rents, utilities, CIVPAY) by UIC.

NCCA-13. Software data for this effort are collected primarily from government software maintenance facilities. It uses Trouble Reports, ECPs and efforts associated with opening and closing reports (time spent on that ECP or trouble report). The methodology portion includes a curve to show distribution of Trouble Reports and ECPs over time. Most of the data up to this point have involved shipboard electronics. This study is developing estimating equations to project maintenance costs over time and maintenance cost per Trouble Report and ECP.
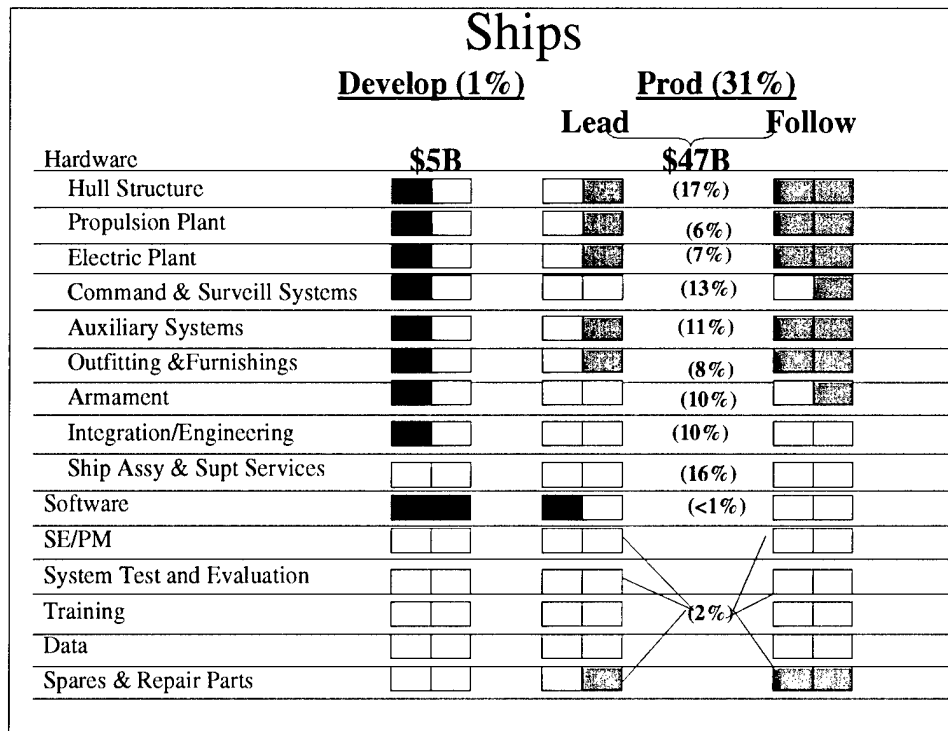
Ships

Hardware	Develop (1%) $5B	Lead $47B		Follow
Hull Structure	■▢	▢▨	(17%)	▨▨
Propulsion Plant	■▢	▢▨	(6%)	▨▨
Electric Plant	■▢	▢▨	(7%)	▨▨
Command & Surveill Systems	■▢	▢▢	(13%)	▢▨
Auxiliary Systems	■▢	▢▨	(11%)	▨▨
Outfitting &Furnishings	■▢	▢▨	(8%)	▨▨
Armament	■▢	▢▢	(10%)	▢▨
Integration/Engineering	■▢	▢▢	(10%)	▢▢
Ship Assy & Supt Services	▢▢	▢▢	(16%)	▢▢
Software	■■	■▢	(<1%)	▢▢
SE/PM	▢▢	▢▢		▢▢
System Test and Evaluation	▢▢	▢▢		▢▢
Training	▢▢	▢▢	(2%)	▢▢
Data	▢▢	▢▢		▢▢
Spares & Repair Parts	▢▢	▢▨		▨▨

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

This slide depicts the assessment of electronics cost-estimating capability. The assessment is based on input from representatives of four DoD organizations. NAVSEA, NSWCCD, NCCA, and OSD CAIG.

There are no apparent changes in the assessment since spring 1999. However, as will be discussed later, there are some ongoing efforts that should result in significant improvement within a few months. With a few exceptions, Development is rated red-yellow and Production is rated yellow-green for the lead ship and mostly green for the follow ships. Ships are different from other types of platforms and systems. There is no breakout of development into PDRR and EMD. There are platform-specific engineering and feasibility studies, but few platform-specific hardware or systems designed or built. Procurement for ships is different too. The lead ship is essentially a procurement-funded, fielded "prototype", with a lot of non-recurring cost, funded by SCN.

- Percentages at the top of chart represent the phases' typical share of LCC
- Dollar values at the top of chart (which are unrelated to the percentages at the top) represent the Navy's budget projections for ships across the years, FY99-05
- Development percentage for ships is significantly lower than percentages for other weapons commodities, because:
  - Procurement and O&S very high in relation to development
  - Development activities often not funded by the SHAPM
  - Major system development often funded by PARMs, not SHAPMs
  - Major systems applicable to more than one platform
- Lead ship is essentially a procurement-funded "prototype"

Before discussing ongoing studies that improve our ships cost-estimating capabilities, I will point out that the dollar values and percentages associated with ships have the same meaning as previously discussed for electronics. They are intended to give a general idea of the relative monetary importance of the different phases of the life cycle and of the different cost elements. The percentages at the top of the chart represent the phases' typical shares of LCC. On average for ships, Development cost accounts for only one percent and Production cost for 31 percent of LCC. The dollar values at the top of the chart, which are unrelated to the aforementioned percentages, represent the services' budget projections for ships across the years, FY 1999 through FY 2005. The Development value is approximately $5 billion (in then-year dollars). For FY 1999 through 2005, Production cost for ships is estimated to be $47 billion.

The percentages associated with the cost elements are also important. These percentages, which sum to 100 percent for a given life-cycle phase and account for both contractor and government in-house costs, indicate a cost element's (or cost element group's) typical share of phase total cost. The intent of these percentages is to focus attention on the significant, from a dollar perspective, red and red-yellow cost elements. Procurement and O&S are high in relation to Development, because Development activities are often not funded by Ship Acquisition Program Managers (SHAPMs), but by Participating Acquisition Resource Managers (PARMs) who fund major systems applicable to more than one platform.

Ships
Development Phase

- ONR-2: "Affordability Measurement and Prediction Methods to Support Affordable Design of Ship Systems"
- ONR-7: "The Effect of New Technologies on Ship Systems: A System Dynamics Cost Modeling Approach"
- NSWCCD-1: "Product-Oriented Design and Construction (PODAC) Cost Model"
- NSWCCD-2: "Leading Edge Advanced Prototyping for Ships (LEAPS)"
- NAVSEA-1: "Material Vendor Survey"
- NCCA-9: "Platform Integration Cost Database Model for Ships Electronics"

ONR-2. Maintenance, repair, and overhaul represent major and difficult-to-predict components of Total Ownership Cost (TOC). The purpose of this study is to develop probabilistic methods to address maintenance cost. This project includes a demonstration of decision making for maintenance, repair, and overhaul of ship service gas turbine generators on destroyers as an initial proof-of-concept. The study is being conducted in collaboration with Ingalls Shipbuilding, and will include software evaluation and development with provisions for interoperability with other models.

ONR-7. The introduction of new technologies often causes a temporary loss of productivity and leads to additional unforeseen costs over a system's life cycle. Traditional systems engineering management often fails to plan for the effects of technology procurement, implementation, and maintenance. Using a systems dynamics approach, this research defines the problem of introducing new technologies for ship systems and outlines how ship system performance can be predicted, evaluated, and controlled.

NSWCCD-1. The focus of this model is to support engineering tradeoff studies. This cost model will be sensitive to changes in shipbuilding strategies, ship construction processes, use of common modules, zonal architecture and equipment standardization. Partial functionality was demonstrated in a prototype PODAC model in 1997. Since then, Version 6.0 has been implemented at NSWCCD and the four surface shipyards. Cost model validation testing has been performed at two shipyards.

NSWCCD-2. This effort incorporates cost estimating and analysis capability into the Leading Edge Advanced Prototyping for Ships (LEAPS) integrated data environment. For selected cost analysis models, this effort provides lists defining the input variables

required by the models, definition of the input variables and definition of the output. It supports the focus object model from a cost perspective, supports the development of wrappers, and documents all results.

NAVSEA-1. The purpose of this annual survey is to capture future price trends and last year's actual price changes for material used in ship construction. The survey samples over 900 material and equipment suppliers, requesting their price changes for the current year and their projections of future price changes for the next 2 years. The results are grouped according to SWBS Cost Groups 1 through 9 and indices are calculated.

NCCA-9. The purpose of the study is to develop a database and cost-estimating methodology for projecting hardware/software integration costs for shipboard electronics and weapon systems. The database will include cost data, technical characteristics, and other relevant information (e.g., software size) for a variety of systems, including sonar, radar, fire control, and launching systems. Costs will include contractor and government in-house. This is a multi-phased effort, with Phase I to concentrate on developing an integration WBS, identifying integration cost factors, and initiating data collection.

Ships
Production Phase

- NSWCCD-1: "Product-Oriented Design and Construction (PODAC) Cost Model"
- NSWCCD-2: "Leading Edge Advanced Prototyping for Ships (LEAPS)"
- NAVSEA-1: "Material Vendor Survey"
- NCCA-10: "Ship Construction Cost Database"

NSWCCD-1, NSWCCD-2, and **NAVSEA-1.** These three studies, discussed under the Ships Development Phase, also have cost-estimating applications in the Ships Production Phase.

NCCA-10. The purpose of this effort is to develop a normalized database of historical ship construction costs and technical characteristics. The database will not contain any new data, but will be an accumulation of existing data in an ACDB format.

Ships

O&S (68%)

Mission Personnel		**(44%)**	
Unit Level Consumption {	Spares/Repair Parts(7%) POL(6%)	**(16%)**	
Intermediate Maintenance		**(<1%)**	
Depot Maintenance		**(30%)**	
Contractor Support		**(included above)**	
Sustaining Support		**(7%)**	
Indirect Support		**(3%)**	

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

This chart depicts the assessment of our cost-estimating capability for ship O&S. On average for a variety of conventionally and nuclear-powered ship classes, O&S costs account for 68% of LCC. In general, this year's assessment of DoD's capability to estimate ship O&S cost is essentially the same as it was in spring 1999. With a couple of notable exceptions, Sustaining Support and Indirect Support, O&S is mostly yellow. Mission Personnel is rated green because estimation of the pay and allowances (P&A) for ship operators and maintainers is a straightforward exercise driven by quantity and average P&A.

Sustaining Support includes the following three major components: modification kits, engineering support, and software maintenance. The red-yellow rating is attributed to database and methodology weaknesses related to software maintenance and, to a lesser extent, engineering support. Indirect Costs continue to be difficult to estimate because of longstanding database and methodology voids. However, several ongoing studies should improve our capabilities in Sustaining Support and Indirect Support.

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│  ╭───╮              Ships                                    │
│  │ ◉ │              O&S Phase                                │
│  ╰───╯                                                       │
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│                                                             │
│  •  ONR-1: "Uncertainty Calculus to Minimize Total          │
│     Ownership Costs for Ships"                              │
│  •  NSWCCD-3: "Oily Water Environmental Quality System      │
│     Life-Cycle Cost Model"                                 │
│  •  NSWCCD-4: "Graywater Environmental Quality System       │
│     Life-Cycle Cost Model"                                 │
│  •  NSWCCD-5: "Force Level Ship Environmental Cost Model"    │
│  •  NCCA-1: "Ship and Shipboard System Operating and        │
│     Support Cost Model (OSCAM)                             │
│  •  NCCA-4: "Naval Visibility and Management of Operating   │
│     and Support Cost (VAMOSC)                              │
│  •  NCCA-6: "Cost of Manpower Estimating Tool (COMET)"       │
│  •  NCCA-7: "Navy Obligation Data Extraction System (NODES)" │
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ONR-1. This project directly addresses affordability of ships by close collaboration with Navy programs to develop mathematical models using uncertainty calculus to minimize Total Ownership Costs (TOC) for Navy ships. It includes development of a Maintenance Cost Model, a Technology Insertion Model, and a Geometry Cost Evaluation model. The research methods include data finding, model construction using uncertainty calculus and model validation/verification. This program provides immediate results for the Navy PMs in the DD-21, NSSN, and LPD-17 programs, with transition to other programs possible.

NSWCCD-3. This effort develops a Price-H/spreadsheet model that was to estimate the LCC of oily wastewater treatment systems. The methodology uses open system architecture approaches and prototype level data to estimate acquisition and life-cycle production level costs. This model also considers fleet implementation for new construction ships. This study ties in with the presentation on environmental issues that Mr. Lile will give this afternoon.

NSWCCD-4. This effort also develops a Price-H/spreadsheet model to estimate the LCC of graywater waste treatment systems. The term "graywater" refers to laundry and kitchen waste. The methodology uses open system architecture approaches and prototype-level data to estimate acquisition and life-cycle production level costs.

NSWCCD-5. In this study, a methodology and spreadsheet model is being developed to estimate the LCC of liquid and solid wastes for fleet-level analysis. The model will input data from the Environmental Compliance database, the disposal cost

model, and the system-level environmental quality cost models. The output will be a force-level acquisition and life-cycle analysis.

NCCA-1, NCCA-4, NCCA-6, and NCCA-7. These previously mentioned studies all have application to the area of ships O&S cost estimation. VAMOSC, OSCAM, COMET, and NODES are databases/models specifically developed for estimating O&S costs for electronics, ships, and AISs.

AIS

	Investment (30%)			O&S (70%)
	PDRR	**EMD**	**Fielding**	
		$23B		$54B
Hardware				
Software				
Non-COTS				
COTS				
Installation				
Sys/Prog/Matl/Item Mgmt				
Training				
Data Maintenance				
Mega Center Ops & Maint				
Unit/Site Ops				

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

AISs do not follow the traditional life-cycle phases of Development, Procurement, and O&S. AISs are primarily concerned with software development and integration of COTS hardware with software. The AIS life cycle is characterized by an Investment phase (covering development and fielding of a system) and an O&S phase. The major components of the Investment phase are Hardware and Software. COTS hardware estimates are low risk, being based on catalog or standard contract prices, and our capability to estimate such costs is pretty good. But our capability in the Software area has been poor in the past, due to limited return cost data, and this area is currently assessed as red.

However, a number of ongoing studies and a broadening of CCDR reporting requirements should result in substantial improvement in our capabilities to estimate software costs.

Automated Information Systems
Dollars & Percentages

- Percentages at the top of chart represent the phases' typical share of LCC
- Dollar values at the top of chart (which are unrelated to the percentages at the top) represent the Services' and OSD's budget projections for IT programs across the years, FY99-05
- AIS programs are primarily software development in nature.
- AIS programs leverage COTS hardware to maximum extent
- COTS hardware/software-intensive nature of AIS programs results in dynamic technical baselines and CARDs
- Rapid technology advancement translates directly into rapid technical baseline obsolescence.

Before discussing ongoing studies that improve our AIS cost-estimating capabilities, we note the percentages and dollar values associated with this AIS area. The values shown on the charts are not intended to be precise portrayals of the monetary resources associated with the LCC phases or the cost element structure. Rather, they are intended to give a general idea of the relative monetary importance of the different phases of the life cycle and of the different cost elements. The percentages at the top of the chart represent the phases' typical shares of LCC. On average for AIS systems, Investment accounts for 30 percent and O&S for 70 percent of LCC.

- AFCAA-10: "Joint Automated information System (AIS) Automated Cost Database (ACDB) Framework"
- AFCAA-12: "COTS Electronics Database/Modeling"
- PA&E-13: "Contractor Cost Data Reporting (CCDR) Clearinghouse Repository"
- NCCA-14: "AIS Life Cycle Cost and Cost Technical Database"
- NCCA-16: "AIS Software Cost/Technical Database and Estimating Methodology"

AFCAA-10. The original purpose of this effort is the development of an AIS database within the ACDB framework. Early in FY 2001, the scope was revised to consolidate AIS data in the Open Software Model and C4I database, collect cost and technical data associated with the AIS programs in the ACDB framework, and load the data into the Joint IT Database. The development of CERs will be conducted in a follow-on effort.

AFCAA-12. This study was addressed in the Electronics Production phase. It is also applicable to AIS systems.

PA&E-13. This project was also addressed earlier in the Electronics Development phase, and it, too, has application to AIS systems. This is the first effort to expand CCDR reporting to AIS.

NCCA-14. This is a data-collection effort using NCCA in-house sources (past ICEs and EAs and any actual and estimated data that supported those programs). It can be used for analogous programs and provides a methodology and actual data, estimated cost, dates, and description by cost element. NCCA has documented this compendium of AIS data, which is a standardization effort that puts AIS data in one database (e.g., site-activation equations).

NCCA-16. The database portion of this effort involves the collection of historical software development and maintenance data. It contains both actual and estimated data such as historical AIS development and maintenance costs and metrics. The data, collected from other government organizations and central design agents such as FMSO and NNSY, do not contain any NCCA data. The data are collected via e-mail using an automated data collection form.

AIS
O&S Phase

- NCCA-6: "Cost of Manpower Estimating Tool (COMET)"
- NCCA-7: "Navy Obligation Data Extraction System (NODES)"
- NCCA-14: "AIS Life Cycle Cost and Cost Technical Database"
- NCCA-16: "AIS Software Cost/Technical Database and Estimating Methodology"

The studies on this slide have been alluded to previously in this presentation. COMET and NODES are relevant to any O&S cost-estimating effort, since they relate to personnel costs and indirect support costs. The two AIS database and methodology efforts are relevant not only to the AIS Investment phase, but also to Electronics.

FIXED-WING AIRCRAFT AND SPACE SYSTEMS

Five presentations on the DoD's capabilities to estimate the costs of weapons systems were presented at the 2001 IDA Cost Research Symposium. This appendix contains an annotated version of the third of those presentations. The presentation, by Lynn Davis, covered the state of cost-estimating capabilities for fixed-wing aircraft and space systems.

Cost Research

Fixed-Wing Aircraft

Fixed-Wing Aircraft Research Sponsoring Agents

- **Air Force**
  - Air Force Aeronautical Systems Center, (AFMC/ASC)
  - Air Force Cost Analysis Agency (AFCAA)
  - Air Force Institute of Technology School of Engineering and Management (AFIT/ENV)

- **Navy**
  - Naval Air Systems Command (NAVAIR)
  - Naval Center for Cost Analysis (NCCA)

- **OSD(PA&E)**

- **Federally Funded Research and Development Centers (FFRDCs)**
  - Institute for Defense Analysis (IDA)
  - RAND Corporation
  - The Aerospace Corporation

The agencies that sponsored this briefing by providing data are listed above.

Aircraft - Fixed Wing

$ thru FYDP (TY$)	RDT&E (20%) PDRR $33.4B		RDT&E (20%) EMD		Production (39%) $94.8B	
Airframe		30%				24%
Propulsion		5%				9%
Avionics		32%				23%
Integration Assembly and Test		5%				10%
Software (Incl in Avnx & IA&T)		0%				0%
Armament		1%				4%
Test and Evaluation		10%				0%
SE/PM		12%				12%
Data		1%				3%
Training		2%				2%
Support Equipment		3%				8%
Spares		0%				6%

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Fixed-wing aircraft is the first commodity I'll be briefing today. Contributing organizations include AFCAA, ASC, NAVAIR and NCCA.

The following explanation applies to the chart here and on the next page. The dollars shown under the phase represent the FYDP years FY 1999 through FY 2005. Percentages next to the phase indicate the typical percentage of each phase's total life cycle cost. Individual WBS percentages reflect their portion of the phase in total. On this chart, the percentage for RDT&E is shown in whole because PDRR and EMD could not be broken out.

Avionics changed from yellow to red this year because there isn't much data available on modification programs. Further, technical advances occur too quickly at times for data to be useful in studies.

Software estimating still remains a challenge as in other commodities. Tools to estimate software are available; however, input is subject to analyst judgment.

There is a need for a broader range of platforms and lower levels of software data. In addition, studies of software estimates versus actual costs would be useful for future estimates. Further, there is a void in collecting O&S software costs for maintenance, debugging, updates, and licensing changes.

Propulsion has changed from green to yellow/green since our last assessment because data and studies are outdated and data on new commercial engines are scarce. While Training remains yellow/green, analysts indicate a lack of available simulator data in current databases or studies.

Aircraft - Fixed Wing (cont.)

O&S (41%)

Mission Personnel	▨▨	22%
Unit Level Consumption	▢▨	15%
Intermediate Maintenance	▢▢	8%
Depot Maintenance	▢▢	13%
Contractor Support	▢▨	8%
Sustaining Support	▢▨	26%
Indirect Support	▢▨	8%

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Overall Changes

- The majority of the colors have not changed since our last presentation, because even though we are making improvements in some areas, we are falling behind in others.
- Within Fixed Wing Aircraft, I will focus on on-going or recently completed studies for areas identified as most in need of further research.
- Areas Most in Need of Further Research are:
- RDT&E / Production
    - Avionics
    - Software
    - Test and Evaluation
- O&S

The reason most of the colors in these charts have not changed since the last presentation is that even though we are making improvements in some areas of collecting data, we are falling behind in others. We have gained improvements from data in MACDAR providing insight into reasonable labor learning curves, but material data and curve analysis still needs significant improvement in data collection on more recent systems.

Avionics

- Avionics changed from yellow to red, because there is a lack of data on modification programs
  - Further, technical advances often occur too quickly for data to be useful in studies.
- The following efforts are on going or recently completed in Avionics estimating:
- Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives (RAND-4)
- Aircraft Avionics Systems Database and Study (AFCAA-9)
- Cost of Developing and Producing Next Generation Tactical Aircraft (PA&E-12)

The Cost of Future Military Aircraft Avionics study focuses on CERs for future avionics and subsystems and contains a JSF study.

The Aircraft Avionics Systems Database Study contained both federated and next-generation integrated avionics data and provided CERs for development, production, and integration.

The Cost of Developing and Producing Next Generation Tactical Aircraft project covers both development and production and provides data on fighter and attack aircraft.

Avionics (Cont'd)

- Avionics Database (NAVAIR-9)
- Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology (NCCA-13)
- PRICE H/S Model Calibration Studies for the F-15 (ASC/FMC-2)
- PRICE H/S Model Calibration Studies for the B-2 (ASC/FMC-3)
- Unmanned Air Vehicle Database (AFCAA-18)

The NAVAIR Avionics Database project is a historical database containing cost, technical and programmatic information. This data are used primarily for ad hoc queries and standard reports.

The Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology study contains software maintenance metrics. It previously focused on ship software, but the new focus will be on avionics and aircraft software.

The Aeronautical Systems Command studies on Price H/S Model Calibration for the F-15 and B-2 focus on Group B equipment for the F-15. This project is adding modifications and manufacturing process changes. The B-2 study covers electronic, structural, and global values for hardware as well as productivity factors for software. The B-2 study includes data on the B-2 JSOW and B-2 GWIS (Generic Weapon Interface System).

The Unmanned Air Vehicle (UAV) Database is a project the AFCAA will begin later this year to collect and normalize UAV cost, technical, and programmatic data. It will provide data for analogy or CER-based estimates.

Software

- The following efforts are ongoing or recently completed in estimating software:
  - PRICE H/S Model Calibration Studies for the F-15 (ASC/FMC-2)
  - PRICE H/S Model Calibration Studies for the B-2 (ASC/FMC-3)
  - Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology (NCCA-13)
  - Cost of Future Military Aircraft: Historical CERs and Cost Reduction Initiatives (RAND-4)
  - Weapon System Software Development Cost/Technical Database (NCCA-11)
  - Weapon System Software Development Estimating Methodology (NCCA-12)
  - Automated Information System (AIS) Software Cost/Technical Database and Estimating Methodology (NCCA-16)

All the projects listed on this slide have been briefed earlier, and in the essence of saving time, I will not repeat them. The first project I'll discuss on this chart is the Weapon System Software Development Cost/Technical Database by NCCA. This effort is expanding software, schedule, labor rate, and SLOC growth. The data will be incorporated into NCCA's Development Estimating Phase I Handbook.

The Weapon System Software Development Estimating Methodology project by NCCA is updating software tools, particularly in the area of commercial software development methodologies.

The Automated Information System Software Cost/Technical Database and Estimating Methodology project is collecting software development and maintenance metrics and identifying software cost drivers.

Test and Evaluation

■ Test and Evaluation remains red for the most part
  ■ The AF currently lacks relevant methodologies for developing aircraft or tactical missile test costs

■ The following efforts are on going in the area of T&E estimating:
  ■ Estimating Methodologies for Non-Air Vehicle Work Breakdown Structure Costs (RAND-7)

  ■ Resource Analysis for Operational Test and Evaluation (OT&E) (IDA-13)

Test and evaluation remains red for the most part due to lack of currently relevant methodologies for developing aircraft or tactical missile test costs.

The following projects are expected to help this area of estimating:

● Estimating Methodologies for Non-Air Vehicle Costs identifies cost drivers, normalizes data and is used early in the program or for crosschecks. The first phase of the program will address aircraft and tactical missile integration while Phase II will address engineering and program management costs.

● IDA's project of Resource Analysis for Operational Test and Evaluation looks at the adequacy of resources for the POM and FYDP and provides data for the Annual Report to Congress and policy for the PPBS cycle.

Operating and Support (O&S)

- The following efforts are ongoing or recently completed in O&S cost estimating:
    - The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives (RAND-4)
    - The Air Force Total Ownership Cost Management Information System (AFCAA-6)
    - Advanced Airframe Structural Materials Operating and Support Costs (RAND-6)
    - Aircraft Support Cost Estimating Relationships (RAND-8)
    - Aging Aircraft Study (RAND-9)
    - O&M Program Balance and Related Cost Drivers (PA&E-3)

While aircraft O&S estimating is doing fairly well, we had so many projects ongoing that I thought it would be of value to address those projects today.

The Rand-4 project was briefed earlier.

The Air Force Total Ownership Cost Management Information System Database is the Air Force's greatly expanded VAMOSC system. It now includes all appropriations, aircraft, space, C3I, and munitions programs as well as small missile expenditures and sustainment costs.

The Advanced Airframe Structural Material and O&S Costs project is studying the impact of advanced versus conventional materials on O&S costs. It is expected to improve estimating for organizational, intermediate, and depot maintenance labor and material costs.

Rand's Aircraft Support Cost Estimating Relationships study contains CERs for O&S software maintenance, data on modification kit installations, sustaining engineering, maintenance manpower, DLRs, consumable supplies, and depot overhauls.

The Aging Aircraft Study by RAND quantifies the effects of aging aircraft fleets focusing on flight safety, aircraft availability, and O&S costs. It is attempting to identify effective management techniques of those resources.

PA&E's O&M Program Balance and Related Cost Drivers study covers global assessment of O&M funding in the areas of OPTEMPO, depot maintenance, base operating support, and real property maintenance.

Operating and Support (O&S) Cont.

- Analysis of the Repair and Overhaul of Reparable Items (PA&E-14)
- Estimating C-17 Operating and Support Costs: Development of a Systems Dynamic Model (AFIT/ENG-9)
- Aircraft Operating and Support Cost Analysis Model (NCCA-2)
- Naval VAMOSC Database (NCCA-4)
- Aviation Maintenance Subsystem Database (AMSD) (NCCA-5)
- Cost of Manpower Estimating Tool (COMET) (NCCA-6)
- Naval Obligations Data Extraction System (NODES) (NCCA-7)
- ACEIT Future Combat Systems (FCS) O&S Cost CAIV (CEAC-10)
- An Analysis of the Sustainability of Pope AFB C-130s Through Their Programmed Service Life (AFIT/ENG-4)

The AFIT paper on Analysis of Repair and Overhaul of Reparable Items identifies inadequacies of reparable management and focuses on improvement of the logistics management process.

The AFIT project on Estimating C-17 O&S Costs: Systems Dynamics Model applies systems dynamics to O&S. It proposes causal relationships through the use of differential equations that create more accurate O&S estimates.

NCCA's Aircraft Operating and Support Cost Analysis Model provides top-level cost estimating for complex systems and is used for policy decision-making.

The Naval VAMOSC Database supports O&S for ships, aircraft, ordnance, and tracked and wheeled vehicles.

The Aviation Maintenance Subsystem is a database of maintenance and material management. It provides insight into maintenance staff-hours and replacement parts costs.

The Cost of Manpower Estimating Tool (COMET) provides data for the Navy's O&S manpower estimates and is used for trade-off analysis.

The Naval Obligations Data Extraction System (NODES) tracks Navy's indirect O&S costs and compliments the VAMOSC system that collects direct costs.

The ACEIT Future Combat Systems O&S Cost CAIV project by CEAC uses Cost as an Independent Variable (CAIV) to project O&S early in the life-cycle cost. It is used for trade-off analysis and design change scenarios.

The final AFIT project, An Analysis of Sustainability of Pope AFB C-130s Through Their Programmed Service Life, assesses the sustainability of the C-130.

Cost Research

Space Systems

The next commodity I will brief is space systems.

Space Systems Research
Sponsoring Agents

- **Air Force**
  - Air Force Cost Analysis Agency (AFCAA)
  - Air Force Space and Missile Systems Center, (SMC/FMC)

- **Federally Funded Research and Development Centers (FFRDCs)**
  - Aerospace Corporation

The agencies that contributed to this briefing are listed above.

Space Systems

$ thru FYDP (TY$)	RDT&E (18%) PDRR $10.3B	EMD	Production (66%) $14B
Integration Assembly and Test	5%		6%
Software	13%		0%
Spacecraft	8%		13%
Payload	37%		42%
Ground C3	9%		13%
Test and Evaluation	1%		0%
SEPM/Data/Training	15%		5%
Support Equipment	4%		0%
Spares (In O&S)	0%		0%
Launch Operations and Orbital Spt	1%		3%
Launch Vehicle	7%		18%

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

As was the case with the aircraft charts, the dollars here and on the next chart represent the FYDP years FY 1999 through FY 2005. Percentages next to the phase indicate the typical percentage of total life cycle cost, and individual WBS percentages reflect their portion of the phase in total. Again, the RDT&E percentage is shown as one amount because PDRR and EMD could not be broken out.

Space Systems (cont.)

	O&S (16%)	
Mission Personnel		14%
Unit Level Consumption		12%
Intermediate Maintenance		0%
Depot Maintenance		3%
Contractor Support		2%
Sustaining Support		66%
Indirect Support		3%

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Areas Most in Need of Further Research

- RDT&E / Production
  - Software
  - Spacecraft
  - Support Equipment
- O&S

Areas most in need of further research are indicated above.

Software

- Software remains the most troublesome area
- Software was revised from red/yellow to red because:
    - Data availability is seriously limited
    - Diminished historical data hampers parametric models' ability (SEER-SEM) to develop estimates and cross-checks
    - Expansion of commercial space industry and DoD moving toward commercially available technology
    - Commercial companies not required to report costs at lower levels of detail leading to
        - Less and less data being available for collection in historical databases

Software remains the most troublesome area. Software was revised from red/yellow to red this year because of the reasons indicated above.

Software

- Software estimating is being supported by the following databases:

  - SEER-SEM

  - PRICE S

  - COCOMO II

  - Contractor Cost Data Reporting (CCDR) Clearinghouse/Repository (PA&E-13)

Software estimating is being supported by the four databases indicated above. The CCDR project office is preparing for the release of software WBS for future data collection. The cost community is hopeful that this will improve software cost estimating in the future.

Spacecraft

■ Spacecraft are becoming increasingly difficult to estimate because the services are moving toward commercial-like practices

   ■ Government databases do not capture the costs of commercial spacecraft

■ The following effort is on-going in supporting the Spacecraft WBS

   ■ Unmanned Spacecraft Cost Model (USCM) (SMC/FMC-2)

USCM provides CERs for subsystem and components of spacecraft and commercial payloads.

Support Equipment

- The following efforts are on-going in supporting the Support Equipment WBS

  - Air Force Total Ownership Cost (AFTOC) Management Information System (AFCAA-6)

  - Unmanned Spacecraft Cost Model (USCM) (SMC/FMC-2)

  - NASA/Air Force Cost Model (NAFCOM) (AFCAA-4)

The first two projects listed here for Support Equipment have already been briefed earlier. The NASA/Air Force Cost Model (NAFCOM) database incorporates Air Force cost procedures and terminology into a complexity generator development process. The database develops prediction intervals.

Operating and Support (O&S)

- Projects supporting O&S estimating are:

  - Unmanned Spacecraft Cost Model (USCM) (SMC/FMC-2)

  - NASA/Air Force Cost Model (NAFCOM) (AFCAA-4)

  - Air Force Total Ownership Cost (AFTOC) Management Information System (AFCAA-6)

  - Space Systems Costing Suite (Aero-1)

  - Costs of Space, Launch and Ground Systems (Aero-2)

  - Ground Station Cost Model (GSCM) (Aero-3)

The first three projects on this slide were briefed previously. The other projects supporting O&S are as follows:

- Space Systems Costing Suite by Aerospace. This database contains infrared sensor payload and integration ground station design and costing models.

- The Costs of Space, Launch and Ground Systems database by Aerospace is a historical database. It contains data on satellites, launch vehicles, launch processing, launch delays and failures, payloads, software, ground facilities, learning rates, and cost overruns.

- The final project by Aerospace, Ground Station Cost Model (GSCM), is a model that incorporates commercial off-the-shelf (COTS) equipment.

Other Areas Needing Research

- Learning Curves
- Methodology for handling non-recurring satellite costs
- Large communications payloads (phased array antenna, communications electronics and Traveling Wave Tube Amplifier) non-recurring and recurring
- Sensor model update (Sensor Chip Assemblies and cryocoolers)

The final slide in my briefing addresses other areas in Space Systems that need research.

ROTARY-WING AIRCRAFT, MISSILES, AND LAND VEHICLES

Five presentations on the DoD's capabilities to estimate the costs of weapons systems were presented at the 2001 IDA Cost Research Symposium. This appendix contains an annotated version of the fourth of those presentations. The presentation, by David Henningsen, covered the state of cost-estimating capabilities for rotary-wing aircraft, missiles, and land vehicles.

U.S. ARMY COST AND ECONOMIC ANALYSIS CENTER

David Henningsen
17 May 2001

Rotary-Wing Aircraft, Missiles, Land Vehicles

IDA COST RESEARCH SYMPOSIUM

This presentation will display charts that show our capabilities to estimate the PDRR, EMD, Production and O&S costs of rotary-wing aircraft, missiles, and land vehicles. In addition, ongoing research intended to improve our capabilities will be discussed.

Aircraft - Rotary Wing

	PDRR 8% $8B	EMD 7%	Production 52% $29B
Airframe	18 ☐	18 ☐	34 ☐
Propulsion	19 ☐	8 ▨	6 ▨
Avionics	15 ☐	15 ☐	36 ☐
Software	10 ■	8 ■	2 ☐
Armament	4 ☐	4 ☐	4 ▨
Test and Evaluation	10 ☐	20 ☐	1 ☐
System Eng/Program Mgmt	21 ▨	21 ▨	6 ☐
Data	1 ▨	1 ▨	2 ▨
Training	1 ▨	4 ▨	3 ☐
Support Equipment	1 ☐	1 ▨	2 ▨
Spares	0 ☐	0 ☐	4 ☐

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Data were provided by Aviation and Missile Command (AMCOM) and Army Cost and Economic Analysis Center (CEAC) for these assessments. Overall, there are no significant changes to the ratings from the last rating period.

Changes/Ratings

- Overall no changes
- Airframe remains yellow
  - composite materials
  - stealth technology
- Avionics remains yellow
  - lack of current data/studies
- Software is red in PDRR to yellow in production
  - estimates lower than actuals particularly for PDRR
- Test & Evaluation, Training, Spares are yellow
  - lack of actual data/studies

Airframe remains yellow due to a lack of methodologies and studies on composite materials and stealth technologies.

Although there are studies on Avionics, they are based on older data. There is a lack of current information. This is the primary reason for its yellow rating.

The red rating for Software in the PDRR phase is essentially because our estimates have been consistently lower than actual costs. Additional emphasis is required on software model inputs.

Test and Evaluation, Training, and Spares are yellow due to a lack of current data and studies.

PDRR & EMD

- Aircraft Avionics Systems Database and Study (AFCAA-9)
- CEAC Rotary Wing Database (CEAC–8)
- Study on Airframe, Propulsion, Avionics Development Engineering (CEAC–16)
- Avionics Database (NAVAIR-9)
- Rotary Wing Database (NAVAIR-10)
- Propulsion Database (NAVAIR-11)
- Weapon System Software Development Cost/Technical Database (NCCA-11)
- Weapon System Software Development Estimating Methodology (NCCA-12)
- Cost of Stealth (IDA-3)
- Cost of Developing and Producing Next Generation Tactical Aircraft (PA&E-12)
- Military Airframe Costs: The Effects of Advanced Materials and

There are many ongoing studies that will help improve our cost-estimating capabilities in the future.

The chart indicates that Software is rated red. "Weapon System Software Development Cost/Technical Database and Estimating Methodology" NCCA 11 and 12 sponsored by NCCA should help in this area.

The chart also indicates that Airframe is rated yellow due to a lack of studies and data on composite materials and stealth technology. A number of current efforts will help address this shortfall. The last three, "Cost of Stealth" sponsored by IDA, "Cost of Developing and Producing Next Generation Tactical Aircraft" sponsored by PA&E and "Military Airframe Costs: The Effects of Advanced Materials and Manufacturing Processes" sponsored by RAND should improve future Airframe capabilities ratings.

Avionics is another area assessed yellow. The following studies will help improve the yellow rating, There are also three Avionics research efforts that should help in this area, the "Aircraft Avionics Systems Database and Study" sponsored by AFCAA-9, "Study on Airframe, Propulsion, Avionics Development Engineering" sponsored by CEAC and the "Avionics Database" sponsored by NAVAIR.

Production

- Aircraft Avionics Systems Database and Study (AFCAA-9)
- CEAC Rotary Wing Database (CEAC–8)
- Avionics Database (NAVAIR-9)
- Rotary Wing Database (NAVAIR-10)
- Propulsion Database (NAVAIR-11)
- Cost of Developing and Producing Next Generation Tactical Aircraft (PA&E-12)
- Military Airframe Costs: The Effects of Advanced Materials and Manufacturing Processes (RAND-1)
- Military Airframe Production Costs: The Effects of Lean Manufacturing (RAND-3)

The Production capabilities assessments were similar to the EMD assessments, so most of the research discussed on the previous chart will help to improve Production estimating capabilities as well.

Aircraft - Rotary Wing

O&S 33%

Mission Personnel	48	
Unit Level Consumption	38	
Intermediate Maintenance	0	
Depot Maintenance	1	
Contractor Support	1	
Sustaining Support	11	
Indirect Support	1	

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

The percentage by life cycle phase of 33% is based on the Comanche estimate. It seems low compared to some older rotary-wing aircraft, and it is based on a planned design to include built-in test/build-in test equipment (BIT/BITE) and fault isolation hardware and software.

Overall there were no changes from the previous capability assessment period.

Changes/Ratings

- Overall no changes
- Unit Level Consumption remains yellow/green
    - OSMIS data being updated to incorporate retail level demands required to cost under single stock fund
- Intermediate Maintenance, Depot Maintenance and Contractor Support remain yellow
    - lack of data
    - OSMIS will start capturing & reporting these elements
- Sustaining Support is red/yellow
    - primarily due to software maintenance & mod kits
- Indirect Support
    - lack of actual data allocated by system

The red/yellow rating for Sustaining Support is due to a lack of data to estimate software maintenance and Modification kits.

Within the Army, we rely primarily on OSMIS for collection of actual costs for Unit Level Consumption, Intermediate Maintenance, Depot Maintenance and Contractor Logistics Support. In FY 2001, the Army combined the retail and wholesale supply systems into a single stock fund. OSMIS is being updated to collect and display single stock fund data. OSMIS will also include updated data for the other cost elements. The other services maintain their own versions of O&S databases.

Indirect Support costs are under development in the Installation Status Reporting System. These costs are still not allocated by system.

O & S

- Study on Rotary Wing Aircraft DLR CER (CEAC-17)
- CEAC OSMIS Relational Database (CEAC-1,2)
- Weapon System Software Development Estimating Methodology (NCCA-12)
- Installation Status Report (CEAC 11,12)
- Personnel Costing System (CEAC-13)
- Force & Contingency Cost Models Update (CEAC-14)
- Aging Aircraft Study Cost Update (NAVAIR-4)
- Aircraft Operating and Support Cost Analysis Model (NCCA-2)
- Aviation Maintenance Subsystem Database (NCCA-5)
- Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology (NCCA-13)
- Force and Support Cost System (PA&E-1)
- Advanced Airframe Structural Materials Operating & Support Costs (RAND-6)
- Aircraft Support Cost Estimating Relationships (RAND-8)

There are numerous ongoing efforts that will improve O&S costing. Rather than cover the entire list, I'll mention two that will help in the only area assessed red/yellow. The NCCA sponsored studies, "Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology" and "Weapon System Software Development Estimating Methodology" should provide current data and methodologies to help upgrade our software maintenance estimating capabilities.

O & S (continued)

- The Cost of Future Military Aircraft Avionics: Cost Estimating Relationships and Cost Reduction Initiatives (RAND-4)
- The Air Force Total Ownership Cost Management Information System (AFCAA-6)
- Aging Aircraft Study (RAND-9)
- O&M Program Balance and Related Cost Drivers (PA&E-3)
- Analysis of the Repair and Overhaul of Reparable Items (PA&E-14)
- Naval VAMOSC Database (NCCA-4)
- Cost of Manpower Estimating Tool (COMET) (NCCA-6)
- Naval Obligations Data Extraction System (NODES) (NCCA-7)
- ACEIT Future Combat Systems (FCS) O&S Cost CAIV (CEAC-10)
- An Analysis of the Sustainability of Pope AFB C-130s Through Their Programmed Service Life (AFIT/ENG-4)

Current research efforts that will help improve our O&S estimating capabilities are continued on this chart.

Tactical Missiles

	PDRR 14%	EMD 13%	PROD 33%
Air Vehicle	$2.2B		$8B
Propulsion	2	6	9
Payload	0	1	2
Airframe	0	1	2
Guidance & Control	6	14	23
Integration/Assembly/Test/Checkout	2	4	7
Command & Launch			
Surveillance, ID & Track Sensor	32	11	24
Launch & Guidance Control	3	5	4
Communication	0	1	2
Launcher & Equipment	1	2	2
Sys Eng/Program Mgmt	25	31	17
System Test & Evaluation	15	14	3
Training	0	2	2
Software	12	7	
Peculiar/Common Spt. Equip	0	0	1
Initial Spares & Repair Parts	1	0	2

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

The above cost of $2.2 billion for RDT&E and $8.0 billion for Production is for FY 2000 through FY 2005 expressed in then-year dollars. This represents Army tactical systems only, not BMDO systems.

Changes/Ratings

- Propulsion remains red/yellow
  - primarily due to lack of data on ballistic missiles
- Launch & Guidance Control changed to yellow
- Integration/Assembly/Test/Checkout remains yellow
  - lack of detailed historical data
- Airframe during PDRR & EMD remains red/yellow
  - lack of data on composite materials
- System Engineering/Program Management and System
      Test & Evaluation changed to green for production
- Software during PDRR & EMD remains red/yellow
  - lack of actual data

There were a few improvements since our 1999 assessment. Launch & Guidance Control was upgraded to yellow. Good data on System Engineering/Program Management and System Test & Evaluation during production improved the rating to green.

Propulsion is still red/yellow, although there is some more data for PDRR, EMD, and Production phases. The low rating is driven by a lack of data and methodologies to estimate ballistic missiles. There is some actual PDRR cost data available on THAAD.

Integration/Assembly/Test/Checkout remains yellow due to a lack of detailed historical data. Airframe hasn't changed essentially due to lack of studies on composite materials. Software during PDRR and EMD remains red/yellow due to a lack of data.

PDRR & EMD

- Tri-Service Missile & Munitions Database (CEAC-6)
- Strategic Missile Model Update (SMDC-1)
- Strategic and Experimental IR Sensor Cost Model III (SMDC-2)
- Missile Database (NAVAIR-14)
- Weapon System Software Development Cost/Technical Database (NCCA-11)
- Weapon System Software Development Estimating Methodology (NCCA-12)
- Missile & Munitions CER Development Study (AFCAA-11)
- Improved Cost Estimating Relationships for BMD Systems (PA&E-7)

Studies that should improve our cost-estimating capabilities for missiles during PDRR and EMD are shown on this chart. Propulsion, Airframe, and Software were assessed red/yellow.

A few listed studies will be mentioned. The two NCCA studies mentioned previously, NCCA-11 and 12, should help improve software estimating methodologies. The "Strategic Missile Model Update" sponsored by SMDC and the "Improved Cost Estimating Relationships for BMD Systems" sponsored by PA&E will help improve the Airframe and Propulsion areas.

Production

- Update of Missile Production Factors (CEAC-19)
- Tri-Service Missile & Munitions Database (CEAC-6)
- Strategic Missile Model Update (SMDC-1)
- Strategic and Experimental IR Sensor Cost Model III (SMDC-2)
- Missile Database (NAVAIR-14)
- Missile & Munitions CER Development Study Production
  Below-the-Line Cost Research (AFCAA)

Studies that should improve our cost-estimating capabilities for missiles during Production are shown on this chart.

Tactical Missiles

		O&S 39%
Mission Personnel	8	
Unit Level Equipment	21	
Intermediate Maintenance	12	
Depot Maintenance	11	
Contractor Support	4	
Sustaining Support	29	
Indirect Support	15	

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

There was one change from the previous assessment.

Changes/Ratings

- Unit Level Consumption changed to yellow/green
    - OSMIS data being updated to incorporate retail level demands required to cost under single stock fund
- Intermediate Maintenance, Depot Maintenance & Contractor Support remain yellow
    - lack of data
    - OSMIS will start capturing & reporting these elements
- Sustaining Support remains yellow
    - primarily due to software maintenance
- Indirect Support
    - lack of actual data allocated by system

Unit Level Consumption was upgraded to yellow/green due to improvements in the OSMIS relational database. One of the improvements previously mentioned was the incorporation of retail-level demands. Under single stock fund, the two supply systems, retail and wholesale, were combined. Other elements remain yellow primarily due to a lack of historical data. OSMIS will start reporting these other elements in the future. Indirect Support remains yellow for the same reason mentioned in the rotary-wing aircraft assessment: the existing data is not allocated by system.

O&S

- CEAC OSMIS Relational Database (CEAC-1,2)
- Installation Status Report (CEAC 11,12)
- Personnel Costing System (CEAC-13)
- Force & Contingency Cost Models Update (CEAC-14)
- Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology (NCCA-13)
- Force and Support Cost System (PA&E-1)
- Air Force Total Ownership Cost Management Information System (AFCAA-6)
- O&M Program Balance and Related Cost Drivers (PA&E-3)
- Analysis of the Repair and Overhaul of Reparable Items (PA&E-14)
- Naval VAMOSC Database (NCCA-4)
- Cost of Manpower Estimating Tool (COMET) (NCCA-6)

This chart lists the current research efforts that should help improve our missile O&S cost-estimating capabilities. The Service's O&S databases, CEAC-1, CEAC-2, AFCAA-6, and NCCA-4, are continually being updated, which should help maintain and improve our capabilities for most O&S elements. The previously mentioned NCCA Software Maintenance research effort should also improve estimating capabilities in this area.

Land Vehicles

	PDRR 4%	EMD 5%	Production 38%
	$8B		$14B
Hull Platform/Suspension/Turret	1%	8%	
Power Package/Drive Train	3%	16%	
Armament	1%	8%	
Autoloader	2%	13%	
Fire Control	1%	4%	
Special Equipment	2%	18%	
Nuclear, Biological, Chemical	1%	8%	
Communications- Navigation	0	4%	
Integration/Assembly/Test/Checkout	1%	5%	
System Eng/Program Mgmt	25%	2%	
System Test & Evaluation	12%	1%	
Training	1%	0%	
Data	3%	1%	
Initial Spares & Repair Parts		3%	
Other	46%	8%	

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Assessments were provided by the Army Tank-automotive and Armaments Command and CEAC. Budget dollars included Crusader, Abrams, Bradley, FMTV, and AAAV. Estimating capability assessments were upgraded for three elements.

Changes/Ratings

- Power Package/Drive Train upgraded to yellow/green in
    production
    - additional ACDB data
- Autoloader upgraded to red/yellow in PDRR & EMD
    - additional data from Crusader
- System Test & Evaluation upgraded to yellow/green in
    EMD & Production
    - lack of historical data during PDR
- Initial Spares & Repair Parts upgraded to red/yellow
- Integration/Assembly/Test/Checkout remains red/yellow
    - lack of detailed historical data

The Power Package/Drive Train was upgraded to yellow/green in production due to additional data available from the Wheeled and Tracked Vehicle database.

The Autoloader was upgraded to red/yellow because of additional data available from the Crusader program.

Our ability to estimate System Test and Evaluation in EMD and Production was upgraded, but the yellow rating was retained for PDRR because of a lack of historical data.

We upgraded the Initial Spares & Repair Parts to red/yellow based on experience gained from the Bradley program.

Integration & Assembly remains red/yellow due to a lack of historical data. Most vehicle programs have not obtained CCDR data. Capability should improve in the future with the IAV CCDR Plan to break out components. Currentlym, the appropriate level of detail is lacking and confidence in parametric methods is slim.

PDRR & EMD

- Wheeled & Tracked Vehicle Database (CEAC-7)
- Total Ownership Cost Reduction (TOCR) Model (TACOM-1)
- PRICE Model Evaluation (CEAC-15)
- IAV CER Development Study (CEAC-18)
- Weapon System Software Development Cost/Technical Database (NCCA-11)
- Weapon System Software Development Estimating Methodology (NCCA-12)

These research efforts will help maintain and improve our vehicle cost-estimating capabilities. Many were mentioned earlier. The Wheeled and Tracked Vehicle Database effort is hindered by the lack of cost reporting on vehicle contracts.

The goal of PRICE Model Evaluation effort is to understand the algorithms behind the model, to calibrate thirteen vehicle subsystems and to determine whether we feel confident with the estimating ability of the PRICE model. An indirect benefit of this effort is that it will provide data that links performance and cost, which should be useful in future cost/performance models.

The "IAV CER Development" study will provide high-level CERs for use in estimating early in the life cycle.

Production

- Wheeled & Tracked Vehicle Database (CEAC-7)
- Total Ownership Cost Reduction (TOCR) Model (TACOM-1)
- PRICE Model Evaluation (CEAC-15)

This chart lists ongoing efforts that should improve vehicle Production cost-estimating capabilities.

Land Vehicles

O&S   54%

Mission Personnel	58%	
Unit Level Consumption	24%	
Intermediate Maintenance	0%	
Depot Maintenance	1%	
Contractor Support	0%	
Sustaining Support	10%	
Indirect Support	6%	

Note: Green means capabilities are good or better; yellow means they are marginal and red means they are poor.

Overall there are no changes to ratings.

Changes/Ratings

- Overall no changes
- Unit Level Consumption, Intermediate Maintenance &
  Depot Maintenance remain yellow/green
  - lack of data
  - future releases of OSMIS will provide maintenance
    data and include retail level demands
- Contractor Support remain yellow
  - lack of data
  - OSMIS will start capturing CLS
- Sustaining Support is yellow
  - primarily due to software maintenance
- Indirect Support
  - lack of actual data allocated by system

Unit Level Consumption, Intermediate Maintenance and Depot Level Maintenance remain yellow/green. This area should improve in the future due to improvements in the OSMIS database. Other elements are rated yellow. OSMIS will start collecting and reporting CLS data that will improve the Contractor Support rating. Sustaining Support is rated yellow for the same reason as in other commodity groups ratings, a lack of data and methodologies to estimate Software Maintenance. Once again, the Indirect Support rating is due to a lack of data allocated by system.

O & S

- CEAC OSMIS Relational Database (CEAC-1,2)
- FCS O&S Cost CAIV (CEAC-10)
- Installation Status Report (CEAC 11,12)
- Personnel Costing System (CEAC-13)
- Force & Contingency Cost Models Update (CEAC-14)
- Weapon System Software Maintenance Cost/Technical Database and Estimating Methodology (NCCA-13)
- Force and Support Cost System (PA&E-1)
- O&M Program Balance and Related Cost Drivers (PA&E-3)
- Analysis of the Repair and Overhaul of Reparable Items (PA&E-14)
- Naval VAMOSC Database (NCCA-4)
- Cost of Manpower Estimating Tool (COMET) (NCCA-6)

This chart lists the research that will maintain and improve our ratings for the land vehicle O&S cost-estimating capabilities. Most of the studies were also shown on earlier charts. One additional study is the CEAC sponsored "FCS O&S Cost CAIV" effort, which is an effort to tie performance to O&S costs.

This is the last slide. Overall these commodity groups ratings were impacted by a few common factors. The largest single factor affecting our estimating ability is a lack of current data.

SUMMARY

Five presentations on the DoD's capabilities to estimate the costs of weapons systems were presented at the 2001 IDA Cost Research Symposium. This appendix contains an annotated version of the last of those presentations. Presented at the symposium by Matthew Schaffer, it summarizes the previous presentations on weapon system cost-estimating capabilities.

Summary of Costing Challenges

- Software
- Electronics/avionics
- Integration and testing
- Payloads

OSD/CAIG

A review of the previous sections suggests four areas in need of cost research: software development and sustainment, electronics integration and installation, system integration and testing, and ballistic-missile and satellite payloads. The next four slides talk about each of these areas in turn.

Ship, aircraft, and ballistic-missile defense systems all have battle management command, control, communications, and intelligence (BMC3I) suites that are complex, highly integrated architectures that blend largely commercial off-the-shelf (COTS) hardware architectures and standard military communications suites with massive software programs that typically comprise multiple millions of lines of code. Satellite ground support systems are software-intensive systems with requirements for communicating with and controlling the satellite constellation; downloading and storing sensor data from the constellation; and processing, storing, and distributing these data and the resulting products.

Much of the code used in these systems is commercially available, some exists from previous developments, and some requires new development. For cost-estimating purposes, analysts need databases that capture the baseline efforts and follow-on upgrades in terms of size (code count), productivity (lines of code delivered per development hour stratified by application type), schedule, and other metrics. Estimators need relationships that can predict software size, coding productivity and schedule as a function of the complexity (generally correlated to the software functionality), and integration extent (generally correlated to the number of external and internal interfaces for each major software item). Models based on these databases must account for leverage gained from predecessor systems. For example, is productivity improved by modifying similar algorithms from previous or related systems, or is the effort equivalent to writing the new algorithm from scratch? What is the cost of integrating existing software modules into new software developments? The exponential growth in computer processing capability requires frequent re-hosting efforts to port old software onto new servers and desktop computers. What is the cost of this effort? How is obsolescence accounted for in the design and cost of ground support systems?

Electronics/Avionics

- "Small" Avionics Group B Items
  - Often individual Group B equipment items are fairly small and inexpensive; however, the quantity and number of platforms they must be integrated with drives them to MDAP status, e.g., JTRS, GPS Mod, JPALS. Need updated tools for estimating platform integration and installation activities.
- "Large" Sensor Installations
  - Designing, building, integrating and installing large sensors into airborne and sea-based platforms continues to be an area of significant interest, e.g., RTIP. Need updated tools for estimating platform integration and installation activities.
- Obsolescence
  - What are the costs of maintaining architectures with interfaces to constantly changing commercial products?
  - Do DoD systems benefit from "open-system" architectures?

OSD/CAIG

Programs that incorporate new electronic or avionic equipment into existing platforms attain MDAP status in one of two ways—either the program comprises a large, expensive sensor to be integrated into a few platforms of a single type or a relatively inexpensive electronic component (i.e., a circuit card or terminal) that must be installed into a large number of platforms of many types. Both program types have common features, such as the development and manufacturing of new functional hardware, often referred to as Group B hardware, and the design and manufacture of installation kits, often referred to as Group A kits. The latter consist of items such as structures or templates necessary for installing the Group B hardware and new cable harnesses for linking the new hardware with platform power supplies and mission computers.

Estimators need new models for understanding the costs associated with the integration, installation, and test and evaluation efforts for both types of programs. For those electronics systems that will be installed on a large number of platform types, estimators need methods for narrowing the universe of platform types to a manageable subset that can serve as useful analogies for platform types with similar integration, installation, and test and evaluation costs.

The trend in inexpensive replacement electronic components is toward form-fit-function circuit cards with the same functionality in considerably less volume. Systems that use functions such as GPS are likely to move even more toward embedding that functionality into the larger subsystems rather than linking the functionality via data buses as is currently done. Despite the low costs of such electronic components, errors in recurring cost estimates are magnified simply because of the large procurement volume.

Software

- Large software development efforts are common across DoD programs.
    - Ship, aircraft, and ballistic-missile defense programs all appear to have complex, highly integrated combat and battle management C3 systems.
    - Satellite systems generally include large ground-support C2 and mission-processing systems, with complex software architectures.
- Need a software database that captures baselines and block upgrades in terms of size, productivity, schedule, etc.
- Need estimating relationships that can predict software coding productivity and schedule as a function of software complexity and integration requirements (number of subsystems).

OSD/CAIG

Ship, aircraft, and ballistic-missile defense systems all have battle management command, control, communications, and intelligence (BMC3I) suites that are complex, highly integrated architectures that blend largely commercial off-the-shelf (COTS) hardware architectures and standard military communications suites with massive software programs that typically comprise multiple millions of lines of code. Satellite ground support systems are software-intensive systems with requirements for communicating with and controlling the satellite constellation; downloading and storing sensor data from the constellation; and processing, storing, and distributing these data and the resulting products.

Much of the code used in these systems is commercially available, some exists from previous developments, and some requires new development. For cost-estimating purposes, analysts need databases that capture the baseline efforts and follow-on upgrades in terms of size (code count), productivity (lines of code delivered per development hour stratified by application type), schedule, and other metrics. Estimators need relationships that can predict software size, coding productivity and schedule as a function of the complexity (generally correlated to the software functionality), and integration extent (generally correlated to the number of external and internal interfaces for each major software item). Models based on these databases must account for leverage gained from predecessor systems. For example, is productivity improved by modifying similar algorithms from previous or related systems, or is the effort equivalent to writing the new algorithm from scratch? What is the cost of integrating existing software modules into new software developments? The exponential growth in computer processing capability requires frequent re-hosting efforts to port old software onto new servers and desktop computers. What is the cost of this effort? How is obsolescence accounted for in the design and cost of ground support systems?

E-2

Thus, estimators also need new tools that reflect the rapid advancements in and miniaturization of digital and RF electronics. What are the fundamental phenomena behind these advances and what are appropriate tools for predicting prices of future electronics?

A related topic of growing interest, given the push to maximize use of commercial products in DoD acquisitions, especially those relying on commercially available information technology, is the issue of obsolescence. How does the rapid pace of technological advances (both in hardware and software) affect programs with acquisition cycle times significantly greater than the obsolescence period (which is true for almost all MDAPs)? Does the notion of an "open-system architecture" accurately capture what happens in today's development efforts, in the sense that programs can readily adopt new commercial developments within the systems architecture? What are the costs associated with maintaining interfaces with constantly changing commercial products? Is the cost of keeping current less than the cost of obsolescence?

Integration and Testing

- "Factors" approach is no longer adequate.
  - to reflect added complexity for system of systems
  - to represent growing application of open architectures
  - to address increased dependency on software
  - to represent expanded reliance on automation and simulation
- Collect and analyze integration and testing cost data.
  - to understand nature and scope of associated work
  - to determine cost drivers and cost estimating relationships
    - hardware cost, software size
    - test sites and facilities, test vehicles and duration

OSD/CAIG

Integration and testing costs typically are estimated using factors that are based on costs of prime mission equipment or some other subset of development or procurement costs. But factors fail to capture the added complexity of the integration task for a system of systems, do not consider the growing application of open architectures, do not address the increased dependency on software, ignore layering effects resulting from lead integrators being separate from prime equipment vendors, and do not represent the expanded reliance on automation and simulation. In addition, these efforts typically show strong time dependencies that are not captured through a factor approach.

Efforts should be undertaken to collect and analyze integration and testing cost data to understand the nature and scope of associated tasks, to determine cost drivers, and to develop estimating tools that consider features such as hardware costs, software size, program duration, number of test sites and facilities, frequency of test events, and duration of the test and evaluation effort.

Payloads
Missiles and Satellites

- Missile seekers
  - Hit-to-kill seekers appear to be significantly more challenging to design and build than predecessor proximity fused seekers.
  - Need updated missile/seeker models to reflect this quantum shift.
- Satellite payloads
  - New communication systems are under development across the RF spectrum (wideband SHF and Ka, protected EHF, and narrowband UHF).
  - New generations of meteorological and infrared sensors and new phased-array antennas for RF-based applications (e.g., GPS) are under development.
  - Need updated models for satellite payloads that incorporate not only DoD/other agency experience but also commercial experience.

OSD/CAIG

The generic hit-to-kill interceptor consists of a single- or multi-stage booster coupled to a kill vehicle front end. The kill vehicle includes a guidance section, often including a divert and attitude control system, and a seeker (usually an active radio frequency or passive infrared system, sometimes both) that make up the bulk of the interceptor cost.

The kill vehicles for hit-to-kill interceptors appear to be significantly more challenging (and, therefore, costly) to design and build than predecessor missiles that relied on proximity-fused warheads. Recent cost analyses of the PAC-3 development and recurring costs show that existing interceptor cost models would underestimate the development costs by 50 percent and the production costs by 30 percent. Using the same cost models, predictions for the THAAD EMD interceptor would have been 25 percent too low when compared to predictions based on actuals. And the NMD interceptor has cost four to ten times what the models predicted.

Estimators need updated vehicle guidance (including the divert and attitude control system) and seeker models that incorporate the latest cost information from the new systems and an understanding of the cost drivers that make today's hit-to-kill seekers more expensive.

Most of DoD's satellite constellations are primarily space-based communications architectures. Thus, most payloads consist of antennas and processors to transmit and receive communications signals. On most of the other DoD constellations (GPS being the exception), as well as most intelligence systems, the payloads consist of specialized sensors for unique military and intelligence applications.

The bulk of DoD's future satellite acquisitions will, therefore, be communication satellites. Each portion of the spectrum in which DoD operates satellite-based communication systems—wideband SHF and Ka, protected EHF, and narrowband UHF—will have replacement satellites launched within the next 8 years. Estimators need updated models for the communication payloads that incorporate not only DoD experience but also commercial experience. Such models should be sensitive to the degree of link protection required for the transmitted signals.

For the other DoD satellite acquisitions, new models are needed for the next generation of meteorological and infrared sensors, as well as new phased-array antennas for radio frequency-based sensors (e.g., GPS Modernization). Such models will likely include sensors found on non-DoD systems, such as those built for NASA, NOAA, and intelligence community applications.

[1] DoD Directive 5000.2-R, "Mandatory Procedures for MDAPs and MAIS Acquisition Programs," 11 May 1999.

[2] Stephen J. Balut and Kathryn L. Wilson, "The IDA Cost Research Symposium," Institute for Defense Analyses, Document D-647, August 1989.

[3] Stephen J. Balut and Kathryn L. Wilson, "1990 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-828, August 1990.

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[11] Stephen J. Balut, "The 1998 IDA Cost Research Symposium," Institute for Defense Analyses, Document D-2173, August 1998.

[12] Stephen J. Balut and Matthew Schaffer, "Defense Cost Research Projects and Plans, 1999," Institute for Defense Analyses, Document D-2345, August 1999.

[13] Stephen J. Balut, Vance Gordon, Deborah Cann, Richard Bishop, and Richard Collins, "Status of DoD's Capability to Estimate the Costs of Weapon Systems: 1999 Update," Institute for Defense Analyses, Document D-2300, April 1999.

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REPORT DOCUMENTATION PAGE	*Form Approved* *OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 2220-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE August 2001	3. REPORT TYPE AND DATES COVERED Aug 2000-Aug 2001	
4. TITLE AND SUBTITLE "Defense Cost Research Projects and Capabilities, 2001"		5. FUNDING NUMBERS DASW01 98 C 0067	
6. AUTHOR(S) Stephen J. Balut, Matthew J. Schaffer, Lynn C. Davis, Leonard P. Cheshire, and David W. Henningsen		BA-7-1138 and CRP C7002	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Institute for Defense Analyses 1801 N. Beauregard Street Alexandria, VA 22311-1772		8. PERFORMING ORGANIZATION REPORT NUMBER IDA Document D-2611	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) LTC Steven Galing Program Analysis and Evaluation OSD(PA&E), Room BE779 1800 Defense Pentagon Washington, DC 20301-1800		10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES Supercedes IDA Document D-2494			
12A. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.		12B. DISTRIBUTION CODE	

13. ABSTRACT (Maximum 200 words)

OSD's Cost Analysis Improvement Group (CAIG) is involved in an annual cycle of efforts aimed at improving DoD's ability to forecast future costs. During the DoD Cost Analysis Symposium, the CAIG reviews the status of DoD's capabilities to estimate the costs of forces and weapon systems. At the annual IDA Cost Research Symposium, CAIG representatives discuss ongoing and planned cost research projects with other offices and organizations involved in defense-related cost research. Following these annual events, the CAIG prepares a plan that encourages those who conduct cost research to focus on areas of highest payoff in view of pending acquisition decisions. This document presents information from certain aspects of this annual process for the 2001 cycle. It presents the summaries of current and planned cost research projects at the offices and organizations that participated in this year's IDA Cost Research Symposium and describes the Services' individual assessments of defense cost-estimating capabilities.

14. SUBJECT TERMS Cost Analysis			15. NUMBER OF PAGES 235
			16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18
298-102